

Supplements to butterfly fauna (Hesperioidea and Papilionoidea) of Grza River Gorge (Eastern Serbia)

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Abstract:

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The aim of this article is report of butterfly fauna of Grza River Gorge (Eastern Serbia). During 2008-2009. nineteen field visits have been made, 11 localities and 12 types of habitats were investigated. A faunistic account of totally 84 recorded butterfly species is given compiling the data: 30 butterfly species previously published by other authors and 81 species from our research. We recorded 54 species new to the investigated territory. Zoogeographical composition of all species is done. Comparison of the data concerning two others valleys, Lazarev Canyon and the Ibar River Gorge studied by Jakšić (2008), was made in order to show the specific fauna elements.

Key words: Butterflies, Grza River Gorge

Introduction

The butterfly fauna of Grza River Gorge has not been truly studied up to now. Only two sources provide data on butterfly species present in the area (van Swaay et al., 2007; Jakšić 2011). These references give us the list of only 29 species recorded at a single locality, Mountain home "Đorđe Živković" and one more species for Grza territory, respectively.

Grza River Gorge is located 20 km Eastern from Paraćin, at the southern side of Kučaj Mountains as a part of Carpatho-Balkanides. Examined territory includes the Grza River Gorge from Vrelo to the mouth of Čestobrodica River extending over Javorački vrh Mt. to the North-East, Veliki Kozji rog Mt. to the East and Pištolje to the West. Grza River Gorge is eight km long spreading North - South and two km from East to West. This whole region is intersected by numerous brooks. The most important springs are Malo vrelo and Vrelo. Grza River Gorge has been carved during

glacial and postglacial phase. The substrate is predominantly calcareous combine with limestone, including Neogene lake sediments, Tertiary volcanic stones, karst and partly andesite and freshwater Middle Miocene sediments.

The climate of the investigated region is temperate continental. Climate and vegetation inversion is characteristic for the Grza River Gorge. In gorges air is cooler at lower altitudes. As gorge sides shelter valley from wind, atmosphere is calm and moist. This inversion provides suitable climate conditions for mesophile plants such as *Fagus moesiaca* (K. Maly) Czech which is dominant edificator of forests in this gorge. Oak forests are distributed at higher altitudes above colline beech forests.

The preliminary number of vascular plants comprises 346 species (Zajić & Lakušić, 2004). According to Mišić (1981) relict and polydominant plant communities are typical for the Grza River Gorge. What makes this territory interesting for biological studies is a significant

presence of the large number of relict and endemorelict species from the Tertiary age and the elements of the Sub-mediterranean flora

Materials and methods

Sampling of butterflies was done by using an entomological net, and after that the specimens were mounted and conserved. The material is in author's collection. Taxonomical order and the nomenclature were given according to Karsholt & Razowsky (1996) and van Swaay et al. (2010), respectively. Nineteen field examinations were done during 2008-2009, from April to September. Localities on the map marked by numbers, the altitude, UTM 10 x 10 km code and the habitat codes are listed on fig. 1.

Determination of habitats was done on the basis of Eunis habitat classification Lakušić (2005a) and Lakušić et al. (2005), and partly Hill et al. (2004). Corresponding habitat types to Davies & Moss (2002) were identified following the Lakušić (2005b). Habitat types F3.242C, G1.691, G1.696 and G1.761 don't have corresponding habitat types in international Eunis habitat classification. As an alternative, these four habitat types were related to Serbian National classification of habitats (Lakušić & Medarević, 2010). Serbian Eunis habitat classification codes of these habitats were given together with codes and their names in English from Serbian National classification. Next habitat types were investigated:

E Grasslands and lands dominated by forbs, mosses or lichens:

E1 Dry grasslands:

E1.2 Perennial calcareous grassland and basic steppes (different than all E1.22 investigated in this study),

E1.22 Arid subcontinental steppic grassland (*Festucion valesiaca*),

E1.74 *Calamagrostis epigejos* stands,

E2.2 Low and medium altitude hay meadows,

E3.4 Moist or wet eutrophic and mesotrophic grassland,

E5 Woodland fringes and clearings and tall forb stands:

E5.21 Xero-thermophile fringes,

E5.22 Mesophile fringes;

F Heathland, scrub and tundra:

F3.242C - B2.511 Oriental hornbeam [*Carpinus orientalis*] thicket;

G Woodland, forest and other wooded land:

G1.691 - A3.22 Colline beech [*Fagus moesiaca*] forests,

G1.696 - A3.22C Polydominant relict colline beech [*Fagus moesiaca*] forest,

G1.761 - A2.111 Moesian Hungarian oak [*Quercus frainetto*] and turkey oak [*Quercus cerris*] woods,

G1.A46 Southeastern European ravine forests.

List of investigated localities.

1. Mouth of Čestobrodica to Grza, 290 m a.s.l., EP 55, E2.2, E3.4, E5.21, E5.22, G1.A46.
2. Weekend estate "Grza", 305-337 m a.s.l., EP 56, E2.2, G1.691.
3. Veliki Kozji rog Mt., 570 m a.s.l., EP 56, E1.74.
4. Mountain home "Đorđe Živković", 423 m a.s.l., EP 56, E1.22, E2.2, E5.22 G1.691, G1.761.
5. Pištolje, 547 m a.s.l., EP 56, E1.22, E5.22.
6. Vrelski krš, 650 m a.s.l., EP 56, F3.242C.
7. Vrelo, 415 m a.s.l., EP 56, G1.691.
8. Vrelska padina, 679 m a.s.l., EP 56, E1.22, G1.761.
9. Barski vrh Mt., 785 m a.s.l., EP 56, E1.2, G1.696.
10. Javoračke padine, 778 m a.s.l., EP 56, E2.2, E5.22.
11. Javorački vrh Mt., 930 m a.s.l., EP 56, F3.242C.

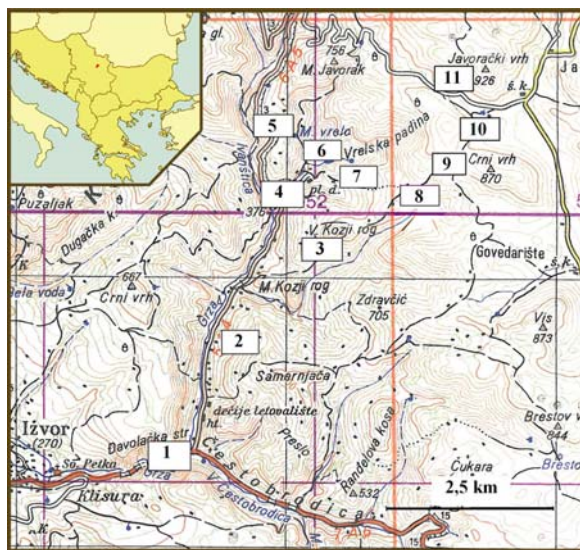


Figure 1. Map of investigated localities

Results

The following list includes all data of butterflies recorded in Grza River Gorge. All new data were made by the author.

Superfamily Hesperioidea
Family Hesperidae

1. *Erynnis tages* (Linnaeus, 1758)

New data: Weekend estate "Grza" (E2.2), 20.04.2009; Mouth of Čestobrodica to Grza (E5.21), 12.07.2009.

2. *Carcharodus alceae* (Esper, 1780)

New data: Weekend estate (E2.2), 13.06.2009.

3. *Pyrgus sidae* (Esper, 1784)

New data: Vrelska padina (E1.22), 14.06.2009.

4. *Pyrgus malvae* (Linnaeus, 1758)

New data: Weekend estate "Grza" (E2.2), 20.04.2009; Mouth of Čestobrodica to Grza (E5.21), 10.5.2009.

5. *Thymelicus lineola* (Ochsenheimer, 1808)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Weekend estate "Grza" (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E1.22), 07.07.2009; Mouth of Čestobrodica to Grza (E5.21), 12.07.2009.

6. *Thymelicus sylvestris* (Poda, 1761)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mouth of Čestobrodica to Grza (E2.2), 13.06.2009; Pištolje (E1.22), 09.07.2009.

7. *Thymelicus acteon* (Rottentburg, 1775)

New data: Mouth of Čestobrodica to Grza (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Vrelska padina (E1.22), 14.06.2009.

8. *Ochlodes sylvanus* (Esper, 1777)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mountain home "Đorđe Živković" (E2.2), 28.07.2008; Mountain home "Đorđe Živković" (E1.22), 01.08.2008; Mouth of Čestobrodica to Grza (E2.2), 13.06.2009; Vrelska padina (E1.22), 14.06.2009; Mountain home "Đorđe Živković" (E2.2), 07.07.2009; Vrelo (G1.691), 08.07.2009; Pištolje (E1.22, E5.22), 09.07.2009; Mouth of Čestobrodica to Grza (E5.21), 12.07.2009; Mouth of Čestobrodica to Grza (E2.2), 12.07.2009; Weekend estate "Grza" (E2.2), 13.07.2009; Vrelska padina (E1.22), 15.07.2009; Barski vrh (E1.2), 15.07.2009; Javoračke padine (E2.2), 15.07.2009;

Javorački vrh (F3.242C), 15.07.2009; Mouth of Čestobrodica to Grza (E5.21), 02.09.2009.

Superfamily Papilionoidea
Family Papilionidae

9. *Zerynthia polyxena* (Denis & Schiffermüller, 1775)

New data: Mouth of Čestobrodica to Grza (E2.2), 10.05.2009.

10. *Zerynthia cerisy* (Godart, 1824)

New data: Mouth of Čestobrodica to Grza (E5.21), 10.05.2010; Mouth of Čestobrodica to Grza (E2.2), 13.06.2009, larvae.

11. *Parnassius mnemosyne* (Linnaeus, 1758)

New data: Vrelska padina (E1.22), 14.06.2009.

12. *Iphiclides podalirius* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mountain home "Đorđe Živković" (E2.2), 28.07.2008; Mountain home "Đorđe Živković" (E1.22), 29.07.2008; Vrelska padina (E1.22), 31.07.2008; Javoračke padine (E2.2), 31.07.2008; Mountain home "Đorđe Živković" (E1.22), 01.08.2008; Vrelo (G1.691), 01.08.2008; Veliki Kozji rog (E1.74), 02.08.2008; Mouth of Čestobrodica to Grza (E2.2), 04.08.2008; Weekend estate "Grza" (E2.2), 20.04.2009; Mouth of Čestobrodica to Grza (E5.21), 10.05.2009; Mouth of Čestobrodica to Grza (E3.4, E5.21), 13.06.2009; Weekend estate (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Mountain home "Đorđe Živković" (E2.2), 07.07.2009; Vrelo (G1.691), 08.07.2009; Pištolje (E1.22, E5.22), 09.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 12.07.2009; Javoračke padine (E2.2), 15.07.2009.

13. *Papilio machaon* (Linnaeus, 1758)

New data: Javoračke padine (E2.2), 31.07.2008; Mouth of Čestobrodica to Grza (E2.2), 10.05.2009; Mouth of Čestobrodica to Grza (E2.2), 02.09.2009.

Family Pieridae

14. *Leptidea sinapis* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Javoračke padine (E2.2), 31.07.2008; Weekend estate "Grza" (E2.2), 20.04.2009; Mouth of Čestobrodica to Grza (E3.4), 10.05.2009, 2\$M; Mouth of Čestobrodica to Grza (E5.21), 13.06.2009;

Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Vrelska padina (E1.22), 14.06.2009; Mountain home "Đorđe Živković" (E1.22, E.22), 07.07.2009; Vrelo (G1.691), 08.07.2009; Pištolje (E1.22, E5.22), 09.07.2009; Mouth of Čestobrodica to Grza (E5.21), 12.07.2009; Weekend estate "Grza" (E2.2), 13.07.2009; Mouth of Čestobrodica to Grza (E2.2, E3.4, E5.21), 12.07.2009; Vrelska padina (E1.22), 15.07.2009; Barski vrh (E1.2), 15.07.2009; Javoračke padine (E2.2), 15.07.2009; Mouth of Čestobrodica to Grza (E2.2, E3.4, E5.21), 02.09.2009.

15. *Antocharis cardamines* (Linnaeus, 1758)

New data: Weekend estate "Grza" (E2.2), 20.04.2009; Mouth of Čestobrodica to Grza (E3.4), 10.05.2009.

16. *Aporia crataegi* (Linnaeus, 1758)

New data: Mouth of Čestobrodica to Grza (E2.2, E5.21), 13.06.2009; Weekend estate (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Vrelska padina (E1.22), 14.06.2009.

17. *Pieris rapae* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mountain home "Đorđe Živković" (E2.2), 28.07.2008; Javoračke padine (E2.2), 31.07.2008; Vrelo (G1.691), 01.08.2008; Mountain home "Đorđe Živković" (E2.2), 03.08.2008; Weekend estate "Grza" (E2.2), 20.04.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 10.05.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 13.06.2009; Weekend estate (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Vrelska padina (E1.22), 14.06.2009; Mountain home "Đorđe Živković" (E1.22, E2.2), 07.07.2009; Vrelo (G1.691), 08.07.2009; Pištolje (E1.22, E5.22), 09.07.2009; Mouth of Čestobrodica to Grza (E5.21), 12.07.2009; Mouth of Čestobrodica to Grza (E2.2, E3.4, E5.21), 12.07.2009; Weekend estate (E2.2), 13.07.2009; Vrelska padina (E1.22), 15.07.2009; Barski vrh (E1.2), 15.07.2009; Javoračke padine (E2.2), 15.07.2009; Javorački vrh (F3.242C), 15.07.2009; Mouth of Čestobrodica to Grza (E2.2, E3.4, E5.21), 02.09.2009.

18. *Pieris napi* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Weekend estate "Grza" (E2.2), 20.04.2009; Mouth of Čestobrodica to Grza (E2.2, E3.4, E5.21) 10.05.2009; Mouth of Čestobrodica to

Grza (E5.21, G1.A46), 13.06.2009; Mouth of Čestobrodica to Grza (E5.21), 12.07.2009; Mouth of Čestobrodica to Grza (E5.21), 02.09.2009.

19. *Colias erate* (Esper, 1805)

New data: Mountain home "Đorđe Živković" (E2.2), 28.07.2008; Mountain home "Đorđe Živković" (E1.22), 01.08.2008.

20. *Colias croceus* (Fourcroy, 1785)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mountain home "Đorđe Živković" (E2.2), 28.07.2008; Mountain home "Đorđe Živković" (E1.22), 29.07.2008; Mouth of Čestobrodica to Grza (E2.2), 04.08.2008; Mountain home "Đorđe Živković" (E2.2), 08.07.2009; Mouth of Čestobrodica to Grza (E2.2), 13.06.2009; Mouth of Čestobrodica to Grza (E2.2), 12.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 02.09.2009.

21. *Colias hyale* (Linnaeus, 1758)

New data: Mouth of Čestobrodica to Grza (E5.21), 12.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 02.09.2009.

22. *Gonepteryx rhamni* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Javoračke padine (E5.22), 31.07.2008; Weekend estate "Grza" (E2.2), 20.04.2009, 25M; Mouth of Čestobrodica to Grza (E5.21, E5.22), 10.05.2009; Mouth of Čestobrodica to Grza (E5.21), 13.06.2009; Mountain home "Đorđe Živković" (E5.22), 14.06.2009; Vrelska padina (E1.22), 14.06.2009; Mountain home "Đorđe Živković" (E2.2), 07.07.2009; Weekend estate "Grza" (E2.2), 13.07.2009; Mouth of Čestobrodica to Grza (E5.21, E5.22), 12.07.2009; Javorački vrh (F3.242C), 15.07.2009.

Family Riodinidae

23. *Hamearis lucina* (Linnaeus, 1758)

New data: Mountain home "Đorđe Živković" (E2.2), 28.07.2008; Mouth of Čestobrodica to Grza (E2.2), 10.05.2009.

Family Lycaenidae

24. *Lycaena phlaeas* (Linnaeus, 1761)

New data: Mouth of Čestobrodica to Grza (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Vrelska padina (E1.22),

14.06.2009; Pištolje (E1.22), 09.07.2009; Mouth of Čestobrodica to Grza (E2.2), 02.09.2009.

25. *Lycaena dispar* (Haworth, 1802)

New data: Mouth of Čestobrodica to Grza (E2.2), 13.06.2009; Vrelska padina (E1.22), 14.06.2009; Mouth of Čestobrodica to Grza (E2.2), 02.09.2009.

26. *Lycaena virgaureae* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Vrelska padina (E1.22), 14.06.2009; Weekend estate (E2.2), 13.07.2009.

27. *Lycaena tityrus* (Poda, 1761)

New data: Mouth of Čestobrodica to Grza (E3.4), 10.05.2009; Mouth of Čestobrodica to Grza (E2.2), 02.09.2009.

28. *Lycaena alciphron* (Rottemburg, 1775)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. Van Swaay et al. (2007).

New data: Vrelska padina (E1.22), 14.06.2009.

29. *Lycaena thersamon* (Esper, 1784)

New data: Vrelska padina (E1.22), 14.06.2009.

30. *Favonius quercus* (Linnaeus, 1758)

New data: Vrelska padina (G1.761), 02.08.2008.

31. *Callophrys rubi* (Linnaeus, 1758)

New data: Vrelska padina (E1.22), 14.06.2009.

32. *Satyrrium ilicis* (Esper, 1779)

New data: Mouth of Čestobrodica to Grza (E5.21, E5.22, G1.A46), 13.06.2009; Vrelska padina (G1.761), 14.06.2009; Mouth of Čestobrodica to Grza (G1.A46), 12.07.2009.

33. *Cupido argiades* (Pallas, 1771)

New data: Mouth of Čestobrodica to Grza (E2.2, E3.4, E5.21), 02.09.2009.

34. *Celastrina argiolus* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mouth of Čestobrodica to Grza (E5.21), 13.06.2009; Vrelska padina (E1.22), 14.06.2009; Mountain home "Đorđe Živković" (E1.22, E2.2), 07.07.2009; Vrelo (G1.691), 08.07.2009; Mouth of Čestobrodica to Grza (E1.22), 13.07.2009; Weekend estate "Grza" (E2.2), 13.07.2009.

35. *Scolitantides orion* (Pallas, 1771)

New data: Mouth of Čestobrodica to Grza (E5.21), 10.05.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21, G1.A46), 12.07.2009.

36. *Iolana iolas* (Ochsenheimer, 1816)

New data: Mountain home "Đorđe Živković" (E1.22), 39.07.2008.

37. *Phengaris alcon* (Doherty, 1891)

New data: Javoračke padine (E2.2), 15.07.2009.

38. *Plebejus argus* (Linnaeus, 1758)

New data: Mountain home "Đorđe Živković" (E1.22), 01.08.2008; Mountain home "Đorđe Živković" (E2.2), 03.08.2008.

39. *Plebejus idas* (Linnaeus, 1761)

New data: Vrelska padina (E1.22), 14.06.2009.

40. *Aricia agestis* (Denis & Schiffermüller, 1775)

New data: Mouth of Čestobrodica to Grza (E2.2, E5.21), 02.09.2009.

41. *Aricia artaxerxes* (Fabricius, 1793)

New data: Pištolje (E1.22), 09.07.2009.

42. *Polyommatus semiargus* (Rottemburg, 1775)

New data: Mouth of Čestobrodica to Grza (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Mountain home "Đorđe Živković" (E1.22), 07.07.2009.

43. *Polyommatus amandus* (Schneider, 1792)

New data: Mouth of Čestobrodica to Grza (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009.

44. *Polyommatus thersites* (Cantener, 1835)

New data: Mouth of Čestobrodica to Grza (E2.2, E5.21), 13.06.2009; Vrelska padina (E1.22), 14.06.2009.

45. *Polyommatus icarus* (Rottemburg, 1775)

New data: Mouth of Čestobrodica to Grza (E3.4), 10.05.2009; Mouth of Čestobrodica to Grza (E2.2, E3.4, E5.21), 13.06.2009; Weekend estate "Grza" (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Mountain home "Đorđe Živković" (E1.22), 07.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 12.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 02.09.2009.

46. *Polyommatus daphnis* (Denis & Schiffermüller, 1775)

New data: Mountain home "Đorđe Živković" (E2.2), 28.07.2008; Vrelska padina (E1.22), 31.07.2008; Veliki Kozji rog (E1.74), 02.08.2008; Pištolje (E5.22), 09.07.2009; Mouth of Čestobrodica to Grza (E5.21, G1.A46), 12.07.2009; Weekend estate (E2.2), 13.07.2009; Vrelska padina (E1.22), 15.07.2009; Javoračke padine (E2.2), 15.07.2009.

Family Nymphalidae

47. *Argynnis paphia* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mountain home "Đorđe Živković" (E2.2), 28.07.2008; Mountain home "Đorđe Živković" (E1.22), 29.07.2008; Vrelska padina (E1.22), 31.07.2008; Javoračke padine (E2.2), 31.07.2008; Mountain home "Đorđe Živković" (E1.22), 01.08.2008; Vrelo (G1.691), 01.08.2008; Mountain home "Đorđe Živković" (E2.2), 03.08.2008; Mouth of Čestobrodica to Grza (E2.2), 04.08.2008; Mouth of Čestobrodica to Grza (E5.21), 13.06.2009; Weekend estate "Grza" (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Mountain home "Đorđe Živković" (E2.2, E5.22), 07.07.2009; Vrelo (G1.691), 08.07.2009; Pištolje (E1.22, E5.22), 09.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 12.07.2009; Barski vrh (E1.2), 15.07.2009; Vrelska padina (E1.22), 15.07.2009; Javoračke padine (E2.2), 15.07.2009; Javorački vrh (F3.242C), 15.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 02.09.2009.

48. *Argynnis aglaja* (Linnaeus, 1758)

New data: Mountain home "Đorđe Živković" (E2.2), 07.07.2009; Javoračke padine (E2.2), 15.07.2009.

49. *Argynnis adippe* (Denis & Schiffermüller, 1775)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

50. *Argynnis niobe* (Linnaeus, 1758)

New data: Mountain home "Đorđe Živković" (E2.2), 14.06.2009.

51. *Issoria lathonia* (Linnaeus, 1758)

New data: Mountain home "Đorđe Živković" (E2.2), 28.07.2008; Javoračke padine (E2.2), 31.07.2008; Mountain home "Đorđe Živković" (E2.2), 03.08.2008; Mouth of Čestobrodica to Grza (E2.2), 04.08.2008; Mouth of Čestobrodica to Grza

(E5.21), 10.05.2009; Mouth of Čestobrodica to Grza (E5.21), 13.06.2009; Weekend estate "Grza" (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Vrelska padina (E1.22), 14.06.2009; Mountain home "Đorđe Živković" (E2.2), 07.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 12.07.2009; Weekend estate "Grza" (E2.2), 13.07.2009; Barski vrh (E1.2), 15.07.2009; Javoračke padine (E2.2), 15.07.2009; Javorački vrh (F3.242C), 15.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 02.09.2009.

52. *Brenthis daphne* (Denis & Schiffermüller, 1775)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mouth of Čestobrodica to Grza (E2.2), 13.06.2009; Weekend estate "Grza" (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Vrelska padina (E1.22), 14.06.2009; Mountain home "Đorđe Živković" (E2.2), 07.07.2009; Vrelo (G1.691), 08.07.2009; Pištolje (E1.22), 09.07.2009; Mouth of Čestobrodica to Grza (E2.2, E3.4, E5.21), 12.07.2009; Weekend estate "Grza" (E2.2), 13.07.2009; Barski vrh (E1.2), 15.07.2009; Vrelska padina (E1.22), 15.07.2009; Javoračke padine (E2.2), 15.07.2009; Javorački vrh (F3.242C), 15.07.2009.

53. *Brenthis hecate* (Denis & Schiffermüller, 1775)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mouth of Čestobrodica to Grza (E2.2), 13.06.2009; Weekend estate "Grza" (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 07.07.2009.

54. *Boloria dia* (Linnaeus, 1767)

New data: Mouth of Čestobrodica to Grza (E2.2), 02.09.2009.

55. *Vanessa atalanta* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mountain home "Đorđe Živković" (E2.2), 28.07.2008; Mountain home "Đorđe Živković" (E1.22), 29.07.2008; Javoračke padine (E2.2), 31.07.2008; Mouth of Čestobrodica to Grza (E2.2), 04.08.2008; Mouth of Čestobrodica to Grza (E5.21), 13.06.2009; Weekend estate "Grza" (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2, E5.22), 07.07.2009; Vrelo (G1.691), 08.07.2009; Pištolje (E1.22, E5.22), 09.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 12.07.2009; Weekend estate "Grza" (E2.2),

13.07.2009; Javoračke padine (E2.2), 15.07.2009; Mouth of Čestobrodica to Grza (E2.2), 02.09.2009.

56. *Vanessa cardui* (Linnaeus, 1758)

New data: Mouth of Čestobrodica to Grza (E5.21), 13.06.2009; Weekend estate "Grza" (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Pištolje (E1.22, E5.22), 09.07.2009; Weekend estate "Grza" (E2.2), 13.07.2009; Mouth of Čestobrodica to Grza (E2.2), 12.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 02.09.2009.

57. *Aglais io* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Javoračke padine (E2.2), 31.07.2008; Mountain home "Đorđe Živković" (E1.22, E2.2), 07.07.2009; Weekend estate "Grza" (E2.2), 13.07.2009; Mouth of Čestobrodica to Grza (E2.2), 12.07.2009; Javoračke padine (E2.2), 15.07.2009; Mouth of Čestobrodica to Grza (E2.2), 02.09.2009.

58. *Aglais urticae* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mouth of Čestobrodica to Grza (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009.

59. *Polygonia c-album* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Javoračke padine (E5.22), 31.07.2008; Weekend estate "Grza" (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E5.22), 14.06.2009; Vrelo (G1.691), 08.07.2009; Mountain home "Đorđe Živković" (E5.22), 07.07.2009; Mouth of Čestobrodica to Grza (E5.21), 12.07.2009; Weekend estate "Grza" (E2.2), 13.07.2009; Javoračke padine (E5.22), 15.07.2009; Mouth of Čestobrodica to Grza (E5.21), 02.09.2009.

60. *Araschnia levana* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Weekend estate "Grza" (E2.2), 20.04.2009; Mountain home "Đorđe Živković" (E5.22, G1.691), 07.07.2009; Mouth of Čestobrodica to Grza (E2.2), 02.09.2009; Mouth of Čestobrodica to Grza (E2.2), 02.09.2009.

61. *Nymphalis antiopa* (Linnaeus, 1758)

New data: Mouth of Čestobrodica to Grza (E5.22), 10.05.2009.

62. *Nymphalis polychloros* (Linnaeus, 1758)

New data: Mountain home "Đorđe Živković" (E5.22), 07.07.2009.

63. *Melitaea cinxia* (Linnaeus, 1758)

New data: Vrelska padina (E1.22), 14.06.2009.

64. *Melitaea arduinna* (Esper, 1783)

Published data: EP 56, Grza River, 380 – 420 m, 14.06.2009. (termophile meadows in vicinity of oak forest) Jakšić (2011).

65. *Melitaea trivia* (Denis & Schiffermüller, 1775)

New data: Mouth of Čestobrodica to Grza (E5.21), 10.05.2009; Pištolje (E1.22), 09.07.2009.

66. *Melitaea didyma* (Esper, 1778)

New data: Mouth of Čestobrodica to Grza (E2.2, E3.4, E5.21), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Vrelska padina (E1.22), 14.06.2009; Mountain home "Đorđe Živković" (E1.22, E2.2), 07.07.2009; Mouth of Čestobrodica to Grza (E2.2), 12.07.2009; Vrelska padina (E1.22), 15.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 02.09.2009.

67. *Melitaea aurelia* (Nickerl, 1850)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

68. *Melitaea athalia* (Rottemburg, 1775)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mouth of Čestobrodica to Grza (E2.2, E3.4), 13.06.2009; Weekend estate "Grza" (E2.2), 13.06.2009; Vrelska padina (E1.22), 14.06.2009.

69. *Limenitis camilla* (Linnaeus, 1764)

New data: Mountain home "Đorđe Živković" (E5.22), 28.07.2008; Javoračke padine (E5.22), 15.07.2009.

70. *Neptis sappho* (Pallas, 1771)

New data: Mountain home "Đorđe Živković" (E5.22), 28.07.2008; Vrelo (G1.691), 01.08.2008; Mountain home "Đorđe Živković" (G1.761), 03.08.2008; Mouth of Čestobrodica to Grza (E3.4), 10.05.2009; Weekend estate "Grza" (G1.691), 13.07.2009; Mouth of Čestobrodica to Grza (E5.21, E5.22, G1.A46), 02.09.2009.

71. *Apatura ilia* (Denis & Schiffermüller, 1775)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mouth of Čestobrodica to Grza (E5.21), 13.06.2009; Mouth of Čestobrodica to Grza (G1.A46), 12.07.2009.

72. *Apatura iris* (Linnaeus, 1758)

New data: Mountain home "Đorđe Živković" (G1.761), 07.07.2009.

73. *Kirinia roxelana* (Cramer, 1777)

New data: Barski vrh (G1.696), 15.07.2009, 1\$M.

74. *Pararge aegeria* (Linnaeus, 1758)

New data: Vrelski krš (F3.242C), 30.07.2008; Vrelo (G1.691), 01.08.2008; Mouth of Čestobrodica to Grza (E3.4, E5.21, G1.A46), 10.05.2009; Mountain home "Đorđe Živković" (G1.691), 14.06.2009; Vrelska padina (G1.761), 14.06.2009; Vrelo (G1.691), 08.07.2009; Mountain home "Đorđe Živković" (G1.691), 07.07.2009; Mouth of Čestobrodica to Grza (E3.4), 12.07.2009; Weekend estate "Grza" (G1.691), 13.07.2009; Barski vrh (G1.696), 15.07.2009; Javorački vrh (F3.242C), 15.07.2009.

75. *Lasiommata megera* (Linnaeus, 1767)

New data: Mouth of Čestobrodica to Grza (E5.21), 12.07.2009; Mouth of Čestobrodica to Grza (E5.21), 02.09.2009.

76. *Coenonympha arcania* (Linnaeus, 1761)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mouth of Čestobrodica to Grza (E2.2, E3.4, E5.21), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Vrelska padina (E1.22), 14.06.2009; Pištolje (E1.22, E5.22), 09.07.2009; Mouth of Čestobrodica to Grza (E3.4, E5.21, G1.A46), 12.07.2009; Weekend estate "Grza" (E2.2), 13.07.2009; Barski vrh (E1.2), 15.07.2009; Vrelska padina (E1.22), 15.07.2009; Javoračke padine (E2.2), 15.07.2009.

77. *Coenonympha pamphilus* (Linnaeus, 1758)

New data: Mountain home "Đorđe Živković" (E2.2), 28.07.2008; Vrelska padina (E1.22), 31.07.2008; Barski vrh (E1.2), 31.07.2008; Javoračke padine (E2.2), 31.07.2008; Vrelska padina (E1.22), 02.08.2008; Veliki Kozji rog (E1.74), 02.08.2008; Mountain home "Đorđe Živković" (E2.2), 03.08.2008; Mouth of Čestobrodica to Grza (E2.2), 04.08.2008; Mouth of

Čestobrodica to Grza (E2.2), 10.05.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 13.06.2009; Weekend estate "Grza" (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Vrelska padina (E1.22), 14.06.2009; Mountain home "Đorđe Živković" (E2.2), 07.07.2009; Pištolje (E1.22), 09.07.2009; Weekend estate "Grza" (E2.2), 13.07.2009; Vrelska padina (E1.22), 15.07.2009; Javoračke padine (E2.2), 15.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 02.09.2009.

78. *Aphantopus hyperantus* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mountain home "Đorđe Živković" (E2.2), 28.07.2008; Javoračke padine (E2.2), 31.07.2008; Vrelo (G1.691), 08.07.2009; Mountain home "Đorđe Živković" (E2.2), 07.07.2009; Pištolje (E1.22, E5.22), 09.07.2009; Barski vrh (E1.2), 15.07.2009; Vrelska padina (E1.22), 15.07.2009; Javoračke padine (E2.2), 15.07.2009.

79. *Maniola jurtina* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Mountain home "Đorđe Živković" (E2.2), 28.07.2008; Vrelski krš (F3.242C), 30.07.2008; Barski vrh (E1.2), 31.07.2008; Javoračke padine (E2.2), 31.07.2008; Vrelska padina (E1.22), 02.08.2008; Veliki Kozji rog (E1.74), 02.08.2008; Mountain home "Đorđe Živković" (E2.2, G1.691), 03.08.2008; Mountain home "Đorđe Živković" (E1.22), 04.08.2008; Mouth of Čestobrodica to Grza (E2.2), 04.08.2008; Mouth of Čestobrodica to Grza (E2.2, E3.4, E5.21, G1.A46), 13.06.2009; Weekend estate "Grza" (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Vrelska padina (E1.22), 14.06.2009; Mountain home "Đorđe Živković" (E1.22, E2.2, E5.22), 07.07.2009; Vrelo (G1.691), 08.07.2009; Pištolje (E1.22, E5.22), 09.07.2009; Mouth of Čestobrodica to Grza (E2.2, E3.4, E5.21), 12.07.2009; Weekend estate "Grza" (E2.2), 13.07.2009; Barski vrh (E1.2), 15.07.2009; Vrelska padina (E1.22), 15.07.2009; Javoračke padine (E2.2), 15.07.2009; Javorački vrh (F3.242C), 15.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 02.09.2009.

80. *Erebia medusa* (Denis & Schiffermüller, 1775)

New data: Vrelska padina (E1.22), 14.06.2009.

81. *Melanargia galathea* (Linnaeus, 1758)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Vrelska padina (E1.22), 31.07.2008; Barski vrh (E1.2), 31.07.2008; Javoračke padine (E2.2), 31.07.2008; Vrelska padina (E1.22), 02.08.2008; Weekend estate "Grza" (E2.2), 13.06.2009; Mountain home "Đorđe Živković" (E2.2), 14.06.2009; Mountain home "Đorđe Živković" (E2.2, E5.22), 07.07.2009; Vrelo (G1.691), 08.07.2009; Pištolje (E1.22, E5.22), 09.07.2009; Mouth of Čestobrodica to Grza (E2.2, E3.4, E5.21), 12.07.2009; Weekend estate "Grza" (E2.2), 13.07.2009; Barski vrh (E1.2), 15.07.2009; Vrelska padina (E1.22), 15.07.2009; Javoračke padine (E2.2), 15.07.2009; Javorački vrh (F3.242C), 15.07.2009.

82. *Minois dryas* (Scopoli, 1763)

New data: Mountain home "Đorđe Živković" (E2.2), 28.07.2008; Vrelski krš (F3.242C), 30.07.2008; Vrelska padina (E1.22), 31.07.2008; Barski vrh (E1.2), 31.07.2008; Vrelska padina (E1.22), 31.07.2008; Veliki Kozji rog (E1.74),

02.08.2008; Mountain home "Đorđe Živković" (E2.2, G1.691, G1.761), 03.08.2008; Vrelska padina (E1.22, G1.761), 15.07.2009; Mouth of Čestobrodica to Grza (E2.2), 02.09.2009.

83. *Arethusana arethusa* (Denis & Schiffermüller, 1775)

New data: Mountain home "Đorđe Živković" (E5.22), 03.08.2008.

84. *Brintesia circe* (Fabricius, 1775)

Published data: Grza (380-420 m, UTM: EP 46), 15.07.2005. van Swaay et al. (2007).

New data: Javoračke padine (E2.2), 31.07.2008; Veliki Kozji rog (E1.74), 02.08.2008; Mountain home "Đorđe Živković" (E1.22), 04.08.2008; Mountain home "Đorđe Živković" (E2.2), 07.07.2009; Pištolje (E1.22, E5.22), 09.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 12.07.2009; Weekend estate "Grza" (E2.2), 13.07.2009; Barski vrh (E1.2), 15.07.2009; Vrelska padina (E1.22), 15.07.2009; Mouth of Čestobrodica to Grza (E2.2, E5.21), 02.09.2009.

Table 1. Comparative review of specific elements of butterfly fauna of three Valleys

Specific elements of butterfly fauna	Lazarev Canyon	Grza River Gorge	Ibar River Gorge
<i>Zerinthia cerisyi</i> (Godart, 1824)	+	+	-
<i>Melitaea arduinna</i> (Esper, 1783)	+	+	-
<i>Pyrgus sidae</i> (Esper, 1784)	-	+	-
<i>Iolana iolas</i> (Ochsenheimer, 1816)	-	+	-
<i>Maculinea alcon</i> (D. & S., 1775)	-	+	-
<i>Aricia artaxerxes</i> (Fabricius, 1793)	-	+	-
<i>Melitaea aurelia</i> (Nickerl, 1850)	-	+	-
<i>Colias erate</i> (Esper, 1805)	-	+	-
<i>Pseudophilotes vicrama</i> (Moore, 1865)	-	-	+
<i>Euphidryas aurinia</i> (Rottemburg, 1775)	-	-	+
<i>Melanargia larissa</i> (Geyer, 1828)	-	-	+

Discussion and conclusion

The total number of recorded species is 84. Quantitative composition of established butterfly species is determined as moderate abundance, following the scale which determines the selection of Prime Butterfly Areas in Serbia (Jakšić (ed.), 2008). There has been recorded 54 species of butterflies new to Grza River Gorge territory. Compared with van Swaay *et al.*, (2007) data, all species were rerecorded, except *Argynnis adippe* and *Melitaea aurelia*, since they are rare in Serbia.

The data for *Melitaea arduinna* is done on the basis of Jakšić (2011). All species are inside the boundaries of their known area of distribution. We consider that level of fauna knowledge is satisfactory.

Zoogeographical division of established species is done according to Jakšić (1998). In zoogeographical point of view Middle-European species are dominant (30 species, 36%) followed by Pontic-Mediterranean group with 16 species (19%). Sub-Mediterranean species (12 species, 14%) are also significant members of Grza River Gorge fauna.

Specific elements of butterfly fauna studied in this paper are compared to specific elements of butterfly fauna of Lazarev Canyon and the Ibar River Gorge on the basis of previous study (Jakšić (ed.), 2008). Lazarev Canyon and the Grza River Gorge belong to Moesian floristic province. Ibar River Gorge is under influence of Illyric province. This comparison is presented in **Table 1**.

After analysing recorded species we can conclude that butterfly fauna of Ibar Gorge is clearly different because of the presence of species *P. vicrama*, *E. aurinia* and *M. larissa* and also because of the absence of *Z. cerisyi* and *M. arduinna*. These elements make the main difference between Illyric and Moesian province. On the other side, species registered in the Grza River Gorge, but not in Lazarev Canyon: *P. sidae*, *C. erate*, *I. iolas*, *M. alcon*, *A. artaxerxes* and *M. aurelia* are species from open sunny worm habitats which are not present in covered plot of Lazarev Canyon. *M. arduinna* is the best represent of Moesian province.

Habitat analysis is made consisting 81 species recorded by author, excluding *A. adippe* *M. arduinna* and *M. aurelia*. Analysis showed that 96,3% of 81 species are recorded at E Grasslands and lands dominated by forbs, mosses or lichens, 12,3% at F Heathland, scrub and tundra and 30,9% at G Woodland, forest and other wooded land. High percentage of butterfly species inhabit forests occurs due to dominance of forest habitats in the Grza River Gorge territory especially G1.69 Moesian *Fagus* forests (G1.691 and/or G1.696) where 19,7% species were recorded. E2.2 Low and medium hay meadows are the most suitable habitat types for butterflies having in mind that 71,6% of species were recorded here. In E1 Dry grasslands (E1.2, E1.22 and/or E1.74) were found 56,8% of species, while also high percentage 54,3% were registered in E5 Woodland fringes and clearings and tall forb stands (E5.21 and/or E5.22). In E3.4 Moist or wet eutrophic and mesotrophic grassland 19,7% species were found, although there is only one meadow of that type in investigated territory. G1.761 - A2.111 Moesian Hungarian oak [*Quercus frainetto*] and turkey oak [*Quercus cerris*] woods and G1.A46 Southeastern European ravine forests inhabits 7,4% and 11,1%, respectively.

Natural habitats in Grza River Gorge are still in good condition, but the intensive touristic development, as well as moderate traffic influence is potential risk for habitat destruction. What makes the special and much stronger reason for providing habitat protection in the Grza River Gorge is occurrence of 9 target species listed in Prime butterfly areas in Serbia (Jakšić (ed.), 2008) (No. from list of species: 7, 9, 11, 25, 35, 37, 64, 67, 80)

and 11 strictly protected species by law of Republic Serbia (Anonymous, 2010) (No. from list of species: 3, 9, 11, 13, 25, 36, 37, 61, 67, 71, 72).

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References

- Anonymous, 2010. Pravilnik o proglašenju i zaštiti strogo zaštićenih biljnih vrsta biljaka, životinja i gljiva. Prilog 2. Strogo zaštićene vrste. Službeni glasnik RS br 5/10.
- Davies, C.E. & Moss, D. 2002: EUNIS Habitat classification - European Habitats Classification System, European Environment Agency & European Topic Centre on Nature Protection and Biodiversity.
- Hill, M.O., Moss, D. & Davies, C.E., 2004. Revision of habitat descriptions originating from Devillers *et al* (2001). European Topic Centre on Nature Protection and Biodiversity, Paris.
- Jakšić, P., 1998. Altitudinal and biogeographical division of the butterflies of Balkan peninsula (Lepidoptera: Hesperioidea & Papilionoidea). *The university thought*, 5(2): 77-88.
- Jakšić, P. (ed.), 2008. Prime Butterfly Areas in Serbia. HabiProt, Beograd, 223 pp.
- Jakšić, P., 2011. *Melitaea arduinna* (Lepidoptera: Nymphalidae): a new species for Serbia. *Phegea* 39(1): 8-11.
- Karsholt, O. & Razowsky, J., 1996. The Lepidoptera of Europe, A Distribution Checklist, Apollo Books, Stenstrup, 380 pp.
- Lakušić, D., 2005a. Ključ za identifikaciju staništa Srbije. - In: Lakušić, D. (ed.), Staništa Srbije, Rezultati projekta "Harmonizacija nacionalne nomenklature u klasifikaciji staništa sa standardima međunarodne zajednice", Institut za Botaniku i Botanička Bašta "Jevremovac", Biološki fakultet, Univerzitet u Beogradu, Ministarstvo za nauku i zaštitu životne sredine Republike Srbije, <http://habitat.bio.bg.ac.rs/>
- Lakušić, D., 2005b. Veze između međunarodnih klasifikacija staništa i klasifikacija staništa Srbije. - In: Lakušić, D. (ed.), Staništa Srbije, Rezultati projekta "Harmonizacija nacionalne nomenklature u klasifikaciji staništa sa standardima međunarodne zajednice", Institut za

- Botaniku i Botanička Bašta “Jevremovac”, Biološki fakultet, Univerzitet u Beogradu, Ministarstvo za nauku i zaštitu životne sredine Republike Srbije, <http://habitat.bio.bg.ac.rs/>
- Lakušić, D., Blaženčić, J., Randelović, V., Butorac, B., Vukojičić, S., Zlatković B., Jovanović, S., Šindar-sekulić, J., Žukovec, D., Čalić, I., Pavićević, D. 2005. Staništa Srbije – Priručnik sa opisima i osnovnim podacima. - In: Lakušić, D. (ed.), Staništa Srbije, Rezultati projekta “Harmonizacija nacionalne nomenklature u klasifikaciji staništa sa standardima međunarodne zajednice”, Institut za Botaniku i Botanička Bašta “Jevremovac”, Biološki fakultet, Univerzitet u Beogradu, Ministarstvo za nauku i zaštitu životne sredine Republike Srbije, 684 pp. <http://habitat.bio.bg.ac.rs/>
- Lakušić, D., Medarević, M., 2010. Tipovi staništa zastupjeni na teritoriji Republike Srbije. Annex 1 – The Rulebook on Habitat Types, the Criteria for the Selection of Habitat Types, on Sensitive, Endangered, Rare and Priority for Protection Habitat Types and on the Protection Measures for their Conservation. Official Gazette of RS No. 35/2010.
- Mišić, V., 1981. The forest vegetation of gorges and canyons in eastern Serbia. Institut za biološka istraživanja “Siniša Stanković”, Beograd, 327 pp. [In Serbian].
- Swaay, C., van, Cuttelod, A., Collins, S., Maes, D., López Munguira, M., Šašić, M., Settele, J., Verovnik, R., Verstrael, T., Waren, M., Wiemers, M. and Wynhof, I. 2010. European Red List of Butterflies Luxembourg: Publications Office of the European Union, 47 pp.
- Swaay, C., van, Jakšić, P. & Đurić, M., 2007. The Notes on some summer butterflies (Lepidoptera: Hesperioidea & Papilionoidea) of Eastern Serbia. Acta Entomologica Serbica, 12(1): 1-10. Beograd.
- Zajić, V., Lakušić, D., 2004. Contribution to the flora of the Grza River Gorge (E. Serbia). Proceedings of the 2nd Congress of Ecologists of Macedonia with International Participation, 25-29.10.2003, Ohrid. Special issues of Macedonian Ecological Society 6, Skopje.