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Endemic and Endangered Species of the Drina National Park

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Abstract

In the eastern part of Bosnia and Herzegovina, on the territory of the Municipality of Srebrenica, in the middle course of the Drina River, lies the Drina National Park. Based on years of field research and existing literature sources, 635 taxa of vascular plants were identified in NP "Drina." Data analysis revealed 55 endemic taxa. Moreover, 43 taxa are included in the preliminary Red List of Bosnia and Herzegovina, 34 taxa are in the preliminary Red List of the Flora of the Federation of Bosnia and Herzegovina, while 48 taxa are in the Red List of the Republic of Srpska. The IUCN list includes 14 taxa, while 12 are in the CITES list. Particular value is added to NP "Drina" by the presence of Pančić spruce, an endemic, tertiary relict species.

Keywords: endemic species, endangered species, relict species, "Drina" National Park.

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1. Introduction

On the territory of the Municipality of Srebrenica, in the middle course of the Drina River, lies the Drina National Park, spreading over 6,315.32 ha. The area forms a unique complex covering the Stari Vlah region and is also part of the central belt of the Dinaric Alps (Panić, 2015). The protected area essentially comprises the gorge-canyon valley of the Drina River, including Perućac Lake and the mountain area of Sušica. The Drina National Park stretches 11 km south to north and 19 km west to east (Petrović, 2018). The highest point in NP "Drina" is located north of Luka village on the Grad viewpoint and measures 1,267 m.a.s.l. The lowest point is downstream of the river and is 291 m.a.s.l. (Panić, 2015).

The complex and varied geological, geomorphological, and pedological structure and specific climatic and vegetation characteristics have contributed to the formation of a rather picturesque landscape along the entire course of the Drina River. The most interesting part is the canyon-gorge valley of the Drina River with its grandiose over 1000 m high limestone sections. The Drina River Canyon, with discovery sites of Pančić spruce and a considerable number of endemic and relict species, is a unique environment in the Drina National Park. The landscape value of the Drina River Canyon is contributed by the thermophile forests of downy oak and hop-hornbeam, hop-hornbeam and manna ash, black pine forests, limestone cracks, and creeps. The Drina River Canyon is among Europe's most conserved parts of nature (Petronić, 2015). The area has been protected under the Drina National Park Law and the Study for the Proclamation of Protected Area - NP Drina adopted by the National Assembly of the Republic of Srpska ("Official Gazette of the Republic of Srpska" No. 63/17).

2. Material and Methods

The paper draws upon existing literature sources showing the diversity of the vascular flora Petronić (2015); endemic taxa of vascular plants were identified according to Lubarda et al. (2014), Šilić (1990), Šoljan (2023). The status of endangered species and levels of conservation are given according to the preliminary Red List of Endangered Species of Bosnia and Herzegovina (Šilić, 1996), the Red List of the RS (2012), the Decree on Strictly Protected and Protected Wild Plant Species of the RS (2020), the Red List of Flora of the FBiH (Đug et al. 2013), CITES (2023) and IUCN (2023). Species names have been harmonized with the Euro+Med PlantBase nomenclature (2006–2023). The species have been classified by taxonomic rank and family according to Tatić and Blečić (1996).

3. Results

Based on years of field research and existing literature sources (Beck, 1903, 1927; Maly, 1936: Plavšić, 1936, 1937; Fukarek, 1951), 635 taxa of vascular plants were identified in the area of NP "Drina." Endemic and endangered vascular flora taxa were singled out from the NP "Drina" inventory (Petronić, 2015) and shown in (Table 1.)

Table 1. List of endemic and endangered species from classes Magnoliopsida (subclasses Asteridae, Rosidae, Dilleniidae, Ranunculidae, Caryophyllidae) and Liliopsida (subclasses Liliidae and Commelinidae) in the Drina National Park

SPECIES	E	PRLBIH	RLFBiH	RLRS	SPSRS	CITES	IUCN
Class PINOPSIDA							
Pinaceae							
***Picea omorika* (Pančić) Purkynê**			NT				EN
Class: MAGNOLIOPSIDA							
SUBCLASS ASTERIDAE							
Asteraceae							
Centaurea derventana Vis. & Pančić	+	V	DD	+			
Cirsium candelabrum Griseb.	+						
Cirsium waldsteini Rouy	+						
Hieracium vilosum Jacq.	+						
Hieracium waldsteinii Tausch subsp. waldsteinii	+	R	EN	+			
Jurinea mollis (L.) Rchb.	+						
Senecio squalidus subsp. rupestris (Waldst. & Kit.) Greuter	+						
Telekia speciosa (Schreb.) Baumg.		V	VU	+			
Acanthaceae							
Acanthus hungaricus (Borbás)Baen.	+	R		+			
Boraginaceae							
Onosma stellulata Waldst. & Kit.	+	R	LC	+			
Campanulaceae							
Edraianthus graminifolius (L.) A. DC.	+			+			
Dipsacaceae							
Scabiosa cinerea Lam. subsp. *cinerea*	+	R	LC				
Scabiosa ochroleuca L.				+			
Gentianaceae							
Gentianella ciliata (L.) Borkh.		R	DD				
Lamiaceae							
Clinopodium alpinum subsp. *hungaricum* (Simonk.) Govaerts	+						
Clinopodium menthifolium (Host) Stace subsp. *menthifolium*	+						
Clinopodium thymifolium (Scop.) Kuntze	+			+			
Satureja subspicata Bartl. Ex Vis. subsp. *subspicata*	+	V	LC	+			
Stachys anisochila Vis. & Pancic	+	R		+			
Thymus praecox subsp. *jankae* (Čelak.) Jalas	+			+			
Orobanchaceae							
Melampyrum hoermannianum K. Malý	+	V		+			
Rinanthus rumelicus Velen.	+						
Plantaginaceae							
Digitalis lanata Ehrh.	+		VU				
Callitriche cophocarpa Sendtn.				+			

SPECIES	E	PRLBiH	RLFBiH	RLRS	SPSRS	CITES	IUCN
Rubiaceae							
Asperula taurina L.				+			
Asperula aristata subsp. *scabra* (J. Presl & C. Presl) Nyman	+						
Scrophulariaceae							
Scrophularia heterophylla subsp. *laciniata* (Waldst. & Kit.) Maire & Petitm.	+	R	EN	+			
Scrophularia scopolii Hoppe		R		+			
Valerianaceae							
Valeriana tripteris L.				+			
SUBCLASS ROSIDAE							
Acearceae							
Acer hyrcanum subsp. *intermedium* (Pančić) Bornm	+	R	EN	+			
Acer obtusatum Willd	+						
Apiaceae							
Athamanta turbith subsp. *haynaldii* (Borbás & R. Uechtr.) Tutin	+	R	EN	+			
Eryngium amethystinum L.	+						
Seseli rigidum Waldst. & Kit.	+						
Pimpinella serbica (Vis.) Benth. & Hook.f. ex Drude	+	R	EN	+			
Fabaceae							
Cytisus tommasinii Vis.	+	R	VU	+			
Genista januensis Viv.	+						
Genista sylvestris subsp. *dalmatica* (Bartl.) H. Lindb.	+			+			
Dorycnium pentaphyllum subsp . *germanicum* (Gremli) Gams	+						
Lathyrus laevigatus (Waldst. & Kit.) Gren		V		+			
Vicia oroboides Wulfen	+	R	LC	+			LC
Rhamnaceae							
Rhamnus alpina subsp. *fallax* (Boiss.) Maire & Petitm.	+						
Rosaceae							
Sorbus austriaca (Beck) Prain & al.		R		+			LC
Sanguisorba officinalis L.				+			LC
Rutaceae							
Dictamnus albus L.				+			
Saxifragaceae							
Saxifraga marginata Sternb.	+	R	NT	+			
SUBCLASS DILLENIIDAE							
Brassicaceae							
Arabis procurrens Waldst. & Kit.	+			+			
Erysimum carniolicum Dolliner	+						
Erysimum linariifolium Tausch	+						
Noccaea praecox (Wulfen) F. K. Mey.	+						
Ericaceae							
Erica carnea L.	+						
Pyrola rotundifolia L.		R	DD	+			
Primulaceae							
Cyclamen purpurascens Mill.		V	LC			+	LC
Primula elatior subsp. *intricate* (Gren. & Godr.) Ludi	+	E	LC	+			
Lysimachia nemorum L.				+			
Thymelaeaceae							
Daphne laureola		R		+			
Daphne malyana Blečić	+	R	EN	+			

SPECIES	E	PRLBIH	RLFBiH	RLRS	SPSRS	CITES	IUCN
SUBCLASS RANUNCULIDAE							
Berberidaceae							
Epimedium alpinum L.	+						
Papaveraceae							
Pseudofumaria alba (Mill.) Lidén	+			+			
Pseudofumaria alba subsp. *leiosperma* (P. Conrath) Lidén	+	R	EN	+			
Ranunculaceae							
Helleborus odorus Willd.	+						
Hepatica nobilis Schreb.	+	V	VU				LC
SUBCLASS CARYOPHYLLIDAE							
Caryophyllaceae							
Cerastium decalvans Schloss. & Vuk.	+	V	LC				
Dianthus giganteus subsp. *croaticus* (Borbás) Tutin	+	V	LC	+			
Dianthus petraeus Waldst. & Kit. subsp. *petraeus*	+	V	LC	+			
Dianthus sylvestris subsp. *bertiscus* Rech. f.	+						
Silene sendtneri Boiss.	+	R	LC	+			
SUBCLASS LILIDAE							
Amaryllidaceae							
Galanthus nivalis L.		V	LC			+	NT
Asparagaceae							
Ruscus aculeatus L.				+			
Iridaceae							
Iris reichenbachii Heuff.	+	R	LC		+		
Liliaceae							
Convallaria majalis L.		V		+			LC
Erythronium dens-canis L.		V	LC				
Lilium martagon L.		V	LC				
Orchidaceae							
Cephalanthera damasonium (Mill.) Druce		R			+	+	LC
Cephalanthera longifolia (L.) R. M. Fritsch		R	VU		+	+	LC
Cephalanthera rubra (L.) Rich.		R	VU		+	+	LC
Dactylorhiza maculata (L.) Soó subsp. *maculata*		V		+		+	LC
Epipactis helleborine (L.) Crantz						+	
Listera ovata (L.) R. Br.						+	
Neottia nidus-avis (L.) Rich.						+	
Neotinea ustulata (L.) R. M. Bateman, Pridgeon & M. W. Chase				+		+	LC
Orchis mascula subsp. *speciosa* (Mutel) Hegi		V		+		+	LC
Platanthera bifolia (L.) Rich.		R	NT		+	+	LC
Traunsteinera globosa (L.) Rchb.			NT	+			
SUBCLASS COMMELINIDAE							
Cyperaceae							
Eriophorum latifolium Hoppe				+			
Poaceae							
Calamagrostis villosa (Chaix) J. F. Gmel.				+			
Poa stiriaca Dörfl.				+			
Sesleria autumnalis (Scop.) F. W Schultz	+						
Sesleria juncifolia Suffren							

Legend:
E – endemic, PRLBIH – Preliminary Red List of Bosnia and Herzegovina, RLFBIH – Red List of the Flora of the Federation of Bosnia and Herzegovina, RLRS –Red List of the Republic of Srpska, SPSRS – Strictly protected species of the Republic of Srpska, CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora, IUCN – International Union for Conservation of Nature

According to the preliminary Red List of Endangered Species of Bosnia and Herzegovina (Šilić, 1996), 43 taxa have been singled out, of which 16 are in the category of endangered or vulnerable species (V), 26 are rare or potentially endangered species (R), and one subspecies is in category E (likely extinct).

Class Pinopsida includes Pančić spruce, an endemic-relic species, which is found in the preliminary Red List of Bosnia and Herzegovina in the category of rare or potentially endangered species (R), in the Red List of Flora of the Federation of Bosnia and Herzegovina in the category of near threatened species (NT), is not found in the endangered category of the Red List of Strictly Protected Species of Republic of Srpska, and is classified in endangered species category (EN) in the IUCN list.

Class Magnoliopsida is represented by five subclasses. Subclass Asteridae includes 30 taxa, of which 20 (66.6%) are endemic, 13 (43.3%) are in the preliminary Red List of Bosnia and Herzegovina, 9 (30%) are in the Red List of the Federation of Bosnia and Herzegovina, while 17 taxa (56%) are in the Red List of Republic of Srpska. In subclass Asteridae, no taxa are found in the category of endangered species in the SPSRS, CITES, or IUCN list. The most represented taxa are from the Asteraceae family. Eight taxa were registered, of which seven are endemic (87.5%), and the Preliminary Red List of Bosnia and Herzegovina, the Red List of the Flora of the Federation of Bosnia and Herzegovina, and the Red List of Republic of Srpska include three taxa (37.5%) each. Of the registered taxa from the Lamiaceae family (6), all are endemic, two (33%) are in the Preliminary Red List of Bosnia and Herzegovina, one (16.67%) is in the Red List of the Flora of the Federation of Bosnia and Herzegovina, while four (66%) are in the Red List of Republic of Srpska (Figure. 1.)

Subclass Rosidae includes 17 taxa, of which 13 are endemic (76%), eight (47.06%) are in the preliminary Red List of Bosnia and Herzegovina, six (35.29%) are in the Red List of the Flora of the Federation of Bosnia and Herzegovina, 11 (64%) are in the Red List of the Republic of Srpska. Three taxa (17.6%) are in the IUCN list in the least concern category. The most numerous taxa in this subclass are from the Fabaceae family, with six taxa, of which five (83%) are endemic. Three taxa (50%) are in the Preliminary Red List of Bosnia and Herzegovina, two (33.33%) are in the Red List of the Flora of the Federation of Bosnia and Herzegovina, and four taxa (66%) are in the Red List of Republic of Srpska, while one (16.67%) is in the IUCN list in the least concern category.

Subclass Dilleniidae includes 12 taxa, of which eight (66%) are endemic. Six taxa (50%) are in the preliminary Red List of Bosnia and Herzegovina, four taxa (33.33%) are in the Red List of the Flora of the Federation of Bosnia and Herzegovina, while

seven taxa (58%) are in the Red List of Republic of Srpska. The CITES list includes one taxon (8.3%). One taxon (8.3%) is also found in the least concern category of the IUCN list. From the Brassicaceae family, there are four endemic taxa, and one taxon (25%) is in the Red List of the Republic of Srpska.

Subclass Ranunculidae includes five taxa, all of which are endemic. The preliminary Red List of Bosnia and Herzegovina, the Red List of the Flora of the Federation of Bosnia and Herzegovina, and the Red List of the Republic of Srpska include two taxa (40%), while one taxon (20%) is in the IUCN list.

The Caryophylaceae family, subclass Caryophyllidae, has five taxa represented, all of which are endemic. Four taxa (80%) are in the Preliminary Red List of Bosnia and Herzegovina and the Red List of Flora of the Federation of Bosnia and Herzegovina, while three taxa (60%) are in the Red List of the Republic of Srpska.

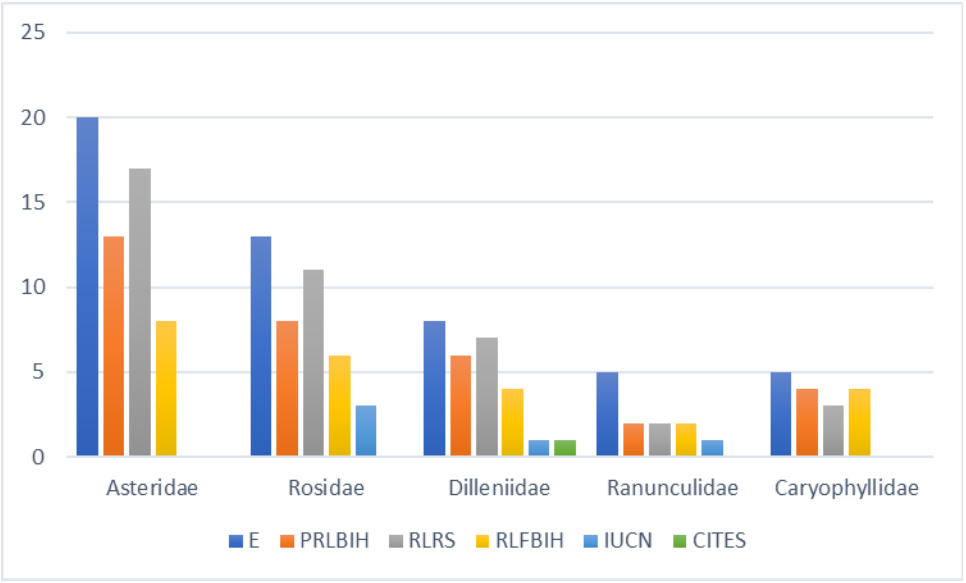

Figure 1. Representation of taxa by different evaluation systems and conservation of species in subclasses of Class Magnoliopsida

Class Liliopsida is represented by two subclasses, Lilidae and Commelinidae. Subclass Lilidae includes 17 taxa, of which one (5.88%) is endemic. There are 11 taxa (64.71) in the preliminary Red List of Bosnia and Herzegovina, eight taxa (47.06%) in the Red List of the Flora of the Federation of Bosnia and Herzegovina, and six taxa (35.29%) in the Red List of Republic of Srpska, five taxa (29.41%) are strictly protected in Republic of Srpska, while eight taxa (47.06%) are in the IUCN list. The CITES list includes 11 taxa (64.7%). The most numerous species are from the Orchidaceae family, of which ten taxa (90%) are in the CITES list, and six taxa (54.54%) are in the

preliminary Red List of Bosnia and Herzegovina. The Red List of Flora of the Federation of Bosnia and Herzegovina, the Red List of the Republic of Srpska, and the List of strictly protected species in the Republic of Srpska include four taxa (36.36%) each. The IUCN list includes six taxa (54.54%) as least concern. Taxa from subclass Commelilnidae include one endemic (20%) and three strictly protected species (60%) in the Republic of Srpska (Figure 2.).

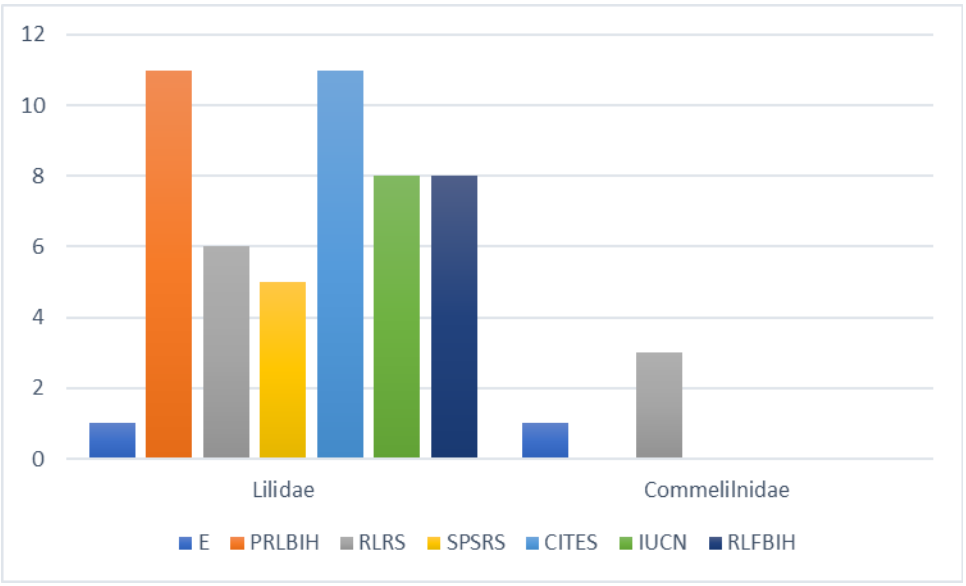

Figure 2. Representation of taxa by different evaluation systems and conservation of species in subclasses of Class Liliopsida

4. Discussion

Fifty-four endemic species have been registered in the studied area. The endemic species are dominated by mesoendemic species, while stenoendemic species are much rarer. The number of endemics decreases from rock cracks and creeps toward forests, thickets, and meadows. The following endemic species are represented: *Acer hyrcanum* subsp. *intermedium*, *Acer obtusatum*, *Athamanta turbith* subsp. *haynaldii*, *Cytisus tommasinii*, *Cirsium candelabrum*, *Cirsium waldsteinii*, *Daphne malyana*, *Iris reichenbachii*, *Clinopodium thymifolium*, *Pseudofumaria alba* subsp. *leiosperma*, *Satureja subspicata* subsp. *subspicata* and others.

The exceptional floristic importance of the Drina National Park is reflected in the presence of vascular plant species found in the preliminary Red List of Bosnia and Herzegovina, the Red List of Flora of the Federation of Bosnia and Herzegovina and the Decree on the Red List of Endangered Plant and Animal Species of Republic of

Srpska. All species give particular significance to the flora and vegetation of the studied area. These are endemic, rare and endangered species protected by national and global regulations.

Species from the preliminary Red List of Bosnia and Herzegovina include *Picea omorika* (R), *Cerastium decalvans* (V), *Dianthus petraeus* (R), *Silene sendtneri* (R), *Saxifraga marginata* (R), *Pyrola rotundifolia* (R), *Hieracium waldsteinii* (R), *Lilium martagon* (V), *Erythronium dens-canis* (V) *Convallaria majalis* (V), *Plathanthera bifolia* (R), *Gentianella ciliata* (R) and others.

Species from the Red List of Flora of the Federation of Bosnia and Herzegovina include *Telekia speciosa* (VU), *Digitalis lanata* (VU), *Scrophularia heterophylla* subsp. *laciniata* (EN), *Pimpinella serbica,* and others.

According to the Decree on the Red List of Endangered Plant and Animal Species of Republic of Srpska, the following species are protected: *Acanthus hungaricus*, *Allium victorialis*, *Arabis procurrens*, *Asperula taurina, Callitriche cophocarpa*, *Campanula sibirica*, *Equisetum sylvaticum*, *Primula elatior subsp. intricata*, *Vicia oroboides,* and others.

In the flora of the studied area, the following species from the Washington Convention CITES list were identified: *Galanthus nivalis*, *Cephalanthera longifolia*, *Cephalanthera rubra*, *Dactylorhiza maculata* subsp. *maculata*, *Anacamptis morio*, *Traunsteinera globosa*, *Epipactis helleborine*, *Orchis mascula* subsp. *speciosa,* and others. These species are listed in Appendix II of the CITES Convention. They are currently not threatened with extinction and are protected, but trade in specimens from natural habitats is prohibited, while it is allowed in nurseries and cultures. These species are endangered due to their decorative and medicinal value.

5. Conclusion

In the eastern part of Bosnia and Herzegovina, on the territory of the Municipality of Srebrenica, in the middle course of the Drina River, lies the Drina National Park. Based on years of field research and existing literature sources, 635 taxa of vascular plants were identified in the area of NP "Drina." Data analysis revealed 55 endemic taxa. Moreover, 43 taxa are included in the preliminary Red List of Bosnia and Herzegovina, 34 taxa are in the Red List of the Flora of the Federation of Bosnia and Herzegovina, while 48 taxa are in the Red List of the Republic of Srpska. The IUCN list includes 14 taxa, while 12 are in the CITES list. Particular value is added to NP "Drina" by the presence of Pančić spruce, an endemic, tertiary relict species.

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