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# Results of a botanical expedition to Mount Roraima, Guyana. II. Lichens

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**Abstract:** Lichen exploration of the Upper Mazaruni District, Guyana yielded 273 species, of which 179 were found for the first time in the Guianas and 13 were as yet undescribed. A list of all taxa encountered is presented, with indications of habitat and distribution in the investigated area as well as first descriptions for the following 7 species: *Buellia aptrootii*, *Byssoloma farkasii*, *Myriotrema guianense*, *M. neofrondosum*, *M. subdactyliferum*, *Ocellularia astrolucens*, and *Thelotrema albomaculatum*. *Mazosia bambusae* is recorded for the first time from the Neotropics. The richest areas for lichens appear to be the rocky tablelands with scrub vegetation on top of the lower mountains. The slopes of Mount Roraima are of special interest because they support some montane species which are unlikely to be found elsewhere in the Guianas; otherwise they are less rich in lichens, probably because of the high humidity, which favours bryophyte growth.

In the framework of the FLORA OF THE GUIANAS PROJECT, which aims at a Flora for Guyana, Surinam, and French Guiana, an expedition to Guyana (former British Guiana) was organized in 1985 by the Institute of Systematic Botany of Utrecht State University, The Netherlands. This expedition included a group mainly interested in cryptogams, whose principal goal was to investigate the flora of Mount Roraima. The leader of this group was the bryologist Dr. S. R. Gradstein, who kindly invited the authors to join in order to study the lichen flora. The localities visited are situated in the Upper Mazaruni District of Guyana. This area is dominated by extremely poor sandstone formations with low forest or savannah vegetation. Tall forest is mainly restricted to the neighbourhood of rivers. The bryological results have been published as "Results of a botanical expedition to Mount Roraima, Guyana, part I" (Gradstein & Florschütz-de Waard 1989), where more details about the expedition and the localities visited, including a map, can be found.

The following lichens have already been

reported from Mount Roraima, mainly by Massee (after Hekking & Sipman 1988: 223): *Alectoria ochroleuca*, *Anzia dictyorhiza* (syn. *Parmelia dictyorhiza*, cf. Yoshimura 1987: 189), *Cladina rangiferina*, *Cladonia capitellata* f. *interhiascens*, *C. fallax*, *C. vicaria*, *Parmotrema perforatum* and *Sphaerophorus melanocarpus*. They are likely to originate from the Venezuelan side of the mountain (Steyermark 1981), and not from the area in Guyana visited by the expedition. Most of them are doubtful records, because the names have been used in the past in a different sense, and the taxa as currently understood are unlikely to occur on Roraima. However, the following records can be assumed to be correct: *Anzia dictyorhiza* (Massee) Yoshim., apparently a rare taxon not known with certainty from elsewhere, *Cladina rangiferina* and *Sphaerophorus melanocarpus*, the latter two widespread species on neotropical mountains. None of these species has been found on the Guyanese side of Mount Roraima during the 1985 expedition, but one, *Cladina rangiferina*, has been found on lower mountains nearby.

The only previous lichen collections from the Upper Mazaruni District appear to be those made by Dr. P.J.M. Maas and collaborators. Only two of these collections, which are preserved in (U), have been published as yet: *Cladina densissima* (Ahti 1984: 38, type) and *Cladonia secundana* (Stenroos 1989: 250). The lichen flora of the area, and indeed of most of Guyana, should be considered as poorly known, because previous collections were mostly made in coastal regions, and no systematic lichen collecting in Guyana has been undertaken before (cf. Hekking & Sipman 1988: 219-220).

The total number of lichen specimens collected during the expedition in the Upper Mazaruni District is nearly 1700. Of these about 950 are now identified to species level. They belong to 273 species and 3 additional infraspecific taxa. The majority of these, 179 taxa, appear to be unrecorded from the Guianas, as a comparison with the recent checklist (Hekking & Sipman 1988, recognizing 364 taxa) shows. Thirteen species appear to be unknown to science. Of these, six have been described already or are being described elsewhere (*Bulbothrix leprieurii*, *Heterodermia flavosquamosa*, *Parmotrema aptrootii*, *P. aurantiacoparvum*, *P. verrucisetosum*, *Porina tetralocularis*). The remaining seven new species are described in this paper (*Buellia aptrootii*, *Byssoloma farkasii*, *Myriotrema guianense*, *M. neofrondosum*, *M. subdactyliferum*, *Ocellularia astrolucens*, *Thelotrema albomaculatum*). So far, at least seven publications have treated material collected during the expedition: Ahti 1990, Aptroot 1988, 1991, Brako 1991, Sipman 1990, 1991, Sipman & van Aubel 1992.

A systematically arranged list of all taxa is presented below, with indications of habitat and altitudinal range in the investigated area, distribution with pertinent collection numbers, and incidental notes. The systematic arrangement largely follows Eriksson & Hawksworth (1991), with occasional changes according to the author's opinions. Taxa new to the Guianas are marked by an asterisk. The collections are kept in the herbarium of the Botanical Museum Berlin-Dahlem (B) and (mainly the families Parmeliaceae and Physciaceae) in the Cryptogamic Herbarium of the University of Utrecht (U). A representative set of duplicates will be deposited in the Guyanan National Herbarium in Georgetown (BRG). Herbarium abbreviations, as used for specimens not collected during the expedition, follow Index Herbariorum, except ARA for the Herbarium Amazonicum, Araracuara, Colombia. For chemical analyses the standard TLC method has been used, as described by White & James (1985), using solvent system A and occasionally G (Culberson et al. 1981). The list is presented in spite of the fact that only about two-thirds of the lichen material has been evaluated so far, because it seemed inappropriate to wait longer for more complete results. The unidentified samples belong mostly to groups for which adequate identification is impossible until basic taxonomic revisions have become available, such revisions being unlikely in the immediate future. Indications of the numbers of unidentified specimens are given with their nearest relatives. A further 100 samples, whose taxonomic position is unclear due to the absence of

ascomata, are omitted.

**Annotated list of species**

**ASCOMYCETES**

ARTHONIALES

Arthoniaceae

****Arthonia accolens*** Stirt. - Foliicolous in undergrowth of tall riverine forest, 500 m alt. Jawalla: 18447. Already cited by Sipman (1991: 138).

****Arthonia aciniformis*** Stirt. - Foliicolous in undergrowth of tall or lower forest, 500-800 m alt. Jawalla: 18447c; Kamarang: 18930; Latipu (foot): 19010d; Pwipwitipu trail: 19221d, 19308d. Already cited by Sipman (1991: 138).

***Arthonia cyanea*** Müll. Arg. - Foliicolous in undergrowth of various forest types, 500-800 m alt. Kamarang: 18214e, 18945f; Jawalla: 18447b; Waruma trail: 18547; Pwipwitipu trail: 19313d.

****Arthonia trilocularis*** Müll. Arg. - Foliicolous in undergrowth of several forest types, 500-800 m alt. Jawalla: 18447d; Kamarang: 18930b; Latipu (foot): 19010f; Pwipwitipu trail: 19314.

***Cryptothecia candida*** (Kremp.) R. Sant. - Foliicolous in undergrowth of tall forest near river, c. 600 m alt. Waramadan: 19222b.

***Cryptothecia rubrocincta*** (Ehrenb.) Thor (syn.: *Chiodecton sanguineum* (Sw.) Vainio) - Epiphytic in low forest or cultivated areas, 500-800 m alt. Kamarang: 18144; Pwipwitipu trail: 19249, 19409.

****Stirtonia sprucei*** R. Sant. - Foliicolous in undergrowth of forest, 500-800 m alt. Jawalla: 18443c; Kamarang: 18934b; Waramadan: 19222c; Pwipwitipu trail: 19316. Already cited by Sipman (1991: 141).

About 20 specimens, mostly *Arthonia*, were left unidentified.

Opegraphaceae

****Mazosia bambusae*** (Vainio) R. Sant. - Foliicolous in undergrowth of forest, c. 500 m alt. Waruma trail: 18542g; Kamarang: 18938c; Waramadan: 19230p. Already cited by Sipman (1991: 140, as *M. pseudobambusae* Kalb & Vezda). However, the specimens differ from *M. pseudobambusae* by the presence of brown crystal aggregates in the thallus warts. This is the first record of the species in the Neotropics.

***Mazosia dispersa*** (Hedrick) R. Sant. - Foliicolous in undergrowth of forest, 500-550 m alt. Kamarang: 18214c, 18938d; Jawalla: 18450e; Waruma trail: 18542f, 18633b.

***Mazosia melanophthalma*** (Müll. Arg.) R. Sant. - Foliicolous in undergrowth of forest, 500-800 m alt. Jawalla: 18450; Waruma trail: 18543d; Roraima: 18736c; Kamarang: 18939; Latipu (foot): 19010; Waramadan: 19229f; Pwipwitipu trail: 19317c, 19318.

***Mazosia phyllosema*** (Nyl.) A. Zahlbr. - Foliicolous in undergrowth of forest, 500-600 m alt. Jawalla: 18450d; Waruma trail: 18543c; Roraima: 18736b; Kamarang: 18939f; Waramadan: 19230o.

****Mazosia pilosa*** Kalb & Vezda - Foliicolous in undergrowth of forest, 500-800 m alt. Jawalla: 18450g; Kamarang: 18939e; Waramadan: 19230n; Pwipwitipu trail: 19318b. Already cited by Sipman (1991: 147).

***Mazosia praemorsa*** (Stirt.) R. Sant. - Foliicolous in undergrowth of forest, 500-800 m alt. Kamarang: 18214b, 18938b; Jawalla: 18450i; Waruma trail: 18542e; Roraima: 18736a; Latipu (foot): 19010c; Waramadan: 19230; Pwipwitipu trail: 19320c.

***Mazosia rotula*** (Mont.) Mass. - Foliicolous in undergrowth of forest, 500-800 m alt. Kamarang: 18244b, 18938; Jawalla: 18450b; Waruma trail: 18543b; Latipu (foot): 19010b; Waramadan: 19230b; Pwipwitipu trail: 19318c.

***Mazosia rubropunctata*** R. Sant. - Foliicolous in undergrowth of forest, uncommon, c. 800 m alt. Pwipwitipu trail: 19320d.

***Mazosia tumidula*** (Stirt.) Müll. Arg. - Foliicolous in undergrowth of forest, c. 500 m alt. Kamarang: 18215b; Jawalla: 18450c; Waruma trail: 18543; Waramadan: 19230q.

***Opegrapha filicina*** Mont. - Foliicolous in undergrowth of forest, 500-800 m alt. Jawalla: 18448; Kamarang: 18939b; Pwipwitipu trail: 19313b.

Unidentified material of this family includes c. 20 specimens of *Chiodecton* s.l., 1 of *Enterographa* s.l., 9 of *Lecanactis*, and over 20 of *Opegrapha*.

CALICIALES

Caliciaceae

****Tylophoron crassiusculum*** Tibell - Epiphyte on *Persea* in village, c. 500 m alt. Jawalla: 18300. Already cited by Sipman (1991: 141).

****Tylophoron protrudens*** Nyl. - On trunks of relic trees in cultivated area or in forest and savannah, 500-800 m alt. Kamarang: 18184; Jawalla: 18398; Pwipwitipu trail: 19417. Already cited by Sipman (1991: 141).

Coniocybaceae

****Chaenotheca brunneola*** (Ach.) Müll. Arg. - Usually on dry bark of dead, standing tree trunks in forest, often on slightly overhanging faces which are protected against rain, occasionally on wood, 800-1000 m alt. Latipu: 19092; Pwipwitipu trail: 19419, 19420, 19473, 19495. Already cited by Sipman (1991: 139).

Sphinctrinaceae

****Pyrgidium monticellum*** (Beltr.) Tibell - On 10 cm. diam. tree trunk in low forest, c. 600 m alt. Latipu (foot): 18977. Already cited by Sipman (1991: 141).

DOTHIDEALES

Arthopyreniaceae

****Mycomicrothelia hemisphaerica*** (Müll. Arg.) D. Hawksw. - Epiphyte in cultivated area, c. 500 m alt. Jawalla: 18367 pr.p. Already cited by Aptroot (1991: 132).

****Mycomicrothelia miculiformis*** (Nyl. ex Müll. Arg.) D. Hawksw. - Epiphyte in light savannah-forest, c. 500 m alt. N of Kamarang: 18273.

Mycoporaceae

****Tomasellia sparsella*** (Nyl.) Harris - Epiphyte in cultivated area, c. 500 m alt. Jawalla: 18367a.

GRAPHIDALES

Graphidaceae

***Glyphis cicatricosa*** Ach. - Epiphyte on *Citrus* in garden, 500 m alt. Kamarang: 18115b.

***Graphis afzelii*** Ach. - Photophytic epiphyte in gardens or savannah, 500-800 m alt. Kamarang: 18158; Jawalla: 18361; Mayoripai: 18522; Pwipwitipu trail: 19345.

***Phaeographina chrysocarpa*** (Raddi) Redgr. - Epiphyte on free-standing trees in cultivated area or savannah, 500-600 m alt. Kamarang: 18132; Jawalla: 18290, 18359; Waramadan: 19183.

****Phaeographis exaltata*** (Mont. & v. d. Bosch) Müll. Arg. - Epiphyte in treecrown in mossy forest, c. 1400 m alt. Roraima: 18856.

Most material (some 140 specimens) of this family, which urgently needs taxonomic revision, is as yet unidentified.

Thelotremataceae

***Chroodiscus coccineus*** (Leight.) Müll. Arg. - Foliicolous in undergrowth of forest, widespread, 500-800 m alt. Jawalla: 18450f; Waruma trail: 18545d; Kamarang: 18934c; Waramadan: 19230d; Pwipwitipu trail: 19316c. The new generic delimitation in the Thelotremataceae, as proposed by Hale (1980, 1981), is still not completely satisfactory. Therefore the genus *Chroodiscus* has been maintained provisionally for the foliicolous representatives of the family, whereas the proposed classification has been followed for the corticolous representatives.

****Chroodiscus mirificus*** (Kremp.) R. Sant. - Foliicolous on mango tree in village garden, 500 m alt. Kamarang: 18149. Already cited by Sipman (1990: 544). The material agrees well with the description of the species by Santesson (1952) and with material from Asia in herbarium [B]. Its hymenium is c. 45 µm high, its spores are 4-celled and measure 10-12 x 3 µm.

Isidia are absent. Consequently there seems to be no need to place the material in a separate neotropical taxon like *C. santessonii* Lücking. As mentioned by Sipman (1990), this is the first record of this species from the Neotropics. The find is also remarkable because it was the only abundant lichen with ascocarps on the leaves of this fruit tree, while it was not found elsewhere during the expedition. This might be indicative of human introduction.

****Myriotrema bahianum*** (Ach.) Hale - Epiphyte on tree trunks in forest, 500-550 m alt. Jawalla: 18416, 18463; Waruma trail: 18675.

****Myriotrema calvescens*** (Fée) Hale - Epiphyte on tree trunks in forest, 700-800 m alt. N-slope Roraima: 18686, 18801; Pwipwitipu trail, 19343.

***Myriotrema concretum*** (Fée) Hale - 12 m high in 40 cm diam. tree trunk in mossy forest, c. 700 m alt. Roraima: 18770.

****Myriotrema congestum*** (Hale) Hale - Epiphyte on thin bark in forest, widespread, 500-800 m alt. Kamarang: 18220, 18231; Jawalla: 18355, 18374, 18417, 18421, 18440, 18483; Waruma trail: 18558; Latipu (foot): 18956, 18981, 19005b; Waramadan: 19215; Pwipwitipu trail: 19471. The material differs from the description in Hale (1978: 17) by its spores which regularly show one, sometimes two, longitudinal septa.

****Myriotrema glaucophaena*** (Kremp.) Hale - Epiphyte of thin tree trunk in forest along stream, c. 550 m alt. Waruma trail: 18596.

****Myriotrema glauculum*** (Nyl.) Hale - Epiphyte on c. 20 cm diam. tree trunk in low forest, c. 600 m alt. Latipu (foot): 18953.

****Myriotrema guianense*** Sipman, *sp. nov.* (Fig. 1A)

Type: Guyana, Upper Mazaruni district, trail from Kamarang river to Puipui mountain, at landing site, on N-bank, c. 5 km NW of Waramadan, coord. 5°48' N, 60°47' W, alt. c. 600 m, c. 25 m tall, riverain forest, 27 February - 1 March 1985, H. Sipman & A. Aptroot 19205 (B holotype).

Diagnosis: Thallus corticola, epiphloeodes, 10 cm diametro vulgo superans, pallide cinereoviridis, laevis, nitidiusculus, continuus, tenuis, acido stictico et/vel psoromico continente. Apothecia 1-2 mm lata, cinereopruinosa, rotunda vel elongata, complicatocolumellata, margine crasso cinereo, disco a columellis in discula c. 0.2 x 0.1 mm diviso, columellis cinereopruinosis interne carbonaceis; hymenium 50-75 µm altum, hyalinum; sporae hyalinae, fusiformes, transversaliter 5-9-septatae, octonae, I+ azureae, c. 20-40 x 4-5 µm.

Thallus corticolous, epiphloeodal, large, often over 10 cm diam., pale greyish green, smooth or slightly rugulose, slightly glossy, continuous, interrupted only by cracks in the substrate, without vegetative propagules, c. 50 µm thick; cortical layer composed of conglutinated hyphae, c. 8 µm thick; TLC: stictic and/or psoromic acid, stictic acid sometimes accompanied by traces of hypostictic acid; algal cells subglobose, c. 8 µm diam.; medulla with large crystals. Apothecia semi-emergent, c. 1-2 mm wide, ashy white-pruinose, round when young, later elongating or branching, with complicated columellae; margin mostly ashy white-pruinose, rounded, c. 0.2 mm thick, usually well-separated from the surrounding thallus; rarely with erect thalline margin; columellae about as thick as the margin, with rounded upper side, initially round, but soon septum-forming, ashy white-pruinose; discs small, seen as splits c. 0.2 x 0.1 mm between the columellae of dry apothecia; columellae and ectal excipulum carbonized; hymenium 50-75 µm thick, clear; spores hyaline, elongated fusiform with rather acute ends, transversely 5-9-septate, 8 per ascus, I+ bluish, c. 20-40 x 4-5 µm, ultimate cells often elongated into a long, obtuse point.

In the Guyanese plants, stictic acid, sometimes with traces of hypostictic acid, is the only constituent, whereas in the Venezuelan and French Guianan plants, psoromic acid is constantly present and stictic acid an accessory.

In general appearance this species resembles the *O. auberiana* group. However, its

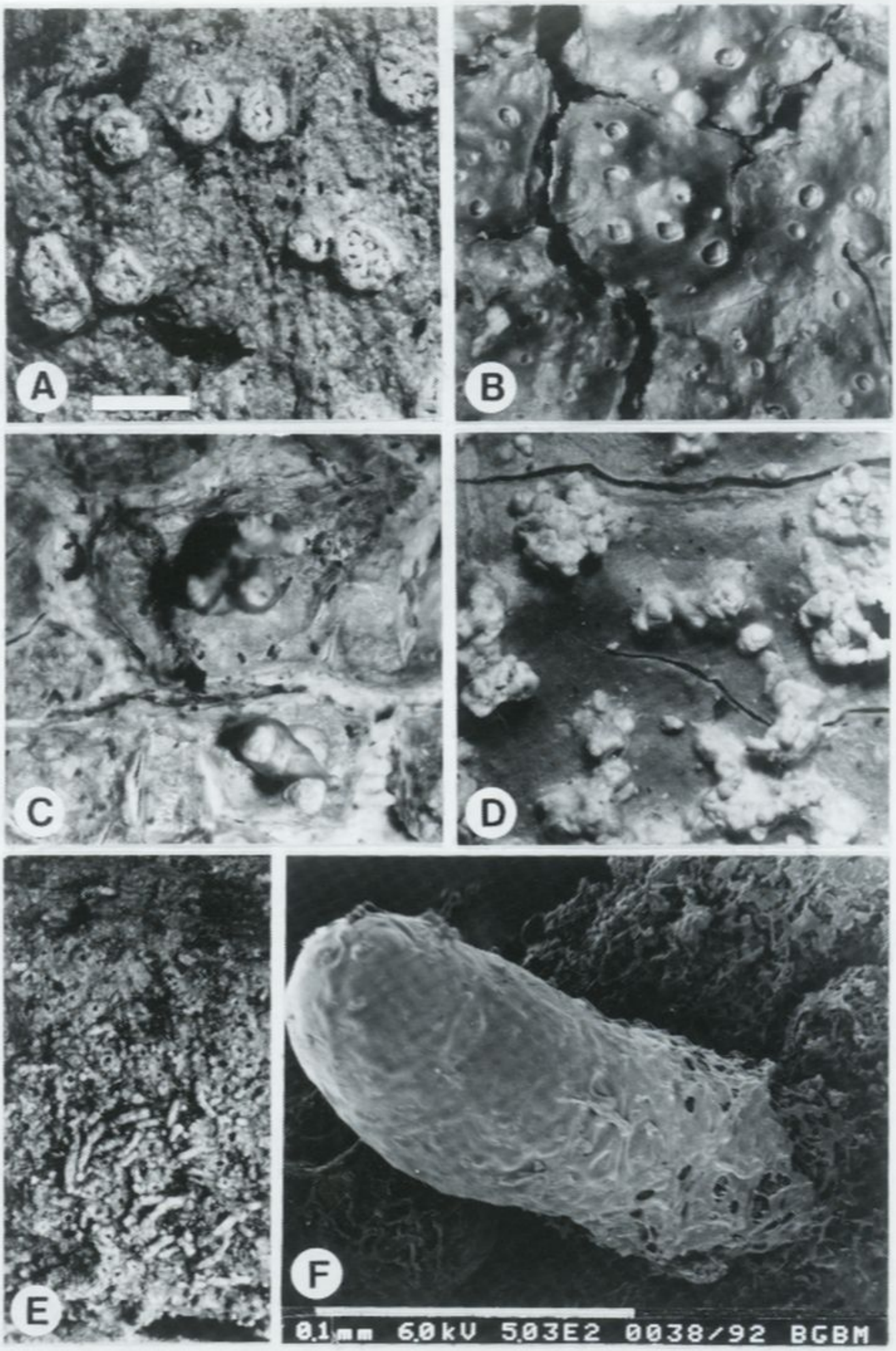


Fig. 1. For legend see p. 108

narrow, I+ bluish spores point to a close relationship with *Myriotrema subwrightii* (Hale) Hale and *M. wrightii* (Tayl.) Hale. From *M. subwrightii* it differs mainly by carbonization in the apothecium.

Distribution and ecology: Apparently widespread in the Guianas and adjacent Venezuela, on soft, weathered, moderately well-lit bark of mature trees in virgin forest.

Additional material: N of Kamarang: 18228; N-foot Latipu:18949; Pwipwitipu trail: 19364, 19399. FRENCH GUIANA: Mountain ridge 40 km SW of Cayenne, March 1985, A. Aptroot 15598, 15609 (U); Saül, "sentier limonade", 17 September 1986, D. Montfoort & R.C. Ek 1987 (U). VENEZUELA: Estado Bolivar, Cerro Guaiquinima, surroundings of Camp 7, 1 February 1990, H. Sipman 26374 (B, VEN); Estado Bolivar, Cerro Guaiquinima, surroundings of Camp 7, 2 February 1990, H. Sipman 26436 (B, VEN); Estado Bolivar, Cerro Guaiquinima, surroundings of Camp 7, 3 February 1990, H. Sipman 26468 (B, VEN); Estado Bolivar, Canaima, 30 January 1980, H. Sipman 27275 (B, VEN).

****Myriotrema hartii*** (Müll. Arg.) Hale - Epiphyte in upper part of trees in mossy mountain forest and on exposed shrubs, c. 1400-2300 m alt. N-slope Roraima: 18836, 18887, 18890, 18900. The material fits the species description by the presence of coarse isidia and psoromic acid; however, in the absence of ascocarps the identification is tentative.

****Myriotrema insigne*** (A. Zahlbr.) Hale - Epiphyte on savannah shrub, 1000 m alt. Latipu: 19087.

****Myriotrema myriocarpum*** (Fée) Hale - Forest epiphyte, 500-800 m alt. Waruma trail: 18593, 18607; Roraima: 18687; Pwipwitipu trail: 19433, 19434, 19450.

****Myriotrema myrioporoides*** (Müll. Arg.) Hale - Epiphyte of tree trunks in forest or on boulders in stream, 500-1000 m alt. Kamarang: 18230; Waruma trail: 18648; Latipu: 19103.

****Myriotrema neofrondosum*** Sipman, *sp. nov.* (Fig. 1B, C, D)
Type: Guyana, Upper Mazaruni district, Pakaraima mountains, c. 2 km NW of Kamarang, coord. 5°53' N, 60°38' W, alt. c. 500 m, on thin stemlet in c. 10 m tall, well-lit savannah-forest on ridge, 4 February 1985, H. Sipman & A. Aptroot 18263 (B holotype).

Diagnosis: Thallus corticola, epiphloeodes, 10 cm diametro vulgo superans, pallide viridicinereus vel flavescens, laevis, nitidus, schizidiis in sitiis plusminusve elevatis producens, acido hypoprotocetrarico continens. Apothecia rara, immersa, sine margine carbonaceo vel columella, c. 0.2 mm diametro, margine tenui albo; hymenium 60-70 µm altum, hyalinum; sporae hyalinae, transversaliter 3-septatae, octonae, I+ azureae, c. 10-15 x 6-7 µm.

Thallus corticolous, epiphloeodal, large, often over 10 cm diam., pale greenish grey, in exposed places more yellowish, smooth, slightly glossy, in older parts reticulately cracked, producing schizidia in more or less raised warts (Fig. 1C, D), 100-200 µm thick; cortical layer composed of strongly conglutinated hyphae, c. 15 µm thick, glassy; TLC: hypoprotocetraric acid and unknown spot (Rf class 1 in A, brown after charring), occasionally with lichexanthone; algal cells elongate with flattened ends, c. 8 x 4 µm (*Cephaleuros*?); medulla with or without large crystal aggregates; schizidia c. 0.2-0.4 mm diam., with glossy upper side. Apothecia immersed, rare, but numerous when present, without carbonaceous tissue or separated excipulum, c. 0.2 mm diam.; pore 0.1-0.2 mm diam., round or elongate, with thin white rim; hymenial surface visible through the pore, pale pinkish; hymenium 60-70 µm high, clear; spores hyaline, transversely three-septate, occasionally with an oblique septum, 8 per ascus, I+ bluish, c. 10-15 x 6-7 µm.

*M. neofrondosum* is usually found sterile, and then recognizable by its schizidia, which are often produced on warts, and the presence of hypoprotocetraric acid. In this stage it is probably indistinguishable from *M. frondosum* Hale except by chemistry, the latter contai-

ning psoromic acid. The spores form another difference: they measure c. 10-15 x 6-7 µm and are mostly transversely three-septate; in *M. frondosum* they measure 21-24 x 9-10 µm and are muriform, with 4-5 transverse septa (Hale 1981: 282). By its spores, *M. neofrondosum* is related to *M. congestum* (Hale) Hale and could be considered as the schizidia-producing derivative of the latter. Indeed, spores with some longitudinal septa, as locally found in *M. congestum*, are also produced in *M. neofrondosum*. A specimen from East Demerara district (nr. 17934) deviates by the presence of lichexanthone.

Distribution and ecology: The available collections are from a limited area in East Demerara and Upper Mazaruni districts in Guyana and Estado Bolivar in Venezuela, where the species is occasionally to be found in virgin forests. It is probably much more widespread but undercollected because it is usually sterile.

Additional material: N-slope Roraima: 18725, 18757; Latipu: 19077; Pwipwitipu trail: 19396. GUYANA: East Demerara district, Timehri, 2 February 1985, H. Sipman & A. Aptroot 17934, 17962. VENEZUELA: Estado Bolivar, Cerro Guaiquinima, surroundings of Camp 2, 9 February 1990, H. Sipman 26855 (B, VEN).

****Myriotrema norsticticum*** (Hale) Hale - Epiphyte on thin bark in forest treecrown and in savannah shrub, 500-650 m alt. Jawalla: 18457; Pwipwitipu trail: 19266. The spores in the investigated material occasionally have a second septum.

****Myriotrema protocetraricum*** (Hale) Hale - Epiphyte on thin tree trunks in forest, c. 600 m alt. N-foot Latipu: 18950, 18964.

****Myriotrema subdactyliferum*** Sipman, *sp. nov.* (Fig. 1E, F)

Type: Guyana, Upper Mazaruni district, trail from Kamarang river to Pwipwi mountain, coord. 5°57' N, 60°45' W, alt. c. 800 m, rocky savannah, c. 10 km N of Waramadan, 28 February 1985, H. Sipman & A. Aptroot 19436 (B holotype).

Diagnosis: Thallus corticola, epiphloeodes, 10 cm diametro vulgo superans, pallide cinereoviridis vel flavescens, opacus, tenuis, continuus, isidiosus, substantia ignota "cinchonarum" continens; isidia cylindrica nitida flavescentia. Apothecia immersa, sine margine carbonaceo vel columella, c. 0.2 mm diam., poro vulgo a materia excipulare obtecto; hymenium 50-65 µm altum, hyalinum; sporae pallide cinereofuscae, transversaliter 5-7-septatae, octonae, I-negativae, c. 15-18 x 6-7 µm.

Thallus corticolous, epiphloeodal, large, often over 10 cm diam., pale greyish green, in exposed sites more yellowish, dull, thin, continuous, more or less covered with isidia, c. 40 µm thick; cortical layer composed of conglutinated hyphae, c. 5 µm thick; TLC: "cinchonarum unknown"; algae subglobose, c. 6 µm diam.; isidia brownish grey-green, glossy, cylindrical with slight constrictions, c. 0.1 mm diam. and c. 0.3 mm long (fig. 1F). Apothecia immersed, numerous, often densely covering considerable parts of the thallus, with thin, irregular thalline margin, seemingly composed of thallus tissue pushed up by the raising apothecium, without carbonization, round, c. 0.2 mm diam.; pore often largely closed by a brownish ring of excipular material inside the pore; hymenium 50-65 µm high, clear; spores pale grey-brown, transversely 5-7-septate, very rarely with an occasional longitudinal septum, 8 per ascus, I-negative, c. 15-18 x 6-7 µm.

This species resembles perhaps most closely *Myriotrema dactyliferum* (Hale) Hale, with which it shares the presence of isidia and the small, immersed, non-carbonized ascocarps with slightly prominent margin and separated excipulum which may fill the pore. Differences are in the chemistry, the spore pigmentation and the I-reaction. The chemistry, the "cinchonarum" unknown substance, is unusual in the genus *Myriotrema*, and this, in combination with the presence of isidia and the pigmented spores, make it a clearly distinct species.

The generic affinity of the species is problematical, because of the often well-developed inner excipulum ring, which makes the ascocarps resemble those of e.g. *Thelotrema*

*refertum* (Hale) Hale. However, no periphyses have been observed. Specimen 18753 is tentatively identified, since it lacks ascocarps, but its chemistry agrees.

Distribution and ecology: known so far only from the Guiana Highlands area, Eastern Guyana and Edo. Bolivar in Venezuela, where it was found on soft, weathered bark in virgin forest on poor soil.

Additional material: Jawalla: 18393; Roraima N-slope: 18753. VENEZUELA: Estado Bolivar, Cerro Guaiquinima, surroundings of Camp 7, 1 February 1990, H. Sipman 26345 (B, VEN).

****Myriotrema subwrightii*** (Hale) Hale - Forest epiphyte, 500-800 m alt. Kamarang: 18227; Jawalla: 18414; Waruma trail: 18620; Roraima: 18697; Pwipwitipu trail: 19424. The spores are sometimes considerably larger than described by Hale (1978: 32), they vary between 12-40 x 5-7 µm, 4-10-celled.

****Myriotrema terebratulum*** (Nyl.) Hale - Epiphyte of treecrown in mossy forest or of savannah forest, 500-700 m m alt. Kamarang: 18250; Roraima: 18685.

****Myriotrema wrightii*** (Tuck.) Hale - Forest epiphyte, 500-600 m alt. Jawalla: 18476, 18495; Waramadan: 19214.

****Ocellularia amplior*** (Nyl.) Redgr. - Forest epiphyte, c. 500 m alt. Jawalla: 18474. This species has not been treated by Hale in his recent revisions. A description can be found in Redinger (1936). It is easily recognizable by its large, rather widely opened apothecia with carbonized margin, without columella, with inspersed, c. 100 µm high hymenium and bacillar, I+ purplish, c. 8-10-celled spores measuring c. 30 x 7 µm. The thallus contains protocetraric acid. In the herbarium the apothecia often develop a pale brownish tinge after some years. In Brazilian material, the hymenium and spores may be larger according to Redinger (1936): to 150 µm high, to 60(-80) µm long. The type collection (Lindig 99, isotype in B examined) has rather small spores, 20-25 x 8-10 µm, (3-)8-celled and its chromatogram (solvent G) shows in addition to protocetraric acid slightly above it a spot with the same colour after charring (virensic acid?). *O. lepadinoides* is probably the closest relative, for differences see under that species. *O. amplior* appears to be restricted to South America.

****Ocellularia astrolucens*** Sipman, *sp. nov.* (Fig. 2A)
Type: Guyana, Upper Mazaruni district, trail from Kamarang river to Pwipwi mountain, 5°57' N, 60°45' W, c. 800 m alt., rocky savannah c. 10 km N of Waramadan, 28 February 1985, H. Sipman & A. Aptroot 19493 (B holotype).

Diagnosis: Thallus corticola, hypophloeodes, 10 cm diametro vulgo superans, pallide olivaceus, laevis, subnitidiusculus, lichexanthonum continens (in apotheciis). Apothecia sessilia, frequentia, margine crasso in 2-4 partibus recurvatis diviso albopruinoso, interne carbonaceo, columella crassa lata albopruinosa interna carbonacea apice convexa, 1-2 mm lata; hymenium c. 130 µm altum, hyalinum; sporae fuscae, transversaliter 3-5-septatae, octonae, I-negativae, 14-20 x 6-7 µm.

Thallus corticolous, hypophloeodal, often over 10 cm. diam., pale olivaceous, smooth, very slightly glossy, without vegetative propagules, c. 100 µm thick; cortex composed of strongly agglutinated hyphae and bark cellwalls, c. 40 µm thick; TLC: lichexanthone (present in the apothecia); algal cells subglobose or deformed by mutual pressure in the treebark cells, c. 6 µm diam.; medulla with large crystal aggregates. Apothecia slightly emergent, frequent, with thick margin divided in 2-4 recurved slips with carbonized internal layer, white-pruinose on the inside, and with a large, white-pruinose, internally carbonized, strongly prominent columella, 1-2 mm diam.; hymenium c. 130 µm high, clear; spores brown, transversely 3-5-septate, 8 per ascus, when young slightly I+ purplish, 14-20 x 6-7 µm.

*Ocellularia astrolucens* is conspicuous under UV-light, when the apothecia shine

brilliantly yellow, because lichexanthone is evidently deposited in the pruina on the columella and the inner side of the margin. Its closest relatives may be *O. meiosperma* (Nyl.) Hale and *O. glyphica* (Nyl.) Hale, which share the brown spores and strong columella; the former differs by its smaller apothecia without lichexanthone, while the latter differs by its apothecia developing a reticulate columella and by lichexanthone being present in the thallus rather than in the apothecia.

Distribution and ecology: The two available specimens suggest that the species is restricted to the Guiana Highlands area. Both are from tree trunks in stunted forest in very oligotrophic conditions, at c. 800 m alt.

Additional material: VENEZUELA: Estado Bolivar, Cerro Guaiquinima, surroundings of Camp 3, 11 February 1990, H. Sipman 26951 (B, VEN).

***Ocellularia auberiana*** (Mont.) Hale - Forest epiphyte, 500-600 m alt. Kamarang: 18281; Waramadan: 19206. The spores deviate from the description by Hale (1978: 36) by the frequent presence of additional, often oblique, occasionally longitudinal, septa, thus being 4-6-loculate.

****Ocellularia aurata*** (Tuck.) Hale - Epiphyte on *Clusia* in exposed scrub on montain ridge, c. 2000 m alt. Roraima: 18898.

***Ocellularia cavata*** (Ach.) Müll. Arg. - Epiphyte, usually on thin stems with smooth bark, on forest floor or canopy, or in scrub, 500-c. 2000 m alt. Kamarang: 18152, 18270; Jawalla: 18402; Roraima: 18701, 18743, 18806, 18831, 18879; Latipu: 19064; Pwipwitipu trail: 19267, 19268, 19382.

****Ocellularia conformis*** (Fée) Hale - Epiphyte on branchlet in rock savannah, c. 800 m alt. Pwipwitipu trail, 19383.

****Ocellularia lepadinoides*** (Leight.) A. Zahlbr. - Forest epiphyte, often on the upper parts of tree trunks, c. 500 m alt. Jawalla: 18379, 18423; Waruma trail: 18577, 18604. A description of this species, which has not been treated by Hale in his recent revisions, can be found in Redinger (1936). It is easily recognized by its large, rather widely opened apothecia with carbonized margin, without columella and with orange disc, by its inspersed, c. 200-300 µm high hymenium and by its large, bacillar, I+ purplish, 16-40-celled spores measuring 60-150 x 10-12 µm. The thallus contains protocetraric acid and the apothecium pigment appears to be an anthraquinone, reacting K+ intensely violet. It is very similar to *O. amplior* by its apothecium form, chemistry and hymenium inspersion, and differs from this by the orange pigment in the epithecium, which penetrates into the hymenium, and by its higher hymenium and larger spores. It seems to have a more restricted distribution, from the Colombian Amazonia to the Guianas.

The specimen Spruce 245 in BM has been selected by Hale as lectotype. Unfortunately most of its apothecia are in poor condition, without hymenium, and the characteristic pigment is visible only in few apothecia. We have not reexamined it microscopically, since the observations published by Redinger (1936) are quite detailed; they agree completely with our material, as does the chemistry indication on an annotation slip by Hale. Judging from the description in Redinger (1936), *O. megalostoma* Müll. Arg. is the same species.

****Ocellularia papillata*** (Leight.) A. Zahlbr. - Forest epiphyte, 500-700 m alt. Jawalla: 18465a, 18487, 18500; Roraima: 18696, 18764; Waramadan: 19212; Pwipwitipu trail, 19207a.

****Ocellularia perforata*** (Leight.) Müll. Arg. - Forest epiphyte, usually on small tree trunks, 500-700 m alt. Jawalla: 18435, 18462; Waruma trail: 18598, 18663; Roraima: 18710; Latipu: 19005a, 19382a.

***Ocellularia rhodostroma*** (Mont.) A. Zahlbr. - Forest epiphyte, c. 500 m alt. Jawalla: 18469; Waruma trail: 18668.

****Ocellularia subemersa*** Müll. Arg. - Forest epiphyte, usually on small tree trunks,

remarkably common on the N-foot of Roraima, 500-700 m alt. Kamarang: 18235; Jawalla: 18419, 18461, 18491; Waruma trail: 18574, 18588; Roraima: 18693, 18709, 18717, 18723, 18742, 18749, 18756, 18773, 18790.

****Ocellularia tenuis*** (Hale) Hale - Epiphyte on tree trunks in humid forest, 550-1400 m alt. Waruma trail: 18634; Roraima: 18851.

****Thelotrema albomaculatum*** Sipman, *sp. nov.* (Fig. 2B)

Type: Guyana, Upper Mazaruni district, Pakaraima mountains, c. 2 km N of Kamarang, 5°53' N, 60°38' W, c. 500 m alt., epiphyte in c. 25 m tall, virgin forest, 4 February 1985, H. Sipman & A. Aptroot 18222 (B holotype).

Diagnosis: Thallus corticola, epiphloeodes, 10 cm diametro vulgo superans, viridicinereus, rugulosus, opacus, continuous, substantia ignota continens. Apothecia sessilia, frequentia, c. 0.3-0.6 mm diametro, rotunda, margine elevato vel recurvato breve acarbonaceo, disco pallide cinereo vel fusco, pruinose, sine columella, aggregata in gregibus 2-5 mm diametro; hymenium 50-65(-80) µm altum, hyalinum; sporae hyalinae, tranversaliter 3-5(-9)-septatae, octonae, I+ azureae, c. 12-14(-20) x 5 µm.

Thallus corticolous, epiphloeodal, to over 10 cm diam., greenish grey, rugulose, dull, continuous, without vegetative propagules, c. 50 µm thick; cortical layer hardly conglutinated, c. 5 µm thick; TLC: with unknown substance; algal cells subglobose, c. 6-8 µm diam.; medulla with scattered aggregates of large crystals (causing the rugulose surface). Apothecia slightly emergent, frequent, c. 0.3-0.6 mm diam., roundish, with erect or slightly recurved, but rather low, whitish margin and pale greyish or pale brownish, pruinose disc, aggregated in c. 2-5 mm diam. groups of c. 3 to over 20, without carbonized parts or columella; hymenium 50-65(-80) µm high, clear; spores hyaline, transversely 3-5(-9)-septate, 8 per ascus, I+ bluish, c. 12-14(-20) x 5 µm.

This species is well characterized by the unknown chemical substance: in solvent system A it resembles salazinic acid, a rare substance in Thelotremataceae, by Rf value and colour after charring. However, in other solvents it runs differently. Also its aggregated apothecia are unusual, and give the lichen a white-maculate habit.

Distribution and ecology: Material is available from Guyana, Venezuela, and the Colombian Amazonia, where the species appears to be common in more or less poor forests on sand or sandstone at 10-600 m. It seems to prefer smooth bark of thin stems in the undergrowth.

Additional material: Jawalla: 18377, 18389, 18466, 18490. Waruma bank: 183568, 18595, 18613. N-foot Latipu: 19005. GUYANA: East Demerara district, Timehri, 2 February 1985, H. Sipman & A. Aptroot 17984. COLOMBIA: Dept. Caquetá, 2.5 km NE of Araracuara, 31 October 1988, H. Sipman & J. Duivenvoorden 27910 (ARA, B). Comisaría Amazonas, comunidad de Villazul, E of Araracuara, N-bank of river Caquetá, opposite Isla Mariñame, 2 November 1988, H. Sipman & J. Duivenvoorden 28308, 28309, 28310 (ARA, B). Comisaría Amazonas, comunidad de Villazul, E of Araracuara, N-bank of river Caquetá, opposite E-end of Isla Morrocoy, 3 November 1988, H. Sipman & J. Duivenvoorden 28499 (ARA, B). VENEZUELA: Estado Bolivar, Cerro Guaiquinima, surroundings of Camp 7, 31 January 1990, H. Sipman 26305, 26313 (B, VEN). Estado Bolivar, Cerro Guaiquinima, surroundings of Camp 7, 1 February 1990, H. Sipman 26367 (B, VEN). Estado Bolivar, Cerro Guaiquinima, surroundings of Camp 7, 2 February 1990, H. Sipman 26423, 26446, 26448 (B, VEN). Estado Bolivar, Cerro Guaiquinima, surroundings of Camp 7, 3 February 1990, H. Sipman 26463 (B, VEN). Depto. Río Negro, Cerro de la Neblina, just outside Cañon Grande, 9 February 1985, W. R. Buck 12871, 11449 (NY).

****Thelotrema dissutum*** (Hale) Hale - Epiphyte on thin tree trunks in low forest, c. 600 m alt. Latipu (foot): 18988, 18990.

About 80 specimens of Thelotremataceae are still unidentified.

GYALECTALES

Gyalectaceae

***Coenogonium leprieurii*** (Mont.) Nyl. - Forest epiphyte, 500-800 m alt. Jawalla: 18386; Waruma trail: 18601, 18635, 18640, 18641; Latipu (foot): 18974; Waramadan: 19225; Pwipwitipu trail: 19320b, 19421.

***Coenogonium linkii*** Ehrenb. - Forest epiphyte, c. 500 m alt. Kamarang: 18226, 18922b; Jawalla: 18488; Waruma trail: 18618.

****Dimerella hypophylla*** Vezda - Foliicolous in undergrowth of forest, 500-800 m alt. Waruma trail: 18541c; Kamarang: 18935b, 18935c; Waramadan: 19227c, 19227d; Pwipwitipu trail: 19308c. Already cited by Sipman (1991: 140).

Nearly 40 specimens of *Coenogonium*, a common and diverse genus on the slopes of Mount Roraima, and 10 of *Dimerella* are still unidentified.

LECANORALES

Acarosporaceae

****Biatorella conspersa*** (Fée) Vainio - Epiphyte in savannah forest, 800 m alt. Pwipwitipu trail: 19470. Already cited by Sipman (1990: 543).

****Biatorella wrightii*** (Tuck.) A. Zahlbr. - Epiphyte in low, open forest, 500-1000 m alt. Kamarang: 18248; Latipu: 19090; Pwipwitipu trail: 19246.

Bacidiaceae

***Bacidia brasiliensis*** (Müll. Arg.) Vainio - Foliicolous in undergrowth of tall forest, 500-800 m alt. Jawalla: 18441c, 18449h; Kamarang: 18932; Pwipwitipu trail: 19220c, 19220f, 19228b, 19309. The material often shows small, only 7-septate spores, as recorded from Costa Rica by Lücking (1992: 130). The thallus warts often show a yellowish colour, rather than whitish as mentioned by Santesson (1952: 453). Iodine-staining of the asci shows that the species is probably not closely related to other Bacidiaceae: they show a short tubular structure in their apex.

****Bacidia palmularis*** (Müll. Arg.) A. Zahlbr. - Foliicolous in undergrowth of various forest types, 500-800 m alt. Jawalla: 18441; Kamarang: 18945d; Latipu (foot): 19008b; Pwipwitipu trail: 19227f, 19308b. Already cited by Sipman (1991: 139).

****Bacidia stanhopeae*** (Müll. Arg.) A. Zahlbr. - Foliicolous in undergrowth of tall forest, 500 m alt. Kamarang: 18931d. Already cited by Sipman (1991: 139).

****Bacidina apiahica*** (Müll. Arg.) Vezda - Foliicolous in undergrowth of tall forest, 600 m alt. Pwipwitipu trail: 19228. Already cited by Sipman (1991: 139) as *Bacidia apiahica* (Müll. Arg.) A. Zahlbr. Since Vezda (1990) gives no opinion about the relationships of the genus, and own observations (see next species) were not conclusive, the genus is left provisionally in the Bacidiaceae.

****Bacidina mirabilis*** (Vezda) Vezda - Foliicolous in undergrowth of forest, 500-600 m alt. Kamarang: 18935; Jawalla: 18411, 18444b; Pwipwitipu trail: 19224c, 19315. The material differs from the original description (Vezda 1980: 80) by its smaller, simple spores measuring 5-7 x 2-3 µm. The remarkably thick paraphyses, about as thick as the asci, are very scarce, much less numerous than the asci. The iodine-staining of the ascus apex was very weak, so that its structure could not be observed well. The species has been recorded for the neotropics already by Lücking (1992: 127), who has not observed apothecia.

****Biatora pyrrhomelaena*** Tuck. - Epiphyte in low forest, 500-550 m alt. Kamarang: 18234; Waruma trail: 18621, 18630.

*"***Catillaria***" ***endochroma*** (Fée) A. Zahlbr. - Canopy epiphyte in forest, cultivated areas, savannah, 500-800 m alt. Kamarang: 18107; Mayoripai: 18532; Roraima: 18839; Waramadan: 19192; Pwipwitipu trail: 19281. The taxonomic position of this species is unclear and it is therefore tentatively placed in the present family.

***Crocynia gossypina*** (Sw.) Mass. - Forest epiphyte, 500-600 m alt. Jawalla: 18383, 18425, 18460; Latipu (foot): 18995.

****Crocynia pyxinoides*** Nyl. - Photophytic epi-

phyte in forest and cultivated areas, c. 500 m alt. Kamarang: 18193, 18259b, 18262. Already cited by Sipman (1991: 139).

***Eschatogonia prolifera*** (Mont.) R. Sant. in Swinsc. & Krog - Forest epiphyte, 500-700 m alt. Jawalla: 18381; Roraima: 18812.

*"***Lecidea*** **leucophyllina** Nyl. - Forest epiphyte, 500-800 m alt. Kamarang: 18218; Jawalla: 18475; Waruma trail: 18580, 18611; Pwipwitipu trail: 19341, 19394, 19469. The generic position of this species is uncertain; it is related to Bacidiaceae rather than to Lecideaceae in the modern sense.

*__Phyllopsora buettneri__ (Müll. Arg.) A. Zahlbr. var. __glauca__ (B. de Lesd.) Brako - Epiphyte in savannah bush, c. 800 m alt. Pwi-pwitipu trail: 19392, 19411. Already cited by Brako (1991: 31).

*__Phyllopsora buettneri__ var. __munda__ (Malme) Brako - On vertical face of shaded sandstone rock in forest, c. 800 m alt. Latipu: 19165. Already cited by Brako (1991: 33).

*__Phyllopsora confusa__ Swinscow & Krog - Epiphyte in savannah bush, c. 800 m alt. Pwipwitipu trail: 19489. Already cited by Brako (1991: 36).

*__Phyllopsora corallina__ (Eschw.) Müll. Arg. var. __ochroxantha__ (Nyl.) Brako - Forest epiphyte, 500-600 m alt. Jawalla: 18459; Latipu (foot): 18998. Already cited by Brako (1991: 40).

*__Phyllopsora corallina__ var. __phaeobyssina__ (Vainio) Brako - Epiphyte in low forest, c. 600 m alt. Latipu (foot): 18982. Already cited by Brako (1991: 42).

*__Phyllopsora furfuracea__ (Pers.) A. Zahlbr. - Epiphyte in low forest, c. 600 m alt. Latipu (foot): 19003. Already cited by Brako (1991: 47).

*__Phyllopsora parvifoliella__ (Nyl.) Müll. Arg. - Epiphyte on small tree in savannah bush, c. 500 m alt. Kamarang: 18279. Already cited by Brako (1991: 57).

*__Physcidia squamulosa__ Tuck. - Epiphyte in savannah bush, c. 500 m alt. Kamarang: 18274. Already cited by Sipman (1991: 140).

*__Physcidia wrightii__ Tuck. - Forest epiphyte on small tree trunks, 500-1000 m alt. Kamarang: 18221; Waruma trail: 18587; Roraima: 18713, 18732, 18795; Latipu: 19114; Pwipwitipu trail: 19255, 19408, 19423, 19468, 19479. Already cited by Sipman (1991: 140).

*__Squamacidia janeirensis__ (Müll. Arg.) Brako var. __janeirensis__ - Epiphyte on 25 cm. diam. tree trunk in low forest, c. 600 m alt. Latipu (foot): 18957. Identified by Brako, 1990.

*__Squamacidia janeirensis__ var. __endococcinea__ (A. Zahlbr.) Brako - Forest epiphyte, 500-800 m alt. Kamarang: 18246; Waruma trail: 18615; Pwipwitipu trail: 19373, 19395, 19482. Identified by Brako, 1990.

About 35 specimens, most belonging to *Bacidia* s.l., are still unidentified.

Brigantiaeaceae

*__Brigantiaea leucoxantha__ (Spreng.) R. Sant. & Haf. - On branches of fruit tree in village, 500 m alt. Kamarang: 18110. Already cited by Sipman (1991: 139).

Catinariaceae

*__Lopezaria versicolor__ (Fée) Kalb & Haf. - Epiphyte on *Persea* in village, c. 500 m alt. Jawalla: 18308. Already cited by Sipman (1991: 140), as *Catinaria versicolor*.

In addition, 6 *Catinaria*-like specimens have not been identified.

Chrysothrichaceae

*__Chrysothrix candelaris__ (L.) Laund. - Epiphyte in savannah forest, c. 800 m alt. Pwipwitipu trail: 19475. Already cited by Sipman (1991: 139).

Cladoniaceae

*__Cladia aggregata__ (Sw.) Nyl. - Among moss on boulders or branches in open forest, or terrestrial in rock savannah, 550-c. 2000 m alt. Waruma trail: 18664; Roraima: 18825, 18872, 18884; Latipu: 19132, 19134. Already cited by Sipman (1991: 139).

__Cladina confusa__ (R. Sant.) Follm. & Ahti -

Terrestrial in rock savannah, c. 650-1000 m alt. Latipu: 19157; Pwipwitipu trail: 19243, 19330a.

***Cladina densissima*** (Ahti) Ahti - Terrestrial in rock savannah, c. 800 m alt. Pwipwitipu trail: 19334. Already published by Sipman (1990: 544).

****Cladina rangiferina*** (L.) Nyl. ssp. ***abbayesii*** (Ahti) W. Culb. - Terrestrial in rock savannah, 1000 m alt. Latipu: 19163.

***Cladina sprucei*** (Ahti) Ahti - Terrestrial in rock savannah, c. 650-1000 m alt. Latipu: 19129; Pwipwitipu trail: 19244, 19387.

****Cladonia carassensis*** Vainio - Terrestrial in rock savannah, c. 650 m alt. Pwipwitipu trail: 19243b, 19251c.

***Cladonia ceratophylla*** (Sw.) Spreng. - Terrestrial in rock savannah, 1000 m alt. Latipu: 19145.

***Cladonia corallifera*** (Kunze) Nyl. - Terrestrial in savannah or on decaying wood on open spots in cultivated area, 500-1000 m alt. Kamarang: 18203, 18239; Jawalla: 18350; Latipu: 19131, 19146; Waramadan: 19178; Pwipwitipu trail: 19248, 19340.

****Cladonia crispatula*** (Nyl.) Ahti - Terrestrial in rock savannah, c. 650-1000 m alt. Latipu: 19152; Pwipwitipu trail: 19263.

****Cladonia didyma*** (Fée) Vainio var. ***vulcanica*** (Zoll. & Moritz.) Vainio - On decaying organic material in open spots in forest, in savannah or cultivated areas, 500-c. 2000 m alt. Kamarang: 18204, 18243; Jawalla: 18349, 18353; Roraima: 18901; Latipu (foot): 18976; Pwipwitipu trail: 19372, 19497. Already cited by Sipman (1990: 544).

****Cladonia furfuracea*** Vainio - On decaying organic material on the soil in open spots, in savannah or cultivated areas, 500-1000 m alt. Jawalla: 18351; Latipu: 19141, 19147; Pwipwitipu trail: 19338b.

***Cladonia peltastica*** (Nyl.) Müll. Arg. - Terrestrial in savannah or open forest, 500-c. 2000 m alt. Jawalla: 18352; Mayoripai: 18539; Roraima: 18792; Latipu: 19130, 19140, 19149a, 19150; Waramadan: 19177; Pwipwitipu trail: 19242, 19323, 19324, 19330b, 19332, 19333, 19336.

****Cladonia pityrophylla*** Nyl. - Terrestrial on rock savannah or in very open forest, 600-1000 m alt. Latipu (foot): 18994; Latipu: 19133, 19136, 19139; Pwipwitipu trail: 19251b, 19338, 19338c, 19370.

***Cladonia pulviniformis*** Ahti - Terrestrial on rock savannah, c. 800-1000 m alt. Latipu: 19151, 19162; Pwipwitipu trail: 19329. Already cited by Ahti (1990: 264).

***Cladonia ramulosa*** (With.) Laund. - On decaying wood on the soil on open spots in cultivated areas, c. 500 m alt. Jawalla: 18347; Mayoripai: 18535, 18536.

***Cladonia secundana*** Nyl. - Terrestrial in rock savannah, c. 650-1000 m alt. Latipu: 19142; Pwipwitipu trail: 19264, 19325.

***Cladonia signata*** (Eschw.) Vainio - Terrestrial in rock savannah, c. 600-1000 m alt. Latipu: 19158; Pwipwitipu trail: 19258,19327, 19328, 19330, 19331.

****Cladonia sphacelata*** Vainio - Terrestrial in light forest, 500-1000 m alt. Kamarang: 18241; Waruma trail: 18660; Latipu: 19149; Pwipwitipu trail: 19322, 19494.

***Cladonia spinea*** Ahti - Terrestrial in white-sand savannah, c. 500 m alt. Mayoripai: 18537.

****Cladonia steyermarkii*** Ahti - Terrestrial in rock savannah, 1000 m alt. Latipu: 19160.

****Cladonia subradiata*** (Vainio) Sandst. - On decaying wood on open spots in cultivated areas or in low forest, 500-600 m alt. Kamarang: 18208; Kako: 18511a; Waruma trail: 18563; Latipu (foot): 18989.

****Cladonia subsquamosa*** Kremp. - Terrestrial in rock savannah, c. 800 m alt. Pwipwitipu trail: 19398.

****Cladonia sufflata*** Ahti - Terrestrial in rock savannah, 1000 m alt. Latipu: 19161. Already cited by Ahti (1990: 266).

Coccocarpiaceae

***Coccocarpia domingensis*** Vainio - Photophytic epiphyte, widespread in forest, savannah and cultivated areas, 500-c. 2000 m alt. Kamarang: 18190, 18265; Jawalla: 18413; Mayoripai: 18529; Roraima: 18797, 18853b; Latipu: 19079; Pwipwitipu trail: 19260, 19453.

***Coccocarpia epiphylla*** (Fée) Kremp. - Foliico-

lous in undergrowth of forest near stream or rivulet, c. 500 m alt. Kamarang: 18232; Waruma trail: 18562.

****Coccocarpia erythrocardia*** (Müll. Arg.) Arvids. - Photophytic epiphyte on shrubs in rock savannah, c. 1000 m alt. Latipu (foot): 18992; Latipu: 19070. Already cited by Sipman (1991: 139).

***Coccocarpia erythroxyli*** (Spreng.) Swinsc. & Krog - Epiphyte in open forest, 500-800 m alt. Kamarang: 18256a; Pwipwitipu trail: 19464.

****Coccocarpia imbricascens*** Nyl. - Epiphyte in forest or savannah, widespread, 500-1000 m alt. Kamarang: 18256; Jawalla: 18371; Mayoripai: 18534; Roraima: 18731, 18794; Latipu (foot): 18991; Latipu: 19080; Pwipwitipu trail: 19261, 19465. This is a poorly-known species, thus far known from a few collections of uncertain origin (Arvidsson 1982). It appears to be common in the Roraima area.

***Coccocarpia palmicola*** (Spreng.) Arvids. & Gallow. - Photophytic epiphyte in cultivated area, savannah forest, or the canopy of tall forest, 500-1600 m alt. Kamarang: 18134, 18142, 18917; Roraima: 18838, 18899; Latipu: 19069; Pwipwitipu trail: 19262, 19277, 19463.

***Coccocarpia pellita*** (Ach.) Müll. Arg. - Epiphyte on fruit trees in gardens, c. 500 m alt. Kamarang: 18116b, 18128; Jawalla: 18299, 18323.

***Coccocarpia tenuissima*** Müll. Arg. - Foliicolous in undergrowth of forest, 500-800 m alt. Jawalla: 18407; Waruma trail: 18547e; Waramadan: 19230c; Pwipwitipu trail: 19307.

Nearly 20 specimens are still unidentified.

Collemataceae

***Leptogium cyanescens*** (Rabenh.) Körb. - Epiphyte on mango tree in cultivated area and in low forest, 500-600 m alt. Kamarang: 18129; Latipu (foot): 18978.

***Leptogium phyllocarpum*** (Pers.) Nyl. - Epiphyte on fruit trees in cultivated area, c. 500 m alt. Kamarang: 18130; Jawalla: 18317.

***Physma byrsaeum*** (Ach.) Tuck. (syn.: *P. byrsinum* (Ach.) Müll. Arg.) - Epiphyte in forest and savannah bush, 500-600 m alt. Kamarang: 18249; Waramadan: 19209.

About 20 specimens of *Leptogium* are still unidentified.

Ectolechiaceae

***Lasioloma arachnoideum*** (Kremp.) R. Sant. - Foliicolous in undergrowth of forest, 500-800 m alt. Jawalla: 18449d, Waruma trail: 18541h, 18546c; Kamarang: 18937c; Waramadan: 19224b; Pwipwitipu trail: 19314b.

***Loflammea flammea*** (Müll. Arg.) Vezda - Foliicolous in undergrowth of tall forest, c. 500 m alt. Kamarang: 18932b.

****Logilvia gilva*** (Müll. Arg.) Vezda - Foliicolous in undergrowth for forest, 700-800 m alt. Roraima: 18739b; Pwipwitipu trail: 19308. Already cited by Sipman (1991: 140).

****Tapellaria epiphylla*** (Müll. Arg.) R. Sant. - Foliicolous in undergrowth of forest, 500-600 m alt. Kamarang: 18944; Waramadan: 19220e. Already cited by Sipman (1991: 141).

Lobariaceae

****Pseudocyphellaria aurata*** (Ach.) Vainio - Epiphyte in savannah bush, c. 800 m alt. Pwipwitipu trail: 19410. Already cited by Sipman (1991: 141).

****Sticta fuliginosa*** (Dicks.) Ach. - Epiphyte on shrubs in savannah bush, 800-1000 m alt. Latipu: 19112; Pwipwitipu trail: 19377. Already cited by Sipman (1991: 141).

***Sticta weigelii*** (Ach.) Vainio - Epiphyte on fruit tree in garden, in forest and savannah bush, 500-1000 m alt. Kamarang: 18135; Jawalla: 18486; Waruma trail: 18666, 18674; Latipu (foot): 18959; Latipu: 19099; Pwipwitipu trail: 19339, 19402.

Unidentified collections of this family comprise one specimen of *Dendriscocaulon*, four of *Lobaria* and six of *Sticta*.

Megalosporaceae

***Megalospora tuberculosa*** (Fée) Sipm. - Epiphyte of treecrowns in cultivated area and forest, and of exposed shrubs, 500-c. 200

m alt. Kamarang: 18155, 18180, 18272; Jawalla: 18305; Roraima: 18807, 18834; Latipu: 19058; Pwipwitipu trail: 19393

Pannariaceae

**Erioderma sorediatum*** Gallow. & Jörg. - Epiphyte in savannah shrub, 1000 m alt. Latipu: 19107a. Already cited by Sipman (1991: 140).

**Erioderma verruculosum*** Vainio - Canopy epiphyte in montane forest, c. 1600 m alt. Roraima: 18853d. Already cited by Sipman (1991: 140).

**Erioderma wrightii*** Tuck. - Epiphyte in savannah forest, c. 800 m alt. Pwipwitipu trail: 19355.

***Pannaria mariana*** (Fr.) Müll. Arg. - Epiphyte in canopy of forest or in savannah scrub, 550-800 m alt. Waruma trail: 18678; Pwipwitipu trail: 19257, 19458.

**Pannaria stylophora*** Vainio - On mango tree in garden, 500 m alt. Kamarang: 18160.

Still unidentified are 3 specimens of *Leioderma* and 10 of *Pannaria*.

Parmeliaceae

**Bulbothrix fungicola*** (Lynge) Hale - Canopy epiphyte in tall forest or epiphyte in savannah forest, 550-800 m alt. Waruma trail: 18540, 18775, 18816, 18821; Pwipwitipu trail: 19306.

**Bulbothrix goebelii*** (Zenk.) Hale - Photophytic epiphyte in primary vegetation and cultivated areas (e.g. on *Persea*, mango), 500-700 m alt. Kamarang: 18113, 18176; Jawalla: 18329, 18372; Mayoripai: 18521; Waruma trail: 18813, 18820.

***Bulbothrix laevigatula*** (Nyl.) Hale - Photophytic epiphyte in primary vegetation and cultivated areas, 500-100 m alt. Kamarang: 18188; Latipu: 19042a; Pwipwitipu trail: 19304.

**Bulbothrix leprieurii*** Aubel - Photophytic epiphyte, 500-600 m alt. Jawalla: 18372a; Waramadan: 19187. Already cited by Sipman & Aubel (1992: 2).

**Bulbothrix suffixa*** (Stirt.) Hale - Photophytic epiphyte, 500 m alt. Kamarang: 18188b.

**Bulbothrix tabacina*** (Mont. & v. d. Bosch) Hale - Photophytic epiphyte in primary vegetation and cultivated areas, 500-1000 m alt. Kamarang: 18114, 18196; Latipu: 19012.

**Canoparmelia amazonica*** (Nyl.) Elix & Hale - Photophilous epiphyte in cultivated area, also found on wood, c. 500 m alt. Kamarang: 18104, 18189; Mayoripai: 18519a.

**Hypotrachyna costaricensis*** (Nyl.) Hale - Epiphytic or on exposed rock in savannah bush, c. 650-800 m alt. Pwipwitipu trail: 19234, 19240, 19289, 19290.

**Hypotrachyna flavida*** (A. Zahlbr.) Hale - On exposed rock, 1000 m alt. Latipu: 19021.

***Hypotrachyna imbricatula*** (A. Zahlbr.) Hale - Epiphyte in canopy of montane forest or on savannah shrubs, 800-c. 2000 m alt. Roraima: 18822, 18823, 18864, 18867; Latipu: 19041, 19042; Pwipwitipu trail: 19303.

**Hypotrachyna microblasta*** (Vainio) Hale - Epiphyte on shrubs at higher altitude or on rock savannah, 800-c. 2000 m alt. Roraima: 18863, 18866, 18869; Latipu: 19043, 19044; Pwipwitipu trail: 19235, 19301, 19302, 19403.

**Hypotrachyna osorioi*** (Hale) Hale - Epiphyte on savannah shrub, c. 1000 m alt. Latipu: 19040.

**Hypotrachyna osseoalba*** (Vainio) Park & Hale - Epiphytic on savannah shrub, c. 800 m alt. Pwipwitipu trail: 19300.

**Hypotrachyna rhabdiformis*** (Kurok.) Hale - Epiphyte on savannah shrub, c. 800 m alt. Pwipwitipu trail: 19291.

**Oropogon loxensis*** (Fée) Th. Fr. - Epiphyte on shrub on exposed mountain ridge, c. 2000 m alt. Roraima: 18907. Already cited by Sipman (1991: 140).

**Parmotrema aptrootii*** Aubel - On relic tree on river shore near village, 500 m alt. Kamarang: 18187. Already cited by Sipman & Aubel (1992: 3).

**Parmotrema aurantiacoparvum*** Sipm. - Epiphyte on free-standing trees in cultivated area or savannah, in light forest or in treecrowns in dense forest, 500-700 m alt. Kamarang: 18125b, 18284; Roraima: 18819; Waramadan: 19186; Pwi-pwitipu trail: 19241a. Already cited by Sipman & Aubel (1992: 4).

****Parmotrema conformatum*** (Vainio) Hale - Epiphyte on small tree in rock savannah, 1000 m alt. Latipu: 19046.

***Parmotrema cristiferum*** (Tayl.) Hale - Epiphyte on shrub in white-sand savannah, c. 600 m alt. Waramadan: 19188.

****Parmotrema dilatatum*** (Vainio) Hale - Epiphyte on trees and shrubs in cultivated area or woodland, 500-1000 m alt. Kamarang: 18105, 18195, 18287; Mayoripai: 18519b; Latipu: 19032; Pwipwitipu trail: 19299. Already cited by Sipman (1990: 548).

****Parmotrema mellissii*** (Dodge) Hale - Epiphyte on isolated trees in cultivated area, in treecrowns in forest or in savannah woodland, 500-1000 m alt. Jawalla: 18330; Kamarang: 18921; Latipu: 19020; Pwipwitipu trail: 19241.

****Parmotrema peralbidum*** (Hale) Hale - Epiphyte on exposed shrubs or on sandstone rock outcrop in savannah woodland, 1000-c. 2000 m alt. Roraima: 18868; Latipu: 19019, 19033, 19036.

****Parmotrema rampoddense*** (Nyl.) Hale - Epiphyte on shrubs in savannah woodland, 800-1000 m alt. Latipu: 19031; Pwipwitipu trail: 19296.

****Parmotrema ramusculum*** (Hale) Hale - Epiphyte on small trees in savannah bush, 500-800 m alt. Kamarang: 18285, 18286, 18288, 18289; Pwipwitipu trail: 19295a.

****Parmotrema subochraceum*** Hale - Epiphyte of free-standing trees or treecrowns in cultivated area and primary vegetation, 500-c. 2000 m alt. Mayoripai: 18519; Roraima: 18865; Kamarang: 18920.

***Parmotrema sulphuratum*** (Nees & Flotow) Hale - Epiphyte on trees and shrubs in cultivated areas, open savannah or savannah bush, 500-1000 m alt. Kamarang: 18174; Latipu: 19030, 19047; Waramadan: 19185; Pwipwitipu trail: 19292, 19293, 19294.

***Parmotrema tinctorum*** (Despr. ex Nyl.) Hale - Epiphyte in treecrown in forest, c. 500 m alt. Kamarang: 18919.

****Parmotrema verrucisetosum*** Sipm. - Epiphyte in savannah bush, c. 800 m alt. Pwipwitipu trail: 19478. Already cited by Sipman & Aubel (1992: 8).

***Pseudoparmelia sphaerospora*** (Nyl.) Hale - Epiphyte on liana in forest, c. 500 m alt. Jawalla: 18400.

****Relicina abstrusa*** (Vainio) Hale - Epiphyte on shrubs in savannah bush or in tree- crown in forest, and on rock outcrop in savannah bush, 500-1000 m alt. Mayoripai: 18525; Roraima: 18815; Latipu: 19022, 19037, 19038.

****Rimelia reticulata*** (Tayl.) Hale & Fletcher - On *Citrus* tree in garden, and on rock outcrop in savannah bush, 500-1000 m alt. Kamarang: 18125a; Latipu: 19023.

****Rimelia subisidiosa*** (Müll. Arg.) Hale & Fletcher - Epiphyte on scrub in savannah bush, 1000 m alt. Latipu: 19045.

***Usnea aspera*** (Eschw.) Vainio - On sandstone outcrop at top of escarpment, c. 1000 m alt. Latipu: 19018.

****Usnea baileyi*** (Stirt.) A. Zahlbr. - Epiphyte on savannah shrub, c. 800 m alt. Pwipwitipu trail: 19480. Already cited by Sipman (1991: 141).

****Xanthoparmelia substenophylloides*** Hale - On sandstone outcrop at top of escarpment, c. 1000 m alt. Latipu: 19015.

15 *Usnea* specimens are still unidentified.

Physciaceae

****Buellia aptrootii*** Sipman, *sp. nov.*

Type: Guyana, Upper Mazaruni district, Mount Latipu, c. 8 km N of Kamarang, scrub on the summit plateau, on sandstone rockridge on top of eastern escarpment, coord. 5°57' N, 60°38' W, alt. c. 1000 m, 25 February 1985, H. Sipman & A. Aptroot 19013 (B holotype).

Diagnosis: Thallus epilithicus vel epiphyticus, pallide flavoviridis, areolatus, hypothallo nigro; areolae c. 0.1-0.2 mm latae, opacae, leviter convexae, reactione C+ aurantiaca, UV-negativus (an xanthonum continens?). Apothecia sessilia, basi constricta, c. 0.3-0.6 mm diametro, disco nigro opaco vulgo plano vel leviter concavo, margine tenui prominente nigro nitido; epithecium fuscum; hymenium hyalinum, 40-60 µm altum; hypothecium et excipulum atrofuscum; pars medullare excipuli substantia sanguinea (anthraquinone?, K+

purpurea) continente. Sporae octonae bicellulares griseae leptodermaticae, 9-14 x 5 µm. Pycnidia ignota.

Thallus epilithic, to c. 5 cm diam., or epiphytic, then only c. 1 cm diam., pale yellow-green, areolate, with black hypothallus; areoles c. 0.1-0.2 mm wide, irregularly round or crenulate, applanate, in the centre of the thallus more or less contiguous to coalescing, near the margin more dispersed, with smooth, slightly glossy or dull, slightly convex upper surface, c. 50 µm thick; medulla to c. 30 µm thick, pale yellow; chemistry: thallus C+ orange, UV-negative; apparently xanthones present. Apothecia sessile, with constricted base, c. 0.3-0.6 mm diam., with black, dull, mostly flat or slightly concave disc, and rather thin, prominent, black, glossy, often flexuous margin; epithecium brown, sometimes in part olivaceous; hymenium 40-60 µm thick, clear; hypothecium and excipulum darkbrown, except for large masses of red substance in the medullary exciple; these masses K+ purplish, dissolving in thin KOH-solution, probably anthraquinones. Ascospores darkbrown, ellipsoid, rather wide at the poles, uniseptate, thin-walled, 8 per ascus, 9-14 x 5-6 µm. Pycnidia not observed.

*Buellia aptrootii* is well characterized by the combination of a yellowish, xanthone-containing (C+ orange) thallus and the presence of conspicuous red masses in the excipulum. The apothecia are easily damaged, so that the red substance is often exposed. The pigment is similar in colour to the one found in *B. coccinea* (Fée) Aptroot (chiodectonic acid, according to Aptroot 1988: 11). This species differs by the pigment occurring mainly in the thallus medulla, and by its papillate-granular thallus.

Distribution and ecology: Thus far known from the Guiana Highlands, from sandstone table mountains in Guyana and Edo. Bolivar in Venezuela. The lichen has been found here on low, strongly leached sandstone outcrops in open vegetation at 1000-1200 m with a humid tropical climate. The epiphytic plant was from a similar habitat, growing on dry twigs of a free-standing shrub.

Additional material: VENEZUELA: Estado Bolivar, Cerro Guaiquinima, near NE edge of upper plateau (near camp 2), 8 February 1990, H. Sipman 26734, 26936 (B, VEN).

****Buellia coccinea*** (Fée) Aptroot - On bark and wood in forest and open vegetation, on primary and secondary habitats, 500-600 m alt. Jawalla: 18346; Waruma trail: 18592; Waramadan: 19200. Already cited by Aptroot (1988: 11).

****Buellia tabacina*** (Müll. Arg.) Malme - On quartzite rock along stream and in rock savannah, 550-1000 m alt. Waruma trail: 18645; Latipu: 19012, 19024, 19025. Already cited by Aptroot (1988: 16).

****Heterodermia barbifera*** (Nyl.) K. P. Singh - Epiphyte in savannah forest, c. 800 m alt. Pwipwitipu trail: 19285a, 19286. Already cited by Aptroot (1988: 26).

****Heterodermia casarettiana*** (Mass.) Trev. - Photophytic epiphyte in cultivated areas or savannah forest, sometimes on wood, 500-1000 m alt. Kamarang: 18103, 18117, 18124, 18282; Latipu: 19026, 19027; Pwipwitipu trail: 19287a, 19287b. Already cited by Aptroot (1988: 26).

****Heterodermia comosa*** (Eschw.) Follm. & Redon - Photophytic epiphyte in gardens, tree canopies or savannah forest, 500-1400 m alt. Jawalla: 18331; Roraima: 18824; Latipu: 19028; Pwipwitipu trail: 19287. Already cited by Aptroot (1988: 27).

****Heterodermia flavosquamosa*** Aptr. & Sipm. - On exposed rock or epiphytic in savannah, c. 650-800 m alt. Pwipwitipu trail: 19233, 19285, 19386. Already cited by Aptroot (1988: 27), as *Heterodermia corallophora* (Tayl.) Skorepa, and by Sipman (1990: 546).

****Heterodermia galactophylla*** (Tuck.) Trev. - Photophytic epiphyte in gardens or savannah, 500-1000 m alt. Kamarang: 18112, 18121, 18122, 18169, 18170, 18179, 18185; Jawalla: 18336; Mayoripai: 18518; Latipu: 19173; Pwipwitipu trail: 19285b, 19285c. Already cited by Aptroot (1988: 29).

*__Heterodermia isidiophora__ (Vainio) Awasthi - Epiphyte on twigs in savannah forest, c. 800 m alt. Pwipwitipu trail: 19288. Already cited by Aptroot (1988: 29).

*__Heterodermia leucomelos__ (L.) Poelt - Epiphyte on twigs in savannah forest, c. 800 m alt. Pwipwitipu trail: 19284. Already cited by Aptroot (1988: 30).

*__Heterodermia obscurata__ (Nyl.) Trev. - Epiphyte on free-standing trees in cultivated areas or savannah, also on wood, 500-600 m alt. Kamarang: 18101, 18123, 18168, 18171, 18172, 18197; Jawalla: 18332, 18333, 18334; Mayoripai: 18524, Waramadan: 19181. Already cited by Aptroot (1988: 30).

*__Physcia atrostriata__ Moberg - Epiphyte on fruit- and other trees in cultivated area, c. 500 m alt. Kamarang: 18120, 18198; Jawalla: 18328, 18335, 18340, 18341. Already cited by Aptroot (1988: 37).

*__Physcia krogiae__ Moberg - Epiphyte on fruit-tree in garden, c. 500 m alt. Jawalla: 18338. Already cited by Aptroot (1988: 40).

*__Physcia sorediosa__ (Vainio) Lynge - Epiphyte on fruit- and other trees in cultivated areas and in savannah scrub, 500-800 m alt. Kamarang: 18118, 18119, 18173, 18186, 18199; Jawalla: 18339; Pwipwitipu trail: 19232, 19280. Already cited by Aptroot (1988: 38) under its synonym *P. fragilescens* A. Zahlbr.

*__Pyxine albovirens__ (G. Mey.) Aptroot - On branches of fruit-tree in garden, 500 m alt. Kamarang: 18111. Already cited by Aptroot (1988: 42).

*__Pyxine eschweileri__ (Tuck.) Vainio - On exposed rock in savannah bush, c. 800 m alt. Pwipwitipu trail: 19282, 19283. Already cited by Aptroot (1988: 46).

*__Pyxine obscurascens__ Malme - On exposed rock in savannah bush, c. 650 m alt. Pwipwitipu trail: 19231. Already cited by Aptroot (1988: 47).

*__Pyxine sorediata__ (Ach.) Mont. - Epiphyte on garden *Citrus* tree, c. 500 m alt. Jawalla: 18337. Already cited by Aptroot (1988: 48).

Pilocarpaceae

__Badimia dimidiata__ (Bab.) Vezda - Foliicolous in undergrowth of various forest types, common, 500-800 m alt. Jawalla: 18409, 18446; Waruma trail: 18541e, 18541f; Kamarang: 18931c; Latipu (foot): 19008; Pwipwitipu trail: 19221, 19221b, 19230g, 19310b, 19310c, 19312c, 19320. Sérusiaux (1986: 6) observed that the ascus structure in this genus does not fit the family Ectolechiaceae, where it has been placed before. His observation could be confirmed on our material of *B. dimidiata* (nr. 19008 investigated).

__Byssolecania deplanata__ (Müll. Arg.) R. Sant. - Foliicolous in undergrowth of forest near river, 500-600 m alt. Kamarang: 18933c; Latipu (foot): 19010e; Waramadan: 19221e; Pwipwitipu trail: 19309b.

*__Byssolecania fumosonigricans__ (Müll. Arg.) R. Sant. - Foliicolous in undergrowth of forest near river, 600 m alt. Waramadan: 19230i. Already cited by Sipman (1991: 139).

*__Byssoloma aeruginascens__ Vezda - Foliicolous in undergrowth of forest, widespread, 500-800 m alt. Kamarang: 18215; Jawalla: 18449e; Waruma trail: 18546d; Waramadan: 19228e; Pwipwitipu trail: 19314c. Already cited by Sipman (1991: 139).

*__Byssoloma amazonicum__ Kalb & Vezda - Foliicolous in undergrowth of forest near river, 600 m alt. Waramadan: 19228f.

*__Byssoloma farkasii__ Sipman, *sp. nov.*
(Fig. 2C)
Type: Guyana, Demerara district, Mabura Hill, c. 120 km S of Georgetown, mixed forest (primary tropical rainforest on poor soil), foliicolous in understorey, March 1985, H. Cornelissen & H. ter Steege 29 (B holotype).

Diagnosis: Thallus invisibilis, hypophyllus; apothecia parva, c. 0.2 mm diametro, basi constricta, paulo convexa, albopruinosa, nonnumquam disco epruinoso pallide fusco, margine tomentoso; hymenium 25-40 µm crassum; hypothecium fulvum; sporae elongatae, bicellulares, a septo mediale gradatim attenuata in apices obtusos, hyalinae, octonae, c. 10-12 x 2-3 µm. Pycnidia ignota.

Thallus virtually invisible, hypophyllous, away from the leaf margins; phycobiont not observed. Apothecia c. 0.2 (0.1-0.3) mm diam., constricted at their base; disc ashy white-pruinose, weakly convex, sometimes pale brown, when the pruina is lacking; margin white, not prominent, tomentose; epithecium indistinct, but hymenium usually covered by a thin granular layer, granules persistent in KOH-solution; hymenium 25-40 µm thick, hyaline, I+ blue; asci with I+ blue tholus; hypothecium yellow-brown, sometimes with crystals, in KOH-solution more intensely brown. Spores elongate, bicellular, gradually attenuated from the middle to the obtuse poles, hyaline, 8 per ascus, c. 10-12 x 2-3 µm. Pycnidia not observed.

The species strongly resembles *B. murinum* Vezda morphologically, judged from its description (Vezda 1987). However, its spores are smaller and constantly one-septate, not 3-septate. Moreover the hypothecium seems less intensely pigmented. The species is named after Dr. E. Farkas (Hungary), who suggested that this species belongs in the genus *Byssoloma.*

Distribution and ecology: The available material suggests that the species is widespread in Amazonian forests. Records are available from Araracuara in Colombia, and the districts Demerara and Upper Mazaruni in Guyana. In the first locality it was fairly frequent, in the other areas only single collections have been made. The species has been found on the lower side of rather leathery dicotyledon leaves in the undergrowth of lowland forest on poor soil, at elevations up to c. 600 m.

Additional material: Pwipwitipu trail: 19228d. COLOMBIA: Comisaría Amazonas, comunidad de Villazul, E of Araracuara, N-bank of river Caquetá, opposite E-end of Isla Morrocoy, 3 November 1988, H. Sipman & J. Duivenvoorden 28522 (ARA, B); Comisaría Amazonas, comunidad de Villazul, E of Araracuara, N-bank of river Caquetá, opposite Isla Mariñame, 2 November 1988, H. Sipman & J. Duivenvoorden 28203 (ARA, B); Dept. Caquetá, 2.5 km NE of Araracuara, 31 October 1988, H. Sipman & J. Duivenvoorden 27995, 27996 (ARA, B); Dept. Caquetá, Araracuara, tableland near airstrip, 29 October 1988, H. Sipman & J. Duivenvoorden 27995, 27996 (ARA, B).

****Byssoloma leucoblepharum*** (Nyl.) Vainio - Foliicolous in undergrowth of forest, widespread, 500-1000 m alt. Jawalla: 18448e; Waruma trail: 18546b; Roraima: 18737; Kamarang: 18933d; Latipu (foot): 19008c; Latipu: 19128c; Waramadan: 19229; Waruma trail: 19312d. Already cited by Sipman (1991: 139).

***Byssoloma subdiscordans*** (Nyl.) P. James - Foliicolous in undergrowth of various forest types, widespread, 500-100 m alt. Kamarang: 18214; Jawalla: 18448d; Waruma trail: 18546; Roraima: 18737b; Kamarang: 18934; Latipu: 19128; Pwipwitipu trail: 19313.

***Byssoloma tricholomum*** (Mont.) A. Zahlbr. - Foliicolous, 800 m alt. Pwipwitipu trail: 19311c.

Placynthiaceae

****Polychidium dendriscum*** (Nyl.) Henssen - Epiphyte in crown of emergent tree in mossy forest, c. 1400 m alt. Roraima: 18841. Already cited by Sipman (1991: 140).

Several other families of Lecanorales are represented, of which the representatives are not yet completely identified. The more important include: Lecanoraceae (3 specimens, belonging to *Lecanora*), Lecideaceae s.l. (c. 35 specimens, belonging to "*Lecidea*" and "*Lopadium*" in wide, traditional sense, *Micarea*?, *Mycobilimbia*?), Pertusariaceae (9 specimens of *Pertusaria*), Ramalinaceae (4 specimens of *Ramalina*).

MELANOMMATALES

Aspidotheliaceae

***Aspidothelium fugiens*** (Müll. Arg.) R. Sant. - Foliicolous in undergrowth of tall forest, 600 m alt. Pwipwitipu trail: 19226f.

Monoblastiaceae

***Anisomeridium foliicola*** R. Sant. & Tibell - Foliicolous in undergrowth of tall riverine forest, common but not abundant, 500-600 m alt. Jawalla: 18441b; Kamarang: 18930d; Waramadan: 19220b.

Pyrenulaceae

***Anthracothecium novemseptatum*** (Vainio) Harris - Epiphyte on *Persea* in cultivated area, c. 500 m alt. Jawalla: 18314. Confirmed by Harris, 1990.

***Pyrenula*** cf. ***anomala*** (Ach.) Vainio - Tree epiphyte in forest and cultivated areas, c. 500-550 m alt. Jawalla: 18360; Waruma trail: 18561, 18585. The specimens differ from the description in Harris (1989: 85) by their smaller spores.

***Pyrenula aspistea*** (Ach.) Ach. - Epiphyte in low forest, c. 600-800 m alt. Latipu (foot): 18984; Pwipwitipu trail: 19445.

***Pyrenula marginata*** Hook. in Kunth - Tree epiphyte in cultivated areas and in forest, 500-600 m alt. Kamarang: 18156; Jawalla: 18302; Latipu: 18952.

****Pyrgillus americanus*** Nyl. - Epiphyte in savannah bush, c. 800 m alt. Pwipwitipu trail: 19429. Already cited by Sipman (1991: 141).

Most specimens of *Pyrenula* (14) still await treatment.

Trypetheliaceae

***Astrothelium cinnamomeum*** (Eschw.) Müll. Arg. - Epiphyte on shrub in rock savannah, c. 1000 m alt. Latipu: 19094.

****Astrothelium confusum*** Müll. Arg. - Epiphyte on shrubs in rock savannah, c. 800-1000 m alt. Latipu: 19097; Pwipwitipu trail: 19426. Identified by Harris, 1991.

***Astrothelium eustomum*** (Mont.) Müll. Arg. - Epiphyte on canopy branches in tall forest and on shrubs in savannah, c. 500-800 m alt. Jawalla: 18454; Pwipwitipu trail: 19442. Confirmed by Harris, 1991.

***Astrothelium galbineum*** Kremp. - Epiphyte in low, open forest, savannah and cultivated areas, c. 500-1000 m alt. N of Kamarang: 18267; Jawalla: 18320; Latipu: 19048; Waramadan: 19198.

****Astrothelium gigasporum*** Harris - Widespread, shade-tolerant epiphyte, usually in dense forest, but also in savannah and cultivated areas, c. 500-550 m alt. N of Kamarang: 18268; Jawalla: 18492; Waruma bank: 18572, 18576, 18608, 18623, 18658. Some specimens lack spores and have been tentatively identified on their habit: ascomata thickly covered by a pale greenish, UV+ thallus; ostiole very pronounced, often chimney-like.

****Astrothelium ocellatum*** Malme - Epiphyte on isolated shrub in white-sand savannah, 600 m alt. Waramadan: 19199.

***Astrothelium ochrothelium*** (Nyl.) Müll. Arg. - Epiphyte on isolated trees in white-sand savannah, c. 600 m alt. Waramadan: 19190, 19196.

***Astrothelium versicolor*** Müll. Arg. - Epiphyte in cultivated area and in savannah, c. 500-800 m alt. Kamarang: 18138, 18166; Pwipwitipu trail: 19347. Confirmed by Harris, 1991.

****Cryptothelium amazonum*** R.C. Harris - Epiphyte on wel-lit branches of shrubs in savannah forest and treecrowns in well-grown forest, c. 500-700 m alt. N of Kamarang: 18261; Roraima: 18683. Confirmed by Harris, 1991, nr. 18683 identified by Harris, 1991.

***Cryptothelium sepultum*** (Mart.) Mass. - Photophytic epiphyte in savannah or cultivated areas, c. 500 m alt. Kamarang: 18167. The specimen lacks spores, and is provisionally identified on the basis of a general resemblance of the greenish thallus with large white pycnidiiferous patches.

****Laurera subdisjuncta*** (Müll. Arg.) R.C. Harris - Epiphyte in savannah forest, c. 500-800 m alt. N of Kamarang: 18258; Pwipwitipu trail: 19348, 19443. Confirmed by Harris, 1991.

****Polymeridium pleiomeroides*** (Müll. Arg.) R.C. Harris - Epiphyte on mango tree in village, c. 500 m alt. Kamarang: 18126. Identified by Harris, 1991.

****Pseudopyrenula subgregaria*** Müll. Arg. - Tree epiphyte in cultivated areas, sometimes in savannah, 500-800 m alt. Kamarang: 18157, 18164; Jawalla: 18304, 18321;

Pwipwitipu trail: 19275, 19385.

***Trypethelium aeneum*** (Eschw.) Nyl. - Epiphyte on isolated shrub in white-sand savannah, alt. c. 600 m alt. Waramadan: 19195. The thallus of the specimen agrees well with this characteristic species, which forms conspicuous, large yellow patches on branches of savannah shrubs. However, the identification is tentative because ascomata are absent.

***Trypethelium crassum*** Fée - Epiphyte in canopy of mossy forest, 700-1400 m alt. Roraima: 18741, 18846. Identified by Harris, 1991.

****Trypethelium infuscatulum*** (Nyl.) R.C. Harris - Epiphyte on free-standing trees and shrubs in savannah, 600-1000 m alt. Latipu: 19049; Waramadan: 19193. Identified by Harris, 1991.

***Trypethelium nitidiusculum*** (Nyl.) R.C. Harris - Forest epiphyte, usually on small tree trunks, also in savannah bush, 500-1000 m alt. Kamarang: 18165, 18254, 18259; Jawalla: 18309, 18366; Roraima: 18548, 18627, 18714, 18767; Latipu: 19066; Waramadan: 19189.

***Trypethelium ochroleucum*** (Eschw.) Nyl. - Epiphyte in rock savannah, c. 800 m alt. Pwipwitipu trail: 19366. Confirmed by Harris, 1991.

****Trypethelium platystomum*** Mont. - Epiphyte in cultivated area near inland village, c. 500 m alt. Jawalla: 18357. Confirmed by Harris, 1991.

***Trypethelium tuberculosum*** (Vainio) R.C. Harris - Epiphyte in rock savannah, c. 800 m alt. Pwipwitipu trail: 19366. Confirmed by Harris, 1991.

VERRUCARIALES

Verrucariaceae

****Microtheliopsis uleana*** Müll. Arg. - Foliicolous in undergrowth of forest, c. 500 m alt. Waramadan: 19225c. Already cited by Sipman (1990: 548).

****Normandina pulchella*** (Borr.) Nyl. - Epiphyte on fruit trees in gardens, c. 500 m alt. Kamarang: 18108; Jawalla: 18307. Already cited by Sipman (1991: 140).

ORDER UNCERTAIN

Gomphillaceae

***Actinoplaca strigulacea*** Müll. Arg. - Foliicolous in undergrowth of tall riverine forest, 500 m alt. Kamarang: 18936b.

***Aulaxina minuta*** R. Sant. - Foliicolous in undergrowth of tall forest, 500 m alt. Kamarang: 18931.

***Aulaxina quadrangula*** (Stirt.) R. Sant. - Foliicolous in undergrowth of forest, 500-800 m alt. Kamarang: 18931b; Pwipwitipu trail: 19311b.

****Aulaxina submuralis*** Kalb & Vezda - Foliicolous in undergrowth of tall forest, 500 m alt. Jawalla: 18443

***Calenia conspersa*** (Stirt.) R. Sant. - Foliicolous in undergrowth of tall forest, 500-600 m alt. Jawalla: 18410, 18445e; Waramadan: 19230j.

***Calenia submaculans*** R. Sant. - Foliicolous in undergrowth of forest, 500-600 m alt. Kamarang: 18213, 18937b; Jawalla: 18446c; Waruma trail: 18544, 18544b; Waramadan: 19221f.

****Echinoplaca affinis*** Kalb & Vezda - Foliicolous in undergrowth of forest, 500-800 m alt. Kamarang: 18244e, 18936d; Jawalla: 18408, 18442; Waruma trail: 18546e; Roraima: 18739; Waramadan: 19222d; Pwipwitipu trail: 19309c. Already cited by Sipman (1991: 140).

****Echinoplaca diffluens*** (Müll. Arg.) R. Sant. - Foliicolous in undergrowth of forest, c. 500 m alt. Jawalla: 18442b; Kamarang: 18945g. Already cited by Sipman (1991: 140).

****Echinoplaca pellicula*** (Müll. Arg.) R. Sant. - Foliicolous in undergrowth of tall forest, c. 600 m alt. Waramadan: 19230k. Already cited by Sipman (1991: 140).

***Gyalectidium filicinum*** Müll. Arg. - Foliicolous in undergrowth of forest, 500-800 m alt. Jawalla: 18445f; Kamarang: 18937; Waramadan: 19230l; Pwipwitipu trail: 19310d.

****Tricharia dilatata*** Vezda - Foliicolous in undergrowth of forest, c. 500 m alt. Jawalla: 18446b. Already cited by Sipman (1991: 148).

****Tricharia santessoniana*** Kalb & Vezda -

Foliicolous in undergrowth of forest, c. 700 m alt. Roraima: 18739c. Already cited by Sipman (1991: 141).

****Tricharia urceolata*** (Müll. Arg.) R. Sant. - Foliicolous in undergrowth of forest, c. 600 m alt. Waramadan: 19230h. Already cited by Sipman (1991: 148).

Phyllobatheliaceae

***Phyllobathelium epiphyllum*** (Müll. Arg.) Müll. Arg. - Foliicolous in undergrowth of forest, 500-600 m alt. Jawalla: 18447e; Kamarang: 18939c; Waramadan: 19225f, 19226.

Strigulaceae

****Phylloporis phyllogena*** (Müll. Arg.) Clem. - Foliicolous in undergrowth of forest, 500-600 m alt. Kamarang: 18940b; Waramadan: 19223. Already cited by Sipman (1991: 140).

****Phylloporis platypoda*** (Müll. Arg.) Vezda - Foliicolous in undergrowth of forest, 500-800 m alt. Jawalla: 18444d, 18445; Kamarang: 18940; Latipu (foot): 19009; Waramadan: 19222f; Pwipwitipu trail: 19317b. Already cited by Sipman (1991: 140).

****Raciborskiella janeirensis*** (Müll. Arg.) R. Sant. - Foliicolous in undergrowth of forest, 500-600 m alt. Jawalla: 18411b; Latipu (foot): 19009g; Waramadan: 19227b. Already cited by Sipman (1991: 141).

***Strigula concreta*** (Fée) R. Sant. - Foliicolous in undergrowth of forest, 500-700 m alt. Waruma trail: 18547d; Roraima: 18735.

****Strigula maculata*** (Cooke & Massee) R. Sant. - Foliicolous in undergrowth of forest, 500-800 m alt. Kamarang: 18214d, 18943b; Waruma trail: 18547c; Roraima: 18735a; Latipu (foot): 19009j; Pwipwitipu trail: 19319b. Already cited by Sipman (1991: 141).

****Strigula melanobapha*** (Kremp.) R. Sant. - Foliicolous in undergrowth of forest, c. 500 m alt. Jawalla: 18446f. Already cited by Sipman (1991: 141).

***Strigula nemathora*** Mont. - Foliicolous in undergrowth of forest, 500-800 m alt. Jawalla: 18446e; Kamarang: 18943; Waramadan: 19229b, 19229c; Pwipwitipu trail: 19319.

***Strigula smaragdula*** E.M. Fries - Foliicolous in undergrowth of forest, 500-800 m alt. Jawalla: 18499; Kamarang: 18943c, 18943d; Latipu (foot): 19009i; Waramadan: 19229e; Pwipwitipu trail: 19319c.

***Strigula subtilissima*** (Fée) Müll. Arg. - Foliicolous in undergrowth of forest, 500-600 m alt. Kamarang: 18244; Jawalla: 18446d; Latipu (foot): 19009k; Waramadan: 19229d.

Trichotheliaceae

***Porina epiphylla*** (Fée) Fée - Foliicolous in undergrowth of forest, 500-800 m alt. Jawalla: 18445c; Kamarang: 18941b, 18941c, 18942b; Latipu (foot): 19009d; Waramadan: 19223c; Pwipwitipu trail: 19315b.

****Porina exasperatula*** Vainio - Epiphyte in forest and cultivated areas, c. 500 m alt. Jawalla: 18380, 18464.

****Porina fulvella*** Müll. Arg. - Foliicolous in undergrowth of forest, 500-600 m alt. Kamarang: 18215d, 18942; Waramadan: 19224 (vs., without spores). Already cited by Sipman (1991: 148).

****Porina fusca*** Lücking - Foliicolous in undergrowth of forest, c. 500-600 m alt. Waramadan: 19223e; Kamarang: 18942c.

***Porina imitatrix*** Müll. Arg. - Foliicolous in undergrowth of forest, c. 600 m alt. Waramadan: 19223f.

****Porina leptosperma*** Müll. Arg. - Foliicolous in undergrowth of forest, c. 500 m alt. Jawalla: 18445b; 18449b. Already cited by Sipman (1991: 140).

***Porina mastoidea*** (Ach.) Müll. Arg. - Epiphyte on tree trunks in light, mostly low forest, 500-800 m alt. Kamarang: 18912; Latipu: 18966, 19006, 19167; Pwipwitipu trail: 19360, 19449. The species name is applied in a wide sense, to include short-spored specimens (45-75 µm long: nr. 19167, 19449) and long-spored ones (75-110 µm long: nr. 18912, 18966, 19006, 19360). In all specimens the spores are rather wide, mostly 10-15 µm, they show a thick epispore, and the number of septa usually

exceeds 7, up to 15, often several close together near the spore ends.

**Porina rubentior* (Stirt.) Müll. Arg. - Foliicolous in undergrowth of forest, 500-600 m alt. Jawalla: 18449c; Waruma trail: 18542c, 18542d; Kamarang: 18945h; Latipu (foot): 19009b; Waramadan: 19223b. Already cited by Sipman (1991: 140).

**Porina rufula* (Kremp.) Vainio - Foliicolous in undergrowth of forest, 500-800 m alt. Jawalla: 18449; Waruma trail: 18542, 18542b; Roraima: 18738b, 18738c; Kamarang: 18941d; Latipu (foot): 19009e; Waramadan: 19223d; Pwipwitipu trail: 19315c. Already cited by Sipman (1991: 141).

**Porina rugosa* Vezda - foliicolous in undergrowth of forest, 500-800 m alt. Jawalla: 18445b; Kamarang: 18941; Waramadan: 19225d; Pwipwitipu trail: 19317.

*Porina tetracerae* (Afz. in Ach.) Müll. Arg. - On small tree trunks in forest, c. 700 m alt. Roraima: 18700.

**Porina tetralocularis* Aptroot ined. - On shaded tree in forest, 550-800 m alt. Waruma trail, 18631; Pwipwitipu trail, 19474. To be published by Aptroot & Sipman (1992, in prep.).

**Trichothelium annulatum* (Karst.) R. Sant. - Foliicolous in undergrowth of forest, 500-800 m alt. Jawalla: 18449f, 18449g; Waruma trail: 18545f; Kamarang: 18945; Waramadan: 19220d, 19228c; Pwipwitipu trail: 19314d. Already cited by Sipman (1991: 141).

**Trichothelium horridulum* (Müll. Arg.) R. Sant. - Epiphyte on liana in undergrowth of forest remnant, c. 500 m alt. Jawalla: 18494.

Uncertain family

**Celothelium dominicanum* (Vainio) Aguirre - Epiphyte in cultivated areas, c. 500 m alt. Kamarang: 18127; Jawalla: 18298, 18362, 18368, 18369.

**BASIDIOMYCETES**

Corticiaceae

**Corella zahlbruckneri* Schiffn. - Terrestrial on rock savannah, c. 800 m alt. Pwipwitipu trail: 19413. Already cited by Sipman (1991: 139).

*Dictyonema glabratum* (Spreng.) D. Hawksw. - Epiphyte in savannah shrubs or montane forest canopy, c. 650-1600 m alt. Roraima: 18854; Latipu: 19068; Pwipwitipu trail: 19245, 19337.

*Dictyonema irpicinum* Mont. - Epiphyte in montane forest, alt. c. 1200 m alt. Roraima: 18787.

*Dictyonema sericeum* (Sw.) Berk. - Epiphyte in open forest, 500-1000 m alt. Kamarang: 18260; Waruma trail: 18665; Latipu: 19054, 19100; Pwipwitipu trail: 19278, 19279, 19351b, 19361, 19374, 19425.

**INCERTAE SEDIS**

*Phyllophiale alba* R. Sant. - Foliicolous in undergrowth of forest, 500-800 m alt. Kamarang: 18939d; Waramadan: 19230f; Pwipwitipu trail: 19309d.

**Siphula carassana* Müll. Arg. - On bare sandstone rock flats along periodically dry water tracks, temporarily wet after heavy rainfall, 1000-2300 m alt. Roraima: 18888, 18888a; Latipu: 19011. TLC: siphulin. The species resembles *S. ceratites* (Wahlenb.) Fr. by its cylindrical branches and chemistry. It differs by the thinner and shorter branches without longitudinal grooves, with slight transverse constrictions, by the more dense branching which gives the plants a more shrubby shape, and by the habitat preference, growing attached to sandstone rock, rather than on soil.

**Siphula decumbens* Nyl. - Terrestrial on regularly soaked humus in open spots, and on mossy, weathered or burnt bark or wood in forest, c. 1000 m alt. Latipu: 19014, 19091. TLC: thamnolic acid, with or without smaller amounts of siphulin. *Siphula decumbens* is a very variable and widespread species. A description of its variability was presented by Galloway (1985: 524). In Guyana and surroundings two very distinct forms occur, which

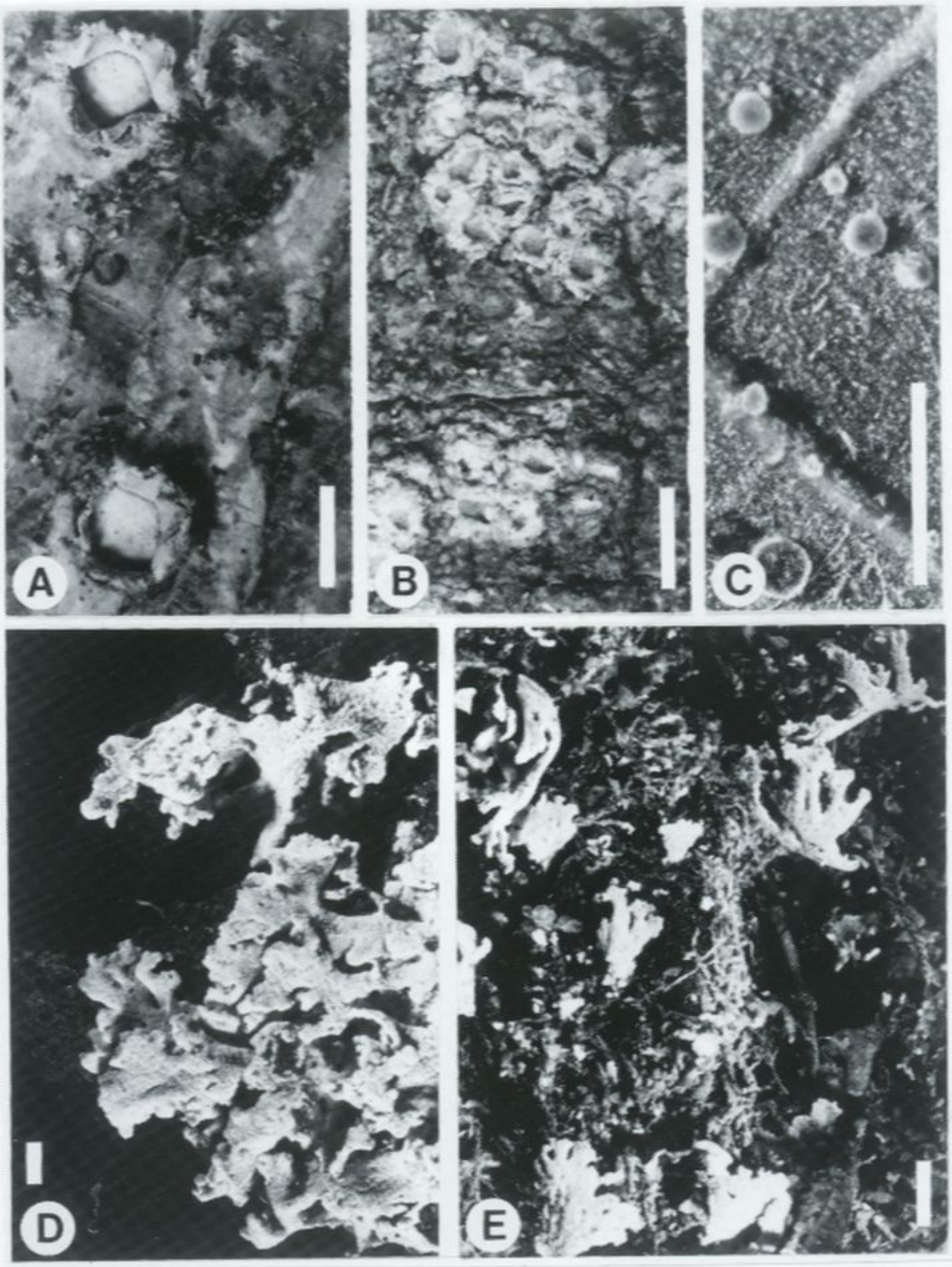


Fig. 2. A. *Ocellularia atrolucens* (type). B. *Thelotrema albomaculatum* (Sipman & Aptroot 18466). C. *Byssoloma farkasii* (type). D, E. *Siphula decumbens*; D: terrestrial plant (Sipman & Duivenvoorden 27894, from Colombia); E: epiphytic plant (Sipman & Aptroot 19091). Scale = 1 mm.

depend on the habitat choice of the plant. Soil-inhabiting plants form usually several cm wide cushions composed of thick lobes which produce coarse granules on the underside of more or less cucullate lobe tips (Fig. 2D). Epiphytic plants are composed of scattered, erect (geotropically oriented), flabellate squamules, which are thinner and produce granules mainly along their margins (Fig. 2E).

**Floristic observations**

Because of current insufficient knowledge of the lichen flora of tropical areas, it is at present impossible to determine whether the Upper Mazaruni District has a particularly high lichen diversity or a particularly high number of species with limited distribution. This chapter is therefore restricted to a discussion of the floristic characteristics of the available habitats. To this end, the habitats have been arranged in four groups:

**1. The savannah.** This term is used here for natural or seminatural habitats with interrupted shrub/tree layer. They occur on very poor sandy soil ("sand savannah") or on rock flats ("rock savannah").

Sand savannah is mainly found in the plains along the rivers, whereas rock savannah is most widespread on top of the table mountains. Sand savannah has been inventoried in Mayoripai and near Waramadan and consists of herbaceous vegetation with scattered shrubs. The vegetation appears to be burnt regularly and has an impoverished lichen flora of terrestrial Cladoniaceae and photophytic epiphytes. *Cladoniae* found include *C. corallifera*, *C. peltastica* and *C. spinea*.

The rock savannah consists of a mosaic of open spaces with bare rock, sometimes with sand or humous accumulations, embedded in scrub and low forest growing in the wider fissures of the rock flats. It is apparently only rarely visited by man and thus protected against frequent fire. It shows a range of Cladoniaceae, depending on the presence of a sandy or humous soil layer and of shade. The predominance of Cladoniaceae showing "rounded heads", as in the boreal *Cladina stellaris*, is remarkable. Common species with such a form are *Cladina confusa*, *C. densissima*, *Cladonia signata*, *C. pulviniformis*. Other common *Cladoniae* include *C. peltastica* agg., *C. corallifera*, *C. secundana*, *C. steyermarkii*. On exposed rock *Heterodermia flavosquamosa*, *Hypotrachyna flavida*, *Parmotrema peralbidum*, *Pyxine obscurascens*, *Usnea aspera*, *Xanthoparmelia stenophylloides* etc. have been observed. Some of these are restricted to rock, while others also occur as epiphytes. Along temporary waterflows on the rock flats *Siphula carassana* is common. The shrubs and low trees seem to basically support the same lichen flora that can be found in the canopy layer of tall forests. However, a number of epiphytes have only been found here, probably because the shrubs are much better investigated than the forest canopy. Noteworthy species found only in the savannah scrub include *Biatorella conspersa*, *B. wrightii*, *Coccocarpia erythrocardia*, *Erioderma sorediatum*, *E. wrightii*, *Heterodermia barbifera*, *H. leucomelos*, *Parmotrema rampoddense*, *P. ramusculum*, *Pseudocyphellaria aurata*, *Pyrgillus americanus*, *Sticta fuliginosa*, *Usnea baileyi*, and especially several Trypetheliaceae, *Astrothelium galbinum*, *A. subfuscum*, *A. variolosum*, *Trypethelium floridanum*. There is also a remarkable similarity with the lichen flora of cultivated areas (see below). The rock savannah on top of the lower Tepuis seems to be the habitat with the highest lichen diversity, wile, in contrast, the bryophyte diversity appears to be low (Gradstein & Florschütz-de Waard 1989: 52).

**2. The cultivated areas.** The region is largely uninhabited, and cultivated areas are present only as isolated patches in the forest near the few settlements along the main rivers. Here the original vegetation, usually forest, has been removed and replaced by herbaceous vegetation and planted trees. This habitat was given special attention in order to look for introduced, synanthropic lichens. It appears that most lichen species encountered are also found in the canopy layer of surrounding forests, or in the savannah areas, to which the cultivated areas have a structural resemblance.

Most lichens are epiphytic, but some terrestrial *Cladoniae* were found in fields on poor sandy soil: *C. didyma, C. corallifera, C. furfuracea, C. peltastica,* and the only find of *C. ramulosa*. Among the epiphytes the following have been found only in the cultivated areas: *Astrothelium cinnamomeum, Brigantiaea leucoxantha, Canoparmelia amazonica, Coccocarpia pellita, Glyphis cicatricosa, Leptogium phyllocarpum, Lopezaria versicolor, Normandina pulchella, Pannaria stylophora, Physcia atrostriata, P. krogii, Pyxine albovirens, P. sorediata, Tylophoron crassiusculum*. Most of them were only found once, and they may eventually prove to be infrequent canopy dwellers in the surrounding forests. However, most of them are widespread in cultivated areas throughout the tropics, and could as well be synanthropic introductions. A possibly introduced foliicolous lichen is *Chroodiscus mirificus* (see the note under the species above).

**3. The forests.** This is the dominant habitat in the area. The forests are generally rather low, up to c. 25 m tall, probably because most soils are poor. The largest trees seem to occur near the rivers, which is where most of the visited forests are situated, since they are more easily accessible.

Within the forest most attention was paid to leaf-inhabiting lichens. About one third of all identified lichen species are foliicolous taxa from the forest undergrowth. They have already been treated by Sipman (1991), who showed that the richest foliicolous lichen flora occurs in tall riverain forests. Low forests and the very humid forests on the lower slope of Mt. Roraima have a reduced flora. In non-forest habitats few foliicolous lichens were found.

In lower levels of the forest high humidity and shade appear to be impeding lichen growth, and the lichen flora is best developed in more open places. Corticolous species restricted to such sites include *Astrothelium gigasporum, Coenogonium* spp., *Eschatogonia prolifera*, various Thelotremataceae, a.o. *Myriotrema bahianum, M. congestum, M. glauculum, M. wrightii, Ocellularia amplior, O. perforata, O. rhodostroma, O. subemersa, Thelotrema albomaculatum, T. dissutum,* further *Phyllopsora corallina, Physcidia wrightii, Porina exasperatula, P. tetracerae, Pyrenula santensis, Squamacidia janeirensis*. The lichen diversity of the forests seems less than that of the rock savannah. However, this may be a wrong impression caused by the insufficient attention paid to forest canopy lichens.

**4. The humid mountain vegetation of Mount Roraima.** A survey of the altitudinal vegetation belts of this mountain, as proposed by Warren in 1973, is presented by Gradstein (1986) and is followed here.

**A**. In the riverain forest at c. 550 m at the foot of the mountain, the lichen flora appears to be basically the same as in other forests in the area. However, bryophytes reach further up into the tree trunks and lichens are restricted more to the canopy layer, preferably occurring on smooth bark. Some Thelotremataceae, e.g. *Myriotrema concretum, Ocellularia lepadinoides*, elsewhere growing all over the tree trunks, appear to be mostly restricted to higher parts of tree trunks. The reduction in lichen diversity is best illustrated by the foliicolous species, cf. Sipman (1991). No increase of Lobarion-type communities was observed, and species of e.g. *Leptogium, Sticta, Lobaria* are scarce. *Ocellularia subemersa* is a fairly common species which seems restricted to the mossy forest of this and the following belt, and the genera *Coccocarpia* and *Coenogonium* seem more diverse than elsewhere. Also *Trypethelium crassum* is only found in this and the next belt. The increase in bryophyte diversity (Gradstein & Florschütz-de Waard 1989) seems to be correlated with a decrease in lichen diversity. The interesting pioneer vegetation described by them from river banks did not yield any lichens. However, lichens were present on some of the big boulders in the open riverbed.

**B**. The submontane rain forest (550-1200 m) much resembles the previous zone, exept that there is a further increase in bryophyte abundance and a further decrease in lichen presence. A Lobarion-type vegetation is lacking.

**C**. The montane forest (1200-1600 m) has still more bryophytes and fewer lichens. Nevertheless, a few lichen species have only been observed here, high in tree canopies: *Polychidium dendriscum, Dictyonema*

*irpicinum*, *Phaeographis exaltata* and *Erioderma verruculosa*. They seem to be representatives of the montane lichen flora and are usually found at higher elevations else-where in the Neotropics. Also, *Myriotrema hartii* was found exclusively, and several times, in the high-elevation mossy forest between 1400-2300 m. This is remarkable, because it is not known to be a montane species.

**D**. The montane scrub and swamp (2000-2300 m) shows an increase of foliose and fruticose epiphytes, including *Hypotrachyna*, *Parmotrema* and *Usnea* species. This is probably mainly due to the shrubby nature of the vegetation, which allows these species to grow within collector's reach. The find of *Oropogon loxensis*, a common lichen in the Andes around 3000 m, at a unusually low elevation here, is worthy of mention. The only specimen of *Ocellularia aurata*, a lowland species, was also found here, as well as several rock savannah species, e.g. *Siphula carassensis*. A diverse Cladoniaceae-flora, as usually found in rock savannah, was not encountered.

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Fig. 1. New *Myriotrema* taxa. A. *M. guianense* (Sipman & Aptroot 18228). B. *M. neofrondosum* (type). C. *M. neofrondosum*, thallus producing schizidia on elevated warts (Sipman & Aptroot 17962). D. *M. neofrondosum*, thallus producing schizidia on low warts (Sipman & Aptroot 18757). E. *M. subdactyliferum* (Sipman 26345). F. *M. subdactyliferum*, SEM photograph of isidium (Sipman 26345). Note difference between smooth surface of isidium and rough surface of thallus. All, except F, same magnification, scale = 1 mm.