Rodriguésia 71: e03012018. 2020
http://rodriguesia.jbrj.gov.br
DOI: https://doi.org/10.1590/2175-7860202071146

Short Communication
New accounts on Hypoxylaceae and Xylariaceae from Brazil

Cristiano Santana da Silva[1,3,4], *Maryana Borges Pereira*[2] & *Jadergudson Pereira*[1,2]

Abstract

This work aims to bring new reports of Hypoxylaceae and Xylariaceae from Brazil. The collections were performed in cocoa plantations in Ilhéus, Bahia, Brazil. Six new occurrences of Hypoxylaceae and two Xylariaceae species are reported to Brazil, Northeast and/or Bahia. A dichotomous key to the species treated is provided.

Key words: Ascomycota, Cocoa plantations, Hypoxylaceae, Xylariaceae.

Resumo

O objetivo deste trabalho é trazer novos relatos de Hypoxylaceae e Xylariaceae para o Brasil. As coletas foram realizadas em plantações de cacau em Ilhéus, Bahia, Brasil. Seis novas ocorrências de Hypoxylaceae e duas de Xylariaceae são reportadas para o Brasil, Nordeste e/ou Bahia. Uma chave dicotômica das espécies tratadas é disponibilizada.

Palavras-chave: Ascomycota, plantações de Cacau, Hypoxylaceae, Xylariaceae.

Southern Bahia is a region of huge importance and considered a hotspot of biodiversity due to some well preserved fragments of Atlantic Rain Forest (ARF) within this area, presenting high levels of diversity of plants and animals. Despite that, there is still a need for studies with other organisms such as fungi, which, except for pathogens, are poorly known in Bahia, even with their huge importance as decomposers of organic matter, endophytes and mycorrhizal symbionts with plants. Cocoa culture is one of the pillars of economy in Bahia, and the fact the cocoa have been cultivated inside or nearby ARF fragments, denotes these areas might be of great importance to biodiversity. Cassano *et al.* (2009) and Faria & Baumgarten (2007), *e.g.*, highlighted the importance of Shaded Cocoa Plantations (SCP) as refuge for species from ARF such as mammals, including threatened species. Even though, studies with fungi in these areas are scarce or focused primarily on pathogenic fungi. Xylariaceae is one of the iconic families of Ascomycota, being highly diverse through the Tropics. In Brazil, the xylariaceous fungi are among the richest in number of species, and despite it is still ranked as Order in the Flora do Brasil database (BFG 2018), the family Xylariaceae is probably the most diverse, with the genus *Xylaria*, *e.g.*, having more than 100 species known so far to Brazil (Maia *et al.* 2015). The diversity of morphology on the Xylariaceae, lead to attempts to divide the family in the Subfamilies Xylarioideae, Hypoxyloideae and Thamnomycetoideae, which has been proposed by Dennis (1961), though not supported, as it was invalidly erected (Stadler *et al.* 2013). Moreover the third subfamily, Thamnomycetoideae, was as well not validated since the genus *Thamnomyces* is closely related to *Daldinia*, supporting its affinity with the Hypoxylaceae (Stadler *et al.* 2010). Some studies (Hsieh *et al.* 2005, 2010; Wendt *et al.* 2018) reinforced the need of a rearrangement of the Xylariaceae based on phylogeny and chemotaxonomy, with the last being the focus of studies from Stadler (2011), Stadler *et al.* (2014) and Kuhnert *et al.* (2017), corroborating the importance

[1] Universidade Estadual de Santa Cruz, Prog. Pós-graduação em Produção Vegetal, Rod. Jorge Amado, km 16, 45662-900, Ilhéus, BA, Brazil.
[2] Universidade Estadual de Santa Cruz, Depto. Ciências Agrárias e Ambientais, Rod. Jorge Amado, km 16, 45662-900, Ilhéus, BA, Brazil.
[3] ORCID: <https://orcid.org/0000-0001-5905-1660>
[4] Author for correspondence: cristiano.mykes@gmail.com

of more studies to a better comprehension and resolution of the subgroups within the Xylariaceae. The diversity of xylariaceous fungi is poorly known in Brazil probably due to its large territory, which becomes an issue to explore farther locations. A few studies such as Pereira *et al.* (2008a, b, 2009, 2010), Cruz & Cortez (2015a, b, 2016) and Trierveiler-Pereira *et al.* (2009) have been of great importance in the last years to the group, bringing novelties and new species. Despite that, North and Northeast regions are still underprivileged, since most studies are focused on South and Southeast regions. Hence the present study aims to bring new reports of Hypoxylaceae and Xylariaceae fungi collected in SCP in Southeast Bahia, a region understudied with great potential for new species and new occurences.

Field collections were performed in a shaded cocoa plantation at the campus of Universidade Estadual de Santa Cruz - UESC (14°47’53”S, 39°10’20”W), in October 2017, February and May 2018; and Comissão Executiva do Plano da Lavoura Cacaueira - CEPLAC (14°47’6.42”S, 39°13’23.35”W), August 2018, in the Matinha do Centro de Pesquisas do Cacau - CEPEC and Estação Experimental Arnaldo de Medeiros - ESARM. The specimens were collected randomly, with substrate whenever possible, and packed in paper bags, tagged with location and date of collection, then taken to the Phytopathology and Nematology Laboratory at UESC and dried at 50 °C for 24 hours. To identification of species, morphological characters of stromata, KOH-extractable pigments, perithecia, asci and ascospores were analyzed. The specimens were deposited at the Tropical Fungarium (TFB) in UESC. Due to the most recent adjustments in the Xylariaceae, we decided to follow the modifications proposed by Wendt *et al.* (2018) and treat it hereby as Hypoxylaceae and Xylariaceae families. The SpeciesLink Network (SpeciesLink 2019) was used to check the Xylariaceous species registered to Brazil.

1. Hypoxylaceae DC. in Lamarck & de Candolle, Fl. franç., Edn 3 (Paris) 2: 280 (1805), emend. M. Stadler & L. Wendt.

Description according to Wendt *et al.* (2018): stromata varying from erect to effused-pulvinate; solitary or confluent; surface colored or black, pruinose or polished, planar or with perithecial mounds; waxy or carbonaceous tissue immediately beneath surface and between perithecia, with or without KOH-extractable pigments; the tissue below the perithecial layer inconspicuous, conspicuous, or massive, most often dark brown to black, persistent or loculate; Some genera presents peculiar features, such as alternating zones under perithecial layer, or hollow and filled with liquid, observed in the *Daldinia* and *Entonaema*, respectively. Perithecia embedded in the stroma, spherical, obovoid, tubular, or long tubular, monostichous, with or without carbonaceous stromatal material surrounding individual perithecia. Ostioles can be umbilicate, at the same level or higher than the level of stromatal surface, with or without discs. The asci are typically eight-spored, cylindrical, stipitate; with apical ring discoid, amyloid or infrequently inamyloid, distinct, highly reduced, or apparently lacking. Ascospores brown, ellipsoid or shorty fusoid, inequilateral, slightly inequilateral or nearly equilateral, with acute, narrowly rounded, or broadly rounded ends, in most species bearing a germ slit; perispore dehiscent or indehiscent in 10% KOH. The anamorph Nodulisporium-like with branching patterns varying from “regular” nodulisporium, periconiella, virgariella or sporothrix-like.

Key to Hypoxylaceae species treated

1. Stromata applanate 2
1’. Stromata other than applanate 3
  2. Stromatal surface orange or with tons of orange 4
  2’. Stromatal surface color differing from above 5
    3. Stromata turbinate with alternate zones, ascospores 12–13 × 5–6 µm .... 1.1. *Daldinia starbaeckii*
    3’. Stromata hemispherical with large opening on the top, ascospores oblong 9–11 × 5–6 µm .... 1.6. *Phylacia bomba*

4. Stromatal surface apricot, ascospores 11–12(–13) × 6–7 µm .... 1.2. *Hypoxylon cinnabarinum*
4'. Stromatal surface vivid orange, ascospores 13–15 × 7–8 µm .... 1.3. *Hypoxylon haematostroma*
 5. KOH-extractable pigments purple in young stromata, ostioles slightly papillate, ascospores inequilateral 7–9 µm × 3–4 µm ....1.4. *Hypomontagnella monticulosa*
 5'. KOH-extractable pigments greenish olivaceous, ostioles umbilicate, ascospores equilateral 7–9 × 3–4 µm ....1.5. *Hypoxylon pulicicidum*

1.1. *Daldinia starbaeckii* M. Stadler & Læssøe, Studies in Mycology 77: 69 (2014). Fig. 1a-d

Stromata turbinate, brown vinaceous, blackened in age, 3.2 cm diam, KOH-extractable pigment yellowish, becoming vinaceous after a few minutes, ostioles inconspicuous. Perithecia tubular, 1–2 × 0.3–0.5 mm, tissue beneath perithecia fibrous, composed of alternating zones, the darker zones brown, 0.3–0.4 mm thick, pithy to woody, the lighter zones grayish, 0.3–0.6 mm thick, pithy to woody. Asci not seen. Ascospores unicellular, brown to dark brown, ellipsoid-inequilateral, with narrowly rounded ends, 12–13 × 5–6 µm, with straight germ slit spore-length, perispore dehiscent in 10% KOH.

Specimen examined: BRAZIL. BAHIA: Ilhéus, UESC, Cabruca da UESC: on dead trunk, 29.X.2017, TFB999, *leg.* C. Silva & M. Pereira.

Daldinia starbaeckii was previously collected in Bahia by Camille Torrend in 1915, however was identified as *D. eschscholtzii* (see Child 1932 and Stadler *et al.* 2014), and apparently there were no other reports for the species after that. This might be probably due to the fact that many specimens collected in the country are misidentified as *D. eschscholtzii*. *Daldinia starbaeckii* differs from *D. eschscholtzii* for yielding yellowish olivaceous pigment in 10% KOH, instead of purplish. Stadler *et al*. (2014) mentioned that *D. starbaeckii* has ascospores smaller than those of *D. eschscholtzii*, although we have not found significant difference in ascospore size. The previous authors mentioned yet that the specimens collected by Starbäck in 1901 in Brazil as *D. concentrica* var. *eschscholtzii* corresponded very much with this species, considering the teleomorphic features and stromatal metabolites. The fact that this species co-occur with *D. eschscholtzii* in the Americas may have caused them not to be properly identified back then, especially the specimens which pigments were not taken into account.

Known distribution: the Americas and Africa.

1.2. *Hypoxylon cinnabarinum* (Henn.) Y.-M. Ju & J.D. Rogers, Mycologia Memoirs, 20: 99 (1996). Fig. 1e-h

Stromata effused-pulvinate, surface plane, apricot, reddish granules immediately beneath the surface and between perithecia, ostioles lower than stromatal surface, KOH-extractable pigments orange to rust, grayish to black tissue beneath perithecia up to 2 mm thick. Perithecia tubular, 0.7–1 × 0.3–0.4 mm. Asci damaged. Ascospores brown to dark brown, unicellular, ellipsoid nearly equilateral, narrowly rounded ends, some slightly citriform, 11–12(–13) × 6–7 µm, with germ slit almost to spore-length, perispore indehiscent in 10% KOH.

Specimen examined: BRAZIL. BAHIA: Ilhéus, UESC, Cabruca da UESC: dead tree of *Citrus* sp., 1.II.2018, TFB1003, *leg.* C. Silva & M. Pereira.

This specimen was collected on dead tree of *Citrus* sp., what seems to be the first report on this host. Apparently there is no evidence of *Hypoxylon cinnabarinum* exhibiting pathogenic behavior so far, but the typical saprophytic behavior observed in most species of Hypoxylaceae and Xylariaceae, or perhaps a weak pathogen, invading the host when it is already affected by a previous pathogen or is under abiotic stress conditions, which is as well not unusual in both Families. According to Ju & Rogers (1996) *H. cinnabarinum* is closely related to *H. crocopeplum*, with the former having ascospores with perispore usually indehiscent in 10% KOH, which was corroborated with our specimen.

Known distribution: Brazil, Mexico, New Zealand, Taiwan, Venezuela, French Guiana, Guadeloupe and Martinique.

1.3. *Hypoxylon haematostroma* Mont., Ann. Sci. nat., Bot., sér II 17: 124 (1842). Fig. 1i-l

Stromata effused-pulvinate, 2–14.5 × 1–2.9 mm × 2.5 mm thick, with inconspicuous to conspicuous perithecial mounds, surface vivid orange, orange granules beneath surface and between perithecia, KOH-extractable pigments vivid orange, becoming scarlet after a few

Figure 1 – a-d. *Daldinia starbaeckii* – a. *D. starbaeckii* stroma on substrate; b. sideview of stroma evidencing alternate zones (detail = pigments); c. comparison of pigments in KOH after a few minutes (upper: *D. Starbaeckii*; bottom: *D. Eschscholtzii*); d. ascospores (arrow = germ slit). e-h. *Hypoxylon cinnabarinum* – e. stromata; f. maximized view of stromatal surface evidencing ostioles and pigments (detail); g. arrows pointing perithecia (white) and massive tissue under perithecial layer (black); h. ascospores (arrow = germ slit). i-l. *Hypoxylon haematostroma* – i. stromata on substrate and pigments (detail); j. maximized view of stromatal surface evidencing ostioles (arrows); k. asci with J^+ apical apparatus (arrow); l. ascospores (arrow = germ slit). m-p. *Hypomontagnella monticulosa* – m. stroma and pigments (detail); n. maximized view of stroma evidencing ostioles (arrows); o. arrows pointing perithecia; p. ascospores (arrow = germ slit). Bars: a = 1.5 cm; b = 3 mm; d = 12 µm; e = 2 cm; f, g, j, n = 1 mm; h = 12 µm; i = 2 cm; k = 10 µm; l = 13 µm; m = 1 cm; o = 0.5 mm; p = 9 µm.

minutes, tissue beneath perithecia inconspicuous to 0.5 mm thick. Perithecia tubular lanceolate, 1.5–2 × 0.3–0.5 mm. Ostioles umbilicate. Asci damaged. Ascospores brown to dark brown, ellipsoid-inequilateral, with slightly to broadly rounded ends, 13–15 × 7–8 μm, straight germ slit less than spore-length on the most convex side, perispore dehiscent in 10% KOH, smooth, epispore smooth.

Specimen examined: BRAZIL. BAHIA: Ilhéus, CEPLAC, Matinha do CEPEC: on dead branch, 1.VIII.2018, TFB1013, *leg.* C. Silva & Jad. Pereira.

This specimen is quite similar to that of Fournier *et al.* (2015), as well differing on the germ slit length from the description of Ju & Rogers (1996). *Hypoxylon haematostroma* has as characteristic features the orange to orange red stromatal granules under a vivid orange surface. According to SpeciesLink (SpeciesLink 2019) the species was collected by J. Rick in Rio Grande do Sul (BPI589361, BPI589362, BPI716321, PACA-fungi162131, PACA-Fungi16295, PACA-Fungi16172, PACA-Fungi21735, PACA-Fungi16196, PACA-Fungi16245, PACA-Fungi22720, PACA-Fungi16093, PACA-Fungi16275) and J.R. Weir in Amazonas (BPI589454) and apparently there is no other report from Brazil since 1945. We believe *H. haematostroma* may have a wide distribution throughout the country, considering it was collected in Southern and Northern regions, both presenting quite distinct profiles of aspects such as climate and altitude.

Known distribution: pantropical.

1.4. *Hypomontagnella monticulosa* (Mont.) Sir, L. Wendt & C. Lambert 2018. Fig. 1m-p

Stromata effused-pulvinate, 0.2–7.5 × 0.3–3 cm, brown when young, blackish when mature, perithecial mounds inconspicuous to conspicuous, ostioles minutely papillate, carbonaceous tissue immediately under the surface, KOH-extractable pigments purple when young, perithecia spherical to obovoid 0.3–0.5 × 0.2–0.5 mm, tissue beneath perithecia inconspicuous to 0.5 mm thick. Asci fragmented, apical ring bluing in Melzer's reagent, discoid, 0.8–1 × 2 μm, ascospores brown to dark brown, unicellular, ellipsoid-inequilateral, narrowly rounded ends, 7–9 × 3–4 μm, with sigmoid germ slit spore-length, perispore dehiscent in 10% KOH, epispore smooth.

Specimens examined: BRAZIL. BAHIA: Ilhéus, UESC, Cabruca da UESC: on bark of fallen tree, 19.X.2017, TFB992; on decorticated branch, 19.X.2017, TFB993; on bark of fallen tree, 19.X.2017, TFB994; on decorticated branch, 30.XI.2017, TFB995; on fallen branches, 30.XI.2017, CS35 (TFB996); on decorticated branch, 30.XI.2017, TFB997; on fallen branch, CS20 (TFB998); on fallen branch, 1.II.2018, TFB1004; on decorticated branch, 1.II.2018, TFB1005; on decorticated branches, 1.II.2018, TFB1006; on bark of fallen tree, 1.II.2018, TFB1007; on dead branches, 1.II.2018, TFB1008; on bark of fallen branch, 1.II.2018, TFB1009, *leg.* C. Silva & M. Pereira; CEPLAC, Matinha do CEPEC: on dead branch of *Theobroma cacao*, 1.VIII.2018, TFB1014, *leg.* C. Silva & Jad Pereira.

Hypomontagnella monticulosa is very common through the tropics, being quite similar to *Hypoxylon submonticulosum*, mostly found in temperate countries. The species can also be misconfused with some species of *Nemania*, although the former release perispore and purplish pigments when young in 10% KOH, while these features are not observed on the latter. *Hypomontagnella monticulosa* was dominant in UESC, colonizing a wide range of substrates.

Known distribution: pantropical and subtropical.

1.5. *Hypoxylon pulicicidum* J. Fournier, Polishook & Bills, PloS One 7(10): 10 (2012). Fig. 2a-d

Stromata effused-pulvinate, brown vinaceous, 1.7–6 × 0.9–1.3 cm, inconspicuous to conspicuous perithecial mounds, carbonaceous tissue beneath surface and between perithecia, tissue beneath perithecia inconspicuous to 0.3 mm, KOH-extractable pigments pale green. Ostioles umbilicate. Perithecia lanceolate, 0.8–1 × 0.3–0.4 mm. Asci cylindrical, unisseriate, 100–140 μm total length × 3–5 μm, stipe 60–80 μm, spore-bearing part 50–55 μm, apical apparatus discoid, bluing in lugol, 0.5 × 1.5 μm. Ascospores light brown, ellipsoid equilateral to oblong, with broadly rounded ends, 7–9 × 3–4 μm, with faint germ slit slightly less than to spore-length, perispore indehiscent in 10% KOH, epispore smooth.

Specimens examined: BRAZIL. BAHIA: Ilhéus, CEPLAC, Matinha do CEPEC: on dead branch of *Theobroma cacao*, 1.VIII.2018, TFB1015; ESARM: on decorticated trunk, 1.VIII.2018, TFB1016, *leg.* C. Silva & Jad Pereira.

Hypoxylon pulicicidum is very similar to *H. investiens*, being separated from the latter based on morphological, molecular, and chemical profile (Bills *et al.* 2012), with the color of the KOH-extractable pigments being a striking difference between both species. Bills *et al.* (2012) isolated

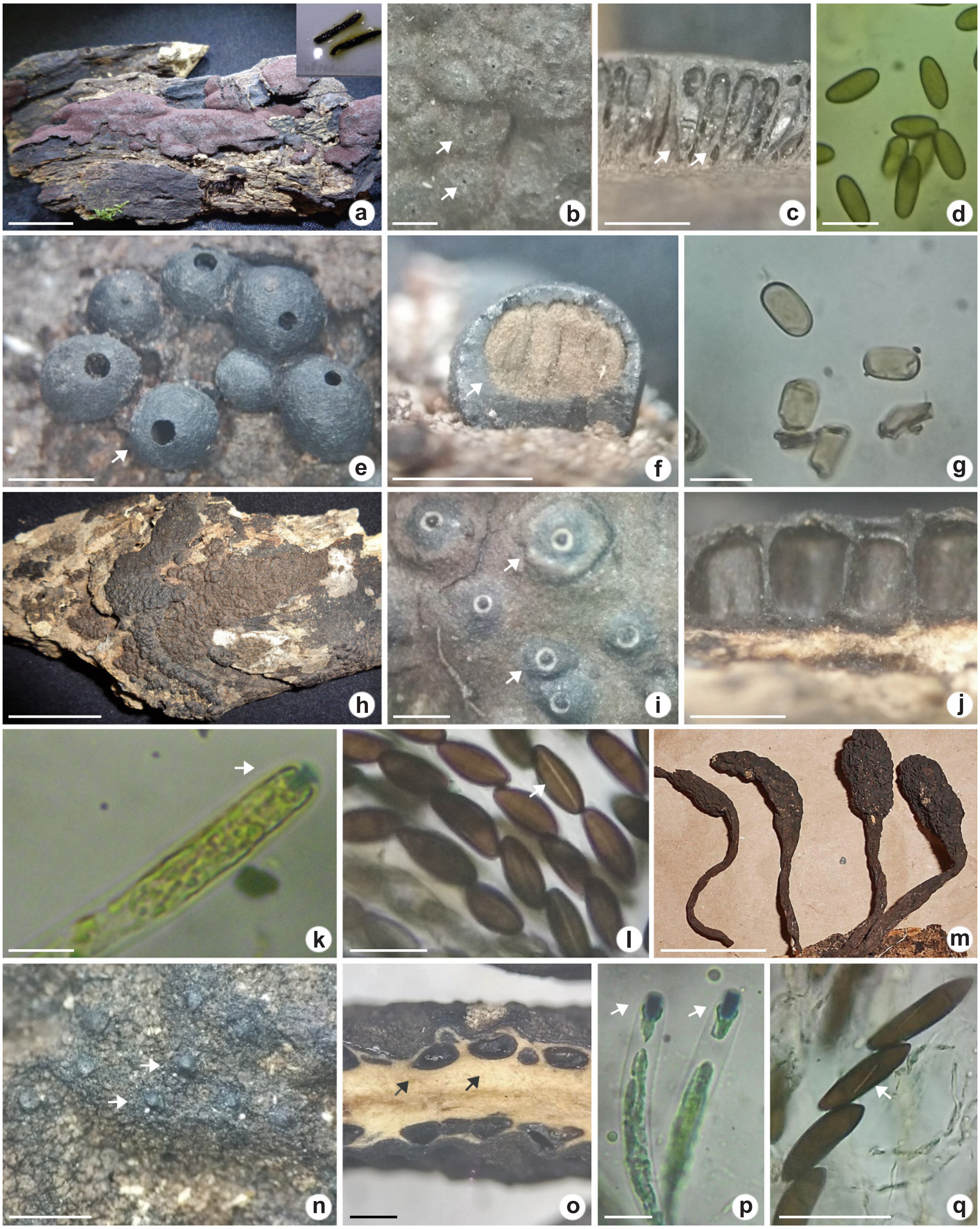

Figure 2 – a-d. *Hypoxylon pulicicidum* – a. stromata on substrate and pigments (detail); b. maximized view of stroma showing ostioles (arrows); c. vertical section of stroma showing perithecia (arrows); d. ascospores. e-g. *Phylacia bomba* – e. upper view of stromata showing large opening on top (arrow); f. vertical section of stroma evidencing ascospore mass; g. ascospores. h-l. *Nemania immersidiscus* – h. stroma on substrate; i. maximized view of stroma showing ostioles (arrows); j. vertical section of stroma showing perithecia; k. asci with apical apparatus J^+ (arrow); l. ascospores (arrow = germ slit). m-q. *Xylaria schweinitzii* – m. stromata on substrate; n. maximized view of stroma showing ostioles (arrows); o. vertical section of stroma showing perithecia (arrows); p. asci with J^+ apical apparatus; q. ascospores (arrow = germ slit). Bars: a = 1 cm; b, c, i, j, n = 1 mm; d = 9 µm; e = 3 mm; f = 2.5 mm; g = 9 µm; h = 2 cm; k = 8 µm; l = 12 µm; m = 2 cm; o = 0.5 mm; p = 10 µm; q = 25 µm.

potent Nodulisporic-acids with insecticidal effects from its asexual morph. Fournier *et al.*(2015), reported this species from Martinique as being the sexual morph of the asexual morph isolated by Bills *et al.* (2012).

Known distribution: probably Pantropical.

1.6. *Phylacia bomba* (Mont.) Pat. in Duss, Crypt. des Antilles, Champ., 74 (1903). Fig. 2e-g

Stromata gregarious, erumpent, sessile, black, carbonaceous, hemispherical, 2.5–8 mm diam, older stromata with large hole at the apex communicating a single locule containing the mass of ascospores with exterior, perithecia not seen, asci not seen, ascospores oblong, translucent yellowish brown, 9–11 × 5–6 µm, germ slit inconspicuous.

Specimens examined: BRAZIL. BAHIA: Ilhéus, UESC, Cabruca da UESC: on bark of fallen tree, 19.X.2017, TFB1000; on dead branch, 29.I.2018, TFB1011; on bark of fallen tree, 29.I.2018, TFB1012, *leg.* C. Silva & M. Pereira.

Phylacia is quite a different genus, presenting some aberrant features for a typical xylariaceous fungus, such as the unusually subglobose to globose asci, which tend to deliquesce prematurely. Rodrigues & Samuels (1989), mentioned the stromata of *Phylacia* species seems to be cleistothecial, as it do not present the typical ostiolar canal observed in perithecial stromata, releasing the ascospores through a large hole observed on the top of mature stromata. The genus share some features with *Camillea*, such as its translucent ascospores apparently lacking germ slit and pigments not extractable in 10% KOH. A specimen was collected in Bahia in 2006, which is deposited in the CEPLAC Herbarium (CEPEC-Fungi 2182) but we have found no report of the species to Bahia or Northeast.

Known distribution: probably Pantropical.

2. Xylariaceae Tul. & C. Tul. [as "Xylariei"] Select. fung. carpol. (Paris)2: 3 (1863), emend. M. Stadler & L. Wendt.

As Hypoxylaceae this family can be saprobic, endophytes and some exhibit pathogenic behavior. The main characteristic of this family are: stromata not yielding pigments in 10% KOH, solitary, glomerate, pulvinate to effused-pulvinate, erect, which can be cylindrical to clavate, laterally compressed, short, long or non-stipitate, acute to round apex, globose to spherical, with interior, whitish to dark, some becoming hollow when mature, discoid, applanate, whitish to black, carbonaceous to woody. Perithecia spherical, obovoid, tubular with or without carbonaceous tissue surrounding individual perithecia. Ostioles inconspicuous, slightly to coarsely papillate, discoid. Asci cylindrical, unisseriate, with apical apparatus urniform or inverted hat-shaped, usually bluing in Lugol or Melzer's reagent. Ascospores unicellular, light brown to blackish brown, navicular, ellipsoid, fusiform, with ends acute to narrow or broadly rounded, germ slit straight, oblique, sigmoid, much less than to as long as spore-length. Asexual stage is mainly Geniculosporium-like.

Key to Xylariaceae species treated

1. Stromata applanate, ostioles circled by sunken discs ....2.1. *Nemania immersidiscus*
1'. Stromata erect, surface wrinkled, ascospores with oblique slit ....2.2. *Xylaria schweinitzii*

2.1. *Nemania immersidiscus* Van der Gucht, Y.-M. Ju & J. D. Rogers, Mycotaxon 55: 550 (1995). Fig. 2h-l

Stromata effused-pulvinate, grayish brown, becoming dark brown when mature, 0.25–6 × 0.19–2.4 cm, conspicuous perithecial mounds, carbonaceous tissue beneath surface, lacking KOH-extractable pigments, ostioles higher than stromatal surface, circled by sunken discs 0.1–0.2 mm diam. Perithecia subglobose to oblong, 0.6–0.9 × 0.5–0.6 mm. Asci fragmented, with apical ring urn-shaped, J^+. Ascospores brown to dark brown, ellipsoid-inequilateral, with slightly rounded ends, (10–)12–13(–14) × 5–6 µm, straight germ slit spore-length or nearly so, perispore indehiscent in 10% KOH.

Specimen examined: BRAZIL. BAHIA: Ilhéus, UESC, Cabruca da UESC: on fallen branch, 1.II.2018, TFB1010, *leg.* C. Silva & M. Pereira.

According to Van der Gucht *et al.* (1995), *Nemania immersidiscus*, *N. bipapillata* (Berk. & M.A. Curtis) Pouzar and *N. circostoma* (Speg.) Y.M. Ju & J.D. Rogers, have ostioles circled by prominent discs, with the former differing from *N. circostoma* in ascospore size and from *N.*

bipapillata in having sunken discs and white, soft stromatal tissue between perithecia.

Known distribution: Papua New Guinea, Hawaii, Guyana.

2.2. *Xylaria schweinitzii* Berk. & M.A. Curtis, J. Acad., Nat. Sci., Philadelphia, 2: 284 (1853).
Fig. 2m-q

Stromata dark brown, 3.4 × 1 cm, surface smooth, with older stromata becoming slightly wrinkled, stipe narrower than fertile part, cortex whitish, ostioles discoid. Perithecia spherical, 0.5–1 mm diam. Asci damaged; apical apparatus J^+, urn-shaped, 4.5–5.5 × 3 µm. Ascospores brown, unicellular, ellipsoid-inequilateral to navicular, (24–)26–30(–34) × 5–7(–8) µm, oblique germ slit less than spore length.

Specimen examined: BRAZIL. BAHIA: Ilhéus, UESC, Cabruca da UESC: on rotten branch, 30.X.2017, TFB1002, *leg.* C. Silva & M. Pereira.

Xylaria schweinitzii is included in the *X. polymorpha* complex. Miller (1934) considered *X. schweinitzii* the tropical variant of *X. polymorpha*, due to both species being morphologically similar. Rogers & Callan (1986) pointed that the anamorph of *X. schweinitzii* release an orange exudation at the first days of culture that is not observed in *X. polymorpha*, which gives a pinkish to reddish aspect, not observed in older cultures which are very similar in both species.

Known distribution: Tropical and Subtropical.

We have brought in this study the first report of *Daldinia starbaeckii*, *Hypoxylon pulicicidum* and *Nemania immersidiscus* to Brazil; *Hypoxylon cinnabarinum*, *H. haematostroma* and *Phylacia bomba* to Northeast, *Hypomontagnella monticulosa* and *Xylaria schweinitzii* to Bahia. *Hypoxylon* was the most dominant genus in all sampled areas, colonizing different substrates. *Xylaria* has a greater number of species and is found quite easily specially in high humidity rates. Despite that, we focused primarily on the Hypoxylaceae, due to the diverse morphological features of some *Xylaria* species, which makes identification more difficult, with *X. schweinitzii* being the only species reported in this work. Fournier & Lechat (2015) observed that some species of *Phylacia*, including *P. bomba*, yielded KOH-extractable pigments and the ascospores presents an inconspicuous germ slit less than spore-length, characters we did not observed on the specimens we collected, with both being important diagnostic aspects on the majority of Hypoxylaceae species.

Although the collections were performed in cocoa plantations, the only species we collected in *Theobroma cacao* were *Hypomontagnella monticulosa* and *Hypoxylon pulicicidum* which does not necessarily means the Hypoxylaceae and Xylariaceae fungi do not colonize this host. Costa (2008) isolated some species of *Xylaria* as endophytic from *T. cacao*, although this kind of interaction between the xylariaceous fungi and plants is hitherto poorly comprehended. Several species of Hypoxylaceae and Xylariaceae are deposited in many herbaria in Brazil and Bahia, such as the CEPEC-Fungi, even though many specimens are identified until generic level, what becomes an issue to assess the diversity of these fungi in Brazil. This uphold the need of more studies towards the comprehension of diversity of Hypoxylaceae and Xylariaceae fungi in Brazil, particularly in North and Northeast regions, from where new species, even genera, of Ascomycota and Basidiomycota have been described in the last decade, evidencing this region can be promising for fungal diversity.

Acknowledgments

The authors thank Dr. José Luiz Bezerra (PPGPV/UESC), for cooperation in the field trip collection; and to Capes, for financial support. They are also grateful to Universidade Estadual de Santa Cruz, for technical support.

References

Bills GF, González-Menéndez V, Martín J, Platas G, Fournier J, Peršoh D & Stadler M (2012) *Hypoxylon pulicicidum* sp. nov. (Ascomycota, Xylariales), a pantropical insecticide-producing endophyte. PloS One 7: e46687 <https://doi.org/10.1371/journal.pone.0046687>.

BFG - The Brazil Flora Group (2018) Brazilian Flora 2020: innovation and collaboration to meet Target 1 of the Global Strategy for Plant Conservation (GSPC). Rodriguésia 69: 1513-1527.

Cassano CR, Schroth G, Faria D, Delabie JHC & Bede L (2009) Landscape and farm scale management to enhance biodiversity conservation in the Cocoa producing region of Southern Bahia, Brazil. Biodiversity and Conservation 18: 577-603. DOI: 10.1007/s10531-008- 9526-x

Child M (1932) The genus *Daldinia*. Annals of the Missouri Botanical Garden 19: 429-496.

Cruz KS & Cortez VG (2015a) Hypoxylon (Xylariaceae, Ascomycota) from Western Paraná, Brazil. Brazilian Journal of Botany 38: 889-901. DOI: 10.1007/s40415-015-0289-z

Cruz KS & Cortez VG (2015b) Xylaria (Xylariaceae, Ascomycota) in the Parque Estadual de São Camilo, Paraná, Brazil. Acta Biológica Paranaense 44: 129-144. DOI: 10.5380/abpr.v44i1-4.43846

Daranagama DA, Hyde KD, Sir EB, Thambugala KM, Tian Q, Samarakoon MC, Mckenzie EHC, Jayasiri SC, Tibpromma S, Bhat JD, Liu XZ & Stadler M (2018) Towards a natural classification and backbone tree for Graphostromataceae, Hypoxylaceae, Lopadostomataceae and Xylariaceae. Fungal Diversity 88: 1-165. DOI: 10.1007/s13225-017-0388-y

Dennis RWG (1961) Xylarioideae and Thamnomycetoideae of Congo. Bulletin du Jardin Botanique de l'Etat à Bruxelles 31: 109-154.

Faria D & Baumgarten J (2007) Shaded Cacao plantations (*Theobroma cacao*) and bat conservation in Southern Bahia, Brazil. Biodiversity and Conservation 16: 291-312. DOI: 10.1007/s10531-005- 8346-5

Fournier J, Lechat C & Courtecuisse R (2015) The genus *Hypoxylon* (Xylariaceae) in Guadeloupe and Martinique (West French Indies). Ascomycete.org 7: 145-212. DOI: 10.25664/art-0140

Fournier J & Lechat C (2015) *Phylacia korfii* sp. nov., a new species of *Phylacia* (Xylariaceae) From French Guiana, with notes on three other *Phylacia* spp. Ascomycete.org 7: 315-319. DOI: 10.25664/art-0154

González M, Hanlin RT, Ulloa M & Aguirre E (2004) *Poroleprieuria*, a new xylariaceous genus from México. Mycologia 96: 675-681. DOI: 10.2307/3762185

Hsieh HM, Ju YM & Rogers JD (2005) Molecular phylogeny of *Hypoxylon* and closely related genera. Mycologia 97: 844-865. DOI: 10.1080/15572536.2006.11832776

Hsieh HM, Linn CR, Fang MJ, Rogers JD, Fournier J, Lechat C & Ju YM (2010) Phylogenetic status of *Xylaria* subgenus *Pseudoxylaria* among taxa of the subfamily Xylarioideae (Xylariaceae) and phylogeny of the taxa involved in the subfamily. Molecular Phylogenetics and Evolution 54: 957-969 <https://doi.org/10.1016/j.ympev.2009.12.015>.

Ju Y-M & Rogers JD (1996) A revision of the genus *Hypoxylon*. Mycologia Memoirs 20: 1-365.

Kuhnert E, Sir EB, Lambert C, Hyde KD, Hladki AI, Romero AI, Rohde M & Stadler M (2017) Phylogenetic and chemotaxonomic resolution of the genus *Annulohypoxylon* (Xylariaceae) including four new species. Fungal Diversity 85: 1-43. DOI 10.1007/s13225-016-0377-6

Maia LC, Carvalho Júnior AAC, Cavalcanti LH, Gugliotta AM, Drechsler-Santos ER, Santiago ALMA, Cáceres MES, Gibertoni TB, Aptroot A, Giachini AJ, Soares AMS, Silva ACG, Magnago AC, Goto BT, Lira CRS, Montoya CAS, Pires-Zottarelli CLA, Silva DKA, Soares DJ, Rezende DHC, Luz EDMN, Gumboski EL, Wartchow F, Karstedt F, Freire FM, Coutinho FP, Melo GSN, Sotão HMP, Baseia IG, Pereira J, Oliveira JJS, Souza JF, Bezerra JL, Araujo Neta LS, Pfenning LH, Gusmão LFP, Neves MA, Capelari M, Jaeger MCW, Pulgarín MP, Menolli Junior N, Medeiros PS, Friedrich RCS, Chikowski RS, Pires RM, Melo RF, Silveira RMB, Urrea-Valencia S, Cortez VG & Silva VF (2015) Diversity of Brazilian fungi. Rodriguésia 66: 1033-1045. DOI: 10.1590/2175-7860201566407

Miller JH (1934) Xylariaceae. *In*: CE Chardon & RA Toro (eds.) Mycological explorations of Venezuela. Monographs of University of Puerto Rico. Ser. B. 2: 195-220.

Pereira J, Bezerra JL & Maia LC (2008a) Revision of taxa of the URM Herbarium 2. Hypoxylon species described by A.C. Batista. Mycotaxon 104: 405-408.

Pereira J, Bezerra JL & Maia LC (2008b) *Kretzschmaria albogrisea* sp. nov. and *K. curvirima* from Brazil. Mycotaxon 106: 237-241.

Pereira J, Rogers JD & Bezerra JL (2009) New Xylariaceae taxa from Brazil. Sydowia, v. 61: 321-325.

Pereira J, Rogers JD & Bezerra JL (2010) New *Annulohypoxylon* species from Brazil. Mycologia 102: 248-252.

Rodrigues KF & Samuels GJ (1989) Studies in the Genus *Phylacia* (Xylariaceae). Memoirs of the New York Botanical Garden 49: 290-297.

Rogers JD & Callan BE (1986) *Xylaria polymorpha* and its allies in continental United States. Mycologia 78: 391-400.

SpeciesLink (2019) Available at <http://www.splink.org.br>. Access on May 17 2019.

Stadler M (2011) Importance of secondary metabolites in the Xylariaceae as parameters for assessment of their taxonomy, phylogeny, and functional biodiversity. Current Research in Environmental and Applied Mycology 1: 75-133. DOI: 10.5943/cream/1/2/1

Stadler M, Fournier J, Læssøe T, Chlebicki A, Lechat C, Flessa F, Hambold G & Persoh D (2010) Chemotaxonomic and phylogenetic studies of *Thamnomyces* (Xylariaceae). Mycoscience: 51: 189-207. DOI 10.1007/s10267-009-0028-9

Stadler M, Kuhnert E, Persoh D & Fournier J (2013) The Xylariaceae as model example for a unified nomenclature following "One Fungus-One Name" (1F1N) concept. Mycology: An International Journal on Fungal Biology 4: 5-21. DOI 10.1080/21501203.2013.782478

Stadler M, Læssøe T, Fournier J, Decock C, Schmieschek B, Tichy H-V & Peršoh D (2014) A Polifasic Taxonomy of Daldinia (Xylariaceae). Studies in Mycology 77: 1-143 <https://doi.org/10.3114/sim0016>.

Trierveiler-Pereira L, Romero AI, Baltazar, JM & Loguércio-Leite C (2009) Addition to the knowledge of Xylaria (Xylariaceae, Ascomycota) in Santa Catarina, Southern Brazil. Mycotaxon 107: 139-156.

Van der Gucht K, Ju Y-M & Rogers JD (1995) *Hypoxylon ravidoroseum* and *Nemania immersidiscus*, two new species from the Hawaiian islands and Papua New Guinea. Mycotaxon 55: 547-555.

Wendt L, Sir E, Kuhnert E, Heitkämper S, Lambert C, Hladki A, Romero AI, Luangsa-Ard J, Srikitikulchai P, Peršoh D & Stadler M (2018) Resurrection and emendation of the Hypoxylaceae, recognized from a multi-gene genealogy of the Xylariales. Mycological Progress 17: 115-154. DOI: 10.1007/s11557-017-1311-3

Area Editor: Dr. Anibal de Carvalho Junior
Received in October 25, 2018. Accepted in August 21, 2019.