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Hyphomycetes from Canadian streams. VI. Rare species in pure cultures

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Marvanová L. and Bärlocher F. (2001): Hyphomycetes from Canadian streams. VI. Rare species in pure culture – Czech Mycol. 53: 1–28

We describe and illustrate a series of rare or inadequately known species of mitosporic fungi (hyphomycetes), which were isolated from foam from Canadian streams: *Alatospora constricta, Arborispora dolichovirga, Calcarispora hiemalis, Cladoconidium articulatum, Lateriramulosa quadriradiata, Sympodiocladium frondosum, Tetrabrunneospora ellisii, Tricladium caudatum, Trifurcospora irregularis, Triglyphium alabamense, Varicosporium trimosum. Ypsilina graminea* is reported with microconidial state.

Key words: aquatic hyphomycetes, species descriptions, distribution in Canada.

Marvanová L. a Bärlocher F. (2001): Hyfomycety kanadských toků. VI. Vzácné druhy v čistých kulturách – Czech Mycol. 53: 1–28

V článku popisujeme a zobrazujeme některé vzácné nebo málo známé druhy hyfomycetů, které byly izolovány z pěny na kanadských potocích a řekách: *Alatospora constricta, Arborispora dolichovirga, Calcarispora hiemalis, Cladoconidium articulatum, Lateriramulosa quadriradiata, Sympodiocladium frondosum, Tetrabrunneospora ellisii, Tricladium caudatum, Trifurcospora irregularis, Triglyphium alabamense, Varicosporium trimosum.* Pro druh *Ypsilina graminea* bylo zjištěno mikrokonidiové stádium.

INTRODUCTION

Freshwater leaf-inhabiting hyphomycetes occupy an essential trophic level between deciduous leaves and detritus-feeding invertebrates (shredders) in running waters (Bärlocher 1992). A recent estimate puts their annual production at a level comparable to that of bacteria and macroinvertebrates, two other major heterotrophic groups in streams (Suberkropp 1997). These fungi have also become popular objects to study fungal successions (Dix and Webster 1995) or potential connections between biodiversity and ecological functions (Raviraja et al. 1998). Both objectives require accurate identification, based primarily on conidial morphology and development.

There are several freshwater hyphomycete species which have been isolated only very rarely or not at all since their description. Often the protologue is based either on a single isolate or on a few isolates from geographically close areas. This lowers the probability of appreciating the full variability within and potential overlaps between species. Reproductive structures of aquatic hyphomycetes are difficult to preserve in a good shape. Permanent preparations may dry out and attempts to restore them are not always successful. Moving the coverslip may distort the long arms of some teraradiate conidia, or even entire scolecoform conidia, and cause them to become entangled. Pure cultures often lose the ability to sporulate after a few transfers. It is therefore advisable to document new isolations of rare species with good drawings or photomicrographs, which may allow others to recognize the species even when misidentified by the author. Good illustrations may also to some extent serve as substitutes for voucher specimens if deposition of material is for some reason impossible.

The sporadic occurrence of some species at very distant localities raises the question of whether they have in fact a disjunct distribution or whether their rarity is simply due to a lack of sustained effort to find them. Some of them have distinctly shaped conidia (*Lateriramulosa quadriradiata*) or quite large (*Tetrabrunneospora ellisii, Varicosporium trimosum*). It seems unlikely that these would escape attention. We therefore have to assume, that they or their hypothetical teleomorphs may have special ecological requirements, which are rarely met, either on a temporal or spatial scale.

MATERIAL AND METHODS

Foam samples were collected into glass jars. Inoculations were performed in the field or the same day after return to the laboratory. Foam was smeared on thin layers of 0.1 % malt agar (MA, Difco), on object slides fixed to the bottom of Petri dishes. After inoculation they were kept in a cool box with ice cubes, or, on return to the laboratory in the fridge at c. 10 °C. Isolations were done within 24–48 hours. The agar layers were scanned under a low power compound microscope. Germinating conidia were cut out with a flammed needle together with a piece of agar and transferred to Petri dishes with 2 % MA. a disadvantage of this method is the impossibility of checking the density of conidial suspension in the field. If it is too high, conidia will be crowded, which makes their isolation uneasy or even impossible. On the other hand, it prevents losses of conidia during transport by sedimentation and adhesion to the walls of the sampling containers. Descriptions of colonies are based on pure cultures on 2 % MA incubated at 15 °C, if not otherwise stated. Sporulation was obtained by submerging pieces of agar cultures into standing sterile distilled water in Petri dishes, incubated at 15–18 °C in diffuse daylight.

Terms:

"Phialidic conidiogenous cells" is used in the sense of Hawksworth et al. (1995), i.e. such, which give rise to several conidia at the same level in a basipetal sequence. "Primoculture" is the one, which is obtained from a conidium collected in nature.

DESCRIPTIONS OF ISOLATES

Alatospora constricta Dyko, Trans. Br. Mycol. Soc. 70: 409, 1978.
(Figs. 1 and 15 D, E)

Colony on MA compact, tough, cream-coloured, greyish (the primoculture chestnut brown) in the centre, slow-growing, reaching 14 mm diam. within 20 days at 15 °C, elevated, glabrous but funiculose in the centre. Globose inflated cells abundant, with thicker walls, in chains or in clumps. Sporulation after submergence, in standing distilled water. Conidiophores terminal or lateral, simple or with a single branch, thin, flexuous. Conidiogenous cells phialidic, single, sometimes proliferating and forming a series of 3–4, rarely in terminal pairs or threes, or intercalary with lateral conidiogenous locus (Fig. 1 F) Conidia tetraradiate, with axis and two opposite synchronous laterals, axis 42–58 × 2–2.7 μm, branches 21.5–41 × 1.7–2.5 μm, one usually shorter. elements rather. cylindrical, straight or less often curved, with more or less subulate ends. Conidial secession schizolytic.

Specimens examined: Pure culture: CCM F-23394, Canada, Nova Scotia, Cape Breton National Park, right tributary of the Cheticamp River, ca 8 km downstream from the First Salmon Pool, isolated from foam collected by L. Marvanová on 9. 10. 1994. Foam samples: conidia seen in foam in Arsenic Brook near Williamstown, in the Cobequid Hills, Nova Scotia, and in the Catamaran Brook near its confluence with the Southwest Branch of the Miramichi River, Miramichi Region, New Brunswick.

A chestnut brown colouration of the colony on Malt Yeast Soytone Agar was reported in the protologue (Dyko 1978). Our isolate showed such colour only in the primocultures on 2 % MA. Dark colour was observed also in primocultures of *A. flagellata* (J. Gönczöl) Marvanová (1977). The Canadian isolate differs in some details from the Dyko's culture (ATCC 32680), namely by having simpler, tiny conidiophores often with profliferating phialides and a single terminal phialide. However, the characteristic intercalary phialides with lateral necks seen in ATCC 32680 (cf. Marvanová and Descals 1985, Fig. 4A) were confirmed in our material.

In spite of c. 15 reports published from various countries this species has not been reisolated in pure culture since the original collections from the Appalachian Mountain streams, where it was reported as common in winter and spring months (Dyko 1978). Owing to the similarity of its conidia to those of *Alatospora acuminata* Ingold sensu lato (Marvanová and Descals 1985) and of *Stenocladiella neglecta* (Marvanová et Descals) Marvanová et Descals 1987, reported identifications might not always be correct.

Arborispora dolichovirga K. Ando, Trans. Mycol. Soc. Japan 27: 125, 1986. (Fig. 2)

Colony compact, pale beige, very slow-growing, reaching 5 mm diam. after 10 weeks at 15 °C, granular, brain-like convoluted, aerial mycelium low, reverse pale brown. Conidiophores absent. Conidiogenous cells mostly intercalary with a short lateral stalk bearing conidia; proliferation not seen. Conidial initiation integrated with the conidiogenous cell. Conidia solitary, terminal, branched, more or less fan-shaped, conidial elements long fusoid, distal ends rounded to subulate. Axis straight, widest in the lower third, 36–51 × 2–3 μm, base truncate. Branches 2–8 (typically 4–5), lateral, sequential, primary and secondary, 9–38 × 2–3 μm, bases obconic, sometimes slightly pedicellate. Primary branches in 1–2(-3) verticils, the lower on the first or second proximal cell of the axis, the upper mostly on the neighbour distal cell. Secondary branches 0–2, more frequent in the lower verticil, typically inserting very near the base of the primary ones ("pedate"), but also remote (Fig. 2 E). Conidial secession schizolytic.

Pure culture examined: CCM F-40394, Canada, New Brunswick, Miramichi Region, near Renous, Catamaran Brook, isolated from foam collected on 4. 11. 1994 by L. Marvanová and H. Garnett

For more than ten years the first author tried to isolate this fungus from foam. Unfortunately, the conidia usually do not germinate or if they do, the growth is so slow that the colony is easily overgrown. The Canadian isolate is probably the first from outside Japan, where the type specimen originated as well as a recent isolate by Matsushima and Matsushima (1996), which, however, remained sterile on artificial media. On dead tree leaves the above authors observed up to 12 branches per conidium. Our isolate corresponds closely to the protologue, but there is a greater variability in the branch number; conidia with tertiary branches are also encountered.

The earlier name for this species is very probably *Magdalaenaea monogramma* Arnaud (1952), which, however, was published invalidly (without Latin diagnosis). The protologue (diagnosis generico-specifica) consists of a brief description of the conidia only, which, according to Arnaud, were the only material at his disposal. None of the two depicted conidia show the secondary branches inserting near

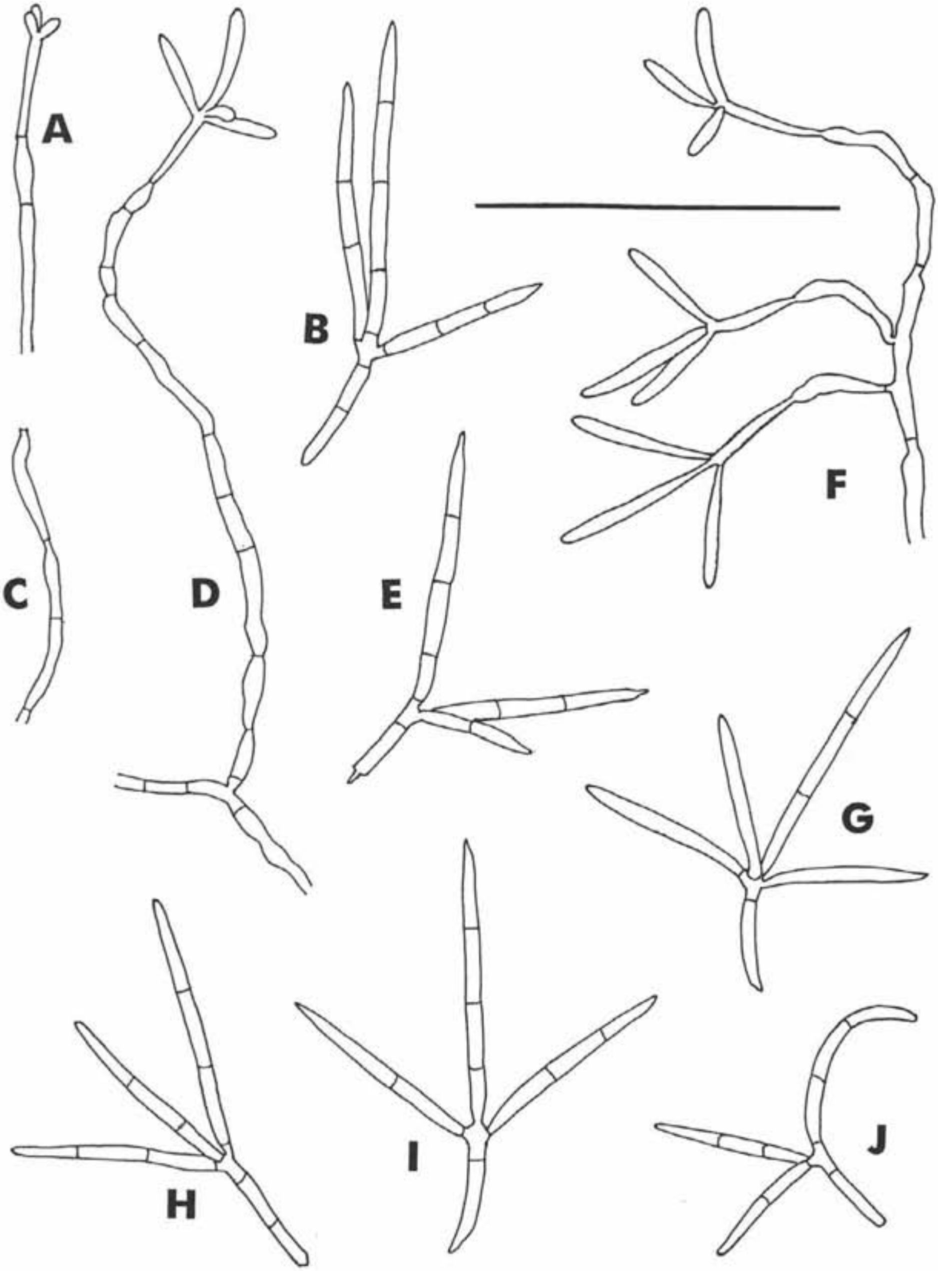

Fig. 1. *Alatospora constricta*, CCM F-23394. A,D,F, conidial development. Note lateral phialides in F. C, spent phialide with indistinct collarette. B,E,G-J, detached conidia. Scale bar = 50 μm.

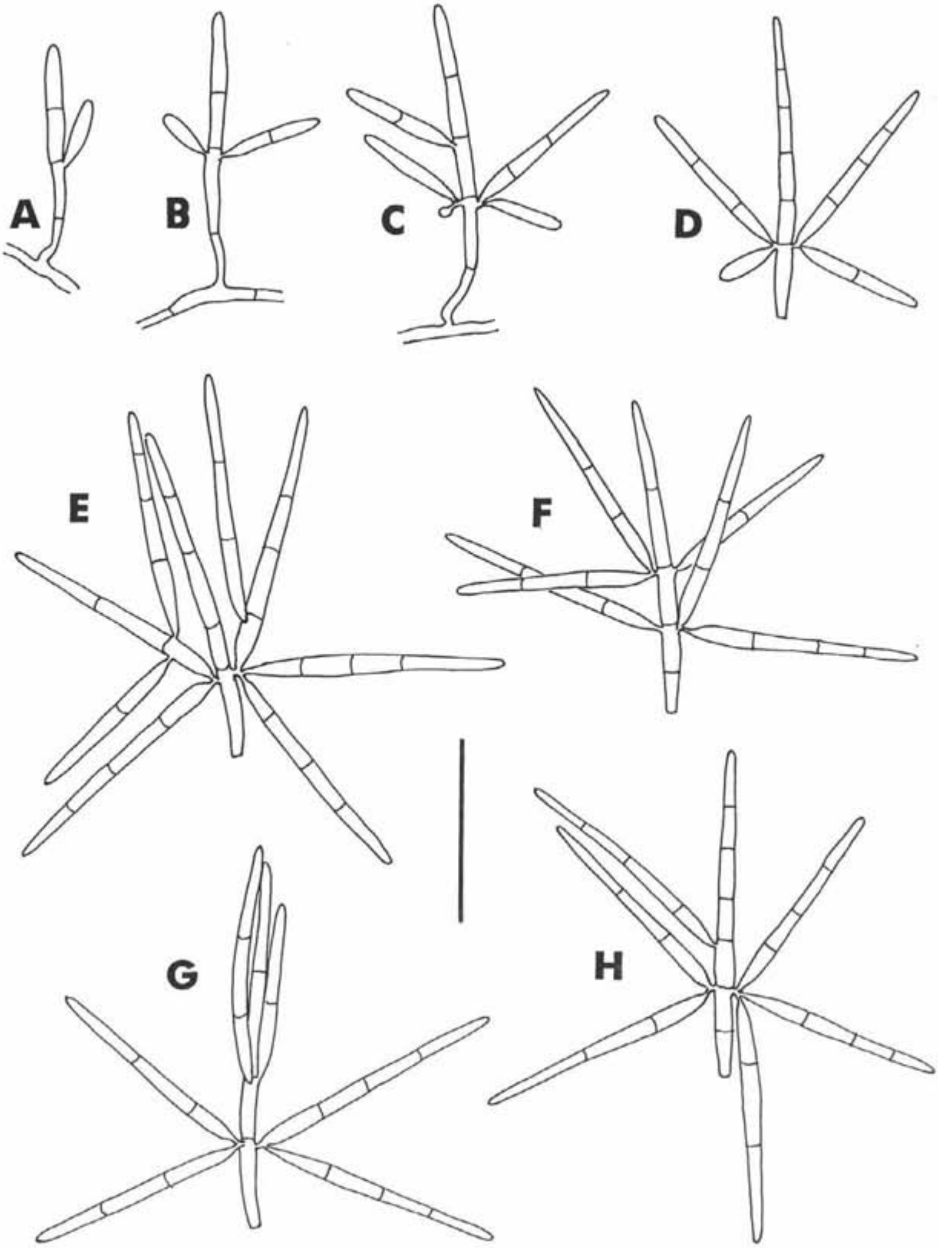

Fig. 2. *Arborispora dolichovirga*, CCM F-40394. A-C, conidial development. E-H, detached conidia. Scale bar = 25 μm.

the base of the primary ones, which was claimed an important generic feature in *Arborispora*; on the contrary, secondary branches are shown as arising at a distance from the base of the primary. However, among the morphological variation in conidial shapes drawn by Ando (Fig. 3, the right bottom conidium) such branch arrangement is illustrated. Because the genus *Arborispora* is a well established taxon documented by type material and other specimens in contrast to the poor information given by Arnaud, we prefer not to validate Arnaud's name.

Ecologically *A. dolichovirga* is probably more close to aquatic hyphomycetes than the other *Arborispora* species; it sporulates profusely under water and its conidia are relatively often being collected in foam on streams. Ando and Kawamoto (1986) collected *A. dolichovirga* on leaf litter. Conidia from plant debris in water or from foam are mostly reported under the name *Magdalaenaea monogramma* (e.g. Gönczöl and Révay 1983, Marvanová 1984, Bärlocher 1987).

Calcarispora hiemalis Marvanová et Marvan, Acta Mus. Silesiae (Opava), Ser. A, 12: 109, 1963. (Figs. 3, 4)

Colonies pale beige to drab, slow-growing, reaching 8–15 mm diam. after 20 days at 15 °C, with low aerial mycelium, coarsely funiculose in the centre. Reverse isabelline, paling towards margin. Numerous globose thicker-walled hyaline inflated cells appear in chains or clusters in older cultures. Conidiophores single, simple or sparsely branched, flexuous, terminal or lateral. Conidiogenous cells discrete, acrogenous, 1–3 per conidiophore apex, mostly widening distally, often irregularly inflated, 11–21 × 2–5 μm, proliferation not seen. Conidial initiation discrete ("budding"). Conidia single, terminal or subterminal, sigmoid or arcuate, (72) 96–219 × 2.5–3.5 μm (basal extension included), parallelwalled, multiseptate, apex subulate, base truncate, basal extension excentric, (7-)18–51 μm long, appearing before secession. Conidial secession schizolytic. Microcycle conidiation with sessile conidiogenous cells producing secondary conidia seen in vigorously sporulating culture in standing distilled water.

Pure cultures examined: CCM F- 23594 Canada, Nova Scotia, Cape Breton National Park, Right tributary of the Cheticamp River, near the First Salmon Pool, isolated from foam collected on 9. 10. 1994 by L. Marvanová CCM F-35994, CCM F-36394, CCM F-40994, Canada, New Brunswick, Miramichi Region, near Renous, Catamaran Brook, isolated from foam collected on 4. 11. 1994 by L. Marvanová and H. Garnett.

Beside two subsequent isolations from the region nearby the type locality in the Czech Republic (Marvanová 1972 and unpubl.) this species is unlikely to have been isolated elsewhere. There are repeated records by Dudka (1973, 1974) from the Ukrainian Carpathians from *Fagus* leaves and from foam. Other reports are from submerged twigs from Pakistani mountain streams (Iqbal et al. 1979) and from a river in Poland (Czeczuga et al. 1989–1990)

The conidiogenesis was described as phialidic in the conventional sense, i.e. the conidium initiation is discrete and the conidiogenous cells produce more than one conidium at the same level and do not change the shape or size after prolonged conidiation. However, no periclinal thickening has been seen on the phialide apex. The shape of some conidiogenous cells of the Canadian isolates (Fig. 3 C) suggests the possibility that polyblastic or polyphialidic conidiogenesis may be involved. However, with the light microscope and with the absence of periclinal thickening it is impossible to distinguish between polyblastic and polyphialidic nature of the conidiogenous cell and only single conidia have been seen at any given time on one conidiogenous cell. Wolfe (1977) who has seen authentic material (permanent preparation in lactophenol) of *C. hiemalis* doubted the phialidic conidiogenesis as published in the protologue and considered the conidia "aleuriospores". This would imply integrated conidium initiation and production of only one conidium at all from the same conidiogenous locus. However, the initiation of a conidial primordium in *C. hiemalis* is clearly discrete.

The Canadian isolates differ from the Czech ones by the temperature optimum for sporulation, which was 5 °C for the Czech, but around 15 °C for the Canadian.

Cladoconidium articulatum Bandoni et Tubaki, Trans. Mycol. Soc. Japan 26: 426, 1985. (Fig. 5)

Colonies very-slow growing, dark olive, aerial mycelium sparse, thinwalled, substrate mycelium thickwalled, reverse black. Characteristic hyphopodia present in older cultures. Conidiogenous structures fuscous. Conidiophores absent or semimacronematous, sometimes bearing a sympodial conidiogenous cell with several denticles (Fig. 5 B). Conidia fan-shaped or cheiroid, axis branched up to 4 levels, branches up to fifth order, sometimes more abundant on one side of the axis, apices rounded or broadly subulate, bases sometimes slightly constricted. Conidial span 20–36 μm. Conidial secession schizolytic.

Pure culture examined: CCM F-33094, Canada, Nova Scotia, Colchester County, Cobequid Mountains, Black Brook, isolated from foam collected on 22. 10. 1994 by L. Marvanová.

In their branching pattern, the conidia resemble those of *Tetracladium palmatum* A. Roldán. However, the latter are hyaline and posses digitiform as well as filiform and narrowly obclavate elements.

Very little is known about the ecological characteristics of this species, described from *Scirpus microcarpus* Presl litter (Bandoni et Tubaki 1985). Other collections of the well recognizable conidia of this species are known from softwater streams

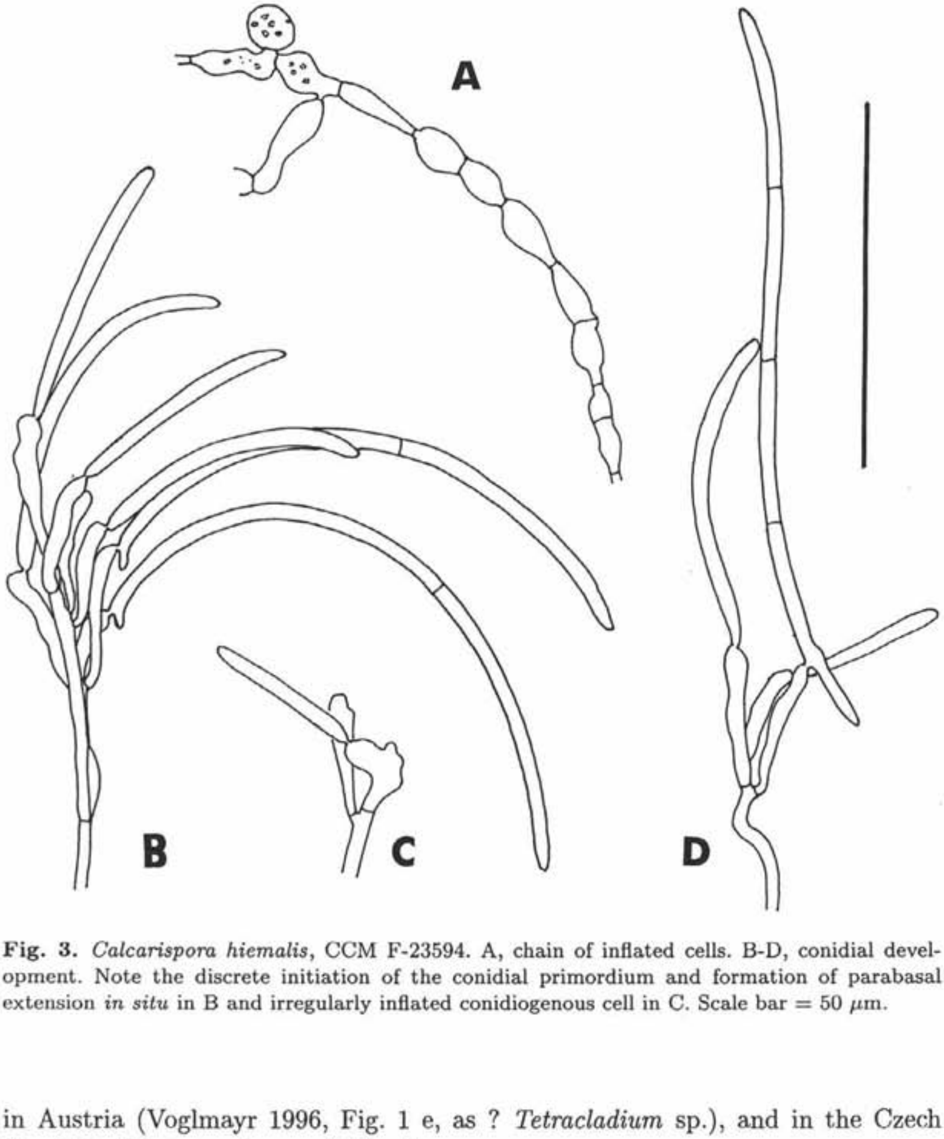

Fig. 3. *Calcarispora hiemalis*, CCM F-23594. A, chain of inflated cells. B-D, conidial development. Note the discrete initiation of the conidial primordium and formation of parabasal extension *in situ* in B and irregularly inflated conidiogenous cell in C. Scale bar = 50 μm.

in Austria (Voglmayr 1996, Fig. 1 e, as ? *Tetracladium* sp.), and in the Czech Republic (Marvanová, unpublished).

Lateriramulosa quadriradiata K. Miura et Okano, J. Jap. Bot. 54: 209, 1979. (Figs. 6 and 14 E, F)

Colony slow-growing, chalky white, with cottony aerial mycelium, reverse pale. Sporulation underwater. Conidiophores typically terminal, single, simple. Conidio-

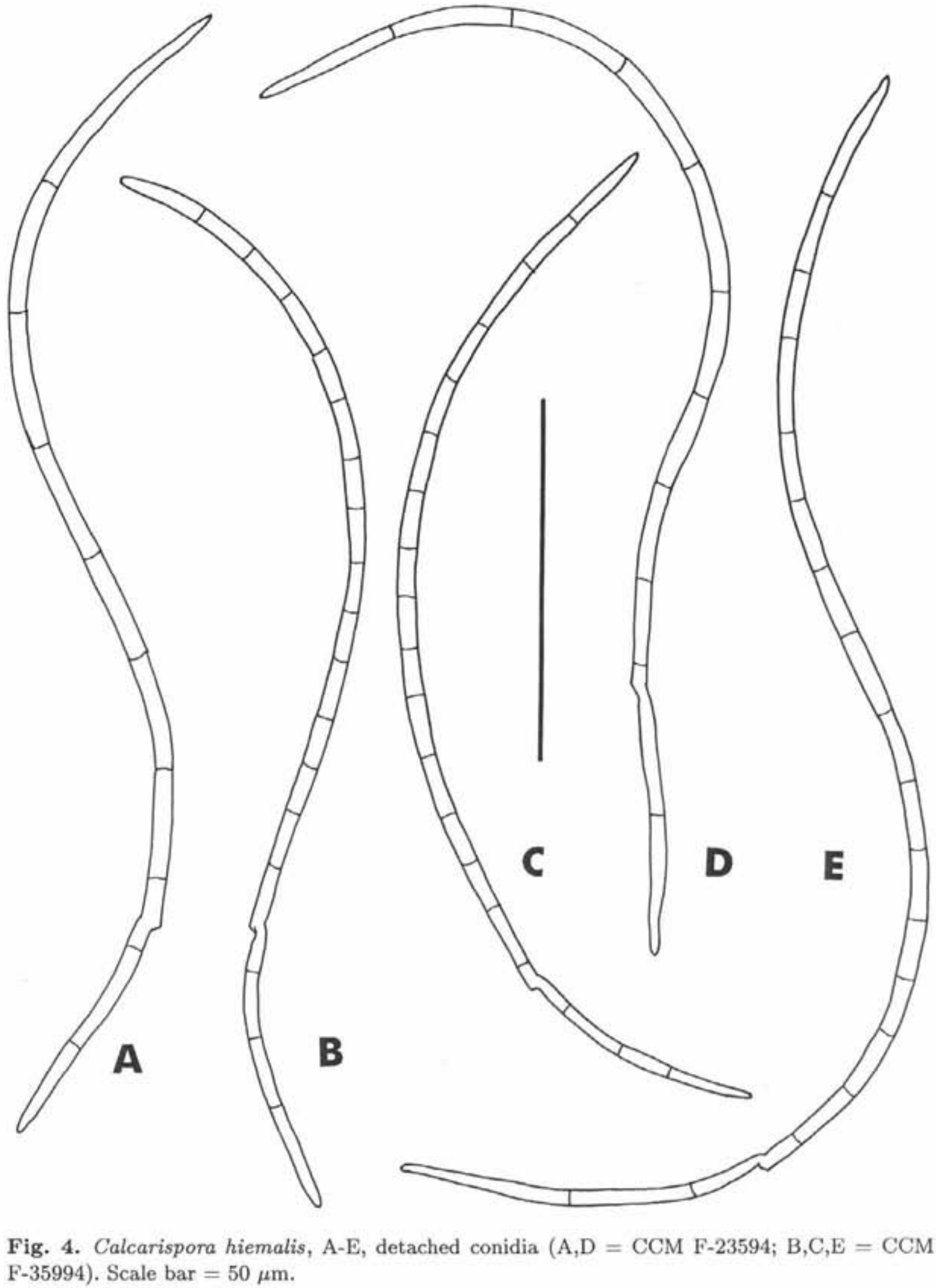

Fig. 4. *Calcarispora hiemalis*, A-E, detached conidia (A,D = CCM F-23594; B,C,E = CCM F-35994). Scale bar = 50 μm.

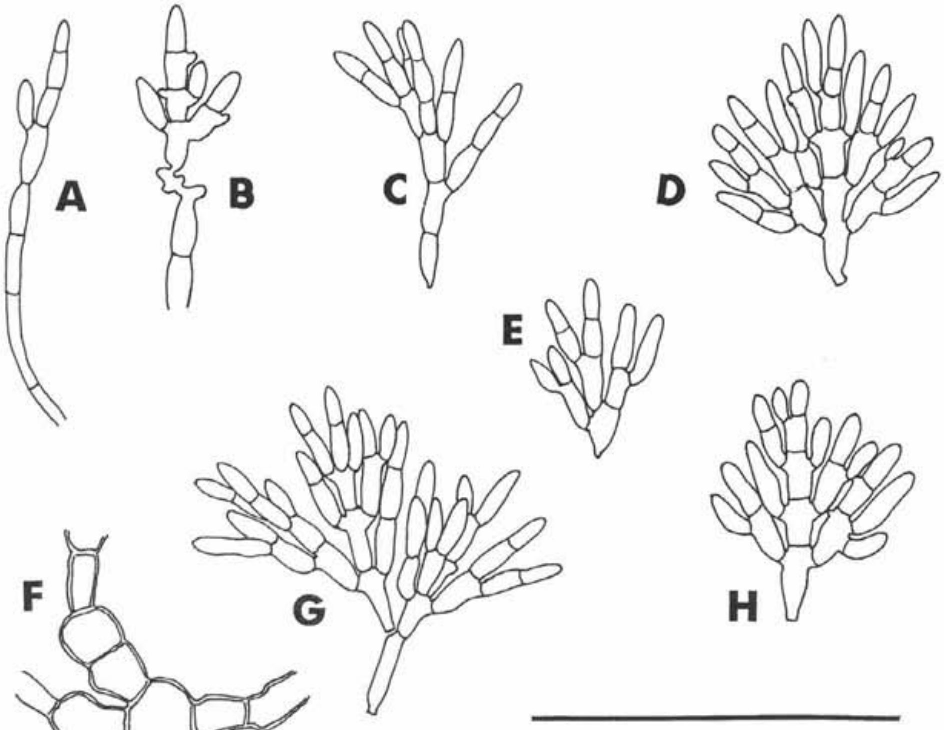

Fig. 5. *Cladoconidium articulatum*, CCM F-33094. A-C, conidial development. Note the sympodial proliferation of conidiogenous cell in B. D,E,H, detached conidia. G, disarticulation of detached conidium into part-conidia. F, thickwalled inflated cells. Scale bar = 50 μm.

genous cells integrated, with distinct denticles, proliferation sympodial. Conidia acrogenous, stauroform, central body short-clavate, aseptate, 5–7 × 2.5–3.5 μm. Branches three, primary, lateral, closely sequential, two on one side of the central body, one on the opposite side. The paired branches straight, inflated or bulbous (sometimes inequilaterally) at the base. The distal one 14–34 × 1.5–2.5 μm in the inflated part, the proximal 15–34 × 1 μm, the bulbous base 2–3 μm wide. The opposite branch gently curved, 21–49 μm long, attached near the median, slightly inflated part. Conidial secession schizolytic.

Pure cultures examined: CCM F-28394, CCM F-29194. CCM F-29394, Canada, Nova Scotia, Cape Breton National Park, side ditch near the Cheticamp River, near the First Salmon Pool, isolated from foam collected on 9. 10. 1994 by L. Marvanová; CCM F-31194, Canada, Nova Scotia, Cumberland County, Cobequid Mountains, Arsenic Brook, isolated from foam collected on 17. 10. 1994 by L. Marvanová.

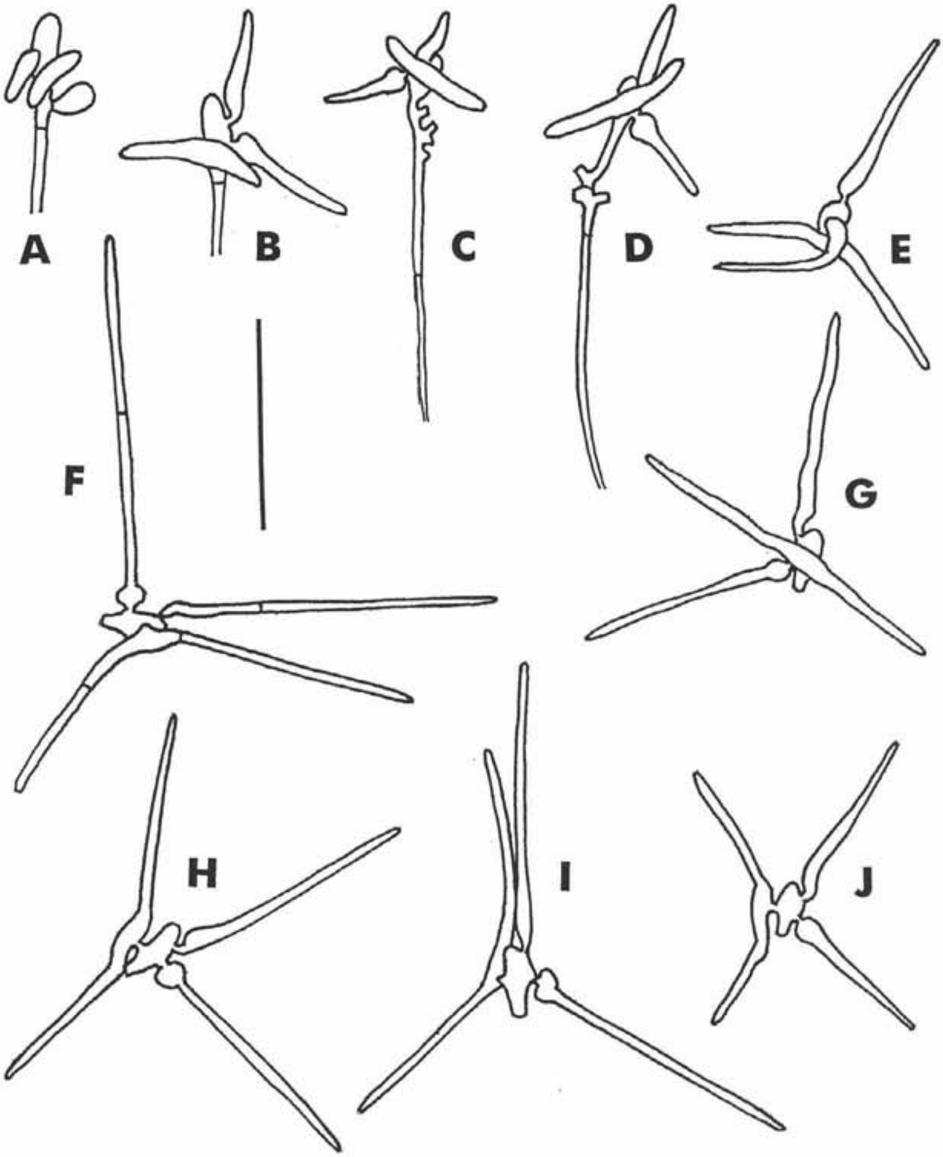

Fig. 6. *Lateriramulosa quadriradiata*. A-D, conidial development. Note the denticles in C and D, left behind after secession of conidia. E-J, detached conidia. (A-D,F,H,I = CCM F-29194; E,G,J = CCM F-28394). Scale bar = 20 μm.

This species has not been isolated after its description and as far as we know, its conidia have not been reported from anywhere else. Our observations are in accordance with the protologue. In spite of the common site of origin of the first three Canadian isolates, the CCM F-28394 differs by having conidial arms roughly one third shorter than those in CCM F-29194 and CCM F-29394.

Sympodiocladium frondosum Descals, Trans. Br. Mycol. Soc. 78: 429, 1982. (Fig. 7)

Colony compact, dirty white or rosy, later becoming dark purple, very slow-growing, reaching 3 mm after 28 days at 15 °C, remaining restricted, elevated and brain-like convoluted, aerial mycelium sparse, granular, reverse very dark blue, blue diffusing pigment in agar appears in one month old cultures. Conidiophores micronematous. Conidiogenous cells integrated with the conidiophore, apex rounded. Conidia acrogenous, attached to the conidiogenous cells by abrupt narrow isthmus. Conidial elements long fusoid, septate, ends subulate. Axis bent at branch insertion, 42–58 × 2–2.7 μm, primary branch single, median, 21.5–41 × 1.7–2.5 μm, bearing one (rarely two) somewhat shorter secondary branch(es) at its lowermost cell. Conidial secession schizolytic.

Pure cultures examined: CCM F-17294, Canada, Nova Scotia, Chignecto Bay Coast, Shulie River, isolated from foam collected on 1. 10. 1994 by L. Marvanová, CCM F-33594, CCM F-33694, Canada, Nova Scotia, Colchester County, Cobequid Mountains, Murphy Brook, isolated from foam collected on 22. 10. 1994 by L. Marvanová.

This is the first published isolation into pure culture after the protologue. Our isolates match fully the original description. Conidia of this species are rarely reported from streams. They were encountered from alkaline stream water (e.g. Roldán et al. 1987, South Spain) or from softwater streams (e.g. Descals 1998, Cantabria, Spain; Marvanová, the Czech Republic, unpubl.).

Tetrabrunneospora ellisii Dyko, Trans. Br. Mycol. Soc. 70: 414, 1978. (Figs. 8 and 14 D, G-I)

Colonies isabelline with a yellow tinge, restricted, reaching c. 10 mm after 8 weeks at 18 °C with dense cottony aerial mycelium, reverse dark brown. Substrate mycelium hyaline or brownish, with numerous globose or irregular swellings on hyphae, aerial mycelium brown. Sporulation on a submerged piece of colony, but above the water level. Conidiogenous structures with brown thick walls. Conidiophores lateral, inconspicuous to macronematous and then erect, simple, septate. Conidiogenous cells single, terminal, integrated with the conidiophores; proliferation or regeneration not seen. Conidial primordia integrated with the conidiogenous cells, forming a rod-like structure; branches lateral, arising more or less simultaneously from a slightly swollen cell near the middle of the primordium; at this time the upper part of the conidial axis bends slightly backwards. Mature conidium is tetraradiate, septate, distal ends paler, rounded to subulate; axis 92–175 × 10–12.5 μm, proximal part shorter than the distal part, detachment scar mostly truncate, rarely with a short, percurrent, sometimes furcate, basal extension. Branches diverging, 69–132 × 10–12.5 μm, branch insertion slightly constricted. Conidial secession tardy, schizolytic.

Specimens examined: Pure culture: CCM F-28294 Canada, Nova Scotia, Cape Breton National Park, Right tributary of the Cheticamp River, near the First Salmon Pool, isolated from foam collected on 9. 10. 1994 by L. Marvanová. Herbarium material: DAOM 164967 (holotype.).

Due to the failure of conidia to germinate, the original description of this species was not based on a pure culture (Dyko 1978). There is a confusing information as regard the holotype specimen: on p. 415, following the Latin diagnosis, Dyko (l.c.) gives the holotype as "B. J. Dyko no. 579, IMI 222995 holotypus" (from N. C.), but on p. 416, in the paragraph Specimens examined she cites... "BJD 579, DAOM 164967, holotype...". The collection deposited as IMI 222995 is here claimed equal to BJD 578, which is a collection from N. Y. The specimen No. 164967 sent to the senior author from DAOM was labelled "holotype" and bears Dyko's collection No. 579, written in her handwritting. The holotype material was accompanied by copies of two letters from Dyko to DAOM, expressing her intention to deposit the holotype of *T. ellisii* in DAOM.

The holotype consisted of two slide preparations with the objects mounted in lactofuchsin (?). The one contained a piece of angiosperm leaf (probably *Betula* sp.) with a few scattered conidia and conidiophores (?). Conidial ontogeny or mature conidia attached to conidiophores were not seen. The conidia were not well discernible because of the thickness of the preparation. The second slide contains 4 mostly partly damaged detached conidia of *Tetrabrunneospora ellisii*.

There are small differences between our isolate and Dyko's material: in Dyko's specimen the walls of the end cells gradually become thinner and paler towards the apex and the edge of the brown cell wall layer is visible as an indistinct line under light microscope (Fig. 8 F,G, aroows). In our isolate there is a thin hyaline septum separating the paler end cells. The different thickness of the entire conidial cell wall (compare Fig. 8 D, E with F, G) of both specimens may be caused by differences in the conidial maturation in vivo vs in vitro. Slight differences in conidial arm length and width may be due to strain variation or again to *in vivo* vs. *in vitro* effts. It is known, than some conidia become 'fatter' when obtained in culture on artificial media. Dyko gives the maximum width of the axis in her material as 7–8.5 μm, but our measurements in her holotype extended up to 9.5 μm.

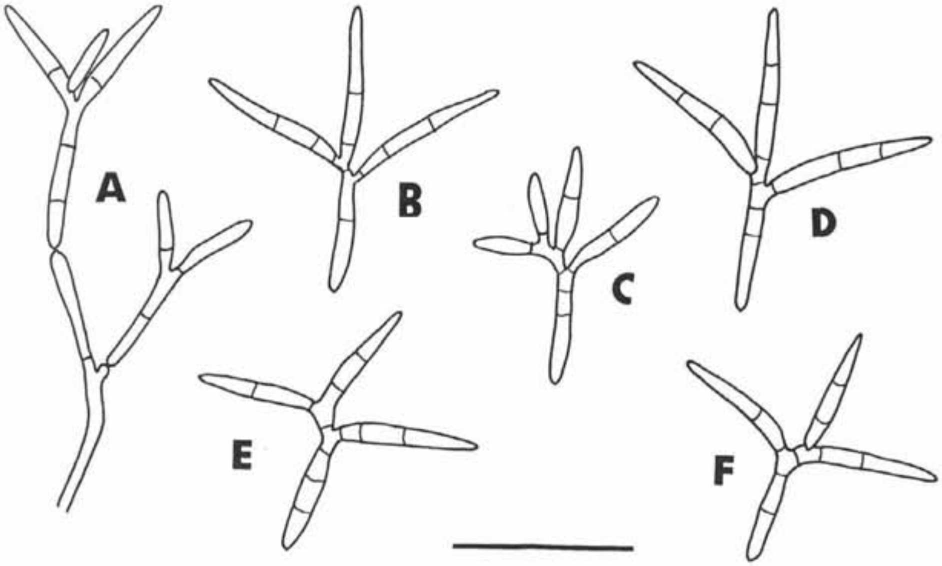

Fig. 7. *Sympodiocladium frondosum*. A, conidial development. B-F, detached conidia. C, aberrant conidium with two secondary branches. (A = CCM F-33594; B-F = CCM F- 17294). Scale bar = 25 μm.

In our collection the conidia germinated tardily, grew slowly and became easily overgrown by more competitive species. Originally this fungus was collected in small streams in U.S.A. (N.C., N.Y. and Va). Conidia were later reported from streams in U.S.A., Va. (Suberkropp and Wallace 1992).

Tricladium caudatum Kuzuha 1973, J. Jap. Bot. 48: 222.

(Figs. 9 and 15 B,C)

Colony compact, greyish in the centre, with black margin, slow-growing, reaching 20 mm diam. after 20 days at 15 °C; aerial mycelium abundant, funiculose, reverse black. Sporulation after submergence in a few days, under water, abundant. Conidiophores terminal, single, simple, hyaline, flexuous. Conidiogenous cells terminal, integrated, sometimes caducous and then remaining attached to the conidia (Fig. 9 F), proliferation percurrent (Fig. 9 A,C, arrows). Conidia branched, axis twice bent, attenuate at each point of flexion, 55–85 × 3–4.5 μm, apex rounded, base slightly convex, basal extension excentric, appearing before secession (Fig. 9 D), up to 17 μm long, very rarely lacking in some conidia; branches typically two, alternate, remote, slightly constricted at the insertion, the proximal one 29–34 × 3–5 μm, the distal one 14–27 × 2–3.5 μm, ends rounded. Conidial secession schizolytic.

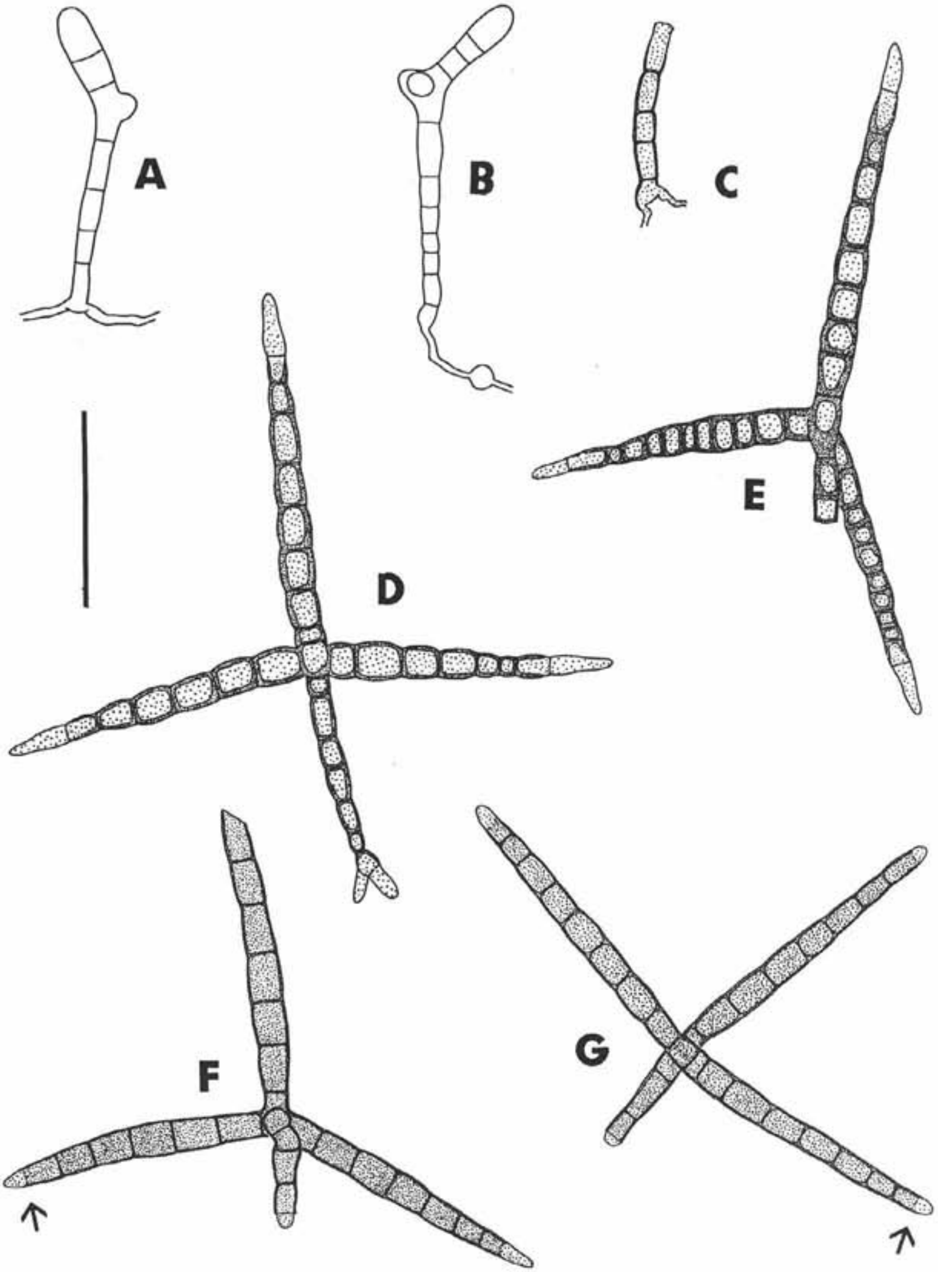

Fig. 8. *Tetrabrunneospora ellisii*. A,B, conidial development. C, spent conidiophore. D-G, detached conidia. (A-E = CCM F-28294; F,G = DAOM 164967). Scale bar = 50 μm.

Pure cultures examined: CCM F-39594, Canada, New Brunswick, Miramichi Region, near Renous, Otter Brook, isolated from foam collected on 4. 11. 1994 by L. Marvanová and H. Garnett. CCM F-37794, 42194, dtto; CCM F-23787, Canada, Nova Scotia, Lime Kiln Brook, isolated from foam collected on 29. 4. 1987 by L. Marvanová and F. Bärlocher.

Our description of the pure culture is the first one published. Kuzuha (1973) isolated conidia into pure culture from stream foam in Japan, but did not give the colony characters. Her original collection was the only one for a long time. The first illustrated published record of conidia of this fungus from outside Japan was probably from Austria (Regelsberger et al. 1987). We isolated the species in Canada in 1987. The conidiation was very sparse and with that isolate we have not succceeded in observing conidiogenesis. Since then, records of conidia of this species from foam accompanied with drawings were published from Spain (Descals 1987), France (Descals and Chauvet 1992) and Austria (Voglmayr 1996, Marvanová and Gulis 2000). Conidia in stream foam were also encountered by Marvanová (unpubl.) in the Czech Republic. The above collections differ from the conidia seen in the type specimen by more curved (especially the "internodal" part of the axis between the two branches), sometimes variously inflated elements and a smaller span. We do not consider these differences distinct enough to justify separation at the species or subspecies level.

The Canadian as well as the European collections are mostly from softwater streams.

Trifurcospora irregularis (Matsush.) K. Ando et Tubaki, Trans. Mycol. Soc. Japan 28: 471, 1987. Figs. 10 and 14 A, B

≡ *Flabellospora irregularis* Matsush., Mats. Mycol. Mem. No. 2, p. 9, 1981.

Colony dirty white, cottony, slow-growing, reaching 12 mm diam. in 14 days at 15 °C; aerial mycelium abundant, delicate, funiculose, reverse pale beige with orange tinge. Sporulation in submerged cultures, moderate, under water and at the water level. Conidiophores mostly lateral, single, simple, short, monilioid; conidiogenous cells single or rarely in pairs, inflated, similar to the conidiophore cells, with one or two monoblastic conidiogenous loci on denticles. Conidia acrogenous, mostly triradiate, but also with 1, 2 or 4 arms. Central body globose, 3.5–5 μm wide. Arms narrowly obclavate, slightly constricted at septa, 24–76(-89) × 3.5–5 μm, often gently curved, sometimes with very thin long ends.

Pure culture examined: CCM F-37494, Canada, New Brunswick, Miramichi Region, near Renous, Catamaran Brook, isolated from foam collected on 4. 11. 1994 by L. Marvanová and H. Garnett.

Originally described from U.S.A., Alabama, as *Flabellospora irregularis* (Matsushima 1981). The variation of the conidial arm length is great: the upper limits

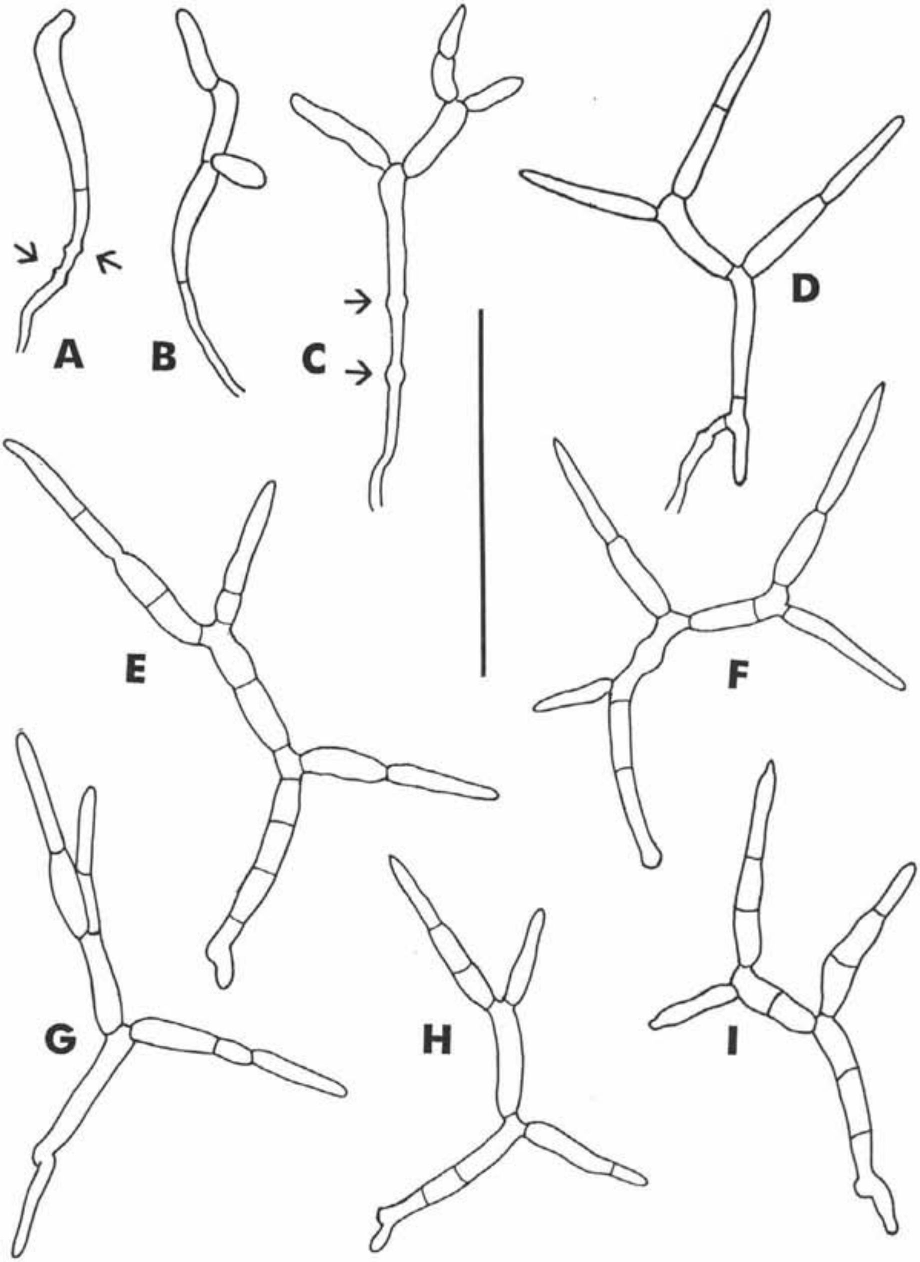

Fig. 9. *Tricladium caudatum*, CCM F-39594. A-D, conidial development. Arrows point out the percurrent proliferation of conidiogenous cells. Note the *in situ* development of the basal extension in D. E-I, detached conidia. F, detached conidium bearing caducous conidiogenous cells attached to the base. Scale bar = 50 μm.

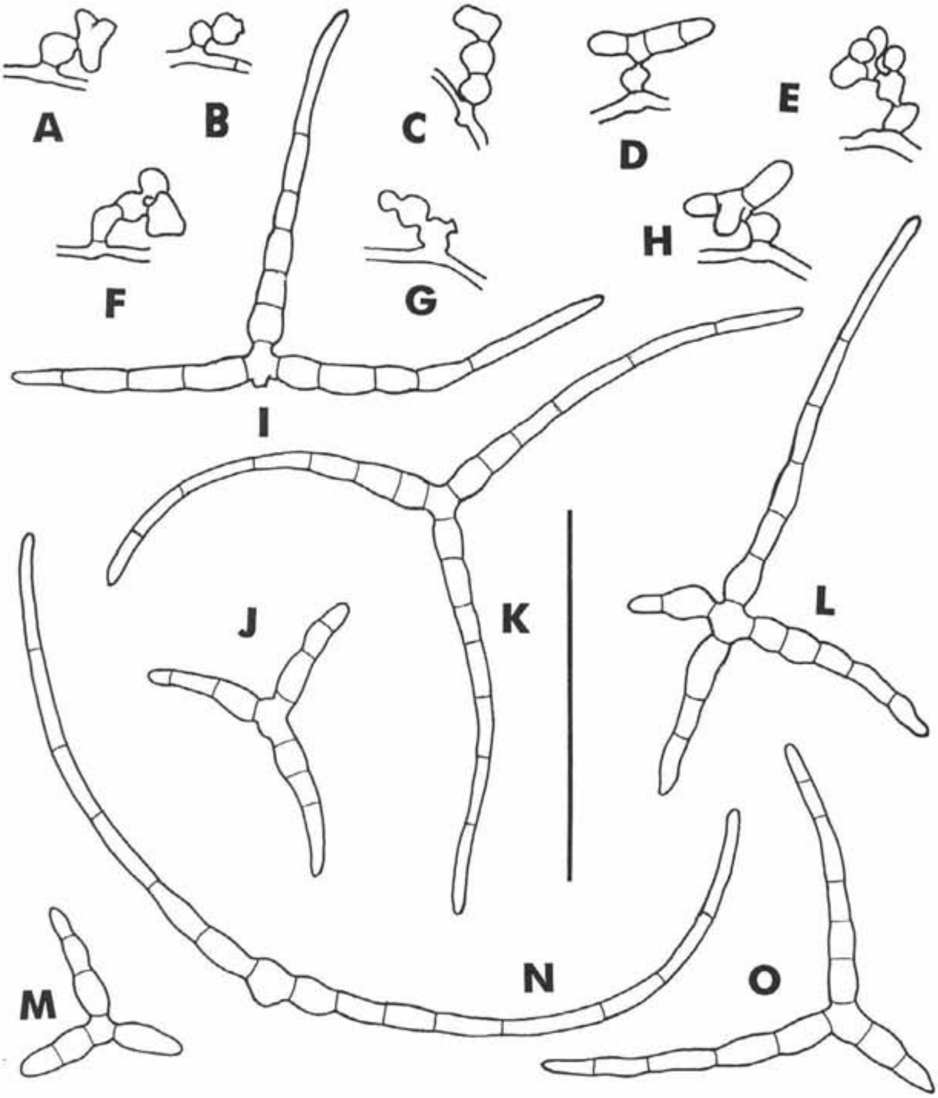

Fig. 10. *Trifurcospora irregularis*, CCM F-37494. A-H, conidial development. I-O, detached conidia. Note the abnormally elongate conidial ends in K and N, probably due to long persistence in foam. Scale bar = 50 μm.

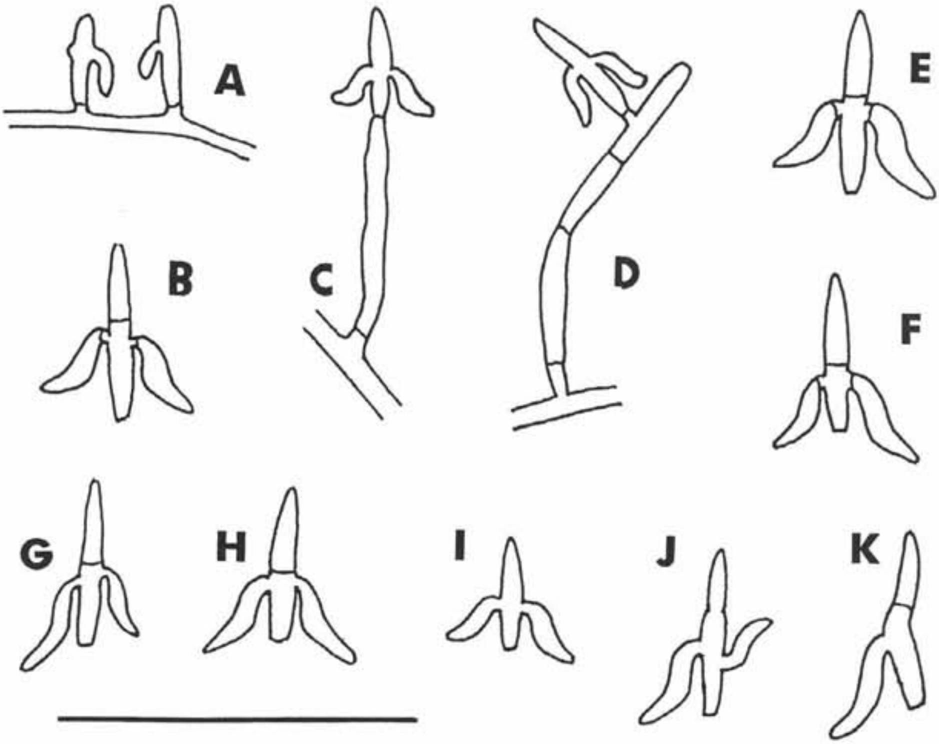

Fig. 11. *Triglyphium alabamense*, CCM F-30187. A,C,D, conidial development. B,E-K, detached conidia. Note the one antrorse branch in J and a single branch in K. Scale bar = 25 μm.

are roughly three times greater than the lower limits (cf. also Matsushima 1981: 18–60 μm, Ando et Tubaki 1987: 16–45 μm and our values. The conidial arm length (27–75 μm) in a new species *Trifurcospora subsessilis* K Matsush. et Matsush. (Matsushima 1995) approximates our measurements, but the conidiophores in *T. subsessilis* are cylindrical instead of monilioid (Matsushima 1995). *Quadricladium aquaticum* Nawawi et Kuthub. (Nawawi and Kuthubutheen 1989) should very probably be considered congeneric.

Triglyphium alabamense Matsush., Mats. Mycol. Mem. No. 2, p. 18, 1981. (Figs. 11 and 14 C).

Colony very slow-growing, pale yellow, tufted, with compact, elevated mycelial structures in the middle. Conidiophores absent or lateral, up to 30 μm long. Conidiogenous cells intercalary, lateral or rarely terminal, integrated or discrete. Conidia terminal or lateral, stauroform. Axis navicular, typically two-celled,

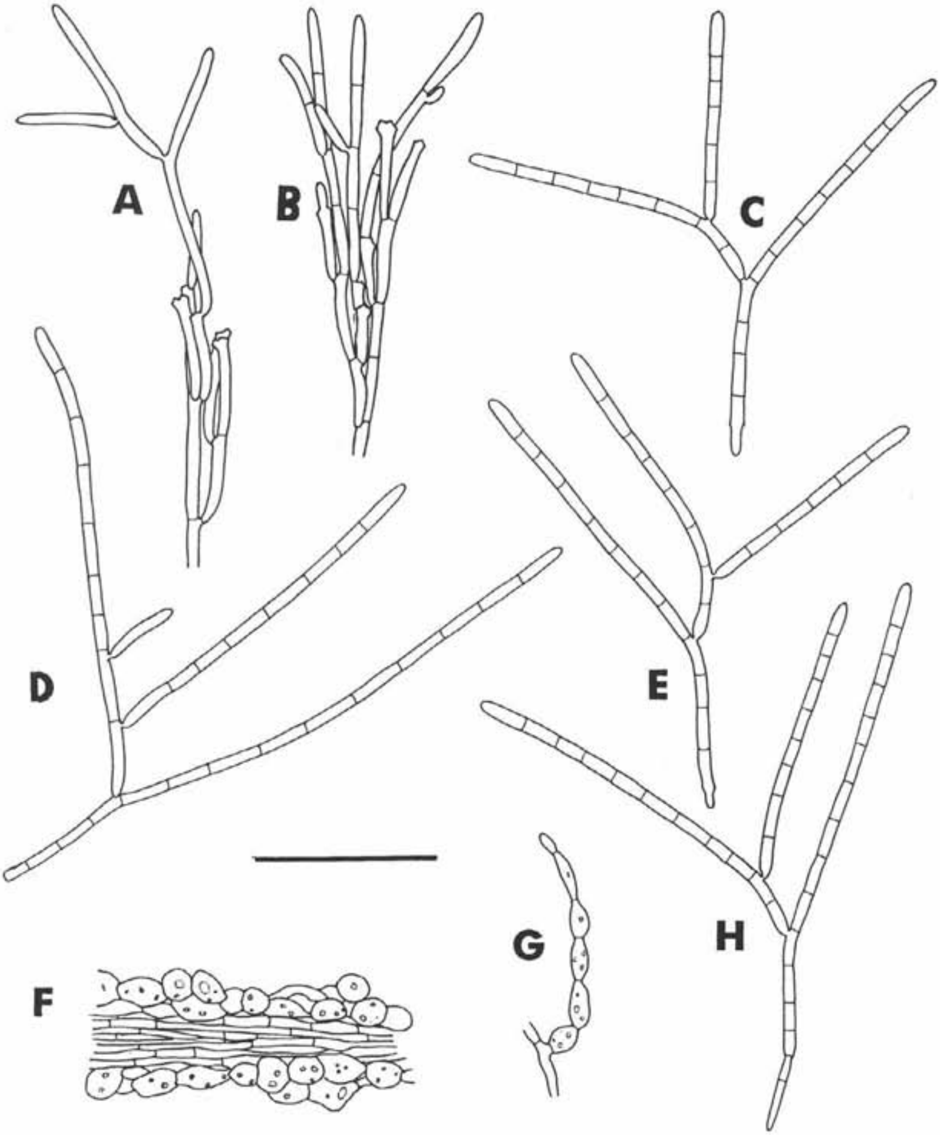

Fig. 12. *Varicosporium trimosum*, CCM F-32994. A,B, conidial development. C-E,H, detached conidia. D, aberrant conidium with two secondary branches. F, mycelial rope. G, inflated cells in chain. Scale bar = 50 μm.

7–13 × 1.3–1.6 μm, apex subulate, base truncate; branches lateral, sequential, submedian, opposite or nearly so, retrorse, long fusoid, sigmoid or bent, tapering towards both ends; the first-formed 5–8 × 1–2 μm, the second 4–6 × 1–2 μm. Aberrant conidia with single branch or with one branch antrorse and one retrorse appear rarely. Conidial secession schizolytic.

Pure culture examined: CCM F-30187, Canada, New Brunswick, Sackville, near Ogden Mill Cross, isolated from foam collected in a stream below the Trans Canada Highway on 25. 4. 1987 by L. Marvanová.

We include this terrestrial taxon because the detached conidia may be found in streams and confused with those of *Tricellula aurantiaca* (Haskins) Arx. Conidia of *T. aurantiaca* differ by deep constrictions between all conidial elements. The tuberculariaceous genus *Triglyphium* Fres. is not well known, its type species, *Triglyphium album* Fres. is lacking. We follow here the concept of Matsushima (1981). *Triglyphium alabamense* was collected in Alabama, USA, on rotting leaves of *Quercus* on land. The authentic material sent by Matsushima to the first author contained dried leaves. They yielded a single detached conidium, which was in accordance with our material.

Varicosporium trimosum Wolfe, Aquatic Hyphomyc. of the Appal., p. 254, 1977. (Figs. 12 and 15 A)

Colony whitish with a rosy-beige hue or beige, slow-growing, reaching 20 mm diam. after 15 days at 15 °C, low, aerial mycelium finely funiculose, reverse pale brown. Globose or irregular inflated cells 5–12 μm in diam. in chains or clusters appear abundantly in culture. Mycelial ropes with parallel-running central hyphae surrounded by 1–2 layers of inflated cells (Fig. 12 F) were also observed. Conidiophores terminal, profusely branched, usually bearing two or three conidia per branch apex. Conidia branched, typically composed of axis and one primary and one secondary branches. Aberrant branching patterns with two primary, or two secondary branches or with a single primary branch may occur. Conidial elements cylindrical, septate, parent elements often slightly bent backwards at the point of daughter element insertion, ends sometimes slightly widening near the apex, apices rounded, branch bases constricted. Conidial axis 72–170(-192) × 2.5–5 μm, base usually with percurrent extension up to 21 μm long. Primary branch similar to the axis, 36–156(-168) × 2.5–3.5 μm. Secondary branch straight or gently curved, 17–77(-120) × 2.5–3.5 μm. Conidial secession schizolytic.

Pure cultures examined: CCM F-32994, Canada, Nova Scotia, Colchester County, Cobequid Mountains. Murphy Brook, isolated from foam collected on 22. 10. 1994 by L. Marvanová. CCM F-32694 dtto, Black Brook, isolated from foam collected on 22. 10. 1994 by L. Marvanová.

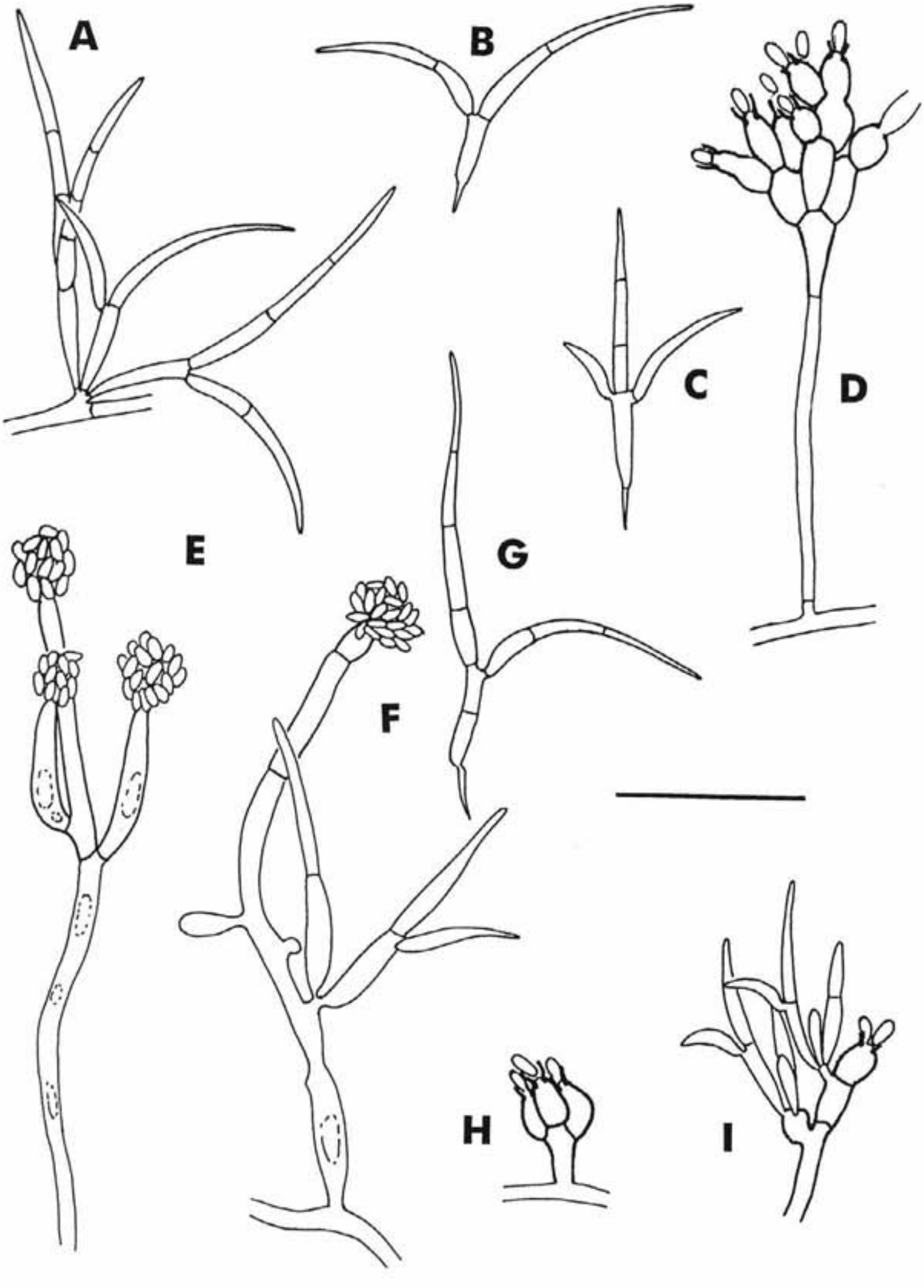

Fig. 13. *Ypsilina graminea*. A, macroconidial development. B,C,G, detached macroconidia. D-F,H,I, microconidial state. Note the occurrence of macro- and microconidial state on the same conidiophore in F and I. (A-D, G-I = CCM F-27687, E,F = unlabelled Czech isolate from 1964). Scale bar = 20 μm.

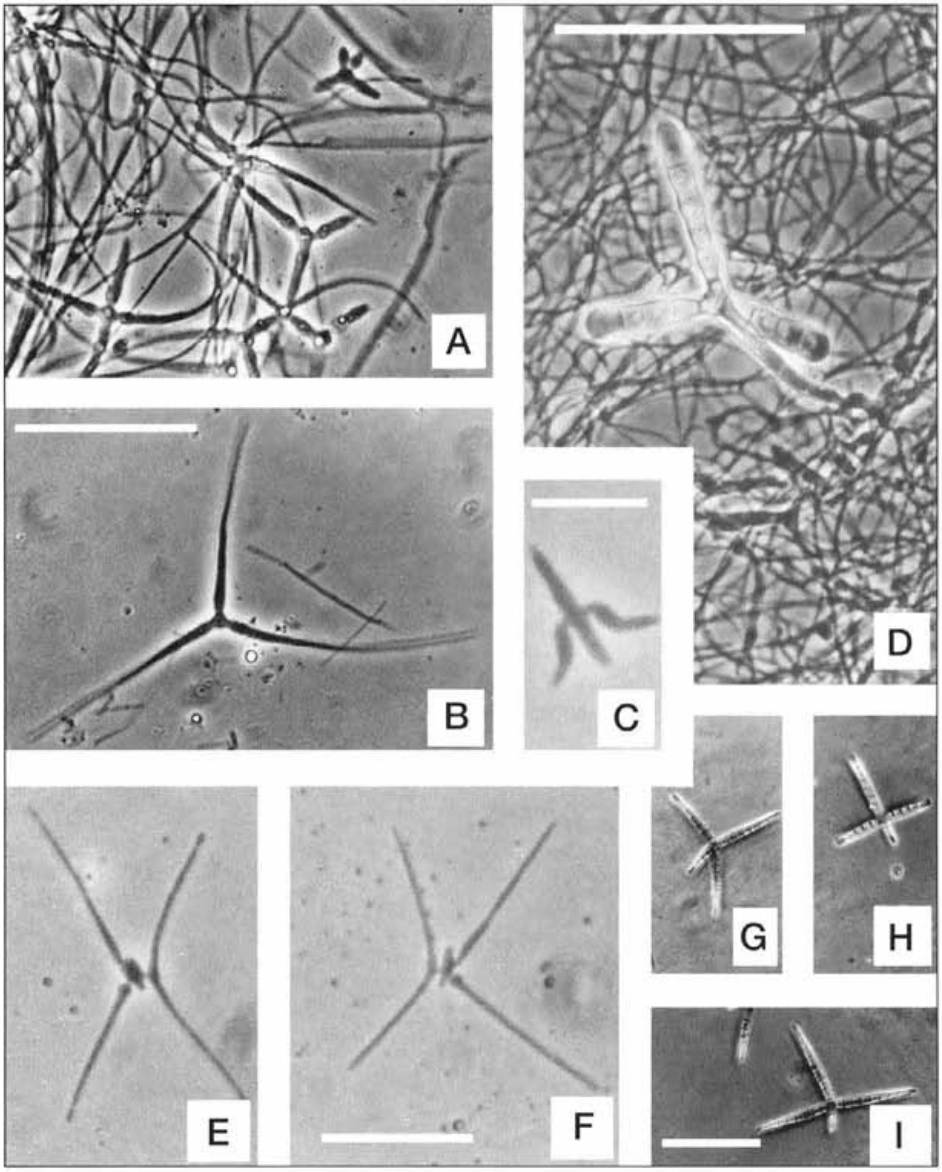

Fig. 14. A, B. *Trifurcospora irregularis*, CCM F-37494. A, developing conidia. B, detached conidium with extremely elongate branches. C, *Triglyphium alabamense*, CCM F-30187, detached conidium. D,G-I, *Tetrabrunneospora ellisii* CCM F-28294. D, developing conidium. G-I, detached conidia. E,F, *Lateriramulosa quadriradiata* CCM F-29194, detached conidia. Scale bar for A,B = 50 μm, for C = 10 μm, for D = 50 μm, for for E,F = 20 μm, for G-I = 100 μm.

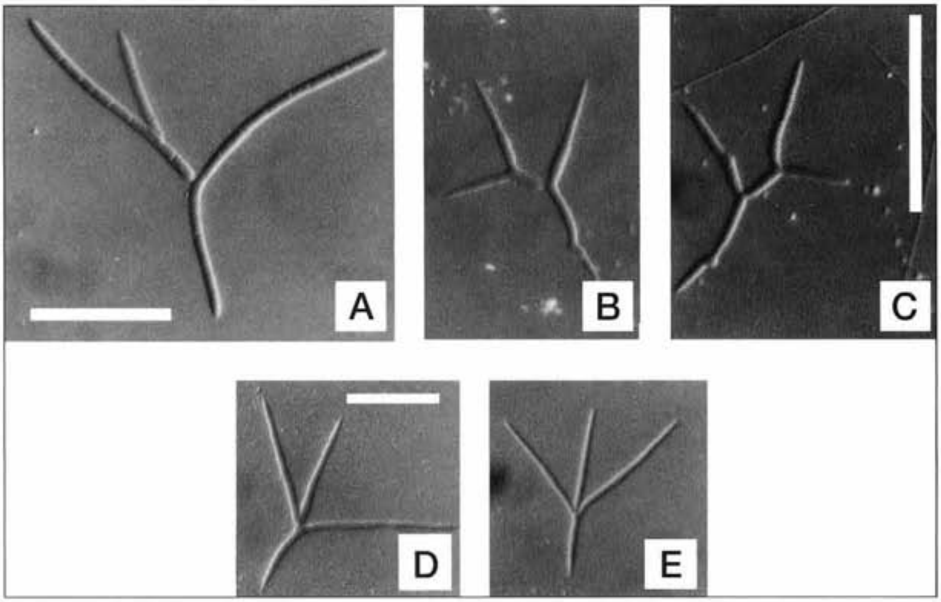

Fig. 15. Detached conidia. A, *Varicosporium trimosum*, CCM F-32994. B, C, *Tricladium caudatum*, CCM F-39594. D, E, *Alatospora constricta*, CCM F-23394. Scale bar for A = 50 μm, for B, C = 50 μm, for D, E = 20 μm.

This species has neither been isolated nor reported with certainty from nature since its description. The only record of conidia from foam (unillustrated) is from SW France (Descals and Chauvet 1992). Conidia of our isolates exceed the dimensions given by Wolfe; he gives the maximum length for the conidial axis, primary and secondary branch 121, 81 and 53.5 μm respectively, but in conidia with long arms such variation is not unusual. Conidia of *V. trimosum* are relatively large and therefore they are unlikely to be overlooked, but owing to their similarity to fragmented conidia of *Varicosporium elodeae* they may be misidentified. Conidial branching in *V. trimosum* is typically sympodial. This is in principle a pattern of conidial branching in *Pleuropedium*, which, however, has tapering elements usually with pointed ends.

This fungus was described from a mountain stream. Data on water chemistry were not given. According to our experience conidia of *V. trimosum* appear in low-nutrient waters on acidic bedrock. In such streams they were found in the Czech republic as well (Marvanová, unpubl.)

Ypsilina graminea (Ingold, P. J. McDougall et Dann) Descals, J. Webster et Marvanová, Can. J. Bot. 76: 1659, 1999. (Fig. 13)

≡ *Volucrispora graminea* Ingold, P. J. McDougall et Dann, Trans. Br. Mycol. Soc. 51: 326. 1968.

Colony 25 mm in diam after 43 days at 10 °C, white, cream-coloured, reverse isabelline, aerial mycelium cottony, slightly tufted in the centre. Macroconidial structures typical for this species, not described here.

Microconidial state hyphomycetous, presumably spermatial (andromorph): conidiophores lateral, rarely terminal, single, simple or with stipes and a penicillate head with cell walls somewhat thicker than that of the rest of structures; metulae up to five per conidiophore apex (or absent), crowded, inflated, 5–7 × 3–4 μm. Phialides lageniform, 5–7 × 3–4 μm, with distinct collarette up to 2 μm deep. Rarely the phialides with microconidia appear on the macroconidiophore along with macroconidia (Fig. 13 F,I). Conidia single, elliptical, smooth, 2–2.5 × 1 μm (description based on CCM F-27687). The isolate from 1964 had no metulae, lower number of loosely arranged phialides per conidiophore apex, phialides cylindrical or long fusoid, collarette obscured among the slimy heads of conidia, conidia elliptical, smooth.

Pure cultures examined: CCM F-27687, Canada, Nova Scotia, Lime Kiln Brook, isolated from foam collected on 29. 4. 1987 by L. Marvanová and F. Bärlocher. Unlabelled culture, Czech Republic, isolated from leaves in 1964 by L. Marvanová, data on locality lost.

The microconidial state in pure culture has been seen for the first time by L. Marvanová in a Czech isolate from 1964, which is no more available. The presence of macro- and microconidia on one conidiophore confirm that both states belong to the same thallus (Fig. 13 F). At that time the fungus, later published as *Volucrispora graminea* was not yet formally described. The macroconidia and the conidiogenesis were very similar to the Canadian isolate, but the microconidial state differred in the phialide shape and length (cf. Fig. 13 E, F). The presence of microconidial state having the character of andromorph suggests existence of a teleomorph. The differences between the andromorphs of the two isolates rise a question, whether two morphological variants of spermatial state may indicate a possibility of *Ypsilina graminea* being a species aggregate. In fact the great variability of conidia seen in nature supports such considerations. The occurrence of andromorph in pure cultures of *Y. graminea* seems rare. The senior author has examined 12 isolates of *Y. graminea*, but only in the above two cases microconidial state developed.

ACKNOWLEDGEMENT

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REFERENCES

ANDO K. and KAWAMOTO (1986): Arborispora, a new genus of Hyphomycetes. – Trans. Mycol. Soc. Japan 27: 119–128.

ARNAUD G. (1952): Mycologie concrete: Genera I. – Bull Soc. Mycol. France 68: 181–223.

BANDONI R. J. and TUBAKI K. (1985). Cladoconidium, new genus: a new hyphomycete anamorph-genus. – Trans. Mycol. Soc. Japan 26: 425–431.

BÄRLOCHER F. (1987): Aquatic hyphomycete spora in 10 streams of New Brunswick and Nova Scotia. – Can. J. Bot. 65: 76–79.

BÄRLOCHER F. (1992): Seasonal occurrence and movements of fungi in streams. – In:. Khulbe R. D (ed.), Microbial Activity in the Himalaya, p. 1–29. Books International, New York.

CZECZUGA B., ORLOWSKA M. and WORONOWICZ L. (1989–1990): Studies of aquatic fungi X. Some rare species of Hyphomycetes in North-Eastern Poland. – Acta Mycol. 25(2): 5–20.

DESCALS E. (1987): Muestro preliminar de hongos ingoldianos de Cataluna – Rev. Iber. Micol. 1987, 4: 17–32.

DESCALS E. (1998): Streamborne fungi from Karrantza (Basque Country) and surroundings. – Boll. Soc. Hist. Nat. Balears 41: 191–219.

DESCALS E. and CHAUVET E. (1992): Diversité des champignons Ingoldiens de quelques riviéres du sud-ouest de la France. – Nova Hedwigia 54: 83–96.

DIX N. J. and WEBSTER J. (1995): Fungal Ecology. – Chapman and Hall, London, 549 pp.

DUDKA I. O. (1973): Aquatic hyphomycetes of Ukraine I. New species for mycoflora of the Soviet Union (in Ukrainian). – Ukr. Bot. Zh. 30: 449–456.

DUDKA I. O. (1974): Fungal spores in foam and scum of running waters in the Ukrainian Carpathians (in Ukrainian). – Ukr. Bot. Zh. 31: 432–439.

DYKO B. J. (1978): New aquatic and water-borne hyphomycetes from the Southern Appalachian Mountains of the United States. – Trans. Br. Mycol. Soc. 70: 409–416.

GÖNCZÖL J. and RÉVAY Á. (1983): Observations on the hyphomycetes inhabiting forest litter of Hungary. – Acta Bot. Hung. 29: 107–125.

HAWKSWORTH D. L., KIRK P. M., SUTTON B. C. and PEGLER D. N. (1995): Ainsworth & Bisby's Dictionary of the Fungi. 8^{th} ed., – CAB International, Wallingford, 616 pp.

IQBAL S. H., BHATTY S. F. and MALIK K. S. (1979): Freshwater hyphomycetes on decaying plant debris submerged in some streams in Pakistan. – Trans. Mycol. Soc. Japan 20: 51–61.

KUZUHA S. (1973): Two new species of aquatic hyphomycetes. – J. Jap. Bot. 48: 219–224.

MARVANOVÁ L. (1972): Concerning Calcarispora hiemalis. – Čes. Mykol. 26: 230–232.

MARVANOVÁ L. (1977): Two new Alatospora species. – Arch. Protistenk. 119: 68–74.

MARVANOVÁ L. (1984): Conidia in waters of the protected area Slovenský Raj. – Biológia (Bratislava) 39: 821–832.

MARVANOVÁ L. and DESCALS E. (1985): New and critical taxa of aquatic hyphomycetes. – Bot. J. Lin. Soc. 91: 1–23.

MARVANOVÁ L. and DESCALS E. (1987): New taxa and new combinations of aquatic hyphomycetes. – Trans. Br. Mycol. Soc. 89: 499–507.

MARVANOVÁ L. and GULIS V. I. (2000): Notes on aquatic hyphomycetes and streamborne spores from Austria. – Österr. Z. Pilzk. 9: 125–140.

MATSUSHIMA T. (1981): Matsushima Mycological Memoirs No. 2. – Matsushima, Kobe, 68 pp.

MATSUSHIMA, T. (1995): Matsushima Mycological Memoirs No. 8. – Matsushima Fungus Collection, Kobe, 54 pp.

MATSUSHIMA K. and MATSUSHIMA T. (1996): Fragmenta Mycologica II. – In: Matsushima T. (ed.), Matsushima Mycological Memoirs No. 9, p. 31–40. – Matsushima Fungus Collection, Kobe.

NAWAWI A. and KUTHUBUTHEEN A. J. (1989): Quadricladium aquaticum gen. et sp. nov., an aquatic hyphomycete with tetraradiate conidia. – Mycotaxon 34: 489–495.

RAVIRAJA N. S., SRIDHAR K. R. and BÄRLOCHER F. (1998): Breakdown of Ficus and Eucalyptus leaves in two organically polluted streams in India: fungal diversity and ecological functions. – Freshwat. Biol. 39: 537–545.

REGELSBERGER B., MESSNER K. and DESCALS E. (1987): Species diversity of aquatic hyphomycetes in four Austrian streams. – Mycotaxon 30: 439–454.

ROLDÁN A., DESCALS E. and HONRUBIA M. (1987): Hifomicetos acuáticos en las cuencas altas de los Ríos Segura y Guadalquivir. – Anal. Biol. 13 (Biologia Vegetal 3): 3–13.

SUBERKROPP K. (1997): Annual production of leaf-decaying fungi in a woodland stream. – Freshwat. Biol. 38: 169–178.

SUBERKROPP K. and WALLACE J. B. (1992): Aquatic hyphomycetes in insecticide treated and untreated streams. – J. North. Am. Benthol. Soc. 11: 165–171.

VOGLMAYR H. (1996): Spores of Ingoldian fungi in two Austrian rivulets. – Österr. Z. Pilzk. 5: 23–49.

WOLFE C. C. (1977): Aquatic hyphomycetes of the Southern Appalachians. – In: Parker B. C. and Roane M. K. (eds.), The Distributional History of the Biota of the Southern Appalachians. Part IV, Algae and Fungi, pp. 242–264. Virginia University Press.

CZECH MYCOL. 53 (1), 2001

Pleurotoid fungi of the family Polyporaceae in the Czech Republic and Slovakia

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Hrouda P. (2001): Pleurotoid fungi of the family Polyporaceae in the Czech Republic and Slovakia – Czech Mycol. 53: 29–87

This paper presents a survey of the pleurotoid genera belonging to the family *Polyporaceae* in the Czech Republic and Slovakia. It is based on material deposited in Czech and Slovak herbaria as well as on published records of finds of the included species from the studied territory. For each species a short description is provided, accompanied by taxonomic or nomenclatoric notes in some problematic cases, and characters distinguishing it from related species are highlighted. Short notes about phenology, ecology, occurrence and distribution are included. The study is supplemented with distribution maps for individual species. A new combination, *Neolentinus degener*, is submitted instead of *Neolentinus cyathiformis* (Schaeff.: Fr.) Redhead et Ginns.

Key words: Pleurotoid fungi, phenology, ecology, occurrence, distribution, Czech Republic, Slovakia.

Hrouda P. (2001): Hlívovité houby České republiky a Slovenska – Czech Mycol. 53: 29–87

Práce představuje souhrnný přehled výsledků studia hlívovitých hub řazených do čeledi *Polyporaceae* na území ČR a SR. Je založena na studiu materiálu uloženého v českých a slovenských herbářích a na literárních záznamech nálezů daných hub ze studovaného území. U každého druhu je vyhotoven stručný popis, zdůrazněny rozlišovací znaky od podobných druhů, případně diskutována taxonomická problematika. Stručně je komentována fenologie, ekologie, výskyt a rozšíření. Studie je doplněna mapami rozšíření jednotlivých druhů. Pro houževnatec pohárovitý je navržena nová kombinace *Neolentinus degener*.

INTRODUCTION

Systematic classification of studied genera

A recent systematic classification of the genera *Lentinus, Neolentinus, Panus, Pleurotus, Phyllotopsis* and *Faerberia* is following:

Division:	*Eumycota*
Subdivision:	*Basidiomycotina*
Class:	*Homobasidomycetes*
Subclass:	*Hymenomycetidae*
Order:	*Polyporales*
Family:	*Polyporaceae*

(classification into order and family according to Moser 1983)

Classification of these genera at the level of order and lower is often varied according to different authors. In the "classical" conception of Singer (1975), this group is classified in the order *Agaricales*, family *Polyporaceae*, tribus *Lentineae*. Kühner (1980) classifies it in his new order *Tricholomatales*, family *Pleurotaceae*, tribus *Lentineae* (this is a nomenclatorical mistake, since the nominate tribus of a family should have the same name) with the genera *Pleurotus* (including the subgenera *Phyllotopsis, Pleurotus, Lentinopanus* and *Lentinotus*) and *Lentinus* (subgenera *Lentinus* and *Geopetalum*). Pegler (1983) classifies this group more closely to *Aphyllophorales* than to *Agaricales* (he refers to the presence of the dimitic hyphal system, which is almost absent in *Agaricales*); he considers it an evolutionary branch derived from the ancestral polyporoid types with the genus *Pleurotus* more recently derived from the genus *Lentinus* (sensu lato).

During the last decade, the taxonomic classification of this group of genera has been studied using the methods of molecular biology, and the results correspond with Moser's conception. Restriction analysis of the ribosomal DNA of *Lentinus tigrinus* (Hibbett and Vilgalys 1991) shows a closer relationship to the family *Polyporaceae* than to the family *Tricholomataceae*. This is also supported by anatomical characters (dimitic hyphal system and the creation of "hyphal pegs" – fascicles of hyphae arising from the gill surface, occurring with the exception of the genus *Lentinus* in some polyporoid genera as well). The whole group is probably derived from the family *Polyporaceae* and the similarity of the gills of these genera with the gills in the order *Agaricales* is the result of convergent evolution (Hibbett et Vilgalys 1993).

Morphology and anatomy of the basidiomes

Basidiomes are solitary or fastigiate, of the pilothecium type, cantharelloid, pleurotoid or cyphelloid in shape (according to Váňa 1996: 120), fleshy or tough. The pileus surface is smooth, slightly fibrillose, flocculose or tomentose to pilose (with slight squamulae in *Lentinus tigrinus* and *Neolentinus degener*, or broken into scales in *Neolentinus lepideus*. Gills¹⁾ are shortly to longly decurrent in various species, and some of them create anastomoses especially on the stipe at some of them. *Neolentinus lepideus* and the species of *Pleurotus* subgen. *Lentodiopsis* create a veil (velum partiale), which leaves more or less persistant fragments on the pileus margin or a ring on the stipe. The stipe is central, excentric, lateral or missing, if the pileus is laterally adnate.

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1) If the term gill is limited strictly to the order *Agaricales*, then the 'gills' of the representatives of *Polyporales* (a case of convergent evolution - see above) should be called 'pseudogills' or 'pseudolamellae'. But I consider it more understandable to use the term 'gills' for these genera as well.

Table 1. Generic classification of the studied species according to the conceptions of various authors. (The mentioned authors still recognise *Geopetalum carbonarium*; in later studies [Watling and Gregory 1989, Boekhout et al. 1990, Käärik 1992] the species is refered to as *Faerberia carbonaria*.)

species	**Kreisel in Michael et al. 1977**	**Kühner 1980**	**Corner 1981**	**Pegler 1983**	**Moser 1983 (as Singer 1975)**	**Hilber 1982, 1997**
... calyptratus	*Lentodiopsis*	*Pleur.* subgen. *Pleurotus*			*Pleurotus*	*Pleur.* subgen. *Lentodiopsis*
... dryinus	*Lentodiopsis*	*Pleur.* subgen. *Pleurotus*			*Pleurotus*	*Pleur.* subgen. *Lentodiopsis*
... eryngii	*Pleurotus*	*Pleur.* subgen. *Pleurotus*			*Pleurotus*	*Pleur.* subgen. *Pleurotus*
... cornucopiae	*Pleurotus*	*Pleur.* subgen. *Pleurotus*			*Pleurotus*	*Pleur.* subgen. *Pleurotus*
... ostreatus	*Pleurotus*	*Pleur.* subgen. *Pleurotus*	*Pleurotus*		*Pleurotus*	*Pleur.* subgen. *Pleurotus*
... pulmonarius	*Pleurotus*	*Pleur.* subgen. *Pleurotus*			*Pleurotus*	*Pleur.* subgen. *Pleurotus*
... nidulans	*Phyllotopsis*	*Pleur.* subgen. *Phyllotopsis*			*Phyllotopsis*	*Phyllotopsis*
... conchatus	*Panus*	*Pleur.* subgen. *Lentinopanus*	*Panus*	*Lent.* subgen. *Panus*	*Panus*	*Panus*
... strigosus	*Panus*	*Pleur.* subgen. *Lentinopanus*		*Lent.* subgen. *Panus*	*Panus*	*Panus*
... suavissimus	*Lentinus*	*Pleur.* subgen. *Lentinotus*		*Lent.* subgen. *Lentinus*	*Panus*	**Redhead and Ginns 1985**
... tigrinus	*Lentinus*	*Pleur.* subgen. *Lentinotus*	*Lentinus*	*Lent.* subgen. *Lentinus*	*Panus*	
... adhaerens	*Lentinus*	*Lent.* subgen. *Lentinus*	*Panus*	*Lent.* subgen. *Panus*	*Lentinus*	*Neolentinus*
... lepideus	*Lentinus*	*Lent.* subgen. *Lentinus*	*Panus*	*Lent.* subgen. *Panus*	*Lentinus*	*Neolentinus*
... degener	*Lentinus*	*Lent.* subgen. *Lentinus*	*Panus*	*Lent.* subgen. *Panus*	*Lentinus*	*Neolentinus*
... carbonarium		*Lent.* subgen. *Geopetalum*	*Geopetalum*		*Geopetalum*	

The hyphal system is monomitic (only generative hyphae), dimitic (generative and skeletal hyphae) or amphimitic (generative and ligative hyphae)[2]. Generative hyphae are thin-walled or thick-walled, in some *Pleurotus* species sclerified; clamp-connections are present. Skeletal (unbranched) and ligative (branched) hyphae are always thick-walled, without clamp-connections.

Table 2. Occurrence of particular hyphal types in the studied genera

genus	**hyphal type**		
	generative (always present)	**skeletal** (always thick-walled)	**ligative (= binding)** (always thick-walled)
Faerberia	thin-walled	present	absent
Lentinus	thin-walled	absent[3]	present
Neolentinus	thin- and thick-walled	present	absent
Panus	thin-walled	present	absent
Phyllotopsis	thin- and thick-walled, sclerified	absent	absent
Pleurotus subgen. *Lentodiopsis*	thin- and thick-walled, sclerified	present, rare	absent
Pleurotus subgen. *Pleurotus*	thin- and thick-walled, sclerified	present at the stipe base (not only in the stipe base in *P. cornucopiae*), rare	absent

Cystidia: Cheilocystidia are present in most of the species, or sometimes reduced to cystidiiform hyphal ends (*Neolentinus degener, N. lepideus*). Pleurocystidia are present in *Panus* species, in *Neolentinus adhaerens* and *Faerberia carbonaria* (with incrustations on the surface in last two species), and as thick-walled metuloids in *Panus strigosus* and *Faerberia carbonaria*. Cheilo- and

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[2] Although both systems with two types of hyphae are called dimitic in recent studies of hyphal systems of these genera (Stankovičová 1973, Corner 1981, Pegler 1993), I consider it practical to follow Singer's (Singer 1975) approach of distinguishing amphimitic system from practical point of view. (Corner rejects the term 'amphimitic' and on the basis of the translation of the Greek word 'amphimitos' he considers it a synonym of the term 'dimitic'. He considers the term 'amphimitic system' to be misleading because it does not allow for the occurrence of long skeletal segments of hyphae /see footnote 3/ - but the term 'dimitic system' is equally misleading in this case. Use of the term 'dimitic system' for both types would have its justification in the case that skeletal and ligative hyphae are considered to be one type of hyphae; however, in this case the term 'trimitic system' lacks significance for the system containing generative, skeletal and ligative hyphae - but this term is used by both Stankovičová and Corner.)

[3] While Stankovičová (1973) considers longer unbranched segments to be only long branches of the ligative hyphae, Corner (1981) and Pegler (1983) mention skeleto-ligative (resp. skeleto-binding) hyphae, in which they distinguish unbranched 'skeletal' segments and branched segments.

pleurocystidia are mostly clavate, visibly fusiform only in *Faerberia carbonaria*. Caulocystidia occur in *Pleurotus* subgen. *Pleurotus* as projecting hyphal elements with cystidiiform ends. On the gills of *Lentinus* species so called hyphal pegs are created – fascicles of unbranched hyphae projecting 25–50 μm (in extreme up to 300 μm) from the gill surface. Their function is not clear – possibly retaining moisture, protection against insect attack or vestiges of clavarioid ancestry (Corner 1981, Pegler 1983).

Basidia are clavate, tetrasporic, ranging in size from 16 × 4 μm (*Lentinus suavissimus, Panus strigosus*) to 40–50 × 7,5–8,5 μm (*Pleurotus dryinus*). Spores are ellipsoid, oval to cylindrical, or reniform at *Phyllotopsis nidulans*, the smallest 5–6,5 × 2,5–3,5 μm (genera *Panus, Phyllotopsis*), the largest approx. 15 × 5 μm (*Neolentinus lepideus, Pleurotus* subgen. *Lentodiopsis*), and non-amyloid.

Conidia creation is known in *Pleurotus dryinus*, where many thick-walled conidia (also called aleuriospores or chlamydospores) are created on the stipe base surface.

Ecology and phenology

The studied group contains – with the exception of the genus *Faerberia* – saprotrophic lignicolous fungi, which may become secondarily parasitic, when infection begins through injured places on roots and trunks as well as through the broken branches (Černý 1989). Although some species considerably prefer certain host trees, no species is limited to only one tree species or genus (possible exception: *Pleurotus calyptratus* on *Populus* species). Some species are limited to deciduous or coniferous trees. In some conditions, growth is not limited to live or dead trees – the growth of *Neolentinus lepideus* on worked wood in cellars and mines or on the pylons and railway sleepers is commonly known, whereas *Pleurotus ostreatus* was recorded growing on the vertebra of a recently washed up sperm whale on Jersey of the Channel Islands (Reid 1985). The monotypic genus *Faerberia* is distinguished by a specific substrate, as it grows on burnt places.

It was discovered that some representatives of lignicolous fungi get nutrients from captured nematodes; nutrients from the nematode bodies probably compensate the low quantity of nitrogen available in wood. Thorn and Barron (1984) present *Pleurotus* (*P. ostreatus, P. cornucopiae*), *Hohenbuehelia* and *Resupinatus* species among such fungi. Various *Pleurotus* species are often "hosts" of mycophilous beetles (Švec and Švecová 1990).

Some authors (Junková and Staněk 1972, Ginterová 1973, Ginterová and Maxianová 1975, Kurtzmann 1978) report that *Pleurotus ostreatus* mycelium fix nitrogen from the air. Hilber (1982) however is sceptical and declared that only some Prokaryota are able to fix nitrogen.

In direct connection with the wood substrate of these fungi, there is a lower dependence of their fructification on the weather course (especially rainfall) than in the terrestrial fungi. Lignicolous fungi have usually – in comparison with other trophic groups – the longest time of fructification (Ivanov 1985), less dependent on some season and on a parallel temperature and rainfall optimum. They are usually recorded in the interval from spring to autumn, but we can also find representatives with year-long fructification in this group (*Neolentinus adhaerens, Phyllotopsis nidulans, Pleurotus ostreatus*).

Some species create more or less shapeless photomorphoses in dark conditions(most often elongated stipes without any pilei or only with small reduced pileoli), known as darkness forms or "mine forms" – their creation is commonly known in *Neolentinus lepideus*, but other species may also create these forms in proper light conditions (light deficiency) – they were observed in *Neolentinus adhaerens, Lentinus tigrinus, Pleurotus ostreatus, Pleurotus dryinus*.

MATERIAL AND METHODS

The core of the work represents a revision of material deposited in Czech and Slovak herbaria (BRA, BRNM, BRNU, CB, HR, Karlovy Vary Museum, LIM, LIT, MJ, MZ, OLM, OLP, OP, OSM, OVMB, PL, PRC, PRM – abbreviations according to Hradílek et al. 1992), as well as personal collections during the 1990's. Special thanks belong to J. Herink and P. Vampola, who kindly offered material from their private herbaria, and to F. Kotlaba and J. Herink, who kindly offered their records of finds not deposited in the herbaria. All unidentified or uncertainly identified specimens as well as specimens of critical species (not clearly distinguishable by macroscopic characters) were studied microscopically and critical cases consulted with Z. Pouzar. The basic characters by which such critical species were distinguished were hyphal system and spore morphology (shape and size).

The studied species are treated as follows. The introduction to the special part is formed by the key to the genera; treatment of the genera and species follows. Discussion of problematic topics for particular genera and species is always included in the text of the genus or species, in the appropriate paragraph (taxonomy, occurrence, ecology etc.).

In species descriptions practical diagnostic characters were emphasized. Descriptions of macroscopic and microscopic characters were created according to live material or exsiccates. Characters undetectable on exsiccates were copied from descriptions in literature (Boekhout et al. 1990, Hilber 1982, 1997, Moser 1983, Pegler 1983, Pilát 1935, 1946, Redhead and Ginns 1985, Watling and Gregory 1989) for species which were not seen alive during recent years; this was also partially done in cases where the number of studied specimens was not regarded sufficiently representative. Descriptions are accompanied by a passage about related or similar species and how to distinguish them. Only the distinguishing characters of the other species are presented (example: for *Neolentinus adhaerens* it is mentioned that "similar *Lentinellus cochleatus* has amyloid spores" and there it is not stated that "spores of *N. adhaerens* are non-amyloid").

Further comments for each species include changes in occurrence during the 20th century, phenology, substrates, distribution in the Czech Republic and Slovakia and world-wide distribution. In comments on substrates (host trees), I have also tried to record changes in the representation of substrates for individual species through time. Distribution is appraised according to the occurrence in the altitude belts, climatic and phytogeographic regions.

Distribution maps produced with DMAP for Windows 6.1 (© Alan Morton 1993–97) are included for each species. Abundant species were grid mapped, using the Central European botanical mapping grid (MTB grid); for less abundant species point mapping was used. In the case of broadly defined localities the centre of each symbol was situated in the centre of the given site (mostly a larger town). The symbol explanation is an integral part of each map. The records from the periods before 1945, 1945–1970 and after 1970 are differentiated in the distribution maps. If records were made from one locality during different periods, the last collection is always decisive; documented records are preferred to literature ones.

In the lists of recorded localities (rare species only) the localities are arranged geographically (from west to east).

Special part

Key to the genera of Czech and Slovak pleurotoid fungi of the family *Polyporaceae*:

1) Anthracophilous fungi; cystidia thick-walled ... *Faerberia*
1') Lignicolous fungi; cystidia absent or thin-walled (exception: thick-walled at *Panus strigosus*) ... 2
2) Tough basidiomes with central or slightly excentric stipe and irregularly serrate gill edge ... 3
2') Tough or fleshy basidiomes, stipe central, excentric, lateral or absent, gill edge smooth ... 4
3) Subtle basidiomes with amphimitic hyphal system; fungi causing white rot ... *Lentinus*
3') Subtle to massive basidiomes with dimitic hyphal system; fungi causing brown rot ... *Neolentinus*
4) Basidiomes adnate laterally or by crest, yellow– to brown-orange; spores reniform, 5–6 × 2–3 μm ... *Phyllotopsis*

4') Basidiomes of various shapes and colours; spores ellipsoid to cylindrical, at least 6 × 3 μm ... 5

5) Young and fresh basidiomes with violet hue or considerably pilose on the pileus and stipe surface; hyphal system dimitic, skeletal hyphae frequent; veil always absent; spores 6–7 × 3-4 μm ... *Panus*

5') Basidiomes are not pilose on the surface and have not any violet hue; hyphal system mono– or dimitic, skeletal hyphae rare; veil present or absent; spores always longer than 7 μm ... *Pleurotus*, see 6

6) Skeletal hyphae present only in the stipe base (also elsewhere in the basidiome at *P. cornucopiae*), cystidia present, veil absent ... subgen. *Pleurotus*

6') Skeletal hyphae present in the whole basidiome, cystidia absent, veil present when young ... subgen. *Lentodiopsis*

Faerberia Pouzar

Terrestrial, anthracophilous fungi. Basidiomes solitary, tiny, cantharelloid (pileate with central stipe and decurrent gills). Pileus smooth or slightly radially fibrillose. Gills low, lamelliform, decurrent, with entire edge. Stipe central. Hyphal system dimitic, clamp-connections present. Thick-walled cystidia present. Spores oval to ellipsoid, colourless. Spore print white.

The genus has some possible systematic relations. Some characters are similar to the genus *Hohenbuehelia* (it was classified close to this genus in the family *Tricholomataceae* by some authors). On the other hand, Kühner (1980) classifies it in the same genus (on the subgeneric level) with the species of the genus *Neolentinus*.

Monotypic genus. Type species: *Faerberia carbonaria* (Alb. et Schw.: Fr.) Pouzar.

The genus name *Faerberia* was proposed by Pouzar (1981) to replace the name *Geopetalum*, which he considered inapplicable for the following reasons:

– the name *Geopetalum* was applied by Patouillard (1887) to the genus including species *G. petaloides, G. geogenium* and *G. carbonarium*; the genus type was not mentioned;

– in this study, Patouillard ignored the older generic name *Hohenbuehelia* – this genus had been described by Schulzer (Schulzer et al. 1866, cited sec. Pouzar 1981) including only the species *H. petaloides*, which is therefore the only possible type of the genus *Hohenbuehelia*;

– if a newly described genus includes a species, which is the type species of some formerly described genus, the new genus name is superfluous and species of the new genus should be included in the formerly described genus;

– a name thus superfluous, from the moment of its description, cannot be used for this or for any other genus – this fact is unaffected by later typification of the name *Geopetalum* (on the subgenus level) by the species *Cantharellus carbonarius* (Patouillard 1900), although the newly typified genus already did not include the species *Hohenbuehelia (= Geopetalum) petaloides*;

– Singer (1951, cited sec. Pouzar 1981) created the name *Geopetalum* "de novo", but it is a later homonym of the name *Geopetalum* Pat. and therefore cannot be used.

Singer (1986) disagrees with Pouzar's opinion that the name *Geopetalum* is superfluous according to Art. 63 of the International Code of Botanical Nomenclature (= Art. 52 in the last edition: Greuter et al. 1994). He states that the name is not superfluous if at the time the genus name was published, a type species was established, which was later found to be of a different genus (here *Geopetalum*) than the type species for the previously published genus (here *Hohenbuehelia*) according to paragraph 63.2 (= 52.2 in Greuter et al. 1994). This would be so if Patouillard's genus *Geopetalum* was at the same time typified by *Geopetalum carbonarium*. As the typification followed the description by 13 years, the above mentioned paragraph 63.2 (= 52.2) does not apply, and the generic name *Geopetalum* must be rejected on behalf of the name *Faerberia*.

After all, as Pouzar mentions (personal communication), the etymology of the name *Geopetalum* indicates epigeous, petaloid fungi (which means it was evidently assigned based upon the species currently included in *Hohenbuehelia* and not upon *G. carbonarium*, an anthracobiontic species with a central stipe).

Faerberia carbonaria (Alb. et Schw.: Fr.) Pouzar

Basidiomes solitary. Pileus 1–4 cm in width, dark brown, grey-brown to grey, depressed in the centre, involute on the margin, sometimes radially fibrillose. Gills distinctly lamelliform, low, concolorous with the pileus or paler, grey-brown (to grey-yellow), decurrent, with entire edge. Stipe 1–4 cm long, 1–3 mm wide, concolorous with the pileus. Context light yellow– to grey-brown. Hyphal system dimitic, generative hyphae thin-walled. Numerous conspicuous hymenial cystidia (metuloids) are lanceolate, 90–120 × 15–20 μm, thick-walled, covered with crystalic matter in the apical part. Spores oval to ellipsoid, (7.5-)8.5–10 × (3.5-)4–5(-5.5) μm. Smell inexpressive, taste mild.

This species is unmistakable based on a combination of macroscopic (grey cantharelloid basidiome), microscopic (conspicuous cystidia) and ecological (substrate) characters.

Occurrence: Rare species with constant occurrence. Because it is limited to a specific substrate, there is a relatively limited chance of finding it – the species is possibly more abundant than the count of observations indicates.

Phenology: Fructification in summer and autumn seasons, rare finds up to the end of the year.

Substrate: The species is restricted to burnt ground, formerly only in deciduous forests (if the forest type was recorded), recently (since the 1980s) also in coniferous forests. Noordeloos (Boekhout et al. 1990) reports its growth on peat, as well.

Distribution in the Czech Republic and Slovakia: Scattered localities especially in the middle altitudes in both states; the species does not occur in higher altitudes and cold regions. As mentioned above, it probably occurs more abundantly than indicated by the distribution map, which more likely represents places where mycologists have encountered basidiomes of this species.

World-wide distribution: Scattered occurrence throughout Europe. It is probably distributed only in Europe.

List of recorded localities:

Czech Republic

Koryta (W Bohemia, N of Plzeň), chalet settlement near the Střela river, 300 m, MTB 6046d, burnt place, 29. IV. and 15. VII. 1979, leg. et det. Z. Hájek ut*Geopetalum carbonarium*, rev. P. Hrouda 3. 4. 1996 (PL).

Záluží near Litvínov (N Bohemia, W of Ústí n. L.), 1 km NE, marshalling yard, 270 m, MTB 5447b, slag and burnt rests of plants and coal, 25. IX. 1980, leg. B. Aubrecht, det. B. Aubrecht et J. Šutara (LIT).

Jetřichovice (NE of Ústí n. L.), on the top of "Koliště" [Goliště] hill, 450 m, MTB 5152a, burnt place (in *Fagetum*), 10. VII. 1970, leg. et det. M. Svrček (PRM).

Nová Ves near Bakov nad Jizerou (NE Bohemia), settlement Velký Rečkov, near the reserve "Klokočka" in the valley of the Rokytka stream on SWW foot of "Lovotín" hill, 220 m, MTB 5455c, old burnt place, 17. VI. 1970, leg. J. Herink et A. Komárková, 12. VII. 1970, leg. J. Herink, both det. J. Herink (Herb. Herink, recently PRM).

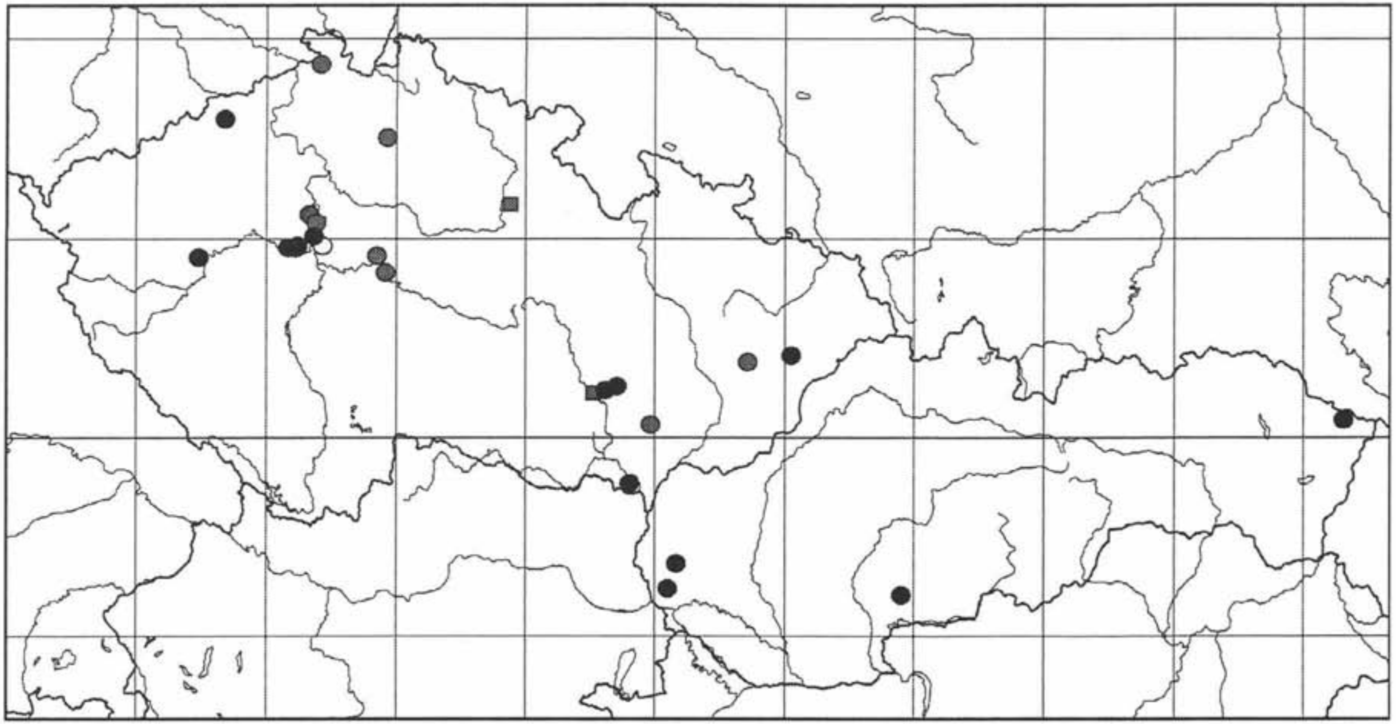
Karlštejn (SW of Prague), "Dřínová hora" hill, near the way to "Královská studánka" spring, MTB 6050d, burnt place on the clearing in *Piceetum*, 5. IX. 1987, leg. R. Fellner et al.; southern slope, burnt place on the clearing in *Piceetum*, 20. X. 1990, leg. J. Herink, J. Holec et K. Kult, both det. J. Herink (Herb. Herink, recently PRM).

Roblín (SW of Prague), MTB 6051a, burnt place, 3. X. 1943, leg. I. Charvát, det. J. Herink ut *Cantharellus carbonarius*; burnt place around the *Fagus* stumps, 13. XI. 1976, leg. J. Trapl, det. Z. Pouzar (PRM).

Prague, part Zbraslav, forest behind "Závist", MTB 6052a, 12. IX. 1922, coll. G. Beck (PRC).

Prague, part Velká Chuchle, "Svatý Jan" hill, 280 m, MTB 5952c, burnt place in deciduous forest, 2. X. 1978, leg. et det. L. Kubičková (PRM).

Map 1 – Faerberia carbonaria



Documented data:

- ○ - locality where the species was found before 1945
- ● - locality where the species was found between 1945 and 1970
- ● - locality where the species was found after 1970

Data from literature:

- ■ - locality where the species was recorded between 1945-1970

Prague, part Smíchov, "Kinského sady" park, MTB 5952a, burnt place under *Quercus*, 17. VI. 1953, 27. VII. 1953, both leg. E. Wichanský, det. A. Pilát ut *Cantharellus carbonarius*, rev. P. Hrouda 7. 2. 1996 (PRM).

Prague, part Nebušice, MTB 5851d, burnt place, IX. 1946, leg. S. Hejný, det. M. Svrček ut *Cantharellus carbonarius*, rev. P. Hrouda 7. 2. 1996 (PRM).

Stříbrná Skalice (SE of Prague), MTB 6155a, burnt place, 6. VII. 1949, leg. Z. Pouzar, det. J. Charvát ut *Cantharellus carbonarius*, rev. P. Hrouda 7. 2. 1996 (PRM).

Sázava (SE of Prague), settlement Poříčko, valley of "Křešický potok" stream, MTB 6155d, burnt place, 3. X. 1948, leg. J. Kubička, det. J. Herink ut *Geopetalum carbonarium* (PRM).

Hradec Králové (E Bohemia), forest near "Bířičky" lake, MTB 5861a, 30. XII. 1951, leg. et det. J. Hásek ut *Cantharellus carbonarius* (Hásek 1952).

Brno (S Moravia), part Bystrc, site "Rakovec" (near the water reservoir), MTB 6765c, burnt place in *Quercus-Fagus* forest (already overgrown by moss and grass), 21. VI. 1970, leg. V. Fux (Kříž et al. 1971).

Brno, part Lesná, "Suchá hora" between Lesná and Soběšice, MTB 6765d, old burnt place, 15. VII. 1990, leg. et det. A. Vágner (BRNM).

Bílovice nad Svitavou (E of Brno), 1,5 km NW of the village, site "U luže", 360 m, MTB 6765b, old burnt place, 8. VI. 1986, leg. et det. A. Vágner ut *Faerberia carbonaria* (BRNM).

Valtice (S of Brno), "Boří les" forest [= in Theimwald], MTB 7266d, under *Quercus*, 24. VI. 1912, leg. et det. H. Zimmermann ut *Cantharellus carbonarius* (PRM; Zimmermann 1914); 2 km E of the town, site "Rendezvous", 190 m, burnt place, 18. VI. 1993, leg. et det. V. Antonín ut *Faerberia carbonaria* (BRNM).

Silničná near Žarošice (SE of Brno), MTB 6967b, burnt place in deciduous forest, 16. VIII. 1946, leg. et det. V. Vacek ut *Cantharellus carbonarius*, rev. P. Hrouda 7. 2. 1996 (PRM).

Bystřice pod Hostýnem (E Moravia), "Čerňava" forest, 540 m, MTB 6672a, 6. XI. 1962, leg. L. Rychtera, det. A. Pilát ut *Cantharellus carbonarius*, rev. P. Hrouda 7. 2. 1996 (PRM).

Bystřička (E Moravia), left bank of Bystřička water reservoir, MTB 6574c, burnt place in coniferous forest *(Picea)*, 22. IX. 1994, leg. et det. A. Vágner ut *Faerberia carbonaria* (BRNM).

Slovakia

Marianka (N of Bratislava), 3,4 km SEE, near "Marianský potok" stream, 370 m, MTB 7768d, burnt place in *Piceetum*, 4. IX. and 8. X. 1988, leg. et det. L. Hagara; dtto 350 m, 8. X. 1988, leg. et det. J. Kuthan ut *Geopetalum carbonarium* (both BRA).

Pernek (N of Bratislava), MTB 7668b, 5. VI. 1987, leg. S. Cubínek, det. A. Dermek ut *Geopetalum carbonarium* (BRA).

Ladzany (S part of central Slovakia), 450 m, MTB 7779a, burnt place under *Quercus*, 18. IX. 1979, leg. et det. J. Kuthan ut *Geopetalum carbonarium* (BRA).

Veľká Poľana (E Slovakia), settlement Ruské, valley of the Cirocha river, 450 m, MTB 6800c, burnt place, 29. IX. 1988, leg. et det. J. Kuthan ut *Geopetalum carbonarium* (BRA).

Lentinus Fr.

Lignicolous fungi. Basidiomes solitary, tiny, stipitate. Pileus surface smooth or squamulose, involute on the margin. Gills decurrent, with slightly serrate edge. Stipe central. Hyphal system amphimitic, clamp-connections present. Cystidia present. Spores cylindrical to ellipsoid, colourless. Spore print white.

Type species: *Lentinus crinitus* (L.: Fr.) Fr.

The genus *Lentinus* typification is not an unambiguous matter. Fries (1825) did not establish the type and later the following species have been proposed as lectotypes: *Agaricus tuber-regium* (Earle 1909: 416), *A. tigrinus* (Clements et Shear 1931: 349), *A. lepideus* (Singer et Smith 1946: 254) and *A. crinitus* (Donk 1949: 313–314).

All these species were originally published as belonging to *Lentinus* in Systema Orbis vegetabilis (Fries 1825). On the basis of the citation from Systema Orbis vegetabilis, Donk (1962: 159) gave reasons for using the lectotype *Agaricus (Lentinus) crinitus*: "Species ... optimae tropicae, versus polos rarescent" shows that for Fries the typical representatives of the genus *Lentinus* were tropical species, representing the substantial part of the genus; he supported this statement with another citation from Elenchus Fungorum (Fries 1828): "Fungi ... praecipue tropici, in temperatis raro obvii". On the other hand, for Singer (1975) the type species remains *Lentinus lepideus*, based on the basionym description (Fries 1821). The latest monographs (Corner 1981, Pegler 1983) nevertheless, present *L. crinitus* as the type species.

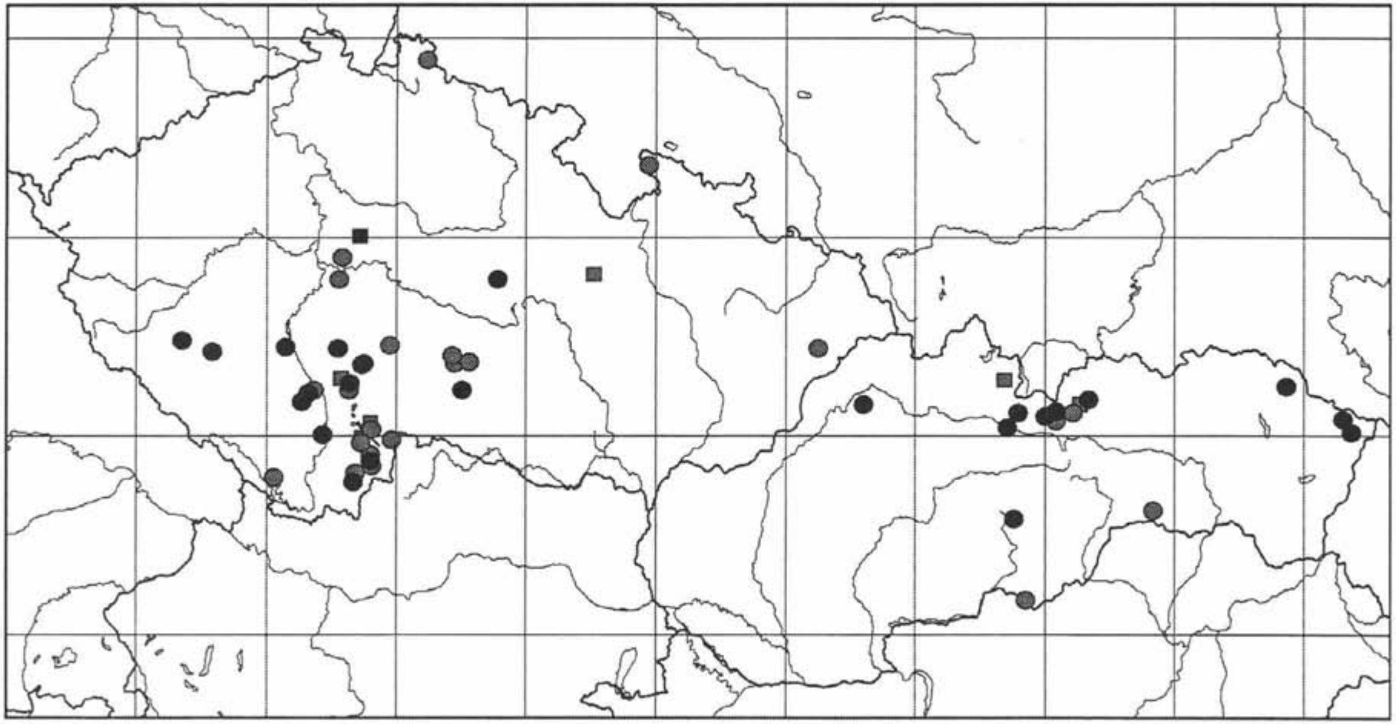
Key to the species:

1)	Pileus surface covered with dark squamulae	... *L. tigrinus*
1')	Pileus surface smooth	... *L. suavissimus*

Lentinus suavissimus Fr.

Basidiomes solitary. Pileus 1–5 cm in width, rarely more (specimen with 11 cm wide pileus was found at "Borkovická blata" near Soběslav /Kotlaba 1957/),

Map 2 – Lentinus suavissimus



Documented data:

● - locality where the species was found between 1945 and 1970

● - locality where the species was found after 1970

Data from literature:

■ - locality where the species was recorded between 1945-1970

Broadly defined localities:

✱ - locality where the species was found between 1945 and 1970 depressed in the centre, pale, beige or yellow, sometimes with orange or brown hue. Gills dense, relatively low, pale or yellowish, decurrent; edge slightly serrate, with hyphae fascicles outgoing from the gill side ("hyphal pegs"). Stipe up to 1 cm long, 2–4 mm wide, concolorous with the pileus; often the gills are so longly decurrent that the stipe is almost missing. Context whitish. Hyphal system amphimitic, generative hyphae thin-walled, ligative hyphae thick-walled, branched. Cystidia absent. Spores cylindrical to ellipsoid, (5.5-)6–8 × 2.5–3(-3.5) μm. Smell anise, very pungent in fresh state (characteristic also for the mycelium /Pilát 1946/), taste fungal.

Related species. *Lentinus tigrinus* has the pale pileus surface covered with dark "squamulae" created by interwoven hyphal strands. *Lentinellus flabelliformis* has darker (brownish) basidiomes with brown stipes and almost globose amyloid spores. *Panellus stipticus* has darker (ferrugineous) gills, which are not decurrent and small (up to 3 μm) amyloid spores. Fresh basidiome of *Lentinus suavissimus* is clearly characterised by the pungent anise smell.

Occurrence: Less abundant species, showing a decline during the last decades (rather considerable in the Czech Republic). There are not any records from either the Czech Republic or Slovakia from the 1990s.

Phenology: Fructification summer (maximum VII.-VIII.) to autumn, rare finds in the mild winter.

Substrate: Deciduous wood. The species of the genus *Salix* (most often *S. caprea, S. aurita*) are most common. White rot is caused by this species.

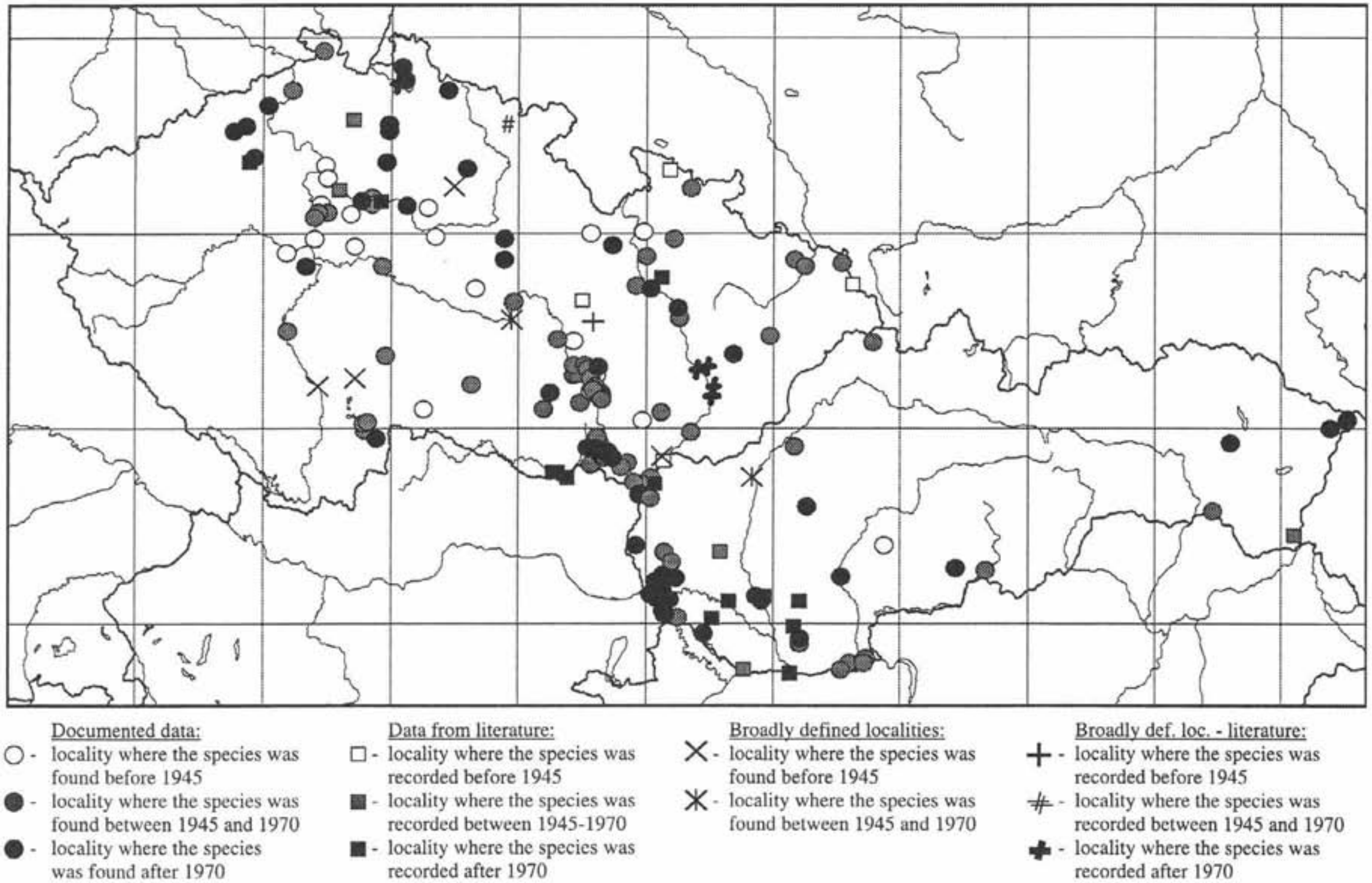
Distribution in the Czech Republic and Slovakia: The species occurs in middle to high altitudes (up to 1200 m in Slovakia). It is absent in the warm regions (the finds from the pannonic thermophyticum are dependant upon higher altitudes ["Šiatoroš" hill] or on inversions ["Zádielska dolina" valley]). There are two distinct distribution centres – southern Bohemia and the Tatra Mts. region. It has been found elsewhere in scattered locations.

World-wide distribution: Temperate zone of the northern hemisphere. The species occurs from subtropical to boreal regions.

Lentinus tigrinus (Bull.: Fr.) Fr.

Basidiomes solitary, more rarely fastigiate. Pileus 2–8 cm wide (rarely more), depressed in the centre, pale, beige or light ochraceous, covered with dark brown or black radial squamulae created by interwoven hyphal strands (rarely the pileus is ochraceous to brown, and without squamulae). Gills dense, relatively low, pale to ochraceous, decurrent; edge slightly serrate, "hyphal pegs" present. Veil (velum partiale) present in the juvenile stage, but soon disappears. Stipe 1–10 cm long, 2–6 mm wide, sometimes broadened below the pileus, concolorous with the pileus, more or less covered with tiny dark squamulae (uniformly dark in extreme cases).

Map 3 – Lentinus tigrinus



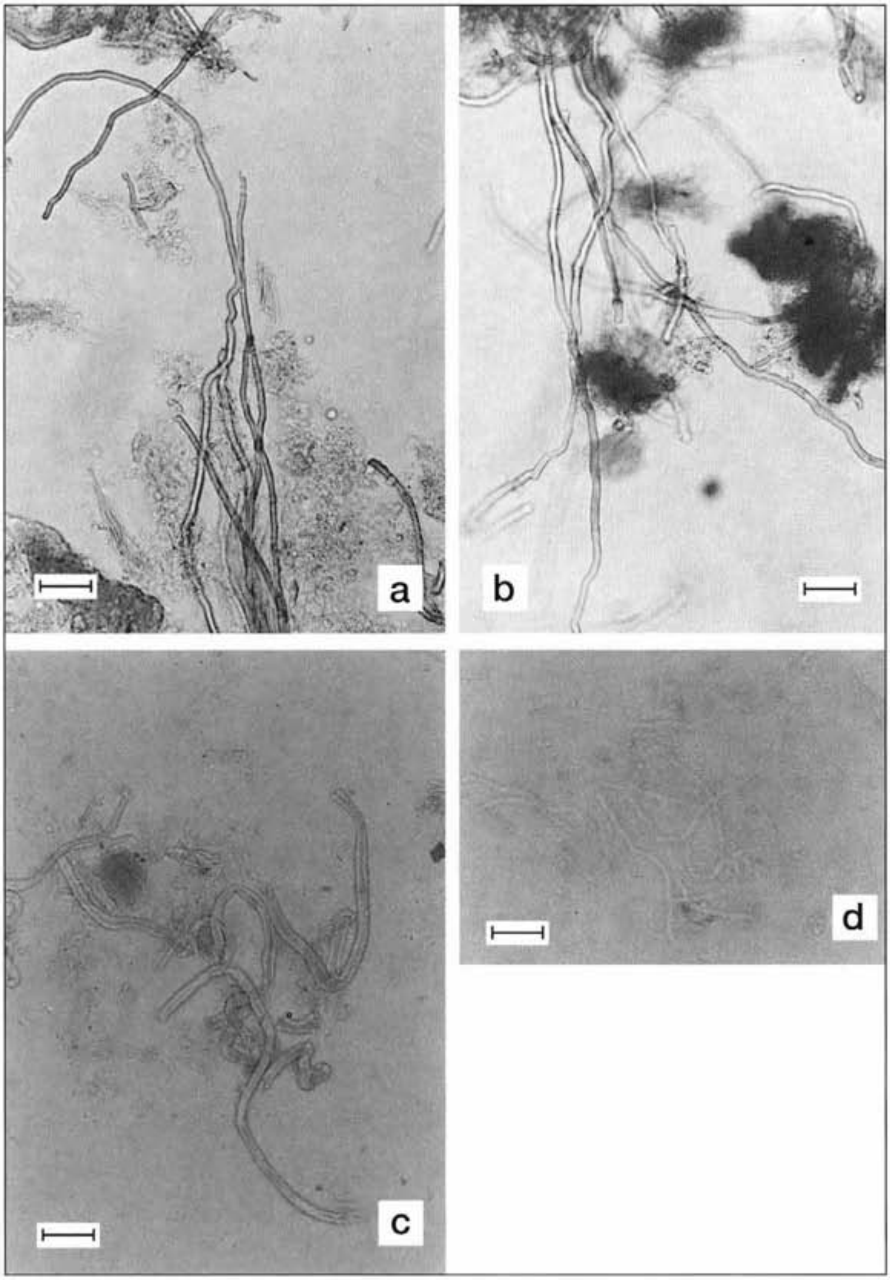


Fig. 1. **a** *Neolentinus degener*, skeletal hyphae; **b** *Panus conchatus*, skeletal hyphae; **c** *Pleurotus cornucopiae*, skeletal hyphae; **d** *Lentinus suavissimus*, ligative (= binding) hyphae. Scale bars = 25 μm.

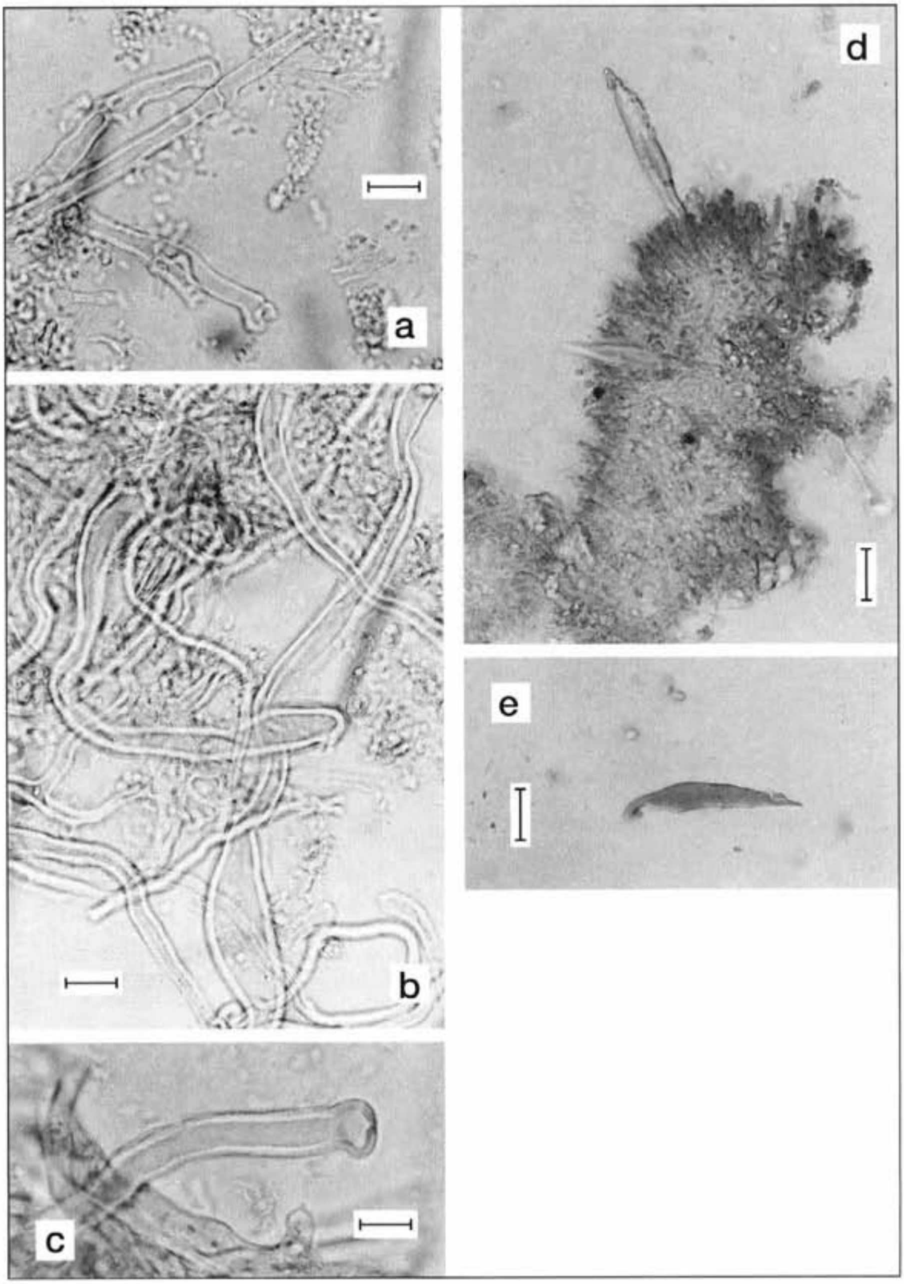


Fig. 2. **a** *Neolentinus adhaerens*, generative hypha with clamp-connection; **b** *Lentinus tigrinus*, inflated generative hyphae; **c** *Phyllotopsis nidulans*, inflated generative hypha. Scale bars = 10 μm. **d** *Faerberia carbonaria*, thick walled cystidia (metuloids) outgoing from the hymenial surface; **e** *Faerberia carbonaria*, isolated cystidium. Scale bars = 25 μm.

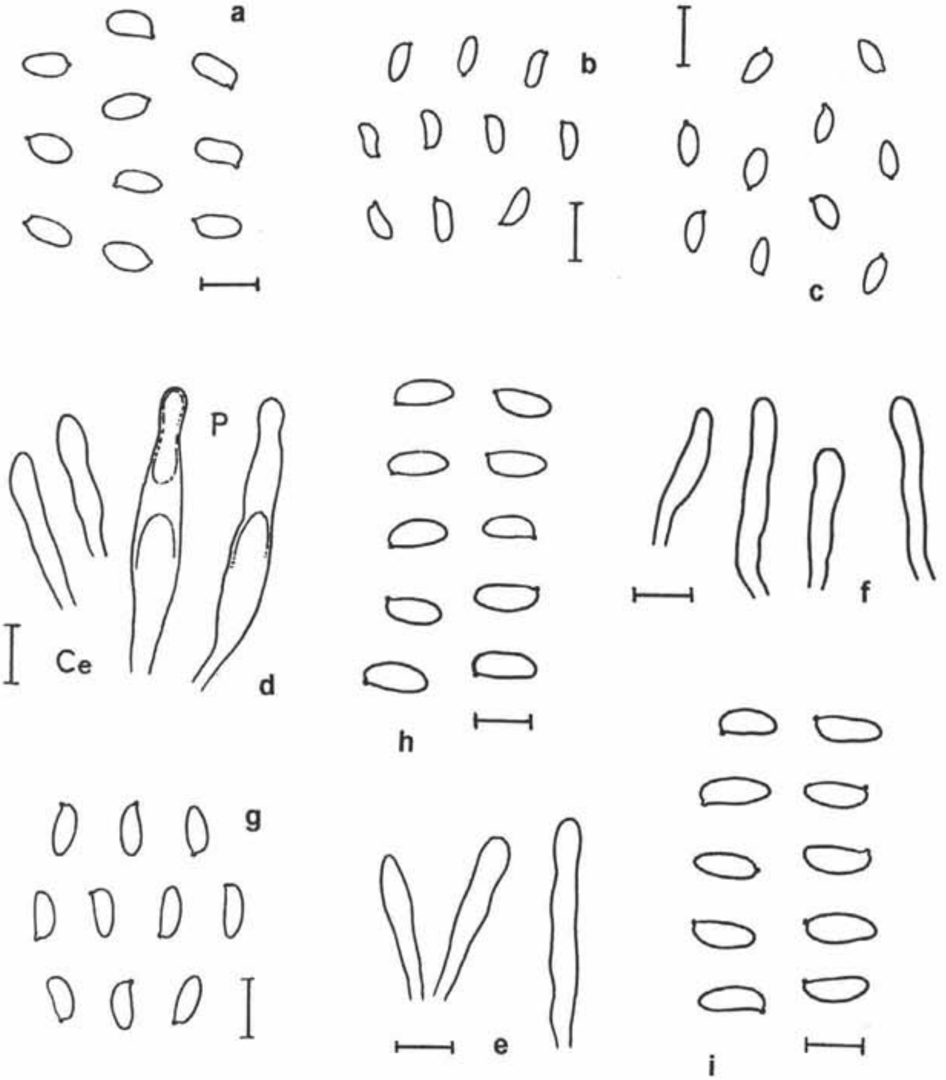


Fig. 3. a *Faerberia carbonaria*, spores. b *Lentinus suavissimus*, spores; c *Lentinus tigrinus*, spores; d *Neolentinus adhaerens*, pleurocystidia (P) and cystidiiform ends of hymenial hyphae (Ce); e *Neolentinus degener*, cystidiiform ends of hymenial hyphae; f *Neolentinus lepideus*, cystidiiform ends of hymenial hyphae; g *Neolentinus adhaerens*, spores; h *Neolentinus degener*, spores; i *Neolentinus lepideus*, spores. Scale bars = 10 μm.

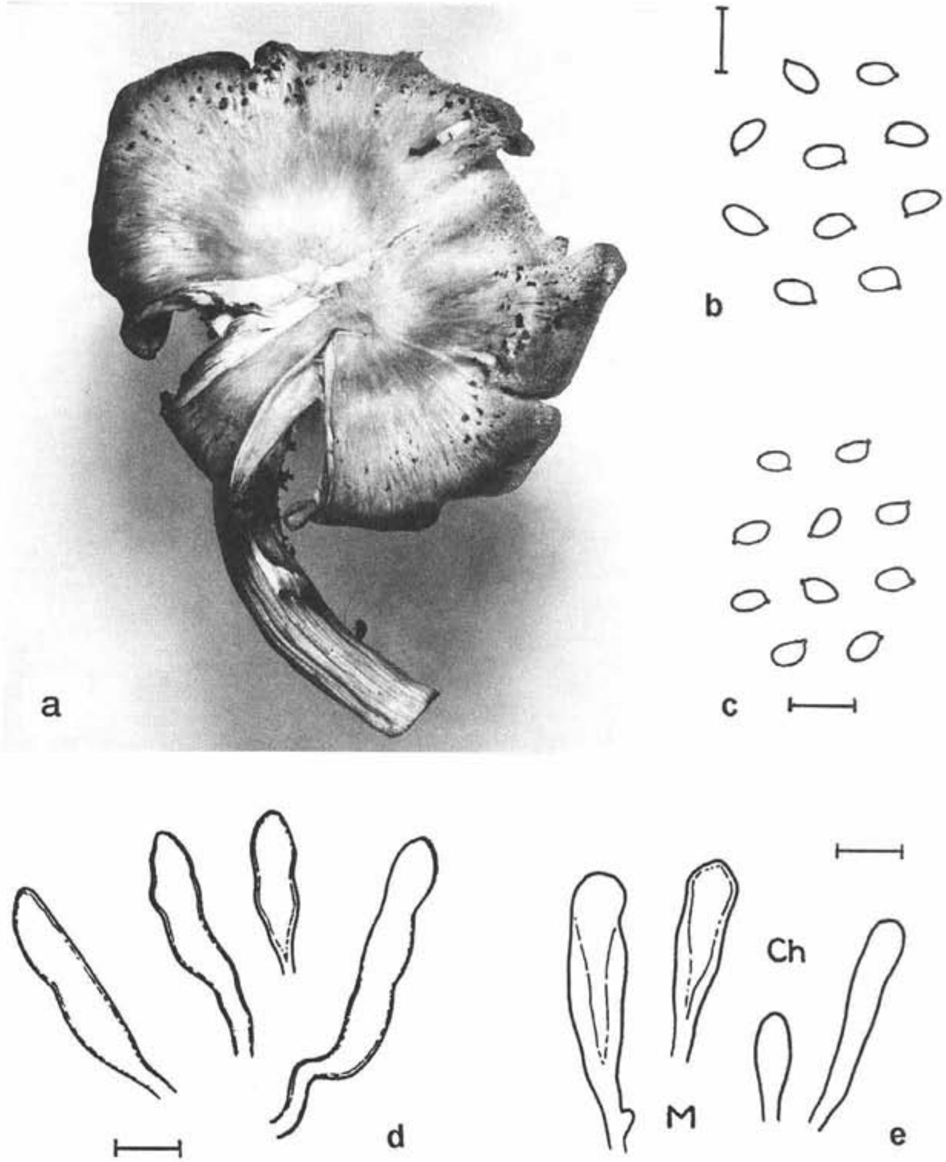


Fig. 4. **a** *Neolentinus lepideus*, rare form with smooth pileus without scales. Photo I. Gottvaldová. **b** *Panus conchatus*, spores; **c** *Panus lecomtei*, **d** *Panus conchatus*, pleurocystidia; **e** *Panus lecomtei*, cheilocystidia (Ch) and metuloids (M). Scale bars = 10 µm.

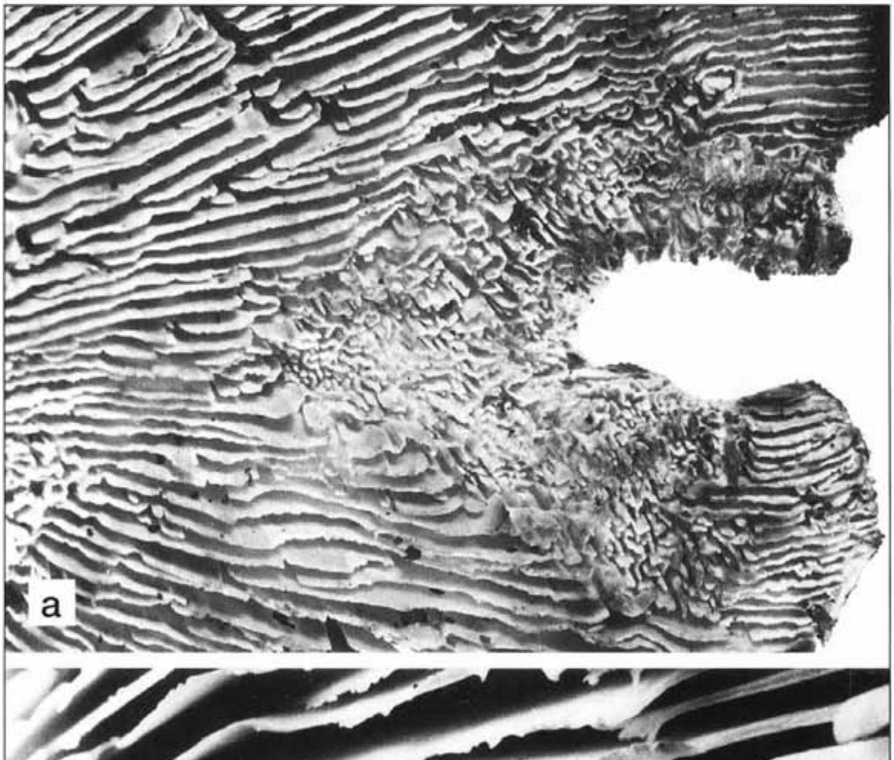


Fig. 5. a *Neolentinus degener*, detail of gills. Labyrinthiform structure is formed by the secondary lamellae (in the place where the gills have been eaten by some animals). **b** *Neolentinus lepideus*, detail of shortly decurrent gills with irregularly serrate edge. Photos I. Gottvaldová.

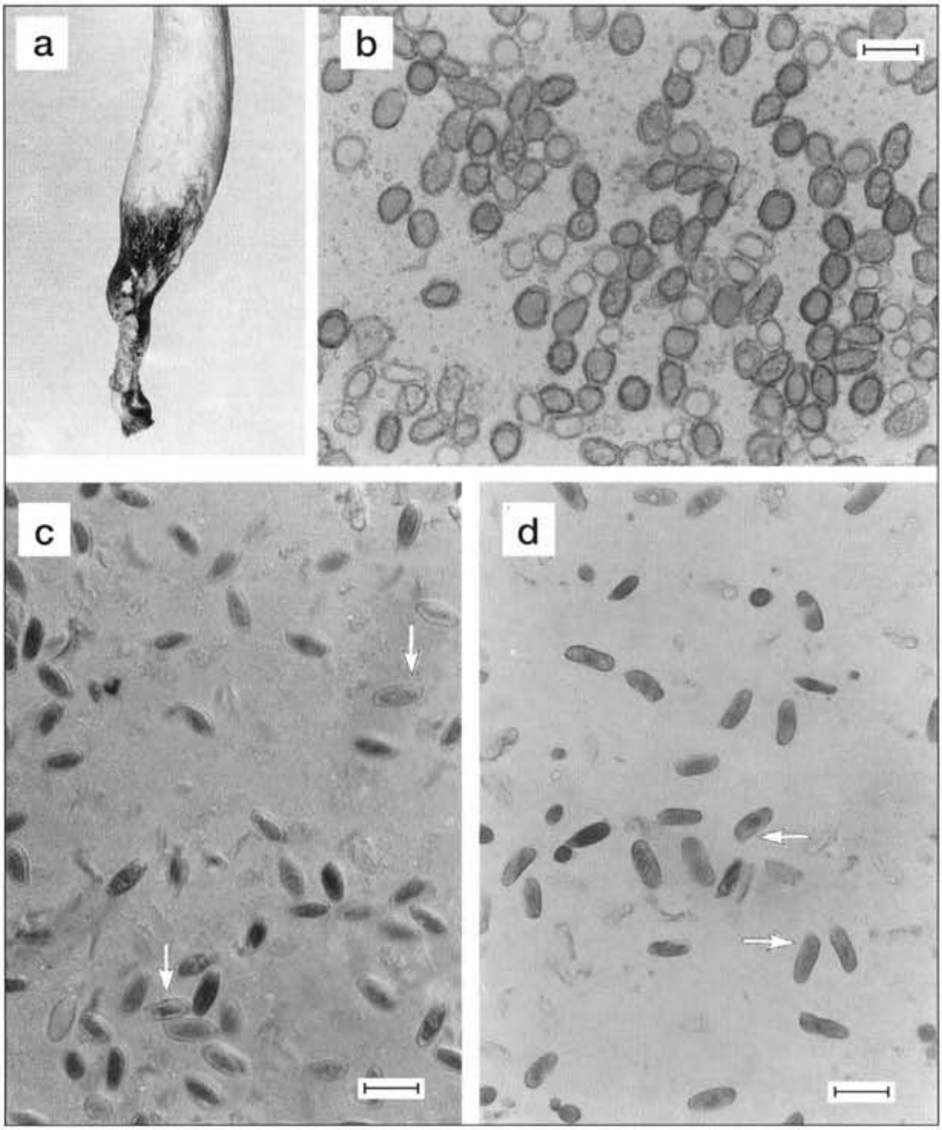


Fig. 6. **a** *Pleurotus dryinus*, anamorph. Dark surface of the stipe base is covered with mass of conidia. Photo I. Gottvaldová. **b** *Pleurotus dryinus*, conidia. Scale bar = 10 μm. **c–d** Comparison of the spore shape of *Pleurotus cornucopiae* and *Pleurotus ostreatus*; **c** *P. cornucopiae* – spores slightly concave on all sides; **d** *P. ostreatus* – spores slightly convex in the subapical part. (Well represetative spores are matked by arrows on both figures.) Scale bars = 10 μm.

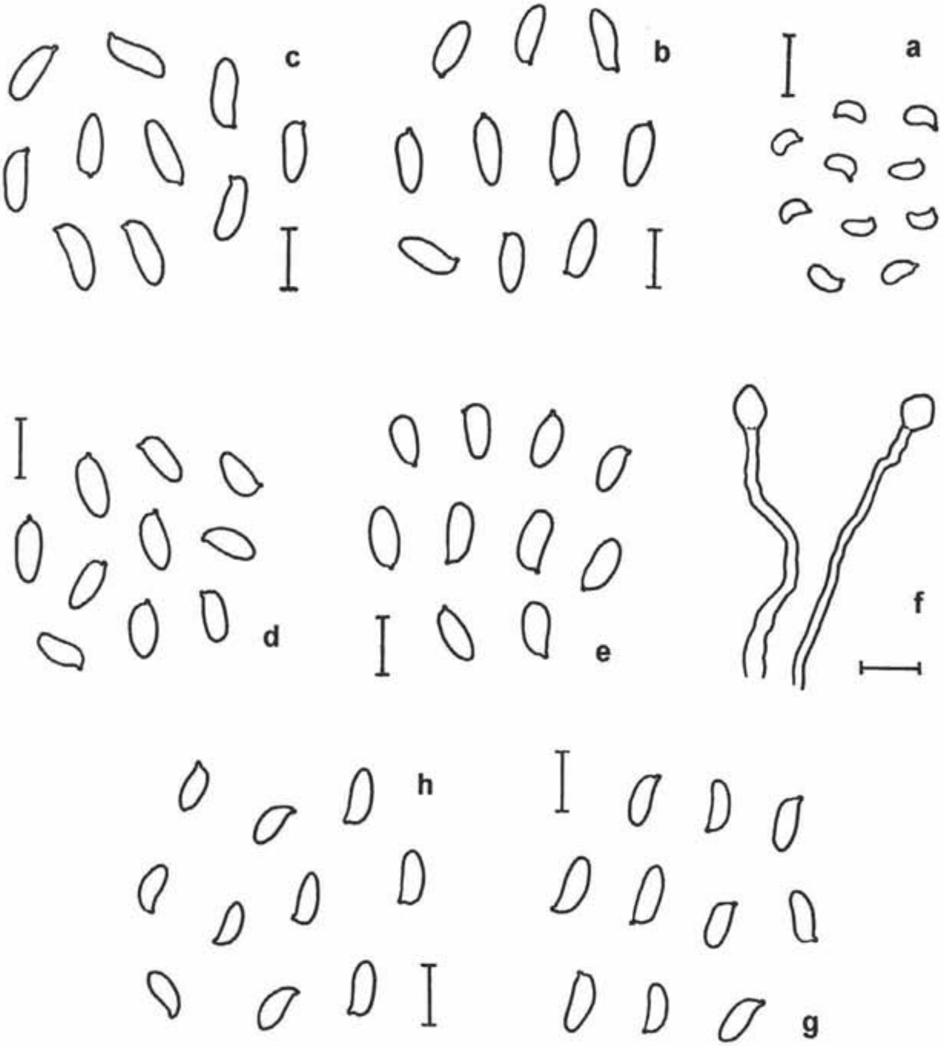


Fig. 7. **a** *Phyllotopsis nidulans*, spores; **b** *Pleurotus calyptratus*, spores; **c** *Pleurotus dryinus*, spores; **d** *Pleurotus cornucopiae*, spores; **e** *Pleurotus eryngii*, spores; **f** *Pleurotus eryngii*, cystidiiform hyphal ends, ending with spherical elements (so called "conidia"); **g** *Pleurotus ostreatus*, spores; **h** *Pleurotus pulmonarius*, spores. Scale bars = 10 μm.

Context pale. Hyphal system amphimitic, generative hyphae thin-walled, ligative hyphae thick-walled, copiously branched. Cheilocystidia clavate, 20–30 × 3–6 μm. Spores cylindrical to ellipsoid, (5.5-)6.5–7.5(-8) × 2.5–3.5(-4) μm. Smell fungal or farinaceous (Kovář 1994 reports pungent farinaceous smell), taste somewhat acidic.

Romagnesi (1968) describes *Lentinus tigrinus* var. *dunalii* as a variety with an elongated stipe (5–11 cm) tapering towards the base; sometimes the pileus creation is reduced. It is evidently a habitat form from shaded habitats (Romagnesi reports it not only from cavities or fissures, but also growing through the forest litter layer). Arcangeli (1895) reports that the clavarioid forms and normal basidiomes are formed at the same time.

Related species. The pileus of *Lentinus suavissimus* is yellowish to ochraceous, without any squamulae. No other lignicolous species is characterised by the following character combination: tiny basidiome with decurrent gills and squamulose pileus surface.

Occurrence: The species is still abundant. The fact the greatest number of collections was made in the 1960s is probably because the collectors were most active during this period.

Phenology: Greatest fructification in late spring (maximum V.-VI.), continuing to a lesser degree until autumn. A clear peak in occurrence in May can be recorded in warm regions (where the species is most abundant), while occurrence in the meso- or oreophyticum is equal during the whole summer.

Substrate: Different deciduous trees, most often from the genus *Salix*. Occasionally found on another substrate (1× *Abies*, 1× straw). White rot is caused by this species.

Sporadic find on *Abies*: Mnichovice (SE of Prague, Czech Republic), "Kožený vrch" hill, MTB 6054c, 1. VII. 1936, leg. et det. Josef Velenovský, rev. F. Kotlaba et Z. Pouzar 10. 5. 1984 (PRM).

Sporadic find on straw (weedly in the bale culture of *Pleurotus pulmonarius*): Mnichovo Hradiště (Czech Republic, NE Bohemia), No. 285, MTB 5455d, 31. I. 1988, leg. Svatava Horáčková, det. Josef Herink (Herb. Herink, recently PRM).

Distribution in the Czech Republic and Slovakia: Relatively common species in the low altitudes and the warm regions; found elsewhere in many scattered locations.

World-wide distribution: Cosmopolitan species occurring all around the world except cold regions; the northern boundary of its occurrence is approximately the 50^{th} parallel line, in Europe it occurs on the whole continent except Scandinavia.

Neolentinus Redhead et Ginns

Lignicolous fungi. Basidiomes stipitate, tiny or large, solitary or the stipes are connate at the base. Pileus surface smooth or covered with scales or squamulae of different origin. Gills decurrent, with irregularly serrate edge. Stipe central or slightly excentric. Hyphal system dimitic, clamp-connections present. Cystidia present or absent. Spores cylindrical to ellipsoid, colourless. Spore print white.

Type species: *Neolentinus kauffmannii* (A. H. Smith) Redhead et Ginns.

The genus was described only 15 years ago (Redhead et Ginns 1985) on the basis of the brown rot and microscopic characters (regular hymenophoral trama, binucleate spores). This was later supported by Hibbett and Vilgalys (1993), who, using morphological characters and nucleic acids sequences characters did not confirm that the genus *Lentinus* sensu Pegler (1983) is monophyletic; on the other hand, in the scope of this "wide genus", they identified three monophyletic groups equivalent to the genera *Lentinus* s. str., *Panus* and *Neolentinus*.

Key to the species:

1) Tiny basidiomes (up to 7 cm), pale to brown-orange, surface of the fresh pileus glutinous; cylindrical cystidia on the gill side ... *N. adhaerens*

1') Carnous basidiomes (usually bigger than 7 cm), pale with darker scales or squamulae, never glutinous on the surface; cystidia on the gill side absent ... 2

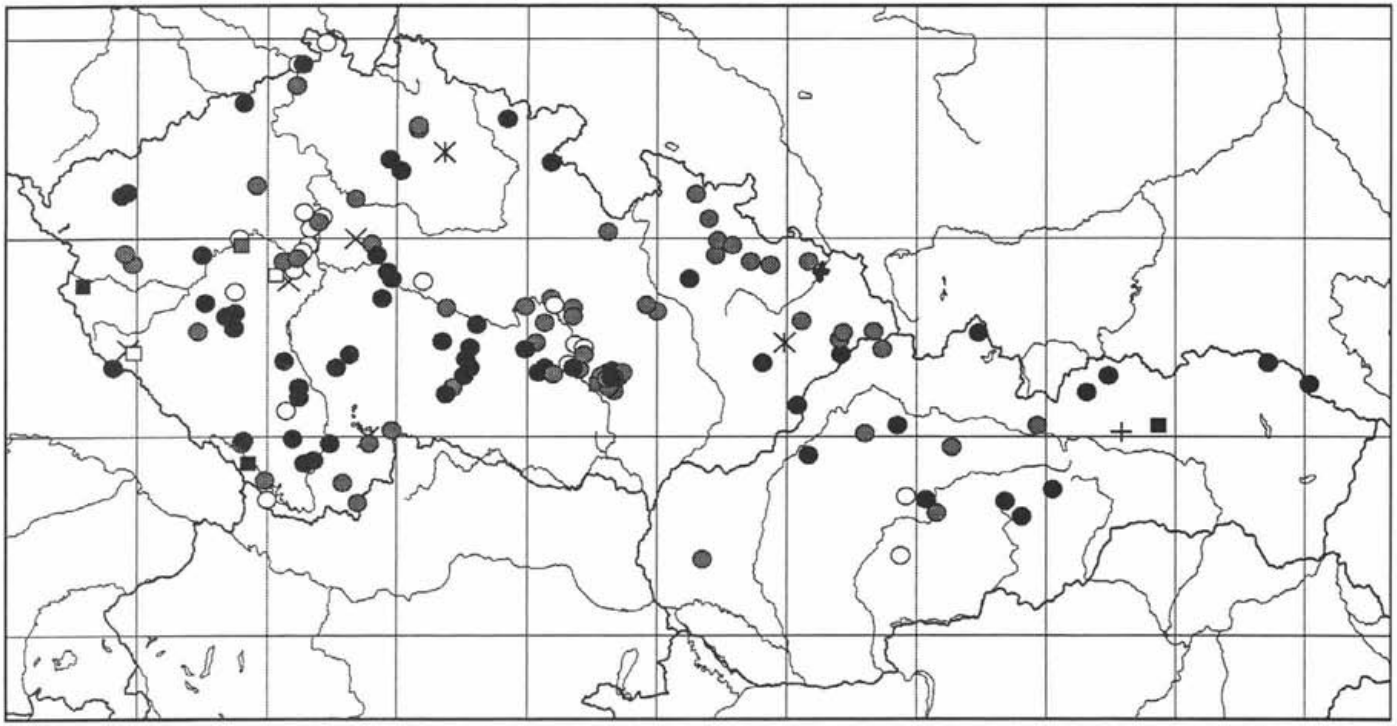
2) Conspicuous (several milimeters) scales of broken cuticle usually on the pileus and stipe surface; veil in the juvenile stage present; found mostly on conifers ... *N. lepideus*

2') Stipe and pileus covered at most by tiny squamulae (max. 1 mm wide); veil absent; found on deciduous trees in warm regions ... *N. degener*

Neolentinus adhaerens (Alb. et Schw.: Fr.) Redhead et Ginns

Basidiomes solitary, more rarely fastigiate. Pileus 2–7 cm in width, sallow or pale ochraceous in the juvenile stage (sometimes till maturity), turning ferrugineous (with orange or brown hue) with age. In the juvenile stage, the whole basidiome can be white (V. Barabáš, herbarium specimen label: Ml. Boleslav, Jemníky village, the surroundings of "Boží voda", 1992 /Herb. Herink/). Expulsion of a glutinous resin-like substance on the pileus surface causes the ferrugineous tint after drying. Gills pale to ochraceous, uncinate and decurrent (not typically decurrent as is common in pleurotoid fungi – the gill edge is parallel with the pileus and forms a short, abrupt curve where it attaches to the stipe; sometimes it looks like non-decurrent gills); edge irregularly serrate. Stipe 3–7 cm long, 0.5–1 cm wide, concolorous with the pileus or somewhat paler, smooth. Context whitish. Hyphal system dimitic, generative hyphae thin– or thick-walled, skeletal hyphae

Map 4 – Neolentinus adhaerens



Documented data:

- ○ - locality where the species was found before 1945
- ● - locality where the species was found between 1945 and 1970
- ● - locality where the species was found after 1970

Data from literature:

- □ - locality where the species was recorded before 1945
- ■ - locality where the species was recorded between 1945-1970
- ■ - locality where the species was recorded after 1970

Broadly defined localities:

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Broadly def. loc. - literature:

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thick-walled. Cystidia: pleurocystidia fusiform, 40–60 × 7–12 μm (Pegler 1983 reports a length of 60–120 μm), additional "cystidiform hairs" on the gill edge. Spores cylindrical to longly ellipsoid, (6.5-)7.5–9.5(-11) × 3–4 μm. Smell fungal or resinous. Taste bitter, astringent (A. Procházka, specimen label: Lomnice, the valley in the direction of Rašov, 1950 /BRNU/).

Neolentinus adhaerens (like *N. lepideus*) forms under insufficient light conditions so called "mine forms" – sterile sprout-like basidiomes without pilei. These forms are (like the juvenile basidiomes) pale to white (Haller 1948). Their occurrence is distinctly more rare than at *N. lepideus* (2 records in the Czech Republic, in one of these cases the determination is not certain).

Related species. Similarly ferrugineous *Lentinellus cochleatus* has an infundibuliform basidiome with longly decurrent gills and globose amyloid spores; it occurs on deciduous trees. Tiny basidiomes (especially juvenile) are mistakable for *Panellus mitis* (it also occurs on conifers, is also glutinous on the pileus surface), which does not have decurrent gills and has smaller (up to 6 μm), amyloid spores.

Occurrence: The species is relatively abundant with constant occurrence in the Czech Republic and quite rare in Slovakia.

Phenology: There are two distinct fructification peaks – spring (with occurrence maximum in April) and autumn (maximum in October). In cold regions (in higher altitudes), only the autumn peak distinctly appears – this is why the spring peak is almost absent in Slovakia, where the most finds are in sub-mountain altitudes. In any case, *Neolentinus adhaerens* is not a winter fungus; the winter finds count is distinctly lower, as is the summer finds count.

Substrate: Almost exclusively coniferous trees; the finds are mostly connected with *Picea* or *Abies* (97 % of our finds were on these trees). Exceptionally found on other substrates (1× *Fagus sylvatica*, 1× humose soil). Brown rot is caused by this species.

Sporadic find on *Fagus sylvatica*: Dobřejice (Czech Republic, S Bohemia), 2,1 km south of village, 410 m, MTB 6653c, 9. IV. 1993, leg. et det. Jiří Valter (CB).

Sporadic find on the humose soil: České Budějovice (Czech Republic, S Bohemia), Štítného street No. 16, house yard, 390 m, MTB 7052b, 23. V. 1986, leg. Tomáš Papoušek, det. František Tondl (CB; note: dia 465).

Distribution in the Czech Republic and Slovakia: In the climatic conditions of our countries, this species distinctly prefers middle to mountain altitudes with colder climates; it is almost absent in the Pannonic region, where it has been recorded only once at the boundary (Brno-Obřany). In the scope of the mentioned higher and colder areas, its occurrence is rather even within the Czech Republic and Slovakia.

World-wide distribution: The species occurs in the northern temperate zone of Eurasia and America. Although it seems – according to its distribution in our countries – that it is a boreal species, its occurrence in northern Europe is not documented. (Käärik 1992 presents the only doubtful record in Finland.)

Neolentinus degener (Kalchbr. in Fr.) P. Hrouda, comb. nov.

Basionym: *Lentinus degener* Kalchbrenner in Fries, Hymenomyc. Eur.: 482, 1874.

Commonly, since Fries (1838), this species is presented as *Panus*, or *Lentinus cyathiformis*. The basionym of this name (*Agaricus cyathiformis*) can be found in Schaeffer (1771). But Kotlaba and Pouzar (1996) on the basis of its illustration and description suggest that *Agaricus cyathiformis* in Schaeffer's work represents quite another species, probably *Pleurotus pulmonarius*. This statement is supported by the following arguments:

– entire gill edge (for comparison: on the illustration of *Agaricus tubaeformis* Schaeff. /= *Neolentinus lepideus*/ by the same painter, the gill edge is distinctly serrate);

– the gills breadth distinctly exceed the pileus context thickness (this proportion is reversed in *Neolentinus degener*);

– dark colour on the stipe is probably a shadow made by the painter, because the description reports pale yellow ("pallide luteo") stipe colour;

– striate pileus is undoubtedly the result of the painter's conventionalization (it was used also on the other pictures in the same work);

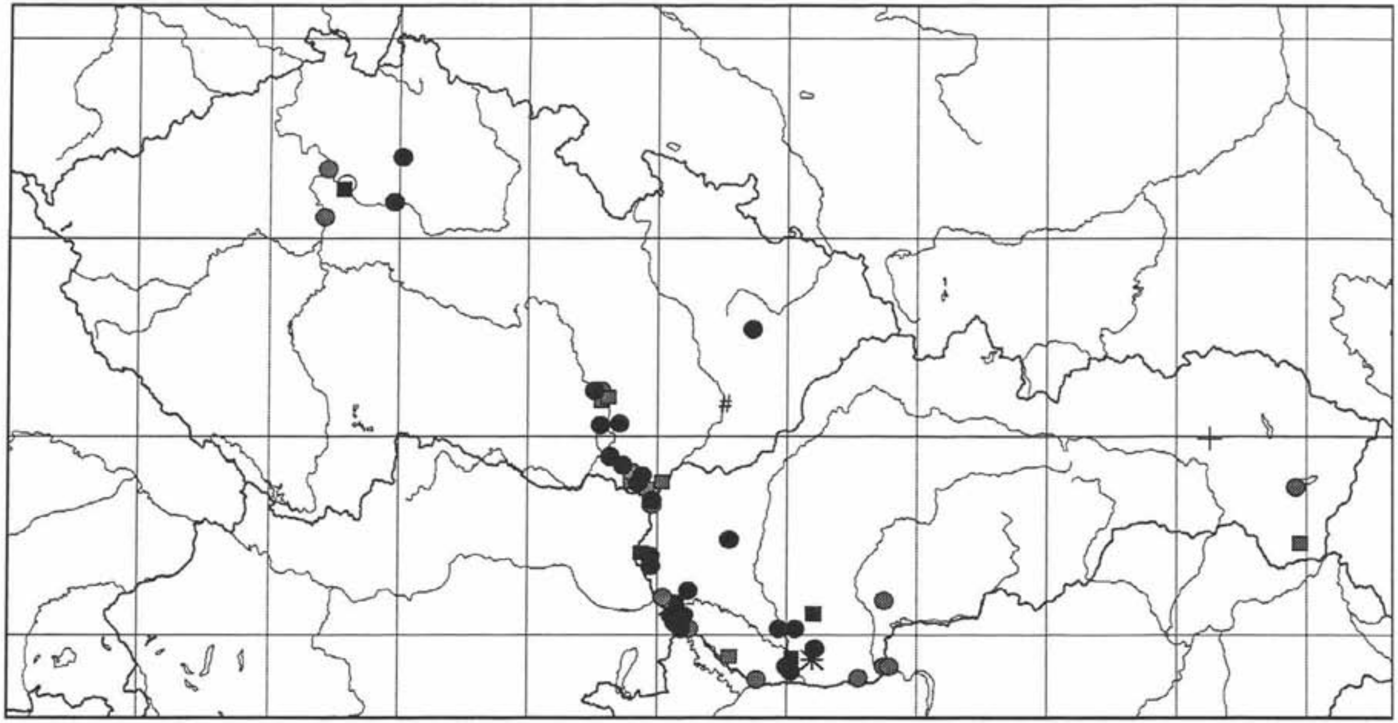
– *Neolentinus degener* occurrence on conifers is known in the Mediterranean region only, but not in central Europe – the illustrated specimens of *Agaricus cyathiformis* were found on *Abies* in Bavaria.

For the above mentioned reasons, Schaeffer's *Agaricus cyathiformis* cannot be identified with thie discussed species and this is why Schaeffer's epithet cannot be used. For the same reason, it is impossible to use the name *Lentinus schaefferi* (Weinm.) Rauschert – its basionym *Agaricus schaefferi* Weinmann is only a new name for Schaeffer's species. One other older name, *Panus urnula*, according to its description also does not relate to this species. This is why it is necessary to keep Kalchbrenner's name *Lentinus degener* as the basionym of this species.

Regarding recent classification of this species into the genus *Neolentinus*, it is necessary to submit a new combination *Neolentinus degener* (Kalchbr. in Fr.) P. Hrouda, as made above.

Basidiomes solitary or fastigiate. Pileus 8–20(-25) cm wide, pale to light ochraceous (sometimes to silvery), covered with tiny (less than 1 mm), unpalpable, sometimes scarcely visible brown squamulae. Gills pale to ochraceous, dense, longly decurrent; edge irregularly serrate; on the stipe the gills are lamelliform, smooth, tapering (in some places seemingly interrupted), anastomosing. Stipe 5–15(-20) cm long, 1–3 cm wide, pale below the gills, densely covered with the

Mapa 5 – Neolentinus degener



Documented data:
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- ● - locality where the species was found between 1945 and 1970
- ● - locality where the species was found after 1970

Data from literature:
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- ■ - locality where the species was recorded after 1970

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Broadly def. loc. - literature:
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tiny dark squamulae towards the base (to solid black-brown "velvet" on the base). Context whitish. Hyphal system dimitic, generative hyphae thin-walled, skeletal hyphae thick-walled. Cystidia absent, only "cystidiform hairs" occur on the gills edge. Spores cylindrical to longly ellipsoid, (9-)10–12(-14) × (3.5-)4–4.5 μm. Smell fungal, taste mild.

Related species. Massive basidiomes, beige to brown (depending on the density and colour of the tiny squamulae) with decurrent gills, growing on deciduous wood (in studied countries) can be considered practically unmistakable.

Occurrence: Not very abundant species, its occurrence is limited to the warm regions; slight occurrence decline has been recorded during the last few decades.

Phenology: Fructification in the late spring to summer (maximum V.-VI.), found rarely in autumn. (Some of the autumn records possibly are finds of old, dry basidiomes.)

Substrate: The typical hosts of this species are *Populus* species, it also occurs rarely on other deciduous trees. (Domański /1955/ also reports *Pinus* among the most common hosts of this species in the world. Kotlaba et Pouzar /1996/ mentioned its occurrence on conifers in the Mediterranean region, but not at our latitude.) Although the small number of finds on live trees indicates a saprophyte, according to Černý (personal communication) this species is parasitic: brown rot caused by this species over many years finally leads to the death of the tree, and the fungus then fructificate on the dead wood.

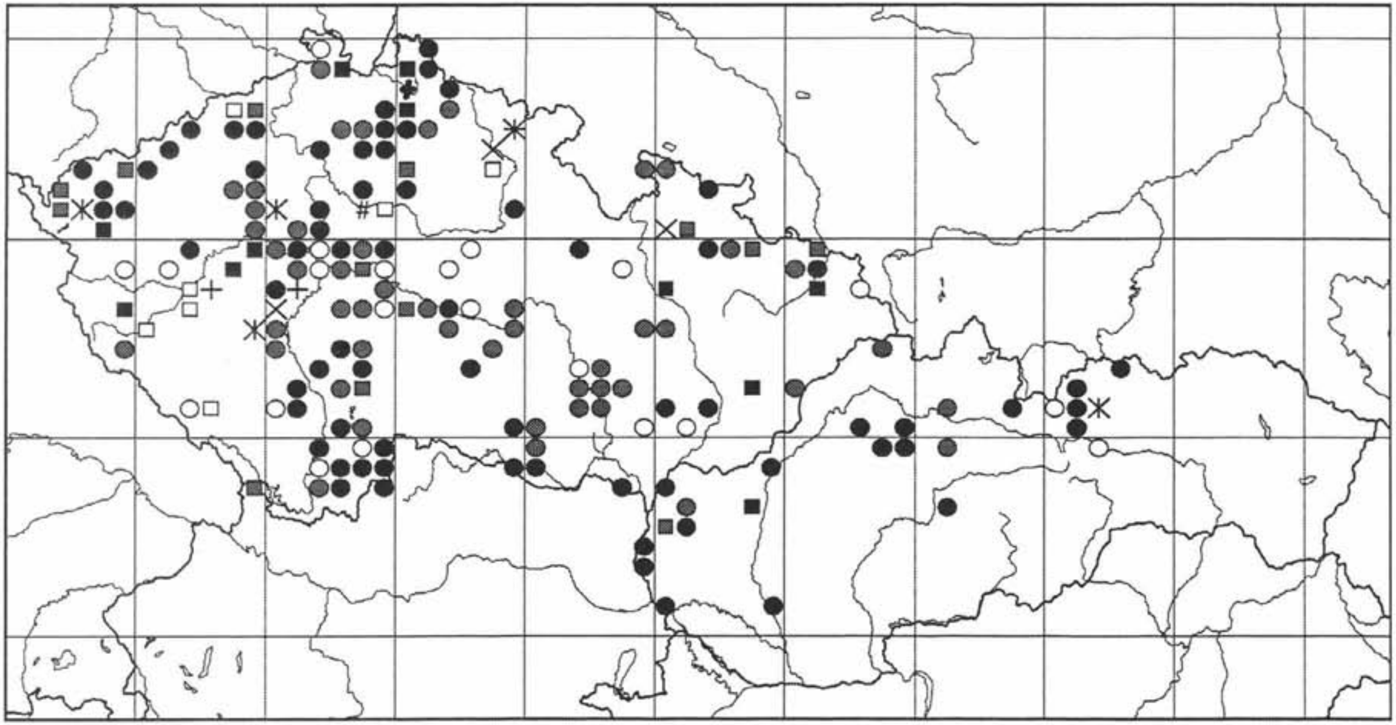
Distribution in the Czech Republic and Slovakia: This species occurs in the lowlands, its area includes Bohemian and Pannonian thermophyticum (Labe River surroundings, the lowlands around the Svratka, Dyje, Morava and Dunaj rivers) and several isolated localities (C Moravia, E Slovakia).

World-wide distribution: The species has been recorded in the temperate and subtropical zones of the Old World. It occurs mainly in flood-plain forests (Pilát 1946). This is confirmed by the specimens in Czech and Slovak herbaria.

Neolentinus lepideus (Fr.: Fr.) Redhead et Ginns

Basidiomes solitary. Pileus 5–15 cm in width (rarely larger), sallow to pale ochraceous. Mature pileus surface (later the surface layer of the context as well) breaking up into brown scales, turning dark with age. (Specimens with a smooth pileus surface occur rarely.) Gills pale to ochraceous, uncinate and decurrent; edge irregularly serrate. Stipe 5–10 cm long, 1–2.5 cm wide, its cutis breaks up into scales or strips. Veil (velum partiale) distinct in the juvenile stage, disappearing with age, creating a spurious ring, more or less palpable. Context whitish. Hyphal system dimitic, generative hyphae thin– or thick-walled, skeletal hyphae thick-walled. Cystidia absent, only "cystidiform hairs" occur on the gill edge. Spores cylindrical

Map 6 – Neolentinus lepideus



Documented data:
○ - locality where the species was found before 1945
● - locality where the species was found between 1945 and 1970
● - locality where the species was found after 1970

Data from literature:
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■ - locality where the species was recorded between 1945-1970
■ - locality where the species was recorded after 1970

Broadly defined localities:
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✳ - locality where the species was found between 1945 and 1970
✳ - locality where the species was found after 1970

Broadly def. loc. - literature:
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to ellipsoid, (8-)10–15 × (3.5-)4–5(-5.5) µm. Smell fungal, sometimes anise. Taste mild to somewhat acidic.

Neolentinus lepideus often forms so called "mine forms" – habitat forms occurring on the wood in the mines, cellars etc. *Lentinus lepideus* forma *ceratioides* (Holmsk.) Pilát (often identified as *Lentinus suffrutescens* in the herbaria) forms only smooth, pale coloured, antler-like branched sprouts, 0,5–1 cm wide and up to several decimeters long. Forma *tubaeformis* Schaeff. forms similarly sprout-like elongated stipes with tiny (1–2 cm in width) smooth or squamulose pileoli at the end. These habitat forms (sometimes also part of normal basidiomes growing out of fissures) often have the surface dusty coloured to entirely black.

Related species. Pileus and stipe surface broken up into scales, the irregularly serrate edge of the decurrent gills and growth on coniferous wood make this species easily distinguishable.

Occurrence: Abundant species. Because of this, finds are not always recorded.

Phenology: Fructification in summer (V.-IX., maximum VII.-VIII.) Formerly, it occurred relatively often in autumn as well. Recently the summer occurrence maximum is more marked.

Substrate: Coniferous trees are the common substrate. When the relative abundance of particular tree species occurrence in our countries is taken into account, *Neolentinus lepideus* prefers mostly *Pinus* and *Larix*. Some changes in the substrate spectrum have been recorded: The species was mostly found on *Picea* in the first half of the 20^{th} century, while the percentage of *Pinus* records has increased during the last decades (almost half of all records have been made since the 1960s). Brown rot is caused by this species. This rot is accompanied by the wood aromatisation by acids (p-methoxycinnamomic and anisic) excreted by the hyphae (Birkinshaw et Findlay 1940, cit. sec. Paclt 1960). Growth on various forms of worked wood (poles, railway ties, mine shoring) is common.

Distribution in the Czech Republic and Slovakia: Common species, occurring throughout both countries, where conifers occur. As mentioned above, not all finds are recorded – this is certainly the reason why the distribution map is not more densely covered by dots.

World-wide distribution: Cosmopolitan species, occurring in the Old and New World, from the tropical zone to Arctic Circle. Only from South America has it not been recorded.

Panus Fr.

Lignicolous fungi. Basidiomes pleurotoid, solitary or mostly clustered. Pileus surface smooth or tomentose. Gills decurrent, with entire edge. Stipe excentric, rarely central. Hyphal system dimitic, clamp-connections present. Cystidia present. Spores oval or ellipsoid, colourless. Spore print white.

The generic name *Panus* is nomen conservandum with the type species *Panus conchatus* (Bull.: Fr.) Fr. (Singer 1975).

Key to the species:

1) Pileus surface distinctly tomentose to crinite; basidiomes mostly separate ... *P. lecomtei*

1') Pileus surface smooth, basidiomes mostly clustered ... *P. conchatus*

Panus conchatus (Bull.: Fr.) Fr.

Basidiomes clustered, more rarely solitary. Pileus fleshy, smooth, 5–10 cm in width (rarely larger), brown to flesh coloured, in time turning pale with a violet hue, sometimes lasting to maturity. Gills pale to yellow-brown, longly decurrent, anastomosing; edge entire. Stipe up to 1(-2) cm long, 0.5–1.5 cm wide, excentric to lateral, sometimes nearly absent, concolorous with the pileus or paler; stipes of the clustered basidiomes are concrescent (sometimes it looks like several pilei from one stipe). Context whitish. Hyphal system dimitic, generative hyphae thin-walled, skeletal hyphae thick-walled. Cheilocystidia broadly clavate, thin-walled, 24–60 × 7–16 μm; pleurocystidia clavate, thick-walled (metuloid-like) on the base, 26–60 × 5–12 μm. Spores oval to ellipsoid, (5-)5.5–6.5 × 2.5–3.5 μm. Smell fungal, taste mild.

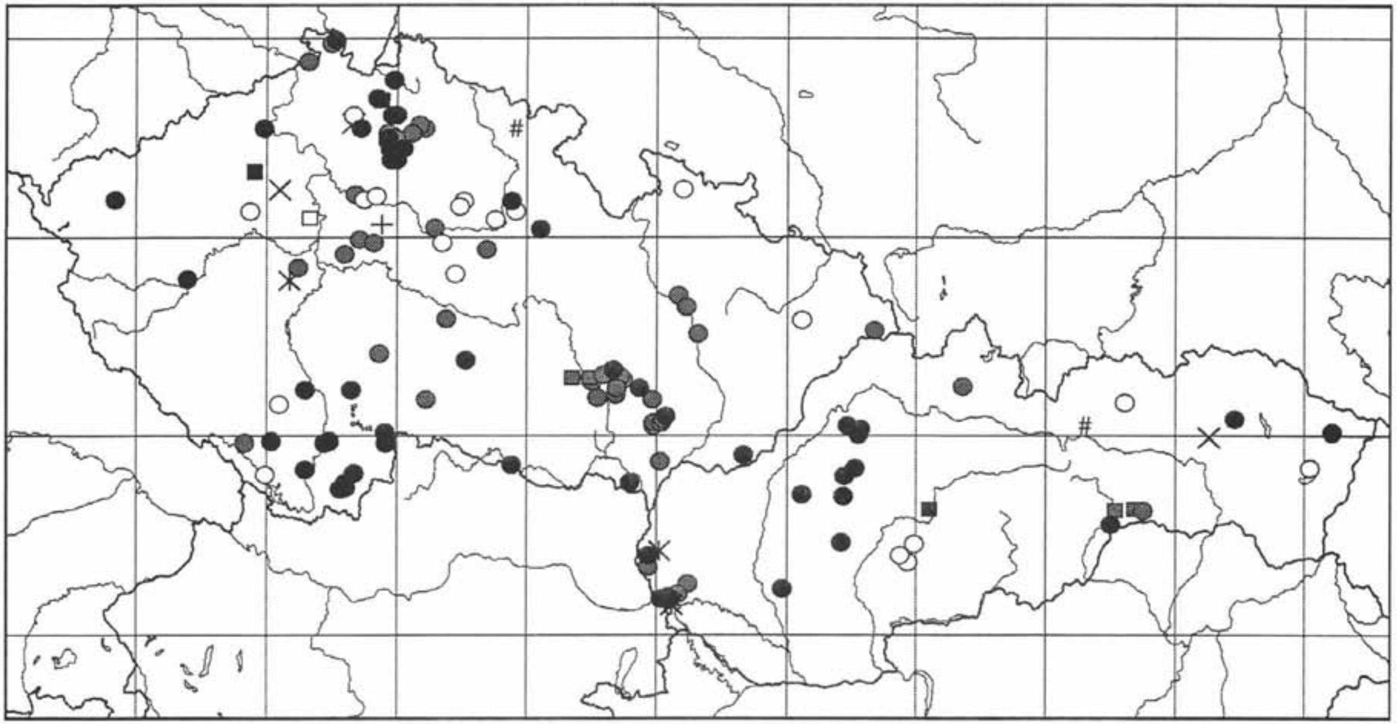
Related species. *Panus lecomtei* is a fungus of a similar shape, but it is noticably tomentose on the pileus and stipe surface. The *Pleurotus* subgen. *Pleurotus* species have a whitish stipe and gills; their hyphal system is monomitic throughout most of the basidiome. The pileus surface of *Pleurotus dryinus* is lanately tomentose or slightly areolate, its gills turn yellow with age or when bruised or dried; spores of all *Pleurotus* species are longer then 7 μm. *Hohenbuehelia petaloides* (and related species) has an almost lateral stipe and whitish gills; apparent acute cystidia (metuloids) are abundant on its gill surface.

Occurrence: Moderately abundant species. Its occurrence is relatively constant.

Phenology: Fructification time of this species are summer and autumn seasons (maximum VII.-IX.), rare occurrences have also been recorded in early winter.

Substrate: Commonly deciduous trees; Pilát (1935) mentions conifers as well on rare occasions. There is great difference between the host spectrum of *Panus conchatus* in the Bohemian Massif region compared with the Carpathian Mountains and the Pannonic region: on the Bohemian Massif (Hercynic part of the Czech Republic) *Betula* species dominate (70 %) among all hosts; on the other hand, *Betula* has been recorded only 3 times as the substrate in the Carpatho-Pannonic territory (Brno and Morava River surroundings, no records in Slovakia); the most common substrate there is *Fagus*. White rot is caused by this species.

Map 7 – Panus conchatus



Documented data:
- ○ - locality where the species was found before 1945
- ● - locality where the species was found between 1945 and 1970
- ● - locality where the species was found after 1970

Data from literature:
- □ - locality where the species was recorded before 1945
- ■ - locality where the species was recorded between 1945-1970
- ■ - locality where the species was recorded after 1970

Broadly defined localities:
- × - locality where the species was found before 1945
- ✳ - locality where the species was found between 1945 and 1970
- ✱ - locality where the species was found after 1970

Broadly def. loc. - literature:
- + - locality where the species was recorded before 1945
- # - locality where the species was recorded between 1945 and 1970

Sporadic find on *Pinus sylvestris* (noted with question mark): Byšť (Czech Republic, E Bohemia), 230 m, MTB 5861c, 18. VI. 1941, leg. Z. Schaefer, det. A. Pilát ut *Pleurotus conchatus*, rev. F. Kotlaba 26. 6. 1984 (PRM).

Distribution in the Czech Republic and Slovakia: Scattered occurrence especially in the middle altitudes of both countries. Relatively large number of localities surrounding collectors' centres (Brno, Mnichovo Hradiště) suggests that the species is probably more frequent than the distribution map shows.

World-wide distribution: Cosmopolitan species of the Old and New World, occurring in all climatic zones. In the southern hemisphere it has been recorded only in Australia, there are no records from Africa or South America.

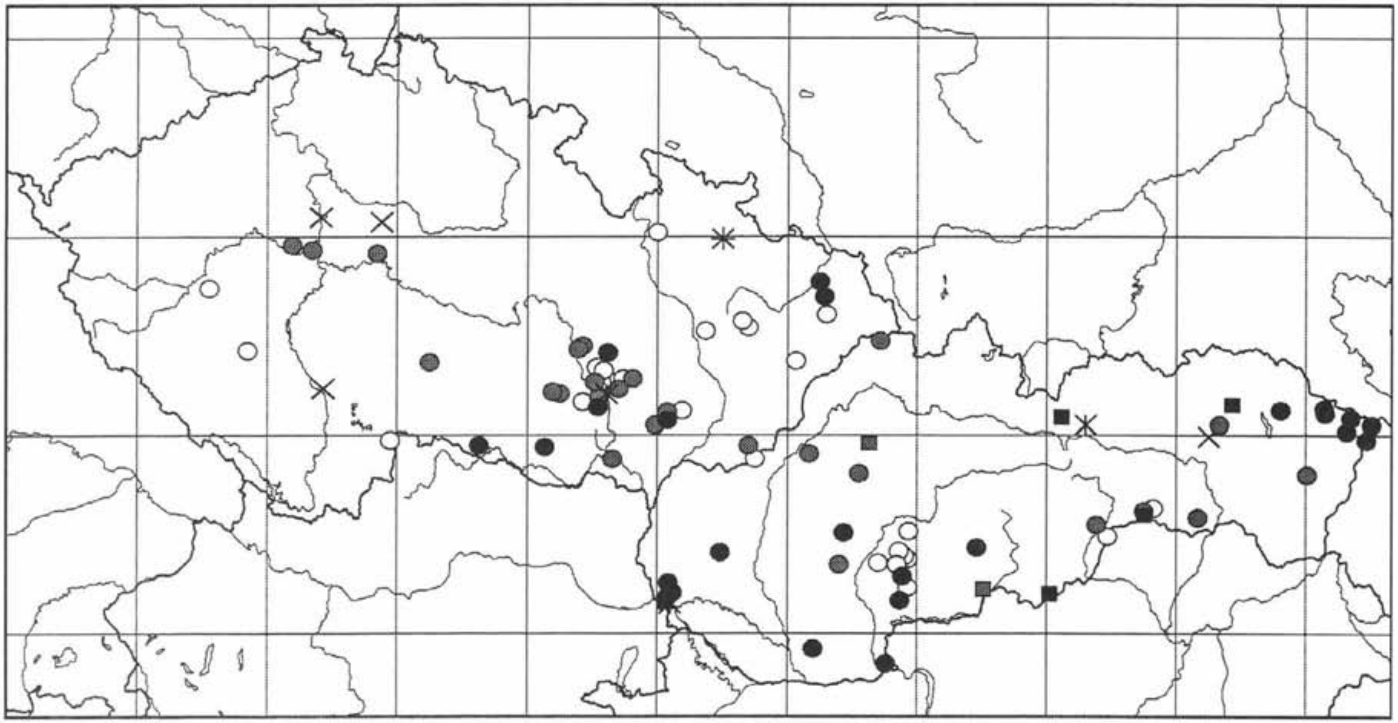
Panus lecomtei (Schw.) Corner

The species is known in our region mostly as *Panus rudis* (Fries 1838). This is apparently the first epithet used in the genus *Panus*, but there are older epithets *lecomtei* and *strigosus*, used by Schweinitz (1822) in the genus *Agaricus*. These, as older validly published epithets of the species, have a priority according to Art. 11.4 of the Code (Greuter et al. 1994). Later, Fries (1828) in Elenchus Fungorum presented both *Lentinus lecomtei* and *L. strigosus*; thereby both names are sanctioned against any other (including older) names (paragraph 13.1d). In the genus *Panus*, the name *Panus strigosus* (Schw.) Lloyd is a later homonym of *Panus strigosus* Berk. et Curt.; this is why *Panus lecomtei* (Schw.) Corner is the only correct name of this species.

Basidiomes solitary, more rarely confluent. Pileus 3–8 cm in width (rarely larger), ochraceous to pale brown (with a violet hue in the fresh juvenile basidiomes); hyphae fascicles projecting from the pileus surface make it coarsely tomentose to pilose (fasciculate coarse "hairs" up to 1 mm long), glabrescent on the exsiccates. Gills pale to yellow-brown, decurrent; edge entire. Stipe up to 4 cm long, 0.5–1.5 cm wide, excentric to lateral, sometimes almost missing, shortly but densely tomentose, concolorous with the pileus or paler; stipes of the clustered basidiomes are concrescent (as in *Panus conchatus*). Context whitish. Hyphal system dimitic, generative hyphae thin-walled, skeletal hyphae thick-walled. Cheilocystidia narrowly clavate, thin-walled, 15–30 × 4–6 μm; pleurocystidia (metuloids) clavate, thick-walled (except the apex), 30–50 × 8–12 μm. Spores oval to ellipsoid, (5-)6–6.5 × 3–3.5(-4) μm. Smell fungal, taste bitterish.

Related species. No other lignicolous fungus occurring in these countries has such a markedly tomentose to pilose pileus and stipe surface. Perhaps in the herbarium it is possible to mistake *Panus lecomtei* for tropical *Lentinus crinitus* (or related species), which has a central stipe and much longer (even curved) "hairs" on the pileus surface.

Map 8 – Panus lecomtei



Documented data:

○ - locality where the species was found before 1945

● - locality where the species was found between 1945 and 1970

● - locality where the species was found after 1970

Data from literature:

■ - locality where the species was recorded between 1945-1970

■ - locality where the species was recorded after 1970

Broadly defined localities:

✕ - locality where the species was found before 1945

✳ - locality where the species was found between 1945 and 1970

✳ - locality where the species was found after 1970

Occurrence: Formerly not very abundant, currently rare species. Very sharp decline in occurrence in the Czech Republic, where only one find has been recorded since the beginning of the 1980s.

Last find in the Czech Republic: Lovčice (southern Moravia), valley of Lovčický potok, approx. 2 km NE of village, SW slope of the valley, MTB 6968a, *Fagus* sp., stump, 12. V. 1989, leg. et det. Vladimír Antonín ut *Pleurotus conchatus*, rev. P. Hrouda 24. 10. 1997 (BRNM).

Last find in Bohemia: Vratišov (Czech Republic, Bohemian-Moravian highland), near the road between Vratišov and Rynárec, MTB 6657a, *Cerasus avium*, stump, half-dead branch, 5. IX. 1953, leg. et det. František Kotlaba (PRC).

Phenology: Fructification in summer (maximum VI.-VII.), more rare in the spring and autumn.

Substrate: Except for two finds on *Abies*, deciduous trees are the common hosts of *Panus lecomtei*. Species of family *Fagaceae* dominate among them. White rot is caused by this species.

Sporadic finds on *Abies*: Karlštejn (SW of Prague, Czech Republic), MTB 6051c, *Abies alba*, stump, X. 1954, leg. et det. Mirko Svrček (PRM);

Banská Štiavnica (Slovak Republic, S part of central Slovakia), Sitno mountain, MTB 7579c, *Abies* sp., wood, 20. X. 1886, leg. et det. Andrej Kmeť, rev. F. Kotlaba 3. 7. 1985 (BRA).

Distribution in the Czech Republic and Slovakia: Scattered occurrence from lowlands to mountains, but especially in the middle altitudes of Moravia and Slovakia; relatively more recorded in warmer regions. Species has always been rare in Bohemia (only 10 localities).

World-wide distribution: Cosmopolitan species, occurring in the Old and New World, from tropical to temperate zones. In Central Europe it reaches its northern boundary on the continent (but it is known from Sweden) – this is the probable reason for its rare occurrence in the Hercynic part of the Czech Republic.

Phyllotopsis (Gilb. et Donk) ex Sing.

Lignicolous fungi. Basidiomes lateral, solitary or imbricate. Pileus rounded, velutinous to tomentose on the surface. Gills decurrent to the connection with the substrate, edge entire. Stipe absent. Hyphal system monomitic, clamp-connections present. Cystidia present. Spores tiny, reniform. Fresh spore print pinkish, turning pale with time.

This is probably the genus least related to the other pleurotoid genera in *Polyporales*. The typical characters of *Phyllotopsis* – thick-walled hyphae, "medallion" clamp-connections, small basidia, allantoid spores and specific cystidia – can be found in some genera of Meruliales (Kost 1986).

Type species: *Phyllotopsis nidulans* (Pers.: Fr.) Sing.

Phyllotopsis nidulans (Pers.: Fr.) Sing.

Basidiomes solitary or imbricate, adnate laterally or partially with the upper part, 3–7 cm in width. Basidiome surface orange coloured in the juvenile stage, turning to dull colours, yellow-brown (to grey-brown) with age, distinctly tomentose or flocculose. Gills yellow-orange to ferrugineous, decurrent to one place (either to the connection place of the lateral basidiome with the substrate or an excentric point to which the "upper" connection with the substrate projects); edge entire. Context dully yellow. Hyphal system monomitic, generative hyphae thin– as well as thick-walled (to sclerified). Cheilocystidia acicular, 30–50 × 1.5–3 μm. Spores ellipsoid to reniform, (4.5-)5–6 × (2-)2.5–3(-3.5) μm. Smell unpleasant (Pilát 1930 reports an offensive odour in the fresh basidiome), taste mild.

Related species. *Paxillus (Tapinella) panuoides* is typically brown (to olive hue) coloured, its context smell is (not always) anise; brown rot is caused by this species only on coniferous wood (often on worked wood). The *Crepidotus* species, which have a similar shape, are mostly pale coloured, their basidiome surface is glabrous and their spore print is ferrugineous. The pileus surface of *Panellus serotinus* is olive coloured, its gills yellow-ochraceous to orange and its spores amyloid.

Occurrence: Uncommon species with constant occurrence.

Phenology: *Phyllotopsis nidulans* fructificates throughout the year with a mild peak in autumn. Two parallel changes can be observed in the Czech Republic: a shift from autumn and winter to year-long occurrence and a shift of the occurrence centre from middle to sub-mountain and mountain altitudes. Considering that no such changes have been observed in Slovakia, they probably reflect only a shift in the collectors' activity to other (higher in the Czech Republic) regions (see also the distribution map).

Substrate: Species growing on both coniferous and deciduous trees. In the first half of this century the majority of finds were on conifers, recently finds on deciduous trees predominate. White rot is caused by this species.

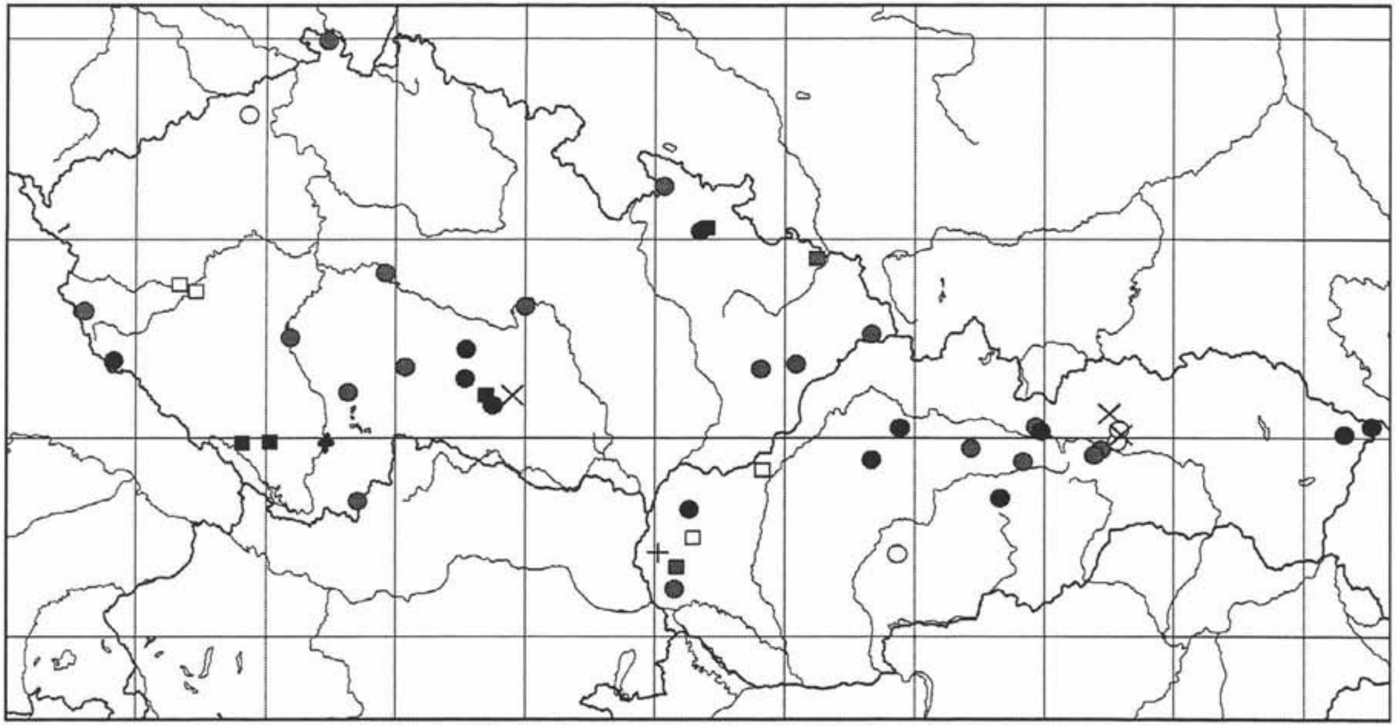
Distribution in the Czech Republic and Slovakia: The species occurs mostly in higher altitudes and colder regions (meso- and oreophyticum); scattered localities in both countries.

World-wide distribution: Its distribution area covers the northern temperate zone, it reaches the Arctic Circle in Europe (according to Pilát /1935/, this species occurs frequently in northern Europe). Singer (1975) mentions its occurrence in temperate zones of both hemispheres, but in southern Africa and South America it is probably adventitious.

Pleurotus (Fr.) Kummer

Lignicolous fungi. Basidiomes pleurotoid, tiny or large, solitary or clustered. Pileus smooth, sometimes slightly radially fibrillose in some species. Gills decurrent, edge entire. Stipe central, excentric, lateral or absent. Hyphal system mono-

Map 9 – Phyllotopsis nidulans



Documented data:
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● - locality where the species was found between 1945 and 1970
● - locality where the species was found after 1970

Data from literature:
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■ - locality where the species was recorded between 1945-1970
■ - locality where the species was recorded after 1970

Broadly defined localities:
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Broadly def. loc. - literature:
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or dimitic (skeletal hyphae are sooner scattered, they do not interweave the tissue so densely as in the *Panus* or *Neolentinus* context), clamp-connections present. Cystidia present or absent. Spores cylindrical or ellipsoid, colourless. Spore print white or slightly coloured (yellowish in the subgenus *Lentodiopsis*, light violet in *P. cornucopiae* and *P. ostreatus*).

Type species: *Pleurotus ostreatus* (Jacq.: Fr.) Kummer.

Singer (1975) does not concede Kummer's publication (Kummer 1871) as valid and he presents Quélet (1872) as the generic name author. The problem is in the interpretation of the Arts. 32.1c, 32.4 and 32.5 of the International Code of Botanical Nomenclature, concretely whether Kummer's indirect reference to Fries' taxa is a sufficient reference to the genus basionym. In the last edition of the Code (Greuter et al. 1994), the indirect reference in Kummer's work is directly the subject of Art. 32.5, example 8, where the problem is explicitly solved. (At the same time, Art. 33.6 gives an exception to Art. 33.5 for Fries' Systema mycologicum – taxa used there on the "tribus" level are considered as validly published, although the term "tribus" is incorrectly used for the infrageneric taxa.)

Systematic classification within the genus *Pleurotus*:

– subgenus *Lentodiopsis* (Bubák) O. Hilber: in Europe *P. calyptratus, P. dryinus*;

– subgenus *Pleurotus*: in Europe *P. eryngii, P. cornucopiae, P. pulmonarius, P. ostreatus*;

– subgenus *Coremiopleurotus* O. Hilber: without European representatives.

Subgenus *Coremiopleurotus* is characterised by coremia creation and a strictly monomitic hyphal system. Characters of the subgenus *Lentodiopsis* are veil creation in basidiome ontogenesis and a dimitic hyphal system. The most complicated situation is explicitly delimiting the nominate subgenus *Pleurotus*. Hilber (1982) presents its representatives as monomitic with the exception of *P. cornucopiae*; if this were true, the character dissimilarity of the subgenus *Lentodiopsis* would probably be sufficient for its classification at the level of a separate genus (resp. for Bubák's genus application). As skeletal hyphae are present in the stipe context of *P. ostreatus* and *P. pulmonarius*, also the explicit delimitation of the above mentioned taxa is limited to veil presence/absence, and this is why they are retained at the subgenus level.

Key to the species:

1) Growth on the roots or stalk bases of *Apiaceae* ... *P. eryngii*

1') Growth on dead or live wood ... 2

2) Basidiomes non-stipitate, laterally adnate; distinct veil in the juvenile stage ... *P. calyptratus*

2') Basidiomes with distinct central or excentric stipe; veil present or absent ... 3

3) Veil in the juvenile stage leaves some residue on the pileus margin; fresh pileus surface slightly tomentose to flocculose; conidia creation on the stipe base ... *P. dryinus*

3') Veil absent; pileus surface smooth or slightly fibrillose; no conidia creation on the stipe base ... 4

4) Occurrence from spring to autumn; gills longly decurrent (often to the stipe base); skeletal hyphae can be present in the whole basidiome context ... *P. cornucopiae*

4') Occurrence more or less all year; gills shortly decurrent; skeletal hyphae present in the stipe base ... 5

5) Pileus colour grey (to bluish), brown, ferrugineous (to ochraceous); basidiome does not turn yellow with age or when bruised or dried ... *P. ostreatus*

5') Pileus colour pale (to almost white), ochraceous, light brown; basidiome turns yellow with age or when bruised or dried ... *P. pulmonarius*

Subgenus *Lentodiopsis* (Bubák) O. Hilber

This subgenus is characterised by veil presence and a dimitic hyphal system (but skeletal hyphae are present in the subgen. *Pleurotus* species, too). It includes two species occurring in central Europe; except for the above mentioned characters these two species do not show close affinity, so they are divided at the section level – *P. calyptratus* to section *Calyptrati* Sing. and *P. dryinus* to section *Lepiotarii* Pilát (they are each the type species of the section).

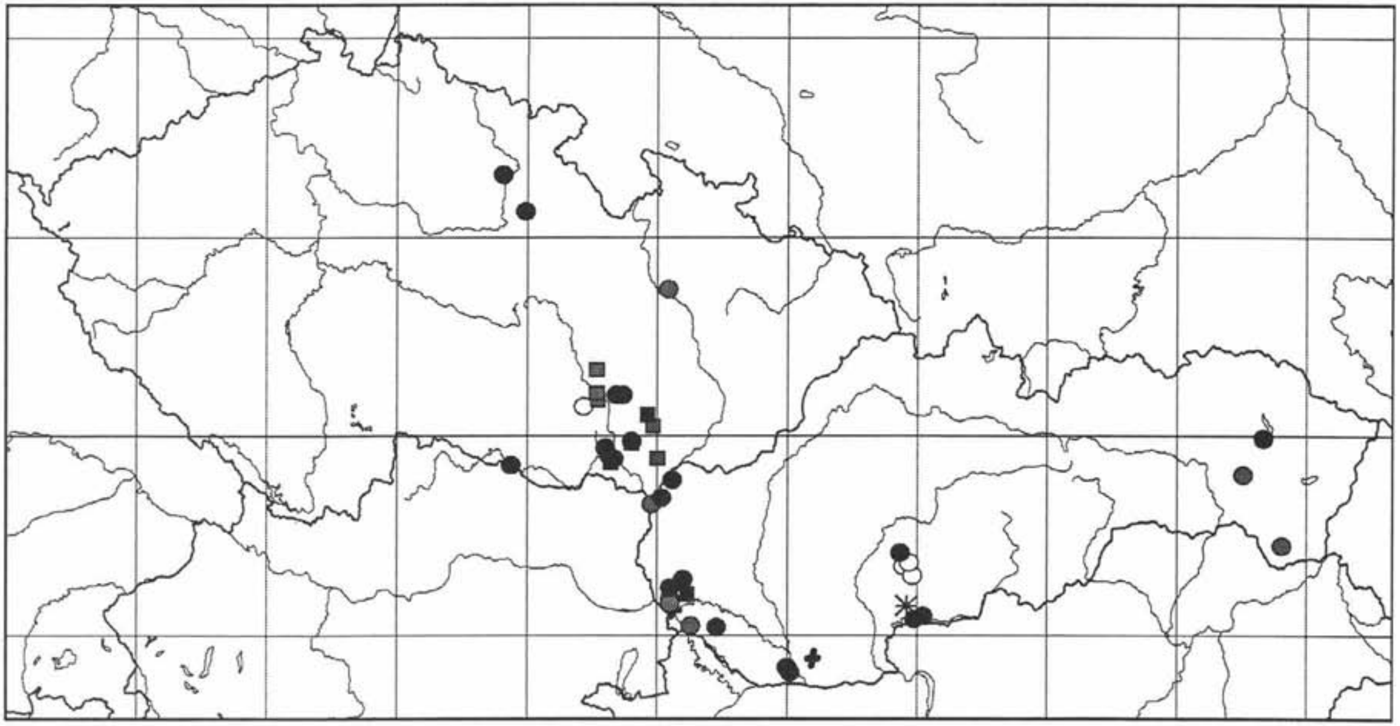
Subgenus type species: *Lentodiopsis albida* Bubák = *Pleurotus dryinus* (Pers.: Fr.) Kummer

Pleurotus calyptratus (Lindbl. in Fr.) Sacc.

Basidiomes solitary or imbricate, adnate laterally, 2–6 × 3–10 cm. Basidiome surface smooth or slightly radially fibrillose, sallow or light brown (to grey-brown). Gills whitish, decurrent to the connection place of the lateral basidiome with the substrate. Juvenile gills are covered with whitish mucid membranaceous veil (velum partiale); remnants of this veil remain on the pileus margin or disappear at maturity. Context whitish. Hyphal system dimitic, generative hyphae thin-walled, skeletal hyphae thick-walled. Cystidia absent. Spores cylindrical or longly ellipsoid, (8.5-)10.5–13.5(-14.5) × (3.5-)4–5(-6) μm. Smell farinaceous, slightly acid or sweet, taste mild.

Related species. Can be confused with the *Crepidotus* species, which are distinguishable by the absence of the veil, presence of hymenial cystidia and smaller spores (up to 10, max. 11 μm). The pileus surface of *Panellus serotinus* is olive coloured, its gills yellow-ochraceous and spores smaller (up to 6 μm) and amyloid.

Map 10 – Pleurotus calyptratus



Documented data:

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Data from literature:

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■ - locality where the species was recorded after 1970

Broadly defined localities:

✳ - locality where the species was found after 1970

Broadly def. loc. - literature:

✚ - locality where the species was recorded after 1970

Occurrence: Uncommon species, extremely rare (or not found?) during the first half of the 20th century. Recently, certain occurrence decline in the Czech Republic, but the species is found in new region (E Bohemia) at the same time.

Phenology: Thermophilous species growing mainly during the summer (maximum in the Czech Republic V.-VI., in Slovakia V.-VIII.). It has been found only in spring and early summer (IV.-VI.) in Czech mesophyticum.

Substrate: *Populus* species are the typical host of *Pleurotus calyptratus*; if the *Betula* determination was correct, it may rarely occur on other deciduous trees. White rot is caused by this species.

Sporadic find on *Betula*: Banská Štiavnica (Slovakia, S part of central Slovakia), Sitno mountain, MTB 7579c, 21. VII. 1887, leg. et det. Andrej Kmeť ut *P. mollis?*, rev. F. Kotlaba 4. 7. 1985 (BRA).

Distribution in the Czech Republic and Slovakia: Distribution in the Czech Republic and Slovakia has been limited for a long time (with a few exceptions) to Pannonic thermophyticum – S Moravia, S and E Slovakia, but there are recent finds from E Bohemia.

Sporadic finds in Bohemia: Bělečko (E Bohemia, SE of Hradec Králové), reserve "Buky", deciduous tree, dead trunk, 1996, leg. et det. Josef Slavíček (HR);

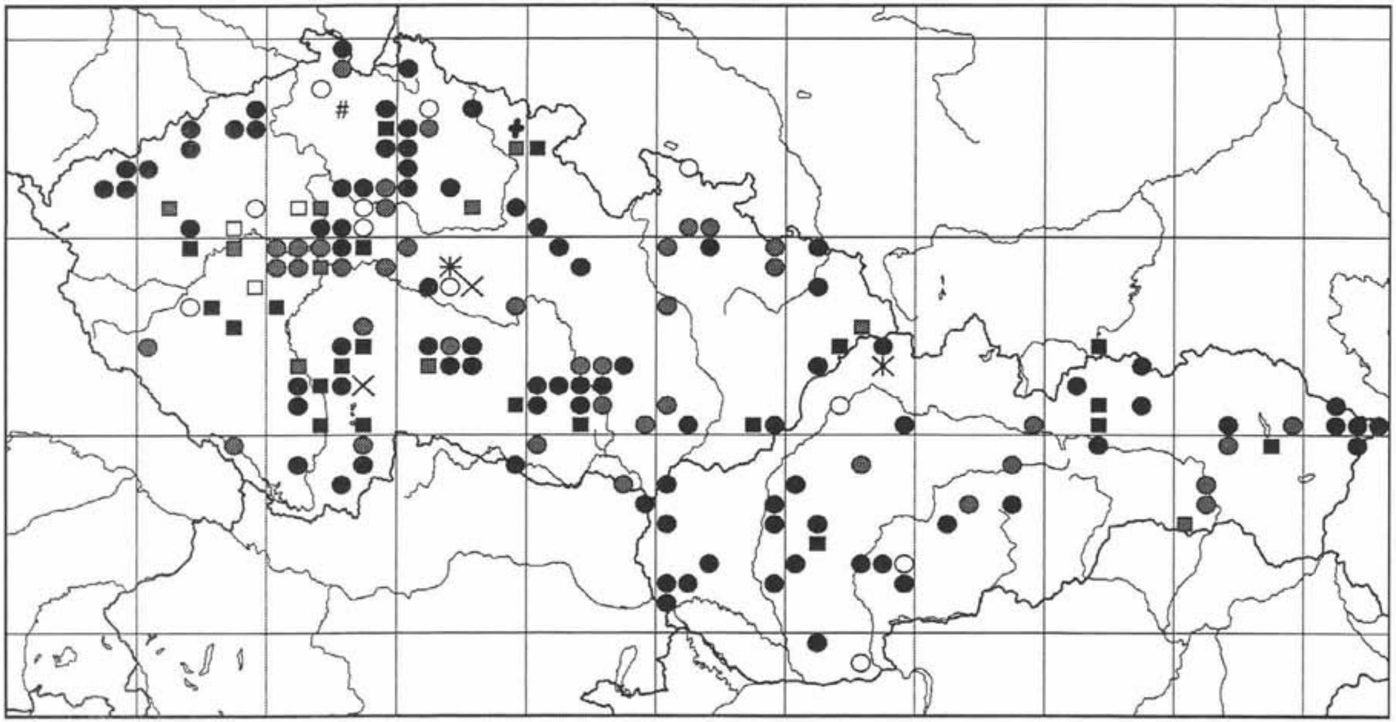
Račice nad Trotinou (N of Hradec Králové), 700 m NE of the village, north part of "Hořička" forest, *Populus tremula*, 17. V. 1997, leg. Zdeněk Herman, 13. IV. 1998, leg. Miloslava Dobešová, both det. Josef Slavíček (HR).

World-wide distribution: Quite rare species in Europe; Zervakis and Balis (1996) present its occurrence also in Asia.

Pleurotus dryinus (Pers.: Fr.) Kummer

Basidiomes solitary. Pileus toughly fleshy, 7–25 cm in width (rarely larger – up to 37 cm, according to V. Vaníček, herbarium specimen label: Karlovy Vary-Doubí, 1989 /K. Vary museum/), whitish, beige or yellowish to grey-brown ochraceous, softly tomentose on the surface; the surface tomentum sometimes changes to adnate lanate squamulae or the surface becomes slightly areolate at maturity. Gills whitish, shortly or longly decurrent. Juvenile gills are covered with a soon disappearing veil (velum partiale); no distinct traces remain on the pileus margin at maturity. Stipe 5–10 cm long (rarely longer), 1–3 cm wide, pale, yellowish or ochraceous, rarely with tiny veil remnants creating an incomplete "annulus". Stipe base dark brown or black with copious conidia production (see later). Context whitish; context, gills and stipe surface turn yellow with age or when bruised or dried. Hyphal system dimitic, generative hyphae thin-walled, skeletal hyphae thick-walled. Cystidia absent. Spores cylindrical or longly ellipsoid, (8-)10–14(-16) × (3-)3.5–4.5(-5) μm. Smell fungal, taste mild.

Map 11 – Pleurotus dryinus



Documented data:
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● - locality where the species was found after 1970

Data from literature:
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■ - locality where the species was recorded between 1945-1970
■ - locality where the species was recorded after 1970

Broadly defined localities:
✕ - locality where the species was found before 1945
✳ - locality where the species was found between 1945 and 1970
✳ - locality where the species was found after 1970

Broadly def. loc. - literature:
+ - locality where the species was recorded before 1945
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Anamorph: *Antromycopsis ruzena* O. Hilber (nom. invalid.). Conidia arising on the stipe base hyaline when young, thick-walled and dark brown at maturity. No creation of coremia (conidiophore fascicles); because of this, the anamorph should not be classified in the genus *Antromycopsis*, but in a separate, closely related genus (Hilber 1997).

Fungi growing on conifers were formerly classified as the species *Agaricus tephrotrichus* (later variety, or forma *tephrotrichus*) – except the coniferous substrate, they do not show any other difference, so there is no reason to separate them either at the specific, or at the infraspecific level.

Like the genus *Neolentinus* species, *P. dryinus* also creates habitat forms under conditions of insufficient light (typically, in tree cavities) – elongated light stipes with reduced pilei creation (Herink 1950b, some herbarium specimens).

Related species. Juvenile basidiomes with a visible veil can be similar to *Neolentinus lepideus*, but its pileus surface is broken up into scales from a very early stage. Distinguishment at maturity: the subgenus *Pleurotus* species do not have a lanate pileus surface, they do not turn yellow with age or when bruised (with the exception of *P. pulmonarius*) and do not have skeletal hyphae in the pileus context (except of *P. cornucopiae*). *Panus conchatus* has flesh-brown juvenile basidiomes (partly the colour remains until maturity), short brown stipe and smaller (up to 7 μm) spores. *Ossicaulis lignatilis* has a more whitish basidiome and smaller (up to 6 μm), widely ellipsoid spores.

Occurrence: Still abundant species. Because of this, not every find is recorded.

Phenology: Fructification in the second half of the year with sharp peak in September and October. Very rarely found in winter and spring.

Substrate: Deciduous trees (*Malus, Quercus, Fagus* etc.) dominate as hosts, but the occurrence of this species on the conifers (mainly *Picea*) is not rare. It has often been found on frost breaches. White rot is caused by this species. The percentage of recorded finds on live trees has increased gradually, as has the percentage of finds on conifers; a certain connection is supported by the fact that the percentage of records on the live trees has increased more sharply among conifers.

Distribution in the Czech Republic and Slovakia: Common species especially in the middle altitudes of both countries. The more prominent (among the studied species) accumulation of finds in the "collectors' centres" (Praha, Brno etc.) suggests that the species certainly is not recorded in all places of its occurrence and the distribution map should be more densely covered by dots.

World-wide distribution: The distribution centre is the northern temperate zone; the species occurs from the subtropical regions to the Arctic Circle. In the southern hemisphere, the species has probably only been recorded in Australia, but its occurrence in other regions of the southern temperate zone is also possible.

Subgenus *Pleurotus*

This subgenus is characterised by absence of the veil; the hyphal system is dimitic, but (with the exception of the mature basidiomes of *P. cornucopiae*) the skeletal hyphae occur only in the basal part of the stipe.

Subgenus type species: *Pleurotus ostreatus* (Jacq.: Fr.) Kummer

There are non-uniform opinions on the relations within this taxonomically compact subgenus. Molitoris and Prillinger (1986) discern two evolutionary branches within each of which are closely related species – the first branch contains *P. ostreatus* and *P. columbinus*, the second *P. eryngii, P. cornucopiae, P. pulmonarius*. Zervakis and Labarere (1992) present *P. ostreatus* as closely related to *P. sapidus* (= *P. cornucopiae*), whereas *P. pulmonarius* is positioned near the afro-asiatic *P. sajor-caju*. Hilber (1997) classifies the species with a monomitic pileus context (among them *P. ostreatus, P. eryngii, P. pulmonarius*) in one group and in a considerably less closely related second group, dimitic species including *P. cornucopiae*.

Except *Pleurotus eryngii*, the species of this subgenus have been classified at the level of infraspecific taxa within the species *P. ostreatus*. In the table of negative results of intersterility tests, Bresinsky et al. (1976) report an incompatibility of *P. cornucopiae, P. columbinus, P. ostreatus* and *P. pulmonarius*. After more experiments, Hilber (1982) confirms 100% incompatibility of *P. ostreatus, P. pulmonarius* and *P. cornucopiae*, but on the contrary reports compatibility between *P. ostreatus* and *P. columbinus*. Whereas *P. columbinus* is reduced to the variety level (see more under *P. ostreatus*), *P. cornucopiae* and *P. pulmonarius* are confirmed as separate species.

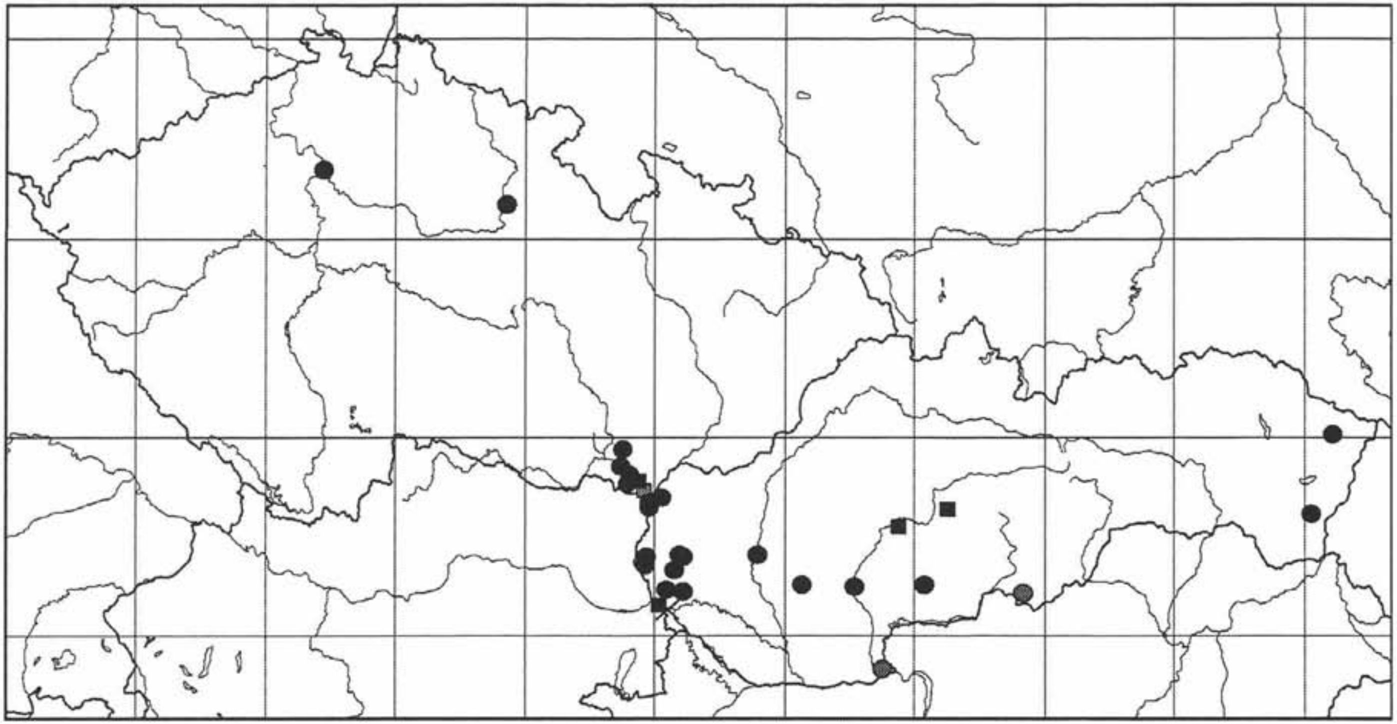
Pleurotus cornucopiae (Paulet) Rolland

Basidiomes solitary or fastigiate. Pileus 4–10 cm in width, depressed in the centre, infundibuliform at maturity; white-brown when young, light-brown at maturity, sometimes with ochre hue. Gills whitish, longly decurrent on the stipe, in this area densely reticulately anastomosing. Stipe 2–6 cm long (often shortened by longly – up to 15 cm – decurrent gills), 1–2 cm wide, white. Context white. Hyphal system dimitic, generative hyphae both thin-walled and sclerified. Caulocystidia present as tapering hyphal ends, bearing so called "conidia". Spores cylindrical to ellipsoid, (7-)7.5–9.5(-11) × 3.5–4.5(-5) μm. Smell farinaceous to anise, taste mild.

Formerly this species was thought a variety, resp. forma of *Pleurotus ostreatus* – intersterility tests (Hilber 1982) proved 100% incompatibility of these two species.

Pleurotus citrinopileatus was distinguished from *P. cornucopiae* according to such characters as yellow pileus and smaller spores. Intersterility tests proved the full compatibility of these two species; the hybrids create normal basidomes with

Map 12 – Pleurotus cornucopiae



Documented data:
● - locality where the species was found between 1945 and 1970
● - locality where the species was found after 1970

Data from literature:
■ - locality where the species was recorded between 1945-1970
■ - locality where the species was recorded after 1970

Broadly defined localities:
× - locality where the species was found before 1945

yellow pilei; spore size is approximately intermediate between the parents' spore sizes. For this reason, *P. citrinopileatus* is reduced to a variety of *P. cornucopiae* (Ohira 1990, Hilber 1997).

Related species. *P. cornucopiae* is characterised by an anise smell and dense gill anastomoses on the stipe, if these characters are well developed. If not, there is a possibility of confusion with *P. ostreatus* or *P. pulmonarius*; these species do not have skeletal hyphae in the context (except the stipe base); the pileus of *P. ostreatus* is rather conchate (not conspicuously infundibuliform); *P. pulmonarius* is characterized by context, gills and stipe surface turning yellow with age or when bruised or dried. Romagnesi (1969) based the distinguishment of these species on the spore shape: *P. cornucopiae* spores are slightly concave on all sides, whereas *P. ostreatus* and *P. pulmonarius* spores are (from the lateral view) slightly convex in the subapical part (subcylindrical).

Occurrence: Not very abundant species with relatively constant occurrence; first records in the 1960s. The possible reasons for the absence of earlier records are either sporadic research of its native flood-plain forests or indistinguishing of this species, long considered a form of the abundant (and often not recorded) *P. ostreatus*.

Phenology: Fructification in summer (maximum V.-VIII.), rare occurrences also in autumn.

Substrate: The deciduous riparian forests species; *Ulmus* species are the dominant substrate in the Czech Republic (69 %). White rot is caused by this species. In the literature, *P. cornucopiae* is considered the leading cause of the *Ulmus* wood destruction (Ivanov 1985).

Distribution in the Czech Republic and Slovakia: Species distribution is restricted to the warm regions of southern Moravia and southern Slovakia, it occurs in the riparian forests and the lower altitudes in the Carpathians; a few isolated finds elsewhere. Cultivated mushroom (Ginterová 1974, Jablonský 1980).

Sporadic finds in Bohemia: Hořín near Mělník (N of Prague), chateau park, 160 m, MTB 5652d, *Populus alba (?)*, fallen trunk, 18. V. 1996, leg. et det. Jiří Baier, rev. F. Kotlaba et Z. Pouzar 23. 5. 1996 (PRM); 22. V. 1999, leg. et det. Václav Janda (HR);

Hradec Králové (E Bohemia), part Nový H. K., northern slope of the hill of Sv. Jan, MTB 5860b, deciduous tree, dead trunk, 14. VII. 1993, leg. et det. Josef Slavíček (HR).

World-wide distribution: The distribution area probably covers the temperate zone and subtropical regions of the northern hemisphere. The relatively small number of records does not allow speculations whether or not its distribution is continuous.

Pleurotus eryngii (DC.: Fr.) Quél.

Basidiomes solitary. Pileus 4–10 cm in width, light to dark-brown, surface smooth. Gills pale to ochraceous, shortly decurrent. Stipe 4–8 cm long, central or slightly excentric, 1–1,5 cm wide, whitish. Context white. Hyphal system monomitic, generative hyphae thin-walled. Cheilocystidia and pleurocystidia present as tapering hyphal ends, carrying so called "conidia". Spores cylindrical to ellipsoid, (7-)8–10(-11) × (3-)3.5–4.5(-5) μm. Smell fungal, taste mild.

Some authors (most recently Hilber 1978) separate the species *P. nebrodensis*, growing on *Laserpitium*; besides the substrate, it differs in size. Intersterility tests proved a considerable compatibility between the taxa, recently separated at the variety level – var. *eryngii*, var. *nebrodensis* and var. *ferulae* (Hilber 1982, after more tests, he changed his appraisal). The basidiome size of the particular varieties is largely proportional to the size of their host plants (Pilát 1935).

Related species. Because it grows on the roots and stem bases of the *Apiaceae* or the *Asteraceae*, not to be confused with other species.

Occurrence: Very rare species, whose occurrence is dependant upon its substrates' habitats. Only one record from the former Czechoslovakia in the first half of the 20^{th} century; not recorded in the 1990s either.

Phenology: This species occurs in the summer and autumn months in the Czech Republic, and in Slovakia only in autumn. This is probably caused by the noticeable drought in the steppe regions of southern Slovakia in the summer months (the same is reported by Pilát /1935/ from the Mediterranean region).

Substrate: The only *Pleurotus* species growing parasitically on the roots and stem bases of the plants of the family *Apiaceae* or *Asteraceae* (recorded *Eryngium, Peucedanum, Laserpitium, Ferula* etc., see Zervakis et Balis 1996). The mycelium covers the roots and may cause the young leaves to dry up (Pospíšil 1952).

Distribution in the Czech Republic and Slovakia: The distribution of this rare species is limited to the steppe habitats of its host plants – scattered localities in the Czech and Pannonic thermophyticum (the surroundings of the town Most, southern Moravia and southern Slovakia). Cultivated mushroom (Jablonský 1980). Endangered species (Lizoň 1995).

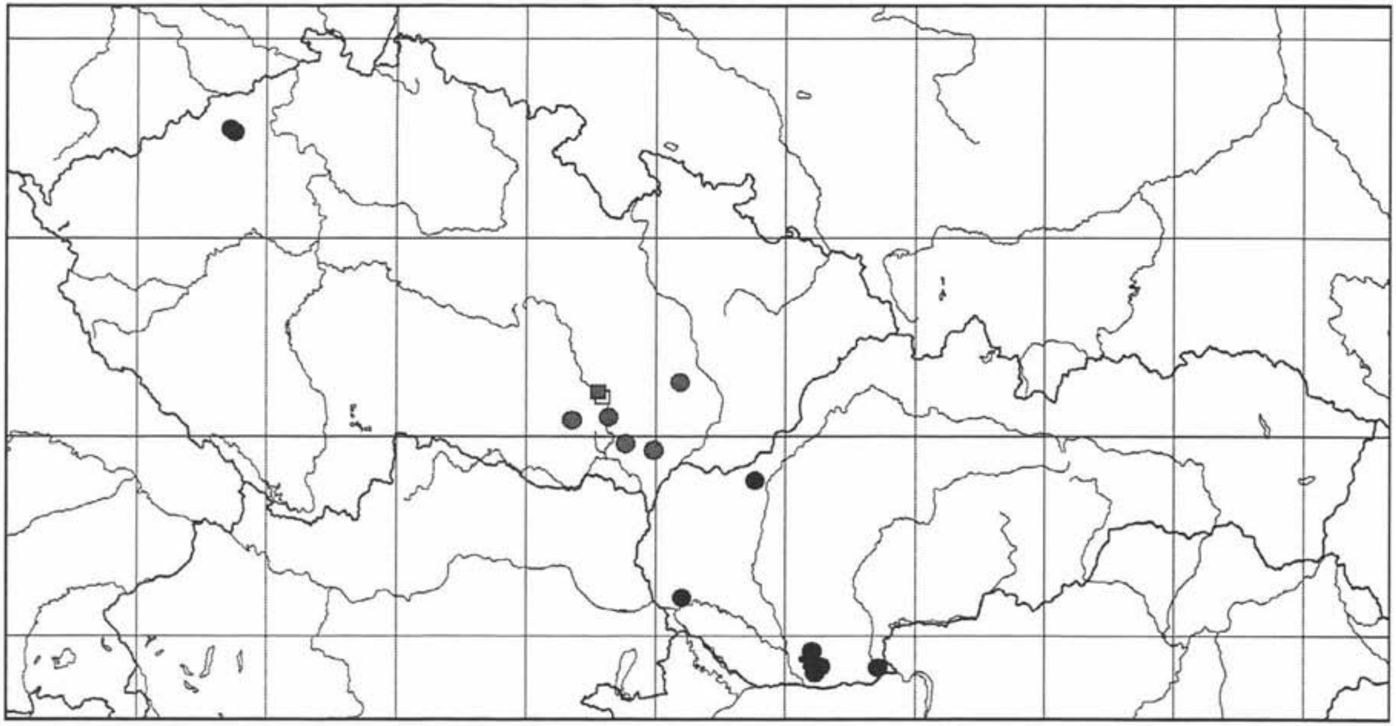
World-wide distribution: Steppe regions of Eurasia (from western Europe to Central Asia), the species also occurs in northern Africa (Algeria).

List of recorded localities:

Czech Republic

Braňany (NW Bohemia), balk near the nursery school, 300 m, MTB 5448c, *Eryngium campestre*, basal parts, 22. IX. 1975, leg. et det. J. Šutara, rev. F. Kotlaba 4. 5. 1984; hill "Kaňkov" 1 km SEE of Braňany, grassland, S and SW slope, MTB 5448c, *Eryngium campestre*, root and basal part, 5. XI. 1975,

Map 13 – Pleurotus eryngii



Documented data:

● - locality where the species was found between 1945 and 1970

● - locality where the species was found after 1970

Data from literature:

☐ - locality where the species was recorded before 1945

■ - locality where the species was recorded between 1945-1970

Broadly def. loc. - literature:

✚ - locality where the species was recorded after 1970

1. VIII. 1977, X. 1978, X. 1979, all leg. et det. J. Šutara, rev. F. Kotlaba 4. 5. 1984; 11. XI. 1989, leg. et det. J. Šutara (all LIT).

Budkovice near Ivančice (S Moravia, SW of Brno), dry slope – grassland, MTB 6964a, *Eryngium* sp. (*Peucedanum?* – note of F. Šmarda), dead rootstocks, 11. X. 1967, leg. A. Vágner, det. F. Šmarda (BRNM).

Brno, between parts Komín and Bystrc, MTB 6765c, 2. X. 1955, leg. J. Šmarda (Dermek 1974).

Brno, part Stránice, "Žlutý kopec" hill, MTB 6765c, *Eryngium campestre*, roots, leg. (et det.?) G. Niessl (Hruby 1935).

Rebešovice (S of Brno), sands ("Horky") near the village, steppe slope, MTB 6865d, *Eryngium campestre*, 25. V. 1962, leg. M. Smejkal et J. Vicherek, det. J. Špaček (BRNU).

Kurdějov (S of Brno), NE of the village, "Kamenný kopec" hill, SW of spot height 409, steppe margin of deciduous grove, 350 m, MTB 7066b, *Peucedanum cervaria*, 23. V. 1954, leg. et det. F. Šmarda, rev. J. Klán 1. 1984 (BRNM), 15. V. and 29. VII. 1954, VI. 1956, all leg. F. Šmarda, 6. X. 1957, leg. V. Zajícová et K. Podhora, 12. VI. 1962, leg. J. Šmarda (all Dermek 1974).

Čejč (SE of Brno), "Panský Špidlák", grassy steppe, MTB 7067d, *Eryngium campestre*, roots, 14. XI. 1954, leg. F. Šmarda (Herb. Herink, recently PRM; Dermek 1974).

Prasklice (E of Brno), site "Křéby", 250 m, MTB 6769a, *Eryngium campestre*, roots, 5. VI. 1952, leg. et det. V. Pospíšil, rev. F. Kotlaba 26. 6. 1984 (PRM, Pospíšil 1952, Šebek 1961, Dermek 1974).

Slovakia

Bratislava, part Vajnory, airport of Aeroklub Zväzarmu, 130 m, MTB 7769c, grassy place, on ground, 27. IX. 1984, leg. V. Kabát, det. A. Dermek (BRA).

Bzince pod Javorinou (W Slovakia), "Maleník" hill, 280 m, MTB 7172c, grassland, community with *Eryngium campestre*, 14. X. 1983, leg. et det. P. Lizoň (BRA).

Bajč (S Slovakia, as all following localities), 110 m, MTB 8075c, 15. X. 1971, leg. et det. E. Futó (BRNM).

Hurbanovo, MTB 8175, 1972 (Semerdžieva et Musílek 1976).

Svätý Peter = Dolný Peter, MTB 8175d, 12. XI. 1972, leg. et det. E. Futó, rev. F. Kotlaba et Z. Pouzar 11. 1972; *Eryngium campestre*, 25. IX. 1974, leg. et det. E. Futó, rev. F. Kotlaba 14. 4. 1983 (both PRM, 1974 also Herb. Herink); 29. IX. 1972, leg. et det. E. Futó; 30. X. 1972 and 10. V. 1974, leg. et det. E. Futó; *Eryngium campestre*, root, 12. XI. 1972, leg. E. Futó, det. A. Dermek (also Dermek 1973); both rev. F. Kotlaba 27. 6. 1985; 17. X. 1974, leg. et det. I. Fábry; on ground in community with *Eryngium* sp., 10. X. 1981, leg. et det. E. Futó (all BRA), 26. X. 1973, leg. A. Dermek, E. Futó et P. Lizoň (Dermek 1974).

Chotín, grassland near the railway station, 110 m, MTB 8175c, on ground in community with *Eryngium campestre*, XI. 1972, 23. IX. 1976, both leg. et det. E. Futó; 26. X. 1973, leg. et det. A. Dermek, all rev. F. Kotlaba 27. 6. 1985; 2. X. 1984, leg. P. Lizoň et L. Opold, det. P. Lizoň (all BRA); near field way, 21. IX. 1977, leg. et det. E. Futó (Herink – personal record).

Štúrovo, 6 km NE, Kováčovské kopce hills, dry grassland on the oak grove margin, 300 m, MTB 8178d, *Eryngium* sp., dead stalks, 10. IX. 1988, leg. et det. P. Škubla (BRA).

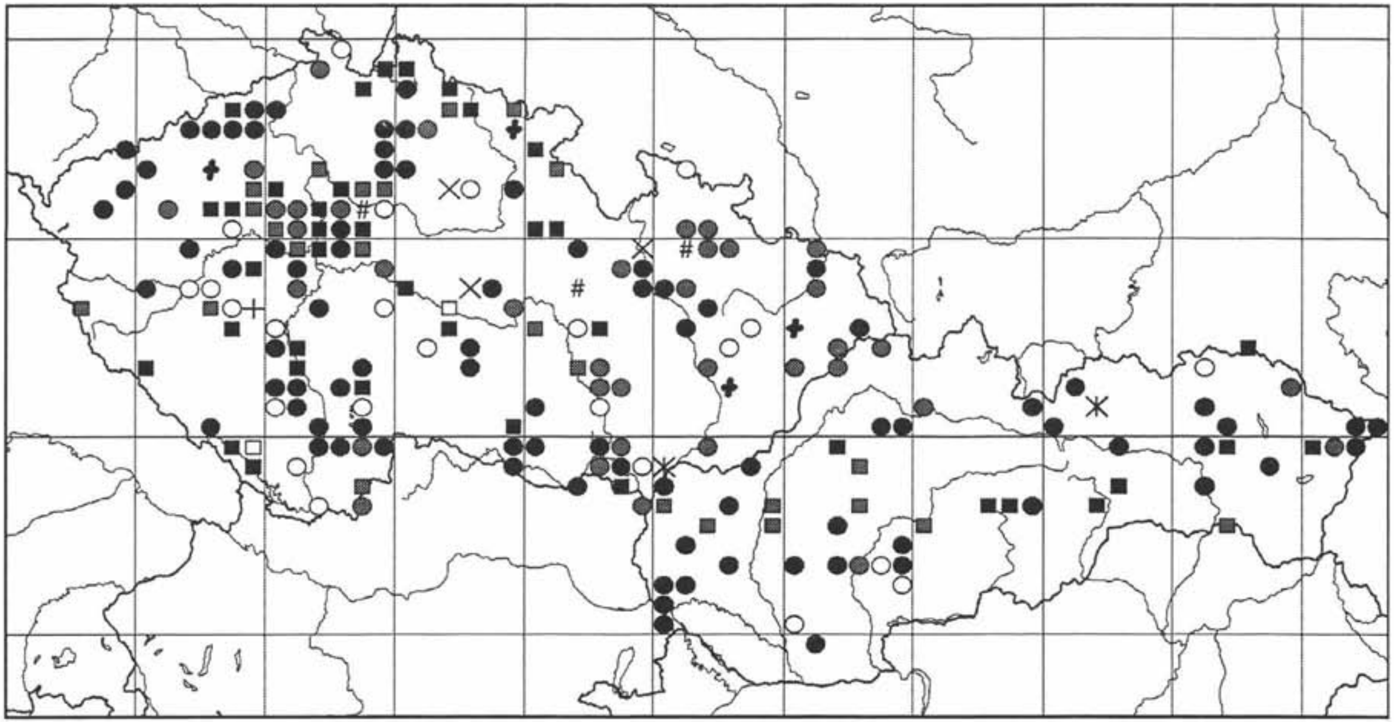
Pleurotus ostreatus (Jacq.: Fr.) Kummer

Basidiomes solitary or frequently fastigiate or imbricate, often a lot of basidiomes cover a large area of the substrate. Pileus 5–15 cm in width (maximum up to 25 cm), surface smooth or slightly radially fibrillose, of different colour – from yellow-brown or ferrugineous (determined as forma *salignus*), through dark-brown, grey-brown (typical *P. ostreatus*), to grey-blue to blue-green (forma *columbinus*). Gills pale, whitish to ochraceous, sometimes with the hue of the pileus colour, decurrent. Stipe excentric to lateral, up to 3 cm long, 1–2 cm wide, often almost absent, especially in rich fascicles or when the basidiome grows laterally. Context white. Hyphal system dimitic, generative hyphae thin– and thick-walled, skeletal hyphae present in the stipe base. Caulocystidia present as tapering hyphal ends, carrying so called "conidia". Spores cylindrical to ellipsoid, (6.5-)7.5–9.5(-11) × 3–4 μm. Smell fungal, taste mild.

P. columbinus and *P. salignus* have been classified at different levels – from forma to separate species. Intersterility tests of *P. ostreatus* and *P. columbinus* (Hilber 1982) showed almost 90% compatibility. On the other hand, Zervakis and Labarere (1992) classified them as separate species based on numerical analysis of the results of enzyme isoelectric focusing. The respective values of the genetic distances in relation with the degree of compatibility noted before, lead to the hypothesis of a sympatric speciation process that is currently under way for *P. columbinus* (Zervakis et Balis 1996). Nevertheless, my opinion is that compatible taxa cannot be rated on the species level (is questionable, whether or not numerical analysis results have greater importance than results of the intersterility tests).

Hilber (1978) tested strains identified as *Pleurotus salignus* and he found compatibility among the different strains (got from the different countries) and *P. ostreatus* or *P. pulmonarius*. Probably, *P. salignus* is in many regions a potential synonym for both above mentioned species, specimens of which have been determined under this name. The characters in Fries' description (Fries 1821) – dense grey gills and grey to ferrugineous spore print – are possible within the scope of *Pleurotus ostreatus* variability, whereas the described colours do not occur in

Map 14 – Pleurotus ostreatus



Documented data:

- ○ - locality where the species was found before 1945
- ◍ - locality where the species was found between 1945 and 1970
- ● - locality where the species was found after 1970

Data from literature:

- □ - locality where the species was recorded before 1945
- ▩ - locality where the species was recorded between 1945-1970
- ■ - locality where the species was recorded after 1970

Broadly defined localities:

- × - locality where the species was found before 1945
- ✳ - locality where the species was found between 1945 and 1970
- ✱ - locality where the species was found after 1970

Broadly def. loc. - literature:

- + - locality where the species was recorded before 1945
- # - locality where the species was recorded between 1945 and 1970
- ✚ - locality where the species was recorded after 1970

P. pulmonarius. This is why the name *P. salignus* is considered a synonym of *P. ostreatus*.

Because *Pleurotus ostreatus*, *P. columbinus* and *P. salignus* do not show any notable differences except the pileus colour and because all colour formae – grey-red(?) to blue-violet – were found growing on one tree (Nikolovský 1969), the taxa should be appraised at the forma level. J. Herink in his notes about some specimens (Slabce, 1940 /PRM/, Praha-Troja, 1932 /personal record/) mentions finding ochraceous specimens following a frost. It is probable that mechanical damage caused by frost can lead to basidiome colour change.

Pleurotus ostreatus is another species which in insufficient light creates habitat forms – elongated stipes with reduced pilei or only clavarioid forms (van der Aa 1984, cit. sec. Boekhout et al. 1990).

Related species. The *P. pulmonarius* basidiome is paler (yellow-brown, almost white when young) and turns yellow with age or when bruised or dried. The same yellowing is characteristic for *P. dryinus*; further characters are a dimitic hyphal system throughout the entire basidiome and a veil in the juvenile stage. *Panus conchatus* also has a dimitic hyphal system; its basidiome is (especially when young) fleshy-brown and the stipe is brown. The gills of *Pleurotus cornucopiae* are longly decurrent with dense anastomoses, skeletal hyphae are present in its context (only in the stipe base in *P. ostreatus*); this species does not occur in higher and colder regions, in the cold months or (as with *Panus conchatus*) on coniferous trees.

Occurrence: Very abundant species. Because of this, not every find is recorded or published.

Phenology: Fructification all year with a maximum in October and November. There is a clear dependence of the occurrence maximum during the year on environmental conditions – it is clearly an autumn fungus in the warm regions, whereas its occurrence is more equally spread throughout the year in colder regions.

Substrate: The common hosts are deciduous trees, more rarely conifers. The spectrum of substrate trees is very wide. Growth can be either saprotrophic or parasitic. White rot is caused by this species. Sometimes it occurs on somewhat strange substrates – collection from Most 16. X. 1964 (PRM): "The fungus grew in the space between WC and concrete." On Jersey (Channel Islands), it was found on the vertebra of a recently washed up sperm whale (Reid 1985).

Distribution in the Czech Republic and Slovakia: Common species. Usually not recorded, occurring throughout the entire Czech Republic and Slovakia. Cultivated and market mushroom.

World-wide distribution: Cosmopolitic species, occurring all over the world, from tropics to the Arctic Circle.

Pleurotus pulmonarius (Fr.) Quél.

Basidiomes solitary, fastigiate or imbricate. Pileus 5–10 cm in width, almost white when young (as the whole basidiome is), light-brown or yellow-brown at maturity, turning yellow with age, by drying or when bruised. Gills whitish, decurrent. Stipe up to 2 cm long, 0,5–1,5 cm wide, or reduced especially in dense fascicles or when the basidiome grows laterally. Context white. Hyphal system dimitic, generative hyphae thin- and thick-walled, skeletal hyphae present in the stipe base. Cystidia: only hyphal ends suggesting pleurocystidia on the stipe surface and elements such as "hyphal pegs" on the gills' sides. Spores cylindrical to ellipsoid, (6.5-)7.5–9.5(-11) × 3–4 μm. Smell fungal (somewhat unpleasant in older basidiomes), taste mild.

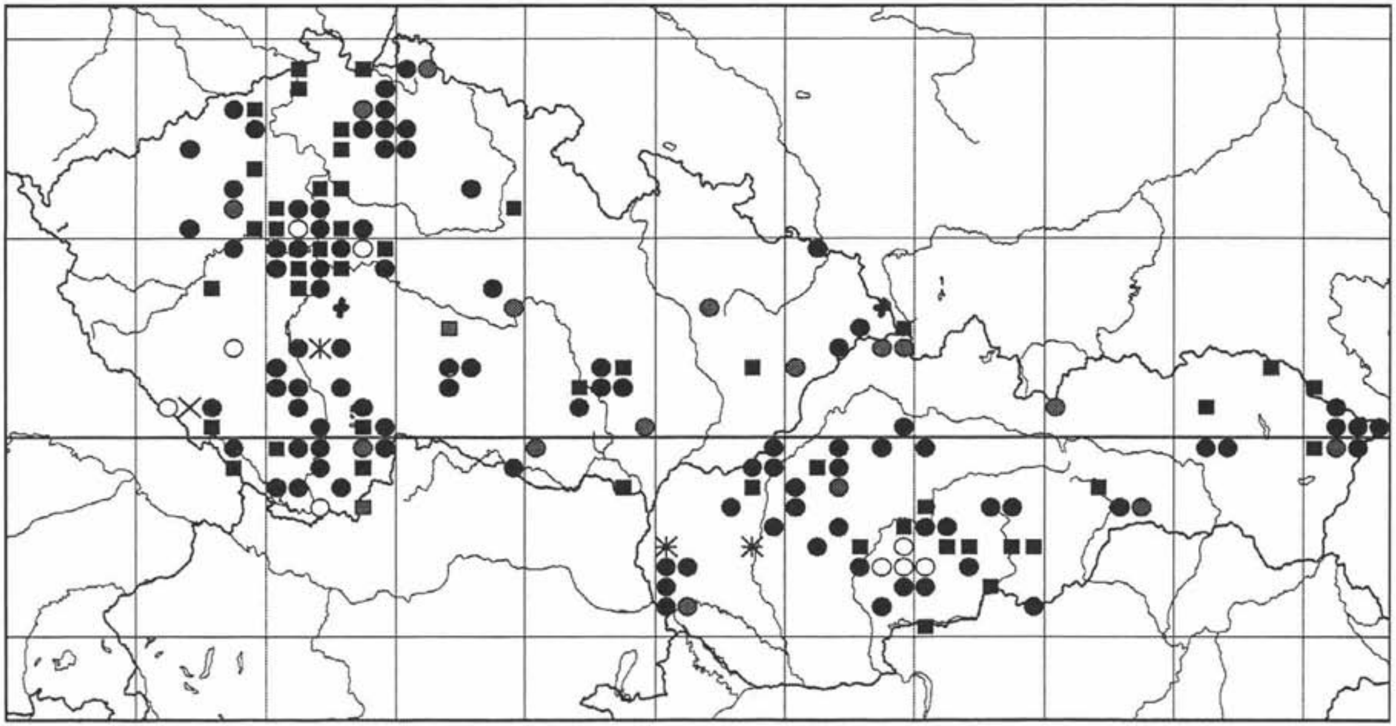
Although the species was already distinguished by Fries (1821, as *Agaricus pulmonarius*), it was classified by many authors as a variety of *P. ostreatus* until the second half of the 20^{th} century. Hilber's intersterility tests (100% incompatibility) in the 1970s and 1980s (Hilber 1982) demonstrated the species' independence of *P. pulmonarius*. Separation of *P. ostreatus* and *P. pulmonarius* as biological species on the basis of intersterility tests was confirmed by Petersen and Hughes (1993); on the other hand, no sexual compatibility barriers were found among specimens of either of these species, even though they were from various parts of the world. Separation of these species was also confirmed by Zervakis and Labarere (1992) on the basis of enzyme pattern isoelectric focusing.

Classification of the cultivated "taxon" *Pleurotus florida* Eger (nom. nud.) is heterogeneous. Hilber (1977) reports its compatibility with *P. pulmonarius* and incompatibility with *P. ostreatus*, whereas 20 years later (Hilber 1997) he lists this name among the synonyms of *P. ostreatus* (without further comment).

As reported by Kotlaba and Pouzar (1996; see also the note for *Neolentinus degener*), the fungus described by Schaeffer (1764: tab. 252) as *Agaricus cyathiformis* probably represents *Pleurotus pulmonarius*; the epithet *cyathiformis* is in this case older than *pulmonarius* for this species. However, the name *Agaricus pulmonarius* was used by Fries (1821: 187) – the name with epithet *pulmonarius* is therefore sanctioned against Schaeffer's older epithet, according to Art. 13.1(d) of the International Code of Botanical Nomenclature (Greuter et al. 1994).

Related species. The *P. ostreatus* basidiome is darker (ferrugineous, brown, grey to blue) and does not turn yellow with age or when bruised or dried. The *P. dryinus* basidiome is larger with gills coloured orange at maturity, a dimitic hyphal system throughout the whole basidiome and a veil in the juvenile stage. The gills of *Pleurotus cornucopiae* are longly decurrent with dense anastomoses, skeletal hyphae are present in its context (only in the stipe base in *P. pulmonarius*); this species does not occur in higher and colder regions, in the cold months or on coniferous trees. Young white basidiomes can be confused with *Pleurocybella*

Map 15 – Pleurotus pulmonarius



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- ● - locality where the species was found between 1945 and 1970
- ● - locality where the species was found after 1970

Data from literature:

- ■ - locality where the species was recorded before 1945
- ■ - locality where the species was recorded between 1945-1970

Broadly defined localities:

- × - locality where the species was found before 1945
- ✳ - locality where the species was found between 1945 and 1970
- ✳ - locality where the species was found after 1970

Broadly def. loc. - literature:

- ✚ - locality where the species was recorded after 1970

porrigens, characterised by almost globose 6–8 μm large spores and by growth on coniferous trees.

Occurrence: Abundant species. The records count has increased by several times in the last third of this century. Probable reason: Around the end of the 1960s, *P. pulmonarius* began to be commonly distinguished from *P. ostreatus* (this species had been distinguished before, but was considered a separate species by mycologists in general approximately since this time, see above). Before this, *P. pulmonarius* mostly had not been distinguished (the great majority of records made before 1960 is determined as *P. ostreatus* or one of its varieties or forms, including *P. ostreatus* var./forma *pulmonarius*) and – as with specimens of common species – its finds had not been documented. (Pilát /1930/ reports that "this remarkable species has not been noticed in Czechoslovakia until now" and he considered its rare occurrence to be the reason – the documents from before 1930 are almost non existant /Pilát probably did not see the old Slovak finds/, but I do not believe that this was caused by the species absence.)

Phenology: Although *P. pulmonarius* is considered a spring species, generally this is not true. Its occurrence is staggered from spring to autumn; only in the last decades has it shown some occurrence shift towards early summer. (Probably this depends on the region – Biber /1991/ observed the species phenology /1979–1990, generally 24 finds/: III. – 5, IV. – 9, V. – 6, VI. – 1, VII. – 1, IX. – 1, X. – 1. In the Teplice region, *P. pulmonarius* is a notably spring species.)

Substrate: The most frequent host of *P. pulmonarius* is *Fagus*, also other deciduous and rarely coniferous trees. In recent decades, the spectrum of species is wider and the percentage of finds on *Fagus* is lower. White rot is caused by this species. In the literature, this species is presented as the leading element in the destruction of *Tilia* wood (Ivanov 1985).

Distribution in the Czech Republic and Slovakia: Frequent occurrence, especially in the middle to submountain altitudes; no large areas where this species is absent are known. Cultivated mushroom (under the synonymic name *P. florida*) (Hilberová-Podlahová 1977).

World-wide distribution: Cosmopolitan species, occurring from subtropical to polar regions (Pilát /1935/: it accompanies *Betula* to the northern tree line) in the Old World and America. Recorded in Australia, but its occurrence in other continents of the southern hemisphere is also probable.

CONCLUSIONS

Fifteen species of pleurotoid fungi of the family *Polyporaceae* were recorded from the Czech Republic and Slovakia. Their occurrence, phenology, ecology and distribution is commented and documented with distribution maps.

Several species show an occurrence decline especially in the Czech Republic (*Panus lecomtei, Pleurotus eryngii*), others show an increasing number of records due to their growing recognition as separate taxa (*Pleurotus cornucopiae, P. pulmonarius*). Some species show interesting differences in their maximum of fructification in various regions – commonly the species have clearer fructification "peaks" and a more marked time of fructification in warmer regions.

Some of the species also show a certain shift in host spectrum – the usual trend is that the spectrum enlarges, i. e. the fungi are found on more diverse trees. This is just the opposite of the trend which was observed for mycorrhizal hydnaceous fungi. There are two possible explanations: either the enlarging of the substrate spectrum is a relict caused by more records being made during the last decades, or it is a reality caused by the deterioration of environmental conditions, which leads to more trees being susceptible to fungal infection. This hypothesis may be supported by the increasing number of records on live trees (*Pleurotus dryinus*).

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REFERENCES

ARCANGELI G. (1895): Sopra una monstruosita del Lentinus tigrinus. – Nuovo Giorn. Bot. Ital. 2 (1): 57–62.

BIBER J. (1991): Hlíva plicní (Pleurotus pulmonarius) v Milešovském středohoří – zajímavá sukcese. – Čas. Čs. Houb.-Mykol. Sborn., Praha, 68 (3–4): 83–85.

BIRKINSHAW J. K. and FINDLAY W. P. K. (1940): Biochemistry of the wood-rotting fungi. I. Metabolic products of Lentinus lepideus Fr. – Fr. Biochem. J. 34: 82–88.

BOEKHOUT T., BAS C. and NOORDELOOS M. E. (1990): Pleurotaceae Over. ex Kühner. – In: Bas C. et al. [eds.]: Flora Agaricina Neerlandica 2: 19–30, Rotterdam.

BRESINSKY A., HILBER O. and MOLITORIS H. P. (1976): The genus Pleurotus as an aid to understanding the concept of species in Basidiomycetes. – In: Proc. Herbette Symp. spec. concept Hymenomyc., Lausanne: 229–258.

Clements F. E. and Shear C. L. (1931): The genera of fungi. – New York (non vidi).

Corner E. J. H. (1981): The Agaric genera Lentinus, Panus, and Pleurotus. – Beih. Nova Hedwigia, fasc. 69, Vaduz.

Černý A. (1989): Parazitické dřevokazné houby. – 104 p., Praha.

Dermek A. (1973): Hliva kotúčová (č. hlíva máčková) – Pleurotus eryngii (DC ex Fr.) Quél. na južnom Slovensku. – Čas. Čs. Houb.-Mykol. Sborn., Praha, 50 (1–2): 3–4.

Dermek A. (1974): Hliva kotúčová – Pleurotus eryngii (DC. ex Fr.) Quél. na Slovensku. – Čes. Mykol., Praha, 28 (1): 57–59.

Domański S. (1955): Nowe stanowisko grzyba Lentinus cyathiformis (Schaeff.) Bres. w Polsce. – Acta Soc. Botan. Poloniae, Warszawa, 24 (1): 197–205.

Donk M. A. (1949): Nomenclature notes on generic names of agarics (Fungi: Agaricales). – Bull. Bot. Gard. Buitenzorg III, 18: 271–402 (non vidi).

Donk M. A. (1962): The generic names proposed for Agaricaceae. – Beih. Nova Hedwigia, Weinheim, 5: 1–320.

Earle F. S. (1909): The genera of North American gill fungi. – Bull. N. Y. Bot. Gard., New York, 5: 373–451 (non vidi).

Fries E. M. (1821): Systema mycologicum 1.–520 p., Gryphiswaldiae.

Fries E. M. (1985): Systema Orbis vegetabilis. – 374 p., Lundae.

Fries E. M. (1828): Elenchus Fungorum. – 154 p., Gryphiswaldiae.

Fries E. M. (1836–8): Epicrisis Systematis mycologici. – 610 p., Upsaliae.

Ginterová A. (1973): Nitrogen fixation by higher fungi. – Biológia, Bratislava, 28 (3): 199–202.

Ginterová A. (1974): Hliva miskovitá (Pleurotus cornucopiae) nová huba pre priemyselné pestovanie. – Mykol. Zprav., Brno, 18 (1): 9–13.

Ginterová A. and Maxianová A. (1975): The balance of nitrogen and composition of proteins in Pleurotus ostreatus grown on natural substrates. – Folia Microbiol. 20: 246–250.

Greuter W. et al. [eds.] (1994): International Code of Botanical Nomenclature (Tokyo Code). – 389 p., Königstein.

Haller R. (1948): Monstrose Pilzformen. – Schweiz. Z. Pilzk., Bern-Bümpliz, 26: 5–6.

Herink J. (1950b): Ekologické studie – II: vyšší houby v dutinách stromů. – Čes. Mykol., Praha, 4 (6–7): 74–79.

Hibbett D. S. and Vilgalys R. (1991): Evolutionary relationships of Lentinus to the Polyporaceae: Evidence from restriction analysis of enzymatically amplified ribosomal DNA. – Mycologia, Lancaster (Pennsylv.), 83 (4): 425–439.

Hibbett D. S. and Vilgalys R. (1993): Phylogenetic relationships of Lentinus (Basidiomycotina) inferred from molecular and morphological characters. – Syst. Bot. 18 (3): 409–433.

Hilber O. (1977): Einige Aspekte aus der Pleurotus ostreatus Gruppe. – Čes. Mykol., Praha 31 (3): 142–154.

Hilber O. (1978): Biosystematische Untersuchungen zur Kenntnis von Pleurotus sect. Pleurotus. – Z. Mykol. 44 (1): 31–50.

Hilber O. (1982): Die Gattung Pleurotus. – 448 p., 197 fig., Vaduz.

Hilber O. (1997): The genus Pleurotus (Fr.) Kummer (2). – 63 p., Kelheim.

Hilberová-Podlahová R. (1977): Některé aspekty druhů ze skupiny hlívy ústřičné – Pleurotus ostreatus (Jacq. ex Fr.) Kumm. – Mykol. Zprav., Brno, 21 (1–2): 7–8.

Hradílek Z., Lizoň P. and Tlusták V. (1992): Index herbariorum čechoslovacorum. – 74 p., Olomouc.

Ivanov A. I. (1985): Makromicety dubrav Penzenskoj oblasti 1. Ksilotrofy. – Mikol. Fitopatol., Leningrad, 19 (5): 383–388.

Jablonský I. (1980): Pěstování tropických a subtropických hub. – Čas. Čs. Houb.-Mykol. Sborn., Praha, 57 (5): 131–135.

Junková A. and Staněk M. (1972): Poutání vzdušného dusíku hlívou ústřičnou (Pleurotus ostreatus [Jacq. ex Fr.] Kummer). – Čas. Čs. Houb.-Mykol. Sborn., Praha, 49 (3–6): 51–55.

Kääri̇k A. (1992): Faerberia, Lentinus, Phyllotopsis, Pleurotus. – In: Hansen L. et Knudsen H. [eds.]: Nordic Macromycetes vol. 2: 46–49, Copenhagen.

KOST G. (1986): Morphology, anatomy, and systematics of carotenoid containing agaricoid Basidiomycetes. – Ber. Deutsch. Bot. Ges., Berlin 99 (1/2): 43–58.

KOTLABA F. (1957): Lokality dvou vzácných houževnatců v Československu. – Čes. Mykol., Praha, 11 (4): 231–235.

KOTLABA F. and POUZAR Z. (1996): The identity of Agaricus cyathiformis Schaeff. – Persoonia, Leiden, 16 (2): 233–238.

KÜHNER R. (1980): Les Hyménomycètes Agaricoïdes. Etude générale et classification. – Bull. Soc. Linn. Lyon, Num. spéc., 1027 p.

KUMMER P. (1871): – Der Führer in die Pilzkunde. – Zerbst.

KURTZMANN R. H. (1978): Nitrogen fixation by Pleurotus? – Mushroom Sci. 10 (1): 427–435.

MICHAEL E., HENNIG B. and KREISEL H. (1977): Handbuch für Pilzfreunde, 2. ed., fasc. 3: Blätterpilze – Hellblätter und Leistlinge. – 464 p., Jena.

MOLITORIS H. P. and PRILLINGER H. (1986): Isoenzyme spectra for characterization and identification of fungi (influence of genetical and nongenetical factors). – Mycol. Helv. 2 (1): 103–122.

MOSER M. (1983): Die Röhrlinge und Blätterpilze. – In: Gams H. [ed.]: Kleine Kryptogamenflora, fasc. IIb/2, 533 p., Stuttgart, New York.

OHIRA I. (1990): A revision of the taxonomic status of Pleurotus citrinopileatus. – Rep. Tottori Mycol. Inst., Tottori, 28: 143–150.

PACLT J. (1960): Mykoflóra odumírající pavlovnie. – Čes. Mykol., Praha, 14 (4): 244–247.

PATOUILLARD N. (1887): Les Hyménomycètes d'Europe. – Paris.

PATOUILLARD N. (1900): Essai taxonomique sur les familles et les genres des Hyménomycètes. – Lons-le-Saunier (non vidi).

PEGLER D. N. (1983): The genus Lentinus: a world monograph – Kew Bull. Add., ser. 10: 1–281.

PETERSEN R. H. and HUGHES K. W. (1993): Intercontinental interbrending collections of Pleurotus pulmonarius, with notes on Pleurotus ostreatus and other species. – Sydowia, Horn, 45 (1): 139–152.

PILÁT A. (1930): Poznámky k některým druhům rodu Pleurotus. – Travaux Mycol. Tchécosl. 13: 1–32.

PILÁT A. (1935): Pleurotus Fr. – Hlíva. – In: Kavina K. et Pilát A.: Atlas hub evropských, fasc. 2., 193 p., Praha.

PILÁT A. (1946): Evropské druhy houževnatců (Lentinus Fr.). – In: Kavina K. et Pilát A.: Atlas hub evropských, fasc. 5, 44 p., Praha.

POSPÍŠIL V. (1952): Pleurotus Eryngii (DC.) Fr. v Československu. – Čes. Mykol., Praha, 6 (6–7): 85–87.

POUZAR Z. (1981): Faerberia, a genus of cantharelloid fungi. – Čes. Mykol., Praha, 35 (4): 185–188.

QUÉLET L. (1872): Les Champignons de Jura et des Vosges, Ed. 1. – Montbéliard.

REDHEAD S. A. and GINNS J. H. (1985): A reappraisal of agaric genera associated with brown rots of wood. – Trans. Mycol. Soc. Japan, Tokyo, 26: 349–381.

REID D. A. (1985): Further records of Jersey [UK] fungi. – Trans. Brit. Mycol. Soc., Worcester, 84 (4): 715–722.

ROMAGNESI H. (1968): Lentinus tigrinus var. dunalii. – Bull. Soc. Myc. France, Paris, 84: Atlas, tab. 178.

ROMAGNESI H. (1969): Sur les Pleurotus de groupe Ostreatus (Ostreomyces Pilat). – Bull. Soc. Mycol. France, Paris, 85 (3): 305–314.

SCHULZER S., KANITZ A. and KNAPP. J. A. (1866): Die bisher bekannten Pflanzen Slavoniens. – Verh. Zool. bot. Ges. Wien, 16: 3–172 (non vidi).

SCHAEFFER J. C. (1771): Fungorum qui in Bavaria et Palatinatu circa Ratisbonam nascuntur icones, vol. 3, Index primus 1774. – Ratisbonae.

SCHWEINITZ L. D. (1822): Synopsis fungorum Carolinae superioris. – 131 p., 2 tab.

SEMERDŽIEVA M. and MUSÍLEK V. (1976): List of cultures of Basidiomycetes of the Institute of Microbiology, Czechoslovak Academy of Sciences. – Čes. Mykol., Praha, 30 (1): 49–57.

SINGER R. (1951): The "Agaricales" (Mushrooms) in modern taxonomy. – Lilloa, Tucumán, 22: 1–832 (non vidi).

SINGER R. (1975): The Agaricales in modern taxonomy, 3. ed. – 912 p., Vaduz.

SINGER R. (1986): The Agaricales in modern taxonomy, 4. ed. – 981 p., Königstein.

SINGER R. and SMITH A. H. (1946): Proposals concerning the nomenclature of gill fungi including a list of proposed lectotypes and genera conservanda. – Mycologia, Lancaster (Pennsylv.), 38: 240–299 (non vidi).

STANKOVIČOVÁ Ľ. (1973): Hyphal structure in some pleurotoid species of Agaricales. – Nova Hedwigia, Stuttgart, 24: 61–120.

ŠEBEK S. (1961): Extrazonální prvky v mykoflóře ČSSR. – Čas. Čs. Houb.-Mykol. Sborn., Praha, 37 (7–8): 97–101.

ŠVEC Z. and ŠVECOVÁ A. (1990): Houby rodu Pleurotus (Fr.) Quél. a mykofilní brouci. – Čas. Čs. Houb.-Mykol. Sborn., Praha, 67 (1): 8–10.

THORN R. G. and BARRON G. L. (1984): Carnivorous mushrooms. – Science, Lancaster (Pennsylv.), 224 (4644): 76–78.

VÁŇA J. (1996): Systém a vývoj hub a houbových organismů. – 164 p., Praha.

WATLING R. and GREGORY N. M. (1989): Crepidotaceae, Pleurotaceae and other pleurotoid agarics. – In: Gregory N. M. et Watling R.: British fungus flora, Agarics and Boleti, fasc. 6, Edinburgh.

ZERVAKIS G. and BALIS C. (1996): A pluralistic approach in the study of Pleurotus species with emphasis on compatibility and physiology of the European morphotaxa. – Mycol. Res. 100 (6): 717–71.

ZERVAKIS G. and LABARERE J. (1992): Taxonomic relationships within the fungal genus Pleurotus as determined by isoelectric focusing analysis of enzyme patterns. – J. Gen. Microbiol., Cambridge, 138 (3): 635–645.

ZIMMERMANN H. (1914): Verzeichnis der Pilze aus der Umgebung von Eisgrub. – Verh. Naturf. Vereines Brünn, Brno 52 [1913]: 66–128.

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Die Rost-, Brand- und Falschen Mehltaupilze des tschechischen Teiles des Erzgebirges (Krušné hory)

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Dietrich W. and Müller J. (2001): The rust fungi, smut fungi and downy mildews in the Czech part of Krušné hory (Erzgebirge) – Czech Mycol. 53: 89–118

In years 1849–2000 it has been found in Czech part of Krušné hory 101 species, subspecies and varieties of Uredinales, 21 of Ustilaginales and 45 of Peronosporales on 229 species of host plants. There are documented host plants, localities, years of findings and collectors. A historical survey of mycofloristical research of these micromycetes is presented. All species has been filed into typical plant formations. Characteristic species for highest mountain sites are enumerated. Statements of literature are compared with actual data. The new hosts in Czech republic are following: for *Peronospora myosotidis Myosotis nemorosa*, for *Coleosporium senecionis* and *Puccinia silvatica Senecio hercynicus*, for *Melampsoridium betulinum Betula nana*.

Key words: Krušné hory, Peronosporales, Uredinales, Ustilaginales

Dietrich W. a Müller J. (2001): Rzi, sněti a fytopatogenní plísně české části Krušných hor – Czech Mycol. 53: 89–118

V letech 1849–2000 bylo nalezeno v české části Krušných hor 101 druhů, subspecií a variet z řádu Uredinales, 21 Ustilaginales a 45 Peronosporales na 229 druzích hostitelských rostlin. Jsou uvedeny hostitelské rostliny, lokality, roky nálezů a sběratelé. Je podán historický přehled mykofloristického výzkumu těchto mikromycetů, všechny druhy jsou zařazeny do typických rostlinných formací, jsou vyjmenovány charakteristické druhy pro nejvyšší horské polohy. Literární údaje jsou porovnány s aktuálními daty. Novými hostiteli pro Českou republiku jsou *Myosotis nemorosa* pro *Peronospora myosotidis*, *Senecio hercynicus* pro *Coleosporium senecionis* a *Puccinia silvatica* a *Betula nana* pro *Melampsoridium betulinum*.

EINLEITUNG

Das Erzgebirge war vor der Besiedlung überwiegend bewaldet. Je nach Höhenlage und Standortbedingungen setzten sich diese Wälder aus Buche, Tanne, Berg-Ahorn, Eberesche, Kiefer, Fichte u.a. zusammen. Buchen und Tannen wuchsen vereinzelt bis über 1000 m ü. M. Noch um 1700 sollen Buchenwälder und Buchen-Tannen-Fichten-Mischwälder zwischen Vejprty und Přísečnice in Höhen zwischen 800–950 m ü. M. vorgeherrscht haben (Firbas 1952). Besonders in den Kammlagen kamen viele Waldmoore vor (Schreiber 1923), die durch Torfgewinnung und die damit verbundene Entwässerung z. T. stark in Mitleidenschaft geraten sind. Mit der Entstehung der Bergstädte im 16. Jahrhundert wurden die Vegetationsverhältnisse stark verändert. Anstelle natürlicher Wälder rückten mehr und mehr Forstgesellschaften, in denen die Fichte dominierte. Naturnahe Waldreste mit der typischen Krautflora blieben meist nur kleinflächig erhalten. Heute kommen die typischen Pflanzen dieser Mischwälder am ehesten an Waldrändern vor und lassen die ursprünglichen Vegetationsverhältnisse oft nur noch erahnen. Mit der Besiedlung entstanden landwirtschaftlich genutzte Flächen, die den Lebensraum vieler Pflanzenarten dezimierten, einzelner jedoch erweiterten.

Mit Ackerbau und Handel kamen ursprünglich nicht heimische Pflanzen in unsere Gegend. In den Gärten wurden zahlreiche Pflanzenarten kultiviert. So hat manche Blütenpflanze in der anthropogen beeinflussten Natur neue Besiedlungsräume gefunden. Einige in den mehr oder weniger geschlossenen Wäldern vorkommenden Kormophyten konnten sich durch die Rodung auch zahlenmässig ausbreiten, z. B. Arten der Quell- und Bachfluren in Sumpfwiesen und Arten lichter Wälder in Mähwiesen, welche mit ihrer Artenvielfalt charakteristisch für das Erzgebirge sind. In dieser Halbkulturformation finden sich zahlreiche Wirtspflanzen für Phytoparasiten. In den letzten Jahrzehnten kam es infolge der Schwefeldioxid-Emission im Erzgebirge zu dramatischen Veränderungen in Wäldern und Moorresten. Die Belichtung des Waldbodens nahm stark zu. Typische Schatten- und Sumpfpflanzen mussten grossflächig z. B. dem Wolligen Reitgras *Calamagrostis villosa* weichen.

Merkwürdigerweise ergab das Literaturstudium, dass nur wenige Funde von phytoparasitären Kleinpilzen vom böhmischen Teil des Erzgebirges bekannt geworden sind. Aus diesem Grunde wurden die Literaturangaben in unsere Zusammenstellung mit aufgenommen und so entstand eine komplette Flora der untersuchten Mikromyzeten bis zur Gegenwart. Sicherlich werden noch mehrere weitere Arten entdeckt.

Belege der Verfasser befinden sich in ihren Privatherbarien. Die Nomenklatur der Pilze richtet sich nach Kochman et Majewski (1970), Wrónska (1986), Constantinescu (1991), Brandenburger (1994), Poelt and Zwetko (1997), Marková and Urban (1998), Vánky (1994 und 1998). Autorennamen wurden nach den Empfehlungen von Hawksworth (1980) abgekürzt. Nomenklatur der Wirtspflanzen wurde den bisher erschienenen 5 Bänden der "Květena České republiky", 1988–1997 von Hejný and Slavík (eds.), sonst Dostál J. (1989): Nová květena ČSSR.1–2, Praha entnommen mit Ausnahme der Senecio nemorensis-Gruppe, die sich nach Weinert (1987) richtet.

Abkürzungen und Erläuterungen zum Text:

Sammler: D = Dietrich, M = Müller, die übrigen sind mit dem Namen aufgeführt.

Himmelsrichtungen: N = nördlich, S = südlich, W = westlich, Ö = östlich, NW = nordwestlich usw.

Bei den Rostpilzen werden das Entwicklungsstadium (0 = Spermogonien, I = Aecien, II = Uredien, III = Telien) und bei allen Pilzen die Monate (I.-XII.), in welchen die Arten von uns im Erzgebirge gesammelt wurden, angeführt. Es folgen die Wirtspflanze, der Fundort, die Seehöhe, das Fundjahr oder Veröffentlichungsjahr und der Sammler oder Autor. Bei den Funden aus dem 19. und 21. Jahrhundert wird die ganze Jahreszahl angeführt, bei denen aus dem 20. Jh. wurden die zwei ersten Ziffern weggelassen. Die Fundorte wurden von West nach Ost angeordnet.

DAS UNTERSUCHTE GEBIET

Das Sammelgebiet der Verfasser dieser Arbeit erstreckt sich im Raum von Pernink im Westen bis nach Krásná Lípa bei Chomutov im Osten und von der Staatsgrenze bei Pohraniční im Norden bis nach Jáchymov im Süden. Die Literaturangaben beziehen sich auch auf das Gebiet um Velké jeřábí jezero und Potůčky im Westen und den östlichen Teil des Erzgebirges bis Telnice nördlich von Ústí n. Lab. Es ist merkwürdig, dass der westliche Teil des böhmischen Erzgebirges westlich und südlich von Velké jeřábí jezero bezüglich der Rost-, Brand- und Falschen Mehltaupilze völlig unerforscht blieb. Wir haben schwerpunktmässig in den Kammlagen und den nach Norden abfallenden Gebieten des mittleren Teiles des Erzgebirges zwischen ca. 600 und 1244 m (Klínovec) ü. M. gesammelt.

Kurze Geschichte der Erforschung der Roste, Brände und Falschen Mehltaue im böhmischen Teil des Erzgebirges

Die wahrscheinlich älteste Aufsammlung, *Uromyces laburni* an *Laburnum anagyroides* aus Červený Hrádek, stammt von Freiherr Rudolf Thysebaert. Der Name ist bei Bubák (1906 u. 1908) offensichtlich falsch als Thysalaert aufgeführt. Er war Priester im Dorfe Údrč (Kreis Karlovy Vary) und Mitglied der Botanischen Tauschanstalt des Begründers der böhmischen Mykologie F. M. Opiz in Prag. Thysebaert sammelte im 1. Drittel des 19. Jahrhunderts.

In den Jahren 1846–1860 sammelte Anton Roth Rostpilze in Červený Hrádek bei Jirkov. Er war Gärtner beim Grafen Buquoy, der eine Vorliebe für Naturwissenschaften zeigte. A. Roth publizierte drei Arbeiten über Phanerogamen aus der Umgebung von Červený Hrádek. Sein Beleg von *Puccinia persistens* aus dem Jahre 1849 dürfte der älteste genauer datierte sein. Noch älter müsste die oben erwähnte Aufsammlung von *U. laburni* durch Thysebaert sein, von der uns jedoch das Sammeljahr nicht bekannt ist. Gleichzeitig mit Roth sammelte dortselbst Josef

F. Sachs, Rentmeister des Grafen Buquoy. Er war ebenfalls Mitglied der Opizschen Tauschanstalt. Nach Bubák (1906) sammelte bei Červený Hrádek noch Fuchs, der nicht näher bekannt ist. Die Belege dieser Sammler befinden sich grösstenteils im PRM und wurden von Bubák für seine Flora der böhmischen Rostpilze (1906) eingesehen. Bubák (1906) ordnet Funde des Rostes *Uromyces viciae-fabae* an *Lathyrus lacteus* (Herb. Peyl) von Kyšperk bei Krupka und Horní Hrad bei Jáchymov dem Erzgebirge zu. Beide Orte liegen jedoch schon im Thermophytikum. Die Aufsammlungen müssten um 1860 erfolgt sein.

Der bekannte Mykologe Felix von Thümen (1839–1892) veröffentlichte 1875 "Beiträge zur Pilz-Flora Böhmens". Diese für die Kenntnis der Pilze Böhmens wichtige Arbeit enthält überwiegend Angaben aus Teplice, also ausserhalb des Erzgebirges. Im Erzgebirge sammelte v. Thümen in den Jahren 1872–1873. Diese Funde wurden in die vorliegende Arbeit übernommen. F.v. Thümen stammt aus Dresden und beschäftigte sich in Schlesien und Brandenburg mit der Landwirtschaft. Ab 1876 war er als Adjunkt an der chemisch-physiologischen Versuchsanstalt in Klosterneuburg in Niederösterreich tätig.

Johann Wiesbaur (1836–1906) war jesuitischer Priester und Mittelschulprofessor in Bohosudov. Er hat mehrere Arbeiten über Gefässpflanzen publiziert und sammelte auch Rostpilze, 1896 die seltene *Puccinia virgae-aureae*.

Es ist interessant, dass an der Erforschung der Mikromyzeten auf der böhmischen Seite des Erzgebirges auch die bekannten deutschen Mykologen Krieger, Wagner, P. Sydow und Dietel Anteil hatten. Sie wiesen einige für das Erzgebirge interessante Arten nach, so *Peronospora alpicola, Puccinia conglomerata, P. mulgedii, P. thlaspeos, Uromyces phyteumatum, Entyloma arnicale, Microbotryum silenes-inflatae, Thecaphora trailii* und *Ustilago pustulata.* Karl Wilhelm Krieger (1848–1921) war ab 1869 Lehrer in Porschdorf bei Schandau und ab 1876 bis 1913 im sächsischen Königstein. Krieger verweilte in den Jahren 1887–1910 mehrmals im Erzgebirge. Viele seiner gefundenen Pilze gab er in seinem berühmten Exsikkatenwerk "Fungi saxonici exsiccati" heraus. Georg Heinrich Wagner (gest. 1903) war Lehrer in Schmilka in der Sächsischen Schweiz, später in Oberschmiedeberg im sächsischen Erzgebirge. Er sammelte 1898 und 1899 ebenso wie Krieger vorwiegend bei Boží Dar, im Zechengrund und am Klínovec sowie im Pressnitztal. Der deutsche Botaniker und Mykologe Paul Sydow (1851–1925), Vater des berühmten Mykologen Hans Sydow, gab mehrere Exsikkatenwerke heraus. Er fand 1905 im Zechengrund einige seltene Roste und Brände. Eine Aufsammlung von *Nyssopsora echinata* stammt von dem in Dresden lebenden Carl Schiller (1840–1907).

Der hervorragende tschechische Mykologe Prof. PhDr. František Bubák (1866–1925) war Professor der Phytopathologie an der Königl. tschechischen landwirtschaftlichen Akademie in Tábor, später an der Technischen Hochschule in Prag. Er hat vor 1898 einige Exkursionen ins Erzgebirge in die Umgebung von Moldava, Dubí, Boží Dar und Jáchymov unternommen und die Nachweise der Rostpilze in seiner Flora der böhmischen Rostpilze niedergelegt. In dieser Arbeit sind alle bis dahin bekannten Arten mit ihren Lokalitäten und Sammlern aufgeführt. Im Jahre 1906 erschien die tschechische Ausgabe, 1908 die deutsche. Im Jahre 1912 in tschechisch und 1916 in deutsch folgte seine Brandpilzflora Böhmens. Bubáks umfangreiches Herbar befindet sich leider in BPI (Beltsville, Maryland, USA). Nach Bubák schrieb niemand mehr eine neuere Rostpilz- oder Brandpilzflora Böhmens.

Der Altmeister der deutschen uredinologischen Forschung Oberstudienrat Dr. Paul Dietel (1860–1947) wies einige Roste im wenig erforschten Westteil des Gebietes nach (s. Baudyš 1924 u. Dietel 1936). Dietel war an verschiedenen höheren Schulen Sachsens, so in Leipzig, Reichenbach im Vogtland, Glauchau und zuletzt von 1907 bis zu seinem 1924 erfolgten Übertritt in den Ruhestand am Realgymnasium Zwickau tätig. Die Arbeit Dietels (1936) enthält auch einige Rostpilzangaben von Dr. W. Zimmermann vom Zechengrund und Boží Dar. RNDr. Jaromír Klika (1888–1957), Professor der Botanik an der Technischen Hochschule in Prag, später an der Karls-Universität, fand 1925 *Nyssopsora echinata* an *Meum athamanticum* bei Telnice. Er ist der Begründer der modernen tschechischen Phytozönologie. Dr. Ing. Ctibor Blattný, einer der hervorragendsten tschechischen Phytopathologen, veröffentlichte 1927 eine umfangreiche Monographie des Falschen Mehltaupilzes *Pseudoperonospora humuli,* der damals nach Böhmen eingeschleppt wurde. Auf der Verbreitungskarte ist auch ein Vorkommen bei Chomutov eingezeichnet. Die pilzfloristische Literatur nach dem 2. Weltkrieg enthält sehr wenig Angaben zu Rost-, Brand- und Falschen Mehltaupilzen aus den Krušné hory. 1949 entdeckte RNDr. Jaroslav Veselý, Direktor der Staatsanstalt für Denkmalspflege und Naturschutz, den seltenen Rostpilz *Puccinia imperatoriae* neu für die damalige Tschechoslowakei im Erzgebirge. Der Beleg wurde leider mit seinem gesamten wertvollen Rostpilzherbar von Insekten gänzlich vernichtet. Prof. RNDr. Zdeněk Urban DrSc. (1923–2000), Professor der Mykologie an der Karls-Universität in Prag, erwähnt in seinem Artikel von 1965 das Vorkommen von *Uromyces airae-flexuosae* bei Jáchymov und in der gemeinsamen Arbeit mit Frau RNDr. Jaroslava Marková 1985 den von J. Roth in Chomutov gefundenen Rostpilz *Puccinia schroeteri.* Doz. Dr. habil. Heinrich Dörfelt (Jena) entdeckte 1968 *Puccinia luzulae-maximae* auf dem Špičák bei Boží Dar.

Der zweitgenannte Autor dieser Arbeit sammelte während seines Urlaubs vom 3. bis 11. August 1976 im Erzgebirge. Im Jahre 1990 fand er zwei Arten in Litvínov und Umgebung und einige Aufsammlungen hat ihm der Student Jiří Koka (Litvínov) geschickt. Dr. Horst Jage aus Kemberg in Sachsen-Anhalt trug in den Jahren 1981–1987 einige bemerkenswerte Pilzparasiten im Torfmoor bei Boží Dar und in der Umgebung von Klášterec n. Ohří zusammen. Der erstgenannte Verfasser dieser Flora untersuchte das ganze genannte Gebiet in den Jahren 1983–2000. Die meisten Nachweise in unserer Flora stammen von ihm.

Zusammenstellung der Rost-, Brand- und Falschen Mehltaupilze des böhmischen Teiles des Erzgebirges

Peronosporales

Albugo amaranthi (Schwein.) O. Kuntze. VIII. An *Amaranthus retroflexus* L.: in Litvínov, ca. 350 m ü. M., 90 (M).

Albugo candida (Pers.: Fr.) O. Kuntze. V.-IX. An *Capsella bursa-pastoris* (L.) Med.: Boží Dar, ca. 1020 m, 98 (D). Loučná, 900 m, 98, 99 (D). Vejprty, 750 m, 98 (D). Černý Potok, 725 m, 98 (D). An *Cardamine pratensis* L.: Hochmoor bei Boží Dar: Bergwiesen am Špičák, 85 (Jage). An *Cardaminopsis arenosa* (L.) Hayek: Vejprty: Bahnhofsgelände, 725 m, 98 (D). An *C. halleri* (L.) Hayek: N Pernink: nasser Strassengraben, 900 m, 99 (D). An *Raphanus raphanistrum* L.: im Erzgebirge verbreitet, auch Oosporen, 1887 (Krieger, Fungi sax. exs. 925).

Bremia lactucae Regel s.l. VI.-IX. An *Lapsana communis* L.: Vejprty: Strassenrand, 730 m, 97 (D). An *Mycelis muralis* (L.) Dumort.: Krupka (Thümen 1875). An *Scorzoneroides autumnalis* (L.) Moench (*Leontodon autumnalis* L.): Boží Dar: im Ort, ca. 1020 m, 85 (Jage). České Hamry: 500 m SÖ Bahnhof, Strassenrand, 830 m, 99 (D). Kryštofovy Hamry: Strassenrand im Ort, 670 m, 99 (D). 200 m SÖ Grenzübergang Reitzenhain: Strassenrand, 790 m, 99 (D). An *Senecio vulgaris* L.: Loučná: Strassenrand, ca. 970 m, 98 (D).

Peronospora agrestis Gäum. IV., VI. An *Veronica chamaedrys* L.: 2, 5 km NW von Hora Sv. Šebestiána: Wiesenstreifen an Strasse nach Chomutov, 840 m, 99 (D). An *V. persica* Poir.: NW Chomutov: Krásná Lípa, 600 m, 2000 (D).

Peronospora alchemillae Otth. VII. An *Alchemilla xanthochlora* Rothm.: Klínovec: ca. 500 m S des Grenzüberganges, Wiese mit *Cirsium heterophyllum* und *Meum athamanticum,* 1100 m, 98 (D). Ohne Angabe der Wirtspflanze: Cínovec (Thümen 1875): die Angabe Thümens (1875) über das Vorkommen von *Peronospora alchemillae* bei Cínovec ist falsch, es ist *Ovularia aplospora* (Speg.) Magnus (Skalický 1983).

Peronospora alpicola Gäum. V.-VI., VIII. An *Ranunculus platanifolius* L. (*R. aconitifolius* s.l.): Ö von Boží Dar: Wiese beim Bach, ca. 1050 m, 76 (M). 500 m Ö Boží Dar: im Strassengraben nahe Grenzübergang, 1050 m, 98 (D). Im Zechengrunde, selten, 1900, 1902 (Krieger, Fungi sax. exs. 1740). SW Loučná: Tal der Polava, 870 m, 99 (D).

Peronospora alta Fuckel. V.-IX. An *Plantago major* L.: S Abertamy: Plešivec, Wegrand, 940 m, 99 (D). Loučná, 890 m, 98 (D). Ortsausgang Loučná: Strassenrand, 840 m, 99 (D). Nahe České Hamry, 800 m, 99 (D). Vejprty, 730 m, 97 (D). Klášterec nad Ohří, ca. 400 m, 85 (Jage). 500 m S Grenzübergang Reitzenhain: Wegrand im Fichtenwald, 790 m, 99 (D).

Peronospora arabidis-glabrae Gäum. V. An *Arabis glabra* (L.)Bernh.: Vejprty: Bahnhofsgelände und Felsen nahe Bahnhof, 730 m, 98 (D).

Peronospora arabidopsidis Gäum. IV. An *Arabidopsis thaliana* (L.) Heynh.: NW Chomutov: Domina, nahe Bahnhof, Wiesenhang, Eisenbahnbrücke, 600 m, 2000 (D).

Peronospora arvensis Gäum. IV. An *Veronica hederifolia* L.: NW Chomutov: Krásná Lípa, 600 m, 2000 (D).

Peronospora barbareae Gäum. VI. An *Barbarea vulgaris* R. Br.: ca. 800 m SSW Pohraniční: unweit Grenzübergang Reitzenhain, ruderal, 780 m, 98 (D).

Peronospora calotheca de Bary. An *Galium odoratum* (L.) Scop.: Osek (Thümen 1875).

Peronospora chrysosplenii Fuckel. IV.-V. An *Chrysosplenium alternifolium* L.: bei Loučná: Tal der Polava, 870 m, 99 (D). Zwischen Loučná und České Hamry: Tal der Polava, 840 m, 99 (D). Bei České Hamry, 800 m, 99 (D). Vejprty – Nové Zvolání: Auenwiese im Tal der Polava, 740 m, 99 (D). Vejprty: Auenwiese im Tal der Polava, 720 m, 99 (D). Ca. 600 m NÖ Vejprty: Tal der Polava, Auenwald und Wiese, 660–710 m, 99 (D). S Černý Potok: Bachaue der Černá voda, 720 m, 98 (D).

Peronospora conglomerata Fuckel. IV. An *Geranium pusillum* L.: NW Chomutov: Krásná Lípa, 600 m, 2000 (D).

Peronospora debaryi E. Salmon et Ware. VII.-VIII. An *Urtica urens* L.: auf der Horní Krupka (Komáří Hůrka), verbreitet, 1898, 1908, 1910 (Krieger, Fungi sax. exs. 2128).

Peronospora dentariae Rabenh. IV.-VIII. An *Cardamine amara* L.: ca. 1 km Ö Špičák bei Boží Dar, 1010 m, 87 (Jage). Zwischen Vejprty und Nové Zvolání: Pöhlbachaue, 740 m, 99 (D) und Tal der Polava, 720 m, 98 (D). Černý Potok: Auenwiese im Tal der Černá voda, 720 m, 98 (D). 1 km SÖ von Černý Potok, ca. 800 m, 98 (D). Zwischen Kryštofovy Hamry und Grenzübergang: am Quellbach, 640 m, 99 (D). 700 m Ö Pohraniční, 800 m, 98 (D). An *C. flexuosa* With.: 600 m NÖ Vejprty: Tal der Polava, Rand eines Wassergrabens im Auenwald, 660 m, 99 (D). An *C. pratensis* L.: Hochmoor bei Boží Dar, Bergwiesen am Špičák, ca. 1020 m, 85 (Jage).

Peronospora digitalidis Gäum. VI. An *Digitalis purpurea* L.: ca. 1,1 km N Kryštofovy Hamry: zwischen Wegrand und Fichtenwald, ca. 625 m, 99 (D).

Peronospora erodii Fuckel. Ohne Wirtspflanze (sicher *Erodium cicutarium* (L.) l'Hér.): Krupka (Thümen 1875).

Peronospora euphorbiae Fuckel (?)-kann *P. esulae* Gäum. sein. An *Tithymalus esula* (L.) Hill (*Euphorbia esula* L.): Krupka (Thümen 1875).

Peronospora ficariae de Bary. IV.-V. An *Ficaria bulbifera* (Marsden-Jones) Holub: nahe Loučná: Tal der Polava, 870 m, 99 (D). Bei České Hamry, 800 m, 99 (D). Vejprty – Nové Zvolání: Wiese im Ort, 760 m, 99 (D). Ortsausgang Vejprty: 300 m N Fischteiche im Tal der Polava, Auenwiese, 720 m, 98 (D). 600 m NÖ Vejprty: Tal der Polava, Auenwald und Wiese, 660–700 m, 99 (D).

Peronospora grisea (Unger) Unger. V.-VIII. An *Veronica beccabunga* L.: W Boží Dar: Strasse nach Abertamy, 85 (Jage). Boží Dar: quellige Stelle, 1020 m, 99 (D).

Bach S Loučná nahe Strasse in Richtung Háj, ca. 920 m, 98 (D). Vejprty: quellige Stelle nahe Bahnhofsgelände, 725 m, 98 (D). Černý Potok: Ufer der Černá voda, ca. 715 m, 98 (D). An *V. serpyllifolia* L.: NÖ Boží Dar: Wiese, 1060 m, 99 (D). N Hora Sv. Šebestiána: ca. 1 km SÖ Pohraniční, Trittfläche eines Weges, ca. 770 m, 98 (D).

Peronospora hesperidis Gäum. V.-VI. An *Hesperis matronalis* L.: Loučná: im Ort, Wegrand, 900 m, 98 (D). Zwischen Loučná und České Hamry, 870 m, 99 (D). České Hamry: nahe Bahnhof, Strassenböschung, 870 m, 99 (D).

Peronospora myosotidis de Bary. IV.,VIII.-IX. An *Myosotis arvensis* (L.) Hill: Černý Potok: Strassenrand im Ort, 725 m, 97 (D). NW Chomutov: NÖ Krásná Lípa, Wiese am Oberhang des Bezručovo údolí, 590 m, 2000 (D). An *M. nemorosa* Besser: Abertamy: Nordhang des Plešivec, Sumpfwiese zwischen Weg und Wald, 940 m, 99 (D). Boží Dar: Špičák, Südhang, ca. 1080 m, 81 (Jage).

Peronospora niessleana Berl. V. An *Alliaria petiolata* (Bieb.) Cavara et Grande: zwischen Vejprty und Nové Zvolání: Strassenrand, 740 m, 99 (D).

Peronospora obovata Bonorden. VIII. An *Spergula arvensis* L. subsp. *arvensis*: Feld zwischen Pernink und Abertamy, ca. 900 m, 76 (M). Rusová: Feld unter Lysá hora, ca. 850 m, 76 (M).

Peronospora parasitica (Pers.: Fr.) Fr. s. str. IV.-X. An *Capsella bursa-pastoris* (L.) Med.: ca. 2,2 km W Boží Dar: nahe Ufer der Černá, 1040 m, 98 (D). Loučná, 900 m, 98,99 (D). Bei Vejprty, 700 m, 96 (D). NW Chomutov: Krásná Lípa, 600 m, 2000 (D).

Peronospora phyteumatis Fuckel. VI.-VII. An *Phyteuma nigrum* F. W. Schmidt: etwa 500 m N Kryštofovy Hamry: frischer bis feuchter Wiesenstreifen am Wegrand, angrenzend Fichtenwald, ca. 650 m, einige *Phyteuma nigrum*-Pflanzen waren am gleichen Fundort von *Ramularia phyteumatis* Sacc. et Winter befallen, 99 (D). An *Ph. spicatum* L.: Nordosthang des Klínovec: wenig W Strassenkreuzung Boží Dar-Loučná, Wiese, 1000 m, 99 (D).

Peronospora ranunculi Gäum. IV.-V. An *Ranunculus repens* L.: Boží Dar: nahe Grenzübergang, Wiese, 1080 m, 99 (D). SW Loučná: Tal der Polava, 870 m, 99 (D). Zwischen Loučná und České Hamry, 99 (D). Vejprty, Ortsteil von Nové Zvolání: Strassenrand, 99 (D). Vejprty: Auenwiese im Tal der Polava, 720 m, 98 (D). N Vejprty: Wegrand in einem Mischwald, ca 700 m, 98 (D). Černý Potok, 720 m, 98 (D). 1 km SÖ Grenzübergang Reitzenhain: Strassenböschung, 810 m, 99 (D).

Peronospora rumicis Corda. V.-VI. An *Acetosa pratensis* Mill.: Zwischen Černý Potok und Kryštofovy Hamry: ca. 1 km SÖ des Černopotocký vrch, Wiesenstreifen am Strassenrand, 775 m, 98 (D). 1 km SÖ Grenzübergang Reitzenhain: Wiesenstreifen an Strasse nach Chomutov, 810 m, 99 (D).

Peronospora sanguisorbae Gäum. VII. An *Sanguisorba officinalis* L.: Abertamy: 600 m NÖ vom Gipfel des Plešivec, Wiese bei Švýcarská bouda, 950 m, 99 (D).

Peronospora thlaspeos-alpestris Gäum. IV.-V. An *Thlaspi caerulescens* J.et C. Presl: SW České Hamry, 800 m, 99 (D). Vejprty: nahe Bahnhof, Wiese am Strassenrand, 730 m, 99 (D). Zwischen Vejprty und Nové Zvolání: Strassenrand, 735 m, 98,99 (D). Černý Potok: Strassenrand, 720 m, 98 (D). NW Chomutov: Krásná Lípa, 590 m, 2000 (D).

Peronospora trivialis Gäum. V. An *Cerastium holosteoides* Fries: Loučná: ruderal, 870 m, 99 (D). Vejprty, 730 m, 98 (D). Zwischen Kryštofovy Hamry und Grenzübergang: Wiese, 640 m, 99 (D). Kryštofovy Hamry: 1,1 km W des Gipfels von Jelení hora, nasser Graben am Wegrand, 780 m, 98 (D).

Peronospora trifoliorum de Bary. VI.-VII. An *Trifolium medium* L.: Abertamy: Plešivec, W der Švýcarská bouda, Wiesenstreifen am Wegrand, 940 m, 99 (D). An *T. repens* L.: Loučná: Rasen im Ort, 870 m, 98 (D). S Grenzübergang Reitzenhain: Wegrand im Fichtenwald, 790 m, 99 (D).

Peronospora verbasci Gäum. An *Verbascum phlomoides* L.: Krupka, Sommer 1872 (Thümen, Fungi austr. 934). An *V. thapsus* L.: Krupka (Thümen 1875).

Peronospora violae Schröter. V. An *Viola arvensis* Murray: zwischen Loučná und České Hamry, ca. 810 m, 99 (D). Vejprty: Rand eines Grundstückes, 730 m, 99 (D). An *V. tricolor* L.: 300 m NÖ Boží Dar: Wiese, 1050 m, 99 (D). Loučná, 870 m, 99 (D).

Plasmopara angelicae (Casp.) A. Trotter. VIII. An *Angelica sylvestris* L.: Kryštofovy Hamry: ca. 300 m N der Staumauer der Talsperre Přísečnice, Sumpfwiese mit *Rumex aquaticus*, 700 m, 99 (D).

Plasmopara chaerophylli (Casp.) A. Trotter. VI. An *Anthriscus sylvestris* (L.) Hoffm.: 1 km SW České Hamry: Hochstaudenflur am Wegrand, 830 m, 99 (D).

Plasmopara densa (Rabenh.) Schröter. VII. An *Pedicularis sylvatica* L.: Cínovec (Thümen 1875). An *Rhinanthus minor* L.: Nordosthang des Klínovec: Wiesenrand, 950 m, 99 (D).

Plasmopara epilobii (Otth) Sacc. et Sydow. VIII.-IX. An *Epilobium palustre* L.: Boží Dar: Spičák, Nordosthang, am Weg durch das Hochmoor, 1020 m, 97 (D) und Südhang, "Spitzbergwiesen", ca. 1050 m, 85 (Jage).

Plasmopara mei-foeniculi Săvul. et O. Săvul. VII.-VIII. An *Meum athamanticum* Jacq.: N Pernink: Wiese, 900 m, 99 (D). Abertamy: Nordosthang des Plešivec, kleine Wiese am Wegrand, 950 m, 99 (D). Boží Dar: Hochmoor, ca. 1000 m, 85 (Jage), Špičák, ca. 1040 m, 85 (Jage) und Wiese an Strasse nahe Grenzübergang, ca. 1080 m, 98 (D). Suchá: Südhang des Klínovec, Wiese, 920 m, 99 (D). An *Meum* (sicher *athamanticum* Jacq.): Cínovec (Thümen 1875).

Plasmopara pimpinellae Săvul. et O. Săvul. var. *pimpinellae*. An *Pimpinella saxifraga* L.: Krupka (Thümen 1875).

Plasmopara pusilla (de Bary) Schröter. V.-X. An *Geranium palustre* L.: in Kryštofovy Hamry: Strassenrand, 660 m, 99 (D). An *G. sylvaticum* L.: N Pernink, 900 m, 99 (D). Abertamy: am Weg zum Lesík, 900 m, 99 (D) und Nordhang des Plešivec, Wiese, 920 m, 99 (D). Boží Dar: an Strasse zum Klínovec, 1120 m, 97 (D). Zechengrund (oberstes Pöhlbachtal), ca. 950 m, 83 (Dietrich 1986). Loučná: Hochstaudenflur eines Seitenbaches der Polava, 930 m, 98 (D). Háj: Hochstaudenflur an der Bílá voda, 970 m, 98 (D). Bei České Hamry, 800 m, 99 (D). N Vejprty, 700 m, 98 (D). Vejprty, 720 m, 97 (D). Černý Potok, 720 m, 96 (D): Wiese im Ort, 98 (D).

Plasmopara pygmaea (Unger) Schröter. IV.-V. An *Anemonoides nemorosa* (L.) Holub: Tal der Polava: SW Loučná, 870 m, 99 (D), zwischen Loučná und České Hamry, 840–800 m, 99 (D), Vejprty: N der Teiche, Auenwiese, auch Mischinfektion mit *Synchytrium anemones* (DC.) Woronin, 720 m, 98 (D).

Plasmopara umbelliferarum (Casp.) Schröter ex Wartenw. IV.-X. An *Aegopodium podagraria* L.: 1 km SW Loučná, 880 m, 98 (D). Zwischen Loučná und České Hamry, 840 m, 99 (D). České Hamry, 840 m, 99 (D). Vejprty, 680 m, 96 (D). N Vejprty: Mischwald, 700 m, 98 (D). Vejprty: nahe Polava, 720 m, 97 (D) u. Nové Zvolání, 760 m, 99 (D). SÖ Černý Potok, ca. 800 m, 98 (D). Měděnec, 840 m, 98 (D). Kryštofovy Hamry, 670 m, 99 (D). NW Chomutov: Domina, Wiese zwischen Bahnhof und Ort, 600 m, 2000 (D).

Pseudoperonospora humuli (Miyabe et Takah.) G. Wilson. An *Humulus lupulus* L.: bei Chomutov, Frühling 1926 (Blattný 1927: Landkarte auf S. 153).

Uredinales

Aecidium grossulariae DC. I ohne Wirtspflanze (sicher *Ribes uva-crispa* L.): Krupka (Thümen 1875).

Aecidium ranunculacearum DC. I im V.-VI. An *Ranunculus acris* L.: W Boží Dar: Tal der Černá an Strasse nach Myslivny, ca. 990 m, 98 (D). Zwischen Loučná und Háj: Strassenrand, 920 m, 98 (D). An *R. repens* L.: Boží Dar, 1020 m, 99 (D). Zwischen Loučná und České Hamry, 840 m, 99 (D). Bei České Hamry, unmittelbar daneben *Dactylis glomerata*, 800 m, 99 (D). Vejprty, 99 (D). Černý Potok, 720 m, 98 (D). Vermutlich gehören die Aecien an *R. acris* zu *Puccinia perplexans* und jene an *R. repens* in den Formenkreis (nach Gäumann 1959) von *Uromyces dactylidis*.

Chrysomyxa ramischiae Lagerh. An *Orthilia secunda* (L.) House: Červený Hrádek (Fuchs sec. Bubák 1906).

Coleosporium campanulae (Str.) Tul. et C. Tul. Im VIII. An *Phyteuma spicatum* L.: an der Strasse vom Fichtelberg nach Boží Dar, daselbst verbreitet, 1898, 1900 (Krieger, Fungi sax. exs. 1561, auch Dietel 1936).

Coleosporium euphrasiae Winter. II im VII. An *Orthantha lutea* (L.) Wettst.: Červený Hrádek (Sachs sec. Thümen 1875 und Bubák 1906). An *Rhinanthus minor* L.: Nordosthang des Klínovec: Wiesenrand, 950 m, 99 (D).

Coleosporium petasitis Cooke. II im IX. An *Petasites albus* (L.) Gaertn.: Zechengrund (Zimmermann sec. Dietel 1936). An *P. hybridus* (L.) Gaertn., Meyer et Scherb.: Vejprty: Tal der Polava, ca. 720 m, 97 (D).

Coleosporium senecionis (Pers.) Kickx f. II, III im VII.-IX. An *Senecio hercynicus* Herborg: Boží Dar: Osthang des Špičák, Rand eines Fichtenwaldes, 1040 m, 97 (D). 800 m SW Boží Dar: Fichtenwald, 1020 m, 99 (D). An *S. ovatus* (Gaertn., Meyer et Scherb.) Willd.: N Pernink: Waldrand, 900 m, 99 (D). Ö Háj: SW Ohnivý vrch, Rand eines Fichtenwaldes, 940 m, 99 (D). Vejprty, ca. 750 m, 97 (D). Kovářská: Malý Špičák, Nordosthang, Fichtenwald, 850 m, 98 (D). An *S. vulgaris* L.: in Vejprty: Strassenrand, ca. 730 m, 97 (D). Funde von *C. senecionis* an *Senecio vulgaris* vom gesamten Erzgebirge sind selten.

Coleosporium tussilaginis (Pers.) Berk. s.str. II im IX. An *Tussilago farfara* L.: in Vejprty: Strassenrand, ca. 730 m, 97 (D).

Frommeëlla tormentillae (Fuckel) Cummins et Y. Hirats. II im VIII. An *Potentilla erecta* (L.) Räuschel: Zwischen Černý Potok und Kovářská: 2 km NW Velký Špičák, Wegrand, Mischinfektion mit *Ramularia grevilleana* (Tul. et C. Tul.) Jørst., 730 m, 98 (D).

Melampsora capraearum Thüm. II im VII.-IX. An *Salix caprea* L.: Jáchymov, 710 m, 99 (D). Vejprty, ca. 800 m, 97 (D). Kovářská: N des Malý Špičák, 860 m, 98 (D). Měděnec: Südhang des Berges Měděnec, ca. 860 m, 98 (D).

Melampsora epitea Thüm. II im VIII.-IX. An *Salix aurita* L.: Boží Dar: Osthang des Špičák, Wegrand im Fichtenwald, 1020 m, 97 (D). Urediosporenwand 1,2–1,5 µm, Warzen dicht, Abstand meist 1–1,5 µm, Paraphysenwand im Kopfbereich 1,5 µm. N Pernink: Rand eines Fichtenwaldes, ca. 900 m, 99 (D). An *Salix cinerea* L.: 700 m SW Boží Dar: Randgebiet des Hochmoores Reisszeche, 1020 m, 99 (D). Der Urediendurchmesser beträgt ca. 0,2–0,3 mm. Die Urediosporen messen 17,5–19 × 12,5–17,5 µm, die dicht stehenden Stacheln stehen im Abstand von ca. 1,5 µm. Die Paraphysen sind kopfig bis keulig. Die Wand ist im oberen Bereich 2,5–4 µm breit. Die Merkmale der Uredien (kleine Uredien, dicht stehende Warzen und besonders die keuligen Paraphysen) weisen auf *Melampsora abieti-caprearum* Tubeuf hin, aber ob *Abies alba* heute noch im Gebiet vorkommt, ist nicht bekannt. Sicher kann man diese Art von den anderen an *Salix aurita* und *S. cinerea* nur mittels der Telien und des Zwischenwirtes identifizieren.

Melampsora euphorbiae (Schub.) Castagne s.str. An *Tithymalus cyparissias* (L.) Scop.: Krupka (Thümen), an *T. esula* (L.) Hill: Krupka (Thümen sec. Bubák 1906).

Melampsora hypericorum Winter. An *Hypericum maculatum* Crantz: Červený Hrádek (Roth sec. Bubák 1906). Cínovec (Thümen 1875). An *H. perforatum* L.: Potůčky (Dietel sec. Baudyš 1924).

Melampsora larici-populina Kleb. II im IX. An *Populus* × *canadensis* Moench cult.: Vejprty: Strassenrand, ca. 800 m, 97 (D). An *Populus* sp. cult.: Černý Potok, 710 m, 97 (D).

Melampsora lini (Ehrenb.) Desm. II, III im VI.-VIII. An *Linum catharticum* L.: Kovářská: 1,8 km NW des Velký Špičák, Wegrand, ca. 800 m, 98 (D). Ca. 2 km SW Kovářská, 870 m, 99 (D).

Melampsora populnea (Pers.) P. Karsten. II, III im VIII. An *Populus tremula* L.: Hochmoor bei Boží Dar, 990 m, 98 (D). 600 m SW České Hamry: Waldrand, 860 m, 99 (D). Zwischen Kryštofovy Hamry und Talsperre, 700 m, 99 (D).

Melampsora vernalis Niessl ex Winter. An *Saxifraga granulata* L.: Červený Hrádek (Roth sec. Bubák 1906).

Melampsoridium betulinum (Fr.) Kleb. II, III im VIII.-X. An *Betula carpatica* W. et K.: Boží Dar: Hochmoor Reisszeche, ca 1,8 km NÖ vom Špičák, ca. 1000 m, 97 (D). An *B. nana* L.: 700 m SW Boží Dar: Hochmoor Reisszeche, 1020 m, 99 (D). An *B. pendula* Roth: Vejprty, ca. 740 m, 97 (D). Vejprty: Přísečnická hora, Randstreifen eines Fichtenwaldes, ca. 820 m, 97 (D). An *B. pubescens* Ehrh.: Cínovec (Thümen 1875).

Nyssopsora echinata (Lév.) Arthur. III im V.-VIII. An *Meum athamanticum* Jacq.: Malé jeřábí jezero bei Johanngeorgenstadt (Dietel 1936). Westhang oberhalb der Häuser in Pernink, ca. 880 m, 76 (M). Beim Weg zwischen Pernink und Abertamy an 3 Stellen, ca. 900 m, 76 (M). Wiesen bei Rybná, ca. 860 m, 76 (M). Bludná: Wiese, 1020 m, 99 (D). Ö Abertamy: Südhang über der Strasse, ca. 860 m, 76 (M). Boží Dar (Schiller sec. Dietel 1936): Špičák, 1030 m, 83 (Dietrich 1990). Hochmoor bei Boží Dar, ca. 1000 m, 81 (Jage). W Boží Dar: trockenere Wiese längs des Baches auf dem Torfgrund Božídarské rašeliniště, ca. 990 m, 76 (M), auf der Waldwiese über dem Seidls Teich, ca. 1000 m, 76 (M) und über den Moorwiesen Ö von Špičák, ca. 1040 m, 76 (M). Oberhalb Jáchymov: beim Skilift, ca. 750 m, 76 (M). 400 m Ö Boží Dar: nahe Grenzübergang, Wiese, 1070 m, 98 (D). Boží Dar: Bergwiese auf dem Neklid, ca. 1100 m, 76 (M). SW Klínovec: beim Parkplatz im Tal des Klínovecký potok, ca. 750 m, 76 (M). Von Klínovec nach Boží Dar: Rain rechts von der Strasse, ca. 1150 m, 76 (M). Suchá: Südhang des Klínovec, 920 m, 99 (D). 1 km W Loučná, ca. 900 m, 98 (D). Háj: Osthang beim Bach Bílá voda, ca. 900 m, 76 (M). Ca. 600 m NÖ Bahnhof Vejprty: Mähwiese, 710 m, 98 (D). Kryštofovy Hamry: Wiese im Ort, 670 m, 99 (D) und Přísečnice-Tal (Wagner sec. Dietel 1936). Rusová: Abhang bei der Eisenbahnstrecke N der Eisenbahnstation, ca. 820 m, 76 (M). 4 km NW Hora Sv. Šebestiána: Wiesen bei Jilmová, 810 m, 99 (D). Moldava, Oldřiš, Nové Město, Kalkofen (Bubák), Cínovec (Thümen, Wagner sec. Bubák 1906). Telnice: "Wiesenleite", 1925 (Klika 1925). Ohne Wirtspflanze (sicher *Meum athamanticum* Jacq.): Cínovec (Thümen 1875). Bem.: Dieser Rost kommt überall vor, wo die Wirtspflanze *Meum athamanticum* häufig ist.

Phragmidium mucronatum (Pers.) Schlecht. II, III im VIII. An *Rosa canina* L. (*R. corymbifera* Borkh.): Jáchymov: Garten im Ort, 720 m, 99 (D).

Puccinia acetosae Körn. II, III im VI.-IX. An *Acetosa pratensis* Mill. im Erzgebirge häufig, z. B.: Abertamy: Nordosthang des Plešivec, Wegrand, 950 m, 99 (D). Boží Dar: Südhang des Špičák, ca. 1040 m, 85 (Jage). Jáchymov, 720 m, 99 (D). Suchá: Wiese, 900 m, 99 (D). Zechengrund (Wagner sec. Bubák 1906). Tal der Polava am Fusse des Klínovec: Hochstaudenflur, ca. 900 m, 98 (D). Zwischen Loučná und České Hamry, 870 m, 99 (D). Ca. 1 km S Černý Potok: Tal der Černá voda, Wiese, 720 m, 98 (D). Měděnec: Wiese, ca. 870 m, 98 (D). 1 km SW Grenzübergang bei Reitzenhain: Strassenböschung, 810 m, 99 (D). An *A. alpestris* (Jacq.) Á. Löve: Boží Dar: NÖ Špičák, Hochstaudenflur am Ufer der Černá, 975 m, 98 (D). Ca. 300 m SW Boží Dar, 990 m, 98 (D). Zechengrund (Zimmermann sec. Dietel 1936). Tal der Polava am Fusse des Klínovec: Hochstaudenflur, 910 m, 98 (D). Teliosporen wurden selten beobachtet.

Puccinia aegopodii Röhl. III im V.-VII. An *Aegopodium podagraria* L.: bei Jáchymov (Bubák 1906). 1 km W Loučná, 890 m, 98 (D). Klínovec: Nordosthang, 970 m, 98 (D). Ca. 250 m W Loučná: Tal der Polava, 880 m, 98 (D). Bei Vejprty, ca. 750 m, 98 (D). Zwischen Černý Potok und Kryštofovy Hamry, 800 m, 98 (D). Kryštofovy Hamry, 670 m, 99 (D). Hora Sv. Šebestiána: Wiesen bei Jilmová, 810 m, 99 (D). Pohraniční, 770 m, 98 (D).

Puccinia angelicae-mamillata Kleb. II, III im VI. An *Bistorta major* F. S. Gray: Kryštofovy Hamry: Feuchtwiese im Ort, ca. 670 m, 99 (D). Červený Hrádek (Roth sec. Bubák 1906).

Puccinia arenariae (Schumacher) Winter. III im VI.-IX. An *Dianthus barbatus* L.: Červený Hrádek (Roth sec. Bubák 1906). An *Moehringia trinervia* (L.) Clairv.: Černý Potok: Fichtenwald, 750 m, 97 (D). Kryštofovy Hamry: Südwesthang der Jelení hora, 780 m, 99 (D). An *Stellaria nemorum* L.: Klínovec: Nordosthang, ca 1030 m, 98 (D). 700 m W Loučná: nahe Bachufer, 98 (D). Ca. 500 m SW von Černý Potok: Ufer eines Seitenbaches der Černá voda, 720 m, 97 (D).

Puccinia arenariicola Plowr. s. l. II im VI.-VIII. An *Vignea ovalis* (Good.) Dost. (*Carex leporina* L.): Kryštofovy Hamry: Südwesthang der Jelení hora, grasiger Weg im Fichtenwald, 780 m, 99 (D). Im montanen Bereich des Erzgebirges kommt als Zwischenwirt *Jacea phrygia* (L.) Soják subsp. *elatior* (Gaud.) Dost. (*Centaurea pseudophrygia* auct.) infrage.

Puccinia argentata (Schultz) Winter. An *Impatiens noli-tangere* L.: Červený Hrádek (Roth sec. Bubák 1906).

Puccinia asarina Kunze. III an *Asarum europaeum* L.: Červený Hrádek (Roth sec. Bubák 1906).

Puccinia bistortae DC. I im V. An *Angelica sylvestris* L.: zwischen Černý Potok und Kryštofovy Hamry: Strassenböschung, unmittelbar daneben *Bistorta major* mit ersten Uredien, ca. 780 m, 98 (D). An *Meum athamanticum* Jacq.: 2 km NW vom Gipfel des Klínovec: Nové Domky, Mähwiese, starker Befall, 900 m, 99 (D). II,III im V.-X. An *Bistorta major* F. S. Gray: Potůčky: gegenüber der Dreckschänke, ca. 710 m, 30 (Dietel 1931). Zwischen Pernink und Abertamy: am Weg, ca. 900 m, 76 (M). Bludná: Mähwiese mit *Meum atham-*

anticum, 1020 m, 99 (D). Abertamy: Wiese auf dem Nordhang des Plešivec, ca 900 m, 76 (M). Dortselbst, *Angelica sylvestris* unmittelbar neben den befallenen *Bistorta*-Pflanzen, 920 m, 99 (D). Zwischen Boží Dar und Špičák: Moorwiesen, ca. 1000 m, 97 (D). Oberhalb Jáchymov: beim Skilift, ca. 750 m, 76 (M). Nové Domky: Mähwiese, 900 m, an Stelle der Aecien an *Meum athamanticum,* 99 (D). Ca. 1 km SW von Loučná: Tal der Polava, Hochstaudenflur, ca. 880 m, 98 (D). Loučná: Bachtal an Strasse nach Háj, 920 m, 98 (D). Ö Háj: Sumpfwiese im Quellgebiet der Černá voda, 910 m, 99 (D). Zwischen Vejprty und Nové Zvolání: Wiese an Strasse, 760 m, 97 (D). Vejprty: Sumpfwiese W Přísečnická hora, 760 m, 97 (D). Černý Potok: Wiese, 720 m, 96 (D).

Von einer Zuordnung der bei Gäumann (1959) aufgeführten Kleinarten *Puccinia cari-bistortae* Kleb. und *P. pimpinellae-bistortae* Semad. wurde abgesehen. Im Gebiet ist Wirtswechsel mit *Angelica sylvestris* und *Meum athamanticum* nachgewiesen. Bei dem bei Nové Domky am Klínovec gesammelten Material konnte ein Wirtswechsel mit *Meum athamanticum* nachgewiesen werden. Die zugehörigen Teliosporen an *Bistorta major* weisen jedoch die typischen Merkmale von *P. cari-bistortae* auf. Während an anderen Standorten, wo ebenfalls Wirtswechsel mit *Meum athamanticum* infrage kommt, auch Funde mit überwiegend glatten Teliosporen auftraten.

Puccinia bromina Eriksson subsp. *symphyti-bromorum* (F. Müller) Urban et Marková. I an *Pulmonaria officinalis* L. s. l.: Červený Hrádek (Roth sec. Bubák 1906).

Puccinia calthae Link. I, II, III im V.-IX. An *Caltha palustris* L.: Boží Dar (Zimmermann sec. Dietel 1936, Wagner sec. Bubák 1906): Nordosthang des Špičák, kleine Sumpfwiese im Fichtenwald, 1000 m, 97 (D). Horní Žďár bei Jáchymov (Bubák 1906). Zechengrund (Zimmermann sec. Dietel 1936, Sydow sec. Bubák 1906): selten, 1887 (Krieger, Fungi sax.exs. 311). Am Fuss des Klínovec (Krieger sec. Bubák 1906). Loučná (Wagner sec. Bubák 1906): ca. 300 m SW Loučná, Bachufer, 930 m, 98 (D). Háj: Sumpfwiese längs des Baches Bílá voda, ca. 950 m, 76 (M). NW Černý Potok: Wiese, 98 (D). Im Erzgebirge häufig: Oldřiš, Nové Město, Kalkofen (Bubák 1906). Anmerkung: Bubák führt diese Ortsnamen ungenau an; höchstwahrscheinlich handelt es sich um Orte östlich und südöstlich von Moldava. Ein Kalkofen stand im Bachtal unweit der Staatsgrenze östlich der Eisenbahnstation Moldava.

Puccinia calthicola Schröter. II, III im IX. An *Caltha palustris* L.: Boží Dar: Nordosthang des Špičák, Feuchtwiese mit *Sedum villosum* und *Pedicularis palustris,* 1030 m, 97 (D). Der einzige den Verfassern bekannte aktuelle Fundort von *P. calthicola* im Erzgebirge.

Puccinia centaureae DC. II, III im VIII.-IX. An *Jacea phrygia* (L.) Soják: Háj: Osthang beim Bach Bílá voda, ca. 900 m, 76 (M). An *Jacea pratensis* Lam.: in Litvínov: Wiese, ca. 350 m, 90 (Koka, det. M).

Puccinia conglomerata (Str.) Röhl. III im VII. An *Homogyne alpina* Cass.: am Klínovec (Wagner sec. Bubák 1906): selten, 28.VII.1887 (Krieger, Fungi sax. exs. 308).

Puccinia coronata Corda. II, III im VI.-X. An *Calamagrostis villosa* (Chaix) J. F. Gmel. Ö Vejprty: Fichtenwald mit *Homogyne alpina,* 760 m, 96 (D). Černý Potok: Fichtenwald, 750 m, 97 (D) und Černopotocký vrch, Fichtenwald, 750 m, 96 (D). An *Elytrigia repens* (L.) Desv.: Červený Hrádek (Sachs sec. Bubák 1906). An *Holcus mollis* L.: Cínovec, 1872 Thümen: Herb. mycol. oeconom. (Baudyš 1916). An *Poa pratensis* L.: Osek (Thümen 1875).

Puccinia deschampsiae Arthur. II im VII.-X. An *Deschampsia cespitosa* (L.) Beauv.: Abertamy: Nordhang des Plešivec, Fichtenwald, 980 m, 99 (D). Boží Dar: Nordhang des Špičák, "Wunderblumenwiese", 1060 m, 97 (D). Kryštofovy Hamry: Südwesthang der Jelení hora, 800 m, 99 (D).

Puccinia epilobii DC. III im VI. An *Epilobium adnatum* Griseb.: NW Hora Sv. Šebestiána: 300 m NNW Jilmová, Feuchtwiese, 820 m, 99 (D).

Puccinia epilobii DC. subsp. *palustris* Urban. III im VII.-IX. An *Epilobium palustre* L.: Boží Dar: Nordosthang des Špičák, Sumpfwiese mit *Sedum villosum* und *Pedicularis palustris,* 1030 m, 97,98 (D), Hochmoor bei Boží Dar, 81,85 (Jage) und Moorwiese N von der Strasse nach Horní Blatná, ca. 1000 m, 76 (M). Ö Háj: Sumpfwiese im Quellgebiet der Černá voda, 910 m, 99 (D). České Hamry: Moorwiese Mrtvá slatina, ca. 870 m, 76 (M).

Puccinia festucae Plowr. II, III im VI., VIII. An *Festuca nigrescens* Lam.: zwischen České Hamry und Kovářská: Mrtvá slatina, hochhalmige Mähwiese, 880 m, 99 (D). Kovářská: zwischen Weg und Fichtenwald am Nordwesthang des Malý Špičák, 880 m, 98 (D).

Puccinia galii-verni Ces. III im VIII. An *Galium saxatile* L.: Boží Dar (Wagner), Klínovec (Krieger sec. Bubák 1906). An *G. uliginosum* L.: zwischen Černý Potok und Kovářská: Tal der Černá voda, nahe Brücke und dem Weg zu den drei Spitzbergen, nasser Strassengraben, 740 m, 98 (D).

Puccinia graminis Pers. subsp. *graminicola* Urban. II, III im VIII. An *Agrostis stolonifera* L.: Červený Hrádek (Roth sec. Bubák 1906). An *Deschampsia cespitosa* (L.) Beauv.: Boží Dar: Südhang des Špičák, 85 (Jage). Kryštofovy Hamry: Südwesthang der Jelení hora, 800 m, 99 (D).

Puccinia holcina Eriksson. II, III im VII.-VIII. An *Holcus mollis* L.: ca. 500 m Ö Háj: am Weg zwischen Hájský kopec und Podlesí, 940 m, nur Telien, 99 (D). Zwischen České Hamry und Kovářská: Mähwiese Mrtvá slatina, 860 m, nur Uredien, 99 (D).

Puccinia imperatoriae Jacky. III im VII. An *Imperatoria ostruthium* L.: zwischen Abertamy und Pernink, ca. 1000 m, Ende VII. 1949 (Veselý 1951).

Puccinia lagenophorae Cooke. I, III im VIII.-IX. An *Senecio vulgaris* L.: Jáchymov, 720 m, 99 (D). In Loučná: Strassenrand, 890 m, 98,99 (D). In České

Hamry: Strassenrand, 795 m, 99 (D). Zwischen Černý Potok und Kovářská: Strassenrand, 730 m, 97 (D).

Puccinia lapsanae (C. Schultz) Fuckel. II, III im VI.-IX. An *Lapsana communis* L.: České Hamry: Strassenrand nahe Bahnhof, 850 m, 99 (D). In Černý Potok, 740 m, 97 (D). In Kryštofovy Hamry: Strassenrand, 670 m, 99 (D).

Puccinia laschii Lagerh. var. *laschii* Savile. II, III im VIII.-IX. An *Cirsium heterophyllum* (L.) Hill: zwischen Pernink und Abertamy: Piceetum-Rand bei der Strasse, ca. 880 m, 76 (M). Zechengrund (Zimmermann sec. Dietel 1936). Auf dem Klínovec und bei Cínovec (Krieger, Wagner sec. Bubák 1906). České Hamry: Moorwiese Mrtvá slatina, ca. 870 m, 76 (M). An *C. oleraceum* (L.) Scop.: bei Loučná: Hochstaudenflur, ca. 930 m, 98 (D). Zwischen Loučná und České Hamry: Polavatal, ca. 830 m, 76 (M). Háj: Sumpfwiese längs des Bachs Bílá voda, ca 900 m, 76 (M). Vejprty: Hochstaudenflur, ca. 730 m, 97 (D). In Černý Potok: Wiese, 715 m, 98 (D). Klášterec n. Ohří: Šumburk bei Černýš, 85 (Jage). Bem.: Es ist interessant, dass *Cirsium oleraceum* nur in niedrigeren Lagen wächst (bis zu ca. 960 m), höher wird es durch *C. heterophyllum* ersetzt.

Puccinia laschii var. *palustris* Savile. An *Cirsium palustre* (L.) Scop.: zwischen Černý Potok und Kovářská: ca. 1,8 km NW Velký Špičák, ca 750 m, 98 (D).

Puccinia leontodontis Jacky. II, III im VIII.-IX. An *Leontodon hispidus* L. subsp. *hispidus*: in Litvínov: Wiese, ca. 350 m, 90 (Koka, det. M). An *Scorzoneroides autumnalis* (L.) Moench: Jáchymov, 720 m, 99 (D). České Hamry: Strasse nach Kovářská, 840 m, 99 (D). 200 m SÖ Grenzübergang Reitzenhain: Strassenrand, 790 m, 99 (D).

Puccinia luzulae-maximae Dietel. II, III im VII.-IX. An *Luzula sylvatica* (Huds.) Gaud.: Boží Dar: Špičák, naturnaher Fichtenwald am Osthang, ca. 1050 m, 68,71 (Dörfelt 1974), dortselbst 85,97 (D et Jage). Klínovec: Piceetum am Südhang, ca. 1230 m, 76 (M). Dortselbst 97,99 (D).

Puccinia maculosa (Str.) Röhl. s. str. II, III im VIII. An *Prenanthes purpurea* L.: im Vorgebirge der Krušné hory bis 1200–1300 m (Bubák 1906). Jáchymov: Wald Jáchymovský les im Tal des Klínovecký-Bachs, ca. 720 m, 76 (M). Litvínov: am Waldweg im Tal des Bachs Bílý potok, ca. 520 m, 90 (M).

Puccinia major (Dietel) Dietel s. str. II, III im VIII. An *Crepis paludosa* (L.) Moench: Boží Dar: Hochmoor, Bergwiesen am Špičák, ca. 1030 m, 85 (Jage). Zechengrund (Zimmermann sec. Dietel 1936). N Klínovec: nasser Waldort im Bachtal oberhalb Nové Domky, ca. 950 m, 76 (M).

Puccinia malvacearum Bertol. ex Mont. III im IV., VIII. An *Malva moschata* L.: in Černý Potok: Wiese, 720 m, 98 (D). An *M. neglecta* Wallr.: NW Chomutov: Krásná Lípa, 600 m, 2000 (D).

Puccinia menthae Pers. I im VI. An *Mentha arvensis* L.: Krupka (Thümen 1875). An *M. longifolia* (L.) L.: Klínovec: Bachtal am Nordhang bei Loučná, Feuchtwiese am Bachrand nahe Strasse nach Háj, 900 m, 98 (D).

Puccinia mulgedii Sydow et H. Sydow. II, III im VI.-VIII. An *Cicerbita alpina* (L.) Wallr.: bei Boží Dar (Bubák 1906). Zechengrund (Zimmermann sec. Dietel 1936, Sydow sec. Bubák 1906): ca. 980 m, 83 (Dietrich 1986). Klínovec (Wagner sec. Bubák 1906): am Bach auf dem Südwesthang nächst der unteren Station der Seilbahn, ca. 800 m, 76 (M), ca. 600 m Ö Strassenkreuzung Berggipfel - Háj, Hochstaudenflur am Bachrand im Fichtenwald, 1120 m, 97 (D), am Waldbach oberhalb Nové Domky am Nordhang, ca. 920 m, 76 (M).

Puccinia opizii Bubák. An *Vignea muricata* (L.) Reichenb.: Cínovec (Thümen 1875).

Puccinia paludosa Plowr. I. An *Pedicularis* sp.: Cínovec (Thümen 1875). An *Pedicularis sylvatica* L.: dortselbst (Thümen sec. Bubák 1906). II, III im VIII.-IX. An *Carex nigra* (L.) Reichard: Boží Dar: Nordosthang des Špičák, kleine Feuchtwiese im Fichtenwald mit *Trifolium spadiceum* und *Caltha palustris,* 1000 m, 97 (D). Zwischen Boží Dar und Špičák: Feuchtwiesen, ca. 1000 m, 93,97 (D). 700 m SW Boží Dar: Hochmoor Reisszeche, 1020 m, 99 (D). Urediosporen mit 3-4 Keimporen, Wand bis 3,8 μm dick. Im Gebiet kommt der Zwischenwirt *Pedicularis palustris* aktuell vor.

Puccinia perplexans Plowr. II, III im VIII. An *Alopecurus pratensis* L.: zwischen České Hamry und Kovářská: Mähwiese Mrtvá slatina, 860 m, 99 (D).

Puccinia persistens Plowr. subsp. *persistens.* I. An *Actaea spicata* L.: Červený Hrádek, 1849 (Roth sec. Bubák 1906). Osek (Thümen 1875). An *Aquilegia vulgaris* L.: Červený Hrádek (Roth sec. Bubák 1906).

Puccinia pimpinellae (Str.) Röhl. An *Pimpinella saxifraga* L.: Červený Hrádek (Roth sec. Bubák 1906).

Puccinia poae-nemoralis Otth. II im VI.-VIII. An *Poa annua* L.: Jáchymov, 725 m, 99 (D). An *Poa nemoralis* L.: Kryštofovy Hamry: 3 km W Gipfel der Jelení hora, Strassenrand, 740 m, 99 (D). Teliosporen wurden im Erzgebirge noch nicht nachgewiesen.

Puccinia poarum Niels. I im VI.-IX. An *Tussilago farfara* L.: zwischen Pernink und Abertamy: am Weg, ca. 900 m, 76 (M). Jáchymov, 720 m, 99 (D). SSÖ Loučná, ca. 930 m, 98 (D). In Vejprty, ca. 730 m, 97 (D). Černý Potok: an Strasse nach Kovářská, 720 m, 97 (D). Kryštofovy Hamry, 680 m, 99 (D) und Nordwesthang der Jelení hora, Strassenrand, 760 m, 99 (D). Uredien und Telien wurden im Gebiet noch nicht sicher nachgewiesen.

Puccinia praecox Bubák. I, II im IV., IX. An *Crepis biennis* L.: NW Chomutov: Domina, Weide zwischen Bahnhof und Ort, 600 m und NÖ Krásná Lípa, Wiese am Oberhang des Bezručovo údolí, 590 m, 2000 (D). In Litvínov: Wiese, ca. 350 m, 90 (Koka, det. M).

Puccinia pulverulenta Grev. I, III. An *Epilobium montanum* L.: Červený Hrádek (Roth sec. Bubák 1906). Krupka (Thümen 1875 ut *Puccinia epilobii*). Horní Krupka (Komáří Hůrka) bei Teplice (Thümen sec. Bubák 1906).

Puccinia punctiformis (Str.) Röhl. 0, II, III im IV.-VIII. An *Cirsium arvense* (L.) Scop.: Jáchymov, 710 m, 99 (D). In Vejprty: ruderal, 720 m, 99 (D). In Černý Potok: ruderal, 715 m, 98 (D).

Puccinia pygmaea Eriksson s. str. II, III im VIII.-IX. An *Calamagrostis epigejos* (L.) Roth: Zechengrund (Zimmermann sec. Dietel 1936). Kryštofovy Hamry: Nordwesthang der Jelení hora, 770 m, 99 (D). An *C. villosa* (Chaix) J. F. Gmel.: N Pernink: Fichtenwald, ca. 900 m, 99 (D). Boží Dar: Nordosthang des Špičák, Fichtenwald, 1000 m, 97 (D). Zwischen Loučná und České Hamry: Fichtenforst, 900 m, 99 (D). Vejprty: Přísečnická hora, Fichtenwald, 800 m, 97 (D). Bei Kovářská (Wagner sec. Bubák 1906): Nordosthang des Malý Špičák, Fichtenwald, 880 m, 98 (D). Bei Přísečnice (Wagner sec. Bubák 1906): Přísečnice-Tal (Wagner sec. Dietel 1936).

Puccinia retifera Lindr. An *Chaerophyllum aureum* L.: Zechengrund (Zimmermann sec. Dietel 1936).

Puccinia schroeteri Pass. III im V. An *Narcissus poeticus* L. kult.: Chomutov, Kostnická 76: im Garten, 27.V.1978 (J. Roth sec. Urban et Marková 1985).

Puccinia silvatica Schröter. I im V.-VI. An *Senecio hercynicus* Herborg: zwischen Loučná und České Hamry, 870 m, 99 (D). An *S. ovatus* (Gaertn., Meyer et Scherb.) Willd.: N Vejprty: Mischwald, 700 m, 98 (D). NÖ Grenzübergang Reitzenhain: nahe Pohraniční, 750 m, 98 (D). SW Grenzübergang Reitzenhain, 800 m, 99 (D). An *Taraxacum officinale* Wiggers: SW České Hamry: Nasswiese im Tal der Bílá voda, 810 m, 99 (D). Kryštofovy Hamry, 660–680 m, 99 (D). Nahe Pohraniční, zusammen mit den Aecien an *Senecio ovatus,* 98 (D). II, III im VI.-IX. An *Vignea brizoides* (L.) Reichenb.: SW České Hamry: Nasswiese im Tal der Bílá voda, 810 m, 99 (D). Černý Potok: Westhang des Černopotocký vrch, Fichtenwald, 750 m, 97 (D). Kryštofovy Hamry: Südwesthang der Jelení hora, 880 m, 99 (D).

Puccinia taraxaci (Rebent.) Plowr. II, III im VIII.-IX. An *Taraxacum officinale* Wiggers: in Jáchymov, 720 m, 99 (D). In Vejprty: Strassenrand, 740 m, 97 (D).

Puccinia thlaspeos Schub. III im V. An *Arabis hirsuta* (L.) Scop.: Osek (Thümen 1875). An *Thlaspi caerulescens* J. et C. Presl: Potůčky (Dietel sec. Baudyš 1924). Zechengrund (Zimmermann sec. Dietel 1936). Klínovec (Wagner sec. Bubák 1906). Černý Potok: Wiesenstreifen an Strasse nach Kryštofovy Hamry, starker Befall, 720 m, 98 (D). Osek (Thümen sec. Bubák 1906).

Puccinia urticata Kern. I im V.-VI. An *Urtica dioica* L.: W Boží Dar, ca. 970 m, 98 (D). Boží Dar: nahe Grenzübergang, Wiesenrand, 1060 m, 99 (D). SW Černý Potok: Bachtal, 750 m, 98 (D). NW Hora Sv. Šebestiána: bei Jilmová, 820 m, 99 (D). Grenzübergang Reitzenhain: NÖ Pohraniční, 790 m, 98 (D).

Puccinia urticata var. *urticae-acutae* (Kleb.) Zwetko. I im V. An *Urtica dioica* L.: Černý Potok: Auenwiese im Tal der Černá voda, 720 m, 98 (D). II, III im VIII.-X. An *Carex gracilis* Curtis: Loučná: Bachtal nahe Strasse nach Háj, ca. 900 m, 98 (D). Černý Potok: Auenwiese im Tal der Černá voda, 720 m, 96 (D).

Puccinia virgae-aureae (DC.) Lib. III im IX. An *Solidago virgaurea* L.: Jindřišská bei Jirkov, 9.IX.1896 (Wiesbaur sec. Bubák 1906).

Pucciniastrum circaeae (Winter) de Toni. An *Circaea alpina* L.: oberhalb Dubí bei Teplice: Jagdhaus (Bubák 1906).

Pucciniastrum epilobii (Pers.) Otth. II im VI.-IX. An *Chamerion angustifolium* (L.) Holub: Boží Dar: Osthang des Špičák, Brandstelle, 1040 m, 97 (D). An *Epilobium adnatum* Griseb.: Abertamy: Nordhang des Plešivec, 1000 m, 99 (D). Jáchymov, 720 m, 99 (D). Loučná: W Nové Domky, kleiner Teich in einem Seitenbachtal der Polava, 890 m, 98 (D). NW Hora Sv. Šebestiána: bei Jilmová, 820 m, 99 (D). Zwischen Kryštofovy Hamry und Grenzübergang, 650 m, 99 (D). An *E. ciliatum* Rafin.: Vejprty: ruderal, 730 m, 97 (D). Černý Potok: ruderal, 720 m, 97 (D). An *E. montanum* L.: Abertamy: Nordhang des Plešivec, 1000 m, 99 (D). An *E.* cf. *obscurum* Schreber: ca. 500 m S Černý Potok: Tal der Černá voda, 720 m, 97 (D). An *E. palustre* L.: Boží Dar: Hochmoor, ca. 1020 m, 85 (Jage) und Nordosthang des Špičák, Feuchtwiese, 1030 m, 97 (D).

Pucciniastrum pyrolae Arthur. An *Orthilia secunda* (L.) House: Červený Hrádek (Sachs sec. Thümen 1875, Roth, Sachs sec. Bubák 1906).

Thekopsora goeppertiana (Kühn) Hirats. f. Ohne Wirtspflanze (sicher *Rhodococcum vitis-idaea* (L.) Avrorin): Cínovec (Thümen 1875).

Thekopsora guttata (Schröter) Sydow et H. Sydow. II im VIII.-X. An *Galium saxatile* L.: N Pernink: Fichtenbestand, 900 m, 99 (D). Ö Vejprty: Fichtenwald mit *Homogyne alpina,* 760 m, 96 (D). Černý Potok: Fichtenwald, 750 m, 96 (D).

Thekopsora symphyti (Bubák) Berndt (*Melampsorella symphyti* Bubák). II im VI. An *Symphytum officinale* L.: České Hamry: an Strasse nach Kovářská, 850 m, 99 (D).

Thekopsora vaccinii (Winter) Hirats. f. II, III im VIII.-IX. An *Vaccinium myrtillus* L.: Boží Dar: Nordosthang des Špičák, Fichtenwald, 1000 m, 97 (D). Černý Potok: Fichtenwald, 740 m, 97 (D). An *V. uliginosum* L.: im Erzgebirge ziemlich oft (Bubák 1906). S Carlsfeld: vermutlich nahe der Staatsgrenze oder im Grenzgebiet, trockener Moorkomplex im Quellgebiet der Wiltzsch, Pinetum uncinatae, ca. 950 m, 68 (Dörfelt 1972). W Abertamy: kleines Reststück des ehemaligen Hochmoores Kieferheide direkt neben Strasse, am Standort auch *Exobasidium pachysporum* Nannf. und *Exobasidium expansum* Nannf., 880 m, 99 (D). Boží Dar: Hochmoor, 1010 m, 93 (D). 700 m SW Boží Dar: Hochmoor Reisszeche, 1020 m, 99 (D). Moldava (Bubák 1898). Cínovec (Thümen 1875).

Trachyspora intrusa (Grev.) Arthur. II, III im V.-VIII. An *Alchemilla glabra* Neygenf.: zwischen Černý Potok und Kryštofovy Hamry: Wiese am Srassenrand, 750 m, 98 (D). An *A. monticola* Opiz: Ö Boží Dar: Wiese, 1070 m, 98 (D). Klínovec:

kurzrasige Wiese, 1100 m, 98 (D) und an der Strasse auf dem Nordwesthang, ca. 1150 m, 76 (M). An *A. vulgaris* agg.: im Erzgebirge gemein (Bubák 1906). Abertamy: Nordosthang des Plešivec, Wiese, 950 m, 99 (D). Hochmoor bei Boží Dar, ca. 1000 m, 81 (Jage). Loučná, 870 m, 99 (D). Zwischen Kryštofovy Hamry und Grenzübergang: Wiese, 650 m, 99 (D). An *A. xanthochlora* Rothm.: Klínovec: ca. 500 m S Grenzübergang nach Boží Dar, 1100 m, 98 (D). Loučná: Bachtal nahe Strasse nach Háj, Feuchtwiese, 930 m, 98 (D).

Tranzschelia fusca (Pers.) Dietel. III im IV.-V. An *Anemonoides nemorosa* (L.) Holub: N Vejprty: Mischwald und Auenwald im Tal der Polava, 660–710 m, 99 (D). SÖ Černý Potok: Feuchtwiese im Bachtal, ca. 750 m, 98 (D).

Triphragmium ulmariae (DC.) Link. II im VII. An *Filipendula ulmaria* (L.) Maxim.: ca. 800 m SW von Loučná: Seitenbach der Polava, Hochstaudenflur, 910 m, 98 (D).

Uromyces acetosae Schröter. An *Acetosa pratensis* Mill.: Krupka (Thümen sec. Bubák 1906).

Uromyces airae-flexuosae Ferd. et Winge. II im VII. An *Avenella flexuosa* (L.) Drejer: bei Jáchymov (Urban 1965). Südhang des Klínovec: am Wegrand nach Suchá, angrenzend Fichtenwald, 1100 m, 99 (D).

Uromyces betae Kickx f. An *Beta vulgaris* L.: Chomutov (Thümen sec. Bubák 1906).

Uromyces dactylidis Otth. II, III im VIII. An *Dactylis glomerata* L.: N Pernink: Wiese, 900 m, 99 (D).

Uromyces ficariae Tul. III im IV.-V. An *Ficaria bulbifera* (Marsden-Jones) Holub: nahe Loučná: Tal der Polava, 870 m, 99 (D). Zwischen Loučná und České Hamry, 840 m, 99 (D). NNW Vejprty: Gebüsch im Tal der Polava, ca. 680 m, 98,99 (D). Zwischen Vejprty und den Teichen im Tal der Polava: Auenwiese, 720 m, 98 (D). In Nové Zvolání: Wiese, 760 m, 99 (D). Kryštofovy Hamry, 680 m, 99 (D). NW Chomutov: Domina, nahe Bahnhof, 600 m, im Tal des Baches Hačka, 520 m und Krásná Lípa, 600 m, 2000 (D). Červený Hrádek (Roth sec. Bubák 1906).

Uromyces genistae Fuckel. I im IV. An *Tithymalus cyparissias* (L.) Scop.: NW Chomutov: Domina, nahe Bahnhof, 600 m, 2000 (D). An *Genista tinctoria* L.: ebendort wie die Aecien, 2000 (D). Červený Hrádek (Sachs sec. Bubák 1906).

Uromyces geranii (DC.) Fr. s. str. I, II, III im V.-IX. An *Geranium palustre* L.: Klášterec n. Ohří: Šumburk bei Černýš, 85 (Jage). An *G. sylvaticum* L.: N Pernink, 900 m, 99 (D). Ö Pernink: Wiese im Bachtal, ca. 850 m, 76 (M). Abertamy: am Weg zum Lesík, 900 m, 99 (D) und Nordosthang des Plešivec, Wiese, 920 m, 99 (D). Jáchymov, 725 m, 99 (D) und an der Strasse im Tal des Klínovecký-Bachs, ca. 640 m, 76 (M). Zechengrund (Krieger sec. Bubák 1906): ca. 950 m, 83 (Dietrich 1986). Suchá: Wiese am Südhang des Klínovec, 920 m, 99 (D). Bei Loučná, ca. 930 m, 98,99 (D). Háj: Osthang am Bach Bílá voda, ca. 900 m, 76 (M). Zwischen Loučná und České Hamry: Polavatal, ca. 830 m, 76 (M). Bei

České Hamry: Strassengraben, ca. 840 m, 76 (M). Vejprty: Tal der Polava, 720 m, 97 (D).

Uromyces junci (Desm.) Tul. II im IX. An *Juncus articulatus* L.: SÖ Vejprty: Westhang der Přísečnická hora, quellige Stelle am Wegrand eines waldfreien Stückes, ca. 800 m, 97 (D).

Uromyces laburni (DC.) Otth s. str. An *Laburnum anagyroides* Med.: Červený Hrádek (Roth, Thysalaert sec. Bubák 1906).

Uromyces orobi (Schumacher) Fuckel. An *Lathyrus tuberosus* L.: Červený Hrádek (Roth sec. Bubák 1906). An *L. vernus* (L.)Bernh.: Červený Hrádek (Roth sec. Bubák 1906).

Uromyces phyteumatum (DC.) Unger. III im VI. An *Phyteuma spicatum* L.: Boží Dar (Krieger), Klínovec (Wagner sec. Bubák 1906). 200 m W Loučná: Tal der Polava, Vorwald zwischen Weg und Wiese, 870 m, 98 (D). Svahová bei Jirkov: Lužecbachtal (Wiesbaur sec. Bubák 1906).

Uromyces poae Rabenh. O, I im IV.-V. An *Ficaria bulbifera* (Marsden-Jones) Holub: NÖ Vejprty: Auenwald im Tal der Polava, 660 m, 99 (D). S Vejprty: Auenwiese im Tal der Polava, 98 (D). Černý Potok: Tal der Černá voda, 720 m, 98 (D). Kryštofovy Hamry, 680 m, 99 (D).

Uromyces polygoni-avicularIae (Pers.) P. Karsten. II, III im VIII.-IX. An *Polygonum aviculare* L.: in Boží Dar: Strassenrand, 1020 m, 98 (D). Jáchymov: bei Kirche, 720 m, 99 (D). In Vejprty: Strassenrand, 730 m, 98 (D).

Uromyces rumicis (Schumacher) Winter. II,III im VIII. An *Rumex aquaticus* L.: Háj: Sumpfwiese längs des Bachs Bílá voda, ca. 900 m, 76 (M). Černý Potok: Wiese im Tal der Černá voda, 720 m, 98 (D).

Uromyces trifolii (DC.) Fuckel. III im VIII.-IX. An *Trifolium repens* L.: SW České Hamry: an Strasse nach Háj, 810 m, 99 (D). Černý Potok: Wegrand, 730 m, 97 (D). Osek (Thümen 1875). Bubák (1908) führt diesen Fund als *Uromyces trifolii-repentis* Liro auf. Thümen führt jedoch I und III auf, was eher *Uromyces trifolii* (Hedwig f. ex DC.) Fuckel sensu Walker 1978 entspricht. An *Trifolium repens* unterschied Bubák diese Art nicht von *Uromyces trifolii-repentis.*

Uromyces trifolii-repentis Liro var. *trifolii-repentis*. II im VII. An *Trifolium repens* L.: S Háj: N Meluzina, Strassenrand, 1020 m, 99 (D).

Uromyces valerianae (DC.) Lév. II, III im VIII.-IX. An *Valeriana dioica* L.: Boží Dar: Osthang des Špičák, Feuchtwiese mit *Sedum villosum, Pedicularis palustris* u.a., ca. 1030 m, 97, 98 (D).

Uromyces viciae-fabae (Pers.) Schröter. II im VIII. An *Vicia sepium* L.: České Hamry: an Strasse nach Kovářská, 830 m, 99 (D). Kryštofovy Hamry: Strassenrand an Talsperre, 730 m, 99 (D).

Xenodochus carbonarius Schlecht. I, III im VII. An *Sanguisorba officinalis* L.: Abertamy: Plešivec (Dietel sec. Baudyš 1924), 600 m NÖ vom Gipfel, Wiese bei Švýcarská bouda, 950 m, 99 (D).

Ustilaginales

Entyloma arnicale Ell. et Everh. VIII. An *Arnica montana* L.: Klínovec (Wagner, Krieger sec. Bubák 1912): selten, 6.VIII.1898 leg. Krieger et Wagner (Krieger, Fungi sax. exs. 1401).

Microbotryum dianthorum (Liro) H. et I. Scholz. VIII. An *Dianthus deltoides* L.: Ö Abertamy: Südhang über der Strasse, ca. 860 m, 76 (M).

Microbotryum lychnidis-dioicae (DC.) Deml et Oberw. VII. An *Silene dioica* (L.) Clairv. (*Melandrium rubrum* Garcke): Abertamy: Nordosthang des Plešivec, Wegrand, 950 m, 99 (D).

Microbotryum marginale (DC.) K. Vánky. V.-VI. An *Bistorta major* S. F. Gray: Boží Dar: Nasswiese auf dem Hochmoor, ca. 1000 m, 83 (Dietrich 1986). NW Boží Dar: Mähwiese, 1060 m, 99 (D). Zechengrund, ca. 950 m, 83 (Dietrich 1986). Loučná: Tal der Polava, 900 m, 99 (D). Klínovec: Wiese NÖ Zámeček am Nordhang, 980 m, 98 (D). České Hamry: Feuchtwiese im Ort, 800 m, 99 (D) und Feuchtwiese Mrtvá slatina, 900 m, 99 (D). Černý Potok: Mähwiese im Ort, 720 m, 98 (D). NW Hora Sv. Šebestiána: 300 m N Jilmová, Frischwiese, 815 m, 99 (D).

Microbotryum pustulatum (DC.) R. Bauer et Oberw. An *Bistorta major* S. F. Gray: Klínovec (Wagner sec. Bubák 1912).

Microbotryum scabiosae K. Vánky. VII.-VIII. An *Knautia arvensis* (L.) Roem.et Schult.: Ö Abertamy: Südhang über der Strasse, ca. 860 m, 76 (M). Boží Dar: Südhang des Špičák, ca. 1030 m, 81,85 (Jage), auch Dietrich (1989), sonniger Hang auf der Bergwiese auf dem Neklid, ca. 1100 m, 76 (M). Suchá: Wiese am Südhang des Klínovec, 900 m, 99 (D). W Loučná: Wiese im Tal der Polava, 885 m, 98 (D). SÖ Loučná: am Weg nach Háj, 930 m, 99 (D). Měděnec: Hügel Měděnec, 910 m, 85 (Jage) und nahe Ort, 880 m, 98 (D). Rusová: Abhang an der Eisenbahnstrecke N Eisenbahnstation, ca. 820 m, 76 (M).

Microbotryum silenes-inflatae (Liro) Deml et Oberw. VI.– VIII. An *Oberna behen* (L.) Ikonn. (*Silene vulgaris* (Moench) Garcke): Klínovec: Magerwiese ca. 500 m SW Grenzübergang bei Boží Dar, 1080 m, 98 (D). Zechengrund bei Oberwiesenthal, selten, 1890, 1902 (Krieger, Fungi sax. exs. 1701a). Krupka (Thümen 1875): 1873 leg. Thümen – lectotypus (Vánky 1994).

Microbotryum stellariae (Liro) Deml et Oberw. V.-VIII. An *Stellaria graminea* L.: N Pernink: Feuchtwiese, 900 m, 99 (D). An *Stellaria uliginosa* Murray: Boží Dar: Hochmoor, ca. 1000 m, 81 (Jage). Loučná: Quellflur am Bach nahe Strasse nach Háj, 910 m, 98 (D). Zwischen Černý Potok und Kryštofovy Hamry: Bachufer ca. 1 km SÖ Černopotocký vrch, 780 m, 98 (D).

Microbotryum stygium (Liro) K. Vánky. V.-VI. An *Acetosa pratensis* Mill.: Loučná: Wiese am Ortsrand, 920 m, 98 (D). Zwischen Loučná und Háj: Wiese nahe Strasse, 870 m, 98 (D). In České Hamry: Frischwiese, 850 m, 99 (D). Ca. 500 m NÖ Bahnhof Vejprty: Mähwiese, 670 m, 98 (D). SÖ Černý Potok: Feuchtwiese im Bachtal, 770 m, 98 (D). Kryštofovy Hamry: Feuchtwiese im Ort, 670 m, 99 (D). 4 km NW von Hora Sv. Šebestiána: Wiesenstreifen an Strasse nach Chomutov, 800 m, 99 (D).

Microbotryum violaceum (Pers.: Pers.) Deml et Oberw. VIII. An *Lychnis flos-cuculi* L.: Boží Dar: Wiese am Špičák, ca. 1050 m, 81,85 (Jage).

Thecaphora seminis-convolvuli (Desm.) Ito. VIII. An *Convolvulus arvensis* L.: Klášterec n. Ohří, 85 (Jage), als Konidienform *Thecaphorella antherarum* (Oud.) H. et I. Scholz.

Thecaphora trailii Cooke. VII.-VIII. An *Cirsium heterophyllum* (L.) Hill: Klínovec, 1899 (Wagner sec. Sydow, Ust. 287): Wiese an Strasse zwischen Klínovec und Boží Dar am Nordwesthang, nur an einer ca. 2 m^2 grossen Stelle, ca. 1120 m, 97,98 (D). Zechengrund (Wagner, Sydow sec. Bubák 1912): 1905 (P. Sydow sec. Sydow, Ust. 369).

Urocystis agropyri (Preuss) Fisch. v. Waldh. VI. An *Elytrigia repens* (L.) Desv.: České Hamry: Strassenrand im Ort, 800 m, 99 (D).

Urocystis anemones (Pers.: Pers.) Wint. IV.-V. An *Anemonoides nemorosa* (L.) Holub: 1 km SW Loučná: Wiese nahe Alnetum, 890 m, 99 (D). Zwischen Loučná und České Hamry: Tal der Polava, 99 (D). Vejprty: Auenwiese im Tal der Polava, 720 m, 99 (D). Nové Zvolání: Auenwiese im Tal der Polava, 740 m, 99 (D).

Urocystis fischeri Wint. VIII. An *Carex panicea* L.: Loučná: nasse Kleinseggenwiese (Caricetum fuscae swertietosum) nahe Bachufer unweit der Strasse nach Háj, ca. 900 m, 98 (D).

Urocystis ranunculi (Lib.) Moesz. VIII. An *Ranunculus repens* L.: Jáchymov: Wegrand, 720 m, 99 (D). In Kryštofovy Hamry: Strassenrand, 670 m, 99 (D).

Ustilago filiformis (Schrank) Rostr. VI.-IX. An *Glyceria fluitans* (L.) R. Br.: Boží Dar: in der Nähe des Fichtelberges, 1887 (Krieger, Fungi sax. exs. 254 b). Zechengrund, 950 m, 85 (Dietrich 1988). Loučná: Bachtal nahe Strasse nach Háj, ca. 930 m, 98 (D). Vejprty: Přísečnická hora, ca. 800 m, 97 (D). Černý Potok: Ufer der Černá voda, 97 (D). NW Hora Sv. Šebestiána: Ufer des Teiches Pohraniční, 840 m, 98 (D).

Ustilago oxalidis Ellis et Tracy. VIII. An *Xanthoxalis fontana* (Bunge) Holub: Klášterec n. Ohří, 85 (Jage).

Ustilago scrobiculata Liro. VIII. An *Calamagrostis villosa* (Chaix) J. F. Gmel.: Nordwesthang des Klínovec: unmittelbar an der Staatsgrenze, Naturschutzgebiet Zechengrund, 1050 m, 21. VIII.1985,86 (Dietrich 1988).

Ustilago striiformis (Westend.) Niessl. VI.-VII. An *Calamagrostis villosa* (Chaix) J. F. Gmel.: Klínovec: Rand eines Fichtenwaldes nahe Kreuzung Klínovecgipfel – Loučná, 1170 m, 97 (D). An *Holcus mollis* L.: NW Hora Sv. Šebestiána: 600 m N von Jilmová, 820 m, 99 (D).

Ustilentyloma brefeldii (Krieger) K. Vánky. VIII. An *Holcus mollis* L.: zwischen České Hamry und Kovářská: Mähwiese Mrtvá slatina, 860 m, 99 (D).

Auswertung

Typische Pflanzen in den Formationen des Erzgebirges und ihre *Peronosporales*-, *Uredinales*- und *Ustilaginales*-Arten

+ = keine Nachweise nach 1950

Mischwälder, Fichtenwälder und Forste

Avenella flexuosa mit *Uromyces airae-flexuosae*. – *Calamagrostis villosa* mit *Puccinia coronata*, *Puccinia pygmaea* und *Ustilago striiformis*. – *Deschampsia cespitosa* mit *Puccinia deschampsiae*. – *Galium saxatile* mit + *Puccinia galii-verni* und *Thekopsora guttata*. – *Homogyne alpina* mit + *Puccinia conglomerata*. – *Luzula sylvatica* mit *Puccinia luzulae-maximae*. – *Moehringia trinervia* mit *Puccinia arenariae*. – *Phyteuma spicatum* mit + *Coleosporium campanulae* und *Uromyces phyteumatum*. – *Prenanthes purpurea* mit *Puccinia maculosa*. – *Senecio hercynicus* und *S. ovatus* mit *Coleosporium senecionis* und *Puccinia silvatica*. – *Solidago virgaurea* mit + *Puccinia virgae-aureae*. – *Stellaria nemorum* mit *Puccinia arenariae*. – *Vaccinium myrtillus* mit *Thekopsora vaccinii*. – *Vignea brizoides* mit *Puccinia silvatica*. – *Vignea ovalis* mit *Puccinia arenariicola*.

Hochstaudenfluren

Acetosa alpestris mit *Puccinia acetosae*. – *Anthriscus sylvestris* mit *Plasmopara chaerophylli*. – *Cicerbita alpina* mit *Puccinia mulgedii*. – *Cirsium oleraceum* mit *Puccinia laschii*. – *Epilobium adnatum* mit *Pucciniastrum epilobii*. – *Filipendula ulmaria* mit *Triphragmium ulmariae*. – *Geranium sylvaticum* mit *Plasmopara pusilla* und *Uromyces geranii*. – *Imperatoria ostruthium* mit + *Puccinia imperatoriae*. – *Petasites hybridus* mit *Coleosporium petasitis*. – *Ranunculus platanifolius* mit *Peronospora alpicola*. – *Stellaria nemorum* mit *Puccinia arenariae*.

Moore, Feuchtwiesen, Quellfluren auf Wiesen und in Wäldern

Anemonoides nemorosa mit *Plasmopara pygmaea*, *Tranzschelia fusca* und *Urocystis anemones*. – *Angelica sylvestris* mit *Plasmopara angelicae* und *Puccinia bistortae*. – *Betula nana* mit *Melampsoridium betulinum*. – *Betula carpatica* mit *Melampsoridium betulinum*. – *Bistorta major* mit *Microbotryum marginale*, *Puccinia angelicae-mamillata* und *Puccinia bistortae*. – *Caltha palustris* mit *Puccinia calthae* und *Puccinia calthicola*. – *Cardamine amara* mit *Peronospora* *dentariae.* – *Cardamine flexuosa* mit *Peronospora dentariae.* – *Cardamine pratensis* mit *Albugo candida* und *Peronospora dentariae.* – *Cardaminopsis halleri* mit *Albugo candida.* – *Carex gracilis* mit *Puccinia urticata.* – *Carex nigra* mit *Puccinia paludosa.* – *Carex panicea* mit *Urocystis fischeri.* – *Chrysosplenium alternifolium* mit *Peronospora chrysosplenii.* – *Crepis paludosa* mit *Puccinia major.* – *Epilobium adnatum* mit *Puccinia epilobii* und *Pucciniastrum epilobii.* – *Epilobium palustre* mit *Plasmopara epilobii, Puccinia epilobii* und *Pucciniastrum epilobii.* – *Ficaria bulbifera* mit *Uromyces poae.* – *Galium uliginosum* mit *Puccinia galii-verni.* – *Geranium palustre* mit *Plasmopara pusilla.* – *Glyceria fluitans* mit *Ustilago filiformis.* – *Juncus articulatus* mit *Uromyces junci.* – *Lychnis flos-cuculi* mit *Microbotryum violaceum.* – *Mentha longifolia* mit *Puccinia menthae.* – *Myosotis nemorosa* mit *Peronospora myosotidis.* – *Populus tremula* mit *Melampsora populnea.* – *Rumex aquaticus* mit *Uromyces rumicis.* – *Salix aurita* mit *Melampsora epitea.* – *Salix cinerea* mit *Melampsora epitea.* – *Stellaria uliginosa* mit *Microbotryum stellariae.* – *Vaccinium uliginosum* mit *Thekopsora vaccinii.* – *Valeriana dioica* mit *Uromyces valerianae.*

Mähwiesen auf trockenen bis frischen Standorten (z. B. Meo-Festucetum und Nardetum)

Acetosa pratensis mit *Microbotryum stygium, Peronospora acetosae* und *Puccinia acetosae.* – *Aegopodium podagraria* mit *Plasmopara umbelliferarum* und *Puccinia aegopodii.* – *Alchemilla vulgaris* agg. mit *Peronospora alchemillae* und *Trachyspora intrusa.* – *Alopecurus pratensis* mit *Puccinia perplexans.* – *Arnica montana* mit + *Entyloma arnicale.* – *Bistorta major* mit *Microbotryum marginale,* + *M. pustulatum* und *Puccinia bistortae.* – *Cirsium heterophyllum* mit *Puccinia laschii* und *Thecaphora trailii.* – *Crepis biennis* mit *Puccinia praecox.* – *Dianthus deltoides* mit *Microbotryum dianthorum.* – *Festuca nigrescens* mit *Puccinia festucae.* – *Geranium sylvaticum* mit *Plasmopara pusilla* und *Uromyces geranii.* – *Holcus mollis* mit *Puccinia holcina, Ustilago striiformis* und *Ustilentyloma brefeldii.* – *Hypericum maculatum* mit + *Melampsora hypericorum.* – *Jacea phrygia* mit *Puccinia centaureae.* – *Knautia arvensis* mit *Microbotryum scabiosae.* – *Leontodon hispidus* mit *Puccinia leontodontis.* – *Malva moschata* mit *Puccinia malvacearum.* – *Meum athamanticum* mit *Nyssopsora echinata, Plasmopara mei-foeniculi* und *Puccinia bistortae.* – *Oberna behen* mit *Microbotryum silenes-inflatae.* – *Phyteuma nigrum* mit *Peronospora phyteumatis.* – *Phyteuma spicatum* mit *Peronospora phyteumatis.* – *Rhinanthus minor* mit *Coleosporium euphrasiae* und *Plasmopara densa.* – *Sanguisorba officinalis* mit *Peronospora sanguisorbae* und *Xenodochus carbonarius.* – *Thlaspi caerulescens* mit *Peronospora thlaspeos-alpestris* und *Puccinia thlaspeos.* – *Trifolium medium* mit *Peronospora trifoliorum.* – *Veronica chamaedrys* mit *Peronospora agrestis.*

Typische Arten des obersten Berglandes

Die folgenden Parasit-Wirt-Beziehungen kommen nach den bisher vorliegenden Daten schwerpunktmässig, teils ausschliesslich, im obersten Bergland zwischen 900 und 1244 m vor.

Coleosporium euphrasiae an *Rhinanthus minor, C. senecionis* an *Senecio hercynicus, Melampsoridium betulinum* an *Betula nana* und *B. carpatica, Peronospora alpicola* an *Ranunculus platanifolius, Plasmopara epilobii* an *Epilobium palustre, Puccinia acetosae* an *Acetosa alpestris, P. calthicola* an *Caltha palustris, P. conglomerata* an *Homogyne alpina, P. imperatoriae* an *Imperatoria ostruthium, P. luzulae-maximae* an *Luzula sylvatica, P. mulgedii* an *Cicerbita alpina, P. paludosa* an *Carex nigra, P. laschii* und *Thecaphora trailii* an *Cirsium heterophyllum, Ustilago striiformis* an *Calamagrostis villosa.*

Vergleich mit historischen Angaben

Vom böhmischen Teil des Erzgebirges liegen sowohl aus den Zeiträumen vor 1900 als auch nach 1950 wenig detaillierte Angaben über Roste, Brände und Falsche Mehltaue vor. Aus diesem Grunde sind Vergleiche schwierig. Die wenigen historischen Angaben lassen dennoch einige Aussagen zu.

Puccinia conglomerata an *Homogyne alpina* (1887 Krieger) und *Entyloma arnicale* an *Arnica montana* (1898 Krieger und Wagner) konnten nicht wieder gefunden werden. Beide Pilze waren im Gebiet schon um die Jahrhundertwende selten und sind vermutlich ausgestorben. Die Bestände beider Pflanzenarten sind heute gering. Durch grossflächige Waldschäden weicht *Homogyne alpina* immer stärker z. B. *Calamagrostis villosa.* Dies erklärt wiederum das massive Auftreten von *Puccinia pygmaea* und *Puccinia coronata* auf dem Wald-Reitgras und dokumentiert deutlich das Ungleichgewicht dieses Naturraumes. Beide Arten dürften um 1900 an *C. villosa* wesentlich seltener gewesen sein. *Ustilago striiformis* befällt im oberen Zechengrund am Nordwesthang des Klínovec ein kleines *Calamagrostis villosa*-Areal, welches auf sächsischer wie böhmischer Seite liegt. Sicherlich gab es diesen Befall auch schon früher. Die Wiesen in den Gebirgslagen werden kaum noch extensiv genutzt, so dass *Arnica montana* und *Homogyne alpina* von konkurrenzstärkeren Pflanzen weitflächig verdrängt worden sind. *Arnica montana* kommt heute in den Kammlagen nur noch punktuell mit geringer Abundanz vor.

Puccinia virgae-aureae wurde im September 1896 von Wiesbaur in Jindřišská bei Jirkov am Fusse des Erzgebirges gefunden. Von der sächsischen Seite des Erzgebirges existiert ebenfalls nur ein Fund vom Oktober 1895 von Wagner im östlichen Teil des Gebirges bei Geising (Fungi sax. 1252). Spätere Nachweise dieser wohl in Mitteleuropa seltenen Art sind nicht bekannt geworden. Die Wirtspflanze *Solidago virgaurea* ist im Gebiet nicht selten. Es ist also möglich, dass der Rost eines Tages wieder gefunden wird.

Puccinia thlaspeos an *Thlaspi caerulescens* dürfte vor 100 Jahren häufiger gewesen sein, obwohl die Wirtspflanze auch heute noch sehr verbreitet ist. Die Ursachen hierfür sind uns nicht bekannt. Merkwürdig sind die Beobachtungen zu *Puccinia paludosa.* Während vor 1900 dieser Rost an *Pedicularis sylvatica* bei Cínovec (Thümen 1875) und in anderen Orten Böhmens gefunden wurde, kommt die Art in der Gegenwart an *Carex nigra* zumindest in den Mooren um Boží Dar vor, Aecienfunde an *Pedicularis* fehlen jedoch seit über 125 Jahren. Die möglichen Zwischenwirte *Pedicularis palustris* und *P. sylvatica* sind heute im Gebiet selten. Wahrscheinlich ist die Art früher an *Carex* übersehen worden und die Chance eines Wirtswechsels hat sich bis in die Gegenwart immer mehr verschlechtert. Es ist bekannt, dass die Urediomyzelien aller *Urtica-Carex-Puccinien* in den Blättern der betreffenden *Carex*-Arten überwintern (Gäumann 1959 S. 619). Es ist möglich, dass es auch bei *Puccinia paludosa* der Fall ist. Die im böhmischen und sächsischen Erzgebirge häufige *Ustilago filiformis* an *Glyceria fluitans* dürfte bis in die Kammlagen hinauf keine Rückgangstendenzen aufweisen. Die Art wurde schon 1887 von Krieger bei Boží Dar in der Nähe des Fichtelberges an *Glyceria fluitans* gesammelt. *U. filiformis* zählt in vielen Gegenden Mitteleuropas zu den häufigsten Brandpilzarten. *Thecaphora trailii* in den Blütenkörben von *Cirsium heterophyllum* kam schon vor 100 Jahren im Fichtelberg– und Klínovecgebiet vor und hat sich bis in die Gegenwart behauptet. Gleiches gilt für *Peronospora alpicola* an *Ranunculus platanifolius* und *Puccinia mulgedii* an *Cicerbita alpina. Ustilentyloma brefeldii* hat ein für Brandpilze eher unerwartetes Befallsbild und wird schnell übersehen. Dieser Brandpilz wurde im August 1898 von Wagner am Fichtelberg bei Kurort Oberwiesenthal gesammelt (Fungi sax. 1352b). *Puccinia angelicae-mamillata* parasitiert im Erzgebirge viel seltener an *Bistorta major* als *P. bistortae.* Nach Bubák (1906) ist dies auch vor 100 Jahren nicht anders gewesen.

Das heute zerstreut vorkommende *Microbotryum marginale* an *Bistorta major* ist historisch nicht belegt, auch nicht aus der Gegend um Oberwiesenthal. Bubák (1912) schreibt, dass diese Art in Böhmen nur im Riesengebirge vorkommt. Da die randständigen Blattsori ab Juli selten noch Sporen enthalten, wird *M. marginale* den Mykologen wie Krieger und Wagner, die in den Monaten Juli bis September des öfteren in Oberwiesenthal verweilten, verborgen geblieben sein. Dagegen ist *Microbotryum pustulatum* von Wagner um 1900 am Klínovec gesammelt worden, der Sammelmonat ist den Verfassern nicht bekannt. Trotz intensiver Suche konnte dieser Brandpilz aktuell dort nicht nachgewiesen werden.

Coleosporium euphrasiae kam um 1900 auf dem benachbarten Fichtelberg an *Pinus mugo* und *Euphrasia officinalis* vor (Wagner 1898). Neuere Nachweise vom Fichtelberggebiet fehlen. Am Nordhang des Klínovec konnte 1999 geringer Befall von *C. euphrasiae* an *Rhinanthus minor* beobachtet werden. Sicher sind früher sowohl *Pinus*-Arten als auch *Euphrasia*– und *Rhinanthus*-Arten wesentlich häufiger gewesen und damit war auch die Wahrscheinlichkeit grösser, dass Haupt–

und Zwischenwirt vergesellschaftet auftraten und Wirtswechsel stattfinden konnte. Das aktuelle Fehlen weiterer *Coleosporium*-Arten wie *C. campanulae* und *C. melampyri* könnte ebenfalls Folge der zu intensiven Moornutzung und besonders durch die Schwefeldioxid-Imission verursachten Waldschäden sein. Allerdings ist vom böhmischen Teil des Erzgebirges historisch nur *C. campanulae* an *Phyteuma spicatum* belegt. In der Nähe der noch vorhandenen *Pinus*-Bestände könnten bei gezielter Suche diese Arten durchaus noch auffindbar sein. Dagegen ist *Coleosporium senecionis* an *Senecio ovatus* und *S. hercynicus* bis in die Kammlagen verbreitet.

Veselý hat im Juli 1949 zwischen Abertamy und Pernink den seltenen Rost *Puccinia imperatoriae* an *Imperatoria ostruthium* gesammelt. Beide Verfasser dieser Arbeit suchten vergeblich den Rost an der dort häufigen Wirtspflanze. Da im Erzgebirge früher niemand über eine Vegetationsperiode Phytoparasiten gesammelt hat, wurden zahlreiche Arten bisher nicht gefunden. Dies betrifft besonders die im Frühling und Frühsommer auftretenden Arten, so *Microbotryum stygium* in den Blüten von *Acetosa pratensis, Peronospora chrysosplenii* an *Chrysosplenium alternifolium* und *Peronospora thlaspeos-alpestris* an *Thlaspi caerulescens.* Der aus Australien und Neuseeland stammende Neomycet *Puccinia lagenophorae* wurde in Böhmen erstmals 1990 an *Senecio vulgaris* gesammelt (Müller 1995). Zumindest seit 1997 hat dieser Rost über Verkehrswege die montane Region erobert und behauptet sich seitdem an ruderalen Standorten. Die auch in den höheren Gebirgslagen häufige *Bellis perennis* wurde dagegen von einem ähnlichen, auch aus Australien stammenden Neomyceten *Puccinia distincta* Mc Alpine noch nicht befallen. *Ustilago oxalidis* gehört ebenfalls zu den Arten, die zu Bubáks Zeiten in Böhmen noch nicht vorkamen. In Europa wurde die aus Nordamerika stammende Art erstmals in der Schweiz 1906 gefunden (Kreisel et Scholler 1994). In Böhmen wurde diese Brandart erst 1949 in Opatovice n. L. (Kreis Pardubice) von Urban entdeckt. Jage sammelte sie 1985 am Erzgebirgsrand. *U. oxalidis* ist sicherlich auch in höheren Lagen des tschechischen Erzgebirgsteiles existent. Auf sächsischer Seite befindet sich das derzeit höchstgelegene Vorkommen im Mittelerzgebirge bei etwa 600 m ü. M.

Untersuchungen in weiteren Gegenden des Erzgebirges, besonders in den westlichen und östlichen Kammlagen sowie in den unteren Lagen am Südabfall, würden unser Wissen über die Verbreitung dieser und anderer Phytoparasiten bereichern und sicherlich so manche Überraschung ans Tageslicht bringen.

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REFERENCES

BAUDYŠ E. (1916): Ein Beitrag zur Kenntnis der Mikromyceten in Böhmen. – Lotos 64: 11–29, 42–64.

BAUDYŠ E. (1924): Příspěvek k rozšíření mikromycetů u nás. – Čas. Morav. Mus. Zem. 21: 1–31.

BLATTNÝ C. (1927): Peronospora chmelová (nepravé padlí chmelové). – Sborn. Výzk. Úst. Zem. RČS, Praha, 27: 1–260.

BRANDENBURGER W. (1994): Die Verbreitung der in den westlichen Ländern der Bundesrepublik Deutschland beobachteten Rostpilze (Uredinales). – Regensburg. Mykol. Schr.-n, Regensburg, 3: 1–381.

BRAUN U. (1982): Die Rostpilze (Uredinales) der Deutschen Demokratischen Republik. – Feddes Repert., Berlin, 93: 213–333.

BUBÁK F. (1898): Zweiter Beitrag zur Pilzflora von Böhmen und Nordmähren. – Verh. Zool.-Bot. Ges. Wien 48: 17–36.

BUBÁK F. (1906): Houby české. I. Rezy (Uredinales). – 1–228, Praha.

BUBÁK F. (1908): Die Pilze Böhmens. Erster Teil. Rostpilze (Uredinales). – Arch. Naturwiss. Landesdurchforsch. Böhm. 13(5): 1–234.

BUBÁK F. (1912): Houby české. II. Sněti (Hemibasidii). – 1–84, Praha.

CONSTANTINESCU O. (1991): An annotated list of Peronospora names. – Thunbergia, Uppsala, 15: 1–110.

DIETEL P. (1931): Kleine Beiträge zur Uredineenkunde. – Jahresber. Ver. Naturk. Zwickau 1928–30: 13–21.

DIETEL P. (1936): Verzeichnis der im Freistaat Sachsen bisher gefundenen Rostpilze (Uredineen) und ihrer Fundorte. – Jahresber. Ver. Naturk. Zwickau 1933–35: 14–47.

DIETRICH W. (1986): Besonderheiten der Pilzflora des Westerzgebirges (V). – Boletus 10: 30–32.

DIETRICH W. (1988): Besonderheiten der Pilzflora des Westerzgebirges (VI). – Boletus 11: 50–56.

DIETRICH W. (1989): Zum Vorkommen der Antherenbrände Ustilago succisae und U. scabiosae in der DDR. – Boletus 13: 15–17.

DIETRICH W. (1990): Funde phytoparasitischer Pilze aus dem Süden der Deutschen Demokratischen Republik (II). – Sächs. Flor. Mitt. 1990: 17–29.

DÖRFELT H. (1972): Zur Kenntnis der Pilzflora der Hochmoore des Oberen Westerzgebirges. – Veröff. Mus. Naturk. Karl-Marx-Stadt 7: 27–44.

DÖRFELT H. (1974): Charakteristische Pilze der montanen Fichtenwälder des Oberen Westerzgebirges. – Veröff. Mus. Naturk. Karl-Marx-Stadt 8: 37–64.

FIRBAS F. (1952): Waldgeschichte Mitteleuropas. 2: Waldgeschichte der einzelnen Landschaften. – 256 pp., Jena.

GÄUMANN E. (1959): Die Rostpilze Mitteleuropas mit besonderer Berücksichtigung der Schweiz. – Beitr. Krypt.-Fl. Schweiz 12: 1–1407.

HAWKSWORTH D. L. (1980): Recommended abbreviations for the names of some commonly cited authors of fungi. – Rev. Pl. Pathol. 59: 473–480.

KLIKA J. (1925): Příspěvek k české mikroflóře.-V. – Čas. Nár. Mus. 99: 148–151.

KOCHMAN J. and MAJEWSKI T. (1970): Grzyby (Mycota), IV Glonowce (Phycomycetes), Wroślikowe (Peronosporales). – 309 p., Warszawa.

KREISEL H. and SCHOLLER M.(1994): Chronology of phytoparasitic fungi introduced to Germany and adjacend countries. – Bot. Acta 107: 387–392.

KRIEGER K. W. (1885–1919): Fungi saxonici exsiccati. – Königstein.

MARKOVÁ J. and URBAN Z. (1998): The rust fungi of grasses in Europe. 6. – Acta Univ. Carol. Biol. 41: 329–402.

MÜLLER J. (1995): Australischer Rostpilz Puccinia lagenophorae auch in der Tschechischen und Slowakischen Republik und in Ungarn. – Czech Mycol., Praha, 48: 161–167.

POELT J. and ZWETKO P. (1997): Die Rostpilze Österreichs. Catal. Fl. Austr. 3 (1). Uredinales. – 365 pp.,Wien.

SCHREIBER H. (1923): Die Moore Nordwestböhmens. – Prag.

SKALICKÝ V. (1983): The revision of species of the genus Peronospora on host plants of the family Rosaceae with respect to Central European species. – Folia Geobot. Phytotax. 18: 71–101.

THÜMEN F. (1875): Beiträge zur Pilz-Flora Böhmens. – Verh. Zool.-Bot. Ges. Wien 25: 523–554.

URBAN Z. (1965): Über die Verbreitung von Puccinia deschampsiae Arth. und Uromyces airae-flexuosae Ferd. et Winge. – Preslia, Praha, 37: 387–395.

URBAN Z. and MARKOVÁ J. (1985): Rust of daffodils, Puccinia schröteri Pass., in Bohemia. – Novit. Bot. Univ. Carol., Praha, 2: 67–72.

URBAN Z. and MARKOVÁ J. (1987): Puccinia poarum in Czechoslovakia and Europe. – Not. Roy. Bot. Gard. Edinburgh 44: 359–375.

URBAN Z. and MARKOVÁ J. (1999): The rust fungi of grasses in Europe. 8. – Acta Univ. Carol. Biol. 43: 119–134.

VÁNKY K. (1994): European smut fungi. – 570 pp., Stuttgart etc.

VÁNKY K. (1998): The genus Microbotryum (smut fungi). – Mycotaxon 67: 33–60.

VESELÝ J. (1951): Puccinia Imperatoriae Jacky – nový druh rzi v Čechách. – Čs. Bot. Listy, Praha, 3: 110–111.

WAGNER G. (1898): Beiträge zur Kenntnis der Coleosporien und der Blasenroste der Kiefer (Pinus silvestris L. und Pinus montana Mill.). – Zeitschr. Pflanzenkrankheiten 8(5): 1–6.

WEINERT E. (1987): Bemerkungen zur Senecio nemorensis-Gruppe. – Mitt. Flor. Kart. Halle 13(1/2): 13–16.

WRÓNSKA B. (1986): Studia nad grzybami z rodzaju Plasmopara, porażającymi przedstawicieli Umbelliferae. – Acta Mycol. 22: 103–128.

Book Review

G. K. Podila and D. D. Douds Jr eds.:

Current advances in mycorrhizae reserach.
St Paul, Minnesota, 2000.
193 pages, 51 ill. APS Press.

The research of mycorrhizae, a symbiotic association common in the most vascular plants, has been accelerated during the last decade. This corresponds to the high ecological and economical importance of mycorrhizal symbiosis. The reviewed book provides a view of the most important problems which are the main interest of several research groups working in the field of mycorrhizae.

The book is divided into 6 thematically distinct sections, each involving 1 to 3 separate contributions. The first one deals with signalling mechanisms which enable communication between the plant and the fungus in mycorrhizal symbiosis. Mycorrhizal symbiosis involves a well-balanced molecular interaction between the two partners in which some normal defense reactions of the plant to fungal invasion are suppressed, whereas other specific plant reactions are induced. However, some defense mechanisms remain active even during the formation of mycorrhiza. Chemical communication occurs even earlier than the partners pass into direct contact, which was observed in experiments. In arbuscular endomycorrhizal symbiosis (the most widespread type of mycorrhizal symbiosis), roots of host plants exude a signal molecule, which affects the growth and branching of germ tubes of the fungus. In ectomycorrhizae, the external concentration of sugars acts as a signal for the regulation of fungal gene expression. This reaction of ectomycorrhizal fungi is similar to that of saprophytic fungi.

The second section is dedicated to the particular reaction of plants to the presence of the fungus, the defense reaction, and its importance in the formation of arbuscular mycorrhizal symbiosis. The various aspects of plant defense mechanisms to mycorrhizal fungi, including the regulation of plant defense-related genes are discussed in details.

The third section involves the molecular genetics of mycorrhizal symbiosis. This kind of research was enabled by the development of modern molecular techniques, which, for example, were used to isolate plant genes induced in mycorrhizal roots. The transcripts of these genes belong to the medium— or low-abundance class of m-RNA and are thus unlikely to be isolated using conventional screening methods. To be detected, arbuscular mycorrhiza-specific RNA was used to prepare DNA library using reverse transcriptase, and non-specific sequences were subtracted using the hybridisation with complementary RNA synthetised in vitro from control DNA library of non-mycorrhizal roots. This results in a significant enrichment of mycorrhiza specific clones. The described method has been shown to be successful in the isolation of plant genes induced in mycorrhizal roots.

Very interesting results presented in the fourth section show the carbon metabolism and energy cost of arbuscular mycorrhizas. High resolution nuclear magnetic resonance has been applied in combination with isotopic labelling techniques to study the fate of saccharides in presymbiotic and symbiotic phases of mycelium of arbuscular mycorrhizal fungi. The major metabolic pathway in germinating spores is gluconeogenesis. Lipid synthesis is almost absent in this presymbiotic phase, and might be an essential factor needed for the fungus to complete its life cycle. Extraradical symbiotic hyphae lack the transporters of exogenous hexose but are able to acquire acetate, whereas intraradical fungal structures are probably specialised to transport hexose, but they do not uptake acetate. These results are very important for understanding the metabolism of arbuscular mycorrhizal fungi since they depict the physiological differentiation of the mycelium.

The fifth section summarises the ultrastructural changes in the root colonised by mycorrhizal fungi, including cytoskeleton modifications. Much of the progress in this field is own to improvements in molecular and cytological methods. The use of fluorescent probes in conjunction with scanning laser confocal microscopy has been particularly important in these studies.

The sixth section is the shortest but the most exciting one, since it introduces the reader to the problems of genetic engineering of mycorrhizal fungi. While the use of naturally occurring mycorrhizal fungi for improving the health of host plants dates back to several decades ago, efforts to genetically engineer them for extensive use in agriculture, forestry and horticulture is at the beginning. The type of physical co-existence of plants with mycorrhizal fungi makes fungi excellent candidates to be genetically changed for the use in a variety of situations where suboptimal conditions exist for growth and survival of the host plants. For example, ectomycorrhizal fungi expressing genes coding for specific insecticidal proteins might be able to protect seedlings from root damaging insects. However, the application of common transformation techniques almost failed since ectomycorrhizal fungi are recalcitrant to form the necessary viable protoplasts, although successful transformation via protoplast formation had been achieved for *Laccaria laccata* and *Hebeloma cylindrosporum*. On the other hand, cultures of arbuscular mycorrhizal fungi are maintained on live plants which constitutes an experimental system too complex for the procedure of transformation. Among several newer transformation techniques for introducing foreign genes, the particle gun-mediated transformation technique is probably the most versatile and has the potential to be adopted for even complex cultivation systems. It was successfully used to transform the ectomycorrhizal fungi *Paxillus involutus* and *Laccaria bicolor*, introducing antibiotic resistance genes, reporter genes and insecticidal genes. Experiments applying this technique on spores of the arbuscular mycorrhizal fungus *Gigaspora* sp. have been performed as well. However, due to the complex nature of the spores containing multiple nuclei and a high genetic diversity within a single spore, obtaining fungal isogenic lines of arbuscular mycorrhizal fungi represents a serious problem.

Although the reviewed book cannot cover all molecular, physiological and ecological aspects of the studies on mycorrhizal symbiosis, it gives a valuable cross-section of the newly applied methodology which provides a new basis to understanding of the biology of mycorrhizal plants and their functioning in ecosystems. The reader will find a significant amount of relevant references here as well as brief conclusions following each contribution. The book can be recommended to postgraduate and advanced undergraduate students of mycology, plant physiology and phytopathology as well as to the interested scientists.

Milan Gryndler

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