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Teleomorph-anamorph connections in Ascomycetes. 1. *Cylindrotrichum* and *Cacumisporium* anamorphs of *Chaetosphaeria*

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Réblová M. and Gams W. (1999): Teleomorph-anamorph connections in Ascomycetes 1. *Cylindrotrichum* and *Cacumisporium* anamorphs of *Chaetosphaeria*. – Czech Mycol. 51: 1–40

The teleomorph-anamorph connections of *Chaetosphaeria* are discussed. On the basis of the revision of the type and other herbarium material, *Zignoëlla crustacea*, *Lasiosphaeria britzelmayri* subsp. *fennica*, *Sphaeria decastyla* and *Melanomma macrosporium* proved to be members of *Chaetosphaeria*. The new combinations *Chaetosphaeria crustacea*, *Chaet. fennica* and *Chaet. decastyla*, are proposed, *Melanomma macrosporium* is included in the synonymy of the latter. *Chaetosphaeria crustacea* has an anamorph intermediate between *Chloridium* and *Cylindrotrichum*, *Chaetosphaeria fennica* has a *Chloridium*-like anamorph, and *Chaetosphaeria decastyla* has *Cacumisporium capitulatum* as its anamorph. Two new species, *Chaetosphaeria tulasneorum* associated with the anamorph *Cylindrotrichum oligospermum* and *Chaetosphaeria acutata* associated with a *Cylindrotrichum* anamorph, are described. The teleomorph-anamorph connections of all accepted *Chaetosphaeria* species, except for *Chaet. fennica*, were confirmed by culture studies. *Chaetosphaeria abietis* and *Chaet. fusiformis* are also considered, and the connection with the *Chloridium cylindrosporium* anamorph of the latter is confirmed by culture studies for the first time. The genus *Cylindrotrichum* and its relationship to *Chloridium* and other related genera is discussed. A key to the species of *Chaetosphaeria* with *Cylindrotrichum* and *Cacumisporium* anamorphs is provided.

Key words: Ascomycetes, *Chaetosphaeria*, culture studies, wood-inhabiting fungi, systematics.

Réblová M. and Gams W. (1999): Vztahy teleomorfa-anamorfa u askomycetů 1. *Cylindrotrichum* a *Cacumisporium*, anamorfní rody rodu *Chaetosphaeria*. – Czech Mycol. 51: 1–40

Jsou diskutovány teleomorfní-anamorfní vztahy rodu *Chaetosphaeria*. Na základě revize typového a dalšího herbářového materiálu jsou druhy *Zignoëlla crustacea*, *Lasiosphaeria britzelmayri* subsp. *fennica*, *Sphaeria decastyla* a *Melanomma macrosporium* umístěny do rodu *Chaetosphaeria*. Jsou navrženy tři nové kombinace, a to *Chaetosphaeria crustacea*, *Chaet. fennica* a *Chaet. decastyla*. *Melanomma macrosporium* je zařazena do synonymiky druhu *Chaet. decastyla*. Rodové zařazení anamorfy druhů *Chaetosphaeria crustacea* a *Chaet. fennica* je na pomezí rodů *Cylindrotrichum* a *Chloridium*. Anamorfou *Chaetosphaeria decastyla* je *Cacumisporium capitulatum*. Jsou popsány dva nové druhy, *Chaetosphaeria tulasneorum* s anamorfou

Cylindrotrichum oligospermum a *Chaetosphaeria acutata* s anamorfoou *Cylindrotrichum* sp. Teleomorfní-anamorfní vztahy všech výše uvedených druhů rodu *Chaetosphaeria* byly ověřeny kultivačními studiemi. Jsou zahrnuty také druhy *Chaetosphaeria abietis* a *Chaet. fusiformis*. Spojení *Chaet. fusiformis* s anamorfoou *Chloridium cylindrosporum* je poprvé potvrzeno kultivačními studiemi. Jsou diskutovány vztahy rodu *Cylindrotrichum* s rodem *Chloridium* a dalšími příbuznými rody. Je vytvořen klíč pro určování druhů *Chaetosphaeria* s anamorfoami *Cylindrotrichum* a *Cacumisporium*.

INTRODUCTION

The genus *Chaetosphaeria* Tul. et C. Tul. (Tulasne and Tulasne 1863) accommodates lignicolous, saprobic fungi with superficial, dark, glabrous or sometimes setose, non-collapsing perithecia, the perithecial wall is brittle, consisting of thin-walled, opaque, brick-like cells or cells that form a network (*textura epidermoidea*); paraphyses and periphyses are persistent, asci have a distinct non-amyloid, refractive apical annulus and ascospores are transversely 1- to multi-septate, non-fragmenting and hyaline. Associated anamorphs have pigmented conidiophores and phialidic conidiogenesis, and are classified in several genera of hyphomycetes.

Among the synonyms of *Chaetosphaeria*, *Zignoëlla* Sacc. was characterized by hyaline, phragmosporous ascospores (Saccardo 1878), a criterion not recognized here as having generic relevance. *Zignoëlla* is a broadly conceived genus (Saccardo 1878, 1883) whose lectotype species, *Zignoëlla pulviscula* (Currey) Sacc., was selected only by Clements and Shear (1931) and was recombined by Booth (1957) in *Chaetosphaeria*.

Barr (1990) and Eriksson and Hawksworth (1993) placed *Chaetosphaeria* in the broadly perceived Lasiosphaeriaceae Nannf. Recently, *Chaetosphaeria* and six other related genera, viz. *Ascocodinaea* Samuels et al., *Melanochaeta* E. Müll. et al., *Melanopsammella* Höhnelt, *Porosphaerella* E. Müll. et Samuels, *Porosphaerellopsis* Samuels et E. Müll., and *Striatosphaeria* Samuels et E. Müll., were transferred to a new family, the Chaetosphaeriaceae Réblová et al., in the order Sordariales Chadeff. ex D. Hawksw. et O. E. Erikss. (Réblová et al. 1999). The Chaetosphaeriaceae are separated from the more narrowly delimited Lasiosphaeriaceae Nannf. and its core genera, viz. *Lasiochaeta* Ces. et De Not., *Bombardia* (Fr.) P. Karst., *Eosphaeria* Höhnelt, *Cercophora* Fuckel, and *Apiosordaria* Arx et W. Gams, on the basis of characters of perithecium, perithecial wall, asci and ascospores. Réblová et al. (1999) recognized twenty-two species of *Chaetosphaeria* with associated dematiaceous hyphomycetous anamorphs in nine genera, viz. *Catenularia* Grove, *Cylindrotrichum* Bonord., *Chalara* (Corda) Rabenh., *Chloridium* Link: Fr., *Custingophora* Stolk et al., *Dictyochaeta* Speg., *Menispora* Pers.: Fr., *Phialophora* Medlar, and *Zanclospora* S. Hughes et B. Kendrick (Saccardo 1883; Booth 1957, 1958; Müller and von

Arx 1962; Hughes and Kendrick 1968; Gams and Holubová-Jechová 1976; Barr and Crane 1979; Holubová-Jechová 1973, 1982, 1984; Barr 1993; Constantinescu et al. 1995; Réblová 1998 a, b).

The genus *Cylindrotrichum* was discussed by a number of authors (e.g. Hughes 1951; Gams and Holubová-Jechová 1976; Morgan-Jones 1977, 1980; Kendrick 1980; DiCosmo et al. 1983; Cabello and Arambarri 1988; Holubová-Jechová 1990), but no clear and final generic concept is available. The genus comprises species with erect, unbranched conidiophores, terminal conidiogenous cells with multiple or single conidiogenous loci produced by sympodial or percurrent proliferation and hyaline, cylindrical to long ellipsoidal, 1-3-septate conidia. DiCosmo et al. (1983) placed species of the genus *Cylindrotrichum* into two new genera, *Kylindria* DiCosmo et al. and *Xenokylindria* DiCosmo et al., and transferred one species formerly placed in *Cylindrotrichum* to *Uncigera* Sacc., two to *Dictyochoeta* Speg. and five to *Chaetopsis* Greville emend. DiCosmo et al., including the type species, *Cylindrotrichum oligospermum* (Corda) Bonord. These authors emphasized especially the shape of the conidia and the conidiogenous cells, the distinction between mono- and polyphialides being a main differentiating character. They preferred to distinguish several closely related anamorph genera of *Chaetosphaeria*, such as *Chaetopsis*, *Dictyochoeta*, *Kylindria* and *Xenokylindria*, based on details of conidiogenesis, though they share a number of morphological, developmental and ecological characteristics (DiCosmo et al. 1983).

Cabello and Arambarri (1988) considered the concept proposed by DiCosmo et al. (1983) incorrect. They redefined the generic concept of *Cylindrotrichum* and accepted eleven species. The genera *Kylindria* and *Xenokylindria* were reduced to synonyms of *Cylindrotrichum*. According to Cabello and Arambarri (1988), *Cylindrotrichum* accommodates species formerly placed in three closely related genera, viz. *Kylindria*, *Xenokylindria* and *Chaetopsis*, that are associated with one teleomorph genus, *Chaetosphaeria*. Although they did not consider teleomorph-anamorph connections of any of the species accepted in *Cylindrotrichum*, their generic concept of *Cylindrotrichum* justifies the close relationship of the *Chaetosphaeria* anamorphs better than the system proposed by DiCosmo et al. (1983).

In the present paper we describe five species of *Chaetosphaeria*, four of them having *Cylindrotrichum* anamorphs and one a *Cacumisporium* Preuss anamorph. Three species were previously known as *Zignoëlla crustacea* Sacc. (Saccardo 1883), *Lasiosphaeria britzelmayri* Sacc. subsp. *fennica* P. Karst. (Karsten 1887) and *Sphaeria decastyla* Cooke (Cooke 1878) [= *Melanomma macrosporum* Sacc. (Saccardo 1875)]. The respective type specimens were examined. On the basis of perithecial anatomy, ascus, ascospore and hamathecium anatomy, and conidiogenesis of the anamorphs, these three species belong to *Chaetosphaeria*. They are recombined as *Chaetosphaeria crustacea*, *Chaet. fennica* and *Chaet. decastyla*. *Melanomma macrosporum* is included in the synonymy of the latter. These species,

except for *Chaet. fennica*, were recollected on strongly decayed wood of coniferous and deciduous trees in Europe (France, Czech Republic, Ukraine). They are redescribed and illustrated along with notes on previous descriptions and illustrations. The anamorph of *Chaet. crustacea* belongs to *Cylindrotrichum*, though it shows great similarity with *Chloridium*. The anamorph of *Chaet. fennica* is *Chloridium*-like. The anamorph of *Chaet. decastyla* is *Cacumisporium capitulatum* (Corda) S. Hughes. On the basis of conidiogenesis and the structure and function of the phialides, *Cac. capitulatum* may also be included in *Cylindrotrichum*, but we refrain at the moment from making this combination before the anamorph-generic delimitations are further analysed. With the exception of *Chaet. fennica*, conidiophores of all these species were observed on a natural substratum and in living cultures.

Several collections of another fungus associated with a *Cylindrotrichum* anamorph were made on decayed wood of deciduous trees in the Czech Republic, France and Ukraine. It has fusiform, hyaline, at maturity 3-septate ascospores, persistent paraphyses and periphyses, unitunicate asci, black glabrous perithecia with a fragile wall and a dematiaceous hyphomycete anamorph with phialidic conidiogenesis. The anamorph was also obtained in culture. This fungus belongs to *Chaetosphaeria* and is described here as *Chaet. acutata*.

A single collection of the fifth species was made on a dead branch of *Sambucus nigra* in the Czech Republic. The anamorph that was obtained in culture represents *Cylindrotrichum oligospermum* (Corda) Bonord., the type of the generic name *Cylindrotrichum*. On the basis of the black, glabrous perithecia with brittle wall, persistent paraphyses and periphyses, ascospores that are hyaline, 1-3-septate and fusiform, and the anamorph, this recent collection represents an undescribed species of *Chaetosphaeria*, which is described here as *Chaet. tulasneorum*.

Chaetosphaeria abietis (Höhnelt) W. Gams et Holubová-Jechová and *Chaetosphaeria fusiformis* W. Gams et Holubová-Jechová (Gams and Holubová-Jechová 1976, 1981) are discussed. A key to the species of *Chaetosphaeria* with *Cylindrotrichum* and *Cacumisporium* anamorphs is provided.

MATERIAL AND METHODS

Dry herbarium specimens were rehydrated in 3% (aq.) KOH and subsequently studied in water, Congo Red (aq.) and Melzer's reagent. The abbreviations of herbaria and institutes that kindly lent the material are cited in accordance with the Index Herbariorum (Holmgren et al. 1990).

In the lists of material examined M. R. is the abbreviation for M. Réblová.

Single ascospores of *Chaetosphaeria crustacea*, *Chaet. acutata*, *Chaet. fusiformis*, *Chaet. decastyla* and *Chaet. tulasneorum* were isolated with the aid of a single-spore isolator on cornmeal agar (CMA, Difco). Colonies were grown

on CMA, malt extract agar (MEA), oatmeal agar (OA) and potato-carrot agar (PCA), colony characters were taken from PCA cultures grown for 10 days at 25 °C in darkness and 10 days at 25 °C in cool white fluorescent light. The cultures are maintained in the Institute of Botany, Academy of Sciences at Průhonice and the Centraalbureau voor Schimmelcultures (CBS) at Baarn, the Netherlands.

TAXONOMIC PART

Key to the species of *Chaetosphaeria* with *Cylindrotrichum* and *Cacumisporium* anamorphs

1. Occurring on decayed wood and bark of angiosperms.....2
1. Occurring on decayed wood and bark of gymnosperms 5
 2. Ascospores at maturity 3-5-septate, long cylindrical to fusiform; anamorph *Cacumisporium capitulatum* 6. *Chaetosphaeria decastyla*
 2. Ascospores at maturity 3-septate 3
3. Ascospores short fusiform, not exceeding 21 µm; anamorph *Cylindrotrichum oligospermum* 7. *Chaetosphaeria tulasneorum*
3. Ascospores elongate-fusiform, longer than 30 µm 4
 4. Ascospores (34.5-36.5-42(-43) × (3.5-4(-4.5) µm, immediately after the middle septum tapering very strongly towards the ends; anamorph *Chloridium*-like; conidia mid-brown, 1-celled 4. *Chaetosphaeria fennica*
 4. Ascospores (28-30.5-38(-44) × 3-4(-5) µm, slightly tapering towards the ends; anamorph *Cylindrotrichum* sp.; conidia hyaline, 2-celled 2. *Chaetosphaeria acutata*
5. Ascospores cylindrical-fusiform, 3-5-septate, perithecia setose; anamorph *Cylindrotrichum-Chloridium*-like 3. *Chaetosphaeria crustacea*
5. Ascospores cylindrical-fusiform, at maturity 3-septate, perithecia glabrous...6
 6. Ascospores asymmetric, tapering towards one end and rounded at the other end; anamorph *Chloridium cylindrosporum* ... 5. *Chaetosphaeria fusiformis*
 6. Ascospores symmetric with rounded ends; anamorph *Cylindrotrichum zignoëllae* 1. *Chaetosphaeria abietis*

1. *Chaetosphaeria abietis* (Höhnelt) W. Gams et Hol.-Jech., Stud. Mycol. 13: 53, 1976. Fig. 1a-f.

≡ *Zignoëlla abietis* Höhnelt, in Rehm, Ann. Mycol. 5: 469, 1907; more elaborated in Höhnelt, Sitzungsber. K. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1, 118: 332, 1909.

Anamorph. *Cylindrotrichum zignoëllae* (Höhnelt) W. Gams et Hol.-Jech., Stud. Mycol. 13: 53, 1976.

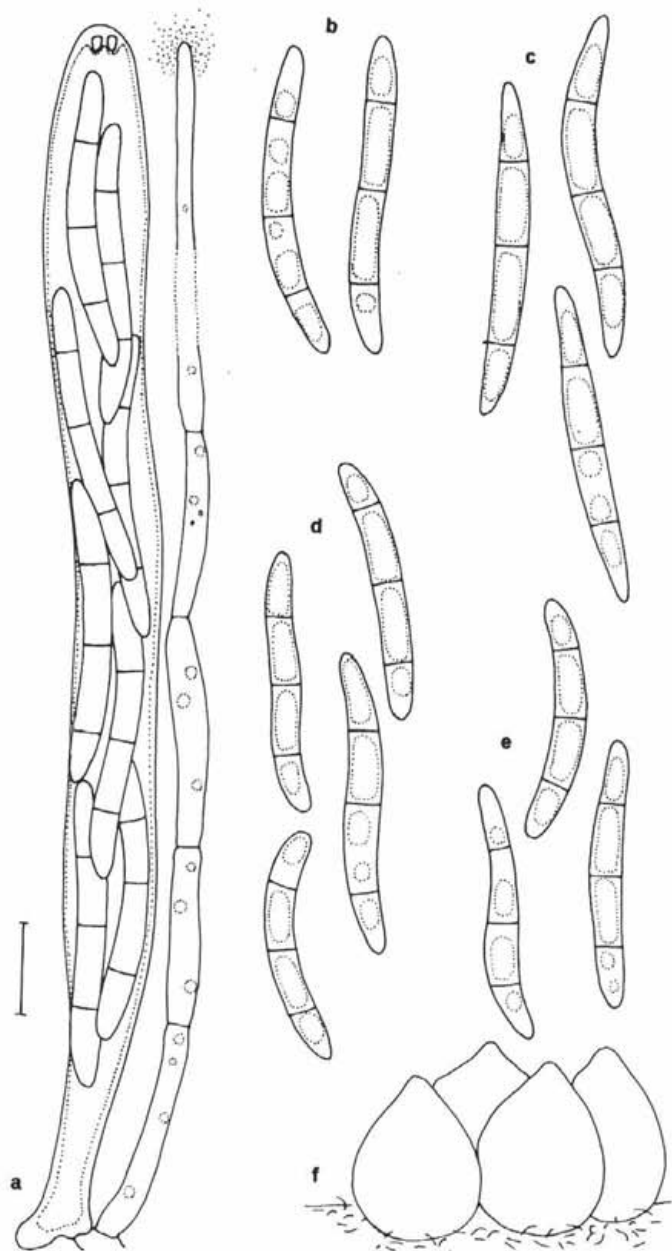


Fig. 1a-f. *Chaetosphaeria abietis*. - a. Ascus with ascospores and a paraphysis. - b-e. Ascospores. - f. Habit sketch of a group of perithecia. - a, b, f from Herb. M. R. 1058/97; c from Herb. M. R. 957/97; d from Herb. M. R. 969/97; e from the type K 49555. - Scale bar: a-c = 10 μ m.

- ≡ *Acrotheca zignoëllae* Höhnelt, Sitzungsber. K. Akad. Wiss. Wien, Math.-naturw. Abt. 1, Kl. 118: 332, 1909.
≡ *Kylindria zignoëllae* (Höhnelt) DiCosmo et al., Mycologia 75: 971, 1983.
= *Cylindrotrichum oblongisporum* G. Morgan-Jones, Mycotaxon 5: 487, 1977.

Material examined. 1) Type material. Rehm Ascom. exsicc. No. 1740 (AUSTRIA. Dürrien, Wiener Wald, on inner side of decayed bark, F. von Höhnelt, July 1907, K 49555 – lectotype of *Zignoëlla abietis*).

2) Additional material. Czech Republic. Southern Bohemia, Šumava Mts., glacial cirque of the lake Čertovo jezero near Železná Ruda, on inner surface of bark of *Abies alba*, 28 Aug. 1997, M. R. (Herb. M. R. 1027/97); *ibid.*, glacial cirque of the lake Černé jezero near Železná Ruda, on bark of *Abies alba*, 27 Aug. 1997, M. R. (Herb. M. R. 1058/97). – France. Pyrenees, Quérigut, Laurenti Lake, on bark of *Abies alba*, 17 July 1997, M. R. (Herb. M. R. 969/97, 973/97). – Ukraine. Eastern Carpathian Mts., Kvasi near Rachiv, on left bank of the river Tisa, on inner side of bark of *Abies alba*, 28 June 1997, M. R. (Herb. M. R. 957/97).

Descriptions and illustrations. Rehm (1907: 469); Höhnelt (1909: 332); Gams and Holubová-Jechová (1976: 53, Fig. 26 a, b).

Habitat. Saprobe on decayed wood and inner surface of bark of conifers.

Known host. *Abies alba*.

Known distribution. Europe: Austria, Czech Republic, France, Ukraine.

Note. The tips of paraphyses were seen enclosed in a small gelatinous cap that was well visible in phase contrast. This character was not seen in any other *Chaetosphaeria* species.

Chaetosphaeria abietis has not yet been grown in culture. The associated anamorph *Cylindrotrichum zignoëllae* was regularly observed growing around the perithecia (Gams and Holubová-Jechová 1976; Réblová, unpublished observations). Hawksworth and Minter (1980) reported the anamorph from dead herbaceous material of *Filipendula ulmaria* to be associated with perithecia of a *Chaetosphaeria*-like fungus; its ascospores were described as differing from *Chaet. abietis*, being 1–3-septate, shortly fusiform, 13–17 × 3–4 μm. Hawksworth and Minter (1980) concluded that *Cylindrotrichum zignoëllae* sensu Gams and Holubová-Jechová (1976) was circumscribed too broadly and may accommodate two taxa belonging to distinct teleomorphs. The perithecia found on *Filipendula ulmaria* could not be investigated further, for most of them were immature. No attempt was made to cultivate the specimen (Hawksworth and Minter 1980).

Chaetosphaeria abietis occurs rarely. All recent collections were made in regions with natural stands of *Abies alba*. Ascospore germination was not observed.

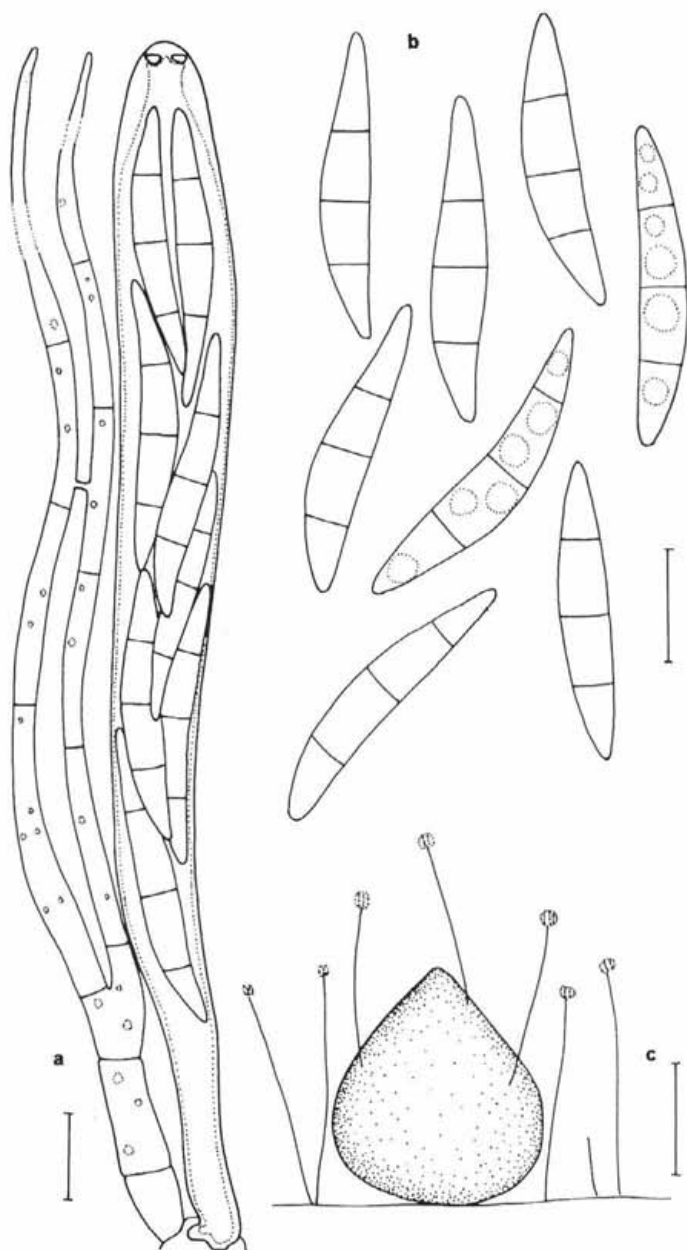


Fig. 2a-c. *Chaetosphaeria acutata*. - a. Ascus with ascospores and paraphyses. - b. Ascospores. - c. Habit sketch of the perithecium and conidiophores. - a-c from the type PRM 842979. - Scale bars: a, b = 10 μ m; c = 100 μ m.

2. *Chaetosphaeria acutata* Réblová et W. Gams, sp. nov.

Figs. 2, 3.

Perithecia superficialia, gregaria vel solitaria, subglobosa, 170–220 μm alta, 170–200 μm diam, papillata, ostiolata, fusca vel quasi atra, lucida, glabra vel conidiophoris oblecta, modice asperulata. Canalis ostiolaris periphysatus. Paries perithecii fragilis, ad latus 26–33 μm crassus, bistratosus: stratum exterius e cellulis tenuitunicatis, fuscis, lateriformibus constans, interius e cellulis tenuitunicatis, compressis, subhyalinis. Paraphyses copiosae, intervallis 11–21 μm septatae, ad septa non constrictae, ramosae, anastomosantes, hyalinae, 3–4 μm latae in parte inferiore, ad 1.5–2 μm angustatae, ultra ascorum apices protrudentes. Asci 8-spori, cylindrici vel clavati, (95–)121–147 \times (8.5–)9.5–10.5(–11.5) μm , breviter stipitati, apex anulo I-, refringente, 3.0–3.5 μm lato et 1.0–1.2 μm alto praeditus, 8-spori. Ascosporae fusiformes, utrinque fere acutatae et minime rotundatae, (28–)30.5–38(–44) \times 3–4(–5) μm , 3-septatae, non constrictae, leves, hyalinae, oblique 1–2(–3)-seriatae inasco, tubis polaribus germinantes.

Anamorphosis *Cylindrotrichum* sp.: Conidiophoris simplicibus, fuscis, sursum pallidioribus, 125–190 \times (4–)5–6.5 μm , sursum ad 3–4 μm angustatis, monophialidicis, saepe semel percurrenter proliferantibus. Phialides supra collare 4–10.5 μm extendentes, quinquies ad dodecies annellatae. Conidia cylindrica vel clavata, recta vel modice curvata, ad basim truncata, ad apicem rotundata, 1-septata, haud constricta, levia, hyalina, (11–)12.5–15.5(–16.5) \times 4–5 μm .

Holotypus. Bohemia meridionalis, montes Šumava, Železná Ruda, ad lignum putridum *Fagi sylvaticae*, 28 Aug. 1997, leg. M. R. 994/97 (PRM 842979).

Etymology. Lat. *acutatus* = pointed, referring to the tapering ends of the ascospores.

Anamorph. *Cylindrotrichum* sp. (described here).

Fig. 3a-d.

Teleomorph. Perithecia superficial, gregarious to solitary, subglobose, 170–220 μm high and 170–200 μm diam, papillate, ostiolate, dark brown to nearly black, glistening, glabrous or covered with conidiophores of the anamorph, slightly roughened. Perithecial wall brittle, lateral wall 26–33 μm thick, consisting of two layers; an outer layer of thin-walled, dark brown, opaque brick-like cells, and an inner layer of thin-walled, compressed, subhyaline cells. Ostiolar canal periphysate. Paraphyses copious, septate at 11–21 μm intervals, non-constricted at the septa, branching, anastomosing, 3–4 μm wide in the lower part, tapering to 1.5–2 μm , protruding beyond the tips of the asci. Asci cylindrical-clavate, (95–)121–147 \times (8.5–)9.5–10.5(–11.5) μm , shortly stipitate, ascal apex with a J-, refractive, 3–3.5 μm wide and 1–1.2 μm deep apical annulus. Ascospores fusiform, narrowly rounded at the ends, (28–)30.5–38(–44) \times 3–4(–5) μm , 3-septate, not

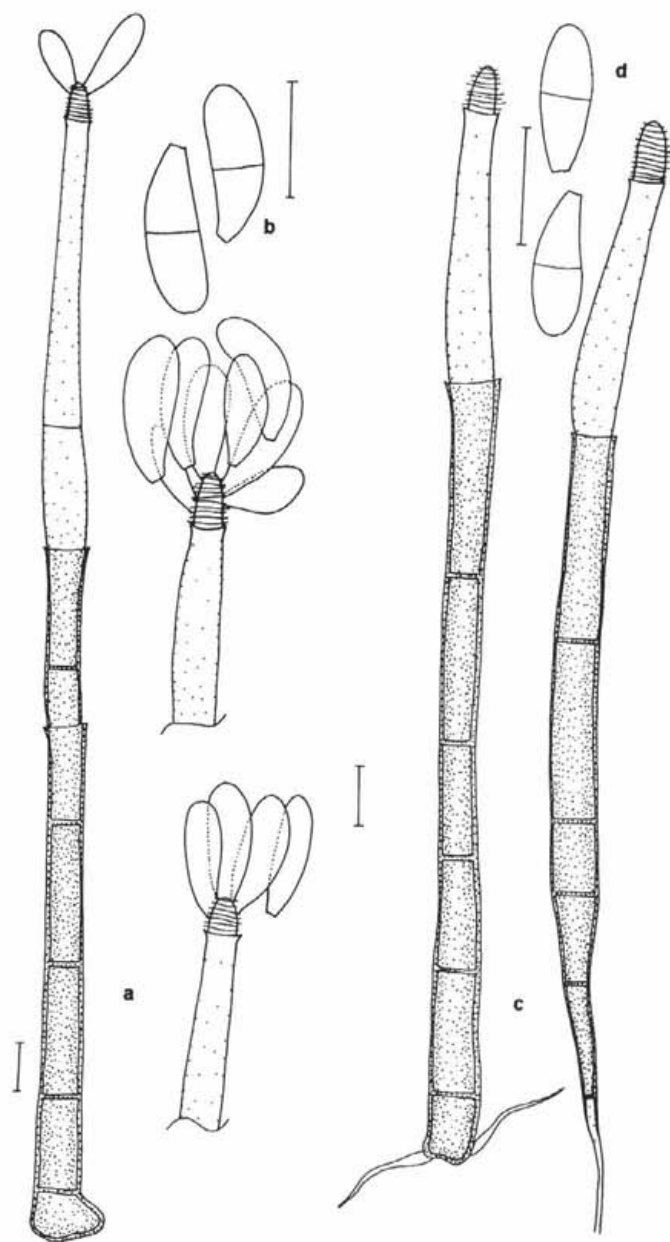


Fig. 3a-d. *Chaetosphaeria acutata*. - a. Conidiophore and sporogenous apices of the conidiophores, from nature. - b. Conidia, from nature. - c. Conidiophores, from PCA culture. - d. Conidia, from PCA culture. - a-d from CBS 101315, PRM 842979. - Scale bar: a-d = 10 μ m.

constricted, smooth, hyaline, obliquely 1-2(-3)-seriate, partially overlapping in the ascus, germinating by germ tubes at the ends.

Anamorph. Colonies hairy, dark, conidiophores arising from the substratum or covering the perithecia. Setae absent. Conidiophores macronematous, mononematous, solitary, erect, unbranched, cylindrical, 125-190 μm long and (4-)5-6.5 μm wide in the middle, tapering to 3-4 μm , straight or slightly flexuous, dark brown, paler towards the apex, smooth, often with 1 percurrent proliferation. Phialides terminal, cylindrical, the percurrently proliferating part above the collarete 4-10.5 μm long and 3.5-5 μm wide, with 5-12 densely annellate proliferations. Primary collarettes hyaline, 4.5-5.5(-6) μm wide and 1 μm deep. Conidia (11-)12.5-15.5(-16.5) \times 4-5 μm , cylindrical to clavate, straight or slightly curved, tapering and truncate at the proximal end, rounded at the distal end, 1-septate, not constricted, smooth-walled, hyaline.

Characteristics in culture. Colonies on PCA slow-growing, reaching 3-4 mm diam in 10 days at 25 °C in darkness, when grown for another 10 days at 25 °C in cool white fluorescent light reaching 7-8 mm diam; felty, greyish brown, aerial mycelium developed, margins fimbriate, no conidiation; reverse dark brown to nearly black. In 20 days: CMA: 4-4.5 mm diam, MEA: 6-7 mm diam; OA: 3.5-4 mm diam; CMA, MEA: felty, greyish brown, aerial mycelium well-developed, margins fimbriate, no conidiation; OA: colonies having a moist appearance, mid-brown, aerial mycelium scant, no conidiation. Colonies sporulated only on PCA, OA and CMA in 2-3-month-old slant cultures preserved at 18 °C under cool white fluorescent light. Mycelium superficial or immersed; hyphae branched, septate, subhyaline, smooth, 2.5-3 μm wide. Setae absent. Conidiophores as on the natural substratum 84-150(-200) μm long and 5-6 μm wide in the middle, tapering to 3-4.5 μm . Phialides with hyaline primary collarete 4-6 μm wide and 1-1.5(-2) μm deep. Conidia 10.5-14.5 \times 3-4.5 μm .

Material examined. 1) Type material. Czech Republic. Southern Bohemia, Šumava Mts., glacial cirque of the lake Čertovo jezero near Železná Ruda, on wood of *Fagus sylvatica*, 28 Aug. 1997, M. R. 994/97 (PRM 842979 - holotype of *Chaetosphaeria acutata*)

2) Additional material examined. Czech Republic. Southern Bohemia, Šumava Mts., glacial cirque of the lake Černé jezero near Železná Ruda, on wood of *Fagus sylvatica*, 23 Oct. 1996, M. R. (Herb. M. R. 906/96); *ibid.*, 27 Aug. 1997, M. R. (Herb. M. R. 1043/97). - France. Central Pyrenees, Bagnères de Luchon, Lys valley, on wood of *Fagus sylvatica*, 13 July 1997, M. R. (Herb. M. R. 974/97). - Ukraine, Eastern Carpathian Mts., Kvasi near Rachiv, on left bank of the river Tisa, on wood of *Corylus avellana*, 26 June 1997, M. R. (Herb. M. R. 948/97).

Cultures. CBS 101311 (Herb. M. R. 948/97); CBS 101312 (Herb. M. R. 974/97); CBS 101315 (PRM 842979).

Habitat. Saprobe on decayed wood of deciduous trees.

Known hosts. *Corylus avellana*, *Fagus sylvatica*.

Known distribution. Europe: Czech Republic, France, Ukraine.

Note. The species was initially identified as *Lasiosphaeria britzelmayri* Sacc. subsp. *fennica* P. Karst. (Karsten 1887). The redescription of this taxon by Podlahová (1974) seemed to match our fungus perfectly. But the type specimen in H showed that ascospores clearly differ in shape and size. They are rather longer [(34.5–)36.5–42(–43) × (3.5–)4(–4.5) μm], elongate-fusiform and tapering strongly towards the ends immediately after the middle septum. The asci are of a size [(126–)133–152(–168) × (8.5–)9–10.5 μm] comparable to that of *Chaetosphaeria acutata*. The anamorph associated with perithecia on the type material of *Lasiosphaeria britzelmayri* subsp. *fennica* is *Chloridium*-like and entirely different from the *Cylindrotrichum* anamorph of *Chaet. acutata*. The conidia are mid-brown and non-septate. *Lasiosphaeria britzelmayri* Sacc. subsp. *fennica* is therefore another species of *Chaetosphaeria* to be included in the present paper.

Chaetosphaeria acutata clearly differs from other species of the genus by its typically long fusiform, at maturity 3-septate ascospores, the *Cylindrotrichum* anamorph and its exclusive occurrence on decayed wood of deciduous trees. In areas with near-natural and natural stands dominated by *Fagus sylvatica* and *Abies alba*, where the fungus occurs, it is not uncommon.

Conidia of the *Cylindrotrichum* anamorph of *Chaet. acutata* are formed successively from the sporogenous apex of the proliferating conidiogenous cells. *Cacumisporium capitulatum* has similarly proliferating conidiogenous cells but differs in having at maturity 4-celled, bicolorous and larger conidia.

3. *Chaetosphaeria crustacea* (Sacc.) Réblová et W. Gams, comb. nov. Figs. 4–6.

≡ *Zignoëlla crustacea* Sacc., Syll. Fung. 2: 220, 1883. – basionym.

≡ *Sphaeria crustacea* P. Karst., Fungi fenn. exs. 865, 1869; more elaborated in Bidr. Känn. Finl. Nat. Folk. 23: 95, 1873 [non *Sphaeria crustacea* Sow., Col. Fig. Engl. Fung. 1: Tab. 372, Fig. 3, Pl. 372, 1803 = *Hypoxylon multifforme* (Fr.: Fr.) Fr.].

Anamorph. Intermediate between *Cylindrotrichum* and *Chloridium* (described here). Fig. 6a–f.

Teleomorph. Perithecia superficial, solitary to densely gregarious, subglobose to globose, 130–250 μm high and 120–220 μm diam, papillate, ostiolate, papilla

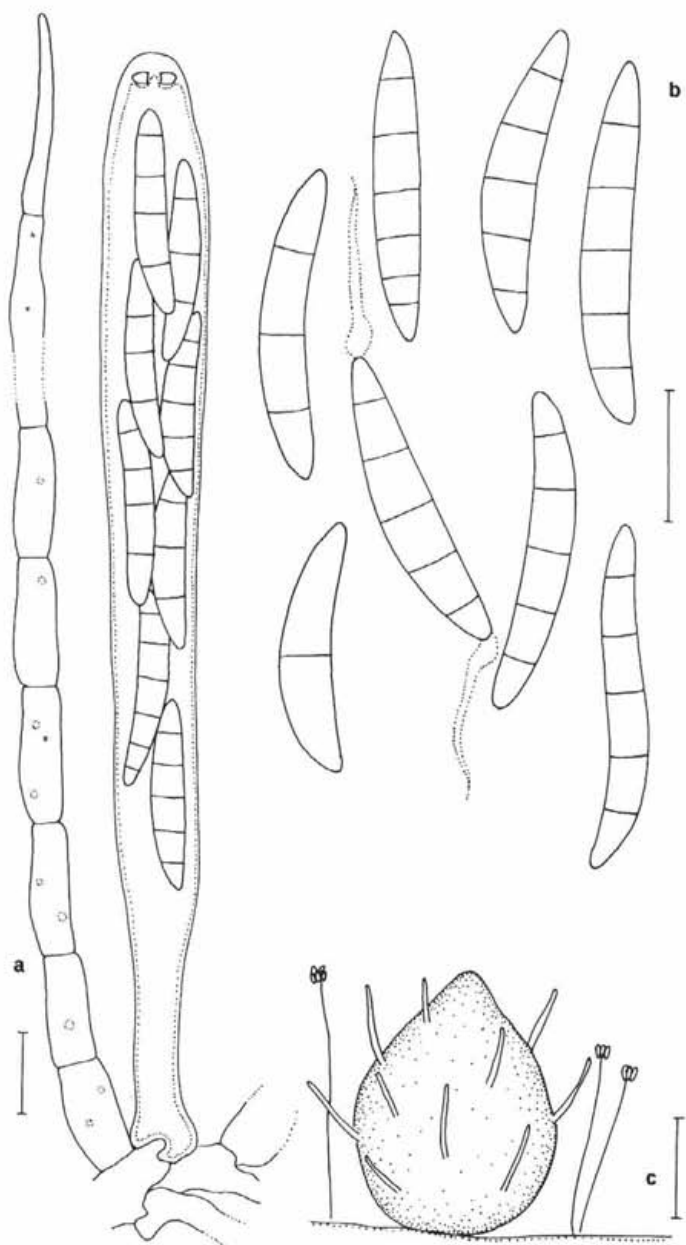


Fig. 4a-c. *Chaetosphaeria crustacea*. - a. Ascus with ascospores and a paraphysis. - b. Ascospores. - c. Habit sketch of perithecium and conidiophores. - a-c from Herb. M. R. 996/97. - Scale bars: a, b = 10 μ m; c = 100 μ m.

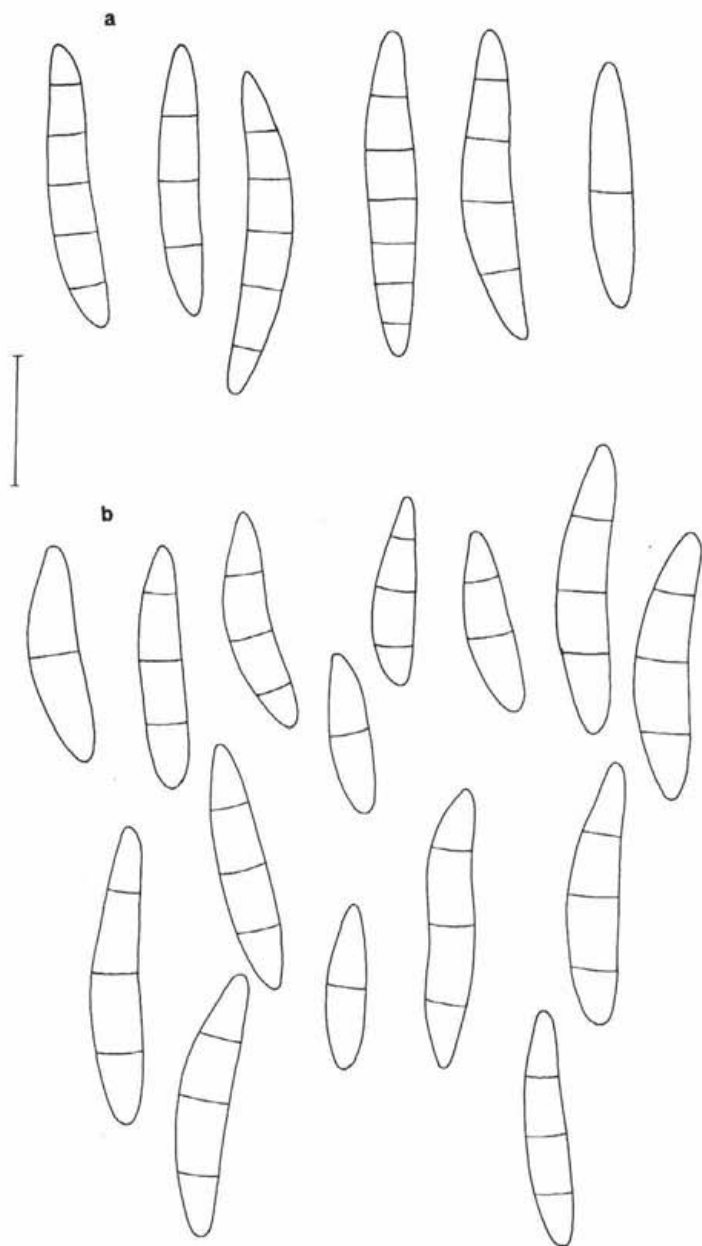


Fig. 5a, b. *Chaetosphaeria crustacea*. - a, b. Ascospores. - a from H; b from Herb. M. R. 1169/97. - Scale bar: a, b = 10 μ m.

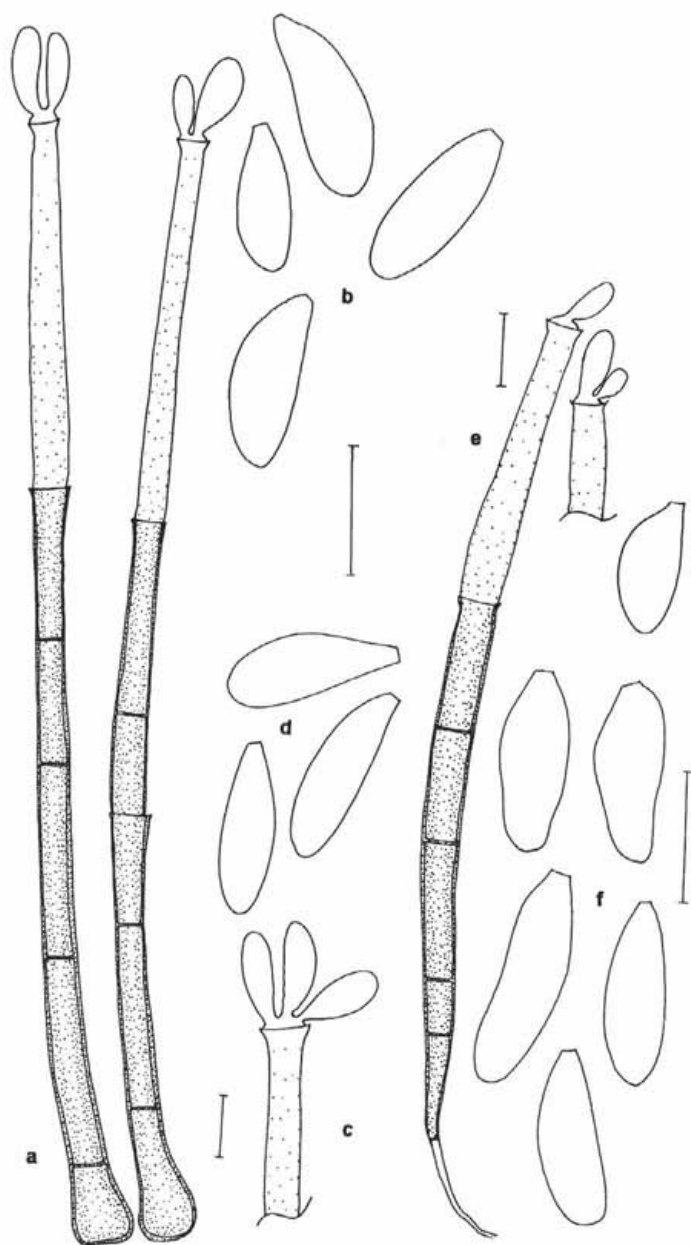


Fig. 6a-f. *Chaetosphaeria crustacea*. - a. Conidiophores, from nature. - b. Conidia, from nature. - c. Sporogenous apex of the conidiophore, from PCA culture. - d, f. Conidia, from PCA culture. - e. Conidiophore, from PCA culture. - a, b, e, f from Herb. M. R. 996/97; c, d from CBS 101321, Herb. M. R. 1169/97; e, f from CBS 101316. - Scale bar: a-f = 10 μ m.

perforated by a rounded pore in old perithecia, black, glistening, setose, slightly roughened. Setae scattered over the perithecia, erect, dark brown, septate, obtuse, 30–130 μm long and 3–3.5 μm wide in the middle. Perithecial wall brittle, lateral wall 15–22 μm thick, consisting of two layers; an outer layer of thin-walled, opaque, brick-like cells, and an inner layer of thin-walled, subhyaline, compressed cells. Ostiolar canal periphysate. Paraphyses copious, septate at 18–21 μm intervals, slightly constricted at the septa, branching, anastomosing, 4–5 μm wide in the lower part, tapering to 2 μm , protruding beyond the tips of the asci. Asci cylindrical-clavate, 75–105(–115) \times (8.5–) 9.5–10.5 μm , shortly stipitate, 8-spored, ascus apex with a J-, 2.5 μm wide and 1.5 μm deep apical annulus. Ascospores cylindrical-fusiform, straight or curved, (15.5–)19–26(–28) \times 3–3.5(–4) μm , predominantly 3-septate, with a delayed formation of the 2–3 additional septa, not constricted, smooth, hyaline, 2–3-seriate, partially overlapping in the ascus, germinating by a germ tube at one or both ends; no tendency of fragmentation.

Anamorph. Colonies hairy, dark, conidiophores arising from decayed wood and also covering the perithecia. Setae absent. Conidiophores macronematous, mononematous, solitary, erect, unbranched, 170–210 μm long and 4.5–5.5 μm wide above the base, tapering to 3–3.5 μm below the collarette, cylindrical, straight or slightly flexuous, septate, often with 1(–2) distant percurrent proliferation, dark brown, paler towards the apex, smooth-walled. Phialides terminal, cylindrical, 23–32 \times 3.5–4.5 μm . Collarettes hyaline, 4–5 μm wide and 1.5–2.5 μm deep. Conidia arising in a sympodial manner on a central dome inside the collarette like in *Chloridium virescens*, cylindrical-clavate, (11.5–)14.5–17(–21) \times 3–4.5 μm , straight or curved, rounded at the tip, tapering and truncate at the base, 1-celled, smooth, hyaline.

Characteristics in culture. Colonies on PCA slow-growing, reaching 4–5 mm diam in 10 days at 25 °C in darkness, when grown for another 10 days at 25 °C in cool white fluorescent light reaching 10–11 mm diam; velvety, centre dark greyish brown due to hyphae of aerial mycelium and conidiophores, dark brown to nearly black at the fimbriate margin, forming a conspicuous dark, sterile zone of submerged mycelium; conidial production copious in 10 days; conidiophores arising in the centre; conidial masses globose, whitish; reverse dark grey; no pigments released. In 20 days: CMA: 9–10 mm diam; MEA 12 mm diam; OA 9–12 mm diam; CMA, MEA, OA: velvety, dark grey, with copious conidial production in 10 days on CMA, OA; on MEA after 20 days. The black sterile zone formed by substrate mycelium at the margins is most pronounced on CMA, less on PCA and OA and is not developed on MEA. Mycelium superficial or immersed; hyphae branched, septate, subhyaline, smooth, 2–3 μm wide. Setae absent. Conidiophores as on the natural substratum, 70–160 μm

long, 4–5 μm wide in the middle, tapering to 3–3.5 μm below the collarette. Phialides 23–44 \times 3.5–4.5 μm ; collarettes 4–5 μm wide and 1.5–2.5(–3) μm deep. Conidia (11–)12.5–16.5(–20) \times 3–4(–5) μm . Chlamydospores absent.

Material examined. 1) Type material. Finland. Ostrobothnia, Vaasa, on *Pinus sylvestris*, P. A. Karsten, Fung. Fenn. exsicc. 865, (H – lectotype of *Zignoëlla crustacea*).

2) Additional material. Czech Republic. Southern Bohemia, glacial cirque of the lake Černé jezero near Železná Ruda, on wood of *Abies alba*, 7 Nov. 1997, K. Prášil (Herb. M. R. 1169/97). – Ukraine. Eastern Carpathian Mts., Kvasi near Rachiv, on left bank of the river Tisa, on wood of *Picea abies*, 26 June 1997, M. R. (Herb. M. R. 996/97).

Cultures. CBS 101316 (Herb. M. R. 996/97); CBS 101321 (Herb. M. R. 1169/97).

Descriptions and illustrations. Karsten (1873: 95); Saccardo (1883: 220).

Habitat. Saprobe on decayed wood and bark of conifers.

Known hosts. *Abies alba*, *Picea abies*, *Pinus sylvestris*.

Known distribution. Europe: Czech Republic, Finland, Ukraine.

Note. The type collection of *Zignoëlla crustacea* made by Karsten in Finland (Karsten 1873) contains densely setose perithecia seated on wood of *Pinus sylvestris*, and 3–5 transversely septate, hyaline ascospores (22–24.5 \times 3–3.5 μm). No anamorph was observed. The perithecia from the recent collections are densely setose in a collection made in the Czech Republic and sparsely setose in a collection made in the Ukraine. In both collections the same *Cylindrotrichum* species was found growing on the substratum and was also obtained in the living culture. Traditionally, *Chaetosphaeria* only contains species with glabrous perithecia. They may, however, become setose when the setae and conidiophores of the associated anamorph arise both from the substratum and the perithecial surface. *Chaetosphaeria crustacea* is an example of a fungus with setose perithecia associated with a *Cylindrotrichum-Chloridium*-like anamorph. The recent finds represent the first records of this fungus since its description.

In the type material both 3-septate and 4–5-septate ascospores were present. Inside the asci only the 3-septate ascospores were seen. The 4–5-septate ascospores were released from the perithecium and seen attached to the perithecial surface and on the substratum. In the specimen from the Ukraine mainly 5-septate ascospores and in that from the Czech Republic only 3-septate ascospores were seen.

Chaetosphaeria crustacea is similar in ascospore shape and septation to *Chaet. decastyla* but differs in shorter ascospores and asci, setose perithecia, the *Cylindrotrichum-Chloridium*-like anamorph and the occurrence on decayed wood of conifers. *Chaetosphaeria crustacea* occurs rarely and is known from three localities in Europe only.

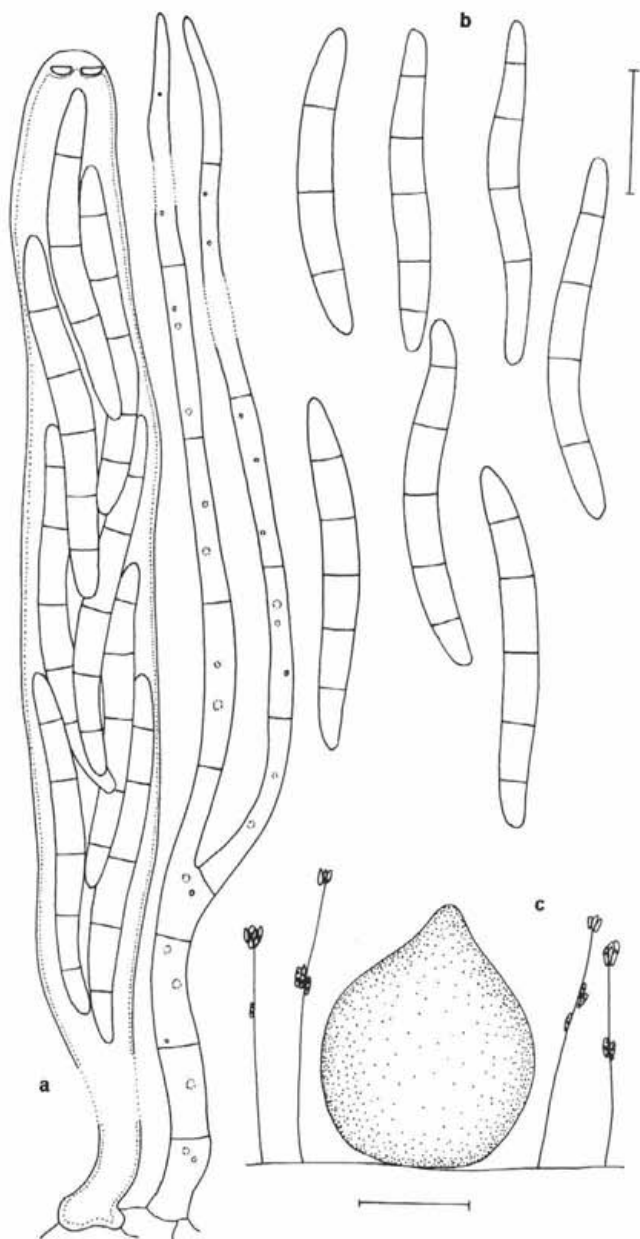


Fig. 7a-c. *Chaetosphaeria decastyla*. - a. Ascus with ascospores and paraphyses. - b. Ascospores. - Habit sketch of perithecium and conidiophores. - a-c from Herb. M. R. 985/97. - Scale bars: a, b = 10 μ m; c = 100 μ m.

4. *Chaetosphaeria decastyla* (Cooke) Réblová et W. Gams, comb. nov.

Figs. 7-9.

≡ *Sphaeria decastyla* Cooke, Grevillea 7: 52, 1878. - basionym.≡ *Acanthostigma decastylum* (Cooke) Sacc., Syll. Fung. 2: 210, 1883.= *Melanomma macrosporum* Sacc., Hedwigia 14: 73, May 1875; see also Saccardo, Fungi ital. delin. 300, Feb. 1878; Michelia 1: 449, 15 Nov. 1878.≡ *Zignoëlla macrospora* (Sacc.) Sacc., Michelia 1: 346, 1 July 1878; Syll. Fung. 2: 221, 1883 [non *Chaetosphaeria macrospora* (Kawamura) Hara, J. Pl. Prot. Tokyo 16(2): 16, 1930].Anamorph. *Cacumisporium capitulatum* (Corda) S. Hughes, Canad. J. Bot. 96: 743, 1958. Fig. 9a-d.≡ *Helminthosporium capitulatum* Corda, Ic. Fung. 2: 13, 1838.= *Cacumisporium tenebrosum* Preuss, Linnaea 24: 130, 1851.

Teleomorph. Perithecia superficial, solitary or in groups of 3-5, subglobose to conical, 200-260 μm high and 180-210 μm diam, papillate, papilla perforated by a rounded pore in old perithecia, ostiolate, dark brown to black, glistening, glabrous or covered with conidiophores of the anamorph, slightly rugose. Perithecial wall brittle, 17-22 μm thick, consisting of two layers; an outer layer of thin-walled, dark brown, opaque, polyhedral to brick-like cells, and an inner layer of thin-walled, compressed, hyaline cells. Ostiolar canal periphysate. Paraphyses copious, branching, septate at 18-42 μm intervals, 3-3.5 μm wide in the lower part, tapering to 1.5 μm , protruding beyond the tips of the asci. Asci clavate-cylindrical, 68-90 μm long in the *pars sporifera* \times 10.5-11.5 μm , stipe 30-54 μm long, narrowly rounded at the tip, with a J-, refractive, 3-3.5 μm wide and 1 μm deep apical annulus. Ascospores cylindrical to cylindrical-fusiform or fusiform, occasionally tapering towards one end, (28-)30-42(-46) \times 3-4 μm , at maturity 5-septate, not constricted or very slightly constricted at the septa, smooth-walled, hyaline, 2-3-seriate, overlapping in the upper part of the ascus, germinating by germ tubes at the ends.

Anamorph. Colonies hairy, dark, conidiophores arising from the substratum or covering the perithecia. Setae absent. Conidiophores macronematous, mononematous, solitary, erect, unbranched, cylindrical, up to 200 μm long, 6.5-7.5 μm wide above the base, tapering to 5-6 μm below the primary collarette, straight or slightly flexuous, septate, brown to pale brown, paler towards the apex, smooth, with 1-2 major percurrent proliferations. Phialides terminal, cylindrical, the proliferating part above the primary collarette 10-15 μm long and 5-6 μm wide, with 9-12 narrow annellate proliferations. Primary collarettes almost hyaline, 7-9.5 μm wide and (1-)1.5-2 μm deep. Conidia cylindrical, 15-20 \times 5-6.5 μm , straight or slightly curved, rounded at the tip, truncate at the base, 3-septate, not constricted, at

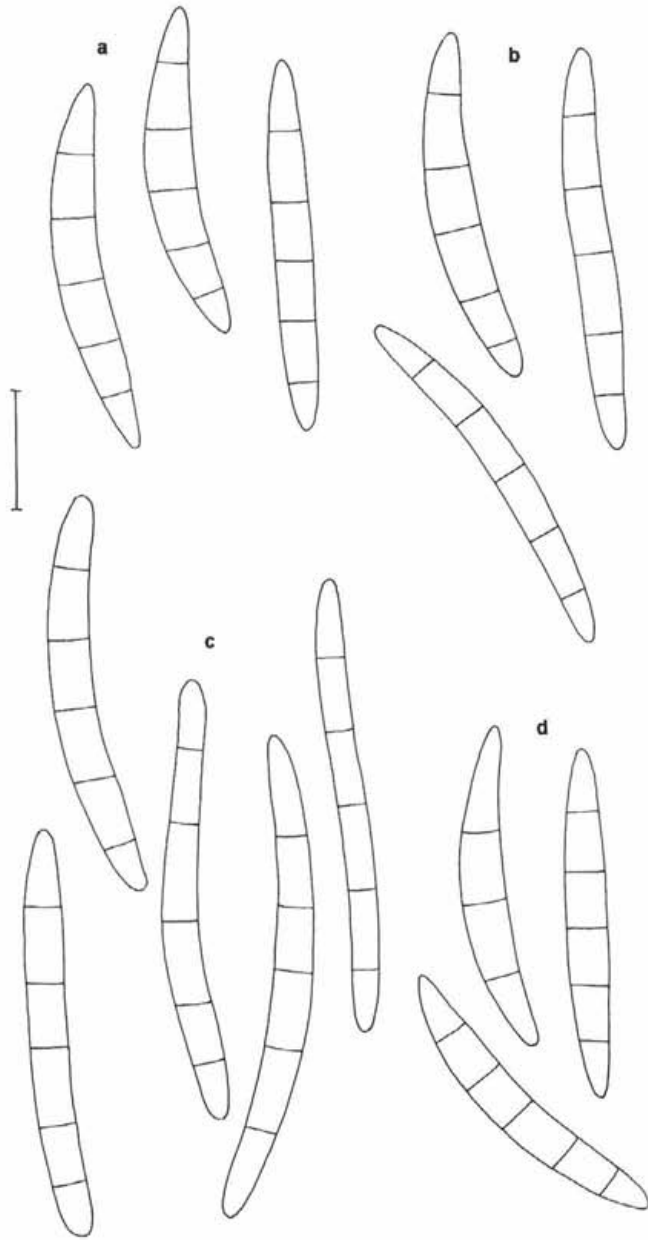


Fig. 8a-d. *Chaetosphaeria decastyla*. - a-d. Ascospores. - a-d from NY: a (USA, New Jersey, Newfield, on bark and wood of *Magnolia* sp.); b (USA, Georgia, Darien, on wood of *Quercus* sp., Ravenel 2420); c (Gloucester County, Newfield, 22 Jan. 1878); d (USA, Louisiana, on a decayed log of oak, 2 Jan. 1886, A. B. Langlois). - Scale bars: a-d = 10 μ m.

first hyaline, at maturity the two middle cells turning brown and the two end cells remaining hyaline, mature conidia often attached to the middle and lower part of the conidiophore.

Characteristics in culture. Colonies on PCA slow-growing, reaching 4–5 mm diam in 10 days at 25 °C in darkness, when grown for another 10 days at 25 °C in cool white fluorescent light reaching 8 mm diam; velvety, dark grey, aerial mycelium well-developed, margins fimbriate; conidial production scarce after 20 days; conidiophores scattered, conidial masses globose, hyaline; reverse greyish. Colonies sporulating copiously with conidiophores arranged in 2–3 concentric zones in 2 month-old slant cultures preserved at 18 °C under cool white fluorescent light. In 20 days: CMA: 7–8 mm diam; OA: 6–7 mm diam; CMA, OA: velvety, dark grey, conidial production scarce at the margins; MEA: 9–10 mm diam, velvety, greyish to pale brown, no conidial production. Mycelium superficial or immersed; hyphae branched, septate, subhyaline, smooth, 1.5–2.5 μm wide. Setae absent. Conidiophores as on the natural substratum, (100–)127–176 μm long, 5.5–6.5(–7.5) μm wide in the middle and 13–16 μm wide at the base, tapering to 5–6(–6.5) μm . Phialides with the proliferating part 5–14 μm long and 5–6(–6.5) μm wide, with 10–12 proliferations. Conidia 19–22(–24) \times 6–7 μm . In 2-month old slant cultures the conidia became mature, the two middle cells gradually turning brown and the two end cells remaining hyaline or at least paler, mature conidia often sticking to the middle and lower part of the conidiophore.

Material examined. 1) Type material. Italy. Cansiglio (Treviso), on decorticated wood of *Fagus sylvatica*, Oct. 1874, P. A. Saccardo (PAD – holotype of *Melanomma macrosporum*). – USA, Georgia, Darien, on wood of *Quercus* sp., Ravenel 2420, (K 59126 – holotype of *Sphaeria decastyla*; NY – isotype).

2) Additional material. France, Central Pyrenees, Bagnères de Luchon, Lys valley, on decayed wood of *Fagus sylvatica*, 13 July 1997, M. R. (Herb. M. R. 985/97, 988/97). – USA, New Jersey, Newfield, on bark of *Magnolia* sp., 10 July 1887 (NY); New Jersey, Gloucester County, Newfield, 22 Jan. 1878 (NY); *ibid.*, on a bark of *Magnolia* sp., 29 June 1882 (NY); Louisiana, on a decayed log of oak, 2 Jan. 1886, A. B. Langlois (NY).

Cultures. CBS 101313 (Herb. M. R. 985/97); CBS 101314 (Herb. M. R. 988/97).

Descriptions and illustrations. Saccardo (1875: 73; 1878: 449; 1883: 210, 221); Cooke (1878: 52); Ellis and Everhart (1882: 155); Berlese (1894: 100, Tab. 94, Fig. 1).

Habitat. Saprobe on decayed wood of deciduous trees.

Known hosts. *Fagus sylvatica*, *Magnolia* sp., *Quercus* sp.

Known distribution. Europe: France, Italy; North America: USA (New Jersey, Louisiana).

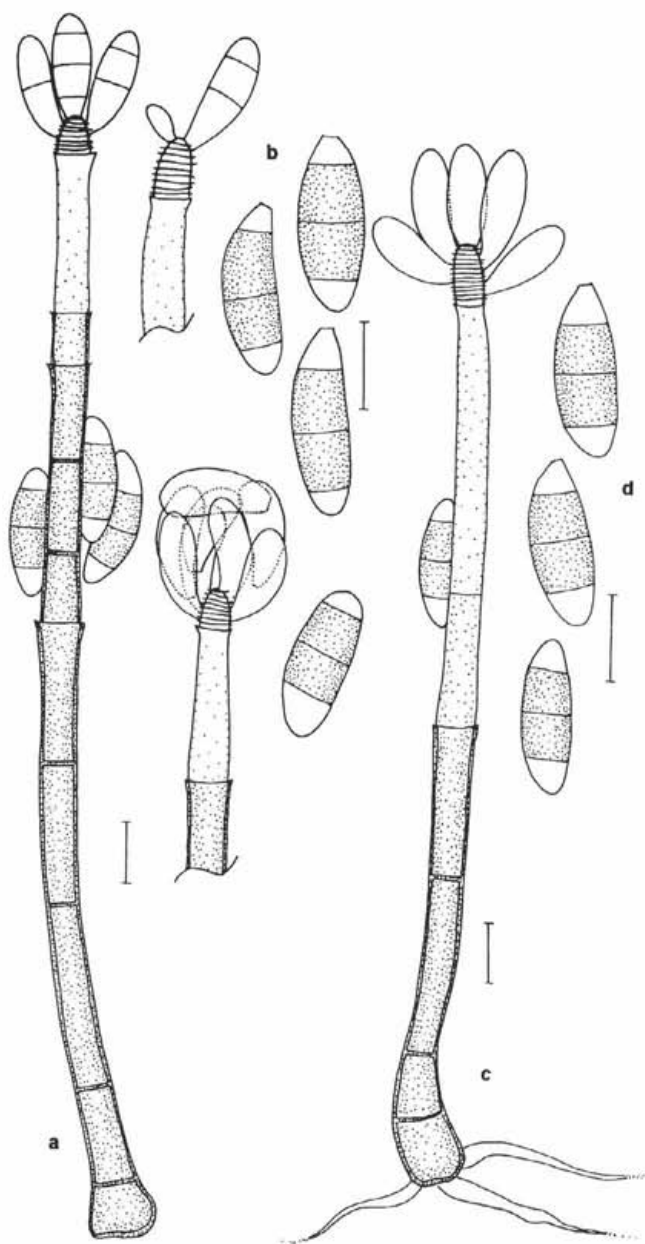


Fig. 9a-d. *Chaetosphaeria decastyla*. - a. Conidiophore with conidia and sporogenous conidiophore apices, from nature. - b. Conidia, from nature. - c. Conidiophore with conidia, from PCA culture. - d. Conidia, from PCA culture. - a-d from Herb. M. R. 985/97; c, d from CBS 101313. - Scale bar: a-d = 10 μ m.

Nomenclatural note. The name *Chaetosphaeria decastyla* is based on *Sphaeria decastyla* Cooke 1878, even though the name *Melanomma macrosporum* Sacc. 1875 would have priority. If the epithet 'macrosporum' were transferred to *Chaetosphaeria* this would result in a homonymous combination (Art. 53.1, Greuter et al. 1994) with *Chaetosphaeria macrospora* (Kawamura) Hara [Hara, J. Pl. Prot. Tokyo 16(2): 16, 1930] that is based on *Miyoshiella macrospora* Kawamura [Kawamura, J. Coll. Sci. Imp. Univ. Tokyo 23(2): 295, 1929]. *Miyoshiella macrospora* does not belong to *Miyoshiella* Kawamura, a member of the Trichosphaeriaceae G. Winter (Réblová 1998c). *Miyoshiella macrospora* is a pyrenomycetous ascomycete forming black spots on bamboo culms having transversely 7-septate, blackish brown ascospores and unitunicate asci. Therefore, the second available name is chosen and the new combination *Chaetosphaeria decastyla* is proposed.

Note. The holotype and isotype and other collections of *Sphaeria decastyla*, including those cited by Ellis and Everhart (1882), are preserved in K and NY. They possess perithecia accompanied by conidiophores of the *Cacumisporium capitulatum* anamorph. Ascospores of North American collections, except for one specimen (USA, New Jersey, Gloucester County, Newfield, 22 Jan. 1878), differ in shape and size from European material that is represented by Saccardo's type material of *Melanomma macrosporum* and two recent collections made in France. Specimens from North America have rather fusiform and shorter ascospores (Fig. 8) [(28-)30-34.5(-36.5) × 3-4 µm] than those of the European material, in which the ascospores (Fig. 7) are cylindrical to cylindrical-fusiform and longer [(31.5-)35.5-42(-46) × 3-4 µm]. The specimen collected in USA, New Jersey, Gloucester County, Newfield, has ascospores much like those of the European collections, cylindrical, measuring (27-) 30.5-39(-42) × 3-4 µm.

Ellis and Everhart (1882) described perithecia sparsely clothed with obtuse, septate setae. These setae (50-115 × 3-4.5 µm) were found only on several perithecia of the holotype of *Sphaeria decastyla* and other material (USA, New Jersey, Newfield, on bark of *Magnolia* sp., 10 July 1887, NY). The majority of perithecia were glabrous and bore remnants of conidiophores. The obtuse setae were not found in European material. Ellis and Everhart (1882) noted that the substratum surface in both collections was clothed with hairs similar to those growing on the perithecia. Our revision revealed that the so-called hairs are conidiophores of the *Cacumisporium capitulatum* anamorph.

Ellis and Everhart (1882) cited in a synonymy of *Acanthostigma decastylum* three names, viz. *Sphaeria cariosa* Cooke et Ellis, *Sphaeria atriella* Cooke et Ellis and *Lasio-sphaeria subvelutina* Ellis et Everhart. *Sphaeria cariosa* (Holotype: USA, New Jersey, Newfield, on bark of decayed oak, 15 Feb. 1877, J. B. Ellis 2789, K 59125, NY - isotype) is a species of *Chaetosphaeria*, known as *Chaet. ovoidea* (Fr.) O. Constant. et al.; the *Menispora glauca* Pers. anamorph is abundantly present on the type. *Sphaeria atriella* Cooke et Ellis (Isotype: USA, New Jersey,

Newfield, Gloucester County, on rotten wood of *Acer* sp., Dec 1876, NY) was combined by Barr (1993) under *Chaetosphaeria*, as *Chaet. atriella* (Cooke et Ellis) M. E. Barr. We do not believe that this is a true *Chaetosphaeria* species, for it differs in several characters that would characterize a *Chaetosphaeria*. The perithecial wall is leathery, three-layered, ca. 35–48 μm thick, composed of non-opaque, thick-walled cells; paraphyses were not present and the asci were enclosed in a hyaline matrix that could be formed of dissolved paraphyses. No anamorph was associated. The wall of perithecium of *Chaetosphaeria* is different; it is thinner, ca. 15–25 μm , comprising thin-walled, opaque brick-like cells or cells that form a network, paraphyses are always persistent and do not dissolve. *Lasiosphaeria subvelutina* is another possible synonym of *Chaetosphaeria decastyla*, but the type could not be examined (not available in NY).

The type material of *Melanomma macrosporum* contained several mature perithecia and conidiophores of the *Cacumisporium capitulatum* anamorph arising sparsely from the substratum. Mature bicolorous conidia were found attached to the substratum and to the perithecial walls.

The conidiogenesis of *Cac. capitulatum* was described in detail by Goos (1969). The conidia have a flat basal scar and are formed successively from multiple growing points on the apex of the conidiogenous cell. The conidiogenous cells proliferate conspicuously 5–14 μm above the shallow collarete. A similarly proliferating apex of the conidiogenous cells is also found in the *Cylindrotrichum* anamorph of *Chaetosphaeria acutata*, which differs by smaller, hyaline, 2-celled conidia. The measurements of conidia of *Cac. capitulatum* are given from the original culture obtained immediately after isolation from the ascospores. Conidia are generally larger in vitro than on material from nature. After several transfers, *Cac. capitulatum* produces much smaller conidia in vitro [(14–)16–22(–24) \times 5–7 μm] than in nature.

The ascospores of *Chaetosphaeria decastyla* are somewhat similar in shape to those of *Chaet. crustacea*. *Chaet. decastyla* can be clearly distinguished from *Chaet. crustacea* by the exclusive occurrence on wood of angiosperms, longer ascospores and asci, and the *Cac. capitulatum* anamorph.

5. *Chaetosphaeria fennica* (P. Karst.) Réblová et W. Gams, comb. nov.

Figs. 10, 11.

- ≡ *Lasiosphaeria britzelmayri* Sacc. subsp. *fennica* P. Karst., Rev. Mycol. Toulouse 9: 160, 1887. – basionym.
- ≡ *Acanthostigma fennicum* (P. Karst.) Berlese, Icon. Fung. 1: 102, 1894.
- ≡ *Zignoëlla abietis* Höhnelt var. *fennica* (P. Karst.) Höhnelt, Sitzungsber. K. Akad. Wiss., Wien, Math.-naturw. Kl., Abt. 1, 118: 332, 1909.

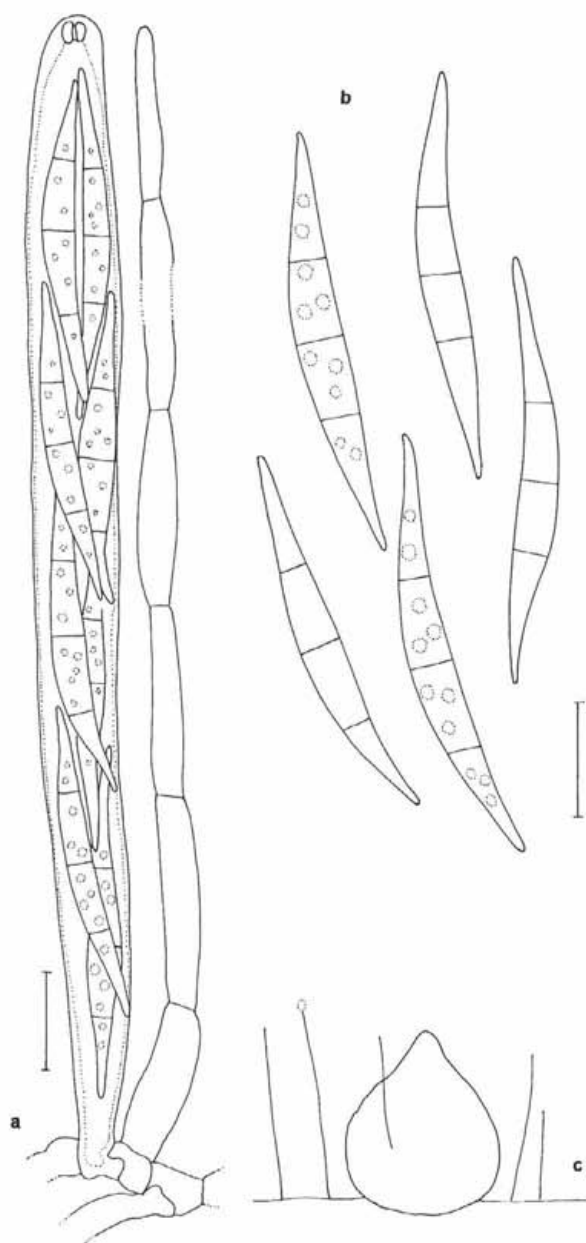


Fig. 10a-c. *Chaetosphaeria fennica*. - a. Ascus with ascospores and a paraphysis. - b. Ascospores. - c. Habit sketch of perithecium and conidiophores. - a-c from H 929. - Scale bars: a, b = 10 μ m.

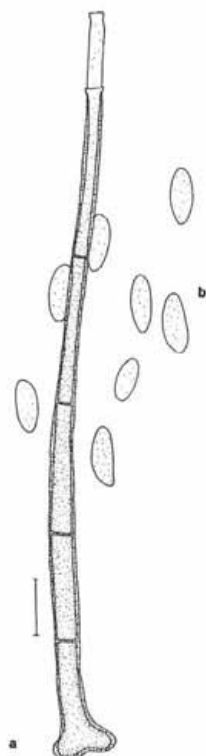


Fig. 11a, b. *Chaetosphaeria fennica*. – a. Conidiophore, from nature. – b. Conidia, from nature. – a, b from H 929. – Scale bar: a, b = 10 μm .

Anamorph. *Chloridium*-like (described here).

Fig. 11a, b.

Teleomorph. Perithecia solitary, scattered, subglobose, 150–200 μm high and 200–220 μm diam, papillate, papilla perforated by a rounded pore in old perithecia, ostiolate, dark brown to black, glabrous or covered with conidiophores of the anamorph, smooth. Perithecial wall brittle, 22–26 μm thick, consisting of two layers; an outer layer of thin-walled, dark brown, opaque, polyhedral to brick-like cells, and an inner layer of thin-walled, compressed, hyaline cells. Ostiolar canal periphysate. Paraphyses copious, branching, anastomosing, septate, 4–5 μm wide in the lower part, tapering to 2.5 μm , protruding slightly beyond the tips of the asci. Asci long-cylindrical, (126–)133–152(–168) \times (8.5–)9–10.5 μm , narrowly rounded at the tip, with a J-, refractive apical annulus, 2.5 μm wide and 1–1.5 μm deep. Ascospores elongate-fusiform and tapering strongly towards the ends immediately after the middle septum, (34.5–)36.5–42(–43) \times (3.5–)4(–4.5) μm , at maturity 3-septate, not constricted at the septa, smooth-walled, hyaline, 2-seriate, overlapping partially in the upper part of the ascus.

Anamorph. Remnants of conidiophores with broken apices were observed growing copiously from the substratum surface and occasionally from the outer wall of the perithecia. Conidiophores macronematous, mononematous, erect, solitary, unbranched, septate, opaque, paler to subhyaline towards the top, 250–270 μm long, 5.5–6.5 μm wide above the base and 20–22 μm wide at the base. Once, a conidiophore with an inconspicuously proliferated apex ending in a hyaline collarete 3 μm wide and 2 μm deep was observed. A lot of conidia were seen attached to the conidiophore. Conidia mid-brown, ellipsoidal, straight or inequilateral, slightly truncate at the base, 8.5–9.5(–10) \times 3–4.5 μm .

The teleomorph-anamorph connection could not yet be proved by culture studies and is only suggested by the joint occurrence of perithecia and conidiophores.

Material examined. Type material. Finland, Mustiala Myllyperä, on decayed bark of *Betula* sp., on old stromata of *Eutypa* sp., 28 July 1887, K. Starbäck, herb. P. Karsten 929 (H – holotype of *Chaetosphaeria fennica*).

Descriptions and illustrations. Karsten (1887: 160); Berlese (1894: 102, Pl. 119, Fig. 3); Saccardo (1891: 852); Podlahová (1974: 149, Tab. 42).

Habitat. Saprobe on stromata of *Eutypa* sp.

Known host. *Eutypa* sp. on *Betula* sp.

Known distribution. Europe: Finland, known only from the type locality.

Note. Podlahová (1974) revised the type material and her observations agree well with ours. Although Karsten (1887) and Berlese (1894) described and illustrated the perithecia as sparsely setose, Podlahová (1974) found them being glabrous. The present revision of the type material showed that the presumed setae were conidiophores that are usually quite firm but only visible as remnants in old herbarium material.

Lasiosphaeria britzelmayri Sacc. (Saccardo 1883) differs from *Chaetosphaeria fennica* in having shorter asci (90–100 \times 9–10 μm) and shorter (28–35 \times 3.5–4 μm), 6–11-celled, cylindrical-fusiform ascospores. Winter (1887) considered this fungus to have bitunicate asci and classified it as *Trematosphaeria paradoxa* G. Winter.

On the basis of ascospore anatomy, *Chaetosphaeria fennica* is closest to *Chaet. acutata*. The ascospores of the latter, though also long-fusiform, are much less tapering towards the ends and are rather shorter. The *Cylindrotrichum* anamorph of *Chaet. acutata* with hyaline and 1-celled conidia at maturity is entirely different from the *Chloridium*-like anamorph associated with *Chaet. fennica*.

6. *Chaetosphaeria fusiformis* W. Gams et Hol.-Jech., Mycotaxon 13: 257, 1981.

Figs. 12, 13.

\equiv *Chaetosphaeria fusispora* W. Gams et Hol.-Jech., Stud. Mycol. 13: 45, 1976. (illegitimate, Art. 53.1.) [non *Chaetosphaeria fusispora* (Kawamura) Hino,

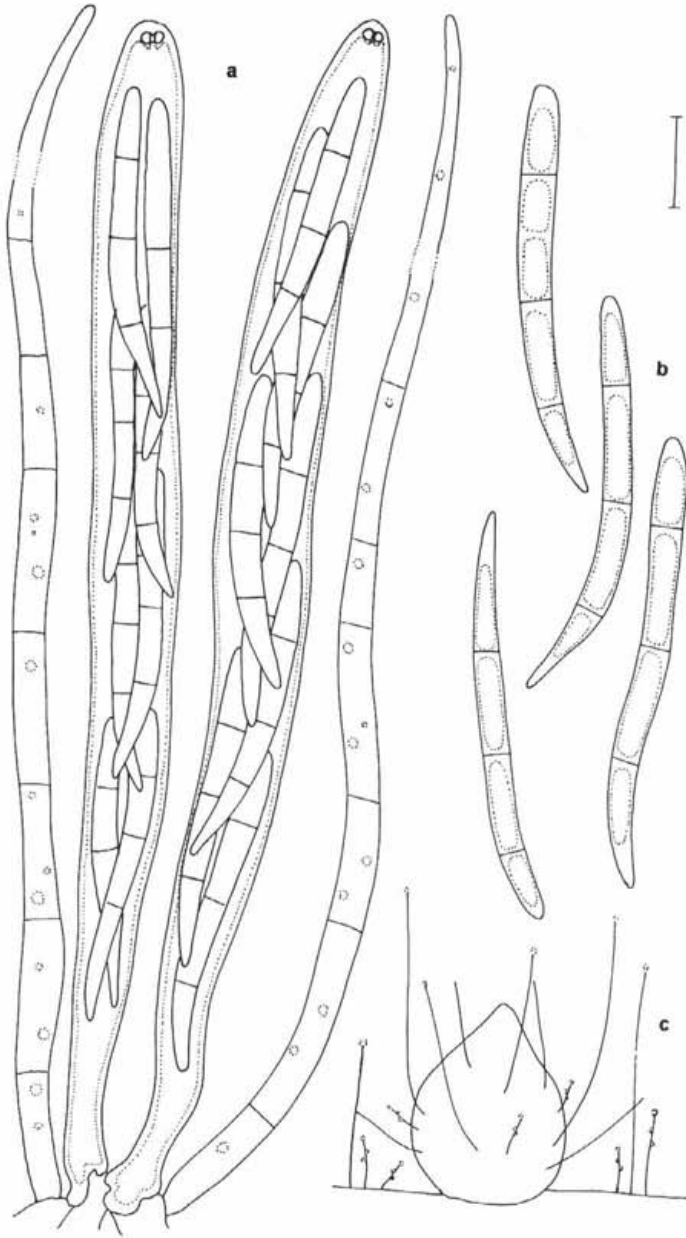


Fig. 12a-c. *Chaetosphaeria fusiformis*. - a. Asci with ascospores and paraphyses. - b. Ascospores. - c. Habit sketch of the perithecium and conidiophores. - a-c from Herb. M. R. 862/96. - Scale bar: a, b = 10 μ m.

Bull. Miyazaki Coll. Agr. For. 4: 191, 1932, nec *Chaetosphaeria fusispora*
P. Larsen, Dansk Bot. Ark. 14(7): 7, 1952.]

Anamorph. *Chloridium cylindrosporum* W. Gams et Hol.-Jech., Stud. Mycol.
13: 46, 1976. Figs. 13a-c.

≡ *Chaetopsis cylindrospora* (W. Gams et Hol.-Jech.) DiCosmo et al., Mycologia
75: 962, 1983.

Teleomorph. Perithecia superficial, densely gregarious or in small groups, globose, 170–250 μm high and 160–240 μm diam, papillate, ostiolate, black, glistening, glabrous, covered with conidiophores of the anamorph, slightly rugose. Perithecial wall brittle, lateral wall 18–28 μm thick, consisting of two layers; an outer layer of dark brown, thin-walled, opaque, brick-like cells, and an inner layer of thin-walled, subhyaline, compressed cells. Ostiolar canal periphysate. Paraphyses copious, septate at 10–21 μm intervals, slightly constricted at the septa, branching, 3–5 μm wide in the lower part, tapering to 2–2.5 μm , rounded at the top, protruding beyond the tips of the asci. Asci cylindrical-clavate, (89–)99–126(–146) \times 8.5–10.5(–11.5) μm , shortly stipitate, ascus apex with a J-, refractive, 2.5–3 μm wide and 1–1.5 μm deep apical annulus that is situated ca. 1 μm below the apex. Ascospores fusiform, tapering at one end and rounded at the other, rarely tapering to both ends, (34.5–)39–53.5(–62) \times 2.5–3(–4) μm , 3-septate, not constricted at the septa, smooth-walled, hyaline, 2–3-seriate, overlapping in the ascus.

Anamorph. Colonies hairy, dark, conidiophores arising from the substratum or covering the perithecia. Setae absent. Conidiophores macronematous, mononematous, solitary, erect, unbranched, forming two layers. Conidiophores of the lower layer cylindrical, 33–55 μm tall and 3.5–4 μm wide in the middle, tapering to 1.5–2 (–2.5) μm below the collarete, straight or slightly flexuous, 0–2-septate, pale brown, sympodially proliferating. Conidiophores of the upper layer cylindrical, (88–)116–230 μm tall and 6–7 μm wide above the base, tapering to 2.0–2.5 μm below the collarete, straight, 6–10-septate, thick-walled, brown to dark brown, paler upwards, usually with 1 percurrent proliferation, ending in a monophialide. Phialides terminal, integrated or intercalary, polyblastic, with 1 apical or 1–3 lateral phialidic openings arising from the sympodial proliferation. Collarettes hyaline, 4–5 μm wide and 2–3 μm deep. Conidia phialidic, cylindrical, centrally slightly constricted, tapering towards the ends, truncate at the base, 10.5–13.5 \times 3.5–5 μm , aseptate when young, later forming 2–3 additional septa, smooth-walled, hyaline, in dry, irregular or star-like heads.

Characteristics in culture. Colonies on PCA slow-growing, reaching 3 mm diam in 10 days at 25 °C in darkness; when grown for another 10 days at 25 °C in

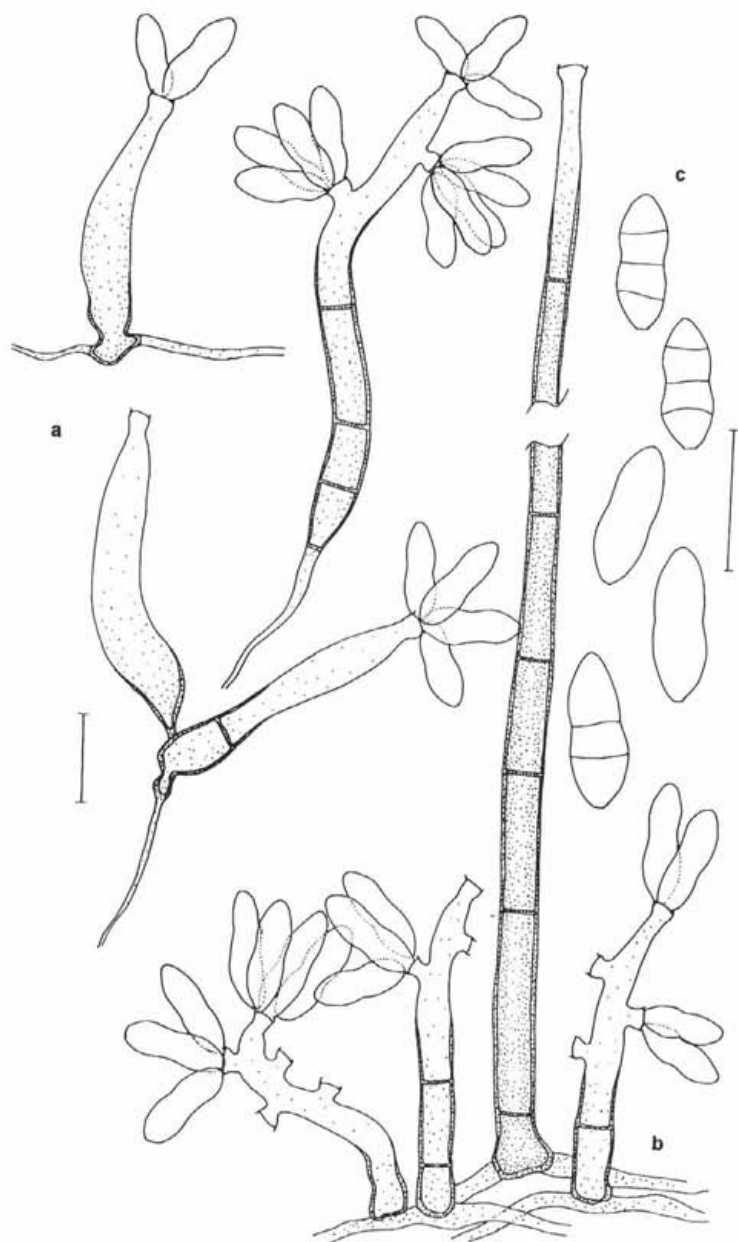


Fig. 13a-c. *Chaetosphaeria fusiformis*. - a. Conidiophores with conidia, from PCA culture. - b. Taller and shorter conidiophores with conidia forming two distinct layers, from nature. - c. Conidia, from nature. - a from CBS 101430; b, c from Herb. M. R. 862/96. - Scale bar: a-c = 10 μ m.

cool white fluorescent light reaching 4–5 mm diam; velvety, mid-brown, zonate, aerial mycelium developed, margins fimbriate; conidial production copious in 20 days, conidiophores scattered, conidial masses globose, hyaline; reverse pale brown. CMA, OA: 4–5 mm diam, velvety, zonate, aerial mycelium developed, conidial production copious in the centre in 10 days; CMA: ochraceous to pale brown; OA: mid-brown; MEA: 2–2.5 mm diam, felty, not zonate, mid-brown, aerial mycelium scant, no conidiation in 20 days. Mycelium superficial or immersed; hyphae branched, septate, subhyaline, smooth-walled, 1.5–2.5 μm wide. Setae absent. Conidiophores as on the natural substratum, conidiophores of the lower layer (24–)30–59(–65) μm tall and 5–6(–7) μm wide above the base, tapering to 1.5–2.5 μm ; conidiophores of the upper layer up to 136 μm tall and 6–7 μm wide above the base, tapering to 2.5–3 μm . Phialides with collarettes 4–5 μm wide and 2–3 μm deep. Conidia 11.5–13.5(–17) \times 4–5 μm .

An upper layer of longer conidiophores was only seen in 4-months old slant cultures on PCA preserved at 18 °C under cool white fluorescent light.

Material examined. 1) Type material. Czech Republic. Moravia, Hrubý Jeseník Mts., on slopes of Mt. Mravenečník near Loučná nad Desnou, on decayed branch of *Abies alba*, 3 Aug. 1971, V. Holubová-Jechová (PRM 794008 – holotype of *Chaetosphaeria fusispora* (\equiv *Chaetosphaeria fusiformis*)).

2) Additional material. Czech Republic. Southern Bohemia, Šumava Mts., glacial cirque of the lake Černé jezero near Železná Ruda, on the inner surface of bark of *Abies alba*, 23 Oct. 1996, M. R. (Herb. M. R. 862/97, 863/97, 866/96, 867/96, 868/96, 874/96, 889/96); *ibid.*, 27 Aug. 1997, M. R. (Herb. M. R. 1042/97, 1048/97, 1049/97); *ibid.*, glacial cirque of the lake Čertovo jezero near Železná Ruda, on bark of *Abies alba*, 22 Oct. 1996, M. R. (Herb. M. R. 864/96). Moravia, Hrubý Jeseník Mts., on slopes of Mt. Mravenečník near Loučná nad Desnou, on decorticated wood of *Abies alba*, 3 Aug. 1971, V. Holubová-Jechová (PRM 794111). – Ukraine. Eastern Carpathian Mts., Kvasi near Rachiv, on the left bank of the Tisa River, on the inner side of bark on a stump of *Abies alba*, 26 June 1997, M. R. (Herb. M. R. 949/97, 958/97).

Cultures. CBS 101429 (Herb. M.R. 1048/97), CBS 101430 (Herb. M.R. 1049/97).

Descriptions and illustrations. Gams and Holubová-Jechová (1976: 45; Figs. 21a, b, 22).

Habitat. Saprobe on decayed wood and inner surface of bark of gymnosperms.

Known host. *Abies alba*.

Known distribution. Europe: Czech Republic, Ukraine.

Note. Although the conidia of *Chloridium cylindrosporum* were described as non-septate (Gams and Holubová-Jechová 1976), 3-septate conidia were seldom observed on recent material from nature. The 3-septate conidia can easily escape our

attention because they are usually attached to the lower part of the conidiophores, the surface of the perithecia or the substratum. The presence of conidial septation, although the septa are formed much later, would argue for placement of the *Chloridium cylindrosporum* anamorph of *Chaet. fusiformis* in *Cylindrotrichum*. Because no applicable and final generic concept of *Cylindrotrichum* is available and the relationships between *Cylindrotrichum* and *Chloridium* require further analysis, we refrain at the moment from making this combination. However, *Chaetosphaeria fusiformis* is considered another member of a group of related species of *Chaetosphaeria* with *Cylindrotrichum* anamorphs.

Chaetosphaeria fusiformis is highly host-specific and occurs seldom, exclusively on decayed wood and bark of coniferous trees. All recent collections were made in regions with natural stands of *Abies alba*.

Of *Chaetosphaeria* species with *Cylindrotrichum* anamorphs, *Chaet. abietis* and *Chaet. crustacea* also occur exclusively on coniferous wood and bark. *Chaet. fusiformis* differs from these two species in having longer, at maturity 3-septate and slightly asymmetrical ascospores that taper towards one end and are rounded at the other end, and the *Chloridium cylindrosporum* anamorph. The ascospores of *Chaet. abietis* and *Chaet. crustacea* are symmetrical and cylindrical-fusiform, 3-septate in the former and 3-5-septate in the latter.

This is the first report of successful cultivating of *Chaet. fusiformis*. The anamorph-teleomorph connection, previously suggested on the basis of the regular joint occurrence, is herewith confirmed.

7. *Chaetosphaeria tulasneorum* Réblová et W. Gams, sp. nov. Figs. 14-16.

Perithecia superficialia, ad basim modice immersa, solitaria vel pauca aggregata, subglobosa vel conica, deorsum applanata, 190-220 μm alta, 185-210 μm diam, minute papillata, ostiolata, fusca, glabra, modice verrucosa. Canalis ostiolaris periphysatus. Paries perithecii fragilis, ad latus et apicem scleroticus, deorsum attenuatus; paries lateralis 26-39 μm crassus, bistratosus: stratum exterius e cellulis tenuitunicatis, fuscis, lateriformibus compositum, interius e cellulis tenuitunicatis, compressis, subhyalinis. Paraphyses copiosae, filiformes, raro septatae, ad septa haud constrictae, ramosae, anastomosantes, reticulum formantes, hyalinae, 12 μm latae in parte inferiore, ultra ascorum apices protrudentes. Asci cylindrici vel clavati, 93.5-115 \times 8.5-10.5(-12.5) μm , sursum modice truncati, breviter stipitati, apex anulo I-, refringente, 2 μm lato et 0.5-1 μm alto praeditus, 8-spori. Ascosporae fusiformes, 15.5-20(-21) \times 4-5(-6) μm , plerumque bicellulares, sero 2 alteris septis divisa, haud vel paene constrictae in medio, leves, hyalinae, 1-2-seriatae inasco.

Anamorphosis *Cylindrotrichum oligospermum* (Corda) Bonord.

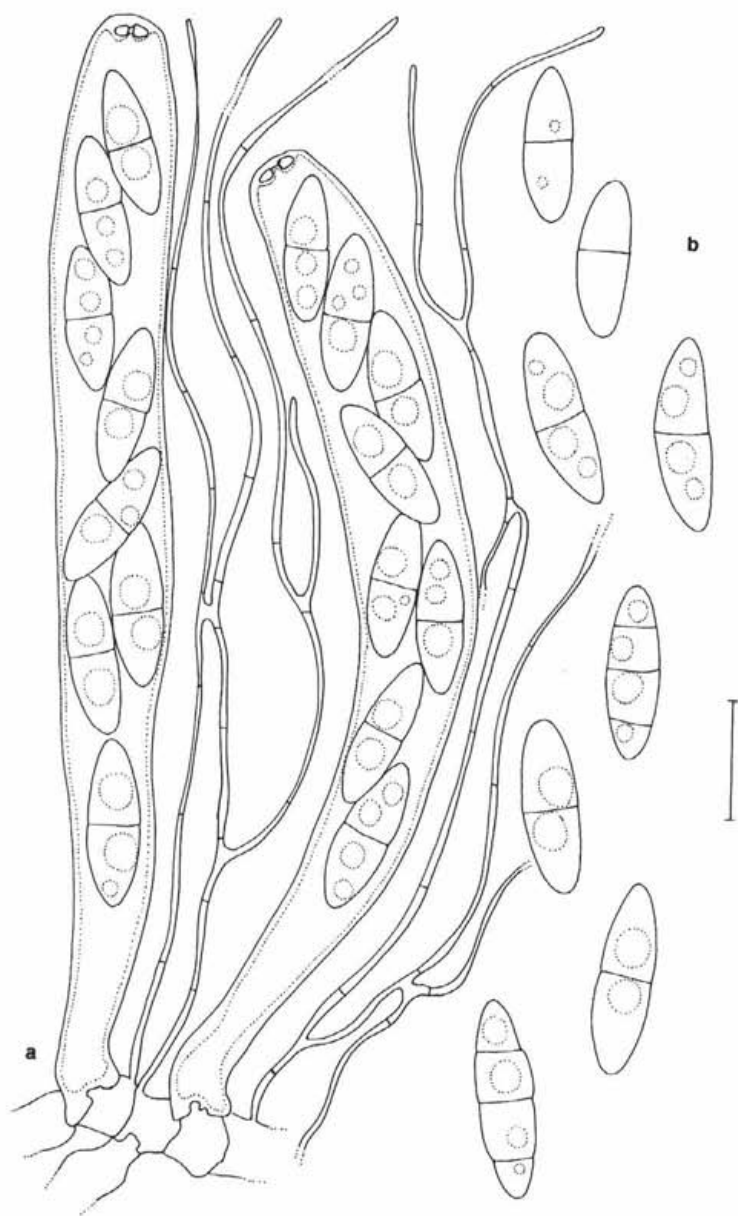


Fig. 14a, b. *Chaetosphaeria tulasneorum*. - a. Asci with ascospores and paraphyses. - b. Ascospores. - a, b from PRM 842978. - Scale bar: a, b = 10 μ m.

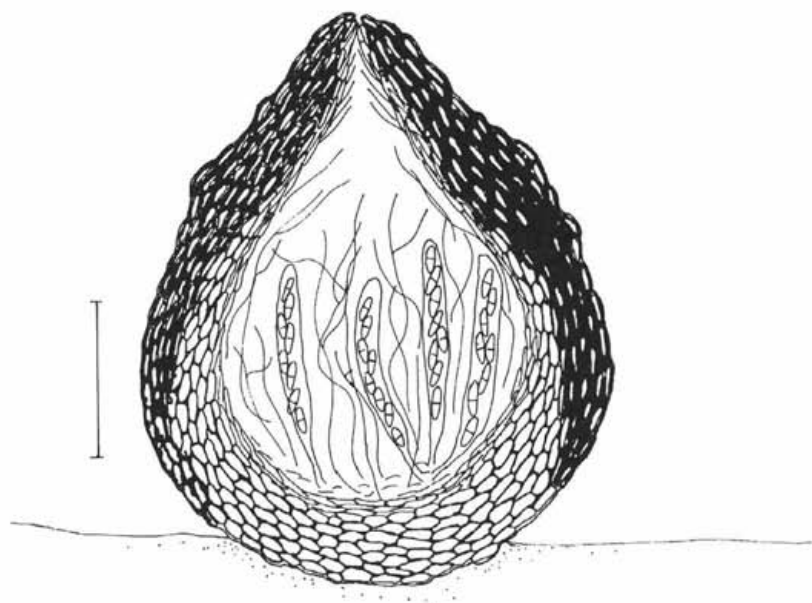


Fig. 15. *Chaetosphaeria tulasneorum*. – Median, longitudinal section of perithecium, note the sclerotisation of the lateral perithecial wall. – From PRM 842978. – Scale bar: 50 μm .

Holotypus. Bohemia meridio-occidentalis, montes Javornická hornatina, Strašín apud Sušice, ad lignum putridum *Sambuci nigrae*, 21 Oct. 1997, leg. M. Svrček (PRM 842978).

Anamorph. *Cylindrotrichum oligospermum* (Corda) Bonord., Handb. allg. Mykol. p. 88, 1851. Fig. 16a–e.

≡ *Menispora oligosperma* Corda, Icon. Fung. 2: 12, 1838.

= *Acrothecium deliculatum* Berk. et Broome, Ann. Mag. nat. Hist., Ser. 3, 15: 402, 1865.

≡ *Cordana deliculata* (Berk. et Broome) O. Kuntze, Rev. Gen. Pl. 2: 850, 1891.

Etymology. Honouring the Tulasne brothers, L.-R. Tulasne and C. Tulasne, who described the genus *Chaetosphaeria*.

Teleomorph. Perithecia superficial, at the base slightly immersed, solitary or in small groups, subglobose to conical, base flattened, 190–220 μm high and 185–210 μm diam, minutely papillate, ostiolate, dark brown, glabrous, slightly verrucose. Perithecial wall brittle, the whole wall heavily sclerotised in the upper part, sclerotisation disappearing towards the bottom and absent at the base.

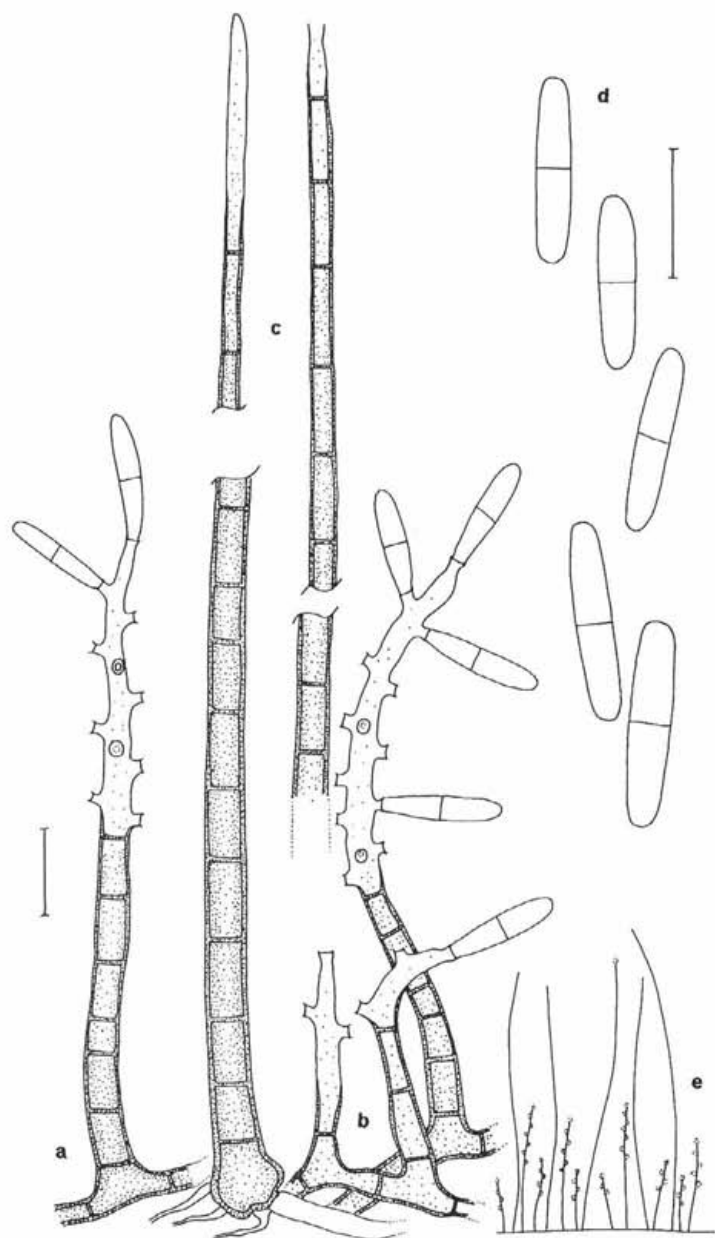


Fig. 16a-e. *Chaetosphaeria tulasneorum*. - a-c. Taller and shorter conidiophores with conidia forming two distinct layers and setae, from PCA culture. - d. Conidia, from PCA culture. - e. Habit sketch of conidiophores and setae. - a-e. from CBS 101319, PRM 842978. - Scale bar: a-d = 10 μ m.

Lateral wall 26–39 μm thick, consisting of two layers; an outer layer of thin-walled, dark brown, brick-like cells, and an inner layer of thin-walled, compressed, subhyaline cells. Ostiolar canal periphysate. Paraphyses copious, filiform, sparsely septate, not constricted at the septa, forming a branching network, hyaline, 1–2 μm wide, protruding beyond the tips of the asci. Asci cylindrical to clavate, 93.5–115 \times 8.5–10.5(–12.5) μm , slightly truncate at the top, shortly stipitate, ascal apex with a J-, refractive, 2 μm wide and 0.5–1 μm deep apical annulus, 8-spored. Ascospores fusiform, 15.5–20(–21) \times 4–5(–6) μm , mostly 2-celled, with a delayed formation of the 2 additional septa, not constricted or slightly constricted at the median septum, smooth, hyaline, 1–2-seriate, partially overlapping in the ascus.

Anamorph. Remnants of shorter and longer conidiophores and setae with broken apices were found growing from the perithecia and from the substratum surface on a decorticated branch of *Sambucus nigra*.

Characteristics in culture. Colonies on PCA slow-growing, reaching 27 mm diam in 10 days at 25 °C in darkness, when grown for another 10 days at 25 °C in cool white fluorescent light reaching 15–16 mm diam; velvety, greyish-yellowish in the centre due to crowded conidiophores, yellowish at the margins, margins fimbriate, thin, aerial mycelium scant, conidiophores scattered, copious conidial production in 10 days, conidial masses whitish; reverse yellow-greyish. CMA, OA: 21–25 mm diam; MEA: 18 mm diam; CMA, OA, MEA: velvety, aerial mycelium scanty, conidial production copious in 10 days; CMA, OA: yellowish to pale brown in the centre due to crowded conidiophores, whitish sterile zone at the margins; MEA: whitish to pale brown in the centre due to crowded conidiophores, whitish sterile zone at the margins. Mycelium superficial or immersed; hyphae branched, septate, subhyaline, smooth, 2–3 μm wide. Setae straight, cylindrical, 180–560 μm tall and 3–4.5 μm wide in the middle, tapering to 1.5–2 μm , 5–23-septate, dark brown, paler towards the apex, narrowly rounded at the top or some developing into a monophialide. Conidiophores macronematous, mononematous, solitary, erect, unbranched, arising from both aerial and substrate mycelium, forming two layers. Conidiophores of the lower layer 33–66(–104) μm tall and 3.5–4.5 μm wide in the middle, tapering to 1.5–2.5 μm below the collarette, cylindrical, straight or slightly flexuous, 0–4-septate, subhyaline to pale brown, sympodially proliferating. Conidiophores of the upper layer 180–280 μm tall and 3–4.5 μm wide in the middle, paler towards the apex, tapering to 1.5–2 μm below the collarette, cylindrical, straight or slightly flexuous, 10–12-septate, mid-brown to dark brown, less commonly sympodially proliferating at the top. Phialides integrated, terminal or intercalary, with 6–11 lateral phialidic openings arising from a sympodial elongation, fertile apices 23–47(–57) \times 3.5–4(–4.5) μm . Collarettes hyaline, disappearing early, 2–2.5 μm wide and 2–3 μm deep. Conidia phialidic,

cylindrical to clavate, (9-)11-14.5(-17) × (2-) 2.5-3(-4) μm, 1-septate, not constricted, rounded at the tip, tapering and truncate at the base, smooth, hyaline.

Material examined. Type material. Czech Republic. South-western Bohemia, Javornická hornatina Mts., Strašín near Sušice, on wood of a dead branch of *Sambucus nigra*, 21 Oct. 1997, M. Svrček (PRM 842978 - holotype of *Chaetosphaeria tulasneorum*).

Culture. CBS 101319 (Herb. M. R. 1164/97).

Habitat. Saprobe on decayed wood of a shrub.

Known host. *Sambucus nigra*.

Known distribution. Europe: Czech Republic; known only from the type locality.

Note. Shape and septation of the ascospores of *Chaetosphaeria tulasneorum* resemble those of *Chaet. innumera* Berk. et Broome ex Tul. et C. Tul., *Chaet. pulviscula* (Currey) C. Booth and *Chaet. ovoidea* (Fr.) O. Constant. et al., but the ascospores are longer than those of the first and shorter than those of the two latter species. *Chaet. tulasneorum* is also distinct in the *Cylindrotrichum oligospermum* anamorph and the occurrence on decorticated wood of an angiosperm shrub. The lateral perithecial wall has a very characteristic sclerotisation that was not observed in any other *Chaetosphaeria* species.

We are not aware of any report of a *Cylindrotrichum oligospermum* anamorph isolated from ascospores of any pyrenomycetous ascomycete. The connection to the teleomorph is reported here for the first time by a culture study. The conidiophores obtained in the living culture formed two layers of taller and shorter conidiophores accompanied by much longer setae. The upper layer of conidiophores was observed neither on the natural substratum nor in culture by Gams and Holubová-Jechová (1976). In all other respects our isolate of *Cyl. oligospermum* agrees well with the observations of Gams and Holubová-Jechová (1976) and Barron (1968).

The size of setae, shorter conidiophores, phialides, collarettes and conidia are given from the original culture of *Cyl. oligospermum* obtained immediately after the isolation from ascospores. The description of taller conidiophores that have 8-11 lateral phialidic openings is given from an older culture after several transfers. In the original culture fertile apices with well-developed lateral phialidic openings were hardly seen.

DISCUSSION

The division of *Cylindrotrichum* into five genera, viz. *Chaetopsis*, *Dictyochaeta*, *Kylindria*, *Xenokylindria* and *Uncigera*, and their delimitation proposed by DiCosmo et al. (1983), seems to be rather schematic, apparently disregarding

natural units. *Chaetopsis grisea* (Ehrenb.) Sacc. has holoblastic conidiogenesis and a predominantly lateral branching pattern of the conidiophores unlike *Cylindrotrichum oligospermum* and is regarded as representing a distinct genus. *Uncigera cordae* Sacc. cannot be separated from *Cylindrodendrum album* Bonord. (W. Gams, unpublished), as redescribed by Buffin and Hennebert (1984). The remaining genera are very closely related indeed. *Cylindrotrichum* is closest to *Chloridium* Link: Fr., from which it is merely separated by conidial septation and shape. Conidia in *Cylindrotrichum* are 1- to multi-septate, usually cylindrical to long-ellipsoidal, straight or slightly curved and truncate at the base. Conidia of *Chloridium* are non-septate, generally shortly ellipsoidal, rarely fusiform to clavate (*Chloridium codinaeoides* Pirozynski) or shortly catenate to dacryoid [*Chloridium clavaeforme* (Preuss) W. Gams et Hol.-Jech.] or reniform (*Chloridium reniforme* Matsushima). But longer ellipsoidal conidia have also been described, e.g. in *Chloridium matsushimae* W. Gams et Hol.-Jech. (1976: 29). Thus the anamorphs of *Chaetosphaeria crustacea* and *Chaet. fusiformis* might be classified in either genus. *Cylindrotrichum* accommodates species with both sympodial and percurrent proliferation of the conidiophores (Cabello and Arambarri 1988); *Cyl. oligospermum* (Corda) Bonord., the type species of the genus, has sympodially proliferating conidiophores with numerous lateral phialidic openings, the conidiophores are accompanied by sterile setae and the conidiogenesis is multiple from different loci within a collarette. The presence of percurrent besides sympodial conidiophore proliferation would argue for distinguishing two sections within *Cylindrotrichum*, comparable with the situation in *Chloridium*. *Chloridium* was divided into three sections (Gams and Holubová-Jechová 1976), viz. species with sympodial proliferation of conidiophores with single conidiogenous loci (sect. *Psilobotrys*), and percurrent proliferation of conidiophores with multiple (sect. *Chloridium*) or single conidiogenous loci (sect. *Gongromeriza*). Species of both *Cylindrotrichum* and *Chloridium* are currently associated with *Chaetosphaeria* and *Melanopsammella* Höhnelt species (Booth 1957, 1958; Gams and Holubová-Jechová 1976; Réblová et al. 1999).

The conidiogenesis of the *Cacumisporium capitulatum* anamorph of *Chaetosphaeria decastyla* is identical to that of the *Cylindrotrichum* anamorph of *Chaet. acutata*, the *Cylindrotrichum* anamorph of *Chaet. crustacea*, and the *Chloridium virescens* (sect. *Chloridium*) anamorph of *Melanopsammella vermicularioides* (Sacc. et Roum.) Réblová et al. (Réblová et al. 1999). However, the conidiophores of *Cac. capitulatum* proliferate percurrently and the conidia are 3-septate and bicolorous. The conidia are formed successively from multiple conidiogenous loci on the sporogenous apex of the percurrently proliferating conidiogenous cell. The conidia mature after being liberated and usually remain attached to the conidiophores separately or in groups of 2-3. In the *Cylindrotrichum* anamorph of *Chaet. acutata* and the *Cac. capitulatum* anamorph of *Chaet. decastyla* the

sporogenous apex of the conidiogenous cell has a similar function and structure as in *Xenokylindria* if a generic separation were required (DiCosmo et al. 1983).

Nine genera have been described for anamorphs of *Chaetosphaeria* (Réblová et al. 1999). In the present paper *Cacumisporium* is introduced as another anamorph genus. The anamorph genera of *Chaetosphaeria* are more or less closely related to each other and require further analysis. Until this has been done, we retain the Saccardoan treatment for them. In Saccardo's (1886) scheme conidial septation was a major criterion and thus we retain *Chloridium*, *Cylindrotrichum*, and *Cacumisporium* for the time being as separate though very closely related taxa.

ACKNOWLEDGMENTS

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