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Bryofloristic survey of rich fens of the National Nature Monument Jestřebské slatiny (Doksy region, North Bohemia)

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Abstract: We present results of the bryofloristic survey of fens and degraded fens of the National Nature Monument 'Jestřebské slatiny' – 'Shnilé louky', 'Baronský rybník' and meadow 'Pod Konvalinkovým vrchem'. Seventeen species of liverworts and 70 mosses were recorded in course of several visits by the authors, of which four liverworts and three mosses are classified as threatened in the Czech Republic. The most significant record was the re-discovery of a putatively vanished moss of rich fens, *Campyliadelphus elodes*, at the locality 'Pod Konvalinkovým vrchem'. Given the regional importance of the record, we performed the revision of herbarium specimens from our country and present the typification of *Chrysohypnum elodes* var. *salinum* Podp., described from South Moravia.

Key words: bryophytes, rich fen, threatened species, *Campyliadelphus elodes*, lectotypification

Introduction

Jestřebská kotlina basin is a lowland region situated in North Bohemia, south-east of the town of Česká Lípa, around the small town of Doksy. The climate is moderately warm with average annual temperature 5–8 °C and average annual precipitation ca. 650 mm (Quitt 1971). Geological substrate of the basin is mostly represented by Upper Cretaceous (Turonian) sandstones and arcoses, which at places contain a substantial amount of calcium. Base-rich substrates contributed to the origin of rich fens, which accumulated in the depressions of region. Other fens developed around ponds, which started to be established in the region in 1300s (Mackovčin et al. 2002). Rich fens generally support specific assemblages of bryophytes and vascular plants, which became highly threatened due to the human activities in past centuries, and particularly in the last 100-150 years.

Bryoflora of the region was first more thoroughly studied in the second half of 19th century thanks to the activities of V. Schiffner and A. Schmidt (Schiffner & Schmidt 1886). These authors themselves acknowledge the treatment of cryptogam flora by Watzel (1874) as the only more important previous contribution. The whole 20th century brought no significant regional floristic treatment; these activities have only started in recent years. M. Vondráková (Vondráková 2013) studied the locality 'Shnilé louky' for her bachelor thesis, the inventory of the locality Swamp was performed by Štechová (2013) and the results of the bryofloristic course of the South Bohemian University were published by Kučera et al. (2013). The most interesting single reports from recent decades include that on the record of *Trematodon ambiguus* (Anonymus 1994), the discovery of *Cephalozia macrostachya* and *Odontoschisma sphagni* (Váňa & Kučera 2002), and several reports of *Scorpidium scorpioides* and *Hamatocaulis vernicosus*, summarized in Štechová et al. (2010, 2012).

The first author (JB) surveyed the rich fens of the National Nature Monument Jestřebské slatiny for the Nature Conservation Agency of the Czech Republic (AOPK ČR) in 2013. The purpose of the survey was the search for rare peatland mosses *Hamatocaulis vernicosus* and *Helodium blandowii*, reported from the region and possibly that particular locality (see below). As the other authors also visited the localities on various occasions between 2001 and 2012, their data have been merged with those of JB.

Methods

National Nature Monument (NNM) Jestřebské slatiny encompasses three major rich fen localities: 'Shnilé louky' – an extracted fen in the western part of the reserve, 'Baronský rybník' – an earlier fishpond in the eastern part, and the peat meadow 'Pod Konvalinkovým vrchem', to the north-east of the 'Konvalinkový vrch' hill in the northern part of the NNM (Fig 1). The original vegetation of 'Shnilé louky' (Fig 2) was largely destroyed with respect to the peat extraction, which occurred between 1960s and 1980s (AOPK ČR 2006). After the mining, the locality was left to spontaneous succession which resulted in woods (*Pinus sylvestris*, *Betula pendula*, *Salix aurita*, *Picea abies*) and common heather (*Calluna vulgaris*) overgrowing dryer places with shallow sandy and peaty substrate and sedges and reed (*Phragmites australis*) dominating in wetter sections which constitute the majority of the area. In the southeastern and eastern part, transitional vegetation towards peaty meadows developed. 'Baronský rybník' has not been run for many decades and became land-filled, which resulted in the development of a rich fen dominated by 'brown mosses' and basiphilous sedges (*Carex davalliana*, *C. flacca*, *C. hostiana*; Štechová et al. 2010). The rich fen (peat meadow) 'Pod Konvalinkovým vrchem' (Fig 3) is densely grown by high reeds (*Phragmites australis*) except for the central part of the area. The whole fen is drained by a network of longitudinal and transverse ditches lined at places with woods.

The survey at the localities 'Shnilé louky' and 'Pod Konvalinkovým vrchem', performed by JB, occurred on 13.–15.9.2013, earlier survey at the locality 'Shnilé louky' by JK occurred on 31.5.2001, the survey at 'Baronský rybník' occurred on 30.–31.5.2001, 28.6.2004, 23.5.2005, 28.4.2012 (data of TS and JK). The largest and most intensively surveyed part of the reserve, 'Shnilé louky', was divided into smaller areas according to dominating habitat types (Fig 2); major emphasis was put on the open peaty places. All localities were systematically bryofloristically surveyed, recording the occurrence of all bryophyte species. Species, which identification was not possible in the field, were collected for later laboratory examination, and the collections also included small vouchers of notable species. Herbarium specimens are deposited in the herbarium of the Department of Botany at the Faculty of Science, University of South Bohemia (CBFS). Names of bryophytes and their threat categories follow the Checklist and Red List of bryophytes of the Czech Republic (Kučera et al. 2012), names of vascular plants follow the Checklist of vascular plants of the Czech Republic (Danihelka et al. 2012). The coordinates of the localities are indicated in WGS-84.

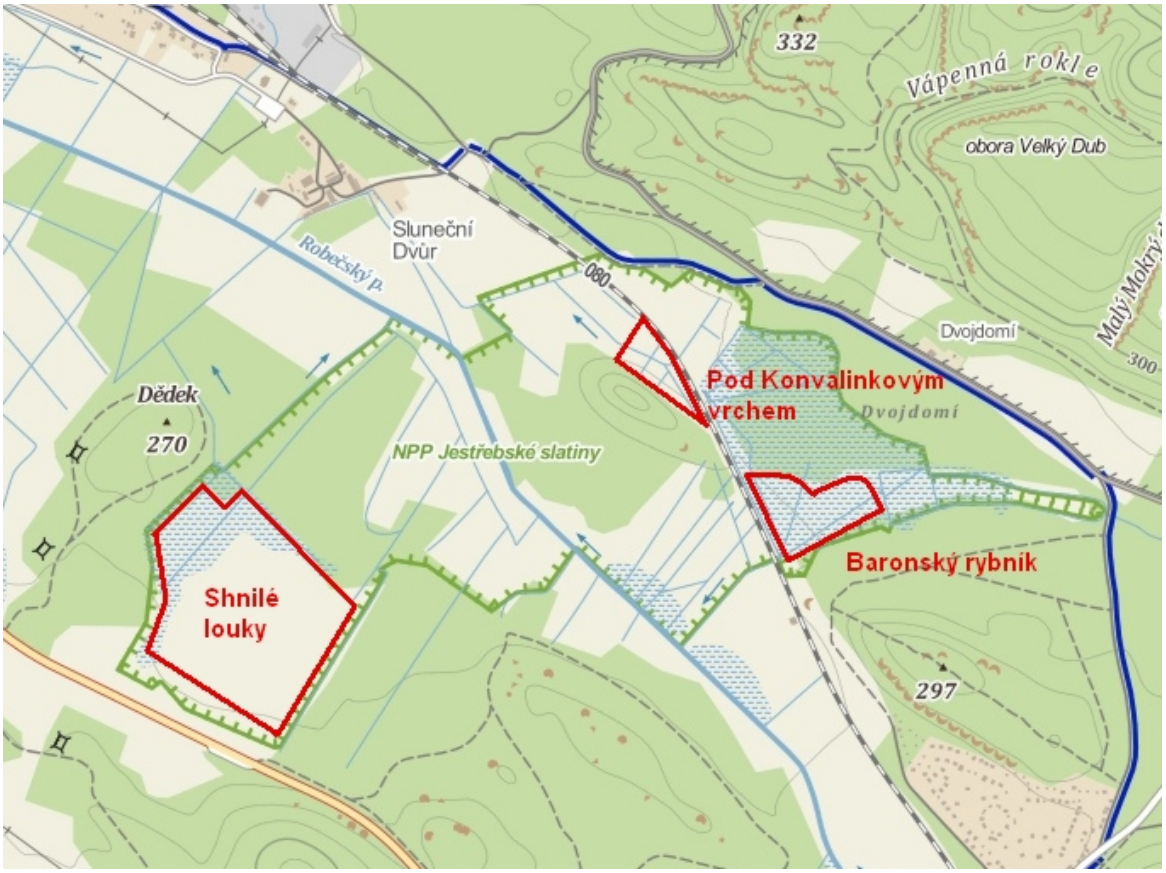

Fig 1: Explored parts of the National Nature Monument Jestřebské slatiny (www.mapy.cz).

List of localities (Figs 1 a 2)

S1: ‘Shnilé louky’, extracted rich fen and peat meadow, with only light growth of reed, between N50°36'0" E014°36'6", N50°35'54" E014°36'17", N50°36'02" E014°36'24", quad. 5453b and 5353d, 260 m a.s.l. 31.5.2001 (JK) 13.-14.5.2013 (JB)

S2: ‘Shnilé louky’, densely reed-grown extracted fen, between N50°36'2" E014°36'6", N50°36'5" E014°36'13" and N50°36'3" E014°36'26" and around points N50°36'9" E014°36'5", N50°36'10" E014°36'14" and N50°35'57" E014°36'8", quad. 5353d and 5453b, 260 m a.s.l. 31.5.2001 (JK) 13.-14.5.2013 (JB)

S3: ‘Shnilé louky’, access road to the fen, wet mineral soil, between N50°35'57" E014°36'10", N50°35'57" E014°36'11", N50°35'55" E014°36'15" and N50°35'54" E014°36'14", quad. 5453b, 260 m a.s.l. 31.5.2001 (JK), 13.-14.5.2013 (JB)

S4: ‘Shnilé louky’, pine woods surrounding the fen, on transect between N50°35'53" E014°36'17", N50°36'0" E014°36'01", N50°36'08" E014°36'13" and N50°36'06" E014°36'21" and around points N50°36'02" E014°36'18" and N50°35'57" E014°36'19", quad. 5453b and 5353d, 260 m a.s.l. 31.5.2001 (JK), 13.-14.5.2013 (JB)

K: ‘Pod Konvalinkovým vrchem’, open peat meadow (rich fen), reed-grown from the edges, between N50°36'23" E014°36'58", N50°36'25" E014°37'0" and N50°36'18" E014°37'07", quad. 5353d, 260 m a.s.l. 15.5.2013 (JB)

B: ‘Baronský rybník’, earlier fishpond, between N50°36'13" E014°37'14", N50°36'8" E014°37'18" and N50°36'11" E014°37'25", quad. 5353d, 260 m a.s.l. 30-31.5.2001 (JK), 28.4.2012 (JK, JB, TS) and 28.6.2004, 23.5.2005 (TS)

Fig 2: Major habitat division of the locality ‘Shnilé louky’ (for explanation of codes S1–S4 see the list above) and localisation of the most important records: F – *Fossombronia foveolata*, R – *Riccardia chamedryfolia*) (www.mapy.cz).

Fig 3: Map of the locality ‘Pod Konvalinkovým vrchem’ with localisation of the most important records: CG – *Calliergon giganteum*, CE – *Campyliadelphus elodes* (www.google.cz).

Results

List of recorded species

Locality codes follow the list specified above, followed by the initials of collectors/ recorders; the abbreviation ‘herb.’ stands for species documented in herbarium CBFS.

Liverworts:

Aneura pinguis: **S1** JB herb.; **K** JB herb.
Calypogeia fissa [LR-nt]: **K** JB herb.; **B** JK 2001 herb.
Cephalozia bicuspidata: **S1** JB herb., JK 2001 herb.; **S2** JK 2001 herb.
Cephalozia pleniceps [VU]: **B** JK 2001 herb.
Cephaloziella hampeana [LC-att]: **K** JB herb.; **B** JK 2001 herb.
Cephaloziella rubella: **B** JK 2012 herb.
Chiloscyphus coadunatus: **S1** JB herb.
Chiloscyphus profundus: **S1** JB herb., JK 2001; **S4** JB
Fossombronia foveolata [EN]: **S3** JB herb.
Fossombronia wondraczekii: **S3** JB herb.
Pellia endiviifolia: **S1** JB herb.
Pellia epiphylla: **S1** JB herb.
Pellia neesiana: **S1** JK 2001 herb.; **B** JK 2001
Pellia sp.: **S1** JB; **S2** JB herb.; **S3** JB
Riccardia chamedryfolia [VU]: **S1** JB herb.
Riccardia incurvata [VU]: **S1** JB, JK 2001 herb.; **S3** JB herb.
Riccardia latifrons [LC-att]: **S2** JK 2001 herb.
Riccardia multifida [LC-att]: **S1** JB herb., JK 2001 herb.; **S2** JB

Mosses:

Amblystegium serpens: **S4** JB
Atrichum undulatum: **S1** JB, JK 2001; **S3** JB; **K** JB
Aulacomnium palustre: **S1** JB, JK 2001; **S2** JB; **K** JB; **B** TS, JK 2001 herb.
Brachythecium mildeanum [LC-att]: **S1** JB herb.; **B** JK 2001 herb.
Brachythecium salebrosum: **S4** JB herb.
Breidleria pratensis [LC-att]: **K** JB herb.
Bryum argenteum: **S3** JB
Bryum dichotomum: **S3** JB herb.
Bryum pallens: **S3** JB herb.
Bryum pseudotriquetrum var. *bimum* [LC-att]: **S1** JB herb., JK 2001 herb.; **S3** JB; **B** JK 2001 herb.
Bryum pseudotriquetrum var. *pseudotriquetrum*: **K** JB
Calliergon giganteum [VU]: **K** JB herb.; **B** JK 2001 herb.
Calliergonella cuspidata: **S1** JB, JK 2001 herb.; **S2** JB; **S3** JB; **K** JB; **B** TS, JK 2001 herb., 2012 herb.
Calliergonella lindbergii: **S1** JB herb.
Campyliadelphus elodes [DD-va]: **K** JB herb.
Campylium protensum [LC-att]: **S2** JK 2001 herb.
Campylium stellatum [LR-nt]: **S1** JB herb., JK 2001 herb.; **S2** JB herb.; **S3** JB; **K** JB herb.; **B** TS 2005 herb., JK 2001 herb.
Campylopus flexuosus: **K** JB herb.
Campylopus introflexus: **S3** JB herb.
Ceratodon purpureus: **S2** JB; **S3** JB, JK 2001; **S4** JB
Cirriphyllum piliferum: **S1** JB
Climacium dendroides: **S1** JB; **S2** JB; **K** JB; **B** JK 2001
Ctenidium molluscum: **B** TS, JK 2012 herb.
Cynodontium polycarpon: **S3** JB (cf.)
Dicranella cerviculata: **S2** JK 2001 herb.
Dicranella heteromalla: **S1** JB, JK 2001; **S2** JB; **S4** JB; **K** JB herb.
Dicranoweisia cirrata: **S4** JB herb.
Dicranum bonjeanii [LR-nt]: **B** TS, JK 2012 herb.
Dicranum montanum: **B** JK 2001
Dicranum polysetum: **K** JB; **B** JK 2001 herb.
Dicranum scoparium: **K** JB herb.
Eurhynchium striatum [LC-att]: **B** JK 2001 herb.
Fissidens adianthoides [LC-att]: **K** JB herb.; **B** TS, JK 2001 herb.
Fissidens osmundoides [LC-att]: **K** JB herb.
Funaria hygrometrica: **S2** JB; **S3** JB herb., JK 2001
Hypnum cupressiforme var. *cupressiforme*: **S1** JB; **K** JB
Hypnum jutlandicum: **S1** JB herb.; **S3** JB herb.
Leucobryum glaucum: **K** JB
Mnium hornum: **S1** JK 2001
Philonotis caespitosa [LC-att]: **S3** JB herb.
Philonotis calcarea [LC-att]: **S1** JB herb., JK 2001 herb.; **S2** JB herb.
Philonotis fontana: **S1** JB herb.
Plagiomnium affine: **S1** JB, JK 2001; **S2** JB herb.; **S4** JB; **K** JB
Plagiomnium elatum [LC-att]: **S1** JK 2001 herb.; **B** JK 2001 herb.
Plagiomnium ellipticum [LC-att]: K JB herb.
Plagiomnium undulatum: **S1** JB, JK 2001
Pohlia nutans subsp. *nutans*: **S1** JB, JK 2001; **S4** JB herb.; **K** JB herb.; **B** JK 2001, 2012 herb.
Polytrichum formosum: **S4** JB, JK 2001; **K** JB herb.; **B** JK 2001
Polytrichum juniperinum: **S1** JB (cf.)
Polytrichum perigoniale: **S1** JB herb.; **K** JB herb.
Pseudocampylium radicale [LC-att]: **B** JK 2001 herb.
Pseudoscleropodium purum: **S1** JB; **S2** JB; **K** JB; **B** TS, JK 2001
Rhytidiadelphus squarrosus: **S3** JB
Sciuro-hypnum curtum: **S1** JB herb.; **S4** JB herb.; **K** JB herb.
Scorpidium cossonii [LR-nt]: **K** JB herb.; **B** TS 2004 herb., JK 2001 herb., 2012 herb.
Scorpidium scorpioides [EN]: **B** TS, JK 2001 herb., 2012 herb.
Sphagnum contortum [LR-nt]: **S1** JB herb.
Sphagnum fimbriatum: **S1** JB herb., JK 2001; **B** JK 2001

Sphagnum flexuosum: **K** JB herb.
Sphagnum palustre: **K** JB herb.
Sphagnum papillosum: **K** JB herb.
Sphagnum russowii: **K** JB herb.
Sphagnum subnitens [LC-att]: **S1** JB herb., JK 2001 herb.; **K** JB herb.; **B** TS, JK 2001 herb.
Sphagnum subsecundum: **K** JB herb.
Sphagnum teres: **K** JB herb.; **B** JK 2001
Straminergon stramineum: **K** JB herb.
Streblotrichum convolutum: **S3** JB herb.
Tetraphis pellucida: **S4** JK 2001; **B** JK 2001
Tomentypnum nitens [LR-nt]: **K** JB herb.
Trichodon cylindricus: **S3** JB herb.
Weissia sp.: **S3** JB

Details for the most important records

Campyliadelphus elodes – a re-discovered species in the Czech Republic (*DD-va → CR*)

Phytogeographic region 52 (Ralsko-bezdězská tabule), Staré Splavy: rich fen 'Pod Konvalinkovým vrchem' 2.5 km NW of Staré Splavy [N50°36'23" E014°37'02"], ca. 260 m a.s.l., in the ditch, 15.9.2013 coll J. Bradáčová 74, herb. CBFS

Campyliadelphus elodes was considered vanished from the Czech bryoflora in recent checklists of the Czech Republic (Kučera & Váňa 2003, Kučera et al. 2012), as the last reported occurrences in the country were reported from 1950s (Maixnerová 1990) but on the other hand, no targeted search for the species at potentially suitable localities was made since those last reports. *C. elodes* has always been a very rare species in the Czech Republic. Velenovský (1897) was the first author to mention it from our territory, having reported two localities in Central Bohemia – near Černošice and Ondřejov, with a note on the rarity of its occurrences. At about the same time, two dubious reports from Silesia were published by Hein (1874) and Svěrák (1905). Later, Podpěra (1906, 1912, 1913, 1923) reported the species from the saline marshes near Podivín in South Moravia and neighbouring localities in the vicinity of a nearby town of Hustopeče. No other records were published until Maixnerová (1990) compiled the distribution of species of the genus *Campylium* (in the broad sense as understood in 1990s) in her unpublished thesis, having accepted most of the above named occurrences and adding several other records based on the revision of available herbarium specimens. However, as some localities seemed improbable to us with respect to the generally known ecology (Hedenäs 2003), we decided to revise the available herbarium specimens from the herbaria which should have housed specimens of the named authors (BRNM, PR, PRC and OP; no Czech specimen was present in OP). In course of the revision, we realized that Podpěra's report of the South Moravian occurrence of the species included a description of a new variety, which to date has not been properly typified. Lectotypification of the taxon is provided here.

Chrysohypnum elodes *‚helodes'* **var. *salinum*** *‚salina'* **Podp.**, Zprávy Kommisse pro přírodovědecké prozkoumání Moravy 2: 76. 1906. Type: ‚Hustopeč: Na mokrých slaných místech ve společnosti *Triglochin maritimum, Scorzonera parviflora* a jiných halofytů u nádraží hojně.' [Hustopeče: frequently on wet, saline places in company of *Triglochin maritimum, Scorzonera parviflora* and other halophytes] – **lectotype** in **BRNM, No. 27466/37 selected here** [*Chrysohypnum helodes* Spruce f. *salina* Podp. 06, Hustopeč: saliny podle dráhy u nádraží s *Triglochin maritimum*, 250 m a.s.l., 1906.V., leg. J. Podpěra] ≡ *Campylium elodes* var. *salinum* (Podp.) Podp., Conspectus Muscorum Europaeorum 555. 1954. = *Campyliadelphus elodes* (Lindb.) Kanda var. *elodes*, J. Sci. Hiroshima Univ., Ser. B, Div. 2, Bot., 15: 273. 1975[1976].

Typification notes: Two specimens corresponding to the protologue were found in course of our revision – the above described specimen in Podpěra's herbarium in BRNM, and

another collection from the site, housed in the herbarium PR. The specimen from PR is also labelled by Podpěra with his handwriting, with a slightly different label (*Chrysohypnum helodes* f. *salina* Podp., v salinách u nádraží Hustopečského, 1906.V, leg. J. Podpěra), which would nevertheless also match the protologue. However, the specimen contains a mixture of *C. elodes* and *Conardia compacta* and more significantly, Podpěra's main part of the herbarium is located in BRNM and the label from BRNM contains a direct note on the publication from 1906, affirming that this part of the collection was used for the description. Nevertheless, we still consider the other specimen from PR to represent a syntype of *Chrysohypnum elodes* var. *salinum* Podp.

Taxonomic note: we were not able to observe any morphological characteristics of Podpěra's variety which would warrant its recognition as distinct from the type of *C. elodes*. He specifically mentioned flexuosely spreading, shorter and bluntly pointed leaves with sharply serrate margin, which were observed in other populations as well; moreover, short, less pointed leaves could refer to the admixture of *Conardia*, which was not noted by Podpěra (observed in the specimen from PR). For these reasons, we regard both taxa synonymous.

Revised distribution of *Campyliadelphus elodes* in the Czech Republic: recent, historical, unverified and erroneous localities are ordered according to the regional phytogeographic classification of the Czech Republic (Skalický 1988).

Historical localities supported by specimens:

11a. Všetatské Polabí – Hrabanov: Milovice, 10.4.1893, leg. J. Velenovský (PRC).
20b. Hustopečská pahorkatina – Hustopeč: saliny podle dráhy u nádraží s *Triglochin maritimum*, 250 m, 5.1906, leg. J. Podpěra (BRNM; lectotype) V salinách u nádraží Hustopečského (PR – Podpěra 1906, syntype; admixture of *Conardia compacta*)

Literature reports unsupported by specimens:

8. Český kras – Černošice, 1893, leg. J. Velenovský (Velenovský 1897).
83. Ostravská pánev – Auf einer Sumpfwiese an der Oderbrücke zu Schönbrunn, 18.6.1860, leg T. Hein (Hein 1874) Na mokré louce při mostu Odry ve Svinově (Svěrák 1905).

Erroneous records:

5a. Dolní Poohří – 7a. Libochovická tabule – Lom v Dusilově stráni u … (opuka), 19.4.1944, leg. V. Bartoš (PR) = *Campyliadelphus chrysophyllus*.
7c. Slánská tabule – Oužice: močály slané, 4.1895, leg. J. Velenovský (PRC) = *Campyliadelphus chrysophyllus*.
12. Dolní Pojizeří – Bažinná louka u Trenčína sev. od Mladé Boleslavi, 26.6.1896, leg. J. Podpěra (PR) = *Cratoneuron filicinum*.
18a. Dyjsko-svratecký úval – Slanná místa dle trati k Podivínu, 160 m, 10.1909, leg. J. Podpěra (BRNM, PR 2× – Podpěra 1912) = *Conardia compacta*, *Amblystegium serpens* Podivín – na slaných místech dle dráhy k Rakvicům (Podpěra 1913) – Podivín: tufové pramenisko na louce pod Hradišťkem k Bilovicím, 12.6.1921, leg. J. Podpěra (PR – Podpěra 1923) = *Conardia compacta* in prato turfoso pr. p. Bilovice 12.6.1921, leg. J. Podpěra (PR) = *Conardia compacta*.
31a. Plzeňská pahorkatina vlastní – Na mokrém lesním místě u Domažlic (na sever), 4.1897, leg. J. Velenovský (PRC) = *Campyliadelphus chrysophyllus.*
39. Třeboňská pánev – Tábor: apud opp. Tučapy, leg. Kostelecký (PRC) = *Aulacomnium palustre*, *Straminergon stramineum*, *Thuidium* sp. – Třeboň: Spolský mlýn, 10.5.1950, leg. Z. Pilous (PR) = *Amblystegium radicale.* – Třeboň: mezi ostřicí na břehu rybníka Káňova, 9.10.1953, leg. Ježek (BRNM) = *Hygroamblystegium humile, Drepanocladus aduncus.*
41. Střední Povltaví – U Senohrab, 5.1898, leg. J. Velenovský (PRC) = *Campyliadelphus chrysophyllus*.
64b. Jevanská plošina – Jevany: Ondřejov perm, 6.1895, leg. J. Velenovský (PRC – Velenovský 1897: 329) = *Hygroamblystegium varium.*
68. Moravské podhůří Vysočiny – Punkevní údolí u Blanska, 10.1955, leg. F. Grüll (BRNM) = *Sciuro-hypnum populeum*.
78. Bílé Karpaty lesní – Zlín: Luhačovice, porticus, in muro, 275 m a.s.l., 16.6.1994, leg. I. Novotný (BRNM) = *Campyliadelphus chrysophyllus*.

Other important records

Cephalozia pleniceps VU

Staré Splavy: former fishpond 'Baronský rybník' 2 km NW of Staré Splavy [N50°36'10" E014°37'17"], ca. 260 m a.s.l., in wet rich fen, 31.5.2001 coll. J. Kučera (7642), herb. CBFS

Fossombronia foveolata EN

Staré Splavy: rich fen 'Shnilé louky' next to the road between Jestřebí and Staré Splavy, S part [N50°35'56" E014°36'11"], ca. 260 m a.s.l., on a bare soil of the wet shaded path, 14.9.2013 coll. J. Bradáčová 35, herb. CBFS

Riccardia chamedryfolia VU

Staré Splavy: rich fen 'Shnilé louky' next to the road between Jestřebí and Staré Splavy, E edge [N50°36'02" E014°36'24"], ca. 260 m a.s.l., reed fen, submerged in a depression, 14.9.2013 coll. J. Bradáčová 27, herb. CBFS

Riccardia incurvata VU

Staré Splavy: rich fen 'Shnilé louky' next to the road between Jestřebí and Staré Splavy, SE edge along the forest fence [N50°35'57" E014°36'20"], 31.5.2001 coll. J. Kučera (7618) and S part [N50°35'56" E014°36'13"], ca. 260 m, on a bare damp soil between reed and sedges, 13.9.2013 coll. J. Bradáčová 7, herb. CBFS. It was found to be abundant in the south-eastern part of the locality with sparser reed cover (for example N50°35'55.62" E014°36'12.84"; N50°35'54" E014°36'15.06"; N50°35'54.6" E014°36'15.12")

Calliergon giganteum VU

Staré Splavy: former fishpond 'Baronský rybník' 2 km NW of St. Splavy [N50°36'10" E014°37'17"], ca. 260 m a.s.l., 31.5.2001 coll. J. Kučera (7643-4), herb. CBFS
Staré Splavy: rich fen 'Pod Konvalinkovým vrchem' 2.5 km NW of St. Splavy [N50°36'21" E014°37'02"], ca. 260 m a.s.l., in the ditch 15.9.2013 coll J. Bradáčová 67, herb. CBFS

Scorpidium scorpioides EN

Staré Splavy: former fishpond 'Baronský rybník' 2 km NW of St. Splavy [N50°36'10" E014°37'17-19"], 260 m a.s.l., wet rich fen, 30.5.2001 coll. J. Kučera (7586), 28.4.2012 coll. J. Kučera (15057)

Discussion

The Jestřebská kotlina basin around the town of Doksy is one of the regions of the Czech Republic with a commoner occurrence of peatlands. However, compared to other peatland-rich regions, such as the Třeboň region, the Czech-Moravian Highland (Českomoravská vrchovina), and the Šumava Mts., the peatlands of Jestřebská kotlina were often formed over calcium-rich sandstones and claystones and therefore support the presence of markedly basiphilous rich fen species. In other peatland regions of the country, calcium-rich substrates occur only very locally (Albrecht et al. 2003, Chytrý 2011, Štechová et al. 2014b). Basiphilous fen mosses, such as *Scorpidium scorpioides*, discussed in detail below, had earlier their distribution centre in the Labe basin, which geologically forms the continuation of the Czech Cretaceous basin. As the localities in the lowlands along the Labe River were mostly destroyed with the conversion of peatlands to agricultural land, the Jestřebská kotlina basin this remained their contemporary distribution centre.

Most important species of base-rich fens of the surveyed localities include the rare liverworts *Cephalozia pleniceps*, *Fossombronia foveolata*, *Riccardia chamedryfolia* and *R. incurvata* and the mosses *Campyliadelphus elodes* (discussed in detail above), *Calliergon giganteum* and *Scorpidium scorpioides*. *Cephalozia pleniceps* is found mostly in moderately rich and rich fens, where it is confined to small patches on wet soil. It is relatively broadly distributed but sparsely scattered throughout the territory of the country. It was recorded by V. Schiffner in a forest near Jestřebí (Schiffner & Schmidt 1886), identified however erroneously as *C. connivens* (Duda & Váňa 1986). *Fossombronia foveolata* grows rarely on peaty and sandy soil mostly along water-filled depressions. It was already found at the locality by Vondráková (2003). Prior to that discovery it was recorded only once in the region (undated collection of an unknown collector), other three reports (near Jestřebí as well) are

unsupported by herbarium specimens (Duda & Váňa 1976). *Riccardia chamedryfolia* is another hygrophilous liverwort, often growing submerged (Duda & Váňa 1981). Records of the species from the region include the Peklo gorge near Česká Lípa (Buryová 2003) and the reed fen at the Máchovo jezero pond near Doksy (Kučera et al. 2013). *R. incurvata* has similar ecology to the preceding species but is markedly more calciphilous (Duda & Váňa 1981). It was found at the locality by Vondráková, too (Vondráková 2003). Schiffner and Schmidt (1886) reported the species from the vicinity of Staré Splavy and K. Preis collected it near Jestřebí in 1934 (Duda & Váňa 1981). *Calliergon giganteum* prefers neutral to base-rich sites, growing partially or fully submerged in water. About 50 occurrences are known recently (Štechová et al. 2014a) with the centre of distribution in the Českomoravská vrchovina Highlands (Štechová et al. 2014b). Scattered occurrences elsewhere include South Bohemia (Třeboň region, Bohemian Forest, Blatná region), West Bohemia (Slavkovský les, Krušné hory Mts.), Central and North Bohemia (Labe basin, Doksy region), and northern Moravia (Nízký Jeseník Mts.). Additional occurrences in the Doksy region include the nature reserve Břehyně-Pecopala. *Scorpidium scorpioides* occurs rarely in water-filled depressions in rich fens and rarer still also along margins of water bodies at suitable secondary localities. Štechová et al. (2010) summarized the current distribution of the species, which is known to persist at seven sites, four of which (and the largest ones) occur in the Doksy region. The population at 'Baronský rybník' has been estimated to have covered over 10 square metres. Lush populations of the species are probably supported by the extremely base-rich chemical conditions compared to other Czech localities of the species except for Polabská černava (conductivity > ca. 500 $\mu S \cdot cm^{-1}$; Štechová et al. 2010, Štechová unpubl.), although even in the Jestřebská kotlina less basic sites occur, such as the locality Břehyně-Pecopala, with the chemism comparable to the sites of the Bohemian-Moravian Highlands. Another commonly encountered species at the fens of the Doksy region with otherwise rare occurrence in the Czech Republic is the peat-moss *Sphagnum subnitens*. Other peatland regions of the Czech Republic such as the Třeboňská pánev basin or the Bohemian-Moravian Highland (Štechová et al. 2013, Štechová et al. 2014b) support only weak populations of the species. Nevertheless, *S. subnitens* is relatively common in the subalpine bogs and wet sites of the glacier cirques in the Krkonoše Mts. (Kučera et al. 2004).

The comparison with the historical situation is quite limited. The aforementioned work by V. Schiffner and A. Schmidt (1886) does not cite the localities of the present survey directly. Nevertheless, rare and threatened mosses *Helodium blandowii* and *Paludella squarrosa* were cited from a 'fen to the left of the road from Jestřebí to Doksy', which likely might be identical to the locality 'Shnilé louky'. At the time of Schiffner and Schmidt's survey, the peatland was still not extracted, so that it is not surprising that these mosses have not been found since that time following the shift of the peatland character. The recent survey of the locality by Vondráková M. (2013) reported the following bryophytes on the locality 'Shnilé louky', not documented by us: the liverworts *Calypogeia muelleriana*, *Cephaloziella rubella* and *Nardia geoscyphus*, the hornwort *Phaeoceros carolinianus* and the mosses *Barbula unguiculata*, *Brachythecium rivulare*, *B. rutabulum*, *Bryum moravicum*, *Dicranella schreberiana*, *Dicranum montanum*, *D. polysetum*, *D. scoparium*, *Drepanocladus aduncus*, *Leptobryum pyriforme*, *Physcomitrium pyriforme*, *Sphagnum capillifolium*, *S. girgensohnii*, *S. squarrosum* and *Tomentypnum nitens*. These bryophytes could have been overlooked especially if they occur in small populations at the locality. On the other hand, some species including *Riccardia multifida*, *Calliergonella lindbergii*, which were found to be relatively common, were not reported earlier. The occurrence of *Leptobryum pyriforme* or *Phaeoceros carolinianus* could have been season-bound and therefore not discovered in course of our limited survey.

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References

Albrecht J. (ed.) (2003): CHKO Třeboňsko. In: Mackovčin P. & Sedlářek M. (eds): Chráněná území ČR, svazek VIII, pp. 510–576, AOPK ČR a EkoCentrum Brno, Praha.

Anonymus (1994): Zajímavé nálezy. – Bryonora 14: 20-21.

AOPK ČR (2006): Jestřebsko - Dokesko. In: Evropsky významné lokality v České republice. – http://www.nature.cz/natura2000-design3/web_lokality.php?cast=1805&akce=karta&id=1000102130 [visited 2.6.2015].

Buryová B. (2003): *Riccardia chamaedryfolia*. In: Kučera J. (ed.): Zajímavé bryofloristické nálezy I., Bryonora 31: 28.

Chytrý M. (ed.) (2011): Vegetace České republiky 3. Vodní a mokřadní vegetace, 828 pp., Academia, Praha.

Danihelka J., Chrtek J. J. & Kaplan Z. (2012): Checklist of vascular plants of the Czech Republic. – Preslia 84: 647-811.

Duda J. & Váňa J. (1976): Die Verbreitung der Lebermoose in der Tschechoslowakei – XX. – Časopis Slezského muzea Opava (A) 25: 97-117.

– (1981): Rozšíření játrovek v Československu – XXXII. – Časopis Slezského muzea Opava (A) 30: 193-209.

– (1986): Rozšíření játrovek v Československu – XLV. – Časopis Slezského muzea Opava (A) 35: 21-30.

Hedenäs L. (2003): The European species of the *Calliergon-Scorpidium-Drepanocladus* complex, including some related or similar species. – Meylania 28: 1-116.

Hein T. (1874): Beiträge zur Laubmoosflora des Troppauer Kreises. – Jahresbericht über die Staatsoberrealschule in Troppau für das Schuljahr 1873–74, Troppau.

Kučera J. & Váňa J. (2003): Check- and Red List of the bryophytes of the Czech Republic (2003). – Preslia 75: 193-222.

Kučera J., Bradáčová J., Holá E., Kubešová S., Manukjanová A., Mikulášková E., Štechová T., Tkáčiková J. & Vicherová E. (2013): Results of the bryofloristic courses of the Department of Botany, University of South Bohemia, in 2012 and 2013. – Časopis Slezského zemského muzea, série A, 62: 173-184.

Kučera J., Váňa J. & Hradílek Z. (2012): Bryophyte flora of the Czech Republic: updated checklist and Red List and a brief analysis. – Preslia 84: 813-850.

Kučera J., Zmrhalová M., Buryová B., Plášek V. & Váňa J. (2004): Bryoflora of the Úpská jáma cirque and adjacent localities of the Eastern Krkonoše Mts. – Časopis Slezského zemského muzea, série A, 53: 143-173.

Mackovčin P., Sedlářek M. & Kuncová J. (eds) (2002): Okres Česká Lípa. In: Mackovčin P., Sedlářek M. & Kuncová J. (eds): Liberecko, Chráněná území ČR, svazek III, pp. 67-109, AOPK ČR a EkoCentrum Brno, Praha.

Maixnerová M. (in litt.): Rozšíření druhů rodu *Campylium* Mitt. v Československu. (Diplomová práce). Univerzita Karlova, 1990, Praha.

Podpěra J. (1906): Výsledky bryologického výzkumu Moravy za rok 1905–1906. – Zprávy Komisse pro přírodovědecké prozkoumání Moravy, oddělení botanické 2: 1-82.

– (1912): Nové mechy květeny moravské. – Živa 22: 238-239.

– (1913): Výsledky bryologického výzkumu Moravy za rok 1909–1912. – Časopis Moravského musea zemského 13: 233-257.

– (1923): Výsledky bryologického výzkumu Moravy za léta 1913–1922. – Sborník Klubu přírodověd. v Brně za rok 1922 5: 1-29.

Quitt E. (1971): Klimatické oblasti ČR 1 : 500 000, Studia geographica 16, 74 pp., Geografický ústav ČSAV, Brno.

Schiffner V. & Schmidt A. (1886): Moosflora des nördlichen Böhmen. – Lotos 34: 3-74.

Svěrák T. (1905): Mechy listnaté na Opavsku. – Věstník Matice opavské 13: 49-60.

Štechová T. (in litt.): Inventarizační průzkum NPP Swamp z oboru bryologie (mechorosty). (Ms.) AOPK ČR, 2013, 15 pp., Praha.

Štechová T., Holá E., Ekrtová E., Manukjanová A. & Kučera J. (2014a): Monitoring ohrožených rašeliništních mechorostů a péče o jejich lokality, 64 pp., Agentura ochrany přírody a krajiny České republiky, Praha.

Štechová T., Manukjanová A., Holá E., Kubešová S., Novotný I. & Zmrhalová M. (2010): Současný stav populací druhů *Helodium blandowii* (Thuidiaceae) a *Scorpidium scorpioides* (Calliergonaceae) v České republice. – Bryonora 46: 24-33.

Štechová T., Manukjanová A., Vicherová E. & Kučera J. (2013): Výskyt vzácných a ohrožených druhů rašeliníků na Třeboňsku. – Sborník Jihočeského muzea v Českých Budějovicích, Přírodní vědy, 53: 120-127.
Štechová T., Peterka T., Lysák F., Bradáčová J., Holá E., Hradílek Z., Kubešová S., Novotný I., Bartošová V., Velehradská T. & Kučera J. (2014b): Významné mechorosty rašelinišť na Českomoravské vrchovině na prahu 21. století. – Acta rerum naturalium 17: 7-32.
Štechová T., Štech M. & Kučera J. (2012): The distribution of *Hamatocaulis vernicosus* (Mitt.) Hedenäs (Calliergonaceae) in the Czech Republic. – Bryonora 49: 5-16.
Váňa J. & Kučera J. (2002): *Cephalozia macrostachya* confirmed in the Czech Republic. – Preslia 74: 197-200.
Velenovský J. (1897): Mechy české – Rozpravy česká akademie císaře Františka Josefa pro vědy, slovesnost a umění, třída II., VI/6: 1-352.
Vondráková M. (in litt.): Mechorosty lokality Shnilé louky u Jestřebí (okr. Česká Lípa). (Bakalářská práce). Univerzita Jana Evangelisty Purkyně, 2013, 58 pp., Ústí nad Labem.
Watzel C. (1874): Die im Horizonte vom Böhm.- Leipa vorkommenden Moose und Gefäss-Cryptogamen. – Elfter Jahresbericht der Communal-Oberrealschule in Böhm. Leipa für das Schuljahr 1873–74: 1-28.

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