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Aspectos sobre a ecologia e taxonomia de fungos poliporoides (Basidiomycota) da Mata Atlântica de Santa Catarina, Brasil

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Aspectos sobre a ecologia e taxonomia de fungos poliporoides (Basidiomycota) da Mata Atlântica de Santa Catarina, Brasil

Esta Dissertação foi julgada adequada para obtenção do Título de "Mestre" e aprovada em sua forma final pelo Programa de Pós-Graduação em Biologia de Fungos, Algas e Plantas.

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À minha Mãe, em memória;
à Nayara, minha amada, dedico.

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RESUMO

Políporos é um dos principais grupos de fungos decompositores de madeira, contudo, o conhecimento sobre sua diversidade ainda é escasso. Em Santa Catarina, a sinopse sobre a diversidade dos macromicetos apresenta 247 espécies de fungos, destas, 143 são poliporoides, principalmente da região insular. Para a continuidade e o avanço do conhecimento sobre a diversidade de fungos poliporoides que ocorrem na Mata Atlântica de Santa Catarina, foram estudados aspectos sobre a ecologia de comunidades fúngicas, particularmente de uma área pouco explorada, bem como um complexo taxonômico que ocorre na região. Primeiramente foi avaliada e caracterizada a comunidade de políporos em uma área de Floresta Ombrófila Densa do Parque Nacional da Serra do Itajaí, em termos de riqueza, abundância e funcionalidade. Entre os 152 espécimes coletados 58 espécies foram identificadas. *Polyporus dictyopus*, *Perenniporia martia* e *Fuscoporia walhbergii* foram as espécies dominantes. Com base nas frequências relativas nos diferentes tipos e substratos foram encontrados cinco grupos funcionais, dos quais dois formados por *Phylloporia spathulata* (em raízes vivas no solo) e *Phylloporia chrysita* (em lianas vivas) e os outros três constituídos por espécies saprofíticas, sendo cada grupo caracterizado pela presença de uma das espécies dominantes citadas. Finalmente, *Phellinus piptadeniae* é apresentada como um complexo taxonômico, em processo de especiação, a partir de evidências ecológicas (hospedeiro e distribuição geográfica) e filogenéticas.

Palavras-chave: Comunidade de Políporos Degradadores de Madeira; Grupos funcionais; Complexo Taxonômico *Phellinus piptadeniae*.

ABSTRACT

Polypores is one of the most important groups of wood-decay fungi; however, its diversity knowledge is still scarce. In Santa Catarina state, a synopsis of macrofungi diversity presented 247 species, of which 143 are polypores, mainly from insular region. In order to continue and improve the knowledge about the diversity of polypores, wich are occurring in the Atlantic Forest of Santa Catarina, ecological aspects of fungal communities were studied, in an unexplored area, as well as a complex taxonomy that occurs in the region. Firstly, was described the community of wood-decaying polypores in the Atlantic Rain Forest of Parque Nacional da Serra do Itajai, characterizing the community in terms of richness, abundance and functionality. Among 152 specimens collected 58 species were identified. *Polyporus dictyopus*, *Perenniporia martia* and *Fuscoporia walhbergii* were the dominant species. Based on the relative frequency in the different types of substrates where five functional groups were recognized. Two of them were formed by *Phylloporia spathulata* (on live roots in the ground) and *Phylloporia chrysita* (on live trunks); and three other functional groups, consisting of saprophytic species, each of them was characterized by the presence of one of the dominant species. Finally, *Phellinus piptadeniae* is presented as a taxonomic complex, in a speciation process, evidenced by the existence of two phylogenetic and ecological (host and geographic distribution) lineages.

Keywords: Wood-decay Polypore Communities; Functional Groups; *Phellinus piptadeniae* Complex.

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LISTA DE ABREVIATURAS E SIGLAS

- Alt. - Altitude.
- ARF - Atlantic Rain Forest.
- BE - do inglês broadly elipsoid, fortemente elipsoide.
- Caa - Caatinga.
- cm - centímetros.
- DB - Dead branche.
- DT - Dead trunk.
- Di - dimitic.
- et al. - do latim *et alii*, e outros, e colaboradores.
- Fig., Figs. - Figura, Figuras.
- i.e. - do latim *id est*, isto é.
- ibid. - do latim *ibidem*, no mesmo lugar.
- IKI - Reagente de Melzer.
- KOH - Hidróxido de Potássio, em solução a 3-5%.
- LT - Living trunk.
- m - metros.
- m.a.s.l. - do inglês meters above sea level, metros acima do nível do mar.
- mm - milímetros.
- Mono - monomitic.
- PE - Pernambuco.
- OG - On the ground.
- s. l. - do latim *sensu lato*, no sentido amplo.
- SC - Santa Catarina.
- SP - São Paulo.

SUMÁRIO

INTRODUÇÃO GERAL

As transformações impulsionadas pela expansão das fronteiras humanas, como crescimento das cidades, agricultura e pecuária, têm exercido forte pressão sobre o ambiente natural, com a destruição dos mais diferentes habitas, e consequentemente, levado a diminuição da diversidade biológica, muito ainda desconhecida. Esses fatos, entre outros, têm tornado a biodiversidade um dos assuntos mais relevantes das últimas décadas (Wilson 1994). Excluindo-se os insetos, os fungos constituem o mais numeroso grupo de seres vivos existentes, encontrados em praticamente todos os ecossistemas. Nesse contexto, estima-se que existam em torno de 1.5 a 5.1 milhões de espécies de fungos (Hawksworth 2001, Blackwell 2011), sendo que destas apenas cerca de 100 mil espécies foram descritas até o momento (Kirk *et al.* 2008).

O bioma Mata Atlântica vem sofrendo historicamente com a rápida degradação de ecossistemas e consequente eliminação de espécies. Este processo é resultado do crescimento da população humana sem limites e ocupação indevida de áreas que deveriam ser preservadas. Esta degradação deixou marcas profundas e atualmente o bioma é representado apenas por fragmentos remanescentes dos diferentes ecossistemas do bioma (Chapron 2010).

Em Santa Catarina, a sinopse sobre a diversidade dos macromicetos apresenta 247 espécies de fungos, sendo 33 de *Ascomycota* Whittaker e 212 de *Basidiomycota* R.T. Moore. Destes, 143 são poliporoides *s.l.* (*Hymenochaetales* Oberw., *Polyporales* Gäum. e *Trechisporales* K.H. Larss) e a grande maioria dos registros é proveniente da região insular (Loguercio-Leite *et al.* 2009). Considerando que há mais de 4.000 espécies de Angiospermas na Mata Atlântica de Santa Catarina (Forzza *et al.* 2010) e se utilizarmos a proporção fungos/plantas conservadora de 2:1 (Mueller *et al.* 2006), é possível estimar que o número de espécies de macromicetos possa ser de 8.000 para o Estado. Desta forma, as 143 espécies de poliporoides *s.l.*, principais agentes lignolíticos dentre os fungos degradadores de madeira, representariam pouco mais de 1% do total.

Em relação à diversidade funcional deste grupo de fungos pouco ainda se conhece sobre seus aspectos ecológicos. As espécies de políporos apresentam afinidades distintas por

diferentes substratos, que variam desde ramos de pequeno diâmetro até troncos grandes de árvores vivas. Tem sido proposto que é possível reconhecer grupos funcionais de fungos lignolíticos baseado nas relações de preferências por tipos de substrato em particular. Estes grupos apresentam capacidade de degradação diferenciada e assim estariam cumprindo diferentes funções no ecossistema (Urcelay & Robledo 2004). O conceito de grupos funcionais sustenta a separação das espécies de fungos poliporoides em categorias que estão diretamente relacionadas com o tipo de substrato (troncos e ramos/galhos de árvores vivas ou mortas, em pé ou ainda ao solo e de diferentes diâmetros), bem como os diferentes estágios de decomposição. Estudos recentes, realizados na Argentina, evidenciam que os fungos polipóroides podem ser classificados em grupos funcionais (Urcelay & Robledo 2004; Robledo 2009).

No Brasil, a Mata Atlântica é um mosaico diversificado, apresentando estruturas e composições florísticas distintas, devido às diferenças de solo, topografia e clima, características disponíveis na ampla área de ocorrência desse bioma no Brasil (IBAMA, 2008). O bioma tem uma diversidade de espécies de plantas calculada em 20.000 espécies (Capobianco 2001; Mittermeier, 1999), dos quais 55% são árvores, proporcionando um grande número de nichos onde as variáveis como a umidade, temperatura, volume e diâmetro dos troncos e ramos, estágios de decomposição, estrutura físico-química das diferentes de árvores mortas (Rayner & Todd, 1979) podem abrigar diferentes grupos funcionais e diferentes estruturas nas comunidades de fungos lignolíticos.

Outro aspecto que subestima a diversidade de políporos é a ocorrência de espécies crípticas, ou seja, complexos taxonômicos que podem ou não apresentar diferentes espécies com morfologia similar. Para a América do Sul, Decock *et al.* (2007) registraram a existência destas espécies crípticas em *Hymenochaetales* poroides, táxons que não apresentam diferenças morfológicas perceptíveis. Para a resolução destes complexos são necessárias análises complementares à morfológica, ou seja, uma abordagem mais integrativa utilizando também caracteres ecológicos, biogeográficos, moleculares e de biologia reprodutiva. Na ilha de Santa Catarina, os basidiomas himenoquetoides (pileados e poroides) coletados em *Piptadenia gonoacantha* (Mart.) J.F.Macbr., foram tradicionalmente determinados como *Phellinus grenadensis* (Murrill) Ryvarden (Drechsler-Santos & Loguercio-Leite 2006). Esta espécie foi descrita para a ilha caribenha de Grenada, que de acordo com Ryvarden (2004) é amplamente distribuída

pelos trópicos e em hospedeiros de diversos gêneros. *Piptadenia gonoacantha*, é uma planta popularmente chamada de "pau-jacaré" com ocorrência em todo o bioma Mata Atlântica. No estado de São Paulo, em 1950, o micólogo brasileiro A.R. Teixeira descreveu *Phellinus piptadeniae* Teixeira como uma espécie encontrada unicamente em "pau-jacaré". Por sua vez, *Phellinus grenadensis* da ilha de SC apresenta morfologia muito similar ao material tipo de *P. piptadeniae*. Em suma, é possível que os materiais da ilha de SC determinados como *Phellinus grenadensis* correspondam à espécie *Phellinus piptadeniae*, que de acordo com Drechsler-Santos *et al*. (2010) ocorre também no Bioma Caatinga com níveis de especialização (*host-recurrent*) em espécies de *Piptadenia*.

Diante do apresentado, faz-se necessário avançar como o conhecimento sobre a diversidade de fungos políporos que ocorrem na Mata Atlântica de Santa Catarina, estudando especificamente aspectos sobre a ecologia das comunidades fúngicas, particularmente, em áreas pouco exploradas, mas também sobre a taxonomia de complexos de espécies existentes.

OBJETIVOS

Com o objetivo principal de investigar aspectos ecológicos e taxonômicos dos fungos poliporoides (Basidiomycota) da Mata Atlântica de Santa Catarina, especificamente pretende-se: (i) Avaliar e caracterizar a comunidade de políporos em termos de riqueza, abundância e funcionalidade de fungos políporos em uma área de Floresta Ombrófila Densa do Parque Nacional da Serra do Itajaí; (ii) Reavaliar taxonomicamente *Phellinus grenadensis* da ilha de Santa Catarina com base na morfologia, ecologia e análises moleculares.

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CAPÍTULO I. Community Structure and Functional Diversity of Polypores (Basidiomycota) in the Atlantic Rain Forest of Santa Catarina State, Brazil

Community structure and Functional diversity of Polypores (Basidiomycota) in the Atlantic Rain Forest of Santa Catarina State, Brazil.

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ABSTRACT

Ecological studies have suggested that different groups of polyporoid species, acting as parasites and/or saprophytes, degrade different types of woody substrates. These functional groups have different decay capabilities and hence different roles in the ecosystems. The aim of this study was to describe the community (species composition and functional groups present) of wood-decaying polypores in the Atlantic Rain Forest of Parque Nacional da Serra do Itajaí, in the Santa Catarina state. The polypores specimens and substrate data were collected in two plots (100x50m). Among 152 specimens collected 58 species were identified. Three dominance groups were identified. A first group of three dominant species (*Polyporus dictyopus*, *Perenniporia martia* and *Fuscoporia walhbergii*); a second group of five subordinate species and a third group of 50 rare species. The species were ordered using a cluster correspondence analysis based on relative frequency in the different types of substrates and the mean size of the substrate they fruit. Five functional groups were recognized: two of them are formed by *Phylloporia spathulata* (on live roots in the ground) and *Phylloporia chrysita* (on live trunks); and three other functional groups, consisting of saprophytic species, each of them was characterized by the presence of one of the three dominant species, subordinate and rare ones. The importance of ecological studies addressing community structure is discussed.

INTRODUCTION

Polypores constitute one of the main groups of wood-decay fungi. Although their importance in the ecology of forests, the diversity of wood-decay fungi of the Atlantic Rain Forest (ARF) has been approached by several authors (see for instance Loguercio-Leite *et al*. 2002; Ryvarden & de Meijer 2002; Drechsler-Santos *et al*. 2008). Recently Baltazar & Gibertoni (2009) presented the most extensive literature survey of 733 aphyllophoraceous species, of which more than 50% are polypores.

Regarding the functional diversity of this group of fungi, little is known about its ecological aspects. Ecological studies have suggested that different groups of polyporoid species, acting as parasites and/or saprophytes, degrade different types of woody substrates. These functional groups have distinct capacity degradation and perform different roles in the ecosystems. Among the wood-decay fungi *Polyporaceae s.l.*, as well as some *Corticiaceae s.l.* and *Hymenochaetaceae*, have been recommended as well suited to study the key role of woody debris in old-growth forests (Bader *et al*. 1995).

In this context, Urcelay & Robledo (2004) have proposed that it is possible to recognize functional groups of polypores based on the preferences of the species for particular types of substrate. The authors recognized groups of species that are directly related to different type of substrates (trunks and branches/twigs of trees living or dead, standing or on the ground and of different volumes) as well as different decay stages. This functional group proposal is based in a study conducted in monospecific *Alnus acuminate* H.B.K (Betulaceae) forests of Northwest Argentinean Yungas.

The polypores functional groups, proposed by Urcelay & Robledo (2004), should be tested in a highly diverse ecosystem, as Atlantic Rain Forest of Brazil. This biome is a diversified mosaic, showing structures and floristical compositions distinguished, due to the differences in soil, topography and climate characteristics available in the broad area of occurrence in Brazil (IBAMA, 2008). The plant species diversity estimated of Atlantic Rain Forest is around 20.000, of which 55% are trees (Capobianco 2001; Mittermeier, 1999). This high diversity provides a large number of niches with different variables (humidity, temperature, volume and diameter of trunks and branches, stage of decomposition of wood, and physical and chemical structure of dead trees) that may influence in the functional diversity and community structure of wood-decay fungi (Rayner & Todd 1979).

The aim of this study is to describe and characterize the community of wood-decay polypores of the Parque Nacional da Serra do Itajaí (PARNA-SJ), in the Atlantic Rain Forest of Santa Catarina state, Brazil, in terms of richness, abundance and functionality.

MATERIAL AND METHODS

Study area

The Parque Nacional da Serra do Itajaí (PARNA-SI) is located in the Itajaí Valley, in Santa Catarina state (Figure 1A), covering an area of 57.374 ha and altitudes from 80 to 1039 m.a.s.l. The climate is temperate humid hot summer (Cfa), no deficiency of rain in any season with evapotranspiration with potential mega thermal (GAPLAN, 1986). The annual mean temperature ranges between 17 ° C and 22 ° C, having an annual rainfall ranging between 1600 and 1800 mm, distributed between 120 and 140 days of rain during the year, with an average relative humidity between 75 and 85% (Klein, 1979).This conservation area comprises a significant portion of the remnants of the Atlantic Rain Forest biome, with patches of primary forests and others in advanced stage of regeneration (source: SOS Mata Atlântica and INPE Instituto Socioambiental). The study was conducted in the Parque Municipal Natural Nascentes do Garcia, Blumenau municipality, where two study areas of 5000 m^2 (100 x 50 m) were plotted (Figure 1B). The vegetation in the study area is classified as Dense Ombrophilous Forest (GAPLAN 1986).

Sampling methods

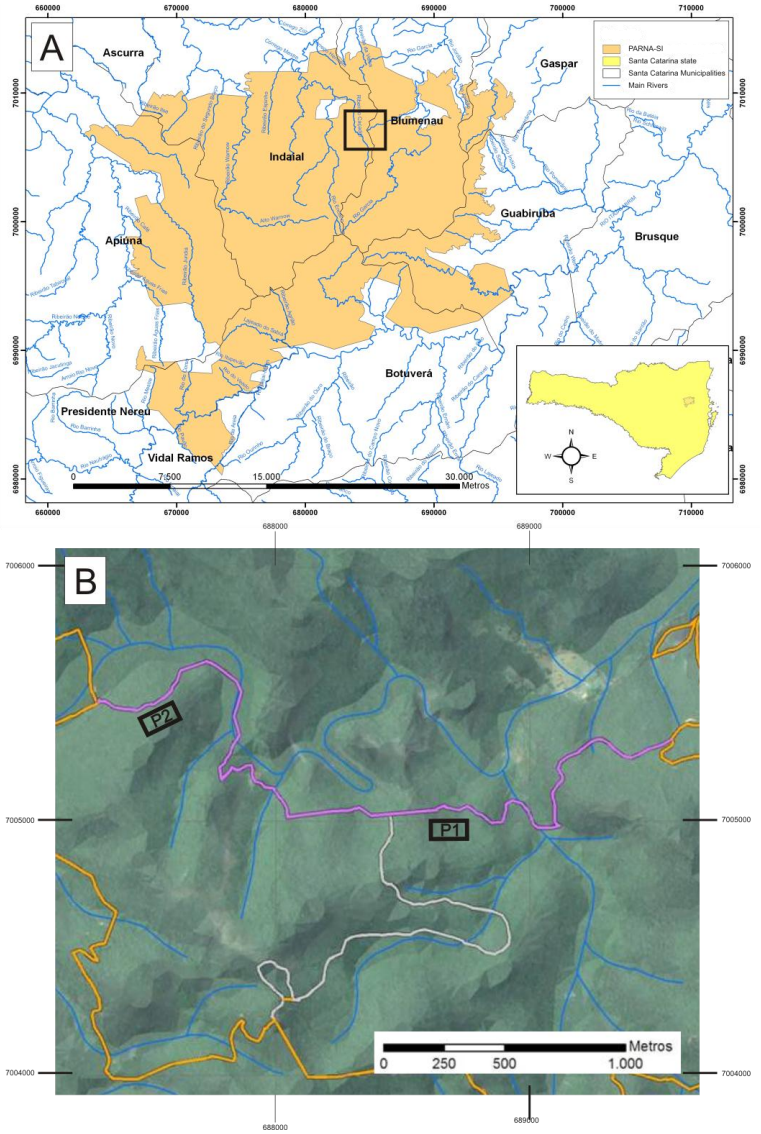
Each plots (Figure 1B) was sampled four times each one (field expeditions: 5-6 November 2011, 22-23 February 2012 , 11-12 June 2012 and 12-13 September 2012) in order to cover the seasons of one year. Figure 1 shows the area and the position of the two plots.

All basidiomes of polypores species were recorded and when there were many basidiomes of the same species in the same substrate only one occurrence was recorded.. Most of substrate sampled was identified by photos in order to avoid recording the same specimens during different field expeditions. The following substrate data were recorded for each fungal occurrence: diameter and length (volume of the substrate was then calculated) and the condition [living trunk (LT); dead trunk (DT): standing or fallen logs and stumps; living branch (LB); dead

branch (DB); and on the ground (OG)]. To consider the trunks established the need for visualization of stumps near the trunks.

According to Urcelay & Robledo (2004), in the present study it was assumed that there was a gradient in the diameter and volume of the logs and a gradient in the level of decay, ranging from the dead trunks trunks living in the soil, representing a decay succession. In the present study we use this classification to decay wood: initial (the bark rot and decay on wood up to 3cm), moderate (the cortical portion with wood rot more than 3 cm, with the center of the timber a hard consistency) and advanced (substrate can be removed easily, all be rotten wood).

Figure 1. Study area: (A) PARNA Serra do Itajaí in the Santa Catarina state, with delimitation of study area (the square represents the Parque Natural Nascentes do Garcia extended in B); (B) Parque Natural Nascentes do Garcia showing the position of plots.



Data analysis

Estimated richness was calculated with ACE and CHAO 1 estimators with one individual-based frequency sample (all polypore species frequency records across all sampling plots and dates) with the software EstimateS (Version 9.0, viceroy.eeb.uconn.edu/estimates).

The relative frequency of each polypore species in each substrate condition was calculated as:

$$Fr_{xi} = \frac{n_{xi}}{A_x}$$

where n_{xi} = number of occurrences of each polypore species x in each substrate condition i (*viz*., LT, DT, LB, DB, and OG) and A_x = abundance of polypore species x (across all sampling plots and dates). The species richness in each substrate condition was also calculated.

Cluster analyses were performed to classify polypores species into groups as recommended by Goodall (1980). This method is based on distances between species and combines the species computed from their relative frequency on different substrate conditions (Fr_{xi}) and the average volume of the substrates on which they occurred (Table 1). The mean Euclidean distance was used as a measure of similarity between species and clustering was based on the average linkage method using the Infostat statistical package (Di Rienzo *et al*. 2001). Species with two or more occurrences were included in the analysis (Urcelay & Robledo 2004).

The sampling effort was tested using the complementarity (dissimilarity), an empirical measure of the degree of species uniqueness between different samples. This empirical test for complementarity was calculated as:

$$Cjk = \frac{Ujk}{Sjk}$$

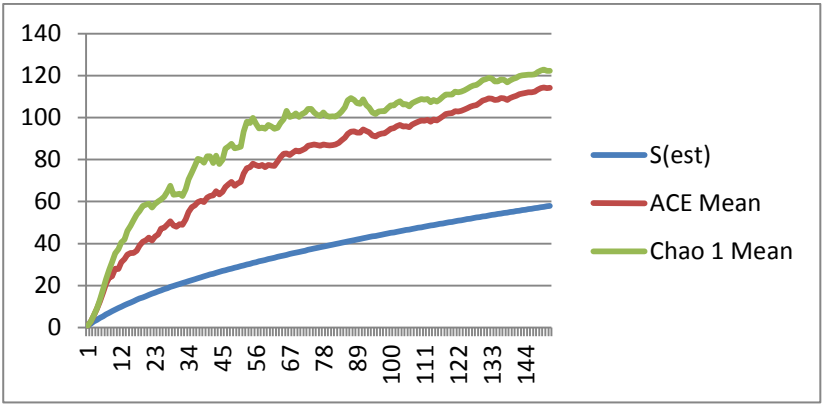
where Cjk = the complementarity between samples (or plots) j and k, Ujk = the total number of taxa encountered at only one plot, and Sjk is the total richness of both plots combined (Colwell & Coddington 1994). Sampling effort for species richness is most efficient when complementarity among samples (Cjk) is about 0.5 (Lodge *et al*. 2004).

RESULTS

Species richness

In the present study 152 records were done, from which 94 % (143 records) were identified at species level representing 58 polypore species. Eleven specimens (6%) could not be identified at species level, however they represent 11 distinct species among the polypore community (*i.e. Dichomitus sp.*, *Fomitiporella sp.*, *Fuscoporia sp.*, *Junghuhnia sp.*, *Oxyporus sp.*, *Phellinus sp.1* and *sp.2*, *Polyporus sp.*, *Rigidoporus sp.*, *Tyromyces sp.1* and *sp. 2)*, and therefore have been included in the study. Species richness observed (58 species) represent 51% of the estimated richness to ACE=114.1 and 47% to CHAO1=122.2 (Fig. 2). Complementarity (dissimilarity) was *Cjk* = 0.7, showing that the sampling for richness was efficient.

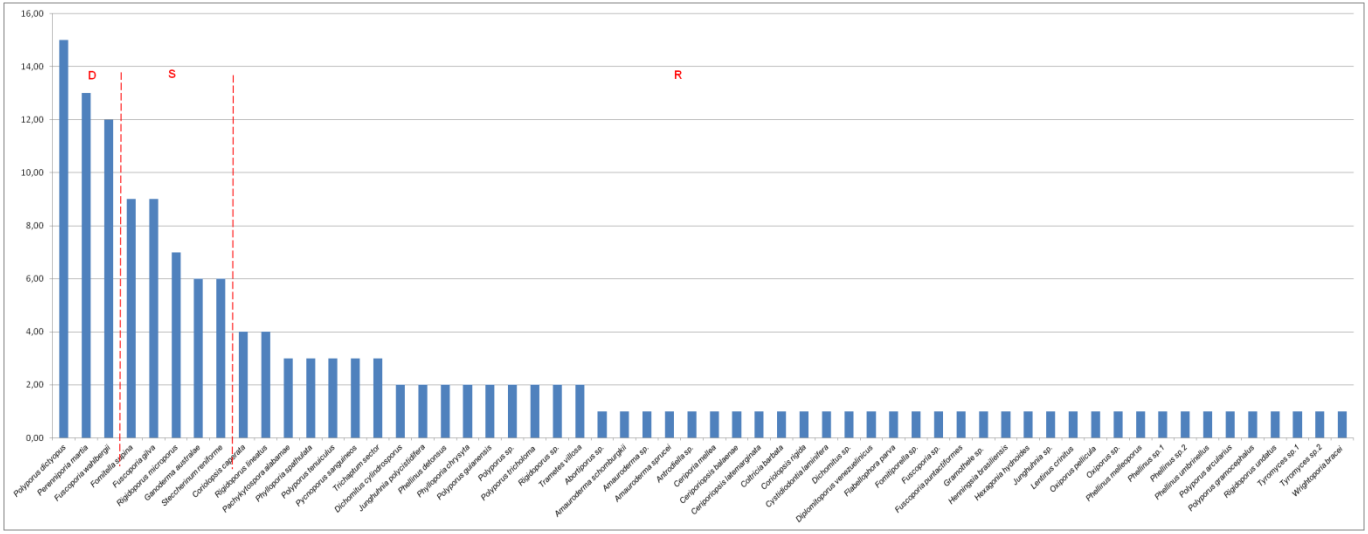
Figure 2. Observed S(est) and Estimated richens by CHAO1 and ACE estimators. Estimators show different values.



Community structure: abundance and richness of species

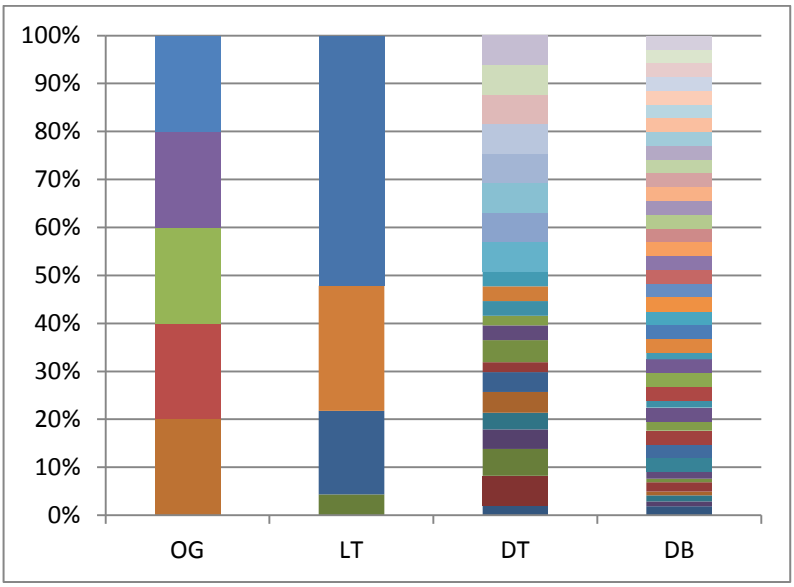
Community structure based on species abundance shows (Figure 3, Table 1) that *Polyporus dictyopus*, *Perenniporia martia*, and *Fuscoporia walhbergii* were the dominant species showing the highest abundance values (15, 13 and 12 respectively). They represent almost 26% of the total occurrences (40 out of 152) but only 5.4% of the species richness. In the other extreme, a group of rare species, mainly with one, two or three records (only two with four records) represent around 50% of the total of occurrences (76/152); however they cover the 86% of species richness. With intermediate abundance values of six to nine records, a group of five subordinate species represent 24% of the total occurrences (38/152) and 8.6% of species richness.

Figure 3. Abundance of species of the PARNA Serra do Itajaí: **D**. dominat species; **S**. subordinate species and **R**. rare species.



Abundance and species richness were increasing according the advanced decay stage of the substrate. Among 152 specimens collected, 6 (4 species) were recorded on LT, 68 (22 species) on DT, 71 (40 species) on DB and 7 (5 species) on the ground (OG) (Figure 4, Table 1).

Figure 4. Richness and relative abundance of polypore species of the PARNA Serra do Itajaí within different substrate types.



Community structure: Functional groups

Based on the relative frequency of each species in the different log conditions and the mean diameter and volume of the log on which the basidiomas were found, the cluster analysis produced four main groups of polypore species when the dendrogram was cut at a distance of 2,30 (Figure 5). *Phylloporia spathulata* (with relative frequency of 1.00 on OG) and *Phylloporia chrysita* (with relative frequency of 1.00 in LT) formed two functional groups, Group 1 and 2 respectively, themselves.

Group 3 is formed by *Ganoderma australe*, *Phellinus detonsus* and *Fuscoporia wahlbergii*. These species present the capability to

decay and basidioma emerge in standing living trunks, but also can continue growing as saprobes and the basidioma emerge on dead trunks too.

Groups 4 and 5 are constituted by saprobe species decaying dead wood, and they are differentiated by the relative frequency and the average size of the substrates. Group 4 is formed by seven species that grow "preferably" on dead trunks of large size, the highest volume values observed are in this group. Group 5 comprise 18 species that grow exclusively on dead branches of small volume. Within Group 5, two smaller subgroups could be distinguished. *Rigidoporus lineatus*, *Steccherinum reniforme*, *Trichaptum sector* and *Polyporus dictyopus* form a subgroup characterized by grow indifferently on DT and DB of relatively low volume. The other subgroup is composed by species that grows exclusively in DB with the lowest volume values. Regarding groups 3 to 5, each group is composed by 1 dominant species, at least one subordinate and several rare species (only one in group 3).

Figure 5. Cluster analysis of different polypores species of the PARNA Serra do Itajaí based on relative frequency of the species in each substrate condition and the mean volume of the substrates where they were found. Arrows indicates dominant species.

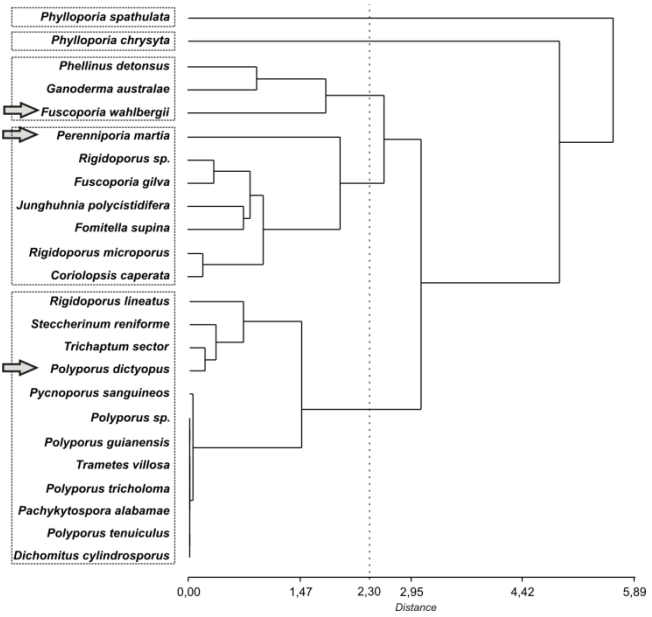


Table 1. Total relative frequency and number of polypores species in the substrate conditions and mean volume of the logs where they were found.

		Relative Frequence					
Species	A	OG	LB	LT	DB	DT	$\bar{X}$Vol (m^3)
Polyporus dictyopus	15	0,00	0,00	0,00	0,67	0,33	0,175
Perenniporia martia	13	0,00	0,00	0,00	0,00	1,00	1,567
Fuscoporia wahlbergii	12	0,00	0,00	0,08	0,00	0,92	0,326
Fomitella supina	9	0,00	0,00	0,00	0,33	0,67	0,744
Fuscoporia gilva	9	0,00	0,00	0,00	0,44	0,56	0,935
Rigidoporus microporus	7	0,00	0,00	0,00	0,29	0,71	1,094
Ganoderma australae	6	0,00	0,00	0,33	0,00	0,67	0,056
Steccherinum reniforme	6	0,00	0,00	0,00	0,67	0,33	0,247
Coriolopsis caperata	4	0,00	0,00	0,00	0,25	0,75	1,168
Rigidoporus lineatus	4	0,00	0,00	0,00	0,50	0,50	0,022
Pachykytospora alabamae	3	0,00	0,00	0,00	1,00	0,00	0,001
Phylloporia spathulata	3	1,00	0,00	0,00	0,00	0,00	0,000
Polyporus tenuiculus	3	0,00	0,00	0,00	1,00	0,00	0,002
Pycnoporus sanguineus	3	0,00	0,00	0,00	1,00	0,00	0,025
Trichaptum sector	3	0,00	0,00	0,00	0,67	0,33	0,029
Dichomitus cylindrosporus	2	0,00	0,00	0,00	1,00	0,00	0,002
Junghuhnia polycistidifera	2	0,00	0,00	0,00	0,50	0,50	0,570
Phellinus detonsus	2	0,00	0,00	0,50	0,00	0,50	0,173
Phylloporia chrysita	2	0,00	0,00	1,00	0,00	0,00	0,001
Polyporus guianensis	2	0,00	0,00	0,00	1,00	0,00	0,001
Polyporus sp.	2	0,00	0,00	0,00	1,00	0,00	0,001
Polyporus tricholoma	2	0,00	0,00	0,00	1,00	0,00	0,001
Rigidoporus sp.	2	0,00	0,00	0,00	0,50	0,50	1,768
Trametes villosa	2	0,00	0,00	0,00	1,00	0,00	0,001
Abortiporus sp.	1	0,00	0,00	0,00	1,00	0,00	0,001
Amauroderma schomburgkii	1	1,00	0,00	0,00	0,00	0,00	0,000
Amauroderma sp.	1	1,00	0,00	0,00	0,00	0,00	0,000
Amauroderma sprucei	1	1,00	0,00	0,00	0,00	0,00	0,000
Antrodiella sp.	1	0,00	0,00	0,00	1,00	0,00	0,001
Ceriporia mellea	1	0,00	0,00	0,00	1,00	0,00	0,001

Ceriporiopsis balaenae	1	0,00	0,00	0,00	1,00	0,00	0,016
Ceriporiopsis latemarginata	1	0,00	0,00	0,00	1,00	0,00	0,006
Coltricia barbata	1	1,00	0,00	0,00	0,00	0,00	0,000
Coriolopsis rígida	1	0,00	0,00	0,00	1,00	0,00	0,011
Cystidiodontia laminifera	1	0,00	0,00	0,00	0,00	1,00	0,377
Dichomitus sp.	1	0,00	0,00	0,00	1,00	0,00	0,003
Diplomitoporus venezuelinicus	1	0,00	0,00	0,00	0,00	1,00	1,256
Flabellophora parva	1	0,00	0,00	0,00	1,00	0,00	0,000
Fomitiporella sp.	1	0,00	0,00	0,00	1,00	0,00	0,004
Fuscoporia puntactiformes	1	0,00	0,00	0,00	1,00	0,00	0,001
Fuscoporia sp.	1	0,00	0,00	0,00	0,00	1,00	0,791
Gramothele sp.	1	0,00	0,00	0,00	1,00	0,00	0,001
Henningsia brasiliensis	1	0,00	0,00	0,00	0,00	1,00	0,006
Hexagonia hydnoides	1	0,00	0,00	0,00	1,00	0,00	0,003
Junghuhnia sp.	1	0,00	0,00	0,00	1,00	0,00	0,001
Lentinus crinitus	1	0,00	0,00	0,00	1,00	0,00	0,001
Oxiporus pellicula	1	0,00	0,00	0,00	1,00	0,00	0,001
Oxiporus sp.	1	0,00	0,00	0,00	1,00	0,00	0,045
Phellinus melleoporus	1	0,00	0,00	0,00	0,00	1,00	1,360
Phellinus sp.1	1	0,00	0,00	0,00	0,00	1,00	0,109
Phellinus sp.2	1	0,00	0,00	0,00	0,00	1,00	0,035
Phellinus umbrinellus	1	0,00	0,00	0,00	0,00	1,00	0,814
Polyporus arcularius	1	0,00	0,00	0,00	1,00	0,00	0,026
Polyporus gramocephalus	1	0,00	0,00	0,00	1,00	0,00	0,014
Rigidoporus undatus	1	0,00	0,00	0,00	1,00	0,00	0,008
Tyromyces sp.1	1	0,00	0,00	0,00	1,00	0,00	0,001
Tyromyces sp.2	1	0,00	0,00	0,00	1,00	0,00	0,004
Wrightoporia bracei	1	0,00	0,00	0,00	1,00	0,00	0,001
Species richness		5	0	4	39	23	
At	152						

DISCUSSION

This work was based on the occurrence of species through presence of their basidiomes. The results and conclusions were underestimated for a part of the community, because they did not have basidiomes on substrate and were not considered. We conducted the sampling trough four seasons in order to consider the seasonal variability and to include as many species as possible. Work with presence-absence of basidiomes is a methodology accepted to do ecological works (Urcelay & Robledo 2004 and references there in).

Species richness and abundance increase as increases the decay stage as here is assumed. This is in accordance with previous results (Urcelay & Robledo 2004) and the theoretical frame of decay succession (Rayner & Todd 1979).

Regarding functional structure of the community, our results agree with those of Urcelay & Robledo (2004). We could identify two additional functional groups (Group 1 and 2), both constituted by *Phylloporia* species. *Phylloporia* species are parasites of roots, living branchs and living stems of creepers (Decock *et al*. 2013). This genus is not present in the *Alnus acumniata* montane forests where polypore functional groups were originally proposed (Robledo *et al*. 2003, Urcelay & Robledo 2004). The groups 3-5 identify in this study agree with those proposed by Urcelay & Robledo (2004), however the species composition is different. This support the idea that all woody substrates types and sizes are important for fungal diversity (Heilmann-Clausen & Christensen 2004).

Species richness observed (58) is near 50% of the estimated (ACE=114.1 and CHAO1=122.2). This represent less than 16% and 31% to ACE and 33% to CHAO1 of ca. 365 polypores species reported by Baltazar & Gibertoni (2009) for the ARF biome. Sampling effort was enough as suggested by complementarity index (Lodge *et al*. 2004); abundance and richness values will increase certainly with more sampling efforts (additional plots), however we believe that dominance and functional structure will not change substantially. From a practical point of view the sample design of this study was enough to have a preliminary overview of the community structure.

Ecological studies describing the community structure of species, as here presented, are extremely important, particular actual conservation issues that threaten the remains of forests. Particular substrates and/or key functional species could be identified, and then could be considered when conservation decisions are taken.

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CAPÍTULO II. *Phellinus piptadeniae* complex: ecological, morphological and molecular evidences of a speciation process in Brazil

***Phellinus piptadeniae* complex: ecological, morphological and molecular evidences of a speciation process in Brazil**

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M.A. Borba-Silva[1*], G.L. Robledo[2], A. Góes-Neto[3] & E.R. Drechsler-Santos[1] (Universidade Federal de Santa Catarina, Departamento de Botânica, Campus Universitário, Trindade, Florianopolis, SC, CEP: 88040-900). *Phellinus piptadeniae* complex: ecological, morphological and molecular evidences of a speciation process in course in Brazil. J. Torrey The occurrence of cryptic species has been documented among the Neotropical polypores. Species complex, new species and speciation process were recently proposed using an integrative approach (host and geographic distribution, morphological, compatibility tests and molecular analysis). *Phellinus piptadeniae* was described by A. Teixeira as specific on *Piptadenia gonoacantha* from Atlantic forest of São Paulo State. The distribution of this species was expanded recently to the Caatinga biome, where was characterized as recurrent on *Piptadenia spp*. In the Atlantic Rain Forest of Santa Catarina state, specimens collected on *Piptadenia gonoacantha* have been traditionally named as *Phellinus grenadensis*. A comparative morphological detailed study reveal that these specimens correspond to *P. piptadeniae*, a fact also supported by molecular analysis. Our results support that *Phellinus piptadeniae* is a taxonomic complex of species that is undergoing a speciation process evidenced by the existence of two phylogenetic and ecological (host and geographic distribution) lineages.

Key words –Taxonomic complex, *Hymenochaetaceae*, ITS analyses, Host specificity.

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INTRODUCTION

The occurrence of cryptic species among the morphospecies concept has been documented in South America (Decock *et al*. 2007). The resolution of taxonomic complexes is as difficult as the perception that a speciation is in course. According with Decock *et al*. (2007) and Rajchenberg & Pildain (2012), cryptic species, species complexes and the process of speciation in courses should be approached with different tools (morphological, ecological and molecular).

Phellinus piptadeniae Teixeira (*Hymenochaetaceae* Donk) were described in 1950, as a specialist on *Piptadenia gonoacantha* (Mart.) J.F.Macbr (*Fabaceae*, as *P. communis* Benth.) from Atlantic forest of São Paulo State (Teixeira 1950). Drechsler-Santos *et al*. (2010) expanded its distribution to the Caatinga biome, reporting it as host-recurrent on *Piptadenia spp.* In the Atlantic Rain Forest of Southeast Brazil, state of Santa Catarina, *Phellinus grenadensis* (Murrill) Ryvarden has been reported exclusively on *Piptadenia gonoacantha* (Gerber & Loguercio-Leite 2000, Drechsler-Santos & Loguercio-Leite 2006). Remarkably, these records are based on specimens that strikingly are morphologically similar to *Phellinus piptadeniae*. *Phellinus grenadensis* was originally described from the Caribbean island of Grenada, and is reported as widely distributed in the tropics growing on different plant families (Ryvarden 2004).

The aims of this work were: (i) to confirm the presence of *P. piptadeniae* on *Piptadenia spp.*, extending the distribution to the Southeast Atlantic Rain Forest of Brazil (Santa Catarina states), and (ii) to delimit the taxon, using molecular, morphological and ecological data.

MATERIAL AND METHODS

Fresh specimens of the presumably *Phellinus grenadensis* growing on *Piptadenia gonoacantha* in Santa Catarina state were collected, analyzed in detail (molecular, macro- and microscopically) and properly kept at Herbarium FLOR. Type material of *Phellinus piptadeniae* (IAC 4365, Figure 1cd) and *Phellinus grenadensis* (NYGB 742990, Figure 1ab) and representative materials from Caatinga biome were also studied for further morphological comparisons (Table 1, n= 40). Microscopic observations were made from slide preparations stained with 3-5% KOH and Phloxine, or Melzer's reagent. Sections of the basidiomes were incubated for two days at 40°C in NaOH 3%

solution, then carefully dissected under a stereomicroscope and examined in NaOH 3% solution at room temperature (Decock *et al*. 2013). Herbaria acronyms are based on Index Herbariorum (Thiers, continuously updated).

Material examined (*Phellinus piptadeniae*): **Brazil**. São Paulo: Campinas, Bosque dos Jequitibás, 12.IX.1943, *A.R.Teixeira e P.R.Santos* (IAC 4365, holotype, figure 1cd); Santa Catarina: Florianópolis, Campus Universitário/UFSC, 25.I.2011, *Borba-Silva MABS 106* (FLOR 39571); ibid, *Borba-Silva MABS 107* (FLOR 39572), 14.IV.2011, *MABS 135* (FLOR 39573); ibid, *MABS 136* (FLOR 39574, figure 1ef); ibid: Santo Amaro da Imperatriz, Caldas da Imperatriz, BR 282 KM 26, 31.X.2012, *Drechsler-Santos et al. DS 846* (FLOR, figure 1g); ibid: Palhoça, Parque Estadual da Serra do Tabuleiro, 27.IX.2000, Groposo 037 (FLOR 11895, as *Phellinus grenadensis*); ibid, 18.VII.2001, Groposo & Andrade 176 (FLOR 11957, as *Phellinus grenadensis*); ibid, 15.V.2005, *Michels et al. 509* (FLOR 31816, as *Phellinus grenadensis*); Pernambuco: Caruaru, Estação Experimental do IPA (8º13'53" S x 35º55'12" W, 562m alt.), 10.XII.2008, *Drechsler-Santos et al*. DS109PE (URM80322, figure 1h); ibid: Triunfo (7º52'53"S x 38º06'15" W, 550-800m alt.), 26.11.2009, *Robledo 1982* (CORD), on *Piptadenia* sp.

Additional material examined (*Phellinus grenadensis*): **Grenada.** Saint George: Annandale Mountain Forests, II.1906, *W.E.Broadway* s/n (NYGB 742990, holotype, figure 1ab).

Molecular studies (Table1) have been carried out in the laboratories of Universidade Federal de Santa Catarina (gDNA extraction and target region amplification) and Universidade Estadual de Feira de Santana (sequencing). The method developed by Doyle and Doyle (1987), modified by Góes-Neto *et al*. (2005), were used for DNA extraction. The nrITS region (fungal DNA barcode region) of the extracted DNA was amplified using the universal primers ITS4 and ITS5 (Schoch *et al*. 2012). Besides the new sequences generated, we were also used ITS sequences from Caatinga specimens of *Phellinus piptadeniae* (unpublished data by Drechsler-Santos *et al*.) and related species/genera of *Hymenochaetaceae* from Genbank to construct the phylogenetic trees. GenBank accession numbers of the sequences obtained are indicated in the tree (Figure 3) after the taxa names. DNA sequences were aligned on MEGA version 5.0 (Tamura *et al*. 2011) and then edited with BioEdit version 7.1.3.0 (Hall 1999). Phylogenetic trees generated by MEGA were based on maximum parsimony (MP) and Neighbor-Joining (NJ). Bootstrap analysis (1000 bootstrap replicates)

was used to determine branch support. *Trichaptum abietinum* (Dicks.) Ryvarden was used as out group (GenBank Fj608591.1). The GeneBank access numbers of new sequences are not mentioned because the data was not published yet.

Table 1. Information of partial ITS rDNA sequences used in the phylogenetic analysis

Species	Accession number	Voucher specimens	Origin	Hosts
Phellinus piptadeniae	unpublished	FLOR39571	Brazil	*Piptadenia gonoacantha*
Phellinus piptadeniae	unpublished	FLOR39573	Brazil	*Piptadenia gonoacantha*
Phellinus piptadeniae	unpublished	FLOR39574	Brazil	*Piptadenia gonoacantha*
Phellinus piptadeniae	unpublished	URM80322	Brazil	*Mimosa sp.*
Phellinus piptadeniae	unpublished	URM80345	Brazil	*Senegalia sp.*
Phellinus piptadeniae	unpublished	URM80361	Brazil	*Senegalia sp.*
Phellinus sp.	unpublished	URM80362	Brazil	not informed
Phellinus fastuosus	AY558615	not informed	not informed	not informed
Phellinus robiniae	AY558646.1	CBS211.36	not informed	not informed
Phellinus ignarius	GQ383717	not informed	not informed	not informed
Phellinus alni	GQ383775	BRNM714864	Finland	*Alnus incana*
Inonotus hispidus	JX501315	B61	not informed	not informed
Outgroup				
Trichaptum abietinum	FJ7686761	1302BG	not informed	not informed

RESULTS AND DISCUSSION

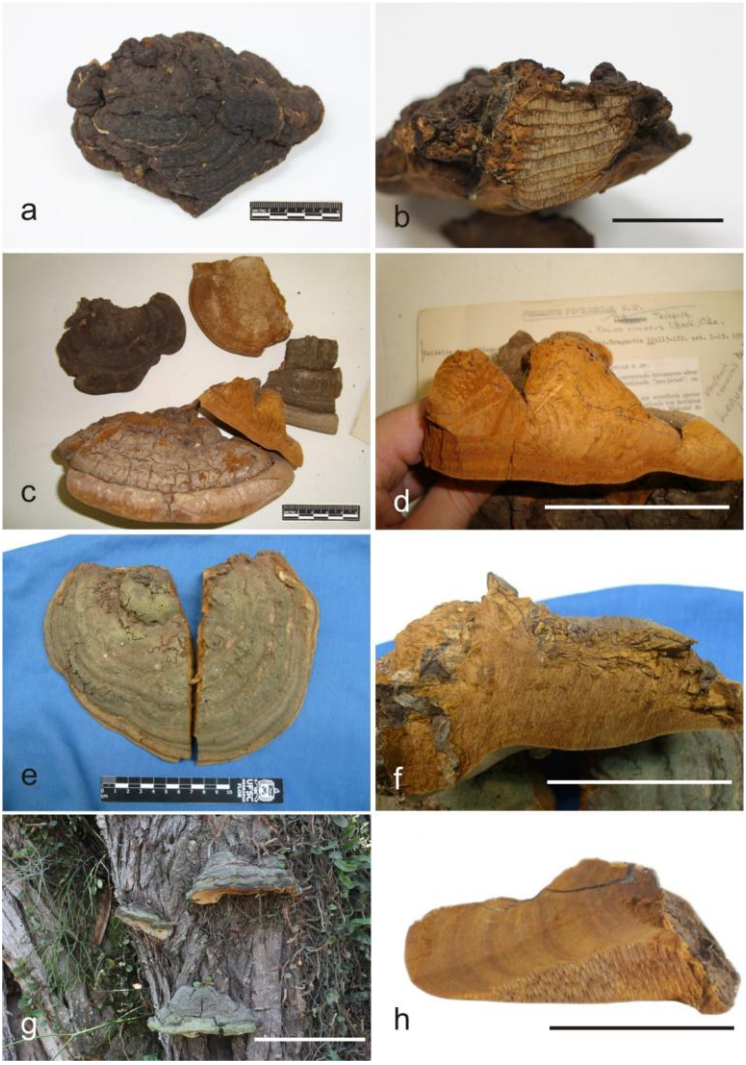
The morphological analysis (Table 2) showed that the characters: hymenophore (thickness dissepiment, diameter and number of pores per mm) and basidiospores (size and shape) were not diagnostic at species level in this group, *i.e.*, there are no differences among the specimens studied. However, the type of hyphal system, black line in the context and the length of skeletal hyphae of the tubes were characters that distinguish *Phellinus grenadensis* from the other specimens studied, previously named as *P. piptadeniae*. *Phellinus grenadensis* is dimitic in the tubes and in the context, while *P. piptadeniae* is dimitic in the tubes and monomitic in the context. Additionally, *P. piptadeniae* presents very distinct black line (figure 1dfh) in the context and longer skeletal hyphae (figure 2ab) than *P. grenadensis*. Furthermore, the specimens from Atlantic Rain Forest of Santa Catarina (ARF of SC) and the holotype of *P. piptadeniae* were collected exclusively in *Piptadenia gonoacantha*, while collections of *P. grenadensis* were recorded widely distributed to the America and Africa on many other hosts (Carranza and Ryvarden 1998, Ryvarden and Guzmán 1993, Dennis 1970, Gilbertson and Ryvarden 1987, Gilbertson *et al*. 2002). In this case (table 1), the data clearly show that the specimens collected in the ARF of SC are not *P. grenadensis*, and consequently, correspond to the species *P. piptadeniae*.

Table 2. Morphological, host and geographical distribution data of *Phellinus grenadensis* and *Phellinus piptadeinae*.

Specimens	*P.grenadensis* Type	*P. piptadeniae* Type	*P. piptadeniae* FLOR 39571*	*P. piptadeniae* FLOR 39573*	*P. piptadeniae* FLOR 39574*	*P. piptadeniae* (CORD)	*P. piptadeniae* (URM80322)
Local specimen (geographical distribution)	Grenada Island (Africa and Americas)	Campinas (Brazil: ARF of SP)	SC Island (Brazil: ARF of SC)	SC Island (Brazil: ARF of SC)	SC Island (Brazil: ARF of SC)	Triunfo (Brazil: Caa of PE)	Caruaru (Brazil: Caa of PE)
Host species	Unknown	*P.gonoacantha*	*P.gonoacantha*	*P.gonoacantha*	*P.gonoacanhta*	*Piptadenia sp.*	*Mimosa sp.*
Pores/mm (average)	5-7 (6.2)	3-5 (4.2)	5-8 (6.0)	5-8 (5.8)	5-8 (5.8)	4-6 (5.1)	4-6 (4.7)
Pores diameter (average) in µm	125-166 (145.4)	130-200 (176.8)	130-280 (204.5)	140-200 (167.1)	145-200 (171)	100-200 (150)	160-230 (188.8)
Dissepiment thickness (average) in µm	40-110 (68.4)	30-150 (126.5)	30-110 (66.9)	35-111 (67.3)	29,5-130,5 (72.8)	50-140 (84.3)	60-160,5 (101.3)
Context (black line present)	indistinct	distinct	distinct	distinct	distinct	distinct	distinct
Hyphal system structure (mitism)	Di	Mono/Di	Mono/Di	Mono/Di	Mono/Di	Mono/Di	Mono/Di
Skeletal hyphae of tubes Length range (mean) in µm	99,3 - 331 (204)	300 - 482 (391)	280 - 450,5 (354)	224,5 – 461,3 (346)	224,2 – 552,1 (356)	309 – 486,5 (373)	338 – 630 (409)
Size of spores (mean) in µm	4,5-5,5 x 3,5-4,5 (4,9 x 4,1)	4,5-6,0 x 3,5-5,0 (5,3 x 4,2)	4,0-5,0 x 3,0-4,5 (4,6 x 3,8)	5,0-5,5 x 4,0-4,5 (5,2 x 4,2)	5,0-6,0 x 4,0-4,5 (5,6 x 4,3)	4,5-6,0 x 3,5-4,5 (5,4 x 4,0)	5-5,5 x 4-4,5 (5,1 x 4,1)
Spore Quotient (Q) in µm and shape	1,20 - BE	1,28 - BE	1,20 - BE	1,24 - BE	1,29 - BE	1,29 - BE	1,25 - BE

* Specimens included in the phylogenetic analysis. ARF = Atlantic Rain Forest; BE = broadly ellipsoid (Q = 1,15 – 1,30 µm, Largent et al. 1977); Caa = Caatinga; Di = Dimitic; Mono/Di = Monomitic in the context and Dimitic in the tubes; PE = Pernambuco states; SP = São Paulo states; SC = Santa Catarina states.

Figure 1. Basidiomes of *Phellinus grenadensis* (a-b) and *P. piptadeniae* (c-h): a. upper surface of holotype; b. tubes layers with context among them of holotype; c. upper surface of holotype; d. context with black line and tubes layers of holotype; e-f. upper surface and context with black line and tubes layers of MABS 136 (FLOR 39574); g. specimens on *Piptadenia gonoacantha* from ARF of SC; h. context with black line and tubes layer of DS109PE (URM80322). (Scale bar = a-d: 5 cm; e-f: 10 cm; g: 20cm; h: 1cm).



According to the macro and micro morphological characters presented in the Table 1, there are no significant differences among the specimens from Atlantic Rain Forest of SC state, previously named as *P. grenadensis*, the type of *P. piptadeniae* from Atlantic Rain Forest of SP state, and those specimens from Caatinga biome in PE state. The exception was the fact that they are from different regions and were founded on different host species (Table 1). The number of pores/mm of holotype of *P. piptadeniae* (3-5) seems to be distinct with is compared with those of the Atlantic Rain Forest of SC and Caatinga of PE specimens (5-8 and 4-6, respectively). However, when considering the pore diameter and the dissepiment thickness there are not differences. On the other hand, the specimens of *P. piptadeniae* from Atlantic Rain Forest of SC, including the type material from SP, present bigger basidiomes with the pilear surface indurating that becomes rimose and more stratified tube layers than those from Caatinga of PE (figure 1fh). These differences could be understood as only morphological variations of different populations of the same species, or as different stages of ontogenetic development of that species. Then, morphological and ecological (host and geographic distribution) data suggested *P. piptadeniae* as a taxonomic complex.

The occurrence of cryptic species among the morphospecies concepts seems to be commonly founded when one studies fungal taxa nowadays (Decock *et al*. 2007). For instance, Fischer & Binder (2004), when trying to resolve the relationships among 69 collections of the genera *Phellinus s.s.* Quél. and *Fomitiporia* Murrill (*Hymenochaetaceae*, *Hymenochaetales*), from the Northern Hemisphere, pointed out that the sole application of morphological criteria was of limited value especially in taxa exhibiting a wide distribution range, both in terms of geographic origin and ecological niche. The authors, using an integrative approach (morphological, phylogenetic and biological species recognition) detected 12 species among the seven species previously recognized by the application of a strict morphological approach.

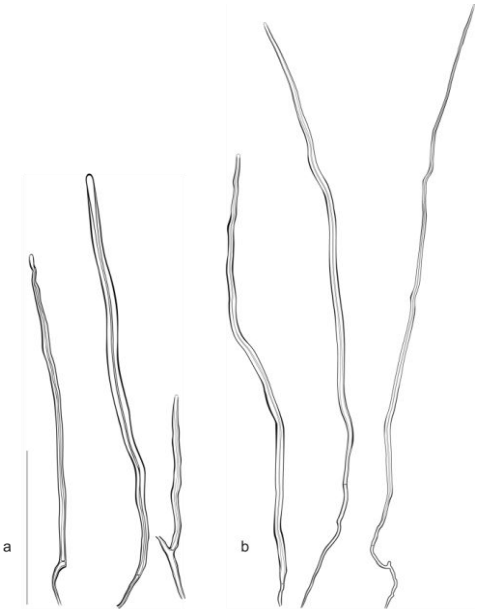
Another possible challenge when working with taxonomic complexes is faced with a speciation processes. Rajchenberg & Pildain (2012), from a detailed studies and comparisons of brown-rot polypore *Ryvardenia cretacea* (Lloyd) Rajchenb. (*Polyporaceae*, *Polyporales*), did not show the existence of significant morphological differences between populations from Australia (Tasmania, Victoria) and Argentina (Patagonia), although the phylogenetic analysis (nrITS) revealed the existence of two well supported clades. The results of this study support

the idea that genotypic differentiation precedes phenotypic and reproductive isolation and provide further evidence on the complex nature of issues regarding species concepts, recognition, and delimitation (Urcelay *et al*. 2012).

Both aforementioned studies, Fischer & Binder (2004) and Rajchenberg & Pildain (2012), used the nuclear ribosomal ITS region as a complementary tool to recognize cryptic species or cryptical speciation, respectively. Furthermore, the ITS region is considered nowadays as a universal DNA barcode marker for fungi (Schoch *et al*. 2012).

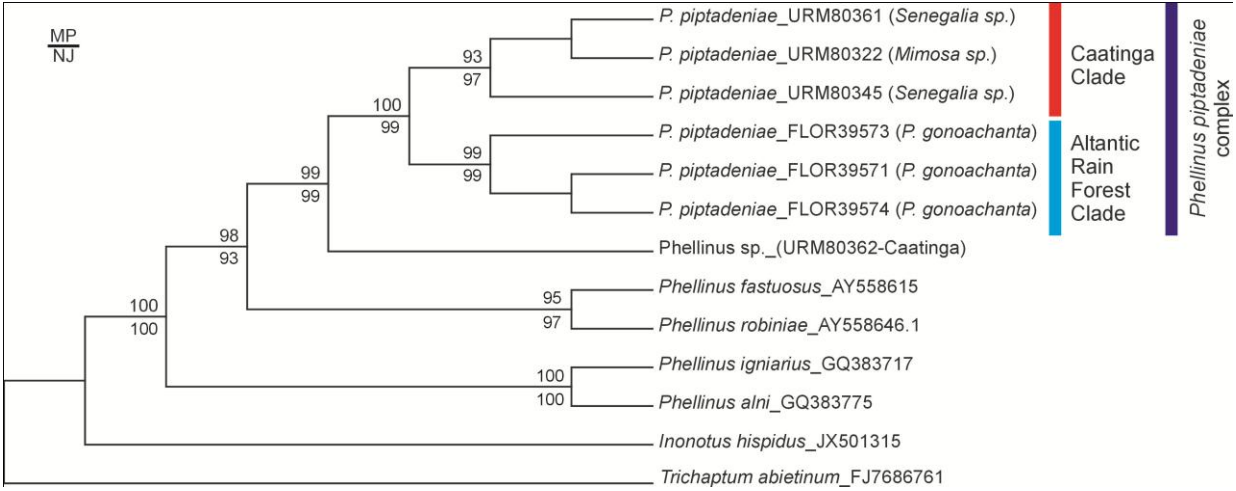
Our phylogenetic analysis of the nrITS region include 873 total characters, of which 514 were parsimony informative. Bootstrap values obtained using MP and NJ were very similar and both analyses resulted in a similar tree topology (the consensus tree is presented in figure 3), with high statistical support for the *Phellinus piptadeniae* complex (MP = 100 and NJ = 99). Geographical/ecological sub-groups within *P. piptadeniae* are well supported with high bootstrap values for Caatinga specimens of PE (MP = 93 and NJ = 97) and for ARF specimens of SC (MP = 99 and NJ = 99). Although, the Caatinga and AFR Clades are inclusive of a single branch (*Phellinus piptadeniae*), they are both highly supported, evidenced that the Caatinga and ARF specimens should be a different species, according to the phylogenetic species concept. These two populations may be the result of their own evolutionary history with their hosts, inferring in this case, that the isolation has occurred according to the specialization with the hosts in particular. As observed, the Atlantic Rain Forest populations are

Figura 2. Skeletal hyphae: a. *Phellinus grenadensis* (holotype); b. *Phellinus piptadeniae* (FLOR 39573) (scale barr = 50 µm).



specific on *Piptadenia gonoacantha* and, although Drechsler-Santos *et al*. (2010) mentioned the recurrence of *P. piptadeniae* on *Piptadenia* spp. as hosts in the Caatinga of National Park of Catimbau (Pernambuco states), the Caatinga population studied here were founded on other genera hosts (*Senegalia* sp. and *Mimosa* sp., Figure 3).

Figure 3. Phylogenetic relationships of *Phellinus piptadeniae* complex (indicated by bars, including the inclusive Caatinga and ARF clades and their hosts) and other species and genera [*Inonotus hispidus* (Bull.) P. Karst., *Phellinus fastuosus* (Lév.) Ryvarden, *P. robiniae* (Murrill) A. Ames, *P. igniarius* (L.) Quél., *P. alni* (Bondartsev) Parmasto] of *Hymenochaetaceae*, based on complete sequence of nrDNA ITS. The tree above was generated by heuristic search using Maximum Parsimony (MP) and Neighbor-Joinin (NJ) and the Bootstrap values (1000 replicates) are indicated at the internal nodes, respectively. The sequences of the materials collected in ARF of SC are represented by the numbers of collector (MABS) and those from Caatinga biome of PE are represented by the numbers of collector (Drechsler-Santos, unpublished data by Drechsler-Santos *et al*.). The sequences obtained from GenBank are labeled with the corresponding accession number, using *Trichaptum abietinum* as an outgroup.



As suggested by Hallenberg et al. (2007), geographically delimited populations of a fungal species may often be distinguished phylogenetically. Accordingly, *Phellinus piptadeniae* presents ecologically (*i.e.* geographical and/or host distribution) and phylogenetically two well delimited populations represented by the two inclusive clades (Caatinga and ARF of SC) in the Figure 3. However, according to Rajchenberg & Pildain (2012), when no morphological differences exist and no compatibility tests were made between segregated populations it is better to understand them as species complexes. For the time being our conclusion is that *Phellinus piptadeniae* represent a taxonomic complex of species that is undergoing a speciation process as evidenced by the existence of two phylogenetic lineages, *i.e.*, two ecological (host and geographic distribution) populations. This work is the first step to assess the relationships within *Phellinus piptadeniae*. Further research including compatibility tests (biological species concept) and more sample sequences of different hosts, as well as multigenic phylogenetic studies, are necessary to further understand the taxonomy and ecology within this complex.

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CONSIDERAÇÕES FINAIS

O estudo realizado mostrou que os fungos poliporoides da Mata Atlântica de Santa Catarina, podem ser agrupados funcionalmente pela sua frequência relativa no tipo de substrato em que ocorrem. Comparado ao estudo de grupos funcionais realizado na região das Yungas argentinas, os grupos funcionais são semelhantes, porém compostos por espécies distintas. *Fuscoporia gilva*, *Pycnoporus sanguineus*, *Polyporus tricholoma* e *Trametes villosa* ocorrem nos diferentes ecossistemas, Mata Atlântica e Yungas, e nos mesmos grupos funcionais, com exceção da primeira, que além de ser registrada em galhos mortos também foi encontrada em galhos vivos nas Yungas.

Com relação à riqueza e abundância de espécies, *Polyporus dictyopus*, *Perenniporia martia* e *Fuscoporia wahlbergii*, mostraram-se como espécies dominantes para cada um dos três grupos funcionais saprófitas, diferentemente das espécies dominantes registradas na Yungas argentinas.

O conhecimento dos políporos da área estudada e da sua relação direta com os tipos de substratos, podem facilitar a elaboração de estratégias de conservação deste bioma em particular, uma vez que a abundância e a riqueza de espécies encontradas podem estar relacionadas com a oferta dos substratos.

Os registros de espécimes himenoquetoides coletadas sobre *Piptadenia gonoacantha* em Santa Catarina, tradicionalmente identificados como *Phellinus grenadensis*, foram confirmados como *Phellinus piptadeniae* a partir das análises morfológicas.

A utilização de uma abordagem integrativa, *i.e.*, a partir de análises morfológicas, filogenéticas e ecológicas (hospedeiro e distribuição geográfica), se mostrou eficiente no entendimento do complexo taxonômico estudado. Obviamente, testes de compatibilidade (conceito biológico) são sugeridos para a resolução de *Phellinus piptadeniae complex.*