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CONTRIBUTION TO THE RESEARCH OF THE FLORA AND HABITAT CHARACTERISTICS OF SP "BORAČKI KRŠ" BORAČ

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Abstract: The Natural Monument "Borački krš", encompasses a part of the Rudnik-Kotlenik region and it is located in the southwestern Šumadija between Rudnički, Kotlenik and Gledić mountains on the municipality of Knić. In the research area, 117 taxa were identified, classified into 41 families. The most numerous species belong to the families Asteraceae (16) and Lamiaceae (9). The forest is hemicrypto-terrophytic with a strong participation of fanerophytes. The high percentage of terophytes and fanerophytes is particularly characteristic, as it indicates a very warm and dry vegetation period of habitat. Invasive species are *Erigeron annuus* (L.) Pers., *Amaranthus retroflexus* L. and *Robinia pseudoacacia* L.

Keywords: Borački krš, plant species, life forms, invasive species

Introduction

The Natural Monument "Borački krš" covers a part of the Rudnik-Kotlenik area, and it is located in the southwestern Šumadija between Rudnik, Kotlenik and Gledić mountains on the territory of the municipality of Knić and includes the municipality of Borač. The geographical location of monument of nature "Borački krš" is shown in Figure 1.

Figure 1. Geographical location of monument of nature "Borački krš"

Borački krš represents an igneous formation formed by bloating dense lava masses whose parts have eroded over time, which gave this elevation its

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recognizable appearance. Borački krš - represents a unique geological and geomorphological phenomenon of the remains of tertiary volcanic relief in Šumadija and specific remains of the edge of the quartzlatite caldera with traces of columnar secretion in rocks and numerous remains of bizarre shapes. Since 1995 it has been kept in the Inventory of Geoheritage Objects of Serbia in the group geomorphological objects of erosive character (Karamata, Mijović, 2005).

According to Brković, (2015), 59 taxa were identified in the investigated area. Among the taxonomies are: *Allium carinatum* L., *Ruscus aculeatus* L. and *Trifolium arvense* L. on the List of plant species and subspecies in the flora of northwestern Serbia and Šumadija, which were included in the European Red List (Bilz et al 2011). While the *Carduus candicans* are Waldst. & Kit., *Crataegus monogyna* Jacq. and *Scabiosa fumarioides* Vis. & Pančić on the List of Strictly Protected Species and Subspecies (Službeni glasnik RS. br. 5/10).

Materials and methods

Going out on the field and sampling of the material was carried out three times in the summer, late summer and autumn aspects.

The determination of plants was made according to the keys EURO + MED. (2006), Josifović (1970-1977), Javorka & Csapody (1991) and Domac (2002).

The affiliation of the taxa to the appropriate life form was determined according to the System Raunkiaer (1934), which was supplemented by Mueller-Dombois and Ellenberg (1974), and for taxa at the Level of Serbia by Stevanovic (1992A).

Results and discussion

After collecting data from earlier research and after determining newly collected plant material in the wider area of SP "Borački krš" 117 taxa were identified. These are: *Sambucus ebulus* L., *Sambucus nigra* L., *Amaranthus retroflexus* L., *Allium carinatum* L., *Eryngium campestre* L., *Carum carvi* L., *Orlaya grandiflora* (L.) Hoffm., *Torilis japonica* (Houtt) DC, *Conium maculatum* L., *Cynanchum vincetoxicum* (L.) Pers., *Arum maculatum* L., *Hedera helix* L., *Asarum europaeum* L., *Ruscus aculeatus* L., *Polygonatum odoratum* (Mill.) Druce, *Asplenium adiantum-nigrum* L., *Asplenium trichomanes* L., *Carduus candicans* W. et K., *Centaurea stoebe* subsp. *australis* (A. Kerner) Greuter, *Hypochoeris radicata* L. subsp. *radicata*, *Sonchusa arvensis* L., *Achillea milefolium* L., *Arctium lappa* L., *Cirsium arvense* L. (Scop.), *Lactuca serriola* L., *Artemisia vulgaris* L., *Echinops sphaerocephalus* L., *Taraxacum campylodes* G.E.Haglund, *Cichorium intybus* L., *Carthamus creticus* L., *Filago arvensis* L., *Erigeron annuus* (L.) Pers., *Artemisia absinthium* L., *Carpinus betulus* L., *Carpinus orientalis* Mill., *Echyum vulgare* L., *Lunaria rediviva* L., *Capsella bursa-pastoris* (L.) Medik., *Alyssum petraeum*

Ard, *Campanula trachelium* L., *Campanula rapunculoides* L., *Scabiosa fumarioides* Visiani et Pančić, *Dianthus armeria* L., *Lychnis coronaria* (L.) Desr., *Petrorhagia saxifraga* (L.) Link., *Silene latifolia* Poir, *Stellaria media* (L.) Vill., *Scleranthus perennis* L., *Convolvulus arvensis* L., *Cornus mas* L., *Cornus sanguinea* L., *Hylotelephium telephium* (L.) Ohba, *Sedum hispanicum* L., *Sedum acre* L., *Sempervivum marmoreum* Griseb., *Dioscorea communis* (L.) Caddick & W., *Euphorbia cyparissias* L., *Lathyrus tuberosus* L., *Trifolium pratense* L., *Securigera varia* (L.) Lassen, *Robinia pseudoacacia* L., *Vicia grandiflora* Scop., *Trifolium arvense* L., *Trifolium patens* Schreb., *Lembotropis nigricans* (L.) Griseb, *Quercus frainetto* Ten., *Quercus cerris* L., *Geranium columbinum* L., *Geranium lucidum* L., *Hypericum perforatum* L., *Stachys germanica* L., *Stachys recta* L., *Ballota nigra* L. subsp. *nigra, Stachys officinalis* (L.) Trevis. ex Briq., *Prunella vulgaris* L.subsp. *vulgaris, Salvia verticillata* L., *Clinopodium vulgare* L., *Sideritis montana* L., *Acinos alpinus* (L.) Moench, *Malva sylvestris* L., *Fraxinus ornus* L., *Fraxinus excelsior* L., *Pinus nigra* Arn., *Digitalis ferruginea* L., *Linaria genistifolia* (L.) Mill. ssp. *sofiana*, *Plantago media* L., *Plantago lanceolata* L., *Plantago major* L., *Agrostis capillaris* L., *Chrysopogon gryllus* (L.) Trin., *Danthonia provincialis* Lam. et DC, *Festuca vallesiacea* Schleich., *Melica ciliata* L., *Poa nemoralis* L., *Melica uniflora* Retz, *Cynosurus echinatus* L., *Rumex acetosella* L., *Rumex crispus* L., *Polypodium vulgare* L., *Primula acaulis* (L.) Hill, *Helleborus odorus* Waldst. & Kit., *Clematis vitalba* L., *Consolida regalis* Gray, *Fragaria vesca* L., *Potentilla argentea* L., *Cotoneaster integerrimus* Medicus, *Crataegus monogyna* Jacq., *Rubus ulmifolius* Schott, *Rosa canina* L., *Prunus avium* L., *Galium corrudifolium* Vill., *Acer tataricum* L., *Acer campestre* L., *Verbascum lychnitis* L., *Viola arvensis* Murr.

Determined plants are classified into 41 families. The expected most abundant plant family is Asteraceae (39%), followed by Lamiaceae (22%), Fabaceae and Poaceae (20%), Apiaceae, Caryophyllaceae and Rosaceae (15%), Plantaginaceae (12%) and Crassulaceae (10%). Other families are represented by less than 10% of the total. The overview and percentage of plant families on the monument of nature "Boračkі krš" is shown in Table 1.

Table 1. Percentage of representation of plant families in the area of monument of nature "Boračkі krš"

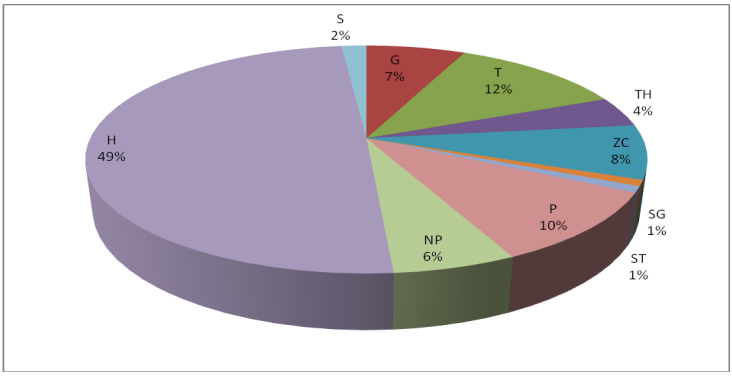
Asteraceae	**16**	39%
Adoxaceae	**2**	5%
Amaranthaceaea	**1**	2%
Amarylidaceae (Liliaceae)	**1**	2%
Apiaceae	**6**	15%
Apocyniaceae	**1**	2%
Araceae	**1**	2%
Araliaceae	**1**	2%

Aristolochiaceae	**1**	2%
Asparagaceae	**2**	5%
Aspleniaceae	**2**	5%
Betulaceae	**2**	5%
Boraginaceae	**1**	2%
Brassicaceae	**3**	7%
Campanulaceae	**2**	5%
Caprifoliaceae	**1**	2%
Caryophyllaceae	**6**	15%
Convolvulaceae	**1**	2%
Cornaceae	**2**	5%
Crassulaceae	**4**	10%
Dioscoreaceae	**1**	2%
Euphorbiaceae	**1**	2%
Fabaceae	**8**	20%
Fagaceae	**2**	5%
Geraniaceae	**2**	5%
Hypericaceae	**1**	2%
Lamiaceae (Labiatae)	**9**	22%
Malvaceae	**1**	2%
Oleaceae	**2**	5%
Pinaceae	**1**	2%
Plantaginaceae	**5**	12%
Poaceae	**8**	20%
Polygonaceae	**2**	5%
Polypodiaceae	**1**	2%
Primulaceae	**1**	2%
Ranunculaceae	**3**	7%
Rosaceae	**6**	15%
Rubiaceae	**1**	2%
Sapindaceae (Aceraceae)	**3**	7%
Scrophulariaceae	**1**	2%
Violaceae	**1**	2%

The results of this study showed that the biological spectrum of the hornbeam forest with the presence of cera malt has the following relationships: hemicryptophytes 49%, fanerophytes and nanofanerophytes 16%. (terophytes) and (terophytes/hamefites) 16%, herbaceous hamephytes 8%, geophytes 7%.

The forest is hemicrypto-terrophytic with a strong participation of fanerophytes. The high percentage of terophytes and fanerophytes is particularly characteristic, as it indicates a very warm and dry vegetation

period of habitat. The percentage of the representation of life forms of plants in the area of monument of nature "Borački krš" is shown on Graph 1.



Graph 1. Percentage of the representation of life forms of plants in the area of monument of nature "Borački krš" P (fanerophytes), NP (nanofanerophytes), ZC (herbaceous hamephytes), H (hemicryptophytes), G (geophytes), T (therophytes), TH (terophytes/hamefites) S scandenophytes (climbers and lians)

Protected plant species in the "Borački krš" are: *Acer hyrcanum* subsp. *intermedium*, *Asarum europaeum* L., *Carduus candicans* W. et K., *Crataegus monogyna* Jacq, *Hypericum perforatum* L., *Primula acaulis* (L.) Hill, *Ruscus aculeatus* L. and *Scabiosa fumarioides* Visiani et Pančić.

Protected wild plant species related to wild flora traffic control (Vuković, 2012) are: *Achillea millefolium* L., *Cornus mas* L., *Sedum acre* L., *Trifolium pratense* L., *Hypericum perforatum* L., *Ruscus aculeatus* L., *Malva sylvestris* L., *Plantago lanceolata* L., *Plantago major* L., *Plantago media* L., *Helleborus odorus* Waldst. &Kit. *Crataegus monogyna* Jacq., *Fragaria vesca* L., *Rosa canina* L., *Sambucus nigra* L. and *Digitalis ferruginea* L.

According to the list of invasive species of Serbia (Stojanović et al., 2021), three species are present in the area of "Borački krš": *Erigeron annuus* (L.) Pers., *Amarantus retlofexus* L. and *Robinia pseudoacacia* L.

Conclusion

In the area of the natural monument "Borački krš" based on literature reviews and field research, 117 plant taxa were noted within 41 plant families.

The expected most abundant plant family is Asteraceae (39%), followed by Lamiaceae (22%), Fabaceae and Poaceae (20%), Apiaceae, Caryophyllaceae and Rosaceae (15%), Plantaginaceae (12%) and Crassulaceae (10%). Other families are represented by less than 10% of the total. The results of this study showed

that the biological spectrum of the hornbeam forest with the presence of cera malt has the following relationships: hemicryptophytes 49%, fanerophytes and nanofanerophytes 16%. (terophytes) and (terophytes/hamefites) 16%, herbaceous hamephytes 8%, geophytes 7%.

In the study area, 16 taxa protected wild plant species were identified, as well as 3 types of invasive plants.

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