

CHOROLOGICAL ANALYSIS OF THE ENDEMIC FLORA IN THE METOHIAN PROKLETIJE MOUNTAINS

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Abstract – The Metohian Prokletije Mountains are the outermost southeastern branch of interior Dinaric Alps. They are one of the most important centers of floristic diversity of the Balkan Peninsula, with many endemic Balkan species.

Key words: Metohian Prokletije Mountains, flora, endemics.

INTRODUCTION

The Prokletije Mountains belong to the Dinaric Alps region within the wide Mediterranean mountain chain zone. They are one of the most complex mountain ranges on the Balkan Peninsula consisting of 24 mountain groups situated in the border zone of Serbia, Montenegro and Albania.

The northeastern part of the Prokletije Mountains, known as Metohian Prokletije, extends for about 90 km in the southwestern part of Serbia. The most important mountain massifs in Metohian Prokletije are Rusolija (2.380 m) with Žljeb, Hajla (2.400 m), Štedim (2.272 m), Siška Planina (1.871 m), Begova Planina (2.015 m), Paklen (1.376 m) and Mokra gora (1.731 m). In the central group the most significant are: Koprivnik (2.460 m), Streočka Planina (2.377 m), Lumbardske Mountains with Žuti kamen (2.522 m), Nedžinat (2.341 m), Bogdaš (2.533 m), Starac (2.426 m) and in the southern group: Juničke Mountains (2.148 m), Dobridol (2.275 m) and Đeravica (2.656 m).

The Metohian Prokletije Mountains are geologically very diverse with various rocks formations (magmatic, sediment and metamorphic), ranging from Paleozoic to the Quaternary age. The whole area is dominated by glacial, periglacial, karst and fluvial relief with steep ridges, almost erect craggy walls and deep river valleys, gorges and canyons (Belij, 2003).

Climatic conditions are exceptionally variable, with four distinctive regions: submountain (600-1150 m), mountain (1150-1750 m), highmountain (1750-2250 m) and subnival (above 2250 m) (Radovanović, 1996). The annual isotherm at 600 m is 10°C, while at 2500 m it is 0°C. Average annual precipitation ranges from 650 mm (Istok) to about 2000 mm (Juničke Planine Mountains). At higher altitudes (above 1500 m) there are more than 60 days yearly with snow cover above 10 cm, which lasts from 90 to 120 days (Radovanović and Vasiljević, 2003).

The barrier position of Prokletije Mountains on the northern limits of the Mediterranean Basin with mixed mediterranean and continental influences, peculiar geological, geomorphological and climatic

variability as well as glacial-refugial character, were important for the evolution of specific, very diverse and rich flora and vegetation (Stevanović, 1992a; 1996; 1999; Tomović, 2007; Niketić, 2005; Amidžić, 1998; 2003; Amidžić, Stevanović, 1997; Amidžić, Belij, 1998; Janković, Pavlović-Muratspahić, 2003; Pavlović-Muratspahić, 2003; Lakušić, 1968). Autochthonous Balkan species represented mostly by submediterranean-tertiary, eumediterranean-tertiary, oromediterranean-tertiary floristic elements as well as migroelements with different origin and age, are intermingled in this area. Particularly interesting are the arcto-tertiary, glacial and boreal elements.

MATERIALS AND METHODS

As a result of comprehensive field work conducted from 1994 to 1997 in the area of the Metohian Prokletije Mountains, which comprise c. 96000 ha from 500 to 2656 m, as well as literature survey, abundant herbarium material was collected and deposited in the Herbarium of the Institute for Nature Conservation of Serbia and the Institute for Nature Conservation of Vojvodina province.

The plant material was identified according to Josifović (1964-1977), Sarić (1986; 1992), Tutin et al. (1968-1980), Tutin et al. (1993), Jordanov (1963-1979), Velchev (1982-1989), Micevski (1985-2005), and Jávorka and Csapody (1991). The classification of floristic elements follows Gajić (1980), Meusel et al. (1965; 1978), Meusel and Jäger (1992) and Stevanović (1992b).

RESULTS AND DISCUSSION

So far 1611 taxa of species and subspecies level have been recorded in the high mountain zone of the Metohian Prokletije Mountains above the forest line, i.e. 44% of vascular flora in Serbia (Amidžić, Panjković, 2003), with 283 Balkan endemic taxa (about 14% of all recorded taxa). The class Dicotyledones within division Magnoliophyta was dominant with 1303 taxa classified into 352 genera and 85 families. The class Monocotyledones was represented by 255 taxa classified into 81 genera and 12 families.

Families with the largest number of endemic taxa were *Asteraceae* (68), *Caryophyllaceae* (24), *Lamiaceae* (19), *Scrophulariaceae* (19), *Brassicaceae* (15), and *Fabaceae* (14) (Tab. 1), which is generally in accordance with the taxonomic spectrum of the Balkan Peninsula (Turrill, 1929).

The richest genus, with 33 recorded endemic taxa, was *Hieracium* L., which distinguishes the Dinaric Alps as one of the centers of *Hieracium* evolution and diversity. It is followed by the genus *Dianthus* L. with 9 taxa, which shows the interconnection of Prokletije Mountains and the wider East Mediterranean area as the speciation center of this genus. Other important genera were *Achillea* L., *Campanula* L., *Stachys* L., *Thymus* L. and *Saxifraga* L. with 6 taxa, and *Centaurea* L., *Trifolium* L., *Knautia* L., *Melampyrum* L. and *Viola* L. with 5 taxa (Tab. 2).

Endemics of the Metohian Prokletije Mountains are classified into three areal groups: southeuropean-mountain (mostly on limestone), centraleuropean-mountain (mostly on silicates) and mediterranean-submediterranean (on serpentinite and limestone).

Dinaric endemic taxa are the most numerous with 79 representatives (*Astragalus fiale* Degen, *Aquilegia bleicicii* Podobnik, *Aquilegia grata* F. Maly ex Zimmeter subsp. *grata*, *Campanula velebitica* Borbás, *Carduus ramississimus* Pančić, *Centaurea melanocephala* Pančić, *Cirsium appendiculatum* Griseb., *Dianthus integer* Vis. subsp. *integer*, *Euphorbia panicicii* G. Beck, *Fritillaria messanensis* Rafin. subsp. *gracilis* (Ebel) Rix, *Heliosperma pusillum* (Waldst. & Kit.) Hoffmans. subsp. *monachorum* (Vis. & Pančić) Niketić & Stevanović, *Micromeria croatica* (Pers.) Schott, *Knautia travnicensis* (G. Beck) Szabó and others). Although they show very heterogenic distribution, many of them (about 50% of taxa) are found only in the southeastern or central-southeastern parts of the Dinaric province (Fig. 1).

Scardo-Pindic endemic taxa have their center of distribution in the mountain areas in the south part of the Balkan Peninsula, and they are represented by 21 taxa (*Achillea holosericea* Sibth. & Sm., *Galium*

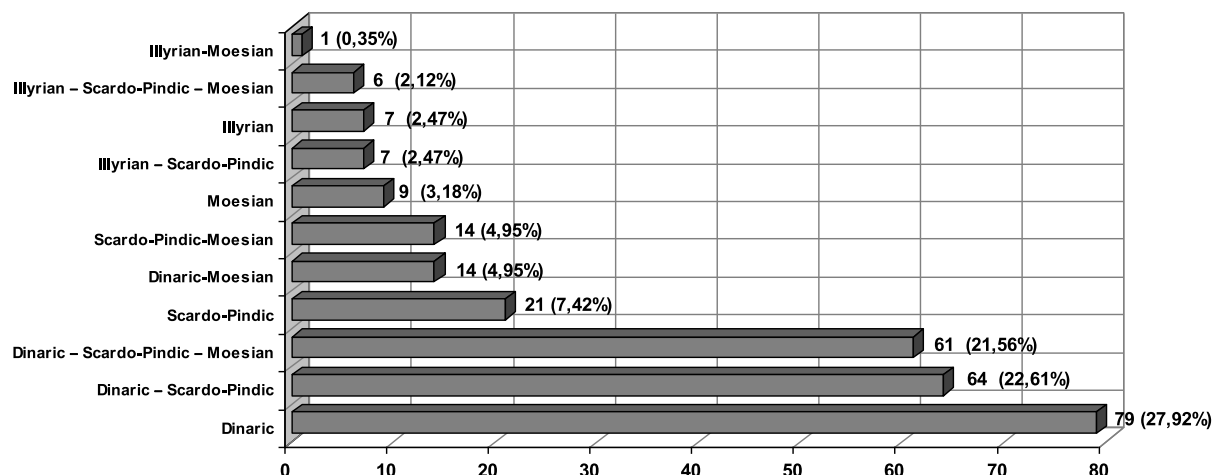


Fig. 1. Chorological spectrum of the endemic flora of Metohian Prokletije.

laconicum Boiss. & Heldr., *Dianthus pinifolius* Sm. subsp. *pinifolius*, *Moltkia doerfleri* Wettst., *Oxytropis halleri* Bunge ex Koch subsp. *korabensis* (Kümmerle & Jáv.) Chrtek, *Saxifraga taygetea* Boiss. & Heldr., *Scabiosa columbaria* subsp. *balcanica* (Velen.) Kokkini, *Solenanthus scardicus* Bornm. and others).

Moesian elements, which are native to mountain areas in the eastern Balkans, are represented by 9 taxa predominantly distributed in the western part of Moesian province (*Dianthus microlepis* Boiss, *Genista hassertiana* (Bald.) Bald. ex Buchegger subsp. *hassertiana*, *Linum tauricum* Willd. subsp. *serbicum* (Podp.) Petrova, *Sedum grisebachii* Heldr. and others).

Illyrian elements with a center of distribution in the mountains of the western Balkan Peninsula are represented by 7 taxa (*Edraianthus tenuifolius* (Waldst. & Kit.) A. DC., *Euphorbia subhastata* Vis. & Pančić, *Hieracium praecurrens* Vuk. subsp. *megaladenophyes* K. Malý & Zahn, *Galium firmum* Tausch, *Verbascum glabratum* Friv. subsp. *bosnense* (K. Malý) Murb. and others).

With the exception of the Balkan areal-group endemics, there are many connective elements. Most numerous is Dinaric-Scardo-Pindic with 64 taxa

(*Achillea abrotanoides* (Vis.) Vis., *Alkanna scardica* Griseb., *Alyssum markgrafii* O. E. Schulz ex Markgraf, *Amphoricarpos autariatus* Blečić & Mayer subsp. *bertisceus* Blečić & E. Mayer, *Campanula hercegovina* Degen & Fiala, *Dioscorea balcanica* Košanin, *Draba kuemmerlei* Stevanović & D. Lakušić, *Pancicia serbica* Vis., *Scorzonera doria* Degen & Bald., *Sempervivum kosaninii* Praeger, *Silene parnassica* Boiss. & Spruner subsp. *serbica* (Adamović & Vierh.) Stevanović & Niketić, *Valeriana bertisceus* Pančić, *Viola elegantula* Schott and others).

The Dinaric-Scardo-Pindic-Moesian element follows, with 61 recorded taxa (*Achillea ageratifolia* (Sibth. & Sm.) Benth. & Hooker fil. subsp. *serbica* (Nyman) Heimerl, *Barbarea balcana* Pančić, *Carduus scardicus* (Griseb.) Wettst., *Cirsium lingu-lare* subsp. *albanum* Wettst., *Cytisus tommasinii* Vis., *Dactylorhiza cordigera* (Fries) Soó subsp. *bosniaca* (G. Beck) Soó, *Hesperis dinarica* G. Beck, *Myricaria ernesti-mayeri* R. Lakušić, *Pinguicula balcanica* Casper, *Polygala croatica* Chodat, *Ramonda serbica* Pančić, *Potentilla montenegrina* Pant., *Viola mac-edonica* Boiss. & Heldr. and others).

Other important connective elements are Dinaric-Moesian (*Centaurea finazzeri* Adamović, *Edraianthus jugoslavicus* R. Lakušić, *Festuca panci-*

Table 1. Number of endemic taxa by family.

Family	Number	Family	Number	Family	Number
<i>Asteraceae</i>	68	<i>Violaceae</i>	5	<i>Gesneriaceae</i>	1
<i>Caryophyllaceae</i>	24	<i>Crassulaceae</i>	4	<i>Hypericaceae</i>	1
<i>Lamiaceae</i>	19	<i>Euphorbiaceae</i>	4	<i>Iridaceae</i>	1
<i>Scrophulariaceae</i>	19	<i>Liliaceae</i>	4	<i>Lentibulariaceae</i>	1
<i>Brassicaceae</i>	15	<i>Linaceae</i>	3	<i>Oleaceae</i>	1
<i>Fabaceae</i>	14	<i>Aceraceae</i>	2	<i>Orchidaceae</i>	1
<i>Campanulaceae</i>	12	<i>Asclepiadaceae</i>	2	<i>Orobanchaceae</i>	1
<i>Apiaceae</i>	10	<i>Caprifoliaceae</i>	2	<i>Papaveraceae</i>	1
<i>Ranunculaceae</i>	9	<i>Gentianaceae</i>	2	<i>Pinaceae</i>	1
<i>Dipsacaceae</i>	8	<i>Primulaceae</i>	2	<i>Plantaginaceae</i>	1
<i>Poaceae</i>	8	<i>Polygonaceae</i>	2	<i>Plumbaginaceae</i>	1
<i>Rosaceae</i>	8	<i>Valerianaceae</i>	2	<i>Polygalaceae</i>	1
<i>Rubiaceae</i>	7	<i>Acanthaceae</i>	1	<i>Rhamnaceae</i>	1
<i>Boraginaceae</i>	6	<i>Cistaceae</i>	1	<i>Rutaceae</i>	1
<i>Saxifragaceae</i>	6	<i>Dioscoreaceae</i>	1	<i>Tamaricaceae</i>	1

Table 2. Genera richest by the endemic taxa (species and subspecies level)

Family	Number	Family	Number
<i>Hieracium</i> L.	33	<i>Saxifraga</i> L.	6
<i>Dianthus</i> L.	9	<i>Centaurea</i> L.	5
<i>Achillea</i> L.	6	<i>Trifolium</i> L.	5
<i>Campanula</i> L.	6	<i>Knautia</i> L.	5
<i>Stachys</i> L.	6	<i>Melampyrum</i> L.	5
<i>Thymus</i> L.	6	<i>Viola</i> L.	5

ciana (Hackel) K. Richter, *Geum bulgaricum* Pančić, *Stachys alpina* L. subsp. *dinarica* Murb. etc.), Scardo-Pindic-Moesian (*Armeria rumelica* Boiss., *Androsace hedraeantha* Griseb., *Alchemilla bulgarica* Rothm., *Campanula patula* L. subsp. *epigaea* (Janka) Hayek, *Fritillaria graeca* Boiss. & Spruner, *Hypericum rumeliacum* Boiss. subsp. *rumeliacum* etc.) (Fig. 1).

Particularly interesting are local endemic species (23) which belong to the South Dinaric areal group: *Centaurea alba* L. subsp. *ipeensis* (Rech. fil.) Dostál, *Crepis bertisceae* Jáv, *Dianthus nitidus* Waldst. & Kit. subsp. *lakisicii* T. Wraber, *Gentiana pneumonanthe* L. subsp. *nopcsae* (Jáv) T. Wraber, *Heliosperma macranthum* Pančić, *Heliosperma oliverae* Niketić & Stevanović, *Hieracium albipellitum* (Zahn) Niketić, *Hieracium bertisceum* Niketić, *Hieracium bjeluschae* K. Malý & Zahn subsp. *tommasiniiforme* Schaeffer

& Zahn, *Hieracium erythrocarpum* Peter subsp. *kurvalae* Rech. fil. & Zahn, *Hieracium grossianum* Zahn subsp. *schefferianum* Zahn, *Hieracium guglerianum* Zahn subsp. *telekianum* Kümmerle & Zahn, *Hieracium murorum* L. subsp. *valdecordatum* Zahn, *Hieracium murorum* L. subsp. *bistricense* Zahn, *Hieracium pichleri* A. Kerner subsp. *chromoneurum* Zahn, *Hieracium praecox* Sch. Bip. subsp. *basilacistum* Rech. fil. & Zahn, *Hieracium pseudobifidum* Schur subsp. *zljebense* (Zahn) Zahn, *Hieracium schefferi* Rech. fil. & Zahn, *Hieracium sericophyllum* Nejc. & Zahn subsp. *acropoliscapum* Zahn, *Hieracium sparsum* Friv. subsp. *ipekanum* Rech. fil. & Zahn, *Ligusticum albanicum* Jáv., *Pedicularis ernesti-mayeri* Stevanović, Niketić & D. Lakušić and *Wulfenia bleicii* R. Lakušić subsp. *bleicii*.

Most of the Balkan endemic taxa are connected with certain habitat types, particularly with sub-

alpine shrub vegetation (alliances Pinion mugi Pawl. 1928, Juniperion sibiricae Br.-Bl. 1939, Bruckenthalion spiculifoliae Horvat 1949), acid alpine and sub-alpine grasslands on silicate substrates (Seslerion cosmosae Horvat 1935, Jasionion orbiculatae R. Lakušić 1964), calcareous alpine and subalpine grasslands (Oxythroidion dinaricae R. Lakušić (1968) 1970, Edraiantho-Seslerion Horvat 1949, Campanulion albanicae R. Lakušić 1966, Seslerion juncifoliae Horvat 1930), calcareous screes (Bunion alpini R. Lakušić 1966, Thlaspidion rotundifolii Jenny-Lips 1930, Silenion marginatae R. Lakušić 1966, Saxifragion prenjae R. Lakušić 1966), poor fens and soft-water spring mires (Caricion casnescentis – fuscae Koch 1926 em. Nordh. 1936, Nartheciion scardici R. Lakušić 1966), vegetation of snow patches and dwarf willow scrubs (Salicion retusae Horvat 1949, Ranunculion crenati R. Lakušić 1966) and rock cliffs and outcrops (Saxifragion cymosae R. Lakušić 1970, Silenion lerchenfeldianae Horvat 1960, Amphoricarpion bertiscei R. Lakušić 1968).

In the Metohian Prokletije Mountains so far 283 Balkan endemic taxa have been recorded. Most numerous were Dinaric (27.92%), Dinaric-Scardopindic (22.61%) and Dinaric-Scardo-Pindic-Moesian (21.56%). Local endemics are represented by 23 taxa.

The most recent estimates show that Balkan Peninsula flora contains 2600 to 2700 endemic taxa with c. 400 local endemics (Stevanović et al., 2005). On the area of the Metohian Prokletije Mountains (c. 96000 ha) over 10% of Balkan endemic taxa and about 6% of Balkan local endemic taxa can be found, which strongly supports its importance as a center of floristic diversity in the Balkans.

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