Bryophyte flora of Hrončecký grúň National Nature Reserve (Poľana Mts, Central Slovakia)

Bryoflóra Národnej prírodnej rezervácie Hrončecký grúň (Poľana, stredné Slovensko)

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Abstract:
This study deals with the Hrončecký grúň National Nature Reserve, characterised by virgin beech-fir forests, and documents its bryophyte flora. A total of 91 bryophyte taxa were recorded, including 22 liverworts and 69 mosses. Among these, two are regarded endangered in Slovakia (*Dicranum viride*, *Orthotrichum alpestre*), four are vulnerable (*Anomodon rugelii*, *Callicladium haldanianum*, *Neckera pennata*, *N. pumila*), three are near threatened (*Buxbaumia viridis*, *Fuscocephaloziopsis catenulata*, *Lewinskya striata*), while four species are not included in the current checklist of Slovak mosses but occur in the country (*Lewinskya fastigiata*, *Schistidium lancifolium*, *Thamnobryum neckeroides*, *Ulota intermedia*). Additionally, eight species are newly reported for the Poľana Protected Landscape Area. This survey contributes to a bridging of gaps in the knowledge of bryophyte distribution and reinforces the need for targeted conservation and monitoring efforts in this unique landscape.

Key words:
biodiversity, conservation, liverworts, mosses, red-listed species

INTRODUCTION

The Poľana Protected Landscape Area (PLA) and Biosphere Reserve is situated in central Slovakia. It mainly covers the Poľana Mts orographic unit, remnant of a Tertiary stratovolcano characterised by a subcircular ridge surrounding a large caldera (Lacika 1993). The eastern part of the

PLA lies in the Veporské vrchy Mts, while its western and southwestern sections extend into the Zvolenská kotlina Basin. This mountainous area is characterised by its well-preserved and predominantly forested landscape, creating conditions essential for the survival of specific and protected plant and animal species, as well as unique and protected habitat types (Hrúz 2009, Švajda et al. 2014). Despite its ecological diversity and attractiveness, the bryophyte flora of this region remains underexplored. Historical studies have focused on liverwort distribution, with notable contributions by J. Duda, J. Váňa, and others. Most data on bryophytes originate from phytosociological research in non-forest habitats such as wet meadows and peatlands, with fewer records from alder and spruce forests (sumarised in Širka et al. 2020). A total of 194 bryophyte species had been recorded in the Poľana PLA by 31 December 2009, based on an inventory conducted during the preparation of the management programme in 2015 (PLA Administration archive, unpublished). This list was later updated to 253 taxa based on available sources (compiled by the first author of this paper). A significant contribution to the knowledge of the bryophyte flora of the Poľana Mts was made by Širka et al. (2020), who added another 93 taxa for the region. However, a detailed review of published works and herbarium specimens has not yet been conducted, leaving the precise number of bryophyte taxa in the Poľana Protected Landscape Area uncertain.

Hrončecký grúň National Nature Reserve (NNR), located in the north-eastern part of the Poľana Mts, remains largely unexplored in terms of bryophyte flora. Apart from a few unpublished species records stored in the Comprehensive Information and Monitoring System of the State Nature Conservancy of the Slovak Republic (*Komplexný informačný a monitorovací systém Štátnej ochrany prírody Slovenskej republiky* – KIMS), data from this area are virtually non-existent. The aim of this paper is to fill this gap.

MATERIAL AND METHODS

Description of the study area

Hrončecký Grúň NNR is situated in the northern part of the Poľana PLA. Its core area covers 55.3 ha and is located in the Poľana Mts. It is surrounded by a buffer zone of 112.83 ha, with its eastern part extending into the Veporské vrchy Mts. The entire reserve area, including its buffer zone, lies at altitudes of 750 to 1100 m a.s.l. and is located in the cadasters of the municipalities of Hronec and Valaská in the Brezno District. The reserve is named after the Hrončecký grúň peak (973 m a.s.l.), which lies at its northern border. The southern to eastern border follows an unnamed stream flowing into the Kamenistý potok stream. Established in 1964 and updated in 1993, the reserve is primarily intended for scientific research and education. It represents the most outstanding examples of

beech and fir-beech forest communities characteristic of the Western Carpathians. The core area comprises forest of over 100 years old and has the highest protection level (5th degree), while the buffer zone serves to minimise the adverse effects of human activities on the reserve which is located in an area dominated by monocultures (Hrúz 2009, CHKO Poľana 2019, ŠOP SR 2025).

According to the phytogeographical classification of Slovakia (Futák 1984), the area of Hrončecký grúň NNR belongs to the Western Carpathian region (Carpaticum occidentale), Pre-Carpathian subregion (Praecarpaticum), Slovenské Stredohorie district, Poľana subdistrict. Most of the Poľana PLA, including the reserve, is situated on Tertiary volcanic rocks, remnants of the Poľana volcano, with layers of andesite from lava flows, along with andesitic tuffs and pyroclastics formed from volcanic ash and bombs (Hrúz 2009, Švajda et al. 2014). The eastern part of the area is made up of acidic rocks, belonging to the Veporic crystallinity, typical of the Veporské vrchy geomorphological unit (Dublan et al. 1997). The Poľana PLA is characterised by a moderately cold, very humid climatic zone, with parts above 800 m lying in a cold mountainous zone with average temperatures in July ranging between 10 °C and 12 °C (Lapin et al. 2002). Average annual precipitation ranges from 900 to 1200 mm (Faško & Šťastný 2002). The dominant soils are cambisols accompanied by rankers derived from weathered acidic rocks (Šály & Šurina 2002), while andosols are more prevalent at higher ridges (Šály 2000). All streams in the area are part of the Hron River watershed (Majerčáková 2002). The forest stands of Hrončecký grúň NNR exhibit a primeval character, featuring all the typical elements of Carpathian mixed forests of the 5th and 6th altitudinal vegetation zone, with a significant amount of deadwood, developing without human influence (Fig. 1). They are dominated by beech (*Fagus sylvatica*) with admixture of fir (*Abies alba*), spruce (*Picea abies*), maple (*Acer pseudoplatanus*), ash (*Fraxinus excelsior*), and elm (*Ulmus glabra*). Favourable abiotic conditions in the reserve allow trees to reach extraordinary dimensions, particularly silver fir with individuals reaching a height of 49.5 m and a circumference of over 400 cm at a height of 1.3 m, making them some of the largest trees not only in Slovakia but also in Central Europe (Hrúz 2009, Ochrana pralesov Slovenska 2025).

Methods

The field survey in the study area was conducted during the vegetation seasons of 2023 (one day in May and two days in July) and 2024 (one day in August). Bryophytes were documented and collected from various substrates, including soil, rocks, bark, and decaying wood by the first two authors. This paper mainly presents data collected during the monitoring of species of European importance, *Buxbaumia viridis* and *Dicranum viride* (extending into the western part of the reserve's buffer zone), as well as results of research in permanent transect plots aimed at studying species

Fig. 1. Western part of Hrončecký grúň National Nature Reserve. Photo P. Širka 20 May 2023.

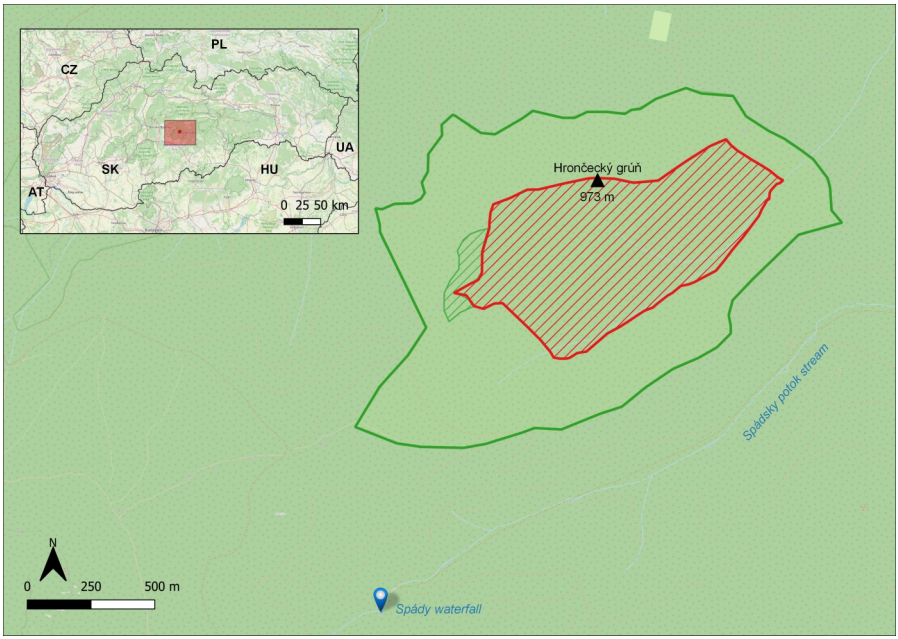

Fig. 2. Hrončecký Grúň National Nature Reserve (in red) with its buffer zone (in green) and its location within Slovakia. The hatched area indicates the surveyed part.

diversity and composition in primeval forests. The collected specimens are kept in the private collection of P. Širka (P.Š.). Nomenclature of bryophytes follows Hodgetts et al. (2020). The Slovak Red-list status of species is given according to Mišíková et al. (2020, 2021). The study area is shown in Fig. 2, created using QGIS software, version 3.22 (Open Source Geospatial Foundation).

List of recorded bryophyte species

Altogether, 91 bryophyte taxa (22 liverworts and 69 mosses) were recorded during fieldwork. Out of these species, two are considered endangered (EN) in Slovakia (*Dicranum viride*, *Orthotrichum alpestre*), four vulnerable (VU) (*Anomodon rugelii*, *Callicladium haldanianum*, *Neckera pennata*, *N. pumila*), three near threatened (NT) (*Buxbaumia viridis*, *Fuscocephaloziopsis catenulata*, *Lewinskya striata*), while four are not included in the latest checklist of Slovak mosses (*Lewinskya fastigiata*, *Schistidium lancifolium*, *Thamnobryum neckeroides*, *Ulota intermedia*).

Based on the preliminary list of bryophytes recorded from the territory of the Poľana PLA (Širka et al. 2020, Širka unpubl.), we report here eight new species for the area: *Callicladium haldanianum*, *Dicranum viride*, *Fissidens bryoides*, *F. gracillifolius*, *Jochenia pallescens*, *Neckera pennata*, *N. pumila*, and *Orthotrichum alpestre*.

Abbreviations: **EN** – endangered, **VU** – vulnerable, **NT** – near threatened, **NE** – not evaluated. 1 – rare, up to three records; 2 – scattered, four to ten records; 3 – abundant, more than ten records.

Liverworts:

Apopellia endiviifolia 1; P.Š.
Blepharostoma trichophyllum 3
Calypogeia muelleriana 2; P.Š.
Calypogeia suecica 2; P.Š.
Cephalozia bicuspidata 3; P.Š.
Conocephalum salebrosum 1; P.Š.
Diplophyllum albicans 1; P.Š.
Frullania dilatata 3; P.Š.
Fuscocephaloziopsis catenulata **(NT)** 1; P.Š.
Fuscocephaloziopsis leucantha 1; P.Š.
Lepidozia reptans 3
Lophocolea heterophylla 3
Lophozia ascendens 1; P.Š.
Metzgeria conjugata 1; P.Š.
Metzgeria furcata 3
Nowellia curvifolia 3
Plagiochila porelloides 3
Porella platyphylla 3
Ptilidium pulcherrimum 2
Radula complanata 3

Riccardia palmata 2; P.Š.
Tritomaria exsecta 2; P.Š.

Mosses:
Alleniella complanata 2; P.Š.
Amblystegium serpens 2
Anomodon rugelii **(VU)** 2; P.Š.
Atrichum undulatum 3
Brachytheciastrum velutinum 3
Brachythecium rutabulum 3
Brachythecium salebrosum 3
Buxbaumia viridis **(NT)** 3; P.Š.
Callicladium haldanianum **(VU)** 1; P.Š.
Chinoloma tenuirostre 1
Ctenidium molluscum 1; P.Š.
Dicranodontium denudatum 1
Dicranum montanum 3
Dicranum scoparium 3
Dicranum viride **(EN)** 1; P.Š.
Eurhynchium angustirete 2
Exsertotheca crispa 2; P.Š.
Fissidens bryoides 1; P.Š.
Fissidens gracilifolius 1; P.Š.
Fissidens pusillus 1; P.Š.
Fissidens taxifolius 1; P.Š.
Grimmia hartmanii 2
Grimmia muehlenbeckii 2; P.Š.
Herzogiella seligeri 3
Heterocladium heteropterum 1; P.Š.
Homalothecium sericeum 2
Homomallium incurvatum 1
Hylocomium splendens 2
Hypnum cupressiforme 3
Isothecium alopecuroides 3
Jochenia pallescens 2
Leucodon sciuroides 3
Lewinskya affinis 2; P.Š.
Lewinskya fastigiata 2; P.Š.
Lewinskya speciosa 2; P.Š.
Lewinskya striata **(NT)** 2; P.Š.
Neckera pennata **(VU)** 1; P.Š.
Neckera pumila **(VU)** 1; P.Š.
Orthotrichum alpestre **(EN)** 2; P.Š.
Orthotrichum diaphanum 1; P.Š.
Orthotrichum pallens 2; P.Š.
Orthotrichum stramineum 2; P.Š.

Paraleucobryum longifolium 3
Plagiomnium affine 2
Plagiomnium cuspidatum 2
Plagiomnium undulatum 2
Plagiothecium cavifolium 3; P.Š.
Plagiothecium denticulatum 2; P.Š.
Plagiothecium nemorale 2; P.Š.
Platygyrium repens 3
Pleurozium schreberi 2
Pogonatum aloides 1
Pohlia cruda 1
Polytrichum formosum 3
Polytrichum juniperinum 1
Pseudanomodon attenuatus 3
Pseudoleskeella nervosa 3
Pterigynandrum filiforme 3
Ptychostomum moravicum 3
Pulvigera lyellii 2
Pylaisia polyantha 2
Rhizomnium punctatum 3
Sanionia uncinata 2
Schistidium lancifolium **(NE)** 2; P.Š.
Sciuro-hypnum populeum 3
Taxiphyllum wissgrillii 2; P.Š.
Tetraphis pellucida 3
Thamnobryum neckeroides **(NE)** 2; P.Š.
Ulota intermedia **(NE)** 1; P.Š.

Comments on red-listed species and other interesting records

Anomodon rugelii **[VU]**

- Brezno Distr., Valaská: ca 600 m SE of Hrončecký grúň peak (973 m), on granite rocks near unnamed periodically drying right tributary of Kamenický potok stream [48°40'52.24"N, 19°30'33.07"E, ℚ 7383a], 905 m a.s.l., 5 Aug 2024, leg. P. Širka.
- ditto: ca 350 m E of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on granite rock [48°41'10.85"N, 19°30'49.25"E, ℚ 7383a], 930 m a.s.l., 5 Aug 2024, leg. P. Širka.
- ditto: ca 30 m SW of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on granite rock [48°41'12.01"N, 19°30'32.82"E, ℚ 7383a], 975 m a.s.l., 23 July 2023, leg. P. Širka, det. P. Širka & S. Kubešová.

This moss species is rather rare and local in Europe, assessed as NT (Hodgetts et al. 2019c, Sabovljević et al. 2019). In Slovakia, it has a scattered distribution, and is known from most mountainous regions. It was recently already reported from two other localities in the Poľana Mts (Dřevojan et al. 2019b, Širka et al. 2020). In Hrončecký grúň NNR, it was found on several shaded granite rocks throughout the reserve but also on *Fraxinus excelsior* bark.

Buxbaumia viridis **[NT]**

– Brezno Distr., Valaská: ca 400 m SW of Hrončecký grúň peak (973 m), old-growth beech-fir forest, gametophyte on moist dead spruce log [48°41'0.13"N, 19°30'19.88"E, Q 7383a], 1010 m a.s.l., 23 July 2023, leg. P. Širka.

Although *B. viridis* occurs throughout much of Europe and is generally not threatened, it is listed in Annex II of the EU Habitats Directive. Intensive surveys of this species in recent years have lead to a substantial increase in records, but this may have masked declines due to habitat destruction in some countries (Hodgetts et al. 2019a,d). The species is relatively common in much of Slovakia's montane region, with its primary distribution in the central (e.g. Jasík & Potocký 2016) and northern parts of the country (KIMS), but is threatened by logging. Most local populations of *B. viridis* are under active monitoring, including those in the Poľana Mts. Monitoring in Hrončecký grúň NNR and its buffer zone in 2023 revealed a large population of *B. viridis*. A total of 34 colonised dead logs and 756 sporophytes, including logs colonised by gametophytes of *Buxbaumia*, were recorded at three separate permanent monitoring sites. The species was also found on several other logs outside these designated plots within the reserve and its buffer zone, generally most frequently on spruce and fir deadwood. In the same year, additional ten colonised logs and 245 sporophytes were identified at another nearby permanent monitoring site, Spády Nature Monument.

Callicladium haldaneanum **[VU]**

– Brezno Distr., Hronec: ca 500 m SW of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on moist, decaying fallen *Picea abies* log together with *Blepharostoma trichophyllum*, *Buxbaumia viridis*, *Dicranum scoparium*, *Herzogiella seligeri*, *Lepidozia reptans*, and *Tetraphis pellucida* [48°41'4.73"N, 19°30'10.03"E, Q 7383a], 1020 m a.s.l., 20 May 2023, leg. P. Širka, det. P. Širka, conf. S. Kubešová.

This moss has a boreo-subcontinental distribution with more frequent occurrences towards the north and east, while it is quite rare in Central Europe. It usually grows on rotten logs and tree bases in various forests from the lowlands to the upper tree line (Baisheva & Ignatov 2019, Kučera 2019). Only a few recent records of this species are known from Slovakia, e.g. from the Bukovské vrchy Mts (Šoltés & Buraľ 2012), the Nízke Beskydy Mts (Dřevojan et al. 2019a), and the Nízke Tatry Mts (Burdelová 2024). This is the first record from the Poľana Mts.

Dicranum viride **[EN]**

– Brezno Distr., Valaská: ca 450 m SW of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on *Fagus sylvatica* bark together with *Alleniella complanata*, *Dicranum scoparium*, *Frullania dilatata*, *Isothecium alopecuroides*, *Metzgeria furcata*, *Orthotrichum alpestre*, *Plagiochila porelloides*, *Pseudoleskeella nervosa*, *Pterigynandrum filiforme*, *Radula complanata*, and *Sciuro-hypnum populeum* [48°41'1.65"N, 19°30'17.27"E, Q 7383a], 1015 m a.s.l., 20 May 2023, leg. P. Širka, det. P. Širka, conf. S. Kubešová.

Like the previous species, *D. viride* is listed in Annex II of the EU Habitats Directive but also in Appendix I of the Bern Convention and in many national Red Lists across Europe (Hodgetts et al. 2019c, Schröck et al. 2019a, Hodgetts & Lockhart 2020). In Slovakia it mainly occurs in Poloniny National Park in the Bukovské vrchy Mts. The results of a monitoring of these populations have been published in Papp & Širka (2023), just as the population from Dobročský prales National Nature Reserve in the Veporské vrchy Mts (Širka et al. 2023). Recently, several new localites of *D. viride* have been discovered in various regions (cf. Dřevojan et al. 2019a, 2023, 2024, Kravec 2024), including a large population in the Ostrôžky Mts which has been monitored but not published. The remaining populations have yet to be monitored. During the 2024 monitoring in Hrončecký grúň NNR, only one colonised *Fagus sylvatica* tree with a total size of only 1 cm^2 was discovered (based on a collection from 2023). Although the population is small, new records are expected in the coming years given the good habitat conditions in the reserve.

Fuscocephaloziopsis catenulata **[NT]**

– Brezno Distr., Valaská: ca 30 m SW of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on dead wood together with *Cephalozia bicuspidata* [48°41 '12.01"N, 19°30 '32.82"E, Q 7383a], 975 m a.s.l., 23 July 2023, leg. P. Širka, det. S. Kubešová.

This boreo-temperate liverwort species occurs in most of Europe, except for the Mediterranean and Arctic regions (Váňa 2017, Hodgetts et al. 2019d). It is also known from various mountain areas in Slovakia, but these are only older records. In the Poľana Mts, it has only been reported from Zadná Poľana National Nature Reserve (Širka et al. 2020).

Lewinskya fastigiata **[NE]**

– Brezno Distr., Valaská: ca 350 m SE of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on deadwood [48°41 '7.69"N, 19°30 '46.14"E, Q 7383a], 910 m a.s.l., 20 July 2023, leg. P. Širka, det. P. Širka & S. Kubešová.
– ditto: ca 400 m SW of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on deadwood [48°41 '0.13"N, 19°30 '19.88"E, Q 7383a], 1010 m a.s.l., 23 July 2023, leg. P. Širka, det. P. Širka & S. Kubešová.

This taxon was not included in the latest Checklist and Red List of Mosses of Slovakia (Mišíková et al. 2020), as it was not distinguished from *L. affinis* at the species rank in the past (see explanation in Vigalondo et al. 2020). It is a widespread species in Europe, growing on a wide range of phorophytes (Vigalondo et al. 2020). The first record of *L. fastigiata* in Slovakia originates from a site near Pri Bútľavke Nature Reserve in the Poľana Mts (Širka et al. 2020). Although still with insufficient data, the recent rapid increase in occurrences from various regions throughout the country suggests that this epiphytic taxon is not uncommon in Slovakia. In Hrončecký grúň NNR, it grew on several trees and deadwood.

Lewinskya striata **[NT]**

– Brezno Distr., Valaská: ca 400 m SW of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on *Fagus sylvatica* bark [48°41'0.13"N, 19°30'19.88"E, Q 7383a], 1010 m a.s.l., 23 July 2023, leg. P. Širka, det. P. Širka & S. Kubešová.
– ditto: ca 70 m SW of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on *Fagus* bark [48°41'12.01"N, 19°30'32.82"E, Q 7383a], 975 m a.s.l., 23 July 2023, leg. P. Širka, det. P. Širka & S. Kubešová.

A widespread boreo-temperate epiphytic species in Europe, sensitive to air pollution and more frequent in natural habitats (Sérgio et al. 2019). In the Poľana Mts, it was recently reported from Pri Bútľavke Nature Reserve (Širka et al. 2020). In Hrončecký grúň NNR, it was recorded from several trees in transect plots.

Neckera pennata **[VU]**

– Brezno Distr., Valaská: ca 400 m SW of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on *Fagus sylvatica* bark together with *Lewinskya striata* and *Orthotrichum stramineum* [48°41'0.13"N, 19°30'19.88"E, Q 7383a], 1010 m a.s.l., 23 July 2023, leg. P. Širka, det. P. Širka & S. Kubešová.

An epiphytic boreo-montane moss, rare in western and southern Europe, but becoming more common towards the north and east. It requires high humidity and grows mainly on deciduous trees (Hodgetts et al. 2019b). It is rare and red-listed in the whole Central European region except Ukraine (Hodgetts & Lockhart 2020). It was recently recorded from another primeval beech-fir forest in Dobročský prales National Nature Reserve in the Veporské vrchy Mts (Širka et al. 2023). In Hrončecký grúň NRR, it was found in one transect plot.

Neckera pumila **[VU]**

– Brezno Distr., Valaská: ca 30 m SW of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on *Fagus sylvatica* bark together with *Amblystegium serpens*, *Frullania dilatata*, *Isothecium alopecuroides*, *Lewinskya affinis*, *Pterigynandrum filiforme*, *Ptychostomum moravicum*, *Pulvigera lyellii*, *Sciuro-hypnum populeum*, and *Ulota* sp. [48°41'12.01"N, 19°30'32.82"E, Q 7383a], 975 m a.s.l., 23 July 2023, leg. P. Širka, det. P. Širka, conf. S. Kubešová.

A suboceanic-temperate species, rather rare in the Central European area. Similarly to the previous species, it is red-listed in the neighbouring countries, except Ukraine (Sim-Sim 2019, Hodgetts & Lockhart 2020). It was recently recorded from the Veporské vrchy, Kremnické vrchy, and Bukovské vrchy Mts (Dřevojan et al. 2023, Širka et al. 2023). In Hrončecký grúň NNR, it was found in one transect plot.

Orthotrichum alpestre **[EN]**

– Brezno Distr., Valaská: ca 350 m SE of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on *Fagus sylvatica* bark and on deadwood [48°41'7.69"N, 19°30'46.14"E, Q 7383a], 910 m a.s.l., 20 July 2023, leg. P. Širka, det. P. Širka & S. Kubešová, conf. V. Plášek.
– ditto: ca 400 m SW of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on deadwood [48°41'0.13"N, 19°30'19.88"E, Q 7383a], 1010 m a.s.l., 23 July 2023, leg. P. Širka, det. V. Plášek.

Epiphytic or epilithic moss, considered critically endangered in the neighbouring Czech Republic, endangered in Austria, and probably rare also in Ukraine, but not yet recorded from Hungary or Poland (Hodgetts & Lockhart 2020). In Slovakia, it was recently recorded only from the Slanské vrchy Mts (Višňovská 2024). In Hrončecký grúň NNR, it was found growing on several trees in transect plots.

Schistidium lancifolium **[NE]**

- Brezno Distr., Valaská: ca 600 m SW of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on granite rock [48°40'55.43"N, 19°30'14.88"E, Q 7383a], 1005 m a.s.l., 5 Aug 2024, leg. P. Širka, det. J. Kučera.
- ditto: ca 30 m SW of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on granite rock [48°41'12.01"N, 19°30'32.82"E, Q 7383a], 975 m a.s.l., 23 July 2023, leg. P. Širka, det. P. Erzberger.

The species occurs mainly in Central and Eastern Europe with a distinct eastern distribution and is apparently relatively frequent in the Carpathians (Blom 1996). It grows on shaded, primarily siliceous boulders in humid forests (Kučera 2004, Erzberger & Schröder 2008, Hallingbäck 2019). Its distribution in Slovakia is unkown due to inconsistent differentiation from *S. apocarpum* in the past and a general lack of dedicated work in the genus. Therefore, it was not included in the latest Checklist and Redlist of Mosses of Slovakia (Mišíková et al. 2020). Since then, it has been found in a few mountain ranges of central and eastern Slovakia, including several records from the Poľana Mts (Širka et al. 2020), where it seems to be relatively common. In Hrončecký grúň NNR, it was found growing on granite rocks in several places throughout the reserve.

Thamnobryum neckeroides **[NE]**

- Brezno Distr., Valaská: ca 600 m S of Hrončecký grúň peak (973 m), on granite rocks near unnamed periodically drying right tributary of Kamenický potok stream [48°40'52.24"N, 19°30'33.07"E, Q 7383a], 905 m a.s.l., 5 Aug 2024, leg. P. Širka.
- ditto: ca 30 m SW of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on granite rock [48°41'12.01"N, 19°30'32.82"E, Q 7383a], 975 m a.s.l., 23 July 2023, leg. P. Širka.

This species was first reported from Central Europe by Mastracci (2003). It shows a continental distribution in Europe and is assessed as vulnerable (Hodgetts et al. 2019c, Schröck et al. 2019d). *T. neckeroides* grows on humid silicate and limestone rocks in humid forests in the sub-montane to montane belt (Mastracci 2003, Meinunger & Schröder 2007, Stebel & Vončina 2018). It was not included in the checklist of Slovak mosses (Mišíková et al. 2020). The first record of this species from Slovakia originates from Pri Bútľavke Nature Reserve in the Poľana Mts (Širka et al. 2020). Since then, it has also been found in the Kremnické vrchy Mts (14 July 2021, leg. K. Skokanová, herb. P. Širka), Slanské vrchy Mts (Višňovská 2024), and Čergov Mts (Kravec 2024). In Hrončecký grúň NNR, it occurred relatively frequently on granite rocks.

Ulota intermedia **[NE]**

- Brezno Distr., Valaská: ca 600 m S of Hrončecký grúň peak (973 m), on *Fagus sylvatica* bark near unnamed periodically drying right tributary of Kamenický potok stream [48°40'52.97"N, 19°30'29.97"E, ℚ 7383a], 930 m a.s.l., 5 Aug 2024, leg. P. Širka.
- ditto: ca 350 m SE of Hrončecký grúň peak (973 m), old-growth beech-fir forest, on deadwood [48°41'7.69"N, 19°30'46.14"E, ℚ 7383a], 910 m a.s.l., 20 July 2023, leg. P. Širka, det. P. Širka & S. Kubešová.

Previously not distinguished from *U. crispa*, but reinstated as a species by Caparrós et al. (2016). Despite some gaps in the knowledge of its European distribution, it is probably a widespread moss, growing epiphytically on various phorophytes (Hodgetts 2019). The distribution in Slovakia is insufficiently known. To date, it has only been confirmed from the Poľana Mts (Širka et al. 2020), Čergov Mts (Kravec 2024), and the Nízke Tatry Mts (Burdelová 2024).

CONCLUSIONS

The Poľana Protected Landscape Area and Biosphere Reserve represents a unique and ecologically significant region with a remarkable diversity of bryophytes. In this paper, we have compiled a comprehensive inventory of bryophytes recorded in Hrončecký grúň National Nature Reserve and its buffer zone, located in the north-eastern part of the Poľana Mts during the monitoring of species of European importance *Buxbaumia viridis* and *Dicranum viride*, as well as during research in permanent transect plots studying species diversity and composition in Carpathian primeval forests. This study documents 91 bryophyte taxa (22 liverworts and 69 mosses), including several species of conservation concern, such as *Dicranum viride*, *Orthotrichum alpestre* (both endangered in Slovakia), *Anomodon rugelii*, *Callicladium haldaneanum*, *Neckera pennata*, *N. pumila* (vulnerable), *Buxbaumia viridis*, *Fuscocephaloziopsis catenulata*, *Lewinskya striata* (near threatened), and species previously not recognised or reported from Slovakia (*Lewinskya fastigiata*, *Schistidium lancifolium*, *Thamnobryum neckeroides*, *Ulota intermedia*). These species are commented in detail. Additionally, eight bryophyte species are newly recorded for the Poľana PLA as a whole, highlighting the area's underexplored bryophyte flora and emphasising the need for further research. The primeval forest stands in Hrončecký grúň NNR provide critical habitats for these species, supported by favourable climatic, geological, and ecological conditions. This work not only expands the knowledge of the bryophyte diversity in the region but also underscores the importance of ongoing monitoring and conservation efforts to preserve these valuable ecosystems.

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