

DIGITALI PURPUREAE-EPILOBIETUM IN THE CZECH REPUBLIC

ZDENKA NEUHÄUSLOVÁ & HANDRIJ HÄRTEL

Abstract: The natural occurrence of the (Sub)Atlantic species *Digitalis purpurea* in the Czech Republic was analyzed and the results of studies of the association *Digitali purpureae-Epilobietum* summarized. *Digitalis purpurea* is an alien species of Czech flora, invading mainly in western and northern Bohemia, more or less influenced by Sub-Atlantic climate. Although *Digitali purpureae-Epilobietum* is a typical vegetation unit of the (Atlantic-)Sub-Atlantic area of Europe, the stands analyzed in the Czech Republic can be included in this unit in terms of their floristic composition. In this association, two subassociations have been distinguished and characterized in the Czech Republic: *Digitali-Epilobietum juncetosum* Oberdorfer 1978 with the differential species *Juncus effusus*, *Agrostis stolonifera*, *Carex brizoides*, *C. canescens*, *C. remota*, *Cirsium palustre*, *Deschampsia cespitosa*, *Equisetum sylvaticum*; and *D.-E. typicum* Oberdorfer 1978. They are characterized by their structure and floristic composition, ecology and distribution.

Key words: *Digitali purpureae-Epilobietum*, phytocenology, ecology, variability, Czech Republic

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INTRODUCTION

Studies of clearing vegetation became a part of the grant projects of the Grant Agency of the Czech Republic (GA ČR) during 1993–1995 and 1996–1998 included in a Pan-European project called ‘Vegetation Research of Europe’ as the 1st and 2nd stages of a Czech Republic subproject. At that time, the first overviews of the clearing vegetation of the Czech Republic were published, completed on the basis of syntheses of literature data and the relevés of the first author of this contribution (Neuhäuslová 1997a, b).

Special attention was paid to clearing communities dominated by the Western European (Sub-)Atlantic species *Digitalis purpurea* L. which forms significant communities in some parts of the country. Priority in the description of association *Digitali purpureae-Epilobietum* is often assigned to Schwickerath (1933), but that author stated only the name ‘Ass. *Digitalis purpurea*’ with the characteristic species *Digitalis purpurea*, *Epilobium angustifolium* L. and *Rubus idaeus* L., without providing any relevés. Oberdorfer (1938) included in association *Epilobium angustifolium-Senecio sylvaticus* of the alliance *Atropion* two relevés from altitudes 500 m and

800 m with dominant *Digitalis purpurea* corresponding to the *Digitali purpureae-Epilobietum*. He evaluated them only as facies of *Epilobio-Senecionetum sylvatici* and stressed their relation as substitute communities to *Quercu-Betuletum typicum* and *Fago-Abietetum luzuletosum albidae*. Bartsch and Bartsch (1940) evaluated this unit similarly, that is, as facies of association *Epilobium angustifolium-Senecio sylvaticus* Tx. 1937.

Schwickerath (1944) reported association *Digitalis purpurea-Epilobium angustifolium* from the Hohe Venn Mts (altitudes 230–600 m). However, his Table 35 represents a rather heterogeneous unit including both *Digitali-Epilobietum* and stands where *Digitalis purpurea* or *Epilobium angustifolium* are rare or missing and dominance is taken over by *Rubus idaeus* or *Senecio fuchsii* C. C. Gmel. together with *Avenella flexuosa* (L.) Drey. Relevé 1 of the Schwickerath’s table can be considered a type of the association; rel. 5 represents ‘*Rubetum idaei*’ auct.

Tüxen (1937) did not mention the *Digitali-Epilobietum* yet; later on (Tüxen 1950) he emended Schwickerath’s association *Digitalis purpurea-Epilobium angustifolium*.

Oberdorfer (1957) introduced the association *Digitali-Epilobietum* in the form of a synthetic table in which a set of indicators of waterlogging can be observed. However, he did not mention any subassociations. Later on, Oberdorfer (1978) described this unit (sub nom. invers. *Epilobio-Digitalietum*) as a 'Sub-Atlantic community whose continuous eastern border goes as far as the line Taunus – Schwarzwald.' Its distribution center is, according to this author, 'in sommerhumidem Bereich des *Luzulo-Fagetum* und *Abieti-Fagetum*,' which provides its altitudinal span. Oberdorfer (1978) distinguished so-called 'reine Ausbildung' (a typical subassociation) and subassociation *E.-D. juncetosum effusi*. This division can also be applied to the stands of the Czech Republic, beyond the border of the natural distribution of this association.

MATERIAL AND METHODS

The vegetation relevés were recorded and synthesized according to the principles of the Braun-Blanquet (1964) approach. In Table 1, species occurring in 1 or 2 relevés only are recorded at the end of the table, with the exception of diagnostic (incl. diff. subass.) species. The nomenclature of the plants follows the handbooks used for Pan-European syntheses: for vascular plants Ehren-dorfer (1973), and for bryophytes Frahm and Frey (1992).

NOTES TO THE OCCURRENCE OF *DIGITALIS PURPUREA* IN THE CZECH REPUBLIC

Since the end of the 18th century, the natural occurrence of *Digitalis purpurea* has been at the center of many discussions. Competent botanists have disputed whether its occurrence is natural in at least some parts of the country, mainly in the border areas of western Bohemia and the Elbe Sandstones (Bohemian-Saxonian Switzerland) influenced by Sub-Atlantic climate. Most florists assumed that this species is natural in the western part of the Czech Republic, where it reaches its eastern distribution limit. Domin (1937) believed

its occurrence was natural in the Slavkovský Les Mts (western Bohemia) and Elbe Sandstones (northern Bohemia); later on (1948) he added some other localities of 'natural occurrence,' mainly Děčínský Sněžník and Lužické Hory Mts. Dostál (1948–1950) had a similar opinion at the beginning, and later on (1989) he considered its origin in the country to be secondary. According to Dittrich (see Klement 1941: 84), for its distribution at the higher levels 'nur die Forstkultur verantwortlich gemacht werden kann.' Systematic sowing of the species is dated since King Friedrich August II, who recommended it 'überall in den sächsischen Staatsforsten zur Hebung des Landschaftsbildes anzupflanzen.'

A study by Mackeová (1999) is a valuable contribution to resolving the question in the Czech Republic. This author considers the secondary origin of this species based on its increasing occurrence in three periods of time since the 1780s, when its first findings were reported.

In the Czech Republic and other Central European countries, *Digitalis purpurea* has its center of distribution mainly in newly created clearing communities of the class *Epilobietea angustifolii* Tüxen & Preising in Tüxen 1950. Thanks to its high number of small seeds spread by wind, it quickly reaches suitable sites.

CHARACTERISTICS OF THE ASSOCIATION

Digitali purpureae-Epilobietum angustifolii Schwickerath 1944 (Table 1)

ORIGINAL DIAGNOSIS: Schwickerath (1944): 146, Tab. 35 sub *Digitalis purpurea-Epilobium angustifolium*-Ass.

TYPE OF THE ASSOCIATION NAME: Schwickerath (1944): 146, Tab. 35, rel. 1 – lectotypus hoc loco.

SYNONYMS: Tüxen (1950, 1971)

DIAGNOSTIC SPECIES COMBINATION: *Agrostis capillaris*, *Avenella flexuosa*, *Digitalis purpurea*, *Epilobium angustifolium*, *Rubus idaeus*.

STRUCTURE AND SPECIES COMPOSITION. One- or two-layered, mostly open initial clearing stands dominated by *Digitalis purpurea* and developing

Table 1. *Digitali purpureae-Epilobietum angustifolii*.

Subassociation	<i>juncetosum effusi</i>									typicum									%
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Relevé no.	1995 08 04	1995 08 13	1995 08 20	1995 08 25	1995 08 30	1995 08 30	1995 08 30	1995 08 30	1995 08 30	1997 09 07	1997 09 07	2000 07 08	1995 08 08	1995 08 08	1995 08 08	1995 08 08	1995 08 07	1997 09 07	
Year	08	13	20	25	30	30	30	30	30	09	09	22	08	08	08	08	08	09	
Month	04	13	20	25	30	30	30	30	30	09	09	22	08	08	08	08	08	09	
Day	04	13	20	25	30	30	30	30	30	09	09	22	08	08	08	08	08	09	
Relevé area (m ²)	450	695	540	580	400	400	450	320	250	655	660	590	260	550	500	745	650	600	
Altitude (m)	270	180	360	90	270	180	270	270	247	-	270	180	45	225	135	180	-	180	
Aspect (degrees)	10	2	2	3	5	3	10	25	5	0	20	10	10	3	25	35	0	10	
Slope (degrees)	0	3	1	0	0	0	0	5	0	5	0	0	0	1	0	1	0	0	
Cover shrub layer (%)	85	65	45	90	65	40	60	50	50	40	30	40	70	45	70	50	60	40	
Cover field layer (%)	0	1	5	0	0	1	1	0	20	5	3	3	0	5	1	1	0	0	
Cover ground layer (%)	16	27	23	12	18	21	16	22	19	29	25	21	17	17	15	14	11	5	
Number of species																			
Shrub layer																			
<i>Picea abies</i>	.	1	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	17
<i>Sorbus aucuparia</i>	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	r	.	17
Field layer																			
Diagnostic species (<i>Digitali-Epilobietum</i> , <i>Carici piluliferae-Epilobion</i> , <i>Atropetalia</i> , <i>Epilobietea angustifolii</i>)																			
<i>Digitalis purpurea</i>	3	2	3	3	4	3	3	3	3	2	2	3	3	3	2	3	3	100	
<i>Epilobium angustifolium</i>	.	1	+	+	.	1	r	1	+	+	+	+	+	+	1	1	+	83	
<i>Rubus idaeus</i>	.	2	+	+	.	+	.	.	.	2	1	1	r	+	+	1	2	72	
<i>Calamagrostis epigejos</i>	1	2	1	.	.	1	+	.	+	.	.	+	+	1	.	.	.	50	
<i>Rumex acetosa</i> subsp. <i>acetosa</i>	.	+	+	1	.	+	.	.	2	2	.	+	2	.	.	.	.	44
<i>Rubus fruticosus</i> agg.	.	.	+	.	1	+	+	.	.	+	r	+	.	.	+	.	.	44	
<i>Carex pilulifera</i>	r	.	.	.	.	.	r	1	1	2	+	.	.	.	+	.	.	39
<i>Senecio sylvaticus</i>	.	+	r	.	.	+	.	r	.	+	.	.	.	.	.	.	.	28
<i>Senecio nemorensis</i> agg.	.	+	.	2	.	+	.	.	.	r	.	.	.	.	.	.	.	22
<i>Calamagrostis villosa</i>	.	.	.	3	.	.	.	2	+	.	.	.	.	.	.	.	.	17
<i>Hypericum perforatum</i>	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	11
<i>Peridium aquilinum</i>	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	+	.	11
<i>Rubus plicatus</i>	.	.	.	.	.	.	.	2	.	.	.	r	.	.	.	.	.	11

(cont.)

Table 1. Continued.

Relevé no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	%
<i>Sambucus nigra</i>	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	11
<i>Salix caprea</i>	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	11
Diff. subass.																			
<i>Juncus effusus</i>	3	+	r	2	1	+	+	+	+	.	.	.	.	.	.	.	.	.	50
<i>Carex brizoides</i>	1	.	.	.	1	.	.	1	.	.	.	.	.	.	.	.	.	.	17
<i>Equisetum sylvaticum</i>	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	11
<i>Cirsium palustre</i>		2	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	11
<i>Agrostis stolonifera</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
<i>Carex remota</i>	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
<i>Deschampsia cespitosa</i>	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
<i>Carex canescens</i>	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	6
Accompanying species																			
Acidophilous species of a large phytocenological and ecological amplitude																			
<i>Avenella flexuosa</i>	.	+	1	+	1	+	2	1	2	.	.	1	2	1	3	2	1	.	78
<i>Picea abies</i>	.	.	r	.	.	.	r	r	2	.	+	r	1	.	r	r	.	.	50
<i>Vaccinium myrtillus</i>	.	.	.	.	1	.	.	1	+	1	.	+	+	.	1	2	.	.	50
<i>Betula pendula</i>	.	+	.	.	.	r	.	.	+	+	1	r	.	r	+	.	.	.	44
<i>Dryopteris dilatata</i>	+	.	.	.	.	.	.	.	.	+	1	.	+	.	r	+	+	.	39
<i>Sorbus aucuparia</i>	.	.	+	.	1	.	.	.	.	+	.	r	.	.	.	r	.	.	33
<i>Galium saxatile</i>	.	.	.	.	1	.	.	.	1	.	.	.	+	.	1	+	1	.	33
<i>Pinus sylvestris</i>	.	.	.	.	.	+	.	r	+	+	.	+	.	.	r	.	.	.	33
<i>Oxalis acetosella</i>	+	.	.	.	.	.	.	.	.	+	1	+	2	.	.	.	.	.	28
<i>Calluna vulgaris</i>	.	.	.	.	.	.	.	+	.	+	.	r	.	+	+	.	.	.	28
<i>Luzula luzuloides</i>	.	.	.	.	.	.	+	+	.	.	1	r	.	.	.	.	.	.	22
Diagnostic species of the order <i>Fagetalia</i> and class <i>Quercio-Fagetea</i>																			
<i>Acer pseudoplatanus</i>	.	.	.	.	.	.	.	.	.	r	r	+	.	.	.	.	.	+	22
<i>Gymnocarpium dryopteris</i>	+	.	.	.	.	.	.	.	.	.	+	.	1	.	.	.	.	.	17
Species of meadows, pastures and peatbogs																			
<i>Agrostis capillaris</i>	+	2	+	2	1	2	1	2	.	1	.	.	2	1	.	1	1	.	72
<i>Holcus mollis</i>	.	1	+	+	1	.	2	+	.	1	.	.	.	.	.	.	+	.	44
<i>Carex leporina</i>	.	.	+	+	+	+	+	.	.	.	.	.	+	.	.	.	+	.	39

<i>Lucula multiflora</i> s.l.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ruderal species							r	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Galeopsis bifida</i>	+	+	r	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Taraxacum</i> sect. <i>Ruderalia</i>	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Urtica dioica</i>	.	.	.	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	.	.
Ground layer																				
<i>Polytrichum formosum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Ceratodon purpureus</i>	.	r	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Dicranum scoparium</i>	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.

Species in 1–2 relevés only:

Shrub layer: *Betula pendula* (rel. 8: ++, 14: +), *Larix decidua* (7: 1).

Field layer: *Acer platanoides* (14: r), *Alnus glutinosa* (1: r), *Athyrium filix-femina* (11: 1, 14: r), *Calamagrostis arundinacea* (16: 2, 18: +), *Carex* sp. (11: +), *Cirsium arvense* (2: +), *Cytisus scoparius* (10: +), *Dryopteris filix-mas* (13: r), *Epilobium ciliatum* (2: +), *Galeopsis tetrahit* (4: +), *Galium sylvaticum* (2: +), *Hieracium laevigatum* (14: r), *Holcus lanatus* (2: +), *Linaria vulgaris* (6: r), *Maianthemum bifolium* (13: +, 15: +), *Molinia arundinacea* (5: 1, 9: +), *Moehringia trinervia* (13: 1), *Phegopteris connectilis* (9: +), *Poa nemoralis* (18: 1), *Poa trivialis* (8: +), *Populus tremula* (12: +), *Potentilla erecta* (2: +), *Prenanthes purpurea* (1: +), *Ranunculus repens* (2: +, 6: +), *Sambucus racemosa* (13: +), *Scrophularia nodosa* (1: +, 11: 1), *Stellaria graminea* (2: +), *Veronica officinalis* (8: +, 11: +), *Victoria cracca* (2: +).

Ground layer: *Barbula unguiculata* (5: 1), *Brachythecium rutabulum* (13: 1), *Brachythecium albicans* (2: +), *Bryum argenteum* (5: +), *Dicranella heteromalla* (9: +, 14: +), *Hylocomium splendens* (3: r), *Hypnum cupressiforme* (3: +, 10: 1), *Pogonatum urnigerum* (12: +), *Pohlia nutans* (3: +), *Polytrichum* spec. (8: 1), *Sphagnum girgensohnii* (7: 1).

Localities:

1. Labské pískovce (Elbe Sandstones), near Rudolfův kámen rock (Neuhäuslová, Härtel)
2. Slavkovský les Mts, Teplá, forest district near the Přírko pond (Nevečeřal)
3. Podbrdsko (Brdy Foodhill), ca 1 km E from Bytíz settlement near Příbram (Neuhäuslová)
4. Lužické hory Mts, S from Nová Huť gamekeepers house (Neuhäuslová, Härtel)
5. Labské pískovce (Elbe Sandstones), near Tokaň settlement (Härtel)
6. Plzeňská pahorkatina hilly land, ca 1 km ENE from Sv. Hubert location (Neuhäuslová)
7. Labské pískovce (Elbe Sandstones), near Rudolfův kámen rock (Neuhäuslová, Härtel)
8. Labské pískovce (Elbe Sandstones), Hřebcový důl valley, 2.5 km WSW from Kyjov village near Krásná Lípa (Neuhäuslová, Härtel)
9. Labské pískovce (Elbe Sandstones), Hlouboký důl valley, 4 km N from Vysoká Lípa village (Neuhäuslová, Härtel)
10. Českomoravská vrchovina Highland, S from Nový Svět village near Kunžák (Neuhäuslová, Vaněčková)
11. Krkonoše Mts, Dlouhý hřeben ridge, slope above the valley of Úpice river (Neuhäuslová)
12. Podbrdsko (Brdy Foodhill), Březina, castle-park (Neuhäuslová, Sofron)
13. Labské pískovce (Elbe Sandstones), Česká silnice road, 1.5 km SE from the former village Zadrní Jetřichovice (Neuhäuslová, Härtel)
14. Plzeňská pahorkatina hilly land, ca 2 km SE from Sv. Hubert location (Neuhäuslová)
15. Labské pískovce (Elbe Sandstones), near Tokaň settlement (Neuhäuslová, Härtel)
16. Lužické hory Mts, Jedlová Mt. (Neuhäuslová, Härtel)
17. Lužické hory Mts, ca 0.5 km W from Placínek hill (Neuhäuslová, Härtel)
18. Labské pískovce (Elbe Sandstones), Růžák Mt. (Härtel)

soon after logging at places with species-poor or missing vegetation. Sometimes *Avenella flexuosa* or *Calamagrostis villosa* occur as subdominants in stands of this association; they are indicators of a continuing succession to *Junco effusi-Calamagrostietum villosae* Sýkora 1983 or *Myrtillo-Avenelletum flexuosae* (Schlüter 1966) Passarge 1984. Species of clearing communities and elements of acidophilous forest and non-forest vegetation prevail in the species composition. Of the grassland species, *Agrostis capillaris* is the most frequent; of the woody species, *Picea abies* occurs frequently. In the ground layer, *Dicranum scoparium* and *Polytrichum formosum* are the typical species.

DISTRIBUTION. *Digitali-Epilobietum* occurs mostly in the mountains bordering the Czech Republic. The most typical stands have been recorded in the Elbe Sandstones Area; individual relevés were made in some other northern Bohemian (Lužické Hory and Krkonoše Mts) and western Bohemian phytogeographical districts (Slavkovský Les Mts, Plzeňská Vrchovina upland, Brdy foothills). Petřík (2000 in litt.) recorded some stands on Ještědský Hřbet Ridge (northern Bohemia).

In central Bohemia, some isolated stands have been recorded in the surroundings of the city of Příbram (Brdy foothills). In the Křivoklátsko biosphere reserve, *Digitalis purpurea* occurs frequently in clearing communities; however, these stands correspond at present to more closed and more developed *Calamagrostis arundinacea* or *Rubus idaeus* stands.

In the Orlické Hory Mts, stands dominated by *Digitalis purpurea* were observed near Vrchmezi Mt. ridge on the Polish border. These stands formed a 3-meter-wide border along the road only, on stony substrate, but with a species composition more or less similar to typical clearing communities.

Digitali-Epilobietum occurs frequently in many countries of Western Europe – Ireland, France, and probably also Great Britain (cf. White & Doyle 1982; Rodwell 2000; Lapraz 1967 in Tüxen 1971); it is also frequent in the western part of Central Europe – Benelux and former West

Germany (Schwickerath 1944; Westhoff *et al.* 1969; Tüxen 1950; Vanden Berghen 1953; Oberdorfer 1978; Pott 1995). Less frequently it occurs in eastern Germany, Poland and Austria (Hilbig & Wagner 1990; Moravec *et al.* 1995; Matuszkiewicz 1984; Mucina *et al.* 1993 etc.).

ECOLOGY. In the Czech Republic, *Digitali purpureae-Epilobietum* is linked with acidophilous (fir-) beech forests (association *Calamagrostio villosae-Fagetum* Mikyška 1972, *Luzulo-Fagetum* Meusel 1937) at altitudes of (450) 500–800 m. In the Elbe Sandstones this community descends, in climatic inversion areas of cold valleys, to even 250 m. In the Krkonoše and Lužické Hory Mts and Ještědský Hřbet Mt. ridge its occurrence was reported from ca 660–750 m, although *Digitalis purpurea* itself ascends in the Krkonoše Mts up to 1300–1400 m. However, it has never been dominant in mountain areas [also, the lower distribution limit of this species in the Czech Republic (100–200 m) is significantly lower than the altitude limit of the *Digitali purpureae-Epilobietum*].

The occurrence of this community is conditioned by soil moisture and light. *Digitali-Epilobietum* covers various kinds of relief – at lower levels on some steeper slopes of river valleys, at higher altitudes on more or less level or slightly undulated areas, and at the highest altitudes on sunny slopes. All the sites were found at places suffering from significant damage caused by human activity – in freshly deforested areas of small or large clearings, roadsides, locations of collected or burned slash, etc. The sites of this community are in moderately warm and/or cold climatic areas (see Quitt 1971).

The soil substrates are mostly mineral-poor rocks of crystalline complex (granite, gneiss, phyllite), mica slates, Proterozoic and Paleozoic slates, silicites, conglomerates, and also palaeohyolites and poor sediments of the Mesozoic (mainly sandstones). Moist, rarely fresh soils of oligotrophic cambisol type, at higher altitudes of semipodsol type, are very strongly acidic, loamy or moderately sandy. At some places this community colonizes gravel soils (along roads). In

Table 2. Example of soil analyses of *Digitali-Epilobietum* in the Elbe Sandstones area.

Depth cm	Horizon	pH		Exchangeable ions meq./100g dry substance				Base Saturation %	CaCO ₃ %	N %	C %	C:N
		H ₂ O	KCl	Ca ²⁺	Mg ²⁺	Al ³⁺	H ⁺					
7–12	A ₁	3.9	3.0	5.483	0.182	2.830	4.130	44.87	0	0.687	18.909	27.52
40–45	A ₂	4.3	3.8	0.126	0.015	0.060	0.086	49.13	0	0.026	0.435	16.73
80–90	G	4.3	3.8	0.155	0.031	3.585	0.092	4.81	0	0.038	0.432	11.37

humid climate inversion areas, podsol soils prevail, sometimes pseudogleyed, with low or very low base saturation, low or very low Ca²⁺ content, low to moderately high humus content and a high or very high C/N ratio (Table 2). This community also develops on layers of raw humus. Its occurrence on basalt scree of Růžák hill in the Elbe Sandstones (Table 1, rel. 18) is quite exceptional. The above-mentioned relevé was recorded at the exposed heights, where contact herb-rich beech forests are replaced by acidophilous beech forests of the association *Calamagrostio arundinaceae-Fagetum*.

VARIABILITY. In the Czech Republic, two sub-associations of the *Digitali-Epilobietum* can be distinguished: *Digitali-Epilobietum juncetosum effusi* (rel. 1–9 in Table 1) and the typical subassociation (rel. 10–18).

1. *Digitali-Epilobietum juncetosum effusi* Oberdorfer 1978

ORIGINAL DIAGNOSIS: Oberdorfer (1978): 304–306, Tab. 131/1b sub *Epilobio-Digitalietum purpureae juncetosum effusi*.

TYPE OF THE SUBASSOCIATION NAME: Neuhäuslová & Härtel hoc loco, Tab. 1, rel. 1 (neotypus).

DIFFERENTIAL SPECIES: *Juncus effusus*, *Agrostis stolonifera*, *Carex brizoides*, *C. canescens*, *C. remota*, *Cirsium palustre*, *Deschamsia caespitosa*, *Equisetum sylvaticum*.

BRIEF CHARACTERISTICS. Stands of compacted and surface-waterlogged soils, differentiated by the above-mentioned species.

DISTRIBUTION. Slavkovský Les Mts, Plzeňská

Vrchovina upland, Brdy foothills, Elbe Sandstones and Lužické Hory Mts.

2. *Digitali-Epilobietum typicum* Oberdorfer 1978

ORIGINAL DIAGNOSIS. Oberdorfer (1978): 304–306, Tab. 131/1a sub *Epilobio-Digitalietum purpureae*, reine Ausbildung.

TYPE OF THE SUBASSOCIATION NAME. Schwickerath (1944): 146, Tab. 35, rel. 1 (holotypus).

DIFFERENTIAL SPECIES. Missing.

Characteristics of the typical subassociation correspond to those of the association.

DISTRIBUTION. Elbe Sandstones, Krkonoše and Lužické Hory Mts, Brdy foothills, Plzeňská and Českomoravská Vrchovina uplands.

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