

Fungi on *Juncus trifidus* in the Czech Republic (II) with taxonomical notes to some species

MARKÉTA SUKOVÁ¹ and ANDRZEJ CHLEBICKI²

¹National Museum, Mycological Department,
Václavské nám. 68, CZ-115 79 Praha 1, Czech Republic,
marketa.sukova@nm.cz

²Polish Academy of Sciences, W. Szafer Institute of Botany,
Lubicz 46, PL-31 512 Kraków, Poland,
chlebick@ib-pan.krakow.pl

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In this second contribution, other eight species of ascomycetes and anamorphic fungi on *Juncus trifidus* collected in the Czech Republic are described (*Ascochyta junci*, *Lachnum diminutum*, *Phaeosphaeria vagans*, *Phialocephala* sp., *Pseudoseptoria* sp., *Pycnothyrium junci*, *Stagonospora junciseda*, *Unguicularia* sp.). Additional localities of *Arthrimum cuspidatum* and *Niptera eriophori* described in the first contribution are given. A fungus previously published as *Septoria* sp. was identified as *Septoria chanousiana*. Additional material of some fungi (*Ascochyta junci*, *Septoria chanousiana*, *S. minuta*, *Unguicularia millepunctata*) from other substrata and countries was studied with the aim to compare it with material from *Juncus trifidus* from the Czech Republic. Numbers of fungi on *Juncus trifidus* at studied localities are discussed.

Key words: *Ascochyta*, dark septate endophyte (DSE), *Pseudoseptoria*, *Pycnothyrium*, *Septoria*, *Stagonospora*, *Unguicularia*

Suková M. a Chlebicki A. (2004): Houby na sítně *Juncus trifidus* v České republice (II) s taxonomickými poznámkami k některým druhům – *Czech Mycol.* 56: 203–221

V tomto druhém příspěvku je popsáno dalších osm druhů askomycetů a anamorfních hub nalezených na sítně *Juncus trifidus* v České republice (*Ascochyta junci*, *Lachnum diminutum*, *Phaeosphaeria vagans*, *Phialocephala* sp., *Pseudoseptoria* sp., *Pycnothyrium junci*, *Stagonospora junciseda*, *Unguicularia* sp.). Jsou doplněny další lokality k druhům *Arthrimum cuspidatum* a *Niptera eriophori*, které byly publikovány s podrobným popisem v prvním příspěvku. Houba uvedená v prvním příspěvku pod jménem *Septoria* sp. byla určena do druhu jako *Septoria chanousiana*. Pro srovnání byl též studován materiál některých druhů z jiných substrátů a zemí (*Ascochyta junci*, *Septoria chanousiana*, *S. minuta*, *Unguicularia millepunctata*). Jsou připojeny poznámky k počtům druhů hub na sítně *Juncus trifidus* na jednotlivých studovaných lokalitách.

INTRODUCTION

This paper is a continuation of the first article (Fungi on *Juncus trifidus* in the Czech Republic I) published in *Czech Mycology* 56(1–2), where a general introduction was given and fourteen species of ascomycetes and anamorphic

fungi were mentioned (Suková 2004). Other interesting species described here are especially from the Hrubý Jeseník Mts. as well as the Krkonoše Mts. and Šumava Mts. (Czech Republic).

METHODS

Unless stated otherwise, dried material was prepared in water under a stereomicroscope and studied and measured under a light microscope. Photographs in Figs. 1, 2 and 3B-C were taken using Nomarski contrast. The amyloid reaction of the asco-apical apparatus (I+, I-) was examined in Melzer's reagent (MLZ). Descriptions of fungi from *Juncus trifidus* are based on collected material, which is deposited in the herbaria PRM and KRAM.

Tab. 1. Localities and character of studied *Juncus trifidus* populations.

Loc.	Localities	Altitude	Character of <i>Juncus trifidus</i> stands
1	Western Bohemia / Germany, Šumava Mts. / Bayerischer Wald Mts., 6.5 km SW of the village of Zelená Lhota, Mt. Velký Ostrý / Gr. Osseer and rock ridge running SE from the peak	1280-1290 m	tufts and stands on rocks of various orientation
2	Western Bohemia, Šumava Mts., 6 km NW of the village of Železná Ruda, Jezerní stěna rock wall, on and under SW edge of cirque of Černé jezero lake, 49°10' 12.5" N, 13°10' 21" E	1300-1315 m	stands and isolated tufts on rocks
3	Eastern Bohemia / Poland, Krkonoše Mts. / Karkonosze Mts., SE and E side of peak of Mt. Sněžka / Śnieżka	1560-1590 (-1600) m	large terrestrial stands with scattered stones
4	Eastern Bohemia, Králický Sněžník mountain range, Vlaštevčí skály rocks c. 850 m SW of peak of Mt. Králický Sněžník	1260-1290 m	scattered tufts on rocks
5	Northern Moravia, Hrubý Jeseník Mts., 4.5 km ESE of the village of Ramzová, Mt. Keprník, 50°10' 13" N, 17°06' 59.5" E	1415-1423 m	mostly terrestrial stands, less frequently stands on small rocks
6	Northern Moravia, Hrubý Jeseník Mts., 5.5 km SE of the village of Ramzová, Mt. Vozka, 50°08' 47" N, 17°08' 11" E	1360-1370 m	stands on rocks and among stones
7	Northern Moravia, Hrubý Jeseník Mts., Mt. Červená hora, small E oriented rock between Červená hora and Kamenné okno, 50°08' 44.5" N, 17°08' 09.5" E	c. 1300 m	scattered (not numerous) tufts on the rock
8	Northern Moravia, Hrubý Jeseník Mts., c. 5.3 km W of the village of Karlova Studánka, Petrovy kameny rock	1430 m	two tufts on ENE slope of the rock

For the studying of dark septate endophytes, roots after gathering were preserved in a refrigerator in a plastic bag. In the beginning, roots were washed in water. Only whitish roots were analysed. To clear root cells, roots were placed in 50 % aqueous chloral hydrate for 30 min. at room temperature and then transferred to lactophenol or distilled water.

To establish "similarities" we followed a method based on fungal host specificity (Chlebicki et al. in press).

For localities and character of studied *Juncus trifidus* populations see Tab. 1.

RESULTS AND DISCUSSION

Fungi collected on *Juncus trifidus*

ASCOMYCETES

Lachnum diminutum (Roberge) Rehm, Hedwigia 23: 51, 1884.

Bas.: *Peziza diminuta* Roberge, Ann. Sci. Nat. Bot., ser. 3, 7: 185, 1847.

Description: Dried apothecia shortly stipitate, 180–260 μm in diam., outer surface vermilion-red or brown, discs deeply orange to vermilion-red. Hairs 21–44 \times 3.2–4.5 μm (longer ones are located at margin, shorter ones on outer surface of excipulum), cylindrical, hyaline, incrustate, mostly 1–2-septate. Asci 47–53 \times 8–8.7 μm , 8-spored, with slightly conical apices, ascospores located mostly in upper part of ascus. Ascospores one-celled, 11.7–12.5 \times 1.5–2.5 μm (measured in ascus), hyaline, biguttulate. Paraphyses probably young, narrowly lanceolate, 2.7–3.5 μm wide, slightly exceeding asci.

Habitat: On old stem and bract of *Juncus trifidus*.

Material studied: Krkonoše Mts., Sněžka (loc. 3), 13 July 2002, leg. M. Suková, PRM 901845 (two apothecia only).

Comments: This poor occurrence of *Lachnum diminutum* in the alpine belt is interesting and is situated at the margin of ecological valence of the species. *Lachnum diminutum* is characteristic of *Juncus effusus* and *Juncus filiformis* in montane and lower altitudes (see also Scheuer 1988, Suková et al. 2003). Poor material of *Lachnum diminutum* was also found on *Juncus filiformis* near Mt. Sněžka (loc. 3) in the subalpine belt.

Additional material studied: Czech Republic, Eastern Bohemia, Krkonoše Mts., Úpské rašeliniště bog, c. 1 km ENE of Luční bouda chalet, on *Juncus filiformis*, 23 August 2004, leg. M. Suková, PRM 901860.

Niptera eriophori, reported in the first article (Suková 2004)

Additional note: The species was collected also at the locality Červená hora.

Material studied: Hrubý Jeseník Mts., Červená hora (loc. 7), on dead stems of *Juncus trifidus*, 5 July 2002, leg. M. Suková, PRM 901857.

Phaeosphaeria vagans (Niessl) O. E. Erikss., Ark. Bot. 6: 430, 1967.

Bas.: *Pleospora vagans* Niessl, Verh. Naturf. Ver. Brünn 14: 174, 1876. Fig. 1A.

Description: Ascomata black, immersed, slightly lifting the surface tissues of the plant, 180–240 μm in diam., openings without conspicuous periphyses. Asci cylindrical, shortly stipitate, 77–93.5 \times 13.5–16.5 μm . Ascospores (observed in asci) biserial, muriform, with (4-)5 transversal septa and one longitudinal septum in the central part, pointed to both ends, slightly constricted at the first septum, not constricted or only slightly constricted at other septa, 17–19.6 \times 5.7–7 μm (measured in asci), olive brown, hyaline to subhyaline and two-celled when young. Pseudoparaphyses hyaline, septate, 1.8–3 μm wide.

Habitat: On dead stem of *Juncus trifidus*.

Material studied: Hrubý Jeseník Mts., Červená hora (loc. 7), 17 May 2003, leg. M. Suková, PRM 901843.

Comments: This non-specialised fungus is known especially from various *Poaceae*, some *Juncus* species and some species of *Cyperaceae* (Shoemaker and Babcock 1989). During the research devoted to *Juncus trifidus* in the Czech Republic only scanty material was found at only one locality. Probably, the fungus was present on other substrata at the locality and *Juncus trifidus* was colonised accidentally.

Unguicularia sp.

Fig. 2A.

Description: Dried apothecia small, sessile, broadly cup-shaped to urn-shaped, whitish with pale beige-brown tint, up to 100 μm in diam., hairs whitish. Excipulum composed of thin-walled, hyaline (near base of apothecium pale brownish) cells. Hairs glassy (glassy matter not changing in 5 % KOH), gradually pointed to rounded apex, 6.5–22 \times 2.7–5.7 μm , dividing line between glassy part of hair (5.5–13 \times 2.7–5.5 μm) and lumen straight or only slightly concave. Hairs pale brown in MLZ. Asci 8-spored, 11.5–26 \times 3.5–5 μm , clavate to nearly cylindrical, upper part of asci conical to rounded, asco-apical apparatus amyloid (blue) in MLZ without pre-treatment in KOH. Ascospores one-celled, 4.7–7.3 \times 1–1.5 μm , straight, hyaline.

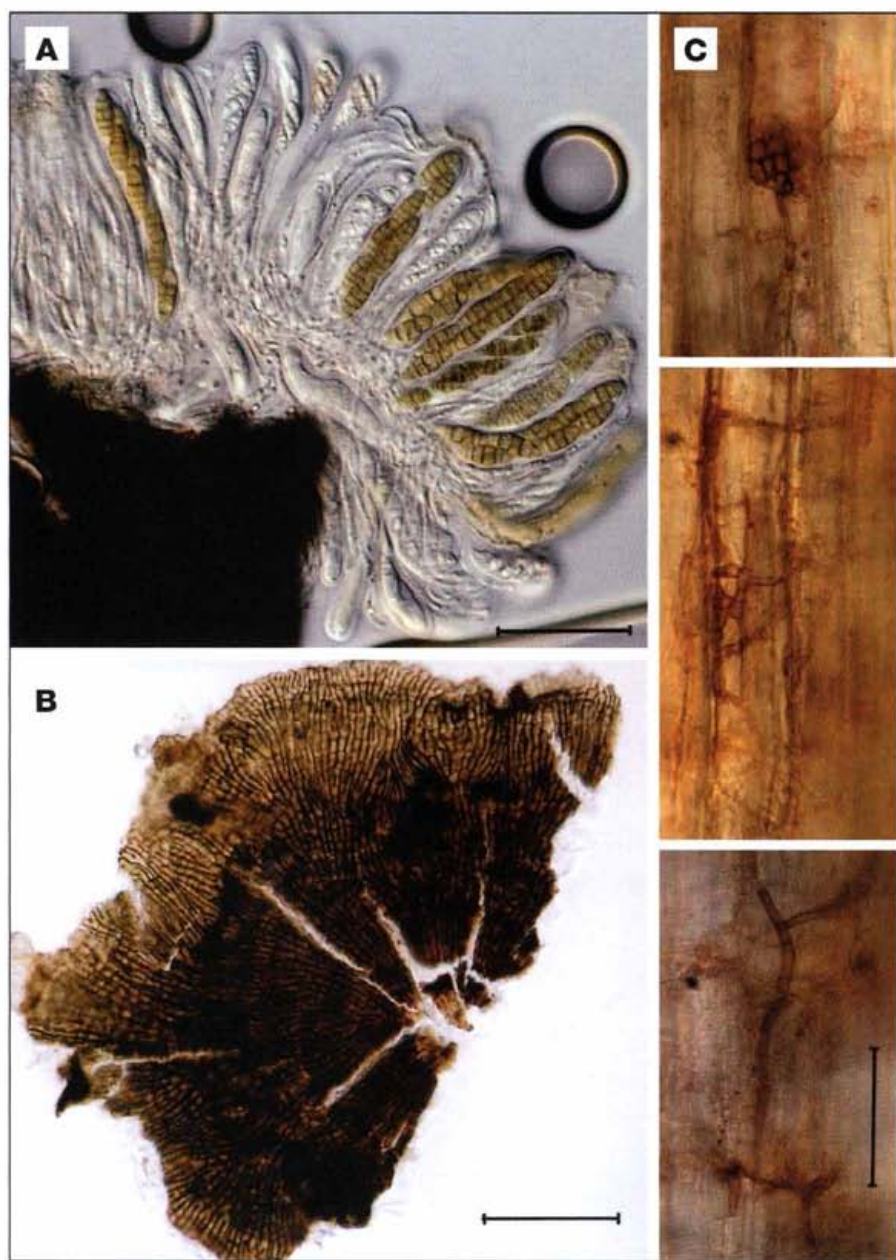


Fig. 1. A: *Phaeosphaeria vagans* (Niessl) O. E. Erikss. (PRM 901843), asci with ascospores and pseudoparaphyses (in water); B: *Pycnothyrium junci* Grove (PRM 901851), upper wall of conidioma (in water); C: *Phialocephala* sp. (dark septate endophyte – DSE), sclerotia and hyphae (in water). Scale bars: A-C: 50 μ m.

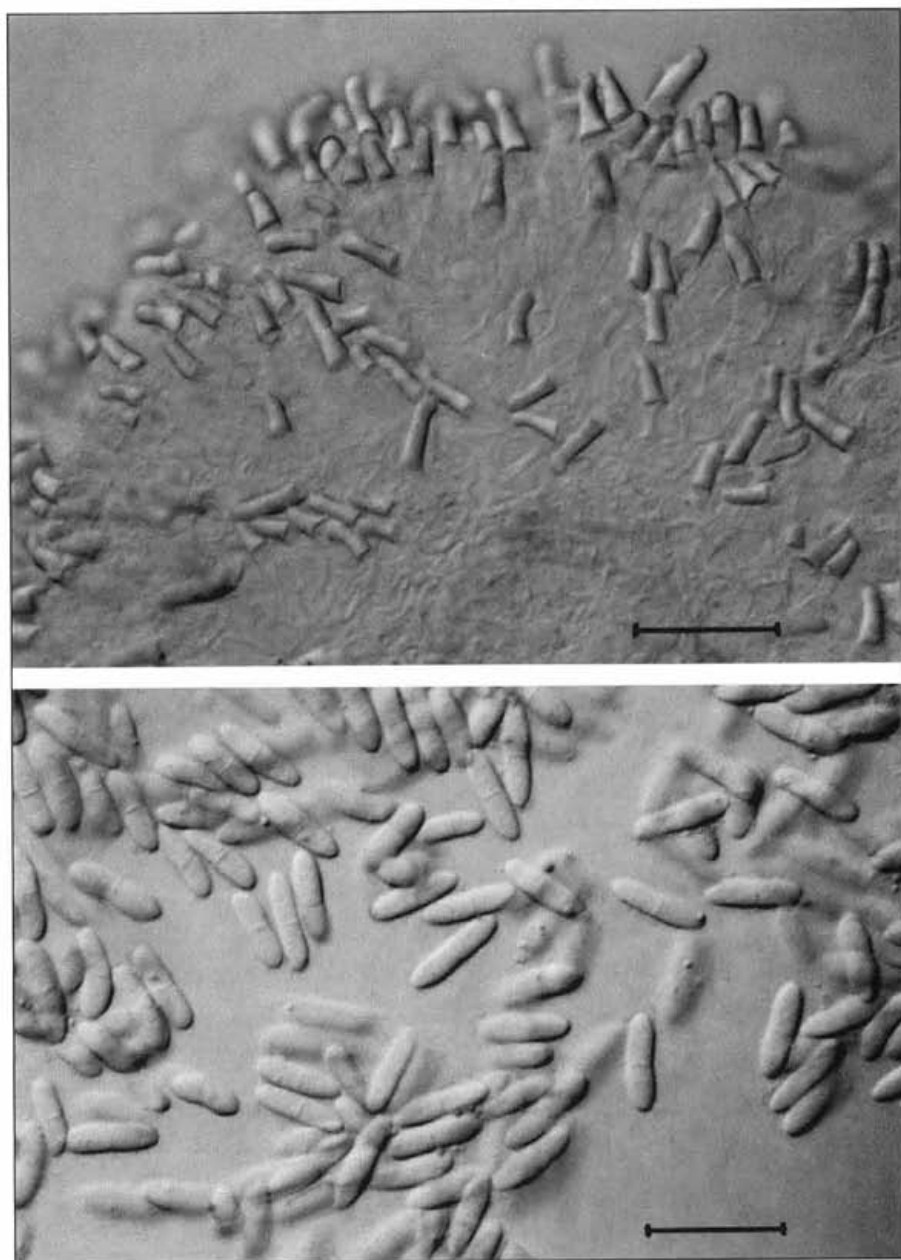


Fig. 2. A: *Unguicularia* sp. (PRM 901844), outer surface of excipulum bearing hairs (in water); B: *Asochyta junci* (Oudem.) Melnik (PRM 901856), conidia (in water). Scale bars: A-B: 20 μ m.

Habitat: On old stems of *Juncus trifidus*.

Material studied: Hrubý Jeseník Mts., Červená hora (loc. 7), 17 May 2003, leg. M. Suková, PRM 901844.

Comments: This material is distinctly different from *Unguicularia costata* (Boud.) Dennis known from the genus *Juncus* (see Raschle 1977, Ellis and Ellis 1985). Studying Raschle's monograph (Raschle 1977) and comparative material (*U. millepunctata* on *Heracleum sphondylium*), our material appeared to be most similar to *U. millepunctata* (Lib.) Dennis. However, *U. millepunctata* is known only from dicotyledonous herbs and trees. Moreover, hairs of our *Unguicularia* sp. are smaller, but may be in the range of variability of *U. millepunctata*.

Korf and Kohn (1980) lowered the genus *Unguicularia* Höhn. to the subgenus rank as *Hyalopeziza* Fuckel subgen. *Unguicularia* (Höhn.) Korf et L. M. Kohn.

Comparative material studied: *Unguicularia millepunctata* (Lib.) Dennis, Czech Republic, Northern Moravia, Moravskoslezské Beskydy Mts., left bank of Rožnovská Bečva river 400 m before Jeřábekový potok tributary, alt. 640 m, on *Heracleum sphondylium*, 18 August 1999, leg. M. Suková, PRC.

COELOMYCETES

Ascochyta junci (Oudem.) Melnik, Nov. Sist. Niz. Rast. 12: 204, 1975.

Bas.: *Diplodina junci* Oudem., Ned. Kruidk. Archf., ser. 3, 2: 1109, 1904.

Fig. 2B, 4A.

Description: Conidiomata black, slightly elongated in the direction of plant tissues, 130–240 μm long, 110–180 μm wide, opened by a small, almost rounded pore, 13–17 \times 11–14 μm . Wall dark blackish brown, a *textura angularis* in surface view. Conidiogenous cells hyaline, subglobose. Conidia two-celled, hyaline, straight, 10.5–13 \times 2.5–3.7 μm , not constricted at septa or only slightly constricted, often 4-guttulate.

Habitat: On dead stems, petals, rarely bracts or leaves of *Juncus trifidus*.

Material studied: Krkonoše Mts., Sněžka (loc. 3), 5 June and 13 July 2002, leg. M. Suková, PRM 901859 and 901855. – Karkonosze Mts. (Poland), Śnieżka (loc. 3), 21 November 1996, leg. A. Chlebicki, KRAM F. – Hrubý Jeseník Mts., Vozka (loc. 6), 21 March 2004, leg. M. Suková et A. Chlebicki, PRM 901856.

Comments: According to Punithalingam (1988), *Ascochyta junci* was only known from a single (type) collection from peduncles and bracts of *Juncus squarrosus* from the Netherlands. However, it has been reported also from the Czech Republic by Petrak (1920), who published the species (as *Diplodina junci* Oudem.) from the same host plant (*J. squarrosus*).

Ascochyta junci is reported here for the first time from *Juncus trifidus*. Conidia in the studied material were mostly almost symmetrical with rounded ends whereas in the drawing by Punithalingam (1988) conidia were distinctly narrowed towards the apex in the type collection on *Juncus squarrosus*. We examined Punithalingam's slide (IMI 311017, entire conidiomata, see Fig. 3B) and found that the conidia were really mostly more or less narrowed towards both ends (more towards the apical end). But the difference in shape of conidia between our material on *Juncus trifidus* and Punithalingam's drawing and slide did not turn out to be relevant, because the slide was prepared in lactophenol whereas we examined our material in water. When we compared our material from *Juncus trifidus* with a collection from *Juncus squarrosus* (PRM 901854, see Fig. 3A) prepared in water, conidia were of the same shape.

Comparative material studied: *Ascochyta junci* (Oudem.) Melnik, Czech Republic, Western Bohemia, Krušné hory Mts., SE slope of Jeřábí vrch, at signal road running along state border at 500 m from the border, alt. c. 930 m, on *Juncus squarrosus*, 16 May 1999, leg. M. Suková, PRM 901854.

Ascochyta junci was found mature in spring (May to beginning of June) and also in late autumn (November). The type collection from the Netherlands was collected in March (see Punithalingam 1988). On *Juncus trifidus*, the species was observed especially on inflorescences (petals, also capsules) and stems, rarely on leaves and bracts. Punithalingam (1988) discussed the parasitism of this fungus. We saw *Ascochyta junci* mostly on overwintered, well-developed capsules and petals, only once on an underdeveloped capsule.

The record of *Ascochyta caricicola* Melnik reported previously from *Juncus trifidus* from the Tatra Mts. (Poland) by the second author (Chlebicki 2002) is in fact *Ascochyta junci* – the material (deposited in KRAM F) agrees with our description here.

Pseudoseptoria sp.

Fig. 4B-C.

Description: Conidiomata immersed, (66-)80-95(-130) μm long, (63-)75-87 μm wide, in upper part with a rounded opening (15-20 μm in diam.). Wall a *textura angularis* in surface view, composed of dark brown cells, 6.5-13 \times 5.5-10.5 μm . Conidiogenous cells hyaline, broadly ampulliform, 5-8 μm high, 6.5-7.5 μm wide (in water as well as lactophenol), formed on inner surface of the wall. Conidia mostly falcate, acute at upper end, slightly acute also at basal end, hyaline, (16.7-)20-23.5 \times (1.5-)1.7-2 μm , often guttulate.

Habitat: On dead stems and bracts of *Juncus trifidus*.

Material studied: Šumava Mts., Jezerní stěna (loc. 2), 14 May 2002, leg. M. Suková, PRM 901846. – Krkonoše Mts., Sněžka (loc. 3, both Czech and Polish

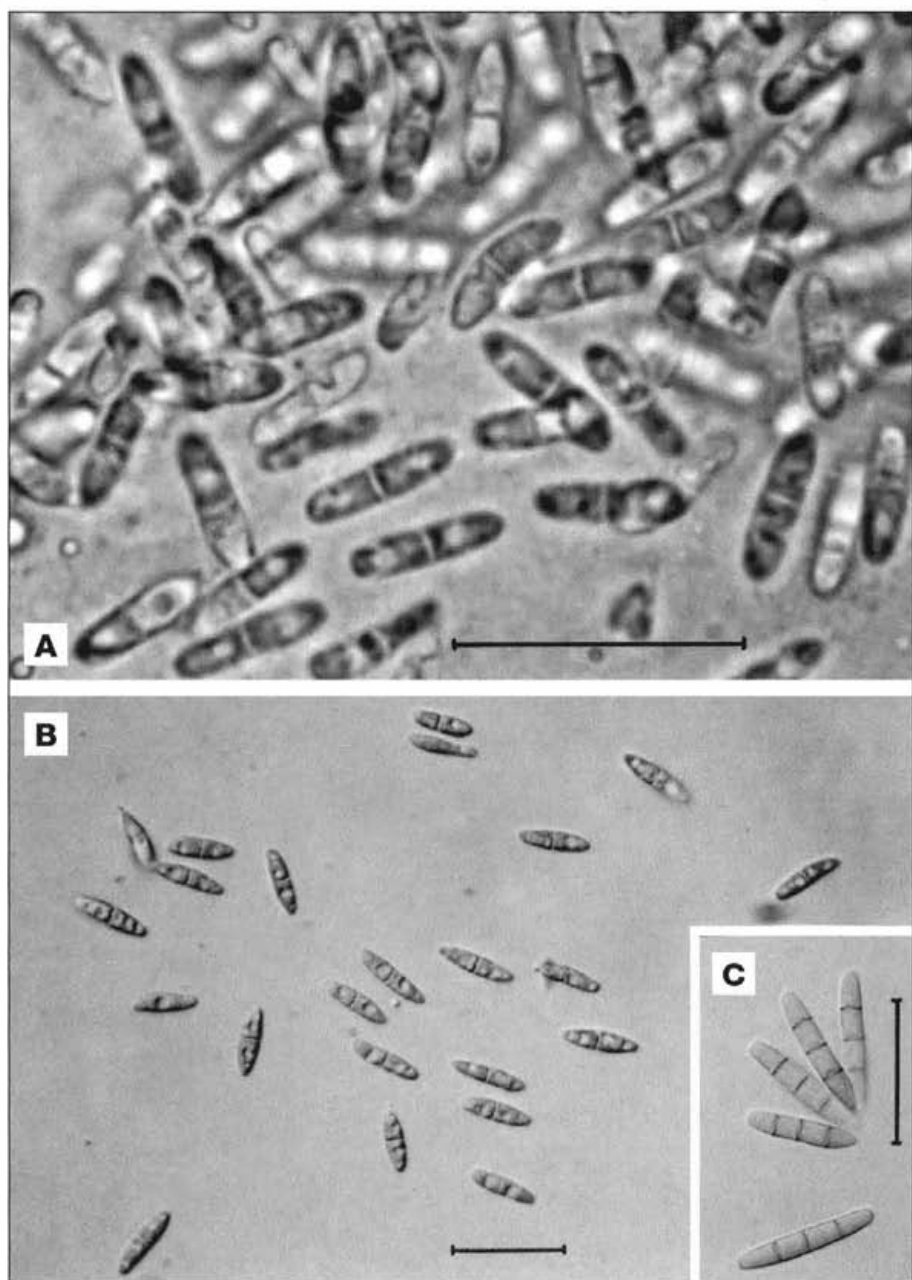


Fig. 3. A: *Ascochyta junci* (Oudem.) Melnik on *Juncus squarrosus* (PRM 901854), conidia (in water); B: *Ascochyta junci* (Oudem.) Melnik on *J. squarrosus* (IMI 311017), conidia, slide ex herb. L prepared by Punithalingam in lactophenol; C: *Stagonospora junciseda* (Sacc.) Sacc. (PRM 901853), conidia (in lactophenol). Scale bars: A-C: 20 μ m.

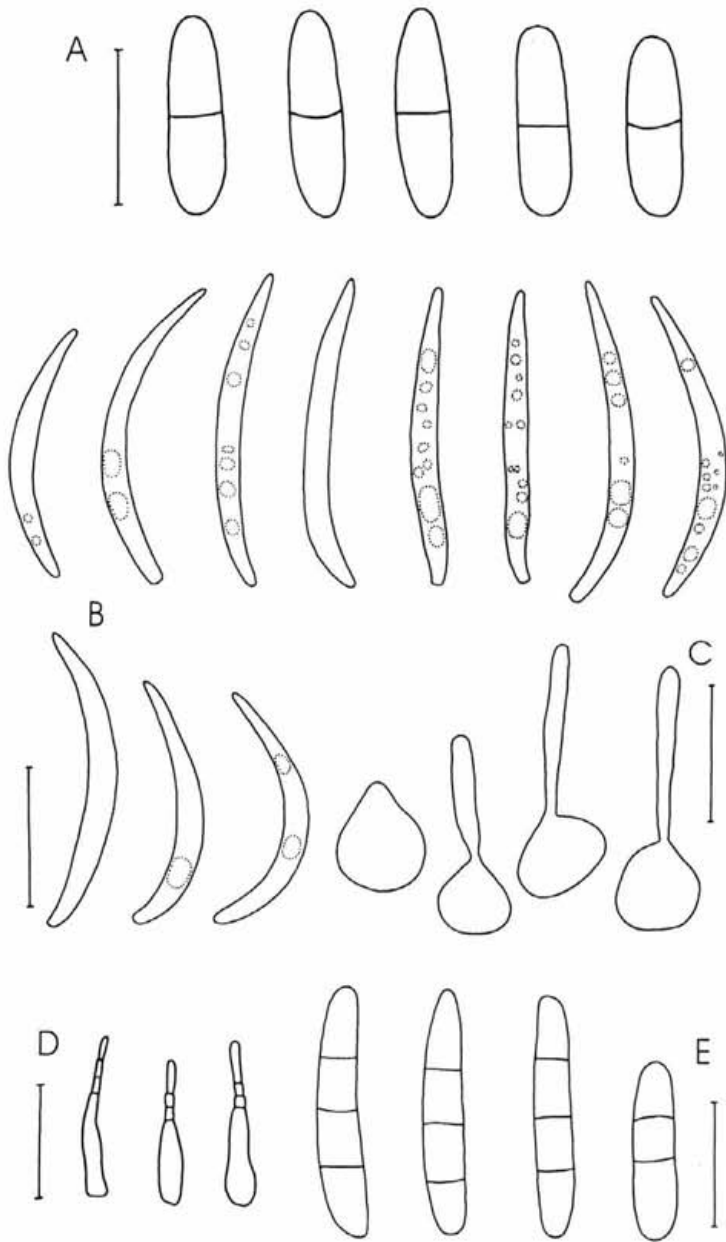


Fig. 4. A: *Ascocyta junci* (Oudem.) Melnik on *Juncus trifidus*, conidia (in water); B-C: *Pseudoseptoria* sp. (in water), B: conidia, C: schema of conidiogenous cells producing conidia; D: *Septoria minuta* J. Schröt. (IMI 188720a) published from *Luzula sylvatica* by Ellis and Ellis (1985), conidiogenous cells (in water); E: *Stagonospora junciseda* (Sacc.) Sacc., conidia (in lactophenol). Scale bars: A-E: 10 μ m.

sides), 5 June 2002, leg. M. Suková, PRM 901849. – Hrubý Jeseník Mts.: Vozka (loc. 6), 17 May 2003, leg. M. Suková, PRM 901848; Červená hora (loc. 7), 5 July 2002 and 17 May 2003, leg. M. Suková, PRM 901858 and 901847.

Comments: The size of the conidia was $(16.7\text{--}20\text{--}23.5 \times 1.7\text{--}2 \mu\text{m})$ in most collections. Longer conidia $[26\text{--}29 \times (1.5\text{--}2 \mu\text{m})]$ were found in material from the Czech side of Mt. Sněžka (loc. 3). Openings of the conidiomata located strictly under stomata of *Juncus trifidus* were observed in the material from Jezerní stěna (loc. 2) and probably this is a property of the whole species.

The material described above belongs to the genus *Pseudoseptoria* (see Sutton 1980). It differs from *Pseudoseptoria donacis* (Pass.) B. Sutton (represented in our study by the collection from Thümen, Herb. Mycol. Oecon., no. 607, PRM 652606) at least in having conidia narrower in shape with less acute ends and darker conidioma wall composed of cells with somewhat thicker wall. The shape of the observed conidiogenous cells was more similar to *Pseudoseptoria*, however neither annellate papillas typical of *Pseudoseptoria* nor scars typical of *Septoria* were seen.

Identification on species level was not possible, because we have not yet found any usable comparative material of *Septoria minuta* J. Schröt. (Jahresber. Schles. Ges. Vaterl. Cult. 65[1887]: 284, 1888) – a species with falcate, one-celled conidia described from *Juncaceae* (*Luzula*). *Septoria minuta* was originally described from *Luzula spicata* and *Elyna bellardi* (syn. of *Elyna myosuroides*, see Dostál 1989) from Greenland (Schröter 1888). The original material was collected on *Luzula spicata* in 1857 by E. Wenck and should be deposited in the herbarium of E. Wenck. Unfortunately, we have not yet been able to find out where this herbarium is located. The WRSL herbarium, where a large part of Schröter's collection is deposited, does not possess any specimen of *Septoria minuta*. We do not combine *Septoria minuta* into *Pseudoseptoria* now, because its conidiogenous cells, which are not described in the original description, must be checked first. We have not been able to study the type collection of *Septoria minuta* and among other collections we have seen only material published by Ellis and Ellis (1985), which may be but need not be a good representative of the species *Septoria minuta*.

Comparative material studied: *Septoria minuta* J. Schröt. published by Ellis and Ellis (1985), England, South Devon, Slapton Ley Nature Reserve, on *Luzula sylvatica*, 6 October 1974, leg. D. L. Hawksworth, IMI 188720a.

The collection IMI 188720a published from *Luzula sylvatica* (Ellis and Ellis 1985) differs from our *Pseudoseptoria* sp. in having pycnidia on dead spots on green leaves. The spots are pale olive-brown, in part with pycnidia, surrounded by a beige-brown area and a paler, distinctly demarcated, beige margin. The conidiogenous cells (Fig. 4D) are narrowly ampulliform, longer than wide, probably with annellate papillas. The conidia are thinner in shape (in comparison with our material from *Juncus* and also with the original description of *Septoria minuta*),

(11-)13-17(-20.5) \times 1 μm , and almost straight or slightly falcate or curved, not distinctly regularly falcate.

Comparison of *Pseudoseptoria* sp. with the literature: *Septoria minuta* is known from leaves of *Luzula* spp. from North America (also Greenland), Europe and Asia (Saccardo 1892, Cooke 1955, Teterevnikova-Babajan 1987, Farr et al. 1989). The length of the conidia of our material agrees rather with the description of *Septoria minuta* in Teterevnikova-Babajan (1987), who mentioned conidia 10-31 μm long, and the falcate conidia agree with descriptions in Schröter (1888), Saccardo (1892), and Ellis and Ellis (1985). Teterevnikova-Babajan (1987) mentioned straight conidia. Schröter (1888) mentioned falcate conidia 17-20 \times 2-2.5 μm in size for material from *Luzula spicata* in his protologue of *Septoria minuta*. Our *Pseudoseptoria* sp. possesses conidia somewhat narrower and more variable in length.

Pycnothyrium junci Grove, British stem and leaf fungi, vol. 2, p. 197, 1937.

Fig. 1B.

Description: Conidiomata brownish black, flat, shield-shaped, rounded, 190-260 μm in diam. Wall of the shield composed of brown, distinctly angular, radiately arranged, 2-2.5(-3.5) μm wide cells. Conidia one-celled, hyaline, straight, (6.5-)7.5-10 \times 1.7-2.2 μm , mostly with two big and several smaller guttules.

On dead stems, leaves and bracts of *Juncus trifidus*.

Material studied: Šumava Mts., Velký Ostrý (loc. 1), 1 June 2003, leg. M. Suková, PRM 901852. - Hrubý Jeseník Mts., Vozka (loc. 6), 5 July 2002, leg. M. Suková, PRM 901851.

Comments: The character of conidiomata of our material agrees very well with the description by Grove (1937). Conidia in Grove's description are a little smaller (6-8 \times 1-1.5 μm), but we consider it a variability in the range of the species.

Septoria chanousiana Ferraris, Malpighia 16: 466, 1902.

Comments: We compared our material of *Septoria* sp. published in a previous article (Suková 2004) from *Juncus trifidus* (conidia 23-25.5 \times 1.8-2.1 μm) with *Septoria chanousiana* from its typical host plant (*Luzula*) and they appear to be conspecific. The material on *Luzula* (WSP 42204) possesses conidia of the same shape measuring (19-)22-29 \times 1.7-2.2 μm . Conidiomata of *Septoria chanousiana* studied on green leaves of *Luzula* were located on small beige spots, surrounded by a violet-brown colour, whereas pycnidia on *Juncus trifidus* were situated directly on withering, but still somewhat green leaves. Teterevnikova-Babajan (1987) men-

tioned conidia $19-21 \times 2 \mu\text{m}$ large and Sprague (1962) conidia $20-23 \times 1-1.2 \mu\text{m}$ for *Septoria chanousiana* on *Luzula*.

Comparative material studied: *Septoria chanousiana*, 'Suoqualmia N. For. Wash.', on *Luzula piperi*, 24 July 1955, leg., det. (as *Septoria minuta*) and rev. (as *Septoria chanousiana*) R. Sprague, WSP 42204.

Stagonospora junciseda (Sacc.) Sacc., Syll. Fung. 3: 452, 1884.

Bas.: *Hendersonia aquatica* subsp. *junciseda* Sacc., Michelia 2: 350, 1881.

Figs. 3C, 4E.

Description: Conidiomata pycnidial, immersed, slightly lifting the surface tissues of the plant, ostioles surrounded by black surface areas (up to $70 \mu\text{m}$ in diam.), elongated in the direction of the stem, $180-230 \times 100-180 \mu\text{m}$. Conidia subhyaline with pale ochraceous tint, cylindrical, tapering towards their rounded ends (more towards the upper end), $14-20.5 \times 3-3.8 \mu\text{m}$ (in lactophenol), four-celled, not constricted at the septa. Young three-celled and two-celled conidia were also observed.

Habitat: On dead stem of *Juncus trifidus*.

Material studied: Šumava Mts., Jezerní stěna (loc. 2), 14 May 2002, leg. M. Suková, PRM 901853.

Comments: There are not many juncicolous *Stagonospora* species with narrow, 3-septate conidia reported in the literature. We noted only two species of such character: *Stagonospora junciseda* (Sacc.) Sacc. with conidia $21-30 \times 3-3.5 \mu\text{m}$ in size according to Ellis and Ellis (1985) or $25-30 \times 3-3.5 \mu\text{m}$ (Saccardo 1884, Allescher 1901 as *S. aquatica* subsp. *junciseda*, Grove 1935) and *Hendersonia juncina* J. W. Ellis with conidia $14-18 \times 3.5-4 \mu\text{m}$ (Grove 1937). Both the species should have conidia not constricted at the septa. The conidiomata of the first one should be up to $200 \mu\text{m}$ in diam., of the second one only $100 \mu\text{m}$. Of course we do not know whether *Stagonospora junciseda* (Sacc.) Sacc. and *Hendersonia juncina* J. W. Ellis are conspecific or not. Grove (1935, 1937) reported them as two different species. In later literature, *H. juncina* was mentioned neither as a synonym nor as a separate species.

Material from *Juncus trifidus* from the Babia Góra Mts. previously published by the second author (Chlebicki 2002) as *Stagonospora* cf. *caricinella* belongs to the same species (*Stagonospora junciseda*) as the material from the Šumava Mts. described above. Material published from Mt. Śnieżka (Chlebicki 2002) possesses two- or three-celled and slightly ochraceous conidia $13-19 \times 3-4.5 \mu\text{m}$ large, not constricted at the septa, symmetrical, with obtuse ends. We never observed four-celled conidia in this material. Moreover, conidia from Mt. Śnieżka are somewhat wider than those four-celled ones. It is probably a different taxon.

HYPHOMYCETES

Arthrinium cuspidatum, reported in the first article (Suková 2004).

Additional note: At the locality Červená hora, where the population of *Juncus trifidus* is very small, scanty material of *Arthrinium* was found with conidia having inward curved horns strongly resembling those of *Arthrinium luzulae*. The conidia measured 17–17.5 × 12.5–13.7 μm incl. horns and were 8.3–8.6 μm long (excl. horns) in face view. But we found several old conidia with inward curved horns also in good collections of *A. cuspidatum* cited in the previous article (Suková 2004). Presence of old conidia of such character is normal at *A. cuspidatum*.

Material studied: Hrubý Jeseník Mts., Červená hora (loc. 7), on dead stems of *Juncus trifidus*, 5 July 2002, leg. M. Suková, PRM 901850, not abundant; old colonies, but conidia, hyphae and mother cells of conidiophores seen.

Phialocephala sp., dark, septate endophyte (DSE)

Comments: So far, dark, septate endophytic fungi were noted in 8 species of *Juncaceae* (Jumponen and Trappe 1998). They are ubiquitous fungi frequently noted in the arctic and alpine plants (Schadt et al. 2001). We noted very distinct septate hyphae and microsclerotia (Fig. 1C) in the young roots of the plant. We observed also solitary conidiophores with conidia, identical with the anamorphic fungus of the genus *Phialocephala* Kendr. They were slightly brown, c. 50 μm long, bearing an indistinct head covered with slime.

Material studied: Hrubý Jeseník Mts., Vozka (loc. 6), roots of *Juncus trifidus*, 21 March 2004, leg. A. Chlebicki, KRAM.

Comments to numbers of fungi on *Juncus trifidus* at studied localities

See also information in Tabs. 1 and 2.

Unless stated otherwise, the number of specialised fungi (restricted to *Juncaceae* and *Cyperaceae*) is discussed.

Comments to the richest localities (Sněžka in the Krkonoše Mts. and Jezerní stěna in the Šumava Mts.) were published in a previous article (Suková 2004). Now, we want to add some notes on the distribution of fungi in the Hrubý Jeseník Mts. (a). We add also comments to numbers of fungi at localities with terrestrial *Juncus trifidus* stands (b), localities with rocks (c) and stands on rocks oriented to cirques (d) within the whole studied area (the Czech Republic incl. localities at the border).

a) Distribution of fungi in the Hrubý Jeseník Mts.

The smallest population of *Juncus trifidus* is on Petrovy kameny rock (loc. 8). By the way, also the endemic plant *Campanula gelida* Kovanda (see Slavík 2000) is known from here. The only two tufts of *Juncus trifidus* hosts three species of fungi which are common in all studied *Juncus trifidus* populations. Only one of the two fungi inhabiting plant tissues under stomata (*Mycosphaerella perexigua* var. *minima* Johanson and *Pseudoseptoria* sp.) is present.

The number of fungi and especially the presence of specialised species is connected with plant population size. The presence of a relatively big number of plurivorous fungi is characteristic of the small *Juncus trifidus* population at Mt. Červená hora (loc. 7). Several tufts of *Juncus trifidus* are located on a small rock oriented to Sněžná kotlina glacial cirque and are covered by snow longer than e.g. the population on Mt. Vozka.

The richest (in fungi) *Juncus trifidus* population of the Eastern Sudetes is undoubtedly on Mt. Vozka (loc. 6). Also another relict plant, *Empetrum hermaphroditum*, occurs at this locality.

Mt. Keprník (loc. 5) is conspicuously poor in *Juncus trifidus* fungi. It is possible that *Juncus trifidus*, present there mostly terrestrially, is gradually suppressed by *Poaceae*. Only scanty material of *Juncus trifidus* is found on a small rock (rather a big stone than a rock).

b) Localities with terrestrial *Juncus trifidus* stands studied in the Czech Republic.

Except of Mt. Keprník (loc. 5, Hrubý Jeseník Mts.), also Mt. Sněžka (loc. 3, Krkonoše Mts.) with prevailing terrestrial stands of *Juncus trifidus* was examined. Compared with Mt. Keprník, Mt. Sněžka is a rich locality at relatively high altitude, with a bigger *Juncus trifidus* population, which seems to be stable and possesses various microhabitats for fungi (e.g. dead stems lying in moss cushions, on stones, in *Juncus trifidus* tufts, etc.).

c) Localities with big rocks studied in the Czech Republic.

Localities with big rocks are mostly rich in *Juncus trifidus* fungi. These are (arranged from the rich to poor) Jezerní stěna (loc. 2), Vozka (loc. 6), Velký Ostrý (loc. 1) and Králický Sněžník (loc. 4). There is also a big rock at the locality Petrovy kameny (loc. 8), but because of the small *Juncus trifidus* population also the number of fungi is very low.

d) Stands on rocks oriented to cirques studied in the Czech Republic.

The locality Jezerní stěna (loc. 2, Šumava Mts.) is influenced by its orientation to the cirque of Černé jezero lake. This cirque has specific climatic conditions

(higher air humidity and less strong winds) in comparison with studied Czech localities situated on open peaks (Suková 2004). The influence of the above described leature is apparently less strong at the locality Červená hora (loc. 7, Hrubý Jeseník Mts.) oriented to a more open cirque named Sněžná kotlina.

Discussion: It is clear that relict populations of *J. trifidus* can survive on big rocks (c) or at high altitude (terrestrial stands on Mt. Sněžka, loc. 3). Reduction of plant population is correlated with a decrease in the number of fungus species (Chlebicki 2002). The same effect can be observed when plant colonises a new area (Chlebicki 2002). Small *Juncus trifidus* populations (loc. 5, 7 and 8 in the Hrubý Jeseník Mts.) can be explained as an effect of vanishing populations but it is also possible that the plant colonised these areas recently (loc. 5).

Method based on fungal host specificity and discussion

Non-specialised fungi (see Tab. 1) were excluded before applying the method based on fungal host specificity (Chlebicki et al. in press; Chlebicki 2002 as FMM – fungal markers method), which we followed to establish “similarities”. We included only species restricted to *Cyperaceae* and *Juncaceae*. Most included species are strictly juncicolous (*Ascochyta junci*, *Hysteronaevia minutissima*, *Lachnum diminutum*, *Pycnothyrium junci*, *Naeviella paradoxa* and *Stagonospora junciseda*). Some of included species (*Arthrimum cuspidatum*, *Brunnipila calycioides*, *Mycosphaerella perexigua* var. *minima* and *Septoria chanousiana*) can infect many species of *Cyperaceae* and *Juncaceae*. However, the picture of fungus distribution in isolated areas of *Juncus trifidus* is very similar to the distribution of *Dryas*-specific fungi on *Dryas octopetala* in the Carpathians (see Chlebicki and Suková 2004).

Similarities in fungi composition from the Šumava Mts., Krkonoše Mts., Mt. Králický Sněžník and the Hrubý Jeseník Mts. are not distinct. However, the most similar appear Krkonoše Mts. and Šumava Mts., which possess suitable habitats for *Juncus trifidus*. It is significant that the similarities between Králický Sněžník and Hrubý Jeseník (close areas) are smaller than between Krkonoše and Hrubý Jeseník (distant areas). This means that the process of vanishing of plant populations from Králický Sněžník is more advanced than from Hrubý Jeseník. The big population in the Krkonoše Mts. is inhabited by fungi not found in other Czech *Juncus trifidus* populations, (*Lachnum diminutum*, *Naeviella paradoxa* and *Septoria chanousiana*). Also the population at Jezerní stěna rock wall in the Šumava Mts. possesses such fungi (*Hysteronaevia minutissima* and *Stagonospora junciseda*).

Tab. 2. Occurrence of fungi on *Juncus trifidus* at the studied localities: Šumava Mts.: Velký Ostrý (loc.1), Jezerní stěna (loc. 2); Krkonoše Mts.: Sněžka (loc. 3); Králický Sněžník mountain range: Králický Sněžník (loc. 4); Hrubý Jeseník Mts.: Keprník (loc. 5), Vozka (loc. 6), Červená hora (loc. 7), Petrovy kameny (loc. 8). The Polish side of Mt. Sněžka and the German side of Mt. Velký Ostrý were also included. The relative size of *Juncus trifidus* populations is indicated. The total number of all species present at each locality on *Juncus trifidus* and the number of specialised (restricted to *Juncaceae* and *Cyperaceae*) ones are given. Species restricted to *Juncaceae* and *Cyperaceae* are marked by the index (S). Data published in this article are in bold. Other data are from a previous article (Suková 2004). Presence of DSE (dark septate endophyte) was investigated only at one locality (and at the locality identified as *Phialocephala* sp.), therefore it was not included into the total number of species.

Phytogeographical unit	Hercynicum		Western Sudetes	Eastern Sudetes				
	Šumava Mts.		Krkonoše Mts.	Králický Sněžník	Hrubý Jeseník Mts.			
Locality	1	2	3	4	5	6	7	8
Size of population of <i>Juncus trifidus</i>	++++	++++	++++	+++	++++	++++	++	+
Total number of all species	11	11	15	9	6	10	9	3
Number of specialised species	4	6	8	3	3	6	3	3
<i>Arthrinium cuspidatum</i> ^(S)	*	*	*	*	*	*	*	*
<i>Ascochyta junci</i> ^(S)			*			*		
<i>Botrytis cinerea</i>	*		*	*	*		*	
<i>Brunnipila calycioides</i> ^(S)	*	*	*	*	*	*	*	*
<i>Cladosporium herbarum</i>	*	*	*	*		*		
<i>Dinemasporium strigosum</i>	*	*	*	*	*	*		
<i>Epicoccum nigrum</i>	*		*				*	
<i>Hysteronaevia minutissima</i> ^(S)		*						
<i>Hysteropezizella diminuens</i>	*	*	*	*		*	*	
<i>Lachnum diminutum</i> ^(S)			*					
<i>Lachnum roseum</i>		*						
<i>Mycosphaerella perexigua</i> var. <i>minima</i> ^(S)	*	*	*	*	*	*		*
<i>Naeviella paradoxa</i> ^(S)			*					
<i>Niptera eriophori</i>	*	*	*	*	*	*	*	
<i>Periconia atra</i>	*		*	*				
<i>Phaeosphaeria vagans</i>							*	

Tab. 2. – continuation

Phytogeographical unit	Hercynicum		Western Sudetes	Eastern Sudetes				
	Šumava Mts.		Krkonoše Mts.	Králický Sněžník	Hrubý Jeseník Mts.			
Locality	1	2	3	4	5	6	7	8
<i>(Phialocephala sp.)</i>						(*)		
<i>Pseudoseptoria sp.</i> ^(S)		*	*			*	*	
<i>Pycnothyrium junci</i> ^(S)	*					*		
<i>Septoria chanousiana</i> ^(S) (<i>Septoria sp.</i>)			*					
<i>Stagonospora junciseda</i> ^(S)		*						
<i>Unguicularia sp.</i>							*	

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