

UNIVERSIDADE FEDERAL DO PARANÁ

KELY DA SILVA CRUZ

XYLARIACEAE (ASCOMYCOTA)
NO PARQUE ESTADUAL DE SÃO CAMILO, PALOTINA, PR

CURITIBA

2015

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Dissertação apresentada ao Programa de Pós-Graduação em Botânica, área de concentração em Taxonomia, Biologia e Diversidade de Algas, Fungos e Líquens, Departamento de Botânica, Setor de Ciências Biológicas, Universidade Federal do Paraná, como requisito parcial à obtenção do título de Mestre em Botânica.

Orientador: Prof. Dr. Vagner G. Cortez

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UNIVERSIDADE FEDERAL DO PARANÁ

Setor de Ciências Biológicas
Programa de Pós-Graduação em Botânica



“Xylariaceae (Ascomycota) no Parque Estadual São Camilo, Palotina, Paraná”

por

Kely da Silva Cruz

**Dissertação aprovada como requisito parcial
para obtenção do grau de Mestre no Programa
de Pós-Graduação em Botânica, pela Comissão
formada pelos doutores**

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Curitiba, 23 de Março de 2015.

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RESUMO

Xylariaceae é uma das maiores famílias de Ascomycota com aproximadamente 1.343 espécies, caracterizada por apresentar estroma geralmente carbonáceo de cor preto, ascoma peritecial e hábito lignícola. No Paraná, até então eram conhecidas 42 espécies pertencentes a essa família, com maior prevalência em áreas de Floresta Ombrófila Densa e Mista, na região de Curitiba e no litoral. Nesse sentido, este trabalho teve por objetivo realizar um levantamento da família *Xylariaceae* no Parque Estadual de São Camilo, localizado no município de Palotina, região oeste do Paraná. As coletas foram realizadas entre maio/2013 a março/2014. Foram analisados 155 exemplares, e identificadas 38 táxons distribuídas em 11 gêneros: *Annulohypoxyton* (4), *Biscogniauxia* (1), *Camillea* (1), *Daldinia* (2), *Entoleuca* (1), *Hypoxyton* (12), *Jumillera* (1), *Kretzschmaria* (1), *Phylacia* (2), *Rosellinia* (2) e *Xylaria* (11). Destas, foi possível registrar três novas espécies, *Annulohypoxyton parvodiscum*, *Entoleuca palotinense* e *Hypoxyton vinaceobrunneum*. *Hypoxyton peleae* é listada pela primeira vez na América do Sul e *Hypoxyton griseobrunneum* uma nova citação para o Brasil. 28 táxons são novas citações para o estado do Paraná. Com a realização do presente estudo, o número de espécies de *Xylariaceae* do Paraná foi expandido de 42 para 70.

Palavras-chave: Ascomicetos, estroma, fungos xilófilos, pirenomicetos

ABSTRACT

Xylariaceae is the largest family in *Ascomycota*, covering fungi with dark and carbonaceous stromata, perithecial ascomata, and lignicolous habit. From the State of Paraná, in South Brazil, 42 species of the family were known up to now; most records were from the ombrophilous forests from the Coastal Region and Metropolitan Region of Curitiba. The present work aimed to provide data on the diversity of the *Xylariaceae* from Parque Estadual de São Camilo, municipality of Palotina, western region of Paraná State. Fieldwork comprised collections from May 2013 to March 2014. 155 specimens were collected, of representing 38 taxa and 11 genera: *Annulohypoxylon* (4), *Biscogniauxia* (1), *Camillea* (1), *Daldinia* (2), *Entoleuca* (1), *Hypoxylon* (12), *Jumillera* (1), *Kretzschmaria* (1), *Phylacia* (2), *Rosellinia* (2) and *Xylaria* (11). three new species are proposed: *Annulohypoxylon parvodiscum*, *Entoleuca palotinense* and *Hypoxylon vinaceobrunneum*; *Hypoxylon peleae* is a new record from South America; *Hypoxylon griseobrunneum* is newly reported from Brazil, and 28 táxons are new for the state of Paraná. With the completion of this study, we expanded the list of species of Paraná 42 to 70.

Key words: stroma, pyrenomycetes, xylophagous fungos

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1. INTRODUÇÃO

1.1 XYLARIACEAE

A família *Xylariaceae* Tul. & C. Tul. está classificada no filo *Ascomycota* Caval.-Sm., subfilo *Pezizomycotina* O.E. Eriksson & Winka, classe *Sordariomycetes* O.E. Eriksson & Winka, subclasse *Xylariomycetidae* O.E. Eriksson & Winka, ordem *Xylariales* Nannfeldt (LUMBSCH; HUHNDORF, 2010). Atualmente ainda é utilizada a classificação *Pyrenomycetes*, mesmo que informal, para referir-se aos fungos com ascoma peritecial. *Xylariaceae* é a maior família de *Ascomycota*, compreendendo 86 gêneros, sendo sete de posição incerta, e mais de 1.343 espécies (LUMBSCH; HUHNDORF, 2010; STADLER, 2013). No Brasil, foram listados 24 nomes genéricos, 213 epítetos específicos e dez infraespecíficos (PEREIRA, 2015). A família foi erguida pelos irmãos Tulasne & Tulasne em 1863, os quais usaram o termo "*Xylariei*" para referir-se a *Xylariaceae*. O gênero tipo da família é *Xylaria* Hill ex Schrank, cujo tipo remete a *Clavaria hypoxylon* L. \equiv *Xylaria hypoxylon* (L.) Grev. (STADLER, 2011).

Em *Xylariaceae* o conceito de subfamílias é usado a fim de dividir gêneros intimamente relacionados. Dennis (1961) foi o primeiro micólogo a separar a família em duas subfamílias, *Hypoxyloideae* e *Xylarioideae*, para distinguir os gêneros *Hypoxylon* Bull. de *Xylaria* Hill ex Schrank. Porém, nessa época ainda não estava disponível o conhecimento dos tipos de estruturas anamórficas e dos pigmentos de importância quimiotaxonômica produzidos por estes fungos, e estas subfamílias não foram amplamente aceitas pelos micólogos (STADLER, 2011). Posteriormente, Ju e Rogers (1996) segregaram *Hypoxylon sensu* Miller (1961) em dois grupos, tipo *Geniculosporium* e tipo *Nodulisporium*, de acordo com o tipo de estrutura anamórfica produzida e ausência ou presença de pigmentos estromáticos liberados em KOH 10 %. Posteriormente, com o trabalho de Hsieh *et al.* (2005) o conceito de subfamílias, *Hypoxyloideae* e *Xylarioideae* associados com os dois grupos segregados por Ju e Rogers (1996) foram evidenciados por dados moleculares.

1.2 CARACTERIZAÇÃO DA FAMÍLIA

Os membros de *Xylariaceae* são caracterizados pelos estromas geralmente escuros e extremamente variados e possuem ascoma peritecial (ROGERS, 2000). Alguns gêneros, como *Annulohypoxyton*, *Hypoxyton* e *Daldinia* liberam pigmentos em KOH 10%, os quais estão presentes nos estromas ou nos grânulos entre os peritécios, podendo ser esféricos, ovoides ou tubulares. Dentro da camada peritecial estão inseridos os ascos com oito ascósporos, exceto em *Wawelia* com quatro, e *Thuemenella*, com seis ascósporos (LUNDQVIST, 1992; SAMUELS; ROSSMAN, 1992).

Os ascos são cilíndricos e possuem no ápice um aparato apical, que se torna amiloide (azul) ou dextrinoide (vermelho) quando montado em reagente de Melzer. O conceito em relação à função do aparato apical varia conforme certos autores. De acordo com Suwannasai *et al.* (2012), Evans (1967) e Beckett e Crawford (1973) esta estrutura age como um esfíncter por onde os ascósporos passam. No entanto, Saccas (1956) e Martin (1967) sugerem que esta estrutura não é funcional, e os ascósporos são descarregados por lise do asco. Porém, Rogers (1979) defende que o aparato apical funciona como um dispositivo de reforço, invertendo sua forma quando há muita pressão para a passagem dos ascósporos. Dentro dos ascos estão inseridos os ascósporos unicelulares, com formas e cores variadas, mas geralmente são elipsoide-inequilateral, com pigmentação marrom e fenda germinativa, que pode ser retilínea ou sigmoide. A fenda germinativa permite a esses fungos sobreviverem no ambiente por um longo tempo sem água, e lhe confere uma rápida germinação em condições favoráveis (ROGERS, 2000).

Os ascósporos destes fungos geralmente apresentam as paredes lisas sob o microscópio de luz. No entanto, sob microscopia eletrônica de varredura (MEV) demonstraram distintas ornamentações, o que permite diferenciar espécies (LAESSØE *et al.*, 1989; WHALLEY, 1996). Um bom exemplo ocorre em *Daldinia concentrica* (Bolton) Ces. & De Not. e *D. eschscholtzii* (Ehrenb.: Fr.) Rehm, ambas são similares morfologicamente e o tamanho dos ascósporos são próximos. Porém, quando analisadas em MEV, a primeira espécie apresenta a superfície dos ascósporos lisa e a outra com estrias transversais. O uso desta ferramenta tem demonstrado ser de grande valor

taxonômico, pois tem possibilitado separar espécies intimamente relacionadas (SUWANNASAI *et al.*, 2012). Outra ferramenta importante que tem possibilitado segregar gêneros correlacionados dentro da família são as estruturas anamórficas e os metabólitos secundários (STADLER, 2011). Esses metabólitos produzem antibióticos que atuam contra organismos associados, e os tipos de metabólitos já conhecidos tem levantado interesse na indústria farmacêutica e de agroquímicos (STADLER; HELLWIG, 2005).

1.3 ASPECTOS ECOLÓGICOS

Os membros de *Xylariaceae* exercem papel funcional nos ecossistemas terrestres, decompondo uma ampla gama de substrato como: madeira, folhas, sementes e frutos. A grande maioria vive como saprófito logo após a morte da árvore, outras espécies atuam como fitopatogênicos e endofíticos (ROGERS, 1979; WHALLEY, 1985).

A maioria das espécies constituem estromas carbonáceos que favorecem suas adaptações em ambientes secos (JU; ROGERS, 1996). Segundo Rogers (1979) as *Xylariaceae* co-evoluíram com as angiospermas, correlacionando o fato de ambas terem derivado de ambientes secos e conseguirem, durante esse período, suportar grave dessecação e germinar na presença de pouca água, liberando seus ascósporos. A adesão dos ascósporos no substrato é facilitada por uma bainha gelatinizada (perispório) e a dispersão ocorrem por correntes de ar, respingos de chuva ou insetos (WEBSTER; WEBER, 2004). No gênero *Daldinia* são observadas zonas concêntricas que foram postuladas, para constituir adaptações especiais para um estilo de vida xerofítica (JU *et al.*, 1997). Certas espécies de *Daldinia*, *Nemanja* e *Biscogniauxia* formam relações simbióticas com insetos vetores e algumas espécies de *Xylaria* formam relações mutualísticas com cupins (PAŽOUTOVÁ *et al.*, 2010; HSIEH, 2010). A diversidade e ocorrência de *Xylariaceae* podem estar relacionadas à associação com insetos vetores, que tiveram radiação adaptativa mediada (GUIDOT *et al.*, 2003; PAŽOUTOVÁ *et al.*, 2010).

1.4 XYLARIACEAE NO BRASIL E NO PARANÁ

O conhecimento de *Xylariaceae* no Brasil iniciou-se com o registro de *Thamnomycetes chamissonis* Ehrenb. e *Sphaeria* sp. pelo biólogo germânico Christian Gottfried Ehrenberg, no ano de 1815, na ilha de Santa Catarina (FIDALGO, 1968). A micobiota brasileira durante o século XIX foi explorada por naturalistas estrangeiros, especialmente europeus, que deram suas primeiras contribuições à micologia brasileira. Dentre eles destacam-se: Berkeley (1851, 1856, 1880), Berkeley e Cooke (1877), Dennis (1956, 1957, 1959), Hennings (1895, 1897, 1900, 1902, 1904a, 1904b, 1904c), Möller (1901), Rehm (1901a, 1901b, 1904), Theissen (1908a, 1908b, 1909a, 1909b, 1909c, 1909d, 1910).

Desde então, publicações esparsas têm contribuído de forma limitada ao conhecimento das *Xylariaceae* brasileiras: na região Norte, Batista (1966), Silveira e Rodrigues (1985) e Yuyama *et al.* (2013) registraram algumas espécies antes não conhecida para a região. No Nordeste brasileiro, Batista *et al.* (1948, 1956), Poroca (1976), e recentemente Pereira *et al.* (2008a, 2008b, 2008c, 2009, 2010, 2015) vêm se dedicando ao estudo dessa família. No Centro-Oeste e no Sudeste apenas o trabalho de Sampaio (1916) e Berkeley (1880) respectivamente foi registrado. A região Sul é a mais conhecida dessa família, pelo fato de que nessa região se concentraram mais micólogos estudando *Xylariaceae*, entre eles estão: Theissen (1908a, 1910), Rick (1905, 1906, 1931, 1932, 1935), Hamme (1993), Hamme e Guerreiro (1994, 1997, 2002), Loguercio-Leite *et al.* (2009), Trierveiler-Pereira (2014), Trierveiler-Pereira *et al.* (2009), Trierveiler-Pereira *et al.* (2012).

No Estado do Paraná, Meijer (2006, 2010) registrou 42 espécies de *Xylariaceae*, com maior prevalência em áreas de florestas ombrófilas mista e densa (Tabela 1). Na região oeste do Estado, o autor menciona algumas coletas de *Xylariaceae* em Foz do Iguaçu. Nessa região, trabalhos pioneiros vêm sendo desenvolvidos no Parque Estadual de São Camilo, com fungos gasteroides (ALVES; CORTEZ, 2013a, 2013b) e agaricoides (FERREIRA; CORTEZ, 2012; DIAS; CORTEZ, 2013). Durante estas coletas a família *Xylariaceae* apresentou uma abundância significativa. Deste modo, o objetivo geral deste trabalho consistiu em realizar um levantamento de *Xylariaceae* no

Parque Estadual de São Camilo, no município de Palotina, Paraná, e produzir chaves dicotômicas, descrições e ilustrações dos táxons.

TABELA 1 – ESPÉCIES DE XYLARIACEAE REGISTRADAS NO PARANÁ.

ESPÉCIE	VEGETAÇÃO	LOCALIDADE
<i>Annulohyphoxylon stygium</i> (Lév.) Sacc.	Floresta Ombrófila Mista	Colombo e Curitiba
<i>Camillea</i> cf. <i>broomeana</i> (Berk. & M.A. Curtis) Læssøe, J.D. Rogers & Whalley	Floresta Ombrófila Densa	Morretes
<i>Camillea</i> cf. <i>cyclisca</i> (Mont.) Læssøe, J.D. Rogers & Whalley	Floresta Ombrófila Densa	Morretes
<i>Camillea</i> cf. <i>scriblita</i> (Mont.) Læssøe, J.D. Rogers & Whalley	Floresta Estacional Semidecidual	Vila Alta
<i>Camillea</i> aff. <i>tinctor</i> (Berk.) Læssøe, J.D. Rogers & Whalley	Floresta Ombrófila Mista	Colombo
<i>Daldinia eschscholzii</i> (Ehrenb.: Fr.) Rehm	Floresta Ombrófila Mista, Floresta Ombrófila Densa Floresta Estacional Semidecidual	Curitiba, Foz do Iguaçu, Morretes, Quatro Barras, Reserva do Iguaçu, São José dos Pinhais, Santa Mariana e Vila Alta
<i>Entonaema</i> cf. <i>liquescens</i> A.Möller	Floresta Estacional Semidecidual	Reserva do Iguaçu,
<i>Hypoxyton cantareirensense</i> Henn.	Floresta Ombrófila Densa	Quatro Barras e Paranaguá
<i>Hypoxyton cinnabarinum</i> (Henn.) Y.M.Ju & J.D. Rogers	Floresta Estacional Semidecidual	Foz do Iguaçu
<i>Hypoxyton investiens</i> (Schwein.) M.A. Curtis	Floresta Estacional Semidecidual	Vila Alta
<i>Hypoxyton</i> cf. <i>placentiforme</i> Berk. & M.A. Curtis	Floresta Ombrófila Mista Seasonal semi-deciduous forests	Curitiba, General Carneiro e Jundiá do Sul
<i>Hypoxyton sclerophaeum</i> Berk. & M.A. Curtis	Floresta Estacional Semidecidual	Foz do Iguaçu e Paranaguá
<i>Hypoxyton</i> cf. <i>symphyon</i> A.Möller	Floresta Ombrófila Densa	Morretes
<i>Kretzschmaria clavus</i> (Fr.) Sacc.	Floresta Ombrófila Mista, Floresta Ombrófila Densa Floresta Estacional Semidecidual	Curitiba, Paranaguá, Piraquara e São José dos Pinhais
<i>Kretzschmaria pavimentosa</i> (Ces.) P. Martin	Floresta Ombrófila Densa	Paranaguá
<i>Kretzschmaria sandvicensis</i> (Reichardt) J.D. Rogers & Y.M. Ju	Floresta Ombrófila Mista Floresta Ombrófila Densa	Antonina e Morretes
<i>Kretzschmaria sigmoidirima</i> A.I. Hladki & A.I. Romero	Floresta Ombrófila Mista	Colombo
<i>Phylacia turbinata</i> (Berk.) Dennis	Floresta Ombrófila Mista Floresta Ombrófila Densa Floresta Estacional Semidecidual	Curitiba, General Carneiro, São José dos Pinhais e São Mateus do Sul
<i>Poronia oedipus</i> Mont.	Floresta Ombrófila Mista	Curitiba
<i>Thamnomycetes chamissonis</i> Ehrenb.	Floresta Ombrófila Densa	Morretes e Paranaguá

TABELA 1 – ESPÉCIES DE *XYLARIACEAE* REGISTRADAS NO PARANÁ.
continuação e/ou conclusão

<i>Xylaria</i> cf. <i>allantoidea</i> (Berk.) Fr.	Floresta Ombrófila Densa Floresta Estacional Semidecidual	Cornélio Procópio, Foz do Iguçu, Jundiá do Sul, Paranaguá e Vila Alta
<i>Xylaria</i> cf. <i>apiculata</i> Cooke	Floresta Ombrófila Mista	Colombo e São José dos Pinhais
<i>Xylaria</i> aff. <i>aristata</i> Mont.	Floresta Ombrófila Densa	Paranaguá
<i>Xylaria</i> cf. <i>ayresii</i> (Cooke) Dennis	Floresta Ombrófila Densa	np
<i>Xylaria</i> <i>berteri</i> (Mont.) Cooke	Floresta Ombrófila Mista Floresta Ombrófila Densa	Colombo, Curitiba, Campina Grande do Sul e São Mateus do Sul
<i>Xylaria</i> <i>chordiformis</i> Lloyd	Floresta Ombrófila Mista Floresta Ombrófila Densa	Morretes
<i>Xylaria</i> aff. <i>coccophora</i> Mont.	Floresta Estacional Semidecidual	Jundiá do Sul e Morretes
<i>Xylaria</i> <i>comosa</i> (Mont.) Fr.	Floresta Ombrófila Mista Floresta Ombrófila Densa	Curitiba, Morretes e São José dos Pinhais
<i>Xylaria</i> aff. <i>comosa</i> (Mont.) Fr.	Floresta Ombrófila Densa	Paranaguá
<i>Xylaria</i> <i>cubensis</i> (Mont.) Fr. s.l.	Floresta Ombrófila Mista Floresta Ombrófila Densa Floresta Estacional Semidecidual	Colombo, Curitiba e Morretes,
<i>Xylaria</i> <i>feejeensis</i> (Berk.) Fr.	Floresta Ombrófila Mista	Curitiba
<i>Xylaria</i> <i>globosa</i> (Spreng.: Fr.) Mont.	Floresta Ombrófila Mista Floresta Ombrófila Densa	Colombo, Morretes e Piraquara, Quatro Barras
<i>Xylaria</i> cf. <i>gracillima</i> (Fr.) Fr.	Floresta Ombrófila Densa	Antonina
<i>Xylaria</i> <i>holmbergii</i> Speg.	Floresta Ombrófila Mista	São José dos Pinhais e Santa Mariana
<i>Xylaria</i> <i>ianthinovelutina</i> (Mont.) Fr.	Floresta Ombrófila Densa	Piraquara e Morretes
<i>Xylaria</i> cf. <i>longipes</i> Nitschke	Floresta Ombrófila Mista	Colombo
<i>Xylaria</i> cf. <i>mellisii</i> (Berk.) Dennis	Floresta Ombrófila Mista Floresta Ombrófila Densa Floresta Estacional Semidecidual	Almirante Tamandaré, Curitiba, Paranaguá, Piraquara, São Mateus do Sul e Santa Mariana
<i>Xylaria</i> cf. <i>phyllocharis</i> Mont.	Floresta Ombrófila Densa	Antonina
<i>Xylaria</i> cf. <i>schweinitzii</i> Berk. & M.A.Curtis	Floresta Estacional Semidecidual	Foz do Iguçu
<i>Xylaria</i> <i>scruposa</i> (Fr.) Fr.	Floresta Ombrófila Mista Floresta Ombrófila Densa Floresta Estacional Semidecidual	Colombo, Morretes, Piraquara, Quatro Barras, São Mateus do Sul e São José dos Pinhais
<i>Xylaria</i> <i>telfairii</i> (Berk.) Fr.	Floresta Ombrófila Mista Floresta Ombrófila Densa	Morretes e São Mateus do Sul
<i>Xylaria</i> <i>tuberoides</i> Rehm	Floresta Ombrófila Densa	Antonina

FONTE: MEIJER (2006)

2 MATERIAI E MÉTODOS

2.1 ÁREA DE ESTUDO

O Parque Estadual de São Camilo (PESC – FIGURA 1), está localizado no município de Palotina, região oeste do Paraná sob as coordenadas 24°18'00" - 24°19'30" S e 53°53'30" - 53°55'30" W. Criado primeiramente como Reserva Biológica de São Camilo, em 23 de agosto de 2007 e depois recategorizado a Parque Estadual de São Camilo sob a portaria 152, com o objetivo de permitir a visitação pública e pesquisa. O PESC. representa um dos últimos fragmentos florestais na região e corresponde a 385,34 ha, sendo a única área protegida do município de Palotina, e possui 647 km² de área territorial, representando 0,59% do município (IAP, 2006).



FIGURA 1 – A,B. VISTA PRINCIPAL DO PESC, C. LAGO, D. TRILHA.

O Parque potencializa e complementa as ações envolvendo o Corredor de Biodiversidade, Caiuá-Ilha Grande e o Programa Paraná-Biodiversidade. A unidade de conservação compõe uma importante rede de drenagem da região, permeada pelo Rio São Camilo, afluente da sub-bacia do Rio Piquiri (bacia do Rio Paraná). O clima da região é definido em Cfa, pela classificação de Köppen. A tipologia vegetal é de Floresta Estacional Semidecidual, o qual corresponde à dupla estacionalidade climática, uma chuvosa e outra seca, ou então a uma acentuada variação térmica (VELOSO *et al.*, 1991). Esta formação compreende uma parte do bioma da Mata Atlântica. (AB'SABER, 1977).

2.1 COLETAS

As coletas foram realizadas mensalmente entre maio de 2013 a março de 2014, pelas trilhas e interior do PESC, com auxílio de canivete, faca e martelo; os espécimes coletados foram registrados com câmera fotográfica digital Nikon Coolpix L120 ou Nikon D-3100. Em seguida, o material foi acondicionado em saco de papel, com as anotações do tipo de substrato, data de coleta.

2.2 HERBORIZAÇÃO

No laboratório, os espécimes foram herborizados em estufa (± 40 °C). Após secos, as exsiccatas foram montadas em envelopes de papel junto dos dados da coleta para identificação. Todo o material estudado foi preservado no Herbário do *Campus* Palotina (HCP) e os tipos depositados no herbário do Departamento de Botânica da UFPR (UPCB).

2.3 ANÁLISE MACROSCÓPICA

As análises macroscópicas foram realizadas por meio de estéreo microscópio trinocular Motic, sendo as seguintes estruturas analisadas:

- Estroma: forma, dimensão (comprimento x largura x espessura) e cor; apenas nos gêneros, *Annulohyphoxylon*, *Daldinia* e *Hyphoxylon*, foram observadas as cores dos pigmentos estromáticos liberados em solução de KOH10%, de acordo com a carta de cores de Rayner (1970).
- Peritécio: forma e dimensão (altura x largura)

- Morfologia dos ostíolos: umbilicada ou papilada
- Morfologia dos ostíolos: umbilicada ou papilada
- Disco ostiolar: tipo-*bovei* ou tipo-*truncatum*. (visto somente nas espécies de *Annulohyphoxylon*).

2.4 ANÁLISE MICROSCÓPICA

As análises microscópicas foram feitas por cortes transversais à mão livre da cavidade peritecial, e montados entre lâmina e lamínula. Primeiro foi montado uma lamina em azul de algodão, a fim de melhor mensurar os ascos, depois foi preparado outra lâmina em reagente de Melzer para observar reação amiloide ou dextrinoide e fazer as medições. Posteriormente, os ascósporos foram analisados em água destilada, com base na medida de pelo menos 25 elementos (em aumento de 1000x) e verificou-se também a presença ou ausência de fenda germinativa. Em solução de KOH 10 % foram observada a deiscência dos perispórios. Todas as análises e medidas foram realizadas sob microscópio óptico trinocular Motic BA310, equipado com câmera fotográfica digital Moticom 5.0MP, acoplada através do software Motic Image Plus 1.0, onde são capturadas as imagens e realizadas as medições.

2.5 MICROSCOPIA ELETRÔNICA DE VARREDURA (MEV)

As análises de microscopia eletrônica de varredura (MEV) foram realizadas no Centro de Microscopia Eletrônica (CME) da UFPR, em Curitiba, PR, a fim de detalhar a morfologia da superfície dos ascósporos, conforme metodologia descrita por Suwannasai *et al.* (2012). Uma pequena porção himenial da cavidade do peritécio foi removida e montada em suportes de alumínio (“stubs”), sob fita adesiva de carbono dupla face. Em seguida, os “stubs” foram submetidos à metalização por três a cinco minutos, em metalizador Balzers SCD030 – Balzers Union FL9496, para revestir o material com uma camada de 150 Å de ouro. Posteriormente, o material foi observado ao MEV sob tensão de 15-20 Kv e magnificação variável (2.000-30.000x).

2.6 IDENTIFICAÇÃO DOS ESPÉCIMES

A identificação dos espécimes analisados foi feita com base na literatura especializada para o grupo, especialmente artigos e monografias, assim como revisões de espécies sul-americanas e brasileiras dos principais gêneros. Os principais trabalhos consultados foram: Dennis (1956, 1957, 1961, 1959, 1963, 1964), Hamme e Guerrero (1994, 1997, 2002), Hladki (2001), Hladki e Romero (2003, 2007, 2009), Ju e Rogers (1996), Pereira (2008, 2009, 2010), Rick (1935), Silveira e Rodrigues (1985), Stadler *et al.* (2014), entre outros.

3 RESULTADOS

O estudo de *Xylariaceae* no PESC. resultou na análise de 155 exemplares, registradas em 38 táxons e distribuídas em 11 gêneros: *Annulohyphoxylon* (4), *Biscogniauxia* (1), *Camillea* (1), *Daldinia* (2), *Entoleuca* (1), *Hypoxylon* (12), *Jumillera* (1), *Kretzschmaria* (1), *Phylacia* (2), *Rosellinia* (2) e *Xylaria* (11). Destas, foi possível registrar três novas espécies, *Annulohyphoxylon parvodiscum*, *Entoleuca palotinense* e *Hypoxylon vinaceobrunneum*. *Hypoxylon peleae* é listada pela primeira vez na América do Sul e *Hypoxylon griseobrunneum* uma nova citação para o Brasil. 28 táxons são novas citações para o Estado do Paraná. Com a realização do presente estudo, o número de espécies de *Xylariaceae* do Paraná foi expandido de 42 para 70.

Dentre os 155 espécimes analisados 43 espécimes não foram possíveis identificar, pois estavam degenerados ou sem ascósporos.

Com base nos resultados obtidos durante o presente trabalho, optou-se por apresentar a dissertação em quatro capítulos, visando facilitar a publicação dos resultados. Para a divisão e preparação dos mesmos, foram considerados o número de espécies e conseqüente número de páginas do manuscrito, e a relevância dos resultados apresentados. Foi decisivo o fato de que há uma limitação de páginas nos periódicos, o que levou à divisão do trabalho como um todo.

Apresentação dos capítulos:

Capítulo 1. *Xylariaceae (Ascomycota) in a seasonal semi-deciduous forest remnant of Paraná, Brazil.*

O artigo será submetido para publicação na revista Iheringia Série Botânica (Brasil) e apresenta a descrição de 11 espécies, sendo uma nova espécie *Entoleuca palotinense*. Destas, oito são novas ocorrências para o Estado do Paraná. São disponibilizadas chave de identificação, descrições, imagens macro e microscópicas das espécies, bem como imagens dos ascósporos em MEV.

O formato apresentado encontra-se nas normas dessa revista (http://www.fzb.rs.gov.br/upload/20140701082504normas_guidelines_ihbotanica_jun2014.pdf)

Capítulo 2. *Xylaria (Xylariaceae, Ascomycota) in the Parque Estadual São Camilo, Paraná, Brazil*

O artigo será submetido à revista Acta Biológica Paranaense (Brasil) e apresenta a descrição de 11 táxons de *Xylaria*. Destes cinco são novas ocorrências para o Paraná (*X. curta*, *X. grammica*, *X. multiplex*, *X. multiplex var. microsperma* e *Xylaria poitei*). São disponibilizadas chave de identificação, descrições e imagens macro- e microscópicas das espécies, bem como imagens dos ascósporos em MEV. O formato apresentado encontra-se nas normas dessa revista, disponíveis em (<http://ojs.c3sl.ufpr.br/ojs2/index.php/acta/about/submissions#authorGuidelines>)

Capítulo 3. *Hypoxyton (Xylariaceae, Ascomycota) from Western Paraná, Brazil*

O artigo será submetido à revista Brazilian Journal of Botany (Brasil), onde são apresentadas 12 espécies de *Hypoxyton*, incluindo a descrição de uma nova espécie (*H. vinaceobrunneum*) e uma nova ocorrência para o Brasil (*H. griseobrunneum*) e uma para América do Sul (*H. peleae*); as demais espécies são novas citações para o Paraná. Da mesma forma, apresenta-se chave de identificação, descrições e imagens macro- e microscópicas dos táxons, e imagens dos ascósporos em MEV. O formato apresentado encontra-se nas normas dessa revista (<http://www.springer.com/life+sciences/plant+sciences/journal/40415>)

Capítulo 4. *Annulohypoxyton (Xylariales) from Western Paraná, Brazil*

O artigo foi submetido à revista Mycotaxon (Estados Unidos) e apresenta a descrição de uma nova espécie, *Annulohypoxyton parvodiscum*; duas novas ocorrências para o Paraná, *A. macrodiscum* e *A. nitens*, e uma já descrita para o Estado: *A. stygium*. São disponibilizadas chave de identificação, descrições, imagens macro e microscópicas das espécies, bem

como imagens dos ascósporos em MEV. O formato apresentado encontra-se nas normas dessa revista (<http://www.mycotaxon.com/instructions.html>).

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YUYAMA, K. T.; PEREIRA, J.; MAKI, C. S.; ISHIKAWA, N. K. *Daldinia eschscholtzii* (*Ascomycota*, *Xylariaceae*) isolated from the Brazilian Amazon: taxonomic features and mycelial growth conditions. **Acta Amazonica**, Manaus, v. 43, p.1-8, 2013.

CAPÍTULO 1: Artigo será submetido à revista *Iheringia Série Botânica* (Rio Grande do Sul).

***Xylariaceae* (Ascomycota) in a seasonal semi-deciduous forest remnant of Paraná, Brazil.**

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RESUMO – *Xylariaceae* é a uma das maiores famílias do Filo *Ascomycota*, reunindo fungos com estroma geralmente carbonáceo e de cor escura, ascoma peritecial e hábito lignícola. Este trabalho apresenta resultados parciais do levantamento de *Xylariaceae* no Parque Estadual de São Camilo, Palotina, Paraná, Brasil. As coletas foram realizadas entre abril/2013 a março/2014, também foram analisados materiais coletados entre os anos de 2010 a 2012. Totalizando 38 táxons, distribuídos em 11 gêneros: *Biscogniauxia* (*B. capnodes*), *Camillea* (*C. sulcata*), *Daldinia* (*D. clavata* e *D. eschscholtzii*), *Entoleuca* (*E. palotinense*), *Jumillera* (*J. punctatobrunnea*), *Kretzschmaria* (*K. clavus*), *Rosellinia* (*R. arcuata* e *R. longispora*) e *Phylacia* (*P. poculiformis* e *P. turbinata*). As espécies de *Annulohypoxyon*, *Hypoxyton* e *Xylaria* foram tratadas previamente em outros trabalhos. O trabalho apresenta a descrição de uma nova espécie, *Entoleuca palotinense* o qual representa o primeiro registro do gênero *Entoleuca* para o Hemisfério Sul. Com exceção de *D. eschscholtzii*, *K. clavus* e *P. turbinata*, as demais espécies representam novas ocorrência para o Paraná.

Palavras chave: micobiota brasileira, peritécio, taxonomia.

ABSTRACT – *Xylariaceae* is one of the largest families of the Phylum *Ascomycota*, and includes lignicolous fungi with dark and carbonaceous stroma, peritecial ascoma. This paper presents partial results of a survey about *Xylariaceae* from Parque Estadual

de São Camilo, Palotina, Paraná, Brazil. Collections were performed between April/2013 to March/2014. Furthermore, material which was collected in between 2010 and 2012, was analysed. A total of 38 taxa, distributed in 11 genera: *Biscogniauxia* (*B. capnodes*), *Camillea* (*C. sulcata*), *Daldinia* (*D. clavata*, *D. eschscholtzii*), *Entoleuca* (*E. palotinense*), *Jumillera* (*J. punctatobrunnea*), *Kretzschmaria* (*K. clavus*), *Rosellinia* (*R. arcuata*, *Rosellinia* sp.), and *Phylacia* (*P. poculiformis*, *P. turbinata*). Were identified among them *Annulohypoxyon*, *Hypoxyton* and *Xylaria* been published in other journals. The present paper provides the description of the new specie *Entoleuca palotinense*. Which is also a new report of this genus for the South Hemisphere. With except for *D. eschscholtzii*, *K. clavus* e *P.turbinata*, the other species represent new occurrence for Paraná state.

Key words: mycobiota brasileira, perithecium, taxonomy.

INTRODUCTION

Xylariaceae Tul. & C. Tul. is one of the largest families of the Phylum *Ascomycota*, with 76 genera and over 1,300 species worldwide distributed (Lumbsch & Huhndorf 2010, Stadler *et al.* 2013). Its species are characterized by producing perithecial ascoma, stroma of variable form and generally dark, asci with amyloid apical ring (rarely dextrinoid), ascospores usually pigmented and generally with a conspicuous germ slit (Rogers 2000). Members of this family can be found in litter, soil, dung and associated with insects (Whalley 1996). Some species are associated as pathogens and endophytes (Petrini 2003). May also produce secondary metabolites of great interest to the pharmaceutical and agrochemical industries (Stadler 2011).

Contributions to the knowledge of *Xylariaceae* in Brazil began with the registration of *Thamnomycetes chamissonis* Ehrenb. and *Sphaeria* sp. by the German biologist Christian Gottfried Ehrenberg, in the year 1815, on the Island of Santa Catarina (Fidalgo 1968). In the State of Paraná *Xylariaceae* is also known through the contributions made by Meijer between (2006, 2010) who described 42 species of this family during a survey about macroscopic fungi. This paper presents partial results of a survey on *Xylariaceae* species from Western Paraná – excluding *Annulohypoxyton*, *Hypoxyton* and *Xylaria*, which will be treated in later publications.

MATERIALS AND METHODS

Specimens were collected between 2013 and 2014. Furthermore, material which was collected at the Parque Estadual São Camilo (abbreviated as PESC - Figure 1), municipality of Palotina, Western Paraná, South Brazil, in between 2010 and 2012, was analysed. PESC is situated between coordinates 24°18'00"-24°19'30" S and 53°53'30"-53°55'30" W, and comprises 385.34 ha of seasonal semi-deciduous forest (IAP 2006, Veloso *et al.* 1991).

The specimens were analyzed macro and microscopically according to traditional techniques used in taxonomic studies of *Xylariaceae*. The colour codes used in the descriptions of *Daldinia* refers to Rayner (1970). Ascospores were analysed under scanning electron microscopy (SEM) Jeol JSM-6360LV, at the Centre of Electron Microscopy (CME) of the Paraná University, following Suwannasai *et al.* (2012). All specimens are preserved at the Herbarium of Palotina Campus (HCP) and holotype at the Herbarium of the National Botanic Department of the Paraná University (UPCB).

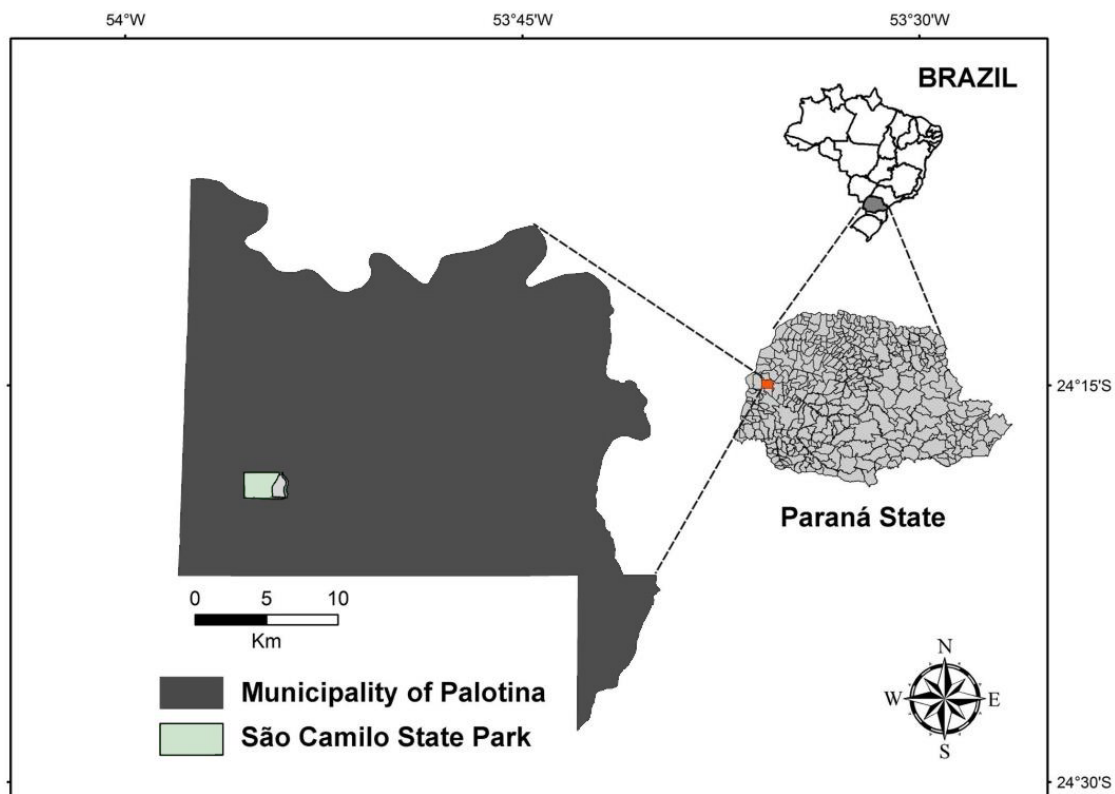


Fig 1. Location of Palotina and PESC: Source Alves (2013).

RESULTS AND DISCUSSION

A total of 155 specimens of *Xylariaceae* were collected, representing 38 taxa, distributed in 11 genera: *Annulohypoxylon* (4), *Biscogniauxia* (1), *Camillea* (1), *Daldinia* (2), *Entoleuca* (1), *Hypoxylon* (12), *Jumillera* (1), *Kretzschmaria* (1), *Phylacia* (2), *Rosellinia* (2) and *Xylaria* (11). *Annulohypoxylon*, *Hypoxylon* and *Xylaria* will be discussed in future works. A taxonomic key is provided for all the mentioned species in this present paper.

Key *Xylariaceae* from PESC, Palotina, Paraná, Brazil

1. Stromata with KOH-extractable pigments
 2. Stromata with concentric zones within (*Daldinia* Ces. & De Not.)
 3. Stromata clavate or cylindrical**3. *D. clavata turbinata***
 - 3'. Stromata hemispheric or pulvinado**4. *D. eschscholtzii***
 - 2'. Stromata without concentric zones within
 4. Ostioles papillate, encircled with an annulate disc***Annulohypoxylon****
 - 4'. Ostioles umbilicate, rarely encircled with an annulate disc***Hypoxylon****
- 1'. Stromata without KOH-extractable pigments
 5. Stromata uniperitheciado, associated with a subiculum (*Rosellinia* De Not.)
 6. Ascospores $36-48 \times 5-7 \mu\text{m}$ **10. *R. arcuata***
 - 6'. Ascospores $45-80 \times 8-16 \mu\text{m}$ **11. *R. longispora***
 - 5'. Stromata multiperitheciado, not associated with a subiculum
 7. Stromata pyriform, with ascospores oblong-cylindric (*Phylacia* Lév.)
 8. Apex of narrow stroma, ascospores $14-18 \times 7-9 \mu\text{m}$ **8. *P. poculiformis***
 - 8'. Apex of flattened stroma, ascospores $9-15 \times 5-6 \mu\text{m}$ **9. *P. turbinata***
 - 7'. Stromata otherwise, with ascospores ellipsoid-inequilateral
 9. Stromata unipartido
 10. Stromata without stipe, pulvinate with 2–8 perithecia
.....**5. *Entoleuca palotinense***
 - 10'. Stromata stipitate, de outra forma with several perithecia
 11. Stromata with convex or flattened apex, often aggregated into a crust-like mass**7. *Kretzschmaria clavus***
 - 11'. Stromata with rounded or acute apex, usually not aggregated into a crust-like mass ***Xylaria****

9'. Stromata bipartido

12. Ascospores yellowish brown2. *Camillea sulcata*

12'. Ascospores brown to black

13. Surface black, ostioles with openings punctate usually
surrounded by rim1. *Biscogniauxia capnodes*13'. Surface with a thin gray layer, abaixo dull brown, ostioles
umbilicate6. *Jumillera punctatobrunnea** **Genera not treated in this publication.****1. *Biscogniauxia capnodes*** (Berk.) Y.M. Ju & J.D. Rogers, Mycotaxon 66: 23. 1998.

(Figs 2a-c. 6a)

Stromata applanate, 5–18 mm long \times 5–10 mm broad \times 0.5 mm thick. Surface black, outer dehiscing layer dark brown, thin; tissue beneath perithecia inconspicuous. Texture carbonaceous. Perithecia obovoid to tubular, 0.3–0.8 mm high \times 0.2–0.5 mm diam. Ostioles slightly higher than stromatal surface with openings slightly papillate, or lower than stromatal surface with openings punctate and usually surrounded by slightly rim. Asci collapsed, with apical ring amyloid, discoid, 1.5–2.3 \times 2.6–3.3 μm . Ascospores brown to dark brown, ellipsoid, nearly equilateral, with narrowly to, less frequently, broadly rounded ends, smooth, 9.5–13 \times 5–7 μm , with a straight germ slit spore-length. Ornaments not successfully examined under SEM.

Specimen examined: BRAZIL, PARANÁ, Palotina, PESC, 02.VII.2013, K.S. Cruz 126 (HCP 632).

Habitat and distribution: on decaying wood. Known in Americas, Oceania and Asia (Ju & Rogers 1996, Vasilyeva *et al.* 2012).

Notes: The studied specimen has slightly smaller apical ring when compared to that described by Ju *et al.* (1998), which are 1.5–4 μm \times 3.5–4 μm . In Brazil, this species has been identified as *Nummularia asarcodes* Theiss., *N. asarcodes* f. *griseoatra* Theiss., *N. bulliardi* Tul. & C. Tul. var. *stenosperma* Theiss. and *Hypoxylon papyraceum* Miller, but these names were synonymized under *Biscogniauxia capnodes* by Ju *et al.* (1998) in review of the genus *Biscogniauxia*.

Biscogniauxia capnodes var. *theissenii* (Syd. & P. Syd.) Y.M. Ju & J.D. Rogers differs in the lighter colour, and the width of ascospores, 9.5–13.5 \times 4.5–5 μm (Ju *et al.*

1998). *B. capnodes* is considered a latent pathogen, invading living hosts and remaining quiescent until stress, thought to be most commonly drought, allows the pathogen to rapidly and widely colonize the host (Rogers 2000). *Biscogniauxia capnodes* is a new record for the State of Paraná.

2. *Camillea sulcata* (Starb.) Lloyd, Mycol. Writ. 5: 77. 1918.

(Figs 2d-e)

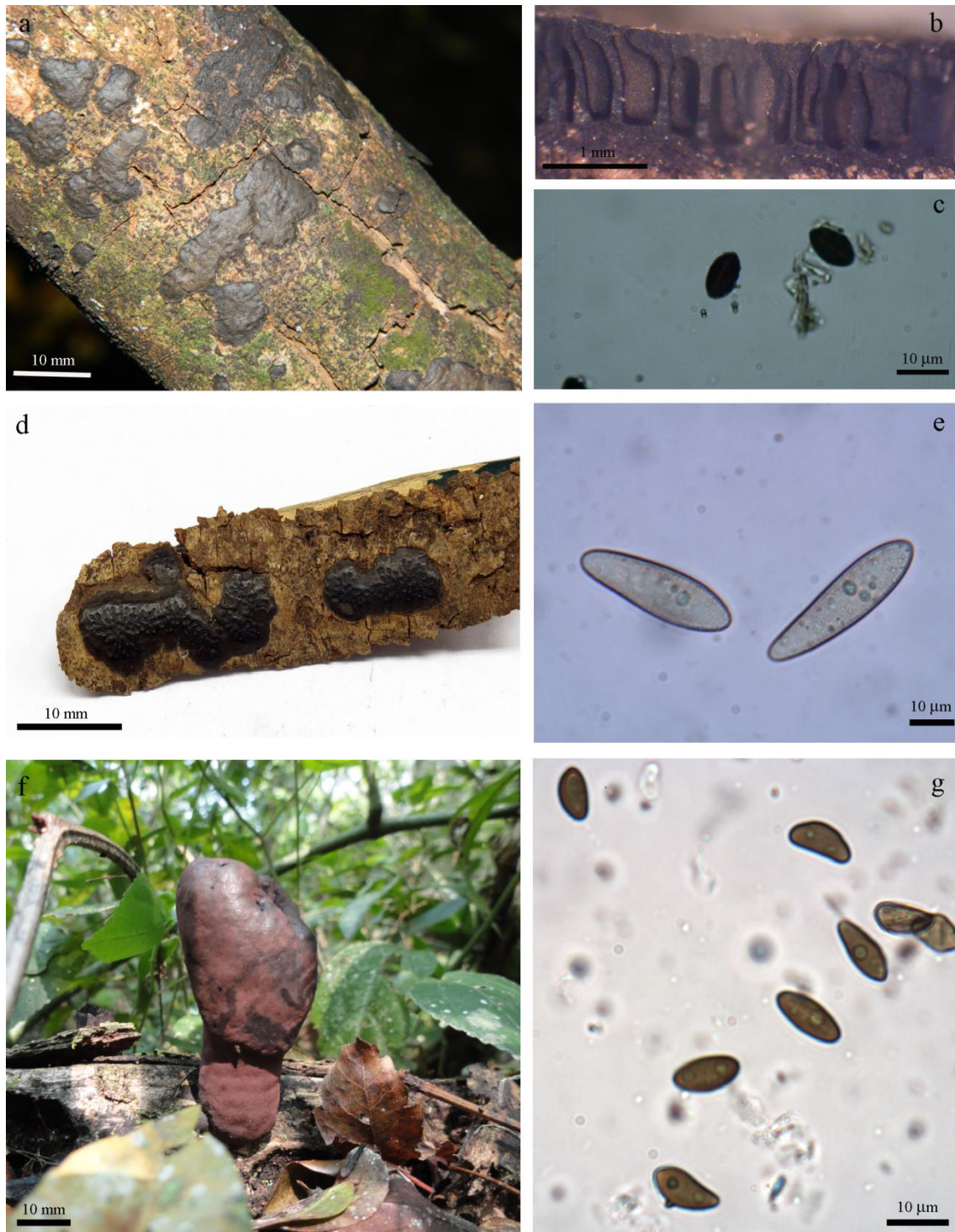
Stromata erupent, with slightly raised sterile margins, 5–20 mm long \times 5–8 mm broad \times 0.6 mm thick. Surface through black deep and narrow furrows. Texture carbonaceous. Perithecia 0.3–0.5 mm diam. Asci 208–268 μm \times 13–18 μm , the spore-bearing part 186–243 μm , the stipe 22–32 μm , with apical ring amyloid, urn-shaped, 0.4–4–5.5 \times 4–5 μm . Ascospores yellowish brown, slightly inequilateral, ellipsoid with one end attenuated or subfusiform, 25.5–35.5 \times 7.5–9.5 μm , ornaments not successfully examined under SEM.

Specimen examined: BRAZIL, PARANÁ, Palotina, PESC, 25.III.2013, K.S. Cruz 222 (HCP 633).

Habitat and distribution: on decaying wood. Known in Argentina, Brazil, Ecuador and Peru (Læssøe *et al.* 1989, Hastrup & Læssøe 2009)

Notes: *Camillea sulcata* differs from other species by its sharp elongated furrows in the stromal surface (Whalley 1995). Ascospores are smooth in light microscope, but they have poroid wall under SEM according to Læssøe *et al.* (1989). Although several attempts to observe this adornment the studied specimen were made we fail because the material is well carbonaceous and ascospores are not released from the asci. *Camillea* species are unique among the *Xylariaceae* by having poroid, cross-linked to ribbed wall under SEM (Suwannasai *et al.* 2012).

Meijer (2006) recorded four species of *Camillea* from Paraná: *Camillea* cf. *broomeana* (Berk. & M.A.Curtis) Læssøe *et al.*, *Camillea* cf. *cyclisca* (Mont.) Læssøe *et al.*, *Camillea* cf. *scriblita* (Mont.) Læssøe, J.D. Rogers & Whalley, *Camillea*. aff. *tinctor* (Berk.) Læssøe *et al.* According to Hastrup & Laessøe (2009), several species of *Camillea* occur in the Neotropics, mainly in the Amazon region. *Camillea sulcata* is a new record for the State of Paraná.



Figs 2a-g. **a-c.** *Biscogniauxia capnodes*. **a**, stroma; **b**, section of perithecia; **c**, ascospores. **d-e.** *Camillea sulcata*. **d**, stroma; **e**, ascospores. **f-g.** *Daldinia clavata*. **f**, stroma; **g**, ascospores

3. *Daldinia clavata* Henn., Hedwigia 41: 14. 1902.

(Figs 2f-g. 6b)

Stromata cylindrical to somewhat clavate, unbranched, sessile or with stout stipe usually bearing constricted rings, solitary, smooth, 29–53 mm long × 11–22 mm broad. Surface brown vinaceous to sepia, blackened and varnished in age; dull brown granules just beneath the surface, with KOH-extractable pigments dark livid (80), vinaceous gray (116), or without apparent KOH-extractable pigments in old overmature specimens; tissue between perithecia grayish to brown, pithy to woody, 1 mm thick. Perithecia obovoid, 0.8–1 × 0.3–0.5 mm. Ostioles slightly papillate, inconspicuous. Asci not seen. Ascospores brown to dark brown, ellipsoid-inequilateral, with narrowly rounded ends, 8.2–12 × 3.5–5 μm, with a straight germ slit spore-length; perispore dehiscent in 10 % KOH, with transverse striations under SEM; episporium smooth.

Specimen examined: BRAZIL, PARANÁ, Palotina, PESC, 15.VI.2011, *T. Heck 020* (HCP 634), 10.IX.2013, *K.S. Cruz 213* (HCP 635).

Habitat and distribution: on decaying trunk. Known in Tropical Africa and the Americas, rarely found in subtropical regions (Stadler *et al.* 2014)

Notes: *Daldinia clavata* is characterized by a cylindrical-shaped stromal clavate. The species was described from material collected in Santa Catarina by Möller (1901). According to Stadler *et al.* (2014), *D. clavata* may release pigment in KOH 10%; the studied specimen showed a very weak purple pigment. *Daldinia clavata* is morphologically similar to *D. albozonata* Loyd, differing in the smaller ascospores (7–9 × 3–4 μm) and by producing cytochalasins (Stadler *et al.* 2014). Previously known from Santa Catarina and Rio Grande do Sul, this is the first record of the species from Paraná.

4. *Daldinia eschscholtzii* (Ehrenb.: Fr.) Rehm, Ann. Mycol. 2: 175. 1904.

(Figs 3a-b. 6 c)

Stromata placentiform to hemispherical, sessile to substipitate, 30–45 × 11–40 mm diam. Surface brown vinaceous, dark brick, but blackened and varnished with age; dull brown granules just beneath the surface, with KOH-extractable pigments dilute, livid purple (81), dark livid (80), or vinaceous purple (101) or without apparent KOH-extractable pigments in old, overmature specimens; tissue between perithecia grayish, or brown, pithy to woody, 1 mm thick. Perithecia obovoid, 0.8–1 × 0.3–0.5 mm. Ostioles slightly papillate, inconspicuous. Asci collapsed, with apical ring inconspicuous, amyloid, discoid, 0.9–2.2 × 1.6–3.2 μm. Ascospores brown to dark brown, ellipsoid-

inequilateral, with narrowly rounded ends, (8.5–) 10–15.5 × 4.5–6 (–7) µm, with a straight germ slit spore-length; perispore dehiscent in 10 % KOH; showing transverse striations under SEM; episore smooth.

Specimen examined: BRAZIL, PARANÁ, Palotina, PESC, 18.XII.2010, *R.L. Dias & A.J. Ferreira* 21–25, 14–20 (HCP 636, 638); 15.VI.2011, *T. Heck* 17 (HCP 637); 02.VII.2014, *K.S. Cruz* 129, 208 (HCP 639, 640).

Habitat and distribution: on decaying trunk. Known in Africa, America, Asia, Northern and Western Australia, New Guinea, Southern Japan and Southern USA (Stadler *et al.* 2014).

Notes: *Daldinia eschscholtzii* is morphologically similar to *D. concentrica* (Bolton) Ces. & De Not. But differs due to the ascospores size (8–14 × 3–6 µm) and to present of smooth ornamentation of ascospores in SEM (Stadler *et al.* 2014). *Daldinia eschscholtzii* has been cited by Meijer (2006).

5. *Entoleuca palotinense* K S. Cruz & Cortez **sp. nov.**

(Figs 3c–d)

Mycobank No.: MB 812744

Surface at first white, becoming dull brown, ascospores dark brown, ellipsoid to cylindrical, equilateral to slightly inequilateral, with broadly rounded ends, 10–13 × 4–6 µm, with a straight germ slit spore-length; episore smooth.

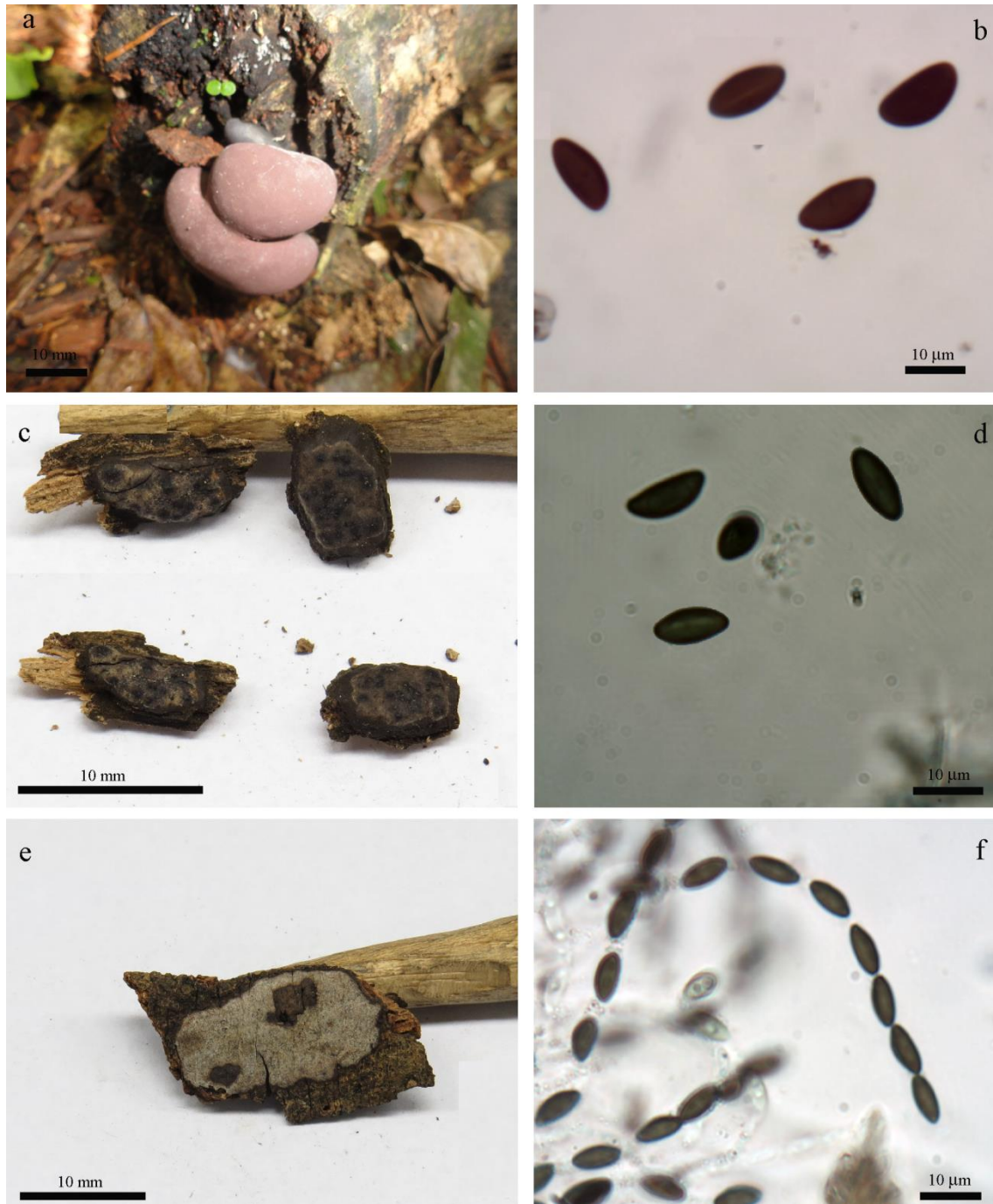
Etymology: reference to the municipality of Palotina, the type locality.

Holotype: BRAZIL, PARANÁ, Palotina, Parque Estadual de São Camilo, 25.III.2013, *K.S. Cruz* 216 (UPCB 81661, holotype here designated; HCP 642, isotype).

Stromata pulvinate, 4–15 mm long × 4–5 mm broad × 0.5–1 mm thick, with 2–8 perithecia, with lower one-third to one-quarter immersed in bleached host tissue; surface at first white, becoming dull brown; outer crust carbonaceous, ca. 0.1 mm thick, overlying and partially encasing perithecia; tissue immediately beneath crust and between perithecia white, soft. Perithecia globose, 0.5–0.9 mm diam. Ostioles conic-papillate. Asci 208–268 µm × 13–18 µm broad, the spore-bearing part 186–243 µm, the stipe 22–32 µm, with apical ring amyloid, urn-shaped, 2.4–3.6 µm high × 1.7–2 µm broad. Ascospores dark brown, 1-celled, ellipsoid to cylindrical, equilateral to slightly inequilateral, with broadly rounded ends, 10–13 × 4–6 µm, with a straight germ slit spore-length; episore smooth.

Specimen examined: BRAZIL, PARANÁ, Palotina, Parque Estadual de São Camilo, 25.III.2013, K.S. Cruz 216 (UPCB 81661, holotype here designated; HCP 642, isotype).

Habitat and distribution: on decaying wood.



Figs 3a-g. **a-b.** *Daldinia eschscholtzii*. **a**, stroma; **b**, ascospores. **c-d.** *Entoleuca palotinese*. **c**, stroma; **d**, ascospores. **e-f.** *Jumillera punctatobrunnea*. **f**, stroma; **g**, ascospores.

Notes: *Entoleuca* is a small genus with only three known species: *Entoleuca callimorpha* Syd. Apud Syd. & Petr, *Entoleuca ellisii* Y.-M. Ju, J.D. Rogers et H.-M. Hsieh and *Entoleuca mammata* (Wahlenberg: Fr.). The genus is characterized by a carbonaceous crust overlying and partially encasing multiple perithecia; abundant white, soft fungal tissue surrounding the perithecia; and equilateral to slightly inequilateral ascospores with a germ slit (Rogers & Ju 1996). *Entoleuca palotinense* differs from other species in the by having dark brown ascospores ascospores dark brown, ellipsoid to cylindrical, equilateral to slightly inequilateral, $10\text{--}13 \times 4\text{--}6 \mu\text{m}$, with straight germ slit spore-length and smooth epispore. The other three species present larger ascospores ($> 13 \mu\text{m}$), and are known from Europe and North America (Rogers & Ju 1996; Ju *et al.* 2004)

6. *Jumillera punctatobrunnea* (Theiss.) J.D. Rogers, Y.M. Ju & F. San Martín, Mycotaxon 64: 47. 1997.

(Figs 3e-f. 6 d)

Stromata appanate or effused-pulvinate, 15–18 mm long \times 5–9 mm broad \times 0.3–0.4 mm thick. Surface with a thin gray layer, tissue beneath the dull brown surface sometimes exposed. Outer layer carbonaceous; tissue between perithecia woody. Perithecia 0.5 \times 0.2 mm diam. Ostioles umbilicate. Asci 83–113 \times 5–6 μm , the spore-bearing part 62–72 μm , the stipe 17–42 μm , with apical ring amyloid, discoid, 0.4–0.8 \times 1.2–2 μm . Ascospores brown to dark brown, ellipsoid to nearly equilateral, 7–9 \times 2.5–3.5 μm , with a straight germ slit spore-length; surface smooth under SEM.

Specimen examined: BRAZIL, PARANÁ, Palotina, PESC, 05.XI.2013, K.S. Cruz 156 (HCP 643).

Habitat and distribution: on decaying wood. Know in Brazil and Mexico (Rogers & Ju 1997).

Notes: *Jumillera* is a small genus with only seven species (Ju & Hsieh 2008), previously classified in *Hypoxylon* section *Applanata* Miller (1961). According to Rogers & Ju (1997) *Jumillera punctatobrunnea* is morphologically similar to *J. cinerea*, differing by having the all grayish stroma and larger ascospores ($8.5\text{--}12 \times 4\text{--}5 \mu\text{m}$). In Brazil are known four species of *Jumillera*, State of Rio Grande do Sul: *J. albida* J.D. Rogers, Y.M. Ju & F. San Martín, *J. cinerea* J.D. Rogers, Y.M. Ju & F. San Martín, *J. punctatobrunnea* (Ellis & Everh.) J.D. Rogers *et al.* and *J. viridis* (Theissen.) J.D.

Rogers *et al.* (Rogers & Ju 1997). *Jumillera punctatobrunnea* is a new record for the state of Paraná.

7. *Kretzschmaria clavus* (Fr.) Sacc., Sylloge Fungorum II: XXIX. 1883.

(Figs. 4a-b. 6 e)

Stromata with convex or flattened, turbinate, with rounded fertile apices, 5–10 mm total length, fertile portion 2–5 mm long, stipe 3–5 mm long. Surface dull copper brown to dull blackish brown, tissue between and beneath perithecia woody. Perithecia obovoid, 0.7–1.2 × 0.6–1 mm. Ostioles finely papillate. Asci 190–251 × 11–13 µm, the spore-bearing part 154–173 µm, the stipe 13–79 µm, apical ring amyloid, urn-shaped, 6–7.5 × 3.5–5 µm. Ascospores brown to dark brown, ellipsoid nearly equilateral, 23.5–30.5 × 6–8.5 µm, with a straight germ slit less than spore-length; surface smooth under SEM.

Specimens examined: BRAZIL, PARANÁ, Palotina, PESC, 16.V.2013, *K.S. Cruz 011* (HCP 644); 02.VII.2013, *K.S. Cruz 132* (HCP 645).

Habitat and distribution: on decaying trunk. Known in Americas, Africa and Oceania (Hladki & Romero 2001).

Notes: *Kretzschmaria clavus* is primarily saprophyte but also a facultative parasite that can become serious root pathogens when to build up on debris. This fungus competes with wood-rotting basidiomycetes in invading and destroying dead wood on the ground (Ju & Rogers 1998, Rogers 2000). The collected specimens were abundant on decaying trunk.

8. *Phylacia poculiformis* (Mont.) Mont. Ann. es Scienc. Nat., Bot. 4: 135. 1855.

(Figs 4c-d. 6 f)

Stromata solitary or in small groups, inverted pyriform, with narrow apices, 5–8 mm high × 5 mm broad. Texture hard, carbonaceous. Surface smooth, laccate, reddish-brown becoming black. Perithecia cylindric, 2 mm length, numerous, compact. Asci not seen. Ascospores pale olive, oblong–cylindric, 14–18 × 7–9 µm; smooth under SEM.

Specimens examined: BRAZIL, PARANÁ, Palotina, PESC, 05.XI.2013, *K.S. Cruz 168* (HCP 646); 25.II.2014, *K.S. Cruz 205* (HCP 647).

Habitat and distribution: on decaying trunk. South America and North America (Medel *et al.* 2006).

Notes: *Phylacia* comprises less than ten species. According to Dennis (1957), *Phylacia poculiformis* presents the apex of the narrower compared to stroma *P. turbinata* (Berk.) Dennis, which has a flat apex and wider stroma (5–8 mm high \times 5 mm broad vs. 8–1 mm high \times 9–15 mm broad). However, according to this author, it is hard to believe that these species are really different, because little is known about the development of this genera stage. For identifying the specimen studied followed Rodrigues & Samuels (1989) because the width of ascospores (13–16 \times 5–9 μ m) and these authors analyzed Brazilian specimens. *Phylacia poculiformis* is a first record from the state of Paraná.



Figs 4a-f. **a-b.** *Kretzschmaria clavus*. **a**, stroma; **b**, ascospores and apical ring. **c-d.** *Phylacia poculiformis*. **c**, stroma; **d**, ascospores. **e-f.** *Phylacia turbinata*. **e**, stroma; **f**, asci and ascospores.

9. *Phylacia turbinata* (Berk.) Dennis, Kew Bull. 12: 323. 1957.

(Figs 4e-f. 6 g)

Stromata solitary or in small groups, turbinate, flat-topped, 8–1 mm length \times 9–15 mm broad. Texture hard, carbonaceous. Surface smooth, laccate, reddish-brown, becoming black, with fine lines. Perithecia cylindric, 3–4 mm length, numerous, compact. Asci elliptical, 9–34 μm length \times 17–20 μm broad. Ascospores pale olive to pale brown, oblong–ellipsoid, 9–15 \times 5–6 μm ; surface smooth under SEM.

Specimens examined: BRAZIL, PARANÁ, Palotina, PESC, 16.IX.2010, *A.J. Ferreira & R. L. Dias* (HCP 357); 30.IX.2010, *A.J. Ferreira & R. L. Dias* (HCP 367); 02.VII.2013, *K.S. Cruz 130, 131* (HCP 648, 649); 10.IX.2013, *K.S. Cruz 148* (HCP 650).

Habitat and distribution: on decaying trunk. South America and North America (Medel *et al.* 2006).

Notes: See under notes *Phylacia poculiformis*.

10. *Rosellinia arcuata* Petch, Ann.of the Royal Bot. Gardens, Peradeniya 6: 175. 1916.

(Figs 5a-b. 6 h)

Subiculum brown to dark brown, covering the base of the stroma. Stromata gregarious to solitary, black. Ectostroma solid, black, shiny. Entostroma yellowish white in the base. Ostioles papillata. Perithecia globose. Asci 265–309 \times 12.5–17.5 μm , the spore-bearing part 237–279 μm , the stipe 28–70 μm , with apical ring amyloid, urn-shaped, 6–9 \times 3.4–5 μm . Ascospores brown to dark brown, inequilateral, narrowly ellipsoidal to fusiform, with narrowly rounded ends, 36–48 \times 5–7 μm , with a straight germ slit, 9–10 μm long centred on the flat side, surrounded by a slimy sheath; surface smooth under SEM.

Specimen examined: BRAZIL, PARANÁ, Palotina, PESC, 05.XI.2013, *K.S. Cruz 182* (HCP 651).

Habitat and distribution: on decaying wood. Known in Africa, Asia, Central and North America (Sir *et al.* 2012)

Notes: *Rosellinia arcuata* is morphologically similar to *R. necatrix* Prill., differing in the size of ascospores (30–41.5 \times 5–8 μm). The studied material was identified according to Sir *et al.* (2012). Several species of *Rosellinia* cause several damages to agriculture (Petrini 2003). *Rosellinia arcuata* is the first record for the State of Paraná.

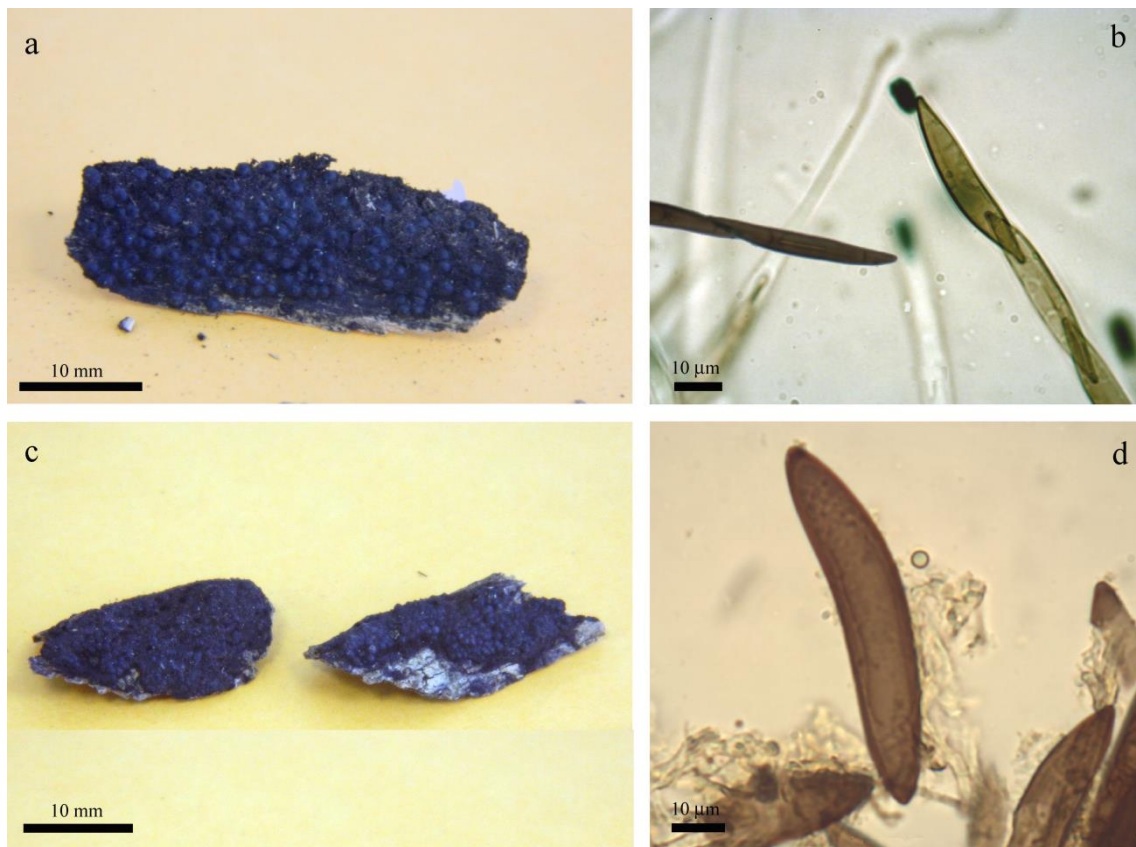
11. *Rosellinia longispora* Rick, Brotéria 1: 189. 1932.

(Figs 5c-d. 6 i)

Subiculum brown to dark brown, completely covering the base of the stromata. Stromata solitary or crowded in small groups, black. Ectostroma solid, black. Entostroma yellowish white in the base. Ostioles papillata. Perithecia partial immersed in the stroma. Asci and apical apparatus not seen. Ascospores brown to dark brown, 45–80 × 8–16 μm, fusiform, with a straight inconspicuous germ slit spore-length, surrounded by a slimy sheath; surface smooth under SEM.

Specimen examined: BRAZIL, PARANÁ, Palotina, PES, 10.IV.2013, *K.S. Cruz 143* (HCP 652).

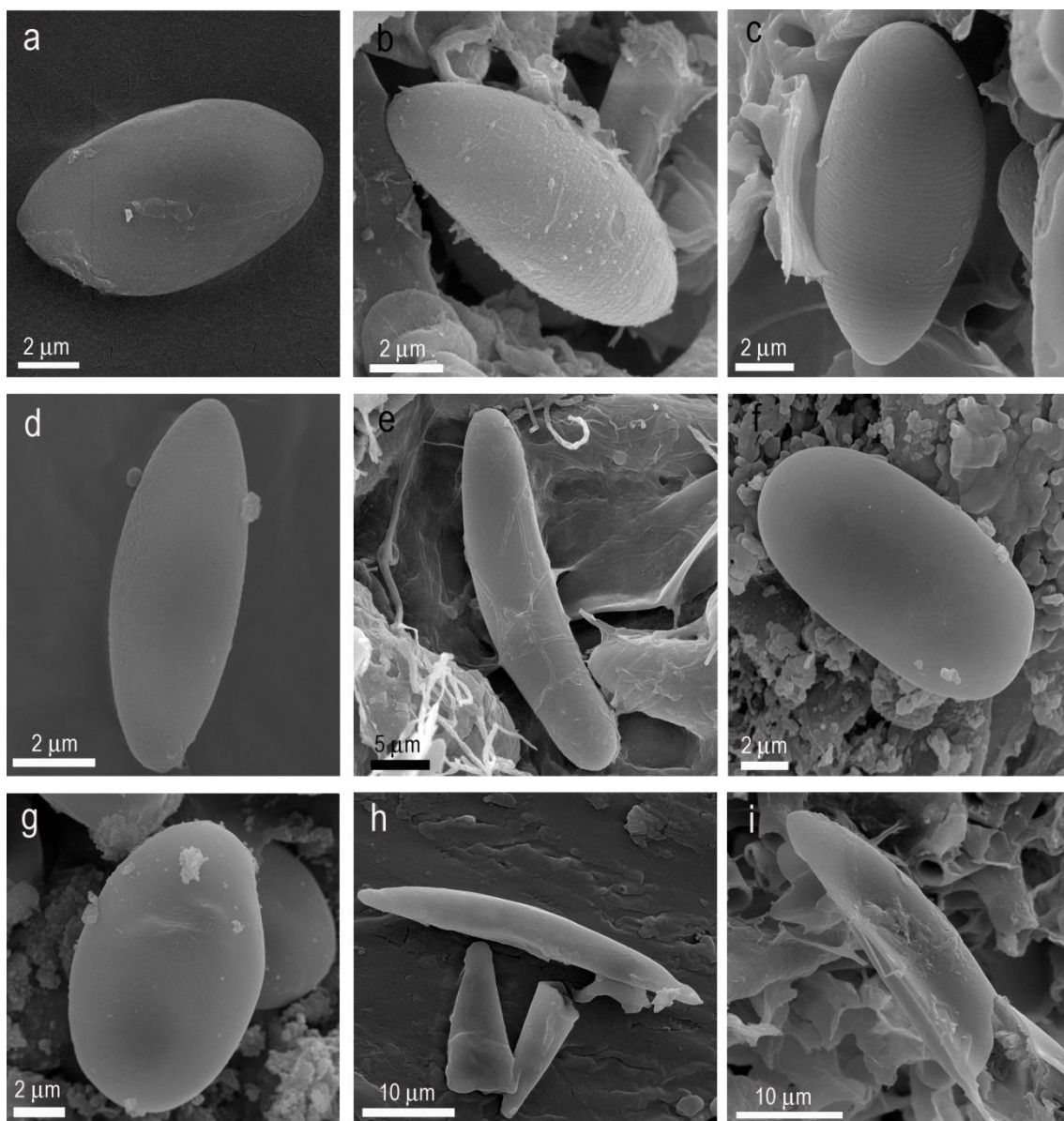
Habitat and distribution: on decaying wood. Known in North America and Asia (Petrini 2003)



Figs 5a-d. a-b. *Rosellinia arcuata*. a, stroma; b, ascospores and apical ring. c-d. *Rosellinia longispora*. c, stroma; d, ascospore.

Notes: *Rosellinia longispora* is characterized by having large ascospores and germ slit the length of ascospores (Petrine 2003). The holotype of this species was described

from material collected by Rick in Rio Grande do Sul, Brazil. *Rosellinia longispora* is the first record for the state of Paraná.



Figs 6a-i. SEM of *Xylariaceae* ascospores: **a**, *Biscogniauxia capnodes*. **b**, *Daldinia clavata*. **c**, *Daldinia eschscholtzii*. **d**, *Jumillera punctatobrunnea*. **e**, *Kretzschmaria clavus*. **f**, *Phylacia poculiformis*. **g**, *Phylacia turbinata*. **h**, *Rosellinia arcuata*. **i**, *Rosellinia longispora*.

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CAPÍTULO 2: Artigo será submetido à revista *Acta Biológica Paranaense* (Paraná).

***Xylaria* (Xylariaceae, Ascomycota) in the
Parque Estadual de São Camilo, Paraná, Brazil**

***Xylaria* (Xylariaceae, Ascomycota) no
Parque Estadual de São Camilo, Paraná, Brasil**

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VAGNER G. CORTEZ²

Xylaria Hill ex Schrank is the type genus of *Xylariaceae* Tul. & C. Tul. (STADLER *et al.*, 2013). *Xylaria* species produce dark carbonaceous stromata, perithecial ascomata, cylindrical asci with an apical ring and pigmented ascospores with a germ slit (ROGERS & SAMUELS, 1986). Members of *Xylaria* grow mainly on wood, but also on litter, fruits, dead palm leaves, seeds, dung and even on ant nests (HSIEH *et al.*, 2010; ROGERS *et al.*, 2005).

Xylaria species are widely distributed in tropical, subtropical and also in temperate zones (ROGERS *et al.*, 2005). In Brazil,

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many taxa has been described or reported – for an historical summary of the knowledge about *Xylaria* in Brazil see TRIERVEILER-PEREIRA *et al.* (2009). From the State of Paraná 22 species of *Xylaria* were reported by (MEIJER, 2006) especially in Curitiba and Coastal regions of the State.

In order to improve the knowledge about *Xylariaceae* from Western region of Paraná State, a survey of the family was carried (CRUZ & CORTEZ, 2015), and in this contribution are presented the results dealing with the genus *Xylaria*.

MATERIALS AND METHODS

Specimens were gathered from April/2013 and March/2014, in the São Camilo State Park (abbreviated as PESC), municipality of Palotina, Western region of Paraná State, South Brazil. PESC is situated between coordinates 24°18'00"-24°19'30" S and 53°53'30"-53°55'30" W, comprising 385.34 ha belonging seasonal semi-deciduous forest (IAP, 2006; VELOSO *et al.*, 1991).

Specimens were examined following standard procedures for xylariaceous fungi. Micromorphological features were measured based on distilled water preparations; asci were observed in Cotton Blue, except for the apical ring, examined on Melzer's reagent. Ascospores were analyzed under scanning electron microscopy (SEM) Jeol JSM-6360LV, at the Center of Electron

Microscopy (CME) of the Paraná University, following Suwannasai et al. (2012). All specimens are preserved at the Herbarium of Palotina Campus (HCP) and holotype at the Herbarium of the National Botanic Department of the Paraná University (UPCB).

RESULTS AND DISCUSSION

Xylaria cubensis (Mont.) Fr.

N. Acta R. Soc. Sci. Upsal. 1: 126, 1851. (Figs. 1a–b, 4a)

Stromata unbranched, cylindric-clavate, sometimes flattened, with rounded fertile apex, 10–50 mm total length, fertile portion 12–35 × 3–20 mm, stipe from reddish tomentose base or simple, 5–25 × 2–9 mm. Texture hard to soft. Surface smooth to slightly rough, externally brown to dark brown, entostroma white, becoming hollow. Perithecia subglobose, 0.5–0.8 mm diam. Ostioles conic-papillate. Asci cylindrical, 113–217 × 7–10 µm, spore-bearing parts 67–87 µm, stipes 47–126 µm; apical ring amyloid, rectangular, 1–2.3 × 1.4–1.8 µm. Ascospores brown to dark brown, obliquely to ellipsoid-inequilateral, 8–10.5 × 4–5 µm, usually without germ slit; surface smooth under SEM.

EXAMINED MATERIAL – Brazil, PARANÁ: Palotina, PESC, 13/VI/2013, K.S. Cruz 89, 83, 93 (HCP 546, 547, 548);

02/VII/2013, K.S. Cruz 125, 123 (HCP 549, 550); 20/I/2014, K.S. Cruz 189 (HCP 551).

GEOGRAPHICAL DISTRIBUTION – Americas (BEUG *et al.*, 2014; HLADKI & ROMERO, 2010), Asia, Africa, and Oceania (STADLER *et al.*, 2008; VAN DER GUCHT, 1995).

NOTES – *Xylaria cubensis* has typical smooth stromata and small, dark brown ascospores without a germ slit (ROGERS, 1984). HAMME & GUERRERO (2002) noted differences in the cultured mycelium of some Brazilian specimens and discussed taxonomic problems in the *X. cubensis* complex. It causes a white rot of wood, but can be associated with as endophyte tropical palms (ROGERS, 1984). The studied specimens were growing on rotting wood.

***Xylaria curta* Fr.**

N. Acta R. Soc. Sci. Upsal. 1: 126, 1851. (Figs. 1c–d, 4b)

Stromata unbranched, cylindric-clavate, with rounded fertile apex, 21–29 mm total length, fertile portion 15–27 × 5–7 mm, stipes 2–6 × 2 mm. Texture hard. Surface rough, with whitish to yellowish squamules, externally brown to dark brown, entostroma white, becoming hollow in mature. Perithecia subglobose, 0.3–0.5 mm diam. Ostioles papillate, surrounded by a black disc. Asci cylindrical, 123–189 × 5–7 μm, spore-bearing parts 66–83 μm, stipes 47–115 μm; apical ring amyloid,

rectangular, $1.5\text{--}2 \times 1.4\text{--}2 \mu\text{m}$. Ascospores brown, oblique to ellipsoid-inequilateral, $7\text{--}10 \times 3\text{--}4 \mu\text{m}$, with a straight germ slit less than the spore-length; surface smooth under SEM.

EXAMINED MATERIAL – Brazil, PARANÁ: Palotina, PESC, 13/VI/2013, K.S. Cruz 90 (HCP 542); 10/IX/2013, K.S. Cruz 10 (HCP 543); 13/XII/2013, K.S. Cruz 177 (HCP 544); 25/III/2014, K.S. Cruz 226 (HCP 545).

GEOGRAPHICAL DISTRIBUTION – Americas (HAMME & GUERRERO 2002; HLADKI & ROMERO, 2010; STADLER *et al.*, 2008), Africa, Asia and Oceania (VAN DER GUCHT, 1995).

NOTES – According to HAMME & GUERRERO (2002), Brazilian specimens of *X. curta* are very variable in size and shape of the stroma, color and presence of whitish to yellowish squamules. DENNIS (1956) stated that this species has similar developmental stages to *X. feejeensis* and by this reason they are commonly get confused. *X. curta* has been collected on roots and trunks of rotting trees of *Luehea divaricata* Mart. (HAMME & GUERRERO, 2002). Our specimens were collected in rotting wood. This species is a new record from Paraná.

Xylaria feejeensis (Berk.) Fr.

N. Acta R. Soc. Sci. Upsal. 1: 128, 1851. (Figs. 1e–f, 4c)

Stromata unbranched or branched, cylindrical-clavate, with rounded fertile apex, 60–135 mm total length, fertile portion 30–

70 × 3–7 mm, stipes short to long, 20–65 × 3–6 mm, from reddish tomentose bases or simple. Texture cheesy to hard. Surface rough, externally dull black, often with brown tones, entostroma white, becoming hollow when very dried. Perithecia subglobose, 0.4–0.8 mm diam. Ostioles finely papillate, surrounded by a white disc. Asci cylindrical, 68–185 × 4–7 µm, spore-bearing parts 50–75 µm, stipes 20–122 µm; apical ring amyloid, rectangular, 0.9–2 × 1.1–2.1 µm. Ascospores brown, ellipsoid-inequilateral, 6.5–10 × 3–4.5 µm, with a straight germ slit spore-length; surface smooth under SEM.

EXAMINED MATERIAL – Brazil, PARANÁ: Palotina, PESC, 16/V/2013, K.S. Cruz 007a (HCP 537); 13/VI/2013, K.S. Cruz 87 (HCP 538); 02/VII/2013 K.S. Cruz 122 (HCP 539).

GEOGRAPHICAL DISTRIBUTION – Americas, Africa, Oceania and Asia (GUZMÁN & PIEPENBRING, 2011; VAN DER GUCHT, 1995)

NOTES – According to DENNIS (1956) and VAN DER GUCHT (1995), *X. feejeensis* is a complex taxon. In Brazil, it was reported as *X. obtusissima* Sacc. and *X. feejeensis* var. *polymorphoides* Rehm (DENNIS, 1956). Our specimens were collected in decaying wood, some with hair at the base, according to the material described by (DENNIS, 1956).

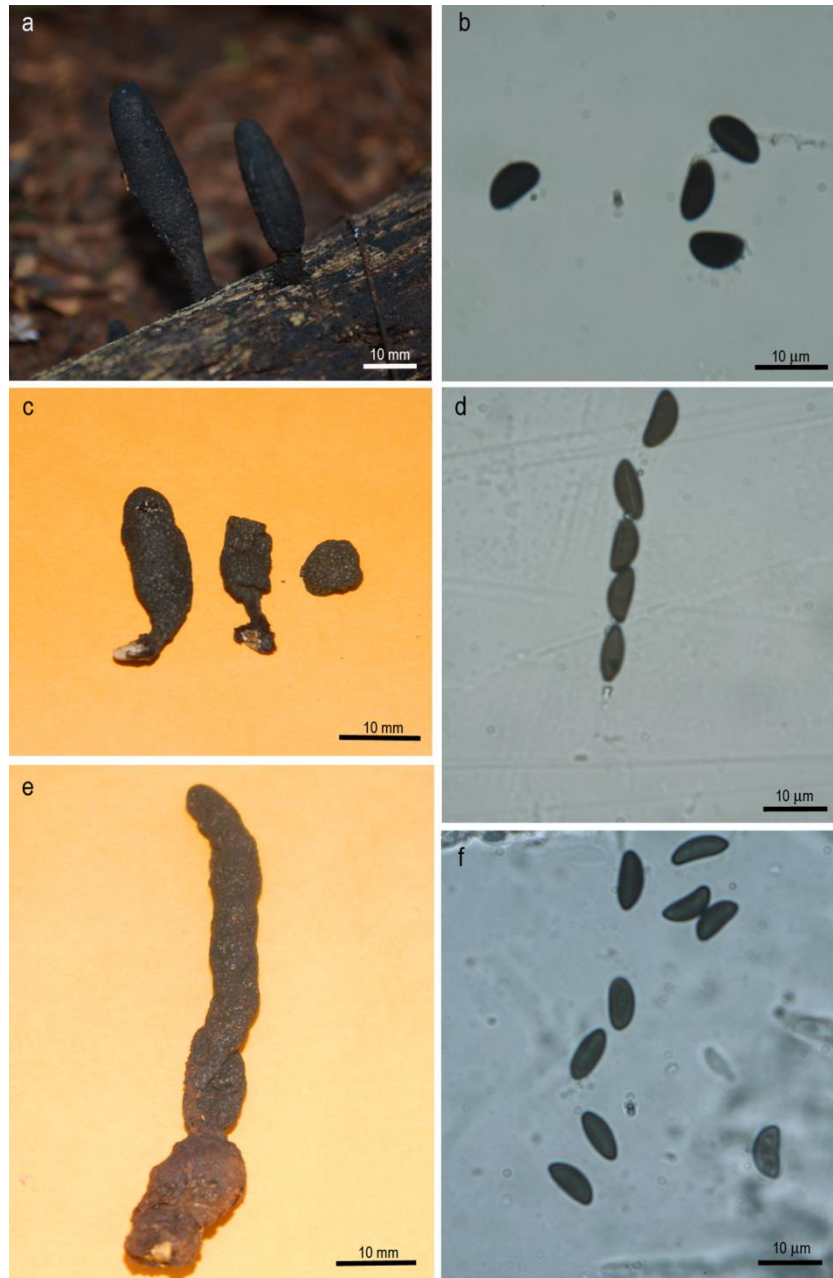


Fig. 1. a, b. *Xylaria cubensis*: a, stroma; b, ascospores. c,d. *Xylaria curta*: c, stroma; d, ascospores. e,f. *Xylaria feejeensis*: e, stroma; f, ascospores.

Xylaria grammica (Mont.) Mont.

An. Sci. Nat. Bot. 3: 108, 1855. (Figs. 2a–b, 4d)

Stromata unbranched or rarely branched, cylindrical-fusoid, with rounded fertile apices, 60–120 mm total length, fertile portion 30–60 × 5–16 mm, stipes short or long, 15–80 × 3–6 mm. Texture hard. Surface smooth, with longitudinal black lines, externally gray, entostroma white, becoming hollow when dried. Perithecia subglobose, 0.4–1 mm diam. Ostioles punctate in longitudinal black lines. Asci cylindrical, 170–254 × 7–9 µm, spore-bearing parts 70–84 µm, stipes 90–170 µm; apical ring amyloid, rectangular, 2.5–3 × 1.5–2 µm. Ascospores brown, ellipsoid-inequilateral, 10–12 × 3.5–5 µm, with a straight germ slit spore-length; surface smooth under SEM.

EXAMINED MATERIAL – Brazil, PARANÁ: Palotina, PESC, 16/II/2011, A.J. Ferreira & R.L. Dias 18-32 (HCP 565; 24/VI/2011, A.J. Ferreira & R.L. Dias 21-1 (HCP 566); 15/VI/2011, T.R. Huguen 019 (HCP 564); 16/V/2013, K.S. Cruz 007b (HCP 567); 13/VI/2013, K.S. Cruz 84, 92 (HCP 568, 569); 02/VII/2013, K.S. Cruz 119 (HCP 570); 20/I/2014, K.S. Cruz 191, 227 (HCP 573, 573); 25/III/2014, K.S. Cruz 009a (HCP 574).

GEOGRAPHICAL DISTRIBUTION – South America (HAMME & GUERRERO, 2002; HLADKI & ROMERO, 2010) Africa, Asia, and Oceania (VAN DER GUCHT, 1995).

NOTES – According to DENNIS (1956) *Xylaria grammica* is characterized by cracking in the stromatical crust and also rows of ostioles within the cracks. Due to these characteristics *X. grammica* is easily recognized in the field. In other species with regularly cracking crusts the cracks surround individual perithecia or form a network between them DENNIS (1956). Our specimens were collected in decaying wood. This species is a new record from Paraná.

Xylaria ianthinovelutina (Mont.) Fr.

Syll. Gen. Spec. Plant. Crypt.: 204, 1856. (Figs. 2c–d, 4e)

Stromata unbranched or branched, cylindrical, with acute sterile apex, 30–40 mm total length, fertile portion 4–22 × 1–2 mm, stipes tomentose, 15–30 × 1–2 mm. Texture soft. Surface rough, covered by tomentum, externally reddish brown to black, entostroma white. Perithecia mammiform, 0.3–0.6 mm diam. Ostioles slightly papillate. Asci cylindrical, 94–104 × 4–6.5 µm, spore-bearing parts 52–74.5 µm, stipes 21–37.5 µm; apical ring amyloid, rectangular, 1.6–2.1 × 1.1–1.6 µm. Ascospores light brown, ellipsoid-inequilateral to fusoid, 10–11 × 3–4 µm, with a straight germ slit spore-length; surface smooth under SEM.

EXAMINED MATERIAL – Brazil, PARANÁ: Palotina, PESC, 02/VII/2013, K.S. Cruz 117 (HCP 540).

GEOGRAPHICAL DISTRIBUTION – North and South America (HLADKI & ROMERO, 2010; TRIERVEILER-PEREIRA *et al.*, 2009).

NOTES – *Xylaria ianthinovelutina* occurs preferentially on fruits of *Fabaceae* Lindley (DENNIS, 1956; ROGERS *et al.*, 1988). South Brazilian collections recorded by THEISSEN (1909) and RICK (1935) were reported as growing on wood. *Xylaria magnoliae* J.D. Rogers is described by occurring only on fruits of *Magnoliaceae* with its ascospores ranging from $10\text{--}17 \times 3\text{--}6 \mu\text{m}$, navicular-crescentic or fusoid and yellowish with obscure germ slits (ROGERS, 1979). Our specimen from Paraná was growing on fruit of *Fabaceae*, as mentioned by DENNIS (1956) and ROGERS *et al.* (1988).

Xylaria multiplex (Fr.) Fr.

N. Acta R. Soc. Sci. Upsal. 1: 127, 1851. (Figs. 2e–f, 4f)

Stromata unbranched or branched, cylindrical, with acute sterile apex, 10–35 mm total length, fertile portion $5\text{--}15 \times 1\text{--}3$ mm, stipes short or long, tomentose, $5\text{--}20 \times 1\text{--}2$ mm. Texture hard. Surface smooth to nodulose, with longitudinal black lines, sometimes with scattered hairs, externally black, entostroma white. Perithecia subglobose, 0.3–0.6 mm diam. Ostioles more or less punctate. Asci cylindrical, $90\text{--}146 \times 5\text{--}7 \mu\text{m}$, spore-bearing parts $60\text{--}89 \mu\text{m}$, stipes $24\text{--}60 \mu\text{m}$; apical ring amyloid, rectangular, $1.5\text{--}3 \times 1\text{--}2 \mu\text{m}$. Ascospores brown, ellipsoid-

inequilateral, with narrowly rounded ends, $9\text{--}14 \times 3\text{--}5 \mu\text{m}$, with a straight germ slit spore-length; surface smooth under SEM.

EXAMINED MATERIAL – Brazil, PARANÁ: Palotina, PESC, 13/VI/2013, K.S. Cruz 86 (HCP 553); 02/VII/2013, K.S. Cruz 116 (HCP 554).

GEOGRAPHICAL DISTRIBUTION – Americas (GUZMÁN & PIEPENBRING, 2011; HLADKI & ROMERO, 2010), Africa, Asia, and Oceania (VAN DER GUCHT, 1995).

NOTES – *Xylaria multiplex* is another complex taxon within the genus (DENNIS, 1956). *Xylaria hypoxylon* has a similar stroma but differs from it by its ascospores size ($9\text{--}16 \times 5\text{--}6.5 \mu\text{m}$) with a straight germ slit slightly less than spore-length (ROGERS, 1986). Our specimens were collected in decaying wood. This species is a new record from Paraná.

Xylaria multiplex var. *microsperma* (Speg.) Dennis

Kew Bull. 11: 418, 1956. (Figs. 2g–h)

Stromata unbranched, cylindrical, with rounded apex, 8–15 mm total length, fertile portion $6\text{--}12 \times 1\text{--}2$ mm, stipe short, $2\text{--}3 \times 1\text{--}2$ mm. Texture hard. Surface smooth to nodulose, with perithecial contours, externally black, white inside. Perithecia Asci cylindrical, $90\text{--}110 \times 5\text{--}6.5 \mu\text{m}$, spore-bearing parts $28\text{--}86 \mu\text{m}$, stipes $28\text{--}57 \mu\text{m}$; apical ring amyloid, rectangular, $1.5\text{--}2 \times 1.2\text{--}1.7 \mu\text{m}$. Ascospores brown, ellipsoid-inequilateral with

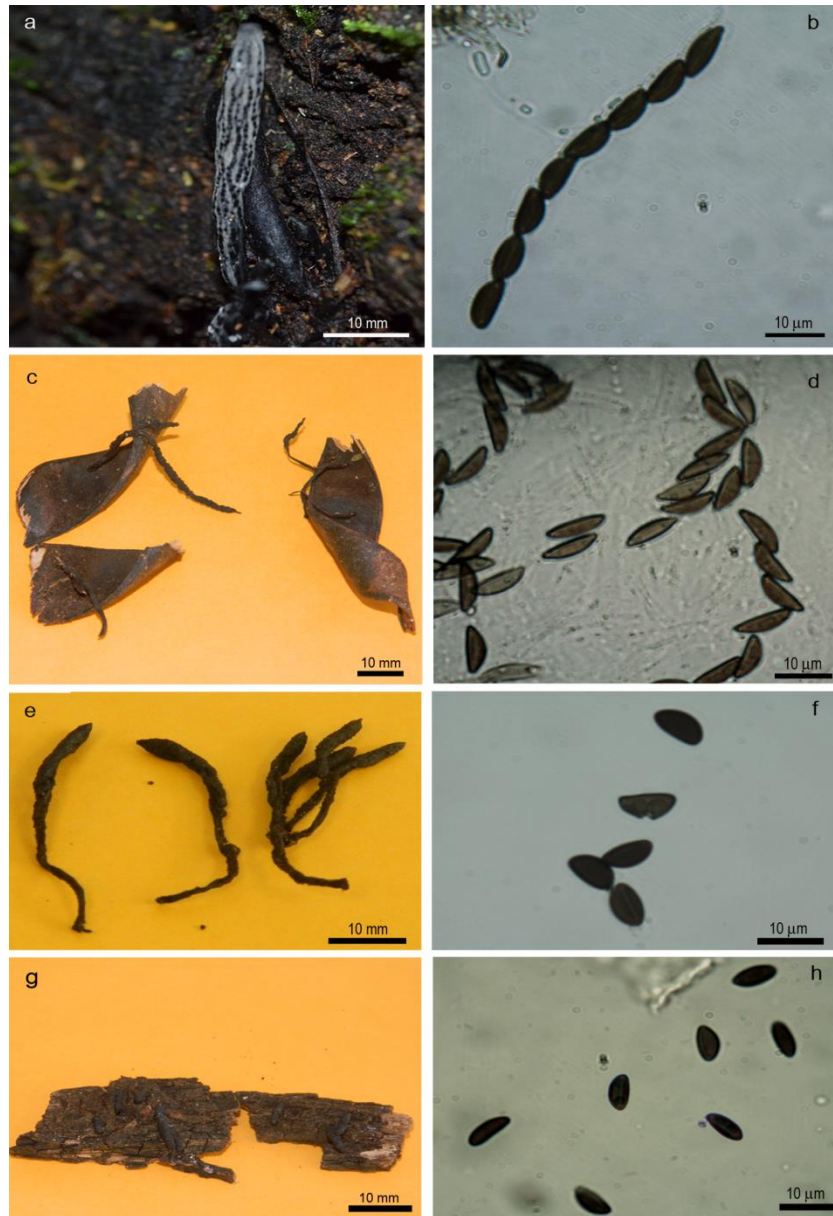


Fig. 2. a, b. *Xylaria grammica*: a, stroma; b, ascospores. c,d. *Xylaria ianthinovelutina*: c, stroma; d, ascospores. e,f. *Xylaria multiplex*: e, stroma; f, ascospores. g,h. *Xylaria multiplex* var. *microspora*: g, stroma; h, ascospores.

narrowly rounded ends, $7-10 \times 3-4 \mu\text{m}$, with a straight germ slit spore-length; surface smooth under SEM.

EXAMINED MATERIAL – Brazil, PARANÁ: Palotina, PESC, 02/VII/2013, K.S. Cruz 121 (HCP 552).

GEOGRAPHICAL DISTRIBUTION – Central and South America (DENNIS, 1956).

NOTES – *Xylaria multiplex* var. *microsperma* differs from typical variety on the basis of rounded apex of stroma, and smaller ascospores (DENNIS, 1956). Our specime was collected in decaying wood. *Xylaria multiplex* var. *microsperma* is a new record from Paraná and Brazil.

***Xylaria poitei* (Lev.) Fr.**

N. Acta Reg. Soc. Sci. Upsal. 1: 125. 1851. (Figs. 3a–b, 4g)

Stromata unbranched, cylindrical-clavate, acute apex to mucronate when immature, then rounded when mature, 90–250 mm total length, fertile portion $65-155 \times 20-30$ mm, stipes short and broad, occasionally branched near to the base, $20-65 \times 5-25$ mm. Texture hard to very hard. Surface rough, externally dull bronze to brown, entostroma cream, becoming hollow when dried. Perithecia subglobose, 0.5–1 mm diam. Ostioles slightly papillate, surrounded by a black a disc. Asci cylindrical, $164-284 \times 6-8 \mu\text{m}$, spore-bearing parts $129-150 \mu\text{m}$, stipes $87-139 \mu\text{m}$; apical ring amyloid, rectangular, $1.6-2.9 \times 1.3-2 \mu\text{m}$.

Ascospores brown, ellipsoid-inequilateral, $12\text{--}15 \times 4\text{--}6 \mu\text{m}$, with a straight germ slit spore-length; smooth surface under SEM.

EXAMINED MATERIAL – Brazil, PARANÁ: Palotina, PESC, 16/V/2013, K.S. Cruz 002 (HCP 562); 13/XII/2013, K.S. Cruz 175 (HCP 563); 20/I/2014, K.S. Cruz 197 (HCP 564);

GEOGRAPHICAL DISTRIBUTION – Americas, Africa, and Oceania (GUZMÁN & PIEPENBRING, 2011; HLADKI & ROMERO, 2010; PATIL *et al.*, 2012; STADLER *et al.*, 2008; VAN DER GUCHT, 1995).

NOTES – *Xylaria poitei* exhibits critical morphological variations according to the developmental stage: when young and immature, the stromatic surface is pale brown, with acute to mucronate apex, and cream inside; when mature, the stromatic surface becomes shiny brown, with a rounded fertile apex, and hollow (ROGERS, 1984). According to DENNIS (1956), *X. guyanensis* (Mont.) Fr. is similar to *X. poitei*, by producing produce large stromata (<100 mm long); however, the former having larger ascospores ($14\text{--}21 \times 5\text{--}8 \mu\text{m}$). The materials from PESC were collected on a fallen decomposing wood covered by lianas. This species was known in Brazil only in the state of Acre (FRIES, 1851; PEREIRA, 2015) and Paraíba (TRIERVEILER, 2014), with its first report to the State of Paraná.

Xylaria scruposa (Fr.) Berk.

N. Acta R. Soc. Sci. Upsal. 1: 127, 1851. (Figs. 3c–d, 4h)

Stromata unbranched or rarely branched, cylindrical-clavate, with rounded fertile apex, 30–80 mm total length, fertile portion 10–40 × 3–5 mm, stipes short or long, 10–40 × 2–3 mm, sometimes tomentose. Texture cheesy to hard. Surface rough, externally dull black, entostroma white. Perithecia subglobose, 0.3–0.7 mm diam. Ostioles papillate, surrounded by a black disc. Asci cylindrical, 141–249 × 7–9.5 µm, spore-bearing parts 88–123 µm, stipes 40–135 µm; apical ring amyloid, urn-shaped, 3.5–10 × 2.5–4.5 µm. Ascospores brown, ellipsoid-inequilateral, with rounded or narrowed ends, 13–21 × 4.5–7 µm, with a short spiral germ slit to side; surface smooth under SEM.

EXAMINED MATERIAL – Brazil, PARANÁ: Palotina, PESC, 16/V/2013, K.S. Cruz 003, 013 (HCP 556, 557); 13/VI/2013, K.S. Cruz 085 (HCP 555); 02/VII/2014, K.S. Cruz 120, 228, 229 (HCP 558, 559, 560).

GEOGRAPHICAL DISTRIBUTION – Americas, Africa, Asia and Oceania (GUZMÁN & PIEPENBRING, 2011; STADLER *et al.*, 2008; VAN DER GUCH, 1995).

NOTES – HAMME & GUERRERO (2002) found misidentified specimens in Rick's collection labelled as *X. polymorpha*. GONZALEZ & ROGERS (1989) discussed the taxonomic confusion in the *X. polymorpha* complex, which includes *X. scruposa*.

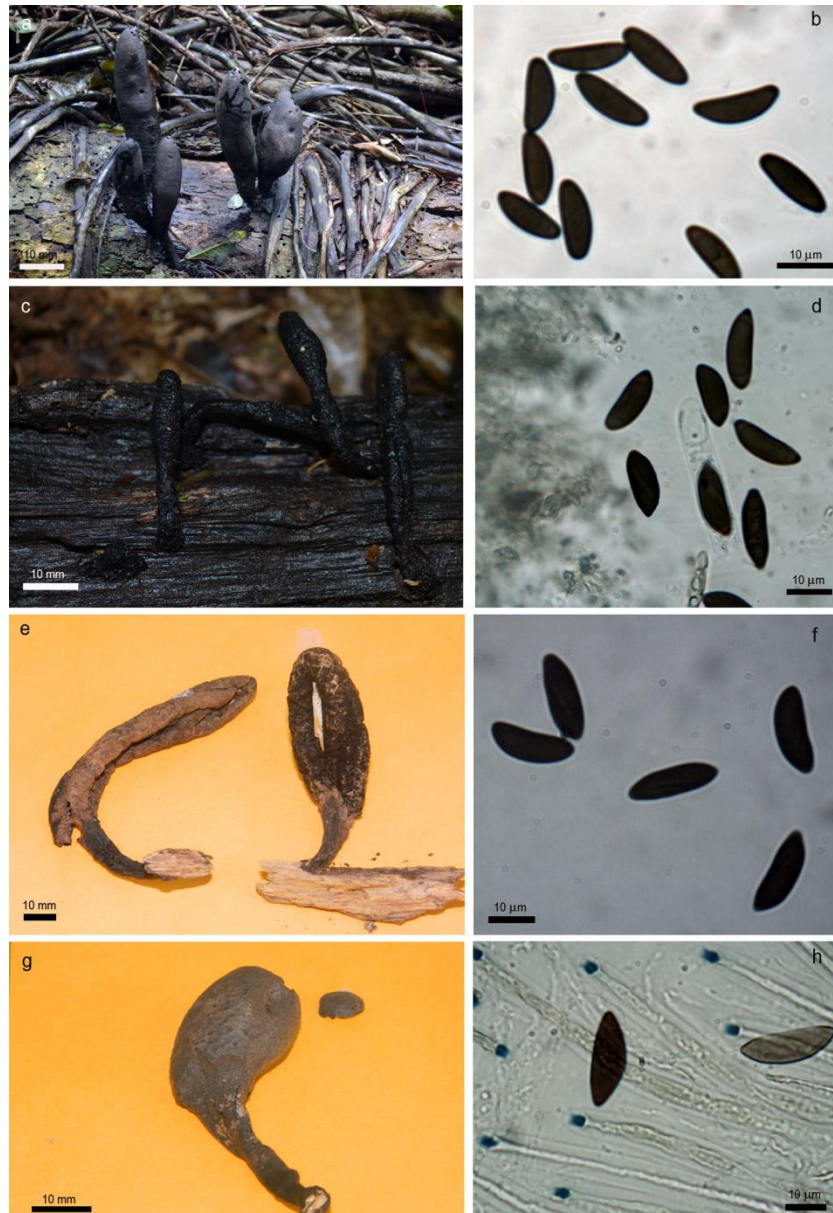


Fig. 3. a,c. *Xylaria poitei*: a, stroma; b, ascospores. c,d. *Xylaria scruposa*: c, stroma; d, ascospores. e,f. *Xylaria telfairii*: e, stroma; f, ascospores. g,h. *Xylaria tuberosoides*: g, stroma; h, ascospores and apical ring.

According to DENNIS (1956) *X. feejeensis* and *X. longipes* are similar to *X. scruposa*, but has still larger ascospores, 16-22 x 6-8 μm , but the latter shows larger ascospores and germ slit. In Brazil this species was recorded as typus of *X. subtorulosa* in Herb. Spegazzinii (DENNIS, 1956). Our specimens were collected in decaying wood.

Xylaria telfairii (Berk.) Sacc.

Syll. Fung. 1: 320, 1882. (Figs. 3e-f, 4i)

Stromata unbranched, cylindrical-clavate with rounded fertile apex, 45–140 mm total length, fertile portion 25–120 \times 5–15 mm, stipes 10–35 \times 5–11 mm. Texture hard. Surface smooth, brown to orange-brown, entostroma white, soon becoming hollow. Perithecia subglobose, 0.5–0.7 mm diam. Ostioles punctate, black. Asci collapsed, spore-bearing parts 126–134 μm , stipes 87–139 μm ; apical ring amyloid, urn-shaped, 4–6 \times 3–4 μm . Ascospores brown, ellipsoid-inequilateral or allantoid, with narrowed ends, 18–25 \times 5.5–7.5 μm , with a germ slit straight to curving side short, 6.5–9 μm ; surface smooth under SEM.

EXAMINED MATERIAL – Brazil, PARANÁ: Palotina, PESC, 16/II/2011, A.J. Ferreira & R.L. Dias 18-32 (HCP 566); 24/III/2011, A.J. Ferreira & R.L. Dias 21-1 (HCP 567); 16/V/2013, K.S. Cruz 012 (HCP 533); 13/VI/2013, K.S. Cruz 088 (HCP

534); 02/VII/2013, K.S. Cruz 118 (HCP 535); 13/XI/2013, K.S. Cruz 178 (HCP 536).

GEOGRAPHICAL DISTRIBUTION – Americas, Asia, Africa and Oceania (GUZMÁN & PIEPENBRING, 2011; STADLER *et al.*, 2008; VAN DER GUCHT, 1995).

NOTES – *Xylaria telfairii* is distinguished from other *Xylaria* species due to its brown to orange-brown stromata and entostroma hollow, the stroma often splits down the middle and the broken edges curl inwards (DENNIS, 1956). *Xylaria enterogena* (Mont.) Fr. looks like *X. telfairii*, by the brown stroma and ascospore size and shape, but has smaller stromata (<20 mm length), and umbilicate ostioles without exposed discs (DENNIS, 1956). By sharing many features, DENNIS (1956) considered *X. enterogena* as young stage of *X. telfairii*. HAMME & GUERRERO (2002) and ROGERS (1984) disagree and consider that *X. enterogena* has consistent features to consider it distinct from *X. telfairii*. Our specimens were collected in decaying wood.

Xylaria tuberoides Rehm

Hedwigia 40: 146. 1901. (Figs. 3g–h)

Stromata unbranched, subglobose, with rounded fertile apex 38 mm total length, fertile portion 15 × 13 mm, stipe 22 × 3 mm. Texture very hard. Surface smooth, gray to brown,

entostroma white, becoming hollow. Perithecia subglobose, 0.5–0.8 mm diam. Ostioles punctate. Asci collapsed, with apical ring amyloid, rectangular, $3.5\text{--}5.5 \times 2\text{--}3 \mu\text{m}$. Ascospores light brown, ellipsoid-inequilateral, $24\text{--}29 \times 7\text{--}9 \mu\text{m}$, with inconspicuous germ slit; surface smooth under SEM.

EXAMINED MATERIAL – Brazil. PARANÁ: Palotina, PES, 02/VII/2013, K.S. Cruz 127 (HCP 541).

GEOGRAPHICAL DISTRIBUTION – Americas (GUZMÁN & PIEPENBRING, 2011; HAMME & GUERRERO, 2002; STADLER *et al.*, 2008).

NOTES – *Xylaria tuberoidea* is diagnosed by its subglobose stromata, smooth, and black punctuated ostioles. LOYD (1917) considered *X. obovata* was synonymous of *X. tuberoidea* (HAMME & GUERRERO, 2002); finally HSIEH *et al.* (2010) considered *X. tuberoidea* as the correct name for this American species. Our specimens was collected in decaying wood.

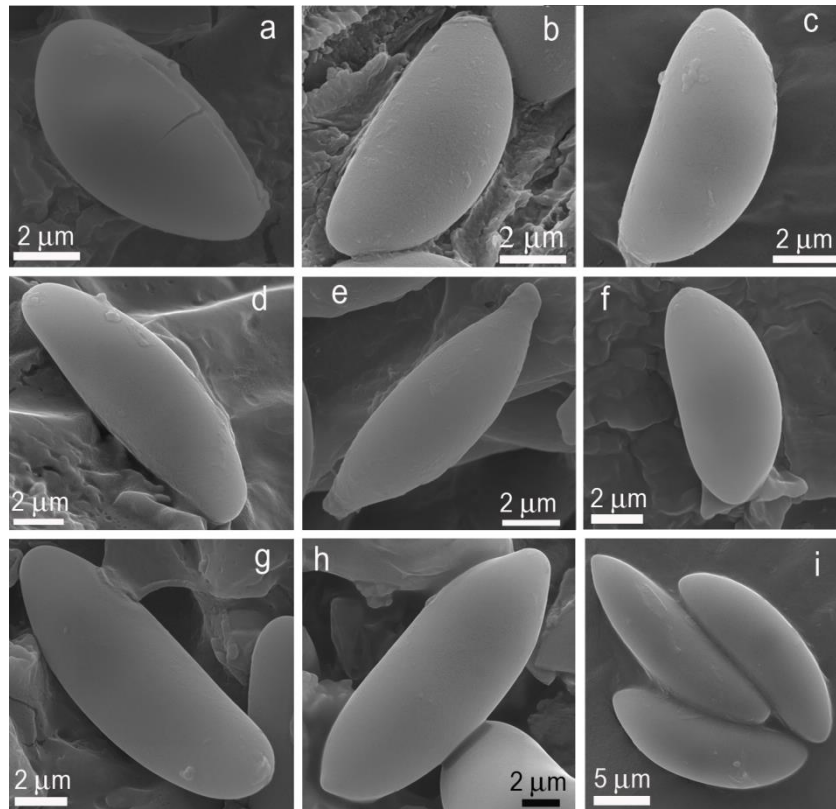


Fig. 4. SEM of *Xylaria* ascospores: a, *Xylaria cubensis*. b, *Xylaria curta*. c, *Xylaria feejeensis*. d, *Xylaria grammica*. e, *Xylaria ianthinovellutina*. f, *Xylaria multiplex*. g, *Xylaria poitei*. h, *Xylariascruposa*. i, *Xylaria telfairii*.

Key for identification of *Xylaria* species from PESC:

1. Stromata growing on fruits of *Fabaceae*.....*X. ianthinovelutina*
1. Stromata growing in wood.....2
2. Stromatic surface smooth.....3
2. Stromatic surface rough.....8
3. Stromata subglobose, ascospores 24–29 × 7–9 μm.....*X. tuberoides*
3. Stromata cylindrical, ascospores <24 μm.....4
4. Ascospores dark brown without germ slit.....*X. cubensis*
4. Ascospores brown, with germ slit.....5
5. Ascospores with a germ slit straight to curving side short.....*X. telfairii*
5. Ascospores with a germ slit straight spore-length.....6
6. Stromatic surface gray, with longitudinal black lines.....*X. grammica*
6. Stromatic surface black, without longitudinal lines.....7
7. Stromatic surface with acute apex, ascospores 9–14 × 3–5 μm.....*X. multiplex*
7. Stromatic surface with rounded apex, ascospores 7–10 × 3–4 μm.....*X. multiplex var. microsperma*
8. Stromatic surface with whitish to yellowish squamules.....*X. curta*

8. Stromatic surface without squamules.....9
9. Ascospores with a short spiral germ slit to side.....*X. scruposa*
9. Ascospores with a germ slit straight spore-length.....10
10. Stromata 90–250 mm total length, ascospores 12–15 × 4–6 μm.....*X. poitei*
10. Stromata 60–135 mm total length, ascospores 6.5–10 × 3–4.5 μ.....*X. feejeensis*

SUMÁRIO

Durante a pesquisa com *Xylariaceae* no Parque Estadual de São Camilo, Palotina, Estado do Paraná, Sul do Brasil. Foram coletados 42 espécimes do gênero *Xylaria*. Os quais representam onze táxons: *X. cubensis*, *X. curta*, *X. feejeensis*, *X. grammica*, *X. ianthinovelutina*, *X. multiplex*, *X. multiplex* var. *microsperma*, *X. poitei*, *X. scruposa*, *X. telfairii* e *X. tuberoides*. Destes táxons, cinco são novas ocorrências para o Paraná, *X. curta*, *X. grammica*, *X. multiplex*, *X. multiplex* var. *microsperma*, *X. poitei*. Todos os táxons são descritos e ilustrados e uma chave de identificação é fornecida.

PALAVRAS-CHAVE: estroma, micobiota, fungos lignícolas, taxonomia.

SUMMARY

During a survey of *Xylariaceae* in the Parque Estadual of São Camilo, Palotina, Paraná State, South Brazil. Were collected 42 specimens of the genus *Xylaria*. They represented eleven taxa: *X. cubensis*, *X. curta*, *X. feejeensis*, *X. grammica*, *X. ianthinovelutina*, *X. multiplex*, *X. multiplex* var. *microsperma*, *X. poitei*, *X. scruposa*, *X. telfairii*, and *X. tuberoides*. Among these, five are new records from the State of Paraná, *X. curta*, *X. grammica*, *X. multiplex*, *X. multiplex* var. *microsperma* and *X. poitei*. All taxa are described and illustrated and an identification key is presented.

KEY WORDS: stroma, lignicolous fungi, mycobiota, taxonomy.

RÉSUMÉ

Les résultats proviennent d'un sondage mené en famille *Xylariaceae* dans le Parc d'Etat de Saint Camille, Palotina, Paraná, Brésil. Nous avons recueilli 42 spécimens de *Xylaria* répartis dans Ils représentaient onze taxa: *X. cubensis*, *X. curta*, *X. feejeensis*, *X. grammica*, *X. ianthinovelutina*, *X. multiplex*, *X. multiplex* var. *microsperma*, *X. poitei*, *X. scruposa*, *X. telfairii*, and *X. tuberoides*. Ces taxa, cinq sont de nouveaux records de l'État du Paraná, *X. curta*, *X. grammica*, *X. multiplex*, *X. multiplex* var. *microsperma* et *X. poitei* Tous les taxons sont décrits et illustrés et une clé d'identification est fourni.

MOTS-CLÉS: strome, champignons lignicoles, mycobiote, taxonomie.

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CAPÍTULO 3: Artigo será submetido à revista *Brazilian Journal Botany* (São Paulo).

***Hypoxylon* (Xylariaceae, Ascomycota) from Western Paraná, Brazil**

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Abstract *Hypoxylon* is one of the most speciose genera in Xylariaceae, whose species are saprobes or facultative parasites. In a survey of the *Hypoxylon* species from Parque Estadual São Camilo, municipality of Palotina, West region of Paraná State (24°18'00"–24°19'30" S and 53°53'30"–53°55'30" W). Twelve taxa were found: *H. anthochroum*, *H. griseobrunneum*, *H. lenormandii*, *H. monticulosum*, *H. peleae*, *H. cf. pilgerianum*, *H. rickii*, *H. rubigineoareolatum*, *H. rubiginosum*, *H. subgilvum*, *H. subrutilum* and *H. vinaceobrunneum*. Among these, *Hypoxylon vinaceobrunneum* is proposed as new species, based on the following characters: surface effused-pulvinate, brown vinaceous; without apparent KOH-extractable pigments or with dilute grayish sepia; ostioles slightly papillate; ascospores light brown to brown, 7–10 × 3–3.5 µm, with slightly germ slit shorter than the spore-length. *Hypoxylon peleae* is new to South America, whereas *H. griseobrunneum* is new to Brazil, and all the remaining taxa are newly reported from the State of Paraná or southern Brazil. Key for the identification, morphological descriptions and illustrations are presented for all species.

Keywords Mycobiota, Neotropical fungi, Pyrenomycetes, Taxonomy, Xylarioid Ascomycetes.

Introduction

Hypoxylon Bull. is one of the most speciose genera of Xylariaceae, characterized by unipartite effused-pulvinate stromata, conspicuous carbonaceous stromatal tissue below the perithecial layer, usually with dissolved stromatic pigment in KOH, and nodulisporium-like anamorphs (Ju and Rogers 1996). The genus is most diverse in warmer climates and live as saprobes or as facultative parasites on stressed or diseased hosts (Kuhnert et al. 2014). Since a world monograph by Ju and Rogers (1996), 54 new *Hypoxylon* species were described, reaching an estimated number of 150 species. In Brazil, the knowledge of the genus is limited to 36 reported species (Pereira 2015), but in the State of Paraná, only six *Hypoxylon* are known (Meijer 2006). This paper presents partial results of a survey of Xylariaceae from the Western region of Paraná State, and aims to improve the knowledge of this group of fungi in southern Brazil.

Materials and Methods

Specimens were collected between 2013/2014 at the Parque Estadual São Camilo (PESC), municipality of Palotina, Western region of Paraná State, Southern Brazil (24°18'00"–24°19'30" S and 53°53'30"–53°55'30" W). PESC has about 385.34 ha of Seasonal Semideciduous Forest (Atlantic Rainforest Domain, IAP 2006). Morphology and terminology followed Ju and Rogers (1996) and colors were based on Rayner (1970). Microscopic features were examined in 10% KOH, and measured based on distilled water preparations; asci were observed in Cotton Blue, except for the apical ring, examined on Melzer's reagent. Ascospores were analyzed under scanning electron microscopy (SEM) Jeol JSM-6360LV, at the Center of Electron Microscopy (CME) of the Paraná University, following Suwannasai et al. (2012). All specimens are preserved at the Herbarium of Palotina Campus (HCP) and holotype at the Herbarium of the National Botanic Department of the Paraná University (UPCB).

Taxonomy

30 specimens were examined, from which twelve *Hypoxylon* species were identified. All species are described as follows, and the following key is proposed for identification of the studied taxa.

Key for *Hypoxylon* species from PESC, Paraná, Brazil:

- | | |
|---|------------------------------|
| 1. Without KOH-extractable pigments | 2 |
| 2. Perithecia spherical to obovoid, ascospores 8–12.5 × 3–5 µm, with sigmoid germ slit spore-length | <i>H. monticulosum</i> |
| 2'. Perithecia exclusively obovoid, ascospores 10.5–15.5 × 4.5–6 µm, with straight germ slit spore-length | <i>H. rubigineoareolatum</i> |
| 1'. With KOH-extractable pigments | 3 |
| 3. Orange KOH-extractable pigments | 4 |
| 4. Ostioles surrounded by a disc | <i>H. peleae</i> |
| 4'. Ostioles not surrounded by a disc | 5 |

5. Stromatal surface grayish sepia, ostioles papillate *H. lenormandii*
- 5'. Stromatal surface presenting distinct color, ostioles umbilicate 6
6. Perithecia exclusively spherical, 0.1–0.2 mm diam *H. cf. pilgerianum*
- 6'. Perithecia spherical, obovoid or tubular, >0.2 mm diam. 7
7. Ascospores 5.5–8.5 μm long *H. rickii*
- 7'. Ascospores > 8 μm long 8
8. Ascospores 9–13.5 \times 3–4 μm , with straight germ slit *H. rubiginosum*
- 8'. Ascospores 8–13 \times 4–5 μm , with sigmoid germ slit *H. subgilvum*
- 3'. Grayish sepia, olivaceous or fawn KOH-extractable pigments 9
- 9'. Ostioles slightly papillate *H. vinaceobrunneum*
- 9'. Ostioles umbilicate 10
10. Ascospores 13–19 (–21.5) μm long *H. subrutulum*
- 10'. Ascospores <13 μm long 11
11. Perithecia spherical to obovoid, 0.3–0.5 \times 0.2–0.4 mm *H. anthochroum*
- 11'. Perithecia obovoid to tubular, 0.3–0.6 \times 0.15–0.25 mm *H. griseobrunneum*

Hypoxylon vinaceobrunneum K.S. Cruz & Cortez **sp. nov.**

Figs. 1a–e, 7a

MycoBank No.: MB 812593

Surface effused-pulvinate, brown vinaceous; without apparent KOH-extractable pigments or with dilute grayish sepia. Ostioles slightly papillate. Ascospores light brown to brown, 7–10 \times 3–3.5 μm , with slightly germ slit shorter than the spore-length.

Type: BRAZIL. PARANÁ: Palotina, PESC, 02-VII-2013, K.S. Cruz 8 (UPCB 81660 – holotype; HCP 626 – isotype).

Stromata effused-pulvinate, 6–16 mm long \times 4–12 mm broad \times 0.8 mm thick; surface brown vinaceous (84), becoming black; blackish granules between perithecia, without apparent KOH-extractable pigments or grayish sepia (106); tissue below the perithecial layer inconspicuous. Perithecia obovoid to tubular, 0.3–0.55 \times 0.2–0.3 mm. Ostioles slightly papillate. Asci partially collapsed, spore-bearing part 50–61 \times 5.5–8 μm , stipe collapsed, with apical ring amyloid, discoid, 1–1.5 \times 2 μm . Ascospores light brown to brown, ellipsoid-inequilateral, with narrowly rounded ends, 7–10 \times 3–3.5 μm , with a germ slit less than spore-length; perispore indehiscent or rarely dehiscent in KOH; epispore smooth; surface transversely striated under SEM.

Habitat and distribution: on decaying wood. Known from type locality.

Etymology: In reference to its brownish-vinaceous colored stromatal surface.

Notes: *Hypoxylon vinaceobrunneum* is proposed as new species because it differs from other *Hypoxylon* species in the brown vinaceous color of the stroma, ostioles slightly papillate and by spreading a greyish sepia pigment or none. The combination of colorless pigments and papillate ostioles is very uncommon in *Hypoxylon* (Ju and Rogers 1996).

The new species can be compared to *H. monticulosum* and *H. submonticulosum* Y.M. Ju & J.D. Rogers, however both taxa have ascospores with a sigmoid germ slit spore-length. On the other hand, *H.*

rubigineoareolatum differs in the larger size of perithecia ($0.4\text{--}0.7 \times 0.3\text{--}0.4$ mm) and ascospores ($10.5\text{--}15.5 \times 4.5\text{--}6$ μm – Ju and Rogers 1996). Our material was collected on decaying wood.

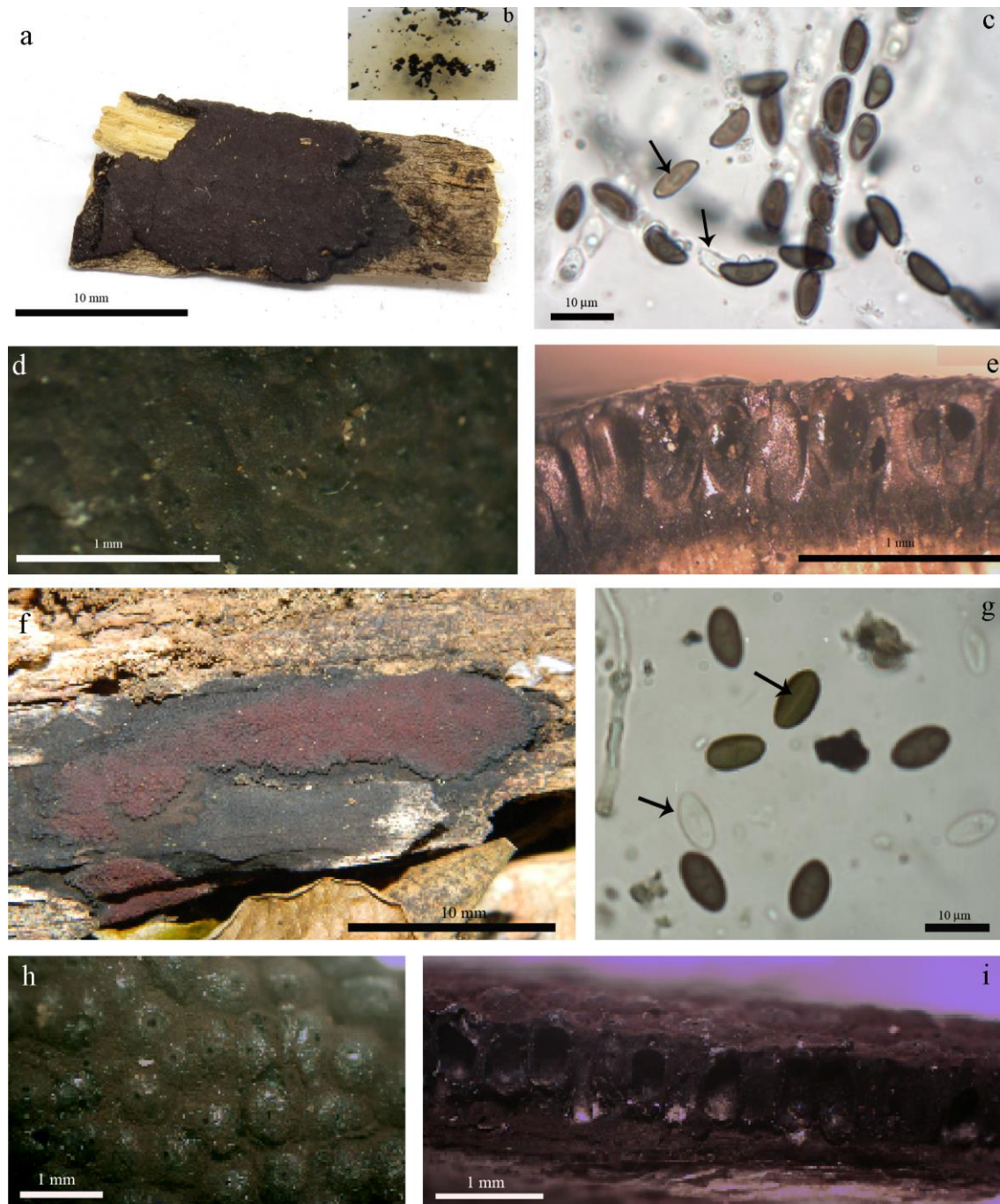


Fig. 1 *Hypoxylon vinaceobrunneum* a: stroma. b: stromatal pigment. c: ascospores. d: top view of stroma. e: section of perithecia. *Hypoxylon anthochroum*. f: stroma. g: ascospores. h: top view of stroma. i: section of perithecia.

Hypoxylon anthochroum Berk. & Broome, Bot. J. Linn. Soc. 14: 122. 1873.

Figs. 1f–i, 7b

Stromata effused-pulvinate, 9–20 mm long \times 4–10 mm broad \times 0.8–1 mm thick; surface dark purple (36) or brown vinaceous (84), becoming black; blackish granules beneath surface and between perithecia, with gray olivaceous (127) KOH-extractable pigments; tissue below the perithecial layer

inconspicuous. Perithecia spherical to obovoid, $0.3\text{--}0.5 \times 0.2\text{--}0.4$ mm diam. Ostioles umbilicate. Asci collapsed, paraphyses numerous, with apical ring amyloid, discoid, $0.9\text{--}1 \times 1.8\text{--}2.3$ μm . Ascospores brown, ellipsoid-inequilateral, with narrowly rounded ends, $8.5\text{--}12.5 \times 4.5\text{--}6$ μm , with a straight germ slit spore-length; perispore dehiscent in KOH; episporium smooth; surface smooth under SEM.

Habitat and distribution: on decaying wood. Known from North to South America, and Asia (Ju and Rogers 1996; Vasilyeva et al. 2012).

Specimens examined: BRAZIL. PARANÁ: Palotina, PESC, 10-IX-2013, *K.S. Cruz 220* (HCP 598).

Notes: The material from PESC presents a dark vinaceous surface similar to *H. fuscopurpureum* (Fr.) M.A. Curtis, but differs in the pyriform shape and size of the ascospores ($11\text{--}16 \times 5.5\text{--}7$ μm) and the indehiscent perispore (Ju and Rogers 1996). Stadler et al. (2008) discussed that *H. anthochroum* is a species complex with wide distribution in warmer climates. This species is known from the State of Mato Grosso in Brazil (Pereira 2015) and is a new record from Southern Brazil.

Hypoxyylon griseobrunneum (B.S. Mehrotra) J. Fourn., Kuhnert & M. Stadler, Fungal Div. 64: 194. 2014.

Figs. 2a–d, 7c

Stromata effused-pulvinate, 20–25 mm long \times 6–10 mm broad \times 0.5–0.8 mm thick, surface dark brown (82); yellow granules beneath surface and between perithecia, with isabelline (65) or fawn (87) KOH-extractable pigments; tissue below the perithecial layer inconspicuous. Perithecia tubular, rarely obovoid, $0.3\text{--}0.6 \times 0.15\text{--}0.25$ mm. Ostioles umbilicate. Asci 128–166 \times 8–10 μm , spore-bearing part 62–73 μm , stipe 48–101 μm , with apical ring amyloid, discoid, $0.9\text{--}1.2 \times 1\text{--}2.4$ μm . Ascospores brown to dark brown, ellipsoid-inequilateral, with narrowly rounded ends, $8\text{--}11.5 \times 3.5\text{--}5.5$ μm , with a straight germ slit spore-length; perispore dehiscent in KOH; episporium smooth; surface transversely striated under SEM.

Habitat and distribution: on decaying wood. Known from Central, North and South America and India (Kuhnert et al. 2014).

Specimen examined: BRAZIL. PARANÁ: Palotina, PESC, 16-V-2013, *K. S. Cruz 001* (HCP 627).

Notes: *Hypoxyylon griseobrunneum* is characterized by the yellow granules beneath the surface and pigments isabelline (65) or fawn (87), perispore dehiscent and transversely striate in KOH (Kuhnert et al. 2014). The material from Paraná matches in all aspects those described by Kuhnert et al (2014) for *H. griseobrunneum*, except for a few perithecia appeared to be obovoid, although they were mostly tubular in shape, as described in the protologue of that species.

Hypoxyylon anthochroum and *H. duranii* J.D. Rogers are morphologically similar but these species have dull reddish brown to black granules in the stromata surface and sigmoid germ slit (Ju and Rogers 1996). Also, *H. subrutulum* Starbäck shares some similarities, however the ascospores are much larger ($13\text{--}23 \times 6.5\text{--}10$ μm , Ju and Rogers 1996). Chemical studies also provided evidences of the separation of all these taxa from *H. griseobrunneum* (Kuhnert et al. 2014). This species had been reported associated to dead wood and barks in Neotropical forests (Kuhnert et al. 2014) and the studied material is the first record from Brazil.

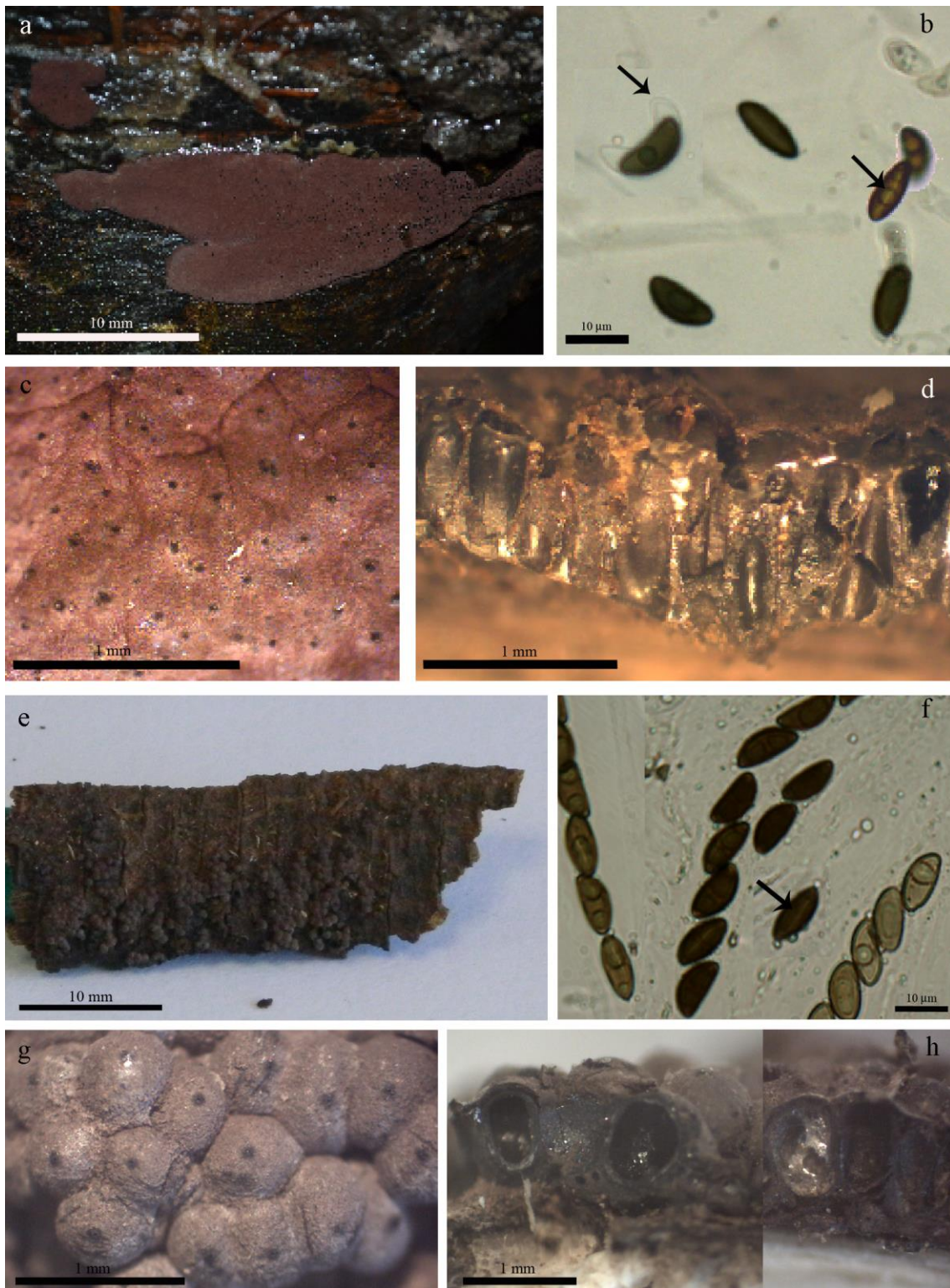


Fig. 2 *Hypoxylon griseobrunneum*. a: stroma. b: ascospores. c: top view of stroma. d: section of perithecia. *Hypoxylon lenormandii* e: stroma. f: ascospores. g: top view of stroma. h: section of perithecia.

Hypoxylon lenormandii Berk. & M. A. Curtis, Bot. J. Linn. Soc. 10: 385. 1869 emend. Sir & Kuhnert, Fungal Divers. 71: 175. 2015.

Figs. 2e–h, 7d

Stromata glomerate (almost rosellinoid) to effused-pulvinate, 7–15 mm long \times 2–4 mm broad \times 0.8 mm thick; with very conspicuous perithecial mounds; surface grayish sepia (106); dark brown granules beneath surface and between perithecia; with ochreous (44) or sienna (8) KOH-extractable pigments; tissue below the perithecial layer inconspicuous. Perithecia spherical, 4–7 mm diam. Ostioles slightly umbilicate. Asci 114–145 \times 6–9 μm , spore-bearing part 68.5–88.5 μm , stipe 41–70 μm , with apical ring amyloid, discoid, 0.7–1 \times 2 μm . Ascospores brown to dark brown, ellipsoid-inequilateral, with narrowly rounded ends, 10–14 \times 5–6 μm , with a slightly sigmoid germ slit spore-length; perispore dehiscent in KOH; episore smooth; surface transversely striated under SEM.

Habitat and distribution: on decaying wood. Known in Central and South America and Asia (Ju and Rogers 1996).

Specimens examined: BRAZIL. PARANÁ: Palotina, PESC, 25-II-2014, K.S. Cruz 206, 203b (HCP 599, 600).

Notes: *Hypoxylon lenormandii* has a glomerate to effused-pulvinate and almost rosellinoid stromata, a feature that may confused several mycologists, who identified it as a member of *Rosellinia* (Fr.) De Not. (Ju and Rogers 1996). However, *Rosellinia* species grows on or surrounded by a persistent subiculum, and does not release any pigments in KOH preparations (Sir et al. 2012). Kuhnert (2015) examined the type material of *H. lenormandii* and found Blood Colour (3) and Dark Vinaceous (84) stromatic pigments under KOH, and not only sphaerical but also obovoid perithecia. Our materials from PESC are identified in the sense of Ju and Rogers (1996), and were collected in the same decomposing trunk as *H. rubiginosoareolatum*, but the stromatic features and pigments clearly differs both taxa. The species is known from the Atlantic Forest of Bahia (Northeastern) and Rio Grande Sul (Southern) in Brazil (Pereira 2015) and this is a new record from the State of Paraná.

Hypoxylon monticulosum Mont., Ann. Sci. Nat., Bot. 3: 120. 1855.

Figs. 3a–d, 7e

Stromata effused-pulvinate, 5–17 mm long \times 4–6 mm broad \times 0.8 mm thick; surface vinaceous brown (84); blackish granules between perithecial; without apparent KOH-extractable pigments; tissue below the perithecial layer, 0.2–0.4 mm thick. Perithecia spherical to obovoid, 5–8 \times 2–5 mm. Ostioles slightly papillate. Asci 120–162 \times 7–9 μm , spore-bearing part 85–108 μm , stipe 33–60 μm ; with apical ring amyloid, discoid, 0.5–0.8 \times 1.5–2 μm . Ascospores brown to dark brown, ellipsoid-inequilateral, with narrowly rounded ends, 9–11 \times 3.5–4.5 μm , with a sigmoid germ slit spore-length; perispore dehiscent in KOH; episore smooth; surface slightly transversely striated under SEM.

Habitat and distribution: on decaying wood. Known in North and South America, Africa and Asia (Ju and Rogers 1996).

Specimens examined: BRAZIL. PARANÁ: Palotina, PESC, 13-VI-2013, K. S. Cruz 95, 96 and 99 (HCP 601, 602, 603); 02-VII-2013, K. S. Cruz 128 (HCP 604); 10-IX-2013, K. S. Cruz 141 and 142 (HCP 605, 606), 05-XI-2013, K. S. Cruz 157 and 221 (HCP 607, 608), 05-III-2014, K. S. Cruz 217 (HCP 609).

Notes: *Hypoxylon monticulosum* is one of the few species in the genus with ostioles papillate and which not release stromatic pigments in KOH (Ju and Rogers 1996). Such features suggest a member of *Nemania* S.F. Gray, a genus diagnosed by the ascospores with perispore indehiscent (Ju and Rogers

2002). *Hypoxylon rubigineoareolatum* Rehm looks like, but those species it has larger ascospores ($10.5\text{--}15.5 \times 4.5\text{--}6 \mu\text{m}$) and straight germ slit (Ju and Rogers 1996). *Hypoxylon monticulosum* was reported only from the State of Rio Grande do Sul in Brazil (Pereira 2015) and the present record is the first from Paraná.

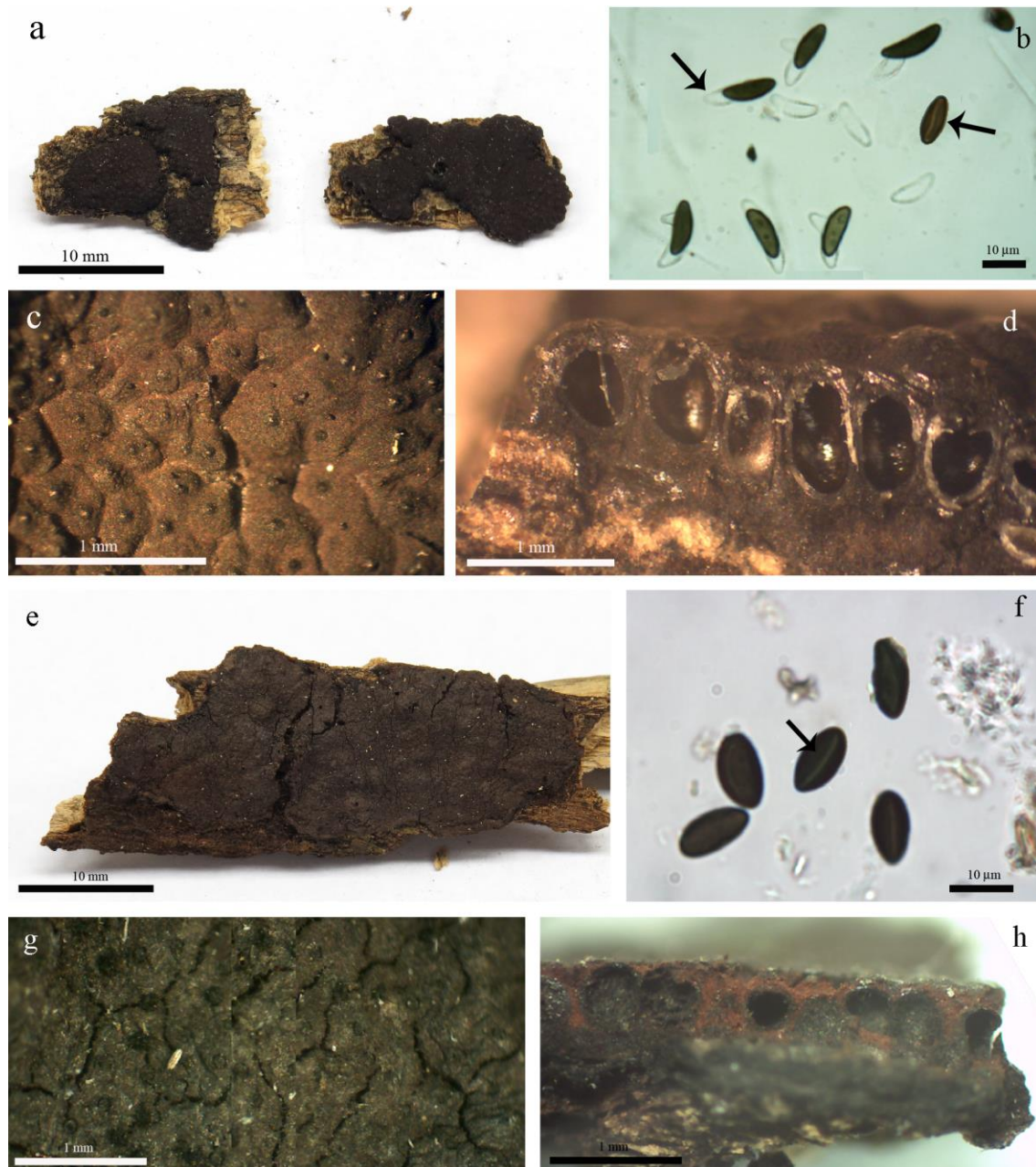


Fig. 3 *Hypoxylon monticulosum* a: stroma. b: ascospores. c: top view of stroma. d: section of perithecia. *Hypoxylon peleae*. e: stroma. f: ascospores. g: top view of stroma. h: section of perithecia.

Hypoxylon peleae J.D. Rogers & Y.M. Ju, Sydowia 59: 269. 2007.

Figs. 3e–h, 7f

Stromata effused-pulvinate, 35 mm long \times 15 mm broad \times 0.5–0.8 mm thick; surface sepia (63); reddish brown granules beneath surface and between perithecial; with orange (7) KOH-extractable pigments; blackish tissue below the perithecial layer, 0.3 mm thick. Perithecia spherical, 0.2–0.4 mm

diam. Ostioles slightly umbilicate or inconspicuous, surrounded by disc or beneath perforated domes. Asci collapsed. Ascospores dark brown, ellipsoid or slightly inequilateral, with narrowly rounded ends, $10\text{--}12 \times 5\text{--}7 \mu\text{m}$, with a straight germ slit spore-length; perispore indehiscent in KOH; episporium smooth; surface smooth with germination pore under SEM.

Habitat and distribution: on decaying wood. Hawaii (Rogers et al. 2007) and Brazil.

Specimens examined: BRAZIL. PARANÁ: Palotina, PESC, 02-VII-2013, *K.S. Cruz 214* (HCP 610).

Notes: *Hypoxylon peleae* was recently described from Hawaii, and is one of the most singular species in the genus, due to the presence of a disc surrounding the ostioles (Rogers et al. 2007).

As discussed by Rogers et al. (2007), *Hypoxylon peleae* shows similar features to *Annulohypoxylon*, but differs by having papillate ostioles and regular disks.

Hypoxylon cinnabarinum (Henn.) Y.M. Ju & J.D. Rogers has similar ascospores in shape and color, but has no stromatic disc (Ju and Rogers 1996). *Hypoxylon peleae* is a new record from South America.

Hypoxylon cf. pilgerianum Henn., Hedwigia 39: 138. 1900.

Figs. 4a–d, 7g

Stromata effused-pulvinate to plane, 10–16 mm long \times 6–11 mm broad, with inconspicuous perithecial elevations; surface brown vinaceous (84), umber (9) to bay (6); orange brown or reddish brown granules beneath surface and between perithecia; with ochreous (44) KOH-extractable pigments; tissue below the perithecial layer inconspicuous. Perithecia spherical, 0.1–0.2 mm diam. Ostioles umbilicate. Asci $67\text{--}100 \times 5\text{--}10 \mu\text{m}$, spore-bearing part $61\text{--}72 \mu\text{m}$, stipe $24.5\text{--}34 \mu\text{m}$, with apical ring amyloid, discoid, $1\text{--}1.4 \times 2\text{--}3 \mu\text{m}$. Ascospores brown to dark brown, ellipsoid-inequilateral, with narrowly rounded ends, $8\text{--}12 \times 4\text{--}6 \mu\text{m}$, with a sigmoid germ spore-length; perispore dehiscent in KOH; episporium smooth; surface transversely striated under SEM.

Habitat and distribution: on live twig. Known Central and South America, Africa, Asia and Papua New Guinea (Ju and Rogers 1996).

Specimens examined: BRAZIL. PARANÁ: Palotina, PESC, 13-VI-2013, *K.S. Cruz 103* (HCP 611).

Notes: Our specimen from Paraná differ from *H. pilgerianum* due to the presence of a sigmoid germ slit, in contrast to straight germ slit, which is reported for that species (Ju and Rogers 1996). All other morphological features, considered diagnostic for *H. pilgerianum*, were observed in the material, and includes small (0.1–0.2 mm) and spherical perithecia with ochraceous stromatal pigment. *Hypoxylon pilgerianum* looks like *H. subgilvum*, but the latter possesses larger ($0.2\text{--}0.7 \times 0.1\text{--}0.3 \text{ mm}$), obovoid to tubular perithecia (Ju and Rogers 1996). It is also reported to occur on bamboos (Ju and Rogers 1996) and our material was growing on twigs of a living angiosperm tree (Ju and Rogers 1996).

Hypoxylon rickii Y.M. Ju & J.D. Rogers, Mycol. Mem. 20: 174. 1996.

Figs. 4e–h, 7h

Stromata effused-pulvinate or plane, 8–45 mm long \times 8–25 mm broad \times 0.8–1 mm thick; surface rust (39) or sienna (8); with orange red granules beneath surface and between perithecia; orange (7)

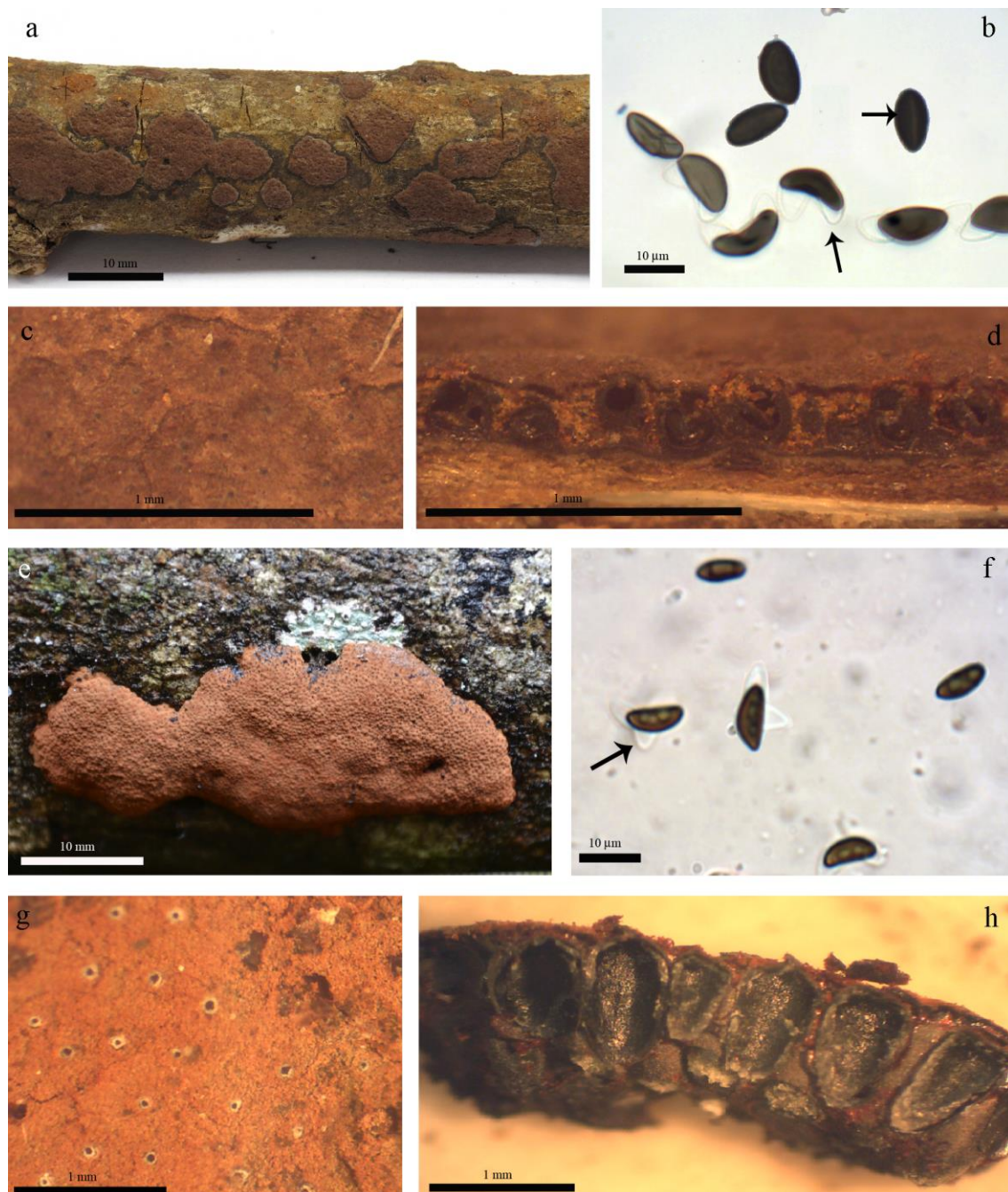


Fig. 4 *Hypoxylon* cf. *pilgerianum*. a: stroma. b: ascospores. c: top view of stroma. d: section of perithecia. *Hypoxylon rickii* e: stroma. f: ascospores. g: top view of stroma. h: section of perithecia.

KOH-extractable pigments; blackish tissue below the perithecial layer, 0.3–0.5 mm thick. Perithecia obovoid to tubular, 0.5–0.8 × 0.2–0.5 mm. Ostioles umbilicate, surrounded by a white tissue. Asci 72–117 × 5–7.5 µm, spore-bearing part 42.5–55 µm, stipe 36.5–63 µm, with apical ring amyloid, discoid, 0.3–0.5 × 1 µm. Ascospores light brown to brown, ellipsoid-inequilateral, with narrowly rounded ends, 5.5–8.5 × 3–4 µm, with a slightly sigmoid germ slit spore-length; perispore dehiscent in KOH; episore smooth; surface transversely striated under SEM.

Habitat and distribution: on fallen rotting twigs and living trees. Known from North and South America (Ju and Rogers 1996; Kuhnert et al. 2014).

Specimens examined: BRAZIL. PARANÁ: Palotina, PESC, 16-V-2013, *K.S. Cruz 004* (HCP 612); 02-VII-2013, *K.S. Cruz 114* (HCP 613); 10-IX-2013, *K.S. Cruz 145* (HCP 614); 25-II-2014, *K.S. Cruz 207* (HCP 615).

Notes: *Hypoxylon rickii* presents small ascospores ($5.5\text{--}8.5 \times 3\text{--}4 \mu\text{m}$), red to orange red pigments and granules, and tubular perithecia (Ju and Rogers 1996). *Hypoxylon erythrostroma* J.H. Miller is morphologically close, but differs in the fusoid to ellipsoid ascospores (Ju and Rogers 1996). The species was previously reported only from Rio Grande do Sul State (Southern Brazil), and this is a new record from Paraná.

Hypoxylon rubigineoareolatum Rehm, Ann. Mycol. 6: 345. 1908.

Figs. 5a–d, 7 i

Stromata effused-pulvinate, 8–50 mm long \times 5–14 mm broad \times 0.5–0.8 mm thick; surface fuscous black (104); blackish granules beneath surface and between perithecia; without apparent KOH-extractable pigments; tissue below the perithecial layer inconspicuous. Perithecia obovoid, $0.4\text{--}0.7 \times 0.3\text{--}0.4$ mm. Ostioles slightly papillate. Asci 90–130 \times 6–8 μm , spore-bearing part 64–80 μm , stipe 30–50 μm , with apical ring amyloid, discoid, $0.9\text{--}1.2 \times 2\text{--}2.5 \mu\text{m}$. Ascospores brown to dark brown, ellipsoid-inequilateral, with narrowly rounded ends, $10.5\text{--}15.5 \times 4.5\text{--}6 \mu\text{m}$, with a straight germ slit spore-length; perispore dehiscent in KOH; epispore smooth; surface transversely striated under SEM.

Habitat and distribution: on rotting trunk. Known only Brazil and Mexico (Ju and Rogers 1996; San Martin and Rogers 1999).

Specimens examined: BRAZIL. PARANÁ: Palotina, PESC, V-XI-2013, *K. S. Cruz 167* (HCP 616); 20-I-2014, *K. S. Cruz 199 e 201* (HCP 617, 618); 25-II-2014, *K. S. Cruz 203a* (HCP 619).

Notes: *Hypoxylon rubigineoareolatum* does not release stromatic pigment in KOH preparations, has a straight germ slit, and broad ascospores (Ju and Rogers 1996). This species is similar to *H. monticulosum*, which also does not release stromatic pigments in KOH but presents smaller ascospores and sigmoid germ slit (Ju and Rogers 1996). Previously known only from the State of Rio Grande do Sul (type locality), its distribution is expanded to Paraná State.

Hypoxylon rubiginosum (Pers.) Fr., Summa Veg. Scand. 2: 384. 1849.

Figs. 5e–h, 7j

Stromata effused-pulvinate or plane, 11–25 mm long \times 5–15 mm broad 0.5–0.8 mm thick; with inconspicuous perithecial elevations; surface brown vinaceous (84) or dark brick (63); reddish granules beneath surface and between perithecia; with orange (7) KOH-extractable pigments; blackish tissue below the perithecial layer, 0.3 mm thick. Perithecia spherical to obovoid, $0.3\text{--}0.5 \times 0.15\text{--}0.3$ mm. Ostioles umbilicate. Asci 91–186.5 \times 7–11 μm , spore-bearing part 63–108 μm , stipe 19–84 μm , with apical ring amyloid, discoid, $0.8\text{--}2 \times 2\text{--}3 \mu\text{m}$. Ascospores brown to dark brown, ellipsoid-inequilateral, with narrowly rounded ends, $9\text{--}13.5 \times 4\text{--}6 \mu\text{m}$, with a straight germ slit spore-length; perispore dehiscent in KOH; epispore smooth; surface transversely striated under SEM.

Habitat and distribution: on rotting trunk. Known from North and South America and Europe (Ju and Rogers 1996; Stadler and Wollweber 2004).

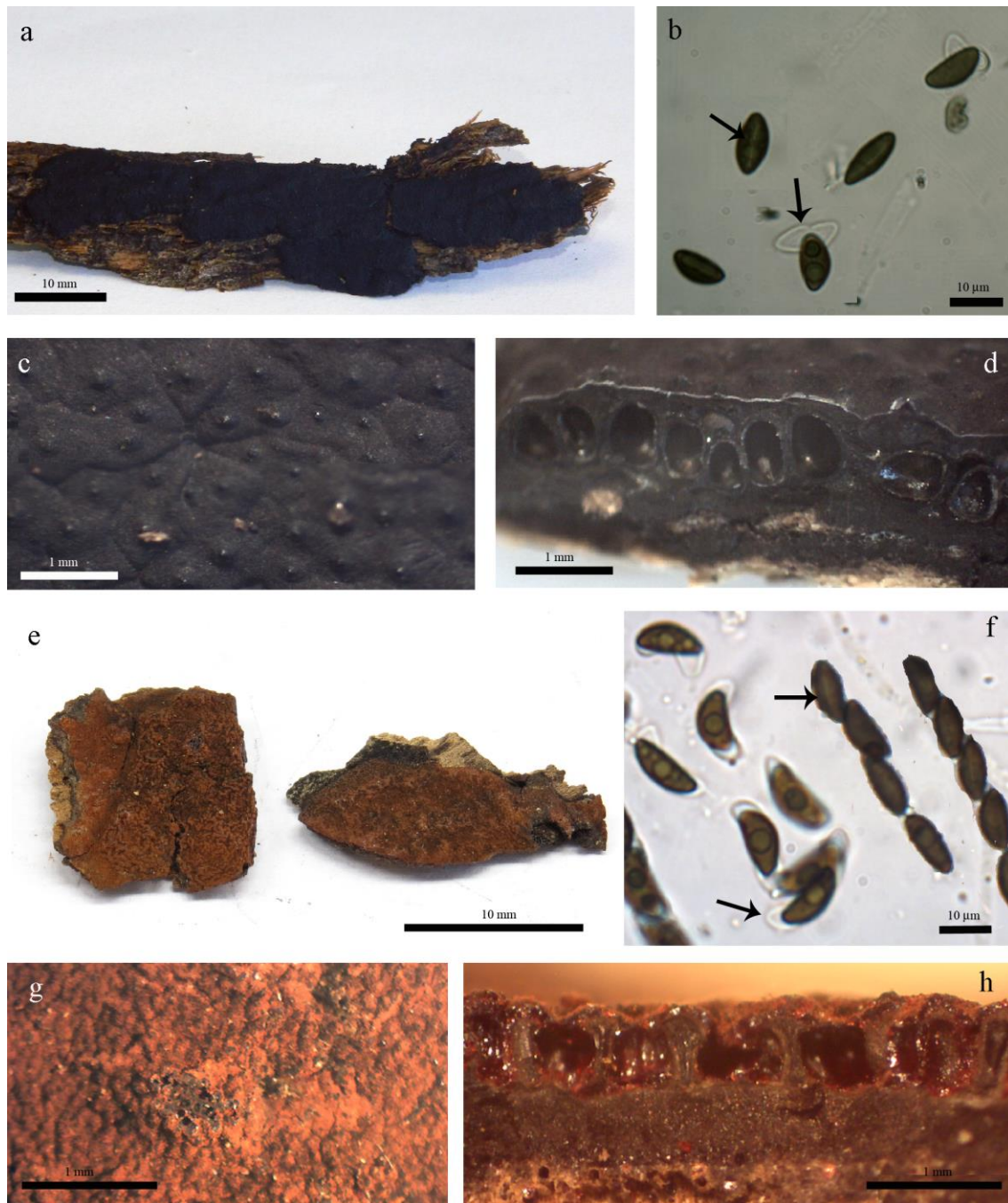


Fig. 5 *Hypoxylon rubigineoaoareolatum* a: stroma. b: ascospores. c: top view of stroma. d: section of perithecia. *Hypoxylon rubiginosum*. e: stroma. f: ascospores. g: top view of stroma. h: section of perithecia.

Specimens examined: BRAZIL. PARANÁ: Palotina, PESC, 13-VI-2013, K.S. Cruz 101 (HCP 620); 20-I-2014, K.S. Cruz 200 (HCP 621); 25-II-2014, K.S. Cruz 219 (HCP 622).

Notes: *Hypoxylon rubiginosum* is diagnosed by the brown vinaceous (84) to dark brick (63) stromatic surface, with yellowish brown granules (Ju and Rogers 1996). Samples from Western Paraná presented orange red granules, but the remaining features are according to descriptions of the species. *H. petrinae* M. Stadler & J. Fournier has close morphological characteristics, but differs in the anamorphic structure and the type of secondary metabolites (Stadler and Wollweber 2004).

Hypoxylon subgilvum Berk. & Broome, Bot. J. Linn. Soc. 14: 120. 1873.

Figs. 6a–d, 7k

Stromata effused-pulvinate or plane, 35 mm long \times 11 mm broad \times 0.5–1 mm thick; surface dark brick (60), umber (9) or bay (6); orange red granules beneath surface and between perithecia; with orange (7) KOH-extractable pigments; tissue below the perithecial layer black or inconspicuous, 0.3 mm thick. Perithecia obovoid to tubular, 0.4–0.6 \times 0.3–0.4 mm. Ostioles umbilicate. Asci 96–127 \times 7–10 μm , spore-bearing part 71–88 μm , stipe 24–48 μm , with apical ring amyloid, discoid, 0.8–1.2 \times 2–2.3 μm . Ascospores brown to dark brown, ellipsoid-inequilateral, with narrowly rounded ends, 8–13 \times 4–5 μm , with a slightly germ slit spore-length; perispore dehiscent in KOH; epispore smooth; surface transversely striated under SEM.

Habitat and distribution: on rotting trunk. Known from North and South America and Asia and Africa (Ju and Rogers 1996; Vasilyeva et al. 2007).

Specimens examined: BRAZIL. PARANÁ: Palotina, PESC, 02-VII-2013, K. S. Cruz 135 (HCP 623); 25-II-2014, K.S. Cruz 204 (HCP 624).

Notes: *Hypoxylon subgilvum* differs from *H. jecorinum* Berk. & Ravenel and *H. erythrostroma* J.H. Mill. by having ascospores measuring 6–9.5 μm long (Ju and Rogers 1996). In Brazil, it was reported from Bahia and Rio Grande do Sul States, so it represents a new record to Paraná.

Hypoxylon subrutilum Starb., Bih. Kongl. Sv. Vet.-Akad. Handl. 27: 10. 1901.

Figs. 6e–h, 7l

Stromata effused-pulvinate, 9 mm long \times 6 mm broad, with inconspicuous perithecial elevations; surface sepia (63) or chestnut (40), brown granules beneath surface and between perithecia; tissue below the perithecial layer inconspicuous, with isabelline (65) or olivaceous (48) KOH-extractable pigments. Perithecia spherical, 0.2–0.5 mm diam. Ostioles umbilicate. Asci collapsed. Ascospores brown to dark brown, ellipsoid-inequilateral, with narrowly rounded ends, 13–19 (–21.5) \times 7–9 μm , with a slightly germ slit almost spore-length; perispore dehiscent in KOH; epispore smooth; surface transversely striated under SEM.

Habitat and distribution: on rotting twig. Known from South America, Africa and Europa (Ju and Rogers 1996; Stadler et al. 2008).

Specimens examined: BRAZIL. PARANÁ: Palotina, PESC, 16-V-2013, K.S. Cruz 18 (HCP 625).

Notes: *Hypoxylon subrutilum* has large ascospores (13–19 \times 7–9 μm) and green stromatic pigments in KOH (Ju and Rogers 1996). Stadler et al. (2008) observed that stromatic pigments ranged from olivaceous, isabelline or honey to luteous or orange in the holotype. Stadler et al. (2008) realized that such variation in the colors were due to the quality of the preserved material. Only known from Rio Grande do Sul in Brazil, it is a new record from the State of Paraná.



Fig. 6 *Hypoxylon subgilvum*. a: stroma. b: ascospores. c: top view of stroma. d: section of perithecia. *Hypoxylon subrutilum* e: stroma. f: ascospores. g: top view of stroma. h: section of perithecia.

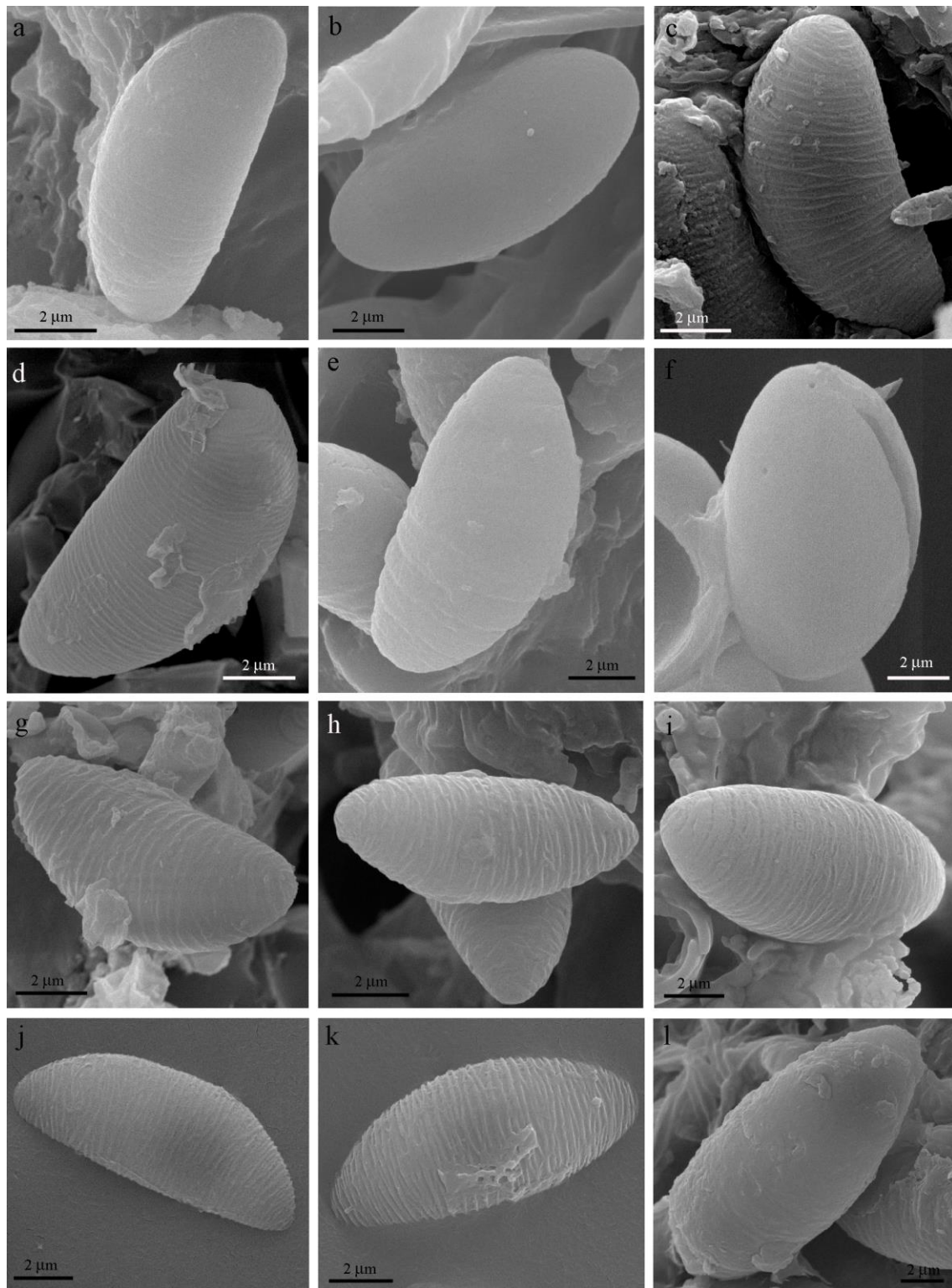


Fig. 7 SEM of the *Hypoxylon* ascospores. a: *H. vinaceobrunneum*. b: *H. anthochroum*. c: *H. griseobrunneum*. d: *H. lenormandii*. e: *H. monticulosum*. f: *H. peleae*. g: *H. cf. pilgerianum*. h: *H. rickii*. i: *H. rubigineaoareolatum*. j: *H. rubiginosum*. k: *H. subgilvum*. l: *H. subrutilum*.

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We thank the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for student fellowship to KSC, the Conselho Nacional de Desenvolvimento Científico e Tecnológico (Proc. 478373/2010-4) for financial support, and the Centro de Microscopia Eletrônica (CME) of Universidade Federal do Paraná (UFPR) for providing the SEM images.

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CAPÍTULO 4: Artigo será submetido à revista *Mycotaxon* (USA)

MYCOTAXON

[#](http://dx.doi.org/10.5248/12#.)

MYCOTAXON style 2014

January 15, 2014

***Annulohypoxyton* (Xylariales) from Western Paraná, Brazil**

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ABSTRACT — Four species of *Annulohypoxyton* are reported from Western Paraná State, Southern Brazil: *A. macrodiscum*, *A. nitens*, *A. parvodiscum* and *A. stygium*. *Annulohypoxyton parvodiscum* is proposed as new, based on small ostiolar disc of *bovei*-type, olivaceous grey pigment and ellipsoid ascospores (9–13 × 3–5 µm). A key for identification of studied taxa is provided.

KEY WORDS — *Ascomycota*, *Hypoxyloideae*, mycobiota, taxonomy, *Xylariaceae*.

Introduction

Annulohypoxyton Y.M. Ju et al. was segregated from *Hypoxyton* Bull., based on morphological, chemotaxonomic and molecular data (Hsieh et al. 2005, Fournier et al. 2010). It covers taxa previously placed in *Hypoxyton* sect. *Annulata*, diagnosed by the presence of carbonaceous stromatic layer surrounding perithecia, projecting ostioles above the stromatic surface, with a conspicuous to inconspicuous annulate disc, and ascospores with dehiscent perispores (Ju & Rogers 1996). The genus comprises about 40 species, of which sixteen are known from Brazil (Pereira 2015), most of them reported from the states of Bahia (Northeastern) and Rio Grande do Sul (Southern). From Paraná State, only *A. stygium* (Lév.) Y.M. Ju et al. had been reported (Meijer 2010).

In order to improve the knowledge on the diversity and geographical distribution of the *Xylariaceae* from Western Paraná State, Southern Brazil, a survey was undertaken and in the present paper we present the results dealing with the members of the genus *Annulohypoxyton*.

Materials & methods

Specimens were collected from 2013 to 2014 in São Camilo State Park (abbreviated onwards as PESC), municipality of Palotina, western Paraná State, Southern Brazil (24°18'00"–24°19'30" S, 53°53'30"–53°55'30" W), which comprises a relict of Seasonal Semideciduous Forest (Atlantic Forest

Domain – IAP 2006). Morphology was examined according to Ju & Rogers (1996) and colors were based on Rayner (1970). Microscopic features were examined in 10% KOH, and measured based on distilled water preparations; asci were mounted in Cotton Blue, except for the apical ring, examined on Melzer's reagent. Ascospores were analyzed under scanning electron microscope (SEM) Jeol JSM-6360LV, at the Center of Electron Microscopy (CME) of the Paraná University, following Suwannasai et al. (2012). All specimens are preserved at the Herbarium of Palotina Campus (HCP) and holotype at the Herbarium of the National Botanic Department of the Paraná University (UPCB).

Annulohyoxylon macrodiscum Jad. Pereira, J.D. Rogers & J.L. Bezerra, *Mycologia* 102: 250, 2010. PLATE 1A–D, 3A

STROMATA pulvinate to effused-pulvinate, 3–25 mm long \times 5–14 mm broad \times 0.5–1.5 mm thick; surface fuscous black (104) with brown vinaceous tone; blackish granules beneath surface and among perithecia, with KOH-diluted pigments, greenish olivaceous (90) or dull green (70); tissue below the perithecial layer, 0.3–0.5 mm thick. PERITHECIA spherical to obovoid, 0.6–1 \times 0.5–1 mm, with perithecial mounds $\frac{1}{4}$ to $\frac{1}{2}$ exposed. OSTIOLES conical-papillate, surrounded by a *truncatum*-type disc, 0.4–0.8 mm diam. ASCI cylindrical, 114–121 \times 5–7 μ m; spore-bearing part 65–80 μ m, stipe 40–50 μ m; apical ring amyloid, inconspicuous, discoid, 0.5 \times 1–1.3 μ m. ASCOSPORES brown to dark brown, ellipsoid-inequilateral, with narrowly rounded ends, 7–12 \times 3.5–5 μ m, with straight germ slit spore-length on the convex side; perispore dehiscent in KOH; episore smooth; surface smooth under SEM.

SPECIMENS EXAMINED: BRAZIL. Paraná State: Palotina, PES, 13 Jun 2013, leg. *K.S. Cruz* 104 (HCP 582), 105 (HCP 583); 13 Dec 2013, leg. *K.S. Cruz* 179 (HCP 584), 180 (HCP 585).

HABITAT AND DISTRIBUTION: On rotting wood, in the board of forest trail. Only known from Brazilian Atlantic Forest, State of Bahia (Pereira et al. 2010a) and now recorded from Paraná.

NOTES: *Annulohyoxylon macrodiscum* is diagnosed by the wide ostiolar disc and spherical to obovoid perithecia (Pereira et al. 2010). Morphologically, *A. macrodiscum* is similar to *A. truncatum* (Fr.) Y.M. Ju, J.D. Rogers & H.M. Hsieh, but as discussed by Pereira et al. (2010), both species differ in the size of ostiolar disc and perithecia. In *A. truncatum* the ostiolar disc is 0.2–0.4 mm and perithecia are smaller (0.4–0.8 mm) and spherical (Ju & Rogers 1996). This species, described from Northeastern Brazil (Pereira et al. 2010) is now reported from Southern region of Brazil, but probably it is widespread throughout the Atlantic Forest biome.

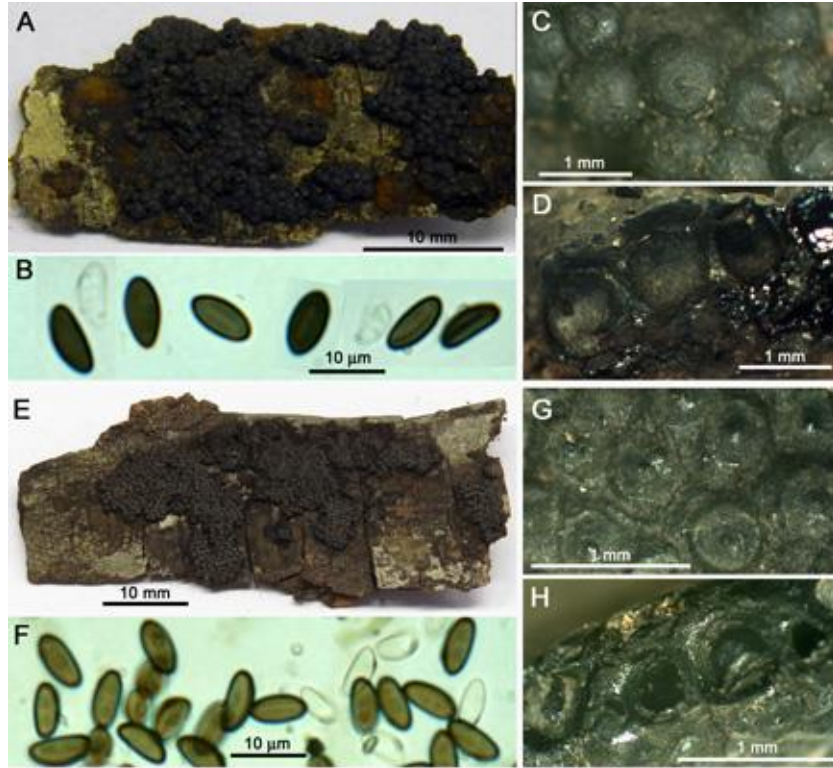


PLATE 1. A-D: *Annulohypoxyylon macrodiscum*. A: stroma. B: ascospores. C: top view of stroma. D: section of perithecia. E-H: *Annulohypoxyylon nitens*. E: stroma. F: ascospores. G: top view of stroma. H: section of perithecia.

Annulohypoxyylon nitens (Ces.) Y.M. Ju, J.D. Rogers & H.M. Hsieh,
Mycologia 97: 861, 2005. PLATE 1E-H, 3B

STROMATA glomerate to effused-pulvinate, 18–35 mm long × 5–12 mm broad × 0.5–1 mm thick, with perithecial mounds ¼ to ½ exposed; surface dark brown vinaceous (84) to fuscous black (104), with a white tissue covering the ostiolar disc; blackish granules beneath surface and among perithecia, with KOH-diluted pigments greenish olivaceous (90) or dull green (70); black tissue below the perithecia inconspicuous, 0.2 mm thick. PERITHECIA spherical, 0.6–1 mm diam. OSTIOLES conical-papillate, encircled with a flattened *bovei*-type disc 0.3–0.5 mm diam. ASCI 80–140 × 4–6 μm, spore-bearing parts 60–80 μm, stipe 21.5–59 μm, with apical ring amyloid, discoid, 0.5 × 1–1.5 μm. ASCOSPORES light brown to brown, ellipsoid-inequilateral, with narrowly rounded ends, 6.5–9 × 3–5 μm, with straight

germ slit spore-length on the convex side; perispore dehiscent in KOH, smooth; episore smooth; surface smooth under SEM.

SPECIMENS EXAMINED: BRAZIL. Paraná State: Palotina, PESC, 13 Jun 2013, leg. *K.S. Cruz 100* (HCP 586); 10 Sep 2013, leg. *K.S. Cruz 139* (HCP 587); 07 Oct 2013, leg. *K.S. Cruz 173* (HCP 588); 18 Oct 2013, leg. *K.S. Cruz 184* (HCP 589), 186 (HCP 590); 5 Nov 2013, leg. *K.S. Cruz 169* (HCP 591); 20 Jan 2014, leg. *K.S. Cruz 196* (HCP 592), 198 (HCP 593); 25 Mar 2014, leg. *K.S. Cruz 218* (HCP 594).

HABITAT AND DISTRIBUTION: On rotting wood, in the forest board. Known from the Americas and Asia (Ju & Rogers 1996, Pereira et al. 2015).

NOTES: According to Ju & Rogers (1996), *A. nitens* presents spherical perithecia. However, our specimens showed spherical to obovoid perithecia, and were determined in the sense of Hladki & Romero (2009), who reported similar materials from Argentina. Similar species are *A. truncatum* and *A. moriforme* (Henn.) Y.M. Ju et al., which differ in the presence of an ostiolar disc of *truncatum*-type (Ju & Rogers 1996). It was one of the most common xylariaceous fungi sampled in PESC. Known from the state of Bahia, *A. nitens* is a new record from Paraná State.

***Annulohypoxyton parvodiscum* K.S. Cruz & Cortez sp. nov.** PLATE 2A–F, 3C
MYCOBANK 812745

DIAGNOSIS: It differs from *Annulohypoxyton squamulosum* (Y.M. Ju, J.D. Rogers & H.M. Hsieh) Y.M. Ju, J.D. Rogers & H.M. Hsieh, differing in the smooth stroma surface and larger ascospores, $9\text{--}13 \times 3\text{--}5 \mu\text{m}$.

TYPE: BRAZIL. Paraná State: Palotina, PESC, 13 June 2013, leg. *K.S. Cruz 194* (UPCB 81662, holotype here designated; HCP 595, isotype).

ETYMOLOGY: due to the small (*L., parvus*) size of ostiolar disc (*L., discus*).

STROMATA effused-pulvinate, 5–30 mm long \times 3–8 mm broad \times 0.5–0.8 mm thick; with inconspicuous perithecial mounds; surface brown vinaceous (84), smooth; blackish granules beneath surface and between perithecia, with KOH-diluted pigment olivaceous grey (121); tissue below the perithecial layer inconspicuous. PERITHECIA spherical to obovoid, $0.3\text{--}0.5 \times 0.2\text{--}0.4$ mm diam. OSTIOLES slightly papillate, surrounded by a *bovei*-type disc, 0.1–0.2 mm diam. ASCI cylindrical, $69\text{--}157.5 \times 5\text{--}10 \mu\text{m}$; spore-bearing part 68–103 μm , stipe 17.5–76 μm ; apical ring amyloid, inconspicuous. ASCOSPORES brown to dark brown, ellipsoid-inequilateral, with narrowly rounded ends, $9\text{--}13 \times 3\text{--}5 \mu\text{m}$, with straight germ slit spore-length, sometimes slightly sigmoid on the convex side; perispore dehiscent in KOH; episore smooth; surface smooth under SEM.

ADDITIONAL SPECIMENS EXAMINED: BRAZIL. Paraná State: Palotina, PESC, 10 Sept. 2013, leg. *K.S. Cruz 144* (HCP 596); 18 Oct. 2013, leg. *K.S. Cruz 185* (HCP 597).

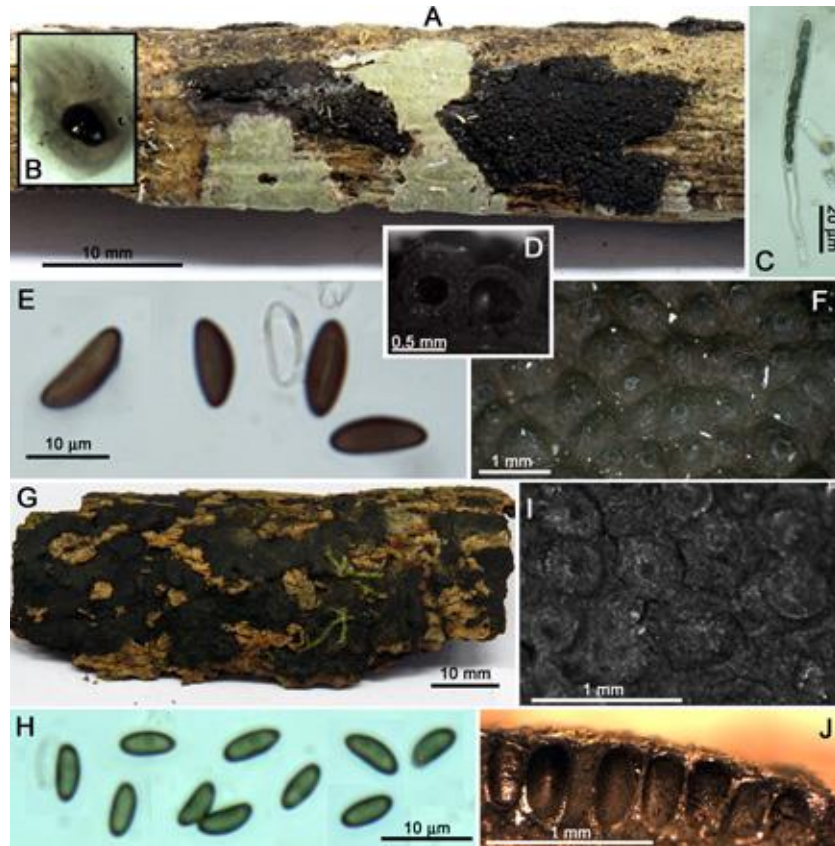


PLATE 2. A-F: *Annulohypoxyton parvodiscum*. A: stroma. B: stromatic pigment. C: ascus. D: section of perithecia. E: ascospores. F: top view of stroma. G-J: *Annulohypoxyton stygium*. G: stroma. H: ascospores. I: top view of stroma. J: section of perithecia.

HABITAT AND DISTRIBUTION: Growing on decayed angiosperm trunk, in the board of forest trail. Only known from type locality.

NOTES: *Annulohypoxyton parvodiscum* is proposed as a new species diagnosed by the presence of olivaceous grey pigment, slightly papillate ostioles, reduced *bovei*-type ostiolar disc, and ascospore size. It is similar to *A. archeri* (Berk.) Y.M. Ju et al., *A. microcarpum* (Penz. & Sacc.) Y.M. Ju et al. and *A. squamulosum* (Y.M. Ju, J.D. Rogers & H.M. Hsieh) Y.M. Ju et al. all bearing reduced ostiolar disc (0.1–0.2 mm). However, in *A. archeri* and *A. microcarpum*, the disc is of *truncatum*-type (Ju & Rogers 1996). On the other hand, *A. squamulosum* has a *bovei*-type disc, but presents rough stromatal surface and smaller ascospores (6.5–8.5 × 3–4 μm, Ju et al. 2004).

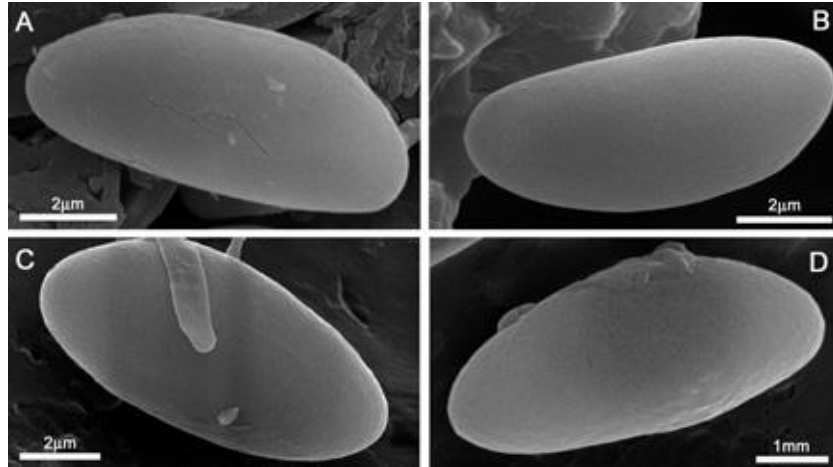


PLATE 3. SEM of *Annulohypoxyylon* ascospores- A: *A. macrodiscum*. B: *A. nitens*. C: *A. parvodiscum*. D: *A. stygium*.

Annulohypoxyylon stygium (Lév.) Y.M. Ju, J.D. Rogers & H.M. Hsieh, Mycologia 97(4): 861. 2005. PLATE 2G-J, 3D

STROMATA hemispherical to effused-pulvinate, 9–10 mm long × 5–7 mm broad × 0.3–0.4 mm thick, with inconspicuous perithecial mounds; surface fuscous black (104), with some reddish brown tone; reddish brown granules beneath surface and among perithecia, KOH-diluted pigments greenish olivaceous (90) or dull green (70); tissue below the perithecial layer inconspicuous. PERITHECIA obovoid, 0.3–0.4 × 0.15–0.25 mm diam. OSTIOLES conical-papillate, surrounded by a *truncatum*-type disc 0.1–0.2 mm diam. ASCI cylindrical, 72–80 × 4–5 µm, spore-bearing part 56–62 µm, stipe 12–19 µm, apical ring amyloid, discoid, 0.5 × 1 µm. ASCOSPORES light brown, ellipsoid-inequilateral, with narrowly rounded ends, 5–7 × 2.5–3 µm, with straight germ slit spore-length on flattened side; perispore dehiscent in KOH; epispore smooth; surface smooth under SEM.

SPECIMENS EXAMINED: BRAZIL. Paraná State: Palotina, PESC, 16 May 2013, leg. K.S. Cruz 016 (HCP 577), 017 (HCP 578); 07 Oct 2013, leg. K.S. Cruz 174 (HCP 579), 183 (HCP 580); 5 Nov 2013, leg. K.S. Cruz 158 (HCP 581).

HABITAT AND DISTRIBUTION: On rotting wood, in the board of forest. Known from the Americas and Asia (Ju & Rogers 1996).

NOTES: The small ascospores and ostiolar disc and green stromatic pigment are diagnostic features for *A. stygium* (Ju & Rogers 1996). It looks like the African *A. atroroseum* (J.D. Rogers) Y.M. Ju et al. but this species has pinkish stromatic surface (Ju & Rogers 1996). In Brazil, *A. stygium* was reported from Amazon and Atlantic Forest biomes, including Paraná State (Meijer 2006, 2010; Pereira 2015).

Key for the *Annulohypoxyton* species from PESC, Paraná, Brazil

1. Ostiolar disc *bovei*-type 2
1. Ostiolar disc *truncatum*-type 3
2. KOH-extractable pigments olivaceous grey, ostiolar disc 0.1–0.2 mm
..... *A. parvodiscum*
2. KOH-extractable pigments olivaceous green, ostiolar disc 0.3–0.5 mm *A. nitens*
3. Ostiolar disc 0.1–0.2 mm, ascospores $5-7 \times 2.5-3 \mu\text{m}$ *A. stygium*
3. Ostiolar disc 0.4–0.8 mm, ascospores $7-12 \times 3.5-5 \mu\text{m}$ *A. macrodiscum*

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9 CONSIDERAÇÕES FINAIS

O Parque Estadual de São Camilo constitui uma considerável diversidade de *Xylariaceae*, representando 38 táxons, distribuídos em 11 gêneros. O estudo contribuiu com as descrições, chaves e imagens das espécies estudadas, o que antes não se tinha para o Estado. Acredita-se que essa pesquisa auxiliará novos estudos da família não somente para o Paraná, mas para todo o Brasil.

O estudo resultou na descrição de três espécies novas, *Annulohypoxyton parvodiscum*, *Entoleuca palotinese* e *Hypoxyton vinaceobrunneum*. Uma nova citação de *Hypoxyton peleae* para a América do Sul e um novo registro de *Hypoxyton griseobrunneum* para o Brasil.

Entoleuca palotinese faz parte de um gênero pequeno com apenas 3 espécies conhecidas. Não havendo ainda registro desse gênero para o Brasil. Foi uma surpresa satisfatória encontrar este gênero no Parque.

Hypoxyton e *Xylaria* foram os gêneros mais representativos com 12 e 11 táxons respectivamente, ambos coletados principalmente em tronco decomposto. Estes gêneros são os que apresentam maior número de espécies dentro da família.

Acredita-se que das espécies pertencentes à *Xylariaceae*, os gêneros *Xylaria* e *Daldinia* são os mais conhecidos, pois apresentam os estromas mais evidentes, e que por isso, foram coletados em anos anteriores a minha pesquisa no PESC, por alunos e professores da UFPR.

Notou-se que para coletas de *Xylariaceae* o período chuvoso é melhor, pois os estromas estão em melhor estado de conservação para identificação, ao contrário do período seco o qual os fungos estavam mais atacados por insetos, principalmente *Xylaria* e *Daldinia*.

A realização deste estudo permitiu ampliar a lista de espécies de *Xylariaceae* do Paraná de 42 para 70 táxons, expandindo a distribuição geográfica para a região oeste do Paraná e Brasil.