

# *Tephroseris longifolia* subsp. *moravica* – population size evaluation and possibilities of its conservation.

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**Abstract.** *Tephroseris longifolia* subsp. *moravica* is an endemic and critically endangered taxon with recently known localities in Biele/Bílé Karpaty Mts., Strážovské vrchy Mts., Pohronský Inovec Mts., Trábeč Mts and Vtáčnik Mts. We visited nine localities of this taxon in 2004. On eight of them (one involving two microlocalities) the occurrence of *T. longifolia* subsp. *moravica* was confirmed and the abundance of the populations was estimated. On one locality and three microlocalities the taxon was not found. In 2004 the populations of *T. longifolia* subsp. *moravica* were less abundant than in previous years and flowering individuals were very sparse. The paper brings the possible explanations together with the recommendation of the suitable management to maintain viable populations. Notes are made to the monitoring methods of *T. longifolia* subsp. *moravica*. Phytosociological characteristics of the two recently found populations in the southern part of the Strážovské vrchy Mts. (locality Čavojs) are given.

**Key words:** *Tephroseris longifolia* subsp. *moravica*, monitoring, population size estimate, optimal management

*Tephroseris longifolia* (Jacq.) Griseb. & Schenk is a suboreophyt of Central Europe distributed mainly in the Eastern Alps in Austria whereas reaches also western Hungary, Slovenia, northern Croatia and northern Italy (Meusel et al. 1992ab). Isolated populations known from the Bílé and Biele Karpaty Mts. since 1926 (Staněk 1926, ut *Senecio pratensis* Hoppe) described Holub (1979) as individual subspecies *T. longifolia* subsp. *moravica* based on several morphological differences e.g. in the type of hairs on stem, leaves and fruits as well as flower colour (cf. Holub 1979; Holub in Elsnerová et al. 1982; Kochjarová 1995, 1997, 1998b). The populations of the Western Carpathians represent an isolated occurrence of an alpine migrant with an individual evolution (Holub 1999). Recently the taxon is considered to be an endemic of the Western Carpathians (Kliment 1999). Localities of the subspecies are known from the following geomorphological units (Mazúr & Lukniš 1978): Biele/Bílé Karpaty, Strážovské vrchy, Pohronský Inovec, Trábeč and Vtáčnik.

*T. longifolia* subsp. *moravica* grows in submontane mesophilous meadows, forest edges, shrubby slopes or in the open forests, prevailing on the northern, northeastern or northwestern slopes in altitudes from 475 to 800 m a.s.l. on various geological bedrock (cf. Holub 1982, Batoušek & Grulich 1989, Kochjarová 1998a, Kliment 1999). *T. longifolia* subsp. *moravica* a heliophyt – heliosciophyt growing on the deeper clay soils which are fresh or moderately moist. It enters into the communities of the alliances *Cirsio-Brachypodium pinnati* Hadač et Klika in Klika et Hadač 1944 emend. Krausch 1961, *Polygono-Trisetion*, *Trifolium medii* and *Fagion*, respectively (Kochjarová 1998a, Holub 1999). The detailed phytosociological evaluation of ecotone communities with the occurrence of the subspecies is generally difficult.

*T. longifolia* subsp. *moravica* is a hemicryptophyt with the prevailing generative reproduction. Chromosome number  $2n = 48$  (hexaploid) published Kochjarová (1997) from localities Inovec, Stráž and Bylnice. According to our observations *T. longifolia* subsp. *moravica* is a perennial living for several years. The individual rosettes (ramets) are monocarpic, they endure in vegetative stage and flower only after several years. The period of flowering is short culminating at the end of May or beginning of June. *T. longifolia* subsp. *moravica* produces large amount of seeds (Kochjarová 1998a), which germinate well in the open sites (Holub 1999). The plant can easily be cultivated (Holub 1995, Svobodová & Řehořek 1995, Kochjarová 1998a, Tlusták 1998). During 1987-1988 first successful experiments of cultivation from the regional seed sources and planting of grown plants into the native habitat took place (Batoušek & Grulich 1989). During 1992-1996 V. Tlusták continued with the cultivation attempts (Tlusták 1992, 1993, 1995, 1996 sec. Jongepierová 1997).

The vulnerability of *T. longifolia* subsp. *moravica* was evaluated by Kochjarová (1998a) and Holub (1999). Data on the population size are sparse and incomplete, censuses were made by Batoušek on the Moravian localities in the 80<sup>th</sup> (Batoušek & Grulich 1989), by Kochjarová (1998a) in Slovakia in the 90<sup>th</sup> and by Devánová (ined.) on locality Lysá at the end of the 90<sup>th</sup>. The taxon is included into the Red List of endangered and rare plant species of Slovak and Czech Republic (Holub 1999). In Slovak Republic it

belongs to protected (Vyhláška MŽP SR č. 24/2003 Z. z.) and endangered species (category EN, Feráková et al. 2001). In Czech Republic the taxon is protected and regarded to be a critically endangered (Vyhláška MŽP ČR 395/1992, Procházka 2001). At the same time, the taxon is protected by Natura 2000, and it is included into the annex No. II and No. IV of Habitat Directive 92/43/EHS from May 21, 1992.

The aims of this paper is a) to evaluate the trends and recent size of the taxon populations, b) to suggest both the optimal management of communities with the taxon occurrence and the monitoring of its populations, c) to give the phytosociological characteristics of the recently found locality in the southern part of the Strážovské vrchy Mts.

## Methods

In 2004 we visited the majority of recently registered localities of *T. longifolia* subsp. *moravica*. Within the individual localities we recognized the microlocalities, if stands with *T. longifolia* subsp. *moravica* were separated from each other by stand/stands without this taxon. However, the reciprocal pollination of individuals belonging to different microlocalities can not be excluded. We recorded the area of stands with the occurrence of *T. longifolia* subsp. *moravica* and the abundance of the taxon while distinguishing both sterile vegetative rosettes and flowering individuals. The leaf rosette with one apical meristem was considered to be one individual. The geographical coordinates and the altitude we recorded by the GPS with accuracy of 5 to 11 m. Phytosociological relevés we made according to the Zurich-Montpellier school using the combined 7-grade scale of abundance and dominance (Barkman et al. 1964). The nomenclature of vascular plants and mosses follows Marhold & Hindák (1998). The syntaxonomical nomenclature follows Mucina & Maglocký (1983), exceptions are presented with the authors name. Names of geomorphological units follow Mazúr & Lukniš (1978).

## Results and discussion

In 2004 we visited 9 localities of *T. longifolia* subsp. *moravica*. In 8 localities (one of them included two microlocalities) we found the taxon and estimated its abundance. The taxon populations occurred in altitudes from 540 to 775 m. In one locality and three microlocalities we did not found the taxon. In the following overview we bring the detailed characteristics of individual localities (ranged from W to E) as well as the estimates of the population size of *T. longifolia* subsp. *moravica*. The name of locality is followed by the name of geomorphological unit, the nearest village, geographical coordinates (the northern latitude and the eastern longitude), identification of basic quadrangle of central-European net mapping, altitude and area of stand with *T. longifolia* subsp. *moravica*.

### Localities/microlocalities with confirmed occurrence of *T. longifolia* subsp. *moravica*:

- **Hodňovská dolina – microlocality pasture** (Bílé Karpaty Mts., Brumov, 49°04'56'', 18°03'22'', 6974a, 576 m a.s.l.)  
The first reference to this locality was made by Staněk (1926). The taxon occurrence was confirmed in 1973 (Skalický in Elsnerová et al. 1982), 1983-84 and 1988 (Batoušek & Grulich 1989). In 1995 Kochjarová (ined.) found 30 flowering and numerous vegetative individuals. The taxon grows on the lower margin of bush stand surrounded by the cattle pasture with locally disturbed soil and vegetation cover. In 2004 administration staff of Protected Landscape Area (PLA) Bílé Karpaty (Jongepierová, Němec, Poková) recorded 21 sterile rosettes while establishing the permanent monitoring plot for taxon observation within the program Natura 2000.
- **Hrušova dolina – microlocality Javor** (Bílé Karpaty Mts., Nedašov, 49°06'20'', 18°05'46'', 6974d, 575 m a.s.l., 1200 m<sup>2</sup>)  
*T. longifolia* subsp. *moravica* on the slope of Kaňúr found Staněk in 1927 (Staněk et al. 1996). Recently the taxon occurs on the upper meadow margin under the woody stand. Population size estimates are available from years 1982 (20 individuals, Batoušek & Grulich 1989), 1997 (140 individuals, Jongepierová 1997) and 2000 (50 individuals; Jongepierová, ined.). In 2004 administration staff of PLA Bílé Karpaty (Jongepierová, Němec, Poková) recorded 40 flowering and 200 vegetative individuals. During the last 7-8 years the locality is regularly mown by the owner in the second half of July. Forced by the mowing *T. longifolia* subsp. *moravica* retreats to the forest margin comparing to the preceding years when it occurred also in the lower part of the meadow.
- **Tratihušť – microlocality Maděrovce** (Bílé Karpaty Mts., Bynice, 49°03'58'', 18°03'36'', 6974a, 675 m a.s.l., 100 m<sup>2</sup>)  
In 2004 we found two sterile rosettes in the forest edge on the northern slope of Tratihušť (708). Once

the population was more abundant (Jongepierová, ined.). Recently the stand is without management and along site grows a young spruce stand.

- **Lysá** (Biele Karpaty Mts., Vršatecké Podhradie, 49°04'20'', 18°08'46'', 6974b, 750-775 m a.s.l., 15000 m<sup>2</sup>)  
Recently most abundant population of *T. longifolia* subsp. *moravica* grows on the northern and northeastern slope of Lysá. The bedrock is built by flysch layers with low content of CaCO<sub>3</sub>. The stands are irregularly mown by administration staff of PLA Biele Karpaty. In 1997 several hundreds of flowering individuals occurred in the locality (Kochjarová 1998a). In 1999 one and in 2000 two permanent plots with area of 25 m<sup>2</sup> were established by Devánová, Kochjarová, Janišová and Šušalová for the taxon observation. In 2004 during the detailed locality survey we found approximately 300 vegetative and only 50 flowering individuals. Within the two phytosociological relevés (5 x 5 m each) with the highest abundance of the subspecies we counted 21/5 and 23/0 (vegetative/generative) individuals.
- **Omšenie - microlocality Trštinke lúky** (Strážovské vrchy Mts., Omšenie, 48°55'02'', 18°14'27'', 7075c, 590 m a.s.l., 900 m<sup>2</sup>)  
Around 1990 approximately ten flowering individuals of *T. longifolia* subsp. *moravica* were found by Mered'a sen. on the margin of mown meadow at the end of the Langačská dolina valley. The bedrock is built mostly by the Triassic dolomites and limestones, locally also the Triassic slates and sandstones (Mahel' 1981). Recently the stand is abandoned with the dominance of *Brachypodium pinnatum* and numerous young trees. In 2004 only 15 vegetative individuals of the taxon were recorded by Mered'a sen., Škodová and Mertanová.
- **Omšenie - microlocality ridge** (Strážovské vrchy Mts., Omšenie, 48°54'52'', 18°14'36'', 7075c, 620 m a.s.l., 100 m<sup>2</sup>)  
This microlocality was found in 2004 on the ridge Omšenská Baba – Slopský vrch above the previously mentioned microlocality (Mered'a sen., Škodová & Mertanová). In the ecotone community flowered two individuals with numerous daughter leaf rosettes. Considering the small biotope area and successional changes in the vicinity the population is threatened and if the appropriate management (including the tree reduction) will not be realized the taxon will extinct from the locality.
- **Čavoj – microlocality nearby the cemetery** (Strážovské vrchy Mts., Čavoj, 48°52'54'', 18°29'17'', 7176b, 560-570 m a.s.l., 2500 m<sup>2</sup>)  
The detailed characteristics of this locality and information on the taxon abundance is in the last chapter.
- **Radobica** (Trábeč Mts., Radobica – Košovskovci, 48°34'22'', 18°29'56'', 7476b, 540-550 m a.s.l., 1000 m<sup>2</sup>)  
The locality is known since 1994, when it was found by members of a floristical excursion (Ambros 1996). *T. longifolia* subsp. *moravica* grows on the southern village border in a narrow belt between the beech forest and a smaller clump of woody species. The bedrock is built by the Triassic limestones and dolomites (Ivanička et al. 1998). Kochjarová (1998a) recorded 30-40 flowering individuals in 1995 and 25 flowering individuals in 1997. Regarding the progressing overgrowing of the biotope by *Cirsium arvense* she recommends an immediate management treatment. In 2004 we estimated the number of vegetative individuals to 100; no flowering individuals were found. In this year the ruderal species were cleared from the locality and the plant community was species rich and in a very good state. The management performer is not known (according to Ulrych ined. it was not the administration staff of the PLA Ponitrie) and probably it is a result of standard treatment by the local inhabitants.
- **Stráž** (Vtáčnik Mts., Veľké Pole, 48°32'54'', 18°32'40'', 7477c, 750-765 m a.s.l., 1500 m<sup>2</sup>)  
Locality on the southern slope of Stráž is situated nearby the intensively utilized field, on the hillside rapidly overgrown by shrubs. The bedrock is built by pyroxenic-amfibolitic andesites with scattered biotit (Šimon et al. 1997). In 1994 Hrouda a Kochjarová with an excursion found 30 flowering individuals. Kochjarová (1998a) recorded about 100 flowering and 50 vegetative individuals in 1995 and 30 flowering individuals in 1997. Population size in 2002 recorded Ulrych (ined.), he found 152 flowering and several hundreds vegetative individuals. In 2004 we recorded three flowering and 80 vegetative individuals. The stands were strongly ruderalized. Leaf rosettes developed also on the shaded places under the shrubs, in spite of that the need for both shrub and ruderal species reduction is acute.

## Localities/microlocalities, where the occurrence of *T. longifolia* subsp. *moravica* was not confirmed in 2004:

- **Tratihušť – microlocality in the valley** (Bílé Karpaty Mts., Bylnice, 49°04'14", 18°03'30", 6974a, 580 m a.s.l.)  
Microlocality on the northern slope of Tratihušť at the end of the Bylnička valley is known since 1925 as *locus classicus* of the subspecies. Batoušek in 1983 recorded 80 individuals of *T. longifolia* subsp. *moravica* and in 1987 he found in here several tens of individuals (Batoušek & Grulich 1989). On a verge of a deciduous tree grove Batoušek & Kochjarová found about 50-60 flowering and 100 vegetative individuals in 1995 (Kochjarová 1998a). In the same year the population was supported by planting of 26 individuals (Tlusták 1995). In 1997 Kochjarová (1998a) found 50 flowering individuals and numerous leaf rosettes. In 2004 we did not found the taxon in the locality, during the survey of the whole upper part of the valley most of the region was intensively trampled and grazed by cattle.
- **PP Hluboče** (Bílé Karpaty Mts., Bylnice, 49°03'35", 18°03'03", 6974a, 475 m a.s.l.)  
Locality is situated on the left brook bank about 3 km SEE from the railway station Bylnice. The taxon is reported by Batoušek in 1983 (about 10 individuals), in the v 90<sup>th</sup> its occurrence was not confirmed (Jongepierová 1997). In 1995 Tlusták planted 26 individuals, which were vital and fertile in 1996 and 1997. In 1997 the whole locality was mown at the end of July. In 2004 we did not find the taxon.
- **Omšenie – microlocality forest margin** (Strážovské vrchy Mts., Omšenie, 48°55'05", 18°14'34", 7075c, 560 m a.s.l.)  
One of the microlocalities in the surrounding of Omšenie known since the 90<sup>th</sup> (P. Mered'a sen., ined.). In 2004 the taxon occurrence was not confirmed (Mered'a sen., Škodová and Mertanová). Recently the locality is overgrown by a dense young forest and the taxon survival is improbable.
- **Čavoj – microlocality behind the orchards** (Strážovské vrchy Mts., Čavoj, 48°52'54", 18°29'20", 7176b, 605 m a.s.l.)  
In this locality we recorded the taxon occurrence in 2002 (two flowering individuals). In 2004 did not confirmed its occurrence. As the biotope has not been changed, survival of the taxon can not be excluded.

In addition to the mentioned localities the taxon occurrence is known from the Hrušova dolina valley – microlocality Lásca (Bílé Karpaty Mts., Nedašov, 6974a) and Veľký Inovec (Pohronský Inovec Mts., Obyce, 7577c). In the localities PP (Protected Monument) Uhličky and PP Lazy in the Bílé Karpaty Mts. 26 cultivated individuals of *T. longifolia* subsp. *moravica* were planted for each in 1995. The repatriation was successful after first years (Tlusták 1996, Jongepierová 1997). On the following localities the taxon is regarded to be extinct or recent information concerning its occurrence is missing: Tratihušť – microlocality summit of the hill, Hodňovská dolina – microlocality forest, Biely vrch – Gabrišovské lúky, Biely vrch – Kamenný stôl (all within the Biele/Bílé Karpaty Mts.), Gýmešská gaštanica (Tríbeč Mts.).

## Evaluation of the *T. longifolia* subsp. *moravica* population size in 2004

As follows from the presented survey, in 2004 the abundance of *T. longifolia* subsp. *moravica* was markedly reduced if compared with the previous years in all visited localities. Noteworthy was the strikingly low number of flowering individuals (in four from eight confirmed localities we found only sterile rosettes). The overall estimate of the taxon abundance in 2004 including all visited localities is 95 flowering and 775 vegetative individuals. Seedlings were not found.

If considering the conservation status of populations in 2004 according to Mered'a et al. (2004), at the locality level three localities were in a good conservation status (category B: locality Lysá, Radobica and Hrušova dolina – Javor) and five localities were in unfavorable conservation status (category C: localities Čavoj, Stráž, Omšenie, Tratihušť and Hodňovská dolina). At the national level the taxon is in a favorable conservation status (category B).

## Evaluation of vulnerability of *T. longifolia* subsp. *moravica*

According to the historical literature sources it is evident, that the taxon was rare also during the last century. It was known from only restricted number of localities, where it survived almost exclusively in less numerous populations. Primary only localities in the Biele/Bílé Karpaty Mts. were known, within most of them the taxon was spread sparsely over more microlocalities. Since the 70<sup>th</sup> years of the previous century gradually further localities has been found in various mountain ridges of the Western Carpathians Mts. It is hardly to suppose that it could be a consequence of the taxon spreading, more probably it is a result of a gradual recognition of botanically less attractive regions and improvement in the taxa determination. All

localities share the common characteristics: location in the lower submontane belt (500-800 m a.s.l.), cool shaded sites on NW-NE slopes, ecotone types of habitat. These facts as well as the overall recently known distribution area of the taxon bear evidence of the relic character of the taxon occurrence which once was wider distributed while nowadays is retreating. During the period before an intensive human intervention into the natural environment the taxon might have survived on both forest clearings and margins within the larger area. Supposing that the original ancestor taxon, from which *T. longifolia* subsp. *moravica* has evolved and separated, preferred similar habitats as the recent *Tephrosia longifolia* agg. (open woodlands, forest edges, brook banks, tall-forb communities and grasslands in altitudes from 300 to 2000 m, Hegi 1976), it can be assumed that this has evolved from a montane woodland taxon with a broad ecological niche to a submontane taxon specialized to the ecotonal habitats.

Already Batoušek & Grulich (1989), based on observation of Moravian localities mentioned the reduction of localities and decreasing population size in *T. longifolia* subsp. *moravica* and consider it to be critically endangered. As a main reason they consider intensive agricultural utilization of localities (ploughing or chemical treatment of meadows, overgrazing). As the data from the previous years are sparse and only censuses from some years are available often without distinguishing between the vegetative and flowering individuals, it is very difficult to decide, whether the low population size in 2004 is a consequence of an annual dynamics of the taxon abundance or an attribute of decreasing trend in abundance. We suppose, that the main reason of both decreasing taxon abundance and reduction of the ratio of flowering individuals is the extreme drought during the previous vegetation season. Another possible explanation is an increasing effect of several unfavorable factors, which lead to a progressive population reduction or extinction (Gilpin & Soulé 1986). Anyway, it is necessary to devote a special attention to the taxon monitoring as the threat of its extinction is actually significant and a marked population reduction exposes the taxon to the risk of diminishing the genetic variability (bottle-neck effect), that could evoke reproduction obstructions.

In general we suppose, that even if the existence of further localities of *T. longifolia* subsp. *moravica* can not be excluded, both the abundance and vitality of its populations is currently in a very unfavorable status. This risk results from several factors:

- a) Number of localities is very low (less than ten).
- b) Population abundance is very low (does not exceed 350 individuals) and is liable to a significant dynamics.
- c) Taxon occurrence is restricted to a very specific vulnerable types of habitat (an ecotonal character can easily be disturbed by progressing succession or vice-versa by intensive utilization).
- d) Knowledge of both the taxon life cycle and its ecological requirements is insufficient for elaboration of a detailed rescue program involving the taxon cultivation and repatriation with a sustained effect.

All these mentioned factors condition a high vulnerability of the taxon populations to extreme events (incidence of dry years can significantly damage or even destroy its populations) and their fragmentation as a result of an inappropriate management, or its absence. At the present level of knowledge the estimation of a minimum viable population size is impossible.

### **Suggestions to the monitoring of *T. longifolia* subsp. *moravica***

It is necessary to monitor the taxon regularly, so that the information important for its effective protection can be obtained. We propose to monitor the following characteristics:

- a) Estimate of both the number of vegetative and flowering individuals as well as the number of seedlings,
- b) Observation of taxon life cycle on permanent plots *in situ* and in cultivated populations. It is possible to continue in observation of permanent plots on the locality Lysá and to establish similar permanent plots on further 2-3 localities. It is necessary to choose and follow the development of the marked individuals in various ontogenetic stages and to estimate the proportion of individual stages in the population. The long term prospects of the population can only be estimated by an extended research including the demographic monitoring of all ontogenetic stages (Davy & Jeffries 1981).
- c) Inspection and control of management effects and succession progress. The monitoring should be performed annually and we consider late May or early June as the optimal time, as the taxon flowers and the vegetation does not hinder the detection of the leaf rosettes.
- d) Very valuable is the information on the presence and proportion of *T. longifolia* subsp. *moravica* seeds in the seed bank and on its ability to maintain the germinative activity.

### Proposals for the management of localities with the occurrence of *T. longifolia* subsp. *moravica*

- Woody species as a result of a progressing succession should be gradually and repetitively removed from the localities and the influence of opening the canopy on the taxon population should be followed. In all localities the tree and shrub reduction should be performed every 2-3 years.
- As in the regularly mown localities the taxon retreats to the marginal parts of an ecotonal character we suggest not to perform mowing annually, but at least once in three years. The optimum time for mowing is end of July, respectively the beginning of August, when *T. longifolia* subsp. *moravica* has mature seeds.
- Intensive grazing does not affect favorably the taxon populations. Therefore, it should be excluded from the existing localities. If necessary sites with the taxon occurrence could be fenced.
- Intervention to the soil regime, fertilization and soil erosion should be prevented. Regarding the big seed productivity and the high seed germinative activity it is appropriate to remove the sod in the surrounding of fertile individuals and to create so artificial safe sites suitable for the germination.
- It is inevitable to prevent any damage of localities and to insure the appropriate management type which is best achievable by a site conservation.

### Phytosociological characteristics of the locality Čavoj in the Strážovské vrchy Mts.

In 2002 we found two microlocalities of *T. longifolia* subsp. *moravica* nearby the village Čavoj on the northern slope of the hill Svibiny (903 m).

Microlocality Čavoj – behind the orchards is located on the meadow edge below the tree clump about 100 m from the end of orchards nearby the small field (relevé 1). In 2002 we recorded two flowering individuals, in 2004 the taxon occurrence could not be confirmed.

Microlocality Čavoj – nearby the cemetery is situated east of the cemetery over a path leading from the village to the cemetery. It is a private orchard with young trees, on the margins overgrown by both *Rosa* sp. and *Crataegus* sp. The locality is irregularly mown by the owner. In 2002 we recorded about 50 flowering individuals (relevé 2), in 2004 only vegetative individuals were found (about 20 sterile rosettes). The soil and vegetation cover was disturbed by the wild-boars, almost in the whole area sign of their activity could be found. Phytosociological relevés (relevés 3 and 4) we obtained on site with the highest taxon number. The bedrock of both microlocalities is built by clay, marl and dark slates, locally by marly limestones (Mahel' 1981).

**Relevé 1:** Čavoj – behind the orchards, N hillside of Svibiny (903 m), meadow margin about 100 m over the end of orchards, 48°52'54", 18°29'20", 7176b, 605m a.s.l., aspect 337.5°, slope 30°, 25 m<sup>2</sup>, E<sub>1</sub>: 100%, E<sub>0</sub>: 90%, 68 taxa, Janišová & Mertanová, 20.6.2002.

**E<sub>1</sub>:** *Cirsium pannonicum* 2b, *Arrhenatherum elatius* 2a, *Brachypodium sylvaticum* 2a, *Dactylis glomerata* 2a, *Origanum vulgare* 2a, *Carex montana* 2m, *Festuca rubra* agg. 2m, *Ajuga reptans* 1, *Campanula glomerata* 1, *Carex flacca* 1, *Festuca pratensis* 1, *Hypericum perforatum* 1, *Leontodon hispidus* subsp. *danubialis* 1, *Leontodon hispidus* subsp. *hispidus* 1, *Medicago falcata* 1, *Plantago media* 1, *Solidago virgaurea* 1, *Trisetum flavescens* 1, *Achillea millefolium* agg. +, *Alchemilla* sp. +, *Anthoxanthum odoratum* +, *Betonica officinalis* +, *Brachypodium pinnatum* +, *Briza media* +, *Carlina acaulis* +, *Jacea pratensis* +, *Cruciata glabra* +, *Galium mollugo* agg. +, *Lathyrus pratensis* +, *Leucanthemum vulgare* agg. +, *Linum catharticum* +, *Lotus corniculatus* +, *Luzula multiflora* +, *Lysimachia nummularia* +, *Pimpinella saxifraga* +, *Plantago lanceolata* +, *Potentilla collina* agg. +, *Potentilla erecta* +, *Primula veris* +, *Ranunculus acris* +, *Ranunculus bulbosus* +, *Acetosa pratensis* +, *Sanguisorba minor* +, *Stellaria graminea* +, *Taraxacum* sect. *Ruderalia* +, *Thymus pulegioides* +, *Tragopogon orientalis* +, *Trifolium montanum* +, *Valeriana officinalis* +, *Veronica chamaedrys* +, *Viola hirta* +, *Anthyllis vulneraria* r, *Campanula patula* r, *Campanula persicifolia* r, *Centaurea scabiosa* r, *Corylus avellana* r, *Filipendula vulgaris* r, *Fragaria vesca* r, *Helianthemum ovatum* r, *Heracleum sphondylium* r, *Hieracium lachenalii* r, *Prunella vulgaris* r, *Rosa canina* agg. r, ***Tephrosia longifolia* subsp. *moravica* r (2 kvitnuce jedince)**, *Veronica officinalis* r, *Vicia cracca* r.

**E<sub>0</sub>:** *Rhytidadelphus triquetrus* 5, *Climacium dendroides* +.

**Relevé 2:** Čavoj – nearby the cemetery, N hillside of Svibiny (903 m), orchard east of the cemetery, 48°52'54", 18°29'17", 7176b, 560 m a.s.l., aspect 330°, slope 35°, 25 m<sup>2</sup>, E<sub>1</sub>: 100%, E<sub>0</sub>: 60%, 55 taxa, Janišová, Smatanová & Škodová, 18.7.2002.

**E<sub>1</sub>:** *Betonica officinalis* 2b, *Cirsium pannonicum* 2b, *Agrostis capillaris* 2a, *Briza media* 2a, *Dactylis glomerata* 2a, *Filipendula vulgaris* 2a, *Hypericum maculatum* 2a, *Luzula luzuloides* 2a, *Potentilla erecta* 2a, *Primula veris* 2m, *Achillea millefolium* agg. 1, *Aquilegia vulgaris* 1, *Arrhenatherum elatius* 1, *Asarum europaeum* 1, *Carex montana* 1, *Jacea phrygia* agg. 1, *Cruciata glabra* 1, *Festuca pratensis* 1, *Festuca rubra* agg. 1, *Galium album* 1, *Lotus corniculatus* 1, *Pimpinella saxifraga* 1, *Trisetum flavescens* 1, *Veronica chamaedrys* 1, *Ajuga reptans* +, *Alchemilla* sp. +, *Anthoxanthum odoratum* +, *Campanula glomerata* +, *Campanula rapunculoides* +, *Carlina acaulis* +, *Dianthus*

*carthusianorum* +, *Heracleum sphondylium* +, *Hypericum perforatum* +, *Knautia arvensis* +, *Leucanthemum vulgare* agg. +, *Phyteuma spicatum* +, *Plantago lanceolata* +, *Poa pratensis* +, *Prunella vulgaris* +, *Ranunculus acris* +, *Ranunculus polyanthemos* +, *Rosa canina* agg. +, *Acetosa pratensis* +, *Salvia pratensis* +, *Solidago virgaurea* +, ***Tephrosia longifolia* subsp. moravica** +, *Thymus pulegioides* +, *Tithymalus cyparissias* +, *Trollius altissimus* +, *Valeriana stolonifera* subsp. *angustifolia* +, *Vicia cracca* +, *Viola canina* +, *Lilium martagon* r.

**E<sub>0</sub>:** *Rhytidadelphus triquetrus* 4, *Climacium dendroides* 1.

**Relevé 3:** Čavoj – nearby the cemetery, N hillside of Svibiny (903 m), orchard east of the cemetery, 48°52'54'', 18°29'17'', 7176b, 570 m a.s.l., aspect 335°, slope 28°, 25 m<sup>2</sup>, E<sub>1</sub>: 80 %, E<sub>0</sub>: 80 %, 56 taxa, Škodová & Hegedúšová, 23.6.2004.

**E<sub>1</sub>:** *Arrhenatherum elatius* 2b, *Betonica officinalis* 2b, *Filipendula vulgaris* 2b, *Fragaria vesca* 2b, *Festuca rubra* agg. 2a, *Primula veris* 2a, *Alchemilla* sp. 1, *Asarum europaeum* 1, *Briza media* 1, *Jacea pratensis* 1, *Cirsium pannonicum* 1, *Dactylis glomerata* 1, *Festuca pratensis* 1, *Hypericum maculatum* 1, *Leucanthemum vulgare* agg., 1, *Luzula luzuloides* 1, *Potentilla erecta* 1, *Thymus pulegioides* 1, *Achillea millefolium* agg. +, *Ajuga reptans* +, *Aquilegia vulgaris* +, *Campanula glomerata* +, *Carex caryophylla* +, *Carlina acaulis* +, *Dianthus carthusianorum* agg. +, *Cruciata glabra* +, *Galium album* +, *Heracleum sphondylium* +, *Hypochaeris maculata* +, *Leontodon hispidus* +, *Lilium martagon* +, *Pimpinella saxifraga* +, *Plantago lanceolata* +, *Potentilla heptaphylla* +, *Rosa canina* agg. +, *Rumex acetosa* +, *Salvia pratensis* +, *Solidago virgaurea* +, ***Tephrosia longifolia* subsp. moravica** +, *Trisetum flavescens* +, *Veronica chamaedrys* +, *Veronica officinalis* +, *Viola canina* +, *Campanula patula* r, *Crataegus monogyna* r, *Knautia* sp. r, *Lathyrus pratensis* r, *Lotus corniculatus* r, *Prunella vulgaris* r, *Prunus* sp. r, *Securigera varia* r, *Sedum sexangulare* r, *Valeriana stolonifera* subsp. *angustifolia* r, *Vicia cracca* r.

**E<sub>0</sub>:** *Rhytidadelphus triquetrus* 3, *Mnium* sp. +.

**Relevé 4:** Čavoj – nearby the cemetery, N hillside of Svibiny (903 m), orchard east of the cemetery, 48°52'54'', 18°29'17'', 7176b, 565 m a.s.l., aspect 330°, slope 26°, 25 m<sup>2</sup>, E<sub>1</sub>: 95%, E<sub>0</sub>: 80%, 53 taxa, Janišová & Smanonová, 26.6.2004.

**E<sub>1</sub>:** *Filipendula vulgaris* 2b, *Potentilla erecta* 2b, *Betonica officinalis* 2a, *Cirsium pannonicum* 2a, *Dactylis glomerata* 2m, *Agrostis capillaris* 1, *Achillea millefolium* agg. 1, *Alchemilla* sp. 1, *Aquilegia vulgaris* 1, *Arrhenatherum elatius* 1, *Asarum europaeum* 1, *Briza media* 1, *Campanula glomerata* 1, *Carlina acaulis* 1, *Jacea* sp. 1, *Festuca pratensis* 1, *Festuca rubra* agg. 1, *Heracleum sphondylium* 1, *Hypericum maculatum* 1, *Luzula luzuloides* 1, *Phyteuma spicatum* 1, *Pimpinella saxifraga* 1, *Primula veris* 1, *Acetosa pratensis* 1, *Salvia pratensis* 1, *Solidago virgaurea* 1, *Thymus pulegioides* 1, *Acer pseudoplatanus* r, *Ajuga reptans* +, *Anthyllis vulneraria* +, *Carex montana* +, *Cruciata glabra* +, *Dianthus carthusianorum* agg. +, *Euphorbia cyparissias* +, *Galium mollugo* agg. +, *Hypericum perforatum* +, *Trommsdorffia maculata* +, *Leucanthemum vulgare* agg. +, *Lotus corniculatus* +, *Luzula campestris* agg. +, *Plantago lanceolata* +, *Prunella vulgaris* +, *Ranunculus acris* +, ***Tephrosia longifolia* subsp. moravica** + (8 sterilných ružíc), *Valeriana stolonifera* subsp. *angustifolia* +, *Veronica chamaedrys* +, *Vicia cracca* +, *Viola canina* +, *Crataegus laevigata* r, *Crepis praemorsa* r, *Prunus* sp. r, *Rosa canina* agg. r, *Trifolium montanum* r.

**E<sub>0</sub>:** *Rhytidadelphus triquetrus* 5, *Pleurozium schreberii* 1, *Climacium dendroides* 1.

Further species not included in the phytosociological relevés are: *Colchicum autumnale*, *Fragaria moschata* a *Onobrychis viciifolia*. Regarding the irregular stand management the phytosociological classification of the recorded plant communities is rather difficult. Significant is the proportion of species belonging to the alliance *Cirsio-Brachypodium pinnati*: *Cirsium pannonicum*, *Betonica officinalis*, *Hypochaeris maculata*, *Filipendula vulgaris*, *Carex montana*, *Brachypodium pinnatum*, *Trifolium montanum*, *Crepis praemorsa*. From the higher syntaxa of the *Festuco-Brometea* the following taxa are present: *Campanula glomerata*, *Carlina acaulis*, *Primula veris*, *Salvia pratensis*, *Anthyllis vulneraria*, *Valeriana stolonifera* subsp. *angustifolia*, *Aquilegia vulgaris*, *Euphorbia cyparissias*, *Securigera varia*, *Potentilla heptaphylla*. The presence of the species of the *Nardo-Callunetea* and its underlying units (*Potentilla erecta*, *Viola canina*, *Hypericum maculatum*, *Hypericum perforatum*) suggests the meagre soil with lower pH values. As a consequence of irregular utilization and ecotonal character of habitat several forest species are present in the herb layer (*Asarum europaeum*, *Luzula luzuloides*, *Phyteuma spicatum*, *Lilium martagon*). Several mesophilous species of the *Molinio-Arrhenatheretea* (e.g. *Lysimachia nummularia*, *Veronica chamaedrys*, *Arrhenatherum elatius*, *Lotus corniculatus*, *Leucanthemum vulgare*, *Ajuga reptans*, *Heracleum sphondylium*, *Leontodon hispidus*, *Lathyrus pratensis*) are present, while species of the *Arrhenatherion* are sparse (*Campanula patula*, *Galium album*).

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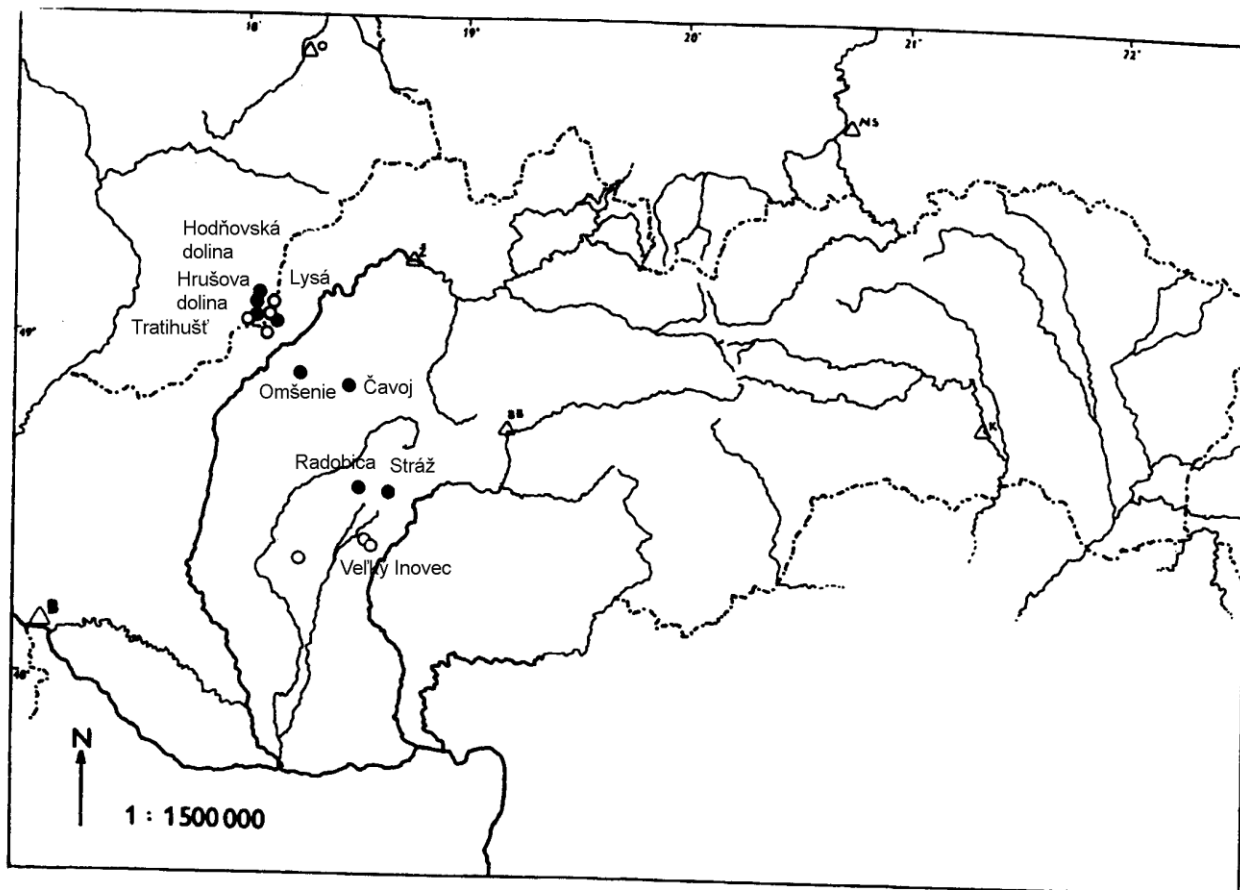


Fig. 1: Distribution of *Tephrosieris longifolia* subsp. *moravica*; localities confirmed in 2004 are depicted by solid circles.