Tuexenia 30: 375–422. Göttingen 2010.

Expert system-based classification of semi-natural grasslands in submontane and montane regions of central Slovakia

– Monika Janišová, Eva Uhliarová and Helena Ružičková –

Abstract

The main aim of this paper was to test the national electronic expert system for grassland classification in Slovakia as a tool for grassland classification on a regional data set from an area with high vegetation diversity. The study region comprised five orographic units located in central Slovakia (Starohorské vrchy Mts., Kremnické vrchy Mts., Veľká Fatra Mts., Nízke Tatry Mts. and Zvolenská kotlina Basin). The data set included 411 phytosociological relevés of all grassland types (xero-, subxero- and mesophilous grasslands as well as wet and fen meadows), recorded by the authors between 1980 and 2007. The relevés were classified to associations by the expert system formulated for the Slovak grassland vegetation either according to association definitions or (in case of relevés not matching any association definition) according to the Frequency-Positive Fidelity Index (FPFI). Wetland relevés were classified according to results of a cluster analysis. Diagnostic species from the regional data were compared to diagnostic species derived at the national level from the data including all vegetation units in Slovakia. According to the results, 49% of the relevés classified by the expert system were matched by the association definitions. Xerophilous grasslands were classified within three alliances of the class *Festuco-Brometea*: *Festucion valesiacae*, *Bromo pannonici-Festucion pallentis* and *Diantho lumnitzeri-Seslerion*. The occurrence of these communities in the region is rare, restricted to rocky habitats and steep slopes with shallow soil over calcareous bedrock. Sub-xerophilous grasslands were classified within four associations belonging to the two alliances *Cirsio-Brachypodion pinnati* and *Bromion erecti*. In the study region, these communities are widely distributed mainly in areas built by calcareous bedrock. Mesophilous grasslands are the most common communities in the study region. They were classified within eight associations belonging to four alliances: *Cynosurion cristati*, *Arrhenatherion elatioris* and *Polygono bistortae-Trisetion flavescentis* (all of them belonging to the class *Molinio-Arrhenatheretea*) and *Nardo strictae-Agrostion tenuis* (belonging to the class *Nardetea strictae*). Wetland communities belonged to the classes *Phragmito-Magnocaricetea* (alliances *Phragmition communis* and *Glycerio-Sparganion*), *Molinio-Arrhenatheretea* (alliance *Deschampsion cespitosae*) and *Scheuchzerio-Caricetea fuscae* (alliance *Caricion davallianae*). The results demonstrate that the national expert system used can be successfully applied to a heterogeneous regional data set without discarding the particularities of the regional vegetation. The uniqueness of the regional vegetation is reflected in the set of diagnostic species determined at the regional level, which can differ strongly from those estimated at the national level.

Zusammenfassung: Klassifikation des meso-hemeroben Grünlandes in submontan-montanen Regionen der Zentral-Slowakei mit Hilfe eines elektronischen Expertensystems

Das Hauptziel der vorliegenden Arbeit war es, das nationale elektronische Expertensystem zur Grünlandklassifikation in der Slowakei als ein Mittel zur Klassifikation von Grünland-Vegetation an einem regionalen Datensatz aus einer Region mit hoher Diversität der Vegetation zu testen. Das Untersuchungsgebiet umfasste fünf Höheneinheiten der zentralen Slowakei (Starohorské vrchy Gebirge, Kremnické vrchy Gebirge, Veľká Fatra Gebirge, Nízke Tatry Gebirge and Zvolenská kotlina Becken). Der Datensatz bestand aus 411 pflanzensoziologischen Aufnahmen von allen Grünland-Typen (Trocken-, Halbtrockenrasen und mesophiles Grünland) sowie Feuchtwiesen und Sümpfe, die von den Autoren in den Jahren zwischen 1980 und 2007 aufgenommen wurden. Die Aufnahmen wurden mit Hilfe des Expertensystems Assoziationen zugeordnet, entweder direkt durch die Assoziations-Definitionen oder anhand des *Frequency-Positive Fidelity Index* (FPFI; für Aufnahmen, die von den Definitionen nicht erfasst wurden). Feuchtwiesen wurden mithilfe der Ergebnisse einer Cluster-Analyse klassifiziert. Die diagnostischen Pflanzenarten der regionalen Daten wurden mit den aus der nationalen Klassifikation aller Vegetationstypen der Slowakei abgeleiteten diagnostischen Arten verglichen. Insgesamt wurden 49 % der durch das Experten-System zugeordneten Aufnahmen auch durch die Assoziations-Definitionen erfasst. Die Trockenrasen wurden innerhalb der Klasse *Festuco-Brometea* den drei Verbänden *Festucion valesiacae*, *Bromo pannonici-Festucion pallentis* und *Diantho lumnitzeri-Seslerion*

zugeordnet. Die Vorkommen dieser Vegetationstypen sind in der Region selten und auf felsige Habitate sowie steile Hänge mit flachgründigen Böden über Kalkgestein beschränkt. Halbtrockenrasen wurden vier Assoziationen aus den beiden Verbände *Cirsio-Brachypodion pinnati* und *Bromion erecti* zugeordnet. Diese Gesellschaften sind im Untersuchungsgebiet weit verbreitet, besonders in Bereichen mit Kalkgestein. Mesophiles Grünland ist im Untersuchungsgebiet am häufigsten. Hier wurden acht Gesellschaften unterschieden, die zu den vier Verbänden *Cynosurion cristati*, *Arrhenatherion elatioris* und *Polygono bistortae-Trisetion flavescentis* (in der Klasse *Molinio-Arrhenatheretea*) sowie *Nardo strictae-Agrostion tenuis* (in der Klasse *Nardetea strictae*) gehören. Die Feuchtwiesen wurden den Klassen *Phragmito-Magnocaricetea* (Verbände *Phragmition communis* und *Glycerio-Sparganion*), *Molinio-Arrhenatheretea* (Verband *Deschampsion cespitosae*) und *Scheuchzerio-Caricetea fuscae* (Verband *Caricion davallianae*) zugeordnet. Die Ergebnisse zeigen, dass das nationale Expertensystem erfolgreich auf einen heterogenen, regionalen Datensatz angewendet werden kann, ohne dass dabei die Besonderheiten der regionalen Vegetation vernachlässigt werden. Die Einmaligkeit der regionalen Vegetation spiegelt sich in der Zusammensetzung der regionalen diagnostischen Arten, die sich stark von denen der Klassifikation auf nationaler Ebene unterscheiden können.

Keywords: diagnostic species, *Festuco-Brometea*, formalised classification, *Molinio-Arrhenatheretea*, *Nardetea strictae*, phytosociology, regional synthesis, supervised classification, Slovakia.

1. Introduction

The wide surroundings of the city Banská Bystrica in central Slovakia are characterised by a variety of landscape types with well-developed habitat diversity. Grasslands belong to the most diverse habitats reflecting the miscellaneous geological and topographical structures as well as the manifold ways of human impact. The broken relief in the area, unsuitable for grassland intensification, was an important condition for development and maintenance of valuable semi-natural grassland communities. Several of the local grassland types are specific of the Carpathian mountain ranges built by carbonates, e.g. *Carici albae-Brometum monocladi* (described by UJHÁZY et al. 2007 from Muránska planina Mts.), *Lilio bulbiferae-Arrhenatheretum elatioris* and *Campanulo glomeratae-Geranietum sylvaticae* (both described by RUŽIČKOVÁ 2002 from Starohorské vrchy Mts.). Together with the *Violo sudeticae-Agrostietum capillaris* (UJHÁZY & KLIMENT 2007), these associations have their distribution centres in central Slovakian montane regions. The diversity of grassland vegetation together with the abundance of numerous specific associations were the main motives to select the central Slovakian montane regions for this detailed phytosociological overview.

In spite of a long tradition of floristic research in this region (reviewed by FUTÁK 1943), a systematic phytosociological research has been performed here only during the last 30 years. Older phytosociological studies are available from areas partly intersecting the study region (SILLINGER 1933, GREBENŠČIKOV 1956, JURKO 1970). However, the collected phytosociological material has never been synthesised and presented in a comprehensive study. Only a stratified subset was included in the analyses during the national synthesis of the Slovak grassland vegetation (JANIŠOVÁ 2007). Moreover, several recent relevés have been published in local periodicals and workshop proceedings (KOCHJAROVÁ 1997, JANIŠOVÁ & UHLIAROVÁ 2008, JANIŠOVÁ 2009).

Since the rapid development of electronic tools for data analyses, the phytosociological research is focussing on the elaboration of objective, unequivocal and comprehensive methods to classify plant communities. An increasing formalisation of classification procedures resulted in the development of electronic expert systems for the identification of plant communities at the level of associations (CHYTRÝ 2007, JANIŠOVÁ 2007). These expert systems are based on association definitions based on the presence of sociological species groups (BRUELHEIDE 1995) and species dominance criteria. In the definitions, the formulated criteria are connected by logical operators (BRUELHEIDE 1997). During the identification procedure, each phytosociological relevé is ordered to an association either precisely (if it fulfils the definition criteria) or according to values of the similarity indices calculated for each of the defined associations. The application of an expert system reduces the role of the researcher to the critical assessment of classification results (in the case of relevés matched

by a definition) or the decision between several most similar associations (in the case of non-matching relevés), respectively.

To be effective and robust, the definitions should be prepared from a large data set including all vegetation types and covering an extensive geographical area. As it is known, classification results and delimitation of syntaxa depend on the geographical extent of the study (DIEKMANN 1997, JANDT 1999, KNOLLOVÁ & CHYTRÝ 2004, KUŽELOVÁ & CHYTRÝ 2004, KNOLLOVÁ et al. 2006). As a result, many local classifications of ecologically delimited units are not applicable on a regional scale, and vice versa, the geographically delimited vegetation units of broad-scale classifications are often difficult to recognise locally (KUŽELOVÁ & CHYTRÝ 2004). After the expert system for identification of grassland communities had been prepared at the national level (JANIŠOVÁ 2007), the demand for its application at lower than national level has risen. Both regional and local data sets provide valuable material for testing the appropriateness of this expert system for the evaluation of local and regional vegetation diversity. The application of broadly accepted criteria formulated at the national level to a regionally restricted data set brings important information on the quality and representativeness of these criteria. In this paper, we tried to apply the expert system for Slovak grassland vegetation on a regional data set. We provide indications for further formalisation of this application procedure in order to reduce or even to rule out subjective decisions during the classification process.

The aims of this paper can be summarised as follows:
1. to provide a synthesis of grassland vegetation in the study region and to characterise the occurring syntaxa floristically, ecologically and chorologically;
2. to test the national electronic expert system as a tool for grassland classification on a regional data set from an area with a high vegetation diversity;
3. to compare the delimitation of presented syntaxa by diagnostic species based on the national and regional classifications.

2. Material and methods

2.1. Study area

The study area is located in the wide surroundings of Banská Bystrica, situated on the right side of the Hron River, mainly towards the north and the west of the city (Fig. 1). Colline to montane areas of the following orographical units were included: Starohorské vrchy Mts., Kremnické vrchy Mts., Veľká Fatra Mts., Nízke Tatry Mts., Zvolenská kotlina Basin. The left side part of the Hron river valley was not included. The study area extends from 48º 39' 30" to 48º 59' 30" northern latitude and from 19º 00' 00" to 19º 19' 00" eastern longitude. The altitude of the studied grasslands ranges from 350 to 1225 m a.s.l., but the vast majority of relevés was collected between 400 and 900 m a.s.l. The study area has a diverse geological structure involving calcareous (limestone and dolomite), volcanic (andesite) and crystalline (orthogneiss) bedrock types as well as quarzite, claystone and diluvial and colluvial deposits of the Quaternary period. Among the soil types, cambisols and rendzinas are most common. In the colline part of the area, the climate is moderately warm (the average temperature during the growing season is 12–15 °C) and moderately wet (evapotranspiration exceeds precipitation during the growing season). The montane parts of the study area belong to regions with cold to very cold (the average temperature during the growing season is 10–13 ºC) and wet climate (precipitation exceeds evapotranspiration during the growing season, DŽATKO et al. 1989).

2.2. Phytosociological sampling

A systematic phytosociological sampling was performed during 1996–2007 in selected regions within the study area (mostly Starohorské vrchy Mts., Kremnické vrchy Mts. and Zvolenská kotlina Basin). To encompass the overall variability of grassland communities in the study area, all semi-natural grassland communities have been recorded including dry and mesophilous grasslands, as well as wet and fen meadows. The main criterion for inclusion of given grassland types in our study was their occurrence

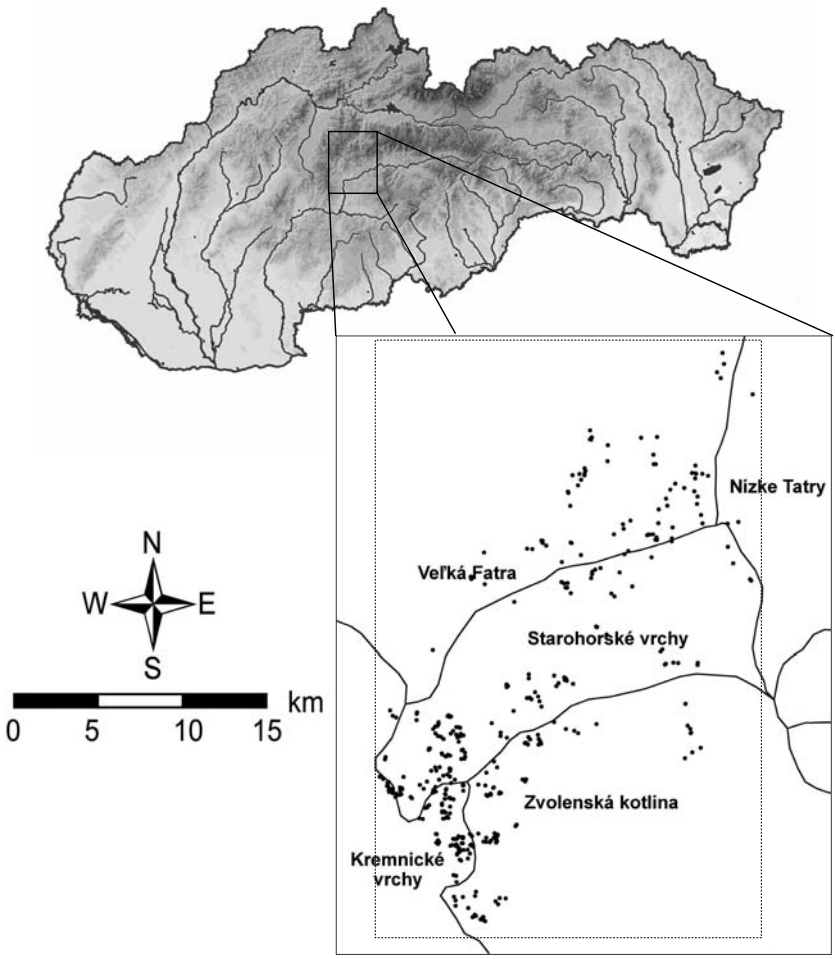


Fig. 1: Location of the phytosociological relevés (dots) in geomorphological districts of Slovakia. The broken line indicates the area presented in Figures 8, 9 and 10.

Abb. 1: Fundorte der pflanzensoziologischen Aufnahmen (Punkte) in den geomorphologischen Distrikten der Slowakei. Die gestrichelte Linie entspricht dem Kartenausschnitt der Abbildungen 8, 9 und 10.

within a spatial complex of semi-natural grasslands in the study region. Additionally, older relevés were included in our data set recorded by H. Ružičková between 1980 and 2001 in submontane and montane mesophilous grasslands of Veľká Fatra Mts. and Nízke Tatry Mts. Some of them were already published in RUŽIČKOVÁ (2002), where two new associations have been described, which are specific for this region. Three relevés were taken from KOCHJAROVÁ (1997). The joint data set contained 411 relevés of all dry, mesophilous and wet semi-natural grassland communities. Although the number of wetland relevés in our data set is considerably lower in comparison to other grassland types, we included them in our analyses because (i) they are rare in the study area and poorly documented; (ii) we aimed at presenting the full heterogeneity of semi-natural grassland communities in the study area.

All relevés were sampled according to the principles of Zurich-Montpelier school (BRAUN-BLANQUET 1964, DENGLER et al. 2008). Some older relevés lack precise geographical coordinates. Still, most relevés were marked on detailed maps of the scale 1:10,000 immediately after recording, so their location is rather precise. Plot size varied from 16 to 30 m^2, most of the relevés being sampled on 25 m^2. As non-vascular plants have been recorded in only 20% of the relevés, some statistical analyses (cluster analyses, detrended correspondence analyses) were based on vascular plant records only.

2.3. Data analysis

The relevé affiliation to associations of all xerophilous, sub-xerophilous and mesophilous grassland types was determined by an electronic expert system (JANIŠOVÁ 2007). This expert system is based on a classification scheme that was created after the critical revision of traditional classification (MUCINA & MAGLOCKÝ 1985) used for the grassland vegetation in Slovakia. The revision was based on the analysis of a large data set containing 32,729 phytosociological relevés 11,552 of which belonged to the grassland communities originally assigned to the *Molinio-Arrhenatheretea*, the *Festuco-Brometea* or the *Nardetea strictae*, respectively. The stratified data set was used to generate sociological species groups by the COCKTAIL method (BRUELHEIDE 2000). Sociological species groups together with dominance of important species have been used to formulate the definitions of associations using logical operators (BRUELHEIDE 1997). The definitions of the associations in the study area are given in Appendix A, while the relevant sociological species groups are listed in Appendix B.

For example, the formal definition of the association *Scabioso ochroleucae-Brachypodietum pinnati* is:

> (Group *Cirsium acaule* OR Group *Scabiosa ochroleuca*) AND *Brachypodium pinnatum* cover >5% NOT Group *Carex humilis* NOT Group *Cirsium pannonicum* NOT Group *Onobrychis viciifolia* NOT Group *Polygala major* NOT *Festuca rupicola* cover >25%

Accordingly, a relevé will be assigned to this association if it contains either the group *Cirsium acaule* or the group *Scabiosa ochroleuca* and when the cover of the species *Brachypodium pinnatum* exceeds 5%. At the same time, none of groups *Carex humilis*, *Cirsium pannonicum*, *Onobrychis viciifolia* and *Polygala major* should be present, and the cover of species *Festuca rupicola* should not be higher than 25%. A sociological group is considered to be represented in the relevé if the relevé contains at least half of all species of the group.

Phytosociological relevés from the study region were identified according to the Slovak expert system in several steps. 1) Relevés matched by a single definition were assigned to the respective associations. 2) Relevés matched by more than one association definition were assigned to the association with the highest similarity according to the Frequency-Positive Fidelity Index (FPFI; TICHÝ 2005). 3) Relevés not matching the definitions were assigned to syntaxa according to their similarity (FPFI) in two possible ways: 3a) A relevé with the highest FPFI value to any association detected in the study region by an exactly identified relevé (i.e. one matched by definition) was ordered directly to this association. 3b) A relevé with the highest FPFI value to an association which was not documented from the study region by an exactly matched relevé was ordered to the association with either the second or the third highest FPFI value provided that this association was documented from the study region. This approach was selected in order to avoid the acceptance of syntaxa which are not typically developed in the region. On the other hand, we wanted to prevent the exclusion of transitional and untypical relevés from our data set and classification. As a result, we assigned the non-matching relevés according to similarity indices exclusively to syntaxa well documented from the region.

The wetland vegetation was classified with a numerical classification method because some of the wetland communities (communities of the alliances *Phragmition communis* and *Glycerio-Sparganion*) are not included in the recently developed expert systems (JANIŠOVÁ et al. 2007, DÍTĚ et al. 2007). We used the Bray-Curtis distance measure and β-flexible group linkage method with $\beta = -0.25$ (PC-ORD 5; MCCUNE & MEFFORD 1999). Square-root transformed cover data of vascular plants were used for the analysis. The number of distinguished clusters was set to nine as at this division level most important relevé groups were separated and could be recognised as associations. The syntaxonomical position of individual clusters was identified according to the published literature (HÁJEK & HÁBEROVÁ 2001, OŤAHELOVÁ et al. 2001, DÍTĚ et al. 2007). Not all clusters could be considered as associations. Two clusters were evaluated as transitional communities between wet and fen meadows (in the synoptic table – Table 1 – they are joined), and one cluster was assigned at the alliance level to the *Caricion davallianae* without distinguishing individual associations.

2.4. Evaluation of diagnostic species

Diagnostic species of identified syntaxa were determined from the regional data set with the program JUICE (TICHÝ 2002) after standardising the size of all relevé groups to $1/n$ of the total size of data set (with n being the number of syntaxa, i.e. 1/23 = 4% for associations and 1/14 = 7% for alliances) and setting the phi coefficient threshold 0.20 (0.25 for alliances). Fisher's exact test ($\alpha = 0.001$) was used to exclude those species from the lists of diagnostic species that only showed a non-significant concentration in the respective unit (CHYTRÝ et al. 2002, CHYTRÝ 2007). Species with a frequency higher than

70% were listed as constant, and species covering more than 25% in at least 5% of relevés were listed as dominant. In the characteristics of individual syntaxa and in the synoptic table, diagnostic species with phi > 0.35 (0.40 for alliances), constant species with a frequency above 85% and species dominant (i.e. cover over 25%) in more than 25% of relevés are printed in bold. The diagnostic species were determined only for associations with more than 7 relevés. The calculation of diagnostic species of an alliance was based on relevés assigned to individual associations of a given alliance; diagnostic species for monotypic alliances (with only one association in the region) were not presented. In the descriptions of the syntaxa, the diagnostic, constant and dominant species are listed alphabetically.

2.5. Main environmental gradients

To visualise the variability of the studied vegetation and relationships among individual associations and species, we performed detrended correspondence analyses (DCAs) with the program package CANOCO 4.5 (TER BRAAK & ŠMILAUER 2002). For the interpretation of the main environmental gradients, average non-weighted indicator values for light, temperature, continentality, soil reaction, moisture and nutrients (ELLENBERG et al. 1992) were calculated for the relevés, and these variables were used supplementary in the ordination graphs.

2.6. Nomenclature

Plant species nomenclature follows MARHOLD & HINDÁK (1998). Several species were merged to supraspecific taxa (agg., sect.) for the analyses: *Achillea millefolium* agg. (*A. collina*, *A. millefolium*, *A. pannonica*), *Campanula rotundifolia* agg. (*C. moravica*, *C. rotundifolia*), *Carex muricata* agg. (*C. pairei*, *C. spicata*), *C. flava* agg. (*C. flava*, *C. lepidocarpa*), *Dorycnium pentaphyllum* agg. (*D. germanicum, D. herbaceum*), *Drepanocladus revolvens* agg. (*D. cossonii*, *D. revolvens*), *Galium mollugo* agg. (*G. album*, *G. mollugo*), *Jacea phrygia* agg. (*J. phrygia*, *J. pseudophrygia*), *Koeleria pyramidata* agg. (*K. macrantha*, *K. pyramidata*), *Luzula campestris* agg. (*L. campestris*, *L. multiflora*), *Molinia caerulea* agg. (*M. arundinacea*, *M. caerulea*), *Myosotis scorpioides* agg. (*M. laxiflora*, *M. nemorosa*, *M. scorpioides*), *Poa pratensis* agg. (*P. angustifolia*, *P. pratensis*), *Potentilla arenaria* agg. (*P. arenaria*, *P. tabernaemontani*), *Scilla bifolia* agg. (*S. bifolia*, *S. buekkensis*). Nomenclature of syntaxa follows JANIŠOVÁ (2007) for dry and mesophilous grasslands and VALACHOVIČ (2001) for the wetland communities.

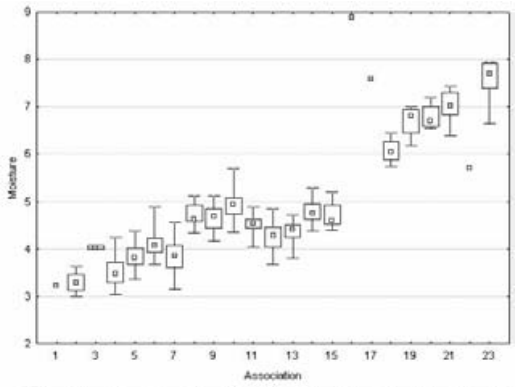
3. Results

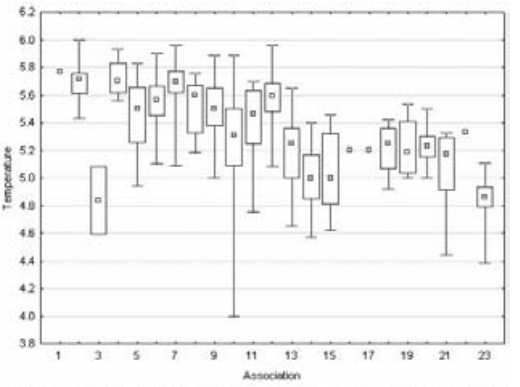
3.1. Application of the expert system to the studied data set

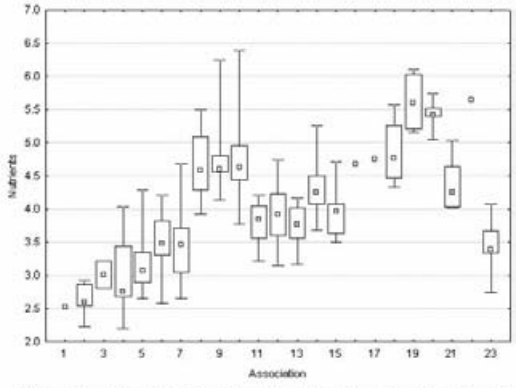
Out of 379 relevés of xero-, sub-xero- and mesophilous grasslands, 187 (49%) were matched by at least one association definition (two of them were concurrently matched by two associations). Out of 192 non-matching relevés, 165 were assigned to associations based on the FPFI similarity index as these relevés showed the highest similarity to associations

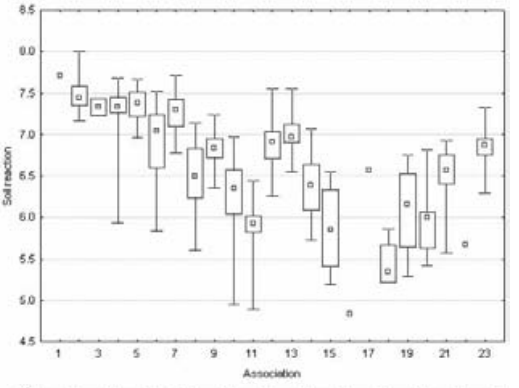
Fig. 2: Comparison of the studied associations with respect to non-weighted Ellenberg indicator values calculated for relevés, to altitude (in m a.s.l.) and species richness (of vascular plants per 16–30 m²). Median values, quartiles and ranges are shown. Associations are numbered as follows: 1 *Festuco rupicolae-Caricetum humilis*, 2 *Festuco pallentis-Seslerietum calcariae*, 3 *Orthantho luteae-Caricetum humilis*, 4 *Scabioso ochroleucae-Brachypodietum pinnati*, 5 *Carici albae-Brometum monocladi*, 6 *Brachypodio pinnati-Molinietum arundinaceae*, 7 *Onobrychido viciifoliae-Brometum erecti* (all *Festuco-Brometea*), 8 *Lolio perennis-Cynosuretum cristati*, 9 *Pastinaco sativae-Arrhenatheretum elatioris*, 10 *Poo-Trisetetum flavescentis*, 11 *Anthoxantho odorati-Agrostietum tenuis*, 12 *Ranunculo bulbosi-Arrhenatheretum elatioris*, 13 *Lilio bulbiferi-Arrhenatheretum elatioris*, 14 *Campanulo glomeratae-Geranietum sylvatici* (all *Molinio-Arrhenatheretea*), 15 *Violo sudeticae-Agrostietum capillaris* (*Nardetea strictae*), 16 *Typhetum latifoliae*, 17 *Glycerietum nemoralis-plicatae* (both *Phragmito-Magnocaricetea*), 18 *Poo trivialis-Alopecuretum pratensis*, 19 *Cirsietum rivularis*, 20 *Scirpetum sylvatici*, 21 *Filipendulo ulmariae-Menthetum longifolia* (all *Molinio-Arrhenatheretea*), 22 transitional stands between wet and fen meadows, 23 *Caricion davallianae* (*Scheuchzerio-Caricetea*).

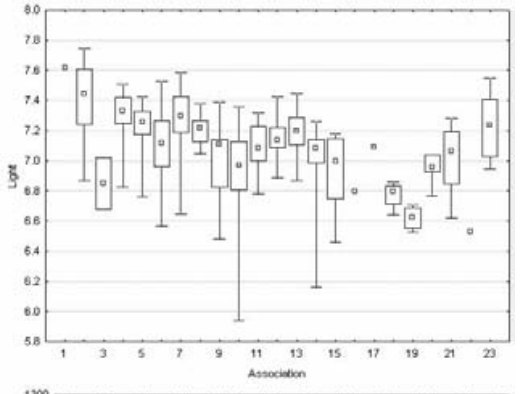
Abb. 2: Vergleich der untersuchten Assoziationen im Hinblick auf Ellenberg-Zeigerwerte (ungewichtete Mittel je Aufnahme berechnet), Meereshöhe (in m. ü. NN) und Artenzahl (Gefäßpflanzen pro 16–30 m²). Dargestellt sind jeweils Median, Quartile und Spannweite. Zur Bedeutung der Assoziationsnummern vgl. englische Abbildungsunterschrift.

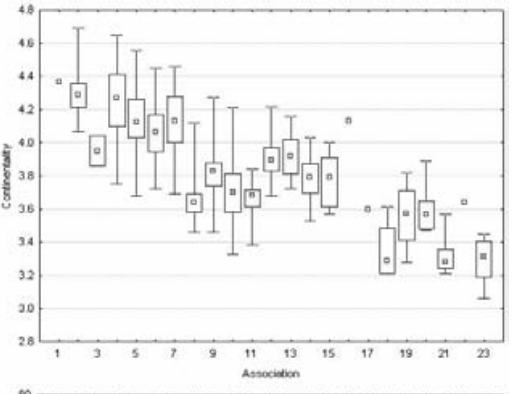

Moisture
Association

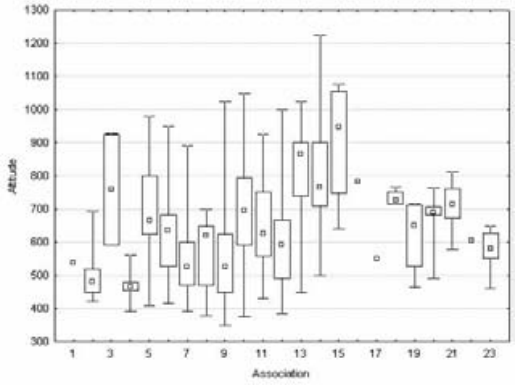

Temperature
Association

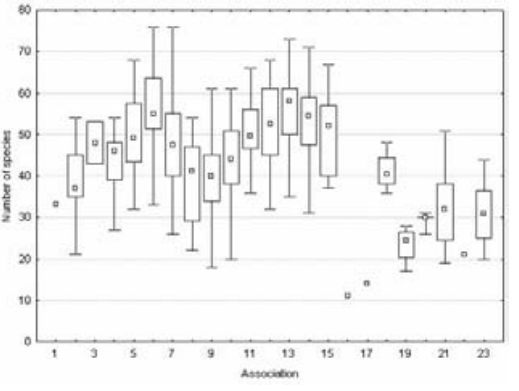

Nutrients
Association


Soil reaction
Association


Light
Association


Continentality
Association


Altitude
Association


Number of species
Association

confirmed for the region by at least one relevé matched by the definition. The rest of the data set – 27 relevés (7%) – exhibited the highest similarity to associations which were not documented for the study region in the published literature and whose recent occurrence in the region was also not confirmed unequivocally by a matched relevé. Most of these disputable relevés belonged to montane grasslands and showed the highest similarity to the *Geranio sylvatici-Trisetetum flavescentis* (20 relevés) or to the *Campanulo rotundifoliae-Dianthetum deltoidis* (6 relevés). As none of these associations were recorded in the study region or its vicinity (HEGEDÜŠOVÁ & RUŽIČKOVÁ 2007, UJHÁZY 2007), the relevés under consideration were assigned to the association with the second or the third highest FPFI value, provided that this association is well documented in the study region.

Altogether, the xero- to mesophilous grasslands in our data set were assigned to 15 associations by the expert system used, belonging to nine alliances and three classes. The xerophilous grasslands were classified within three alliances of the *Festuco-Brometea*: *Festucion valesiacae*, *Bromo pannonici-Festucion pallentis* and *Diantho lumnitzeri-Seslerion*. The occurrence of these communities in the region is rare, restricted to rocky habitats and steep slopes with shallow soil over calcareous bedrock. The only association with slightly higher frequency is the *Orthantho luteae-Caricetum humilis*. Sub-xerophilous grasslands were classified within four associations belonging to the two alliances *Cirsio-Brachypodion pinnati* and *Bromion erecti* of the *Festuco-Brometea*. In the study region, these communities are widely distributed mainly in areas with calcareous bedrock. Mesophilous grasslands are the most common communities in the study region. They were classified within eight associations belonging to four alliances: *Cynosurion cristati*, *Arrhenatherion elatioris* and *Polygono bistortae-Trisetion flavescentis* (all of them belonging to the class *Molinio-Arrhenatheretea*) and *Nardo strictae-Agrostion tenuis* (belonging to the class *Nardetea strictae*). Most relevés were assigned to the *Poo-Trisetetum flavescentis* and *Ranunculo bulbosi-Arrhenatheretum elatioris*, which are the two most common grassland communities in the study region.

Wetland communities were classified according to the results of the cluster analysis. They belong to the classes *Phragmito-Magnocaricetea* (alliances *Phragmition communis* and *Glycerio-Sparganion*), *Molinio-Arrhenatheretea* (alliance *Deschampsion cespitosae*) and *Scheuchzerio-Caricetea fuscae* (alliance *Caricion davallianae*).

3.2. Description of the syntaxa

3.2.1. Xerophilous and mesophilous grassland communities

Class *Festuco-Brometea* (Table 1: 1–7, Table 2, Figs. 2, 3, 4 and 5)

Alliance *Festucion valesiacae*

Association *Festuco rupicolae-Caricetum humilis*
Number of relevés: 1 (1 matched by the definition)
Table 1: 1, Table 2, relevé 1, Fig. 5A (black triangle).

This association represents the transition of typical dry grasslands of the *Festucion valesiacae* to sub-xerophilous communities of the *Bromion erecti* and *Cirsio-Brachypodion pinnati*. Only one relevé fulfilled the criteria of this association, thus the diagnostic species were neither ascribed to the association nor to the alliance. The only stand occurred on dolomite covered by rendzina soil, rich in gravel. The stand is rather open (cover 60%) and dominated by *Festuca rupicola* and *Koeleria macrantha*. In general, this association is poor in diagnostic species, most of them being common dry grassland species diagnostic also for the class *Festuco-Brometea* (JANIŠOVÁ 2007). In our relevé, the following diagnostic species of the national level occurred: *Asperula cynanchica*, *Bothriochloa ischaemum*, *Festuca rupicola*, *Koeleria macrantha*, *Sanguisorba minor*, *Scabiosa ochroleuca* and *Teucrium chamaedrys*. Other more abundant species were *Carex caryophyllea*, *Helianthemum ovatum*, *Jovibarba globifera*, *Poa compressa* and *Potentilla arenaria* agg. The moss layer was well developed (30% cover). Although this association is rare in the study area (Fig. 5A), it frequently occurs in the adjacent region situated at lower altitudes on the left side of Hron River in the Zvolenská kotlina Basin (MICHÁLKOVÁ 2007).

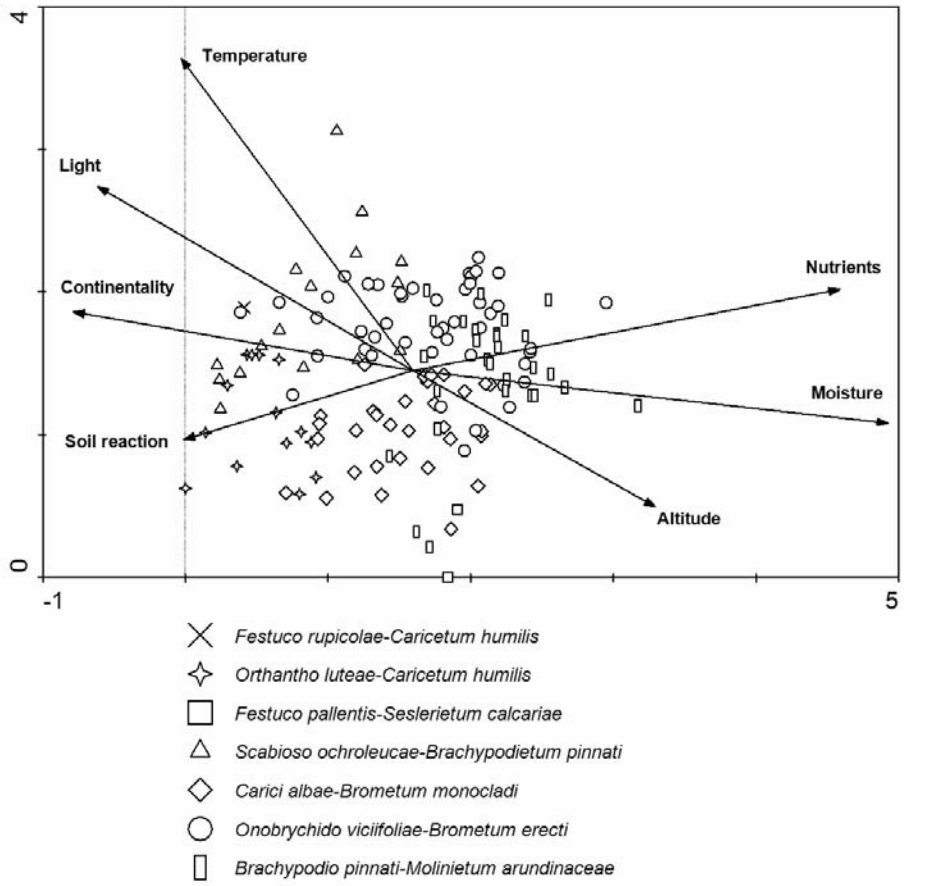


Fig. 3: Detrended correspondence analysis (DCA) of dry and semi-dry grasslands belonging to the class *Festuco-Brometea* based on square-root transformed cover data of the herb layer. Supplementary environmental variables represent unweighted average Ellenberg indicator values and altitude.

Abb. 3: Trendbereinigte Korrespondenzanalyse (DCA) der Trocken- und Halbtrockenrasen der Klasse *Festuco-Brometea*, basierend auf den quadratwurzel-transformierten Deckungsgraden der Krautschicht. Die zusätzlichen Umweltvariablen sind ungewichtete mittlere Ellenberg-Zeigerwerte sowie Höhenlage.

Alliance *Diantho lumnitzeri-Seslerion*

Association *Festuco pallentis-Seslerietum calcariae*

Number of relevés: 2 (2 matched by the definition)

Table 1: 2, Table 2, relevés 2–3, Fig. 5A (black diamonds).

The stands of this association represent a relict community dominated by *Sesleria albicans*. In the study region, they are very rare (Fig. 5A), and they are documented by only two relevés in our dataset. From the diagnostic species of the national level, the following also occurred in our relevés: *Acinos alpinus, Galium pumilum* agg., *Genista pilosa, Hippocrepis comosa, Leontodon incanus, Phyteuma orbiculare, Polygala amara* ssp. *brachyptera, Sesleria albicans* and *Teucrium chamaedrys*. The occurrence of *Bellidiastrum michelii* and *Pulsatilla subslavica* in the region is restricted to this association. Likewise, in all Slovakia, this community is bound to calcareous bedrock. The localities in the study region are situated at the eastern border of the overall distribution of the association. Several other localities can be found in the adjacent part of the Horehronské podolie Valley (BALÁŽ 1991).

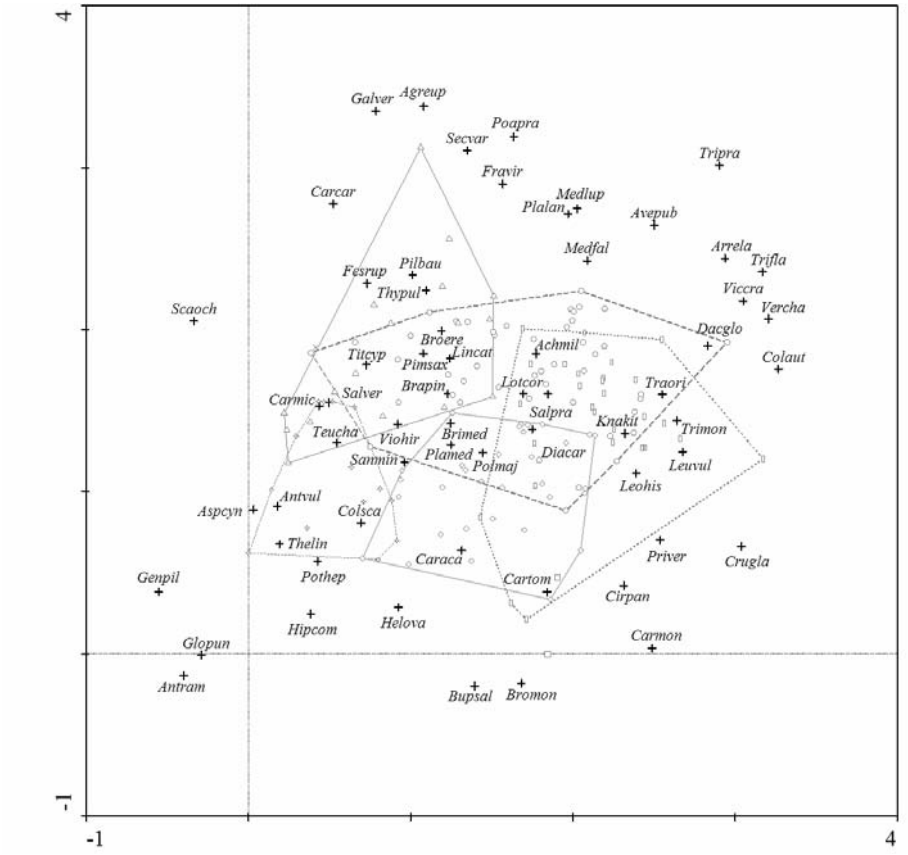


Fig. 4: Detrended correspondence analysis (DCA) of dry and semi-dry grasslands belonging to the class *Festuco-Brometea*. Envelopes are drawn around relevés belonging to individual associations (see Fig. 3 for symbols explanation). 61 species with weight over 12 are shown, the abbreviations are as follows: *Agreup – Agrimonia eupatoria*, *Achmil – Achillea millefolium* agg., *Antram – Anthericum ramosum*, *Antvul – Anthyllis vulneraria*, *Arrela – Arrhenatherum elatius*, *Aspcyn – Asperula cynanchica*, *Avepub – Avenula pubescens*, *Brapin – Brachypodium pinnatum*, *Brimed – Briza media*, *Broere – Bromus erectus*, *Bromon – Bromus monocladus*, *Bupsal – Buphthalmum salicifolium*, *Caraca – Carlina acaulis*, *Carcar – Carex caryophyllea*, *Carmic – Carex michelii*, *Carmon – Carex montana*, *Cartom – Carex tomentosa*, *Cirpan – Cirsium pannonicum*, *Colaut – Colchicum autumnale*, *Colsca – Colymbada scabiosa*, *Crugla – Cruciata glabra*, *Dacglo – Dactylis glomerata*, *Diacar – Dianthus carthusianorum*, *Fesrup – Festuca rupicola*, *Fravir – Fragaria viridis*, *Galver – Galium verum*, *Genpil – Genista pilosa*, *Glopun – Globularia punctata*, *Helova – Helianthemum ovatum*, *Hipcom – Hippocrepis comosa*, *Knakit – Knautia kitaibelii*, *Leohis – Leontodon hispidus*, *Leuvul – Leucanthemum vulgare*, *Lincat – Linum catharticum*, *Lotcor – Lotus corniculatus*, *Medfal – Medicago falcata*, *Medlup – Medicago lupulina*, *Pilbau – Pilosella bauhinii*, *Pimsax – Pimpinella saxifraga*, *Plalan – Plantago lanceolata*, *Plamed – Plantago media*, *Poapra – Poa pratensis agg.*, *Polmaj – Polygala major*, *Pothep – Potentilla heptaphylla*, *Priver – Primula veris*, *Salpra – Salvia pratensis*, *Salver – Salvia verticillata*, *Sanmin – Sanguisorba minor*, *Scaoch – Scabiosa ochroleuca*, *Secvar – Securigera varia*, *Teucha – Teucrium chamaedrys*, *Thelin – Thesium linophyllon*, *Thypul – Thymus pulegioides*, *Titcyp – Tithymalus cyparissias*, *Traori – Tragopogon orientale*, *Trifla – Trisetum flavescens*, *Trimon – Trifolium montanum*, *Tripra – Trifolium pratense*, *Vercha – Veronica chamaedrys*, *Viccra – Vicia cracca*, *Viohir – Viola hirta*.

Abb. 4: Trendbereinigte Korrespondenzanalyse (DCA) der Trocken- und Halbtrockenrasen der Klasse *Festuco-Brometea*. Die eingezeichneten Gruppen zeigen die Zugehörigkeit der Aufnahmen zu den einzelnen Assoziationen (Erläuterung der Symbole s. Abb. 2). 61 Arten mit Artwerten über 12 sind dargestellt, für die Erklärung der Abkürzungen vgl. englische Abbildungsunterschrift.

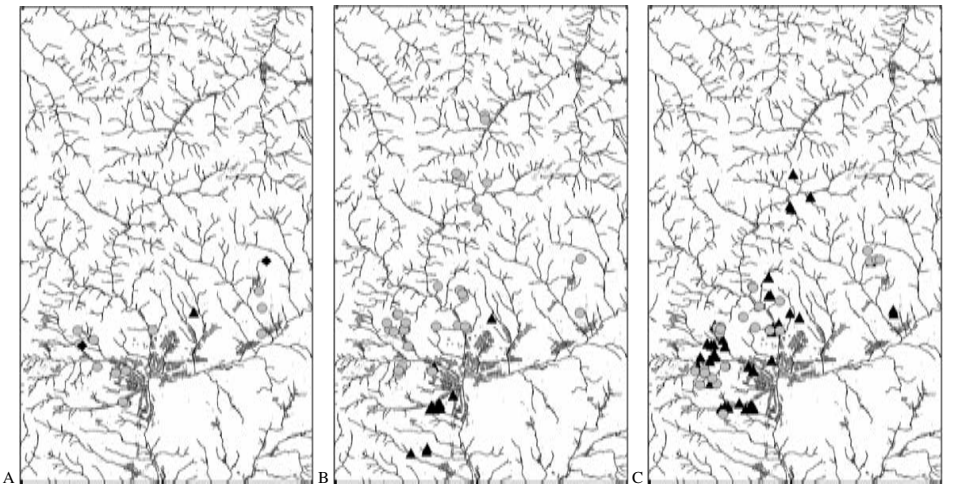


Fig. 5: Distribution of associations in the study area I: A) *Festuco rupicolae-Caricetum humilis* (black triangle), *Orthantho luteae-Caricetum humilis* (grey circles) and *Festuco pallentis-Seslerietum calcariae* (black diamonds); B) *Scabioso ochroleucae-Brachypodietum pinnati* (black triangles) and *Carici albae-Brometum monocladi* (grey circles); C) *Onobrychido viciifoliae-Brometum erecti* (black triangles) and *Brachypodio pinnati-Molinietum arundinaceae* (grey circles).

Abb. 5: Verbreitung der Assoziationen im Untersuchungsgebiet I: A) *Festuco rupicolae-Caricetum humilis* (schwarze Dreiecke), *Orthantho luteae-Caricetum humilis* (graue Kreise) und *Festuco pallentis-Seslerietum calcariae* (schwarze Rauten); B) *Scabioso ochroleucae-Brachypodietum pinnati* (schwarze Dreiecke) und *Carici albae-Brometum monocladi* (graue Kreise); C) *Onobrychido viciifoliae-Brometum erecti* (schwarze Dreiecke) und *Brachypodio pinnati-Molinietum arundinaceae* (graue Kreise).

Alliance *Bromo pannonici-Festucion pallentis*

Association *Orthantho luteae-Caricetum humilis*

Number of relevés: 14 (1 matched by the definition)
Table 1: 3, Table 2, relevés 4–17, Fig. 5A (grey circles), Fig. 6.

Diagnostic species: ***Anthericum ramosum***, *Asperula cynanchica*, ***Bupleurum falcatum***, ***Carex humilis***, ***Carlina vulgaris***, ***Colymbada scabiosa***, ***Genista pilosa***, ***Globularia punctata***, *Helianthemum ovatum*, ***Hippocrepis comosa***, *Leontodon incanus*, ***Linum flavum***, *Pinus sylvestris*, *Potentilla arenaria* agg., *Pseudolysimachion spicatum*, ***Scabiosa ochroleuca***, *Seseli annuum*, *Teucrium chamaedrys*, ***Thesium linophyllon***, *Tithymalus cyparissias*.

Constant species: ***Anthericum ramosum***, *Asperula cynanchica*, *Brachypodium pinnatum*, *Colymbada scabiosa*, ***Festuca rupicola***, *Genista pilosa*, ***Globularia punctata***, ***Helianthemum ovatum***, *Hippocrepis comosa*, ***Salvia pratensis***, *Sanguisorba minor*, *Scabiosa ochroleuca*, ***Teucrium chamaedrys***, *Thesium linophyllon*, ***Tithymalus cyparissias***.

Dominant species: ***Anthericum ramosum***, *Bromus erectus*, *Genista pilosa*.

The occurrence of this community is restricted to the warmest regions in the close vicinity of the Hron River valley at altitudes between 420 and 700 m a.s.l. (Fig. 5A). The bedrock is nearly always dolomitic; only in the vicinity of village Riečka, the community also occurs on quarzites. The localities are typically situated on south- or southwest-facing slopes. The stands are not entirely closed: the cover of the herb layer reaches usually about 80%, the moss layer is usually species-rich with a cover of up to 80%. In the past, stands of this association commonly have been grazed at least occasionally. Recently, most localities are abandoned, and the succession by woody species contributes to their slow, but continuous degradation. As this community is relict and infrequent also within the whole Slovakia (JANIŠOVÁ 2007), it urgently requires effective conservation.

Fig. 6: The *Orthantho luteae-Caricetum humilis* inhabits steep slopes and rocky hills protruding from the agriculturally used landscape. It is common near the village Slovenská Ľupča in the Zvolenská kotlina Basin (Photo: M. Janišová, 7 August 2006).

Abb. 6: Das *Orthantho luteae-Caricetum humilis* besiedelt steile Hänge und felsige Hügel, die aus der landwirtschaftlich genutzten Landschaft herausragen. Die Assoziation ist in der Umgebung des Ortes Slovenská Ľupča im Zvolenská kotlina Becken häufig (Foto: M. Janišová, 7. August 2006).

Fig. 7: The of *Scabioso ochroleucae-Brachypodietum pinnati* has developed on pastures. Even after abandonment it forms species-rich stands full in colours during summer. Flowering *Dianthus carthusianorum*, *Galium verum*, *Salvia verticillata* and *Securigera varia* in the locality Malachovské skalky (Photo: Eva Uhliarová, 9 July 2006).

Abb. 7: Das *Scabioso ochroleucae-Brachypodietum pinnati* hat sich auf beweideten Flächen entwickelt. Auch nach Nutzungsaufgabe bildet es artenreiche Bestände, die im Sommer sehr farbenfroh sind. Blühende *Dianthus carthusianorum*, *Galium verum*, *Salvia verticillata* und *Securigera varia* am Fundort Malachovské skalky (Foto: Eva Uhliarová, 9. Juli 2006).

Alliance *Cirsio-Brachypodion pinnati*

Number of relevés: 49.

Diagnostic species: *Anthyllis vulneraria*, ***Brachypodium pinnatum***, *Bromus monocladus*, ***Buphthalmum salicifolium***, ***Carex michelii***, ***Carex tomentosa***, *Cirsium pannonicum*, ***Colymbada scabiosa***, *Cuscuta epithymum*, *Falcaria vulgaris*, *Festuca rupicola*, *Inula salicina*, *Plantago media*, ***Salvia verticillata***, *Sanguisorba minor*, *Teucrium chamaedrys*, *Thesium linophyllon*, *Tithymalus cyparissias*, *Vincetoxicum hirundinaria*, *Viola collina*, ***Viola hirta***.

Constant species: *Brachypodium pinnatum*, *Briza media*, *Dianthus carthusianorum*, *Festuca rupicola*, *Plantago media*, *Sanguisorba minor*, *Teucrium chamaedrys*, *Thymus pulegioides*, *Tithymalus cyparissias*, *Viola hirta*.

Dominant species: *Anthericum ramosum*, *Bromus erectus*, *Bromus monocladus*, *Genista pilosa*.

In comparison to the *Bromion erecti*, the communities of the *Cirsio-Brachypodion pinnati* are more xerophilous, and their sites are poorer in nutrients and particularly lime-rich (Fig. 3). Both associations of the alliance have developed on localities traditionally used as pastures. They can be regarded as vicariants, with the *Carici albae-Brometum monocladi* replacing the more termophilous *Scabioso ochroleucae-Brachypodietum pinnati* at higher altitudes (Fig. 5B) and thus hosting numerous additional montane species.

Association *Scabioso ochroleucae-Brachypodietum pinnati*

Number of relevés: 17 (9 matched by the definition)
Table 1: 4, Table 2, relevés 18–34, Fig. 5B (black triangles), Fig. 7.

Diagnostic species: ***Acosta rhenana***, ***Agrimonia eupatoria***, *Asperula cynanchica*, ***Brachypodium pinnatum***, *Bromus erectus*, ***Campanula rotundifolia* agg.**, *Carex caryophyllea*, ***Carex michelii***, ***Carlina vulgaris***, ***Falcaria vulgaris***, *Festuca rupicola*, *Galium verum*, *Genista pilosa*, *Ononis spinosa*, ***Picris hieracioides***, ***Prunella laciniata***, ***Scabiosa ochroleuca***, ***Seseli annuum***, *Teucrium chamaedrys*, ***Teucrium montanum***, *Thesium linophyllon*, *Tithymalus cyparissias*, ***Vicia hirsuta***, ***Viola collina***.

Constant species: ***Agrimonia eupatoria***, *Achillea millefolium* agg., *Anthyllis vulneraria*, ***Brachypodium pinnatum***, *Briza media*, ***Bromus erectus***, *Campanula rotundifolia* agg., *Carex caryophyllea*, ***Festuca rupicola***, *Galium verum*, *Linum catharticum*, ***Pimpinella saxifraga***, ***Plantago media***, *Scabiosa ochroleuca*, ***Teucrium chamaedrys***, ***Thymus pulegioides***, ***Tithymalus cyparissias***, *Viola hirta*.

Dominant species: *Anthericum ramosum*, ***Bromus erectus***, ***Genista pilosa***.

This association comprises closed semi-dry grassland communities occurring predominantly on dolomites and limestones at lower altitudes between 390 and 560 m a.s.l. (Fig. 5B). They are moderately species-rich (usually 40–50 species of vascular plants per 16–25 m^2) with a well-developed bryophyte layer (40–80%). In the past, these stands were used as pastures, and some of them have at least been slightly grazed until recent days, as indicated by the presence of pasture weeds like *Carlina vulgaris* and *Ononis spinosa*. However, most localities are endangered by succession and due to their attractive situation in the vicinity of Banská Bystrica also by building activities. Within Slovakia, the community is most common at lower altitudes throughout the Carpathian region (ŠKODOVÁ 2007b). Among the semi-dry grasslands detected in the study region, this association is the most xerophilous (Fig. 3), often growing in contact with dry grasslands of the *Orthantho luteae-Caricetum humilis*.

Association *Carici albae-Brometum monocladi*

Number of relevés: 32 (10 matched by the definition)
Table 1: 5, Table 2, relevés 35–66, Fig. 5B (grey circles), Fig. 8.

Diagnostic species: *Anthericum ramosum*, *Anthyllis vulneraria*, *Brachypodium pinnatum*, ***Bromus monocladus***, ***Buphthalmum salicifolium***, *Carduus glaucinus*, *Carex michelii*, *Carex montana*, ***Carex tomentosa***, ***Cirsium pannonicum***, *Colymbada scabiosa*, *Globularia punctata*, *Helianthemum ovatum*, *Hippocrepis comosa*, *Inula ensifolia*, *Inula salicina*, *Knautia kitaibelii*, *Pilosella bauhinii*, *Polygonatum odoratum*, *Potentilla heptaphylla*, *Primula veris*, *Prunella grandiflora*, *Pyrethrum corymbosum*, *Salvia pratensis*, *Salvia verticillata*, *Sanguisorba minor*, *Sorbus aria*, *Teucrium chamaedrys*, *Tithymalus cyparissias*, *Trommsdorfia maculata*, *Vincetoxicum hirundinaria*, *Viola hirta*.

Fig. 8: The *Carici albae-Brometum monocladi* occurs usually on steep slopes. Spring aspect with flowering *Salvia pratensis* and *Leucanthemum vulgare* in the village Skubín, Starohorské vrchy Mts. (Photo: M. Janišová, 10 June 2004).

Abb. 8: Das *Carici albae-Brometum monocladi* kommt normalerweise an steilen Hängen vor. Frühjahrsaspekt mit *Salvia pratensis* und *Leucanthemum vulgare* am Dorf Skubín, Starohorské vrchy Berge (Foto: M. Janišová, 10. Juni 2004).

Fig. 9: The *Brachypodio pinnati-Molinietum arundinaceae* belongs to the most species-rich grasslands in the study region. It has developed on deeper soils by regular mowing. Recently almost all localities are abandoned and these beautiful meadows are sentenced to gradual succession and degradation. The picture shows one of best preserved stands in locality near the village Jakub, Starohorské vrchy Mts. with most conspicuous species *Cirsium pannonicum*, *Colymbada scabiosa*, *Pyrethrum corymbosum*, *Rhinanthus serotinus* and *Salvia verticillata* (Photo: M. Janišová, 14 July 2007).

Abb. 9: Das *Brachypodio pinnati-Molinietum arundinaceae* gehört zu den artenreichsten Rasengesellschaften im Untersuchungsgebiet. Es hat sich auf etwas tieferen Böden mit regelmäßiger Mahdnutzung entwickelt. Inzwischen sind fast alle Fundorte ohne Nutzung und diese schönen Wiesen sind zur graduellen Sukzession und Degradation verurteilt. Das Bild zeigt einen der am besten erhaltenen Bestände in der Nähe des Dorfes Jakub, Starohorské vrchy Berge, mit den Arten *Cirsium pannonicum*, *Colymbada scabiosa*, *Pyrethrum corymbosum*, *Rhinanthus serotinus* und *Salvia verticillata* (Foto: M. Janišová, 14. Juli 2007).

Constant species: *Briza media, Bromus monocladus, Buphthalmum salicifolium, Carlina acaulis, Dianthus carthusianorum, Helianthemum ovatum, Knautia kitaibelii, Plantago media, Primula veris, Salvia pratensis,* ***Sanguisorba minor,*** *Teucrium chamaedrys, Viola hirta.*

Dominant species: *Bromus erectus, Bromus monocladus.*

In the study region, this association is commonly distributed at altitudes between 410 and 980 m a.s.l. (Fig. 5B), but most localities are above 600 m a.s.l. Thus, numerous montane and dealpine species are present in the stands (*Acinos alpinus*, *Buphthalmum salicifolium*, *Carduus glaucinus*, *Phyteuma orbiculare*, *Thesium alpinum*). The association inhabits steep slopes (mostly 20–40°), where it forms loose stands. The cover of the herb layer usually reaches about 80%, while that of the moss layer is very variable (1–70%). The bedrock is formed by dolomites and limestones (in the surroundings of Riečka village also quarzites); the soils are very shallow. This community is very species-rich (usually 50–60, and up to 68 species per 16–25 m^2). In the study region, this association has the centre of its distribution. It is also known from Muránska planina Mts. (UJHÁZY et al. 2007), where it is much less frequent.

Alliance *Bromion erecti*

Number of relevés: 74.

Diagnostic species: *Agrimonia eupatoria, Brachypodium pinnatum, Bromus erectus, Carex michelii, Cirsium pannonicum, Dianthus carthusianorum, Knautia kitaibelii, Lathyrus latifolius,* ***Medicago falcata,*** *Onobrychis viciifolia, Pimpinella saxifraga, Polygala major, Primula veris, Pseudolysimachion orchideum, Pyrethrum corymbosum,* ***Salvia pratensis,*** *Salvia verticillata, Senecio jacobaea, Tithymalus tommasinanus, Trifolium montanum, Trommsdorfia maculata, Viola hirta.*

Constant species: *Achillea millefolium* agg., *Arrhenatherum elatius,* ***Bromus erectus,*** *Carlina acaulis, Dactylis glomerata, Dianthus carthusianorum, Knautia kitaibelii, Lotus corniculatus, Medicago falcata, Pimpinella saxifraga, Plantago media,* ***Salvia pratensis,*** *Sanguisorba minor, Trifolium montanum.*

Dominant species: ***Bromus erectus.***

Associations of this alliance represent the most frequent semi-dry grasslands in the study region (Fig. 5C). They occur on deeper soils, rich in nutrients and retaining enough water even during extended droughts (see Fig. 3). In the past, these communities were regularly mown, and those with continued mowing until recent times belong to the most species-rich grasslands within the whole of Slovakia (cf. JANIŠOVÁ & UHLIAROVÁ 2008). The two associations of this alliance do not differ much in their ecological requirements and their species composition, and their distribution ranges overlap to a high extent (Fig. 4, Fig. 5C). If abandoned, the typically species-rich *Brachypodio pinnati-Molinietum arundinaceae* gradually transforms into the species-poorer *Onobrychido viciifoliae-Brometum erecti* (JANIŠOVÁ, ined.).

Association *Brachypodio pinnati-Molinietum arundinaceae*

Number of relevés: 28 (27 matched by the definition)
Table 1: 6, Table 2, relevés 67–94, Fig. 5C (grey circles), Fig. 9.

Diagnostic species: ***Betonica officinalis,*** *Brachypodium pinnatum, Campanula persicifolia,* ***Carex montana,*** *Carlina acaulis,* ***Cirsium pannonicum,*** *Filipendula vulgaris, Hypericum perforatum,* ***Lathyrus latifolius,*** *Medicago falcata, Onobrychis viciifolia,* ***Polygala major,*** *Primula veris, Pyrethrum corymbosum, Salvia pratensis, Scorzonera hispanica, Thesium linophyllon, Tithymalus cyparissias, Trifolium montanum,* ***Trommsdorfia maculata.***

Constant species: *Arrhenatherum elatius, Brachypodium pinnatum, Bromus erectus, Carex montana,* ***Carlina acaulis,*** *Cirsium pannonicum,* ***Cruciata glabra, Dactylis glomerata,*** *Dianthus carthusianorum, Knautia kitaibelii, Leontodon hispidus, Lotus corniculatus, Plantago media, Primula veris,* ***Salvia pratensis,*** *Tragopogon orientalis,* ***Trifolium montanum,*** *Trisetum flavescens, Trommsdorfia maculata.*

Dominant species: *Brachypodium pinnatum, Bromus erectus, Carex montana.*

This community occurs at lower to middle altitudes from 400 to 800 m a.s.l. on gentle as well as steeper slopes (up to 40°). Its distribution is concentrated in the surroundings of the

villages Riečka, Tajov, Jakub and Uľanka, but there is also one isolated locality nearby Podkonice, where this community covers a large deforested mountain ridge at altitudes between 800 and 950 m a.s.l. (Fig. 5C). There is no clear preference to a specific bedrock type: The association develops on calcareous bedrock as well as on claystones and quaternary sediments. Most localities are former meadows, several of which have been mown regularly up to recent times. The stands are usually closed (the cover of the herb layer reaching 90–100%) and rather high (up to 120 cm). The moss layer is well developed with coverages up to 90%, with the species *Thuidium abietinum*, *Rhytidiadelphus squarrosus* and *R. triquetrus* being the most frequent. The stands are extremely species-rich; the number of vascular plant species per 16–25 m^2 commonly exceeds 70. In spite of the fact that this association has its distribution centre in the Biele/Bílé Karpaty Mts. (ŠKODOVÁ 2007a), central Slovakian localities belong to important biodiversity hotspots (HOBOHM 2005) and require strict and effective conservation (JANIŠOVÁ & UHLIAROVÁ 2008).

Association *Onobrychido viciifoliae-Brometum erecti*

Number of relevés: 46 (38 matched by the definition)
Table 1: 7, Table 2, relevés 95–140, Fig. 5C (black triangles).

Diagnostic species: *Agrimonia eupatoria, Brachypodium pinnatum, Bromus erectus, Carex michelii, Dianthus carthusianorum, Festuca rupicola, Knautia kitaibelii,* ***Medicago falcata,*** *Onobrychis viciifolia, Pimpinella saxifraga, Polygala major, Primula veris, Pseudolysimachion orchideum, Salvia pratensis, Salvia verticillata, Sanguisorba minor, Securigera varia, Trifolium montanum, Viola hirta.*

Constant species: *Achillea millefolium* agg., *Arrhenatherum elatius,* ***Bromus erectus,*** *Dactylis glomerata,* ***Dianthus carthusianorum,*** *Festuca rupicola, Knautia kitaibelii,* ***Lotus corniculatus,*** *Medicago falcata, Pimpinella saxifraga, Plantago media,* ***Salvia pratensis,*** *Sanguisorba minor, Trifolium montanum.*

Dominant species: ***Bromus erectus***.

These semi-dry grasslands are distributed at altitudes ranging from 400 to 900 m a.s.l., inhabiting gentle to steep slopes (up to 45°) mainly in orchards or nearby human settlements (Fig. 5C). The herb layer typically covers 70–90% and is thus lower than in the former association. Most localities occur on carbonates, but occasionally the association develops on other bedrock, except andesites, where it is completely missing. If mown at least occasionally, the stands remain very species-rich (60–70 species per 16–25 m^2), otherwise their diversity gradually declines. Abandonment is initially indicated by an increasing dominance of *Bromus erectus* and the loss of rare accessory species. In the later successional stages, *Bromus erectus* becomes mono-dominant, and woody species (mainly *Rosa canina* agg., *Acer pseudoplatanus* and *Carpinus betulus*) encroach the sites. This association represents the transition to mesophilous grasslands of the *Arrhenatherion elatius*, as numerous mesophilous species are constant here, e.g. *Arrhenaterum elatius*, *Dactylis glomerata*, *Trifolium pratense*, *Trisetum flavescens* (cf. Fig. 4). This association is widely distributed in Slovakia and Central Europe (ŠKODOVÁ 2007a).

Class *Molinio-Arrhenatheretea* (Table 1: 8–14, Table 3, Figs. 2, 10, 11, 12 and 13A)

Alliance *Cynosurion cristati*

Association *Lolio perennis-Cynosuretum cristati*

Number of relevés: 9 (4 matched by the definition)
Table 1: 8, Table 3, relevés 1–9, Fig. 12A (black triangles).

Diagnostic species: ***Bellis perennis, Cynosurus cristatus, Lolium perenne, Plantago major, Potentilla anserina, Trifolium dubium.***

Constant species: *Agrostis capillaris,* ***Achillea millefolium*** **agg.**, *Alchemilla* spec. div., ***Cynosurus cristatus, Festuca pratensis, Festuca rubra, Plantago lanceolata, Plantago media,*** *Ranunculus acris, Ranunculus bulbosus,* ***Taraxacum*** **sect.** ***Ruderalia, Trifolium pratense, Trifolium repens,*** *Trisetum flavescens.*

Dominant species: *Cynosurus cristatus, Festuca pratensis, Taraxacum* sect. *Ruderalia, Trifolium pratense, Trifolium repens.*

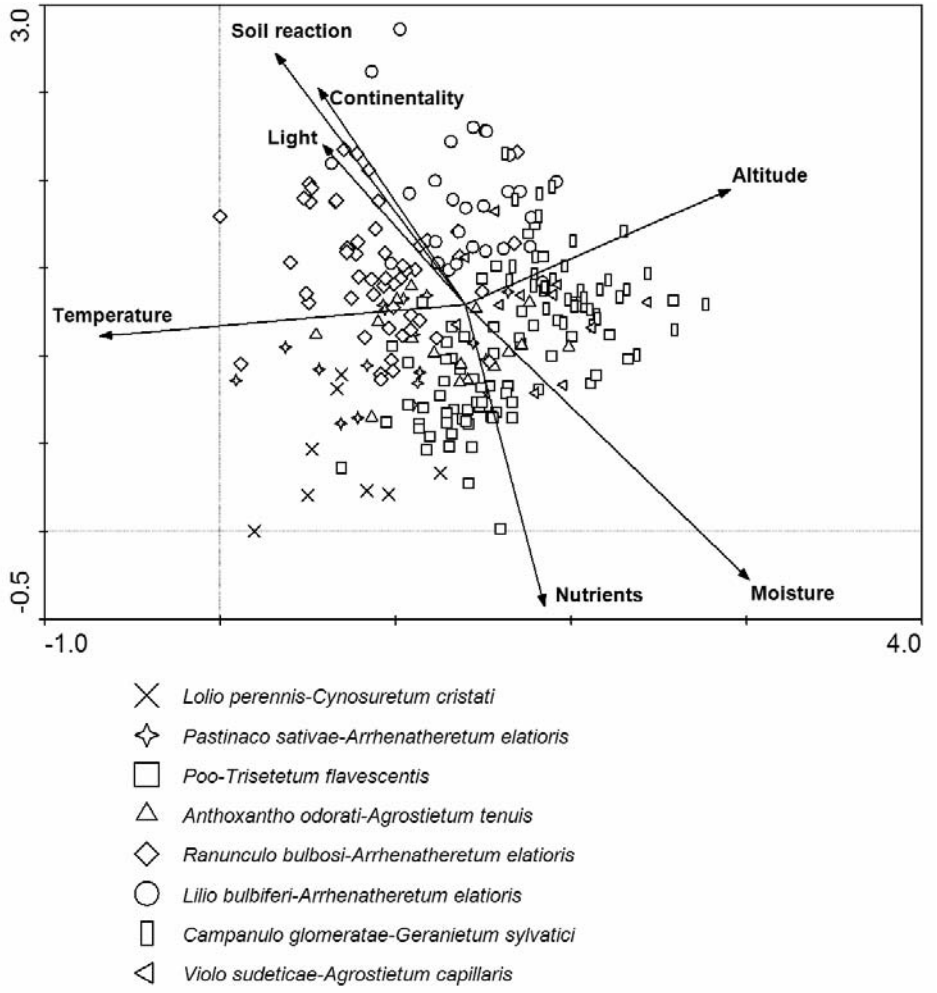


Fig. 10: Detrended correspondence analysis (DCA) of mesophilous grasslands belonging to the classes *Molinio-Arrhenatheretea* (excl. *Molinietalia*) and *Nardetea strictae*, based on square-root transformed species data of the herb layer. Supplementary environmental variables represent unweighted average Ellenberg indicator values and altitude.

Abb. 10: Trendbereinigte Korrespondenzanalyse (DCA) des mesophilen Grünlands der Klassen *Molinio-Arrhenatheretea* (ohne *Molinietalia*) und *Nardetea strictae*, basierend auf den Quadratwurzel transformierten Deckungsgraden der Krautschicht. Die zusätzlichen Umweltvariablen sind ungewichtete mittlere Ellenberg-Zeigerwerte sowie Höhenlage.

In the study region, this association belongs to the less frequent communities occurring in alluvia of smaller streams (Revúca) and in cooler and wetter sites, mainly at altitudes between 600–700 m a.s.l., occasionally also lower (380 m a.s.l., see Fig. 12A). The association inhabits plains or gentle slopes facing to N, NE and NW, independent of the bedrock type. The soils are moist, and the stands moderately species-rich. Grazing by sheep and cattle results in a disturbance of the sites followed by invasions of pasture weeds such as *Cirsium arvense*, *C. eriophorum*, *Tithymalus cyparissias* and *Elytrigia repens*. The moss layer is usually poorly developed with a cover of 20–40%. Within Slovakia, the community is widely distributed (JANIŠOVÁ 2007).

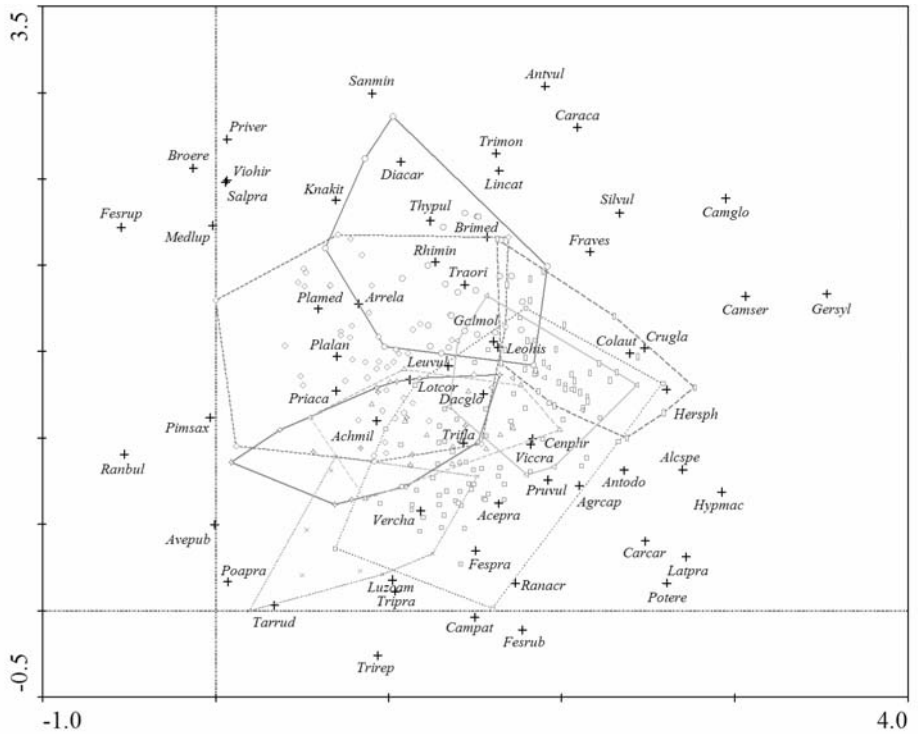


Fig. 11: Detrended correspondence analysis (DCA) of mesophilous grasslands belonging to the classes *Molinio-Arrhenatheretea* (excl. *Molinietalia*) and *Nardetea strictae*. Envelopes are drawn around relevés belonging to individual associations (see Fig. 10 for explanation of the symbols). 60 species with weight over 20 are shown, the abbreviations are as follows: *Acepra – Acetosa pratensis, Agrcap – Agrostis capillaris, Achmil – Achillea millefolium, Alcspe – Alchemilla* spec. div., *Antodo – Anthoxanthum odoratum, Antvul – Anthyllis vulneraria, Arrela – Arrhenatherum elatius, Avepub – Avenula pubescens, Brimed – Briza media, Broere – Bromus erectus, Camglo – Campanula glomerata, Campat – Campanula patula, Camser – Campanula serrata, Caraca – Carlina acaulis, Carcar – Carum carvi, Cenphr – Jacea phrygia* agg., *Colaut – Colchicum autumnale, Crugla – Cruciata glabra, Dacglo – Dactylis glomerata, Diacar – Dianthus carthusianorum, Fespra – Festuca pratensis, Fesrub – Festuca rubra, Fesrup – Festuca rupicola, Fraves – Fragaria vesca, Galmol – Galium mollugo* agg., *Gersyl – Geranium sylvaticum, Hersph – Heracleum sphondylium, Hypmac – Hypericum maculatum, Knakit – Knautia kitaibelii, Latpra – Lathyrus pratensis, Leohis – Leontodon hispidus, Leuvul – Leucanthemum vulgare, Lincat – Linum catharticum, Lotcor – Lotus corniculatus, Luzcam – Luzula campestris* agg., *Medlup – Medicago lupulina, Pimsax – Pimpinella saxifraga, Plalan – Plantago lanceolata, Plamed – Plantago media, Poapra – Poa pratensis* agg., *Potere – Potentilla erecta, Priaca – Primula acaulis, Priver – Primula veris, Pruvul – Prunella vulgaris, Ranacr – Ranunculus acris, Ranbul – Ranunculus bulbosus, Rhimin – Rhinanthus minor, Salpra – Salvia pratensis, Sanmin – Sanguisorba minor, Silvul – Silene vulgaris, Tarrud – Taraxacum* sect. *Ruderalia, Thypul – Thymus pulegioides, Traori – Tragopogon orientale, Trifla – Trisetum flavescens, Trimon – Trifolium montanum, Tripra – Trifolium pratense, Trirep – Trifolium repens, Vercha – Veronica chamaedrys, Viccra – Vicia cracca, Viohir – Viola hirta.*

Abb. 11: Trendbereinigte Korrespondenzanalyse (DCA) des mesophilen Grünlandes der Klassen *Molinio-Arrhenatheretea* (ohne *Molinietalia*) und *Nardetea strictae*. Die eingezeichneten Gruppen zeigen die Zugehörigkeit der Aufnahmen zu den einzelnen Assoziationen (Erläuterung der Symbole s. Abb. 2). 60 Arten mit Artwerten über 20 sind dargestellt, für die Erklärung der Abkürzungen vgl. englische Abbildungsunterschrift.

Alliance *Arrhenatherion elatioris*

Number of relevés: 183.

Diagnostic species: *Anthriscus sylvestris*, *Arrhenatherum elatius*, *Avenula pubescens*, *Campanula patula*, *Jacea phrygia* agg., *Cruciata glabra*, *Dactylis glomerata*, *Daucus carota*, *Galium mollugo* agg., *Leontodon hispidus*, *Leucanthemum vulgare*, *Lotus corniculatus*, *Plantago lanceolata*, *Primula acaulis*, *Taraxacum* sect. *Ruderalia*, *Tragopogon orientalis*, *Trifolium pratense*, *Trifolium repens*, *Trisetum flavescens*, *Vicia cracca*.

Constant species: *Acetosa pratensis*, *Achillea millefolium* agg., *Arrhenatherum elatius*, *Cruciata glabra*, ***Dactylis glomerata***, *Festuca pratensis*, *Leontodon hispidus*, *Leucanthemum vulgare*, ***Lotus corniculatus***, *Plantago lanceolata*, *Poa pratensis* agg., *Taraxacum* sect. *Ruderalia*, *Trifolium pratense*, ***Trisetum flavescens***, *Veronica chamaedrys*.

Dominant species: *Festuca rubra*.

This alliance includes the most wide-spread types of mesophilous meadows in the region. All five associations distinguished within this alliance in the national survey (JANIŠOVÁ 2007) occur in the study region. Recently, the floristic composition of these mesophilous communities is gradually rebuilding due to decreasing utilisation intensity and re-establishment of numerous species sensitive to intensive utilisation. Moreover, keeping small livestock herds retreated, and the remote areas with the most diverse grassland vegetation remained abandoned.

Association *Pastinaco sativae-Arrhenatheretum elatioris*

Number of relevés: 17 (4 matched by the definition)

Table 1: 9, Table 3, relevés 10–26, Fig. 12B (black triangles).

Diagnostic species: ***Campanula rapunculoides***, *Poa pratensis* agg., *Taraxacum* sect. *Ruderalia*.

Constant species: *Achillea millefolium* agg., ***Arrhenatherum elatius***, ***Dactylis glomerata***, *Festuca pratensis*, *Lotus corniculatus*, *Plantago lanceolata*, ***Poa pratensis* agg.**, ***Taraxacum* sect. *Ruderalia***, *Tragopogon orientalis*, ***Trifolium pratense***, ***Trisetum flavescens***.

Dominant species: *Rhytidiadelphus squarrosus*, *Trifolium pratense*, *Trisetum flavescens*.

The meadows of this association grow at sites well supplied by both water and nutrients. Usually they occur at altitudes between 350 and 750 m a.s.l., but on steeper south-facing slopes they occasionally reach even higher altitudes (e.g. Donovaly 1025 m a.s.l., Fig. 12B). The bedrock usually consists of limestones, claystones or quaternary sediments. In the study region, this association occurs in orchards and gardens, sporadically also on fallows which are manured or fertilised. Diversity and physiognomy of the stands are strongly affected by both soil type and management. On steeper slopes over limestones, the species richness can reach 61 species per 16–25 m², including several rare species (*Lilium martagon*, *Ophioglossum vulgatum*). However, stands that have developed on former fields or recultivated grasslands are usually poorer in species. Sufficiency of water and nutrients in soil enables the occurrence of broad-leaved forbs such as *Heracleum sphondylium*, *Anthriscus sylvestris*, *Aegopodium podagraria*, *Crepis biennis* and *Colchicum autummnale*. In Slovakia, the community is widely distributed (JANIŠOVÁ 2007).

Association *Poo-Trisetetum flavescentis*

Number of relevés: 69 (22 matched by the definition)

Table 1: 10, Table 3, relevés 27–95, Fig. 12B (grey circles).

Diagnostic species: *Anthriscus sylvestris*, *Campanula patula*, *Carum carvi*, *Dactylis glomerata*, *Festuca rubra*, *Chaerophyllum aromaticum*, *Phyteuma spicatum*, *Taraxacum* sect. *Ruderalia*, *Trifolium pratense*, *Trifolium repens*, *Vicia cracca*, *Viola tricolor*.

Constant species: *Acetosa pratensis*, *Agrostis capillaris*, *Achillea millefolium* agg., *Alchemilla* spec. div., *Campanula patula*, *Jacea phrygia* agg., ***Cruciata glabra***, ***Dactylis glomerata***, *Festuca pratensis*, *Festuca rubra*, *Leontodon hispidus*, *Leucanthemum vulgare*, *Lotus corniculatus*, *Plantago lanceolata*, *Poa pratensis* agg., ***Ranunculus acris***, *Taraxacum* sect. *Ruderalia*, ***Trifolium pratense***, *Trifolium repens*, *Trisetum flavescens*, *Veronica chamaedrys*, *Vicia cracca*.

Dominant species: *Agrostis capillaris*, *Festuca rubra*.

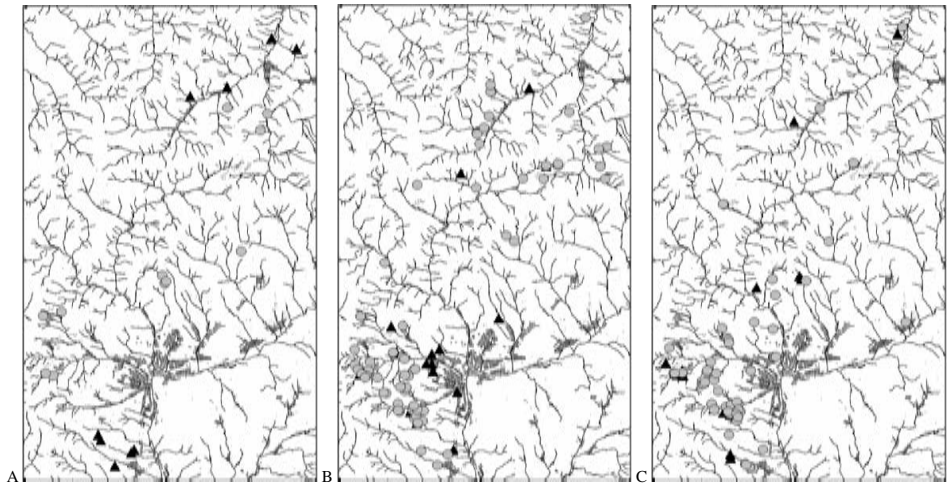


Fig. 12: Distribution of associations in the study area II: A) *Lolio perennis-Cynosuretum cristati* (black triangles) and *Violo sudeticae-Agrostietum capillaris* (grey circles); B) *Pastinaco sativae-Arrhenatheretum elatioris* (black triangles) and *Poo-Trisetetum flavescentis* (grey circles); C) Anthoxantho odorati-Agrostietum tenuis (black triangles) and *Ranunculo bulbosi-Arrhenatheretum elatioris* (grey circles).

Abb. 12: Verbreitung der Assoziationen im Untersuchungsgebiet II: A) *Lolio perennis-Cynosuretum cristati* (schwarze Dreiecke) and *Violo sudeticae-Agrostietum capillaris* (graue Kreise); B) *Pastinaco sativae-Arrhenatheretum elatioris* (schwarze Dreiecke) und *Poo-Trisetetum flavescentis* (graue Kreise); C) *Anthoxantho odorati-Agrostietum tenuis* (schwarze Dreiecke) und *Ranunculo bulbosi-Arrhenatheretum elatioris* (graue Kreise).

This association is the most frequent grassland type in the study region distributed mainly on moderately steep slopes (20°) at altitudes between 500 and 800 m a.s.l. (Fig. 12B). The prevailing geological bedrock types are andesites and quaternary sediments. The stands occur in the vicinity of settlements, in orchards, on alluvia or on slopes. In the past, they used to be mown once or twice a year and manured. Since recently, some localities are grazed. The stands are closed (coverage 75–100%) and moderately species-rich (20–43 species per 16–25 m^2), with well-developed moss layers covering up to 95%. Traditionally managed stands can host rare or endangered species, e.g. *Campanula serrata*, *Lilium bulbiferum* and *Aquilegia vulgaris*. In Slovakia, the community is widely distributed (JANIŠOVÁ 2007).

Association *Anthoxantho odorati-Agrostietum tenuis*

Number of relevés: 16 (13 matched by the definition)
Table 1: 11, Table 3, relevés 96–111, Fig. 12C (black triangles).

Diagnostic species: *Acetosa pratensis, Agrostis capillaris,* ***Anthoxanthum odoratum,*** *Avenula pubescens, Briza media,* ***Campanula patula,*** *Danthonia decumbens, Dianthus deltoides, Festuca rubra,* ***Hypochaeris radicata,*** *Leucanthemum vulgare, Luzula campestris* agg., ***Nardus stricta, Polygala vulgaris,*** *Thymus pulegioides, Trifolium repens,* ***Viola canina.***

Constant species: ***Acetosa pratensis, Agrostis capillaris,*** *Achillea millefolium* agg., *Alchemilla* spec. div., ***Anthoxanthum odoratum,*** *Avenula pubescens,* ***Briza media, Campanula patula, Jacea phrygia*** **agg.,** ***Cruciata glabra, Festuca rubra, Leontodon hispidus, Leucanthemum vulgare, Lotus corniculatus,*** *Luzula campestris* agg., *Pimpinella saxifraga,* ***Plantago lanceolata,*** *Polygala vulgaris,* ***Thymus pulegioides, Trifolium pratense, Trifolium repens,*** *Veronica chamaedrys,* ***Viola canina.***

Dominant species: *Agrostis capillaris, Festuca rubra.*

This association involves slightly managed pastures and grazed meadows on shallower and more acidic soils. In the study region, it grows on various bedrock types on slopes at altitudes between 438 and 925 m a.s.l. (Fig. 12C). The herb layer is usually closed, and the moss layer well developed. Moderately high grasses and lower herb species usually dominate the stands. This community belongs to the most species-rich ones with 33–68 species per 16–25 m^2. Several rare and endangered species occur here, e.g. *Campanula serrata* and *Ophioglossum vulgatum*. In Slovakia, the community is widely distributed (JANIŠOVÁ 2007).

Association *Ranunculo bulbosi-Arrhenatheretum elatioris*

Number of relevés: 52 (16 matched by the definition)
Table 1: 12, Table 3, relevés 112–163, Fig. 12C (grey circles)

Diagnostic species: *Arrhenatherum elatius, Avenula pubescens, Dactylis glomerata, Daucus carota, Dianthus carthusianorum, Festuca rupicola, Leucanthemum vulgare, Lotus corniculatus, Plantago lanceolata, Ranunculus bulbosus, Salvia pratensis, Thlaspi perfoliatum, Trisetum flavescens*.

Constant species: *Agrostis capillaris, Achillea millefolium* agg., ***Arrhenatherum elatius***, *Avenula pubescens, Briza media, Bromus erectus, Cruciata glabra,* ***Dactylis glomerata,*** *Dianthus carthusianorum, Festuca rupicola,* ***Leontodon hispidus, Leucanthemum vulgare, Lotus corniculatus,*** *Pimpinella saxifraga,* ***Plantago lanceolata,*** *Plantago media, Poa pratensis* agg., *Salvia pratensis, Tragopogon orientalis, Trifolium pratense,* ***Trisetum flavescens,*** *Veronica chamaedrys*.

Dominant species: –

These meadows are widely distributed in the study region except the area of the Nízke Tatry Mts. (Fig. 12C). They occur in old orchards, on dry fallows and slightly managed pastures at altitudes between 385 and 1000 m a.s.l., but the centre of their distribution is between 400 and 600 m a.s.l. The geological bedrock is usually built by limestones, dolomites and quaternary sediments. In the case of the latter bedrock type, the association is restricted to steeper slopes. The stands are frequently open with lower coverages of herb and moss layers than in the former communities of the *Arrhenatherion elatioris*. Most stands are very species-rich (commonly more than 60 species per 16–25 m^2). In Slovakia, the community is widely distributed (JANIŠOVÁ 2007).

Association *Lilio bulbiferi-Arrhenatheretum elatioris*

Number of relevés: 29 (24 matched by the definition)
Table 1: 13, Table 3, relevés 164–192, Fig. 13A (black triangles).

Diagnostic species: ***Anemone ranunculoides,*** *Aquilegia vulgaris, Arabis hirsuta, Arrhenatherum elatius, Campanula glomerata, Campanula serrata, Carduus glaucinus, Carlina acaulis, Dianthus carthusianorum, Fragaria vesca,* ***Gentiana cruciata, Lilium bulbiferum,*** *Medicago lupulina, Phyteuma orbiculare, Plantago lanceolata, Ranunculus nemorosus, Rhinanthus minor,* ***Rhinanthus serotinus,*** *Sanguisorba minor, Silene nutans, Silene vulgaris, Tragopogon orientalis, Trifolium montanum*.

Constant species: ***Achillea millefolium agg., Arrhenatherum elatius, Briza media,*** *Campanula glomerata,* ***Carlina acaulis,*** *Jacea phrygia* agg., *Colchicum autumnale,* ***Cruciata glabra, Dactylis glomerata, Dianthus carthusianorum,*** *Leontodon hispidus, Leucanthemum vulgare, Lilium bulbiferum,* ***Lotus corniculatus,*** *Medicago lupulina,* ***Plantago lanceolata, Plantago media,*** *Salvia pratensis,* ***Sanguisorba minor,*** *Thymus pulegioides,* ***Tragopogon orientalis, Trifolium montanum, Trisetum flavescens***.

Dominant species: *Arrhenatherum elatius, Trifolium pratense, Trisetum flavescens*.

This association has the centre of its overall distribution in the study region (Starohorské vrchy Mts., partly Kremnické vrchy Mts. and Veľká Fatra Mts., Fig. 13A). It occurs at higher altitudes (up to 1025 m a.s.l.) on moderately steep to steep slopes, mostly on limestones. It is very species-rich (commonly over 60 species per 16–25 m^2), hosting numerous rare and endangered species. It is distributed in the vicinity of settlements, but also in the valleys, in the mountain saddles and in steeper mountain ridges.

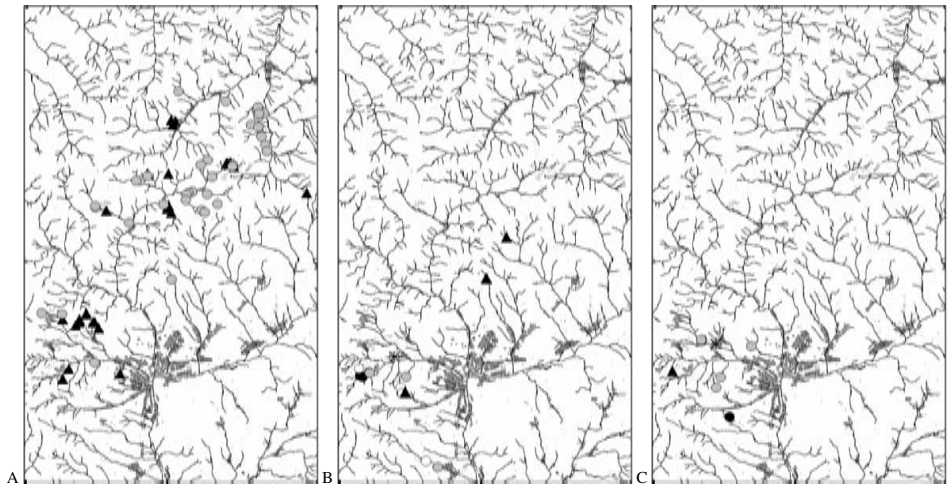


Fig. 13: Distribution of associations in the study area III: A) *Lilio bulbiferi-Arrhenatheretum elatioris* (black triangles) and *Campanulo glomeratae-Geranietum sylvatici* (grey circles); B) wet meadows of the *Cirsietum rivularis* (black circles), *Scirpetum sylvatici* (grey circles), *Filipendulo ulmariae-Menthetum longifoliae* (white circles) and transitional stands between wet and fen meadows (black triangles and asterisk); C) *Typhetum longifoliae* (black triangle), *Glycerietum nemoralis-plicatae* (asterisk), *Poo trivialis-Alopecuretum pratensis* (black circle) and fen meadows of the *Caricion davallianae* (grey circles).

Abb. 13: Verbreitung der Assoziationen im Untersuchungsgebiet III: A) *Lilio bulbiferi-Arrhenatheretum elatioris* (schwarze Dreiecke) und *Campanulo glomeratae-Geranietum sylvatici* (graue Kreise); B) Feuchtwiesen des *Cirsietum rivularis* (schwarze Kreise), *Scirpetum sylvatici* (graue Kreise), *Filipendulo ulmariae-Menthetum longifoliae* (weisse Kreise) und Übergangs-Bestände von Feuchtwiesen und Niedermooren (schwarze Dreiecke und Stern); C) *Typhetum longifoliae* (schwarzes Dreieck), *Glycerietum nemoralis-plicatae* (Stern), *Poo trivialis-Alopecuretum pratensis* (schwarzer Kreis) und Kalksümpfe des *Caricion davallianae* (graue Kreise).

Alliance *Polygono bistortae-Trisetion flavescentis*

Association *Campanulo glomeratae-Geranietum sylvatici*

Number of relevés: 36 (15 matched by the definition)
Table 1: 14, Table 3, relevés 193–228, Fig. 13A (grey circles), Fig. 14.

Diagnostic species: ***Campanula glomerata, Campanula serrata, Cirsium erisithales***, *Colchicum autumnale, Crepis biennis,* ***Crepis mollis, Crocus discolor,*** *Cruciata glabra, Dactylis glomerata, Galium mollugo* agg., ***Geranium sylvaticum,*** *Heracleum sphondylium, Hypericum maculatum, Jacea phrygia* agg., *Knautia arvensis, Knautia maxima, Leontodon hispidus, Lilium bulbiferum, Luzula luzuloides, Phleum hirsutum, Phyteuma spicatum,* ***Pimpinella major, Polygala vulgaris, Primula elatior, Pyrethrum clusii,*** *Ranunculus polyanthemos, Silene dioica,* ***Silene vulgaris,*** *Stellaria graminea, Tragopogon orientalis, Trisetum flavescens, Vicia cracca, Vicia sepium.*

Constant species: *Acetosa pratensis, Agrostis capillaris,* ***Achillea millefolium*** **agg.,** *Alchemilla* spec. div., *Briza media,* ***Campanula glomerata, Campanula serrata,*** *Carlina acaulis, Jacea phrygia* agg., ***Colchicum autumnale, Cruciata glabra, Dactylis glomerata,*** *Festuca pratensis, Geranium sylvaticum,* ***Leontodon hispidus,*** *Leucanthemum vulgare, Pimpinella major, Primula elatior, Silene vulgaris,* ***Tragopogon orientalis,*** *Trifolium pratense,* ***Trisetum flavescens,*** *Vicia cracca.*

Dominant species: ***Agrostis capillaris,*** *Alchemilla* spec. div., *Cruciata glabra, Geranium sylvaticum, Trisetum flavescens.*

These montane meadows belong to the most specific associations in the study region. They grow in contact to the last-mentioned association *Lilio bulbiferi-Arrhenatheretum elatioris*, but are restricted to the cooler and wetter microhabitats (valleys in the vicinity of forests or mountain ridges). They inhabit steep slopes at altitudes up to 1225 m a.s.l., mostly

Fig. 14: The thriving stand of the *Campanulo glomeratae-Geranietum sylvatici* in the Bukovská dolina Valley, Starohorské vrchy Mts. with the typical species *Lilium bulbiferum*, *Cirsium erisithales*, *Hypericum maculatum*, *Arrhenatherum elatius*, *Silene vulgaris*, etc. (Photo: K. Hegedüšová, 18 July 2007).

Abb. 14: Der gut entwickelte Bestand des *Campanulo glomeratae-Geranietum sylvatici* im Tal von Bukovská dolina , Starohorské vrchy Berge, mit den typischen Arten *Lilium bulbiferum*, *Cirsium erisithales*, *Hypericum maculatum*, *Arrhenatherum elatius*, *Silene vulgaris*, etc. (Foto: K. Hegedüšová, 18. Juli 2007).

over limestones and quarzites. They are especially species-rich (32–79 species per 16–25 m^2), mainly if managed in traditional manner up to these days. Due to the occurrence of numerous rare and endangered species (*Aquilegia vulgaris*, *Campanula serrata*, *Crocus discolor*, *Lilium bulbiferum*), they need strict conservation. Most localities occur within the Veľká Fatra Mts. and Starohorské vrchy Mts. (Fig. 13A).

Class *Nardetea strictae* (Table 1: 15, Table 3, Figs. 2, 10, 11 and 12A)

Alliance *Nardo strictae-Agrostion tenuis*

Association *Violo sudeticae-Agrostietum capillaris*

Number of relevés: 11 (1 matched by the definition)
Table 1: 15, Table 3, relevés 229–239, Fig. 12A (grey circles).

Diagnostic species: ***Campanula serrata, Hypericum maculatum, Luzula luzuloides, Phleum hirsutum, Potentilla aurea, Ranunculus polyanthemos, Ranunculus pseudomontanus, Veronica officinalis***.

Constant species: *Agrostis capillaris*, ***Achillea millefolium* agg.**, *Alchemilla* spec. div., *Anthoxanthum odoratum*, ***Briza media*, *Campanula serrata*, *Carlina acaulis*, *Cruciata glabra***, *Dactylis glomerata*, *Dianthus carthusianorum*, *Festuca rubra*, ***Hypericum maculatum***, *Leontodon hispidus*, *Leucanthemum vulgare*, ***Lotus corniculatus***, *Luzula luzuloides*, *Plantago lanceolata*, *Ranunculus acris*, *Ranunculus polyanthemos*, *Thymus pulegioides*, *Veronica chamaedrys*, *Veronica officinalis*.

Dominant species: *Festuca rubra*.

This community is distributed mainly at higher altitudes, while at lower altitudes it is restricted to cooler microhabitats on north-, west- or east-facing slopes. In the study region, it occurs at the lower altitudinal limit of its overall distribution (UJHÁZY & KLIMENT 2007), and thus the stands are not typically developed. It grows on limestones and quaternary sediments. The stands are closed, with well-developed moss layers, and moderately to very species-rich. Most localities occur in the Starohorské vrchy Mts. and Veľká Fatra Mts. (Fig. 12A), where they inhabit slopes and the upper parts of the higher mountains including the downhill courses.

3.2.2. Wetland communities

(Table 1: 16–23, Table 4, Figs. 2, 13B, 13C, 15 and 16)

Class *Molinio-Arrhenatheretea*

Alliance *Deschampsion cespitosae*

Association *Poo trivialis-Alopecuretum pratensis*

Number of relevés: 1

Table 1: 18, Table 4, relevé 3, Fig. 13C (black circle).

In the study region, the alluvial plains were mostly transformed into arable land, and thus the alluvial meadows became very rare. In our data set, they are represented by a single relevé recorded near the village Pršany in the Kremnické vrchy Mts. (Fig. 13C). The stand was dominated by *Alopecurus pratensis* with high cover of *Poa pratensis* agg., *Dactylis glomerata* and *Ranunculus acris*. This type of meadow is rather species-poor, but highly productive. In Slovakia, it is common in regularly flooded nutrient-rich sites (HÁJKOVÁ 2007b).

Alliance *Calthion palustris*

Number of relevés: 21.

Diagnostic species: ***Caltha palustris***, *Carex echinata*, *Carex flava*, ***Carex hirta*, *Carex nigra*, *Carex ovalis***, *Carex panicea*, *Carex paniculata*, ***Cirsium rivulare*, *Crepis paludosa***, *Dactylorhiza majalis*, ***Equisetum arvense*, *Ficaria bulbifera*, *Filipendula ulmaria***, *Galium aparine*, *Galium palustre*, *Galium rivale*, ***Juncus effusus*, *Lathyrus pratensis*, *Lychnis flos-cuculi*, *Lysimachia nummularia*, *Mentha longifolia*, *Myosotis scorpioides* agg.**, ***Poa trivialis***, *Ranunculus repens*, *Rumex obtusifolius*, *Scirpus sylvaticus*, ***Urtica dioica***.

Constant species: *Festuca pratensis*, ***Lathyrus pratensis***, *Lysimachia nummularia*, ***Myosotis scorpioides* agg.**, *Ranunculus acris*.

Dominant species: *Carex paniculata*, *Filipendula ulmaria*, *Mentha longifolia*, *Scirpus sylvaticus*.

This alliance comprises the majority of the wetland stands in the study region. Although they usually contain a basic set of diagnostic species of the alliance (*Caltha palustris*, *Cirsium rivulare*, *Crepis paludosa*, *Equisetum palustre*, *Lathyrus pratensis*, *Mentha longifolia*, *Myosotis scorpioides* agg., *Poa trivialis*, *Ranunculus repens*, *Scirpus sylvaticus*, etc., Fig. 16), the other species present indicate the transition to other wetland syntaxa. A large group of relevés represents a transition to fen meadows of the *Caricion davallianae* alliance. The stands of the *Calthion palustris* inhabit mostly non-calcareous habitats with a higher content of nutrients (Fig. 15).

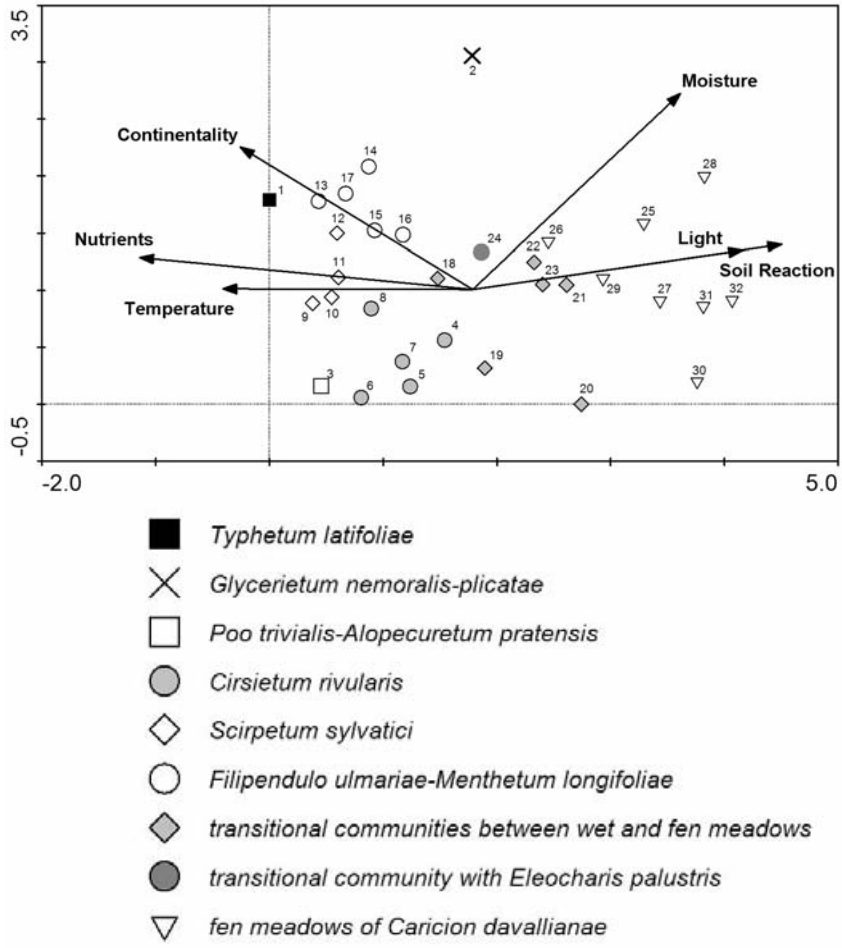


Fig. 15: Detrended correspondence analysis (DCA) of wetland communities (*Molinio-Arrhenatheretea*: *Molinietalia*, *Scheuchzerio-Caricetea*, *Phragmito-Magnocaricetea*), based on square-root transformed species data of the herb layer. Arrows represent the post-hoc correlated non-weighted averages of Ellenberg indicator values calculated for relevés. The first axis (eigenvalue 0.571) correlates mostly with nutrients (r = –0.90), the second axis (eigenvalue 0.345) correlates mostly with moisture (r = 0.69). Relevé numbers follow Table 4.

Abb. 15: Trendbereinigte Korrespondenzanalyse (DCA) der Feuchtwiesen-Gesellschaften (*Molinio-Arrhenatheretea*: *Molinietalia*, *Scheuchzerio-Caricetea*, *Phragmito-Magnocaricetea*) basierend auf den quadratwurzel-transformierten Deckungsgraden der Krautschicht. Die Pfeile stellen die post-hoc Korrelation der pro Aufnahme berechneten, nicht gewichteten Mittelwerte der Ellenberg Zeigerwerte dar. Die erste Ordinationsachse (Eigenwert 0.571) korreliert am stärksten mit der Nährstoff-Zahl (r = –0.90), die zweite Achse (Eigenwert 0.345) korreliert am stärksten mit der Feuchte-Zahl (r = 0.69). Die Aufnahmenummern entsprechen denen der Tabelle 4.

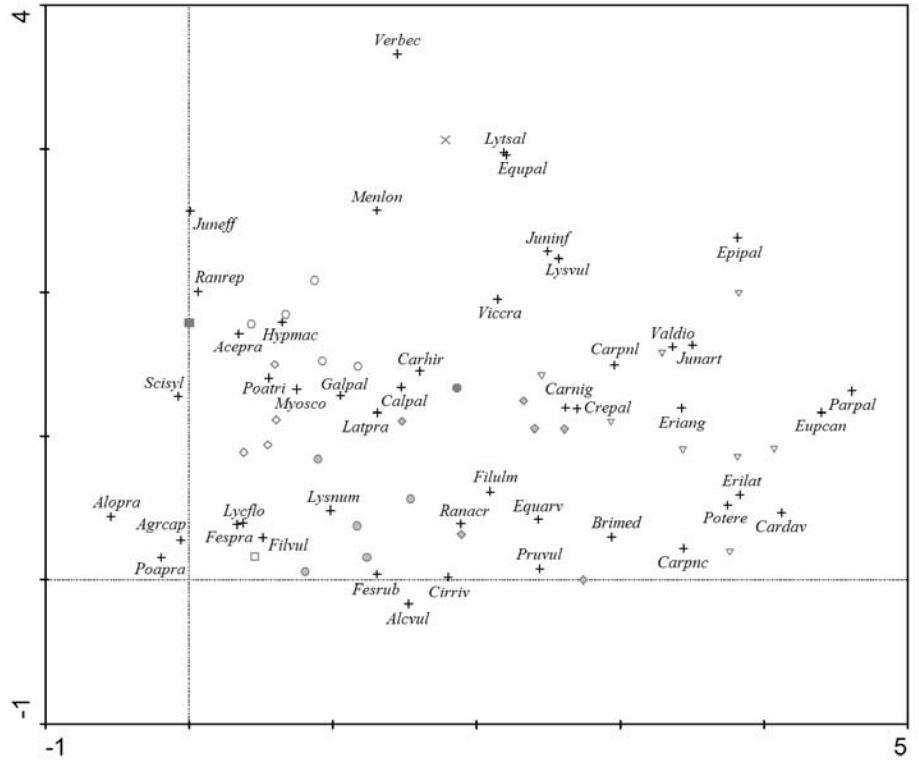


Fig. 16: Detrended correspondence analysis (DCA) of wetland communities (*Molinio-Arrhenatheretea*: *Molinietalia*, *Scheuchzerio-Caricetea*, *Phragmito-Magnocaricetea*). Fifty species with the highest weight (over 19) and relevé position are shown. Species abbreviations: *Acepra – Acetosa pratensis*, *Agrcap – Agrostis capillaris*, *Alcvul – Alchemilla* spec. div., *Alopra – Alopecurus pratensis*, *Brimed – Briza media*, *Calpal – Caltha palustris*, *Cardav – Carex davalliana*, *Carhir – Carex hirta*, *Carpnc – Carex panicea*, *Carpnl – Carex paniculata*, *Cirriv – Cirsium rivulare*, *Crepal – Crepis paludosa*, *Epipal – Epipactis palustris*, *Equarv – Equisetum arvense*, *Equpal – Equisetum palustre*, *Eriang – Eriophorum angustifolium*, *Erilat – Eriophorum latifolium*, *Eupcan – Eupatorium cannabinum*, *Fespra – Festuca pratensis*, *Fesrub – Festuca rubra*, *Filulm – Filipendula ulmaria*, *Filvul – Filipendula vulgaris*, *Galpal – Galium palustre*, *Hypmac – Hypericum maculatum*, *Junart – Juncus articulatus*, *Juneff – Juncus effusus*, *Juninf – Juncus inflexus*, *Latpra – Lathyrus pratensis*, *Lycflo – Lychnis flos-cuculi*, *Lysnum – Lysimachia nummularia*, *Lysvul – Lysimachia vulgaris*, *Lytsal – Lythrum salicaria*, *Menlon – Mentha longifolia*, *Myosco – Myosotis scorpioides* agg., *Parpal – Parnassia palustris*, *Poapra – Poa pratensis* agg., *Poatri – Poa trivialis*, *Potere – Potentilla erecta*, *Pruvul – Prunella vulgaris*, *Ranacr – Ranunculus acris*, *Ranrep – Ranunculus repens*, *Scisyl – Scirpus sylvaticus*, *Valdio – Valeriana dioica*, *Verbec – Veronica beccabunga*, *Viccra – Vicia cracca*. For explanation of relevé symbols, see Fig. 15.

Abb. 16: Trendbereinigte Korrespondenzanalyse (DCA) der Feuchtwiesen-Gesellschaften (*Molinio-Arrhenatheretea*: *Molinietalia*, *Scheuchzerio-Caricetea*, *Phragmito-Magnocaricetea*). 50 Arten mit den höchsten Artwerten (über 19) sind dargestellt, für die Erklärung der Abkürzungen vgl. englische Abbildungsunterschrift.

Association *Cirsietum rivularis*

Number of relevés: 5
Table 1: 19, Table 4, relevés 4–8, Fig. 13B (black circles).

This community comprises wet meadows dominated by *Cirsium rivulare*, *Scirpus sylvaticus*, *Festuca pratensis* or *Festuca rubra*. In the study region, it is atypically entered by *Carex echinata*, which can also reach a high cover value. The species composition of these meadows is rather heterogeneous; their common attributes are their topography (terrain depressions) and regular management by mowing, which is reflected by high constancy of species of moist meadows (*Agrostis capillaris*, *Anthoxanthum odoratum*, *Cruciata glabra*, *Lathyrus pratensis*, *Lychnis flos-cuculi*, *Lysimachia nummularia*, *Prunella vulgaris*, *Ranunculus acris*, *Ranunculus auricomus*, etc). The association is best documented from the orchards in the village Králiky in the Kremnické vrchy Mts. (Fig. 13B) at altitudes between 715–770 m a.s.l. on claystones or limestones.

Association *Scirpetum sylvatici*

Number of relevés: 4
Table 1: 20, Table 4, relevés 9–12, Fig. 13B (grey circles).

This community comprises wet meadows with strong dominance of *Scirpus sylvaticus*. *Lysimachia nummularia* and *Myosotis scorpioides* agg. are constantly present, and other species of the *Calthion palustris* are frequent, e.g. *Galium palustre*, *Juncus effusus*, *Lathyrus pratensis*, *Poa trivialis* and *Ranunculus repens*. This community occurs at lower altitudes (465–715 m a.s.l.) mostly over quaternary sediments in Kremnické vrchy Mts. in the close vicinity of villages (Fig. 13B). Formerly, the stands were utilised as meadows.

Association *Filipendulo ulmariae-Menthetum longifoliae*

Number of relevés: 5
Table 1: 21, Table 4, relevés 13–17, Fig. 13B (white circles).

This is a tall-herb community dominated by *Mentha longifolia* and *Juncus effusus*. The presence of other wetland and nitrophilous species, such as *Caltha palustris*, *Cirsium arvense*, *Juncus conglomeratus*, *Lycopus europaeus*, *Lythrum salicaria*, *Myosotis scorpioides* agg., *Ranunculus repens*, *Rumex crispus* and *Urtica dioica* is typical. In the study region, this association occupies wet terrain depressions over andesites and quaternary sediments in the Kremnické vrchy Mts. at altitudes of 490–765 m a.s.l. (Fig. 13B).

***Calthion palustris* – transitional stands between wet and fen meadows**

Number of relevés: 7
Table 1: 22, Table 4, relevés 18–24, Fig. 13B (black triangles and asterisk).

Into this group, we include relevés classified to the *Calthion palustris* (based on the presence of numerous diagnostic species of this alliance), which also have transitional features of other wetland communities mostly of the *Caricion davallianae* alliance. Along with *Cirsium rivulare* and *Filipendula ulmaria*, *Carex paniculata* frequently dominates. Some other species are very frequent in the stands, e.g. *Crepis paludosa*, *Equisetum arvense*, *Lathyrus pratensis*, *Mentha longifolia*, *Myosotis scorpioides* agg., *Potentilla erecta* and *Valeriana dioica*. This transitional vegetation occurs at middle altitudes of the Starohorské vrchy Mts. (Fig. 13B), exclusively over quaternary sediments in regions with heterogeneous geological structure.

Class *Scheuchzerio-Caricetea fuscae*

Alliance *Caricion davallianae*

Number of relevés: 8
Table 1: 23, Table 4, relevés 25–32, Fig. 13C (grey circles).

Diagnostic species: ***Agrostis canina, Bryum pseudotriquetrum, Calamagrostis varia, Campylium stellatum, Carex acuta, Carex davalliana, Carex hostiana, Carex lepidocarpa, Carex nigra, Carex panicea,***

***Cirsium rivulare*, *Crepis paludosa*, *Dactylorhiza majalis*, *Drepanocladus revolvens* agg., *Epipactis palustris*, *Equisetum arvense*, *Equisetum palustre*, *Equisetum telmateia*, *Eriophorum angustifolium*, *Eriophorum latifolium*, *Eupatorium cannabinum*, *Fissidens adianthoides*, *Gymnadenia densiflora*, *Homalothecium nitens*, *Juncus articulatus*, *Juncus inflexus*, *Lysimachia vulgaris*, *Lythrum salicaria*, *Mentha aquatica*, *Parnassia palustris*, *Pinguicula vulgaris*, *Plagiomnium elatum*, *Potentilla erecta*, *Primula farinosa*, *Succisa pratensis*, *Triglochin palustre*, *Tussilago farfara*, *Valeriana dioica*, *Viburnum opulus*.**

Constant species: *Briza media, Bryum pseudotriquetrum,* ***Carex davalliana*, *Carex panicea*,** *Crepis paludosa, Equisetum palustre, Eriophorum latifolium,* ***Eupatorium cannabinum*,** *Juncus articulatus, Lythrum salicaria,* ***Parnassia palustris*, *Potentilla erecta*,** *Ranunculus acris,* ***Valeriana dioica.***

Dominant species: *Campylium stellatum, Carex davalliana, Carex panicea, Carex paniculata, Cratoneuron commutatum, Drepanocladus revolvens* agg., *Eleocharis quinqueflora, Potentilla erecta.*

The stands belonging to this alliance are distributed mostly in the Starohorské vrchy Mts. on calcareous bedrock (Fig. 13C). Contrary to the communities of *Calthion palustris*, they occupy base-rich habitats, which are poorer in nutrients (Fig. 15). Numerous transitions to other wetland communities can be found in the study region. Due to the small number of relevés, we did not distinguish separate associations. The relevés can be classified within two associations. Typically developed fen meadows of the *Caricetum davallianae* are richer in species and typically include rare fen species such as *Primula farinosa*, *Epipactis palustris* and *Pinguicula vulgaris*. In Slovakia, this association belongs to rare and endangered communities developed mainly on calcareous bedrock and maintained to recent times only in fragments. Species-poorer stands with frequent occurrence of *Carex flacca*, *C. lepidocarpa*, *Juncus inflexus*, *Eupatorium cannabinum* and *Tussilago farfara* can be classified within the *Carici flavae-Cratoneuretum filicini*. They are often influenced by spring water as indicated by higher coverages of *Cratoneuron commutatum*. These communities are rather common on slope springs saturated by mineral water in most calcareous mountains of Slovakia (HÁJEK & HÁBEROVÁ 2001).

Class *Phragmito-Magnocaricetea*

Alliance *Phragmition communis*

Association *Typhetum latifoliae*

Number of relevés: 1
Table 1: 16, Table 4, relevé 1, Fig. 13C (black triangle).

This association occurs only rarely in the study region, and in our data set it is represented by only one relevé (Fig. 13C). The mono-dominant stand of *Typha latifolia* with subdominants *Equisetum fluviatile* and *Scirpus sylvaticus* was found near the village Králiky at 785 m a.s.l. (Fig. 13C).

Alliance *Glycerio-Sparganion*

Association *Glycerietum nemoralis-plicatae*

Number of relevés: 1
Table 1: 17, Table 4, relevé 2, Fig. 13C (asterisk).

This community is rare in the study region (Fig. 13C). It is dominated by *Equisetum palustre*, with the highly abundant *Veronica beccabunga* indicating spring water. The only stand was found near the village Riečka at an altitude of 550 m a.s.l. The community is sporadically distributed in the whole area of Slovakia, however, its syntaxonomical characteristics are not well-known yet (OŤAHELOVÁ et al. 2001).

3.3. Comparison of regional and national delimitation of syntaxa

The delimitation of associations was evaluated according to their diagnostic species. Diagnostic species determined from the regional data were compared to diagnostic species derived at the national level from the data including all vegetation units in Slovakia. Three categories of diagnostic species were recognised: those diagnostic only at the regional level,

those common for the region and the whole Slovakia and those diagnostic only at the national level (Appendix D).

The following associations had the highest numbers of regional diagnostic species: *Campanulo glomeratae-Geranietum sylvatici* (33), *Carici albae-Brometum monocladi* (30), *Scabioso ochroleucae-Brachypodietum pinnati* (24) and *Lilio bulbiferi-Arrhenatheretum elatioris* (24). At the national level, the following associations had the highest numbers of diagnostic species: *Carici albae-Brometum monocladi* (35), *Campanulo glomeratae-Geranietum sylvatici* (26), *Lilio bulbiferi-Arrhenatheretum elatioris* (24), *Orthantho luteae-Caricetum humilis* (24) and *Brachypodio pinnati-Molinietum arundinaceae* (24). It is obvious that the specific regional associations (having the distribution centres in the study area) had the leading position in number of diagnostic species with high fidelity at both regional and national levels and belong to the floristically best delimited syntaxa. On the other hand, the *Lolio perennis-Cynosuretum cristati* and *Pastinaco sativae-Arrhenatheretum elatioris* were the worst delimited associations at both the regional (4 and 4, respectively) and the national levels (6 and 3, respectively). These communities belong to intensive grasslands utilised by grazing and/or mowing. Several associations that had small numbers of high fidelity species at the national level were rather rich in diagnostic species at the regional level, e.g. *Onobrychido viciifoliae-Brometum erecti* (6 vs. 18), *Poo-Trisetetum flavescentis* (2 vs. 12) and *Anthoxantho odorati-Agrostietum tenuis* (4 vs. 17).

If the number of common diagnostic species (confirmed at both regional and national level) was expressed as percentage of the whole number of regional diagnostic species, the following associations belonged to syntaxa with the highest compatibility of diagnostic species sets (Appendix D): *Carici albae-Brometum monocladi* (73%), *Brachypodio pinnati-Molinietum arundinaceae* (63%), *Violo sudeticae-Agrostietum capillaris* (63%) and *Lilio bulbiferi-Arrhenatheretum elatioris* (57%). The lowest percentages of common diagnostic species were found in the *Pastinaco sativae-Arrhenatheretum elatioris* (no common diagnostic species at all), *Poo-Trisetetum flavescentis* (8%) and *Anthoxantho odorati-Agrostietum tenuis* (17%).

Several species which were not diagnostic at the national level showed strict preferences for certain grassland communities in our study region, e.g. *Tithymalus cyparissias* indicated most dry and semi-dry grasslands (associations 1–4 in Appendix D), *Phleum hirsutum* and *Ranunculus polyanthemos* indicated montane grasslands (associations 12 and 13 in Appendix D).

4. Discussion

4.1. Application of the expert system to the studied data set

The identification of syntaxa by an electronic expert system is a formalised procedure easily applicable even without detailed knowledge of the local plant communities. It is based on the application of criteria formulated at a large geographical level (e.g. the national level) to a data set collected in a certain region or consisting of relevés without any geographical restriction. In our paper, an expert system was applied to a data set including all types of xero-, sub-xero- and mesophilous grasslands of a selected region irrespective of their syntaxonomical position. As a result, a regional classification was proposed, and regional diagnostic species were calculated.

When applying the national criteria to geographically restricted data, the question of scale becomes important. As the classification results are strongly dependent on the extent of study, the national classification might not be sufficiently sensitive to detect all regional particularities. This was demonstrated by KNOLLOVÁ et al. (2006), who showed that large-scale classifications usually include vegetation units with larger geographical ranges, while many of the traditional local associations disappear. This is caused mainly by the fact that classifications on different scales reflect different environmental and phytogeographical gradients. On a local scale, the most important gradients are usually those associated with small-scale heterogeneity in disturbance, light availability and soil properties such as mois-

ture, nutrient status and pH (KNOLLOVÁ et al. 2006). On a larger scale, macroclimatic gradients and differences in the evolutionary and migration histories of local floras become increasingly important (DIEKMANN 1997). These consequences seem to be lessened, if the criteria defined at a larger scale are applied to smaller areas which have a high habitat heterogeneity or which have a central position along the major large-scale gradients (KUŽELOVÁ & CHYTRÝ 2004). In our study, the relevés originated from a region with very diverse and heterogeneous habitat conditions (see Fig. 2). The main gradients in the xero- to mesophilous grassland subset (JANIŠOVÁ et al. 2010) included the macroclimatic characteristics (climatic water balance), phytochorological attributes (affiliation to phytochorions according to the presence of thermophilous species) as well as small-scale topographical and geological characteristics (slope, solar radiation and geological bedrock type). The data heterogeneity reflecting gradients on both macro- and micro-scale was the main prerequisite of a successful application of the national expert system to our regional data. In addition, the occurrence of several specific (local) associations in the region was not overlooked, as they were differentiated by numerous diagnostic species and were thus accepted as associations in the national classification.

The high percentage of relevés matched by the definitions as well as the sufficient sensitivity of the national classification to the particularities of the region studied proved the application of the expert system for Slovak grasslands to our data set as successful. In certain situations, e.g. in areas with low habitat diversity, an independent local classification based on, e.g., a numerical classification scheme, might be more appropriate. Local classifications can provide an accurate description of local vegetation diversity, which fits locally specific environmental gradients much better than a mechanical application of vegetation units defined on a national scale (KNOLLOVÁ et al. 2006). However, for sufficiently heterogeneous areas, such as our study region, the application of a national classification has the advantage of better serving applied purposes, e.g., nature conservation, which are organised within national boundaries. Moreover, this approach enables valuable comparisons of our study region with other regions of Slovakia.

The associations *Brachypodio pinnati-Molinietum arundinaceae*, *Lilio bulbiferi-Arrhenatheretum elatioris*, *Onobrychido viciifoliae-Brometum erecti* and *Anthoxantho odorati-Agrostietum tenuis* had the highest proportion of relevés matched by the association definition: 96%, 83%, 82% and 81%, respectively (Appendix D). These communities grow in habitats that are very common in the study region, and this could be a reason why they are so well and typically developed. On the other hand, in the *Orthantho luteae-Caricetum humilis* and *Violo sudeticae-Agrostietum capillaris* the proportion of matched relevés was very low: 7% and 9%, respectively. Interestingly, these associations inhabit habitats on the extreme poles of the moisture and temperature gradients detected in the study area. One possible explanation of their untypical floristic composition is that both associations occur here at the limits of their overall distribution. Other associations had either intermediate proportions of the matched relevés (23–53%, Appendix D), or they were too rare for this evaluation (e.g. *Festuco rupicolae-Caricetum humilis* and *Festuco pallentis-Seslerietum calcariae*). Several associations were detected only by the similarity indices, while they remained non-matched by the association definitions, e.g. *Geranio sylvatici-Trisetetum flavescentis* and *Campanulo rotundifoliae-Dianthetum deltoidis*. Although we decided not to accept these associations, their occurrence in the study region can not be excluded. The different proportions of the matching relevés in various associations is probably related to both their distribution range and the scope of their definitions, so that more narrowly delimited units with distribution centres outside the study region had more non-matching relevés and were thus identified mostly by the similarity index. Frequently, the scope of the definition is related to the amount of phytosociological material in the national database, upon which the definitions are based.

The expert system used is based on sociological species groups and species dominance criteria combined in formal definitions by logical operators (BRUELHEIDE 1995, 1997). We chose this method to ensure stable classification results independent of size and composition

of the data set. Using this method, the relevés with transitional features and the poorly developed stands with small numbers of diagnostic species remain unassigned by the definitions. They do not affect the classification results as it is the case in other classification methods, e.g. TWINSPAN and numerical classification methods (BRUELHEIDE 1995, JANDT 1999, BRUELHEIDE & CHYTRÝ 2000). Moreover, the classification process is well formalised and reproducible. To eliminate the subjective decisions and to allow an unambiguous allocation of non-matching relevés to vegetation units, we propose to accept strict criteria also during the classification of non-matching relevés by the similarity indices. In our analysis, we classified the non-matching relevés by the FPFI only to those associations which were confirmed in the region by at least one other matched relevé. Such an approach has worked well in the study region, preventing us from accepting syntaxa which are not typically developed in the region and allowing the further formalisation of the classification process.

4.2. Wetlands

Contrary to the xero- and mesophilous grasslands, the wetland communities of the study region were classified with a numerical classification method. Several attempts have been reported concerning the application of expert systems on regional data for mire vegetation (DÍTĚ et al. 2007, HRIVNÁK et al. 2008). Although some of the relevés recorded in our study region could be identified by the expert system for mires proposed by DÍTĚ et al. (2007), and some relevés of the *Calthion palustris* and *Deschampsion cespitosae* alliances could be identified by the definitions proposed by HÁJKOVÁ (2007a, 2007b), there were several wetland communities (belonging to the class *Phragmito-Magnocaricetea*), for which the formalised definitions have not yet been formulated. For that reason and also to avoid the subjective choice of the proper expert system to be applied for the identification of wetland relevés, we decided on a joint classification of wetland communities by a cluster analysis. Another important fact in favour of a joint classification was that the wetland communities in the study region are rather sparse and restricted to small patches of suitable environmental conditions. They are often developed atypically or have a transitional character, hosting diagnostic species of several distinct classes and alliances. In our opinion, the joint evaluation of their species composition and variability better reflects their typical features and is thus more reasonable and comprehensive. The situation might change by developing a complete expert system (recently available only for the Czech Republic) in which all vegetation types will be defined (NOBLE 1987).

4.3. Comparison of local and national delimitation of syntaxa

The comparison of two sets of diagnostic species (regional and national ones) was enabled by the fact that although the diagnostic species were calculated from different data sets, the same fidelity measure (phi coefficient) was used with the same threshold value (phi = 0.20). In most associations, the differences were rather large, and the number of diagnostic species common to both data sets did not exceed 50%. These differences can not be explained by the fact that the national diagnostic species were calculated merely from relevés matched by individual associations, while in the regional data set, also relevés classified by the FPFI were included. There is no correlation between the proportion of common diagnostic species and the proportion of the matched relevés (correlation coefficient –0.009). Another reason for a low compatibility of regional and national diagnostic species sets could be differences in heterogeneity of the input data sets. Nevertheless, we think that the differences in diagnostic species can also be attributed to the particularities in the regional floristic compositions of the studied grasslands and can thus be used to demonstrate the uniqueness of the local vegetation.

Acknowledgements

We would like to thank K. Hegedüšová, M. Janiš, V. Janiš, L. Janišová, V. Linkešová, †Š. Maglocký, H. Pisarčíková, V. Stanová, J. Šeffer, I. Škodová, M. Veselá and V. Veselý for field assistance, A. Kubinská

for the identification of bryophytes, J. Dengler, R. Hrivnák, U. Jandt and an anonymous reviewer for valuable comments on the manuscript and A. Huckauf for linguistic assistance. The research was financially supported by the grant SK 0115 through the EEA Financial Mechanism and the Norwegian Financial Mechanism and by the state budget of the Slovak Republic, by the Slovak Research and Development Agency (APVT-51-015804), Science Grant Agency of the Ministry of Education of the Slovak Republic and Slovak Academy of Sciences (VEGA 2/0181/09, VEGA 2/0166/08, VEGA 2/5084/25), and the Floristisch-Soziologische Arbeitsgemeinschaft e. V. (language editing).

Appendix A: Classification scheme of the studied vegetation and formal definitions of associations

Anhang A: Syntaxonomische Übersicht der behandelten Vegetationstypen und formale Definitionen der Assoziationen

Class *Festuco-Brometea* Br.-Bl. & Tx. ex Soó 1947

Order *Festucetalia valesiacae* Br.-Bl. & Tx. ex Br.-Bl. 1949

Alliance *Festucion valesiacae* Klika 1931

Association *Festuco rupicolae-Caricetum humilis* Klika 1939

Definition: Group *Festuca rupicola* AND (Group *Festuca valesiaca* OR Group *Scabiosa ochroleuca*) AND (*Carex humilis* cover >5% OR *Festuca rupicola* cover >5%) NOT Group *Jasione montana* NOT Group *Leucanthemum vulgare* NOT Group *Rhodax canus* NOT *Brachypodium pinnatum* cover >5% NOT *Bromus erectus* cover >5% NOT *Festuca valesiaca* cover >25%

Order *Stipo pulcherrimae-Festucetalia pallentis* Pop 1968

Alliance *Diantho lumnitzeri-Seslerion* (Soó 1971) Chytrý & Mucina in Mucina et al. 1993

Association *Festuco pallentis-Seslerietum calcariae* Futák 1947 corr. Janišová 2007

Definition: Group *Sesleria albicans* AND (Group *Galium verum* OR Group *Rhodax canus*) AND *Sesleria albicans* cover > 25%

Alliance *Bromo pannonici-Festucion pallentis* Zólyomi 1966

Association *Orthantho luteae-Caricetum humilis* Kliment & Bernátová 2000

Definition: Group *Rhodax canus* AND (Group *Bromus monocladus* OR Group *Galium verum*) AND *Carex humilis* cover >5% NOT Group *Scabiosa lucida* NOT *Brachypodium pinnatum* cover >25% NOT *Sesleria albicans* cover >5%

Order *Brometalia erecti* Koch 1926

Alliance *Cirsio-Brachypodion pinnati* Hada & Klika ex Klika 1951

Association *Scabioso ochroleucae-Brachypodietum pinnati* Klika 1933

Definition: (Group *Cirsium acaule* OR Group *Scabiosa ochroleuca*) AND *Brachypodium pinnatum* cover >5% NOT Group *Carex humilis* NOT Group *Cirsium pannonicum* NOT Group *Onobrychis viciifolia* NOT Group *Polygala major* NOT *Festuca rupicola* cover >25%

Association *Carici albae-Brometum monocladi* Ujházy et al. 2007

Definition: Group *Bromus monocladus* AND (*Bromus monocladus* cover >25% OR *Carex alba* cover >5%) NOT Group *Carex humilis* NOT *Sesleria albicans* cover >5%

Alliance *Bromion erecti* Koch 1926

Association *Brachypodio pinnati-Molinietum arundinaceae* Klika 1939

Definition: Group *Cirsium pannonicum* NOT Group *Bromus monocladus* NOT Group *Calamagrostis varia* NOT *Nardus stricta* cover >5%

Association *Onobrychido viciifoliae-Brometum erecti* T. Müller 1966

Definition: Group *Onobrychis viciifolia* AND (Group *Festuca rupicola* OR Group *Galium verum* OR Group *Securigera varia*) AND *Bromus erectus* cover >25% NOT Group *Carex humilis* NOT Group *Cirsium pannonicum* NOT Group *Heracleum sphondylium* NOT Group *Viola canina*

Class *Molinio-Arrhenatheretea* Tx. 1937

Order *Arrhenatheretalia* Tx. 1931

Alliance *Cynosurion cristati* Tx. 1947

Association *Lolio perennis-Cynosuretum cristati* Tx. 1947

Definition: Group *Leontodon autumnalis* AND Group *Lolium perenne* NOT Group *Arrhenatherum elatius* NOT Group *Lychnis flos-cuculi* NOT *Deschampsia cespitosa* cover >5% NOT *Juncus tenuis* cover >25% NOT *Plantago major* cover >5% NOT *Prunella vulgaris* cover >15%

Alliance *Arrhenatherion elatioris* Luquet 1926

Association *Pastinaco sativae-Arrhenatheretum elatioris* Passarge 1964

Definition: Group *Arrhenatherum elatius* AND Group *Leucanthemum vulgare* NOT Group *Agrostis capillaris* NOT Group *Carlina acaulis* NOT Group *Festuca rupicola* NOT Group *Geranium sylvaticum* NOT Group *Securigera varia* NOT Group *Viola canina* NOT *Alopecurus pratensis* cover >50% NOT *Brachypodium pinnatum* cover >5% NOT *Bromus erectus* cover >5% NOT *Cirsium canum* cover >5%

Association *Poo-Trisetetum flavescentis* Knapp ex Oberdorfer 1957

Definition: Group *Agrostis capillaris* AND Group *Leucanthemum vulgare* AND Group *Trisetum flavescens* NOT Group *Carlina acaulis* NOT Group *Festuca rupicola* NOT Group *Geranium sylvaticum* NOT Group *Leontodon autumnalis* NOT Group *Ranunculus bulbosus* NOT Group *Viola canina* NOT *Arrhenatherum elatius* cover >5% NOT *Brachypodium pinnatum* cover >5% NOT *Bromus erectus* cover >5% NOT *Cirsium rivulare* cover >5% NOT *Lolium perenne* cover >5%

Association *Anthoxantho odorati-Agrostietum tenuis* Sillinger 1933

Definition: Group *Agrostis capillaris* AND Group *Carlina acaulis* AND Group *Galium verum* AND Group *Leucanthemum vulgare* AND Group *Viola canina* NOT Group *Campanula serrata* NOT Group *Cirsium pannonicum* NOT Group *Geranium sylvaticum* NOT Group *Onobrychis viciifolia* NOT Group *Scabiosa ochroleuca* NOT *Festuca rupicola* cover >25% NOT *Nardus stricta* cover >5%

Association *Ranunculo bulbosi-Arrhenatheretum elatioris* Ellmauer in Mucina et al. 1993

Definition: Group *Agrostis capillaris* AND Group *Arrhenatherum elatius* AND Group *Leucanthemum vulgare* AND (Group *Festuca rupicola* OR Group *Ranunculus bulbosus*) NOT Group *Campanula glomerata* NOT Group *Cirsium pannonicum* NOT Group *Geranium sylvaticum* NOT Group *Hypericum maculatum* NOT Group *Leontodon autumnalis* NOT Group *Viola canina* NOT *Brachypodium pinnatum* cover >5% NOT *Bromus erectus* cover >25%

Association *Lilio bulbiferi-Arrhenatheretum elatioris* Ruži ková 2002

Definition: Group *Arrhenatherum elatius* AND Group *Campanula glomerata* AND (Group *Carlina acaulis* OR Group *Filipendula vulgaris*) NOT Group *Cirsium pannonicum* NOT Group *Geranium sylvaticum* NOT Group *Heracleum sphondylium* NOT Group *Nardus stricta* NOT Group *Viola canina* NOT *Brachypodium pinnatum* cover >25% NOT *Bromus erectus* cover >25% NOT *Geranium sylvaticum* cover >5%

Order *Poo alpinae-Trisetetalia* Ellmauer & Mucina 1993

Alliance *Polygono bistortae-Trisetion flavescentis* Br.-Bl. & Tx. ex Marshall 1947

Association *Campanulo glomeratae-Geranietum sylvatici* Ruži ková 2002

Definition: Group *Campanula glomerata* AND (Group *Geranium sylvaticum* OR *Geranium sylvaticum* cover >5%) NOT *Festuca rupicola* cover >5% NOT *Sanguisorba officinalis* cover >5%

Order *Molinietalia* Koch 1926

Alliance *Deschampsion cespitosae* Horvati 1930

Association *Poo trivialis-Alopecuretum pratensis* Regel 1925

Alliance *Calthion palustris* Tx. 1937

Association *Cirsietum rivularis* Nowiński 1927

Association *Scirpetum sylvatici* Ralski 1931

Association *Filipendulo ulmariae-Menthetum longifoliae* Zlinská 1989

Class *Nardetea strictae* Rivas Goday & Borja Carbonell 1961

Order *Nardetalia strictae* Oberd. ex Preising 1949

Alliance *Nardo strictae-Agrostion tenuis* Sillinger 1933

Association *Violo sudeticae-Agrostietum capillaris* Ujházy in Janišová 2007

Definition: Group *Campanula serrata* AND Group *Carlina acaulis* AND Group *Hypericum maculatum* AND (Group *Veronica officinalis* OR Group *Vaccinium myrtillus*) AND *Agrostis capillaris* cover >5% NOT Group *Cardaminopsis halleri* NOT Group *Geranium sylvaticum* NOT Group *Poa alpina* NOT Group *Soldanella carpatica* NOT Group *Thymus alpestris*

Class *Scheuchzerio-Caricetea fuscae* Tx. 1937

Order *Caricetalia davallianae* Br.-Bl. 1949

Alliance *Caricion davallianae* Klika 1934

Association *Caricetum davallianae* Dutoit 1924

Association *Carici flavae-Cratoneuretum filicini* Kovács & Felföldy 1958

Class *Phragmito-Magnocaricetea* Klika in Klika & Novák 1941

Order *Phragmitetalia* Koch 1926

Alliance *Phragmition communis* Koch 1926

Association *Typhetum latifoliae* Lang 1973

Order *Nasturtio-Glycerietalia* Pignatti 1953

Alliance *Glycerio-Sparganion* Br.-Bl. & Sissingh in Boer 1942

Association *Glycerietum nemoralis-plicatae* Kopecký 1972

Appendix B: Sociological species groups used in the formal association definitions

Anhang B: Soziologische Artengruppen,
die in den formalen Assoziationsdefinitionen Verwendung fanden

Group *Agrostis capillaris*: *Agrostis capillaris*, *Anthoxanthum odoratum* agg., *Festuca rubra* agg.
Group *Arrhenatherum elatius*: *Arrhenatherum elatius*, *Galium mollugo* agg., *Tragopogon orientalis*
Group *Bromus monocladus*: *Anthericum ramosum*, *Bromus monocladus*, *Buphthalmum salicifolium*
Group *Calamagrostis varia*: *Calamagrostis varia*, *Digitalis grandiflora*, *Laserpitium latifolium*
Group *Campanula glomerata*: *Aquilegia vulgaris*, *Campanula glomerata* agg., *Lilium bulbiferum*
Group *Campanula serrata*: *Campanula serrata*, *Potentilla aurea*, *Viola lutea*
Group *Cardaminopsis halleri*: *Cardaminopsis halleri*, *Crocus discolor*, *Primula elatior*
Group *Carex humilis*: *Carex humilis*, *Globularia punctata*, *Teucrium montanum*
Group *Carlina acaulis*: *Briza media*, *Carlina acaulis*, *Thymus pulegioides*
Group *Cirsium acaule*: *Cirsium acaule*, *Linum catharticum*, *Ononis spinosa*
Group *Cirsium pannonicum*: *Carex montana*, *Cirsium pannonicum*, *Lathyrus latifolius*, *Trommsdorfia maculata*
Group *Festuca rupicola*: *Agrimonia eupatoria*, *Festuca rupicola*, *Fragaria viridis*, *Sanguisorba minor*
Group *Festuca valesiaca*: *Bothriochloa ischaemum*, *Eryngium campestre*, *Festuca valesiaca*, *Koeleria macrantha*, *Thymus pannonicus*
Group *Filipendula vulgaris*: *Filipendula vulgaris*, *Primula veris*, *Ranunculus polyanthemos*
Group *Galium verum*: *Galium verum* agg., *Pimpinella saxifraga* agg., *Plantago media*, *Trifolium montanum*
Group *Geranium sylvaticum*: *Crepis mollis*, *Geranium sylvaticum*, *Phyteuma spicatum*
Group *Heracleum sphondylium*: *Anthriscus sylvestris*, *Chaerophyllum aromaticum*, *Crepis biennis*, *Geranium pratense*, *Heracleum sphondylium*
Group *Hypericum maculatum*: *Hypericum maculatum*, *Luzula luzuloides*, *Poa chaixii*
Group *Jasione montana*: *Jasione montana*, *Phleum phleoides*, *Orthantha lutea*, *Vicia lathyroides*
Group *Leontodon autumnalis*: *Cynosurus cristatus*, *Euphrasia rostkoviana* agg., *Leontodon autumnalis*
Group *Leucanthemum vulgare*: *Campanula patula*, *Leontodon hispidus*, *Leucanthemum vulgare* agg., *Lotus corniculatus* agg., *Plantago lanceolata*, *Rhinanthus minor*, *Trifolium pratense*
Group *Lolium perenne*: *Bellis perennis*, *Lolium perenne*, *Trifolium repens*
Group *Lychnis flos-cuculi*: *Acetosa pratensis*, *Alopecurus pratensis*, *Cardamine pratensis* agg., *Festuca pratensis*, *Lathyrus pratensis*, *Lychnis flos-cuculi*, *Ranunculus acris*, *Ranunculus auricomus* agg.

Group *Nardus stricta*: *Carex pallescens*, *Nardus stricta*, *Potentilla erecta*
Group *Onobrychis viciifolia*: *Bromus erectus*, *Onobrychis viciifolia* agg., *Salvia pratensis*
Group *Poa alpina*: *Ligusticum mutellina*, *Phleum rhaeticum*, *Poa alpina*
Group *Polygala major*: *Aster amellus*, *Inula ensifolia*, *Linum flavum*, *Polygala major*
Group *Ranunculus bulbosus*: *Daucus carota*, *Dianthus carthusianorum* agg., *Ranunculus bulbosus*
Group *Rhodax canus*: *Dorycnium pentaphyllum* agg., *Hippocrepis comosa*, *Potentilla heptaphylla*, *Rhodax canus*
Group *Scabiosa lucida*: *Carduus glaucinus*, *Phyteuma orbiculare*, *Scabiosa lucida*, *Thesium alpinum*
Group *Scabiosa ochroleuca*: *Asperula cynanchica*, *Scabiosa ochroleuca*, *Teucrium chamaedrys*
Group *Securigera varia*: *Colymbada scabiosa*, *Medicago falcata*, *Securigera varia*, *Tithymalus cyparissias*
Group *Sesleria albicans*: *Genista pilosa*, *Leontodon incanus*, *Sesleria albicans*
Group *Soldanella carpatica*: *Avenula planiculmis*, *Homogyne alpina*, *Soldanella carpatica*
Group *Thymus alpestris*: *Ranunculus nemorosus*, *Ranunculus pseudomontanus*, *Thymus alpestris*
Group *Trisetum flavescens*: *Dactylis glomerata*, *Taraxacum* sect. *Ruderalia*, *Trisetum flavescens*
Group *Vaccinium myrtillus*: *Avenella flexuosa*, *Vaccinium myrtillus*, *Vaccinium vitis-idaea*
Group *Veronica officinalis*: *Carex pilulifera*, *Danthonia decumbens*, *Pilosella officinarum*, *Veronica officinalis*
Group *Viola canina*: *Luzula campestris* agg., *Polygala vulgaris*, *Viola canina*

Appendix C: Origin of the relevés in Tables 2–4

Anhang C: Herkunftsnachweis der Vegetationsaufnahmen in den Tabellen 2–4

The entries are organised as follows: Relevé number: Locality, Latitude, Longitude (both WGS84), Date (YYYY MM DD), Author(s), Reference if published before. Abkürzungen der Autoren: EU – Eva Uhliarová, HP – Helena Pisarčíková, HR – Helena Ružičková, IŠ – Iveta Škodová, JK – Judita Kochjarová, JŠ – Ján Šeffer, MJ – Monika Janišová, ŠM – Štefan Maglocký, VS – Viera Stanová. Abbreviations of publications: #1 – Janišová (2009); #2 – Kochjarová (1997); #3 – Ružičková (2002); #4 – Janišová & Uhliarová (2008).

Die Einträge sind folgendermaßen organisiert: Aufnahmenummer: Aufnahmeort, geografische Breite, geographische Länge (beide WGS84), Aufnahedatum (JJJJ MM TT), Autor(en), Quellenangabe bei zuvor publizierten Aufnahmen. Abkürzungen der Autoren: EU – Eva Uhliarová, HP – Helena Pisarčíková, HR – Helena Ružičková, IŠ – Iveta Škodová, JK – Judita Kochjarová, JŠ – Ján Šeffer, MJ – Monika Janišová, ŠM – Štefan Maglocký, VS – Viera Stanová. Abkürzungen der Publikationen: #1 – Janišová (2009); #2 – Kochjarová (1997); #3 – Ružičková (2002); #4 – Janišová & Uhliarová (2008).

Table 2 – Rel. 1: Zvolenská kotlina, Nemce, Kajchiar, 48°46’41’’ N, 19°11’15’’ E, 2006 06 03, MJ, #1; **Rel. 2:** Starohorské vrchy, Podkonice, Pleše, 48°48’50’’ N, 19°15’57’’ E, 2005 06 28, EU, #1; **Rel. 3:** Starohorské vrchy, Riečka, 48°45’17’’ N, 19°04’03’’ E, 2002 05 21, MJ, HP; **Rel. 4:** Zvolenská kotlina, Podkonice, 48°47’33’’ N, 19°15’30’’ E, 2006 08 07, MJ, #1; **Rel. 5:** Starohorské vrchy, Riečka, 48°45’54’’ N, 19°03’45’’ E, 2000 06 10, MJ; **Rel. 6:** Zvolenská kotlina, Jakub CHU, 48°45’55’’ N, 19°08’38’’ E, 2007 06 00, KH, MJ, IŠ; **Rel. 7:** Zvolenská kotlina,Banská Bystrica, Tichá ulica Street, 48°44’14’’ N, 19°06’52’’ E, 2001 07 11, MJ; **Rel. 8:** Starohorské vrchy, Riečka, 48°45’31’’ N, 19°04’48’’ E, 2001 05 23, MJ; **Rel. 9:** Starohorské vrchy, Tajov-Riečka, 48°45’20’’ N, 19°03’53’’ E, 2004 08 18, MJ; **Rel. 10:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’53’’ N, 19°06’50’’ E, 2006 08 23, EU; **Rel. 11:** Kremnické vrchy, Skubín, Mlynská ulica Street, 48°44’24’’ N, 19°05’01’’ E, 1996 05 21, MJ; **Rel. 12:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’52’’ N, 19°06’52’’ E, 2006 06 08, EU; **Rel. 13:** Zvolenská kotlina, Skubín, Pod Dúbravou, 48°44’07’’ N, 19°06’15’’ E, 2004 07 07, MJ; **Rel. 14:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’51’’ N, 19°06’51’’ E, 2006 07 18, EU; **Rel. 15:** Zvolenská kotlina, Slovenská Lupča, 48°46’51’’ N, 19°15’41’’ E, 2006 08 07, MJ; **Rel. 16:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’55’’ N, 19°06’42’’ E, 2006 08 23, EU; **Rel. 17:** Zvolenská kotlina, Slovenská Lupča, Mackov bok, 48°45’47’’ N, 19°15’40’’ E, 1996 06 26, JK, #2; **Rel. 18:** Zvolenská kotlina, Nemce, Bučičie, 48°46’25’’ N, 19°10’12’’ E, 2004 08 03, MJ, #1; **Rel. 19:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’52’’ N, 19°06’46’’ E, 2006 07 26, EU; **Rel. 20:** Zvolenská kotlina, Badín, 48°40’51’’ N, 19°05’59’’ E, 2002 06 19, EU; **Rel. 21:** Zvolenská kotlina, Skubín, 48°44’23’’ N, 19°06’28’’ E, 2001 07 21, MJ; **Rel. 22:** Zvolenská kotlina, Badín, 48°40’59’’ N, 19°06’01’’ E, 2002 06 19, EU; **Rel. 23:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’48’’ N, 19°06’45’’ E, 2006 07 18, EU; **Rel. 24:** Zvolenská kotlina, Banská

Bystrica, Malachovské skalky, 48°42’40’’ N, 19°06’51’’ E, 2006 07 28, EU; **Rel. 25:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’50’’ N, 19°06’45’’ E, 2006 08 23, EU; **Rel. 26:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’45’’ N, 19°06’19’’ E, 2006 07 25, EU; **Rel. 27:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’51’’ N, 19°06’47’’ E, 2006 08 01, EU; **Rel. 28:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’39’’ N, 19°06’50’’ E, 2006 07 18, EU; **Rel. 29:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’45’’ N, 19°06’49’’ E, 2006 07 24, EU; **Rel. 30:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’50’’ N, 19°06’50’’ E, 2006 07 14, EU; **Rel. 31:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’37’’ N, 19°06’12’’ E, 2001 10 02, EU; **Rel. 32:** Zvolenská kotlina, Badín, 48°40’46’’ N, 19°04’58’’ E, 2002 06 05, EU; **Rel. 33:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’37’’ N, 19°06’30’’ E, 2006 07 25, EU; **Rel. 34:** Zvolenská kotlina, Radvaň, 48°43’12’’ N, 19°07’42’’ E, 2001 08 12, EU; **Rel. 35:** Zvolenská kotlina, Jakub, 48°46’06’’ N, 19°08’00’’ E, 2006 07 06, MJ; **Rel. 36:** Starohorské vrchy, Baranovo, 48°47’17’’ N, 19°08’04’’ E, 2005 09 09, MJ, #1; **Rel. 37:** Starohorské vrchy, Riečka, 48°45’14’’ N, 19°04’49’’ E, 2000 05 20, MJ; **Rel. 38:** Zvolenská kotlina, Slovenská Ľupča, 48°46’38’’ N, 19°15’53’’ E, 2006 08 07, MJ; **Rel. 39:** Veľká Fatra, Vyšné Revúce, 48°54’54’’ N, 19°09’45’’ E, 2006 08 08, MJ; **Rel. 40:** Starohorské vrchy, Riečka, 48°45’55’’ N, 19°03’36’’ E, 2000 06 10, MJ; **Rel. 41:** Starohorské vrchy, Riečka, 48°45’50’’ N, 19°03’53’’ E, 2000 05 27, MJ; **Rel. 42:** Veľká Fatra, Valentová, Prášnica, 48°52’23’’ N, 19°07’59’’ E, 2006 07 11, MJ; **Rel. 43:** Kremnické vrchy, Tajov, Zadný háj, 48°44’12’’ N, 19°04’11’’ E, 2001 06 27, EU; **Rel. 44:** Starohorské vrchy, Baranovo, Varta, 48°47’34’’ N, 19°08’09’’ E, 2004 06 18, MJ; **Rel. 45:** Starohorské vrchy, Riečka, Pod Dúbravou, 48°45’58’’ N, 19°04’39’’ E, 2001 06 08, MJ, ŠM; **Rel. 46:** Starohorské vrchy, Baranovo, Varta, 48°47’26’’ N, 19°08’19’’ E, 2005 09 09, MJ; **Rel. 47:** Starohorské vrchy, Uľanka, 48°47’45’’ N, 19°06’44’’ E, 2002 06 12, MJ, EU; **Rel. 48:** Starohorské vrchy, Podkonické Pleše, 48°48’54’’ N, 19°15’57’’ E, 2005 06 28, MJ; **Rel. 49:** Starohorské vrchy, Riečka, Pod Dúbravou, 48°45’58’’ N, 19°04’34’’ E, 2000 06 21, MJ, VS, JŠ; **Rel. 50:** Zvolenská kotlina, Skubín , 48°44’11’’ N, 19°06’22’’ E, 2004 06 09, MJ; **Rel. 51:** Starohorské vrchy, Ravasky, 48°46’04’’ N, 19°06’38’’ E, 2004 06 15, MJ; **Rel. 52:** Zvolenská kotlina, Jakub, 48°45’58’’ N, 19°08’36’’ E, 2004 08 06, MJ; **Rel. 53:** Starohorské vrchy, Riečka, Dedkovo, 48°46’34’’ N, 19°04’07’’ E, 2002 06 13, MJ; **Rel. 54:** Starohorské vrchy, Riečka, Dedkovo, 48°46’35’’ N, 19°04’10’’ E, 1998 06 28, HR; **Rel. 55:** Kremnické vrchy, Tajov, Zadný háj, 48°44’04’’ N, 19°04’10’’ E, 2001 06 27, EU; **Rel. 56:** Veľká Fatra, Šturec, 48°52’05’’ N, 19°09’53’’ E, 1988 07 14, HR, #3; **Rel. 57:** Veľká Fatra, Prášnica, 48°52’19’’ N, 19°08’10’’ E, 2006 07 11, EU; **Rel. 58:** Veľká Fatra, Prášnica, 48°52’28’’ N, 19°07’55’’ E, 2006 07 11, EU; **Rel. 59:** Starohorské vrchy, Tajov, Galovo, 48°44’26’’ N, 19°04’25’’ E, 2001 05 11, EU; **Rel. 60:** Starohorské vrchy, Riečka, Dedkovo, 48°45’55’’ N, 19°04’33’’ E, 1998 06 28, HR, #3; **Rel. 61:** Zvolenská kotlina, Jakub, 48°46’04’’ N, 19°08’30’’ E, 2004 09 06, MJ; **Rel. 62:** Veľká Fatra, Vyšné Revúce, 48°54’44’’ N, 19°09’46’’ E, 2006 08 08, MJ; **Rel. 63:** Kremnické vrchy, Tajov, Zadný háj, 48°44’14’’ N, 19°04’12’’ E, 2001 06 27, EU; **Rel. 64:** Starohorské vrchy, Riečanské sedlo, 48°46’14’’ N, 19°04’39’’ E, 1998 07 07, HR; **Rel. 65:** Starohorské vrchy, Hornojelenská dolina, 48°51’00’’ N, 19°09’15’’ E, 2001 06 26, HR; **Rel. 66:** Starohorské vrchy, Lučivnô, 48°46’13’’ N, 19°03’26’’ E, 1998 06 28, HR; **Rel. 67:** Zvolenská kotlina, Jakub, 48°45’53’’ N, 19°08’31’’ E, 2007 06 14, MJ, #4; **Rel. 68:** Starohorské vrchy, Riečka, 48°46’03’’ N, 19°04’42’’ E, 1998 06 28, HR; **Rel. 69:** Starohorské vrchy, Uľanka, 48°47’45’’ N, 19°06’45’’ E, 2003 05 09, EU, #4; **Rel. 70:** Kremnické vrchy, Malachov, 48°42’25’’ N, 19°04’52’’ E, 2001 06 05, EU; **Rel. 71:** Starohorské vrchy, Uľanka, 48°46’55’’ N, 19°07’11’’ E, 2007 06 10, MJ; **Rel. 72:** Zvolenská kotlina, Jakub , 48°45’55’’ N, 19°07’54’’ E, 2004 09 00, MJ, #4; **Rel. 73:** Starohorské vrchy, Riečka, 48°46’01’’ N, 19°04’29’’ E, 2001 07 08, HR; **Rel. 74:** Starohorské vrchy, Podkonice, Pleše, 48°49’14’’ N, 19°14’11’’ E, 2005 06 28, EU, #4; **Rel. 75:** Kremnické vrchy, Suchý vrch, 48°43’40’’ N, 19°04’27’’ E, 2002 06 20, EU; **Rel. 76:** Starohorské vrchy, Podkonice, 48°48’46’’ N, 19°14’22’’ E, 1996 07 15, JK, #2; **Rel. 77:** Starohorské vrchy, Riečka, Pod Dúbravou, 48°45’47’’ N, 19°04’38’’ E, 2001 06 08, MJ, HR, ŠM, #4; **Rel. 78:** Starohorské vrchy, Riečka, Pod Dúbravou, 48°45’58’’ N, 19°04’42’’ E, 2001 06 08, MJ, #4; **Rel. 79:** Starohorské vrchy, Ravasky, 48°46’02’’ N, 19°06’57’’ E, 2004 06 15, MJ; **Rel. 80:** Zvolenská kotlina, Jakub, 48°45’54’’ N, 19°07’54’’ E, 2004 09 10, EU, #4; **Rel. 81:** Kremnické vrchy, Skubín, Mlynská ulica Street, 48°44’23’’ N, 19°05’00’’ E, 1996 06 04, MJ, #4; **Rel. 82:** Kremnické vrchy, Tajov, Suchý vrch, 48°43’54’’ N, 19°04’10’’ E, 2001 06 27, EU, #4; **Rel. 83:** Kremnické vrchy, Tajov, Holý vŕšok, 48°43’38’’ N, 19°03’22’’ E, 2001 06 20, MJ; **Rel. 84:** Starohorské vrchy, Ravasky, 48°46’28’’ N, 19°06’10’’ E, 2004 06 15, MJ, #4; **Rel. 85:** Starohorské vrchy, Podkonice, Pleše, 48°48’51’’ N, 19°14’46’’ E, 2005 06 28, MJ, #4; **Rel. 86:** Starohorské vrchy, Podkonice, 48°48’51’’ N, 19°15’00’’ E, 1998 06 29, HR; **Rel. 87:** Kremnické vrchy, Skubín, Mlynská ulica Street, 48°44’23’’ N, 19°05’01’’ E, 1996 05 21, MJ, #4; **Rel. 88:** Starohorské vrchy, Tajov, Biela hlina, 48°44’11’’ N, 19°03’06’’ E, 2000 06 12, MJ; **Rel. 89:** Starohorské vrchy, vrchy, Uľanka, 48°47’42’’ N, 19°06’49’’ E, 2002 06 12, MJ, EU, #4; **Rel. 90:** Kremnické vrchy, Tajov, Brúsy, 48°44’07’’ N, 19°03’38’’ E, 2001 06 26, EU; **Rel. 91:** Starohorské

vrchy, Tajov, Brúsy, 48°44’16’’ N, 19°03’40’’ E, 2001 06 26, EU, #4; **Rel. 92:** Kremnické vrchy, Skubín, Mlynská ulica Street, 48°44’24’’ N, 19°04’59’’ E, 1996 05 21, MJ, #4; **Rel. 93:** Starohorské vrchy, Tajov, Brúsy, 48°44’07’’ N, 19°03’42’’ E, 2001 06 26, EU; **Rel. 94:** Starohorské vrchy, Baranovo, 48°47’07’’ N, 19°08’31’’ E, 2005 09 09, MJ, #4; **Rel. 95:** Starohorské vrchy, Tajov, 48°44’49’’ N, 19°04’19’’ E, 2004 05 21, MJ; **Rel. 96:** Starohorské vrchy, Hornojelenská dolina, 48°51’00’’ N, 19°09’15’’ E, 2001 06 26, HR, #3; **Rel. 97:** Kremnické vrchy, Suchý vrch, Galovo, 48°43’42’’ N, 19°04’03’’ E, 2001 08 09, EU, MJ, HP; **Rel. 98:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’44’’ N, 19°06’46’’ E, 2002 06 13, EU; **Rel. 99:** Kremnické vrchy, Malachov, 48°42’41’’ N, 19°05’11’’ E, 2001 05 30, EU; **Rel. 100:** Zvolenská kotlina, za Tichou ul., 48°44’15’’ N, 19°06’48’’ E, 2004 06 14, MJ; **Rel. 101:** Starohorské vrchy, Tajov, Riečka, 48°45’22’’ N, 19°03’51’’ E, 2004 08 18, MJ; **Rel. 102:** Zvolenská kotlina, Baranovo, 48°46’39’’ N, 19°09’11’’ E, 2001 07 24, MJ; **Rel. 103:** Zvolenská kotlina, Banská Bystica, Tichá ulica Street, 48°44’13’’ N, 19°06’47’’ E, 2001 08 25, MJ; **Rel. 104:** Starohorské vrchy, Riečka, 48°45’32’’ N, 19°04’51’’ E, 2001 05 23, MJ, EU, HP; **Rel. 105:** Veľká Fatra, Šturec, 48°52’27’’ N, 19°09’23’’ E, 1988 07 17, HR; **Rel. 106:** Zvolenská kotlina, Skubín, Pod Stráňou Street, 48°44’24’’ N, 19°06’30’’ E, 2001 07 21, MJ; **Rel. 107:** Starohorské vrchy, Podkonice, 48°48’48’’ N, 19°14’24’’ E, 1996 07 15, JK, #2; **Rel. 108:** Kremnické vrchy, Malachov, 48°42’43’’ N, 19°05’12’’ E, 2001 05 30, EU; **Rel. 109:** Starohorské vrchy, Špania Dolina, 48°47’23’’ N, 19°07’55’’ E, 2004 06 18, EU; **Rel. 110:** Zvolenská kotlina Jakub, 48°45’52’’ N, 19°07’60’’ E, 2004 09 00, MJ; **Rel. 111:** Kremnické vrchy, Malachov, 48°42’38’’ N, 19°04’43’’ E, 2001 05 29, EU; **Rel. 112:** Zvolenská kotlina, Jakub, 48°45’60’’ N, 19°08’34’’ E, 2004 09 06, MJ; **Rel. 113:** Starohorské vrchy, Riečka, 48°45’19’’ N, 19°04’16’’ E, 2001 07 28, MJ; **Rel. 114:** Zvolenská kotlina, Laskomer, 48°44’40’’ N, 19°08’00’’ E, 2002 06 12, EU; **Rel. 115:** Zvolenská kotlina, Jakub , 48°46’02’’ N, 19°08’05’’ E, 2006 07 14, MJ; **Rel. 116:** Starohorské vrchy, Riečka, 48°45’18’’ N, 19°04’06’’ E, 2002 05 21, MJ; **Rel. 117:** Starohorské vrchy, Tajov, Kalvária, 48°44’39’’ N, 19°03’60’’ E, 2001 06 26, EU; **Rel. 118:** Zvolenská kotlina, Slovenská Ľupča, 48°46’45’’ N, 19°15’49’’ E, 2006 08 07, MJ; **Rel. 119:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’52’’ N, 19°05’55’’ E, 2001 05 29, EU; **Rel. 120:** Zvolenská kotlina, Jakub, 48°46’12’’ N, 19°06’87’’ E, 2004 09 06, MJ; **Rel. 121:** Starohorské vrchy, Špania Dolina, 48°48’08’’ N, 19°07’47’’ E, 2004 06 18, MJ; **Rel. 122:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’37’’ N, 19°06’49’’ E, 2006 07 18, EU; **Rel. 123:** Kremnické vrchy, Malachov, 48°42’41’’ N, 19°05’09’’ E, 2001 06 04, EU; **Rel. 124:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’37’’ N, 19°06’19’’ E, 2001 10 02, EU; **Rel. 125:** Starohorské vrchy, Baranovo, Varta, 48°47’22’’ N, 19°07’47’’ E, 2004 06 18, MJ, #1; **Rel. 126:** Starohorské vrchy, Tajov, Predné, 48°44’47’’ N, 19°03’24’’ E, 2001 06 15, EU; **Rel. 127:** Starohorské vrchy, Tajov, 48°44’50’’ N, 19°04’19’’ E, 2004 05 21, EU; **Rel. 128:** Kremnické vrchy, Malachov, 48°42’38’’ N, 19°04’53’’ E, 2001 06 04, EU; **Rel. 129:** Starohorské vrchy, Tajov, 48°44’54’’ N, 19°04’17’’ E, 2004 05 21, EU; **Rel. 130:** Starohorské vrchy, Bukovská dolina, 48°51’30’’ N, 19°10’30’’ E, 2001 06 26, HR, #3; **Rel. 131:** Zvolenská kotlina, Nemce, Bučičie, 48°46’27’’ N, 19°09’47’’ E, 2004 08 03, MJ; **Rel. 132:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’46’’ N, 19°06’41’’ E, 2002 06 18, EU; **Rel. 133:** Starohorské vrchy, Riečka, 48°46’07’’ N, 19°04’19’’ E, 2001 07 08, HR; **Rel. 134:** Starohorské vrchy, Riečka, 48°45’15’’ N, 19°04’58’’ E, 2000 05 19, MJ; **Rel. 135:** Zvolenská kotlina, Banská Bystrica, Malachovské skalky, 48°42’40’’ N, 19°06’33’’ E, 2001 10 02, EU; **Rel. 136:** Starohorské vrchy, Tajov, 48°44’53’’ N, 19°04’20’’ E, 2004 05 21, MJ; **Rel. 137:** Starohorské vrchy, Tajov, Biela hlina, 48°44’25’’ N, 19°03’14’’ E, 2000 06 12, MJ; **Rel. 138:** Kremnické vrchy, Malachov, 48°42’44’’ N, 19°04’58’’ E, 2001 05 30, EU; **Rel. 139:** Starohorské vrchy, Hornojelenská dolina, 48°51’08’’ N, 19°09’10’’ E, 2001 06 26, HR, #3; **Rel. 140:** Zvolenská kotlina, Slovenská Ľupča, 48°46’37’’ N, 19°15’51’’ E, 2006 08 07, MJ.

Table 3 – Rel. 1: Veľká Fatra, Liptovská Osada, 19°16’03’’ N, 48°58’08’’ E, 1980 06 25, HR; **Rel. 2:** Veľká Fatra, Nižná Revúca, 19°13’10’’ N, 48°56’05’’ E, 1980 07 02, HR; **Rel. 3:** Kremnické vrchy, Badín, 19°04’52’’ N, 48°41’28’’ E, 2002 06 05, EU; **Rel. 4:** Nízke Tatry, Liptovská Osada, 19°17’40’’ N, 48°57’41’’ E, 1980 06 25, HR; **Rel. 5:** Veľká Fatra, Stredná Revúca, Veľká Turecká, 19°10’48’’ N, 48°55’42’’ E, 1980 06 29, HR; **Rel. 6:** Zvolenská kotlina, Rakytovce, 19°07’11’’ N, 48°40’50’’ E, 2001 08 15, EU; **Rel. 7:** Kremnické vrchy, Badín, 19°05’02’’ N, 48°41’15’’ E, 2002 06 19, EU; **Rel. 8:** Zvolenská kotlina, Badín, 19°05’57’’ N, 48°40’09’’ E, 2001 08 14, EU; **Rel. 9:** Zvolenská kotlina, Rakytovce, 19°07’00’’ N, 48°40’43’’ E, 2002 06 21, EU; **Rel. 10:** Zvolenská kotlina, Nemce, 19°10’24’’ N, 48°46’21’’ E, 2006 06 01, MJ; **Rel. 11:** Veľká Fatra, Valentová, Prášnica, 19°07’57’’ N, 48°52’25’’ E, 2006 07 11, MJ; **Rel. 12:** Zvolenská kotlina, Skubín , 19°06’10’’ N, 48°44’08’’ E, 2000 06 02, MJ; **Rel. 13:** Kremnické vrchy, Malachov, 19°04’41’’ N, 48°42’26’’ E, 2001 05 28, EU; **Rel. 14:** Zvolenská kotlina, Skubín , 19°05’44’’ N, 48°44’27’’ E, 2004 06 11, MJ; **Rel. 15:** Starohorské vrchy Donovaly, 19°13’30’’ N, 48°52’45’’ E, 1988 07 11, HR; **Rel. 16:** Kremnické vrchy, Králiky, 19°01’26’’ N, 48°44’00’’ E, 2001 06 19, EU; **Rel. 17:** Zvolenská kotlina, Rakytovce, 19°07’29’’ N,

48°40’50’’ E, 2001 08 15, EU; **Rel. 18:** Starohorské vrchy, Tajov, Predné, 19°03’28’’ N, 48°45’60’’ E, 2001 06 15, EU; **Rel. 19:** Kremnické vrchy, Malachov, Pršany, 19°05’07’’ N, 48°42’17’’ E, 2001 06 11, EU; **Rel. 20:** Kremnické vrchy, Malachov, 19°05’07’’ N, 48°41’59’’ E, 2001 06 11, EU; **Rel. 21:** Zvolenská kotlina, Podlavice, 19°06’05’’ N, 48°44’51’’ E, 2004 05 23, MJ; **Rel. 22:** Zvolenská kotlina, Radvaň, 19°07’44’’ N, 48°43’15’’ E, 2001 08 09, EU; **Rel. 23:** Starohorské vrchy, Tajov, Predné, 19°03’48’’ N, 48°44’55’’ E, 2001 06 15, EU; **Rel. 24:** Veľká Fatra, Nižná Revúca, 19°12’23’’ N, 48°56’01’’ E, 1980 07 02, HR; **Rel. 25:** Zvolenská kotlina, Laskomerská dolina, 19°06’35’’ N, 48°45’03’’ E, 2001 06 02, MJ; **Rel. 26:** Zvolenská kotlina, Skubín , 19°06’05’’ N, 48°44’26’’ E, 2004 06 11, MJ; **Rel. 27:** Veľká Fatra, Donovaly, 19°13’30’’ N, 48°52’45’’ E, 1998 07 11, HR, #3; **Rel. 28:** Starohorské vrchy, Motyčky, 19°14’15’’ N, 48°52’45’’ E, 1992 07 01, HR, #3; **Rel. 29:** Kremnické vrchy, Malachov, 19°03’60’’ N, 48°42’26’’ E, 2001 06 14, EU; **Rel. 30:** Starohorské vrchy, Donovaly, Sliačany, 19°12’00’’ N, 48°52’13’’ E, 1998 06 25, HR, #3; **Rel. 31:** Veľká Fatra, Vyšná Revúca, 19°09’01’’ N, 48°54’06’’ E, 1980 06 29, HR; **Rel. 32:** Veľká Fatra, Vyšná Revúca, Črtlas, 19°09’03’’ N, 48°54’04’’ E, 1980 06 29, HR; **Rel. 33:** Kremnické vrchy, Malachov, 19°04’53’’ N, 48°42’28’’ E, 2001 06 05, EU; **Rel. 34:** Kremnické vrchy, Králiky, Ruskov, 19°01’36’’ N, 48°44’07’’ E, 2001 06 14, EU; **Rel. 35:** Veľká Fatra, Nižná Revúca, Končitá, 19°15’00’’ N, 48°55’00’’ E, 1992 07 01, HR, #3; **Rel. 36:** Kremnické vrchy, Suchý vrch, 19°04’22’’ N, 48°43’18’’ E, 2001 06 27, EU; **Rel. 37:** Kremnické vrchy, Pršany, 19°04’58’’ N, 48°42’10’’ E, 2001 06 11, EU; **Rel. 38:** Kremnické vrchy, Malachov, 19°05’00’’ N, 48°42’22’’ E, 2001 06 05, EU; **Rel. 39:** Nízke Tatry, Korytnická dolina, 19°17’25’’ N, 48°53’32’’ E, 1980 07 01, HR; **Rel. 40:** Kremnické vrchy, Pršany, 19°04’58’’ N, 48°42’08’’ E, 2001 06 11, EU; **Rel. 41:** Zvolenská kotlina, Rakytovce, 19°07’08’’ N, 48°40’38’’ E, 2002 06 21, EU; **Rel. 42:** Kremnické vrchy, Pršany, 19°05’05’’ N, 48°42’14’’ E, 2001 06 11, EU; **Rel. 43:** Starohorské vrchy, Baláže, 19°10’56’’ N, 48°49’48’’ E, 2005 06 24, MJ; **Rel. 44:** Veľká Fatra, Vyšná Revúca, 19°09’29’’ N, 48°54’20’’ E, 1988 07 14, HR; **Rel. 45:** Starohorské vrchy, Tajovská chata, 19°01’07’’ N, 48°45’02’’ E, 2001 08 06, MJ; **Rel. 46:** Veľká Fatra, Liptovské Revúce, Veľká Turecká, 19°09’58’’ N, 48°55’50’’ E, 1982 07 02, HR; **Rel. 47:** Kremnické vrchy, Malachov, 19°05’12’’ N, 48°42’31’’ E, 2001 06 05, EU; **Rel. 48:** Starohorské vrchy, Riečka, Hodíkovo , 19°04’13’’ N, 48°46’02’’ E, 2000 06 20, MJ; **Rel. 49:** Starohorské vrchy, Tajov, Predné, 19°03’35’’ N, 48°44’54’’ E, 2001 06 15, EU; **Rel. 50:** Kremnické vrchy, Kordiky, 19°01’30’’ N, 48°46’25’’ E, 1998 06 28, HR; **Rel. 51:** Kremnické vrchy, Suchý vrch, 19°03’10’’ N, 48°43’12’’ E, 2001 08 09, MJ; **Rel. 52:** Kremnické vrchy, Suchý vrch, 19°04’15’’ N, 48°43’28’’ E, 2002 06 20, EU; **Rel. 53:** Veľká Fatra, Liptovské Revúce, Veľká Turecká, 19°09’54’’ N, 48°55’51’’ E, 1982 07 02, HR; **Rel. 54:** Starohorské vrchy, Tajov, Ortutnô, 19°02’34’’ N, 48°43’51’’ E, 2001 06 14, EU; **Rel. 55:** Zvolenská kotlina, Badín, 19°05’24’’ N, 48°40’47’’ E, 2002 06 17, EU; **Rel. 56:** Kremnické vrchym Suchý vrch, 19°04’28’’ N, 48°43’27’’ E, 2001 06 27, EU; **Rel. 57:** Kremnické vrchy, Suchý vrch, 19°04’05’’ N, 48°43’28’’ E, 2002 06 20, EU; **Rel. 58:** Starohorské vrchy, Králiky, 19°02’05’’ N, 48°44’31’’ E, 1988 06 28, HR; **Rel. 59:** Kremnické vrchy, Králiky, Pod stádlom, 19°01’24’’ N, 48°44’09’’ E, 2001 06 14, EU; **Rel. 60:** Zvolenská kotlina, Badín, 19°06’27’’ N, 48°40’11’’ E, 2002 06 21, EU; **Rel. 61:** Starohorské vrchy, Králiky, Ruskov, 19°01’49’’ N, 48°43’57’’ E, 2001 06 14, EU; **Rel. 62:** Kremnické vrchy, Králiky, Stádlo, 19°01’20’’ N, 48°44’17’’ E, 2001 08 07, EU; **Rel. 63:** Kremnické vrchy, Malachov, 19°05’34’’ N, 48°42’28’’ E, 2001 05 28, EU; **Rel. 64:** Kremnické vrchy, Pršany, 19°05’30’’ N, 48°42’02’’ E, 2001 06 14, EU; **Rel. 65:** Starohorské vrchy, Tajov, Kalvária, 19°04’12’’ N, 48°44’42’’ E, 2001 06 26, EU; **Rel. 66:** Starohorské vrchy, Králiky, 19°01’60’’ N, 48°44’09’’ E, 2001 06 22, EU; **Rel. 67:** Veľká Fatra, Turecká , 19°05’10’’ N, 48°51’56’’ E, 2006 07 12, EU; **Rel. 68:** Starohorské vrchy, Králiky, 19°01’52’’ N, 48°43’55’’ E, 2001 06 22, EU; **Rel. 69:** Kremnické vrchy, Králiky, Kvartová, 19°01’06’’ N, 48°44’24’’ E, 2001 08 07, EU; **Rel. 70:** Kremnické vrchy, Pršany, 19°05’11’’ N, 48°41’57’’ E, 2001 06 11, EU; **Rel. 71:** Starohorské vrchy, Tajov , 19°04’20’’ N, 48°44’38’’ E, 2004 05 13, MJ; **Rel. 72:** Veľká Fatra, Hornojelenská dolina , 19°08’59’’ N, 48°51’49’’ E, 2006 07 11, EU; **Rel. 73:** Veľká Fatra, Donovaly, Mišúty, 19°14’15’’ N, 48°52’50’’ E, 1999 07 03, HR; **Rel. 74:** Kremnické vrchy, Králiky, Stádlo, 19°01’19’’ N, 48°44’11’’ E, 2001 08 07, EU; **Rel. 75:** Kremnické vrchy, Malachov, 19°04’01’’ N, 48°42’29’’ E, 2001 05 28, EU; **Rel. 76:** Kremnické vrchy, Podlavice, Uhliská, 19°04’35’’ N, 48°43’55’’ E, 2001 06 25, EU; **Rel. 77:** Kremnické vrchy, Malachov, 19°03’54’’ N, 48°42’45’’ E, 2001 05 29, EU; **Rel. 78:** Kremnické vrchy, Podlavice, Mlynská, 19°05’02’’ N, 48°44’13’’ E, 2001 06 20, EU; **Rel. 79:** Veľká Fatra, Liptovská Osada, Javoriská, 19°16’03’’ N, 48°58’57’’ E, 1980 06 25, HR; **Rel. 80:** Kremnické vrchy, Králiky, 19°01’34’’ N, 48°43’60’’ E, 2001 06 19, EU; **Rel. 81:** Kremnické vrchy, Malachov, 19°05’09’’ N, 48°42’31’’ E, 2001 06 05, EU; **Rel. 82:** Starohorské vrchy, Korytnica, Baba, 19°17’00’’ N, 48°52’42’’ E, 1980 07 01, HR; **Rel. 83:** Kremnické vrchy, Malachov, 19°04’56’’ N, 48°42’41’’ E, 2001 06 04, EU; **Rel. 84:** Nízke Tatry, Korytnica, 19°16’55’’ N, 48°53’27’’ E, 2006 07 20, MJ; **Rel. 85:** Veľká Fatra, Vyšná Revúca, Suchá dolina , 19°09’11’’ N, 48°53’39’’ E, 1980 06 29, HR; **Rel. 86:** Starohorské vrchy, Donovaly, Somárska lúka, 19°13’20’’ N, 48°52’11’’ E, 2006 07 20, MJ; **Rel. 87:** Kremnické vrchy, Králiky, pod Ortutným, 19°01’46’’ N, 48°43’51’’ E, 2001 06 22, EU; **Rel. 88:** Kremnické vrchy, Suchý vrch,

Mútne, 19°03’00’’ N, 48°43’13’’ E, 2001 08 09, EU; **Rel. 89:** Kremnické vrchy, Malachov, 19°03’55’’ N, 48°42’28’’ E, 2001 06 14, EU; **Rel. 90:** Veľká Fatra, Dolný Harmanec, Bánik, 19°03’02’’ N, 48°48’40’’ E, 2006 06 14, EU; **Rel. 91:** Starohorské vrchy, Baláže, 19°11’25’’ N, 48°49’34’’ E, 2005 06 05, MJ, IŠ; **Rel. 92:** Veľká Fatra, Vyšná Revúca, Pilná dolina, 19°09’48’’ N, 48°54’49’’ E, 2006 08 08, MJ; **Rel. 93:** Nízke Tatry, Korytnica, 19°17’19’’ N, 48°52’11’’ E, 1980 07 01, HR; **Rel. 94:** Kremnické vrchy, Podlavica, Uhliská, 19°04’22’’ N, 48°43’57’’ E, 2001 06 25, EU; **Rel. 95:** Kremnické vrchy, Podlavica, Uhliská, 19°09’53’’ N, 48°56’08’’ E, 1982 07 02, HR; **Rel. 96:** Zvolenská kotlina, Badín, 19°05’05’’ N, 48°40’29’’ E, 2001 08 09, EU; **Rel. 97:** Zvolenská kotlina, Badín, 19°06’28’’ N, 48°40’05’’ E, 2002 06 17, EU; **Rel. 98:** Kremnické vrchy, Kraliky, Kvartová, 19°00’55’’ N, 48°44’28’’ E, 2001 08 07, EU; **Rel. 99:** Zvolenská kotlina, Badín, 19°05’04’’ N, 48°40’39’’ E, 2002 06 05, EU; **Rel. 100:** Starohorské vrchy, Panský diel, 19°09’39’’ N, 48°48’01’’ E, 2000 06 08, MJ; **Rel. 101:** Kremnické vrchy, Kraliky, Ruskov, 19°01’38’’ N, 48°43’60’’ E, 2001 06 14, EU; **Rel. 102:** Starohorské vrchy, Panský diel, 19°09’31’’ N, 48°48’07’’ E, 2006 08 05, MJ; **Rel. 103:** Kremnické vrchy, Malachov, 19°04’37’’ N, 48°42’24’’ E, 2001 05 28, EU; **Rel. 104:** Kremnické vrchy, Malachov, 19°03’59’’ N, 48°42’33’’ E, 2001 05 29, EU; **Rel. 105:** Starohorské vrchy, Králiky, 19°02’02’’ N, 48°43’57’’ E, 2001 06 22, EU; **Rel. 106:** Veľká Fatra, Liptovská Osada, 19°15’51’’ N, 48°58’19’’ E, 1980 06 25, HR; **Rel. 107:** Starohorské vrchy, Uľanka, 19°06’45’’ N, 48°47’40’’ E, 2002 05 28, EU; **Rel. 108:** Kremnické vrchy, Malachov, Pršany, 19°05’16’’ N, 48°42’18’’ E, 2001 06 06, EU; **Rel. 109:** Kremnické vrchy, Malachov, Pršany, 19°05’02’’ N, 48°42’20’’ E, 2001 06 06, EU; **Rel. 110:** Starohorské vrchy, Králiky, 19°01’57’’ N, 48°44’10’’ E, 2001 06 22, EU; **Rel. 111:** Veľká Fatra, Liptovské Revúce, Magura, 19°09’11’’ N, 48°54’39’’ E, 1982 07 02, HR; **Rel. 112:** Kremnické vrchy, Malachov, 19°04’48’’ N, 48°42’38’’ E, 2001 06 04, EU; **Rel. 113:** Starohorské vrchy, Králiky, 19°01’58’’ N, 48°44’04’’ E, 2001 06 22, EU; **Rel. 114:** Kremnické vrchy, Kraliky, 19°01’25’’ N, 48°44’04’’ E, 2001 06 19, EU; **Rel. 115:** Zvolenská kotlina, Laskomer, 19°07’52’’ N, 48°44’43’’ E, 2004 07 09, MJ; **Rel. 116:** Kremnické vrchy, Badín, 19°04’60’’ N, 48°41’27’’ E, 2002 06 05, EU; **Rel. 117:** Veľká Fatra, Liptovská Osada, 19°16’10’’ N, 48°58’36’’ E, 1980 06 25, HR; **Rel. 118:** Starohorské vrchy, Baláže, 19°11’25’’ N, 48°49’35’’ E, 2005 06 05, MJ; **Rel. 119:** Starohorské vrchy, Špania Dolina, 19°07’48’’ N, 48°48’00’’ E, 2004 06 18, EU; **Rel. 120:** Zvolenská kotlina, Badín, 19°06’34’’ N, 48°40’03’’ E, 2002 06 17, EU; **Rel. 121:** Veľká Fatra, Hornojelenská dolina , 19°04’38’’ N, 48°51’08’’ E, 2006 07 11, EU; **Rel. 122:** Starohorské vrchy, Riečka, 19°04’52’’ N, 48°45’32’’ E, 2001 05 22, MJ; **Rel. 123:** Zvolenská kotlina, Rakytovce, 19°07’11’’ N, 48°40’50’’ E, 2001 08 15, EU; **Rel. 124:** Kremnické vrchy, Malachov, 19°03’52’’ N, 48°42’45’’ E, 2001 05 29, EU; **Rel. 125:** Starohorské vrchy, Riečka, 19°04’33’’ N, 48°45’56’’ E, 2001 07 08, HR; **Rel. 126:** Kremnické vrchy, Malachov, 19°05’08’’ N, 48°42’43’’ E, 2001 06 04, EU; **Rel. 127:** Zvolenská kotlina, Jakub, 19°07’50’’ N, 48°45’54’’ E, 2004 09 10, EU; **Rel. 128:** Zvolenská kotlina, Badín, 19°06’20’’ N, 48°40’06’’ E, 2002 06 17, EU; **Rel. 129:** Starohorské vrchy, Ravasky, 19°06’38’’ N, 48°46’11’’ E, 2004 06 15, MJ; **Rel. 130:** Starohorské vrchy, Malý diel, 19°09’58’’ N, 48°47’56’’ E, 2004 08 17, MJ; **Rel. 131:** Zvolenská kotlina, Laskomer, 19°07’54’’ N, 48°44’43’’ E, 2002 06 12, EU; **Rel. 132:** Kremnické vrchy, Suchý vrch, Tajov, 19°04’03’’ N, 48°43’45’’ E, 2001 06 13, EU; **Rel. 133:** Zvolenská kotlina, Slovenská Ľupča, 19°16’24’’ N, 48°46’10’’ E, 2006 08 07, MJ; **Rel. 134:** Kremnické vrchy, Pršany, 19°05’30’’ N, 48°42’02’’ E, 2001 06 11, EU; **Rel. 135:** Kremnické vrchy, Malachov, Pršany, 19°05’03’’ N, 48°42’20’’ E, 2001 06 06, EU; **Rel. 136:** Kremnické vrchy, Suchý vrch, Tajov, 19°03’14’’ N, 48°43’34’’ E, 2001 06 20, EU; **Rel. 137:** Kremnické vrchy, Malachov, 19°05’43’’ N, 48°42’26’’ E, 2001 06 11, EU; **Rel. 138:** Veľká Fatra, Stredná Revúca, 19°10’50’’ N, 48°55’11’’ E, 2006 08 08, MJ; **Rel. 139:** Veľká Fatra, Turecká, 19°04’37’’ N, 48°51’08’’ E, 2006 07 12, MJ; **Rel. 140:** Starohorské vrchy, Tajovská chata, 19°01’08’’ N, 48°45’07’’ E, 2001 08 06, MJ; **Rel. 141:** Zvolenská kotlina, Medený Hámor, 19°08’02’’ N, 48°44’44’’ E, 2004 07 09, MJ; **Rel. 142:** Kremnické vrchy, Tajov, Brúsy, 19°03’49’’ N, 48°44’31’’ E, 2001 06 26, EU; **Rel. 143:** Kremnické vrchy, Malachov, 19°04’56’’ N, 48°42’26’’ E, 2001 06 04, EU; **Rel. 144:** Zvolenská kotlina, Badín, 19°06’02’’ N, 48°40’14’’ E, 2002 06 21, EU; **Rel. 145:** Zvolenská kotlina, Badín, 19°06’06’’ N, 48°40’12’’ E, 2002 06 21, EU; **Rel. 146:** Kremnické vrchy, Králiky, 19°01’29’’ N, 48°44’02’’ E, 2001 06 19, EU; **Rel. 147:** Kremnické vrchy, Tajov, Holý vŕšok, 19°03’20’’ N, 48°43’35’’ E, 2001 06 20, MJ; **Rel. 148:** Kremnické vrchy, Suchý vrch, Tajov, 19°03’26’’ N, 48°43’40’’ E, 2001 06 20, EU; **Rel. 149:** Veľká Fatra, Donovaly, 19°13’02’’ N, 48°52’53’’ E, 1999 07 01, HR; **Rel. 150:** Zvolenská kotlina, Malachov, 19°05’37’’ N, 48°42’46’’ E, 2001 05 29, EU; **Rel. 151:** Starohorské vrchy, Tajov, Brúsy , 19°03’34’’ N, 48°44’05’’ E, 2001 06 26, EU; **Rel. 152:** Kremnické vrchy, Malachov, 19°05’31’’ N, 48°42’50’’ E, 2001 05 30, EU; **Rel. 153:** Zvolenská kotlina, Skubín , 19°06’23’’ N, 48°44’09’’ E, 2004 06 10, MJ; **Rel. 154:** Starohorské vrchy, Špania Dolina, 19°08’00’’ N, 48°47’20’’ E, 2004 06 18, EU; **Rel. 155:** Kremnické vrchy, Tajov, Zadný háj, 19°04’11’’ N, 48°44’03’’ E, 2001 06 27, EU; **Rel. 156:** Starohorské vrchy, Riečka, 19°04’58’’ N, 48°45’27’’ E, 2000 05 17, MJ; **Rel. 157:** Starohorské vrchy, Riečka, 19°04’60’’ N, 48°45’19’’ E, 2001 05 23, MJ; **Rel. 158:** Kremnické vrchy, Malachov, 19°04’03’’ N, 48°42’30’’ E, 2001 05 28, EU; **Rel. 159:** Starohorské vrchy, Tajov,

Brúsy, 19°03’35’’ N, 48°44’10’’ E, 2001 06 26, EU; **Rel. 160:** Kremnické vrchy, Suchý vrch, 19°04’18’’ N, 48°43’18’’ E, 2001 06 27, EU; **Rel. 161:** Kremnické vrchy, Malachov, 19°05’37’’ N, 48°42’30’’ E, 2001 05 28, EU; **Rel. 162:** Kremnické vrchy, Malachov, Pršany, 19°05’28’’ N, 48°42’19’’ E, 2001 06 06, EU; **Rel. 163:** Kremnické vrchy, Malachov, Pršany, 19°05’35’’ N, 48°42’12’’ E, 2001 06 06, EU; **Rel. 164:** Veľká Fatra, Hiadeľ, Pod Príslopom, 19°18’15’’ N, 48°51’40’’ E, 2001 06 26, HR, #3; **Rel. 165:** Starohorské vrchy, Kordíky, Holé sedlo, 19°02’30’’ N, 48°46’23’’ E, 1998 06 28, HR, #3; **Rel. 166:** Starohorské vrchy, Riečka, Dedkovo, 19°04’00’’ N, 48°46’35’’ E, 1998 06 26, HR, #3; **Rel. 167:** Veľká Fatra, Motyčky, Biely potok, 19°09’20’’ N, 48°52’28’’ E, 1998 07 14, HR, #3; **Rel. 168:** Veľká Fatra, Donovaly, 19°13’32’’ N, 48°52’46’’ E, 2006 07 19, MJ; **Rel. 169:** Starohorské vrchy, Riečka, Dedkovo, 19°03’32’’ N, 48°46’15’’ E, 1998 06 28, HR, #3; **Rel. 170:** Starohorské vrchy, Hornojelenská dolina, 19°09’15’’ N, 48°51’00’’ E, 2001 06 19, HR; **Rel. 171:** Starohorské vrchy, Riečanské sedlo, 19°04’35’’ N, 48°46’15’’ E, 1998 06 28, HR, #3; **Rel. 172:** Starohorské vrchy, Hornojelenská dolina, 19°09’32’’ N, 48°50’50’’ E, 1992 07 09, HR, #3; **Rel. 173:** Starohorské vrchy, Riečka, Lučivno, 19°03’35’’ N, 48°46’22’’ E, 1998 06 28, HR, #3; **Rel. 174:** Veľká Fatra, Donovaly, 19°13’10’’ N, 48°52’55’’ E, 1998 06 25, HR, #3; **Rel. 175:** Starohorské vrchy, Tajov, Ortutnô, 19°02’30’’ N, 48°43’53’’ E, 2001 06 14, EU, #3; **Rel. 176:** Starohorské vrchy, pod Dedkovom, 19°04’28’’ N, 48°46’15’’ E, 1998 06 28, HR; **Rel. 177:** Starohorské vrchy, Riečka, Lučivno, 19°03’21’’ N, 48°46’08’’ E, 1998 06 26, HR, #3; **Rel. 178:** Starohorské vrchy, Riečka, Lučivno, 19°03’34’’ N, 48°46’17’’ E, 1998 06 26, HR, #3; **Rel. 179:** Veľká Fatra, Valentová, Prášnica, 19°07’58’’ N, 48°52’28’’ E, 2006 07 11, MJ; **Rel. 180:** Veľká Fatra, Turecká, 19°05’19’’ N, 48°50’55’’ E, 2006 07 12, MJ; **Rel. 181:** Veľká Fatra, Vyšné Revúce, 19°09’31’’ N, 48°54’42’’ E, 2006 08 08, MJ; **Rel. 182:** Starohorské vrchy, Hornojelenská dolina, 19°09’20’’ N, 48°51’00’’ E, 2001 06 26, HR; **Rel. 183:** Veľká Fatra, Vyšná Revúca, 19°09’37’’ N, 48°54’31’’ E, 1999 07 03, HR, #3; **Rel. 184:** Veľká Fatra, Donovaly, Sliačany, 19°13’05’’ N, 48°52’55’’ E, 1999 07 01, HR; **Rel. 185:** Starohorské vrchy, Donovaly, 19°09’20’’ N, 48°51’09’’ E, 1999 07 01, HR; **Rel. 186:** Veľká Fatra, Donovaly, 19°13’19’’ N, 48°52’56’’ E, 2006 07 19, MJ; **Rel. 187:** Starohorské vrchy, Tajov, Zaprávka, 19°02’54’’ N, 48°44’18’’ E, 2001 06 14, EU; **Rel. 188:** Starohorské vrchy, Tajov, Zaprávka, 19°03’35’’ N, 48°46’18’’ E, 2001 06 14, HR; **Rel. 189:** Starohorské vrchy, Riečka, Dedkovo, 19°04’50’’ N, 48°46’00’’ E, 1998 06 28, HR; **Rel. 190:** Veľká Fatra, Vyšná Revúca, 19°09’46’’ N, 48°54’40’’ E, 2006 08 08, MJ; **Rel. 191:** Zvolenská kotlinay, Skubín, 19°06’13’’ N, 48°44’06’’ E, 1998 07 04, MJ; **Rel. 192:** Starohorské vrchy, Riečka, Dedkovo, 19°04’02’’ N, 48°46’37’’ E, 1998 06 28, HR; **Rel. 193:** Veľká Fatra, Donovaly, Sliačany, 19°12’10’’ N, 48°52’20’’ E, 1998 06 26, HR; **Rel. 194:** Veľká Fatra, Donovaly, Zvolen Hill, 19°15’10’’ N, 48°55’00’’ E, 1992 07 02, HR, #3; **Rel. 195:** Starohorské vrchy, Donovaly, Hrubý vrch, 19°12’30’’ N, 48°51’12’’ E, 1990 07 09, HR, #3; **Rel. 196:** Veľká Fatra, Revúcke podolie, 19°15’35’’ N, 48°53’40’’ E, 1982 07 01, HR, #3; **Rel. 197:** Veľká Fatra, Rybô, 19°07’30’’ N, 48°52’10’’ E, 1990 07 14, HR, #3; **Rel. 198:** Starohorské vrchy, Panský diel, 19°09’33’’ N, 48°48’02’’ E, 2000 06 08, MJ; **Rel. 199:** Veľká Fatra, Turecká, 19°04’39’’ N, 48°51’03’’ E, 2006 07 12, MJ; **Rel. 200:** Starohorské vrchy, Hornojelenská dolina, 19°09’02’’ N, 48°51’10’’ E, 1998 06 25, HR, #3; **Rel. 201:** Starohorské vrchy, Motyčky, Bukovská dolina, 19°11’30’’ N, 48°50’55’’ E, 2001 06 26, HR, #3; **Rel. 202:** Kremnické vrchy, Kordiky, 19°01’11’’ N, 48°46’38’’ E, 1988 07 07, HR; **Rel. 203:** Veľká Fatra, Korytnica, 19°15’10’’ N, 48°54’50’’ E, 1980 06 30, HR; **Rel. 204:** Veľká Fatra, Turecká, 19°04’36’’ N, 48°51’07’’ E, 2006 07 11, EU; **Rel. 205:** Veľká Fatra, Valentová, Prášnica, 19°07’59’’ N, 48°52’23’’ E, 1988 07 14, HR; **Rel. 206:** Veľká Fatra, Donovaly, Motyčkova hoľa, 19°11’52’’ N, 48°53’02’’ E, 1988 07 11, HR; **Rel. 207:** Starohorské vrchy, Staré Hory, 19°06’49’’ N, 48°50’25’’ E, 1998 06 26, HR; **Rel. 208:** Veľká Fatra, Korytnica, Žarnovka, 19°15’41’’ N, 48°53’24’’ E, 1980 07 01, HR; **Rel. 209:** Starohorské vrchy, Donovaly, Štubne, 19°10’53’’ N, 48°51’43’’ E, 1998 06 25, HR; **Rel. 210:** Veľká Fatra, Jelenská dolina, Rybô, 19°07’15’’ N, 48°52’10’’ E, 1988 07 11, HR; **Rel. 211:** Starohorské vrchy, Kordíky, 19°02’29’’ N, 48°46’35’’ E, 2001 05 29, MJ; **Rel. 212:** Veľká Fatra, Donovaly, 19°13’30’’ N, 48°52’50’’ E, 1998 06 25, HR, #3; **Rel. 213:** Veľká Fatra, Revúcke podolie, 19°14’40’’ N, 48°54’30’’ E, 1992 07 01, HR, #3; **Rel. 214:** Starohorské vrchy, Donovaly, Štubne, 19°10’38’’ N, 48°51’39’’ E, 1998 06 25, HR, #3; **Rel. 215:** Veľká Fatra, Revúcke podolie, Veľká Bzdová, 19°15’10’’ N, 48°54’25’’ E, 1992 07 02, HR, #3; **Rel. 216:** Veľká Fatra, Revúcke podolie, 19°15’30’’ N, 48°55’00’’ E, 1999 07 03, HR, #3; **Rel. 217:** Starohorské vrchy, Tajov, 19°04’35’’ N, 48°44’33’’ E, 2004 05 13, EU; **Rel. 218:** Veľká Fatra, Donovaly, 19°13’27’’ N, 48°52’46’’ E, 1999 07 01, HR; **Rel. 219:** Starohorské vrchy, Donovaly, Štubne, 19°10’30’’ N, 48°51’35’’ E, 1999 07 03, HR, #3; **Rel. 220:** Veľká Fatra, Donovaly, Mackova dolina, 19°11’25’’ N, 48°52’50’’ E, 1990 07 11, HR, #3; **Rel. 221:** Veľká Fatra, Korytnická dolina, 19°15’21’’ N, 48°54’01’’ E, 1980 07 01, HR; **Rel. 222:** Starohorské vrchy, Motyčky, Bukovská dolina, 19°11’40’’ N, 48°50’50’’ E, 1998 06 25, HR, #3; **Rel. 223:** Starohorské vrchy, Motyčky, Bukovská dolina, 19°10’28’’ N, 48°51’22’’ E, 1998 07 09, HR, #3; **Rel. 224:** Veľká Fatra, Liptovská osada, Kopiská, 19°15’08’’ N, 48°55’15’’ E, 1982 07 01, HR; **Rel. 225:** Veľká Fatra, Nižná Revúca, 19°13’03’’ N, 48°55’30’’ E, 1980 07 02, HR; **Rel. 226:** Veľká Fatra, Korytnická dolina, 19°15’12’’ N, 48°54’59’’ E, 1980 07 01, HR; **Rel. 227:**

Starohorské vrchy, Donovaly, 19°11’50” N, 48°51’37” E, 1999 07 03, HR, #3; **Rel. 228:** Veľká Fatra, Liptovské Revúce, VeľkáTurecká, 19°09’59” N, 48°55’55” E, 1982 07 02, HR; **Rel. 229:** Kremnické vrchy, Kordíky, 19°01’20” N, 48°46’28” E, 1998 06 28, HR; **Rel. 230:** Starohorské vrchy, Kordíky, 19°02’30” N, 48°46’38” E, 2002 07 08, MJ; **Rel. 231:** Veľká Fatra, Liptovská Osada, 19°15’47” N, 48°54’57” E, 2006 07 20, MJ; **Rel. 232:** Starohorské vrchy, Podkonice, Pleše, 19°14’06” N, 48°49’10” E, 2005 06 28, EU; **Rel. 233:** Veľká Fatra, Korytnická dolina, 19°15’21” N, 48°54’15” E, 1980 07 01, HR; **Rel. 234:** Starohorské vrchy, Králiky, 19°01’59” N, 48°43’56” E, 2001 06 22, EU; **Rel. 235:** Kremnické vrchy, Králiky, 19°01’29” N, 48°44’03” E, 2001 06 19, EU; **Rel. 236:** Starohorské vrchy, Panský diel, 19°09’10” N, 48°47’49” E, 2004 08 24, MJ; **Rel. 237:** Veľka Fatra, Nižná Revúca, 19°13’12” N, 48°55’12” E, 1980 07 02, HR; **Rel. 238:** Starohorské vrchy, Panský diel, 19°09’01” N, 48°48’09” E, 2001 06 13, MJ; **Rel. 239:** Starohorské vrchy, Panský diel, 19°09’16” N, 48°47’55” E, 2004 08 24, MJ.

Table 4 – Rel. 1: Kremnické vrchy, Králiky, Stádlo, 19°01’20” N, 48°44’13” E, 2001 08 07, EU; **Rel. 2:** Starohorské vrchy, Riečka, 19°04’09” N, 48°45’20” E, 2002 05 21, MJ; **Rel. 3:** Kremnické vrchy, Malachov, Pršany, 19°05’02” N, 48°42’17” E, 2001 06 06, EU; **Rel. 4:** Starohorské vrchy, Králiky, 19°02’03” N, 48°44’09” E, 2001 06 22, EU; **Rel. 5:** Starohorské vrchy, Králiky, 19°02’03” N, 48°44’07” E, 2001 06 22, EU; **Rel. 6:** Kremnické vrchy, Králiky, 19°01’37” N, 48°43’58” E, 2001 06 19, EU; **Rel. 7:** Starohorské vrchy, Králiky, 19°02’02” N, 48°44’08” E, 2001 06 22, EU; **Rel. 8:** Kremnické vrchy, Králiky, 19°01’27” N, 48°44’00” E, 2001 06 19, EU; **Rel. 9:** Zvolenská kotlina, Badín, 19°06’28” N, 48°40’11” E, 2002 06 21, EU; **Rel. 10:** Kremnické vrchy, Podlavice, Uhliská, 19°04’25” N, 48°43’57” E, 2001 06 25, EU; **Rel. 11:** Starohorské vrchy, Králiky, 19°02’04” N, 48°44’07” E, 2001 06 22, EU; **Rel. 12:** Kremnické vrchy, Suchý vrch, 19°04’09” N, 48°43’16” E, 2001 06 27, EU; **Rel. 13:** Kremnické vrchy, Suchý vrch, 19°04’05” N, 48°43’30” E, 2002 06 20, EU; **Rel. 14:** Zvolenská kotlina, Badín, 19°05’42” N, 48°40’26” E, 2002 06 17, EU; **Rel. 15:** Kremnické vrchy, Suchý vrch, 19°04’11” N, 48°43’16” E, 2001 06 27, EU; **Rel. 16:** Starohorské vrchy, Tajov, Predné, 19°03’39” N, 48°44’48” E, 2001 06 15, EU; **Rel. 17:** Starohorské vrchy, Králiky, Stádlo, 19°01’23” N, 48°44’19” E, 2001 08 07, EU; **Rel. 18:** Kremnické vrchy, Suchý vrch, 19°04’21” N, 48°43’20” E, 2001 06 27, EU; **Rel. 19:** Starohorské vrchy, Baláže, 19°10’53” N, 48°49’49” E, 2005 06 24, MJ; **Rel. 20:** Starohorské vrchy, Baláže, 19°10’54” N, 48°49’48” E, 2005 06 24, MJ; **Rel. 21:** Starohorské vrchy, Šachtičky, 19°09’34” N, 48°48’06” E, 2002 05 31, MJ; **Rel. 22:** Kremnické vrchy, Suchý vrch, 19°04’24” N, 48°43’18” E, 2001 06 27, EU; **Rel. 23:** Starohorské vrchy, Šachtičky, 19°03’36” N, 48°48’05” E, 2002 05 31, MJ; **Rel. 24:** Starohorské vrchy, Tajov - Predné, 19°03’39” N, 48°44’48” E, 2001 06 15, EU; **Rel. 25:** Kremnické vrchy, Suchý vrch, 19°04’10” N, 48°43’30” E, 2002 07 10, MJ; **Rel. 26:** Kremnické vrchy, Podlavice, Uhliská, 19°04’27” N, 48°43’56” E, 2002 06 20, EU; **Rel. 27:** Starohorské vrchy, Tajov, 19°03’12” N, 48°45’27” E, 2002 06 30, MJ; **Rel. 28:** Kremnické vrchy, Suchý vrch, 19°04’10” N, 48°43’30” E, 2002 07 10, MJ; **Rel. 29:** Starohorské vrchy, Riečka, 19°04’12” N, 48°45’19” E, 2002 05 21, MJ, HP; **Rel. 30:** Zvolenská kotlina, Laskomerská dolina, 19°06’25” N, 48°45’14” E, 2002 07 05, MJ; **Rel. 31:** Starohorské vrchy, Tajov, 19°03’15” N, 48°45’30” E, 2002 05 16, MJ; **Rel. 32:** Starohorské vrchy, Tajov, 19°03’13” N, 48°45’30” E, 2002 06 30, MJ.

Appendix D: Overview of species that are diagnostic of associations at regional level (•), at national level (○), or at both levels (⊙)

Anhang D: Übersicht der diagnostischen Arten von Assoziationen auf regionaler Ebene (•), auf nationaler Ebene (○) sowie auf beiden Ebenen (⊙)

1 *Orthantho luteae-Caricetum humilis*, 2 *Scabioso ochroleucae-Brachypodietum pinnati*, 3 *Carici albae-Brometum monocladi*, 4 *Brachypodio pinnati-Molinietum arundinaceae*, 5 *Onobrychido viciifoliae-Brometum erecti* (all *Festuco-Brometea*), 6 *Lolio perennis-Cynosuretum cristati*, 7 *Pastinaco sativae-Arrhenatheretum elatioris*, 8 *Poo-Trisetetum flavescentis*, 9 *Anthoxantho odorati-Agrostietum tenuis*, 10 *Ranunculo bulbosi-Arrhenatheretum elatioris*, 11 *Lilio bulbiferi-Arrhenatheretum elatioris*, 12 *Campanulo glomeratae-Geranietum sylvatici* (all *Molinio-Arrhenatheretea*), 13 *Violo sudeticae-Agrostietum capillaris* (*Nardetea stricae*).

Association	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Sum of •	9	15	8	7	13	3	3	11	15	7	10	16	3
Sum of ○	15	4	13	10	1	1	4	1	1	2	11	9	18
Sum of ⊙	9	9	22	12	5	3	0	1	3	6	13	17	5
% of ⊙ in (• plus ⊙)	50	38	73	63	28	50	0	8	17	46	57	50	63
% of matched relevés	7	53	31	96	83	44	24	32	81	31	83	42	9
Acetosa pratensis									•				
Acinos alpinus			○										
Acosta rhenana		•											
Agrimonia eupatoria		⊙			•								
Agrostis capillaris									•		○		○
Allium oleraceum			○										
Anemone ranunculoides											•		
Antennaria dioica													○
Anthericum ramosum	⊙		⊙										
Anthoxanthum odoratum									•				
Anthriscus sylvestris								•					
Anthyllis vulneraria	○		⊙								○	○	
Aquilegia vulgaris			○								⊙	○	
Arabis hirsuta			○								•		
Arrhenatherum elatius					○		○			⊙	⊙	○	
Asperula cynanchica	⊙	⊙											
Avenella flexuosa													○
Avenula praeusta													○
Avenula pubescens									•	•			
Bellis perennis						⊙							
Betonica officinalis				⊙									
Brachypodium pinnatum	○	⊙	⊙	⊙	•								
Briza media									•				
Bromus erectus		•	○	○	⊙								
Bromus monocladus	○		⊙								○		
Buphthalmum salicifolium			⊙										
Bupleurum falcatum	•												
Campanula glomerata				○							⊙	⊙	
Campanula patula								⊙	•				
Campanula persicifolia				•									
Campanula rapunculoides							•						
Campanula rotundifolia agg.		•											
Campanula serrata											⊙	⊙	⊙
Carduus glaucinus			•								•		
Carex alba			○										
Carex caryophyllea		•											
Carex humilis	⊙												
Carex michelii		•	⊙		•								
Carex montana			⊙	⊙									
Carex pilulifera													○
Carex tomentosa			⊙										

Association	1	2	3	4	5	6	7	8	9	10	11	12	13
Carlina acaulis				⊙							⊙	○	○
Carlina vulgaris	•	⊙											
Carum carvi								•					
Chaerophyllum aromaticum								•					
Chamaecytisus supinus				○									
Cirsium acaule		○											
Cirsium erisithales												⊙	
Cirsium pannonicum			⊙										
Colchicum autumnale											○	⊙	
Colymbada scabiosa	⊙		○										
Crepis alpestris											○		
Crepis biennis							○					•	
Crepis mollis												•	
Crepis praemorsa				○									
Crocus discolor												⊙	
Cruciata glabra												•	
Cuscuta epithymum													
Cynosurus cristatus						⊙							
Dactylis glomerata								•		•		•	
Danthonia decumbens									•				
Daucus carota										⊙			
Dianthus carthusianorum			○		•					⊙	⊙	○	
Dianthus deltoides									•				○
Falcaria vulgaris		•											
Festuca rubra								•	•				
Festuca rupicola	○	⊙			⊙					•			
Filipendula vulgaris				⊙									
Fragaria vesca											•		
Galium mollugo agg.												•	
Galium verum		•											
Genista pilosa		⊙											
Gentiana cruciata			○								⊙		
Geranium sylvaticum												⊙	
Globularia punctata	⊙		⊙										
Gymnadenia conopsea													○
Helianthemum ovatum	•		•										
Heracleum sphondylium												•	
Hippocrepis comosa	⊙		⊙										
Hypericum maculatum												•	⊙
Hypericum perforatum				•									
Hypochaeris radicata									•				
Inula ensifolia			•										
Inula salicina			⊙										
Jacea phrygia agg.											○	⊙	
Knautia arvensis					•							⊙	
Knautia kitaibelii	○		⊙									○	
Knautia maxima												•	
Koeleria pyramidata agg.	○			○									
Lathyrus latifolius				⊙									
Leontodon autumnalis						○							
Leontodon hispidus										○		⊙	
Leontodon incanus	⊙												
Leucanthemum vulgare									•	•			
Lilium bulbiferum											⊙	⊙	
Linum catharticum		○											
Linum flavum	•												
Linum tenuifolium	○												
Lolium perenne						⊙							
Lotus corniculatus										•			
Luzula campestris agg.									•				

Association	1	2	3	4	5	6	7	8	9	10	11	12	13
Luzula luzuloides												•	⊙
Medicago falcata				•	⊙								
Medicago lupulina											•		
Melampyrum cristatum				○									
Nardus stricta									•				○
Onobrychis viciifolia				⊙	⊙								
Ononis spinosa		⊙											
Ophrys insectifera	○												
Orchis militaris	○												
Orthantha lutea	○												
Phleum hirsutum												•	•
Phyteuma orbiculare											•		
Phyteuma spicatum								•				•	
Picris hieracioides		•											
Pilosella bauhinii			•										
Pilosella officinarum													○
Pimpinella major				⊙								⊙	
Pimpinella saxifraga					•								
Plantago lanceolata										•	•		
Plantago major						•							
Plantago media											○		
Poa chaixii													○
Poa pratensis agg.							•						
Polygala amara subsp. *brachyptera*			○										
Polygala major	○				•								
Polygala vulgaris									⊙			⊙	
Polygonatum odoratum			⊙										
Potentilla alba				○									
Potentilla anserina						•							
Potentilla arenaria agg.	•												
Potentilla aurea													⊙
Potentilla heptaphylla	○		⊙										
Potentilla thuringiaca											○		
Primula acaulis											○		
Primula elatior												⊙	
Primula veris			⊙	⊙	•								
Prunella grandiflora	○		•										
Prunella laciniata		•											
Pseudolysimachion orchideum					•								
Pseudolysimachion spicatum	•												
Pyrethrum clusii												⊙	
Pyrethrum corymbosum			•	•								○	
Ranunculus bulbosus										⊙			
Ranunculus nemorosus											•		
Ranunculus polyanthemos				○								•	•
Ranunculus pseudomontanus													•
Rhinanthus minor											•		
Rhinanthus serotinus			○								⊙		
Salvia pratensis			⊙	⊙	⊙					⊙			
Salvia verticillata		○	⊙		•								
Sanguisorba minor	○	○	⊙								⊙		
Scabiosa ochroleuca	•	⊙											
Scorzonera hispanica				•									
Securigera varia		○			•								
Seseli annuum	•	•											
Silene dioica												•	
Silene nemoralis											○	○	
Silene nutans											•		○
Silene vulgaris			○								⊙	⊙	

Association	1	2	3	4	5	6	7	8	9	10	11	12	13
Stellaria graminea												•	○
Taraxacum sect. *Ruderalia*							•	•					
Teucrium chamaedrys	⊙	⊙	⊙										
Teucrium montanum		•											
Thesium linophyllon	⊙	•		•									
Thlaspi caerulescens													○
Thlaspi perfoliatum										•			
Thymus praecox	○												
Thymus pulegioides									⊙				○
Tithymalus cyparissias	•	•	•	•									
Tithymalus tommasinanus													
Tragopogon orientalis				○			○				⊙	⊙	
Trifolium dubium						•				○			
Trifolium montanum			○	⊙	•				○		⊙	○	
Trifolium pratense								•					
Trifolium repens								•	•				
Trifolium rubens				○									
Trisetum flavescens							○	○		⊙	○	⊙	
Trommsdorfia maculata			⊙	⊙									○
Veronica officinalis													⊙
Vicia cracca								•				•	
Vicia hirsuta		•											
Vicia sepium												•	
Vincetoxicum hirundinaria			•										
Viola canina									⊙				○
Viola collina		•											
Viola hirta			⊙	○	•								
Viola lutea													○
Viola tricolor								•					

References

Baláž, D. (1991): Fytocenologický a floristický výskum projektovanej ŠPR Mačková v Nízkych Tatrách (Phytosociological and floristic research in the projected state nature reserve Mačková in the Nízke Tatry Mts.) [In Slovak]. – Diplom thesis, Comenius University, Bratislava: 54 pp.

Braun-Blanquet, J. (1964): Pflanzensoziologie. Grundzüge der Vegetationskunde. 3rd ed. – Springer, Wien: XIV + 865 pp.

Bruelheide, H. (1995): Die Grünlandgesellschaften des Harzes und ihre Standortsbedingungen. Mit einem Beitrag zum Gliederungsprinzip auf der Basis von statistisch ermittelten Artengruppen. – Diss. Bot. 244: 338 pp. Cramer, Berlin.

– (1997): Using formal logic to classify communities. – Folia Geobot. Phytotaxon. 32: 41–46. Praha.

– (2000): A new measure of fidelity and its application to defining species groups. – J. Veg. Sci. 11: 167–178. Uppsala.

– & Chytrý, M. (2000): Towards unification of national vegetation classification: a comparison of two methods for analysis of large datasets. – J. Veg. Sci 11: 295–306. Uppsala.

Chytrý, M. (2007) [Ed.]: Vegetace České republiky. 1. Travinná a keřičková vegetace (Vegetation of the Czech Republic. 1. Grassland and Heathland Vegetation) [in Czech, with English summary]. – Academia, Praha: 526 pp.

–, Tichý, L., Holt, J. & Botta-Dukát, Z. (2002): Determination of diagnostic species with statistical fidelity measures. – J. Veg. Sci. 13: 79–90. Uppsala.

Dengler, J., Chytrý, M. & Ewald, J. (2008): Phytosociology. – In: Jørgensen, S. E., Fath, B. D. [Eds.]: Encyclopedia of Ecology: 2767–2779, Elsevier, Oxford.

Diekmann, M. (1997): The differentiation of alliances in South Sweden. – Folia Geobot. Phytotaxon. 32: 193–205. Praha.

Dítě, D., Hájek, M. & Hájková, P. (2007): Formal definitions of Slovak mire plant associations and their application in regional research. – Biologia 62: 400–408. Bratislava.

Džatko, M., Masat, K. & Cambel, B. (1989): Agroklimatické regióny SR (Agroclimatic regions of the Slovak Republic) [In Slovak]. – VCPÚ-ÚPVR, Bratislava: 123pp.

Ellenberg, H., Weber, H. E., Düll, R., Wirth, W., Werner, W. & Paulißen, D. (1992): Zeigerwerte von Pflanzen in Mitteleuropa. 2nd ed. – Scr. Geobot. 18: 258 pp. Goltze, Göttingen.

Futák, J. (1943): Kremnické hory (Kremnické hory Mts.) [In Slovak]. – Matica slovenská, Martin: 112 pp.

Grebenščikov, O. (1956) [Ed.]: Hole južnej časti Veľkej Fatry (Hills of the southern part of the Veľká Fatra Mts.) [In Slovak]. – Vydavate stvo SAV, Bratislava: 252 pp.

Hájek, M. & Háberová, I. (2001): *Scheuchzerio-Caricetea fuscae*. – In: Valachovi , M. [Ed.]: Rastlinné spolo enstvá Slovenska. 3. Vegetácia mokradí. (Plant communities of Slovakia 3. Wetland vegetation) [In Slovak]: 185–273. Veda, Bratislava.

Hájková, P. (2007a): *Calthion palustris* Tüxen 1937. – In: Janišová, M., Hájková, P., Hegedüšová, K., Hrivnák, R., Kliment, J., Michálková, D., Ružičková, H., ezníčková, M., Tichý, L., Škodová, I., Uhliarová, E., Ujházy, K & Zaliberová, M.: Travinnobylinná vegetácia Slovenska – elektronický expertný systém na identifikáciu syntaxónov (Grassland vegetation of Slovakia – electronic expert system for identification of syntaxa) [In Slovak]: 134–162. Botanický ústav SAV, Bratislava.

– (2007b): *Deschampsion cespitosae* Horvati 1930. – In: Janišová, M., Hájková, P., Hegedüšová, K., Hrivnák, R., Kliment, J., Michálková, D., Ružičková, H., ezníčková, M., Tichý, L., Škodová, I., Uhliarová, E., Ujházy, K & Zaliberová, M.: Travinnobylinná vegetácia Slovenska – elektronický expertný systém na identifikáciu syntaxónov (Grassland vegetation of Slovakia – electronic expert system for identification of syntaxa) [In Slovak]: 166–180. Botanický ústav SAV, Bratislava.

Hegedüšová, K. & Ružičková, H. (2007): *Polygono bistortae-Trisetion flavescentis* Br.-Bl. et Tüxen ex Marshall 1947. – In: Janišová, M., Hájková, P., Hegedüšová, K., Hrivnák, R., Kliment, J., Michálková, D., Ružičková, H., ezníčková, M., Tichý, L., Škodová, I., Uhliarová, E., Ujházy, K & Zaliberová, M.: Travinnobylinná vegetácia Slovenska – elektronický expertný systém na identifikáciu syntaxónov (Grassland vegetation of Slovakia – electronic expert system for identification of syntaxa) [In Slovak]: 118–130. Botanický ústav SAV, Bratislava.

Hobohm, C. (2005): Was sind Biodiversity Hotspots – global, regional, lokal? – Tuexenia 25: 379–386. Göttingen.

Hrivnák, R., Hájek, M., Blanár, D., Kochjarová, J. & Hájková, P. (2008): Mire vegetation of the Muránska Planina Mts – formalised classification, ecology, main environmental gradient and influence of geographical position. – Biologia 63: 368–377. Bratislava.

Jandt, U. (1999): Kalkmagerrasen am Südharzrand und im Kyffhäuser. Gliederung im überregionalen Kontext, Verbreitung, Standortverhältnisse und Flora. – Diss. Bot. 322: 246 pp. Cramer, Berlin.

Janišová, M. (1995): Príspevok k flóre a vegetácii Baranova (Contribution on the flora and vegetation of Baranovo) [In Slovak]. – Nat. Tutela 3: 181–190. Liptovský Mikuláš.

– (Ed.) (2007): Travinnobylinná vegetácia Slovenska – elektronický expertný systém na identifikáciu syntaxónov (Grassland vegetation of Slovakia – electronic expert system for identification of syntaxa) [In Slovak]. – Botanický ústav SAV, Bratislava: 263 pp.

– (2009): Travinnobylinná vegetácia JZ časti Národného parku Nízke Tatry (Grassland vegetation in the south-western part of the Nízke Tatry Mts.) [In Slovak]. – Príroda Nízkych Tatier 2: 115–124. Banská Bystrica.

– & Uhliarová, E. (2008): *Brachypodio pinnati-Molinietum arundinaceae* Klika 1939 v Starohorských vrchoch (*Brachypodio pinnati-Molinietum arundinaceae* Klika 1939 in the Starohorské vrchy Mts.) [In Slovak]. – Bull. Slov. Bot. Spoločn. 30: 227–238. Bratislava.

–, –, Hlásny, T. & Turisová, I. (2010): Vegetation – environment relationships in grasland communities of central Slovakia. – Tuexenia 30: 423–443. Göttingen.

Jurko, A. (1970): Weidegesellschaften des Kremnitzer Gebirges, Slowakei. – Folia Geobot. Phytotaxon. 5: 117–132. Praha.

Kochjarová, J. (1997): Poznámky k rozšíreniu, cenológii a ohrozenosti populácií zástupcov rodu *Tephroseris* (Rchb.) Rchb. na Slovensku I. (Notes on distribution, coenology and vulnerability of species of the genus *Tephroseris* (Rchb.) Rchb. in Slovakia I.) [In Slovak]. – Bull. Slov. Bot. Spoločn. 19: 50–61. Bratislava.

Knollová, I. & Chytrý, M. (2004): Oak-hornbeam forests of the Czech Republic: geographical and ecological approaches to vegetation classification. – Preslia 76: 291–311. Praha.

–, –, Tichý, L. & Hájek, O. (2006): Local ranges of phytosociological associations: are they reflected in numerical classification? – Biologia 61: 71–77. Bratislava.

Kuželová, I. & Chytrý, M. (2004): Interspecific associations in phytosociological data sets: how do they change between local and regional scale? – Plant Ecol. 173: 247–257. Dordrecht.

MARHOLD, K. & HINDÁK, F. (1998): Zoznam nižších a vyšších rastlín Slovenska. (Checklist of non-vascular plants and vascular plants of Slovakia) [In Slovak]. – VEDA, Bratislava: 687 pp.

MCCUNE, B. & MEFFORD, M. J. (1999): PC-ORD. Multivariate analysis of ecological data. Version 4. – MjM Software Design, Gleneden Beach: 237 pp.

MICHÁLKOVÁ, D. (2007): *Festucion valesiacae* Klika 1931. – In: JANIŠOVÁ, M., HÁJKOVÁ, P., HEGEDÜŠOVÁ, K., HRIVNÁK, R., KLIMENT, J., MICHÁLKOVÁ, D., RUŽIČKOVÁ, H., EZNÍČKOVÁ, M., TICHÝ, L., ŠKODOVÁ, I., UHLIAROVÁ, E., UJHÁZY, K & ZALIBEROVÁ, M.: Travinnobylinná vegetácia Slovenska – elektronický expertný systém na identifikáciu syntaxónov (Grassland vegetation of Slovakia – electronic expert system for identification of syntaxa) [In Slovak]: 33–49. Botanický ústav SAV, Bratislava.

MUCINA, L. & MAGLOCKÝ, Š. (1985) [Eds.]: A list of vegetation units of Slovakia. – Doc. Phytosociol. N. S. 9: 175–200. Camerino.

NOBLE, I. R. (1987): The role of expert systems in vegetation science. – Vegetatio 69: 115–121. Dordrecht.

OŤAHELOVÁ, H., HRIVNÁK, R. & VALACHOVIČ, M. (2001): *Phragmito-Magnocaricetea.* – In: VALACHOVIČ, M. [Ed.]: Rastlinné spoločenstvá Slovenska. 3. Vegetácia mokradí. (Plant communities of Slovakia 3. Wetland vegetation) [In Slovak]: 51–183. Veda, Bratislava.

RUŽIČKOVÁ, H. (2002): Species-rich meadows of the Starohorské vrchy Mts and the south-eastern part of the Veľká Fatra Mts – relict of the extensive and semiintensive agriculture of the Central Western Carpatians. – Biologia 57: 493–504. Bratislava.

SILLINGER, P. (1933): Monografická studie o vegetaci Nízkych Tater (Monograph on the vegetation of the Nízke Tatry Mts.) [In Czech]. – Orbis, Praha: 339 pp.

ŠKODOVÁ, I. (2007a): *Bromion erecti* Koch 1926. – In: JANIŠOVÁ, M., HÁJKOVÁ, P., HEGEDÜŠOVÁ, K., HRIVNÁK, R., KLIMENT, J., MICHÁLKOVÁ, D., RUŽIČKOVÁ, H., EZNÍČKOVÁ, M., TICHÝ, L., ŠKODOVÁ, I., UHLIAROVÁ, E., UJHÁZY, K & ZALIBEROVÁ, M.: Travinnobylinná vegetácia Slovenska – elektronický expertný systém na identifikáciu syntaxónov (Grassland vegetation of Slovakia – electronic expert system for identification of syntaxa) [In Slovak]: 71–78. Botanický ústav SAV, Bratislava.

ŠKODOVÁ, I. (2007b): *Cirsio-Brachypodion pinnati* Hadač et Klika ex Klika 1951. – In: JANIŠOVÁ, M., HÁJKOVÁ, P., HEGEDÜŠOVÁ, K., HRIVNÁK, R., KLIMENT, J., MICHÁLKOVÁ, D., RUŽIČKOVÁ, H., EZNÍČKOVÁ, M., TICHÝ, L., ŠKODOVÁ, I., UHLIAROVÁ, E., UJHÁZY, K & ZALIBEROVÁ, M.: Travinnobylinná vegetácia Slovenska – elektronický expertný systém na identifikáciu syntaxónov (Grassland vegetation of Slovakia – electronic expert system for identification of syntaxa) [In Slovak]: 78–86. Botanický ústav SAV, Bratislava.

TER BRAAK, C. J. F. & ŠMILAUER, P. (2002): CANOCO reference manual and CanoDraw for Windows user's guide: software for canonical community ordination. Version 4.5. – Microcomputer Power, Ithaca, New York: 500 pp.

TICHÝ, L. (2002): JUICE, software for vegetation classification. – J. Veg. Sci. 13: 451–453. Uppsala.

– (2005): New similarity indices for the assignment of relevés to the vegetation units of an existing phytosociological classification. – Plant Ecol. 179: 67–72. Dordrecht.

UJHÁZY, K. (2007): *Violion caninae* Swickerath 1944. – In: JANIŠOVÁ, M., HÁJKOVÁ, P., HEGEDÜŠOVÁ, K., HRIVNÁK, R., KLIMENT, J., MICHÁLKOVÁ, D., RUŽIČKOVÁ, H., EZNÍČKOVÁ, M., TICHÝ, L., ŠKODOVÁ, I., UHLIAROVÁ, E., UJHÁZY, K & ZALIBEROVÁ, M.: Travinnobylinná vegetácia Slovenska – elektronický expertný systém na identifikáciu syntaxónov (Grassland vegetation of Slovakia – electronic expert system for identification of syntaxa) [In Slovak]: 223–230. Botanický ústav SAV, Bratislava.

– & KLIMENT, J. (2007): *Nardo strictae-Agrostion tenuis* Sillinger 1933. – In: JANIŠOVÁ, M., HÁJKOVÁ, P., HEGEDÜŠOVÁ, K., HRIVNÁK, R., KLIMENT, J., MICHÁLKOVÁ, D., RUŽIČKOVÁ, H., EZNÍČKOVÁ, M., TICHÝ, L., ŠKODOVÁ, I., UHLIAROVÁ, E., UJHÁZY, K & ZALIBEROVÁ, M.: Travinnobylinná vegetácia Slovenska – elektronický expertný systém na identifikáciu syntaxónov (Grassland vegetation of Slovakia – electronic expert system for identification of syntaxa) [In Slovak]: 202–223. Botanický ústav SAV, Bratislava.

–, UHLIAROVÁ, E., KOCHJAROVÁ, J., RUŽIČKOVÁ, H., BLANÁR, D. & KLIMENT, J. (2007): Spoločenstvá podhorských trávnych porastov NP Muránska planina (Submontane grassland communities in the Muránska planina National park) [In Slovak]. – Reussia 4: 107–146. Revúca.

VALACHOVIČ, M. (2001) [Ed.]: Rastlinné spoločenstvá Slovenska. 3. Vegetácia mokradí. (Plant communities of Slovakia 3. Wetland vegetation) [In Slovak]. – Veda, Bratislava: 434 pp.

Monika Janišová
Institute of Botany, Slovak Academy of Sciences
Ďumbierska 1
974 11 Banská Bystrica, SLOVAKIA
monika.janisova@savba.sk

Eva Uhliarová
Faculty of Natural Sciences, Matej Bel University
Tajovského 40
974 01 Banská Bystrica, SLOVAKIA
uhliarov@fpv.umb.sk

Helena Ružičková
Institute of Landscape Ecology, Slovak Academy of Sciences
Štefánikova 3
814 99 Bratislava. SLOVAKIA
helena.ruzickova@savba.sk

Co-ordinating editor: Ute Jandt
Manuscript received: 25.10.2009; accepted: 08.02.2010

Zu Janišová et al.: Expert system-based classification of semi-natural grasslands in submontane and montane regions of central Slovakia

Table 1: Abridged synoptic table of grassland vegetation in the study region
Species are sorted according to their percentage frequency and the modified phi coefficient. Diagnostic species with the highest phi coefficient are printed in bold (** for phi > 0.35 and * for phi > 0.20); columns based on only one relevé are printed in italics. Non-diagnostic species with a mean constancy among the 23 units of less than 5% are not displayed. The columns represent the following vegetation types: 1 *Festuco rupicolae-Caricetum humilis*, 2 *Festuco pallentis-Seslerietum calcariae*, 3 *Orthantho luteae-Caricetum humilis*, 4 *Scabioso ochroleucae-Brachypodietum pinnati*, 5 *Carici albae-Brometum monocladi*, 6 *Brachypodio pinnati-Molinietum arundinaceae*, 7 *Onobrychido viciifoliae-Brometum erecti* (all *Festuco-Brometea*), 8 *Lolio perennis-Cynosuretum cristati*, 9 *Pastinaco sativae-Arrhenatheretum elatioris*, 10 *Poo-Trisetetum flavescentis*, 11 *Anthoxantho odorati-Agrostietum tenuis*, 12 *Ranunculo bulbosi-Arrhenatheretum elatioris*, 13 *Lilio bulbiferi-Arrhenatheretum elatioris*, 14 *Campanulo glomeratae-Geranietum sylvatici* (all *Molinio-Arrhenatheretea*), 15 *Violo sudeticae-Agrostietum capillaris* (*Nardetea strictae*), 16 *Typhetum latifoliae*, 17 *Glycerietum nemoralis-plicatae* (both *Phragmito-Magnocaricetea*), 18 *Poo trivialis-Alopecuretum pratensis*, 19 *Cirsietum rivularis*, 20 *Scirpetum sylvatici*, 21 *Filipendulo ulmariae-Menthetum longifolia* (all *Molinio-Arrhenatheretea*), 22 transitional stands between wet and fen meadows, 23 *Caricion davallianae* (*Scheuchzerio-Caricetea*).

Tabelle 1: Gekürzte Stetigkeitstabelle der Grünland-Vegetation im Untersuchungsgebiet
Die Arten sind nach prozentualer Stetigkeit und modifiziertem phi-Koeefizienten sortiert. Diagnostische Arten mit dem höchsten phi-Koeffizienten sind fett gedruckt (** für phi > 0.35 und * für phi > 0.20); Spalten, die auf einer einzigen Aufnahe beruhen, sind kursiv gesetzt. Nicht diagnostische Arten mit einer mittleren Stetigkeit von weniger als 5 % innerhalb der 23 Vegetationseinheiten sind nicht wiedergegeben. Zur Bedeutung der Spaltennummern vgl. englische Tabellenüberschrift.

Syntaxon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
No. of relevés	1	2	14	17	32	28	46	9	17	69	16	52	29	36	11	1	1	1	5	4	5	7	8
Festuco rupicolae-Caricetum humilis																							
Bothriochloa ischaemum	100	.	21	6	.	.	9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Koeleria pyramidata agg.	100	.	21	24	.	.	2	.	.	.	6	2	.	.	.	.	.	.	.	.	.	.	.
Viola rupestris	100	.	21	6	9	7	4	.	.	.	.	2	.	3	.	.	.	.	.	.	.	.	.
Sedum sexangulare	100	.	14	12	12	4	7	.	.	.	12	13	7	.	.	.	.	.	.	.	.	.	.
Cardaminopsis arenosa	100	.	14	.	9	11	4	.	.	.	.	.	14	6	.	.	.	.	.	.	.	.	.
Stachys recta	100	.	14	.	9	14	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Jovibarba globifera	100	.	14	.	6	.	2	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.
Poa compressa	100	.	.	.	3	.	4	.	.	1	6	2	.	.	.	.	.	.	.	.	.	.	.
Festuco pallentis-Seslerietum calcariae																							
Sesleria albicans	.	100	7	.	9	.	2	.	.	.	.	.	7	3	.	.	.	.	.	.	.	.	.
Leontodon incanus	.	100	36*	.	3	4	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.
Galium pumilum agg.	.	100	7	.	34	14	15	.	.	9	6	4	34	28	27	.	.	.	.	.	.	14	.
Polygala amara ssp. brachyptera	.	100	7	.	25	25	9	.	12	7	6	13	10	8	.	.	.	.	.	.	.	29	12
Orthantho luteae-Caricetum humilis																							
Bupleurum falcatum	.	.	43**	6	9	.	2	.	.	.	.	4	3	.	.	.	.	.	.	.	.	.	.
Carex humilis	.	.	36**	.	16	.	7	.	.	1	.	2	3	.	.	.	.	.	.	.	.	.	.
Linum flavum	.	.	21**	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Potentilla arenaria agg.	100	.	43*	29	9	7	11	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Pseudolysimachion spicatum	100	.	29*	.	.	.	7	.	.	.	6	4	.	.	.	.	.	.	.	.	.	.	.
Scabioso ochroleucae-Brachypodietum pinnati																							
Campanula rotundifolia agg.	100	.	36	71**	6	.	17	.	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.
Teucrium montanum	.	.	29	53**	.	.	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Picris hieracioides	.	.	7	41**	.	.	9	.	6	.	.	6	.	.	.	.	.	.	.	.	.	.	.
Prunella laciniata	.	.	14	41**	6	4	15	11	.	.	12	8	3	.	.	.	.	.	.	.	.	.	.
Acosta rhenana	.	.	.	24**	.	.	7	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Falcaria vulgaris	.	.	.	24**	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Viola collina	.	.	.	24**	3	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vicia hirsuta	.	.	.	18**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ononis spinosa	.	.	.	41*	3	4	17	44	6	.	12	4	.	.	.	.	.	.	.	.	.	14	.
Carex caryophyllea	100	.	43	76*	31	36	54	.	12	10	62	35	31	14	45	.	.	.	.	.	.	.	.
Galium verum	.	.	14	71*	19	32	41	33	18	26	38	37	17	.	18	.	.	100	.	.	20	.	.
Carici albae-Brometum monocladi																							
Buphthalmum salicifolium	.	.	21	.	78**	14	13	.	.	.	.	.	28	6	.	.	.	.	.	.	.	.	.
Bromus monocladus	.	50	36	.	75**	14	11	.	.	1	.	12	34	3	9	.	.	.	.	.	.	.	.
Carex tomentosa	.	.	.	24	59**	25	22	11	.	4	6	10	31	8	.	.	.	.	.	.	.	14	.
Anthyllis vulneraria	100	.	57	71	66*	32	37	11	.	10	19	35	62	58	18	.	.	.	.	.	.	.	.
Potentilla heptaphylla	.	50	57	35	56*	18	37	11	.	6	6	19	41	47	18	.	.	.	.	.	.	.	.
Pilosella bauhinii	100	.	21	35	50*	21	39	.	.	.	12	17	31	3	18	.	.	.	.	.	.	.	.
Polygonatum odoratum	.	50	14	.	31*	21	.	.	.	1	.	.	7	3	.	.	.	.	.	.	.	.	.
Vincetoxicum hirundinaria	.	.	29	12	28*	18	9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Inula salicina	.	.	7	.	22*	11	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Prunella grandiflora	.	.	21	.	19*	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Inula ensifolia	.	.	21	.	16*	4	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Brachypodio pinnati-Molinietum arundinaceae																							
Betonica officinalis	.	50	.	.	3	43**	9	.	6	1	6	2	3	.	.	.	.	.	.	.	.	.	.
Lathyrus latifolius	.	.	.	.	.	18**	2	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Filipendula vulgaris	.	50	7	6	16	64*	13	.	12	25	50	21	24	6	9	.	.	.	40	25	.	14	.
Hypericum perforatum	100	.	14	24	16	50*	24	11	24	9	19	25	28	17	9	.	.	.	.	.	.	.	.
Campanula persicifolia	.	.	.	.	3	21*	4	.	.	3	.	4	3	.	9	.	.	.	.	.	.	.	.
Scorzonera hispanica	.	.	.	.	16	18*	2	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Onobrychido viciifoliae-Brometum erecti																							
Pimpinella saxifraga	.	50	64	88	59	68	83*	67	65	46	81	79	48	11	55	.	.	.	20	.	.	.	.
Securigera varia	100	.	21	53	25	36	61*	22	18	1	12	40	41	19	9	.	.	.	.	.	.	.	.
Pseudolysimachion orchideum	.	.	.	.	.	4	11*	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Species diagnostic for more than one association of the class *Festuco-Brometea*																							
Scabiosa ochroleuca	100	.	71**	82**	22	.	33	.	.	.	.	10	3	.	.	.	.	.	.	.	.	.	.
Carlina vulgaris	.	.	43**	53**	6	.	11	.	.	.	6	2	.	.	.	.	.	.	.	.	.	.	.
Genista pilosa	.	100	79**	47*	38	32	26	.	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.
Seseli annuum	.	.	36*	41**	3	.	20	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.
Asperula cynanchica	100	50	71*	59*	41	14	28	.	.	.	.	2	10	.	.	.	.	.	.	.	.	.	.
Teucrium chamaedrys	100	100	86*	88*	75*	39	52	.	.	.	.	13	24	.	.	.	.	.	.	.	.	.	.
Globularia punctata	.	.	93**	6	47*	7	15	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Anthericum ramosum	100	100	86**	29	62*	21	17	.	.	.	.	.	14	.	.	.	.	.	.	.	.	.	.
Hippocrepis comosa	.	100	71**	6	62*	25	33	.	.	.	.	10	7	.	.	.	.	.	.	.	.	.	.
Colymbada scabiosa	.	.	71*	53	69*	43	39	.	12	1	6	27	34	3	.	.	.	.	.	.	.	.	.
Helianthemum ovatum	100	100	86*	18	75*	54	37	.	.	3	31	19	41	6	.	.	.	.	.	.	.	.	.
Thesium linophyllon	.	.	79**	53*	38	43*	30	.	6	1	12	13	3	.	.	.	.	.	.	.	.	.	.
Tithymalus cyparissias	100	50	93*	88*	66	68*	57	22	6	3	25	35	21	3	.	.	.	.	.	.	.	.	.
Agrimonia eupatoria	.	.	21	94**	16	39	65*	56	18	13	25	48	3	.	.	.	.	.	.	.	.	.	.
Bromus erectus	100	50	64	88*	56	75	98*	11	47	14	19	71	45	22	18	.	.	.	.	.	.	.	.
Carex michelii	.	.	43	65**	47*	21	48*	.	.	.	6	10	14	3	.	.	.	.	.	.	.	.	.
Cirsium pannonicum	.	.	7	.	56**	75**	15	.	.	.	.	8	14	.	.	.	.	.	.	.	.	.	.
Trommsdorfia maculata	.	.	7	.	41*	71**	4	.	.	.	12	8	7	14	.	.	.	.	.	.	.	.	.
Carex montana	.	100	14	12	50*	71*	15	.	6	13	31	21	14	6	9	.	.	.	.	.	.	.	.
Knautia kitaibelii	.	100	36	18	75*	71	80*	.	53	28	44	58	62	33	64	.	.	.	.	.	.	.	.
Viola hirta	.	.	57	76	75*	57	70*	11	12	16	31	62	59	17	18	.	.	.	.	.	.	.	.
Salvia verticillata	.	.	64	59	62*	29	50*	.	12	6	.	21	38	11	.	.	.	.	.	.	.	.	.
Pyrethrum corymbosum	.	.	14	.	41*	46*	22	.	.	6	.	15	21	19	18	.	.	.	.	.	.	.	.
Medicago falcata	.	.	7	65	44	64*	76**	11	24	12	.	42	38	6	.	.	.	.	.	.	.	.	.
Polygala major	.	.	43	12	25	50*	35*	.	6	.	.	15	.	.	.	.	.	.	.	.	.	.	.
Onobrychis viciifolia	.	.	.	.	9	25*	20*	.	6	.	.	8	7	.	.	.	.	.	.	.	.	.	.
Lolio perennis-Cynosuretum cristati																							
Cynosurus cristatus	.	.	.	.	3	.	2	100**	.	16	19	6	7	6	9	.	.	.	40	.	.	.	.
Bellis perennis	.	.	.	.	.	.	2	67**	12	17	.	10	.	.	.	.	.	.	40	.	.	.	.
Plantago major	.	.	.	.	.	.	.	56**	12	12	6	2	.	.	.	.	.	.	.	.	20	.	.
Potentilla anserina	.	.	.	.	.	.	.	33**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lolium perenne	.	.	.	.	.	.	.	33**	12	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Trifolium dubium	.	.	.	6	.	.	.	33**	.	.	6	2	.	.	.	.	.	.	.	.	.	.	.
Pastinaco sativae-Arrhenatheretum elatioris																							
Campanula rapunculoides	.	.	7	.	12	14	22	.	53**	4	.	12	14	.	.	.	.	.	.	.	.	.	.
Poa pratensis agg.	100	.	29	53	31	46	65	67	94*	78	56	83	28	58	27	.	.	100	60	50	60	14	.
Poo-Trisetetum flavescentis																							
Trifolium pratense	.	.	.	35	12	46	41	100	88	86*	88	77	52	75	64	.	100	.	60	25	.	.	12
Carum carvi	.	.	7	.	6	11	7	56	29	48*	12	13	34	42	9	.	.	.	.	.	.	.	.
Anthriscus sylvestris	.	.	.	.	.	4	.	.	24	36*	6	13	3	8	.	.	.	.	20	.	.	.	.
Chaerophyllum aromaticum	.	.	.	.	.	.	.	.	6	26*	.	4	3	6	9	.	.	.	.	.	20	.	.
Viola tricolor	.	.	.	.	6	.	.	.	6	19*	6	6	10	19	.	.	.	.	.	.	.	.	.
Anthoxantho odorati-Agrostietum tenuis																							
Viola canina	.	.	.	.	.	21	4	11	.	23	100**	19	7	14	36	.	.	.	.	.	.	.	.
Anthoxanthum odoratum	.	.	.	6	6	25	22	33	6	45	94**	46	24	61	73	.	.	.	80	25	.	29	.
Hypochaeris radicata	.	.	7	6	.	7	.	11	.	3	31**	4	3	.	.	.	.	.	.	.	.	.	.
Thymus pulegioides	.	50	36	88	66	50	70	33	41	32	100*	67	76	64	82	.	.	.	.	.	.	14	.
Briza media	.	50	57	82	78	57	67	33	24	49	100*	75	86	78	91	.	.	.	60	.	.	57	75
Agrostis capillaris	.	.	.	24	12	46	30	78	18	74	94*	71	55	72	82	100	.	100	80	.	60	.	.
Acetosa pratensis	.	50	.	6	16	50	28	44	65	83	94*	67	52	75	64	.	.	100	40	75	100	14	12
Luzula campestris agg.	.	.	.	12	9	32	26	44	29	46	81*	42	14	39	45	.	.	.	60	.	.	14	.
Nardus stricta	.	.	.	.	.	4	.	33	.	10	56*	10	.	11	45	.	.	.	60	.	.	.	.
Danthonia decumbens	.	.	21	.	6	11	.	11	.	.	31*	.	.	.	9	.	.	.	.	.	.	.	.
Dianthus deltoides	.	.	.	6	.	4	.	11	.	6	25*	4	.	.	.	.	.	.	.	.	.	.	.
Ranunculo bulbosi-Arrhenatheretum elatioris																							
Lotus corniculatus	.	100	57	65	66	82	87	67	71	81	94	98*	86	69	100	.	.	.	.	.	.	29	12
Ranunculus bulbosus	.	50	.	12	22	43	41	78	53	14	44	60*	14	3	.	.	.	.	.	.	.	.	.
Daucus carota	.	.	.	6	3	11	22	56	24	17	31	54*	21	3	.	.	.	.	.	.	.	.	.
Thlaspi perfoliatum	.	.	.	.	.	.	2	.	.	4	.	13*	.	.	.	.	.	.	.	.	.	.	.
Lilio bulbiferi-Arrhenatheretum elatioris																							
Rhinanthus serotinus	.	.	14	.	19	21	4	.	.	1	.	2	45**	19	.	.	.	.	.	.	.	.	.
Gentiana cruciata	.	.	.	.	19	.	4	.	.	3	.	6	38**	8	.	.	.	.	.	.	.	.	.
Anemone ranunculoides	.	.	.	.	.	.	.	.	.	.	.	.	24**	.	.	.	.	.	.	.	.	.	.
Medicago lupulina	.	.	7	41	31	32	39	44	59	22	.	52	72*	25	18	.	.	.	.	.	.	.	.
Phyteuma orbiculare	.	100	7	.	41	18	9	.	.	9	.	6	59*	33	9	.	.	.	.	.	.	.	.
Rhinanthus minor	.	.	7	18	25	32	15	44	6	26	31	33	55*	31	18	.	.	.	20	.	.	.	.
Fragaria vesca	.	.	.	.	19	29	11	.	18	23	44	23	52*	42	64	.	.	.	.	.	.	14	.
Arabis hirsuta	100	.	29	6	47	36	24	.	18	6	.	21	52*	22	9	.	.	.	.	.	.	.	.
Silene nutans	.	.	7	.	28	18	20	.	.	1	12	19	45*	17	27	.	.	.	.	.	.	.	.
Aquilegia vulgaris	.	.	.	.	19	29	13	.	6	3	.	8	38*	22	9	.	.	.	.	.	.	.	.
Ranunculus nemorosus	.	.	.	.	3	4	.	.	.	.	.	.	17*	6	.	.	.	.	.	.	.	.	.
Campanulo glomeratae-Geranietum sylvatici																							
Geranium sylvaticum	.	.	.	.	.	.	7	.	6	17	6	2	21	83**	55	.	.	.	.	.	.	.	.
Pimpinella major	.	.	.	.	.	4	4	11	6	17	.	2	31	75**	27	.	.	.	.	.	.	14	.
Primula elatior	.	.	.	.	.	11	.	11	.	22	6	4	21	75**	45	.	.	.	.	.	.	57	.
Crocus discolor	.	.	.	.	.	.	4	.	6	9	.	2	17	56**	.	.	.	.	.	.	.	.	.
Cirsium erisithales	.	.	.	.	3	.	7	.	.	4	.	2	10	44**	9	.	.	.	.	.	.	.	.
Pyrethrum clusii	.	.	.	.	.	7	7	.	.	3	12	2	7	42**	27	.	.	.	.	.	.	.	.
Crepis mollis	.	.	.	.	.	.	.	.	.	7	6	2	.	39**	18	.	.	.	.	.	.	.	.
Cruciata glabra	.	100	7	6	66	86	46	22	41	88	100	81	90	100*	100	.	.	.	80	25	.	43	.
Leontodon hispidus	.	100	14	41	66	71	61	67	59	81	88	87	83	92*	82	.	.	.	20	.	.	14	12
Colchicum autumnale	.	50	7	.	28	68	46	11	41	67	38	60	72	86*	55	.	.	100	40	25	20	43	12
Jacea phrygia agg.	.	.	.	12	12	57	30	44	47	74	88	58	76	81*	64	.	.	100	20	.	20	14	.
Knautia arvensis	.	.	7	18	.	14	11	22	24	20	19	21	31	61*	18	.	.	.	40	.	.	.	.
Galium mollugo agg.	.	.	7	6	12	18	22	22	59	48	31	46	59	61*	36	.	.	.	20	50	20	14	12
Stellaria graminea	.	.	.	.	3	7	.	.	6	33	12	8	34	53*	36	.	.	100	60	.	20	.	.
Heracleum sphondylium	.	.	.	.	12	21	11	.	29	39	19	19	17	53*	27	.	.	.	20	.	.	.	.
Vicia sepium	.	.	.	.	.	18	2	.	12	30	.	10	7	47*	27	.	.	.	20	.	40	14	.
Crepis biennis	.	.	.	6	.	7	4	.	35	19	.	12	21	36*	.	.	.	.	.	.	.	.	.
Knautia maxima	.	.	.	.	9	.	2	.	.	3	.	4	7	25*	.	.	.	.	.	.	.	.	.
Silene dioica	.	.	.	.	.	.	.	.	.	4	.	.	.	14*	.	.	.	.	.	.	.	.	.
Violo sudeticae-Agrostietum capillaris																							
Veronica officinalis	.	.	.	12	3	7	.	11	6	10	31	12	3	6	73**	.	.	.	.	.	.	.	.
Potentilla aurea	.	.	.	.	.	.	.	.	.	7	19	2	10	14	45**	.	.	.	.	.	.	.	.
Ranunculus pseudomontanus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	18**	.	.	.	.	.	.	.	.
Species diagnostic for more than one association of the classes *Molinio-Arrhenatheretea* and *Nardetea strictae*																							
Taraxacum sect. Ruderalia	.	50	.	41	22	32	37	100	94*	84*	56	67	69	44	27	.	.	100	40	25	.	.	12
Trifolium repens	.	.	.	24	12	25	26	89	59	80*	88*	65	38	53	64	.	.	.	60	.	.	14	.
Festuca rubra	.	.	.	12	9	46	22	89	24	84*	94*	62	66	53	82	.	.	100	60	.	40	29	12
Campanula patula	.	.	.	6	.	18	9	33	24	74*	88**	33	24	36	36	.	.	.	.	25	.	.	.
Vicia cracca	.	.	7	18	25	39	50	22	65	77*	38	58	52	78*	55	.	.	.	60	.	40	14	50
Phyteuma spicatum	.	.	.	.	.	11	7	.	18	32*	6	4	3	33*	9	.	.	.	.	.	.	.	.
Leucanthemum vulgare	.	50	14	12	56	68	57	44	65	71	100*	87*	72	81	73	.	.	.	40	.	.	14	12
Avenula pubescens	.	.	7	35	16	32	43	56	59	57	81*	71*	24	14	45	.	.	.	60	.	20	.	.
Polygala vulgaris	.	.	.	.	3	4	4	22	.	10	81**	4	17	58**	18	.	.	.	.	.	.	.	.
Arrhenatherum elatius	100	.	14	53	44	82	72	22	94	62	62	92*	93*	64	36	.	.	.	20	.	20	29	.
Plantago lanceolata	100	.	7	59	44	64	67	89	76	71	94	90*	93*	53	82	.	.	.	60	.	.	14	.
Trisetum flavescens	.	.	7	12	22	71	50	78	94	83	69	90*	90	92*	64	.	.	100	60	.	.	14	.
Lilium bulbiferum	.	50	.	.	25	14	20	.	.	4	6	6	83**	42*	.	.	.	.	.	.	.	.	.
Tragopogon orientalis	.	.	.	35	59	75	65	11	82	61	50	75	90*	94*	64	.	.	.	.	.	.	.	.
Campanula glomerata	.	50	.	.	31	29	24	.	18	26	6	15	76*	94**	45	.	.	.	.	.	.	.	.
Silene vulgaris	.	.	7	12	41	25	35	.	53	28	12	44	69*	78*	27	.	.	.	.	.	.	.	.
Campanula serrata	.	.	7	.	.	11	9	.	12	41	44	8	66*	94**	100**	.	.	.	.	.	.	.	.
Hypericum maculatum	.	.	.	.	3	32	2	.	6	58	56	13	38	69*	91**	.	.	.	60	25	80	14	12
Luzula luzuloides	.	.	.	.	.	7	.	.	.	10	25	.	.	39*	73**	.	.	.	.	.	.	.	.
Ranunculus polyanthemos	.	.	7	.	12	21	.	.	24	13	19	10	10	47*	73**	.	.	.	.	.	.	.	.
Phleum hirsutum	.	.	7	.	.	.	.	.	.	1	.	4	3	19*	36**	.	.	.	.	.	.	.	.

Syntaxon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
No. of relevés	1	2	14	17	32	28	46	9	17	69	16	52	29	36	11	1	1	1	5	4	5	7	8
Species diagnostic for more associations with centre of distibution in sub-xero- and mesophilous grasslands																							
Brachypodium pinnatum	.	.	71	94**	62*	82*	63*	11	12	10	25	29	24	11	9	.	.	.	.	.	.	.	12
Festuca rupicola	100	50	86	88*	69	61	74	33	41	13	44	75*	24	.	9	.	.	.	.	.	.	.	.
Sanguisorba minor	100	50	79	53	100*	61	80*	11	12	17	19	56	86*	44	18	.	.	.	.	25	.	.	.
Salvia pratensis	.	50	86	35	84*	89*	100*	33	65	29	25	83*	76	33	36	.	.	.	.	.	.	.	.
Primula veris	.	100	21	6	78*	71*	63*	.	18	19	19	54	66	17	18	.	.	.	.	.	.	.	12
Carduus glaucinus	.	.	.	.	28*	7	2	.	.	1	.	.	31*	8	.	.	.	.	.	.	.	.	.
Trifolium montanum	.	100	14	12	66	93*	78*	11	18	29	50	52	86*	58	45	.	.	.	.	.	.	14	.
Carlina acaulis	.	100	64	53	75	89*	61	.	18	25	50	52	93*	75	91	.	.	.	.	.	.	.	.
Dianthus carthusianorum	.	100	64	59	78	79	87*	22	29	22	50	81	86*	58	73	.	.	.	.	.	.	.	.
Dactylis glomerata	.	.	14	24	53	86	80	67	100	94*	62	98*	90	97*	73	.	.	100	40	.	60	14	.
Plantago media	.	100	43	88	81	75	74	100	59	49	69	85	86	44	55	.	.	.	.	.	.	.	.
Linum catharticum	.	.	36	71	50	50	39	22	12	19	38	42	48	47	27	.	.	.	.	.	.	29	50
Achillea millefolium agg.	100	50	29	71	59	68	76	89	82	83	81	81	86	97	100	.	.	100	40	.	20	14	25
Veronica chamaedrys	.	100	7	6	19	61	43	56	65	81	75	79	62	64	82	.	.	100	60	.	20	14	.
Festuca pratensis	.	.	.	6	9	43	15	100	76	81	62	67	59	75	45	.	.	100	100	50	100	43	.
Ranunculus acris	.	100	.	.	12	21	24	78	65	87	69	56	52	58	73	.	.	100	100	75	60	57	75
Alchemilla spec. div.	.	100	.	.	22	46	22	78	35	81	81	60	69	83	82	.	.	100	100	50	20	57	12
Prunella vulgaris	.	.	.	.	9	21	26	67	35	41	62	35	45	47	64	.	.	.	80	.	.	57	50
Typhetum latifoliae																							
Typha latifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	.	.	.	.	.	.	.
Viola palustris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	.	.	.	.	.	.	12
Equisetum fluviatile	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	.	.	.	.	.	14	.
Glycerietum nemoralis-plicatae																							
Veronica beccabunga	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	.	40	.	40	14	.
Agrostis stolonifera	.	.	.	6	3	.	.	.	.	3	.	4	7	3	.	.	100	.	.	.	.	29	.
Glyceria sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	.	.	.	20	.	.
Epilobium parviflorum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	.	.	.	.	14	12
Poo trivialis-Alopecuretum pratensis																							
Alopecurus pratensis	.	.	.	.	.	.	.	11	12	14	12	6	.	.	9	.	.	100	.	75	60	.	.
Cardamine pratensis	.	.	.	.	.	.	.	.	24	19	12	2	3	11	9	.	.	100	20	.	.	.	12
Ranunculus auricomus	.	.	.	.	3	18	7	.	18	35	25	13	7	17	36	.	.	100	80	25	.	.	.
Cirsietum rivularis																							
Carex ovalis	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	100	25	20	.	.
Carex echinata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	60	.	.	.	.
Ficaria bulbifera	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	60	25	.	.	.
Scirpetum sylvatici																							
Juncus effusus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	20	75	40	29	12
Poa trivialis	.	.	.	.	.	.	.	.	.	10	.	2	7	3	9	.	.	.	60	75	60	43	12
Rumex obtusifolius	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	20	50	.	.	.
Filipendulo ulmariae-Menthetum longifoliae																							
Cirsium arvense	.	.	.	18	.	7	.	33	18	14	12	6	.	.	.	.	.	.	.	50	80	.	.
Urtica dioica	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	20	50	60	.	.
Rumex crispus	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	40	.	.
Juncus conglomeratus	.	.	.	.	.	.	.	.	.	.	6	.	.	.	.	.	.	.	.	.	40	.	.
Lycopus europaeus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	.	.	.	.	40	.	.
Transitional communities of wet and fen meadows (*Calthion palustris – Caricion davallianae*)																							
Filipendula ulmaria	.	.	.	.	.	.	.	11	.	.	.	.	.	.	.	.	.	.	20	25	.	71**	.
Carex paniculata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	57**	25
Carex flava agg.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	20	.	.	57**	25
Cirsium palustre	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	29**	.
Carex hirta	.	.	.	.	.	.	2	11	12	9	6	2	.	.	.	.	.	.	20	.	60	71**	.
Caricion davallianae																							
Parnassia palustris	.	.	.	.	3	.	.	.	.	1	.	.	.	3	.	.	.	.	.	.	.	14	88**
Eupatorium cannabinum	.	.	.	.	.	4	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	29	88**
Eriophorum latifolium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	29	75**
Juncus articulatus	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	20	.	20	14	75**
Pinguicula vulgaris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	62**
Carex hostiana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	50**
Mentha aquatica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	50**
Epipactis palustris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	14	50**
Calamagrostis varia	.	.	.	.	9	.	.	.	.	1	.	.	7	.	.	.	.	.	.	.	.	.	50**
Eriophorum angustifolium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	20	.	.	29	50**
Tussilago farfara	.	.	.	.	.	.	2	.	.	3	.	.	3	3	.	.	100	.	.	.	20	.	50**
Carex lepidocarpa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	38**
Succisa pratensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	38**
Triglochin palustre	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	38**
Gymnadenia densiflora	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	38**
Equisetum telmateia	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	38**
Carex acuta	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25**
Primula farinosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25**
Agrostis canina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	14	25**
Species diagnostic for several wetland communities																							
Lychnis flos-cuculi	.	.	.	.	.	.	.	.	.	14	.	.	.	.	.	.	.	100	100	75**	60	14	12
Lysimachia nummularia	.	.	7	.	.	7	7	.	29	29	6	23	3	8	18	.	.	.	100	100**	60	43	25
Scirpus sylvaticus	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	100	100	.	100	100**	40	29	12
Ranunculus repens	.	.	.	.	.	.	.	11	12	3	.	2	.	.	.	.	100	100	80	75*	100**	14	.
Myosotis scorpioides agg.	.	.	.	.	.	.	.	.	.	7	.	6	.	.	9	100	.	.	100	100**	80*	86**	12
Cirsium rivulare	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	80	75**	40	71**	50*
Caltha palustris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	60	50	60**	57*	12
Equisetum palustre	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	100	.	60	50	60*	43	75*
Carex panicea	.	50	.	.	3	11	4	.	.	1	.	.	.	3	.	.	.	.	80	.	20	57*	100**
Carex nigra	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	60	.	40	57**	50*
Galium palustre	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	.	.	40	75**	20	43*	12
Mentha longifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	25	100**	86**	38
Lythrum salicaria	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	100	.	40	.	80**	14	75**
Crepis paludosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	40	50	20	86**	75**
Valeriana dioica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	.	.	.	.	86**	88**
Equisetum arvense	.	.	.	.	.	.	.	.	12	14	6	6	.	3	.	.	.	.	40	25	60	71**	62*
Carex davalliana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	57**	88**
Dactylorhiza majalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	40	.	.	43**	38*
Lysimachia vulgaris	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	100	.	.	.	.	40	43*	62**
Juncus inflexus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	.	.	.	40	57*	50*
Potentilla erecta	.	100	.	.	6	39	9	33	6	35	56	10	21	25	55	.	.	.	.	25	.	86*	100**
Vascular plants: most frequent other species																							
Lathyrus pratensis	.	.	.	6	.	14	15	11	35	57	19	25	24	64	36	.	.	.	100	75	100	86	38
Ajuga reptans	.	.	7	.	12	21	7	.	29	28	44	25	7	39	55	.	.	.	40	.	.	43	38
Acinos alpinus	100	100	14	.	41	18	13	.	.	1	6	4	38	8	.	.	.	.	.	.	.	.	.
Primula acaulis	.	.	7	12	19	32	20	.	29	32	31	37	45	8	18	.	.	.	40	.	.	.	12
Cerastium holosteoides	.	.	.	6	6	11	4	33	41	38	19	15	24	33	18	.	.	.	40	25	.	14	.
Phleum pratense	.	.	.	.	3	14	2	44	6	29	19	10	10	14	9	.	.	.	60	.	40	.	.
Fragaria viridis	.	.	29	35	28	32	33	22	12	3	19	33	10	3	.	.	.	.	.	.	.	.	.
Carex pallescens	.	.	.	.	.	11	2	44	6	14	38	8	.	17	18	.	.	.	60	.	20	.	.
Aegopodium podagraria	.	.	.	.	.	7	2	.	18	17	19	8	.	14	36	.	.	.	.	75	20	14	.
Carex alba	.	100	14	29	31	11	4	.	.	.	.	4	3	3	.	.	.	.	.	.	.	.	.
Pilosella officinarum	.	.	21	6	16	14	20	.	.	3	25	23	3	.	36	.	.	.	.	.	.	14	.
Potentilla collina	.	50	7	12	3	25	20	11	18	1	6	15	3	.	.	.	.	.	.	.	.	.	.
Gymnadenia conopsea	.	50	7	6	19	18	.	.	.	7	.	2	3	22	9	.	.	.	.	.	.	14	.
Trifolium flexuosum	.	.	.	.	6	18	7	11	.	16	31	21	3	14	9	.	.	.	.	.	20	.	.
Allium oleraceum	.	.	.	12	19	18	11	.	6	9	6	19	31	11	9	.	.	.	.	.	.	.	.
Luzula multiflora	.	50	.	6	.	14	2	.	.	4	6	13	.	.	36	.	.	.	.	.	.	14	.
Euphrasia rostkoviana	.	.	.	.	12	4	9	22	.	19	25	10	10	11	9	.	.	.	.	.	.	.	12
Potentilla reptans	.	.	.	.	9	.	.	33	18	3	.	10	3	.	.	.	.	.	.	25	40	.	.
Clinopodium vulgare	.	.	7	24	9	11	4	11	12	3	19	8	10	6	.	.	.	.	.	.	.	.	.
Thesium alpinum	.	50	.	.	9	7	.	.	.	1	.	2	17	11	27	.	.	.	.	.	.	.	.
Astrantia major	.	.	.	.	.	7	4	.	18	19	12	8	3	19	27	.	.	.	.	.	.	.	.
Polygala comosa	.	.	.	12	9	14	15	.	6	.	12	17	3	.	27	.	.	.	.	.	.	.	.
Thlaspi caerulescens	.	.	.	.	6	11	4	.	29	12	6	6	17	6	18	.	.	.	.	.	.	.	.
Convolvulus arvensis	.	.	7	6	.	7	20	22	24	3	6	12	7	.	.	.	.	.	.	.	.	.	.
Shrubs and trees (juvenile): diagnostic species																							
Pinus sylvestris	.	.	36*	35*	6	11	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	12
Ligustrum vulgare	.	.	14	24*	.	.	7	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Viburnum opulus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25**
Swida sanguinea	.	.	.	18**	3	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sorbus aria	.	.	.	.	12*	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Shrubs and trees (juvenile): most frequent other species																							
Acer pseudoplatanus	.	100	14	18	28	21	20	.	12	7	6	8	10	8	9	.	.	.	.	.	.	43	50
Rosa canina agg.	.	.	7	29	16	29	20	11	.	3	19	21	10	8	9	.	.	.	.	.	.	14	.
Quercus sp.	.	50	14	29	6	7	4	.	.	.	12	8	.	3	.	.	.	.	.	.	.	.	25
Fagus sylvatica	.	100	7	.	9	7	2	.	6	1	.	2	.	3	9	.	.	.	.	.	.	.	.
Salix cinerea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	.	.	.	.	.	.	25
Carpinus betulus	.	50	7	6	9	18	7	.	6	4	12	6	.	.	.	.	.	.	.	.	.	.	.
Bryophytes: diagnostic species																							
Bryum pseudotriquetrum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	75**
Campylium stellatum	.	.	.	.	.	.	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	63**
Plagiomnium elatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	63**
Drepanocladus revolvens agg.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	38**
Drepanocladus cossonii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25**
Fissidens adianthoides	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25**
Homalothecium nitens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25**
Bryophytes: most frequent other species																							
Rhytidiadelphus squarrosus	.	.	25	.	22	17	7	.	57	67	100	27	40	75	50	.	.	.	.	.	.	.	.
Thuidium abietinum	100	.	50	56	17	53	17	.	14	.	.	18	40	.	50	.	.	.	.	.	.	.	.
Bryum caespiticium	100	.	.	.	11	.	.	.	.	.	100	.	20	.	.	.	.	.	.	.	.	.	.
Thuidium philibertii	.	.	50	.	33	.	13	.	.	67	.	.	40	25	.	.	.	.	.	.	.	.	.
Rhytidiadelphus triquetrus	.	.	.	.	33	33	13	.	.	33	.	18	20	50	.	.	.	.	.	.	.	.	13
Plagiomnium cuspidatum	.	.	25	.	22	33	7	.	14	33	.	18	20	.	.	.	.	.	.	.	.	.	.
Fissidens dubius	.	.	25	.	44	33	13	.	.	.	.	9	40	.	.	.	.	.	.	.	.	.	.
Encalypta streptocarpa	100	.	25	.	11	.	.	.	.	.	.	.	20	.	.	.	.	.	.	.	.	.	.
Climacium dendroides	.	.	.	.	11	.	.	.	.	.	.	27	20	50	.	.	.	.	.	.	.	25	.
Tortella inclinata	100	.	.	.	11	.	.	.	.	.	.	.	20	.	.	.	.	.	.	.	.	.	.
Tortula ruralis	100	.	.	.	.	.	13	.	.	.	.	9	.	.	.	.	.	.	.	.	.	.	.
Plagiomnium medium	.	.	.	.	.	17	7	.	14	.	.	9	20	25	25	.	.	.	.	.	.	.	.

Table 4: Phytosociological table of wetland communities (*Phragmito-Magnocaricetea; Molinio-Arrhenatheretea: Molinietalia; Scheuchzerio-Caricetea*)
The relevés belong to the following syntaxa: 1 *Typhetum latifoliae*, 2 *Glycerietum nemoralis-plicatae*, 3 *Poo trivialis-Alopecuretum pratensis*, 4–8 *Cirsietum rivularis*, 9–12 *Scirpetum sylvatici*, 13–17 *Filipendulo ulmariae-Menthetum longifolia*, 18–24 transitional stands between wet and fen meadows, 25–32 *Caricion davallianae*. Information on the origin of the relevés is given in Appendix C.

Tabelle 4: Pflanzensoziologische Tabelle der Feuchwiesen-Gesellschaften (*Phragmito-Magnocaricetea; Molinio-Arrhenatheretea: Molinietalia; Scheuchzerio-Caricetea*)
Zur Bedeutung der Assoziationsnummern vgl. englische Tabellenüberschrift. Die Herkunftsnachweise der Aufnahmen finden sich in Anhang C.

Syntaxon	1	2	3	*Cirsietum rivularis*					*Scirpetum sylvatici*				*Filipendulo - Menthetum*					Transitional stands							*Caricion davallianae*							
Releve number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Altitude (m)	785	550	605	715	718	735	715	768	465	592	714	710	690	490	705	682	765	675	715	710	812	670	805	580	650	605	560	650	545	460	575	583
Aspect (degrees)	1	1	?	144	48	45	42	270	76	360	126	324	236	?	225	68	108	150	168	162	90	98	90	68	45	220	185	360	25	60	150	160
Slope (degrees)	1	0	2	6	2	4	6	2	2	1	4	2	17	7	2	2	2	4	2	5	3	4	8	2	10	5	1	3	10	5	1	2
Cover herb layer (%)	15	80	90	100	100	100	100	100	100	100	100	100	70	85	100	100	100	100	100	80	45	100	85	90	90	85	98	70	80	75	80	80
Cover moss layer (%)	20	1	5	90	0	70	90	20	40	5	0	0	20	15	0	0	5	0	1	55	75	0	3	0	55	90	20	85	80	80	80	80
Plot size (m²)	16	20	16	16	16	16	16	16	16	16	16	16	16	20	16	16	16	16	24	21	16	16	24	16	20	16	25	18	20	25	24	25
Species richness (total)	11	15	21	39	48	41	40	36	28	25	25	17	27	31	31	30	30	23	38	51	42	26	30	19	35	40	23	39	44	42	37	25
Species richness (vascular plants)	11	14	21	39	48	41	40	36	28	25	25	17	27	31	31	30	30	23	38	51	36	26	28	19	30	40	20	34	44	35	30	22
Species richness (bryophytes)	?	1	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	6	?	2	?	5	?	3	5	?	7	7	3
Typhetum latifoliae																																
Typha latifolia	**4**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Equisetum fluviatile	**2**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
Glycerietum nemoralis-plicatae																																
Veronica beccabunga	.	**3**	.	+	.	.	.	+	.	.	.	.	2	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Glyceria species	.	**2**	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Brachythecium rutabulum	.	**+**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Agrostis stolonifera	.	**+**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	.	.	.	.	.	.	.	.
Poo trivialis-Alopecuretum pratensis																																
Alopecurus pratensis	.	.	**3**	.	.	.	.	.	+	1	.	+	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cardamine pratensis	.	.	**1**	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.
Poa pratensis agg.	.	.	**2**	.	+	1	+	.	1	+	.	.	+	.	.	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ranunculus auricomus	.	.	**1**	+	+	2	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cirsietum rivularis																																
Cirsium rivulare	.	.	.	**+**	**2**	**2**	.	**2**	+	2	+	.	.	.	1	1	.	+	3	1	.	2	.	+	+	+	+	.	1	.	.	.
Carex ovalis	.	.	.	**1**	**+**	**2**	**+**	**+**	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex echinata	.	.	.	**3**	**+**	**.**	**+**	**.**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Scirpetum sylvatici																																
Scirpus sylvaticus	2	2	.	2	2	1	3	2	**4**	**4**	**4**	**5**	.	.	1	.	1	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.
Lysimachia nummularia	.	.	.	2	2	1	2	2	**1**	**+**	**1**	**+**	.	.	1	2	1	+	2	.	.	.	.	2	.	+	.	.	+	.	.	.
Galium palustre agg.	1	.	.	1	.	.	.	+	**.**	**2**	**1**	**2**	.	+	.	.	.	.	+	.	+	.	+	.	.	+	.	.	.	.	.	.
Juncus effusus	.	.	.	.	.	+	.	.	**+**	**2**	**.**	**1**	4	2	.	.	.	+	.	.	.	.	.	1	.	+	.	.	.	.	.	.
Filipendulo ulmariae-Menthetum longifoliae																																
Mentha longifolia	.	.	.	.	.	.	.	.	1	.	.	.	+	+	4	4	4	1	2	r	+	+	1	.	.	+	.	r	1	.	.	.
Carex hirta	.	.	.	.	.	+	.	.	.	.	.	.	.	+	1	2	.	+	+	+	.	+	.	1	.	.	.	.	.	.	.	.
Alliance *Calthion palustris*																																
Myosotis scorpioides agg.	1	.	.	1	1	+	1	2	1	1	1	2	2	1	1	+	.	+	+	.	+	+	+	1	.	1	.	.	.	.	.	.
Festuca pratensis	.	.	1	1	+	3	1	2	.	2	.	+	1	1	+	1	2	+	.	1	.	.	.	+	.	.	.	.	.	.	.	.
Ranunculus repens	.	+	+	+	.	1	1	2	1	2	1	.	2	2	1	2	+	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.
Poa trivialis	.	.	.	.	.	1	+	1	2	2	.	+	.	2	1	1	.	1	+	.	.	.	.	+	.	1	.	.	.	.	.	.
Acetosa pratensis	.	.	1	+	.	.	.	+	+	.	1	+	+	+	+	+	+	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.
Caltha palustris	.	.	.	+	.	.	1	1	.	+	.	1	1	.	+	.	+	.	1	.	r	1	1	.	.	.	.	.	+	.	.	.
Lychnis flos-cuculi	.	.	+	+	2	2	1	+	+	1	+	.	1	1	.	1	.	.	+	.	.	.	.	.	.	1	.	.	.	.	.	.
Filipendula ulmaria	.	.	.	.	.	.	2	.	.	.	+	.	.	.	.	.	.	5	+	+	1	.	3	.	.	.	.	.	.	.	.	.
Crepis paludosa	.	.	.	2	.	.	.	2	.	+	1	.	.	.	+	.	.	+	+	r	+	2	+	.	2	2	2	1	2	.	+	.
Carex nigra	.	.	.	2	1	.	+	.	.	.	.	.	.	+	.	+	.	.	+	+	+	.	1	.	.	2	+	+	.	.	.	1
Lythrum salicaria	.	2	.	.	.	+	.	2	.	.	.	.	2	2	+	.	+	.	.	.	.	+	.	.	+	+	.	r	+	.	r	r
Lysimachia vulgaris	+	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	1	+	.	.	.	2	.	1	1	+	.	+	.	r	1	.
Alliance *Caricion davallianae*																																
Potentilla erecta	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	+	2	+	+	1	.	2	1	2	2	2	2	3	2
Valeriana dioica	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	1	+	2	2	2	2	2	2	.	1	2	1
Carex panicea	.	.	.	1	+	+	+	.	.	.	.	.	.	.	.	1	.	.	1	2	.	+	+	.	+	2	2	4	1	2	2	2	1
Carex davalliana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	.	1	2	+	2	2	.	2	2	3	3
Eupatorium cannabinum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	+	.	.	+	.	+	1	2	1	1	1
Dactylorhiza majalis	.	.	.	r	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	.	.	1	+	.	+	.	.	.
Juncus inflexus	.	+	.	.	.	.	.	.	.	.	.	.	.	2	+	.	.	.	2	r	.	+	.	1	+	1	+	.	2	.	.	.
Eriophorum latifolium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	+	.	.	.	+	1	1	.	2	.	1	+
Carex flava agg.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	+	+	.	.	.	.	.	1	1	.
Briza media	.	.	.	+	1	.	1	.	.	.	.	.	.	.	.	.	.	.	+	2	1	+	.	.	.	+	+	+	+	+	.	+
Parnassia palustris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	+	.	+	1	+	1	1	1
Eriophorum angustifolium	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	1	.	.	+	.	.	2	1
Cirsium palustre	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	+	.	.	.	.	.	.	.	.	.	.
Epipactis palustris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	2	2	.	2	.	.	.	+
Plagiomnium elatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	2	+	.	1	1	.
Bryum pseudotriquetrum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	1	.	1	1	1
Juncus articulatus	.	.	.	+	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	r	.	.	.	.	+	+	.	+	.	1	r	+
Gymnadenia densiflora	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	+	.	.	.	.
Triglochin palustre	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	1	.	.	r	.
Carex hostiana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	.	2	+
Calliergonella cuspidata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	2	.	.	.	2	.
Tussilago farfara	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	r	1	r	r	.
Carex lepidocarpa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	+	.	2
Pinguicula vulgaris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	2	+	r
Carex flacca	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	+	.
Mentha aquatica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	+	.	+	.
Drepanocladus revolvens agg.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	3	3
Primula farinosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1
Fissidens adianthoides	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.
Campylium stellatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	+	.	.	.	.	+	3	3
Other species																																
Ranunculus acris	.	.	2	2	2	2	2	1	+	+	+	.	.	1	+	1	.	.	+	1	+	.	+	.	r	+	r	+	+	.	+	.
Lathyrus pratensis	.	.	.	1	2	2	2	2	+	2	.	+	1	+	2	1	2	1	1	+	r	1	1	.	.	1	.	r	1	.	.	.
Alchemilla spec. div	.	.	1	2	2	2	2	+	1	.	+	.	+	.	.	.	.	.	.	2	1	.	+	1	.	.	.	.	+	.	.	.
Colchicum autumnale	.	.	+	.	+	.	+	.	.	r	.	.	.	.	.	1	.	r	.	+	.	+	.	.	.	.	.	.	+	.	.	.
Festuca rubra	.	.	1	1	3	.	2	.	.	.	.	.	.	.	+	+	.	.	+	.	+	.	.	.	.	+	.	.	.	.	.	.
Prunella vulgaris	.	.	.	2	2	+	2	.	.	.	.	.	.	.	.	.	.	.	.	+	1	+	.	1	r	.	.	+	r	1	.	.
Vicia cracca	.	.	.	.	+	+	.	+	.	.	.	.	+	.	.	.	1	+	.	.	.	.	.	.	+	1	.	+	+	.	.	.
Agrostis capillaris	+	.	1	+	2	1	2	.	.	.	.	.	+	.	+	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dactylis glomerata	.	.	2	.	+	.	.	+	.	.	.	.	.	.	+	+	1	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.
Achillea millefolium agg.	.	.	+	.	+	1	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	r	.	.	r	.	.	.	.
Trifolium pratense	.	r	.	+	+	.	+	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Galium mollugo agg.	.	.	.	.	.	.	.	+	+	.	+	.	.	.	.	+	.	.	r	.	.	.	.	.	.	.	.	.	r	.	.	.
Veronica chamaedrys	.	.	1	.	+	.	+	1	.	.	.	.	.	.	+	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.
Trisetum flavescens	.	.	1	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Taraxacum sect. *Ruderalia*	.	.	1	.	.	1	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.
Stellaria graminea	.	.	+	.	+	+	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Phleum pratense	.	.	.	.	+	1	.	1	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium repens	.	.	.	+	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Plantago lanceolata	.	.	.	.	1	+	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Leucanthemum vulgare	.	.	.	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.
Avenula pubescens	.	.	.	.	+	1	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cerastium holosteoides	.	.	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Arrhenatherum elatius	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.
Leontodon hispidus	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	+	.	.
Knautia arvensis	.	.	.	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cynosurus cristatus	.	.	.	.	+	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bellis perennis	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Equisetum palustre	+	4	.	2	2	.	2	.	.	.	1	2	.	+	2	+	.	.	.	.	2	.	2	+	2	1	1	1	1	.	+	.
Hypericum maculatum	.	.	.	.	+	+	.	+	.	r	.	.	+	+	r	.	+	.	.	.	.	.	r	.	.	+	.	.	.	.	.	.
Equisetum arvense	.	.	.	.	.	+	.	1	+	.	.	.	+	.	+	.	+	1	2	1	1	1	.	.	1	+	+	.	.	+	.	1
Cruciata glabra	.	.	.	+	1	+	1	.	.	.	+	.	.	.	.	.	.	.	+	+	.	.	1	.	.	.	.	.	.	.	.	.
Ajuga reptans	.	.	.	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	+	.	+	.	.	.	+	.	+	.
Anthoxanthum odoratum	.	.	.	1	2	2	1	.	1	.	.	.	.	.	.	.	.	.	.	r	r	.	.	.	.	.	.	.	.	.	.	.
Urtica dioica	.	.	.	.	.	.	.	+	.	.	+	+	+	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cirsium arvense	.	.	.	.	.	.	.	.	.	.	+	+	.	1	1	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aegopodium podagraria	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	1	.	.	.	.	1	.	.	.	.	.	.	+	.	.	.
Carex paniculata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	4	3	2	3	.	.	.	+	.	.	.
Linum catharticum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	2	.	.	.	.	.	.	.	+	+	+	+
Acer pseudoplatanus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	r	r	.	.	.	.	.	.	r	.	+	r	r
Jacea phrygia agg.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Filipendula vulgaris	.	.	.	1	.	.	.	4	1	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
Luzula campestris agg.	.	.	.	+	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.
Carex pallescens	.	.	.	+	1	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ficaria bulbifera	.	.	.	+	+	.	2	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vicia sepium	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Primula elatior	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	+	.	+	.	.	.	.	.	.	.	.	.
Calamagrostis varia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	+	.	.	.	1
Salix cinerea	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	r	.
Lycopus europaeus	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Epilobium parviflorum	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	r	.	.	.
Nardus stricta	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mentha arvensis	.	.	.	+	.	.	.	.	.	2	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Primula acaulis	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Glechoma hederacea	.	.	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rumex obtusifolius	.	.	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Chaerophyllum hirsutum	.	.	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Galium aparine	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Potentilla reptans	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Agrostis canina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	+	.	.	.	.
Deschampsia cespitosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	1	+	.
Galium rivale	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lotus corniculatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	r	.	.
Polygala amara subsp. *brachyptera*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	r	.	.	.	.	.	.	.	.	r	.	.
Succisa pratensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	1	.	.	.	.
Equisetum telmateia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	+	.	.	.	.

Other species (present in only one relevé):
Weitere Arten (in einer einzigen Aufnahme vorhanden):
Acetosa arifolia 21: +; *Angelica sylvestris* 11: +; Anthriscus sylvestris 8: +;*Blysmus compressus* 28: 2; *Brachypodium pinnatum* 30: +; *Campanula patula* 9: +; *Cardamine amara* 13: +; *Carex acutiformis* 26: +; *Carex distans* 32: 1; *Carex remota* 26: 1; *Carex tomentosa* 19: r; *Chaerophyllum aromaticum* 17: 2; *Chamerion angustifolium* 23: +; *Cratoneuron commutatum* 30: 3; *Eleocharis quinqueflora* 28: 3; *Epilobium obscurum* 13: +; *Euphrasia rostkoviana* 30: +; *Fragaria vesca* 21: r; *Frangula alnus* 29: r; *Fraxinus excelsior* 30: +; *Galeopsis tetrahit* 17: +; *Galium album* 23: r; *Galium pumilum* agg. 20: +; *Geranium phaeum* 11: +; *Geum rivale* 19: 2; *Glyceria fluitans* 13: 1; *Gymnadenia conopsea* 20: +; *Heracleum sphondylium* 6: +; *Holcus lanatus* 9: 2; *Luzula multiflora* 20: +; *Marchantia polymorpha* 30: +; *Melampyrum nemorosum* 18: 1; *Mentha* x *verticillata* 6: 2; *Molinia caerulea* agg. 29: 1; *Myosoton aquaticum* 19: +; *Ononis spinosa* 20: r; *Persicaria hydropiper* 14: 1; *Petasites hybridus* 27: 1; *Philonotis fontana* 21: 1; *Picea abies* 30: +; *Pilosella officinarum* 20: r; *Pimpinella major* 20: +; *Pimpinella saxifraga* 6: +; *Pinus sylvestris* 30: r; *Plagiomnium affine* 23: +; *Plagiothecium succulentum* 21: 1; *Plantago major* 13: r; *Poa palustris* 17: 1; *Poa remota* 19: 1; *Primula veris* 29: r; *Prunus spinosa* 30: r; *Rhinanthus minor* 6: 1; *Rhytidiadelphus triquetrus* 30: +; *Rosa canina* agg. 23: r; *Rumex sanguineus* 14: +; *Salix rosmarinifolia* 29: r; *Sanguisorba minor* 9: +; *Solidago canadensis* 2: r; *Steris viscaria* 21: r; *Thymus pulegioides* 20: r; *Tilia* sp. 29: r; *Trifolium flexuosum* 17: +; *Trifolium montanum* 20: +; *Valeriana simplicifolia* 16: +; *Vicia tetrasperma* 14: +.

Table 2: Phytosociological table of xero- and sub-xerophilous grasslands of the *Festuco-Brometea*
The relevés belong to the following associations: 1 *Festuco rupicolae-Caricetum humilis*, 2–3 *Festuco pallentis-Seslerietum calcariae*, 4–17 *Orthantho luteae-Caricetum humilis*, 18–34 *Scabioso ochroleucae-Brachypodietum pinnati*, 35–66 *Carici albae-Brometum monocladi*, 67–94 *Brachypodio pinnati-Molinietum arundinaceae*, 95–140 *Onobrychido viciifoliae-Brometum erecti*.
Information on the origin of the relevés is given in Appendix C.

Tabelle 2: Pflanzensoziologische Tabelle der Trocken- und Halbtrockenrasen der Klasse *Festuco-Brometea*
Zur Bedeutung der Assoziationsnummern vgl. englische Tabellenüberschrift. Die Herkunftsnachweise der Aufnahmen finden sich in Anhang C.

Syntaxa: F-C = relevé 1; F-S = relevés 2–3; *Orthantho luteae-Caricetum humilis* = 4–17; *Scabioso ochroleucae-Brachypodietum pinnati* = 18–34; *Carici albae-Brometum monocladi* = 35–66; *Brachypodio pinnati-Molinietum arundinaceae* = 67–94; *Onobrychido viciifoliae-Brometum erecti* = 95–140.

Syntaxon	F-C	F-S		Orthantho luteae-Caricetum humilis													
Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Altitude (m)	537	926	590	518	695	483	430	535	603	450	508	480	450	470	482	480	420
Aspect (degrees)	180	140	17	74	180	270	293	225	265	293	135	203	30	216	186	168	90
Slope (degrees)	35	7	12	5	20	25	32	10	18	15	30	38	40	12	18	8	20
Cover herb layer (%)	60	95	85	98	80	55	80	60	60	85	80	70	95	85	85	85	85
Cover moss layer (%)	35	0	5	45	0	20	70	25	35	65	20	65	45	80	10	55	0
Plot size (m²)	25	25	24	25	24	25	25	25	22	25	30	25	25	20	25	16	16
Species richness (total)	39	53	45	60	52	37	35	21	41	36	43	28	47	38	37	45	32
Species richness (vascular plants)	33	53	45	54	52	36	35	21	37	36	43	28	47	38	35	45	32
Species richness (bryophytes)	6	?	?	6	?	1	?	?	4	?	?	?	?	?	2	?	?

Syntaxon	Scabioso ochroleucae-Brachypodietum pinnati																
Relevé number	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Altitude (m)	560	460	505	422	510	475	460	460	455	480	455	465	475	455	550	470	390
Aspect (degrees)	105	342	140	355	140	225	236	268	250	23	312	318	45	315	132	354	336
Slope (degrees)	7	12	18	30	15	14	18	25	15	25	30	6	15	15	35	22	21
Cover herb layer (%)	95	98	75	90	80	95	98	100	100	95	90	95	98	75	60	100	100
Cover moss layer (%)	2	55	40	80	50	87	40	70	50	60	85	75	80	60	50	45	70
Plot size (m²)	25	25	16	24	16	20	25	25	25	25	20	25	25	16	16	25	16
Species richness (total)	47	49	46	55	49	48	40	36	46	30	37	27	46	42	46	39	49
Species richness (vascular plants)	47	49	46	55	49	48	40	36	46	30	37	27	46	42	46	39	49
Species richness (bryophytes)	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

Syntaxon	Carici albae-Brometum monocladi																															
Relevé number	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
Altitude (m)	410	980	500	490	740	665	630	772	630	950	620	975	635	931	640	432	665	415	880	901	654	800	740	797	580	650	440	795	647	800	720	890
Aspect (degrees)	85	230	68	30	204	200	150	57	134	300	175	50	210	158	135	360	30	330	135	225	18	135	220	146	135	270	263	171	225	225	225	180
Slope (degrees)	28	25	30	20	38	35	12	40	33	23	30	30	15	3	10	40	12	30	25	30	11	7	39	34	20	30	25	20	25	35	30	30
Cover herb layer (%)	97	98	85	98	90	85	80	85	93	75	80	97	85	95	60	90	85	80	90	90	70	90	80	85	70	80	95	90	90	90	88	90
Cover moss layer (%)	10	1	40	25	45	1	5	1	35	0	1	10	60	0	1	55	30	65	1	0	25	0	0	0	65	0	70	35	30	0	0	0
Plot size (m²)	24	25	25	25	25	25	25	25	16	24	25	25	25	25	25	25	25	25	25	25	16	25	20	20	25	25	25	25	16	25	25	25
Species richness (total)	52	54	63	68	50	45	68	35	60	43	49	54	59	62	68	51	55	47	58	49	64	39	36	58	42	44	48	53	41	53	51	45
Species richness (vascular plants)	47	54	63	57	42	45	68	33	60	43	49	54	59	62	68	49	49	42	58	49	64	39	36	58	42	44	44	50	41	53	51	45
Species richness (bryophytes)	5	?	?	11	8	?	?	2	?	?	?	?	?	?	?	2	6	5	?	?	?	?	?	?	?	?	4	3	?	?	?	?

Syntaxon	Brachypodio pinnati-Molinietum arundinaceae																											
Relevé number	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
Altitude (m)	420	650	600	538	460	415	579	948	690	880	575	630	610	430	520	672	650	785	883	900	510	640	600	655	645	520	650	880
Aspect (degrees)	275	270	180	45	178	10	180	250	96	90	255	270	35	7	45	252	120	210	175	225	135	50	182	222	240	360	156	250
Slope (degrees)	15	35	15	15	30	40	10	25	13	25	20	15	5	30	30	11	20	5	18	25	12	8	30	9	13	38	5	2
Cover herb layer (%)	98	95	65	90	90	95	80	90	85	100	95	90	98	95	90	95	95	97	98	98	100	100	95	90	85	90	100	90
Cover moss layer (%)	3	0	70	90	3	80	0	0	10	0	10	0	25	85	40	0	1	1	0	0	0	0	60	0	60	0	0	10
Plot size (m²)	25	25	25	16	25	25	25	25	16	24	30	30	25	25	30	16	25	25	25	25	30	25	25	16	16	30	16	24
Species richness (total)	64	55	36	54	51	72	54	78	59	40	73	71	61	46	57	74	60	66	54	72	61	45	54	51	55	63	33	54
Species richness (vascular plants)	64	55	36	54	51	67	53	78	59	40	73	71	59	43	55	74	60	64	54	72	61	45	54	51	55	63	33	54
Species richness (bryophytes)	?	?	?	?	?	5	1	?	?	?	?	?	2	3	2	?	?	2	?	?	?	?	?	?	?	?	?	?

Syntaxon	Onobrychido viciifoliae-Brometum erecti																																													
Relevé number	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
Altitude (m)	470	670	650	452	510	405	595	600	400	560	800	405	890	517	850	410	540	410	540	400	390	570	550	469	480	485	650	480	520	455	785	590	480	520	540	730	620	470	630	465	450	530	560	550	650	493
Aspect (degrees)	200	225	342	90	108	90	240	150	90	225	135	15	90	45	225	35	180	280	5	360	80	25	126	271	18	225	315	222	165	293	225	248	200	150	190	225	210	36	225	68	45	145	300	150	225	280
Slope (degrees)	40	20	13	25	6	18	30	18	25	11	40	35	25	25	25	28	45	5	5	19	15	10	10	3	20	13	30	23	6	33	8	20	38	12	38	35	5	14	15	20	10	45	32	20	40	5
Cover herb layer (%)	85	90	90	75	75	85	85	95	75	80	90	80	100	85	90	100	65	100	98	78	80	75	75	90	80	85	100	90	85	70	98	85	70	90	75	95	88	70	98	90	75	85	85	90	95	80
Cover moss layer (%)	0	0	40	80	70	35	12	0	80	1	0	75	0	0	15	30	40	15	75	80	75	85	8	50	15	1	75	50	80	55	5	60	50	75	10	0	5	40	0	25	85	1	70	70	0	25
Plot size (m²)	24	25	16	16	25	24	25	25	25	25	24	24	16	25	25	16	24	25	25	16	25	25	16	25	16	24	25	25	16	16	25	16	25	16	25	25	25	16	25	30	16	25	25	16	25	24
Species richness (total)	35	57	57	52	47	53	50	41	47	42	46	57	37	36	51	63	49	58	78	36	50	64	38	50	38	58	67	43	42	42	50	43	26	53	39	65	40	52	36	62	57	40	54	49	57	52
Species richness (vascular plants)	35	57	57	52	47	49	47	41	47	42	46	57	37	36	50	58	49	56	78	35	47	64	38	47	38	57	64	43	42	42	48	43	25	53	37	65	37	52	36	62	57	39	51	49	57	45
Species richness (bryophytes)	?	?	?	?	?	4	3	?	?	?	?	?	?	?	1	5	?	2	?	1	3	?	?	3	?	1	3	?	?	?	2	?	1	?	2	?	3	?	?	?	?	1	3	?	?	7

Species	1 (F-C)	2 (F-S)	3 (F-S)
Festuco rupicolae-Caricetum humilis			
Bothriochloa ischaemum	+	.	.
Festuco pallentis-Seslerietum calcariae			
Acinos alpinus	r	+	+
Phyteuma orbiculare	.	1	2
Galium pumilum agg.	.	+	+
Sesleria albicans	.	3	4
Polygala amara ssp. *brachypter*	.	r	+
Carex ornithopoda	.	.	+
Leontodon incanus	.	+	+
Orthantho luteae-Caricetum humilis			
Tithymalus cyparissias	+	+	.
Colymbada scabiosa	.	.	.
Teucrium chamaedrys	1	r	+
Thesium linophyllon	.	.	.
Genista pilosa	.	1	2
Asperula cynanchica	+	.	.
Anthericum ramosum	+	+	+
Helianthemum ovatum	2	1	+
Hippocrepis comosa	.	1	+
Globularia punctata	+	.	.
Bupleurum falcatum	.	.	.
Carex humilis	.	.	.
Pseudolysimachion spicatum	+	.	.
Linum flavum	.	.	.
Thymus praecox	.	.	.
Ophrys insectifera	.	.	.
Orthantha lutea	.	.	.
Linum tenuifolium	.	.	.
Scabioso ochroleucae-Brachypodietum pinnati			
Festuca rupicola	2	+	.
Bromus erectus	+	.	1
Brachypodium pinnatum	.	.	.
Viola hirta	.	.	.
Carex michelii	.	.	.
Agrimonia eupatoria	.	.	.
Carex caryophyllea	1	.	.
Galium verum	.	.	.
Scabiosa ochroleuca	+	.	.
Campanula rotundifolia agg.	+	.	.
Carlina vulgaris	.	.	.
Potentilla arenaria agg.	1	.	.
Seseli annuum	.	.	.
Teucrium montanum	.	.	.
Prunella laciniata	.	.	.
Ononis spinosa	.	.	.
Picris hieracioides	.	.	.
Koeleria pyramidata agg.	2	.	.
Dorycnium pentaphyllum agg.	.	.	.
Acosta rhenana	.	.	.
Viola collina	.	.	.
Falcaria vulgaris	.	.	.
Vicia hirsuta	.	.	.
Clinopodium vulgare	.	.	.
Carici albae-Brometum monocladi			
Salvia pratensis	.	+	.
Sanguisorba minor	+	+	.
Potentilla heptaphylla	.	.	r
Salvia verticillata	.	.	.
Anthyllis vulneraria	r	.	.
Knautia kitaibelii	.	r	+
Primula veris	.	+	r
Pilosella bauhinii	r	.	.
Arabis hirsuta	+	.	.
Carex tomentosa	.	.	.
Bromus monocladus	.	1	.
Pyrethrum corymbosum	.	.	.
Buphthalmum salicifolium	.	.	.
Carex alba	.	+	+
Vincetoxicum hirundinaria	.	.	.
Polygonatum odoratum	.	.	1
Rhinanthus serotinus	.	.	.
Aquilegia vulgaris	.	.	.
Allium oleraceum	.	.	.
Inula salicina	.	.	.
Carduus glaucinus	.	.	.
Prunella grandiflora	.	.	.
Inula ensifolia	.	.	.
Gentiana cruciata	.	.	.
Acinos arvensis	.	.	.
Brachypodio pinnati-Molinietum arundinaceae			
Carlina acaulis	.	1	+
Medicago falcata	.	.	.
Trifolium montanum	.	1	+
Carex montana	.	2	2
Cirsium pannonicum	.	.	.
Polygala major	.	.	.
Hypericum perforatum	r	.	.
Trommsdorfia maculata	.	.	.
Filipendula vulgaris	.	.	r
Campanula glomerata	.	r	.
Betonica officinalis	.	r	.
Scorzonera hispanica	.	.	.
Ranunculus polyanthemos	.	.	.
Campanula persicifolia	.	.	.
Crepis praemorsa	.	.	.
Lathyrus latifolius	.	.	.
Trifolium rubens	.	.	.
Onobrychido viciifoliae-Brometum erecti			
Dianthus carthusianorum	.	r	+
Pimpinella saxifraga	.	r	.
Securigera varia	+	.	.
Onobrychis viciifolia	.	.	.
Pseudolysimachion orchideum	.	.	.
Class *Festuco-Brometea*			
Plantago media	.	+	r
Medicago lupulina	.	.	.
Fragaria viridis	.	.	.
Ranunculus bulbosus	.	r	.
Primula acaulis	.	.	.
Silene nutans	.	.	.
Lilium bulbiferum	.	.	+
Potentilla collina	.	+	.
Polygala comosa	.	.	.
Daucus carota	.	.	.
Senecio jacobaea	.	.	.
Veronica teucrium	.	.	.
Viola rupestris	r	.	.
Erysimum odoratum	.	.	.
Vicia tenuifolia	.	+	.
Laserpitium latifolium	.	.	.
Aster amellus	.	.	.
Asperula tinctoria	.	+	.
Carex flacca	.	.	.
Tephroseris integrifolia	.	r	.
Thesium alpinum	.	+	.
Class *Molinio-Arrhenatheretea*			
Lotus corniculatus	.	+	r
Achillea millefolium agg.	+	+	.
Dactylis glomerata	.	.	.
Arrhenatherum elatius	r	.	.
Leontodon hispidus	.	+	1
Tragopogon orientalis	.	.	.
Plantago lanceolata	+	.	.
Cruciata glabra	.	2	+
Leucanthemum vulgare	.	+	.
Poa pratensis agg.	r	.	.
Trisetum flavescens	.	.	.
Colchicum autumnale	.	r	.
Veronica chamaedrys	.	r	+
Vicia cracca	.	.	.
Trifolium pratense	.	.	.
Avenula pubescens	.	.	.
Taraxacum sect. *Ruderalia*	.	.	+
Silene vulgaris	.	.	.
Acetosa pratensis	.	.	+
Festuca rubra	.	.	.
Trifolium repens	.	.	.
Festuca pratensis	.	.	.
Ranunculus acris	.	r	r
Galium mollugo agg.	.	.	.
Prunella vulgaris	.	.	.
Campanula rapunculoides	.	.	.
Heracleum sphondylium	.	.	.
Ajuga reptans	.	.	.
Lathyrus pratensis	.	.	.
Jacea pratensis	.	.	.
Ranunculus auricomus	.	.	.
Cerastium holosteoides	.	.	.
Class *Nardetea strictae*, alliance *Violion caninae*			
Briza media	.	+	.
Thymus pulegioides	.	r	.
Linum catharticum	.	.	.
Jacea phrygia agg.	.	.	.
Agrostis capillaris	.	.	.
Alchemilla spec. div.	.	+	+
Luzula campestris agg.	.	.	.
Pilosella officinarum	.	.	.
Anthoxanthum odoratum	.	.	.
Potentilla erecta	.	+	1
Hypericum maculatum	.	.	.
Campanula patula	.	.	.
Campanula serrata	.	.	.
Danthonia decumbens	.	.	.
Viola canina	.	.	.
Other vascular plants			
Acer pseudoplatanus	.	+	+
Rhinanthus minor	.	.	.
Rosa canina agg.	.	.	.
Fragaria vesca	.	.	.
Cuscuta epithymum	.	.	.
Pinus sylvestris	.	.	.
Tithymalus tommasinianus	.	.	.
Allium scorodoprasum	.	.	.
Carpinus betulus	.	.	1
Gymnadenia conopsea	.	r	.
Quercus sp.	.	.	+
Convolvulus arvensis	.	.	.
Knautia arvensis	.	.	.
Sedum sexangulare	+	.	.
Cardaminopsis arenosa	+	.	.
Juniperus communis	.	.	.
Stachys recta	r	.	.
Trifolium flexuosum	.	.	.
Carum carvi	.	.	.
Euphrasia rostkoviana	.	.	.
Fagus sylvatica	.	+	+
Fragaria moschata	.	.	.
Ligustrum vulgare	.	.	.
Prunus spinosa	.	.	.
Trifolium campestre	.	.	.
Galium album	.	.	.
Trifolium alpestre	.	.	.
Acer campestre	.	.	.
Carex panicea	.	+	.
Luzula multiflora	.	+	.
Thlaspi caerulescens	.	.	.
Arenaria serpyllifolia	.	.	.
Asarum europaeum	.	.	.
Convallaria majalis	.	.	+
Fraxinus excelsior	.	.	r
Jovibarba globifera	2	.	.
Lilium martagon	.	.	.
Lysimachia nummularia	.	.	.
Phleum pratense	.	.	.
Phyteuma spicatum	.	.	.
Sorbus aria	.	.	.
Vicia sepium	.	.	.
Cirsium arvense	.	.	.
Crepis biennis	.	.	.
Picea abies	.	.	r
Potentilla thuringiaca	.	.	.
Pyrethrum clusii	.	.	.
Swida sanguinea	.	.	.
Thymus sp.	.	.	.
Tilia sp.	.	.	1
Veronica officinalis	.	.	.
Allium carinatum	.	.	.
Allium vineale	.	.	.
Anemone sylvestris	.	.	.
Astrantia major	.	.	.
Carex pallescens	.	.	.
Chamaecytisus hirsutus	.	.	.
Cirsium erisithales	.	.	.
Clematis vitalba	.	.	.
Crataegus monogyna	.	.	.
Crataegus sp.	.	.	.
Echium vulgare	.	.	.
Hypochaeris radicata	.	.	.
Knautia maxima	.	.	.
Listera ovata	.	.	.
Melampyrum nemorosum	.	.	.
Peucedanum cervaria	.	.	.
Poa compressa	1	.	.
Polygala vulgaris	.	.	.
Symphytum tuberosum	.	.	.
Bryophytes			
Thuidium abietinum	1	.	.
Hypnum cupressiforme	.	.	.
Fissidens dubius	.	.	.
Brachythecium salebrosum	.	.	.
Plagiomnium cuspidatum	.	.	.
Rhytidiadelphus squarrosus	.	.	.

Other species (present in less than four relevés):
Weitere Arten (in weniger als vier Aufnahmen vorhanden):
Acer platanoides 36: r, 83: r; *Acer* sp. 1: r; *Acetosa arifolia* 58: +, 88: 1; *Aegopodium podagraria* 74: 1, 87: +, 107: +; *Agrostis stolonifera* 30: +, 62: +; *Ajuga genevensis* 5: +, 37: r, 44: 2; *Alyssum montanum* 6: 1; *Amblystegium serpens* 35: +; *Anemone nemorosa* 95: +, 134: +; *Antennaria dioica* 47: +, 69: +; *Anthriscus sylvestris* 83: +; *Arabidopsis thaliana* 10: r; *Asplenium ruta-muraria* 124: +; *Astragalus cicer* 67: +; *Astragalus glycyphyllos* 71: r, 74: +; *Avenula* sp. 74: 1, 85: +; *Barbula unguiculata* 39: 1; *Bellidiastrum michelii* 3: +; *Bellis perennis* 99: r; *Berberis vulgaris* 12: r; *Betula pendula* 72: r; *Botrychium lunaria* 7: r; *Brachythecium campestre* 131: 1; *Brachythecium glareosum* 4: +, 35: 1, 62: 1; *Brachythecium velutinum* 51: 1, 84: r; *Bromus hordeaceus* 41: r; *Bryum caespiticium* 1: 2, 39: +; *Bryum capillare* 79: 1; *Calamagrostis epigejos* 107: 3; *Calamagrostis varia* 39: 3, 58: +, 62: +; *Campanula trachelium* 57: +, 107: +; *Campylium chrysophyllum* 51: 1; *Campylium stellatum* 120: r; *Cardaminopsis halleri* 56: +, 105: +, 139: +; *Carduus acanthoides* 123: +; *Carex hirta* 123: +; *Carex muricata* agg. 95: 1; *Carex pilulifera* 59: 1, 69: 2, 70: +; *Carex sempervirens* 39: 1; *Cephalanthera rubra* 56: +, 105: +; *Chamaecytisus supinus* 38: 2; *Cichorium intybus* 34: +; *Cirriphyllum piliferum* 129: 1; *Cirsium eriophorum* 43: +; *Cirsium oleraceum* 107: +; *Cladonia furcata* 61: +; *Climacium dendroides* 38: 2; *Coronilla vaginalis* 62: +; *Corylus avellana* 17: +, 87: +, 92: r; *Cotoneaster* sp. 92: r; *Crataegus laevigata* 19: +, 20: +, 44: r; *Crocus discolor* 130: +, 139: +; *Ctenidium molluscum* 39: +, 52: 2; *Cyclamen fatrense* 42: r; *Cynosurus cristatus* 56: +, 109: +; *Dactylorhiza sambucina* 75: 1, 78: +; *Danthonia alpina* 67: +; *Dianthus deltoides* 32: 2, 76: +; *Dicranum polysetum* 38: +; *Digitalis grandiflora* 62: 2, 76: r; *Ditrichum heteromallum* 9: 2, 52: 2; *Elytrigia repens* 58: +, 129: +, 132: +; *Encalypta streptocarpa* 1: +, 4: +, 39: 2; *Entodon concinnus* 39: 1; *Erophila verna* agg. 32: 1; *Erysimum witmannii* 98: +; *Eupatorium cannabinum* 72: r; *Euphrasia stricta* agg. 7: r; *Festuca ovina* 32: 2, 98: 1; *Festuca pallens* 98: +; *Festuca pseudodalmatica* 98: 2; *Frangula alnus* 12: r, 33: r; *Galium aparine* 76: +; *Genista tinctoria* 70: +, 80: r; *Gentianopsis ciliata* 31: r; *Geranium pusillum* 22: r; *Geranium sanguineum* 76: +, 86: +; *Geranium sylvaticum* 96: +, 130: +, 139: 1; *Geum urbanum* 75: r, 107: +; *Gladiolus imbricatus* 88: 1; *Hieracium bifidum* 120: r; *Homalothecium lutescens* 115: 2; *Homalothecium phillipeanum* 110: r; *Hylocomium splendens* 38: +, 81: 2; *Hypericum hirsutum* 72: r, 74: r, 107: +; *Isopyrum thalictroides* 134: r; *Larix decidua* 81: r; *Lathyrus niger* 86: +, 96: +; *Lathyrus nissolia* 22: 1; *Lathyrus sylvestris* 80: +, 90: 2; *Lathyrus tuberosus* 23: +, 98: r; *Lathyrus vernus* 76: +; *Lembotropis nigricans* 69: 1, 111: +; *Lepidium campestre* 6: r; *Leskea polycarpa* 52: 2, 61: 2; *Leucodon sciuroides* 1: 1; *Linaria vulgaris* 87: +, 111: +; *Linum perenne* agg. 6: 1; *Lithospermum purpurocaeruleum* 11: 1, 87: 1; *Luzula luzuloides* 70: +, 74: +; *Maianthemum bifolium* 72: r; *Medicago sativa* 79: r; *Medicago x varia* 115: +; *Melampyrum arvense* 100: r; *Melica ciliata* 124: +; *Melica nutans* 17: +; *Mercurialis perennis* 2: r, 62: r, 66: +; *Muscari comosum* 112: r; *Mycelis muralis* 58: r; *Myosotis arvensis* 83: r; *Myosotis sylvatica* 86: +; *Nardus stricta* 70: +; *Orchis* sp. 61: r; *Origanum vulgare* 5: +; *Orobanche* sp. 48: +; *Parnassia palustris* 39: +; *Peucedanum oreoselinum* 111: +, 128: +; *Phleum hirsutum* 16: 1; *Pimpinella major* 88: +, 96: +, 130: +; *Plagiomnium medium* 73: 1, 114: 1; *Plagiomnium* sp. 110: 2; *Plagiomnium undulatum* 38: +, 100: 1; *Pleurozium schreberi* 80: 2, 121: +, 137: 1; *Poa alpina* 46: +; *Poa annua* 132: 1; *Polygonatum multiflorum* 55: +, 75: r; *Potentilla argentea* agg. 32: 1; *Potentilla reptans* 42: +, 57: r, 58: +; *Potentilla rupestris* 82: r; *Primula elatior* 69: +, 82: 1, 87: +; *Primula x brevistyla* 78: r, 84: r; *Prunella x intermedia* 120: r; *Pulsatilla grandis* 17: 2, 140: 2; *Pulsatilla subslavica* 2: 1; *Pyrus* sp. 21: r, 37: r, 120: r; *Ranunculus nemorosus* 46: r, 94: +; *Reseda lutea* 92: +; *Rhytidiadelphus* sp. 137: 1; *Rhytidium rugosum* 38: +, 140: 2; *Scilla bifolia* agg. 121: +; *Scleranthus annuus* 32: 1, 43: +; *Sedum acre* 28: r; *Solidago virgaurea* 34: +, 72: r, 92: r; *Stellaria graminea* 64: +, 74: +, 88: 1; *Steris viscaria* 130: +, 139: +; *Tanacetum vulgare* 80: r; *Thalictrum lucidum* 113: r; *Thalictrum simplex* 38: +; *Thlaspi perfoliatum* 138: r; *Thuidium* sp. 118: 3, 137: 3; *Tithymalus amygdaloides* 60: +, 68: +; *Tithymalus epithymoides* 5: +; *Tortella inclinata* 1: 2, 39: 2; *Tortula ruralis* 1: 2, 118: +, 140: 1; *Traunsteinera globosa* 86: r; *Trifolium arvense* 22: +; *Trifolium aureum* 32: 1, 71: +; *Trifolium dubium* 22: +; *Trommsdorfia uniflora* 120: 1; *Tussilago farfara* 113: +; *Verbascum chaixii* ssp. *austriacum* 32: 2, 104: +; *Verbascum* sp. 1: r, 42: r, 108: r; *Veronica arvensis* 32: 1; *Vicia sativa* 128: +; *Vicia sylvatica* 83: r; *Vicia tetrasperma* 32: +; *Vicia villosa* 19: +; *Viola reichenbachiana* 58: r, 130: +; *Viola riviniana* 39: +; *Viola tricolor* 42: +, 58: +.

Table 3: Phytosociological table of mesophilous grasslands of the classes *Molinio-Arrhenatheretea* (excl. *Molinietalia*) and *Nardetea strictae* classes
The relevés belong to the following associations: 1–9 *Lolio perennis-Cynosuretum cristati*, 10–26 *Pastinaco sativae-Arrhenatheretum elatioris*, 27–95 *Poo-Trisetetum flavescentis*, 96–111 *Anthoxantho odorati-Agrostietum tenuis*, 112–163 *Ranunculo bulbosi-Arrhenatheretum elatioris*, 164–192 *Lilio bulbiferi-Arrhenatheretum elatioris*, 193–228 *Campanulo glomeratae-Geranietum sylvatici*, 229–239 *Violo sudeticae-Agrostietum capillaris*.
Information on the origin of the relevés is given in Appendix C.

Tabelle 3: Pflanzensoziologische Tabelle der mesophilen Grünlands der Klassen *Molinio-Arrhenatheretea* (ohne *Molinietalia*) und *Nardetea strictae*
Zur Bedeutung der Assoziationsnummern vgl. englische Tabellenüberschrift. Die Herkunftsnachweise der Aufnahmen finden sich in Anhang C.