

# New or interesting records of lichens and lichenicolous fungi from Suriname, with descriptions of eight new species

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**Abstract:** Altogether 193 taxa of lichens and lichenicolous fungi are reported from Suriname of which many are new records for the country. These include eight species which are described as new to science: *Bacidia fellhaneroides*, *B. multicarpa*, *B. surinamensis*, *Bactrospora ochracea*, *Cryptolechia submyriadella*, *Graphis triseptata*, *Lasioloma pauciseptatum* and *Zwackhiomyces parmotrematis*. Notes on morphology, chemistry and ecology are given.

**Keywords:** biodiversity, chemistry, ecology, lichenized Ascomycetes, South America, taxonomy.

## Introduction

Suriname belongs together with Guiana and French Guiana to the Guayana Shield, an area in north-eastern South America. Together with Venezuelan Guiana and parts of Colombia and Brazil, it forms a distinct geographical region. This region is characterized by geological rock formations with poor soils and hilly terrain with emerging table mountains (LÜCKING, 1998). Several main geographical zones are distinguished in the Guianas of which three are important to consider for this study (SIPMAN, 1991): 1) A narrow band of low-lying, fertile alluvial soils, found along the coast. Much of it is cultivated and human influence is strongest here. 2) A zone of flat, low-lying white sand extends along the coast from the Venezuelan border to the westernmost part of French Guiana. This carries extensive savannahs and light forest. Because the soil is poor, there is little human influence, except for fire. 3) Most of the remaining area consist of hilly country below c. 500 m altitude, covered with native forest. It is virtually uninhabited and so far little influenced by man. The climate of Suriname is equatorial, the temperatures are rather high and stable throughout the year and the humidity is high, the average maximum temperatures are around 29°–33°C and the average minimum temperatures are 28°–29°C throughout the year. The rains are more intense between April and July and in December and January; on average, Suriname gets about 2,000 to 2,500 mm of rain per year.

Lichens and lichenicolous fungi are an extremely neglected group in Suriname. This reflects the poor taxonomic knowledge of most tropical lichen groups until recently. Reliable identifications were hardly possible, except in a few recently revised groups and for a few widespread taxa. This situation has changed considerably in recent years. Particularly many descriptions of new species as well as new keys have been published for the genera *Buellia* (MARBACH, 2000), *Coenogonium* (RIVAS PLATA *et al.*, 2006), *Graphis* (LÜCKING *et al.*, 2008, 2009; STAIGER, 2002), *Gyalideopsis* (LÜCKING *et al.*, 2006), *Haematomma* (BRODO *et al.*, 2008), and for the families *Pyrenulaceae* (APTROOT, 2012) and *Trypetheliaceae* (APTROOT & LÜCKING, 2016). These and other smaller publications have greatly improved the possibilities to study the Neotropical lichen flora in general and certainly that of countries like Suriname. The first author has started an exploration of lichens and lichenicolous fungi of Suriname. First results, concerning foliicolous lichens and their lichenicolous fungi, were published by VAN DEN BOOM & SIPMAN (2016).

The present study treats various taxonomic groups for which the available literature allows a reliable identification. Apart from the references cited above, this includes — for pyrenocarpous genera and thelotremoid *Graphidaceae* — the treatments for the Central American country Costa Rica (APTROOT *et al.*, 2008, SIPMAN *et al.*, 2012).

Eight species are described as new for science, *Bacidia fellhaneroides*, *B. multicarpa*, *B. surinamensis*, *Bactrospora ochracea*, *Cryptolechia submyriadella*, *Graphis triseptata*, *Lasioloma pauciseptatum* and *Zwackhiomyces parmotrematis*. Besides these, a further 185 species are listed and annotated below.

## Material and methods

The specimens investigated were collected in 2014 by the first author and his wife and are deposited in the herbarium of the first author. They are numbered between 50300 and 51200. A set of representative duplicates is deposited in Paramaribo (herbarium BBS), and holotypes and some duplicates are in Meise, Belgium (BR) and Berlin, Germany (B), including some isotypes. The visited localities are in the northern part of Suriname, in cultivated lowland areas with (secondary) forest remnants. An exception is the Brownsberg, which has an altitude of up to 500 m and is covered by primary tropical forest.

Measurements of ascospores and pycnospores were made in tap water at 400× or 1000× magnification under a light microscope. Amyloid reactions were tested using Lugol's iodine solution, with (KI), or without pretreatment with K (I). The secondary metabolites of many crustose specimens were analysed by TLC using the methods of CULBERSON & AMMANN (1979) and CULBERSON & JOHNSON (1982). Apart from the literature mentioned above, the lichen herbaria of B and BR were consulted.

## Collecting sites of P. & B. van den Boom in Suriname, 2014

### Province Paramaribo

- 1 = Paramaribo, centre, Palmentuin, many high palm trees, with grassy soil and a few different, unidentified trees, 5° 49.67' N, 55° 9.02' W, 12 m, 19 February 2014.
- 2 = Paramaribo, W of centre, area of Gravenberchstraat, trees along street, 5° 49.80' N, 55° 10.90' W, 4 m, 20 February 2014.
- 3 = Paramaribo, N of centre, Henck Arronstraat, near crossing with Letitia Vriesdelaan, brick wall, 5° 49.81' N, 55° 9.50' W, 6 m, 21 February 2014.
- 4 = Paramaribo, N of centre, along Kanangalaan, Cultuurtuin, small tropical forest with some cacao trees, 5° 50.70' N, 55° 9.60' W, 15 m, 21 February 2014.
- 5 = Paramaribo, N of centre, along Kanangalaan, Paramaribo zoo, with various trees, 5° 50.80' N, 55° 9.60' W, 10 m, 21 February 2014.

### Province Commewijne

- 6 = E of Paramaribo, Marienburg, former plantation with mixed trees and shrubs, 5° 52.40' N, 55° 2.90' W, 2 m, 22 February 2014.
- 7 = E of Paramaribo, Alkmaar, roadside, citrus plantation, 5° 50.50' N, 55° 1.38' W, 3 m, 22 February 2014,
- 8 = E of Paramaribo, Frederiksdorp, N side of river Commewijne, former plantation, many palm trees and some broadleaf trees, 5° 53.35' N, 55° 1.80' W, 3 m, 22 February 2014.
- 20 = SSE of Paramaribo, Laarwijk (plantage), houses with orchards of mainly citrus and banana, with small secondary tropical forest, 5° 42.30' N, 55° 3.70' W, 5 m, 2 March 2014.

### Province Saramacca

- 9 = W of Paramaribo, between Uitkijk and Groningen, E of Kampong Baroe, farm with path along field, orchard and swamp, 5° 45.0' N, 55° 23.30' W, 4 m, 23 February 2014.
- 10 = W of Paramaribo, 4 km SE of Groningen, Bloemendaal, very small village, garden with *Coccoloba uvifera*, unidentified trees and shrubs, 5° 45.75' N, 55° 27.78' W, 8 m, 23 February 2014.
- 11 = W of Paramaribo, 4 km W of Groningen, along main road (N site), abandoned citrus orchard and trail along swamp, with unidentified trees and shrubs, 5° 49.40' N, 55° 30.30' W, 5 m, 24 February 2014.
- 12 = W of Paramaribo, 12 km W of bridge on Coppename river near Boskamp, near ponds, trail in tropical forest, with unidentified trees and shrubs, 5° 46.57' N, 56° 0.32' W, 7 m, 25 February 2014.
- 13 = W of Paramaribo, c. 18 km E of bridge on Coppename river near Boskamp, Calcutta, row of mature mango trees along football field, 5° 51.71' N, 55° 40.55' W, 5 m, 25 February 2014.
- 14 = W of Paramaribo, 5 km E of Groningen, Vanckweg, unpaved road among gardens and fields, 5° 47.85' N, 55° 29.02' W, 20 m, 26 February 2014.
- 15 = W of Paramaribo, 1 km W of Groningen, along main road, orchard with scattered mixed trees, 5° 49.27' N, 55° 30.51' W, 9 m, 26 February 2014.

### Province Para

- 16 = S of Paramaribo, Domburg, area of Surinat, La Rencontre 5e street, orchards, roadside trees and small secondary tropical forests with various unidentified trees, 5° 41.31' N, 55° 4.24' W, 12 m, 27 February 2014.
- 18 = S of Paramaribo, S of Lelydorp, SE of Bernharddorp, botanical garden, dominated by *Heliconia*, with palm trees and mixed foliose trees, 5° 36.12' N, 55° 11.25' W, 10 m, 1 March 2014.
- 26 = SE of Paramaribo, E side of Domburg, near white beach, unpaved road, small palm trees and *Cassia*, in front of houses, 5° 41.89' N, 55° 4.33' W, 5 m, 7 March 2014.
- 27 = SE of Paramaribo, SE of Domburg, Waterland, very small harbor, mixed mature trees along Surinam river, 5° 39.52' N, 55° 3.88' W, 10 m, 7 March 2014.

### Province Wanica

- 17 = S of Paramaribo, Domburg, centre of village with mature Swietenia trees and road to Boxel with palm trees along fields and road, 5° 42.32' N, 55° 5.05' W, 5 m, 28 February 2014.
- 19 = S of Paramaribo, Lelydorp, Neotropical Butterfly Park, with mixed trees and shrubs, 5° 41.27' N, 55° 12.09' W, 8 m, 1 March 2014.
- 21 = SSE of Paramaribo, NNW of Domburg, road along Surinam river, to Paramaribo, Boxel, roadside trees and trees at edge of small forest, 5° 42.40' N, 55° 5.90' W, 8 m, 3 March 2014.

### Province Para

- 22 = S of Paramaribo, Zanderij, road from Cabendadorp to airport (Berlin), trees at edge of small forest, N side of road, dead fallen tree at S side of road, 5° 23.95' N, 55° 10.03' W, 15 m, 4 March 2014.
- 23 = S of Paramaribo, north of Onverwacht, near crossing of main road with road to Onverwacht, mature trees at edge of forest, 5° 36.10' N, 55° 11.46' W, 15 m, 4 March 2014.

### Province Brokopondo

- 24 = S of Paramaribo, Brownsberg Natuurpark, primary tropical forest, c. 4 km S of Brownsweg, unpaved road to the mountain top, trail in forest, 4° 59.50' N, 55° 11.54' W, 100 m, 5 March 2014.
- 25 = S of Paramaribo, S of Brownsweg, Brownsberg Natuurpark, primary tropical forest, top of the mountain, trail in forest, 'natuurpad' and trail to waterfall, 4° 57.0' N, 55° 10.94' W, 500 m, 5 March 2014.

## Results

*Bacidia fellhaneroides* van den Boom, *sp. nov.* – Fig. 1 – MycoBank #828459

**Diagnosis:** A *Bacidia* species similar to *B. medialis* (Tuck. ex Nyl.) de Lesd., but differs in areolate to scurfy thallus; areoles up to 0.5 mm wide; apothecia pale pinkish to brownish pink; excipulum with conglutinated radiating cells, lumina 6–8 × 2.5 µm; ascospores small fusiform, 1–3(–6)-septate, 20–27 × 1.2–2 µm; pycnidia hyaline to pale brownish, up to 50 µm wide, conidia filiform curved, 20–30 × 0.8 µm.

**Holotype:** SURINAME, prov. Saramacca, W of Paramaribo, 5 km E of Groningen, Vanckweg, unpaved road among gardens and fields, 5° 47.85' N, 55° 29.02' W, 20 m, 26 February 2014, P. & B. van den Boom 50679 (BR, holotype; hb. van den Boom, B, isotypes).

**Etymology:** The epithet refers to the appearance of the new species, which looks like a *Fellhanera* species.

**Thallus** areolate to scurfy, areoles 0.1–0.5 mm wide, white or very pale grey, up to 100 µm thick, upper surface slightly uneven, weakly shiny, ecorticated. Prothallus sometimes present and visible among the thallus parts as a pale greyish white rim. **Photobiont** chlorococoid, cells 10–15 µm diam. **Apothecia** scattered to crowded, irregular in outline, thinly marginate when young; margin 30–50 mm wide, becoming immarginate, up to 0.6(–0.7) mm diam.; disc flat to weakly convex, pale pinkish to brownish pink; excipulum hyaline, without crystals, with conglutinated radiating cells, 20–40 µm wide, hyphae with walls of 1.5–2.5 µm wide between adjacent cell lumina, with isodiametric to ellipsoid lumina 6–8 × 2.5 µm; epithecium hyaline, without crystals, K–, N–; hymenium 30–40 µm high, without any pigment; hypothecium hyaline; hamathecium of paraphyses, thin, 1–1.5 µm wide, septate, sometimes slightly branched, not anastomosed, mid-hymenium cells c. 7–9 × 1–1.5 µm, tips often widened, up to 3 µm, not pigmented. **Asci** small cylindrical to slightly clavate, 25–30 × 8–10 µm, 8-spored, tholus rather wide; ocular chamber with a blunt body, surrounded by a rather small but strongly amyloid layer, not open at the apex. **Ascospores** straight, not coiled in the ascus, small, fusiform, straight to slightly curved, hyaline, 1–3(–6)-septate, 20–27 × 1.2–2 µm. **Pycnidia** c. 50 µm wide, ostiole and margin hyaline to pale brownish; conidia filiform, weakly to strongly curved, 20–30 × 0.8 µm, not septate.

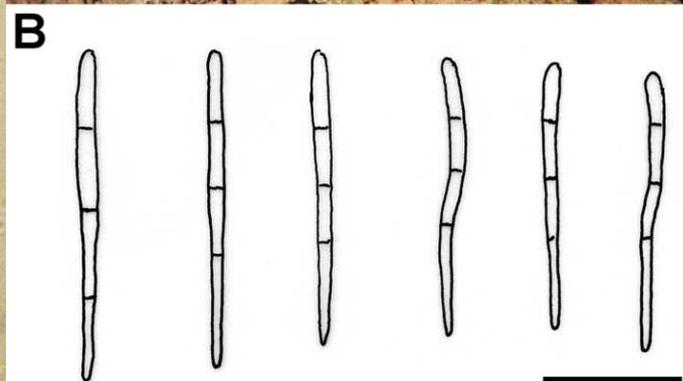
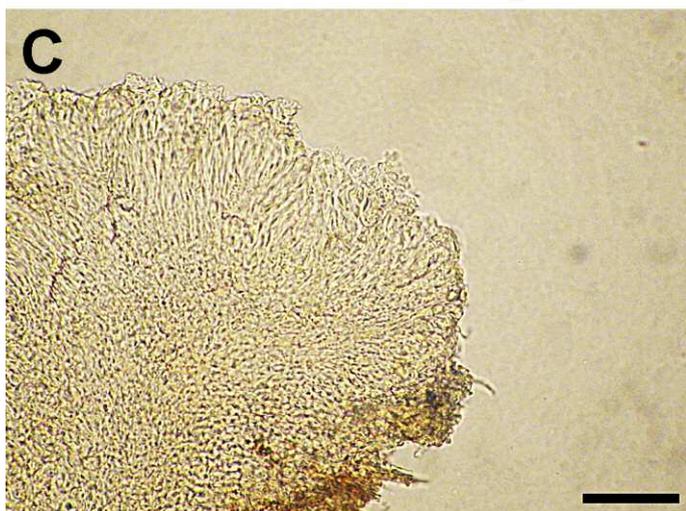
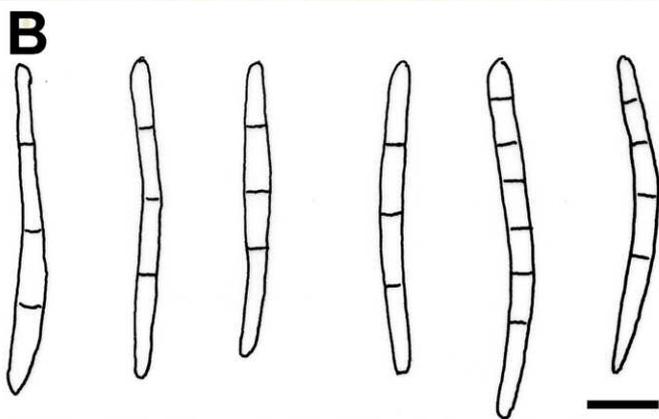
**Chemistry:** K–, C–, P–, UV–, no chemical compounds detected.

**Distribution and ecology:** Known from the type locality only, where it grows lignicolous on fence posts, abundantly, along a meadow.

**Notes:** The new species is easily mistaken for a *Fellhanera* species. However *Fellhanera* has a paraplectenchymatous excipulum, *Byssoloma*-type asci, mostly shorter ascospores, sometimes with a gelatinous sheath and usually pyriform conidia. In MALME (1935), thirty two *Bacidia* (*s.l.*) species are treated but it includes not this species. *Bacidia medialis* is similar to the new species in having bacilliform to fusiform, 20–26 µm long ascospores, but 2.0–3.4 µm wide which is clearly wider than the new species. Conidia in *B. medialis* measure 13–17 × 0.8–1.0 µm (EKMAN, 1996). *Bacidina varia* S. Ekman



**Fig. 1** – (left) *Bacidia fellhaneroides* (holotype). A = Habitus, B = Ascospores, C = Section through excipulum. Scales: A = 0.5 mm, B = 5  $\mu$ m, C = 20  $\mu$ m.



**Fig. 2** – (right) *Bacidia multicarpa* (holotype). A = Habitus, B = Ascospores, C = Section through excipulum. Scales: A = 1 mm, B = 10  $\mu$ m, C = 40  $\mu$ m.



can have also pinkish apothecia, but they are somewhat smaller, 0.2–0.4(–0.6) mm diam., ascospores measure 19–50 × 1.2–2.5 µm and are 3–7-septate. Conidia are 3–11-septate, but non-septate in the new species.

***Bacidia multicarpa*** van den Boom, *sp. nov.* – Fig. 2 – MycoBank #828460

**Diagnosis:** A *Bacidia* species similar to *B. medialis*, but differs in smooth to slightly rimose thallus, greenish grey, matt; apothecial disc pale yellowish pink, to pinkish cream, up to 0.4 mm diam.; excipulum with strongly conglutinated radiating cells; ascospores bacillar to slightly acicular, 1–3-septate, 1–1.5 µm wide; pycnidia hyaline to pale yellowish, up to 100 µm wide; conidia filiform, not or slightly curved, 30–35 × 0.8–1 µm.

**Holotype:** SURINAME, prov. Saramacca, W of Paramaribo, 4 km W of Groningen, along main road (N side), abandoned *Citrus* orchard and trail along swamp, with unidentified trees and shrubs, 5° 49.40' N, 55° 30.30' W, 5 m, 24 February 2014, P. & B. van den Boom 50585 (BR, holotype; hb. van den Boom, isotype).

**Etymology:** The epithet refers to the abundant and often crowded apothecia.

**Thallus** effuse, thin, smooth, slightly rimose, greenish grey, matt. Photobiont chlorococcoid, cells 4–10 µm diam. **Apothecia** abundantly present, marginate, sometimes becoming immarginate, often clustered, up to 0.4 mm diam., if clustered up to 0.6 mm wide, slightly constricted at base to appressed; margin slightly paler than the disc and reaching the same level as the disc; disc pale yellowish pink to pinkish cream, flat to slightly convex; excipulum with strongly conglutinated, radiating cells, without crystals; epitecium hyaline; hymenium 35–40 µm high; hypothecium hyaline; paraphyses abundant, simple, thin, 1–1.5 µm wide, septate, not or slightly widened at the tip, tips 2–4 µm wide, not pigmented. **Asci** cylindrical, 25–37 × 8–11 µm, 8-spored. **Ascospores** straight in the ascus, bacillar to slightly acicular, sometimes slightly curved, hyaline, 1–3-septate, 20–27(–30) × 1–1.5 µm. **Pycnidia** inconspicuous, hyaline to pale yellowish, up to 100 µm wide; conidia filiform, not or slightly curved, 30–35 × 0.8–1 µm.

**Chemistry:** K–, C–, P–, UV–, no lichen substances detected.

**Additional specimen examined:** SURINAME, prov. Para, SE of Paramaribo, E side of Domburg, near white beach, unpaved road, small palm trees and *Cassia*, in front of houses, 5° 41.89' N, 55° 4.33' W, 5 m, 7 March 2014, P. & B. van den Boom 51176 (hb. v.d. Boom).

**Distribution and ecology:** The type-collection was collected on a *Citrus* tree, the additional record on *Cassia* tree. The two localities are from the lowlands.

**Notes:** For the main focus group of this manuscript, *Bacidia s.l.*, we relied much on MALME (1935), who described 32 new species in *Bilimbia* and *Bacidia*, mainly for South America. Equally helpful was the study on *Bacidia* and *Bacidina* for North America by EKMAN (1996). In MALME (1935) this species is not treated. The most similar species *Bacidia medialis* (Tuck. ex Nyl.) de Lesd. agrees with the new species in having bacilliform to fusiform, 20–26 µm long ascospores, but their width is 2.0–3.4 µm, which is clearly wider than the new species. The conidia in *B. medialis* measure 13–17 × 0.8–1.0 µm (EKMAN, 1996), so much shorter than in the new species.

***Bacidia surinamensis*** van den Boom, *sp. nov.* – Fig. 3 – MycoBank #828461

**Diagnosis:** A *Bacidia* species similar to *B. medialis*, but differs in a thin, continuous, shurfy to uneven thallus, brownish grey to very pale brown, matt; apothecia sometimes thinly marginate to very soon immarginate; margin slightly paler than the disc, level with the disc in young apothecia; disc pale cream to pale grey-brown; ascospores fusiform, 1–3(–5)-septate, 16–25(–27) × 2.5–3 µm; conidia filiform, straight, 20–30 × 0.9–1.1 µm, sometimes thinly 3-septate.

**Holotype:** SURINAME, prov. Crommewijne, E of Paramaribo, Marienburg, former plantation with mixed trees and shrubs, 5° 52.40' N, 55° 2.90' W, 2 m, 22 February 2014. P. & B. van den Boom 50435 (BR, holotype; hb. van den Boom, B, isotypes).

**Etymology:** The epithet refers to the country where it has been discovered.

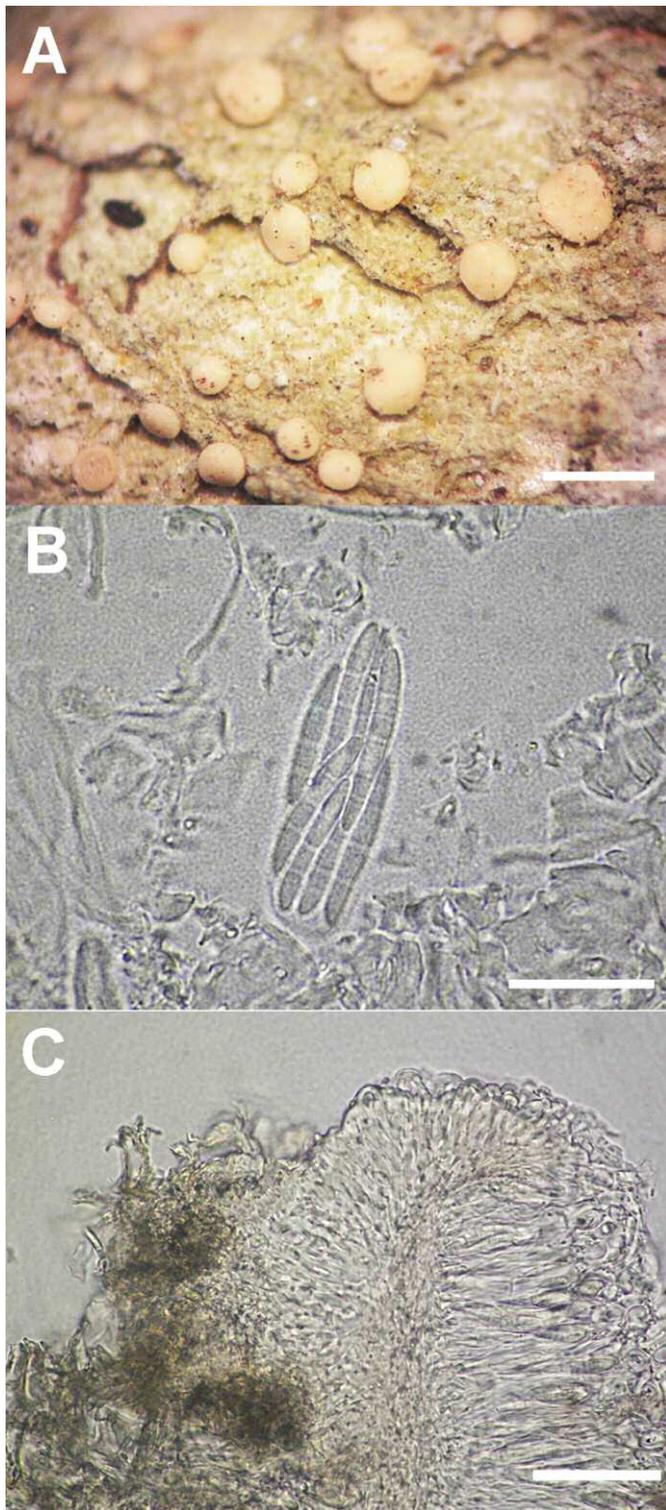
**Thallus** corticolous, thin, continuous, shurfy to uneven, brownish grey to very pale brown, matt, 50–100 µm high, without crystals. Prothallus sometimes present, very thin and greyish, inconspicuous, visible among the thallus parts. **Photobiont** chlorococcoid, cells 4–10 µm diam. **Apothecia** scattered, sometimes thinly marginate when young, somewhat paler than the disc, margin 30–50 µm wide, very soon becoming immarginate, up to 0.7 mm diam.; disc plane to weakly convex, pale cream to pale grey-brown; excipulum hyaline, without crystals, laterally and below with radiating cells, cells strongly conglutinated, isodiametric, lumina 2–3.5 µm wide, with rather thick walls (2–3 µm between adjacent cell lumina); epitecium pale yellowish brown, without crystals, K–, N–; hymenium 45–55 µm high, without any pigment; hypothecium hyaline, 40–60 µm high, K–; hamatecium of paraphyses, thin, 1–1.5 µm wide, not septate, tips often not, or slightly widened, up to 2.5 µm, not pigmented. **Asci** abundant, small, cylindrical to slightly clavate, 35–45 × 9–11 µm, 8-spored, tholus rather thick, weakly amyloid, more strongly amyloid below and at the apex, ocular chamber lacking. **Ascospores** straight, not coiled in the ascus, fusiform, hyaline, 1–3(–5)-septate, 16–25(–27) × 2.5–3 µm. **Pycnidia** rarely found, c. 50 µm diam, hyaline; conidia filiform, straight, 20–30 × 0.9–1.1 µm, sometimes thinly 3-septate.

**Chemistry:** K–, C–, P–, UV–, no chemical compounds detected.

**Additional specimens examined:** SURINAME, prov. Crommewijne, type locality, 22 February 2014, on young *Cassia*, P. & B. van den Boom 50438 (hb. v.d. Boom); on unidentified shrub, P. & B. van den Boom 50427 (hb. v.d. Boom).

**Distribution and ecology:** Known from one lowland locality only, where it grows abundantly, on different kinds of substrate.

**Notes:** The most similar species, *Bacidia medialis*, for which it can be mistaken in the field, differs by the pale pinkish or yellowish apothecia and the greenish to brownish thallus, more or less cracked to areolate, wrinkled to warted with convex areoles and its larger, bacilliform to fusiform, 20–26(–40) × 2.0–3.4(–4) µm ascospores, 3–7-septate (EKMAN, 1996). Although the type collection of *B. surinamensis* is rather large, > 200 apothecia, the thallus is never areolate as it often is in *B. medialis*, even in the additional specimens, areoles are lacking. Ascospores in *B. medialis* are often 5–7-septate, but only 5-septate ascospores are very rarely found in the new species. Pycnidia are rarely found in the new species, but conidia are clearly longer in the new species, 20–30 µm vs. 13–17 µm in *B. medialis*.



**Fig. 3** – *Bacidia surinamensis* (holotype). A = Habitus, B = Ascospores, C = Section through excipulum. Scales: A = 1 mm, B = 20  $\mu$ m, C = 50  $\mu$ m.

***Bactrospora ochracea*** Ertz & van den Boom, *sp. nov.* – Fig. 4 – MycoBank #828466

**Diagnosis:** The only species of *Bactrospora* characterized by the combination of single apothecioid ascomata covered by orange pruina, a pale hypothecium, an inconspicuous excipulum (no carbonaceous parts), richly anastomosing paraphysoids, I– and KI– ascus wall, and long narrowly clavate to almost acicular straight ascospores.

**Holotype:** SURINAME, prov. Para, S of Paramaribo, north of Onverwacht, near crossing of main road with road to Onverwacht, mature trees at edge of forest, 5°36.10'N, 55°11.46'W, 15 m, on bark of tree, 4 March 2014, P. & B. van den Boom 51013 (BR, holotype; hb. van den Boom, isotype).

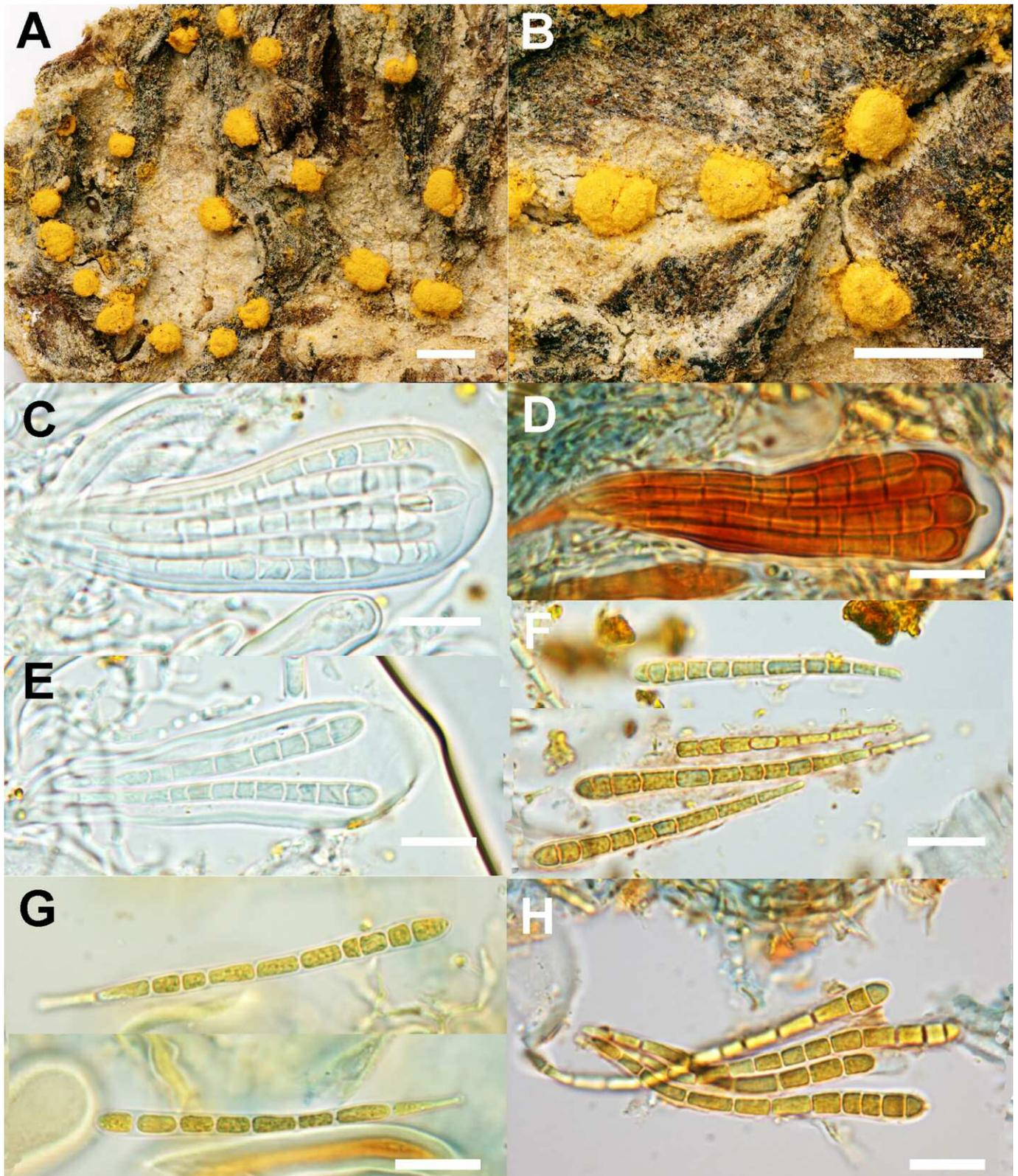
**Etymology:** The specific epithet refers to the colour of the pruina.

**Thallus** crustose, very thin,  $\pm$ cream, c. 50–100  $\mu$ m thick, not sorediate. Prothallus not seen (external limits of the thallus not visible on the specimen). **Photobiont** trentepohlioid; cells c. (5–)8–13  $\times$  4–8  $\mu$ m. **Ascomata** apothecioid, 0.3–0.8 mm in diam., single or arranged in groups of 2–3 ascomata, entirely covered by an orange pruina; hymenial disc pale cream (under the pruina); excipulum inconspicuous; hypothecium hyaline to pale straw or pale brown, c. 160–180  $\mu$ m thick, I+ dark blue, KI+ dark blue; hymenium hyaline to pale straw, 75–85  $\mu$ m thick, I+ pale blue turning pale orange (dark reddish colour inside the asci), K/I+ pale blue (dark reddish colour inside the asci); epihymenium hyaline, K+ magenta red (due to the orange pruina that dissolves in K), I+ pale blue turning pale orange, K/I+ pale blue turning pale orange; paraphysoids 1  $\mu$ m wide, richly branched and anastomosed, with apices c. 2  $\mu$ m wide. **Asci** 62–70  $\times$  16–22  $\mu$ m, clavate, 8-spored, with a small ocular chamber; ascus wall without amyloid reactions. **Ascospores** hyaline, narrowly clavate to almost acicular, tapering at one end, usually straight, (38–)40.0–50.0(–53)  $\times$  (3–)4–5(–6)  $\mu$ m (n=13), 7–13-septate; gelatinous sheath absent. **Conidiomata** not observed.

**Chemistry:** Thallus K– (sometimes magenta red if traces of pruina present), C–, P–, UV+ dark reddish. TLC (solvent B): three substances detected: 1) orange and UV++ yellow before heating of Rf 60 and becoming orange-brown and UV– after heating; 2) orange-yellow and UV++ yellow before heating of Rf 72 and becoming orange-brown and UV– after heating (similar to parietin); 3) very pale orange and UV+ orange-brown before heating of Rf 75 and becoming colourless and UV– after heating (specimen tested: holotype).

**Distribution and ecology:** Only known from the type locality in Suriname, corticolous on the trunk of an unidentified tree.

**Notes:** The new species has affinities with members of *Roccellaceae* notably because of the apothecioid ascomata, the branched-anastomosing paraphysoids, clavate asci, the ascospore type lacking a gelatinous sheath. The species has a combination of characters that does not fit with any other genera of *Roccellaceae*, notably a crustose thallus with single apothecioid ascomata covered by orange pruina, a pale hypothecium and an inconspicuous excipulum (no carbonaceous parts), richly anastomosing paraphysoids, an I– and KI– ascus wall, long narrowly clavate to almost acicular straight ascospores. Therefore, a new genus might be described for it, but in the absence of molecular data (our attempts to sequence the lichen failed, probably because the specimen was too old), we refrain to describe a new genus for it. Therefore, we provisionally place the species in the genus *Bactrospora* despite species of this genus differ notably by a different ascus type. The external appearance of the lichen is somewhat similar to *Sporodochiolichen flavus* Aptroot & Sipman, a species described from Papua New Guinea (APTROOT & SIPMAN, 2011). However, this species is a lichenized hyphomycete of uncertain affiliation but assumed to belong to the *Arthoniales*. It must be noted that the genus *Sporodochiolichen* is considered as a synonym of *Tylophoron* (ERTZ *et al.*, 2014), so that this species needs to be transferred to another genus. The possibility that *S. flavus* is the anamorphic stage of our new species is unlikely because *S. flavus* is only known from Papua New Guinea so far and we have not seen sporodochia on the holotype of the new species, nor in the other collections from Suriname; moreover, the pruina of *S. flavus* is more golden yellow (not orange).



**Fig. 4** – *Bactrospora ochracea* (holotype). A, B = Habitus, C, D, E, = Ascospores in ascus, F, G, H = Ascospores. Scales: A, B = 1 mm, C, D, E, F, G, H.= 10  $\mu$ m.

***Cryptolechia submyriadella*** van den Boom, *sp. nov.* – Fig. 5 – MycoBank #828462

**Diagnosis:** A *Cryptolechia* species similar to *C. myriadella* (Nyl.) D. Hawksw. & Dibben, but differs in very thin and filmy to immersed thallus, smooth, dull whitish to pale grey, matt to slightly shiny; apothecia 0.4(–0.45) mm diam.; margin thin, persistent, pale yellow to pale orange-brown; disc flat, pale to dark brown; excipulum pseudoparaplectenchymatic; asci 12–16-spored; ascospores fusiform, 14–20  $\times$  2.8–3.5(–4)  $\mu$ m; pycnidia not observed.

**Holotype:** SURINAME, prov. Commewijne, E of Paramaribo, Marienburg, former plantation with mixed trees and shrubs, 5° 52.40'N, 55° 2.90'W, 2 m, 22 February 2014, P. & B. van den Boom 50437 (BR, holotype; hb. v.d. Boom, isotype).

**Etymology:** The epithet refers to the similarity with the species *Cryptolechia myriadella*.

**Thallus** very thin and filmy to immersed, smooth, dull whitish to pale grey, matt to slightly shiny. **Apothecia** marginate, margin thin,

persistent, pale yellow to pale orange-brown; disc flat, pale to dark brown, up to 0.4(–0.45) mm diam.; excipulum pseudoparaplectenchymatic, outer edge sometimes brownish; epithecium yellowish brown, hymenium 50–55  $\mu\text{m}$  high; hypothecium hyaline; paraphyses abundant, thin, simple to very rarely branched or anastomosed, c. 1  $\mu\text{m}$  wide, with subglobose tips up to 3  $\mu\text{m}$  wide. **Asci** broadly clavate, 12–16-spored, 30–45  $\times$  12–15  $\mu\text{m}$ . **Ascospores** fusiform, hyaline, 3–5-septate, 14–20  $\times$  2.8–3.5(–4)  $\mu\text{m}$ . **Pycnidia** not observed.

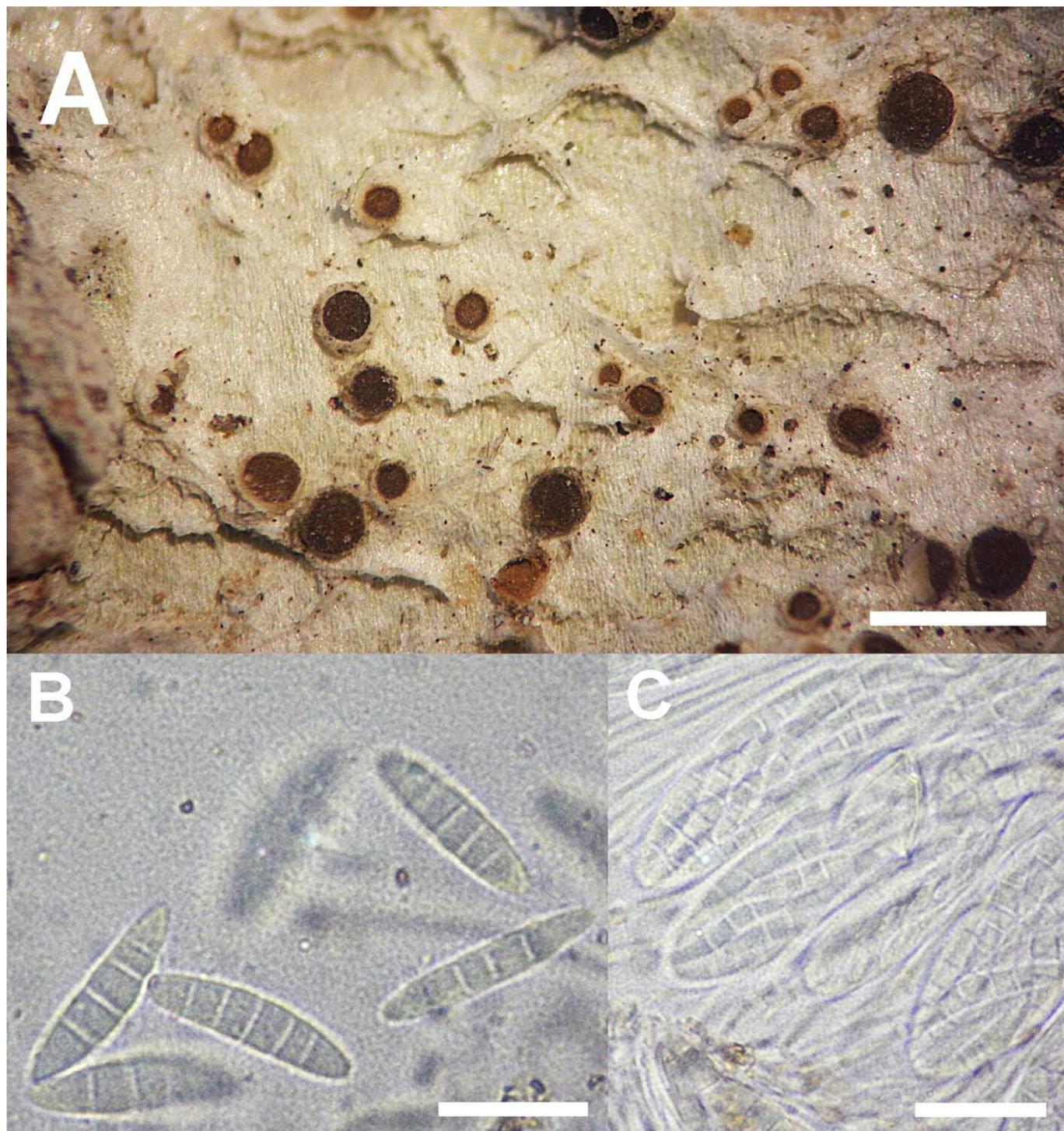
**Chemistry:** K–, C–, P–, UV–, most probably no chemical compounds, thallus too thin for TLC.

**Additional specimens examined:** SURINAME, prov. Paramaribo, N of centre, along Kanangalaan, Paramaribo zoo, with mixed trees, 5° 50.80' N, 55° 9.60' W, 10 m, 21 February 2014, P. & B. van den Boom 50408 (hb. v.d. Boom); Saramacca, W of Paramaribo, between Uitkijk

and Groningen, E of Kampong Baroe, farm with path along field, orchard and swamp, 5° 45.0' N, 55° 23.30' W, 4 m, 23 February 2014, P. & B. van den Boom 50484 (hb. v.d. Boom); Saramacca, W of Paramaribo, 12 km W of bridge near Boskamp (from river 'Coppename'), near ponds, trail in tropical forest, with unidentified trees and shrubs, 5° 46.57' N, 56° 0.32' W, 7 m, 25 February 2014, P. & B. van den Boom 50649 (hb. v.d. Boom).

**Distribution and ecology:** Known from a few lowland localities in northern Suriname, where it grows on different kinds of corticolous substrate.

**Notes:** In the key to the known species of *Cryptolechia* (Kalb, 2007), the new species keys out as *C. myriadella*, but that species has a relative thick grey thallus, larger ascospores, 20–25  $\times$  3.5–4.5  $\mu\text{m}$ ,



**Fig. 5** – *Cryptolechia submyriadella* (holotype). A = Habitus, B = Ascospores, C = Ascospores in ascus. Scales: A = 1 mm, B = 10  $\mu\text{m}$ , C = 20  $\mu\text{m}$ .

with 8–12(–16) spores per ascus and is known from Australia, New Caledonia and New Zealand.

***Graphis triseptata*** van den Boom & Sipman, *sp. nov.* – Fig. 6 – MycoBank #828463

**Diagnosis:** A *Graphis* species similar to *G. tetralocularis* C. Bock & Hauck, because of the 3-septate ascospores, but differs in immersed apothecia, not even slightly raised, up to 2 mm long, up to 0.1 mm wide, mostly branched; disc concealed; excipulum laterally and basally carbonized; ascospores 14–17 × 5.5–8 µm, I+ blue to slightly violet. No chemical compounds found by TLC.

**Holotype:** SURINAME, prov. Para, S of Paramaribo, S of Lelydorp, SE of Bernhardtorp, botanical garden, dominated by *Heliconia*, with palm trees and mixed broadleaf trees, 5° 36.12' N, 55° 11.25' W, 10 m, 1 March 2014, P. & B. van den Boom 50910 (B, holotype; hb van den Boom, isotype).

**Etymology:** The epithet refers to the three septate ascospores which is very rare in the genus.

**Thallus** corticolous, corticate, effuse, somewhat rimose, up to 0.2 mm thick, surface smooth, pale brownish grey, slightly shiny. Prothallus absent. **Apothecia** lirelliform, straight to mostly flexuous, mostly branched, immersed in the thallus, not even slightly raised, to 2 mm long, 0.05–0.1 mm wide; disc concealed, narrow, sunken, dark brown to black; excipulum not striate, carbonized laterally and basally; hymenium clear, 75–100 µm high; hypothecium hyaline. **Asci** 35–50 × 9–14 µm, 8-spored. **Ascospores** hyaline, transversally (2–)3-septate, 14–17 × 5.5–8 µm, I+ blue to slightly violet; perispore not visible. **Pycnidia** not found.

**Chemistry:** P–, K–, C–, UV–. No chemical compounds found by TLC.

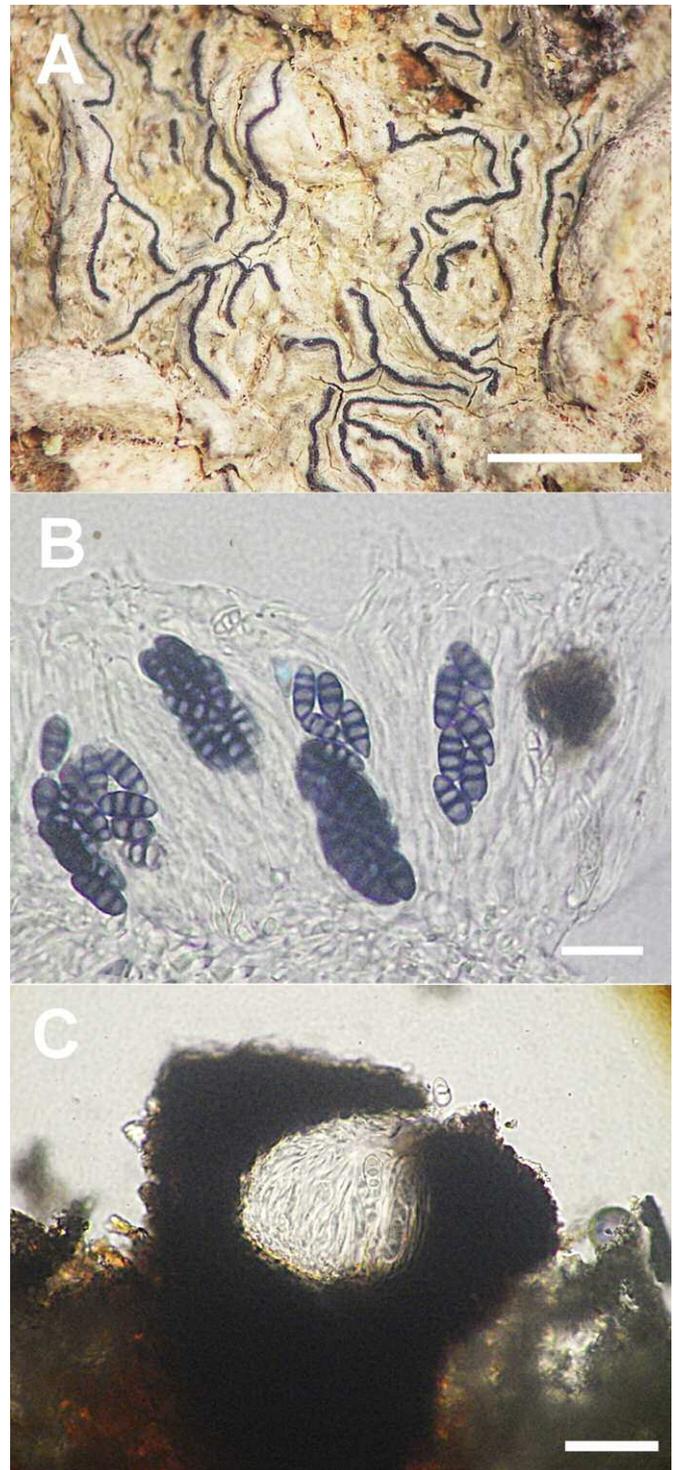
**Distribution and ecology:** Only known from the type locality in Suriname, corticolous on a trunk of an unidentified tree.

**Notes:** So far, no *Graphis* species is known with consistently 3-septate ascospores, except *G. tetralocularis* C. Bock & Hauck of which the placement in *Graphis* is questionable (LÜCKING *et al.*, 2009). *G. tetralocularis*, known from the African Paleotropics, has 3-septate ascospores, 12–17 µm long, it contains atranorin (trace), but it has short and sparsely branched erumpent lirellae instead of long, branched and immersed as in the new species. The only known species that shares small, bacillar ascospores, immersed lirellae with completely carbonized excipulum, and absence of lichen substances (LÜCKING *et al.*, 2009) is *Graphis hyphosa* Staiger. This has stellately branched lirellae with white-pruinose labia, immersed in pseudostroma, and 3–11-septate ascospores 20–40 µm long (STAIGER, 2002).

***Lasioloma pauciseptatum*** van den Boom, *sp. nov.* – Fig. 7 – MycoBank #828464

**Diagnosis:** A corticolous *Lasioloma* species, characterized by thin to immersed thallus, matt to slightly shiny; dark blue-black prothallus; excipulum laterally with short hairs; hypothecium dark olive-brown; asci 4–8-spored; ascospores ellipsoid, submuriform, 3(–5)-septate, 0–1(–2) longitudinal septa per segment, 20–27 × 8–12 µm; conidia filiform with 3–5 branches originating from single point, each branch 1–6-septate, 45–55 × 2–2.5 µm.

**Holotype:** SURINAME, prov. Saramacca, W of Paramaribo, 4 km SE of Groningen, Bloemendaal, very small village, garden with *Coccoloba uvifera*, unidentified trees and shrubs, 5° 45.75' N, 55° 27.78'

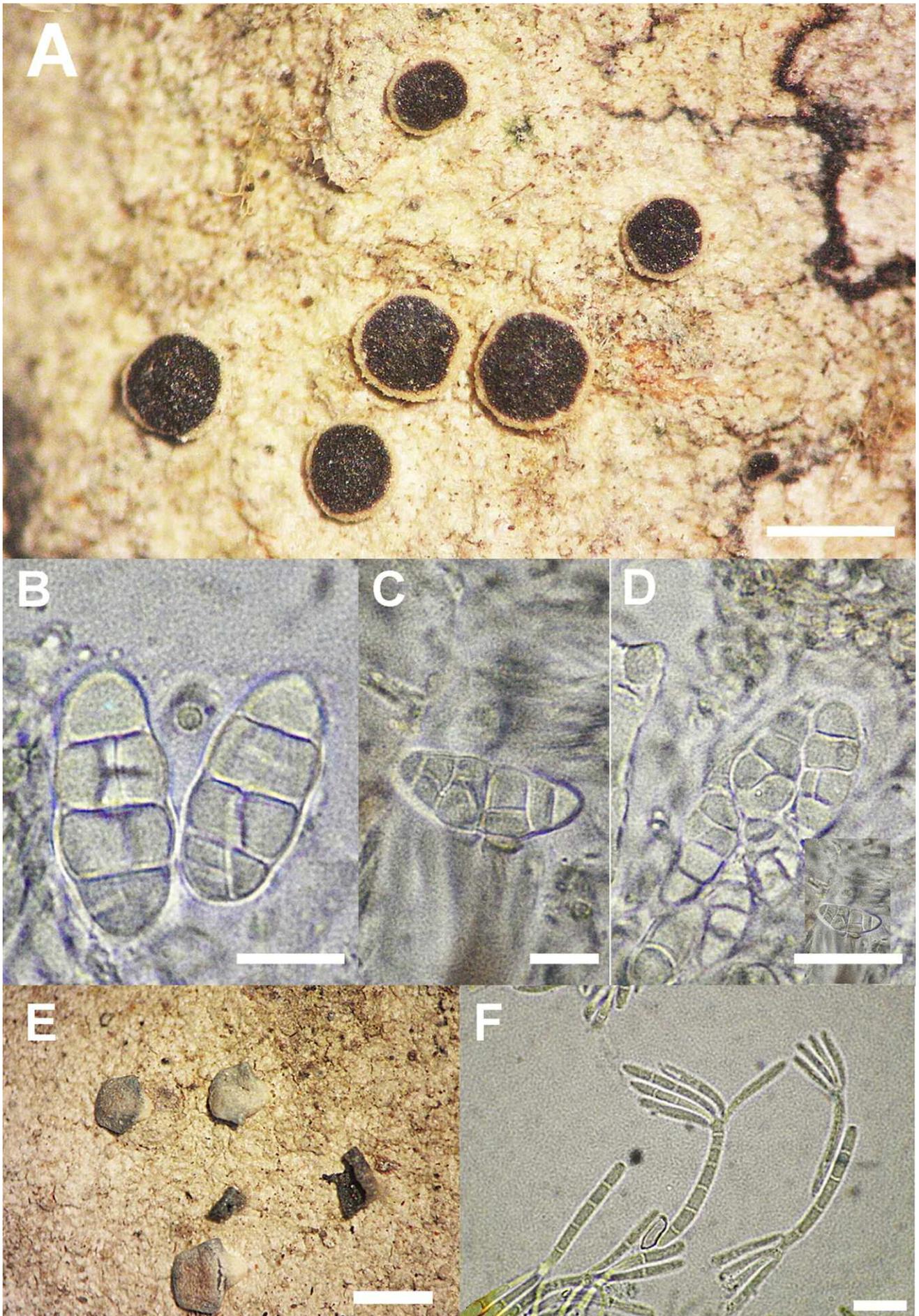


**Fig. 6** – *Graphis triseptata* (holotype). A = Habitus; B = Ascospores; C = Section through lirella showing completely carbonized excipulum. Scales: A = 1 mm, B = 20 µm, C = 20 µm.

W, 8 m, 23 February 2014, on *Coccoloba*, P. & B. van den Boom 50519 (B, holotype; hb. van den Boom, isotype).

**Etymology:** The epithet refers to the ascospores, which have few septa.

**Thallus** continuous, thin to immersed, smooth, dull grey with a pale brownish tinge, matt to slightly shiny. Prothallus dark blue black. **Apothecia** marginate; margin thin, persistent, pale grey to pale brown; disc flat, dark brown, up to 0.5–1 mm diam.; excipulum pseudoparaplectenchymatous, hyaline, laterally with short hairs, up to c. 20 µm long and 1.5–3 µm wide, septate; epithecium hyaline;



**Fig. 7** – *Lasiozyma pauciseptatum* (holotype). A = Habitus; B, C = Ascospores; D = Ascus with ascospores; E = Campylidia, F = Conidia. Scales: A = 1 mm, B = 10  $\mu$ m, C = 10  $\mu$ m, D = 20  $\mu$ m, E = 1 mm, F = 20  $\mu$ m.

hymenium hyaline, 50–60 µm; hypothecium dark olive-brown. **Asci** broadly clavate, 4–8-spored, 35–50 × 22–30 µm. **Ascospores** ellipsoid, hyaline, 3(–5)-septate, 0–1(–2) longitudinal septa per segment, 20–27 × 8–12 µm; perispore present. **Campylidia** sessile, 0.4–0.8 mm wide, grey, with pale bluish tinge, especially toward the margin. **Conidia** filiform with 3–5 branches originating from single point, each branch 1–6-septate, 45–55 × 2–2.5 µm.

**Chemistry:** P–, K–, C–, UV–. No chemical compounds detected.

**Distribution and ecology:** Only known from the type locality in Suriname, corticolous on bark of the trunk of an *Coccoloba* tree.

**Notes:** The new species is not included in the key of the genus *Lasioloma* published by LÜCKING & SÉRUSIAUX (2001). The only species in that paper with 8-spored asci is *Lasioloma inexpectatum* R. Sant. & Lücking, but it has 7-septate ascospores, is foliicolous and known only from Africa. A species with (sub) muriform ascospores is *L. spinosum* Hafellner & Vězda, but the asci are 2–4-spored, the ascospores are 10–14-septate and it is known foliicolous from Indonesia. A species more recently described from Nicaragua is *L. appendiculata* Breuss, a corticolous species, only known from the type locality and only known with campylidia and conidia. Conidia are filiform with 4 branches originating from single point, each branch 2–4-septate. Two of the four branches have c. 5 µm long appendix, which is lacking in the new species.

**Zwackhiomyces parmotrematis** van den Boom, *sp. nov.* – Fig. 8 – MycoBank #828467

**Diagnosis:** A *Zwackhiomyces* species in thallus of *Parmotrema praesorediosum* similar to *Z. kantvilasii* S.Y. Kondratyuk, but differs in ascomata of 50–100 µm diam., immersed; ascus cylindrical, 8-spored; ascospores smooth, hyaline, 12–15(–17) × (4.5–)5–6 µm, locules without guttules.

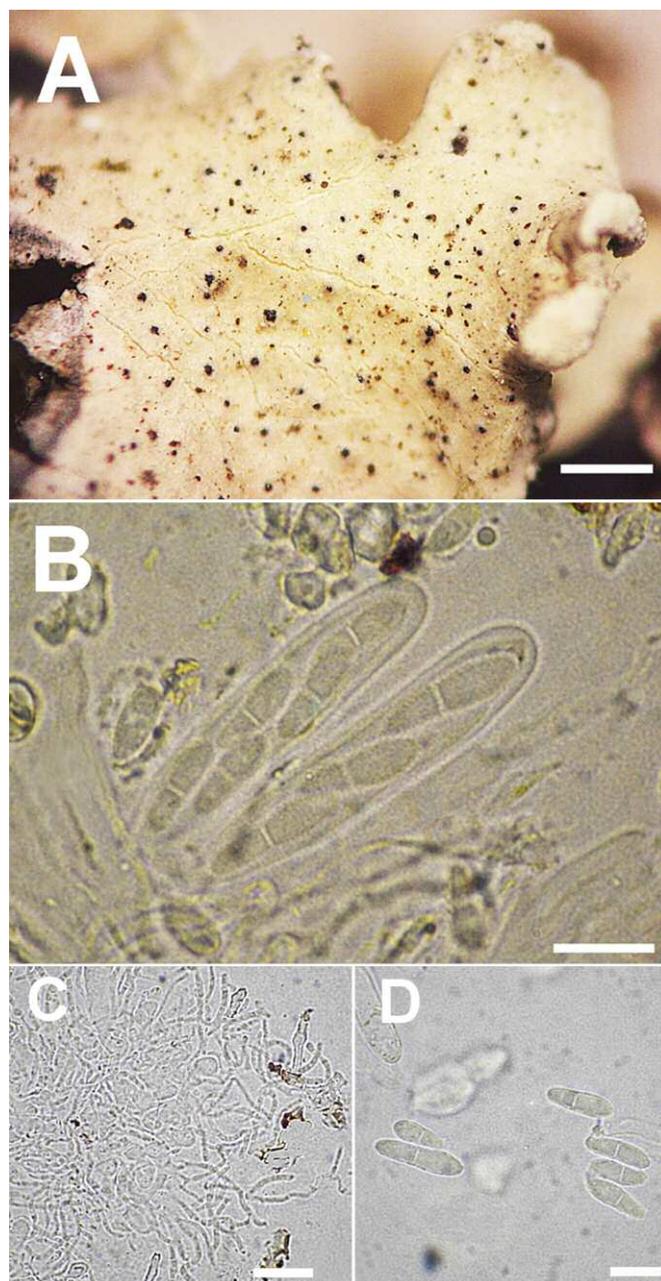
**Holotype:** SURINAME, prov. Saramacca, W of Paramaribo, 4 km W of Groningen, along main road (N side), abandoned *Citrus* orchard and trail along swamp, with unidentified trees and shrubs, 5° 49.40' N, 55° 30.30' W, 5 m, 24 February 2014, P. & B. van den Boom 50569 (BR, holotype; hb. van den Boom, isotype).

**Etymology:** The epithet refers to the host genus on which this lichenicolous fungus grows.

**Ascomata** perithecioid, black, globose, immersed in the thallus, 50–100 µm diam., scattered; perithecial wall pseudoparaplectenychmatous, in section up to 35 µm wide, with granular, dark brown to black intracellular pigments; hamathecial filaments abundant, branched and anastomosing, embedded in a gel, 1–1.5(–2) µm wide, l–. **Asci** fissitunicate, cylindrical, with a small ocular chamber, l–, 55–65 × 8–10 µm, 8-spored. **Ascospores** 1-septate, hyaline, with a smooth surface, ovoid to slightly clavate, 12–15(–17) × (4.5–)5–6 µm, without oil droplets in the lumina, not or rarely slightly constricted at the septum; a perispore not observed. **Conidiomata** not observed.

**Host:** On the thallus and apothecia of corticolous *Parmotrema praesorediosum* (Nyl.) Hale. It does not cause visible damage (discoloration, gall forming) of the host.

**Distribution and ecology:** The new species is known only from the type locality, on *Citrus* tree, growing abundantly on the host thallus, all over the host, in a habitat, rather rich in lichen species. Accompanying lichens observed are from the genera *Diorygma*, *Graphis*, *Malmidea* and *Phaeographis*.



**Fig. 8** – *Zwackhiomyces parmotrematis* (holotype). A = Habitus; B = Ascospores in ascus; C = Paraphyses; D = Ascospores. Scales: A = 0.5 mm, B = 10 µm, C = 20 µm, D = 10 µm.

**Notes:** Nearly all known species of *Zwackhiomyces* are supposed to be host-specific, as is made clear in the recent key by CALATAYUD *et al.* (2007). When comparing the new species with hitherto known *Zwackhiomyces* species, several characters can be considered.

The internal filaments are relatively thin in the new species. In other *Zwackhiomyces* species they vary from c. 1.5 to 3.5 µm in width (BRACKEL, 2008; CALATAYUD *et al.*, 2007; DIEDERICH & ZHURBENKO, 2009). This new, relative small species keys out as *Z. argentina* (Räsänen) D. Hawksw. & V. Atienza. The measurement of the ascospores in this latter species are comparable, 14–16 × 5–6 µm, but the perithecia are somewhat larger, 50–150 µm and the interascal filaments may be up to 3 µm wide. However it grows on *Acarospora* species in Argentina. Another comparable *Zwackhiomyces* species described from *Parmotrema perlatum* is *Z. kantvilasii*, but this species has clearly different characters: ascomata pseudoperithecioid, superficial to only immersed at base, of 140–200 µm diam., 4-spored asci, ascospores of 14.5–18 × 3.5–4(–5.5) µm, distinctly verrucose at maturity. It is only known from Tasmania (KONDRATYUK, 1996). In the recent papers about lichenicolous fungi of South America (ETAYO, 2002;

ETAYO & SANCHO, 2008), not any species of *Zwackhyomyces* is treated. In ETAYO (2017), lichenicolous species of Ecuador, are only treated two species of *Zwackhyomyces*, *Z. cladoniae* (Dodge) Diederich and *Z. coepulonus* (Norm.) Grube & Sant. However these species are different in many ways and known from *Cladonia* and *Xanthoria* respectively.

## Annotated species list of lichens

- Agonimia octospora* Coppins & P. James – Loc. 17 on palm, 50882  
*Agonimia tristicula* (Nyl.) Zahlbr. – Loc. 1 on palm, 50340; 21 on *Mangifera*, 51000  
*Amandinea efflorescens* (Müll. Arg.) Marbach – Loc. 1 on tree, 50348; 8 on palm, 50480; 17 on *Swietenia*, 50843  
*Anisomeridium albidoatrum* (Nyl.) R.C. Harris – Loc. 2 on *Mimosaceae*, 50354  
*Anisomeridium tamarindii* (Fée) R.C. Harris – Loc. 8 on tree, 51185  
*Arthonia microsperma* Nyl. – Loc. 8 on palm, 50470  
*Aspidothelium glabrum* Lücking, Aptroot & Sipman – Loc. 11 on *Citrus*, 50581  
*Astrothelium cinnamomeum* (Eschw.) Müll. Arg. – Loc. 13 on *Mangifera*, 50671  
*Astrothelium eustomum* (Mont.) Müll. Arg. – Loc. 16 on tree, 50787  
*Astrothelium leucosessile* Lücking, M. Nelson & Aptroot – Loc. 13 on *Mangifera*, 50675; 16 on *Citrus*, 50817, 50831  
*Astrothelium ochrothelium* (Nyl.) Müll. Arg. – Loc. 16 on *Citrus*, 50840  
*Astrothelium porosum* (Ach.) Aptroot & Lücking – Loc. 7 on *Citrus*, 51193; 8 on palm, 50472; 13 on *Mangifera*, 50675  
*Astrothelium pulcherrimum* (Fée) Aptroot & Lücking – Loc. 22 on dead fallen tree, 51006  
*Astrothelium scoria* (Fée) Aptroot & Lücking – Loc. 7 on *Citrus*, 50448; 11 on *Citrus*, 50571  
*Astrothelium sepultum* Mont. – Loc. 11 on *Citrus*, 50557. This specimen keys out as *Astrothelium norisianum* Lücking, M. P. Nelsen & Aptroot (APTROOT & LÜCKING, 2016). However, examination of specimens in B and the original descriptions of this species and the closely related *A. sepultum* show that pseudostromata are present in both species and that *A. norisianum* is better treated as synonym. This species is widely distributed in the Neotropics (APTROOT & LÜCKING, 2016).  
*Bacidia medialis* (Tuck. ex Nyl.) de Lesd. – Loc. 5 on *Syzygium*, 50388, 50389  
*Bacidina apiahica* (Müll. Arg.) Vězda – Loc. 14 on wood of fence-post, 50701. This species is recorded as foliicolous in VAN DEN BOOM & SIPMAN (2016).  
*Bactrospora myriadea* (Fée) Egea & Torrente – Loc. 11 on tree, 50597  
*Bulbothrix subdissecta* (Nyl.) Hale – Loc. 16 on *Citrus*, 50785; on *Citrus*, 50836  
*Byssoloma subdiscordans* (Nyl.) P. James – Loc. 10 on *Coccoloba*, 51186  
*Calicium hypercelloides* Nyl. – Loc. 14 on stump, 50681  
*Calopadia editae* Vězda ex Chaves & Lücking – Loc. 16 on palm, 50753; 26 on *Cassia*, 51178  
*Calopadia perpallida* (Nyl.) Vězda – Loc. 7 on *Citrus*, 50445  
*Calopadia pruinosa* Lücking & Chaves – Loc. 16 on palm, 50822  
*Calopadia subcoerulescens* (Zahlbr.) Vězda – Loc. 1 on palm, 50331. This species is recorded as foliicolous in VAN DEN BOOM & SIPMAN (2016).  
*Calopadia puiggarii* (Müll. Arg.) Vězda – Loc. 8 on *Citrus*, 50457; 11 on *Citrus*, 50574; 16 on *Mangifera*, 50763; 17 on palm, 50888; 21 on *Cecropia*, 50991. This species is recorded as foliicolous in VAN DEN BOOM & SIPMAN (2016).  
*Canoparmelia texana* (Tuck) Elix & Hale – Loc. 1 on palm, 50338; on palm, 50339  
*Carbacanthographis chionophora* (Redinger) Staiger & Kalb – Loc. 16 on *Citrus*, 50782  
*Chapsa lepieurii* (Mont.) Frisch – Loc. 16 on tree, 50751  
*Chrysothrix xanthina* (Vain.) Kalb – Loc. 8 on *Citrus*, 50453  
*Cladonia subradiata* (Vain.) Sandst. – Loc. 1 on palm, 50326; 18 on palm, 50906; 18 on stump, 50908; 23 on bark of fallen tree, 51015  
*Clathroporina turgida* (Vain.) Zahlbr. – Loc. 10 on tree, 50521, 50526  
*Coccocarpia erythroxyli* (Sprengel) Swinscow & Krog – Loc. 16 on *Citrus*, 50775  
*Coccocarpia palmicola* (Spreng.) Arvidss. & D.J. Galloway – Loc. 7 on *Citrus*, 50443; 17 on palm (fertile), 50874; 21 on *Mangifera* (fertile), 50981; 23 on tree, 51017  
*Coenogonium lepieurii* (Mont.) Nyl. – Loc. 11 on tree, 50556; 16 on tree, 50757; 20 on tree, 50969, on *Mangifera*, 50970; 21 on tree, 50990  
*Coenogonium linkii* Ehrenb. – Loc. 12 on tree, 50602; 16 on mandarin tree, 50796  
*Coenogonium lisowskii* (Vězda) Lücking – Loc. 9 on tree, 50487. This species is recorded as foliicolous in VAN DEN BOOM & SIPMAN (2016).  
*Coenogonium* cf. *nepalense* (G. Thor & Vězda) Lücking, Aptroot & Sipman – Loc. 6 on *Cassia*, 50431, 50439; 11 on tree, 50595, 50599; 21 on *Cecropia*, 50992  
*Coenogonium siquirrense* f. *denticulatum* Rivas Plata & Lücking – Loc. 25 on tree, 51030, 51148  
*Coniocarpus cinnabarinum* DC. – Loc. 5 on *Syzygium*, 50385  
*Cratiria lauricassiae* (Fée) Marbach – Loc. 5 on tree, 50400  
*Cresponea flava* (Vain.) Egea & Torrente – Loc. 8 on palm, 50476  
*Cresponea lepieurii* (Mont.) Egea & Torrente – Loc. 5 on *Syzygium*, 50382; 27 on tree, 51182  
*Crocynia gossypina* (Sw.) A. Massal. – Loc. 25 on tree (fertile), 51028  
*Crocynia pyxinooides* Nyl. – Loc. 16 on *Citrus*, 50780  
*Cryptothecia striata* G. Thor – Loc. 23 on tree, 51018  
*Dichosporidium nigrocinctum* (Ehrenb.) G. Thor – Loc. 11 on tree, 50596; 21 on *Mangifera*, 50978 (fertile)  
*Dimidiographa* cf. *longissima* (Müll. Arg.) Ertz & Tehler – Loc. 6 on *Albizia*, 50426; 8 on tree, 50461. The ascospores are 3–5-septate but slightly smaller than in *D. longissima*.  
*Diorygma confluens* (Fée) Kalb, Staiger & Elix – Loc. 14 on *Mangifera*, 50687  
*Diorygma epiglaucum* (Müll. Arg.) Kalb, Staiger & Elix – Loc. 11 on *Citrus*, 50566; 15 on tree, 50703; 20 on *Citrus*, 50973  
*Diorygma hieroglyphicum* (Pers.) Staiger & Kalb – Loc. 5 on tree, 50405  
*Diorygma* aff. *intermedium* Kalb, Staiger & Elix – Loc. 11 on *Citrus*, 50584. The specimen keys out as *Diorygma intermedium* in KALB *et al.* (2004). The ascospores are 70–85 × 20–25 µm. However the perispore is rather wide, up to 8 µm wide and the central spore loculus are regularly arranged in rows 16–20/6–8 locular. More material is needed to verify whether this is a new species or not.  
*Diorygma poitaei* (Fée) Kalb, Staiger & Elix – Loc. 7 on *Citrus*, 50441; 10 on tree, 50520; 12 on tree, 50646, 50656; 16 on *Citrus*, 50829; 21 on tree, 50987. This species is published from Suriname by KALB *et al.* (2004).  
*Diorygma pruinatum* (Eschw.) Kalb, Staiger & Elix – Loc. 11 on *Citrus*, 50577  
*Diorygma reniforme* (Fée) Kalb, Staiger & Elix – Loc. 18 on tree, 50909  
*Diplolabia afzelii* (Ach.) A. Massal. – Loc. 7 on *Citrus*, 50442; 13 on *Mangifera*, 50666  
*Dirinaria aegialita* (Afz. in Ach.) Moore – Loc. 1 on palm, 50330  
*Dirinaria applanata* (Fée) Awasthi – Loc. 8 on palm, 50471; 16 on *Citrus*, 50776, 50783  
*Dirinaria confluens* (Fr.) Awasthi – Loc. 5 on tree, 50406; 8 on palm, 50481  
*Dirinaria papillulifera* (Nyl.) Awasthi – Loc. 1, on palm, 50333; 1 on tree, 503528; 8 on tree, 50462; 17 on *Swietenia*, 50845  
*Dirinaria picta* (Sw.) Clem. & Shear – Loc. 8 on *Citrus*, 50458; 8 on palm, 50475; 13 on *Mangifera*, 50667  
*Enterographa tropica* Sparrius – Loc. 5 on *Syzygium*, 50397; 8 on palm, 50478, 50482; 10 on *Coccoloba*, 50517. All these specimens

- have roccellic acid by TLC and ascospores similar to *E. tropica*, mostly 7-septate, with rather thick outer wall, no distinct gelatinous sheath, about 32–38(–43) × 4–4.75 µm. *E. tropica* was described as having no substances but roccellic acid might be easily overlooked in TLC, or missed when TLC is not done on glass plates to verify also the fatty acids such as roccellic. In our material, the thallus varies from brownish to greenish, apothecia surrounded by a white rim, epruinose and pycnidia with similar conidia as in *E. tropica* are sometimes present but might also be absent. Ascospores of *E. tropica* were described as having a gelatinous sheath (SPARRIUS, 2004) but we could not see it when we examined the holotype of that species.
- Flakea papillata* O.E. Erikss. – Loc. 4 on cocoa, 50370; 16 on tree, 50814
- Glyphis cicatricosa* Ach. – Loc. 13 on *Mangifera*, 50668; 17 on tree, 50899
- Graphis aquilonia* (A.W. Archer) Staiger – Loc. 11 on *Citrus*, 50568
- Graphis caesiella* Vain. – Loc. 13 on *Mangifera*, 50663
- Graphis dendrogramma* Nyl. – Loc. 5 on tree, 50404, 50412, 50413
- Graphis dracena* Vain. – Loc. 16 on palm, 50754
- Graphis furcata* Fée – Loc. 5 on *Syzygium*, 50396; 8 on *Citrus*, 50454; 8 on palm, 50468
- Graphis glaucescens* Fée – Loc. 5 *Syzygium*, 50394; 5 on *Cecropia*, 50391; 6 on shrub, 50428; 10 on *Coccoloba*, 50512; 11 on *Citrus*, 50572, 50576; 11 on tree, 50565; 12 on tree, 50648; 16 on tree, 50752, 50808, 50819, 50820; 16 on cocoa, 50799; 17 on palm, 50894; 20 on *Citrus*, 50976; 23 on tree, 51016; 27 on tree, 51183
- Graphis hiascens* (Fée) Nyl. – Loc. 1 on tree, 50325, 50346; 6 on *Albizia*; 17 on *Swietenia*, 50841
- Graphis leptocarpa* Fée – Loc. 17 on palm, 50893
- Graphis longula* Kremp. – Loc. 16 on *Citrus*, 50786
- Graphis miniata* Redinger – Loc. 16 on *Citrus*, 50781; 20 on *Citrus*, 50972
- Graphis rhizocola* (Fée) Lücking & Chaves – Loc. 7 on *Citrus*, 50450; 13 on *Mangifera*, 50660; 16 on *Citrus*, 50779
- Graphis sayeri* Müll. Arg. – Loc. 21 on *Aucuba*, 51005
- Graphis scripta* (L.) Ach. – Loc. 16 on palm, 51195; 12 on tree, 50606
- Graphis streblocarpa* (Bél.) Nyl. – Loc. 6 on *Albizia*, 50421
- Graphis subchrysocarpa* Lücking – Loc. 7 on *Citrus*, 50440; 10 on *Coccoloba*, 50514
- Graphis vestitoides* (Fink) Staiger – Loc. 16 on *Citrus*, 50834
- Helminthocarpon leprevostii* Fée – Loc. 17 on tree, 50903
- Herpothallon aurantiacoflavum* (B. de Lesd.) Aptroot, Lücking & G. Thor – Loc. 25 on tree, 51162
- Herpothallon rubromaculatum* G. Thor – Loc. 25 on tree, 51166
- Heterodermia albicans* (Pers.) Swinc. & Krog – Loc. 1 on palm, 50332
- Hyperphyscia mobergii* Kalb – Loc. 6 on *Albizia*, 50416
- Hyperphyscia pandani* (H. Magn.) Moberg – Loc. 6 on *Albizia*, 50425
- Lecanora helva* Stizenb. – Loc. 1 on tree, 50353; 8 on palm, 50467
- Leptogium azureum* (Sw.) Mont. – Loc. 11 on *Citrus*, 50586; 13 on *Mangifera*, 50672; 17 on tree, 50901
- Leptogium chloromelum* (Sw.) Nyl. – Loc. 1 on palm, 50336; 2 on *Mimosaceae*, 50357; 7 on *Citrus*, 50449; 17 on palm, 50870; 21 on *Mangifera*, 51100
- Leptogium cyanescens* (Rabenh.) Körb. – Loc. 16 on cocoa, 50800; 17 on palm, 50881, 50884
- Leptogium denticulatum* F. Wilson – Loc. 17 on palm, 50877
- Leptogium marginellum* (Swartz) Gray – Loc. 7 on *Citrus*, 50447; 10 on *Hymenaea*, 50529; 26 on *Cassia*, 51177
- Leptogium phyllocarpum* (Pers.) Nyl. aggr. – Loc. 17 on palm, 50883
- Leptotrema wightii* (Tayl.) Müll. Arg. – Loc. 6 on *Albizia*, 50422; 17 on *Swietenia*, 50842
- Letrouitia domingensis* (Pers.) Hafellner & Bellem. – Loc. 5 on *Syzygium*, 50386; 12 on tree, 50655
- Letrouitia vulpina* (Tuck.) Hafellner & Bellem. – Loc. 16 on tree, 50803, 50804
- Leucodecton bisporum* (Nyl.) Sipman & Lücking – Loc. 12 on tree, 50603
- Leucodecton compunctellum* (Nyl.) Frisch – Loc. 1 on palm, 50327
- Leucodecton glaucescens* (Nyl.) Frisch – Loc. 1 on palm, 50341, 50349
- Malmidea bacidinoidea* Lücking – Loc. 4 on cocoa, 50368; 5 on tree, 50409
- Malmidea* cf. *badimioidea* (Cáceres & Lücking) Cáceres & Kalb – Loc. 11 on tree, 50550, 50560; 16 on tree, 50810. With BREUSS & LÜCKING (2015) these specimens key out as *Malmidea badimioidea*, but the K+ green reaction of the excipulum is lacking.
- Malmidea fuscella* (Müll. Arg.) M. Cáceres & Lücking – Loc. 11 on tree, 50562; 12 on tree, 50601
- Malmidea granifera* (Ach.) Kalb et al. – Loc. 11 on *Citrus*, 50579; 16 on tree, 50789; 25 on tree, 51152, 51163; 27 on tree, 51180
- Malmidea gyalectoides* (Vain.) Kalb & Lücking – Loc. 11 on tree, 50552; 25 on tree, 51153; 25 on liane, 51022
- Malmidea leptoloma* (Müll. Arg.) Cáceres & Lücking – Loc. 5 on *Syzygium*, 50384; 11 on *Citrus*, 50578; 25 on tree, 51037
- Malmidea piperis* (Spreng.) Kalb et al. – Loc. 12 on tree, 50605; 25 on tree, 51156
- Malmidea rhodopsis* (Tuck.) Kalb – Loc. 25 on tree, 51158
- Malmidea vinosa* (Eschw.) Kalb et al. – Loc. 11 on *Citrus*, 50575; 16 on tree, 50813
- Mazosia praemorsa* (Stirt.) R. Sant. – Loc. 24 on leaf, 51067
- Mazosia pseudobambusae* Kalb & Vězda – Loc. 24 on leaf, 51068
- Mazosia rotula* (Mont.) A. Massal. – Loc. 16 on leaf, 50724; 25 on leaf, 51146
- Mazosia tenuissima* Lücking & Matzer – Loc. 24 on leaf, 51068a. This specimen was found in the collection of *Mazosia pseudobambusae*.
- Mazosia uniseptata* Lücking – Loc. 24 on leaf, 51064
- Myriotrema* cf. *album* Fée – Loc. 25 on tree, 51034. This specimen has no chemical compounds (tlc) and ascospores of 17–22 × 6–7 µm, 3–5 septate; the pore is relative small, c. 50 µm.
- Myriotrema glauculum* (Nyl.) Hale – Loc. 22 on dead fallen tree, 51007
- Neosergipea* cf. *hyphosa* Aptroot & M. Cáceres – Loc. 17 on Mahony, 50846. The identification is uncertain because the species was described with immature ascomata not allowing comparison of the ascospores. We have found fusiforme ascospores of c. 25 × 5 µm, 5–6-septate, hyaline and 8 per ascus.
- Nigrovothelium tropicum* (Ach.) Lücking et al. – Loc. 7 on *Citrus*, 50444
- Ocellularia bahiana* (Ach.) A. Frisch – Loc. 1 on palm, 50337
- Ocellularia* cf. *fecunda* (Vain.) Hale – Loc. 25 on liana, 51150. While all other characters fit well with the description in SIPMAN et al. (2012), we could not find chemical compounds by tlc.
- Ocellularia perforata* (Leight.) Müll. Arg. – Loc. 25 on tree, 51024
- Ocellularia rhodostroma* (Mont.) Zahlbr. – Loc. 25 on tree, 51033
- Ocellularia subpyrenuloides* Lücking – Loc. 25 on tree, 51023
- Ocellularia vezdana* Frisch – Loc. 4 on cocoa, 50372; 25 on tree, 51029
- Ocellularia violacea* Räsänen – Loc. 25 on liana, 51021, on tree, 51031, 51161
- Opegrapha* cf. *aperiens* Vain. – Loc. 5 on *Syzygium*, 50398
- Parmotrema latissimum* (Fée) Hale – Loc. 1 on palm, 50317; 17 on palm, 50876
- Parmotrema praesorediosum* (Nyl.) Hale – Loc. 6 on tree, 50429; 11 on *Citrus*, 50570; 17 on palm, 50875
- Parmotrema sulphuratum* (Nees & Flotow) Hale – Loc. 11 on *Citrus*, 50567; 14 on wood of fence post, 50697; 16 on *Citrus*, 50778
- Parmotrema tinctorum* (Nyl.) Hale – Loc. 1 on palm, 50322
- Phaeographis* aff. *caesiodisca* Staiger – Loc. 11 on *Citrus*, 50573
- Phaeographis caesioradians* (Leight.) A.W. Archer – Loc. 11 on *Citrus*, 50558
- Phaeographis* cf. *epruinosa* (Redinger) Staiger – Loc. 20 on *Citrus*, 50974. In STAIGER (2002) the specimen keys out as *P. epruinosa*. Our

specimen has a clear hymenium and muriform ascospores of c. 40 × 12 µm. No chemical compound has been found by tlc.

*Phaeographis haematites* (Fée) Müll.Arg. – Loc. 11 on *Citrus*, 50559; 18 on tree, 50907

*Phaeographis intricans* (Nyl.) Staiger – Loc. 17 on tree, 50900

*Phaeographis leiogrammodes* (Kremp.) Müll. Arg. – Loc. 13 on *Mangifera*, 50659

*Phaeographis scalpturata* (Ach.) Staiger – Loc. 7 on *Citrus*, 50446; 10 on *Coccoloba*, 50513; 13 on *Mangifera*, 50662; 16 on *Citrus*, 50830; 17 on tree, 50896

*Physcia atrostriata* Moberg – Loc. 16 on *Citrus*, 50773, 50815

*Physcia fragileszens* Zahlbr. – Loc. 2 on *Mimosaceae*, 50355; 10 on *Hymenaea*, 50528; 16 on *Citrus*, 50777, 50832; 17 on palm, 50880, 50892

*Physcia undulata* Moberg – Loc. 11 on *Citrus*, 50582

*Placynthiella dasaea* (Stirt.) Tønsberg – Loc. 18 on stump, 50914

*Platythecium grammitis* (Fée) Staiger – Loc. 20 on *Citrus*, 50977

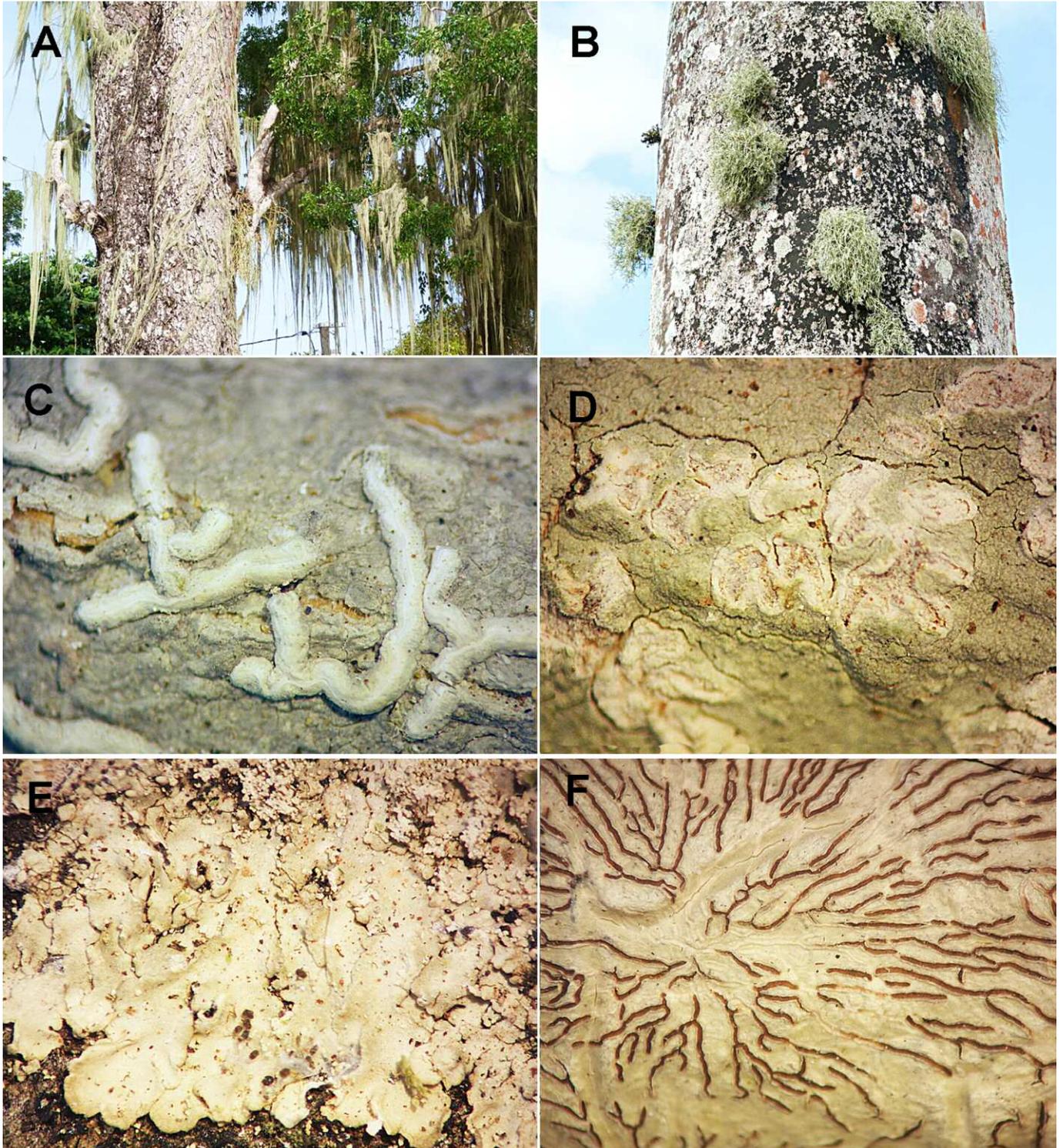
*Porina curtula* Malme – Loc. 12 on palm, 50657; 25 on tree, 51036

*Porina exasperatula* Vain. – Loc. 22 on tree, 51010

*Porina farinosa* C. Knight – Loc. 15 on tree, 50702

*Porina guaranítica* Malme – Loc. 12 on palm, 50658; 16 on tree, 50802

*Porina internigrans* (Nyl.) Müll. Arg. – Loc. 13 *Mangifera*, 50674



**Fig. 9** – A= *Ramalina anceps* on *Swietenia*; B= *Ramalina dendriscooides* on palm; C= *Carbacanthographis chionophora* 50782 (habitus); D= *Diorygma pruinosa* 50577(habitus); E= *Hyperphyscia mobergii* 50416 (habitus); F= *Platythecium grammitis* 50977 (habitus).

*Porina mastoidea* (Ach.) Müll. Arg. – Loc. 16 on tree, 50788, 50790, 50805, 50811; 16 on cocoa, 50824

*Porina nucula* Ach. – Loc. 1 on palm, 50324; 11 on tree, 50600; 16 on *Citrus*, 50795

*Porina simulans* Müll. Arg. – Loc. 16 on tree, 50758

*Porina tetracerae* (Ach.) Müll. Arg. – Loc. 24 on tree, 51041

*Pseudopyrenula thallina* Lücking & Aptroot – Loc. 12 on tree, 50650

*Pyrenula astroidea* (Fée) R.C. Harris – Loc. 21 on *Aucuba*, 51003

*Pyrenula confinis* (Nyl.) R.C. Harris – Loc. 8 on palm, 50473; 10 on *Coccoloba*, 50510

*Pyrenula* cf. *costaricensis* Müll. Arg. – Loc. 13 on *Mangifera*, 50669

*Pyrenula parvinuclea* (Meyen & Flot.) Aptroot – Loc. 5 on tree, 50399

*Pyrenula thelomorpha* Tuck. – Loc. 5 on tree, 50402

*Pyxine cocoes* (Sw.) Nyl. – Loc. 1 on palm, 50321; 2 on tree, 50363

*Pyxine coralligera* Malme – Loc. 17 on palm, 50873

*Pyxine obscurascens* Malme – Loc. 16 on *Citrus*, 50774, 50784, 50835

*Pyxine subcinerea* Stirt. – Loc. 17 on palm, 50869

*Ramalina anceps* (Ach.) Lücking *et al.* – Loc. 17 on *Swietenia*, 50848, 50849, 50853; 17 on palm, 50855, 50866, 50868

*Ramalina complanata* (Sw.) Ach. – Loc. 17 on palm, 50859

*Ramalina dendriscooides* Nyl. – Loc. 17 on *Swietenia*, 50847, 50857; 17 on palm, 50852, 51184

*Ramonia microspora* Vězda – Loc. 9 on tree, 50485

*Roccellina leptothalla* (Malme) Ertz & Tehler – Loc. 1 on palm, 50318; 5 on *Syzygium*, 50393

*Sarcographa heteroclita* (Mont.) Zahlbr. – Loc. 12 on tree, 50651; 16 on *Citrus*, 50816

*Sarcographa labyrinthica* (Ach.) Müll. Arg. – Loc. 11 on *Citrus*, 50555; 18 on tree, 50911

*Sarcographa ramificans* (Kremp.) Staiger – Loc. 12 on tree, 50652

*Stegobolus berkeleyanus* Mont. – Loc. 24 on tree, 51039

*Sticta weigeli* (Ach.) Vain. s.l. – Loc. 16 on cocoa, 50823; 20 on *Citrus*, 50975

*Strigula phaea* (Ach.) R.C. Harris – Loc. 9 on tree, 50483; 11 on tree, 50593; 12 on tree, 50608; 16 on tree, 50760

*Synnesia leprobola* Nyl. ex Tehler – Loc. 6 on *Albizia*, 50424; 14, on *Mangifera*, 50683

*Thelenella paraguayensis* Malme – Loc. 26 on *Cassia*, 51170

*Thelotrema adjectum* Nyl. – Loc. 24 on tree, 51042

*Thelotrema* cf. *conveni*ens Nyl. – Loc. 25 on liana, 51194. This species keyed out as *T. conveniens* in SIPMAN *et al.* (2012), but the pore in our specimen is rather small, 50–100 µm.

*Tylophoron hibernicum* (D. Hawksw., Coppins & P. James) Ertz *et al.* – Loc. 21 on *Mangifera*, 50979; 23 on tree, 51019

*Waynea californica* Moberg – Loc. 17 on palm, 50878

*Wirthotrema glaucopallens* (Nyl.) Rivas Plata & Kalb – Loc. 25 on tree, 51157

## Annotated species list of lichenicolous fungi

*Cornutispora ciliata* Kalb – Loc. 8 on palm, on *Dirinaria*, 50466; 14 on wood of fence post, on *Dirinaria*, 50700

*Lichenodiplis lecanorae* (Vouaux) Dyko & D. Hawksw. – Loc. 17 on palm, on *Ramalina*, 50865. This species is known from a wide range of hosts, including micro- and macrolichens. However, it is so far not mentioned from *Ramalina*.

*Mazosia adelphoparasitica* Matzer – Loc. 24 on leaf, 51069; 25 on leaf, 51091, on *Mazosia* cf. *melanophthalma*, a new host. In MATZER (1996) this species is described from one (type) locality in Costa Rica.

*Melaspileopsis diplasiospora* (Nyl.) Ertz & Diederich – Loc. 17 on *Swietenia*, on *Graphis*, 51191

*Ovicuculispora parmeliae* (Berk. & M.A. Curt.) Etayo – Loc. 8 on *Citrus* on *Dirinaria*, 50459; 13 on *Mangifera*, on *Dirinaria*, 50673

*Stigidium ramalinae* (Müll. Arg.) Etayo & Diederich – Loc. 17 on palm, on *Ramalina*, 50867

*Xenonectriella* aff. *leptalea* (J. Steiner) Rossmann & Lowen – Loc. 17 on palm, 50886, 50890, on *Physcia* sp. The ascospores in these specimens are 6–9 × 5–5.5 µm, which is rather smaller than in the original material, 8–12 × 6.5–8 µm (ROSSMAN *et al.*, 1999). The habitus is rather the same. Our specimens may be related with the Ecuador specimen, published in ETAYO (2017). His saxicolous specimen has ascospores of 7–9.5 × 5–7 µm.

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