

## Grassland Monitoring of Meadows in the Region around Banská Bystrica

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**Abstract:** Meadow grassland communities were monitored *in situ* in the region around the town of Banská Bystrica (Central Slovakia) over the 2008 growing season. The botanical compositions were determined at the sites listed in NATURA 2000 (Donovaly, Tajov, and Priechod). The respective site coordinates were determined using a Global Position System, and then put on the digital map of the Google server. A range of rare, endangered, and protected plant species were found at the monitored sites (e.g. *Gymnadenia densiflora*, *Lilium bulbiferum*, *Lilium matragon*, and *Stipa joannis*).

**Keywords:** grassland monitoring; flora; Kremnické vrchy Mountains; Starohorské vrchy Mountains; vegetation

Botanically, the region around the town of Banská Bystrica is a very rich area within the Western Carpathian mountain range. The specific natural character of the area is given by its location in the mountain region of Central Slovakia, a diverse geological substratum, and a large range of altitudes. In compliance with the phytogeographic classification of Slovakia (FUTÁK 1943) it is included in the West-Carpathian flora (*Carpaticum occidentale*). Many of these precious meadows are registered in the European network of protected sites NATURA 2000. Earlier botanical research was carried out in this area by GALVÁNEK (1999), TURISOVÁ and MARTINCOVÁ (2001) and JANIŠOVÁ (2001a). Some data on valuable local plant species were reported for the area around the village of Badín by FUTÁK (1943) and JANIŠOVÁ (2001b), and also for the area around the village of Kordíky by UHLIAROVÁ and MARTINCOVÁ (2004). JASÍK (1992) monitored the populations of *Orchidaceae* around the village of Malachov. TURIS (2001a) reported on flax species (*Linum*) in the area of the Zvolenská kotlina basin. The references all agree that many precious plant communities are found in this species-rich area.

The objective of the present paper is to bring forth more information about the vegetation at some botanically interesting sites around Banská Bystrica, as well as to collect the ecotypes of important forage-crop species to be preserved in the Gene Bank.

### MATERIALS AND METHODS

Over the 2008 growing season, the botanical research was carried out at those sites already registered in the European network of protected sites NATURA 2000 (Donovaly, Tajov, Priechod, Donovaly-Zvolen and Priechod-Kopec), plus one site (Tajov-Tajovská lúka) which is proposed for registration. The sites were recommended for the research, respectively, by the headquarters of the Nízke Tatry Mts. National Park (NAPANT) and the Protected Landscape Area - Biosphere Reserve Poľana (CHKO Poľana). The vegetation surveys (phytocoenological relevés) were carried out in compliance with BRAUN-BLANQUET (1964) in 5 × 5 m plots. The proportion of species in a sward was specified in compliance with their

abundance and dominance using the following combined scale:

- r – precious, rare species
- + – species of negligible ground cover of less than 1%
- 1 – species of ground cover 1–5%
- 2 – species of ground cover 6–25%
- 3 – species of ground cover 26–50%
- 4 – species of ground cover 51–75%
- 5 – species of ground cover 76–100%.

The geographical coordinates were recorded according to GPS, and the records were transferred onto a map onto which the site borderlines were drawn. The maps of each site are enclosed. The plant names are given in compliance with MARHOLD and HINDÁK (1999). In the relevés, those plants that are rare, endangered, and/or protected species listed in the Red Data Book of Plants in Slovakia (FERÁKOVÁ *et al.* 2001) are given in bold letters.

## RESULTS AND DISCUSSION

In the research areas nearby to Banská Bystrica are mainly thermophilic plant communities, mostly of the alliances *Bromion erecti* and *Cirsio Brachypodion*. The richness of species is related to the geological bedrock (limes and dolomites), as well as to the traditional management of meadows. The potential natural vegetation consists of beech (*Fagus*) forests on lime and dolomite substratum, as well as of beech-fir (*Fagus-Abies*) forests.

### Donovaly site characteristics

The village of Donovaly (altitude 980 m a.s.l.) is a mountain resort located to the north of Banská Bystrica, and between the Veľká Fatra and the Starohorské vrchy mountain ranges. In compliance with the geomorphological characteristics of Slovakia, the site is included in the West Carpathians province, Inner Western Carpathians subprovince, the Tatra-Fatra area, and the Starohorské vrchy unit. The site is included in the NAPANT protection zone (level 2 of nature protection). The agro-climatic classification of Slovakia defines the site as a cold area, district C1 – mildly cold. The vegetation of the area is very diverse and rich in species, such as *Crepis sibirica*, *Campanula serrata*, *Lilium bulbiferum*, *Lilium martagon*, *Gymnadenia densiflora*, *Orchis mascula*, *Anemone narcissiflora*,

and *Trollius altissimus*. TURIS and TURISOVÁ (1995) confirmed the incidence of *Crepis sibirica* at Zvolen, the hill located above Donovaly.

Nowadays, Donovaly is an important holiday destination and the intensive local construction activity has a rather negative impact on the precious habitats, and also on the important non-production functions of the grassland.

Zvolen (altitude 1402 m a.s.l.) is an important European site in NATURA 2000. It is a part of the orographic unit of the Veľká Fatra mountain range as the sub-unit of Zvolen. The relevés (No. 1 and 2) were recorded on the slope of Zvolen, at 1 161 to 1 282 m a.s.l., alliance *Polygono-Trisetion*.

### Relevé 1

At the Donovaly-Zvolen site, the old path to Zvolen hill at the old ski-tow area; a little moor a hydrophilic slope; altitude 1161 m a.s.l.; exposure SW; slope 15°; geographical coordinates N 48°53'07.49" E 19°13'35.69"; plot size 5 × 5 m; ground cover: E<sub>1</sub> 95%, E<sub>0</sub> 70%; number of species: 36; date: 3 July 2008; recorded by Uhliarová and Martincová;

*Equisetum arvense* 3; *Eriophorum angustifolium* 3; *Alchemilla vulgaris* 2; *Carex nigra* 2; *Gymnadenia densiflora* 2; *Potentilla erecta* 2; *Agrostis capillaris* 1; *Caltha palustris* 1; *Cirsium palustre* 1; *Dactylorhiza majalis* 1; *Festuca rubra* 1; *Festuca pratensis* 1; *Lotus corniculatus* 1; *Parnassia palustris* 1; *Ranunculus acris* 1; *Trifolium repens* 1; *Tussilago farfara* 1; *Briza media* +; *Carex echinata* +; *Carex flava* +; *Carex gracilis* +; *Carex panicea* +; *Cardamine pratensis* +; *Cruciata glabra* +; *Crepis paludosa* +; *Linum catharticum* +; *Mentha longifolia* +; *Poa pratensis* +; *Potentilla anserina* +; *Prunella vulgaris* +; *Rhinanthus minor* +; *Trifolium medium* +; *Trifolium pratense* +; *Galium mollugo* r; *Listera ovata* r; *Polygala amara* r.

### Relevé 2

At the Donovaly-Zvolen site, the meadow close to the top of Zvolen hill dominated by *Pimpinella major*, below the walking track, on a mild slope between spruces (*Picea*) and maples (*Acer pseudoplatanus*); altitude 1282 m a.s.l.; exposure SW; slope 10°; geographical coordinates: N 48°53'16.06", E 19°13'39.72"; plot size 5 × 5 m; ground cover:

E<sub>1</sub> 5%, E<sub>0</sub> 100%; number of species: 49; date: 3 July 2008; recorded by Uhliarová and Martincová;

*Agrostis capillaris* 3; *Pimpinella major* 3; *Alchemilla* sp. 1; *Campanula glomerata* 1; *Carlina acaulis* 1; *Crepis conyzifolia* 1; *Festuca rubra* 1; *Hypericum maculatum* 1; *Jacea phrygia* 1; *Leucanthemum vulgare* 1; *Luzula luzoides* 1; *Primula elatior* 1; *Plantago lanceolata* 1; *Veronica chamaedrys* 1; *Acetosa pratensis* +; *Ajuga reptans* +; *Astrantia major* +; *Briza media* +; *Campanula serrata* +; *Cyanus mollis* +; *Cirsium eriophorum* +; *Clinopodium vulgare* +; *Cruciata glabra* +; *Dactylis glomerata* +; *Dianthus carthusianorum* +; *Festuca rupicola* +; *Galium anisophyllum* +; *Geranium sylvaticum* +; *Heracleum sphondylium* +; *Hypochoeris uniflora* +; *Lotus corniculatus* +; *Luzula campestris* +; *Knautia arvensis* +; *Pilosella officinarum* +; *Potentilla aurea* +; *Potentilla heptaphylla* +; *Phleum alpinum* +; *Phleum pratense* +; *Plantago media* +; *Prunella grandiflora* +; *Pyrethrum clusii* +; *Ranunculus* sp. +; *Rumex acetosa* +; *Thesium alpinum* +; *Trisetum flavescens* +; *Trifolium pratense* +; *Trifolium repens* +; *Viola lutea* +; *Hieracium aurantiacum* r.

#### Tajov site characteristics

Tajov (altitude 464 m a.s.l.) is a village 3 km to the north of Banská Bystrica. The village is located at the eastern foot of the Kremnické vrchy mountain range. In conformity with the geomorphological characteristics of Slovakia, a part of Tajov site is included in the West-Carpathians province, the Inner Western Carpathians sub-province, the Tatra-Fatra area, and the Starohorské vrchy unit. The terrain relief is divided by the Tajovský, Farbený, and Mutenský streams.

The flora here, as well as in the villages nearby (Kordíky, Králiky, and Riečka) is very rich. There is valuable grassland, comprising a range of rare species (e.g. *Orchidaceae*), as well as the important species (e.g. *Scorzonera hispanica*, *Campanula serrata*, *Lilium bulbiferum*, and *Trollius altissimus*). The grassland for the most part ranks among the thermophilic pasture communities dominated by *Festuca rupicola*. There are many natural monuments within the area, such as the Tajovský stream, Tajovská kopa (a hill), and Králická tiesňava (a narrow valley or canyon). The latter two are protected natural monuments (level 5) the highest protection level, as defined in compliance with Slovak Act No. 287/1994 on nature and landscape conservation.

Today, Tajov is frequently visited by admirers of this site, located within the Kremnické vrchy mountain range. The area is important due to the species-rich thermophilic vegetation of high diversity.

The relevés were recorded at the Tajov site in the Kremnické vrchy Mts, at an extensively managed meadow of high diversity within an orchard (Relevé No. 3), very close to the area proposed for registering in NATURA 2000 as the Tajovská lúka meadow.

#### Relevé 3

Tajov site in an orchard of a cooperative farm, the meadow in this orchard is behind a wooden hut; altitude 631 m a.s.l.; exposure N; slope 10°; geographical coordinates N 48°44'19.05"; E 19°02'57.37"; plot size 5 × 5 m; ground cover: E<sub>1</sub> 95%, E<sub>0</sub> 80%; number of species: 51; date: 27 June 2008; recorded by Uhliarová and Martincová; *Bromus erectus* 3; *Festuca rubra* 2; *Medicago falcata* 2; *Trifolium montanum* 2; *Arrhenatherum elatius* 1; *Avenella flexuosa* 1; *Dactylis glomerata* 1; *Galium mollugo* 1; *Lilium bulbiferum* 1; *Primula veris* 1; *Salvia pratensis* 1; *Agrimonia eupatoria* +; *Agrostis capillaris* +; *Achillea millefolium* +; *Allium oleraceum* +; *Aquilegia vulgaris* +; *Carex michelii* +; *Carex tomentosa* +; *Carlina acaulis* +; *Centaurea pseudophrygia* +; *Colchicum autumnale* +; *Cruciata glabra* +; *Dianthus carthusianorum* +; *Festuca pratensis* +; *Hypericum perforatum* +; *Knautia kitaibelii* +; *Lathyrus pratensis* +; *Lotus corniculatus* +; *Medicago lupulina* +; *Poa pratensis* +; *Potentilla anserina* +; *Pimpinella saxifraga* +; *Ranunculus acris* +; *Rhinanthus minor* +; *Rumex acetosa* +; *Sanguisorba minor* +; *Silene nutans* +; *Silene vulgaris* +; *Thymus pulegioides* +; *Tithymalus cyparissias* +; *Tragopogon orientalis* +; *Trifolium pratense* +; *Trifolium repens* +; *Trisetum flavescens* +; *Veronica chamaedrys* +; *Viola hirta* +; *Anthyllis vulneraria* r; *Campanula glomerata* r; *Helianthemum ovatum* r; *Plantago lanceolata* r; *Taraxacum officinale* r.

#### Priechod site characteristics

Priechod (altitude 460 m a.s.l.) is a village 10 km to the north-east of Banská Bystrica. The village is located in the Zvolenská kotlina basin, as well as on

the southern slopes of the western portion of the Starohorské vrchy mountain range. In conformity with the geomorphological characteristics, this site is included in the West-Carpathians province, the Inner Western Carpathians sub-province, Slovenské stredohorie area, Zvolenská kotlina unit, Bystrické podolie.

There are two NATURA 2000 sites: the Kopec site on southern thermophilic non-forested slopes, with the occurrence of rare plants, e.g. *Stipa joannis*, *Fumana procumbens* (the latter also reported by TURIS 2001b), and the Brvnište site, an area of level 4 protection, of forest stands with the occurrence of *Cyclamen fatrense*. The relevés were recorded at the Kopec site which is a fast-drying xerothermic community with notable thermophilic species. This is an aesthetically unique area with *Stipa* species, and it resembles a steppe area (Relevé No. 4).

#### Relevé 4

Priechod-Kopec site, dry steppe, the sward comprising *Stipa joannis*, altitude 613 m a.s.l.; exposure S; slope 10°; geographical coordinates: N 48°47'00.66", E 19°13'33.60"; plot size 5 × 5 m; ground cover E<sub>1</sub> 80%; E<sub>0</sub> 50%; number of species: 27; date: 2 July 2008; recorded by Martinová; *Stipa joannis* 4; *Dorycnium germanicum* 3; *Brachypodium pinnatum* 2; *Bromus erectus* 2; *Briza media* 1; *Euphrasia rostkoviana* 1; *Echium vulgare* 1; *Festuca rupicola* 1; *Fragaria vesca* 1; *Galium verum* 1; *Helianthemum grandiflorum* 1; *Medicago falcata* 1; *Medicago lupulina* 1; *Poa pratensis* 1; *Securigera varia* 1; *Agrimonia eupatoria* +; *Centaurea scabiosa* +; *Centaurea stoebe* +; *Cuscuta epithimum* +; *Holcus mollis* +; *Koeleria pyramidata* +; *Salvia verticillata* +; *Salvia pratensis* +; *Sanguisorba minor* +; *Plantago lanceolata* +; *Primula veris* +; *Teucrium chamaedrys* +.

#### CONCLUSIONS

The monitoring of grassland in the region around Banská Bystrica showed a range of sites, with many plant species that are important from the aspect of nature conservation, as well as from a farming point of view. Limiting or stopping the traditional grassland management practices might markedly decrease the biodiversity and lower the

aesthetic value of the local landscape. At all the research sites, botanical relevés were recorded, and the seeds of grasses (*Bromus erectus*, *Festuca pratensis*, and *Festuca rupicola*), legumes (*Securigera varia*, *Anthyllis vulneraria*, *Astragalus glycyphyllos*, *Medicago falcata*, *Trifolium medium*, and *Trifolium montanum*) and herbs (*Tragopogon orientalis*, etc.) were collected with the aim to utilise them in plant breeding and also to deposit them in the Gene Bank.

#### References

- BRAUN-BLANQUET J. (1964): Pflanzensociologie. Grundzüge der Vegetationskunde. 3<sup>rd</sup> Ed., Springer, Wien, New York.
- FERÁKOVÁ V., MAGLOCKÝ Š., MARHOLD K. (2001): Red list of ferns and flowering plants of Slovakia. In: BALÁŽ D., MARHOLD K., URBAN P. (eds): Red list of plants and animals of Slovakia. Ochrana prírody, Banská Bystrica, 20: 44–76. (in Slovak)
- FUTÁK J. (1943): Kremnické hory Mountains. Geo-botanical Studies. Matica Slovenská, Turčiansky Sv. Martin. (in Slovak)
- GALVÁNEK J. (1999): The Banská Bystrica landscape – values, processes, changes and their effects on biodiversity. In: NOVODOMEC R. (ed.): Central Slovakia – Transformation of Natural and Cultural Landscape. Acta Facultatis Rerum Naturalium Universitatis Matthiae Belii, Geographical studies, 6: 67–73. (in Slovak)
- JANIŠOVÁ M. (2001a): Botanical research of the non-forest stands around the village of Riečka ("Starohorské vrchy" mountain range). Bulletin of the Slovak Botanical Society, 23: 121–129. (in Slovak)
- JANIŠOVÁ M. (2001b): Botanical research of the non-forest stands around the village of Kordíky ("Starohorské vrchy" mountain range). In: TURISOVÁ I. (ed.): Proc. Conf. Ecological Diversity of the Model Site of Banská Bystrica Region. November 8, 2001, Banská Bystrica, 124–131. (in Slovak)
- JASÍK M. (1992): Mapping the orchid family (*Orchidaceae*) in Slovakia – the results from the environs of Banská Bystrica. [Thesis.] Department of Landscape Ecology, Faculty of Forestry, Technical University in Zvolen. (in Slovak)
- MARHOLD K., HINDÁK F. (1999): The List of Non-vascular and Vascular Plants in Slovakia. Veda, Bratislava. (in Slovak)
- TURIS P. (2001a): The flax species (*Linum*) in the northern part of Zvolenská kotlina basin. In: TURISOVÁ I. (ed.):

- Proc. Conf. Ecological Diversity of the Model site of Banská Bystrica region. November 8, 2001, Banská Bystrica, 171–180. (in Slovak)
- TURIS P. (2001b): *Fumana procumbens* in Slovakia. Ochrana prírody, Banská Bystrica, **19**: 69–73. (in Slovak)
- TURIS P., TURISOVÁ I. (1995): Confirmed incidence of *Crepis sibirica* at Zvolen, the hill located above Doňovaly. Bulletin of the Slovak Botanical Society, **17**: 85–86. (in Slovak)
- TURISOVÁ I., MARTINCOVÁ E. (2001): Flora in the area of Banská Bystrica. In: TURISOVÁ I. (ed.): Proc. Conf. Ecological Diversity of the Model site of Banská Bystrica region. November 8, 2001, Banská Bystrica, 107–123. (in Slovak)
- UHĽIAROVÁ E., MARTINCOVÁ E. (2004): Flora of the non-forest areas near the village of Badín. In: TURISOVÁ I., PROKEŠOVÁ R. (eds): Proc. Conf. Ecological Diversity of Zvolenská kotlina Basin. September 9, 2004, Banská Bystrica, 113–119. (in Slovak)