

Fungi on *Juncus trifidus* in the Czech Republic. I.

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Fungi on *Juncus trifidus* were collected and studied during the years 1998–2003, most intensively in 2002. Almost all known localities of this relict plant in the Czech Republic were visited. In this first contribution, 14 species of ascomycetes and anamorphic fungi are mentioned. Populations of *Juncus trifidus* in the Sudetes and Hercynian mountains are small in comparison with populations in the Alps and Carpathians. However, three species of arcto-alpine fungi (*Hysteronaevia minutissima*, *Hysteropezizella diminuens*, *Naeviella paradoxa*) and *Lachnum roseum* have been found there as new records for the Czech Republic. The richest localities of fungi on *Juncus trifidus* are Mt. Sněžka (Krkonoše Mts., Sudetes) and Jezerní stěna rock wall in the cirque of Černé jezero lake (Šumava Mts., Hercynicum).

Key words: Ascomycetes, anamorphic fungi, *Hysteronaevia minutissima*, *Hysteropezizella diminuens*, *Mycosphaerella perezigua* var. *minima*, *Naeviella paradoxa*, *Septoria*, taxonomy, ecology.

Suková M. (2004): Houby na sitině *Juncus trifidus* v České republice. I. – Czech Mycol. 56: 63–84

Houby na sitině trojklanné (*Juncus trifidus*) byly studovány v letech 1998–2003, nejintenzivněji v roce 2002. Téměř všechny lokality této sitiny známé v České republice byly navštíveny. Z nalezených askomycetů a anamorfních hub v tomto prvním příspěvku uvádím 14 druhů. Populace sitiny trojklanné v sudetských a hercynských pohorích jsou oproti alpským a karpatským malé, nicméně byly v nich nalezeny významné arктоalpínské druhy (*Hysteronaevia minutissima*, *Hysteropezizella diminuens*, *Naeviella paradoxa*) a druh *Lachnum roseum*, které nebyly dosud z území České republiky publikovány. K lokalitám nejbohatším na juncikolní houby patří Sněžka v Krkonoších a Jezerní stěna v karu Černého jezera na Šumavě.

INTRODUCTION

In Central Europe fungi on *Juncus trifidus* have been studied especially in the Eastern Alps, Karkonosze Mts., Wysokie and Zachodnie Tatry Mts. and Babia Góra mountain range (Scheuer 1988, 1996, 1999; Scheuer and Chlebicki 1997; Chlebicki 2002). Altogether 10 species of ascomycetes, one hyphomycete (*Arthrimum cuspidatum*) and four coelomycetous species were given. Of the ascomycetes, *Bricookea sepalorum*, *Lophodermium juncinum* and *Phaeosphaeria juncicola* are not known from the Czech Republic. Five species (*Brunnipila calycioides*, *Hysteropezizella diminuens*, *Hysteronaevia minutissima*, *Lachnum*

roseum and *Naeviella paradoxa*) were found during the recent study. Two species (*Cistella fugiens* and *Diplonaevia emergens*) are known from other *Juncus* species in the Czech Republic (Suková 2003).

In the Czech Republic, *Juncus trifidus* occurs in the Šumava Mts., Krkonoše Mts., Králický Sněžník mountain range and Hrubý Jeseník Mts. (Dostál 1989, Jeník 1961, Procházka and Štech 2002). No attention to fungi on *Juncus trifidus* was paid and almost no data were published. Only one species (*Brunnipila calycioides*) was mentioned by Svrček (1993) from plant communities which are known from the Carpathians (Slovakia) and also from the Krkonoše Mts. (Czech Republic). One specimen of the species collected in Hrubý Jeseník by A. Pilát is housed in PRM and one locality was published by Suková (2003) from the Šumava Mts. Fungi on *Juncus trifidus* on the Polish side of Mt. Sněžka (Polish part of the Krkonoše Mts.) were investigated by Chlebicki (1990a, 2002).

METHODS

Almost all known localities of *Juncus trifidus* in the Czech Republic were recurrently visited. From Mt. Šerák in the Hrubý Jeseník Mts. only a herbarium specimen was seen. More (mycologically not yet studied) localities of *Juncus trifidus* are known from the Krkonoše Mts. and the Hrubý Jeseník Mts. (see Jeník 1961: 32, 309–314). Unless stated otherwise, dried material was prepared in water under a stereomicroscope and studied under a light microscope, using Nomarski contrast. The amyloid reaction of the asco-apical apparatus (I+, I-) was examined in Melzer's reagent (MLZ). Descriptions are based on studied material, which is deposited in the Herbarium of the Mycological Department, National Museum, Praha (PRM 618868, 896497, 900000, 901483–901552) and the Herbarium of the Department of Botany, Charles University, Praha (PRC). Unless stated otherwise, the specimens were collected and identified by M. Suková. The abbreviation "not." was used for scanty material, not worth to be kept in herbarium, but sufficient for microscopic study, identification and confirmation of the occurrence at the locality. For morphological terms used for the occurrence of fungi on various parts of *Juncus trifidus* see Fig. 1.

Localities and character of studied *Juncus trifidus* populations

1: Western Bohemia/Germany, Šumava Mts./Bayerischer Wald Mts., 6.5 km SW of the village of Zelená Lhota, Mt. Velký Ostrý/Gr. Osser and rock ridge going SE from the peak, alt. 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,

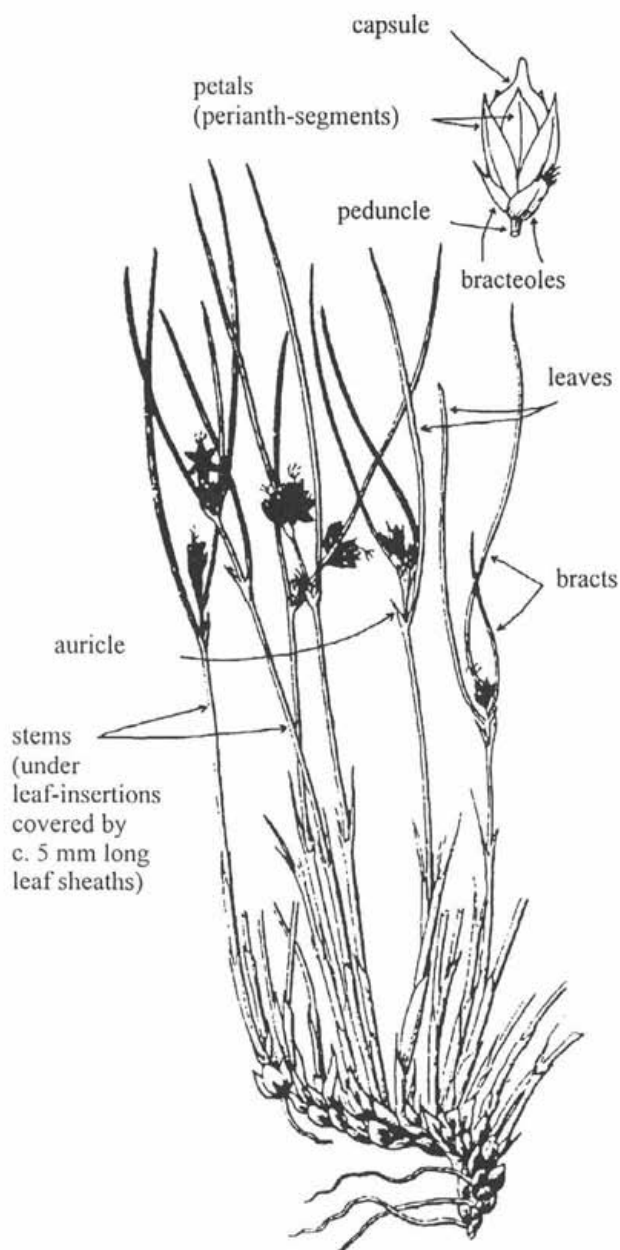


Fig. 1. Morphological terms used for the location of occurrence of fungi on various parts of shoots (aboveground parts of plants) of *Juncus trifidus*. Lower leaves and their long sheaths were often missing in collections, so especially upper leaves with sheaths about 5 mm long were examined. The schematic drawing of a living plant is taken over from Dostál (1989).

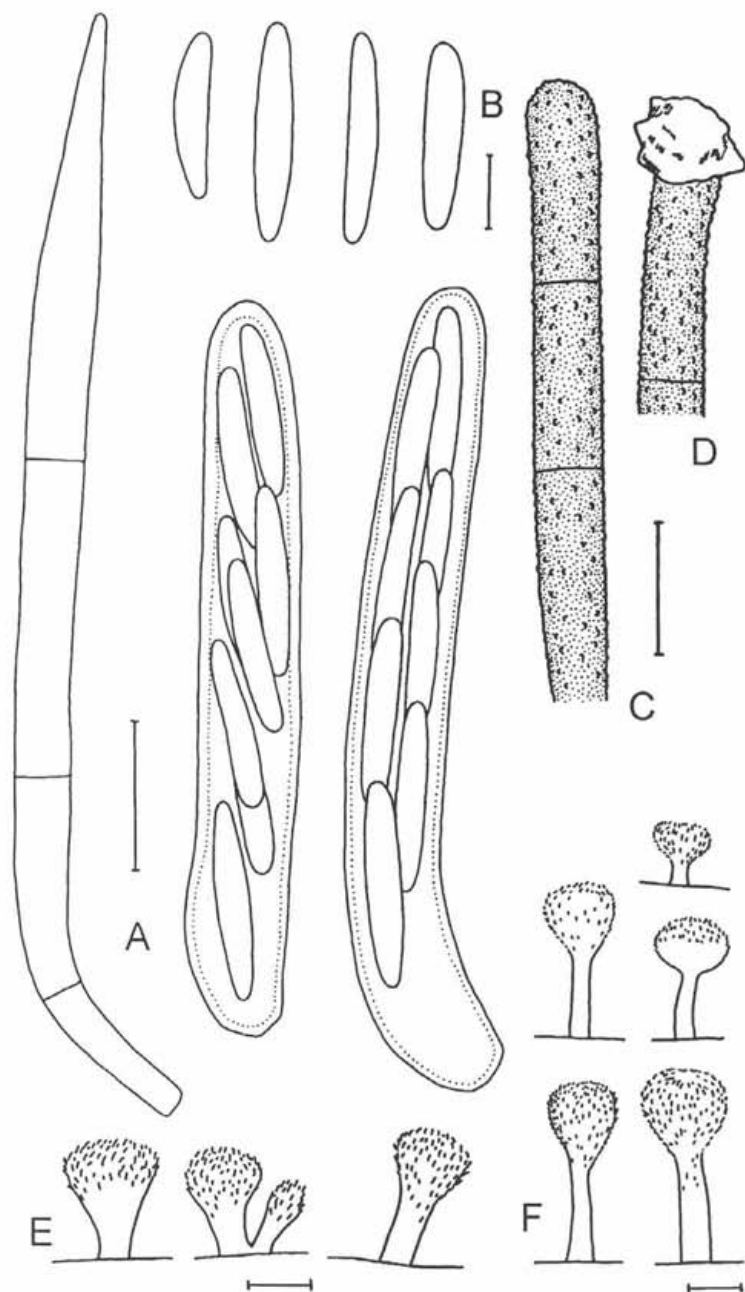


Fig. 2. *Brunnipila calycioides* (Rehm) Baral (in MLZ): A: paraphyse and asci; B: ascospores; C-D: hairs (C: PRM 901518, D: PRM 618868); E-F: shape of dried apothecia (E: PRM 618868, F: PRM 901519). Scale bars: A: 10 μm ; B: 5 μm ; C-D: 10 μm ; E-F: 100 μm .

alt. 1300–1315 m, 49° 10' 12.5" N, 13° 10' 21" E; stands and isolated tufts on rocks. – **3:** Eastern Bohemia/Poland, Krkonoše Mts./Karkonosze Mts., SE and E side of peak of Mt. Sněžka/Snieżka, alt. 1560–1590(–1600) m; large terrestrial stands with scattered stones. – **4:** Eastern Bohemia, Králický Sněžník mountain range, Vlaštovčí skály rocks c. 850 m SW of peak of Mt. Králický Sněžník, alt. 1260–1290 m; scattered tufts on rocks. – **5:** Northern Moravia, Hrubý Jeseník Mts., 4.5 km ESE of the village of Ramzová, Mt. Keprník, alt. 1415–1423 m, 50° 10' 13" N, 17° 06' 59.5" E; mostly terrestrial stands, less frequent stands on small rocks. – **6:** Northern Moravia, Hrubý Jeseník Mts., 5.5 km SE of the village of Ramzová, Mt. Vozka, alt. 1360–1370 m, 50° 08' 47" N, 17° 08' 11" E; stands on rocks and among stones. – **7:** Northern Moravia, Hrubý Jeseník Mts., Mt. Červená hora, small E oriented rock between Červená hora peak and Kamenné okno rock, alt. c. 1300 m, 50° 08' 44.5" N, 17° 08' 09.5" E; 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, alt. 1430 m; two tufts on ENE slope of the rock.

RESULTS AND DISCUSSION

Fungi collected on *Juncus trifidus*

ASCOMYCETES

Brunnipila calycioides (Rehm) Baral et Krieglst., Beih. Zeitschr. Mykol., 6: 49, 1985.

Syn.: *Lachnum calycioides* (Rehm) Rehm, Ascomyceten in Rabenhorst's Krypt.-Fl. Deutschl., Oest. und Schweiz, 1/3: 909, 1893.

Bas.: *Dasyscypha calycioides* Rehm, Ber. Naturhist. Ver. Augsburg 26: 42, 1881. Fig. 2.

Description: Apothecia stipitate, brown with brown hairs and whitish-greyish yellow discs, 180–450 μm in diam. Stipes at least in lower parts dark brown, up to 400 μm long. Hairs 56–72 \times 4.3–6.3 μm (width measured in apical parts), cylindrical, brown, incrustated, mostly 2–3-septate, lateral wall of cells of hairs about 0.5–0.7 μm thick (thicker in young hairs). Asci (35–)50–57 \times 5.5–6 μm , asco-apical apparatus I– in MLZ, I+ in MLZ only after pretreatment in 5% KOH solution. Ascospores biseriata, one-celled, 9–12 \times 2–2.5 μm , straight, rarely slightly curved, hyaline. Paraphyses lanceolate, 3.3–4 μm wide, distinctly exceeding asci by 8.5–19.5 μm .

Habitat: On dead stems, leaves, bracts and peduncles of *Juncus trifidus*. It was observed almost in all studied parts of the plants except of the capsules. It was rarely observed also on lying old, conglomerated stems.

Material studied: Šumava Mts.: Velký Ostrý (loc. 1), 31 May 2003, PRM; Šumava Mts., Jezerní stěna (loc. 2), 14 May 2002, PRM. – Krkonoše Mts., Sněžka (loc. 3), 5 June 2002 (PRM 901552) and 13 July 2002 (PRM 901518, 901519). – Králický Sněžník (loc. 4): 23 July 1999, PRC; 19 May 2002 and 7 July 2002, PRM. – Hrubý Jeseník Mts.: Mt. Šerák, July 1947, leg. A. Pilát, det. M. Svrček, rev. M. Suková, PRM 618868; Keprník (loc. 5), 5 July 2002, PRM; Vozka (loc. 6), 5 July 2002, PRM; Červená hora (loc. 7), 5 July 2002, not. M. Suková (one apothecium only); Petrovy kameny (loc. 8), 21 May 2002 and 4 July 2002, PRM.

Comments: In the collected material, apices of hairs of young apothecia were often paler than other parts of hairs. The stipe or base of the stipe is usually brown to dark brown, the cup (or also upper part of the stipe) is paler and covered by hairs. Older, dark brown, long stalked apothecia with only a palisade of 3-celled hairs at the margin were found on Mt. Sněžka (PRM 901518). Other outer parts than the margin were dark brown, with blackened surface cells, without hairs.

In material from the Hrubý Jeseník Mts. and Králický Sněžník mountain range also some apothecia bearing hairs with a hyaline refractive matrix on hair apices (resembling primordia of apical crystals known e.g. in *Brunnipila clandestina*) and sometimes also well-developed apical crystals were observed. It was frequent especially in the material from Mt. Šerák and Mt. Vozka in the Hrubý Jeseník Mts. The presence of an amorphous matrix was already described by Scheuer (1988), and the crystals were reported by Breitenbach and Kränzlin (1984).

Brunnipila calycioides is the most frequent and abundant fungus species on *Juncus trifidus* in the Czech Republic. It is also known from other *Juncus* species, especially *Juncus filiformis* (Suková et al. 2003), *J. squarrosus* and rarely also *J. effusus* in the Czech Republic, where it is distributed from the supramontane to the alpine belt. It has been recorded on *Juncus trifidus* at the Polish side of Mt. Sněžka in the Karkonosze Mts. (Chlebicki 1990a) and on the Jezerní stěna rock wall (loc. 2) in the Šumava Mts. (Suková 2003). In Central Europe, the species has been reported on *Juncus trifidus* also from the Tatry Mts. (e.g. Velenovský 1934, Scheuer and Chlebicki 1997, Chlebicki 2002), Nízke Tatry Mts. (Svrček 1962), Babia Góra mountain range (Chlebicki 1990b) and from the Eastern Alps (Scheuer 1988). It has been reported from various *Juncaceae* and *Cyperaceae* (Scheuer 1988).

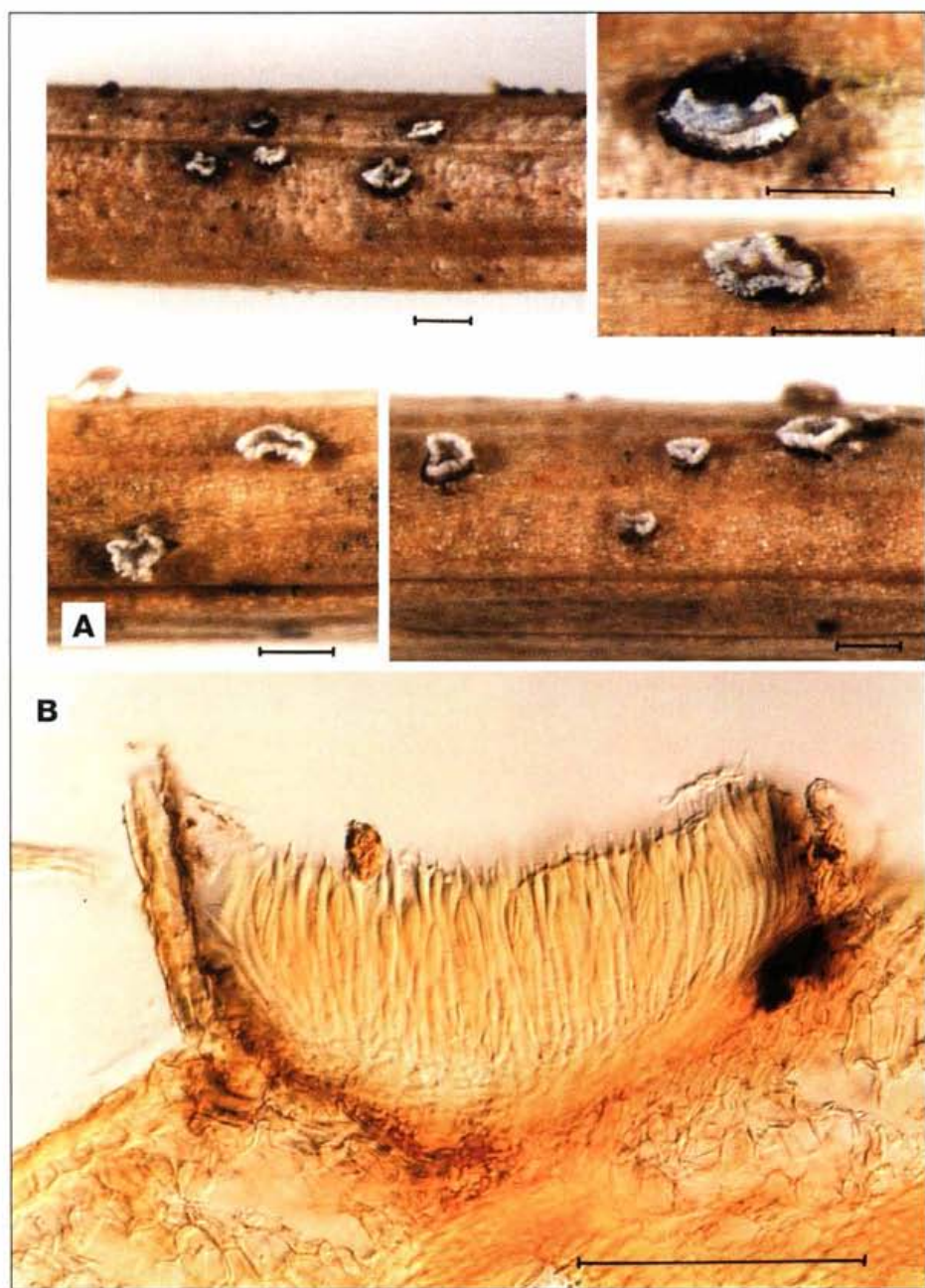


Fig. 3. A: *Hysteronaevia minutissima* (Rehm) Nannf.: apothecia; B: *Hysteropezizella diminuens* (P. Karst.) Nannf.: apothecium in longitudinal section (in MLZ). Scale bars: A: 250 μ m; B: 100 μ m.

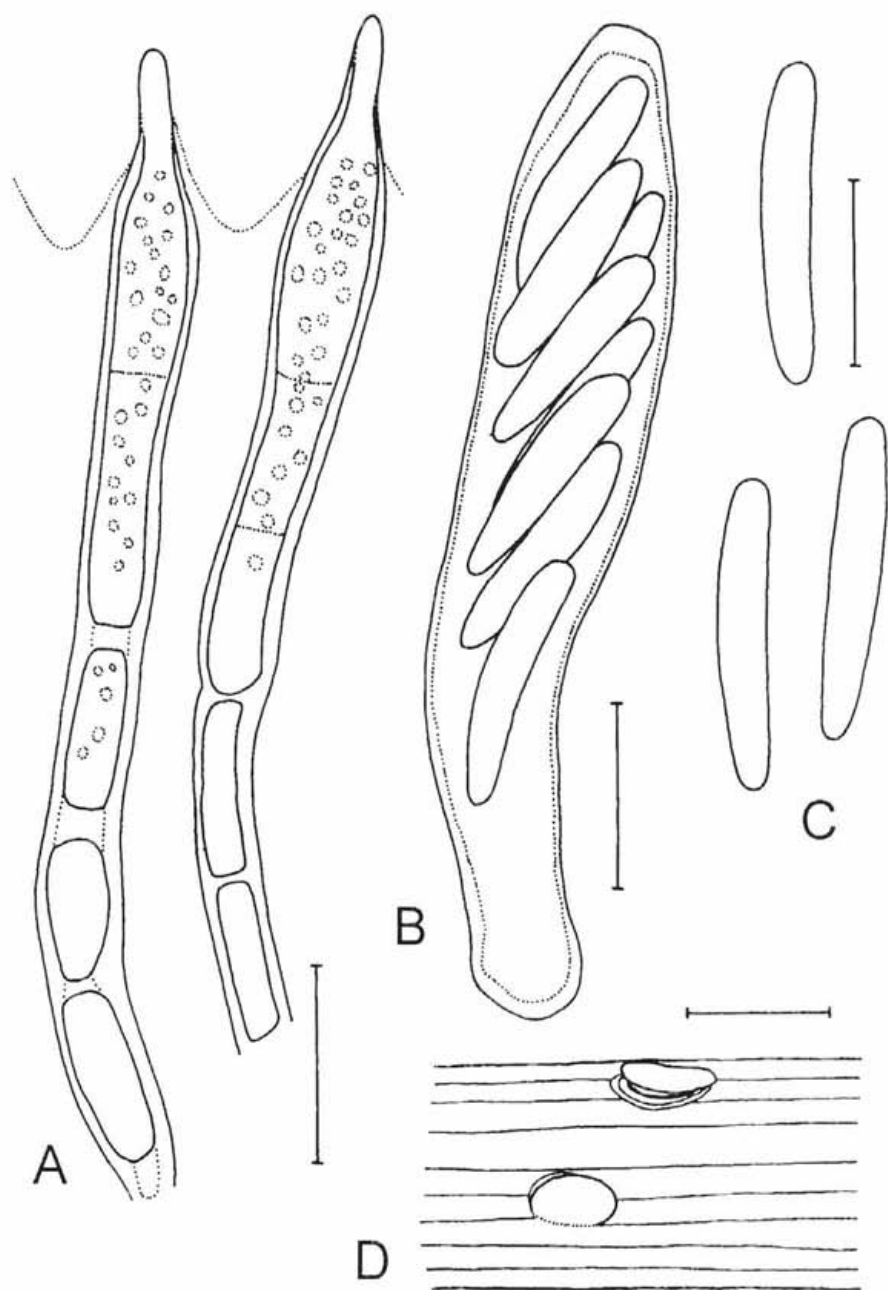


Fig. 4. A-D: *Hysteropezizella diminuens* (P. Karst.) Nannf. (in MLZ): A: paraphyses; B: ascus; C: ascospores; D: apothecia. Scale bars: A-C: 10 μm ; D: 500 μm .

Hysteronaevia minutissima (Rehm) Nannf., Nord. J. Bot. 4: 242, 1984.

Bas.: *Belonidium juncisedum* var. *minutissimum* Rehm, Ascomyceten in Rabenhorst's Krypt.-Fl. Deutschl., Oest. und Schweiz, 1/3: 568, 1891.

Fig. 3A.

Description: Apothecia erumpent by a longitudinal slit in the surface of plant tissues, black with white fringed margin and grey surface of the hymenium, rounded, slightly elongated in the direction of the stem, (140-)170-200(-340) μm long when fresh, remaining protruded on drying. Microcharacters observed in MLZ in slides from fresh material and in water from dried material: Excipulum in water composed of light brown, elongated, thin-walled cells, 9.5-12.5 \times 6.5-10 μm . Surface layer of excipulum dark brown, marginal hyphae brown to light beige-brown, apical cells of the hyphae slightly tapering to the rounded tips. Asci I-, 74-88 \times 10-12 μm in MLZ, 8.5-9 μm wide in water, clavate, apically conical. Ascospores biserial, hyaline, one-celled, almost straight, (20-)21-23 \times 3-3.7(-4) μm in MLZ, 17-20 \times 3 μm in water, guttulate. Paraphyses hyaline, filiform with rounded to slightly acute tips, 2-3.3 μm wide.

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

Material studied: Šumava Mts., Jezerní stěna (loc. 2), 28 July 2002, leg. et det. M. Suková, rev. C. Scheuer, PRM 900000.

Comments: An ascospores size of 15-21(-23) \times 2-2.5(-3) μm is given in Nannfeldt's description (Nannfeldt 1984). Wider ascospores were seen in material from the Czech Republic, however, it was in the range of variability of this species.

I found *Hysteronaevia minutissima* only on two tufts of *J. trifidus* in a gorge between rocks (loc. 2). The shoots of the tufts hung down over a slanting stone. Probably it also occurs in other (not yet examined) parts of the population of *J. trifidus* at the locality.

Hysteronaevia minutissima is an arcto-alpine species, reported here for the first time from the Czech Republic. Nannfeldt (1984) reported the species on *Juncus trifidus* from Mt. Arber (Javor) in the German part of the Šumava Mts. (Bayerischer Wald). It is known on *Juncus trifidus* also from Scandinavia, from the Alps in Austria (Nannfeldt 1984, Scheuer 1988) and from the Chornohora Mts. in Ukraine (Chlebicki 2002).

Hysteronaevia minutissima has been reported from *Juncus gerardii*, *J. hostii*, *J. jacquinii*, *J. trifidus* and *J. monanthos* (Rehm 1891, Nannfeldt 1984, Scheuer 1988).

Hysteropezizella diminuens (P. Karst.) Nannf., Nova Acta Reg. Soc. Sci. Upsal. ser. 4, 8(2): 114, 1932.

Bas.: *Trochila diminuens* P. Karst., F. fenn. n. 851, 1869 (not seen).

Figs. 3B, 4A-D.

Description: Apothecia black or dark grey with white margin, 150–350 μm in diam., often slightly elongated in the direction of the stem or bract, immersed, exposed by 'cutting off' a lid (as wide as the apothecium) composed of plant-tissue. Excipulum most well-developed in lateral wall of apothecium, composed of elongated, pale greyish brown, thin-walled cells. Asci 47–60 \times (7.5–)9.5–12 μm , 8-spored, clavate, asco-apical apparatus distinctly I+ in MLZ after pretreatment in 5% KOH solution, only slightly I+ without pretreatment. Ascospores biseriate, one-celled, 13.5–17.5 \times 2.5–3 μm , straight, rarely slightly curved, hyaline, often biguttulate. Paraphyses lanceolate, 4.2–6 μm wide, exceeding asci by 16–24 μm , apical parts embedded in a hyaline, slightly granular substance.

Habitat: On dead stems (also basal parts of stems) and bracts of *Juncus trifidus*.

Material studied: Šumava Mts.: Velký Ostrý (loc. 1, both Czech and German side), 31 May–1 June 2003, PRM, young and old material; Jezerní stěna (loc. 2), 28 July 2002, PRM. – Karkonosze Mts. (Poland), Snieżka (loc. 3), 21 October 1996, leg. et det. A. Chlebicki, rev. M. Suková, KRAM F, old material. – Králický Sněžník (loc. 4): 23 July 1999, PRC; 7 July 2002, PRM. – Hrubý Jeseník Mts.: Vozka (loc. 6), 5 July 2002, PRM; Červená hora (loc. 7), 5 July 2002 and 17 May 2003, PRM.

Comments: The asco-apical apparatus was only slightly amyloid in Melzer's reagent, when dried material had been rehydrated in water before studying. After pretreatment in 5% KOH solution it was distinctly amyloid in MLZ. Défago (1968) and Scheuer (1988) described amyloid reaction in Lugol's solution.

Hysteropezizella diminuens is known from various *Poaceae*, *Cyperaceae* and *Juncaceae* (Défago 1968, Scheuer 1988). I have collected this species only on *Juncus trifidus* in the Czech Republic. It is fructifying in July and August. However, young apothecia still covered by a continuous layer of plant-tissues are present already in the spring. The hymenium in these young apothecia contains only septate hyphae with rounded to slightly conical tips. Lanceolate paraphyses and asci are not developed at this stage.

The species has been reported on various host plants from the Eastern Alps (Scheuer 1988, Magnes and Hafellner 1991), Sudetes (Schröter 1893–1908, Chlebicki 2002), Tatra Mts. (Hruby 1932, Scheuer and Chlebicki 1997), Greenland (Défago 1968), Faeroe Islands, Alaska, Iceland and Canada (see Chlebicki 2002). From the Czech Republic, this arcto-alpine species is reported for the first time. Schröter (1893–1908) published it from the Polish side of the Krkonoše Mts. on

leaves of *Carex*. Chlebicki (2002) reported it on *Juncus trifidus* from the Polish side of Mt. Sněžka. I have collected only material that is too young for identification on Mt. Sněžka (loc. 3).

Lachnum roseum (Rehm) Rehm, Ascomyceten in Rabenhorst's Krypt.-Fl. Deutschl., Oest. und Schweiz, 1/3: 882, 1893.
Bas.: *Dasyscypha rosea* Rehm, Ber. Naturhist. Ver. Augsburg 26: 41, 1881.

Description: Apothecia sessile or shortly stipitate, 270–300 μm in diam., light-coloured. Hairs hyaline or with slight brown-rose tint, thick-walled, incrustate, $37\text{--}43 \times 3\text{--}3.7 \mu\text{m}$, mostly 1-septate, with apical octahedral crystals (5–10 μm high, 9–11 μm wide). Paraphyses lanceolate, 2.2–2.8 μm wide, up to 5 μm longer than immature asci.

Habitat: On old, dead, conglomerated stems of *Juncus trifidus* lying in litter.

Material studied: Šumava Mts., Jezerní stěna (loc. 2), 14 May 2002, PRM 896497, two apothecia only.

Comments: The presence of distinct octahedral crystals on the apices of hairs agrees with the description in Scheuer (1988). Colour and shape of the apothecia is in agreement with Rehm (1893), Raitviir (1970) and Scheuer (1988). The smaller diameter of the apothecia, shorter, narrower and only one-septate hairs and the narrower paraphyses only slightly exceeding asci are probably a consequence of studying too young, not yet developed material.

In the Czech Republic it was found only at one locality in the Šumava Mts. The nearest known localities are in the Alps (Scheuer 1988, Nogrsek and Matzer 1994). It is known also from the Vysoké Tatry Mts., Nízke Tatry Mts. (Svrček 1962) and Kremnické vrchy Mts. (Mihál sec. Škubla 2003) in Slovakia. Scheuer (1988) reported it from *Juncus trifidus*, *Carex ferruginea* and *Trichophorum cespitosum*, Nogrsek and Matzer (1994) from *Sesleria varia* and Svrček (1962) from *Nardus stricta*.

Mycosphaerella perexigua (P. Karst.) Johanson var. **minima** Johanson, Öfvers. af Kongl. Vetenskaps-Akad. Förh. 41/9[1884]: 166, 1885. Fig. 5A.

Description: Ascomata immersed, (35-)45–50(-60) μm in diam. Wall blackish brown to brown or light brown, textura angularis composed of cells $5.5\text{--}8 \times 5\text{--}6.2 \mu\text{m}$ in surface view. Ascoma containing 5–9 mature asci and 2–6 young asci (without spores and mostly without developed thickened wall in upper part). Asci bitunicate with wall thickened in upper part, as typical in *Mycosphaerella*, $23\text{--}27(-31) \times (7.5\text{--})9\text{--}11.5(-13) \mu\text{m}$, (5-)8-spored. Ascospores hyaline, two-celled, mostly without

constriction at septum or slightly constricted, $12-17.5 \times 2.5-3.3 \mu\text{m}$ (in asci $10-15 \times 1.5-2.8 \mu\text{m}$), often 4-guttulate.

Habitat: On dead stems, sheaths, leaves, bracts, peduncles and only rarely on petals of *Juncus trifidus*.

Material studied: Šumava Mts.: Velký Ostrý (loc. 1, both Czech and German side), 31 May 2003, PRM; Jezerní stěna (loc. 2), 14 May 2002, PRM. – Karkonosze Mts. (Poland), Sněžka (loc. 3), 5 June 2002, PRM. – Králický Sněžník (loc. 4), 18 May 2002, PRM. – Hrubý Jeseník Mts.: Keprník (loc. 5), 17 May 2003, PRM; Vozka (loc. 6), 21 March 2004, not. M. Suková (too young material); Petrovy kameny (loc. 8), 21 May 2002, PRM.

Comments: It is a common fungus on *Juncus trifidus* and *Juncus filiformis* (see Suková et al. 2003) in the Czech Republic. The Czech material was identified according to Johanson (1885), Tomilin (1979) and Scheuer (1988), and agrees especially with Scheuer's description, including the fact that the fungus mostly occurs in parts of plants with a well-developed cuticula. This variety is known from various *Cyperaceae* and *Juncus* spp. (Scheuer 1988, Magnes and Hafellner 1991, Suková et al. 2003). In comparison with my material from *J. trifidus*, Magnes and Hafellner (1991) observed longer asci and ascospores more distinctly constricted at the septa in material from *Cyperaceae*. Johanson (1885) mentioned ascospores not being constricted at the septa in the original description based on material from *Scirpus caespitosus*, syn. *Trichophorum caespitosum* (see Tutin et al. 1980). According to my observation, at least the non-constricted and slightly constricted ascospores are in the range of variability of the variety.

Ascomata located strictly under stomata of *Juncus trifidus* were observed in the material from Králický Sněžník (loc. 4).

Naeviella paradoxa (Rehm) Clem., Gen. fung., p. 174, 1909.

Bas.: *Naevia paradoxa* Rehm, Ber. Naturhist. Ver. Augsburg 26: 102, 1881.

Description: Apothecia in dried material dark brownish black, rounded, slightly elongated in the direction of the *Juncus trifidus* bracts, $100-180 \mu\text{m}$ long, $70-120 \mu\text{m}$ wide, erumpent through surface plant tissues by several irregular valves. Asci I-, $42.5-55 \times 7.5-9.7 \mu\text{m}$, 8-spored, clavate. Ascospores biseriate, one-celled, $11-13 \times 3-4.2 \mu\text{m}$ (measured only in asci), straight or almost straight, hyaline, with two big and several smaller guttules. Paraphyses filiform, hyaline, septate, branched, with slightly enlarged, light brown ($1.2-2.5 \mu\text{m}$ wide) to conspicuously enlarged, rounded, brown-coloured apices ($4-4.5 \mu\text{m}$ wide), apices sometimes surrounded by a brown, finely granular extracellular matrix $5.5-8(-9) \mu\text{m}$ wide.

Habitat: On dead, overwintered bracts of *Juncus trifidus*.

Material studied: Krkonoše Mts., Sněžka (loc. 3), 5 June 2002, PRM.

Comments: In the Czech Republic, this arcto-alpine species was found only at the locality with the highest altitude, Mt. Sněžka. The nearest known locality is Liliowe pass between the Zachodnie Tatry Mts. and the Wysokie Tatry Mts. (Scheuer and Chlebicki 1997). It has also been reported from the Alps (Nannfeldt 1982, Scheuer 1988), Scandinavia and Greenland (Nannfeldt 1982). According to Nannfeldt (1982) it is known only from *Juncus trifidus* and *J. monanthos*. Scheuer (1988, 1999) recorded a very similar fungus (*Naeviella* cf. *paradoxa*) with slightly shorter ascospores on *Elyna myosuroides*.

Niptera eriophori (Opiz) Rehm, Ber. Bayer. Bot. Ges. 14: 103, 1914.

Bas.: *Peziza eriophori* Opiz, Lotos 5: 86, 1855.

Description: Apothecia sessile, 180–400 μm in diam., brown, erumpent through surface tissues of the plant during their ontogenesis, finally superficial. Excipulum of a textura angularis, cells isodiametric, light brown to brown, 6.5–10 \times 6–7.5 μm in view on surface. Marginal cells brown, smooth, 7.5–10.5 \times 5.5–7.5 μm . Asci 72–80 \times 10.5–15.5 μm , 8-spored, asco-apical apparatus I+ in MLZ. Ascospores biseriate, two-celled, hyaline, 15–17.5 \times 4.8–5.5 μm . Paraphyses filiform, hyaline, septate, branched, in upper part slightly enlarged, 1.8–3 μm wide.

Habitat: On dead stems (especially in their upper part) and bracts of *Juncus trifidus*.

Material studied: Šumava Mts.: Velký Ostrý (loc. 1), 1 June 2003, PRM; Jezerní stěna (loc. 2), 28 July 2002, PRM. – Krkonoše Mts., Sněžka (loc. 3), 5 June and 13 July 2002, PRM. – Králický Sněžník (loc. 4): 23 July 1999, PRC; 18 May 2002 and 7 July 2002, PRM. – Hrubý Jeseník Mts.: Keprník (loc. 5), 5 July 2002, PRM; Vozka (loc. 6), 5 July 2002, PRM.

Comments: Common species on various *Juncaceae* and *Cyperaceae*. On *Juncus trifidus* it occurred on stems and especially bracts lying for example on or in moss cushions. On the Jezerní stěna rock wall, which possesses good air-humidity conditions, it was found on stems and bracts caught in *Calluna vulgaris* growing on a rock.

In a previous work focusing on *Juncus filiformis* (Suková et al. 2003), *Niptera eriophori* was published with an erroneous citation of the authors' names (as *Niptera eriophori* (L. A. Kirchn.) Rehm). The species was not mentioned in Kirchner's publications (Kirchner 1856). The protologue is in Opiz (1855) and the correct author's citation is *Niptera eriophori* (Opiz) Rehm (see also Magnes and Hafellner 1991). The incorrect basionym *Peziza eriophori* L. A. Kirchn. was given by Rehm (1891) for the first time and taken over by later authors cited in Nannfeldt (1983).

COELOMYCETES

Dinemasporium strigosum (Pers.: Fr.) Sacc., *Michelia* 2: 281, 1881.

Bas.: *Peziza strigosa* Pers., *Syn. method. fung.*, p. 648, 1801.

Fig. 5B.

Description: Conidiomata black, densely setose. Setae $150-340 \times 6-9 \mu\text{m}$, dark brown, septate, medially thick-walled, gradually attenuated to tips. Conidia one-celled, hyaline, nearly straight to slightly curved, with appendages at each end, $10.5-13 \times 2.3-3 \mu\text{m}$ (measured without appendages), appendages $6.5-8.5 \mu\text{m}$ long.

Habitat: On dead stems, leaves, bracts, peduncles, petals and rarely also on capsules of *Juncus trifidus*.

Material studied: Šumava Mts.: Velký Ostrý (loc. 1, both Czech and German side), 31 May–1 June 2003, PRM; Jezerní stěna (loc. 2), 14 May 2002, PRM; 28 July 2002, PRM, old material. – Krkonoše Mts., Sněžka (loc. 3), 5 June 2002, PRM. – Králický Sněžník (loc. 4), 7 July 2002, PRM. – Hrubý Jeseník Mts.: Keprník (loc. 5), 5 July 2002, PRM; Vozka (loc. 6), 5 July 2002, PRM.

Comments: Common species occurring on various host plants from *Poaceae* to *Juncaceae* and *Cyperaceae*, from lowlands to mountains. It is frequent on *Juncus trifidus*.

Septoria sp.

Fig. 5C.

Description: Conidiomata immersed, $40-77 \times 40-56 \mu\text{m}$, about $45-50 \mu\text{m}$ high, in upper part with a large, irregularly rounded opening ($21.5-23.5 \times 17.5-22 \mu\text{m}$) as typical of *Septoria*. Wall composed of a *textura angularis* with greyish-brown, angular cells ($5.5-7.5 \times 3.3-5.7 \mu\text{m}$) in surface view; in longitudinal section composed of oval, elongated cells ($4.7-7.5 \times 1.3-1.8 \mu\text{m}$). Conidia hyaline, smooth, straight to slightly curved, attenuated at apical ends, slightly tapering to truncate basal ends, 1-2-celled, two-celled: $23-25.5 \times 1.8-2.1 \mu\text{m}$, one-celled: $16.5-22.5 \times 1.7-2.1 \mu\text{m}$.

Habitat: On withering bracts of living plants of *Juncus trifidus*.

Material studied: Krkonoše Mts., Sněžka (loc. 3), 13 July 2002, PRM.

Comments: My collection differs from *Septoria* sp. 1 and *Septoria* sp. 2 reported from *Juncus trifidus* by Chlebicki (2002). It is more similar to *Septoria* sp. 2, which has one-septate conidia, but it differs in having distinctly smaller conidiomata and shorter conidia. Identification according to Teterevnikova-Babajan (1987: 232-233) and Saccardo (1892: 381-387) was not successful.

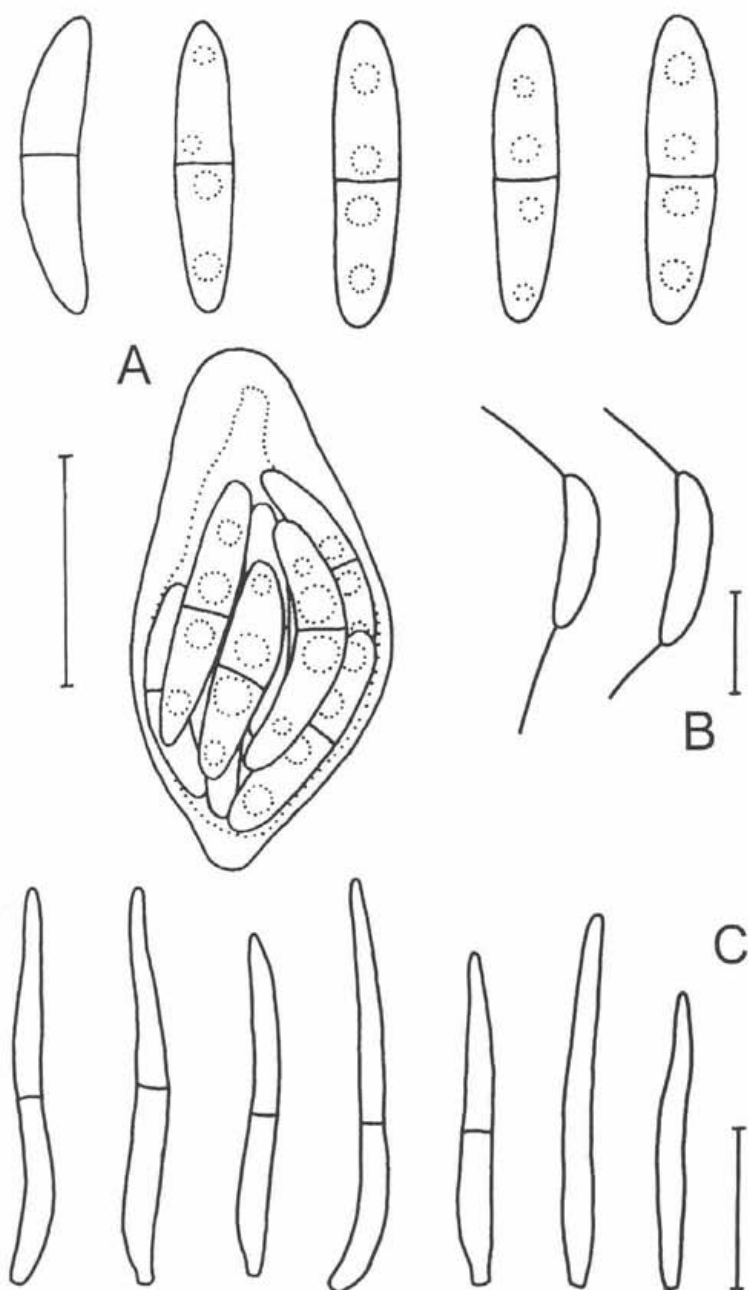


Fig. 5. Conidia: A: *Mycosphaerella perexigua* (P. Karst.) Johanson var. *minima* Johanson (in water): ascus and ascospores; B: *Dinemasporium strigosum* (Pers.: Fr.) Sacc. (in MLZ); C: *Septoria* sp. (in water). Scale bars: A: 10 μ m; B: 5 μ m; C: 10 μ m.

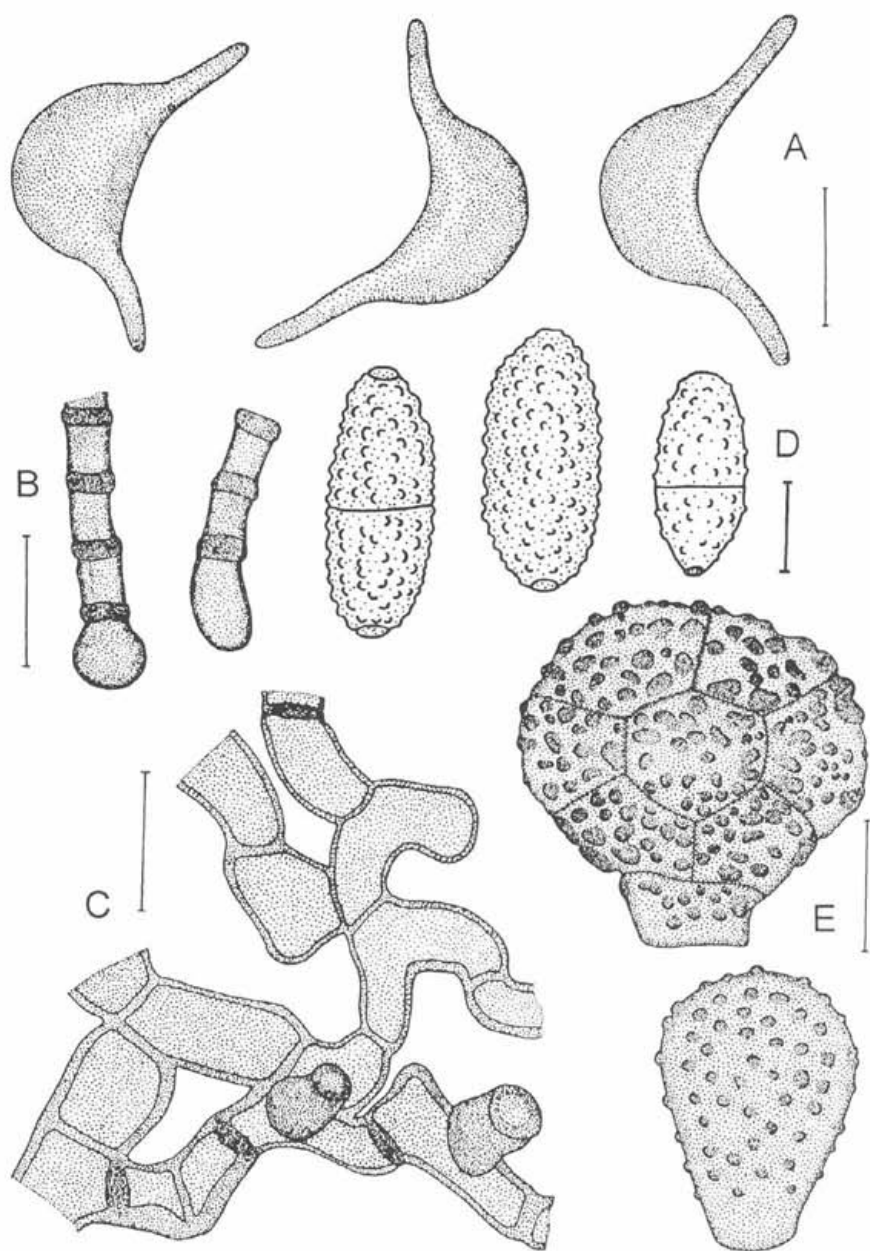


Fig. 6. A-C: *Arthrimum cuspidatum* (Cooke et Harkn.) Höhn. (in MLZ): A: conidia; B: conidiophores; C: hyphae with mother cells of conidiophores; D: *Cladosporium herbarum* (Pers.: Fr.) Link (in MLZ): conidia; E: *Epicoccum nigrum* Link (in MLZ): conidia. Scale bars: A-C: 10 μm ; D: 5 μm ; E: 10 μm .

HYPHOMYCETES

Arthrimum cuspidatum (Cooke et Harkn.) Höhn., Mitt. Bot. Inst. Tech. Hochsch. Wien 2: 15, 1925.

Bas.: *Camptoum cuspidatum* Cooke et Harkn., Grevillea 12: 33, 1883.

Syn.: *Arthrimum bicornis* Rostr., Bot. Tidsskr. 15: 235, 1886. Fig. 6A-C.

Description: Colonies on surface of plant tissues brownish black to black, rounded to ellipsoid, 400–700 μm in diam. Hyphae 3.5–6 μm wide, pale brown, septate, branched and anastomosing. Mother cells of conidiophores 5.5–10 \times 4.5–7 μm , ampulliform, dark brown. Conidiophores 18–30 \times 4.5–5.5 μm , light brown, with distinct, thick, dark brown septa, unbranched. Conidia brown, curved, with two outward curved horns, 22–31 (measured incl. horns) \times 8.5–9 μm , horns 8–12 μm long.

Habitat: On dead stems, sheaths, leaves, bracts and peduncles of *Juncus trifidus*. It was also abundant on long leaf sheaths at the base of plants.

Material studied: Šumava Mts.: Velký Ostrý (loc. 1, both Czech and German side), 31 May 2003, PRM; Jezerní stěna (loc. 2), 14 May 2002, PRM. – Krkonoše Mts., Sněžka (loc. 3, both Czech and Polish side), 5 June 2002, PRM. – Králický Sněžník (loc. 4), 18 May 2002, PRM. – Hrubý Jeseník Mts.: Keprník (loc. 5), 17 May 2003, PRM; Vozka (loc. 6), 17 May 2003, PRM; Vozka (loc. 6), 21 March 2004, leg. et det. M. Suková et A. Chlebicki, PRM; Petrovy kameny (loc. 8), 21 May 2002, PRM.

Comments: Common species on *Juncus* spp., occurring from the supramontane to the alpine belt in the Czech Republic (Suková et al. 2003) and sporulating on *Juncus trifidus* especially from March to May. The occurrence of *Arthrimum cuspidatum* especially at bases of shoots and that of *Brunnipila calycioides* in upper parts of shoots was observed at the locality Sněžka (loc. 3).

It was reported on various *Juncus* species, e.g. by Lindau (1906, 1910) from Switzerland and Scandinavia, and a collection on *Juncus filiformis* from Sweden was distributed by Kabát et Bubák (Fungi imperfecti exsiccati, fasc. 7, no. 340, 1906), both under the name *Arthrimum bicornis* Rostr. Cooke (1954) reported it also from *Cyperaceae*. Recently *A. cuspidatum* has been published on *Juncus trifidus* from the Eastern Alps (Scheuer 1996), Western Sudetes (Chlebicki 2002) and Carpathians (Scheuer and Chlebicki 1997).

Botrytis cinerea Pers.: Fr., Syst. mycol., vol. 3(2), p. 396, 1832. *Botrytis cinerea* Pers., Syn. method. fung., p. 690, 1801.

Description: Sclerotia black, immersed, erumpent through surface plant tissues or only conidiophores growing through the tissues. Conidiophores brown, septate in intervals of 48–90 μm , branched, cells c. 18–24 μm wide, usually

constricted at the septa to 16.5–19 μm . Conidia 9.7–15.5 \times 6–8.5(-10) μm , hyaline to subhyaline, smooth, ellipsoid to obovate, rounded at upper end, tapering to basal end, produced holoblastically at apices of conidiophores and branches.

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

Material studied: Šumava Mts.: Velký Ostrý (loc. 1, both Czech and German side), 31 May 2003, PRM. – Krkonoše Mts.: Sněžka (loc. 3), 25 September 1999, cultivated in moist chamber culture from 27 September to 19 October, PRC; Sněžka (loc. 3, both Czech and Polish side), 5 June 2002, PRM. – Králický Sněžník (loc. 4), 18–19 May 2002, PRM. – Hrubý Jeseník Mts.: Keprník (loc. 5), 5 July 2002, PRM; Červená hora (loc. 7), 5 July 2002 and 17 May 2003, PRM.

Comments: Common plurivorous species growing especially on dicotyledonous plants. Not so common on *Juncus trifidus*, but more frequent there than on other *Juncus* species.

Cladosporium herbarum (Pers.: Fr.) Link, Mag. Ges. naturf. Freunde 7: 37, 1815.
Bas.: *Dematium herbarum* Pers., Usteri's Ann. Bot. 11: 32, 1794. Fig. 6D.

Description: Conidiophores brown, nodose, 80–120 μm long, 5.5–7 μm wide, often arranged in tufts or in rows in the direction of the stem. Ramo-conidia rare. Conidia pale brown, verrucose, 0–1(-3)-septate, mostly 1-septate, (10-)11.5–18.5 \times 4–6.5(-8.5) μm , with scars on one or both ends.

Habitat: On dead stems, leaves, bracts, peduncles, bracteoles and petals of *Juncus trifidus*.

Material studied: Šumava Mts.: Velký Ostrý (loc. 1, both Czech and German side), 31 May–1 June 2003, PRM; Jezerní stěna (loc. 2), 14 May 2002, PRM. – Krkonoše Mts., Sněžka (loc. 3), 19 September 1998, PRC. – Králický Sněžník (loc. 4): 23 July 1999, PRC; 7 July 2002, PRM. – Hrubý Jeseník Mts., Vozka (loc. 6), 5 July 2003, PRM.

Comments: Common plurivorous species, frequent on *Juncus trifidus* especially at the end of summer. In the beginning of the next season usually only dead material of the fungus can be found.

Epicoccum nigrum Link, Mag. Ges. Naturf. Freunde 7: 32, 1815. Fig. 6E.

Description: Conidia brown, roughly verrucose, broadly obovate with truncate base, 14–17.5 high, 12–18 μm wide, arranged in rounded clusters ('tufts') 75–100 μm in diam. on surface of stems.

Habitat: On dead stems of *Juncus trifidus*.

Material studied: Bayerischer Wald Mts.: Gr. Osser (loc. 1, German side), 31 May 2003, PRM. – Krkonoše Mts., Sněžka (loc. 3), 19 September 1998, PRC. – Hrubý Jeseník Mts., Červená hora (loc. 7), 17 May 2003, PRM, old material.

Comments: Plurivorous species, occasionally found on *Juncus trifidus*. It was found together with *Cladosporium herbarum* at the end of summer.

Periconia atra Corda, Icon. fung. 1: 19, 1837.

Description: Conidiophores about 250–300 μm high (including heads), 16.5–18.5 μm wide in lower half, brown, septate, in upper part with branches arranged in verticils. Rarely divided into two branches, each of them with verticils. Conidia brown, rounded, verrucose, 5.5–9(-10) μm in diam.

Habitat: On dead stems, leaves, bracts, peduncles and petals of *Juncus trifidus*.

Material studied: Šumava Mts.: Velký Ostrý (loc. 1, both Czech and German side), 31 May–1 June 2003, PRM. – Krkonoše Mts., Sněžka (loc. 3), 13 July 2002, PRM. – Králický Sněžník (loc. 4), 19 May 2002, PRM. – Hrubý Jeseník Mts., Vozka (loc. 6), 21 March 2004, PRM.

Comments: Species known from various grasses, *Cyperaceae* and *Juncaceae* (Ellis 1971). In the Czech Republic it is common on *Juncaceae* from lowlands to mountains.

CONCLUSIONS

Distribution of fungi in studied localities (Tab. 1): Mt. Sněžka in the Krkonoše Mts. and Jezerní stěna rock wall in the cirque of Černé jezero lake in the Šumava Mts. are localities richest in fungi on *Juncus trifidus*. The population of *Juncus trifidus* on Mt. Sněžka is the biggest one in comparison with other localities in the Czech Republic and is situated at the highest altitude. Only there the arcto-alpine species *Naeviella paradoxa* was found, earlier known from the Alps, Tatra Mts. (Carpathians), Scandinavia and Greenland. The cirque of Černé jezero lake has specific climatic conditions (higher air humidity and less strong winds) whereas other studied Czech localities are mostly situated on open peaks or slopes. Three species (*Hysteronaevia minutissima*, *Hysteropezizella diminuens* and *Naeviella paradoxa*) considered arcto-alpine fungi by Chlebicki (2002) have been found in the Czech Republic for the first time. *Brunnipila calycioides* (see Suková et al. 2003), considered an arcto-alpine species by Chlebicki (2002), is distributed in the Czech Republic also at lower altitudes (from the supramontane to the alpine belt) than the above mentioned species.

Substrate specificity: *Botrytis cinerea*, *Cladosporium herbarum*, *Dinema-sporium strigosum*, *Epicoccum nigrum* and *Periconia atra* are common plurivorous

Tab. 1. Occurrence of fungi 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.

	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>	++++	++++	+++++	+++	++++	++++	++	+
<i>Arthrimum cuspidatum</i>	*	*	*	*	*	*		*
<i>Botrytis cinerea</i>	*		*	*	*		*	
<i>Brunnipila calycioides</i>	*	*	*	*	*	*	*	*
<i>Cladosporium herbarum</i>	*	*	*	*		*		
<i>Dinemasporium strigosum</i>	*	*	*	*	*	*		
<i>Epicoccum nigrum</i>	*		*				*	
<i>Hysteronaevia minutissima</i>		*						
<i>Hysteropezizella diminuens</i>	*	*	*	*		*	*	
<i>Lachnum roseum</i>		*						
<i>Mycosphaerella perexigua</i> var. <i>minima</i>	*	*	*	*	*	*		*
<i>Naeviella paradoxa</i>			*					
<i>Niptera eriophori</i>	*	*	*	*	*	*		
<i>Periconia atra</i>	*		*	*				
<i>Septoria</i> sp.			*					

species. *Hysteropezizella diminuens*, *Lachnum roseum* and *Niptera eriophori* are ascomycetes inhabiting various grasses, sedges and rushes. *Arthrimum cuspidatum*, *Brunnipila calycioides* and *Mycosphaerella perexigua* var. *minima* are known from *Juncaceae* and *Cyperaceae* only. *Hysteronaevia minutissima* is a species specific to *Juncus*. *Naeviella paradoxa* is known from *Juncus trifidus* and *J. monanthos* according to Nannfeldt (1982).

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