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Distribution of Burnets & Foresters species in plant associations and habitats of Special Nature Reserve „Jelašnička Klisura Gorge“ (Serbia) (Lepidoptera: Zygaenidae)

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***Abstract*:**

Jakšić, P., Zlatković, B.: ***Distribution of Burnets & Foresters species in plant associations and habitats of Special Nature Reserve „Jelašnička Klisura Gorge“ (Serbia) (Lepidoptera: Zygaenidae). Biologica Nyssana, 6 (1), September 2015: 33-39.***

General geographic and biogeographic features of Special Nature Reserve „Jelašnička Klisura Gorge“ in Eastern Serbia are represented. The lists of plant communities and habitat types for the area are given. Faunistic account of Zygaenidae species recorded in period 2009-2014. is analised. Distribution of Zygaenidae species within plant assotiations and habitat types is presented for the first time.

Key words: Zygaenidae, Habitats, Jelašnička Klisura Gorge

***Apstrakt*:**

Jakšić, P., Zlatković, B.: ***Distribucija vrsta familije Zygaenidae (Lepidoptera) u biljnim zajednicama i staništima Specijalnog rezervata prirode „Jelašnička klisura“ (Srbija). Biologica Nyssana, 6 (1), Septembar 2015: 33-39.***

Prikazane su opšte geografske i biogeografske odlike Specijalnog rezervata prirode „Jelašnička klisura“, smeštenog u istočnoj Srbiji. Navedene su liste biljnih zajednica i tipova staništa konstatovanih na području klisure. Sumirani su rezultati faunističkog istraživanja predstavnika familije Zygaenidae realizovanog u periodu od 2009. do 2014. godine. Po prvi put je prikazana distribucija utvrđenih vrsta familije Zygaenidae na primeru biljnih zajednica i staništa Specijalnog rezervata prirode „Jelašnička klisura“.

Key words: Zygaenidae, staništa, Jelašnička klisura

Introduction

Adopting Rio Declaration on Environment and Development (1992), Serbia significantly initiated activities in protection of biodiversity and nature in general (Anonymous, 1992). Within numerous protected natural resources there are 67 Nature Reserves in the country. One of them is Jelašnička Klisura Gorge, situated 15 km SE of the town of Niš, between Jelašnica Village and Čukljenik Village (**Fig. 1**). Geographic location, geological, geomorphological, climatic and other natural features have made Jelašnička Klisura Gorge

one of the most interesting areas in eastern Serbia from the aspect of biodiversity and nature conservation. The main hidrological phenomena among several, periodical streams of the area is Studena river, that forms small but magnificent gorge, with narrowed sometimes closed sides. Geological base is made of limestone. The gorge is strongly influenced by a temperate continental climate (Semi-arid temperate continental (subcontinental) climate) with ethesian influences from sub-Mediterranean region. However, largest part of the gorge is situated at lower altitudes (ranged from 293 to 580 m.a.s.l.) and therefore opened to the influence of the continental and southern climate that strongly influenced its plant life and species composition in general. Typical climate type is additionally underlined by characteristic of limestone ground and prominent karst geomorphology, making the special mesoclimatic conditions in the gorge. The climate of the area is depicted by climate diagram according to Walter & Leith (1967) for Niška Banja Spa as the nearest location (**Fig. 2**). From the phytogeographycal point of view investigated area belongs to the west-Moesian floristic province of the Balkan sub-region, and central European floristic region. Due to a strong presence of steppe floristic region to the gorge, some of its parts can be understood as an enclave of Pontic-south-Sibirian floristic region. The role of refugia that have gorges and canyons of the central Balkan Peninsula explains species richness, originality and the antiquity of their flora and vegetation (Mišić, 1981). The most important elements of flora are tertiary relicts *Ramonda serbica* Pančić and *R. nataliae* Pančić & Petrović, as well as Balkan endemic and sub-endemic taxa such as *Satureja kitaibelii* Wierzb. ex Heuff., *Dianthus noeanus* Boiss., *Parietaria lusitanica* subsp. *serbica* (Pančić) P. W. Ball, *Micromeria cristata* (Hampe) Griseb., ect. (Lazarević et al., 2007). The protected area of of the Nature Reserve, established in 1995., is around 116 ha (Anonymous, 1995). Investigated area is positioned in the close vicinity of large Sićevačka Klisura Gorge and surrounded by large massif of Mt. Suva Planina, also important from the point of biodiversity and nature conservation.

Material and methods

During the period of six years of field work (2009.-2014.) representatives of Burnets & Foresters (family Zygaenidae) were notified in certain habitat types of Jelašnička Klisura Gorge. The adult specimens has been collected on the field using

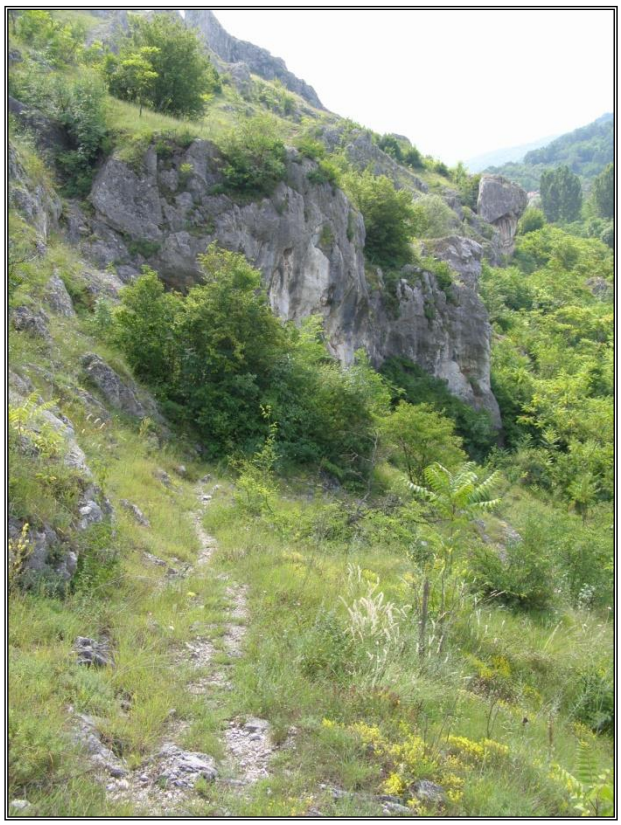

Fig. 1. Jelašnička Klisura Gorge, habitat detail, photo P. Jakšić

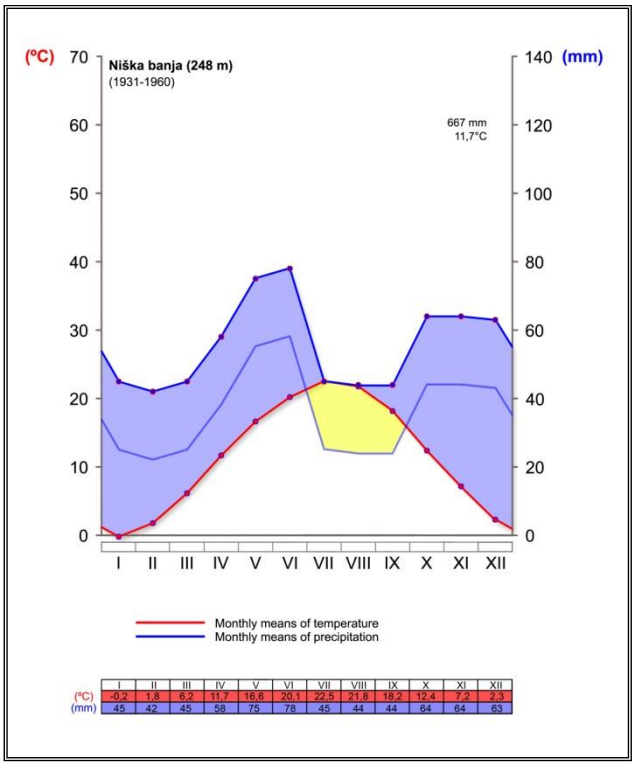

Fig. 2. Climatic diagram of Niška Banja Spa according to Walter & Leith (1967)

entomological net. After preparing, we determined the specimens by the wing-patterns and in all cases the identification has been also carried out by an examination of the male genitalia. The preparations were carried out following the well known standard procedure: maceration by boiling in potash, dissecting and cleaning, clearing in xylolum and mounting in Canada balsam. The photos of genital parameters were taken using the "Leica DM 1000" microscope with the "Camera Leica DEC 290"; photos terrain, habitats and in situ specimen were taken using "Olympus" SP-510UZ (7.1 megapixel and 25X optical zoom). All the material (specimens and genitalia slides) are deposited in the first author's collection. The list of plant communities is based on field survey as well as relevant literature sources given in the article. The list of syntaxonomic units is aligned with Jovanović et al. (1986), Kojić et al. (1998). Habitat types are defined by immediate field study. The habitat types are in accordance with "NATURA 2000" classification system (Anonymous, 2000). Their equivalents for the territory of Serbia according to Lakušić (2005) are shown in the **Tab**. **2.** and **3.** Fieldwork on protected areas was done on the basis of permits provided by the Ministry of Environment, Mining and Spatial Planing, Republic of Serbia, No. 353-01-1559-2011-03, dated from 8. 6. 2011; No. 353-01-1070/2012-03, dated from 12. 06. 2012. and No. 353-01-916/2014-08, dated from 29.05.2014.

Results and discussion

On the base of the literature data given by several authors (Jovanović-Dunjić, 1955; Jovanović, 1980; Mišić, 1981; Stevanović et al., 1987; Lazarević et al., 2007) as well as field survey, the list of plant communities in Jelašnička Klisura Gorge has been established (**Tab. 1**). The presence of 23 plant associations belonging to 16 alliances and 9 classes is recorded.

Table 1. Syntaxonomic review of vegetation in Jelašnička Klisura Gorge

Syntaxonomic Unit (**CLASSIS**, ORDER, ***Alliantia,*** *Assotiation*)
QUERCO-FAGETEA Br.-Bl. et Vlieger 1937
QUERCETALIA PUBESCENTIS Br.-Bl. 1932
Ostryo-Carpinion orientalis Horvat 1954
Ass.: *Carpinetum orientalis serbicum* Rudski 1940 em. B. Jov. 1953
Quercion frainetto Ht. 1954
Ass.: *Quercetum frainetto-cerris* Rudski (1940) 1949 subass. *carpinetosum orientalis* (Knapp) B. Jovanović 1953
Syringo-Carpinion orientalis Jakucs 1959
Ass.: *Carpino orientalis-Quercetum mixtum* Mišić 1967
Ass.: *Syringo-Carpinetum orientalis* (Greb. 1950.) Mišić 1967
PRUNETALIA SPINOSAE R. Tx. 1952
Prunion spinosae Soó (1930) 1940
Ass.: *Pruno spinosae-Crataegetum* (Soó 1927) Hueck 1931
POPULETALIA ALBAE Br.-Bl. 1931
Salicion albae Soó (1930) 1940
Ass.: *Salicetum albae-fragilis* Soó (1933) 1958
PALIURETEA Trinajstić 1978
PALIURETALIA Trinajstić 1978
Paliurion moesiacum B. Jov. 1985
Ass.: *Botryochloo-Paliuretum* B. Jov. 1973
ASPLENIETEA TRICHOMANIS Br.-Bl. 1926
POTENTILLETALIA CAULESCENTIS Br.-Bl. 1926
Edraiantho graminifolii-Erysimion comatae Mucina et al. 1990
Ass.: *Ceterachi-Ramondetum serbicae* R. Jovanović 1953
subass.: *ramondetosum nathaliae* V. Stevanović et al.
Ass.: *Parietarietum serbicae* Niketić 1986
Micromerion cristatae N. & V. Ranđ. 1998
Ass.: *Campanulo velebiticae-Micromerietum cristatae* V. et N. Ranđ. 1999
FESTUCO-SESLERIETEA Barbero et Bonim 1969
SESLERIETALIA JUNCIFOLIAE Ht. 1930
Seslerion rigidae Zolyomy 1939
Ass.: *Seslerietum filifoliae* Zolyomy 1939 subass. *scabiosetsoum fumarioides* Niketić et Lakušić 1988
Ass.: *Anthyllo-Seslerietum rigidae* R. Jovanović 1955

FESTUCO-BROMETEA Br.-Bl. et R. Tx. 1943
SCORZONERO-CHRYSOPOGONETALIA Horvatić et Horvat (1956) 1958
Chrysopogoni-Satureion Horvat et Horvatić 1934
Ass.: *Euphorbio myrsiniti-Bothryochloetum* R. Jovanović 1955
FESTUCETALIA VALESIACAE Br.-Bl. et Tx. 1943
Festucion valesiacae Klika 1933
Ass.: *Poterio-Festucetum valesiacae* Danon 1960
Ass.: *Potentillo-Caricetum humilis* R. Jovanović 1955
Ass.: *Galio-Festucetum valesiacae* R. Jovanović 1955
Ass.: *Andropogono-Danthonietum calycinae* Danon et Blaženčić 1975
Ass.: *Festuco-Agrostidetum vulgaris* Danon et Blaženčić 1978
Satureion kitaibelii Horvat 1962
Ass.: *Sedo-Potentilletum arenariae* Ružić 1978
PHRAGMITETEA COMMUNIS R. Tx. et Preising 1942
MAGNOCARICETALIA Pignatti 1953
Caricion gracilis-vulpinae E. Bálatová-Tulačková 1963
Ass.: *Junco articulatae-Caricetum vulpinae* Danon et Blaž. 1978
BIDENTETEA TRIPARTITI Tx., Lohm. Et Prsg. 1950
BIDENTETALIA TRIPARTITII Br.-Bl. Ex Tx. 1943
Bidention tripartiti Nordh 1940
Ass.: *Polygono-Rumicetum conglomerati* V. Ranđ. 1990
PLANTAGINETEA MAJORIS Tx. et Preising 1950
PLANTAGINETALIA MAJORIS Tx.et Preising 1950
Polygonion avicularis Br.- Bl.1931
Ass.: *Lolio-Plantaginetum majoris* Beger 1930
ARTEMISIETEA VULGARIS Lohm., Preising et R. Tx. 1950
ARTEMISIETALIA VULGARIS Lohm. apud R.Tx.1947
Arction lappae Tx.(1937) 1942 em. Gutte 1972
Ass: *Arctio-Artemisietum vulgaris* (R.Tx.1942) Oberd. et al.1967

Table 2. Survey of "NATURA 2000" habitat types in Jelašnička Klisura Gorge. Codes for their equivalents according to Lakušić (2005) given in the brakets

TEMPERATE HEATH AND SCRUB
40A0 *Subcontinental peri-Pannonian scrub (F3.24)
SEMI-NATURAL DRY GRASSLANDS AND SCRUBLAND FACIES
6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (*important orchid sites) (E1.21, E1.22, E1.55)
ROCKY SLOPES WITH CHASMOPHYTES VEGETATION
8210 Calcareous rocky slopes with chasmophytic vegetation (H3.2A)
FORESTS OF TEMPERATE EUROPE
9180 **Tilio-Acerion* forests of slopes, screes and ravines (G1.A4)
91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) (G1.11)
91M0 Pannonian-Balkanic turkey oak-sessile oak forests (G1.76)

**priority habitat*

Summarizing literature data (Lakušić et al., 2005; Sekulić et al., 2010), as well as personal terrain insight, the list of most important habitats for species of family Zygaenidae has been made (**Tab. 2**).

Field research established that fauna of Burnets and Foresters in Special Nature Reserve "Jelašnička Klisura Gorge" are represented with total number of 8 species*: Adscita* (1 species), *Jordanita* (2 species), and *Zygaena* (5 species). Following species have been notified: *Adscita mannii* (8 records), *Jordanita chloros* (2 records), *J. graeca* (4 records), *Zygaena carniolica* (1 record), *Z. ephialtes* (1 record), *Z. filipendulae* (1 record), *Z. loti* (1 record) and *Z. purpuralis* (6 records), listed in **Tab. 3**. The largest number of representatives, actually the presence of entire 8 identified species have been notified at habitats type 6210 in accordance with classification "Natura 2000". At habitat type 8210 in accordance with previously mentioned classification, only 3 species have been notified (*A. mannii, J. graeca* and *J. chloros*), while at the rest of habitat types in the gorge, only 1 species of Burnets and Foresters has been presented and notified.

Table 3. Distribution of Zygaenidae species within the main habitats of Jelašnička Klisura Gorge and presence of their larval foodplants

SPECIES, DATE OF COLLECTION AND GENITALIA SLIDES NUMBER	HABITAT TYPE ACCORDING TO „NATURA 2000“, (EUNIS); *LARVAL FOODPLANTS AND RELATED PLANT SPECIES*
Adscita (*Tarmannita) mannii* (Lederer, 1853) 5.VI 2013., 1♂ (Prep. no. sr-2556); 14. V 2014., 1♂ (Prep. no. sr-2571); 20. V 2014., 2♂♂ (Prep. no. sr-2578 and sr-2589) and 27.V 2014., 1♂ (Prep. no. sr-2576)	**6210** (E1.21, E1.22, E1.55), **8210** *Helianthemum* spp. (including *H. nummularium, H. canum* and *H. salicifolium)*
Jordanita (*Jordanita*) *graeca* (Jordan, 1907) 6. VII 2010., 1♂; (Prep. no. sr-2464); 2. VI 2011., 2♀♀.	**6210** (E1.21, E1.22, E1.55), **8210** *Centaurea* spp. (including *C. salonitana, Centaurea scabiosa* subsp. *apiculata* and *C. cyanus)*
Jordanita (*Jordanita*) *chloros* (Hűbner, [1813]) 6. VII 2010., 2♂♂, 1♀. (Prep. no. sr-2473 and sr-2474).	**6210** (E1.21, E1.22, E1.55), **8210** *Centaurea* spp. (including *C. salonitana, Centaurea scabiosa* subsp. *apiculata* and *C. cyanus)*
Zygaena (*Mesembrynus*) *purpuralis* (Brünnich, 1763) 2. VI 2011., 1♂; 14. V 2014., 3♂♂ (Prep. no. ANZ-164 and ANZ-165); 20.V 2014., 1♂ (Prep. no. ANZ-166); 5.VI 2014., 1♂ (Prep. no. ANZ-167).	**6210** (E1.22), **9180** (G1.A4), **91M0** (G1.76) *Thymus* sl. (including *Thymus praecox* subsp. *jankae,* and *T. glabrescens*); *Eryngium* spp. as larval foodplants of *Z. minos* (*E. palmatum, E. campestre*)
Zygaena (*Agrumenia*) *carniolica* (Scopoli, 1763) 6. VII 2010, 1♀.	**6210** (E1.21, E1.22, E1.55) *Onobrychis arenaria* (including *O. alba)*
Zygaena (*Zygaena*) *loti* ([Denis & Schifferműller], 1775) 6. VII 2010., 1♂.	**6210** (E1.22, E1.55) *Onobrychis* spp., (including *Onobrychis arenaria* and *O. alba) Coronilla varia* (including *C. elegans), Lotus corniculatus*
Zygaena (*Zygaena*) *ephialtes* (Linnaeus, 1767) 6. VII 2010., 1♂, 1♀.	**6210** (E1.22, E1.55) *Coronilla varia* (including *C. elegans)*
Zygaena (*Zygaena*) *filipendulae* (Linnaeus, 1758) 23. VI 2011., 1♂.	**6210** (E1.22) *Dorycnium pentaphyllum* (including *D. pentaphyllum* subsp. *germanicum* and *D. pentaphyllum* subsp. *herbaceum)*

Semi-natural dry grassland and scrubland facies on calcareous substrates (6210) are developed throughout research area, so the fact that they have a great significance in terms of species diversity of family Zygaenidae, is not unexpected. They are mainly dry, termophilic steppe alike habitats, occupying large areas on shallow soil of eroded and moderately steep slopes of the gorge. Importance of this habitat type is also multiple, according to the presence of several protected orchid species e.g. *Orchis purpurea* Hudson and *Himantoglossum hircinum* (L). Sprengel on the slopes of the gorge. In terms of vegetation point of view they belong to a vegetation of dry pastures of rocky continental which is characterized by extreme presence of steppe and submediterranian plant species. In syntaxonomic sense, these are associations of class Festuco-Brometea, presented in Jelašnička Klisura Gorge with large numbers of phytocoenoses, where by the most significant are communities of *Festucion valesiacae* and *Satureion kitaibelli* alliances. Supported by anthropogenic activities this vegetation type has been widespread throughout East and South-East Serbia. It is of secondary character and it is developed under subaride climate conditions on destroyed forest communities, mainly oak forest communities with termophilic character (Diklić & Nikolić, 1964).

Calcareous rocky slopes with chasmophytic vegetation (8210) habitat types have far less importance compared to represents of family Zygaenidae in terms of distribution and diversity of the research area. Although in terms of spatial representation, this habitat type represents one of the area characteristic, and it is one of the most interesting in the gorge, from the phytogeographical point of view, but has secondary role in terms of diversity of Burnets and Foresters. This type of habitat includes rocky, limestone cliffs, that are overgrown by vegetation from the class Asplenietea

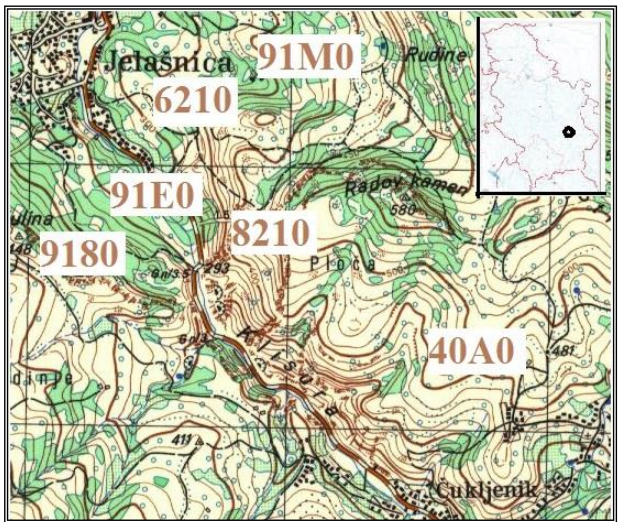

Fig. 3. Position of examined habitat types on topographic map (Sheet 583_1_3_Bela Palanka, 1: 25000)

Fig. 4. Male genitalia slide of *Adscita* (*Tarmannita) mannii* (Lederer, 1853), Jelašnička Klisura Gorge, 27.V 2014., Genitalia slide no. sr-2576, X25

Fig. 5. *Zygaena purpuralis* (Brünnich, 1763), Jelašnička Klisura Gorge, 14. V 2014., (Genitalia slide prep. no. ANZ-164), photo P. Jakšić

trichomanis on slopes and canyon parts of the gorge. The greatest significance in the context of this type of vegetation on the research area are phytocoenoses of alliances *Edraiantho graminofolii-Erysmion comatae* and *Micromerion cristatae*, comprising community of endemo-relict species of the genus *Ramonda*, as well as community of *Parietaria lusitanica* subsp. *serbica*, which represents specific vegetation of this part of Europe. Related to two mentioned habitat types, all other types of habitats, listed in **Tab. 2**, as well as plant communities, listed in **Tab. 1**, have much smaller role in terms of distribution and diversity of family Zygaenidae.

Conclusion

After several years of monitoring of distribution of the species of Zygaenidae family in Jelašnica gorge we have established their priority habitats and shed light to their diversity in this area (**Tab. 3**). Analysing distribution of certain types we can conclude that main criteria in selection of habitats was presence of their larval foodplants, followed by the number of Zygaenidae species recorded. From that point of view, the most important habitats in the gorge are semi-natural dry grasslands and scrubland facies on calcareous substrates and calcareous rocky slopes with chasmophytic vegetation. According to the parameters that calculated richness of Zygaenidae in the gorge those habitats are particularly important, diserving special attention in further aspects of conservation within deserving area of the gorge.

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