



## Notes on two species of *Diplomitoporus* (Basidiomycota, Polyporaceae) of Central America

### Comentarios sobre dos especies de *Diplomitoporus* (Basidiomycota, Polyporaceae) de America Central

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**Abstract.** Two species of *Diplomitoporus* were studied from Central America and notes about their distribution are presented. Noteworthy records include *Diplomitoporus dilutabilis* Log.-Leite et J.E. Wright, which is reported for the first time to Guatemala and *Diplomitoporus hondurensis* (Murrill) Ryvarden, which is found in a new locality from Belize. A list of *Diplomitoporus* species cited from America is presented.

Key words: Polyporaceae, Poliporoid fungi, Belize, Guatemala.

**Resumen.** Se estudiaron 2 especies de *Diplomitoporus* de America Central y se presentan notas sobre su distribución. Sobresale *Diplomitoporus dilutabilis* Log.-Leite et J.E. Wright, que se registra por primera vez para Guatemala y *Diplomitoporus hondurensis* (Murrill) Ryvarden, se encontró en una nueva localidad en Belice. Se presenta una lista de las especies de *Diplomitoporus* citadas para el continente Americano.

Palabras clave: Polyporaceae, hongos poliporoides, Belice, Guatemala.

#### Introduction

The Polish mycologist Stanislaw Domański established in 1970 a new genus *Diplomitoporus* in his study on lignicolous fungi of the virgin Białowieża forest in Poland (Domański, 1970). Light-colored, effused or effused-reflexed fruitbodies, dimitic hyphal system, and white rot were assigned as crucial characters of the new genus. He classified as *Diplomitoporus* 2 polyporoid species: *Diplomitoporus crustulinus* (Bres.) Domański and *Diplomitoporus flavescens* (Bres.) Domański. In following years, several common polypores causing white rot (*Poria overholtsii*, *Poria rimosa*), were transferred into *Diplomitoporus* (Gilbertson and Ryvarden, 1985). Also, *Poria lindbladii* (Berk.) Cooke, which was in 1981 assigned to *Cinereomyces* because of skeletal hyphae dissolving in KOH (Jülich, 1981), was included in *Diplomitoporus* by Ryvarden and Gilbertson (1985), as its affinities to other *Diplomitoporus* species were regarded more important. In 1998, Pieri and Rivoire described new species *D. meridionalis* with similar KOH reaction in skeletal and emended *Diplomitoporus* to include species with skeletal

gelatinized in KOH (Pieri and Rivoire, 1998).

*Diplomitoporus* Domański, *Acta Soc. Bot. Pol.* 39: 191 (1970) emend. Pieri et Rivoire, *Bulletin de la Société Mycologique de France* 114:39-52 (1998).

Type species: *Diplomitoporus flavescens* (Bres.) Domański (1970).

The most important characters of *Diplomitoporus* are annual, whitish or cream-colored resupinate to effused-reflexed basidiocarps with light-colored context and circular or angular small to medium pores. Microscopic examination is necessary for positive determination in most cases. The hyphal system was defined originally as dimitic (Domański, 1970), but with the new species described, also pseudo-dimitic (Buchanan and Ryvarden, 1998) and trimitic (Loguercio-Leite and Wright, 1998) construction of fruitbodies may be found. Generative hyphae are clamped, and skeletal hyphae thick-walled, showing specific swelling and dissolving in KOH solution in some species. The inamyloid, smooth spores are often broadly allantoid, in some species ellipsoid, and are of medium size (Pieri and Rivoire, 1998).

Causing white rot, *Diplomitoporus* is well separated from externally similar *Antrodia* P. Karst. which causes

brown rot (Domański, 1970; Ryvarden and Gilbertson, 1993). *Antrodiella* Ryvarden et I. Johans. 1980 has very similar characters and the borderline between both genera is not always clear. However, the spores of *Antrodiella* are always very small and ellipsoid and the basidiocarps usually dense and cartilaginous (Ryvarden and Gilbertson, 1993). *Skeletocutis* Kotl. et Pouz. has similar basidiocarps and hyphae, but hyphal ends in dissepiments have very specific incrustation that is diagnostic. Moreover, spores are in the majority of species narrowly allantoid. *Cinereomyces* Jülich, which was established for *Poria lindbladii* only, is characterized by weakly amyloid skeletal, dissolving in KOH. It was not recognized by Ryvarden and Gilbertson (1985) nor by Pieri and Rivoire (1998) as the amyloid reaction is usually weak and unreliable and the KOH reaction was implemented in *Diplomitoporus* emendation. Spirin (2005), on the other hand, used *Cinereomyces* also for *Skeletocutis* species *S. lenis* (P. Karst.) Niemelä and *S. vulgaris* (Fr.) Niemelä et Y.C. Dai. We feel that grouping based on amyloid or KOH reactions of skeletal may cause problems and prefer, at present, not to recognize *Cinereomyces*. *Skeletocutis diluta* (Rajchenb.) A. David et Rajchenb. and *S. papyracea* A. David show also weak amyloidity and KOH gelatinization and still were not included in *Cinereomyces* by Spirin. *Skeletocutis diluta* was described at first as a variety of *S. nivea* (Jungh.) Jean Keller, the type species of genus *Skeletocutis*, and it is really very similar, so it is true *Skeletocutis*. *Skeletocutis papyracea* has a typical incrustation for *Skeletocutis* but its spores resemble those of *S. lenis*, which is considered a member of *Cinereomyces* by Spirin (David, 1982; Rajchenberg, 1983; David and Rajchenberg, 1992; Spirin 2005). So, weak amyloidity and KOH gelatinizing of skeletal hyphae seem to occur both in *Diplomitoporus* and *Skeletocutis*. Also, *Antrodiella incrustans* (Berk. et M.A. Curtis) Ryvarden shows some KOH gelatinizing reaction (Spirin and Zmitrovich, 2003).

In Europe and North America, there are only a few *Diplomitoporus* species but they belong to common polypores. Circumpolar *Diplomitoporus lindbladii* (Berk.) Gilb. et Ryvarden is widespread on both continents. *Diplomitoporus rimosus* (Murrill) Gilb. et Ryvarden and *Diplomitoporus overholtsii* (Pilát) Gilb. et Ryvarden grow abundantly in North America (Gilbertson and Ryvarden, 1986; Ryvarden and Gilbertson, 1993; Pieri and Rivoire, 1998). Surprisingly, no *Diplomitoporus* collection was known from South America until 1998, when *Diplomitoporus dilutabilis* was described (Loguercio-Leite and Wright, 1998).

## Materials and methods

The specimens were collected by the first author in 2006 during a 2 month expedition in Central America. Voucher specimens are deposited in the National Museum, Prague (herbarium PRM) with duplicates in the private herbarium of the first author (herbarium acronym follows Holmgren and Holmgren, 1998). The macro and microscopic characters are described, according to the model of the standard monographs of polypores (e.g. Gilbertson and Ryvarden, 1986; Ryvarden and Gilbertson, 1993). The microscopic mounts were prepared in a standard way using Melzer's reagent and a 5% KOH solution. Specimens were studied with an Olympus BX41 microscope. A 100x oil immersion lens was used. The photographs were taken with an Olympus Camedia C-5060 Wide Zoom digital camera.

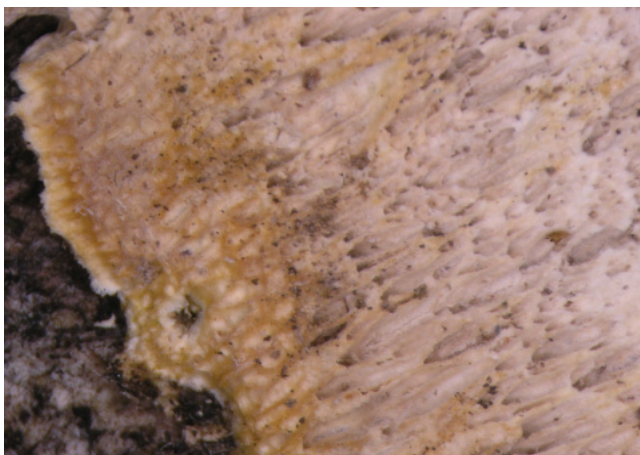
## Description

***Diplomitoporus dilutabilis*** C.L. Leite et J.E. Wright, 1998: Mycotaxon 68: 48 (1998) (Figs. 1-2)

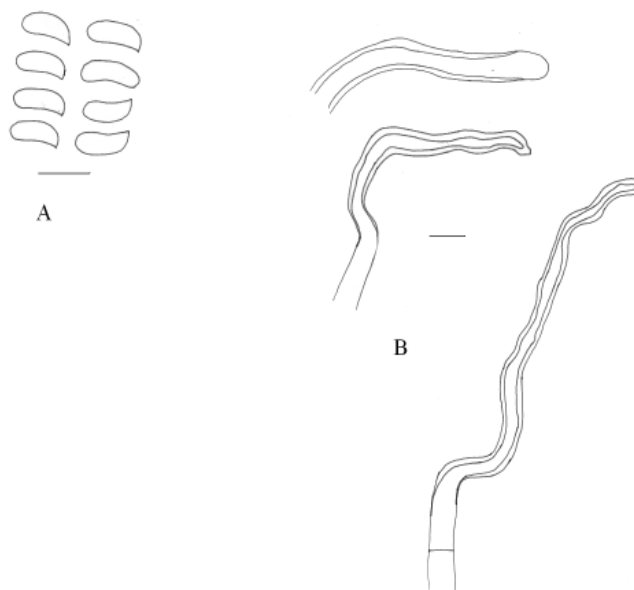
Basidiocarp 6 x 2 cm, 2 mm thick, seemingly annual, resupinate to slightly nodulose, tough, after desiccation hard, not cracking notably, margin sterile, whitish, narrow; hymenophore poroid, cream or ochraceous, pores angular, occasionally elongate to labyrinthine, 4-5 per mm, dissepiments pruinose at first and becoming resinous with age (Fig. 1); tubes lightly ochraceous, 2 mm long, subiculum very thin, white and fibrous.

Hyphal system trimitic; generative hyphae with large clamps, hyaline, thin-walled, 3 µm in diam., (up to 6.5 µm in clamps); skeletal hyphae sinuous, hyaline, thick-walled, nonseptate, short (about 100 µm in long), 6 µm in diam (Fig. 2A). Their lumen is weakly dextrinoid after a longer time in Melzer's reagent. They show striking, immediate reaction with KOH: small pieces of thickened walls spring away and dissolve very quickly until the original thin-walled hypha is exposed, then it is also disintegrated and dissolved. Binding hyphae narrow and branched at right angles, up to 3 µm wide. Rhomboid crystals are present in various sizes, 4-7 x 2-5 µm. Cystidia none. Basidia clavate, 4-sterigmate, 11 x 4-6 µm, with a basal clamp, sterigmata thin, 3 µm long. Basidiospores cylindrical to widely allantoid, distinctly bent on one side, hyaline, thin-walled, negative in Melzer's reagent, (4.5) 5-5.5 (6) x 2-2.2 µm (Fig. 2B). The general appearance of the spores agrees with original description (Loguercio-Leite and Wright, 1998), but they are slightly narrower. White rot.

*Locality*: Guatemala, department Huehuetenango, San Mateo Ixtatán, 21. XI. 2006, on dead wood, PRM 915287



**Figure 1.** *Diplomitoporus dilutabilis*, the edge of the dried fruitbody.



**Figure 2.** *Diplomitoporus dilutabilis*. A, spores; B, skeletal hyphae. Bar= 5µm.

and private herbarium of J. Kout (JK 2111/06K19).

*Notes:* this polypore was first described from Brazil in 1998. Specific reaction of skeletal hyphae with KOH is very characteristic (Loguercio-Leite and Wright, 1998). There are other species of *Diplomitoporus* with skeletal hyphae dissolving in KOH but in a different way. Their skeletal hyphae absorb the surrounding KOH solution, getting very broad, and at last they optically disappear.

This is not the first report about *D. dilutabilis* outside of Brazil. We found 1 record from Costa Rica in the literature (Carranza Velázquez and Ruiz-Boyer, 2005). Still, Drechsler Santos et al. (2008) consider *D. dilutabilis* to be indigenous to Brasil. Our specimen was collected in the Cuchumatanes Mountains in Guatemala (above 2500 m). Notably, the Brazilian specimens were found in southern Brazil, in Santa Catarina state with a temperate climate. The Sierra de los Cuchumatanes supports a threatened ecosystem of virgin oak and fir cloud forests. Unfortunately this biotope is disappearing rapidly due to planting of pine trees and all species here are endangered.

***Diplomitoporus hondurensis*** (Murrill) Ryvarden, 2000: Mycotaxon 74(1): 121 (2000) - (Figs. 3-5)

Basionym: *Poria hondurensis* Murrill 1920, Mycologia 12(6): 303 (1920)

Synonymy: *Grammothele hondurensis* (Murrill) Ryvarden, Mycotaxon 23: 185 (1985)

Basidiocarp 7 x 2 cm, scarcely 1mm thick, seemingly annual, totally resupinate, undetachable, firm, without sterile margin, pores becoming rudimentary toward the edge of fruitbody; hymenophore poroid, white, pores angular, irregular, with lacerate mouths, 2-3 per mm (at the margin to 4 per mm). Conspicuous hyphal pegs can be observed

on the walls of tubes. Tube layer is concolorous with the pore surface. Tube trama is formed as a semitranslucent ceraceous layer, which continues into white subiculum and divides it in pore-wide sections (Figs. 3, 4).

Hyphal system dimitic; generative hyphae with clamps, hyaline, thin-walled, 3-3.5 µm in diam; skeletal hyphae hyaline, straight to sinuous, thick-walled to solid, with large coarse crystal clumps, narrow, 2-3 µm in diam, not dissolving in KOH, inamyloid, dominating. Some types of skeletal hyphae are branched subconjunctively and create a net of very thin projections. In dissepiments, remarkable endings of hyphae up to 10 µm in diameter are formed (Fig. 5A). Hymenium is developed also on the bottom of pores. Basidia clavate, 4-sterigmate, with 4 µm long sterigmata. Basidiospores ellipsoid, slightly navicular, tapering to the apiculus, hyaline, smooth and negative in Melzer's reagent, 5.5 x 2.8 µm (Fig. 5B).

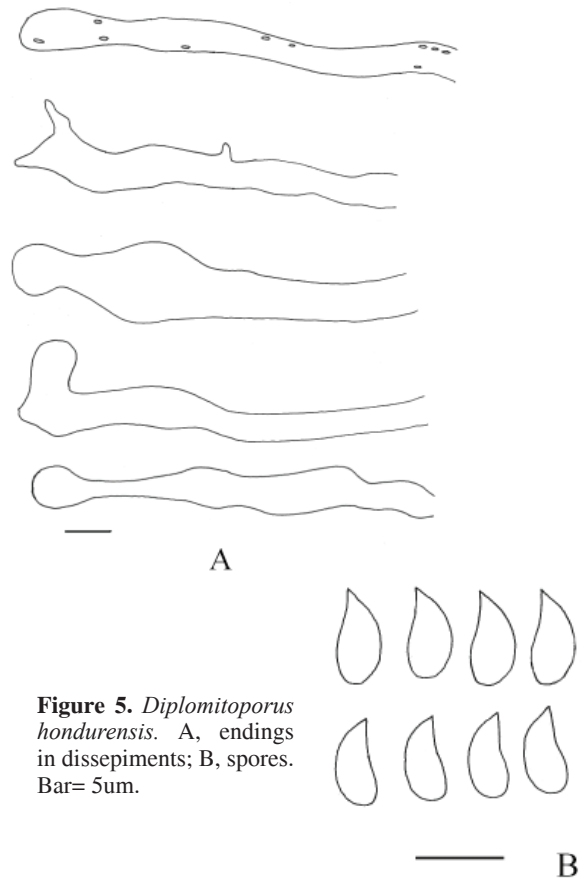
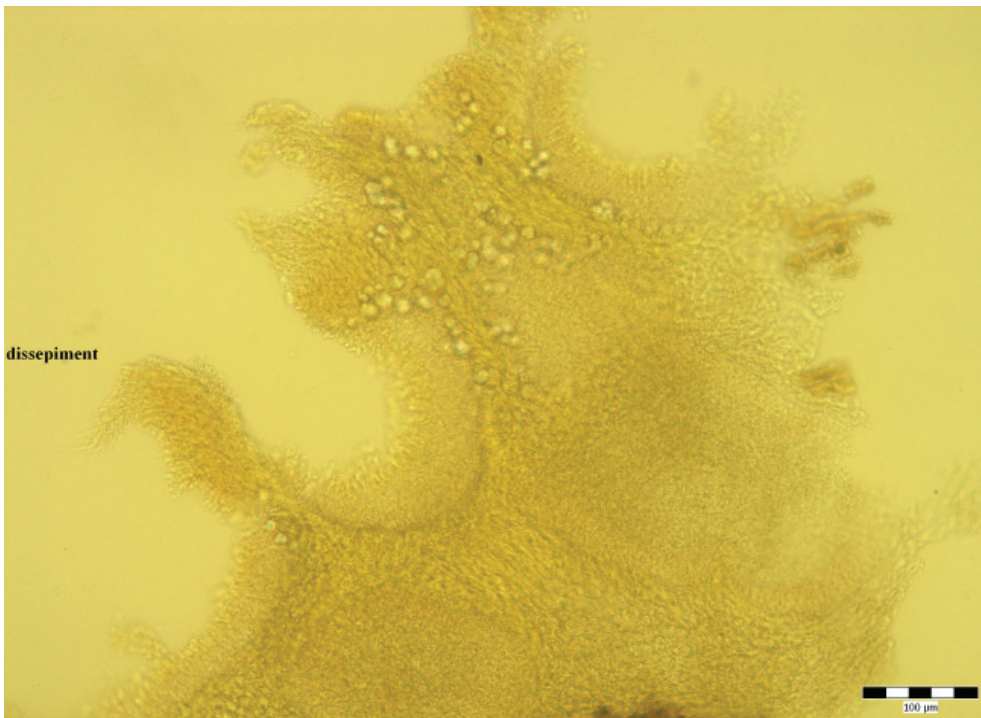
*Locality:* Belize, Cockscomb Basin Wildlife Preserve, X. 2006, on dead hardwood, PRM 915288 and private herbarium of J. Kout (JK 3010/06R2).

*Note:* the type specimen of *D. hondurensis* (Murrill, 1920) originates from Belize (former British Honduras), and not from Honduras as stated by Ryvarden (2000). The Macroscopically similar *Diplomitoporus incisus* Ryvarden (2000) may be separated because of absence of hyphal pegs and variable endings of hyphae in dissepiments. The spores are more robust and tapering to the apiculus in *D. hondurensis* (Ryvarden, 1985). The proportions of basidiospores of both species are similar, though. Ryvarden



**Figure 3.** *Diplomitoporus hondurensis*, transverse section.

**Figure 4.** *Diplomitoporus hondurensis*, transverse section under microscope.



**Figure 5.** *Diplomitoporus hondurensis*. A, endings in dissepiments; B, spores. Bar= 5µm.

(2000) gives similar values 5.5 – 6.5 (7) x 2.5-3 µm for *D. incisus* and 5-8 x 3-3.5 µm for *D. hondurensis*, but the shape is distinct. Tapering to the apiculus discriminates *D. hondurensis* spores well against oblong ellipsoid of *D. incisus*. This difference was not emphasized in the Ryvarden's descriptions but it can be seen very well in the figure (Ryvarden 1985).

## Remarks

The genus *Diplomitoporus* contains 17 recognized species (Domański, 1970; Gilbertson and Ryvarden, 1986; Buchanan and Ryvarden, 1998; Loguercio-Leite and Wright, 1998; Pieri and Rivoire, 1998; Lindblad and Ryvarden, 1999; Ryvarden, 2000; Ryvarden and Iturriaga, 2003; Gibertoni et al., 2004; Coelho, 2008, 2008a). Fourteen species are found in the Americas (3 of them are considered endemic to Venezuela– EV, 3 in Brazil– EB, and 1 in Costa Rica). The following species have been recorded in America:

- Diplomitoporus allantosporus* Ryvarden et Iturr. (2003)- EV  
*Diplomitoporus costaricensis* I. Lindblad et Ryvarden (1999)- endemic to Costa Rica  
*Diplomitoporus crustulinus* (Bres.) Domański (1970)- North America and Venezuela  
*Diplomitoporus dilutabilis* Log.-Leite et J. E. Wright (1998)- Brazil, Costa Rica and Guatemala  
*Diplomitoporus hondurensis* (Murrill) Ryvarden (2000)- known from Puerto Rico and Belize  
*Diplomitoporus incisus* Ryvarden (2000)- found in Puerto Rico, French Guiana and Venezuela  
*Diplomitoporus lindbladii* (Berk.) Gilb. et Ryvarden (1985)- North and Central America  
*Diplomitoporus marianoi-rochae* G. Coelho (2008)- EB  
*Diplomitoporus navisporus* Gibertoni et Ryvarden (2004)- EB  
*Diplomitoporus overholtsii* (Pilát) Gilb. et Ryvarden (1985)- Central and North America  
*Diplomitoporus rimosus* (Murrill) Gilb. et Ryvarden (1985)- North America  
*Diplomitoporus stramineus* Ryvarden et Iturr. (2003)- EV  
*Diplomitoporus taquarae* G. Coelho (2008)- EB  
*Diplomitoporus venezuelicus* Ryvarden et Iturr. (2003)- EV

Overall 6 species of *Diplomitoporus* were collected in Central America. *Diplomitoporus costaricensis* is known only from Costa Rica and it differs from other Central American species by its very small pores (6-8 per mm). *Diplomitoporus incisus*, with disjunctive distribution area is very close to *D. hondurensis*. They have similarly shaped basidiocarps, whitish color and incised pores (Ryvarden,

2000). *Diplomitoporus overholtsii* occurs mainly in the eastern part of the USA, but occasionally it may be found more to the south. It is characterized by wide (up to 5 µm), ellipsoid spores and thick rhizomorphs (Gilbertson and Ryvarden, 1986). *Diplomitoporus lindbladii*, which is characterized by rather large pores with greyish tints and skeletal gelatinizing in KOH, is very common in northern USA and Europe, becoming rare to the south. Its occurrence in Central America is not well documented. Here it may be replaced by the recently described *D. meridionalis*, though probably it has been reported only from the Mediterranean area in France (Pieri and Rivoire 1998). Presently, we collected this species several times in pine woods in southern Florida (unpublished) and its occurrence in Central America can be expected. The species is similar to *D. crustulinus* but spores are ellipsoid and skeletal dissolve in KOH.

The list shows that many *Diplomitoporus* species are known only from small areas and about half of them are considered endemic for 1 country. Nevertheless, it can be expected that this is likely due to the limited knowledge of their true distribution. In fact, a large number of *Diplomitoporus* species has been recently described from South America, making South and Central America important centres of distribution of *Diplomitoporus* (Loguercio-Leite and Wright, 1998; Lindblad and Ryvarden, 1999; Ryvarden, 2000; Ryvarden and Iturriaga, 2003; Gibertoni et al., 2004; Coelho, 2008, 2008a). As the mycological exploration of the neotropical world continues, even more *Diplomitoporus* species will likely be recorded throughout the area in the future. Our work contributes to the knowledge concerning 2 *Diplomitoporus* species occurring in Central America.

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