Linzer biol. Beitr.	38/2	1269-1287	29.12.2006

Dry psammophytic non-forest vegetation of the Třeboňsko Biosphere Reserve (Czech Republic)

K. BOUBLÍK & T. ČERNÝ

A b s t r a c t : Dry psammophytic vegetation in non-forest habitats in the Třeboňsko Biosphere Reserve (Southern Bohemia, Czech Republic) was studied using the Braun-Blanquet approach. Based on 124 relevés, 10 vegetation groups were distinguished using cluster analysis. The vegetation units belong to the Thero-Airion, Corynephorion canescentis, Plantagini-Festucion ovinae, Hyperico perforati-Scleranthion perennis, and Genistion alliances. The species-rich community dominated by *Sedum sexangulare* or *S. acre* was recorded as a new vegetation type for the Czech Republic in frequently mown and unfertilised lawns in the villages. The Shannon-Weaner index and Ellenberg indicator values were used for the ecological calibration of the distinguished units. The variability of vegetation groups was depicted using detrended correspondence analysis. Special attention was paid to communities with new alien species *Agrostis scabra*, which, however, seems not to endanger the native flora.

K e y w o r d s : *Agrostis scabra*, Corynephorion canescentis, phytosociology, Plantagini-Festucion ovinae, Southern Bohemia, Thero-Airion.

Introduction

In the Czech Republic, psammophytic vegetation occurs only in few regions and belongs to rare vegetation types. Relatively well-developed psammophytic vegetation occurs only in Central and Northern Bohemia (Dokesko region, Labe river Basin), Southern Bohemia (Třeboňsko region) and South-eastern Moravia (Morava and Dyje river Basin). The gradient between the Atlantic and Continental climate is important for the composition of psammophytic vegetation within the Czech Republic. For the south Moravian vegetation, the Pannonian floristic influence is important (e.g. presence of *Stipa borysthenica*, *Erysimum diffusum*, *Linaria genistifolia*), while occurrences of subatlantic species are typical of the Bohemian stands (e.g. *Aira praecox*, *Spergula morisonii* – CHYTRÝ et al. 2001, ČERNÝ et al., submitted). The Třeboňsko Biosphere Reserve belongs to areas markedly influenced by the suboceanic floristic element (SKALICKÝ 1988). The communities of annuals on wet sandy substrates, in which species with suboceanic distribution range occur (e.g. *Radiola linoides*, *Illecebrum verticillatum*), are also typical of the Třeboňsko region (CHÁN 1999, PRACH 1999).

Despite the fact that psammophytic vegetation of the Třeboňsko region contains several rare and endangered plant species of the Czech flora (e.g. *Aira praecox*, *Arnoseris*

minima, *Carex ericetorum*, *Spergula morisonii*), it has not been sufficiently studied yet. Only PRACH (1999) studied weed communities of the Arnoseridion and Radiolion linoidis alliances; several phytosociological relevés of dry psammophytic vegetation have been explored by two other studies (DOUDA in HADINEC et al. 2003, ČERNÝ et al., submitted).

Recently, a new alien species for the Czech Republic – *Agrostis scabra* WILLD. – has been discovered in the sandy vegetation of the Třeboňsko Biosphere Reserve (BOUBLÍK & ČERNÝ 2005). It is native to North America, North-eastern Asia and Greenland and has been found as naturalised species in neighbouring countries (Germany and the adjacent part of Austria – it was first discovered in 1909 in the vicinity of Gmünd; TUTIN et al. 1980, MELZER & BARTA 1992, CONERT 1998, FISCHER et al. 2005). It seems that *Agrostis scabra* spreads around sand pits and along roads (BOUBLÍK & ČERNÝ 2005).

The aims of this study are to describe vegetation types in the dry non-forest psammophytic habitats of the Třeboňsko Biosphere Reserve and to reveal their ecological demands. Special attention is paid to vegetation with new alien species *Agrostis scabra*.

Material and methods

Study area

The study area is located in the south-eastern part of Bohemia (Czech Republic) near the Austrian state boundary. The borders of the study area are identical with those of the Třeboňsko Protected Landscape Area and Biosphere Reserve (Fig. 1). The study area covers ca 700 km^2. The altitude varies between 410 and 530 m. The Třeboňská pánev Basin is a flat landscape with alluvial Quarternary terraces along rivers and with low hills in the transient area to the Českomoravská vrchovina Upland. The basin is filled by Mesozoic, Tertiary and Quarternary sediments (e.g. sandstone, conglomerate, claystone, clay, (gravel) sand, peat) (CHÁBERA et al. 1985). For our study, only sandy substrates, on which Arenosols, Arenic Cambisols or Podzols are developed, are important. All sandy substrates in the area are acidic and nutrient-poor (CULEK 1996). The area belongs to the moderately warm climatic region (QUITT 1971). The mean annual temperature varies between 7 and 8ºC and the mean annual precipitation is ca. 600-700 mm (SYROVÝ 1958).

Vegetation sampling and data analysis

Phytosociological relevés were collected subjectively using the Braun-Blanquet method; for estimation of species cover and abundances, a modified 9-degree Braun-Blanquet scale was used (WESTHOFF & VAN DER MAAREL 1973). The plots were selected in order to represent all main vegetation types in the study area. In total, 124 relevés were gathered in 2003 and 2004 – all of them are stored in the Czech National Phytosociological Database (CHYTRÝ & RAFAJOVÁ 2003); six of them are included in ČERNÝ et al. (submitted). Cryptogams were not identified.

Relevés were stored using the TURBOVEG 2.0 database programme (HENNEKENS & SCHAMINÉE 2001). The cluster analysis in the SYN-TAX 2000 programme (PODANI 2001)

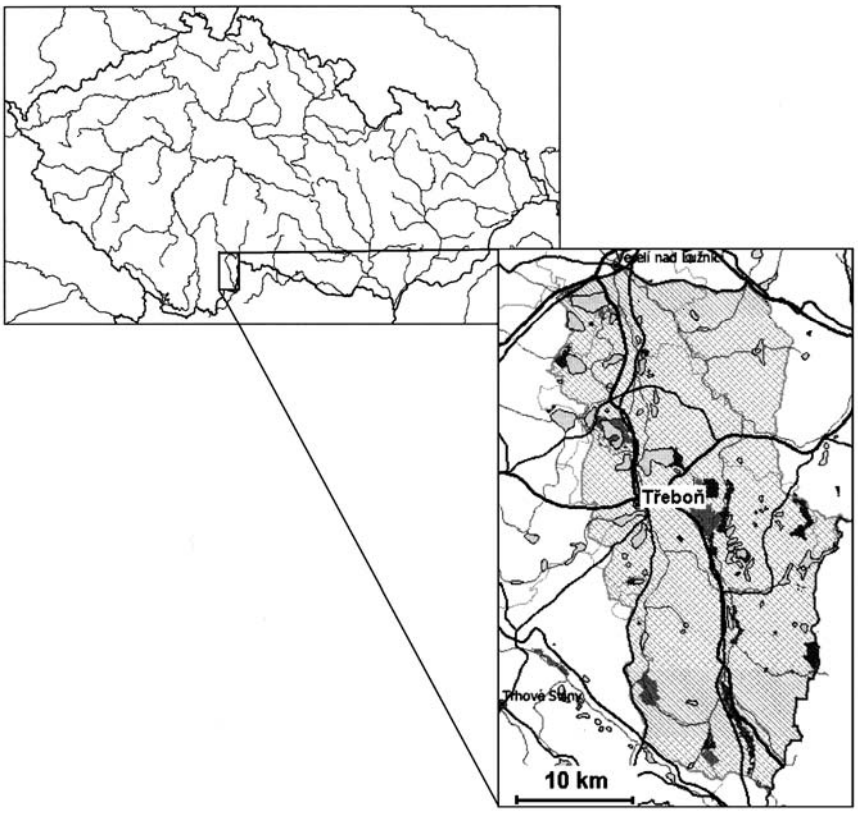

Fig. 1. Location of the study area in the Czech Republic. The Třeboňsko Biosphere Reserve is shaded.

was used for the preliminary classification of relevés. For this analysis, the beta-flexible clustering algorithm was selected, with parameter beta set to –0.25. All cover values of species were transformed into an ordinal scale (VAN DER MAAREL 1979). Consequently, several relevés with questionable numerical classification were reclassified subjectively. The synoptic table of the distinguished vegetation groups was prepared in the JUICE 6.3 programme (TICHÝ 2002). The diagnostic species for the particular vegetation groups were determined using the phi coefficient as a measure of fidelity (CHYTRÝ et al. 2002). The phi coefficient was adjusted for an equal size of clusters (TICHÝ & CHYTRÝ 2006). Only species with both significant concentration in particular vegetation units (using Fisher's exact test and significance level $p < 0.01$) and phi coefficient > 0.30 were considered as diagnostic species.

Ellenberg indicator values (ELLENBERG et al. 2001) were used for comparison of basic ecological conditions of the distinguished vegetation groups (computed as simple means

from species values). The name soil calcium was used instead of soil reaction since there is a stronger correlation of the indicator value with calcium content than with soil reaction (SCHAFFERS & SÝKORA 2000). The species richness of the particular vegetation groups was expressed as the Shannon-Weaner index of diversity H′ (LUDWIG & REYNOLDS 1988). Box-and-whisker plots for the Ellenberg indicator values and the Shannon-Weaner index were prepared in the STATISTICA 5.1 package (STATSOFT, INC. 1998).

For a better description of vegetation variability, detrended correspondence analysis was carried out with all 124 relevés in the programme CANOCO 4.5 (TER BRAAK & ŠMILAUER 2002), together with passive projection of computed site mean Ellenberg indicator values and the Shannon-Wiener index (LEPŠ & ŠMILAUER 2003).

For basic comparison of the vegetation sampled in the Třeboňsko region with other relevant data from the Czech Republic, we selected (i) all relevés of psammophytic vegetation and (ii) relevés that have the same dominants as our collected field data (another 251 relevés in total). These data were obtained from the Czech National Phytosociological Database.

The nomenclature follows KUBÁT et al. (2002) for vascular plant taxa and MORAVEC et al. (1995) for syntaxa. The scientific names not included in these studies are mentioned with the author's name.

Results and discussion

Ten vegetation groups were distinguished within the dry psammophytic vegetation in the Třeboňsko Biosphere Reserve (Appendix, Tab. 1).

Vegetation group 1

The unit represents communities of the Thero-Airion alliance. We classify the stands with the presence of *Vulpia myuros* or *Aira praecox* as the Vulpietum myuri PHILIPPI 1973 or the successionally more developed stands of the Airetum praecocis, respectively – see ČERNÝ et al., submitted. Several relevés lack differential association species, therefore they are assigned only to the alliance level. The group 1 stands occur near sand pits, on sandy fishpond beaches, sand dunes and in pine forest margins. *Arnoseris minima* – a critically threatened species of the Czech flora (HOLUB & PROCHÁZKA 2000) – was found in a stand belonging to this vegetation group. This stand is dominated by therophytes and can be found in a pine forest margin in the Pařiž settlement (BOUBLÍK & ČERNÝ 2005).

Vegetation group 2

The unit contains grasslands dominated by fescues (*Festuca ovina*, *F. filiformis*), *Agrostis capillaris* or *Hieracium pilosella* belonging to the Jasiono montanae-Festucetum ovinae (the Hyperico perforati-Scleranthion perennis alliance) due to the presence of *Jasione montana*, *Veronica dillenii*, *V. verna*, and *Scleranthus perennis*. Some of the stands with *Festuca brevipila* represent transient vegetation types between the Hyperico perforati-Scleranthion perennis and Plantagini-Festucion ovinae alliances. The stands are

scattered within villages, pine forest margins, on sand dunes, and near sand pits. *Botrychium matricariifolium*, a critically threatened species (HOLUB & PROCHÁZKA 2000), was registered in a stand dominated by *Festuca filiformis* belonging to this unit (Paříž settlement – BOUBLÍK & ČERNÝ 2005).

In the Czech Republic, *Festuca filiformis*-dominated subxerophilous communities have been reported only in the south-eastern part of Bohemia in the form of fringe vegetation (BOUBLÍK & KUČERA 2004). As a dominant species, *F. filiformis* is known especially in wet and peaty grasslands (RYBNÍČEK 1974).

Vegetation group 3

In comparison with the foregoing vegetation group, this one contains species richer grasslands (see the Shannon-Weaner index in Fig. 2) of the Hyperico perforati-Scleranthion perennis alliance dominated by *Hieracium pilosella* and *Thymus pulegioides*, with the presence of *Cerastium semidecandrum*, *Erophila verna*, *Potentilla argentea*, *Scleranthus perennis* (Polytricho piliferi-Scleranthetum perennis). Also, a community dominated by *Festuca brevipila* and with the presence of *Hypochaeris radicata*, *Pimpinella saxifraga*, *Plantago lanceolata*, and *Potentilla argentea* (Sileno otitae-Festucetum brevipilae LIBBERT 1933 corr. KRATZERT & DENGLER 1999 ranked into Plantagini-Festucion ovinae – see SÁDLO in CHYTRÝ 2006) is included. Similarly with vegetation group 4, annual species such as *Cerastium semidecandrum*, *Veronica verna*, and *Myosotis stricta*, gain dominance in this vegetation group. Its stands were recorded in sand pits, villages, on pastureland, sandy beaches, and sand dunes.

Communities dominated by *Festuca brevipila* are occasionally reported from Central and Eastern Bohemia (MORAVEC et al. 1995), but in contrast with the Třeboňsko region, they usually contain thermophilous species. We can identify our data with the mesophilous variant of the Sileno otitae-Festucetum brevipilae (see SÁDLO in CHYTRÝ 2006).

Vegetation group 4 (Appendix, Tab. 2, rels 1-8)

It comprises the most pronounced and species-rich vegetation unit (Figs 2 & 3) which is usually dominated by *Sedum sexangulare*, *S. acre*, or *Hypochaeris radicata* and contains many therophytes (e.g. *Arenaria serpyllifolia* agg., *Cerastium semidecandrum*, *Myosotis stricta*, *Veronica sublobata*) and meadow species. It occurs on frequently mown, unfertilised lawns in villages. To date, such a vegetation type has not been described in the Czech Republic. A similar type, occurring in the Netherlands, has been described as the Sedo-Thymetum pulegioidis DOING ex WEEDA, DOING & SCHAMINÉE (Koelerio-Corynephoretea class) (SCHAMINÉE et al. 1996). In addition to the South Bohemian stands, this association contains e.g. *Carex arenaria* L., *Eryngium campestre*, *Ornitopus perpusillus*, *Trifolium striatum* and it is questionable to identify it with the South Bohemian *Sedum*-rich stands. PASSARGE (1977, 1996), too, mentions certain *Sedum*-rich communities, but his relevés represent species poorer vegetation in comparison with the stands in the Třeboňsko region. Other localities with this vegetation type are located in Central Bohemia (e.g. in Prague or Dobříš town); stands of this unit need further study for a proper syntaxonomical evaluation.

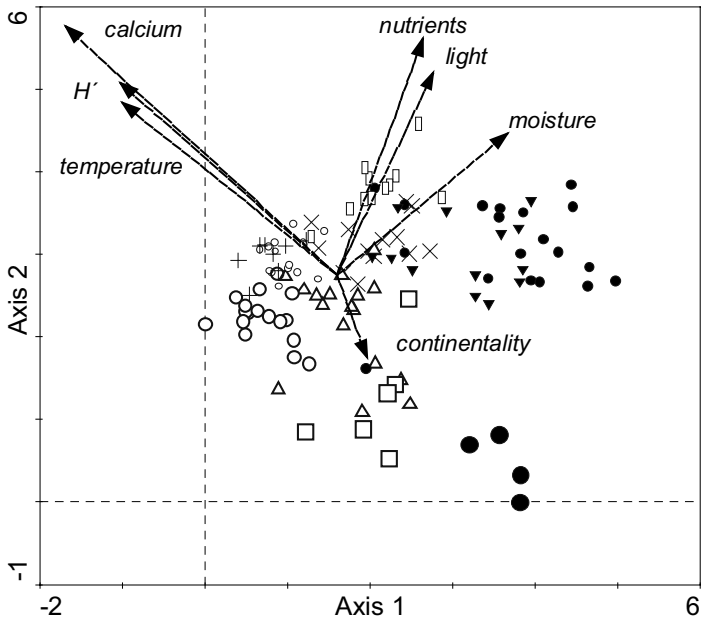

Fig. 2. DCA analysis of the relevés based on species data only, with passive projection of the Ellenberg indicator values (calculated as site means) and the Shannon-Weaner index of diversity (H´). Length of species gradient = 4.97 SD units. Symbols of the vegetation groups defined in the text: × = group 1, △ = group 2, ○ = group 3, + = group 4, ○ = group 5, □ = group 6, ● = group 7, ▼ = group 8, ▯ = group 9, ● = group 10.

Vegetation group 5

This group comprises stands of the Sileno otitae-Festucetum brevipilae with the dominant presence of *Festuca brevipila* and stands of Jasiono montanae-Festucetum ovinae dominated by *Hieracium pilosella* or *Festuca ovina* (see the picture of such a stand in Fig. 4). In contrast to vegetation types 2 and 3, the concentration of subthermophytes such as *Carex caryophyllea*, *Cerastium arvense*, *Lychnis viscaria*, *Potentilla tabernaemontani* is characteristic. This group's communities were recorded on gravel sand terraces, sand dunes and man-made habitats (sand pits, areas around rail tracks). *Arnoseris minima*, a rare species in the Czech Republic, grows in a stand of this vegetation group dominated by *Festuca brevipila* near the Tušť village (BOUBLÍK & ČERNÝ 2005).

In comparison with Central Bohemian stands, the Jasiono montanae-Festucetum ovinae stands in the Třeboňsko region lack saxicolous and more thermophilous species such as *Asperula cynanchica*, *Dianthus carthusianorum*, *Verbascum lychnitis*, or *Cardaminopsis arenosa* (see e.g. KOLBEK in KOLBEK et al. 2001). On the other hand, some of the stands in the study region contain psammophytes of the Thero-Airion or Plantagini-Festucion ovinae alliances (*Armeria elongata*, *Teesdalia nudicaulis*).

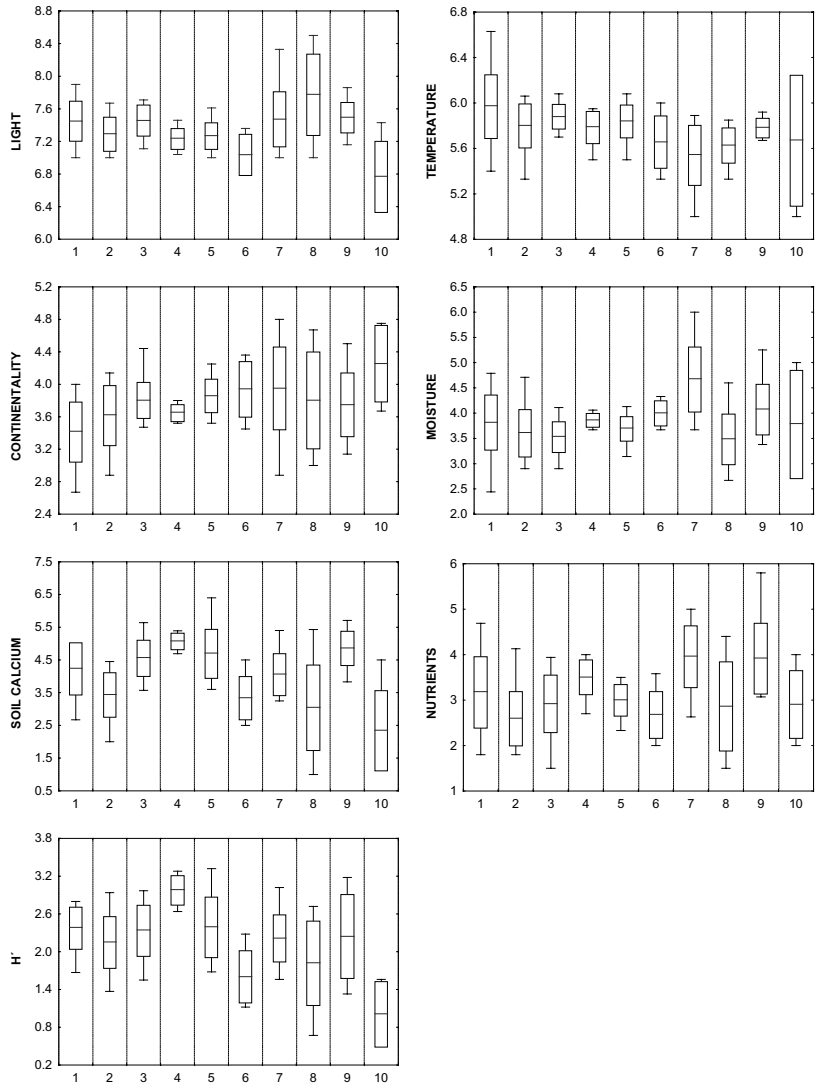

Fig. 3. Box-and-whisker plots of the mean site Ellenberg indicator values for light, temperature, continentality, moisture, soil calcium, and macronutrients for each of the distinguished vegetation groups (numbers 1–10, see text and table 1). Species richness of the particular vegetation groups expressed as the Shannon-Weaner index of diversity is also shown. Boxes represent mean values ± SD, whiskers are non-outlier min-max values. Significance test using Tukey HSD test for comparison of vegetation groups was performed and it proved significant differences between markedly shifted groups ($p < 0.05$). Results are not shown due to overflow of graphs with letters.

Vegetation group 6

Based on a typical diagnostic species group (*Carex ericetorum*, *Potentilla erecta*, *Vaccinium myrtillus*, *V. vitis-idaea*) and *Calluna vulgaris* dominance, we matched this vegetation group with the Calluno-Vaccinietum (Genistion alliance). It occurs on gravel sand terraces and as well as man-made habitats (sand pits, railway banks). *Thymus serpyllum*, a critically threatened species of the south Bohemian flora (CHÁN 1999), was recorded in one stand of this unit in a railway bank close to the Suchdol nad Lužnicí village.

Vegetation group 7

The unit represents various wet (see Figs 2 & 3) or ruderalised communities of the Thero-Airion alliance – the Vulpietum myu*ri* and a community similar to the Teesdalio nudicaulis-Sperguletum morisonii SCHUBERT 1974 (species poor stands with the co-occurrence of both of the name giving species – SCHUBERT 1974, PASSARGE 2002). The stands occur especially in contact with sand pits. Relevés with *Agrostis scabra* are frequent in this type.

Vegetation group 8

The Corniculario aculeatae-Corynephoretum canescentis STEFFEN 1931 nom. invers. propos. (see CHYTRÝ & SÁDLO in CHYTRÝ 2006), dominated by *Corynephorus canescens*, and species poor initial vegetation of the Thero-Airion alliance can be distinguished within this group. The Thero-Airion communities are represented by the Airetum praecocis and the communities with *Spergula morisonii* and *Teesdalia nudicalis* similar to the Teesdalio nudicaulis-Sperguletum morisonii. Transient types between the Corniculario-Corynephoretum and communities of the Thero-Airion alliance are also present in this unit. The stands occur on nutrient-poor and acidic soils (Figs 2 & 3) mostly in sand pits and on sand dunes. Up to date, *Corynephorus canescens*-dominated stands have been described in Central, Northern, Western, and Southern Bohemia, Southern Moravia, and Silesia (summarised in VICHEREK in MORAVEC et al. 1995, SÁDLO & CHYTRÝ in CHYTRÝ et al. 2001, CHYTRÝ & SÁDLO in CHYTRÝ 2006).

Vegetation group 9

This vegetation group contains moist and ruderal communities dominated by *Scleranthus perennis* or *S. annuus* agg. occurring along reservoir beaches in abandoned sand pits. In the Třeboňsko region, this unit is relatively species-rich (Fig. 3), but when compared with similar vegetation with dominance or co-dominance of *Scleranthus perennis* known from the Czech Republic (e.g. Jasiono montanae-Festucetum ovinae*, Diantho serotini-Festucetum vaginatae*, Corniculario aculeatae-Corynephoretum), it lacks strictly psammophytic or subthermophilous species (*Hieracium pilosella*, *Potentilla tabernaemontani*, *Thymus pulegioides*). We can indicate this type as a basal community of the Hyperico perforati-Scleranthion perennis alliance.

Fig. 4. Acidophilous grassland dominated by *Festuca ovina* (Jasiono montanae-Festucetum ovinae) with *Scleranthus perennis*, *Lychnis viscaria* and *Teesdalia nudicalis* on the slope of a Quarternary gravel-sand terrace NE of the Tušť village. The stand is spontaneously invaded by *Betula pendula*, *Pinus sylvestris*, and *Quercus robur* (May 21, 2005, photo by K. Boublík).

Vegetation group 10

It is a species-poor community (1-4 vascular species) dominated by *Avenella flexuosa* with an unclear assignment to a higher syntaxa. It occurs on sand pit slopes with frequently disturbed soil surface. According to the Ellenberg indicator values, the soils are extremely poor in nutrients and very acidic (Figs 2 & 3).

Vegetation with new alien grass *Agrostis scabra* (Appendix, Tab. 2, rels 9-18)

Agrostis scabra grows in the initial and successionally slightly developed vegetation of the Thero-Airon alliance. Some stands can be assigned to the Vulpietum myuri while others are similar to the Teesdalio nudicaulis-Sperguletum morisonii. Uniquely, *A. scabra* was recorded in Corniculario aculeatae-Corynephoretum canescentis. It seems that *A. scabra*, a competitively weak species (MELZER & BARTA 1992), is not a threat to the native flora. In the study area, it does not infiltrate into successionally more developed stands and does not inhibit native species in the initial vegetation types. This non-native grass enters into semiruderal open communities with concentration of other naturalised neophytes (*Juncus tenuis*, *Conyza canadensis*).

Considerations on psammophytic vegetation conservation

The current psammophilous vegetation in the Třeboňsko Biospere Reserve seems to represent the remnants of its former greater extension, a consequence of pasture management and more intensive landscape exploitation by humans in the past. Nowadays, grassland vegetation is being overgrown by competitively stronger species (Fig. 4). CHÁN (1999), too, documented the retreat of many psammophilous species in the study area. In contrast, psammophilous vegetation still holds and develops in disturbed areas near sand pits and in villages. The primary succession of herb vegetation on open sand often leads into development of remarkable vegetation types, increasing the biodiversity of the region. The psammophilous vegetation remnants are threatened by the extensive afforestation of old sand pits out of use.

Acknowledgments

We thank Milan Štech for the determination of *Agrostis scabra* specimens and for field help and Jiří Kolbek, Petr Petřík, and Milan Štech for valuable comments on the manuscript. Jakub Lepš kindly corrected our English. The study was supported by the Grant Agency of the Academy of Sciences of the Czech Republic (Grant No. A6005202) and by the long-term research plan AV0Z60050516 of the Academy of Sciences of the Czech Republic.

References

BOUBLÍK K. & T. ČERNÝ (2005): Nové nálezy psamofilních druhů rostlin na Třeboňsku. — Sborn. Jihočes. Muz. v Čes. Budějovicích, Přír. Vědy **45**: 57-60.

BOUBLÍK K. & T. KUČERA (2004): Acidofilní lemy jihovýchodních Čech – první přiblížení. — In: KOLBEK J. & M. VALACHOVIČ (eds), Vegetační výzkum a mapování regionů. Hranice v geobotanike, Bull. Slov. Bot. Spoločn., Suppl. **11**: 101-126.

CHÁBERA S. et al. (1985): Jihočeská vlastivěda. Řada A. Neživá příroda. — Jihočeské nakladatelství, České Budějovice.

CHÁN V. (ed.) (1999): Komentovaný červený seznam květeny jižní části Čech. — Příroda **16**: 1-284.

CHYTRÝ M. (ed.) (2006): Vegetace České republiky. 1. Travinná a keříčková vegetace. — Academia, Praha.

CHYTRÝ M., KUČERA T. & M. KOČÍ (eds) (2001): Katalog biotopů České republiky. — AOPK, Praha.

CHYTRÝ M. & M. RAFAJOVÁ (2003): Czech National Phytosociological Database: basic statistics of the available vegetation-plot data. — Preslia **75**: 1-15.

CHYTRÝ M., TICHÝ L., HOLT J. & Z. BOTTA-DUKÁT (2002): Determination of diagnostic species with statistical fidelity measures. — J. Veg. Sci. **13**: 79-90.

CONERT H.J. (ed.) (1998): Gustav Hegi. Illustrierte Flora von Mitteleuropa **I/3**. *Spermatophyta*: *Angiospermae*: *Monocotyledones* **1 (2)** *Poaceae* (Echte Gräser oder Süßgräser). — Parey, Berlin.

CULEK M. (ed.) (1996): Biogeografické členění České republiky. — Enigma, Praha.

ČERNÝ T., PETŘÍK P., BOUBLÍK K. & J. KOLBEK (submitted): Vegetation with *Aira praecox* in the Czech Republic compared to its variability in Western Europe. — Phytocoenologia.

ELLENBERG H., WEBER H. E., DÜLL R., WIRTH V. & W. WERNER (2001): Zeigerwerte von Pflanzen in Mitteleuropa. — Scripta Geobotanica **18**: 1-262.

FISCHER M.A., ADLER W. & K. OSWALD (2005): Exkursionsflora für Österreich, Liechtenstein und Südtirol. 2nd ed. — Land Oberösterreich, Biologiezentrum der OÖ Landesmuseen, Linz, 1392 pp.

HADINEC J., LUSTYK P. & F. PROCHÁZKA (red.) (2003): Additamenta ad floram Reipublicae Bohemicae. II. — Zpr. Čes. Bot. Společ. **38**: 217-288.

HENNEKENS S.M. & J.H.J. SCHAMINÉE (2001): TURBOVEG, a comprehensive data base management system for vegetation data. — J. Veg. Sci. **12**: 589-591.

HOLUB J. & F. PROCHÁZKA (2000): Red List of vascular plants of the Czech Republic – 2000. — Preslia **72**: 187-230.

KOLBEK J., NEUHÄUSLOVÁ Z., SÁDLO J., DOSTÁLEK J., HAVLÍČEK P., HUSÁKOVÁ J., KUČERA T., KROPÁČ Z. & S. LECJAKSOVÁ (2001): Vegetace Chráněné krajinné oblasti a Biosférické rezervace Křivoklátsko. **2**. Společenstva skal, strání, sutí, primitivních půd, vřesovišť, termofilních lemů a synantropní vegetace. — Academia, Praha, 364 pp.

KUBÁT K., HROUDA L., CHRTEK J. jun., KAPLAN Z., KIRSCHNER J., ŠTĚPÁNEK J. & J. ZÁZVORKA (eds) (2002): Klíč ke květeně České republiky. — Academia, Praha, 928 pp.

LEPŠ J. & P. ŠMILAUER (2003): Multivariate analysis of ecological data using CANOCO. — Cambridge Univiversity Press.

LUDWIG J.A. & J.F. REYNOLDS (1988): Statistical ecology. A primer on methods and computing. — Wiley, New York.

MELZER H. & TH. BARTA (1992): Neues zur Flora von Österreich und neue Fundorte bemerkenswerter Blütenpflanzen im Burgenland, in Niederösterreich und Wien. — Linzer biol. Beitr. **24**: 709–723.

MORAVEC J., BALÁTOVÁ-TULÁČKOVÁ E., BLAŽKOVÁ D., HADAČ E., HEJNÝ S., HUSÁK Š., JENÍK J., KOLBEK J., KRAHULEC F., KROPÁČ Z., NEUHÄUSL R., RYBNÍČEK K., ŘEHOŘEK V. & J. VICHEREK (1995): Rostlinná společenstva České republiky a jejich ohrožení. Ed. 2. — Severočes. Přír., App. **1995**: 1–206.

PASSARGE H. (1977): Über Initialfluren der *Sedo-Scleranthetea* auf pleistozänen Böden. — Feddes Repert. **88**: 503–525.

PASSARGE H. (1996): Pflanzengesellschaften Nordostdeutschlands **1**. Hydro- und Therophytosa. — Cramer, Berlin, Stuttgart.

PASSARGE H. (2002): Pflanzengesellschaften Nordostdeutschlands **3**. Cespitosa und Herbosa. — Cramer, Berlin & Stuttgart.

PODANI J. (2001): SYN-TAX 2000. User's manual. — Scientia, Budapest.

PRACH K. (1999): Výskyt vzácných druhů v plevelových společenstvech svazu *Arnoseridion* a *Radiolion linoidis* na lokalitě u Vlkova, jižní Čechy (1989–1998). — Příroda **14**: 99–106.

QUITT E. (1971): Klimatické oblasti Československa. — Stud. Geogr. **16**: 1–83.

RYBNÍČEK K. (1974): Die Vegetation der Moore im südlichen Teil der Böhmisch-Mährischen Höhe. — In: Vegetace ČSSR, **A 6**, Academia, Praha.

SCHAFFERS A.P. & K.V. SÝKORA (2000): Reliability of Ellenberg indicator values for moisture, nitrogen and soil reaction: a comparison with field measurements. — J. Veg. Sci. **11**: 225–244.

SCHAMINÉE J.H.J., STORTELDER A.H.F. & E.J. WEEDA (1996): De vegetatie van Nederland. **3**. Plantengemeenschappen van graslanden, zomen en droge heiden. — Opulus Press, Uppsala, Leiden.

SCHUBERT R. (1974): Übersicht über die Pflanzengesellschaften des südlichen Teiles der DDR. **X**. Silbergrasreiche Pionierfluren auf nährstoffarmen Sand- und Grusböden. — Hercynia N. F. **11**: 291–298.

SKALICKÝ V. (1988): Regionálně fytogeografické členění. — In: HEJNÝ S. & B. SLAVÍK (eds), Květena České socialistické republiky **1**: 103–121, Academia, Praha.

STATSOFT, INC. (1998): STATISTICA for Windows. — Tulsa, Oklahoma. [http://www.statsoft.com]

SYROVÝ S. (ed.) (1958): Atlas podnebí Československé republiky. — Ústřední správa geodesie a kartografie, Praha.

TER BRAAK C.J.F. & P. ŠMILAUER (2002): CANOCO Reference Manual and CanoDraw for Windows User's Guide: Software for Canonical Community Ordination (version 4.5). — Microcomputer Power, Ithaca NY.

TICHÝ L. (2002): JUICE, software for vegetation classification. — J. Veg. Sci. **13**: 451-453.

TICHÝ L. & M. CHYTRÝ (2006): Statistical determination of diagnostic species for site groups of unequal size. — J. Veg. Sci. (submitted).

TUTIN T.G., HEYWOOD V.H., BURGES N.A., MOORE D.M., VALENTINE D.H., WALTERS S.M. & D.A. WEBB (eds.) (1980): Flora Europaea **5**. *Alismataceae* to *Orchidaceae* (Monocotyledones). — Cambridge University Press.

VAN DER MAAREL E. (1979): Transformation of cover-abundance values in phytosociology and its effects on community similarity. — Vegetatio **39**: 43–45.

WESTHOFF V. & E. VAN DER MAAREL (1973): The Braun-Blanquet approach. — In: WHITTAKER R. H. (ed.), Ordination and classification of communities, Handbook of vegetation science **5**: 619–726, Junk, The Hague.

Addresses of the authors: Karel BOUBLÍK, Tomáš ČERNÝ
Institute of Botany
Academy of Sciences of the Czech Republic
Zámek 1
CZ-252 43 Průhonice
E-Mail: boublik@ibot.cas.cz
cerny@ibot.cas.cz

Appendix

Tab. 1. Synoptic table of dry psammophytic vegetation of the Třeboňsko Biospere Reserve. The percentage constancies of species in particular vegetation groups are given, the upper indices are phi coefficients (× 100). The values for diagnostic species are in bold. Seventy taxa occurring in only one column with percentage constancy < 20% were omitted. All listed species occur in the herb layer.

Group No.	1	2	3	4	5	6	7	8	9	10
No. of relevés	13	17	15	8	17	6	19	13	11	5
Aira praecox	**38** $^{48.8}$	.	.	.	.	.	.	15	.	.
Poa bulbosa	**23** $^{46.1}$	.	.	.	.	.	.	.	.	.
Jasione montana	.	**47** $^{33.8}$	27	.	35	.	5	15	.	.
Danthonia decumbens	.	**29** $^{36.4}$	.	.	6	17	.	.	.	.
Cerastium semidecandrum	8	12	**100** $^{66.8}$	38	.	17	.	8	18	.
Veronica verna	23	12	**40** $^{31.6}$	12	12	.	.	8	.	.
Poa pratensis agg.	62	24	67	**100** $^{53.4}$	59	33	.	.	27	.
Achillea millefolium	31	35	27	**100** $^{53.2}$	41	.	5	15	27	.
Veronica arvensis	8	6	47 $^{27.0}$	**88** $^{63.7}$	18	.	.	.	.	.
Luzula campestris	31	53	27	**88** $^{57.9}$	65 $^{21.9}$	67	.	8	.	.
Sedum sexangulare	.	6	.	**75** $^{51.8}$	.	.	.	.	.	.
Hypochaeris radicata	8	29	47 $^{22.8}$	**75** $^{46.7}$	.	.	11	8	18	.
Myosotis stricta	8	24	53 $^{27.3}$	**75** $^{45.3}$	29	.	5	.	9	.
Potentilla argentea	38	41	60 $^{23.5}$	**75** $^{34.4}$	18	.	5	.	45	.
Arabidopsis thaliana	15	12	27	**75** $^{53.2}$	6	.	11	8	9	.
Cerastium arvense	.	6	20	**75** $^{52.3}$	47 $^{27.3}$	.	.	.	18	.
Taraxacum sect. Ruderalia	8	18	27	**62** $^{37.6}$	24	.	16	23	9	.
Trifolium dubium	8	12	20	**62** $^{52.9}$	.	.	5	.	9	.
Alopecurus pratensis	.	.	7	**62** $^{49.6}$	6	.	.	.	.	.
Cerastium glutinosum	31	.	7	**62** $^{56.3}$	6	.	.	.	.	.
Arenaria serpyllifolia agg.	.	.	.	**50** $^{68.8}$	.	.	.	.	.	.
Lamium purpureum	.	.	.	**50** $^{64.5}$	6	.	.	.	.	.
Veronica sublobata	23	.	.	**50** $^{47.5}$	18	.	.	.	.	.
Dianthus deltoides	.	18	20	**50** $^{40.5}$	12	.	5	.	9	.
Dactylis glomerata	8	.	13	**50** $^{33.7}$	.	.	.	.	.	.
Trifolium arvense	.	.	27 $^{25.9}$	**38** $^{40.1}$	.	.	5	.	.	.
Silene vulgaris	.	.	7	**38** $^{45.3}$	6	.	.	8	.	.
Bromus hordeaceus	.	.	.	**25** $^{48.0}$	.	.	.	.	.	.
Hieracium pilosella	54	88 $^{28.0}$	73	75	**94** $^{32.0}$	33	5	31	9	.
Hypericum perforatum	15	41	13	.	**71** $^{33.2}$	50	16	23	36	.
Carex caryophyllea	.	.	20	12	**59** $^{46.8}$	33	.	.	.	.
Potentilla tabernaemontani	15	6	7	50	**47** $^{32.9}$	.	.	.	9	.
Lychnis viscaria	.	.	.	.	**35** $^{45.2}$	17	.	.	.	.
Avenula pubescens	.	.	.	25	**29** $^{35.2}$	.	.	.	.	.
Arrhenatherum elatius	.	. $^{18.6}$	7	12	**24** $^{31.8}$	.	.	.	.	.
Calluna vulgaris	.	35	.	.	12	**100** $^{78.6}$	5	.	.	.
Quercus robur	.	47 $^{26.2}$	.	.	18	**83** $^{58.1}$	5	.	.	20
Carex ericetorum	.	.	.	.	.	**50** $^{56.2}$	.	.	.	20
Potentilla erecta	.	.	.	.	.	**33** $^{55.7}$	.	.	.	.

Vaccinium myrtillus	.	.	.	.	.	**33** $^{55.7}$	.	.	.	.
Filago minima	15	.	.	12	.	17	**63** $^{43.0}$	15	36	.
Agrostis scabra Willd.	.	.	.	.	.	.	**47** $^{61.2}$	8	.	.
Conyza canadensis	8	.	.	.	.	17	**47** $^{51.9}$	.	.	.
Juncus effusus	.	.	.	.	.	.	**26** $^{49.3}$	.	.	.
Epilobium angustifolium	.	.	.	.	.	.	**21** $^{44.0}$	.	.	.
Carex ovalis	15	.	.	.	.	.	**21** $^{31.0}$	.	.	.
Filago arvensis	.	.	.	.	.	.	**16** $^{38.0}$	.	.	.
Corynephorus canescens	.	6	.	.	.	.	.	**77** $^{83.0}$	.	.
Trifolium repens	8	6	.	.	.	.	16	.	**73** $^{68.8}$	.
Scleranthus annuus s.lat.	54 $^{27.8}$	.	.	.	.	17	21	38	**73** $^{43.5}$	.
Spergularia rubra	38	12	7	.	.	33	53 $^{22.5}$	23	**73** $^{38.2}$	.
Tanacetum vulgare	8	.	7	12	.	.	5	8	**55** $^{51.4}$	.
Lepidium campestre	.	.	7	.	.	.	.	.	**45** $^{60.4}$	.
Tripleurospermum inodorum	8	.	7	.	12	.	16	.	**45** $^{43.3}$	.
Potentilla norvegica	.	.	.	.	.	.	.	.	**27** $^{50.2}$	.
Plantago major	.	.	.	.	.	.	5	.	**27** $^{45.1}$	.
Avenella flexuosa	15	12	.	.	12	33	11	15	.	**100** $^{67.1}$
Pinus sylvestris	.	41	7	.	12	17	53 $^{22.7}$	16	.	**100** $^{59.9}$
Rumex acetosella s.lat.	38	71	67	100 $^{29.5}$	71	50	21	23	100 $^{29.5}$	20
Agrostis capillaris	69	65	60	38	35	50	58	38	82	.
Teesdalia nudicaulis	23	24	13	.	18	33	26	62 $^{27.3}$	18	40
Festuca filiformis	92 $^{49.1}$	76 $^{37.2}$	33	12	18	17	5	15	.	.
Festuca rubra agg.	15	6	20	38	18	17	5	.	9	.
Erophila verna	62	29	67 $^{23.8}$	75	35	.	11	15	36	.
Scleranthus perennis	38	35	73 $^{30.0}$	38	18	.	5	8	100 $^{49.1}$	.
Viola arvensis	8	.	27	50	12	17	5	15	18	.
Capsella bursa-pastoris	8	6	33	38	12	.	5	.	9	.
Plantago lanceolata	31	47	87 $^{31.2}$	100 $^{40.2}$	53	.	.	8	82 $^{27.9}$	.
Festuca brevipila	.	18	80 $^{43.3}$	12	82 $^{45.2}$	33	.	8	9	.
Lotus corniculatus	.	12	27	12	12	.	5	8	36	.
Poa annua	46 $^{29.7}$	6	.	12	.	.	21	15	45	.
Elytrigia repens	8	6	7	12	12	.	.	.	18	.
Juncus tenuis	15	.	7	.	.	17	32 $^{27.0}$	8	9	.
Calamagrostis epigejos	.	12	20	.	.	17	42 $^{27.3}$	38	9	.
Festuca ovina	.	24	20	38	53 $^{28.4}$	50	.	.	9	.
Viola tricolor	8	29	7	50	41 $^{27.0}$	.	.	.	.	.
Veronica dillenii	31	29	7	.	35	.	.	8	.	.
Carex hirta	15	6	.	25	12	.	.	.	9	.
Erigeron acris	8	.	13	12	.	17	.	8	.	.
Erodium cicutarium	15	.	20	38	.	.	.	8	9	.
Herniaria glabra	8	6	53 $^{40.6}$	.	6	.	.	.	55 $^{41.8}$	.
Vicia hirsuta	.	12	33	25	18	.	.	.	18	.
Pimpinella saxifraga	.	6	20	75 $^{46.1}$	88 $^{57.2}$	.	.	.	9	.

Betula pendula	.	24	7	.	.	17	16	.	.	40
Holcus mollis	23	18	.	.	24	17	.	.	.	.
Spergula morisonii	46	6	.	.	.	.	63 $^{38.4}$	69 $^{43.7}$	.	.
Phleum pratense agg.	8	.	7	25	.	.	.	.	9	.
Poa compressa	8	.	7	.	.	.	.	8	9	.
Vulpia myuros	23	.	.	.	.	.	5	15	9	.
Thymus pulegioides	.	18	40	62 $^{39.8}$	53 $^{31.4}$	.	.	.	.	.
Sedum acre	.	6	13	25	6	.	.	.	.	.
Vicia tetrasperma	.	6	7	.	6	.	.	.	9	.
Verbascum nigrum	.	.	7	12	24 $^{24.8}$	17	.	.	.	.
Cytisus scoparius	.	.	7	.	.	33	.	8	9	.
Oenothera biennis	.	.	.	.	6	.	11	.	9	20
Echium vulgare	8	.	7	.	.	.	.	.	18	.
Vicia lathyroides	.	12	13	12	.	.	.	.	.	.
Nardus stricta	.	18	.	25	12	.	.	.	.	.
Galeopsis sp.	.	24	.	.	29 $^{29.4}$	17	.	.	.	.
Carex pilulifera	.	18	.	.	.	33	16	.	.	.
Populus tremula	.	18	.	.	.	.	16	8	.	.
Salix caprea	.	6	.	.	.	.	21 $^{25.8}$	.	.	20
Vicia sativa agg.	.	.	7	25	6	.	.	.	.	.
Centaurea jacea	.	.	7	25	.	.	.	8	.	.
Leontodon hispidus s.lat.	.	.	7	.	24 $^{29.0}$	.	.	.	18	.
Artemisia vulgaris	.	.	7	.	.	.	5	.	18	.
Anthoxanthum odoratum	.	.	.	12	6	.	5	.	.	.
Trifolium pratense	.	.	.	12	6	.	.	.	9	.
Viola canina	.	.	.	.	12	33	.	.	9	.
Carex sp.	.	.	.	.	6	.	5	15	.	.
Senecio sp.	.	.	.	.	.	17	16	8	.	.
Arnoseris minima	8	.	.	.	6	.	.	.	.	.
Cerastium pumilum	8	.	.	.	6	.	.	.	.	.
Alopecurus geniculatus	15	.	.	.	.	.	.	.	9	.
Leontodon autumnalis	.	6	.	25	.	.	.	.	.	.
Acer platanoides	.	6	.	12	.	.	.	.	.	.
Veronica chamaedrys	.	12	.	.	6	.	.	.	.	.
Chamaecytisus ratisbonensis	.	6	.	.	.	17	.	.	.	.
Silene nutans	.	6	.	.	.	17	.	.	.	.
Hieracium umbellatum	.	6	.	.	6	.	.	.	.	.
Gnaphalium sylvaticum	.	6	.	.	.	.	5	.	.	.
Geranium pusillum	.	.	7	25	.	.	.	.	.	.
Medicago lupulina	.	.	13	.	6	.	.	.	.	.
Armeria elongata	.	.	7	.	6	.	.	.	.	.
Lactuca serriola	.	.	7	.	.	.	5	.	.	.
Knautia arvensis	.	.	.	25	18	.	.	.	.	.
Ranunculus bulbosus	.	.	.	25	18	.	.	.	.	.

Hylotelephium jullianum	.	.	.	12	6	.	.	.	.	.
Holcus lanatus	.	.	.	12	.	.	16	.	.	.
Acer pseudoplatanus	.	.	.	12	.	.	.	8	.	.
Botrychium lunaria	.	.	.	.	6	17	.	.	.	.
Campanula rotundifolia	.	.	.	.	6	17	.	.	.	.
Trisetum flavescens	.	.	.	.	6	17	.	.	.	.
Vicia cracca	.	.	.	.	12	.	5	.	.	.
Vicia angustifolia	.	.	.	.	6	.	5	.	.	.
Alopecurus aequalis	.	.	.	.	.	.	5	8	.	.
Cerastium holosteoides	.	.	.	.	.	.	16	.	9	.
Leucanthemum vulgare	.	.	.	.	.	.	5	.	9	.
Rorippa palustris	.	.	.	.	.	.	5	.	9	.
Veronica serpyllifolia	.	.	.	.	.	.	5	.	9	.
Leucanthemum ircutianum	.	.	.	.	.	.	.	15	9	.
Linaria vulgaris	.	.	.	.	.	.	.	8	9	.

Tab. 2. Relevés of the *Sedum*-rich grasslands (rels 1-8) and vegetation with *Agrostis scabra* (rels 9-18).

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Relevé area (m^2)	20	12	12	25	16	12	25	25	3	24	25	25	2	6	15	18	2	15
Altitude (m)	423	423	425	425	425	465	462	464	450	445	470	470	470	475	473	473	444	469
Aspect	SE	-	S	-	-	-	SSW	WNW	-	-	-	-	-	N	-	-	-	-
Slope (°)	3	0	5	0	0	0	5	20	0	0	0	0	0	5	0	0	0	0
Cover herb layer (%)	65	50	65	80	75	65	50	75	20	30	5	8	10	20	10	25	15	15
Cover moss layer (%)	30	30	30	40	10	60	30	30	5	5	5	1	0	15	0	20	0	20
Authors	B	B	B+Č	B+Č	B+Č	B	B	Č	B	B	B	B	B	B	B	B	B+Š	Č
Rumex acetosella s.lat.	2m	+	1	1	1	+	+	1	.	.	.	.	.	.	.	.	.	.
Poa pratensis agg.	1	1	2a	2m	2m	2a	2m	2a	.	.	.	.	.	.	.	.	.	.
Plantago lanceolata	+	+	+	1	2m	+	1	2a	.	.	.	.	.	.	.	.	.	.
Achillea millefolium	r	+	1	1	1	+	+	1	.	.	.	.	.	.	.	.	.	.
Hypochaeris radicata	2b	+	2a	2a	1	.	2a	.	.	.	.	.	.	.	.	.	r	.
Veronica arvensis	1	+	+	+	2m	+	.	+	.	.	.	.	.	.	.	.	.	.
Luzula campestris	+	+	+	+	.	2m	+	2m	.	.	.	.	.	.	.	.	.	.
Erophila verna	+	.	1	+	+	1	+	.	.	.	.	.	.	+	.	.	.	.
Sedum sexangulare	2b	2b	2a	.	1	2a	.	2a	.	.	.	.	.	.	.	.	.	.
Hieracium pilosella	1	2b	.	1	1	2m	2m	.	.	.	.	.	.	.	.	.	.	.
Myosotis stricta	1	+	1	+	+	.	2m	.	.	.	.	.	.	.	.	.	.	.
Taraxacum sect. *Ruderalia*	+	1	r	.	.	.	+	r	.	.	.	.	.	.	.	.	.	+
Potentilla argentea	+	+	1	+	+	r	.	.	.	.	.	.	.	.	.	.	.	.
Arabidopsis thaliana	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.
Cerastium arvense	+	.	.	1	2m	1	+	2a	.	.	.	.	.	.	.	.	.	.
Pimpinella saxifraga	+	.	.	r	+	+	+	1	.	.	.	.	.	.	.	.	.	.
Trifolium dubium	+	.	1	r	.	.	2m	+	.	.	.	.	.	.	.	.	.	.
Alopecurus pratensis	r	+	.	r	.	+	.	r	.	.	.	.	.	.	.	.	.	.
Thymus pulegioides	.	1	.	.	2m	+	+	+	.	.	.	.	.	.	.	.	.	.
Cerastium glutinosum	.	+	1	1	.	1	1	.	.	.	.	.	.	.	.	.	.	.
Potentilla tabernaemontani	2a	1	.	.	3	+	.	.	.	.	.	.	.	.	.	.	.	.
Viola tricolor	+	1	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.
Arenaria serpyllifolia agg.	+	+	1	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Viola arvensis	+	+	2a	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Lamium purpureum	+	+	.	r	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Veronica sublobata	+	+	.	.	+	.	.	r	.	.	.	.	.	.	.	.	.	.
Dianthus deltoides	+	+	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.
Dactylis glomerata	.	.	1	r	r	.	.	r	.	.	.	.	.	.	.	.	.	.
Cerastium semidecandrum	2a	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Scleranthus perennis	1	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Erodium cicutarium	1	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium arvense	1	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca rubra agg.	+	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.
Silene vulgaris	+	.	.	.	.	.	+	r	.	.	.	.	.	.	.	.	.	.
Capsella bursa-pastoris	r	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Festuca ovina	.	.	1	.	.	+	.	2b	.	.	.	.	.	.	.	.	.	.
Vicia hirsuta	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vicia sativa agg.	+	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.
Ranunculus bulbosus	r	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Knautia arvensis	r	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Avenula pubescens	r	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.

Nardus stricta	.	2m	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Phleum pratense agg.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bromus hordeaceus	.	r	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sedum acre	.	.	.	3	.	.	2m	.	.	.	.	.	.	.	.	.	.	.
Carex hirta	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Geranium pusillum	.	.	.	r	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Centaurea jacea	.	.	.	r	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Leontodon autumnalis	.	.	.	.	.	r	+	.	.	.	.	.	.	.	.	.	.	.
Agrostis scabra	.	.	.	.	.	.	.	.	2a	2b	1	2m	+	2a	+	2b	+	2m
Filago minima	.	.	.	.	.	.	2m	.	1	+	1	+	2m	1	.	.	1	1
Spergula morisonii	.	.	.	.	.	.	.	.	+	1	r	.	.	1	+	2m	.	.
Juncus tenuis	.	.	.	.	.	.	.	.	+	+	.	+	1	.	.	+	.	+
Spergularia rubra	.	.	.	.	.	.	.	.	+	+	.	.	.	+	2m	+	+	.
Calamagrostis epigejos	.	.	.	.	.	.	.	.	.	1	+	.	.	+	+	.	+	r
Pinus sylvestris	.	.	.	.	.	.	.	.	1	+	+	+	.	.	.	.	r	.
Juncus effusus	.	.	.	.	.	.	.	.	.	1	r	.	+	.	.	+	+	.
Holcus lanatus	.	.	.	r	.	.	.	.	.	+	.	.	.	+	.	+	.	.
Poa annua	.	.	+	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.
Conyza canadensis	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	1	.
Tanacetum vulgare	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.
Festuca filiformis	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.
Carex pilulifera	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	+	.	.
Teesdalia nudicaulis	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.
Salix caprea	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.
Epilobium angustifolium	.	.	.	.	.	.	.	.	.	.	r	+	.	.	.	.	.	.
Betula pendula	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	+	.
Scleranthus annuus agg.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+
Carex leporina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.
Agrostis capillaris	.	+	.	.	.	2b	+	.	1	+	.	.	.	+	+	1	+	.

Species occurring in only one relevé:

Lithospermum arvense 1: r, *Veronica triphyllos* 2: +, *Lapsana communis* 2: r, *Veronica verna* 3: 1, *Festuca brevipila* 3: +, *Acer platanoides* 3: r, *Vicia lathyroides* 4: 2m, *Festuca pratensis* 4: r, *Verbascum nigrum* 5: +, *Elymus repens* 5: r, *Acer pseudoplatanus* 5: r, *Stellaria media* 5: r, *Lotus corniculatus* 7: 1, *Trifolium pratense* 7: +, *Anthoxanthum odoratum* 7: +, *Erigeron acris* 7: +, *Carex caryophyllea* 8: 1, *Hylotelephium jullianum* 8: +, *Arrhenatherum elatius* 8: r, *Calluna vulgaris* 9: +, *Agrostis stolonifera* 10: r, *Salix purpurea* 11: r, *Populus tremula* 12: +, *Senecio* sp. 12: r, *Epilobium* sp. 12: r, *Agrostis canina* 12: r, *Avenella flexuosa* 14: r, *Rubus nessensis* s.lat. 15: +, *Vulpia myuros* 17: 2m, *Corynephorus canescens* 18: 2a.

Localities and number of relevés in the Czech National Phytosociological Database:

1, 2 – Lužnice village, near the Šochle settlement 1.5 km N of the village, 347727, 347728

3 – Lužnice village, in the village square, 347755

4 – Lužnice village, in the northern margin of the village, 347756

5 – Lužnice village, near the school, 347757

6 – Halámky village, near the house in southern margin of the village, 347769

7 – Halámky village, in the village near the main crossroads, 347770

8 – Halámky village, 400 m W of the bridge over the ditch on the south-eastern margin of the village, 570224

9 – Suchdol nad Lužnicí village, near the northern bank of the sand pit reservoir, 2.5 km NNW of the railway station, 347735

10 – Suchdol nad Lužnicí village, near the western bank of the sand pit reservoir, 1.5 km N of the railway-station, 347736

11, 12 – Krabonoš village, southern margin of the sand pit 2 km N of the village, 347759, 347760

13 – Krabonoš village, near the eastern bank of the southern sand pit reservoir, N of the village, 347761

14 – Krabonoš village, between sand pits N of the village, 347762

15, 16 – Krabonoš village, near the eastern bank of the northern sand pit reservoir, N of the village, 347764, 347765

17 – Suchdol nad Lužnicí village, southeastern bank of the sand pit reservoir 1.3 km NNE of the railway-station, 347825

18 – Krabonoš village, near the western bank of the sand pit reservoir 1.7 km N of the village, 570222

Authors of relevés: B = Karel Boublík, Č = Tomáš Černý, Š = Milan Štech