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On *Trichaptum sprucei* and the genus *Phaeodaedalea* (Basidiomycetes, Hymenochaetales)

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Abstract – The concept of *Trichaptum sprucei* and the status of the genus *Phaeodaedalea* are discussed, on the basis of new data, morphological, ultra-structural, and molecular (genomic). The present concept of *T. sprucei* is demonstrated to represent at least two different taxa. *Trichaptum sprucei* s.s. is in all probability restricted to the Neotropics. A second species occurs at least in India. *Phaeodaedalea* is confirmed as a synonym of *Trichaptum*.

Caribbean / parenthosomes / Neotropics / Polypores / Phylogeny

INTRODUCTION

Trichaptum sprucei (Berk.) Rajchenb. & Bianchin. was first described by Berkeley (1856) in *Daedalea* Fr., on the basis of a collection originating in Brazil. The species is macroscopically highly variable, both in the basidiome habit (ranging from resupinate to sessile pileate) and the hymenophore configuration (poroid, daedeloid, variably lamellate, irpiciform, or hydnoid); the pore surface is initially vinaceous, but may discolor to brown up to dark brown. The species is currently reported as pantropical (Ryvarden & Johansen, 1980; Corner, 1987).

Because of its variable basidiome and hymenophore, the species was repeatedly described, in various genera, and the presumed list of taxonomic synonyms included: *Daedalea umbrina* Lloyd (1914), *D. fuscostratosa* Lloyd (1924), *Fomes gossweileri* Lloyd (1920), *Hexagonia erubescens* Berk. (1856), *H. aequalis* Pat. (1889), *H. sclerodermea* Pat. & Har. (1912), *Irpex rickii* Lloyd (1925), *Lenzites distancifolia* Romell (1901), or again *Polyporus incertus* Curr. (1874). The basionym epithet was also recombined several times, in *Phaeodaedalea* K. Fidalgo (Kauffman Fidalgo, 1961), *Coriolopsis* Murrill (Roy & Mitra, 1986), *Gloeophyllum* (P. Karst.) P. Karst. (Teixeira, 1992), and, finally, *Trichaptum* Murrill (Rajchenberg & Bianchinotti, 1992), in which the species is presently accepted. The placement in *Trichaptum* was justified, *inter alias*, by the presence of imperforated parenthosomes at hyphal septa, fusiform to ventricose, variously apically incrusted hymenial cystidia (Fig. 1), and the production of a white rot, all features typical of the genus (Ryvarden & Gilbertson, 1994; Traquair

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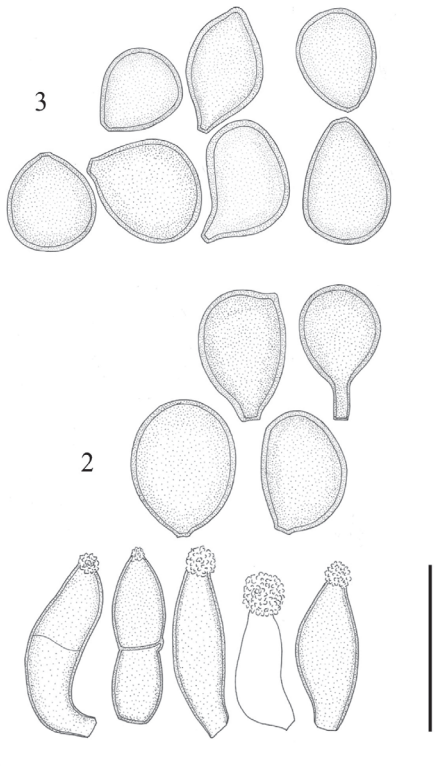
1. MUCL is a part of the Belgian Coordinated Collections of Microorganisms, BCCM.



Figs 1-3. *Trichaptum sprucei*. 1. Hymenial cystidia; 2-3. Chlamydospores, from basidiomes (HAC5523). Scale bar = 20 µm.

& McKeen, 1978; Rajchenberg & Bianchinotti, 1991; Moore, 1985).

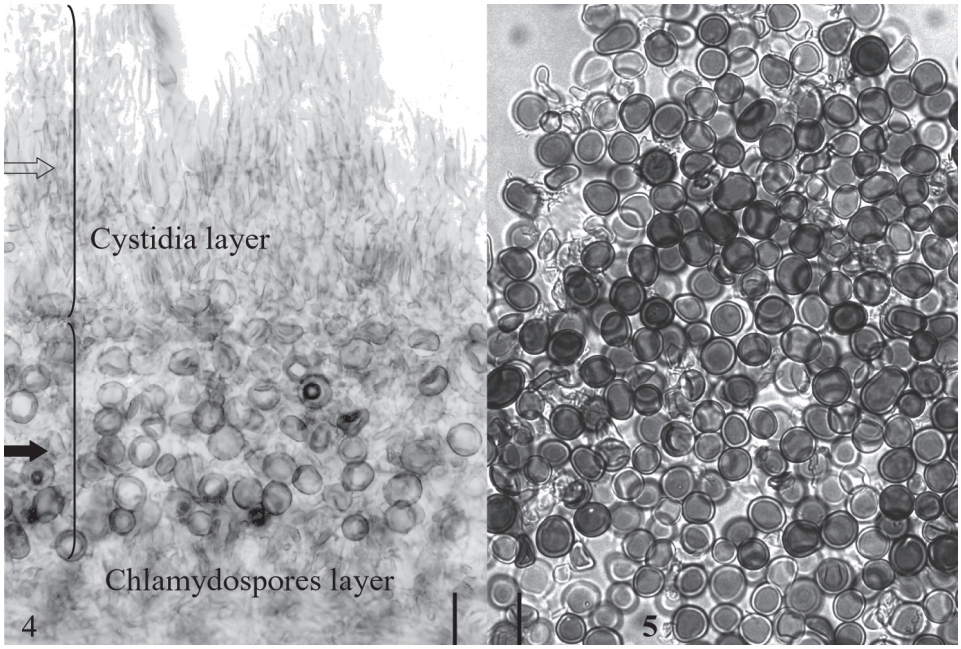
Several authors (Lloyd, 1913, 1917; Kauffman Fidalgo, 1961; Kreisel 1971; Corner 1987) reported the presence of peculiar brown "spores" in this species, whose origin and nature have been debated and variably interpreted, either as basidiospores (Kauffman Fidalgo, 1961; Kreisel 1971; Lloyd, 1913, 1917) or conidia (Corner, 1987; Dennis, 1970; Ryvarden, 1974; Reid, 1976). Reid (1976) was uncertain about their origin and concluded that they were conidia[2] "… either … produced by the fungus itself, or the spores of another fungus parasitic in the hymenium". Corner (1987) just noted: "there was no obvious reason for their presence". Rajchenberg and Bianchinotti (1992) concluded that the "spores" present in the basidiome are chlamydospores produced by the fungus, seemingly identical to those produced in pure culture (Bakshi *et al*., 1970; Roy & Mitra, 1986), without commenting however on the fact that the latter remained hyaline while those seen in the basidiomes are brown. Whether this difference is taxonomically informative is difficult to interpret, when considered alone. It is important to note that the strains studied by Bakshi *et al*. (1970), Roy and Mitra (1986), and Rajchenberg and Bianchinotti (1992) originated in India, and not in the Neotropics, type locality of *T. sprucei*.

As part of taxonomical and biogeographical studies of the polypores in Cuba and more generally in the Caribbean, various collections of *T. sprucei*, either held in HAC or collected by the authors during field trips, were re-examined. All the collections examined were sterile or no hyaline basidiospore was observed. However, thick-walled, yellow brown, mostly globose "spores" were observed in several specimens (Figs 2-3, 5), with variable abundance and location.

One freshly collected specimens (MUCL 45130), in which brown chlamydospores-like "spores" were present at the base of the hymenial layer (Fig. 4), was successfully cultivated from small portions of the hymenial surface, on which no "spores" were observed, as far as it could be ascertained in field station conditions. Attempts to isolate the fungi from the "spore" layer all failed.

The resulting culture produced clamped hyphae and, interestingly, abundant chlamydospores, that soon turned yellow to brown (Figs 6-10), and

2. Basidiospores of *T. sprucei* are reported in Lit. as hyaline, ellipsoid, 4.0-5.0 × 2.0-3.5 µm (Corner 1987, Reid 1976, Roy and Mitra 1986, Ryvarden and Johansen 1980).



Figs 4-5. *Trichaptum sprucei*. 4. Transversal section of the hymenium with cystidia and chlamydospores (MUCL 45130). Scale bar = 20 µm; 5. Chlamydospores from basidiomes (HAC5523). Scale bar = 20 µm.

became seemingly identical to the ones found in the basidiome, but deviating from the hyaline chlamydospores described by previous authors (Bakshi *et al*., 1970; Rajchenberg & Bianchinotti, 1992; Roy & Mitra, 1986). This led us to question the identity of our culture. We therefore compared MUCL 45130 to two other strains of *T. sprucei*, both received under the synonymous name *T. incerta* and originating in India (the strain of *T. sprucei* used by Bianchinotti and Rajchenberg (1992) was not available for comparison; no strain originating in the neotropics was located). The organization of the parenthosome was determined by TEM studies. The phylogenetic affinities and relationships of MUCL 45130 and the two Indian isolates were inferred by parsimony analysis based on nuclear ribosomal large subunit (28S) region. The results are presented below.

MATERIAL AND METHODS

Herbarium specimens are preserved at HAC, HAJB, and MUCL (Holmgren *et al*., 1990). Strains used in this study are preserved at BCCM/MUCL and in the Cuban *Coleccion de Recursos Geneticos Fungicos* (CRGF). Specimens were examined in Melzer's reagent, lactic acid Cotton blue (Kirk *et al.*, 2001), and KOH 4%. Colors are described according to Kornerup and Wanscher (1981). All microscopic measurements were performed in Melzer's reagent. In presenting the

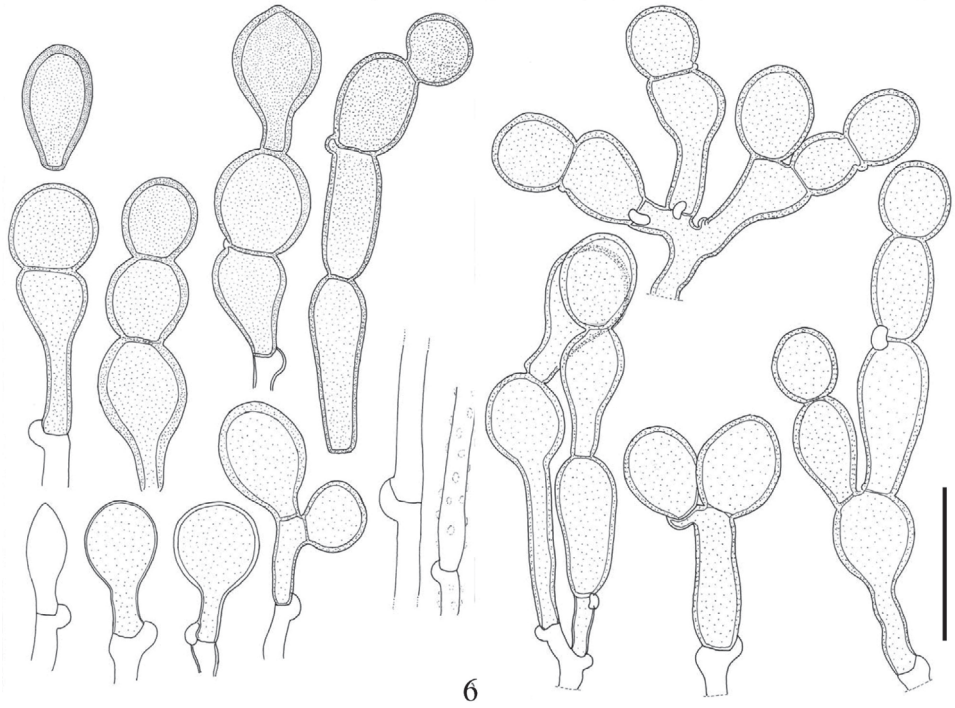


Fig. 6. *Trichaptum sprucei*. Chlamydospores from culture on MA2 (MUCL 45130). Scale bar = 20 µm.

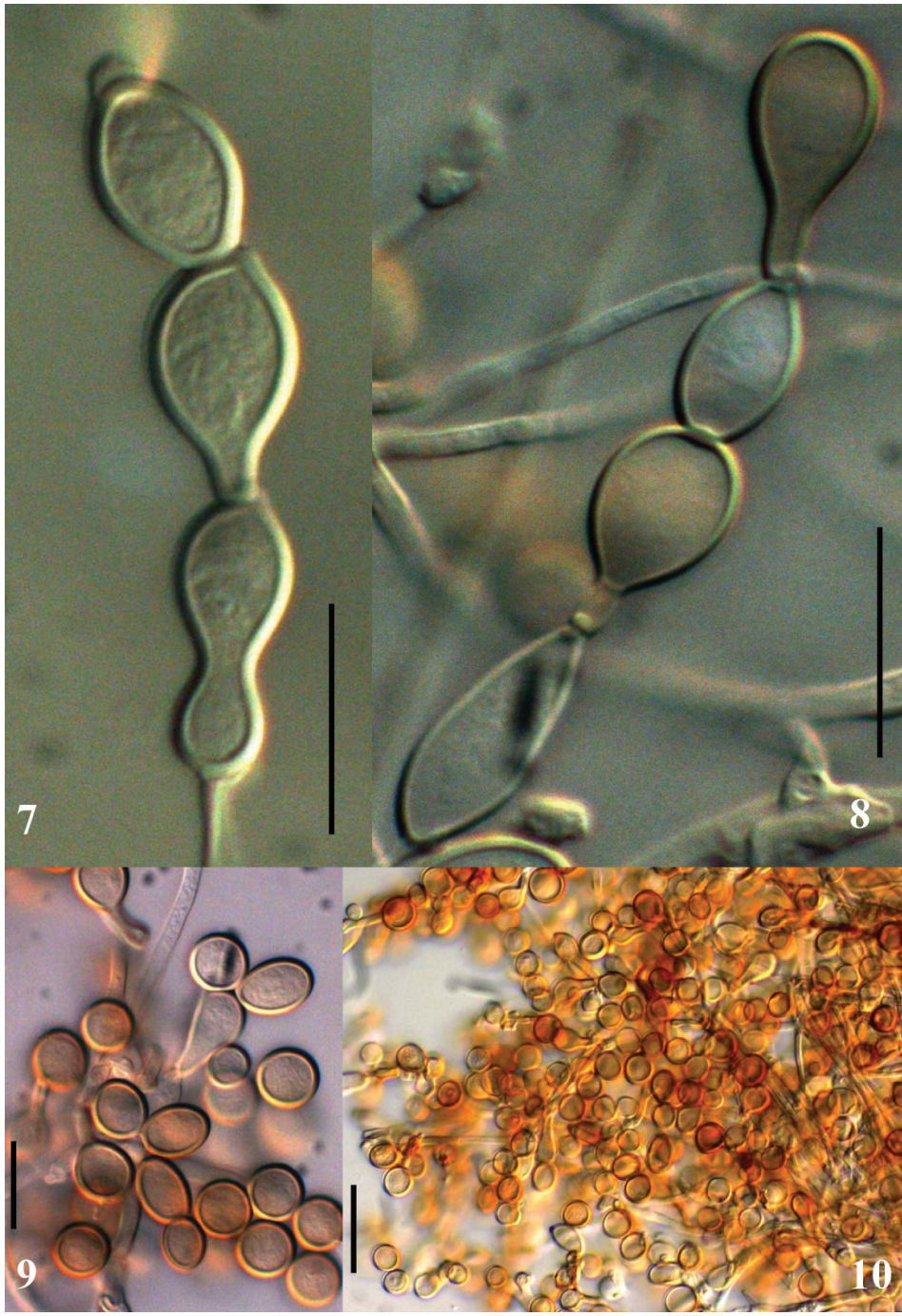
size range of the microscopic elements, 5% of the measurements were excluded at each end and are given in parentheses, when relevant. = $\bar{x}$ Arithmetic mean, R = the ratio of length/width of basidiospores, and $\bar{x}_R$ = arithmetic mean of the ratio R.

TEM studies

Mycelium was grown in malt broth at 25°C in the dark, and a pellet was fixed with in $KMnO_4$ 1.5% in a cacodylate buffer, followed by 1% osmium tetroxide in 0.1 M cacodylate, at 5°C for 2 hours After dehydration and infiltration by Spurr's medium, sections were cut and stained in Uranyl Acetate. TEM Jeol microscope was used.

Sequencing

The DNA was extracted from freshly collected mycelium grown in malt broth at 25°C in the dark. Extractions were carried out using the QIAGEN Dneasy plant Mini Kit (QIAGEN Inc.), and later purified with Geneclean® III kit (Q-Biogene), following the manufacturer's recommendations. The primer pair LROR-LR6 (White *et al.*, 1990) was used to amplify the 5'end of the nr LSU DNA regions. Successful PCR reactions



Figs 7-10. *Trichaptum sprucei*. Chlamydospores from culture on MA2 (MUCL 45130). 7-8, scale bar = 15 µm; 9, scale bar = 20 µm; 10, scale bar = 30 µm.

resulted in a single band observed on a 0.8% agarose gel, corresponding to approximately 1200 bps. Polymerase chain reaction products were cleaned using the QIAquick® PCR purification kit (250) (QIAGEN Inc.), following the manufacturer's protocol. Sequencing reactions were performed using CEQ DTCS Quick Start Kit® (Beckman Coulter), according to the manufacturer's recommendations, with the primers LROR, LR3, LR3R, LR5 (biology.duke.edu/fungi/mycology/primers). Nucleotide sequences were determined with a CEQ 2000 XL capillary automated sequencer (Beckman Coulter). Initially, nucleotide sequences were automatically aligned with Clustal X for Macintosh (version 1.5b), then manually adjusted as necessary with the editor in PAUP* (version 4.0b10).

The final data set comprised 40 sequences (31 taxa) and 897 characters, including gaps. A small insert was present in *Pseudoinonotus dryadeus* (5 nucleotides), and was recoded as a single event. 209 characters were parsimony informative. Phylogenetic analysis of the aligned sequences was performed using the maximum parsimony method of PAUP* version 4.0b10 (Swofford 2002) with gaps treated as fifth base. The most parsimonious trees were identified using heuristic searches with random addition sequence (1000), max tree set to 100, and further evaluated by bootstrap analysis, retaining clades compatible with the 50% majority-rule in the bootstrap consensus tree. Analysis conditions were: tree bisection addition branch swapping (TBR), starting tree obtained via stepwise addition, steepest descent not in effect, MulTrees effective.

Species included in the phylogenetic analysis

Fomes fomentarius (L.: Fr.) Kickx AF261538; *Fomitiporia hartigii* (Allesch. & Schnabl.) Fiasson & Niemelä AF311051; *F. punctata* (Fr.: P. Karst.) Murrill MUCL 34101 = AY618200; *Inocutis dryophila* (Berk.) Fiasson & Niemelä AF311012; *I. tamaricis* (Pat.) Fiasson & Niemelä AF311021; *Fuscoporia contigua* (Pers.) G. Cunn. AF311029; *F. ferruginosa* (Schrad.: Fr.) Murrill AF311032; *F. palmicola* (Berk. & Curt.) Bondartseva & S. Herrera MUCL 44080; *F. torulosa* (Pers.) T. Wagner & M. Fisch. AF311041; *Inonotus hispidus* (Bolton) Pilát AF311014; *I. obliquus* (Fr.) Pilát AF311017; *I. rickii* MUCL 45529; *I. marginatus* Ryvarden MUCL 45517; *Onnia triquetra* (Pers.) Imazeki AF311024; *Pseudoinonotus dryadeus* (Pers.:Fr.) T. Wagner & M. Fisch. AF311011; *Phylloporia ephedrae* (Woron.) Parmasto AF411826; *P. chrysita* (Berk.) Ryvarden AF411821; *P. pectinata* (Kl.) Ryvarden AF411823; *Phellinus ignarius* AF311033; *P. populicola* AF311038; *Phellinidium sulphurescens* AY059016; *Trametes incerta* Curr. MUCL 45494; 45537; *Trichaptum abietinum* (Dicks.) Ryvarden complex MUCL 44123; MUCL 34048; MUCL 45935; MUCL 45936; AF518659; AJ406473; *T. byssogenum* (Jungh.) Ryvarden MUCL 45938; MUCL 47133; *T. durum* (Jungh.) Corner MUCL 46969; *T. fumosoavellaneum* (Romell) Rajchenb. & Bianchin. MUCL 45919; MUCL 45918; *T. perrottetti* (Lév.) Ryvarden MUCL 46032; MUCL 47130; *T. sprucei* (Berk.) Rajchenb. & Bianchin. MUCL 45130; *Trichaptum sp*. MUCL 47070; *Fibricium rude* (P. Karst.) Jülich AJ406475; *Schizopora paradoxa* (Fr.) Donk AF518647.

RESULTS

Cultural features — Figs 6-10

The main cultural features are:

Growth on MA2 at 25°C 12-14 mm/weeks; *colony* white; *reverse* white to pale yellowish brown; odor indistinct; *advancing zone* appressed to raised, slightly plumose, with the marginal hyphae distant, radiating, hyaline, clamped, sparsely branched, 2.0-4.2 µm diam., $\bar{x}$ = 3.4 µm; *mat* aerial, cottony with radiating hyphae, sometime plumose, white to off white, locally very slightly ochraceous or pale brown when old; aerial hyphae thin- to slightly thick-walled, smooth or with some small, hyaline droplets, hyaline, clamped, sparsely branched, 2.0-4.0 µm diam., $\bar{x}$ = 3.2 µm; *skeletal hyphae* few at six weeks, appearing later, clamped at the basal septum, non branched, hyaline, thick-walled; narrow, heavily branched hyphae present in old cultures, mainly immersed, hyaline; *chlamydospores* appearing on the aerial mycelium after two to three weeks, solitary or in short, occasionally branched, chains, later forming clusters, the first cells ellipsoid, elongated barrel-shaped, pyriform, 15-27.5 × 9.0-14 µm ($\bar{x}$ = 18.7 × 11.2 µm), with or without hyphal-like base, with a clamp at the basal septum, the ultimate cells mainly subglobose to globose, ventricose, occasionally with a apical umbo, 10.5-17.5 × (6.5-)8.5-13.5(-17.0), ($\bar{x}$ = 13 × 11.5 µm), all cells hyaline at first but soon turning yellowish, yellowish brown, to pale brownish, thick-walled. No basidiome or basidiospore formed within six weeks; *enzymatic tests*: laccases positive (test: complete).

Culture examined: CUBA. GUANTANAMO PROV.: Municipio Baracoa, Camino a Mesa Alto de Iberia, on a dead fallen trunk, unidentified angiosperm, 08 Sep. 2003, *J. Ortiz, L. del Castillo, and K. Licea*, isolated on 08 Sep. 2003, C. Decock, CU-03/81, MUCL 45130 = CRGF 476.

TEM Studies

TEM studies showed the dolipore/parenthosome organization in MUCL 45130 (Fig. 11); it demonstrated the presence of barrel-shaped septal swelling (dolipore) and imperforate parenthosomes (septal pore caps) (O1/P2 type of dolipore/parenthosomes combination, Moore, 1985). This organization is identical to that described previously in an Indian isolate presumed to represent *T. sprucei* (Rajchenberg & Bianchinotti, 1992), and other *Trichaptum* species (Moore, 1985; Rajchenberg & Bianchinotti, 1991; Traquair & McKeen, 1977).

Molecular studies

Preliminary indications of the relationships of MUCL 45130 and well as of (*T. incerta*) ATCC 55333 and CBS 455.76 were obtained using the BLAST search option at GenBank (Altschul *et al.* 1990). The search using 868 bps of the 5' end of the LSU regions demonstrated, for our *T. sprucei*/*T. incerta* strains, homology with *T. abietinum* (Fr.) Ryvarden, the result expected, based on morphological and ultra-structural data. Subsequently, a partial LSU data matrix was constructed that included, in addition to *T. perrotteti* (*Trichaptum* type), several other tropical species of which *T. byssogenum*, *T. durum*, and *T. fumosoavellaneum*.

The resulting phylogeny resolved *Trichaptum* as a monophyletic clade (Fig. 12) with good bootstrap support (bootstrap value 87%), supporting the present circumscription of the genus. Most of the internal branches are

moderately to well supported. MUCL 45130 clustered within the *Trichaptum* clade, together with *T. fumosoavellaneum* and the two Indian strains, forming a well-supported subclade (bootstrap value 95%). However, MUCL 45130 appears more closely related to *T. fumosoavellaneum* than to the Indian strains (Fig. 12).

DISCUSSION

The current phylogenetic analysis (Fig. 12) has, without any doubt, identified the strain MUCL 45130 to a species of *Trichaptum*, as the latter is presently circumscribed. The presence of imperforate parenthosomes (Fig. 11), a feature demonstrated in several other *Trichaptum* species (Traquair & McKeen, 1978; Moore, 1985; Alexander *et al*., 1989, Rajchenberg & Bianchinotti, 1991, 1992), support this placement. Consequently, both results support the identification of our strain to *T. sprucei*, since it was isolated from a basidiome, which morphology, both at macro- and microscopic level, and origin (neotropical area) clearly point toward this species[3].

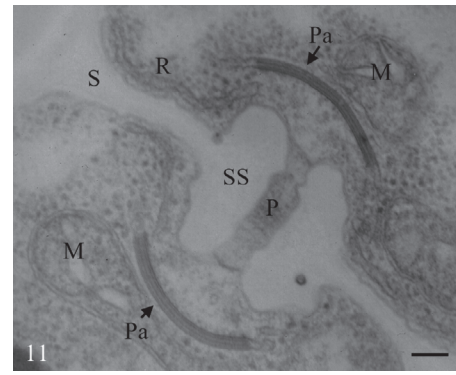


Fig. 11. *Trichaptum sprucei*. Septal pore apparatus (MUCL 45130). Scale bar = 0.2 µm. R = endoplasmic reticulum; M = mitochondria; P = pore; Pa = parenthosome; S = septum; SS = septal swelling.

These studies thus demonstrate that *T. sprucei* produces in pure culture a chlamydosporic state forming aerial, yellow to yellow brown, thick- to very thick-walled chlamydospores, morphologically identical and, in all probability, homologous to those occasionally present in the basidiome (Corner, 1987; Lloyd, 1913, 1917; Kaufman Fidalgo, 1961; Kreisel, 1971, pers. obs.) and misinterpreted by several authors as basidiospores (Lloyd, 1913, 1917; Kaufman Fidalgo, 1961; Kreisel, 1971). These results reinforce Reid (1976)'s hypothesis that these "spores" are "…conidia produced by the fungus itself…"

The location and abundance of these chlamydospores in the basidiome are variable. In the specimens studied, they originate either at the base of the thickened hymenial layer (Fig. 4, MUCL 45130), forming a loose sub-hymenial chlamydosporic layer, or are abundantly present on the hymenophore surface (HAC 5523), forming a powdery layer. In HAC 2396, they form a thick deposit on the pileus surface, presumably deposited from a different basidiome located above. They were not observed in the French Guyana specimen.

Conditions that favor their production and abundance in the basidiome are unknown so far. It might be an environmental dependent process, and such factors as relative humidity or substrate water content could be critical. Adverse conditions such as a period of drought might favor their production.

3. The type of *T. sprucei* was not studied, but comparison with literature data, especially Kaufman Fidalgo 1961, support our identification.

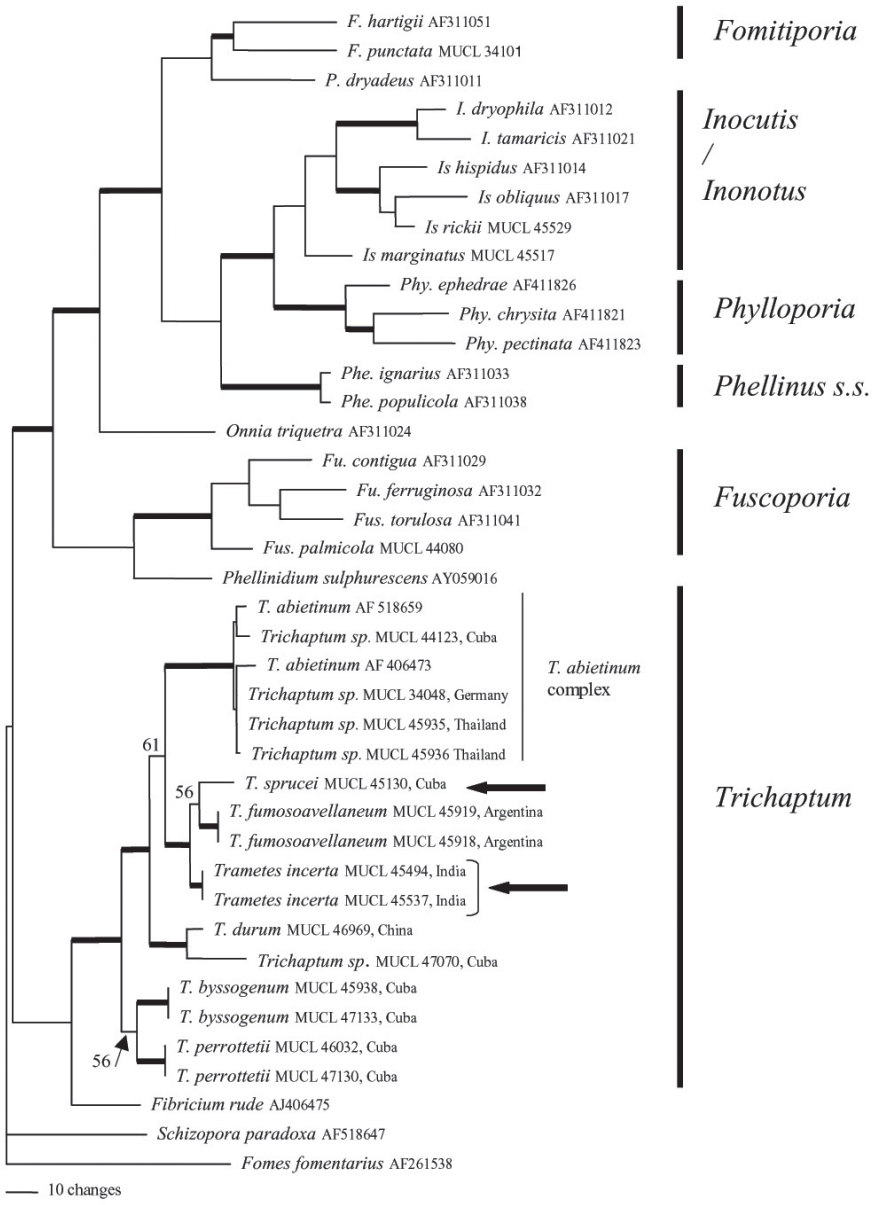


Fig. 12. One of the 4 most parsimonious trees were identified using heuristic searches with random addition sequence (1000), max tree set to 100 (Tree length: 915; CI: 0.498; RI: 0.723). = *T. sprucei s.l.*

Cultural features and current preliminary phylogenetic studies (Fig. 12) support the con-specificity of the two Indian strains ATCC 55333 and CBS 455.76, and their placement in *Trichaptum*. However, these studies do not support their conspecificity with *T. sprucei*, that appears more closely related to

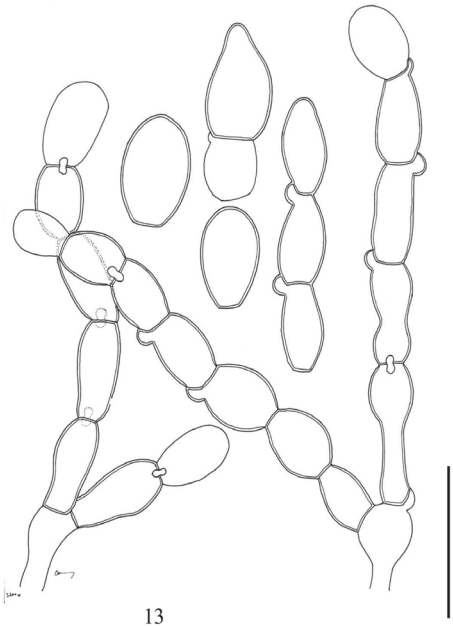


Fig. 13. *Trametes incerta*. Chlamydospores from culture on MA2. (CBS455.76). Scale bar = 20 µm.

T. fumosoavellaneum, with which it forms a weakly supported clade (bootstrap 56%, Fig. 12). Furthermore, although both Indian strains also produce chlamydospores in culture (Fig. 13), in some respects similar to those of *T. sprucei*, they differ by being permanently hyaline, as previously described (Bakshi *et al*., 1970; Roy & Mitra, 1986). We thus to conclude that ATCC 55333 and CBS 455.76 represent a *Trichaptum* species but, in all probability, different from *T. sprucei*, although related, and occurring at least in the Indian subcontinent.

The present concept of *T. sprucei* should therefore be carefully revised, especially outside the Neotropics as it most probably encompasses other taxonomic entities. The type specimens of its presumed taxonomic synonyms and other *Trichaptum* species, especially those occurring in India or more generally in Asia, should be revised.

Daedalea umbrina, *H. erubescens*, *H. aequalis*, *I. rickii*, and *L. distancifolia* are all based on types[4] originating in the Neotropics, and, *a priori*, it can be reasonably assumed that they all represent *T. sprucei s.s.* (see Kauffman Fidalgo, 1961).

The status of *Hexagonia sclerodermea* and *F. gossweileri*, both originating in central Africa, should be evaluated.

The type of *T. incerta*, originating in India (Currey 1874), should be carefully compared to *T. sprucei*; the two voucher herbarium specimens from which strains studied were isolated should be also compared to the type of *T. incerta*. However, even if the latter name should prove to represent a distinct taxon, which could be the taxon represented by the Indian strains analyzed, the name would not be available, its basionym (*Polyporus incertus* Curr.) being an illegitimate homonym of *Polyporus incertus* Pers. (1825).

More generally, more collections and strains from both Neo- and paleotropical regions should be studied to ascertain the concept of the species presently refereed as to *T. sprucei* in these regions. For the time being, collections originating from the paleotropics could be referred to as *T. sprucei s.l.*

Kauffman Fidalgo (1961) erected *Phaeodaedalea* with *D. sprucei* as type on the basis of these peculiar "spores", that were interpreted as basidiospores. In describing the genus, Kauffman Fidalgo (1961) referred to a note of Lloyd (1913), in which the latter emphasized also the presence of these colored spores in *T. sprucei*. Lloyd (1913) thought by then that this species would not belong to *Daedalea*, a genus characterized by hyaline spores, but to a "new genus" [*hence it forms a "new genus"*] that, notwithstanding, he did not named by that time (*viz*.

4. Their type specimens were not examined in these studies.

in Lloyd, 1913). Later on, he (Lloyd, 1917) repeated his observations and then concluded that *D. sprucei* "belong to the genus *Phaeodaedalea* McGinty", a name he had previously coined as "a new genus" erected for "*Daedalea guyoniana*" (Lloyd, 1915) (basionym: *Trametes guyoniana* Mont.), a species that he described also as having colored spores (Lloyd, 1917). *Trametes guyoniana*, consequently, would have been the type of *Phaeodaedalea*, in the case the latter would have been a valid name. However, as argued by Donk (1951, 1960), McGinty's names, including "*Phaeodaedalea*", were never formally and therefore validly published. Kauffman Fidalgo (1961) thus validated *Phaeodaedalea* but with *D. sprucei* as type. The present analysis demonstrated that these spores are conidia that can be interpreted as chlamydospores. The formation of a chlamydosporic state in addition to the dense, hard, and sometime large basidiomes and the development of a presumed catahymenium with numerous cystidia embedded at variable levels are however peculiar to *Trichaptum*, as previously emphasized (Rajchenberg & Bianchinotti, 1992), and could have served as a basis for a reappraisal of *Phaeodaedalea*. However, rigid and hard basidiomes are also found in *T. fumosoavellaneum* (Rajchenberg & Bianchinotti, 1991; Ryvarden & Iturriaga, 2003) and still more obviously in *T. durum* (Ryvarden & Johansen, 1980); chlamydospores are also found in the Indian *T. sprucei s.l.* although presently only observed in pure culture. Furthermore, *Trichaptum sprucei s.s.*, *T. fumosoavellaneum, T. durum*, and *T. sprucei s.l.* all cluster within the *Trichaptum* clade. These morphological features appear thus to be of marginal taxonomic significance compared to more fundamental characteristics such as the occurrence of imperforate parenthosome, presence hymenial cystidia, production of a white rot, and molecular data.

Brief description of the species

Trichaptum sprucei (Berk.) Rajchenb. & Bianchin., Mycol. Res. 96: 957, 1992.
≡ *Daedalea sprucei* Berk., Hook. J. Bot. 8: 236, 1856.
≡ *Phaeodaedalea sprucei* (Berk.) K. Fidalgo, Mycologia 53: 203, 1961.
≡ *Coriolopsis sprucei* (Berk.) Roy & Mitra, Mycotaxon 26: 446, 1986.
≡ *Gloeophyllum sprucei* (Berk.) Teix., Revta bras. Bot. 15: 126, 1992.
= *Daedalea umbrina* Lloyd, 1914.
= *Hexagonia erubescens* Berk., Hook. J. Bot. 8: 1856.
= *Hexagonia aequalis*, Pat., 1889.
= *Irpex rickii*, Lloyd 1925.
= *Lenzites distancifolia*, Romell, 1901.

Descriptions of the species (in a broad sense) can be found in Corner (1987), Kauffman Fidalgo (1961), Reid (1976), and Ryvarden and Johansen (1980). Corner (1987) also illustrates the species with a color plate, although the origin of the specimen shown is not noted, it correspond very well to *T. sprucei s.s.*

The species can be strictly pileate, sessile, applanate to fully resupinate (Kauffman Fidalgo 1961).

In the collection MUCL 45130, basidiome totally resupinate, effused, adnate, pieces up to 65 × 30 mm, and up to 20 mm thick; hymenial surface strongly hydnoid, the "teeth" stout, cylindrical or slightly tapering to the apices, 10-20 mm high, either round in transversal section, 0.75-2 mm diam. or laterally flattened, then large and ellipsoid in transversal section, then 2-5 mm wide × 1 mm thick, mainly brown (6(E–F)6, cocoa brown to dark brown), the apex lighter, light brown (6D6, cinnamon brown) to grayish light brown, often with a grayish superficial tint, pruinose-like, with a hard consistency, easily broken; *teeth*

composed of two concentric layers, *viz*. a central trama and an external thickened hymenial layer (catahymenium, fide Reid, 1976; Rajchenberg & Bianchinotti 1992); the *central trama* trimitic, although dominated by skeletal hyphae; *generative hyphae* hyaline, clamped, difficult to see, 1.5-2.8 µm; *vegetative hyphae* as unbranched, brownish, thick-walled skeletal hyphae, 2.8-3.5 µm; the *hymenial* layer (catahymenium) thickened, up to 300 µm thick, dense, pseudo-stratified, composed mainly of layered cystidia, mostly embedded but slightly projecting on the surface, fusiform to ventricose, at the hymenial surface hyaline, thin-walled, and commonly apically incrusted with a hyaline cap of crystal, making the teeth surface pruinose-like and with a grayish tint, those deeper in the hymenial layer variously thick-walled and pale yellow brown, apically smooth or more commonly bearing a small crystal cap, (14.0-)15.5-22.5(-25.0) × (3.7-)4.4-7.2(-8.1) µm ($\bar{x}$ = 18.3 × 5.6 µm); *basidia* and *basidiospores* not observed in the specimens examined, small, hyaline, ellipsoid basidiospores, 4.0-5.0 × 2.0-3.5 m (fide Corner, 1987; Reid, 1976; Roy & Mitra, 1986; Ryvarden & Johansen, 1980); *chlamydospores* absent to present, then variably abundant, forming either a loose layer at the base of the thickened hymenium, or a dense powdery layer covering the hymenial surface, mainly (sub)globose, pyriform, or irregularly shaped, very thick walled, brownish to brown, 10-10-16(-23) × (9-)10-14(-17) µm ($\bar{x}$ = 13.4 × 11.8 µm); *substrate*: on a dead woof of angiosperm; *type of rot*: a white rot.

Specimen examined: CUBA, GUANTANAMO PROV.: Municipio Baracoa, Camino a la mesa "Alto de Iberia", on a dead fallen trunk of an unidentified angiosperm, 08 Sep. 2003, collected by J. Ortiz, L. del Castillo, K. Licea, and C. Decock, CU-03/81, MUCL 45130, HAC; PINAR DEL RÍO PROV.: Mil Cumbres, on leaving trunk of an unidentified angiosperm, 09 Jul. 1980, G. Gonzalez, HAC 5523, MUCL; PINAR DEL RÍO PROV.: Biosphere Reserve "Sierra del Rosario", on dead trunk of unidentified angiosperm, 18 Feb. 1976, J. L. Ortiz, HAC 2396; FRENCH GUYANA: Montagne de Kaw, Jan. 2000, G. Castillo # GC 1871, LG-GC.

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