Thaiszia - J. Bot., Košice, 13: 31-66, 2003
http://www.bz.upjs.sk/thaiszia/index.html

THAISZIA
JOURNAL OF
BOTANY

Geo rivali-Caricetum paniculatae ass. nova from the West Carpathians

JOZEF ŠKOLEK

Research Station of the Tatra National Park, Centre, SK-03314 Liptovský Hrádok, SLŠ, Slovakia, e-mail: foff@slslhr.sk

ŠKOLEK J. (2003): *Geo rivali-Caricetum paniculatae* ass. nova from the West Carpathians. – Thaiszia – J. Bot. 13: 31-66. – ISSN 1210-0420.

ABSTRACT: By searching hydromorphic habitats throughout Upper Liptov (1996-2000), we focused vegetation types with *Carex paniculata*, not belonging to the association *Caricetum paniculatae*. The study resulted in the description of a new association *Geo rivali-Caricetum paniculatae* and subassociations *typicum* and *valerianetosum simplicifoliae* (*Calthion*, *Molinio-Arrhenatheretea*). All the relevés published from the West Carpathians were revalued from the point of view of the new association. The new association is characterized from ecological and coenological points of view. The differences compared to other communities dominated by *Carex paniculata* and C. *appropinquata* are discussed.

KEYWORDS: *Geo rivali-Caricetum paniculatae* ass. nova, phytosociology, Liptov, Slovakia.

Introduction

Having searched hydromorphic habitats throughout Upper Liptov (Fig. 1), we often met, especially on sloping mires, vegetation types dominated by *Carex paniculata*. RUŽIČKOVÁ (1980, 1986) described similar sedge stands not belonging to the well known association *Caricetum paniculatae* WANGERIN 1916 (cf. OBERDORFER 1977), alliance *Magnocaricion elatae* KOCH 1926. The vegetation types of similar floristical composition are lacking in the Liptov region, since the characteristic species of the tall-sedge growth of the alliance *Magnocaricion* are nearly absents, while entering the species of the minerotrophic fens. This is the reason why the author placed this vegetation type

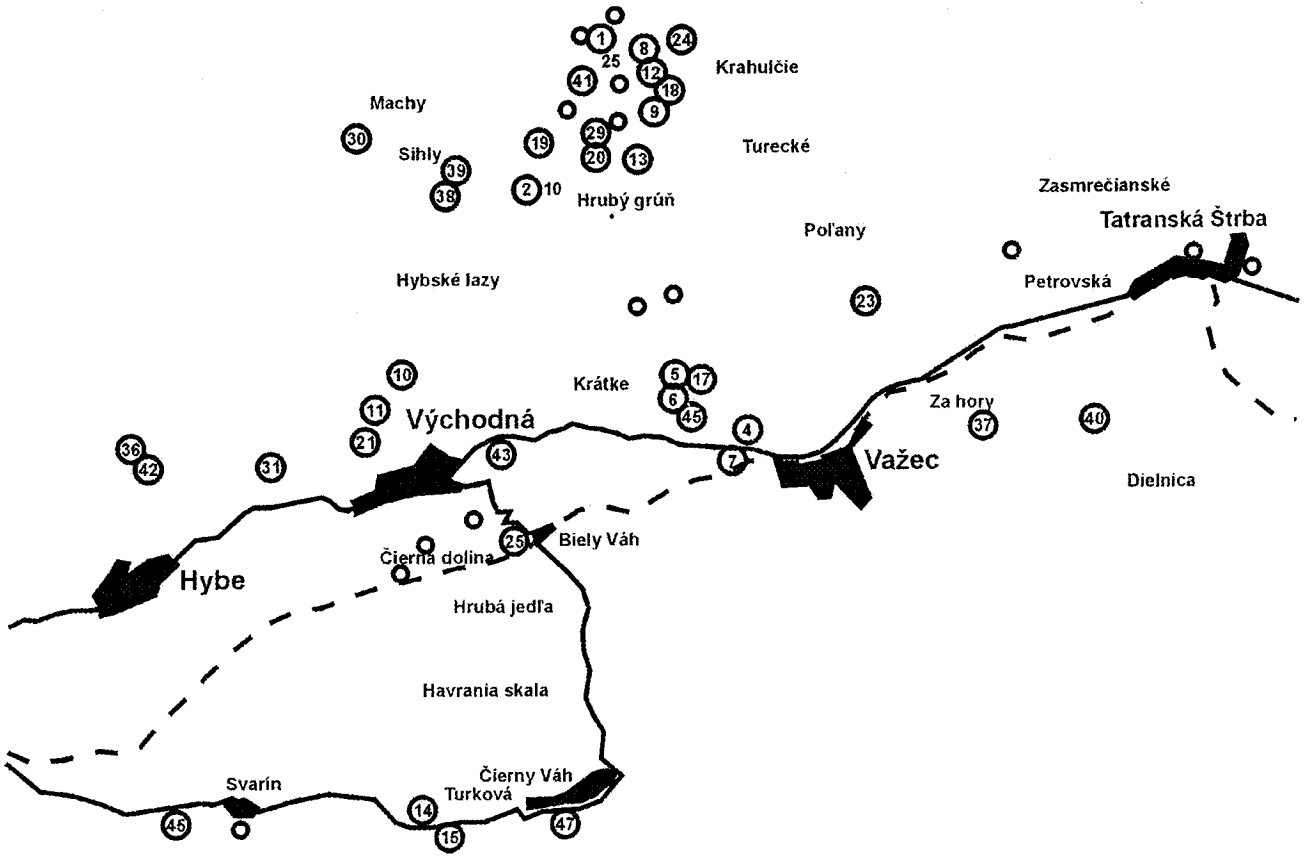

Fig. 1. Distribution of the association *Geo rivali-Caricetum paniculatae* in upper Liptov. The numbers coresponding with the locality list in table 1. Circles without numbers occurence without relevé.

into the alliance *Caricion davallianae* KLIKA 1934, as a community with *Carex paniculata*.

Having elaborated own relevés I found that these do not match with the alliance *Magnocaricion* because of a large number of the species of the alliances *Caricion davallianae* and *Calthion* R. TX. 1937 em. BAL.-TUL. 1978. This is the reason why we have decided to describe a new association reflecting the real floristical features of the tall-sedge stands with *Carex paniculata* in Liptov region and to stress differences between the old association *Caricetum paniculatae* and the related association *Caricetum paradoxae* R. TX. ex VON ROCHOW 1951 (= *Caricetum appropinquatae* ASZÓD 1938) and to others associations and subassociations having integrated stands with *Carex paniculata*.

Similar to Liptov's tall-sedge vegetation types occur in other parts of the Slovak Carpathians (see Distribution and Fig. 2).

Methods

In the years 1996, 1997 and 2000, we recorded 30 relevés. The BRAUN-BLANQUET approach (MORAVEC et al. 1994) has been used in the field and during the synthetic phase of the work. All the available published and unpublished phytocoenological relevés were included into the synthesis (FAJMONOVÁ 1991, HÁBEROVÁ & FAJMONOVÁ 1995, KYSELOVÁ 1976, LESKOVJANSKÁ ined., ONDREJOVÁ & HRIVNÁK 1994, RUŽIČKOVÁ 1980, 1986, RYBNÍČEK ined., ŠMARDA 1960, ŠPÁNIKOVÁ 1985, ŠPÁNIKOVÁ & ZALIBEROVÁ 1982, ŠUCHOVÁ 1970).

To stress the differences, the following published and unpublished relevés were compared: BOSÁČKOVÁ (1975), MALOVCOVÁ (ined.), OBERDORFER (1977), OŤAHELOVÁ et al. (2001), HÁJEK (1999) and HÁJKOVÁ et al. (2001).

To compare the community with *Carex appropinquata*, not growing in the Liptov region, we have used published and unpublished relevés recorded out of the Liptov region by BOSÁČKOVÁ (1970,1974), KLIKA (1958), ŠKOVIROVÁ (ined.), ŠOLTÉS (2000). Some relevés showed features of the both old and new communities.

Nomenclature of the taxa follows MARHOLD & HINDÁK (1998) and that of syntaxa is in accordance with MUCINA & MAGLOCKÝ (1985).

Temperature, pH level and conductivity of the ground water were measured in October 17, 2001 using device CyperScan PC 300.

The bryophytes were determined by Dr. R. ŠOLTÉS, PhD., Research Station of the Tatra National Park.

The description of the new association

Since the floristical composition of the *Carex paniculata* community growing in the Liptov region, as well as in some other territories of Slovakia, differs from the *Caricetum paniculatae* described by OBERDORFER (1977) in Germany, we have decided to describe the new association *Geo rivali-Caricetum paniculatae* **ass. nova.**

We were conducted by the following arguments:

a) missing species of the alliance *Magnocaricion elatae* or *Caricion rostratae* BAL.-TUL. 1963 in our stands, but abundant in Germany,
b) high frequency of the species of the alliance *Caltion* (50%) in our communities (Tab. 3),
c) high frequency of the species of the alliance *Caricion davallianae* in our communities, but missing in the *Caricetum paniculatae* WANGERIN 1915,
d) missing species of the order *Magnocaricetalia* (KOCH 1926) PIGNATTI 1953, except for *Galium palustre* but with a low frequency (Tab. 1, 4),
e) high frequency of the species of the order *Molinietalia* KOCH 1926 (50%) in our communities (Tab. 3).

Creating the name, the following facts were accepted: the first species, *Geum rivale*, is of a high constancy, in connection with *Carex paniculata* considered as the main floristical feature of the community. The ecological features of *Geum rivale* are mostly similar to the ones of *Carex paniculata*, compared to the other species of the characteristic species composition, like *Galium uliginosum*, *Cirsium rivulare*, *Equisetum palustre*, *Lathyrus pratensis* and others. The second, most important (BARKMANN et al. 1988) in the syntaxon name, belongs to *Carex paniculata*, one dominant species of high constancy.

Ordination of the new association is as follows:
Molinio-Arrhenatheretea R. TX. 1937 em. 1970
Molinietalia KOCH 1926
Calthion R. TX. em. BAL.-TUL. 1978
Calthenion (R. TX. 1937) BAL.-TUL. 1978
Geo rivali-Caricetum paniculatae **ass. nova**
typicum **subass. nova**
valerianetosum simplicifoliae **subass. nova**

The characteristics of the association *Geo rivali-Caricetum paniculatae* ass. nova

(synonymums are *Caricetum paniculatae* WANGERIN 1916 reported in the articles of ŠMARDA 1960, KYSELOVÁ 1976, ŠPÁNIKOVÁ 1985 and HÁBEROVÁ & FAJMONOVÁ 1995, *Valeriano simplicifoliae-Caricetum davallianae caricetosum paniculatae* reported in the paper of ŠUCHOVÁ 1970).

Nomenclatoric type: Tab. 1, relevé 5, holotypus.

Diagnostical taxa of the association E_1: *Carex paniculata* (dom.), *Geum rivale* (subdom., dif.), *Cirsium rivulare*, *Caltha palustris* subsp. *laeta*, *Lathyrus pratensis*, *Filipendula ulmaria*, *Myosotis scorpioides*, *Angelica sylvestris*, *Crepis paludosa*, *Equisetum palustre*, *Galium uliginosum*.

E_0 (Tab. 2): *Tomenthyphnum nitens* (dom.), *Drepanocladus revolvens*, *Plagiomnium elatum*, *Bryum pseudotriquetrum*, *Palustriella commutata*, *Bryum scheicheri*.

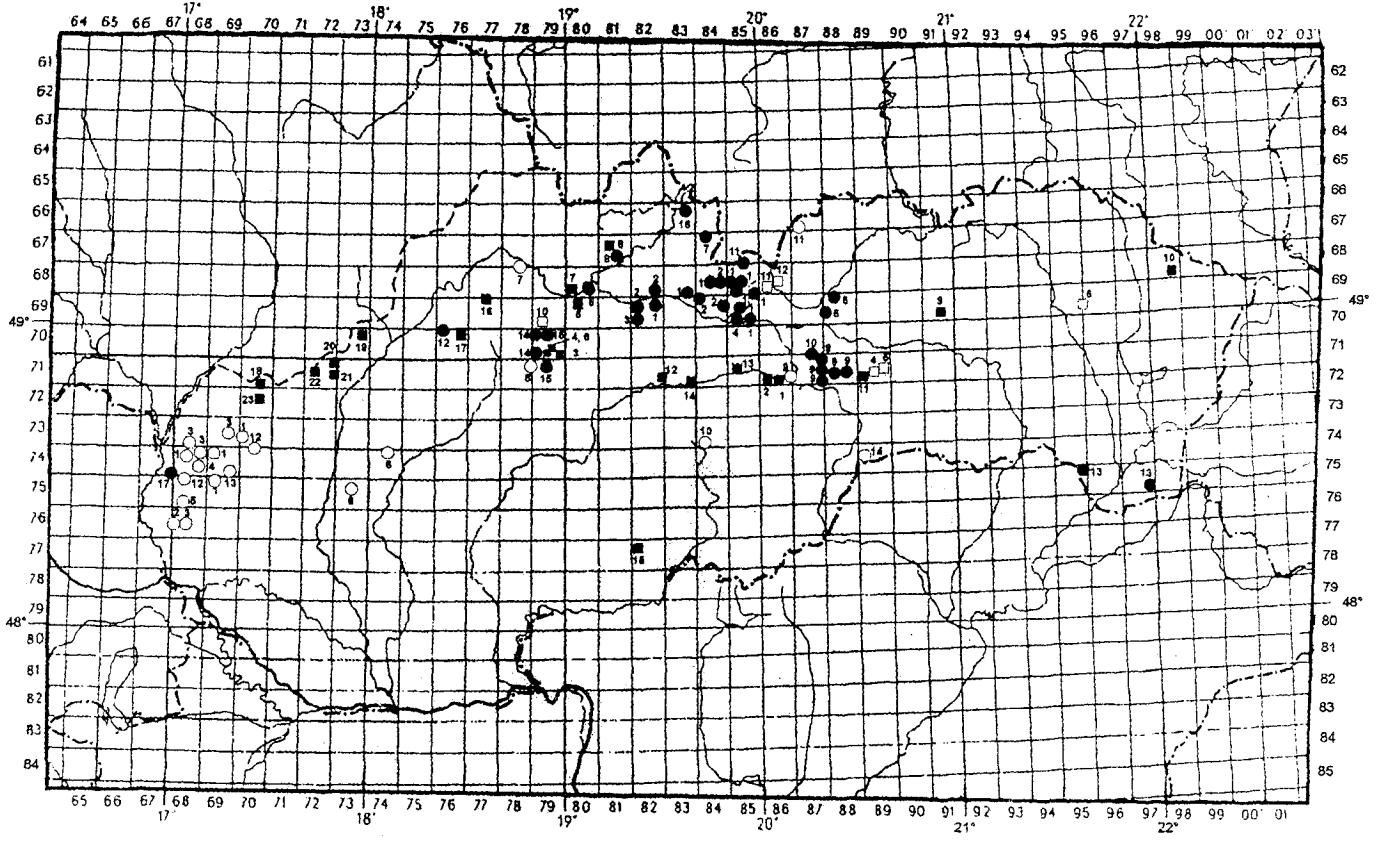

Fig. 2. Distribution of the association *Geo rivali-Caricetum paniculatae* and *Geo rivali-Caricetum appropinquatae* (●- with relevés and ■- floristical list without relevés) compared to the association *Caricetum paniculatae* and *Caricetum paradoxae* (O- with relevés, □- without relevés), numbers corresponding with table 5, 6.

Habitat features

The main ecological feature allowing the community existence is spring water rich in bivalent bases. All over the years the water table has reached the soil surface or just below.

The soils are mild acid or neutral. From a typological point of view they are glue peaty soils and peaty soils or, using morphogenetic classification system (HRAŠKO et al. 1991) Histi-Mollic Gleysols and Eutric Histosols.

The peat layer in Histi-Mollic Gleysols is up to 30 cm thick, placed on glue horizon with permanent water excess, while in Eutric Histosols the peat layer is thicker, reaching 30-50 cm.

The majority of species requires permanent wet habitats rich in bases but poor in nitrogene (RUŽIČKOVÁ 1986), this is supported by the results of our field measurements: temperature 9.5-15.7°C with an average 12.9°C; pH 6.42-7.61 with an average 7.08; conductivity 359-605 µS with an average 506 µS.

The community covers small areas along spring outlets, sometimes larger areas especially on flat terrains or in depressions along brooks or in the ones caused by soil slide. It occurs in the altitudinal span 400-900 m asl, in the Upper Liptov region mostly above 700 m asl.

Development and community structure

Firstly, the association *Geo rivali-Caricetum paniculatae* consists of huge bunches of the sedge *Carex paniculata*. The aspect of the association changes along successional stages, from open stands, consisting of hummocks, 70-100 cm high, to closed stands, without hummocks, 50-70 cm high. In the initial stages, the surface water is running between bunches. The dead plant rests and soil particles are seized in the bunches and around them. Consequently, the isles of peaty soils are created and the number of species increases. In some places, connected stands with the sedge *Carex paniculata* can be seen. The water stream is restricted. The next development come through subassociation *valerianetosum simplicifoliae* to the association *Valeriano simplicifoliae-Caricetum davallianae* MORAVEC 1966.

The upper layer is dominated by the sedge *Carex paniculata* together with *Cirsium rivulare* and *Filipendula ulmaria*. The central layer is composed by *Eriophorum latifolium*, *Geum rivale* and *Ranunculus acris*. The lower layer consists of many species, the most important ones are *Carex davalliana*, *Valeriana simplicifolia*, *Caltha palustris* subsp. *laeta*, *Potentilla erecta* and *Carex panicea*. The moss layer is strongly developed. An important constituent of the community structure is a moss layer. Unfortunately, it has not often been analysed.

Phytocoenological features

The characteristic species of the association is *Carex paniculata* combined with *Geum rivale* (differential species to ass. *Caricetum paniculata*, and other associations or subassociations dominated by *Carex paniculata*). *Geum rivale* grows on wet meadows and springs, in floodplains along brooks, in flooded forests, in fen meadows, wet forests and tall-herb mountain floodplains. Enters to more plant communities, more often to the communities of the ordo *Molinietalia* as the characteristic species af the alliance *Calthion* (OBERDORFER 1970). *Carex paniculata* is a semiheliophylous or heliophylous, mesotrophic sedge. Occurs on wet, mild acid or neutral, rich in nutrients, slightly humuseous, sandy to gravelly or explicitly loamy soils. The sedge is rooting up to 50 cm.

The association is dominated by some fen species, e. g. (Tab. 1) *Carex davalliana*, *Valeriana simplicifolia*, *Caltha palustris* subsp. *laeta* and others. Some species of mesofileous meadows enter the community, e. g. *Lathyrus pratensis* and *Ranunculus acris*.

The association is separated from ass. *Caricetum paniculatae* (except for *Geum rivale*) mainly by the presence of *Carex davalliana*, *Eriophorum latifolium*, *Valeriana simplicifolia*, *Cirsium rivulare*, *Lathyrus pratensis*, *Filipendula ulmaria*, *Succisa pratensis* (Tab. 2).

The high frequency of the diagnostic species of the alliance *Calthion* (Tab. 1, 2) and *Caricion davallianae* and the absence of the diagnostic species *Magnocaricion elatae* is characteristic for the new association.

The number of species in one relevé varies from 16 to 37, with an average of 26 species. A high constancy (III-V) is typical for 18% of the species, indicating phytocoenological dishomogenity of the community. The cause of the intra-variability is mainly differences in habitat contitions, which is the base on which two subassociations were set aside (Tab. 1). The distribution of the species according to their constancy is as follows (in %): I-68, II-14, III-6, IV-6, V-6.

The number of fen species can be found in the moss layer, e. g. *Drepanocladus revolvens*, *Campylium stellatum*, *Palustriella commutata*, *Tomenthypnum nitens*, *Paludella squarrosa*, belonging to the alliance *Caricion davallianae*, is an argument to support creation of the new association. They are absent in the association *Caricetum paniculatae* (Tab. 2).

Subassociations

Geo rivali-Caricetum paniculatae valerianetosum simplicifoliae subass. nova

Nomenclatoric type: Tab. 1, relevé Nr. 22, holotypus.

Differencial species: *Valeriana simplicifolia*, *Carex davalliana*, *C. flava*, *Eriophorum latifolium*, *Primula farinosa*, *Pinguicula vulgaris*, *Epipactis palustris*, *Parnassia palustris*.

The species of minerotrophic fens (alliance *Caricion davallianae*) entering the subassociation, differ this subassociation from the following, typical subassociation. They occur in the sloping mires.

Inside the subassociation is defined a variant with *Primula farinosa*, containing more species of the alliance *Caricion davallianae*: *Pinguicula vulgaris*, *Epipactis palustris* and *Parnassia palustris*. The stands without these species are placed in the typical variant (Tab. 1).

***Geo rivali-Caricetum paniculatae typicum* subass. nova.**

Nomenclatoric type: Tab. 1, relevé 5, holotypus.

Differencial species: The negative differentiation against the thirst subassociation. The stands without diagnostic species of the alliance *Caricion davallianae* are placed into the subassociation *typicum.* They often cover bottomlands along the brooks.

Distribution

The association occurs mostly in the span 400-900 m asl. (Tab. 2). Only exceptionally it occurs in lower (100, 170 m asl.) or higher (1240, 1310, 1530 m asl.) elevations.

Below is the list of the stands of *Carex paniculata* in accordance with increasing altitude, placed in the new association:

In Východoslovenská rovina lowland, land register of the settlements Malá Tŕňa (170 m asl.) and Plešany (100 m asl.), placed into the association *Caricetum paniculatae* (ŠPÁNIKOVÁ 1985). In Hostovické lúky meadows (330 m asl., Laborecká vrchovina hill country) occurs *Carex paniculata* stands (BURAĽ 2000) belonging to the new association (Tab 6).

FAJMONOVÁ (1991) reported three relevés in the Strážovské vrchy hills, in the altitude of 400-480 m asl., recorded in the spring area of Slatinský potok brook and in the Podhradská dolina valley. The communitiy is signed as „community with *Carex paniculata*".

The stands with *Carex paniculata* recorded by HÁBEROVÁ & FAJMONOVÁ (1995) in Rojkov fen (610 m asl., Veľká Fatra Mts.) and by ŠPÁNIKOVÁ & ZALIBEROVÁ (1982) in Popradská kotlina basin, placed in the association *Caricetum paniculatae*, are in correspondance with the new association.

The relevés recorded by RYBNÍČEK (ined.) near the Oravice Settlement (840 m asl., Skorušinské vrchy hills) and LESKOVJANSKÁ et al. (ined.) in Slovenský raj National Park (850 m asl., Kopanické sedlo sattle) belong to the new association. ŠUCHOVÁ (1970), in this orographic unit, made a note of the *Carex paniculata* stands (845-940 m asl), placing them in the subassociation *Valeriano simplicifoliae-Caricetum davallianae caricetosum paniculatae.*

GREBENŠČIKOV et al. (1957) recorded a stands with *Carex paniculata* growing on Kubínska hoľa hill (1310 m asl., Oravská Magura hills) as a fragment of the association *Caricetum elatae*, the floristical composition suggests the relation with the new association.

ŠMARDA (1960) recorded the relevés of the community with *Carex paniculata* in the West Tatra Mts. (Tichá dolina, 1249 m asl. and Tomanová dolina, 1530 m asl., this is the highest placed locality in Slovakia).

The largest and the most luxuriant developed *Carex paniculata* stands are in the upper Liptov region, in the land register Východná. The majority of relevés (Fig. 1) were recorded here. Similarly, the majority of relevés included in the paper of RUŽIČKOVÁ (1986) came from the areas of the settlements Východná and Važec. There are only few isles of *Carex paniculata* stands in the lower and middle Liptov region (Fig. 1), as in the Strážovské vrchy hills, in Orava region and other areas of Slovakia (Fig. 2). A large, continuous *Carex paniculata* stand, is developed in the Tichá dolina valley in the West Tatra Mts., while in the neighbouring Tomanova dolina valley there are only patchy, sloping stands.

Due to the destruction of wetlands by drainage, in the past, there are only few remnants of the previous large, luxuriant *Carex paniculata* stands in many areas of Slovakia, e. g. Turčianska kotlina basin, Kubínska hoľa hill and others. But, when disfunction of drainage equipment, the conditions for *Carex paniculata* may be improved.

According to some sources (SLOBODNÍK & KADLEČÍK 2000, STANOVÁ 2000), there are conditions for other *Carex paniculata* stands in the areas mentioned above (Tab. 5) or in still unmentioned territories: Biele Karpaty hills, Malá Fatra Mts., Krupinská vrchovina, Branisko, Ľubovnianska vrchovina hills and Spišsko-gemerský kras karst (Tab. 6, Fig. 2). A more detailing phytoceonological investigation is needed.

Evaluation of the *Geo rivali-Caricetum paniculatae* association and its syntaxonomical features

The new association is sharply distinctive from the *Caricetum paniculatae* (OBERDORFER 1977), this is showed in tables 2 and 4. The *Carex paniculata* stands described by HRIVNÁK (2001) and placed in the ass. *Caricetum paniculatae*, are clearly distinctive from the new association. Likewise, the relevés recorded by MALOVCOVÁ (ined.) in Borská nížina lowland does not correlate with the new association.

Wetland communities with *Carex paniculata* in Biele Karpaty described HÁJEK (1998). He placed them to the ass. *Cirsietum rivularis* and subass. *caricetosum paniculatae* and *Angelico cirsietum oleracei caricetosum paniculatae* BAL.-TUL. et HÁJEK 1998. Our association is sharply distinctive from these communities (Tab. 7). Primarily, the differential species *Geum rivale* is lacking. This species reliably indicates relation the stands with *Carex paniculata* to the association *Geo rivali-Caricetum paniculatae.* This opinion is supported by the floristic composition of other stands not included in this contribution. More over, in his associations do not occur some indicator species of the alliances *Calthion*, *Caricion davallianae* and of the ordo *Molinietalia* (Tab. 7), which are abundant in the described association.

Apart from mentioned communities, the author introduces some other ones, but illustrated only by few relevés. Based on the presence of the species of the classis *Phragmito-Magnocaricetea*, two relevés are placed to the ass. *Caricetum paniculatae*, a dissimilarity from our association is clearly showed. One relevé is placed to the subass. *Junco inflexi-Menthetum longifoliae caricetosum*

paniculatae HÁJEK 1998 and one relevé to the subass *Scirpo-Cirsietum caricetosum paniculatae* BAL.-TUL. et HÁJEK 1998, the floristic composition is quite different from our association. It is important to stress, that never ever occurs *Geum rivale* in mentioned relevés!

In Strážovské vrchy Hills HÁJEKOVÁ et al. (2001) placed the stands with *Carex paniculata* to the ass. *Cirsietum rivulare* and subass. *caricetosum davallianae*, this association does not correlate with the new association as well. (Tab. 7).

The *Carex panniculata* community described by RUŽIČKOVÁ (1986) fit with the new association very well (Tab. 2, 4). The *Carex paniculata* stands recorded by FAJMONOVÁ (1991) in Strážovské vrchy hills, by ONDREJOVÁ & HRIVNÁK (1994), KYSELOVÁ (1976), Háberová & FAJMONOVÁ (1995), ŠPÁNIKOVÁ & ZALIBEROVÁ (1982), RYBNÍČEK (ined.), ŠUCHOVÁ (1970) and LESKOVJANSKÁ et al. (ined.) may be included in the new association because of similar floristical composition (Tab. 2).

The *Carex paniculata* communities in Tichá and Tomanová valley placed ŠMARDA (1960) into the association *Caricetum paniculatae*. The table 4 suggest the possibity to take them into the new association since the diagnostical species of the alliance *Magnocaricion elatae* and the ordo *Magnocaricetalia* are lacking, while diagnostical species of the alliance *Calthion* and *Caricion davallianae* and of the ordo *Caricetalia fuscae* are abundant. This is supported by the presence of the moss *Paludella squarrosa*, typical fen species.

The association *Caricetum paradoxae* in Germany (OBERDORFER 1977) has similar dominant feature, floristical composition and constancy as the *Caricetum paniculatae*, apart from three species *Carex elata, Lycopus europaeus* and moss *Climacium dendroides*, differing in constancy.

In Slovakia, the *Caricetum paradoxae* is reported in Záhorská nížina lowland by KLIKA (1958) and by BOSÁČKOVÁ (1970, 1975), in Turčianska kotlina basin by ŠKOVIROVÁ (ined.) and BOSÁČKOVÁ (1974) and in Orava region by ŠOLTÉS (2000).

Lacking indicator species of the alliances *Caricion davallianae* and *Caltion* as well of the ordo *Caricetalia fuscae*, this growths are distinctly separated from the new association, while these species are present in Slovakia, suggesting including these communities into the association *Geo rivali-Caricetum paniculatae* (Tab. 4). The similarity is particularly outstanding by the relevés recorded by BOSÁČKOVÁ (1970) in the National Nature Reserve Abrod and in Turčianska kotlina basin (Tab. 2, 4), one relevé recorded by ŠOLTÉS (2000) in Orava region prognosticates the similarity of the Orava communities occuring in fens near the settlements of Beňadovo, Bobrov and Trstená (MIGRA, pers. cont.).

Neither the *Carex appropinquata* communities in Záhorie lowland are coincidental with those in Germany, separating mainly by the presence of the species from the alliances noticed above and lacking in Germany (Tab. 2), despite the occurrence of some indicator species of the alliance *Magnocaricion elatae*. This is distinctively recorded by BOSÁČKOVÁ (1975) in her relevés. This is the reason why they had been included in the association *Caricetum paradoxae* (cf. Tab. 2, 5).

Based on the similar ecologicat features and similar floristical composition, it seems that the growths with *Carex appropinquata* in Slovakia is a vikaring community of the *Geo rivali-Caricetum paniculatae*. This is the reason why we suggest to place this community in the association *Geo rivali-Caricetum appropinquatae*.

Nevertheless, more work is needed for the analysis of the communities with *Carex appropinquata*, especially for those with the highest extent.

Figure 2 introduce the more widespread association *Geo rivali-Caricetum paniculatae* compared to the association *Caricetum paniculatae*, restricted predominantly to the Borská nížina lowland, where may interfere the Atlantic climatic conditions. This supports the validity of the description of the new association.

Threat and gene pool importance

The spring vegetation dominated by the sedge *Carex paniculata* belongs to the minerotrophic fens of the endangered alliance *Caricion davallianae*. Due to the destruction of wetlands by drainage in the past, the original, unchanged fens became rare, there are mostly only patchy remnants to meet. The original, unchanged communities with *Carex paniculata* are very valuable (e. g. location Pálenice near Východná settlement). Their botanical value is supported by presence of 13 endangered and protected species, like *Primula farinosa*, *Pinguicula vulgaris*, *Dactylorhiza majalis*, *D. maculata* subsp. *schurii*, *Epipactis palustris* and others. In the relevé Nr. 25, we noticed no fewer than 8 such species. From a gene pool point of view, these valuable communities were suggested for protection (cf. ŠKOLEK 1999).

In Strážovské vrchy hills are met along brooks bottomland communities dominated by *Carex paniculata*, not identical to the *Caricetum paniculatae* (SMATANOVÁ 2000). The floristical composition suggests the belonging to our new association. Competitive more powerful sedge *Carex paniculata* pushes out more submissive species and contributes to owergrowing of unscythed fen meadows. The remnants of well preserved fens the author (SMATANOVÁ 2000) calls for protection.

Acknowledgements

The author wish to thank to the Rudolf Šoltés for mosses determination and for translation and to Isabelle Nordmand, ENGRAF, Nancy, for correction the English.

References

BALÁTOVÁ-TULÁČKOVÁ E. (1968): Grundwasserganglinien und Wiesengesselschsften (Vergleichenden Studie der Wiesen aus Sudmähren). – Přír. Práce Ústavu Českoslov. Akad. Brne 2: 1-37.

BALÁTOVÁ-TULÁČKOVÁ E. (1976): Rieder- und Sumpfweisen der Ordnung *Magnocaricetalia* in der Záhorie-Tiefebene und dem nordlich angrenzenden Gebiete (Synokologische Studie der *Magnocaricetalia* - Gesellschaften). – Vegetácia ČSSR, B 3, Veda, Bratislava. [258 pp.]

BALÁTOVÁ-TULÁČKOVÁ E. (1985): Travinná spoločenstva v Československu. – In: RYCHNOVSKÁ M. et al., Ekologie lučních porostů, p. 14-95, Academia, Praha.

BARKMAN J., MORAVEC J. & RAUCHERT S. (1988): Kód fytocenologické nomenklatury. – Zprávy Českoslov. Bot. Společn. 1: 1-59.

BOSÁČKOVÁ E. (1970): Kvetena a rastlinné spoločenstvá štátnej prírodnej rezervácie Abrod na Záhorí. – Práce a štúdie československ. ochrany prírody pri SÚPSOP v Bratislave, ser. II, spis 1, p. 1-83.

BOSÁČKOVÁ E. (1974): Ochranársky výskum močiarnych biocenóz Turčianskej kotliny (vegetačné pomery význačnejších lokalít). – Českoslov. Ochr. Prír. 14: 59-102.

BOSÁČKOVÁ E. (1975): Rastlinné spoločenstvá slatinových lúk na Záhorskej nížine. – Českoslov. Ochr. Prír. 15: 173-273.

FAJMONOVÁ E. (1991): Ohrozené spoločenstvá pramenísk v Strážovských vrchoch. – Biológia (Bratislava) 46 (5): 427-433.

HÁBEROVÁ I. (1978): Rastlinné spoločenstvá alúvií Silickej planiny. – Acta Bot. Slov. 4: 123-135.

HÁBEROVÁ I. (1997): Klasifikácia rastlinných spoločenstiev rašelinísk. – In: Flóra a vegetácia rašelinísk, Zborn. z vedec. konferencie, pp. 75-82, Orava.

HÁBEROVÁ I. & FAJMONOVÁ E. (1995): Rastlinstvo ŠPR Rojkovské rašelinisko. – Ochr. prír. (Banská Bystrica) 13: 15-31.

HRAŠKO J. et al. (1991): Morfogenetický klasifikačný systém pôd ČSFR. – VÚPÚ, p. 1-106, Bratislava.

KANTOROVÁ D. (1971): Vegetácia a rastlinné spoločenstvá Osturnianskych jazier. – Ms. [Mgr. thesis; Prír. fak. UK, Bratislava].

KLIKA J. (1958): K fytocenologii rašelinných a slatinných spoločenstev na Záhorské nížine. – Biol. Práce Slov. Akad. Vied. IV(4): 1-34.

KYSELOVÁ Z. (1976): Travinno-bylinné spoločenstvá doliny Čierneho Váhu. – Ms., 102 pp. [Mgr. thesis; Prír. fak. UK, Bratislava].

MARHOLD K. & HINDÁK F. (eds.) (1998): Zoznam nižších a vyšších rastlín flóry Slovenska. – Veda, Bratislava. [687 pp.]

MORAVEC J. et al. (1994): Fytocenologie (Nauka o vegetaci). – Academia, Praha. [403 pp.]

MUCINA L. & MAGLOCKÝ Š. (eds.) (1985): A list of vegetation units of Slovakia. – Doc. Phytosoc. 9: 175-220.

OBERDORFER E. (1977): Süddeutsche Pflanzengesellschaften. Teil I. – Stuttgart. [311 pp.]

ONDREJOVÁ I. & HRIVNÁK R. (1994): Zaujímavé mokradné lokality z okolia Liptovskej Štiavnice. – Bull. Slov. Bot. Spoločn. 16: 99-101.

OŤAHELOVÁ H., HRIVNÁK R. & VALACHOVIČ M. (2001): *Phragmito-Magnocaricetea* Klika in Klika et Novák 1941. – In: VALACHOVIČ M. (ed.), Rastlinné spoločenstvá Slovenska 3. Vegetácia mokradí, Veda, Bratislava (in press).

RUŽIČKOVÁ H. (1980): Spoločenstvá zväzu *Caricion davallianae* v Liptovskej kotline. – Biológia (Bratislava) 35 (4): 275-284.

RUŽIČKOVÁ H. (1986): Trávne porasty Liptovskej kotliny. – Biol. Práce Slov. Akad. Vied. 32 (2): 1-140.
RYBNÍČEK K., BALÁTOVÁ-TULÁČKOVÁ E. & NEUHAUSL R. (1984): Přehled rostlinných společenstev rašelinišť a mokřadních luk Československa. – Studie ČSAV. 8, Academia, Praha. [123 pp.]
SLOBODNÍK V. & KADLEČÍK J. (2000): Mokrade Slovenskej republiky. – SZOPK, Prievidza. [148 pp.]
SMATANOVÁ J. (2000): Slatinná vegetácia Strážovských vrchov. – In: STANOVÁ V. (ed.), Rašeliniská Slovenska, p. 139-142, DAPHNE. Inštitút aplikovanej ekológie, Bratislava.
STANOVÁ V. (ed.) (2000): Rašeliniská Slovenska. – DAPHNE. Inštitút aplikovanej ekológie, Bratislava. [194 pp.]
ŠKOLEK J. (1999): Floristicko-vegetačné pomery hydromorfných lokalít ochranného pásma TANAPu na Hornom Liptove. – Ochr. Prír. (Banská Bystrica) 17: 101-112.
ŠKOVIROVÁ K. (1971): Rastlinné spoločenstvá Turčianskej kotliny na dolnom toku Turca. – Ms. [Mgr. thesis; Prír. fak. UK, Bratislava].
ŠMARDA J. (1960): Reliktní společenstvo s převládající *Carex paniculata* v Západních Tatrách. – Biológia (Bratislava) 15 (5): 344-351.
ŠOLTÉS R. (2000): Glaciálny relikt mach *Helodium blandovii* na Slovensku. – Ochr. Prír. (Banská Bystrica) 18: 41-49.
ŠPÁNIKOVÁ A. (1985): Vegetačné pomery južnej časti Východoslovenskej nížiny. – Acta Bot. Slov. 8: 192.
ŠPÁNIKOVÁ A. & ZALIBEROVÁ M. (1982): Die Vegetation des Poprad-Flussgebietes (die Becken Popradská kotlina und Ľubovnianska kotlina). – Vegetácia ČSSR, B 5. [303 pp.]
ŠUCHOVÁ, H. (1970): Vlhkomilné lúčne spoločenstvá na alúviu horného Hnilca. – Ms. [Mgr. thesis; Prír. fak. UK, Bratislava].
URBANOVÁ V. & ZALIBEROVÁ M. (1996): Rastlinné spoločenstvá v zátopovom území vodného diela Žilina. – Vlastiv. Zborn. Považia 8: 143-173.

Received: 28 August 2003
Revised: 24 September 2003
Accepted: 24 September 2003

Tab. 1-7 on the pages 44-66.

Tab. 1. Association *Geo rivali-Caricetum paniculatae*, subassociation 1 – *typicum*, 2 – *valerianetosum simplicifoliae*, variant a – typicum, b – with *Primula farinosa*.

Subassociation		1										2																					
Variant												a												b									
Relevé Nr.		1	2	3	4	5	6	7	8	9	C1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	C2	C
												0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0		
Diagnostic species of the association																																	
C	*Carex paniculata* (dm)	5	5	4	4	4	4	5	4	5	V	4	4	4	4	3	5	5	4	3	4	5	5	4	4	4	4	4	5	4	3	4	V	V
C	*Geum rivale* (sdm, d)	2	2	1	1	2	3	+	1	1	V	1	1	2	2	1	1	2	3	1	1	2	1	1	.	1	+	2	2	1	2	2	V	V
C	*Cirsium rivulare*	3	3	1	2	3	.	3	.	1	IV	3	3	2	3	1	2	2	4	1	1	3	2	1	2	.	1	2	+	1	2	2	V	V
C	*Caltha palustris* subsp. *laeta*	1	2	1	2	3	1	3	3	2	V	2	3	1	3	.	1	.	3	.	1	2	2	1	.	1	.	1	.	+	1	+	IV	V
C	*Lathyrus pratensis*	1	3	+	3	2	2	3	2	3	V	2	1	2	3	2	1	1	.	1	1	2	1	2	2	.	1	2	.	2	2	3	V	V
M	*Filipendula ulmaria*	2	2	1	1	3	2	3	5	2	V	2	2	2	4	1	3	2	2	1	1	1	2	1	1	1	1	3	.	2	.	.	V	V
C	*Myosotis scorpioides*	.	2	+	.	1	2	+	2	2	IV	2	3	3	2	.	1	.	1	3	1	1	1	.	.	1	.	1	.	1	.	.	IV	IV
C	*Angelica sylvestris*	.	2	.	+	1	2	2	1	2	IV	.	1	1	.	.	1	+	1	1	+	+	1	.	2	1	.	.	.	.	1		III	IV
C	*Crepis paludosa*	1	2	.	.	1	2	.	2	1	IV	.	1	.	+	.	1	1	.	+	.	.	.	1	1	1	1	2	1	1	.	1	IV	IV
M	*Equisetum palustre*	.	.	.	1	1	.	1	2	1	III	.	1	2	.	2	2	.	1	1	1	2	1	2	1	.	.	3	2	2	2	2	IV	IV
M	*Galium uliginosum*	1	2	.	2	+	.	+	1	.	IV	2	2	.	1	.	1	1	3	1	1	2	1	.	2	1	.	2	.	2	.	.	IV	IV
Cd	*Carex panicea*	1	.	1	.	.	.	.	.	.	II	1	.	1	.	2	.	1	.	1	+	1	.	1	.	1	1	+	1	+	1	.	IV	III
Differential species of subassociations and variants																																	
Cd	*Valeriana simplicifolia*	.	.	.	.	+	.	.	.	.	.	1	2	2	1	2	2	1	3	1	1	2	3	3	2	2	1	2	+	2	3	2	V	IV
Cd	*Carex davalliana*	.	.	.	.	.	.	.	.	.	.	.	1	.	.	2	.	.	1	1	1	1	2	+	1	1	1	+	1	+	2	.	IV	III
Cd	*Eriophorum latifolium*	.	.	.	.	.	.	.	.	.	.	1	.	.	.	2	.	.	1	+	1	.	2	1	+	1	1	.	1	.	3	+	IV	III
Cd	*Carex flava*	.	.	.	.	.	.	.	.	.	.	1	.	+	.	+	+	.	.	1	.	.	3	.	.	1	2	.	.	+	.	.	III	II
Cd	*Pinguicula vulgaris*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	2	.	1	.	.	.	II	I
Cd	*Primula farinosa*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	+	+	.	1	.	.	.	II	I
Cd	*Epipactis palustris*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	.	.	.	2	.	R	3	II	I

Subassociation		1										2																							
Variant												a												b											
Relevé Nr.		1	2	3	4	5	6	7	8	9	C1	1 0	1 1	1 2	1 3	1 4	1 5	1 6	1 7	1 8	1 9	2 0	2 1	2 2	2 3	2 4	2 5	2 6	2 7	2 8	2 9	3 0	C2	C
Cd	*Parnassia palustris*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	+	1	+	.	.	II	I
Accopanying species																																			
	Ranunculus acris	1	.	1	1	2	.	1	2	1	V	2	1	2	1	1	1	1	2	3	1	1	2	1	+	1	1	1	1	1	1	.	V	V
	Potentilla erecta	3	.	2	1	1	.	.	.	.	III	1	1	.	.	2	+	1	1	.	.	1	.	2	1	1	2	1	2	+	1	2	IV	IV
M	*Lychnis flos-cuculi*	.	+	1	.	.	.	1	.	1	III	+	1	.	1	.	+	+	1	2	+	.	.	+	.	+	.	1	.	+	.	.	III	III
M	*Ranunculus auricomus* agg.	.	+	.	.	.	2	.	1	.	II	1	.	.	1	.	.	+	2	1	.	1	+	.	.	.	.	1	.	1	.	.	III	III
	Cruciata glabra	.	1	.	.	+	1	.	.	.	II	1	1	.	1	1	.	+	1	.	.	1	.	1	1	.	.	.	.	.	1	.	III	III
	Acetosa pratensis	.	.	.	1	.	+	1	.	1	III	1	2	1	1	.	1	.	1	.	.	1	+	.	.	.	.	1	.	1	.	.	III	III
C	*Scirpus sylvaticus*	.	.	.	1	2	.	3	1	.	III	1	.	2	.	.	.	1	.	1	1	1	2	.	.	.	.	.	R	.	.	.	III	III
C	*Cardamine pratensis*	.	.	.	.	+	.	.	.	.	I	.	+	+	.	.	.	.	.	+	+	.	+	.	.	+	.	.	.	+	+	.	III	II
C	*Cirsium palustre*	.	.	.	.	.	.	.	+	.	I	.	.	.	.	.	.	.	.	.	+	.	1	1	+	1	.	.	.	.	.	.	II	II
C	*Ranunculus repens*	.	.	.	.	.	1	.	1	1	II	1	.	2	1	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	II	II
C	*Trollius altissimus*	.	1	1	.	1	.	.	.	2	III	.	.	.	.	.	+	.	.	.	.	.	1	.	+	.	.	.	.	.	.	.	I	II
M	*Dactylorhyza majalis*	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	1	.	1	1	+	1	1	+	2	.	.	.	1	+	III	II
M	*Juncus conglomeratus*	.	.	.	.	.	.	1	1	.	II	1	.	1	.	1	1	.	.	1	.	.	.	.	.	.	.	.	.	.	1	.	II	II
	Succisa pratensis	.	.	1	.	.	.	.	.	.	I	.	.	.	.	3	.	.	.	+	.	2	.	2	1	1	.	.	.	.	2	1	II	II
	Salix pentandra	.	.	.	2	.	.	.	.	.	I	1	.	.	.	2	.	.	.	.	.	.	1	1	.	1	.	.	3	.	.	1	II	II
	Salix cinnerea	.	1	.	2	1	.	.	.	2	III	.	1	.	1	2	.	.	.	1	.	.	2	.	.	.	.	.	1	.	.	+	II	II
	Equisetum arvense	+	2	.	.	.	.	.	.	.	II	.	.	.	.	1	.	.	.	.	.	.	.	2	.	1	3	.	1	.	1	.	II	II
	Alchemilla sp.	.	.	.	.	.	1	.	+	.	II	1	.	.	1	.	1	.	.	1	.	1	.	.	1	1	.	.	.	.	1	.	II	II
	Vicia cracca	.	1	+	1	.	.	1	.	.	III	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	I	II
	Galium mollugo	2	.	.	1	.	.	+	.	1	III	.	.	2	.	.	.	1	.	.	.	.	.	1	.	.	1	.	.	.	.	.	I	II
C	*Cirsium oleraceum*	2	.	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	I	I
C	*Deschampsia cespitosa*	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1	.	.	.	.	.	1	1	.	.	.	.	.	.	1	.	II	I

Subassociation		1										2																													
Variant																	a														b											
												1	1	1	1	1	1	1	1	1	1	2	2		2	2	2	2	2	2	2	2	3								
Relevé Nr.		1	2	3	4	5	6	7	8	9	C1	0	1	2	3	4	5	6	7	8	9	0	1		2	3	4	5	6	7	8	9	0	C2	C						
C	*Poa trivialis*	.	.	.	1	.	.	2	1	.	II	.	1	.	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.	.	.	I	I						
Cf	*Carex nigra*	.	.	.	.	.	.	.	.	+	I	.	1	1	.	.	.	.	.	1	.	.	.		.	.	.	.	.	.	.	.	.	I	I						
M	*Sanquisorba officinalis*	.	.	2	1	.	.	.	.	.	II	.	1	.	.	.	.	.	.	.	.	.	1		.	.	.	.	.	.	.	.	.	I	I						
M	*Lysimachia vulgaris*	.	.	.	2	1	1	.	.	.	II	.	.	.	1	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.	.	1	I	I						
Mg	*Galium palustre*	.	1	.	.	.	.	.	.	.	I	1	.	.	.	.	.	.	.	.	.	.	.		.	.	1	.	1	.	.	.	.	I	I						
	Briza media	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.		1	+	.	R	.	.	.	.	.	I	I						
	Epilobium palustre	.	1	.	.	.	.	.	.	.	I	1	.	.	.	.	.	.	.	.	.	1	.		.	.	.	.	.	.	.	.	.	I	I						
	Anthoxantum odoratum	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	1	.		.	.	+	.	.	.	.	.	.	I	I						
	Equisetum sylvaticum	2	1	.	.	.	.	.	.	.	II	3	.	.	.	.	.	.	.	.	.	2	.		.	.	.	1	.	.	.	.	.	I	I						
	Ajuga reptans	.	.	.	.	.	.	.	.	+	I	.	.	.	+	.	.	.	.	.	.	+	.		.	.	+	.	.	.	.	.	.	I	I						
	Primula elatior	.	.	+	.	.	.	.	.	.	I	+	.	.	.	.	.	.	1	.	.	.	.		.	.	.	.	.	.	.	.	.	I	I						
	Festuca rubra	.	.	.	1	.	.	.	.	.	I	.	2	.	.	.	.	.	.	.	.	1	.		1	.	.	.	.	.	.	.	.	I	I						
	Melampyrum nemorum	.	.	.	.	1	.	.	.	.	I	.	1	.	1	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.	.	+	I	I						
	Mentha aquatica	.	.	.	.	.	.	.	.	.	.	+	.	1	+	.	.	.	.	1	.	.	.		.	.	.	.	.	.	.	.	.	I	I						
	Veronica chamaedrys	.	.	.	.	.	+	.	.	.	I	.	.	.	1	.	1	.	.	.	.	.	.		.	.	.	.	.	.	.	.	.	I	I						
	Cirsium arvense	.	.	.	.	.	1	1	.	.	II	.	.	.	.	.	.	.	.	.	+	.	.		.	.	.	.	.	.	.	.	.	I	I						
	Rumex sp.	.	.	.	.	.	.	1	.	.	I	.	.	.	+	.	+	.	.	.	.	.	.		.	.	.	.	.	.	.	.	.	I	I						
	Urtica dioica	.	.	.	.	.	.	1	.	.	II	.	.	.	.	.	+	.	.	.	.	.	.		.	.	.	.	.	.	.	.	.	I	I						
	Poa pratensis	.	.	.	2	.	.	1	.	+	II	.	1	.	.	.	.	.	.	.	+	+	.		.	.	.	.	.	.	.	.	.	I	I						
	Chaerophylum hirsutum	.	.	.	.	.	.	.	2	1	II	.	.	.	.	.	.	.	.	.	.	.	.		.	.	.	1	.	.	.	.	.	I	I						
	Carex hirta	.	.	.	.	.	.	.	+	.	I	.	.	+	.	.	+	.	.	.	.	.	.		.	.	.	.	.	.	.	.	.	I	I						
	Alopecurus pratensis	.	+	.	1	.	.	+	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.	.	.	.	I						

Species in 1 – 2 relevés only: *Achillea millefolium* 3 (+); *Aegopodium podagraria* 15 (1-2); *Alnus incana* 24 (+); *Antriscus sylvestris* 7 (1); *Avenula pubescens* 11 (+); *Bistorta vivipara* 27 (+); *Blysmus compressus* 29 (+); *Cardamine amara* 2 (+); *Carex boreale* 17 (+); *C. rostrata* 13 (1), 30 (1); *C. umbrosa* 21 (+); *Cerastium holosteoides* 12 (+); *Colchicum autumnale* 15 (1); *Epilobium hirsutum* 15 (1), 9 (+); *E. montanum* 10 (+); *E. parviflorum* 29

(+); *Festuca ovina* 11 (+); *Galeopsis speciosa* 2 (+); *G. tetrahit* 4 (+); *Galium aparine* 15 (1), 2 (+); *G. verum* 11 (1); *Geranium palustre* 26 (+); *G. pratense* 7 (+); *Heracleum sphondylium* 7 (+); *Impatiens noli-tangere* 2 (+); *Jacea pratensis* 15 (+); *Juncus articulatus* 1 (1), 22 (1); *Linum catharthicum* 18 (+); *Luzula multiflora* 4 (+); *Lysimachia nemorum* 19 (+); *Lythrum salicaria* 4 (+); *Molinia caerulea* 3 (+); *Phleum pratense* 19 (+); *Picea abies* 23 (+), 24 (1); *Polemonium ceruleum* 15 (1); *Prunella vulgaris* 25 (+); *Pyrola rotundifolia* 27 (2), 14 (2); *Rhinanthus serotinus* 9 (+), 13 (1); *Salix purpurea* 20 (1); *Symphytum officinale* 7 (1); *Trifolium alpestre* 2 (+), 29 (1); *T. pratense* 8 (+), 18 (1); *T. repens* 18 (+), 10 (+); *Veronica beccabunga* 2 (+); *Vicia sepium* 8 (1), 9 (1); *Valeriana officinalis* 7 (1), 13 (+).

Explanation 1: C – alliance *Calthion*, Cd – alliance *Caricion davallianae*, Cf – ordo *Caricetalia fuscae*, M – ordo *Molinietalia*, Mg – alliance *Magnocaricion elatae*, d – diferential species, dm – dominant species, sdm – subdominant species.

Tab. 2. Synoptic table of the ass. *Geo rivali-Caricetum paniculatae* compared to ass. *Caricetum paniculatae* and ass. *Caricetum paradoxae*.

Association		*Geo rivali-Caricetum paniculatae*									*Caricetum paniculatae*			*Caricetum paradoxae*						
Relevé number		30	13	3	6	13	2	3	3	3	45	36	13	7	3	1	2	15	2	59
Altitud (m asl.)	from	550	570	700		845	850	400	1240	670	100	200	200	460	490	670	200	150	200	100
	to	960	625	718		940	-	480	1530	-	700	-	-	500	510	-	-	200	-	700
Author		Šk	Rž	Ky	*	Šu	Le	Fa	Šm	Šp	Ob	Hr	Ma	Bo2	Škv	Šo	Bo1	Kl	Bo3	Ob
Indicating species of the alliance *Calthion*																				
Carex paniculata		V^{3-5}	V^{3-5}	$3/3^{4}$	V^{+-8}	V^{2-4}	$2/2^{2-3}$	$3/3^{4}$	3/3	$3/3^{4}$	V	V^{7-9}	V^{3-9}	.	$1/3^{1}$	.	.	.	.	.
Geum rivale		V^{+-3}	V^{+-2}	$3/3^{+}$	III^{1-2}	V^{+-1}	$2/2^{+}$	.	2/3	.	.	.	.	IV^{+-1}	$2/3^{+-1}$	.	.	.	.	.
Cirsium rivulare		V^{+-3}	IV^{+-2}	$2/3^{+-1}$	IV^{1-3}	V^{R-1}	$1/2^{1}$	$2/3^{+-2}$	.	.	.	I^{2-4}	I^{4-6}	IV^{+-2}	$3/3^{+-2}$	1	$2/2^{1}$	II^{0-4}	.	.
Caltha palustris		V^{+-3}	V^{+-3}	$1/3^{+}$	V^{2-6}	IV^{+-1}	$1/2^{+}$	$2/3^{1-3}$	2/3	$1/3^{1}$	I	II^{1-6}	II^{2-6}	V^{+-2}	$3/3^{1-2}$	2a	$2/2^{1}$	V^{0-7}	$2/2^{+}$	I
Lathyrus pratensis		V^{+-3}	V^{+-2}	$2/3^{+}$	IV^{1-3}	IV^{+}	$1/2^{1}$	.	.	$1/3^{1}$	.	I^{2-4}	II^{2-5}	III^{+}	$3/3^{0-1}$	+	$2/2^{1}$	.	.	.
Crepis paludosa		IV^{+-2}	IV^{+-2}	$2/3^{+}$	IV^{2-5}	III^{+}	$1/2^{1}$	$2/3^{+-1}$	1/3	.	I	I^{2}	.	III^{+-1}	$3/3^{+-1}$	1	.	.	.	I
Myosotis scorpioides		IV^{+-3}	II^{+-1}	$1/3^{+}$	IV^{2}	III^{R-+}	.	.	2/3	.	I	I^{2}	.	III^{+}	$3/3^{+-1}$	.	.	III^{0-4}	$1/2^{+}$	I
Angelica sylvestris		IV^{+-2}	.	.	I^{3}	II^{+-1}	.	$1/3^{R}$	.	.	I	II^{1-5}	.	.	.	1	$2/2^{+}$	.	$1/2^{+}$	I
Cardamine pratensis		II^{+}	II^{+-1}	$1/3^{+}$	IV^{2}	IV^{+-1}	$2/2^{R-+}$	.	.	.	.	I^{1-2}	.	.	.	.	.	.	.	.
Cirsium palustre		II^{+-1}	III^{+}	.	II^{1-3}	I^{R}	$1/2^{+}$	.	.	.	I	I^{2}	.	.	.	.	.	.	.	I
Scirpus sylvaticus		II^{R-3}	I^{+}	$2/3^{+}$	I^{1}	I^{2}	.	$3/3^{+}$	.	.	.	III^{1-6}	V^{2-6}	.	.	.	.	.	$1/2^{+}$	.
Cirsium oleraceum		I^{+-2}	.	$1/3^{+}$	I^{3}	.	.	.	.	.	.	I^{1-5}	I^{6}	.	.	.	.	.	.	.
Deschampsia cespitosa		I^{+-1}	I^{+}	$2/3^{+}$	II^{2}	I^{R-+}	$1/2^{2}$	.	2/3	.	.	.	.	I^{+}	.	.	.	.	.	.
Ranunculus repens		II^{+-2}	.	.	.	II^{R-+}	.	.	.	$3/3^{+}$	.	II^{2-3}	II^{3}	II^{3}	.	.	.	.	.	.
Poa trivialis		I^{+-2}	II^{+-1}	$1/3^{+}$	I^{2}	.	.	.	.	.	I	III^{1-3}	II^{2}	.	.	.	$2/2^{+-1}$	II^{0-2}	.	I
Trollius altissimus		II^{+-1}	.	$2/3^{+-1}$	.	III^{R-1}	$2/2^{+}$	.	.	.	.	.	.	.	.	.	.	.	.	.

Association		*Geo rivali-Caricetum paniculatae*									*Caricetum paniculatae*			*Caricetum paradoxae*						
Relevé number		30	13	3	6	13	2	3	3	3	45	36	13	7	3	1	2	15	2	59
Altitud (m asl.)	from	550	570	700		845	850	400	1240	670	100	200	200	460	490	670	200	150	200	100
	to	960	625	718		940	-	480	1530	-	700	-	-	500	510	-	-	200	-	700
Author		Šk	Rž	Ky	*	Šu	Le	Fa	Šm	Šp	Ob	Hr	Ma	Bo2	Škv	Šo	Bo1	Kl	Bo3	Ob
Indicating species of the alliance *Caricion davallianae*																				
Valeriana simplicifolia ([1])		IV$^{1-3}$	V^{+-3}	2/3^{+}	III$^{2-3}$	IV^{+-2}	1/2^{1}	2/3$^{1-2}$	1/3	.	(I)	(I)	.	(IV^{+-1})	(2/3+)	1	(2/2$^{1-2}$)	(V^{2})	(2/2^{+})	(I)
Carex davalliana		III^{+-2}	V^{+-3}	.	III^{3}	V^{R-4}	2/2^{+}	2/3^{1}	1/3	.	.	.	.	III^{+}	1/3^{+}	.	2/2^{1}	III$^{0-4}$	1/2^{+}	.
Carex panicea		III^{+-1}	IV^{+-2}	1/3^{+}	V$^{2-5}$	IV^{+-2}	2/2$^{1-2}$	2/2^{1}	1/3	1/3^{1}	I	.	I^{3}	V^{+}	.	.	2/2^{1}	II	1/2^{+}	I
Eriophorum latifolium		III^{+-3}	V^{+-2}	2/3^{+}	II^{2}	IV^{R-2}	2/2^{+-2}	2/3^{+-1}	1/3	.	.	.	.	IV^{+}	1/3^{+}	.	1/2^{+}	I$^{0-6}$	1/2^{+}	.
Carex flava		II^{+-3}	II^{+}	.	II$^{1-3}$	IV^{R-2}	1/2^{3}	.	3/3	.	.	.	.	.	.	.	1/2^{+}	.	.	.
Parnassia palustris		I^{+-2}	III^{+-2}	.	.	I^{R-2}	2/2^{+-2}	.	2/3	.	.	.	.	III^{+}	.	.	.	.	.	.
Pinguicula vulgaris		I^{+-2}	II^{+}	.	.	II^{R-3}	1/2^{R}	.	3/3	.	.	.	.	.	.	.	.	.	.	.
Primula farinosa		I^{+-1}	II^{+}	.	I^{2}	IV^{+-2}	2/2$^{1-2}$	.	.	.	.	.	.	.	.	.	.	.	.	.
Epipactis palustris		I^{R-3}	II^{+-2}	.	.	.	1/2^{+}	.	2/3	.	.	.	.	.	.	.	1/2^{1}	I$^{0-2}$	.	.
Blysmus compressus		I^{+}	.	.	.	I^{+}	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Indicating species of the alliance *Magnocaricion elatae*																				
Carex appropinquata		.	.	.	.	.	.	.	.	.	I	.	.	V$^{3-4}$	3/3$^{4-5}$	2a	2/2	V$^{0-5}$	2/2$^{3-4}$	V
Carex acutiformis		.	.	.	.	.	.	1/3^{1}	.	.	III	III$^{2-6}$	IV$^{2-9}$	.	3/3^{1}	.	.	.	1/2^{1}	II
Naumburgia thyrsiflora		.	.	.	.	.	.	.	.	.	I	.	.	II^{+}	.	.	.	.	.	II
Galium palustre		I^{+-1}	II^{+}	2/3^{+}	V$^{2-3}$	I^{+-1}	.	.	1/3	2/3^{+-1}	IV	III$^{2-5}$	I^{2}	II^{+-1}	.	.	2/2^{+}	IV$^{0-2}$	2/2^{+-1}	V
Scutellaria galericulata		.	.	.	I^{1}	.	.	.	.	.	II	II$^{1-3}$	I^{2}	IV^{+}	1/3^{+}	.	.	.	1/2^{+}	I
Lythrum salicaria		I^{+}	.	.	I^{3}	.	.	.	.	.	III	IV$^{2-3}$	V$^{2-4}$	III^{+}	.	.	2/2^{+}	III$^{0-2}$	2/2^{+}	II
Stellaria palustris		.	.	.	.	.	.	.	.	.	I	I^{3}	.	.	.	.	.	.	.	II

Association		*Geo rivali-Caricetum paniculatae*									*Caricetum paniculatae*			*Caricetum paradoxae*						
Relevé number		30	13	3	6	13	2	3	3	3	45	36	13	7	3	1	2	15	2	59
Altitud (m asl.)	from	550	570	700		845	850	400	1240	670	100	200	200	460	490	670	200	150	200	100
	to	960	625	718		940	-	480	1530	-	700	-	-	500	510	-	-	200	-	700
Author		Šk	Rž	Ky	*	Šu	Le	Fa	Šm	Šp	Ob	Hr	Ma	Bo2	Škv	Šo	Bo1	Kl	Bo3	Ob
Comarum palustre		.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	$1/2^{1}$	III
Peucedanum palustre		.	.	.	.	.	.	.	.	.	II	I^{2-5}	II^{2-3}	.	.	.	.	II^{0-4}	.	IV
Carex elata		.	.	.	.	.	.	.	.	.	I	I^{2}	I^{8}	.	.	.	.	.	$1/2^{+}$	IV
Indicating species of the ordo *Molinietalia*																				
Filipendula ulmaria		V^{1-5}	IV^{+-2}	$2/3^{+-1}$	III^{1-3}	III^{+-1}	.	1/3	.	.	I	II^{1-6}	II^{2-3}	III^{+}	$2/3^{+}$	.	.	II	.	II
Equisetum palustre		IV^{1-3}	V^{+-3}	$2/3^{+-1}$	V^{2-7}	V^{+-3}	$1/2^{1}$	$3/3^{2}$	3/3	$1/3^{+}$	II	II^{1-6}	I^{3-6}	V^{+}	$3/3^{+-2}$	1	.	.	$1/2^{+}$	II
Galium uliginosum		IV^{+-3}	IV^{+-1}	$2/3^{+-2}$	I^{2}	IV^{+-2}	.	.	.	.	.	II^{2-3}	II^{2-3}	III^{+}	$1/3^{+}$	+	$2/2^{+}$	II	$2/2^{+}$	.
Lychnis flos-cuculi		III^{+-1}	II^{+}	$2/3^{+}$	IV^{1-3}	II^{R-1}	.	2/3	$1/3^{+}$	.	I	I^{1-2}	.	III^{+}	$3/3^{R-+}$	R	$1/2^{+}$	IV^{0-3}	.	II
Dactylorhiza majalis		II^{+-2}	III^{+}	.	I^{3}	II^{R-+}	$1/2^{+}$	.	1/3	.	.	.	.	II^{+}	$1/3^{R-+}$	+	$2/2^{+}$	.	.	I
Lysimachia vulgaris		I^{1-2}	.	$2/3^{+}$	II^{2-3}	.	.	$2/3^{+}$	.	.	.	IV^{2-3}	IV^{2-6}	II^{+}	$3/3^{+-1}$	.	$2/2^{1}$	II^{0-4}	$2/2^{+-1}$	.
Sanguisorba officinalis		I^{+-2}	I^{+}	$1/3^{+}$	I^{2}	I^{+}	.	.	.	.	.	I^{1-2}	I^{2}	V^{+}	$1/3^{R}$	.	.	.	.	.
Succisa pratensis		II^{+-2}	III^{+}	.	II^{2}	III^{+-2}	$2/2^{1-3}$	.	.	.	.	.	.	.	$1/3^{+}$	.	.	.	.	.
Juncus effusus		.	.	.	I^{2}	.	.	.	.	.	.	I^{2-5}	II^{3-6}	.	.	.	.	.	$1/2^{+}$	.
Juncus conglomeratus		II^{+-1}	I^{+}	.	.	I^{R-+}	.	.	.	$1/3^{+}$	.	.	.	.	.	.	.	.	.	.
Ranunculus auricomus		III^{+-2}	I^{+}	$3/3^{+}$	I^{2}	II^{+-1}	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Indicating species of the ordo *Magnocaricetalia*																				
Galium palustre		I^{+-1}	II^{+}	$2/3^{+}$	IV^{2-3}	I^{+-1}	.	.	.	.	IV	III^{2-5}	I^{2}	II^{+-1}	.	.	$2/2^{+}$	III	$2/2^{+}$	V
Carex acutiformis		.	.	.	I^{2}	.	.	$1/3^{1}$	.	.	III	III^{2-6}	IV^{2-9}	.	$3/3^{1}$	.	.	.	$1/2^{1}$	II
Scutellaria galericulata		.	.	.	.	.	.	.	.	.	II	II^{1-3}	I^{2}	IV^{+}	$1/3^{+}$	.	.	.	$1/2^{+}$	I

Association		*Geo rivali-Caricetum paniculatae*									*Caricetum paniculatae*			*Caricetum paradoxae*					
Relevé number		30	13	3	6	13	2	3	3	3	45	36	13	7	3	1	2	15	2	59
Altitud (m asl.)	from	550	570	700		845	850	400	1240	670	100	200	200	460	490	670	200	150	200	100
	to	960	625	718		940	-	480	1530	-	700	-	-	500	510	-	-	200	-	700
Author		Šk	Rž	Ky	*	Šu	Le	Fa	Šm	Šp	Ob	Hr	Ma	Bo2	Škv	Šo	Bo1	Kl	Bo3	Ob
Carex disticha		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	$1/2^{1}$	.
Accompanying species																				
Ranunculus acris		V^{+-3}	V^{+-1}	.	V^{1-3}	V^{R-1}	.	$1/2^{+}$	2/3	$2/3^{+1}$	.	I^{1-2}	.	IV^{+}	$2/3^{1}$	R	$2/2^{+}$	.	$1/2^{+}$	.
Potentilla erecta		IV^{+-3}	V^{+-2}	$1/3^{+}$	IV^{2}	V^{+-1}	$2/2^{2}$	$1/2^{1}$	2/3	.	I	I^{2}	.	.	$3/3^{1-3}$	.	.	.	.	I
Mentha aquatica		I^{+-1}	III^{+-1}	$1/3^{+}$	I^{2}	I^{+}	.	$3/3^{+}$	.	.	.	III^{2-5}	II^{2-5}	V^{+}	.	.	$1/2^{1}$	II	$1/2^{+}$	.
Briza media		I^{R-1}	III^{+-1}	.	III^{1-3}	II^{R-+}	$2/2^{+}$	.	1/3	.	.	.	.	III^{+}	.	.	.	II	.	.
Poa pratensis		I^{+-1}	.	.	II^{2-3}	I^{1}	.	.	.	$2/2^{+}$	.	I^{3}	II^{2-3}	IV^{+}	.	1	$2/2^{1}$	.	.	.
Juncus articulatus		I^{1}	II^{+}	.	.	I^{R}	.	$2/3^{1}$	.	.	.	.	.	.	$1/3^{+}$	.	.	.	$1/2^{+}$	.
Festuca rubra		I^{1-2}	II^{+-1}	.	I^{2}	III^{R-+}	$2/2^{+-1}$	.	.	.	.	I^{2}	.	.	.	.	.	.	.	.
Acetosa pratensis		III^{+-2}	II^{+}	$1/3^{+}$	.	II^{R-+}	.	.	.	.	.	.	.	.	$1/3^{R}$	+	.	.	.	.
Salix cinnerea		II^{+-2}	.	.	.	I^{R}	.	.	.	.	.	I^{2}	.	II^{+-1}	.	.	.	.	$1/2^{+}$	.
Alchemilla sp.		II^{+-1}	I^{+}	.	I^{1}	III^{R-1}	.	.	.	.	.	.	.	II^{+}	.	.	.	.	.	.
Anthoxanthum odoratum		I^{+}	I^{+}	.	I^{2}	I^{+}	.	.	2/3	.	.	.	.	.	.	.	.	.	.	.
Carex hirta		I^{+}	.	.	I^{2}	.	.	.	.	$3/3^{+}$	.	I^{1-2}	I^{2}	.	.	.	.	.	.	.
Rumex sp.		I^{+-1}	.	.	.	.	.	.	.	$1/3^{+}$	.	I^{2-3}	I^{3}	II^{+}	.	.	.	.	.	.
Primula elatior		I^{+-1}	I^{+}	$1/3^{+}$	I^{2}	II^{R-1}	.	.	2/3	.	.	.	.	.	.	.	.	.	.	.
Cruciata glabra		III^{+-1}	II^{+}	$1/3^{+}$	I^{2}	II^{+-1}	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Salix pentandra		II^{+-3}	II^{+}	.	I^{2}	III^{R-+}	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Epilobium palustre		I^{+-1}	II^{+}	.	.	.	.	.	.	.	I	I^{2}	.	.	.	.	.	.	.	.
Chaerophyllum hirsutum		I^{1-2}	.	.	.	.	.	.	1/3	.	.	.	.	.	I^{R}	.	.	.	.	.

Association		*Geo rivali-Caricetum paniculatae*									*Caricetum paniculatae*			*Caricetum paradoxae*						
Relevé number		30	13	3	6	13	2	3	3	3	45	36	13	7	3	1	2	15	2	59
Altitud (m asl.)	from	550	570	700		845	850	400	1240	670	100	200	200	460	490	670	200	150	200	100
	to	960	625	718		940	-	480	1530	-	700	-	-	500	510	-	-	200	-	700
Author		Šk	Rž	Ky	*	Šu	Le	Fa	Šm	Šp	Ob	Hr	Ma	Bo2	Škv	Šo	Bo1	Kl	Bo3	Ob
Ajuga reptans		I^{+}	I^{+}	$1/3^{+}$	I^{1}	I^{R}	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Equisetum arvense		II^{+-3}	.	.	.	.	.	.	.	.	.	I^{2-3}	II^{2}	.	.	.	.	.	.	.
Cirsium arvense		I^{+-1}	.	.	.	.	.	.	.	.	.	I^{2-3}	II^{2-3}	.	.	.	.	.	.	.
Equisetum sylvaticum		I^{+-3}	.	.	I^{2}	.	.	.	1/3	.	.	.	.	.	.	.	.	.	.	.
Vicia cracca		II^{+-1}	.	.	.	II^{R-+}	.	.	.	.	.	.	I^{2}	.	.	.	.	.	.	.
Veronica chamaedrys		I^{+-1}	I^{+}	.	.	I^{+}	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Urtica dioica		I^{+-1}	.	.	.	.	.	.	.	.	.	.	IV^{2-5}	.	.	.	.	.	.	.
Galium mollugo		II^{+-2}	.	.	.	I^{+}	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Alopecurus pratensis		I^{+-1}	.	$2/3^{+}$	.	.	.	.	.	.	.	I^{2}	.	.	.	.	.	.	.	.
E_0																				
Caliergonella cuspidata		$1/3^{1-3}$	V^{+-3}	.	II^{1-3}	II^{+-3}	.	.	1/3	-	II	II^{1-3}	I^{5}	III^{+-1}	$2/3^{+}$	R	$2/2^{+-1}$	III	$2/2^{1-2}$	II
Climacium dendroides		$1/3^{3}$	I^{+}	.	I^{1}	II^{+}	$1/2^{1}$	.	1/3	-	I	.	.	II^{1}	$1/3^{+}$	.	$2/2^{1-2}$	III	.	I
Plagiomnium elatum		.	IV^{+-5}	1/3	II^{5-R}	III^{+-3}	$2/2^{1}$	$1/2^{2}$	1/3	-	.	I^{5}	.	.	$2/3^{+}$	R	.	.	.	.
Bryum pseudotriquetrum		$1/3^{1}$	III^{+-3}	.	II^{2-5}	.	$1/2^{1}$	.	1/3	-	.	.	.	II^{+}	$1/3^{1}$	R	.	.	.	.
Drepanocladus revolvens		$2/3^{3}$	IV^{1-3}	.	I^{2}	I^{+}	$2/2^{2-3}$	.	.	-	.	.	.	.	.	.	.	.	.	.
Palustriella commutata		.	.	.	I^{3}	III^{+}	$1/2^{2}$	.	2/3	-	.	.	.	.	.	.	.	.	$1/2^{3}$	.
Tomenthyphnum nitens		$2/3^{4-5}$	.	.	.	III^{+-1}	$1/2^{4}$	.	.	-	.	.	.	.	.	R	.	.	.	.
Bryum scheicheri		.	.	.	.	.	$1/2^{1}$	.	2/3	-	.	.	.	.	.	.	.	.	.	.

Association		*Geo rivali-Caricetum paniculatae*									*Caricetum paniculatae*			*Caricetum paradoxae*						
Relevé number		30	13	3	6	13	2	3	3	3	45	36	13	7	3	1	2	15	2	59
Altitud (m asl.)	from	550	570	700		845	850	400	1240	670	100	200	200	460	490	670	200	150	200	100
	to	960	625	718		940	-	480	1530	-	700	-	-	500	510	-	-	200	-	700
Author		Šk	Rž	Ky	*	Šu	Le	Fa	Šm	Šp	Ob	Hr	Ma	Bo2	Škv	Šo	Bo1	Kl	Bo3	Ob
Philonotis fontana		.	.	.	I[2]	I[+]	.	.	**2/3**	-	.	.	.	.	.	.	.	.	.	.
Marschantia polymorpha		.	.	.	.	.	.	.	**2/3**	-	.	.	.	.	.	2	.	.	.	.
Paludella squarosa		.	.	.	.	.	.	.	1/3	-	.	.	.	.	.	.	.	.	.	.
Aulacomnium palustre		.	.	.	.	.	**1/2**[2]	.	.	-	.	.	.	.	.	2	.	.	.	.
Campilium stellatum		.	**IV**[2-4]	.	.	.	.	.	.	-	.	.	.	I[+]	.	.	**1/2**[1]	.	.	.
Caliergon giganteum		.	.	.	I[6]	I[+]	.	.	.	-	.	I[7]	.	.	.	.	.	**IV**	**1/2**[1]	.
Plagiomnium affine		.	.	.	.	.	.	.	.	-	.	I[3]	.	III[+]	.	.	**2/2**[+]	.	.	.
Hamatocaulis vernicosus		.	.	.	.	I[R]	.	.	.	-	.	.	.	.	.	.	.	**III**	.	.
Rhizomnium punctatum		1/3[1]	.	.	.	.	.	.	1/3	-	.	.	.	.	.	.	.	.	.	.
Thuidium philibertii		.	.	1/3	.	II[+]	.	.	.	-	.	.	.	.	.	.	.	.	.	.
Fissidens adianthoides		.	.	.	.	I[+]	.	.	.	-	.	.	.	.	.	.	**1/2**[+]	.	.	.

Species in 1 column only: **E1** *Galium mollugo* (Šk); *Picea abies* (Šk); *Salix purpurea* (Šk); *Trifolium alpestre* (Šk); **E0** *Brachythecium mildeanum* (Hr); *B. rivulare* (Hr); *Campyllium stellatum* (Rž – IV2-4); *Drepanocladus aduncus* (Ob); *Helodium blandowii* (Šo); *Hyphnum pratense* (Le); *Philonotis calcarea* (Le); *Plagiomnium elipticum* (Šk); *Thuidium recognitum* (Bo2).

Explanation to table 2: Šk – Školek (constancy and abundantion transfered from tab. 1); Rž – Ružičková (1986); Ky – Kyselová (1976); * – Háberová; Fajmonová (1995) – 1 zápis; Hrivnák, Cvachová ined – 1 zápis; Ondrejová, Hrivnák (1994) – 1 zápis; Rybníček ined – 1 zápis; Špániková, Zaliberová (1982) – 2 zápisy; Šu – Šuchová (1970); Le – Leskovjanska et al. ined; Fa – Fajmonová (1991); Šm – Šmarda (1960); Šp – Špániková (1985); Ob – Oberdorfer (1977); Hr – Hrivnák (in Oťahelová, Hrivnák, Valachovič 2002); Ma – Malovcová ined; Bo1 – Bosáčková (1970); Bo2 – Bosáčková (1974); Bo3 – Bosáčková (1975); Škv – Škovirová ined; Šo – Šoltés (2000); Kl – Klika (1958).

([1]) –*Valeriana dioica*.

Tab. 3. The number of the alliance and ordo species (constancy III-V) in the stands of presented in tab. 1.

Alliance, ordo	Indicating species		
	in literature	in our stands	
	total number	number	%
Caricion davallianae	9	4	44
Calthion	16	8	50
Magnocaricion elatae	12	0	0
Caricion rostratae	5	0	0
Caricetalia fuscae	7	1	15
Molinietalia	10	5	50

Tab. 4. Ordination of the stands with *Carex paniculata* and *C. appropinquata* into association based on the number of alliance and ordo indicating species with constancy III-V according the authors from tab. 2.

Author	Geomorphological unit	The number of indicating species - alliance - ordo							Association
		Cd	Cal	Mge	Cr	Cf	Mol	Mgl	
Šk	Liptov basin	**4**	**8**	0	1	1	**5**	0	Gr-Cp
Rž	Liptov basin	**4**	**7**	0	1	2	4	0	Gr-Cp
Ky	Čierny Váh river	**2**	**9**	1	0	0	**6**	0	Gr-Cp
Le	Slovenský raj paradise	**8**	**10**	1	2	4	2	0	Gr-Cp
Šu	Slovenský raj paradise	**5**	**9**	0	1	2	**3**	0	Gr-Cp
*	Popradská kotlina basin Skorušinské vrchy hills Veporské vrchy hills	**2**	**8**	2	3	1	**4**	1	Gr-Cp
Šm	Západné Tatry Mts.	**4**	**6**	0	2	5	**4**	0	Gr-Cp
Fa	Strážovské vrchy hills	**3**	**5**	0	1	1	**3**	0	Gr-Cp
Šp	Východosl. níž. lowland	0	**5**	1	1	0	**2**	0	Gr-Cp

Author	Geomorphological unit	The number of indicating species - alliance - ordo							Association
		Cd	Cal	Mge	Cr	Cf	Mol	Mgl	
Bo1	Borská nížina lowland	**5**	**6**	2	1	2	**4**	1	Gr-Capp
Bo2	Turčianska kotlina basin	**3**	**7**	3	3	3	**7**	1	Gr-Capp
Škv	Turčianska kotlina basin	**3**	**7**	1	2	0	**7**	1	Gr-Capp
Šo	Oravská kotlina basin	1	**4**	1	1	0	**3**	0	Gr-Capp
Bo3	Borská nížina lowland	3	4	**8**	4	4	4	**4**	Cpar
Kl	Borská nížina lowland	2	3	**4**	1	1	1	**1**	Cpar
Hr	more in Slovakia**	0	0	**5**	1	0	1	**3**	Cp
Mal	Borská nížina lowland	0	1	**4**	1	0	1	**1**	Cp
Ob	Germany	0	1	**3**	1	0	0	**2**	Cp
Ob	Germany	0	0	**5**	4	0	0	**2**	Cpar

Explanation: ** Borská nížina lowland, Nitrianska pahorkatina hill-country, Žilinská kotlina basin, Turčianska kotlina basin, Horehronské podolie basin, Veporské vrchy hills, Spišská Magura hills.
Abbreviation of the authors see tab. 2.
Cd = alliance *Caricion davallianae*, Cal = all. *Calthion*, Mge = all. *Magnocaricion elatae*, Cr = all. *Caricion rostratae*, Cf = ordo *Caricetalia fuscae*, Mol = or. *Molinietalia*, Mgl = or. *Magnocaricetalia*.

Tab. 5. Review of the stands with *Carex paniculata* (ass. Gr-Cp, as. Cp) a s. *C. appropinquata* (ass. Gr-Capp, ass. Cpar) in Slovakia – authors and geomorphological units.

Number	Author	Geomorphological units	Relevé number	
		Association *Geo rivali-Caricetum paniculatae* (Gr-Cp)		
1	Školek	Liptovská kotlina basin	30	
2	Ružičková (1986)	Liptovská kotlina basin	13	
3	Ondrejová, Hrivnák (1994)	Liptovská kotlina basin	1	
4	Kyselová (1976)	Čierny Váh river	3	
5	Špániková, Zaliberová (1982)	Popradská kotlina basin	2	
6	Háberová, Fajmonová (1995)	Veľká Fatra Mts.	1	
7	Rybníček ined	Skorušinské vrchy hills	1	
8	Grebenščikov et al. (1956)	Oravská Magura hills	1	
9	Šuchová (1970)	Slovak Paradise	13	
10	Leskovjanská et al. ined	Slovak Paradise	2	
11	Šmarda (1960)	Západné Tatry Mts.	3	
12	Fajmonová (1991)	Strážovské vrchy hills	3	
13	Špániková (1985)	Východoslovenská nížina lowland	3	
Total relevés				76
		Association *Geo rivali-Caricetum appropinquatae* (Gr-Capp)		
14	Škovirová ined	Turčianska kotlina basin	3	
15	Bosáčková (1974)	Turčianska kotlina basin	7	
16	Šoltés (2000)	Oravská kotlina basin	1	
17	Bosáčková (1970)	Borská nížina lowland	2	
Total relevés				13
Total				**89**

Number	Author	Geomorphological units	Relevé number	
		Association *Caricetum paniculatae* (Cp)		
1	Malovcová ined	Borská nížina lowland	13	
2	Balátová-Tuláčková (1968)	Borská nížina lowland	1	
3	Balátová-Tuláčková (1976)	Borská nižina lowland	8	
4	Hrivnák ined	Borská nížina lowland	1	
5	Valachovič ined	Borská nížina lowland	1	
6	Ripka ined	Nitrianská pahorkatina hill-country	3	
7	Urbanová, Zaliberová (1996)	Žilinská kotlina basin	1	
8	Škovirová (1971)	Turčianska kotlina basin	3	
9	Háberová ined	Horehronské podolie basin	2	
10	Hrivnák, Cvachová ined	Veporské vrchy hills	1	
11	Kantorová (1971)	Spišská Magura hills	1	
Total relevés				35
		Association *Caricetum paradoxae* (Cpar)		
12	Klika (1958)	Borská nížina basin	15	
13	Bosáčková (1975)	Borská nížina basin	2	
14	Háberová (1978)	Slovak karst	1	
Total relevés				18
Total				**53**
Total in all relevés				**142**

Tab. 6. Review of the stands with *Carex paniculata* and *C. appropinquata* according to floristical notices in the publications „Mokrade SR" (M) and „Rašeliniská Slovenska" (R) published in 2000.

Number	Author	Geomorphological units	Locality	Publication
		Possible association *Geo rivali-Caricetum paniculatae*		
1	Turis	Spišsko-gemerský kras karst	Dolina Trsteník	M
2	Turis	Horehronské podolie basin	Za Havraník	M
3	Chilová	Veľká Fatra Mts.	Blatnická dolina	M
4	Chilová	Turčianska kotlina basin	Rybníky Mošovce	M
5	Chilová	Turčianska kotlina basin	Konské	M
6	Chilová	Turčianska kotlina basin	Hlísna studňa	M
7	Dobošová	Turčianska kotlina basin	Hrabinka	R
8	Dobošová	Oravská Magura hills	Kozinská	R
9	Gojdičová	Branisko hills	Salvatorské lúky	M
10	Buraľ	Laborecká vrchovina hills	Hostovické lúky	M
11	Leskovjanská	Sloval Paradise	Húzovské	R
12	Cvachová	Horehronské podolie basin	Predajnianska slatina	R
13	Cvachová	Horehronské podolie basin	Polomka	R
14	Cvachová	Veporské vrchy hills	Rohozná	R
15	Cvachová	Krupinská vrchovina hills	Močiar	R
16	Smatanová	Strážovské vrchy hills	Vrchteplá	R
17	Smatanová	Strážovské vrchy hills	dolina Šiandrová	R
18	Smatanová	Biele Karpaty hills	Žalobná	R
19	Devánová, Deván	Biele Karpaty hills	U Mitochov, U Čechov	R
20	Devánová, Deván	Biele Karpaty hills	Grúň	R
21	Devánová, Deván	Biele Karpaty hills	Blažejová	R
22	Devánová, Deván	Biele Karpaty hills	Záhradská	R
23	Devánová, Deván	Biele Karpaty hills	Matejov	R