A Conspectus of the Lichens (Lichenized Fungi) of Singapore

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Abstract

A total of 296 species of lichenized fungi are reported from Singapore and presented in an annotated list with local distributional information. It is based on herbarium and literature study and the fieldwork done in the year 2000. Unidentified samples suggest the figure to be an underestimation, while some of the listed species may have become extinct. Lists of synonyms and collectors are added.

Introduction

Tropical conurbations, the world's most fast-growing habitat, have turned out to harbour significant numbers of lichenized fungi. Aptroot and Seaward (1999) and Aptroot and Sipman (2001) report no less than 308 species for the city of Hongkong. Singapore seems particularly suitable for a study of lichens in an urbanized tropical area because it has received regular attention from botanists during its development from primary lowland forest with small settlements *ca* 1800 to extensive plantations a century later and to the present urbanized area with large built-up high rise areas interspersed by parks and secondary forest. During 1800-1964 scattered lichen collections were made by visiting and resident general botanists, e.g., E. Almquist, O. Beccari, T.R. Chipp, Kiah, A.M. Lemaitre, A.C. Maingay, H. Möller. Their collections have been investigated and published by, e.g., Krempelhuber (1875, 1877), Nylander and Crombie (1884) and Müller Argoviensis (1893). From 1964-1992 three lichen experts visited the area and made herbarium vouchers, Aptroot, Degelius, and Tibell (see list of collectors below). In November 2000 the author made a lichen inventory in collaboration with Dr. B.C. Tan (NUS/SING) and Prof. D.H. Murphy (Singapore), and took samples from 18 study sites spread over Singapore Island and on some of the smaller off shore islands. Presented below is an evaluation of the present day lichen flora of Singapore. A comparison with temperate urban areas

and a discussion of probable changes in the island's lichen flora through the centuries are presented in another paper (Sipman, in press).

Material and methods

The evaluated records originated mainly from fieldwork conducted in 2000 by the author in collaboration with Dr. B.C. Tan, Prof. D.H. Murphy and Ms Farida then at the National University of Singapore. This yielded 962 specimens of lichenized fungi and 1,126 records when taking into account mixed specimens and field observations. Where possible the names of the phorophytes of lichens collected were noted, and in the Botanical Garden also the tree ID number. The specimens are deposited in the herbaria of B and SING and the data of the B set are available in the web database - http://www.bgbm.org/scripts/ASP/lichcol/query.asp. For a list of the visited localities and habitats see Table 1. In addition, the lichenological literature was searched for lichen records from Singapore, and relevant specimens were also borrowed from the herbaria SING and UPS, and the private collections of A. Aptroot, P. Diederich and F. Schumm. Additional collections were found notably via the herbarium database of UPS (http://www-hotel2.uu.se:8888/cgi-bin/wwwdrive.fytotek/beginner). All indicated specimens were examined by the author, unless otherwise stated. The specimens were investigated in the usual way by stereomicroscope and photomicroscope, and selected specimens were analysed by TLC (Orange *et al.*, 2001).

Table 1. List of localities of the fieldwork by the author in 2000 with codes used in the species list (in bold), collection numbers and habitat information.

1 - Sungei Buloh Nature Park, on N-coast, opposite Johor Baru. At E-margin of reserve. Mangrove forest *ca* 10 m tall. Elev. *ca* 1 m. Coord. 1° 27' N, 103° 44' E, 4 Nov 2000 - *H. Sipman & D.H. Murphy 45441-45514*.
1. Away from the coast. On *Allophylus cobbe* branchlet. **1a.** On *Rhizophora apiculata* trunk/Foliicolous in undergrowth, on *Brownlowia tersa* leaves/on *Xylocarpus granatum* leaves/on *Asplenium nidus* leaves/On *Rhizophora apiculata* trunk. **1b.** On *Xylocarpus granatum* trunk. **1c.** Away from the coast. On *Excoecaria agallocha* trunk. **1d.** Away from the coast. On *Hibiscus tiliaceus* branches. **1e.** At the coast. On *Sonneratia alba* trunk. **1f.** On *Avicennia officinalis* trunk (Nr. 45477 on *A. alba* in splash zone)**. 1g.** On *Bruguiera cylindrica* trunk. **1h.** On *Avicennia alba* trunk. **1i.** On *Excoecaria agallocha* trunk. **1j.** Land-side. On *Excoecaria agallocha* trunk.
2 - Campus of National University of Singapore, around Kent Ridge, parkland with scattered buildings and roads. Elev. *ca* 50 m Coord. 1° 18' N, 103° 45.5' E, 5 Nov 2000 - *H. Sipman 45515-45637*.
2. On thin palm stem (*Ptychosperma macarthurii*)/On trunk of leguminose

tree/Kent Ridge Road. On weathered siliceous stone/On low concrete ridge along road, shady, on top/On soil of steep bank of path, open, over weathered stone/Kent Ridge Road. On branches of *Erythrina crista-galli* shrub. **2a.** On small tree of *Bauhinia purpurea*, on trunk *ca* 20 cm diam. **2b.** On *ca* 20-30 cm diam. trunk of small *Cassia fistula* tree. **2c.** On *ca* 10-30 cm diam. *Acacia auriculiformis* trunk. **2d.** On *ca* 50-100 cm diam. *Samanea saman* trunk. **2e.** Kent Ridge Road. On *Peltophorum pterocarpum* trunk. **2f.** Kent Ridge Road. On *Khaya* sp.(Meliaceae) trunk *ca* 40 cm diam. **2g.** Kent Ridge Road. On branches of *Callistemon* sp. treelet/On *Roystonea regia* trunk/On *Cassia*? trunk/On trunk.

3 - Singapore Botanic Gardens, parkland with scattered trees and shrubs. Elev. *ca* 50 m Coord. 1° 18' N, 103° 48' E, 7-9 Nov and 10 Nov 2000 - *H. Sipman 45638-45814, 45836-45855*.

3. On trunk./(45814) On lava stone in half shade of shrub in succulent garden./Epiphyte./On concrete roadside/On soil on ant heap in lawn. **3a.** On 50 cm diam. *Peltophyllum pterocarpum* (nr. 5500) trunk. **3b.** On 25 cm diam. *Archontophoenix alexandrae* (nr. 10151) trunk. **3c.** On 15 cm diam. *Phoenix rupicola* (nr. 5315) trunk. **3d.** On 15 cm diam. *Atalantia monophylla* (nr. 5322) trunk. **3e.** On 50 cm diam. *Tectona grandis* (nr. 5325) trunk. **3f.** On 150 cm diam. short *Calophyllum inophyllum* (nr. 5323) trunk. **3g.** On *ca* 25 cm diam. *Lepisanthes rubiginosa* (nr. 5301) trunk. **3h.** On *ca* 20 cm diam. *Azadirachta indica* (nr. 5313) trunk. **3i.** On *ca* 60 cm diam. *Hevea brasiliensis* (nr. 5305) trunk. **3j.** On *ca* 30 cm diam. *Jacaranda obtusifolia* ssp. *rhombifolia* (nr. 5498, planted 1968) trunk. **3k.** On *ca* 30 cm diam. *Podocarpus falcatus* (nr. 5503) trunk. **3l.** On *ca* 40 cm diam. *Podocarpus neriifolius* (nr. 5513) trunk. **3m.** On *ca* 20-40 cm diam. tree trunks and branches of *Juniperus chinensis* (nr. 5488, 5489, 5379). **3n.** On *ca* 35 cm diam. *Podocarpus rumphii* trunk (nr. 5286 planted 1942, 5287). **3o.** On *ca* 30 cm diam. slanting *Majidea zanguebarica* (nr. 5497, planted 1955) trunk. **3p.** On *ca* 30 cm diam. *Libocedrus macrolepis* var. *formosana* (nr. 5385) trunk. **3q.** On *ca* 30 cm diam. *Podocarpus gracilior* (nr. 5389, planted 1932) trunk. **3r.** On *ca* 30 cm diam. *Swietenia macrophylla* (nr. 5983) trunk. **3s.** On *ca* 20 cm diam. 10 m tall palm stem of *Scheelea insignis* (nr. 5054). **3t.** On *ca* 40 cm diam. *Mangifera caesia* (nr. 5062) trunk. **3u.** On *ca* 40 cm diam. *Podocarpus neriifolius* trunk. **3v.** On *ca* 25 cm diam. branchy trunk of small *Pithecellobium dulce* (Nr. B-72). **3w.** On *ca* 100 cm diam. *Fagraea fragrans* trunk. **3x.** On *ca* 100 cm diam. *Tetrapleura thonningii*? (near Nr. 6002) trunk. **3y.** On *ca* 100 cm diam. *Michelia alba* (Nr. 6516) trunk. On *ca* 100 cm diam. *Michelia alba* (Nr. 6516) trunk. **3z.** On *ca* 40 cm diam. *Cassia fistulosa* (Nr. 09354A) trunk. **3aa.** On *ca* 70 cm diam. *Peltophorum pterocarpum* trunk. **3ab.** On trunks and branches of *Plumeria*. **3ac.** On *ca* 100 cm diam. *Carapa guianensis* (Nr. 6007) trunk, between the butresses. **3ad.** On *ca* 20 cm diam. *Podocarpus* sp. trunk. **3ae.** On *ca* 80 cm diam. *Samanea saman* (Nr. 5968) trunk. **3af.** On *ca* 35 cm diam. *Quercus bambusaefolia* (Nr. B/136/36/6, planted 1935) trunk. **3ag.** On *ca* 30 cm diam. *Artocarpus altilis* (Nr. j/184/93/897) trunk. **3ah.** On ca. 100 cm diam. trunk, between buttresses. **3ai.** On *ca.* 20-30 cm diam. *Maniltoa browneoides* trunk. **3aj.** On *ca* 70 cm

diam. 15 m tall palm stem of *Roystonea oleracea* near herbarium entrance. **3ak.** On *ca* 40 cm diam. *Heritiera alata* (Nr. 09332G) trunk, on buttresses. **3al.** On *ca*. 30 cm diam. trunk. **3am.** On *ca* 25 cm diam. palm stem of *Phoenix sylvestris* (Nr. K/00/7094). **3an.** On *ca* 20 cm diam. stem of tall palm. **3ao.** On *ca* 15 cm diam. young *Shorea curtisii* (Nr. K99/95/4990A) trunk. **3ap.** On base of palm stem of *Phoenix loureirii*. **3ar.** On *ca* 60 cm diam. *Tamarindus indicus* (Nr. XH 26) trunk. **3as.** On *ca* 80 cm diam. trunk. **3at.** On *ca* 25 cm diam. *Shorea* fa. *apueiiana* (Nr. XH 64) trunk. **3au.** On *ca* 20 cm diam. branch of *Eugenia brasiliensis* shrub (Nr. 19970843 A 2). **3av.** On *Plumeria* dwarf trees. **3ax.** On *ca* 80 cm diam. *Fagraea fragrans* (Nr. XH-11) trunk./On *ca* 80 cm diam. *Fagraea fragrans* (Nr. XH-11) trunk. **3ay.** On *ca* 60 cm diam. *Myristica lowiana* (Nr. XH-79) trunk. **3az.** On *ca* 100 cm diam. *Pterocarpus indicus* (Nr. XH-26) trunk. **3ba.** On *ca* 80 cm diam. trunk.

4 - Singapore Botanic Gardens, Rainforest Reserve. Elev. *ca* 50 m Coord. 1° 18' N, 103° 48' E - 7-9 Nov 2000 - *H. Sipman 45815-45835*.
On lower part of *Castilla elastica* trunk 50 cm diam./On lower part of *Dyera costulata* trunk 100 cm diam./On lower part of small tree trunk./Foliicolous in undergrowth.

5 - SE side of MacRitchie Reservoir. Elev. *ca* 50 m Coord. 1° 21' N, 103° 50' E - 12 Nov 2000 - *H. Sipman & B.C. Tan 45856-45944*.
5a. Parkland with scattered trees and shrubs. On *ca* 120 cm diam. *Peltophorum pterocarpum* trunk. **5b.** Parkland with scattered trees and shrubs. On *ca* 100 cm diam. *Mangifera* trunk. **5c.** Parkland with scattered trees and shrubs. On *ca* 40 cm diam. tree trunk of leguminose. **5d.** Parkland with scattered trees and shrubs. On *ca* 70 cm diam. *Calophyllum inophyllum* trunk. **5e.** Secondary forest with primary forest remnants. On 10 cm diam. *Calophyllum* trunk at forest margin, within reach from the soil/On 10 cm diam. tree trunk at forest margin, within reach from the soil/On tree trunk, within reach from the soil/ On loamy bank of path at forest margin on lake shore/Secondary forest with primary forest remnants. On *Pandanus* leaves in undergrowth/On leaves in undergrowth. **5f.** Secondary forest with primary forest remnants. On tree trunk in gap (*Macaranga macrophylla* 10-15 cm diam.), within reach from the soil.

6 - Bukit Timah Nature Reserve, slightly disturbed primary forest. Elev. *ca* 50-80 m Coord. 1° 21' N, 103° 41' E - 13, 15, 24 Nov 2000 - *H. Sipman & D.H. Murphy 45945-45985*, *H. Sipman & Farida 46076-46114*, *H. Sipman & B.C. Tan 46379-46383*.
6. SE-side, Taban valley. On trunks within reach from the ground/On leaves in undergrowth/On *Pandanus* leaves in undergrowth/On *Streblus elongatus* leaves in undergrowth/E-side, along Cave Path and Rock Path. On 20 cm diam. *Adinandra dumosa* trunk within reach from the ground/On *Macaranga triloba* trunk within reach from the ground/On tree trunk within reach from the ground/E-side, Rock Path. Slightly disturbed primary forest. On *ca* 50 cm diam. trunk of fallen tree. **6a.** E-side, along Cave Path and Rock Path. On leaves in undergrowth.

7 - Southern islands: Lazaro Island. Secondary scrub and beach forest of *Terminalia*

and *Casuarina*. Elev. *ca* 1 m Coord. 1° 13' N, 103° 51.5' E - 14 Nov 2000 - *H. Sipman & B.C. Tan 45986-46048*.

7. On trunk in secondary scrub/On siliceous stone on clearing in beach forest/ On loamy soil of termite heap in road bank/On loamy soil of road bank/On rusty iron in clearing/On humid, shady concrete. **7a.** On *Terminalia catappa* trunk, among buttresses./On *Terminalia catappa* trunk. **7b.** On *Casuarina equisetiolia* trunk.

8 - Southern islands: Kusu Island. Cleared beach forest with scattered *Casuarina*, *Terminalia* and planted trees. Elev. *ca* 1 m Coord. 1° 13' N, 103° 52' E - 14 Nov 2000 - *H. Sipman & B.C. Tan 46049-46075*.

On *Casuarina equisetifolia* trunk within reach from the ground/On trunk within reach from the ground/On trunk within reach from the ground, in fissure/On *Terminalia catappa* trunk within reach from the ground.

10 - Nee Soon, SE of Upper Selatar Reservoir. Freshwater swamp forest. Elev. *ca* 20 m Coord. 1° 23.5' N, 103° 48.5' E - 16 Nov 2000 - *H. Sipman, D.H. Murphy & B.C. Tan 46115-46201*.

10. On trunks within reach from the ground/On twig within reach from the ground. **10a.** On trunk and canopy of fallen tree. **10b.** On leaves in undergrowth.

11 - Nature trail N of Lower Peirce Reservoir. Low secondary forest with *Nepenthes*. Elev. *ca* 20 m Coord. 1° 23' N, 103° 49' E - 16 Nov. 2000 - *H. Sipman, D.H. Murphy & B.C. Tan 46202-46217*.

On trunks within reach from the ground.

12 - Lower Peirce Reservoir Park. Elev. *ca* 20 m Coord. 1° 23' N, 103° 49' E - 16 Nov 2000 - *H. Sipman, D.H. Murphy & B.C. Tan 46218-46219*. On *Roystonea* palm stem along road.

13 - Fort Canning Park, in town center. Elev. *ca* 30 m Coord. 1° 17.5' N, 103° 51' E - 18 Nov 2000 - *H. Sipman 46220-46262*.

13. On trunks in park on hilltop. **13a.** On *Plumeria* trunks in park on hilltop.

14 - Pulau Ubin Island, from ferry to Kampong Melayu. Abandoned gardens. Elev. *ca* 5 m Coord. 1° 24' N, 103° 58' E - 19 Nov 2000 - *H. Sipman & B.C. Tan 46263-46361*.

14. On granite cliff at border of garden/On loamy bank of road/On trunk of fruit tree (*Nephelium rambutan*)/On trunk/On termite heap/On roots of betelnut palm/On trunk. **14a.** On durian (*Durio* sp.) trunk. **14b.** On trunk of fruit tree (*Lansium domesticum*). **14c.** On coconut stem in plantation. **14d.** On trunk of fruit tree (*Psidium guava*). **14e.** On trunk of rubber tree (*Hevea brasiliensis*) in abandoned plantation. **14f.** On leaves of lower branches of fruit trees.

15 - Labrador Park, at coast SW of city center. Elev. *ca* 10 m Coord. 1° 16' N, 103° 48' E - 23 Nov 2000 - *H. Sipman & D.H. Murphy 46362-46378*. Secondary forest on hilltop at the coast. On *Eugenia grandis* trunk within reach from the ground/On leaves in undergrowth/On trunk within reach from the ground/On *Millettia atropurpurea* trunk within reach from the ground/On liana near the ground/On *Barringtonia indica* trunk/On *Tabebuia* trunk/On *Casuarina* trunk./Scattered trees on lawns at the coast. On tree trunk./On

coastal conglomerate rock, sheltered, about 1 m above highwater level./On underside of overhanging, *ca* 10 cm diam. *Hibiscus tiliaceus* trunk at sheltered coast, about 2 m above highwater level.

16 - Bukit Timah Nature Reserve, N-side, abandoned quarry. Elev. *ca* 100 m Coord. 1° 21' N, 103° 41' E - 24 Nov 2000 - *H. Sipman & B.C. Tan 46384-46397*.
Shaded, humid rockface at base of cliff.

17 - Bukit Brown Chinese Cemetery, S of MacRitchie Reservoir. Grassy vegetation with scattered trees and grave tombs. Elev. *ca* 30 m Coord. 1° 21' N, 103° 49' E - 25 Nov 2000 - *H. Sipman & B.C. Tan 46388a-46391*.
On tree stump in secondary forest/On leaves of undergrowth in secondary forest/On brick of tomb/On granite of tomb/On fallen, dry branch.

18 - Sembawan Park, on N-coast. Elev. *ca* 2 m Coord. 1° 28' N, 103° 51' E - 25 Nov 2000 - *H. Sipman & B.C. Tan 46392-46412*. Grassland with scattered trees and shrubs. On trunk within reach from the ground.

Results

The accepted lichen taxa are presented in the following list. In addition lists are given of synonyms used in past publications relating to Singapore lichens, rejected records, and the collectors.

Alphabetical list of the lichen species reported from Singapore with comments

For each species herbarium vouchers and literature references are given. Abbreviations: *S* = *Sipman*; *SF* = *Sipman & Farida*; *SM* = *Sipman & Murphy*; *SMT* = *Sipman, Murphy & Tan*; *ST* = *Sipman & Tan*; *obs.*: field observation by the author, without voucher; accompanying species in herbarium specimens deposited under another name are indicated as "in [collector + number] [Herbarium abbreviations] (= [name or taxon under which it is deposited])". Locality codes are given in brackets; they correspond to table 1. Pictures of many species are available in the website http://www.bgbm.fu-berlin.de/sipman/Zschackia/Singa/genuslist.htm

Amandinea diorista (Nyl.) Marbach – (13) *S 46228* [B, SING].

Amandinea efflorescens (Müll.Arg.) Marbach – (2b) *S 45523* [SING]; (2d) *S 45557* [B]; (2f) *S 45615* [B]; (2g) *S 45626* [B], *45631* [B], *45636* [SING] c. apoth.; (3) *obs.*; (7b) *ST 46005* [SING; (8) *ST 46052* [B, SING]; (13) *obs.*; (14) *obs.*; (15) *obs.*; corticola prope Singapore, *ca* 1890, *Maingay 158* [Müller Arg., 1893: 129, type description; Marbach, 2000: 61]; Fort Canning Park, on tree in park, 1989, *Aptroot 25954* [B, Hb. Aptroot; Kalb and Elix, 1998: 468 as *Buellia*; Marbach 2000: 63]; crossing Oxley Road/Oxley Rise, roadside trees, 1994, *Diederich 12223* [Hb. Diederich].

Anisomeridium biforme (Borrer) R.C.Harris – Kusu Island, 1989, *Aptroot 25972* [Hb. Aptroot].
Anisomeridium foliicola R.Sant. & Tibell – (10b) *SMT 46172* [SING].
Anisomeridium subprostans (Nyl.) R.C.Harris – (3i) *S 45663* [SING]; (3ae) *S 45778* [B, SING]; (3ba) *S 45854* [B, SING]; Botanic Gardens, forest area, 1989, *Aptroot 25962* [B, Hb. Aptroot].
Anisomeridium terminatum (Nyl.) R.C.Harris – (3ab) *S 45745* [B, SING].
Anisomeridium throwerae R.C.Harris – (1j) *SM 45509* [SING], in *SM 45514* [B, SING] (= *Pyxine cocoes*); (2a) *S 45516* [B, SING]; (2c) *S 45546* [B, SING]; (2d) *S 45576* [B, SING]; (5e) *ST 45942* [SING]; (6a) *SF 46100* [B]; (7) *ST 46039* [SING]; (13) *S 46245* [SING]; (14d) *ST 46299* [B, SING]; (14f) *ST 46353* [SING]; (18) *ST 46411* [B, SING].

Here all *Anisomeridium* specimens are included with long-beaked, seta-like pycnidia. The conidia are of two types, suggesting that more than one species may be on hand: 9-12 x 4-5 µm with rounded ends, 1-septate (*45516*, *46411*) and 8 x 4 µm, cubic, simple (*45942*, *46299*). The conidia are lacking in many specimens.
Arthonia catenatula Nyl. – (1a) *SM 45444* [B, SING]; (1b) *SM 45446* [B, SING], in *SM 45452* [B, SING] (= *Graphis caesiella*); (1c) *SM 45457* [SING]; (1e) *SM 45474* [B, SING]; (1f) *SM 45483* [B, SING]; (1g) *obs.*, in *SM 45489* [SING] (= *Graphis caesiella*); (1h) *SM 45494* [SING]; (1i) *SM 45498* [SING]; (1j) *SM 45511* [B, SING]; (2) *S 45520* [SING]; (2b) in *S 45526* [SING] (= *Cryptothecia* cf. *subnidulans*); (2c) *S 45542* [B, SING]; (2d) *S 45559* [B, SING], *S 45575* [B, SING]; (2e) *S 45589* [SING]; (2f) *S 45604* [SING]; (2g) in *S 45631* [B] (= *Amandinea efflorescens*), in *S 45635* [SING] (parasite), in *S 45637* [B, SING] (= *Lecanora helva*); (3k) *obs.*, in *S 45668* [B, SING] (= *Enterographa pallidella*); (3v) *S 45723* [SING]; (3y) *obs.*, in *S 45732* [SING] (= *Graphis cf. caesiella*); (3ab) *obs.*, in *S 45750* [B, SING] (= *Arthonia cinnabarina*); (3ac) *obs.*, in *S 45773* [B] (= *Porina tetracerae*); (3ad) *obs.*, in *S 45775* [B, SING] (= *Phaeographis* sp.); (3at) *S 45839* [SING]; (3av) *obs.*, in *S 45842* [SING] (= *Trypethelium tropicum*); (5a) *ST 45863* [SING]; (7) *obs.*; (7a) *ST 45999* [SING]; (7b) *ST 46006* [B, SING]; (8) *obs.*; (13) *obs.*, *S 46246* [SING]; (14) *obs.*; (14c) *ST 46285* [SING], *ST 46285a* [B, SING]; (15) *SM 46375* [SING]; (18) in *ST 46409* [B, SING] (= *Arthonia* sp. E); crossing Oxley Road/Oxley Rise, roadside trees, 1994, *Diederich 12230* [Hb. Diederich].

The ascocarps are usually stellate with narrow radii, but conspicuously rounded ascocarps occur occasionally (*45575*, *45723*, *46246*, *46285a*). Deviating ascospores (attenuated towards both ends, resembling *A.* sp. A, but larger) were observed in *46409*. TLC: tr. atranorin, confluentic acid (*45511*, *45522*, *45559*, *45575*). The ascospore size (usually about 30 x 12 µm) deviates from the protologue and the identification is provisional.
Arthonia cinnabarina (DC.) Wallr. – (1b) *SM 45447* [SING]; (2a) *S 45518*

[B, SING]; (3ab) *S 45750* [B, SING]; (18) *ST 46412* [B, SING].

Arthonia complanata Fée – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 22].

Arthonia subbessalis Nyl. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 23, type description].

Arthonia trilocularis Müll.Arg. – (6a) *SF 46107* [SING]; (10b) *SMT 46169* [SING], *SMT 46170* [B, SING] cf.; (14f) *ST 46358* [B, SING] cf.

The material is often in poor condition and the identification provisional.

***Arthonia* sp. A** – (2b) *S 45528* [B, SING], *S 45537* [B, SING]; (2e) *S 45598* [B, SING]; (7a) *ST 45999a* [B, SING]; (18) *ST 46410* [B, SING].

Superficially like *A. catenatula*, but apothecia pale brownish and ascospores attenuated at both ends, 20-26 x 6-7 µm, 5-7-septate.

***Arthonia* sp. B** – (3d) *S 45648* [B, SING]; (3ac) *S 45771* [B, SING]? (no spores); (3ah) *S 45790* [B, SING]? (no spores); (5a) *ST 45860* [SING]? (no spores); (14c) *ST 46285b* [B, SING]; (18) *ST 46408* [B, SING].

Ascocarps brown to black, rounded or shallowly lobed, often slightly brownish-pruinose; ascospores 12-15 x 4.5-6 µm, 1-2-septate, one terminal cell swollen.

***Arthonia* sp. C** – (2d) *S 45576a* [SING], *S 45580* [B, SING]; (3l) *S 45673* [B, SING]; (3w) *S 45726* [B, SING]; (5f) *ST 45931* [SING]; (14) *ST 46321* [B, SING]; (14e) *ST 46314* [B, SING]; (15) *SM 46366* [B, SING].

Ascocarps black, rounded, small; ascospores 6-11 x 3 µm, 1-septate, with one swollen terminal cell.

***Arthonia* sp. D** – (1c) *SM 45458* [B, SING]?; (3a) *S 45641* [SING]? (no spores); (3v) *S 45722* [SING]? (no spores); (3y) *S 45730* [SING]; (3aa) *S 45740* [SING]? (no spores); (3az) *S 45850* [B, SING]; (3ba) *S 45853* [B, SING]; (5a) *ST 45858* [B, SING]; (18) *ST 46407* [B, SING].

Ascocarps black, rounded, immersed when on soft, large-celled bark; ascospores 10-16 x 3 µm, 2-septate, with one swollen terminal cell; epithecium dark-brown.

***Arthonia* sp. E** – (18) *ST 46409* [B, SING].

Similar to *A. catenatula*, but ascocarps with prominent white margin.

***Arthothelium* sp.** – (3i) *S 45662* [SING]; (3ab) *S 45748* [B]; (5d) *ST 45878* [SING].

Ascocarps small, lobed, blackish; ascospores regularly muriform, 40 x 16 µm, *ca* 10 x 4 locules.

Astrothelium ochrothelizum (Nyl.) Müll.Arg. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 26 as *Trypethelium*].

Astrothelium subfuscum Kremp. – Ad cortices, *Beccari 256* [Krempelhuber, 1875: 64, type description].

Bacidia rubellovirens (Nyl.) Zahlbr. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 21 as *Lecidea*, type description].

***Bacidia* sp.** – (5e) *ST 45922* [B, SING].

Apothecia pale brown; ascospores unripe, becoming acicular?

Bacidina* aff. *arnoldiana (Körb.) V.Wirth & Vězda – (2g) *S 45627* [B, SING].

Pycnidia present only; conidia *ca* 60 x 0.5 µm, curved.

***Bacidina* sp.**? – (18) *ST 46397* [SING].

A poor specimen probably belonging to this genus, but not conspecific with the preceding species.

Bactrospora metabola (Nyl.) Egea & Torrente – (5c) *ST 45867* [B, SING].

Bactrospora myriadea (Fée) Egea & Torrente – (1b) *obs.*, in *SM 45447* [SING] (= *Arthonia cinnabarina*); (1c) in *SM 45456* [SING] (= *Chrysothrix xanthina*); (1f) *SM 45485* [B, SING]; (1i) *SM 45496* [B, SING]; (2b) *S 45536* [SING]; (2f) *S 45601* [B, SING]; (3) *S 45657* [SING]; (7) *ST 46046* [B].

***Badimia* sp.?** – (17a) *ST 46388b* [SING].

The material is very scarce and was not examined microscopically.

***Biatora* (s.l.) sp.** – (2) *S 45585* [B, SING]; (3) *obs.*

Material with biatorine apothecia and simple, hyaline ascospores, of unclear affinity.

***Biatorella* (s.l.) sp.** – (2) *S 45581* [B, SING].

Material with biatorine apothecia, polysporous asci and simple, hyaline ascospores, of unclear affinity.

***Buellia* sp. A** – (17) *ST 46389* [SING].

Single thallus, on brick.

***Buellia* sp. B** -- (7) *ST 46013* [SING].

Single thallus, on granitic boulder.

Byssoloma leucoblepharum (Nyl.) Vain. – (10b) *SMT 46191* [B, SING]; 1882, on *Cantley 48* (*Memecylon cantleyi*) [K, not seen; Santesson, 1952: 487].

Byssoloma tricholomum (Mont.) Zahlbr. – Ad folia coriacea, *Beccari 269a* [Krempelhuber, 1875: 60 as *Lecanora epiphylla*; Santesson, 1952: 483].

Calenia aspidota (Vain.) Vězda – (14f) *ST 46355* [B, SING].

Calicium hyperelloides Nyl. – (3s) *S 45715* [SING]; (14c) *ST 46288* [B, SING]; (15) *SM 46368* [B, SING]; Sentosa, along the southern shore, outskirts of forest along the beach, on trunk, 1980, *Tibell 8865* [UPS L-057807].

Calopadia subcoerulescens (Vain.) Vězda – (10b) *SMT 46186* [SING].

Calopadia cf. ***vermiculifera*** (Vain.) Sérus.? – (10b) *SMT 46173* [B, SING].

Poor specimen, identification uncertain.

***Calopadia* sp.** – (14f) *ST 46354* [B, SING].

Poor specimen with muriform ascospores 1-2/ascus.

***Caloplaca* sp. A** – (14) *ST 46266* [SING].

Single, saxicolous thallus.

***Caloplaca* sp. B** – Kusu Island, 1989, *Aptroot 25969* [Hb. Aptroot].

The apothecia have a grey thalloid margin and orange disc.

Carbacanthographis candidata (Nyl.) Staiger & Kalb – Vega expedition,

corticola, 1879, *Almquist* [Nylander, 1891: 23 and Redinger, 1936: 50 as *Graphis singaporina*, type description; Staiger and Kalb, 1999: 124].
Carbacanthographis marcescens (Fée) Staiger & Kalb – (6) *SM 45963* [B, SING].
Catarraphia dictyoplaca (Mont. & v.d. Bosch) A.Massal. – (10) *SMT 46124* [B, SING].
***Catillaria* (s.l.) sp.** – (11) *SMT 46202* [B, SING].

Specimen with biatorine apothecia and hyaline, uniseptate ascospores, of uncertain affinity.
Chapsa indica A.Massal. – (13) *S 46258* [B, SING].

TLC: none.
Chapsa platycarpella (Vain.) A.Frisch – (5e) *ST 45899* [B, SING]; (10) *SMT 46133* [B, SING]; (11) *SMT 46208* [SING].
Chiodecton leptospermum Müll.Arg. – (3ab) *S 45770* [B, SING]; (3an) *S 45810* [SING].
Chiodecton natalense Nyl. – (3v) *S 45721* [B, SING]; (3af) *S 45781* [SING]; (5a) *ST 45862* [SING]; (5c) *ST 45869* [SING].
Chroodiscus australiensis Vězda et Lumbsch – (10b) *SMT 46193* [B, SING].
Chroodiscus mirificus (Kremp.) R.Sant. – (10b) *SMT 46199* [B, SING]; Nee Soon Forest Reserve, tropical forest remnant, on leaves of *Aglaea trinervis*, 1980, *Tibell 8813* [UPS L-057770]; ibidem, on leaves of *Calamus scipionum*, 1980, *Tibell 8815* [UPS L-057772].
Chroodiscus* cf. *mirificus (Kremp.) R.Sant. – (6a) *SF 46103* [B, SING]; (10b) *SMT 46199a* [B, SING].

The material deviates from *SMT 46199* because the rounded schizidia develop on the thallus, not at the margin, and are thickened in the centre. In the absence of ascocarps the classification is provisional.
Chrysothrix xanthina (Vain.) Kalb – (1c) *SM 45456* [SING]; (1g) in *SM 45490* [SING] (= *Herpothallon granulare*); (2b) *S 45525* [SING]; (2d) *S 45574* [B, SING]; (2e) in *S 45598* [B, SING] (= *Arthonia* sp. A); (2f) *S 45603* [B, SING]; (2g) in *S 45630* [SING] (= *Lecanora helva*), in *S 45635* [SING] (= parasite), in *S 45624* [SING] (= *Pyrrhospora quernea*); (7) *obs.*; (8) *obs.*; (13) *obs.*; (14) *obs.*; (15) *obs.*; (18) *obs.*; on mango tree along road, Pulau Tekong, 2000, *B. C. Tan* [Hb. Tan]; crossing Oxley Road/Oxley Rise, roadside trees, 1994, *Diederich 12222* [Hb. Diederich].
Cladonia subradiata (Vain.) Sandst. – (3w) *S 45725* [B, SING].

TLC: fumarprotocetraric acid.
Coccocarpia erythroxyli (Sprengel) Swinsc. & Krog – *sine loc*. [BM, L, not seen; Arvidsson 1982: 62]; Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 18 as *Coccocarpia ciliolata*].
Coccocarpia palmicola (Spreng.) L.Arvidss. & D.J.Gallow. – (14) *ST 46351*

[B, SING]; *sine loc*. [US, not seen; Arvidsson, 1982: 76]; St. John's Island, 1989, *Aptroot 26000* [Hb. Aptroot]; Botanical Garden, on *Cupressus* sp., 1980, *Tibell 8889b* [UPS L-057820, not seen].
Coccocarpia pellita (Ach.) Müll.Arg. – (3a) *S 45645* [B, SING]; (14c) *ST 46291* [B, SING]; sine loc. [W, not seen; Arvidsson, 1982: 79].
Coccocarpia rottleri (Ach.) L. Arvidss. – (14e) ST 46301 [B, SING].
Coenogonium confervoides Nyl. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 20].
Coenogonium dilucidum (Kremp.) Kalb & Lücking – (6a) *SF 46102* [B, SING]; (10b) *SMT 46184* [B, SING]; (14f) *ST 46359* [B, SING].
Coenogonium epiphyllum Vain. – (2d) *S 45572* [B, SING] cf.; (6a) *SF 46106* [B, SING], *46108* [B, SING].
Coenogonium luteum (Dicks.) Kalb & Lücking – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 21 as *Gyalecta lutea*].
Coenogonium subluteum (Rehm) Kalb & Lücking – (10b) *SMT 46182* [B, SING].
Collema actinoptychum Nyl. – 1897, *Möller* [S, TUR, not seen; Degelius, 1974: 125].
Collema leptaleum Tuck. var. ***biliosum*** (Mont.) Degel. – University area, roadside trees, often abundant, 1964, *Degelius As-533, 535, 559* [UPS-Hb. Degelius, not seen; Degelius, 1974: 108].
Collema rugosum Kremp. – Singapore Botanic Gardens, 189?, *Ridley A. 54* [SING]; Economic Gardens, *Bombax*, 1919, *unknown collector, 5416, pp.* [K, UPS not seen; Degelius, 1974: 153]; Singapore Botanical Garden, on *Cupressus* sp., 1980, *Tibell 8887* [UPS L-057817, not seen]; university area, roadside trees, locally abundant, 1964, *Degelius As-489, 495* [UPS-Hb. Degelius; Degelius, 1974: 153].
Cratiria lauricassiae (Fée) Marbach – Singapore Botanic Gardens, 1959, *Burkill 2178* [SING].
Cresponea flava (Vain.) Egea & Torrente – (2d) *S 45549* [B, SING]; (2g) *S 45632* [B, SING], in *S 45630* [SING] (= *Lecanora helva*), in *S 45635* [SING] (= parasite); (3r) *S 45713* [SING]; (3z) *S 45736* [B, SING]; (3aa) *S 45741* [B]; (5b) *obs.*, in *ST 45864* [B, SING] (= *Graphis insulana*); (7a) *obs.*, in *ST 45999* [SING] (= *Arthonia catenatula*); (8) *ST 46055* [B, SING]; (13) *S 46243* [SING]; (13a) *S 46224* [SING]; Fort Canning Park, on tree in park, 1989, *Aptroot* [Hb. Aptroot]; Kusu Island off the coast, on tree along the coast, 1989, *Aptroot* [Herb. Aptroot]; St. John's Island, 1989, *Aptroot 25995* [Herb. Aptroot, det. Egea 1992]; Singapore Botanical Garden, on *Cedrela toana*, 1983, *Tibell* [UPS; Egea and Torrente, 1993: 316]; crossing Oxley Road/Oxley Rise, roadside trees, 1994, *Diederich 12229* [Hb. Diederich].
Cresponea proximata (Nyl.) Egea & Torrente – (14) *ST 46325* [B, SING], *46348* [SING].

Crocynia pyxinoides Nyl. – (3m) *S 45682* [B, SING], in *S 45678* [SING] (= *Porina tetracerae*).

TLC: atranorin, stictic acid, pannarin?, indet. substances (*45682*).
Cryptothecia aleurella (Nyl.) Makhija & Patwardhan – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 22 as *Arthonia*, type description].
Cryptothecia candida (Kremp.) R.Sant. – (10) *SMT 46143* [B, SING], *46145* [B, SING]; (10b) *SMT 46197* [B, SING]; Nee Soon Forest Reserve, tropical forest remnant, on leaves of *Aglaea trinervis*, 1980, *Tibell 8814* [UPS L-057771, not seen].

TLC: 2'-0-methylanziaic acid or similar spot (*46143, 46145, 46197*).
Cryptothecia irregularis Lücking *et al.* – (10b) *SMT 46196* [B, SING].
Cryptothecia lunulata (Zahlbr.) Makhija & Patwardhan -- (1j) *SM 45507* [B, SING]; (2a) *S 45515* [SING]; (2c) *S 45540* [B, SING]; (3q) in *S 45709* [B] (= *Enterographa pallidella*); (5e) *ST 45886* [B, SING], *45917* [B, SING], *45927* [B, SING]; (5f) *ST 45934* [B, SING]; *Benjamin Lee n.c.* [SING].

TLC: confluentic and/or barbatic? acid (*45540, 45886, 45917, 45934*).
Cryptothecia obtecta Makhija & Patwardh. – (5f) *ST 45935* [B, SING]; (6) *SF 46090* [SING]; (10) *SMT 46128* [B, SING], *46130* [B, SING], *46144* [B, SING]; (14) *ST 46331* [SING].

TLC: confluentic, gyrophoric? acids (*45935, 46128, 46130, 46144, 46425*).
Cryptothecia scripta Thor – (1d) *SM 45468* [SING]; (3a) *S 45643* [B, SING]; (3i) *S 45664* [SING]; (3m) *S 45683* [B, SING]; (3ab) *S 45763* [B, SING]; (3ar) *S 45836* [B, SING]; (5a) *ST 45859* [SING]; (5c) *ST 45868* [B, SING]; (13) in *S 46240* [B] (= *Diorygma rufopruinosum*); (14) *ST 46318* [SING]; (14e) *ST 46310* [B, SING]; (17) *ST 46391* [SING]; Singapore Botanic Gardens, 1959, in *Burkill 2177* [SING] (= *Dirinaria picta*) vs., I+ blue, C+ red; juv. asci.

TLC: gyrophoric/hiascic acid complex (*45643, 45683, 45763, 45836, 45868, 46310*).
Cryptothecia cf. ***subnidulans*** Stirt. – (2b) *S 45526* [SING]; (6) *SM 45971* [B, SING], *SF 46091* [B, SING]; (14) *ST 46323* [SING]; *Benjamin Lee* [B, SING].

TLC: gyrophoric acid agg. (*45971, 46091, Lee s.n.*).
***Cryptothecia* sp. A** – (13) *S 46238* [B, SING]; (14) *ST 46319* [B, SING]; (18) *ST 46394* [SING].

TLC: barbatic acid (*46319*). Thick, sorediate thalli of unclear affinity.
***Cryptothecia* sp. B** – (1f) *SM 45484* [B, SING]; (3a) in *S 45643* [B, SING] (= *Cryptothecia scripta*); (3o) *S 45692* [SING]; (5d) *ST 45877* [SING]; (5f) *ST 45936* [B, SING]; (7) *ST 46009* [SING]; (13) *S 46230* [SING]; (14a) *ST 46273* [B, SING]; (14d) *ST 46300* [B, SING]; (15) *obs.*

The material is chemically variable and probably includes more than one species. It is sorediate and lacks ascocarps and is therefore of unclear affinity.

***Cryptothelium* sp.** – (10a) *SMT 46159* [B, SING], *46164* [B, SING].

Ascospores 4/ascus, muriform, 60-80 x 20 µm.

Dichosporidium boschianum (Mont.) Thor – (6) *SM 45949* [SING], *45962* [B, SING]; Bukit Timah, 1959, *Burkill 2139* [SING]; Botanical Garden, Jungle, on *Castillea elastica*, *Tibell 8872*, 1980 [UPS]; Bukit Timah, 1950, *Lemaitre* [H, not seen; Thor, 1990: 67].

Diorygma hieroglyphicum (Pers.) Staiger & Kalb – (1f) *SM 45478* [SING]; (3ab) *S 45757* [B].

TLC: stictic, cryptostictic acids (*45478*).

Diorygma pruinosum (Eschw.) Kalb, Staiger & Elix – (3ag) *S 45786* [SING]; (13) *S 46236* [B]; (14a) *ST 46270* [B]; (14d) *ST 46298* [SING].

TLC: protocetraric acid (*45789, 46298*).

Diorygma reniforme (Fée) Kalb, Staiger & Elix – (3m) *S 45685* [B, SING]; (13) *S 46257* [B, SING].

TLC: salazinic acid (*45685, 46257*). Ascocarps absent.

Diorygma rufopruinosum (A.W.Archer) Kalb, Staiger & Elix – (2d) *S 45554* [B, SING], *45577* [B, SING]; (2f) *S 45612* [SING]; (3m) *S 45681* [B]; (3p) *S 45705* [B, SING]; (3ai) *S 45793* [SING], *45794* [SING]; (3au) *S 45840* [B, SING]; (7) *ST 46007* [SING], *46026* [B, SING]; (13) *S 46240* [B]; (15) *SM 46372* [B, SING], *46373* [B, SING] (c. apoth.).

TLC: norstictic, connorstictic, protocetraric acids (*45554, 45577, 45840, 46240, 46372, 46373*). The Singapore material of this species deviates by the thallus, which is densely covered by very irregular warts turning into pustules, which burst and become sorediate. It is a common "sterile crust" in Singapore and ascocarps are rare.

Dirinaria applanata (Fée) Awasthi – University area, on trees, 19464, *Degelius As-491* [Degelius in UPS]; Awasthi, 1975:82; 1879, *Almquist* [S, not seen], *Harmand* [M, not seen; Awasthi, 1975:82]; Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 18 as *Physcia picta* f. *sorediata*]; university area, roadside trees, 1964, *Degelius As-491* [UPS L-099232, not seen].

The reports may be erroneous, see note under *D. picta*.

Dirinaria caesiopicta (Nyl.) Awasthi – On bark, 1879, *Almquist* [H-Nyl 31822, not seen; Awasthi, 1975: 96].

Dirinaria confluens (Fr.) Awasthi – Botanical Garden, ad corticem palmae, 1949, *Lemaitre* [SING 031008; det. Awasthi 1966].

Dirinaria consimilis (Stirton) Awasthi – On stones, 1949, *Lemaitre* [H, not seen; Awasthi, 1975: 93].

Dirinaria naggarana (Kremp.) Awasthi – Botanical Garden, 1949, *Lemaitre* [H, SING, not seen; Awasthi, 1975: 62].

Dirinaria picta (Sw.) Clem. & Shear – (1c) *SM 45454* [B, SING], *45455* [B, SING]; (1d) *SM 45464* [B, SING]; (1e) in *SM 45476* [SING] (= *Pyrenula ochraceoflava*); (1i) in *SM 45499* [B] (= *Pyrenula ochraceoflava*); (1j) *SM*

45503 [B, SING], *45513* [SING]; (2a) in *S 45519* [B] (= *Graphis caesiella*); (2b) *S 45535* [B, SING]; (2d) *S 45551* [B, SING], *45555* [B, SING], *45579* [SING]; (2f) *S 45616* [B], *45617* [B, SING]; (2g) *S 45628* [B, SING], *45629* [SING], *45633* [B, SING], *45634* [SING], in *45624* [SING] (= *Pyrrhospora quernea*); (3) *obs.*; (3a) in *S 45643* [B, SING] (= *Cryptothecia scripta*); (3m) in *S 45679* [B] (= *Graphis insulana*); (3aa) *S 45737* [SING]; (3aj) *S 45802* [B], *45802a* [B]; (5d) *ST 45871* [SING]; (7) *ST 46021* [SING]; (7a) *ST 45993* [SING], *45994* [B]; (8) *ST 46064* [B, SING], *46065* [SING], *46066* [B, SING], *46067* [B, SING], *46069* [SING], *obs.*; (12) *SMT 46219* [B, SING] c. ap.; (13) *S 46260* [SING], *46261* [B, SING]; (14) *ST 46322* [SING]; (14c) *ST 46287* [B, SING]; (15) *obs.* (2x); (18) *obs.*; Botanic Gardens, 1959, *Burkill 2177* [SING]; Pulau Terkukor, 1960, in *Lemaitre* [SING] (= *Pyxine farinosa*); Singapore Botanical Garden, on palm trunk, 1949, *Lemaitre* [SING 031010; Awasthi, 1975: 75]; Singapore Botanical Garden, 1991, *Gams* [Hb. Aptroot]; on trees, 1861-1865, *Maingay* [Nylander and Crombie, 1884: 52 as *Physcia*]; Pulau Tekong, on rubber tree, 2000, *B.C. Tan* [Hb. Tan]; Pulau Tekong, on *Acacia* tree at seashore, 2000, *B.C. Tan* [Hb. Tan]; Pulau Tekong, on mango tree along road, 2000, *B. C. Tan* [Hb. Tan]; crossing Oxley Road/Oxley Rise, roadside trees, 1994, *Diederich 12228* [Hb. Diederich]; Sentosa, close to the ferry, on trunk of tree, 1980, *Tibell 8853* [UPS L-057795, not seen]; Fort Canning Park, 1989, *Aptroot 25952* [Hb. Aptroot]; Botanical Garden, ad ramas arborum, 1949, *Lemaitre* [SING 500374; Awasthi, 1975: 82 as *D. applanata*].

This sorediate species tends to form clones. Thus, it is not uncommon to find two separate populations differing in lobe size on a single trunk. These may give the impression of separate species, in particular *D. picta* together with *D. applanata* (Fée) D.D.Awasthi. However, populations from adjacent trunks are often intermediate and the large material available did not allow a clear subdivision in two species. TLC: atranorin, sekikaic acid, terpenoids (*45455, 45503, 45551, 45616, 45628, 45633, 45802, 46261, 46287, 46219*); atranorin, divaricatic acid, terpenoids (*45464, 45535, 4555, 45617, 45802a, 45994, 46064, 46066, 46067*). No morphological differences seem to exist between the two chemotypes.

Dyplolabia afzelii (Ach.) A.Massal. – (3o) *S 45697* [SING]; (3ai) *S 45795* [B]; (5e) *ST 45900* [B, SING]; (10a) *SMT 46161* [SING]; Mandai Road, 1920, *Chipp 5801* [SING]; Botanic Gardens, 1920, in *Kiah 5846* [SING] (= *Phaeographina*?); Botanic Gardens, 1920, in *Noor 5663* [SING] (= *Trypethelium* sp.); 0n bark of trees, 1861-1865, *Maingay* [Nylander and Crombie, 1884: 57 as *Graphis*]; Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 23]; *Beccari 240* [M, not seen; Redinger, 1936: 54; Krempelhuber, 1875: 61]; *Beccari 244* [M, not seen; Redinger, 1936: 55 and Krempelhuber, 1875: 61 as *Graphis atro-alba*].

According to Redinger (1936) *Graphis atro-alba* is a damaged stage

of *D. afzelii*.

Echinoplaca pellicula (Müll.Arg.) R.Sant. – (4) *S 45835* [B, SING]; (6a) *SF 46099* [B, SING], *46112* [B, SING]; (10b) *SMT 46177* [B, SING], *46178* [B, SING]; (17a) *ST 46388a* [B, SING].

***Echinoplaca* sp.** – (5e) *ST 45943* [B, SING]?; (10b) *SMT 46166* [SING]; Bot. Gardens, 1919, *Chipp 4915* [SING].

The material lacks apothecia but contains hygrophores. More then one species may be involved.

Endocarpon pallidum Ach. – (2) *S 45583* [B, SING], *45584* [SING]; (7) *obs.*

Enterographa anguinella (Nyl.) Redinger – (1e) *SM 45475* [B, SING; Sparrius, 2004: 27].

Enterographa angustissima (Vain.) R.Sant. – (5e) *ST 45938* [B, SING]; (10b) *SMT 46176* [SING].

Enterographa divergens (Müll.Arg.) Redinger – (7a) *ST 45989* [B, SING; Sparrius, 2004: 37].

Enterographa pallidella (Nyl.) Redinger – (1a) *SM 45445* [SING]; (1b) *SM 45451* [B]; (1h) *SM 45495* [B, SING]; (3k) *S 45668* [B, SING]; (3q) *S 45709* [B; Sparrius, 2004: 50]; (14b) *ST 46278* [B, SING]; (15) *SM 46378* [SING].

Enterographa subserialis (Nyl.) Redinger – (3a) *S 45638* [B; Sparrius, 2004: 61].

Enterographa tropica Sparrius – (3o) *S 45691* [B; Sparrius, 2004: 62]; (4) *S 45829* [B; Sparrius, 2004: 62]; (6) *ST 46383* [B holotype, SING isotype; Sparrius, 2004: 61, 62]; (11) *SMT 46203* [SING].

***Enterographa* sp.** – (15) *SM 46374* [B, SING].

This material has lecanoroid apothecia and reminds *E. anguinella*, in particular the morph named *E. lecanoroides* R.C.Harris. However, it lacks psoromic acid and contains an unidentified depsid staying low in the standard solvent systems.

Eremothecella palmulacea (Müll.Arg.) Sérusiaux – (10b) *SMT 46168* [B, SING].

***Eschatogonia*? sp. A** – (4) *S 45817* [B, SING]; (14e) *ST 46315* [B, SING] c. ap.

The genus identification is provisional and based on the squamules with a glossy, corticate lower side.

***Eschatogonia*? sp. B** – (5e) *ST 45898* [B, SING].

The genus identification is provisional and based on the squamules with a glossy, corticate lower side.

Eugeniella micrommata (Kremp.) Lücking, Sérus. & Kalb – (6a) *SF 46101* [B, SING]; (10b) *SMT 46189* [B, SING]; Nee Soon Forest Reserve, tropical forest remnant, on leaves of *Calamus scipionum*, 1980, *Tibell 8816* [UPS L-057773].

Fellhanera bouteillei (Desm.) Vězda – (6) *SM 45984* [SING]; (14f) *ST 46356* [B, SING].

***Fellhanera* sp. A** – (2d) *S 45578* [SING]; (3m) *S 45676* [B, SING]; (3al) *S 45807* [B, SING]; (3am) *S 45808* [B, SING].

This species has conspicuous, dark-brown, beaked pycnidia and brown apothecia with three-septate ascospores *ca* 10-12 × 2.5-4 µm. Conidia 3 × 1.5 µm.

***Fellhanera* sp. B** – (1a) *SM 45441c* [SING].

Foliicolous, grey, granular thallus with pale yellow-brown, small apothecia; ascospores uniseptate, 14 × 5 µm.

***Fellhanera* sp. C** – (2d) *S 45571* [B, SING]; (3g) *S 45658* [B, SING] (c. pycn.); (6) *SM 45957* [B, SING]; (7) *ST 46012* [B, SING], *46030* [B, SING]; (4) *S 45818* [B, SING].

Apothecia pale brown with an often prominent, whitish margin; ascospores 3-septate, 10-12 × 3 µm. Pycnidia like small, young apothecia; conidia 3-4 × 1.5 µm.

***Fellhanera* sp. D** – (10b) *SMT 46171* [B, SING].

Apothecia tiny, dark-brown, dense; ascospores 3-septate, 10 x 3 µm.

***Fellhanera* sp. E** – (3) *S 45855* [B, SING]; (7) *ST 46015* [B, SING], *46016* [B, SING]; (7a) *ST 45986* [B, SING]; (13) *S 46256* [SING]?; (14) *ST 46336* [B, SING], *46337* [B, SING]; (14c) *ST 46292* [B, SING]; (14e) *ST 46312* [SING]; (16) *ST 46387* [SING]; 1989, *Aptroot* [Hb. Aptroot].

Apothecia pale brown to brown; ascospores 3-septate, 13-20(-24) × 4 µm.

***Fellhanera* sp. F** – (14) *ST 46317* [B, SING].

Muscicolous; apothecia black, soon convex; ascospores 3-septate, 16 × 5 µm.

Fissurina cf. ***dumastii*** Fée – (5e) *ST 45907* [B, SING]; (6) *SF 46077* [B, SING] (no spores), *46098* [B, SING] (no spores); (7) *ST 46041* [B, SING] (thin septa); (11) *SMT 46205* [B, SING] (no spores), *46206* [B, SING] (thin septa); (14) *ST 46339* [B] (thin septa).

TLC: none (*45907, 46041, 46077, 46098, 46205, 46206*). The identifications in this genus are provisional.

Fissurina cf. ***incrustans*** Fée – (3m) *S 45677* [B, SING]; (3o) *S 45696* [SING]; (4) *S 45820* [B, SING], *45828* [B, SING]; (6) *SF 46093* [B, SING], *46095* [B, SING], *46096* [SING]; (14e) *ST 46305* [B, SING], *46309* [B, SING].

TLC: stictic acid (*45677, 45820, 45828, 46096, 46305, 46309*).

Fissurina cf. ***radiata*** Mont. – (6) *SM 45973* [B, SING]; (6) *SF 46089* [B, SING] (no spores); (10) *SMT 46122* [B, SING].

TLC: none (*45973, 46122*).

***Fissurina* sp. A** – (1d) *SM 45472* [B, SING].

TLC: none; ascospores muriform, *ca* 4/ascus, 18 x 7 µm.

Glyphis cicatricosa Ach. – (2b) in *S 45525* [SING] (= *Chrysothrix xanthina*); (3ag) *S 45785* [SING]; on Cocos palms, 1861-1865, *Maingay* [Nylander and

Crombie, 1884: 59]; corticola, *Maingay* [Nylander, 1891: 25]; *Beccari 239* [M, not seen; Redinger, 1936: 98; Krempelhuber, 1875: 62].

Glyphis scyphulifera (Ach.) Staiger – (13a) *S 46220* [B, SING].

Graphis assimilis Nyl. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 23].

Graphis caesiella Vain. – (1) in SM 45473 [SING] (= *Phaeographis* sp. C); (1b) *SM 45452* [B, SING]; (1d) *SM 45466* [B, SING]; (1f) *obs.*, in *SM 45485* [B, SING] (= *Bactrospora myriadea*); (1g) *SM 45489* [SING]; (2a) *S 45519* [B]; (2b) *S 45527* [SING]; (2c) in *S 45539* [B, SING] (= ster. crust.); (2e) *obs.*, in *S 45587* [B, SING] (= *Phaeographis intricans*); (2f) *S 45609* [B, SING]; (2g) *S 45625* [B, SING], in *S 45635* [SING] (= parasite); (3o) *S 45689* [SING]; (3y) *S 45732* [SING] cf. (large ascospores); (3ab) *obs.*, *45758* [B]; (7) *obs.*, *ST 46027* [B, SING]; (7a) *ST 45995* [B, SING]; (8) *ST 46074* [B, SING]; (13) *obs.*, *S 46233* [SING]; (13a) *obs.*, in *S 46227* [SING] (= *Pyxine cocoes*); (14) in *ST 46352* [B] (= *Graphis insulana*); (14a) *ST 46275* [B, SING] (small); (14c) *ST 46286* [B, SING]; (15) *obs.*; (18) *ST 46395* [B, SING].

TLC: norstictic, tr. connorstictic acids (*45625, 46286, 46395*); (tr.) norstictic, salazinic acids (*45466, 45519, 45609* (with galbinic acid), *46074*); salazinic acid (*46027, 46275*); none (*45995*). Salazinic acid-containing specimens would fit *Graphis bakeri* Vain. (Lücking *et al.*, 2008). However, the salazinic acid is usually accompanied by traces of norstictic acid not mentioned by Lücking *et al.* (2008), the chemical variation is not correlated with any morphological differences and an intermediate specimen containing about equal amounts of norstictic and salazinic acids was observed. Therefore all material is considered to be a single species. Only a specimen containing stictic acid but otherwise rather similar in morphology is treated here as a separate species, *G. dendrogramma*. Its ascocarps seem less pruinose and more radiately branched.

Graphis cf. ***cleistoblephara*** Nyl. – (7) *ST 46023* [B, SING].

TLC: norstictic acid. The specimen deviates by the smaller ascospores, *ca* 35 x 12 µm, *ca* 4 /ascus.

Graphis confluens (Mont.) Nyl. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 24.

This record may need reinvestigation to establish its current taxonomic position.

Graphis dendrogramma Nyl. – (2d) *S 45564* [B, SING].

TLC: stictic acid with traces of cryptostictic and ?constictic acid. See comment under *G. caesiella*.

Graphis glaucescens Fée – (2d) *S 45562* [B, SING], *45563* [B, SING]; (3m) *S 45686* [B, SING]; (3ab) *S 45761* [SING]; (5d) *ST 45872* [B] (large ascospores); (5e) *ST 45908* [SING]; (6) *SM 45975* [B, SING]; *SF 46087* [B, SING].

TLC: indet. terpenoid? (*45562, 45563, 45686, 45761, 45908, 45975,*

46087).

Graphis insulana (Müll.Arg.) Lücking & Sipman – (1b) *SM 45448* [B, SING]; (1c) *SM 45459* [SING]; (1i) *SM 45497* [B, SING]; (2d) *S 45560* [B, SING], *45565* [B, SING]; (2g) in *S 45631* [B] (= *Amandinea efflorescens*); (3a) *S 45642* [SING]; (3i) *S 45665* [B, SING]; (3m) *S 45679* [B]; (3y) in *S 45732* [SING] (= *Graphis caesiella*) (degenerated); (3ae) *S 45777* [SING]; (5b) *ST 45864* [B, SING]; (7) *ST 46042* [SING]; (8) *ST 46071* [SING]; (13) *S 46237* [SING]; (14) *ST 46352* [B]; (14e) *ST 46307* [B, SING]; (15) *obs.*; (18) *obs.*; Jungis Banactas, 1920, *Ridout 5657* [SING]; Sentosa, along the southern shore, on trunk, 1980, *Tibell 8858* [UPS L-057800]; nahe der Philippinischen Botschaft, 1999, *Schumm & Schwarz* [Hb. Schumm 5849].

TLC: norstictic acid with or without traces of connorstictic and galbinic? acid (*45448, 45497, 45665, 45777, 45864, 46352*); indet. high spot (*45560, 45565*); none (*45679, 46042, 46071, 46307*). The species is easily recognizable by the thick thalline margin of the lirellae and the finely inspersed hymenium with large, muriform, single ascospores. Its chemistry is somewhat variable because norstictic acid is sometimes accompanied by other substances, and occasionally it is not observed on the TLC plates. The excipulum is usually only laterally carbonized, but may be thinly carbonized below. It has been confused with *G. hiascens* (Fée) A.W.Archer.

Graphis librata C.Knight – (1d) *SM 45462* [SING]; (11) *SMT 46215* [B, SING] (thin lirellae).

TLC: norstictic acid (*45462, 46215*).

Graphis rustica Krempelh. – Ad cortices, *Beccari 258* [M, not seen; Redinger, 1936: 49; Krempelhuber, 1875: 61, type description].

Graphis scripta Ach. – On bark of trees, atypical, 1861-1865, *Maingay* [Nylander and Crombie, 1884: 57]; Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 23]; species dubia vel excludenda [Redinger, 1936: 118].

These records may need reinvestigation to establish their current taxonomic position.

Graphis scripta Ach. var. ***serpentina*** Ach. – On cocos-nut and palms, 1861-1865, *Maingay* [Nylander and Crombie, 1884: 57].

This record may need reinvestigation to establish its current taxonomic position.

Graphis striatula Ach. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 23].

Graphis tenella Ach. – (10a) *SMT 46156* [B, SING]; (18) *ST 46392* [B, SING].

TLC: none (*46156*).

Graphis vestitoides (Fink) Staiger – (2d) *S 45561* [B, SING].

TLC: none.

Gyalideopsis vainioi Kalb & Vězda – (13) *S 46251* [B, SING].

***Gyalideopsis* sp.** – (3ab) *S 45752* [B]; (4) *S 45834* [SING]; (14e) *ST 46302* [B, SING].

The material is insufficiently developed for certain identification. More than one species may be involved.

Haematomma rufidulum (Fée) A.Massal. – on trees, 1861-1865, *Maingay 67* [BM, not seen; Staiger and Kalb, 1995: 162]; on trees, 1861-1865, *Maingay* [Nylander and Crombie, 1884: 53 as *Lecanora punicea*]; Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 19 as *Lecanora punicea*].

It is unclear if the Maingay specimen investigated by Staiger is the same as that investigated by Nylander and thus belongs to *H. rufidulum*. For the time being all literature reports are considered to belong to the same species. However, many *Haematomma* species look very similar and occur in similar habitats, so that the presence of more than one species in Singapore is not unlikely.

Herpothallon granulare (Sipman) Aptroot & Lücking – (1g) *SM 45490* [SING]; (2d) *S 45566* [SING]; (3f) *S 45654* [SING]; (3l) *S 45671* [B, SING]; (3as) *S 45838* [B holotype, SING isotype); (3az) *S 45851* [B, SING]; (7) *ST 46031* [B, SING], *46036* [SING].

See also Sipman (2003).

Jamesiella perlucida (Vězda & Hafellner) Lücking, Sérusiaux & Vězda – (3aj) *S 45799* [B, SING].

Laurera phaeomelodes (Müll.Arg.) Zahlbr. – (3o) *S 45694* [B, SING]; (14) *ST 46340* [B, SING].

Lecanora helva Stizenb. – (2b) *S 45521* [B], *45529* [SING]; (2c) *S 45541* [B, SING]; (2f) *S 45619* [SING]; (2g) *S 45630* [SING], *45637* [B, SING]; (7a) *ST 45992* [SING]; (13) *S 46255* [B]; (15) *SM 46370* [B, SING], *46371* [B]; (17) *ST 46390* [SING] cf.; (18) *ST 46396* [B, SING].

TLC: atranorin, 2'-0-methylperlatolic acid (*45521, 45541, 45630, 45637, 46370, 46371, 46396*). The material looks somewhat heterogeneous, as some individuals have more appressed, slightly white-pruinose apothecia and others more raised, non-pruinose and darker-coloured apothecia. Both types may occur mixed and appear to have the same chemistry. Nr. *46390* grew on granitic rock.

***Lecanora* sp.** – (8) *ST 46062* [B, SING].

TLC: atranorin, fatty acid; ascospores notably elongated, 18 × 5 µm.

Lecidopyrenopsis corticola Vain. – University area, roadside trees, 1964, *Degelius As-492* [UPS L-104123 det. P.M. Jörgensen 1999].

Lepraria usnica Sipman – (2) *S 45547* [B, SING]; (2c) in *S 45540* [B, SING] (= *Cryptothecia lunulata*); (2d) *S 45548* [B, SING], *45553* [B, SING]; (3d) *S 45651* [SING]; (8) *ST 46053* [B, SING]; (13) *S 46253* [B, SING], *46254* [B]; (14) *ST 46263* [SING], *46335* [SING], *46349* [SING]; (16) *ST 46385* [B, SING]; (18) *ST 46399* [B holotype, SING isotype]; crossing Oxley Road/

Oxley Rise, roadside trees, 1994, *Diederich 12225* [Hb. Diederich].

See also Sipman (2003).

***Lepraria*? sp. A** (thin yellowish) – (2f) *S 45600* [B, SING]; (7a) *ST 45988* [B, SING]; (13) *obs.*; (14c) *ST 46280* [B, SING]; (18) *obs.*; crossing Oxley Road/ Oxley Rise, roadside trees, 1994, *Diederich 12226* [Hb. Diederich].

TLC: usnic acid, zeorin (*45600, 45988, 46280*). Thallus finely sorediate, therefore generic affinity uncertain.

***Lepraria* sp. B** – (3w) *S 45727* [B, SING].

TLC: indet. substances.

Leptogium cyanescens (Rabenh.) Körb. – (17) *ST 46388* [B, SING]; Botanical Garden, on *Cupressus* sp., 1980, *Tibell 8888* [UPS L-057818].

The species is understood here in a wide sense, to accommodate thin-lobed *Leptogium* species with phyllidia.

Leptogium cochleatum (Dicks.) P.M.Jørg. & P.James – New Tiew, Ama Kong, 1949, *Lemaitre* [SING].

Leptogium marginellum (Sw.) S.F.Gray – Botanical Garden, root of *Swietenia macrophylla*, 1964, *Degelius As-486* [UPS L-102634].

Leptogium phyllocarpum (Pers.) Nyl. – Botanical Garden, root of *Swietenia macrophylla*, 1964, *Degelius As-485* [UPS L-102652].

Leucodecton occultum (Eschw.) A.Frisch – (1j) *SM 45504* [B, SING]; (3ab) *S 45754* [B, SING].

TLC: norstictic, stictic, tr. cryptostictic acids (*45504, 45754*).

Lithothelium illotum (Nyl.) Aptroot – (1d) *SM 45471* [B, SING].

Lopadium sophodinum (Nyl.) Zahlbr. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 21 as *Lecidea*, type description].

This record needs reinvestigation to establish its current taxonomic position.

Malcolmiella* cf. *olivaceolurida (Vain.) INED. – (4) *S 45815* [SING]; (10) *SMT 46126* [B, SING], *46141* [B, SING].

Ascospores 7-10 × 4-5 µm. The description of *Lecidea olivaceorufa* Vain. fits, but an investigation of type material is desirable for certainty. Therefore no formal new combination is made.

Malcolmiella sp. A – (10) *SMT 46126a* [B, SING].

***Malcolmiella* sp. B** – (6) *SF 46097* [B, SING].

Material sorediate, without ascocarps, therefore identification provisional.

***Malcolmiella* sp. C** – (6) *SF 46086* [B, SING]; (14) *ST 46329* [B, SING]; on treefork in disturbed forest, 2000, *B. C. Tan* [SING].

Mazosia phyllosema (Nyl.) Zahlbr. – (5e) *ST 45937* [SING] vs.; (6a) *SF 46105* [SING]; (10b) *SMT 46185* [B, SING]; (14f) *ST 46361* [B, SING].

Melanotrema* aff. *meiospermum (Hale) A.Frisch – (14a) *ST 46276* [B, SING].

TLC: none. The material deviates from the description by Frisch and Kalb (2006) by the convex columella.

Micarea* cf. *leprosula (Th.Fr.) Coppins & A.Fletcher – (3ax) in *S 45844* [B, SING] (in *Micarea* sp.), *S 45845* [B, SING] (ster.).

Micarea* cf. *prasina Fr. – (2c) *S 45545* [B, SING] c. apoth.

***Micarea* sp. A** – (2c) *S 45544* [B, SING]; (3n) *S 45688* [B, SING]; (3w) *S 45724* [B, SING].

Thallus granular, apothecia black.

***Micarea* sp. B** – (3ax) *S 45844* [B, SING].

Apothecia brown, without spores.

***Micarea* sp. C** – (8) *ST 46051* [B, SING]; (15) *SM 46367* [B, SING].

Thallus finely granular, green and apothecia black.

Microtheliopsis uleana Müll.Arg. – (10b) *SMT 46187* [B, SING].

Monoblastia pellucida Aptroot – (13) *S 46249* [B, SING]; (14) *ST 46326* [B, SING].

Mycoporum eschweileri (Müll.Arg.) R.C.Harris – (2f) *S 45614* [B, SING]?; (3w) *S 45728* [B, SING]?; (3ah) *S 45788* [B, SING]?; (3an) *S 45809* [B, SING]?; (3az) *S 45852* [B, SING]; (5e) *ST 45925* [B, SING]?; (6) *SM 45979* [SING]?; (7a) *ST 46002* [SING]?; (8) *ST 46063* [B, SING]; (15) *SM 46369* [B, SING]?; Kusu Island, 1989, *Aptroot 25977, 25978* [Hb. Aptroot]; St. John's Island, 1989, *Aptroot 25998* [Hb. Aptroot].

The material is often poorly developed and the identification provisional. Ascospores uniseptate, 15-18(-22) × 3-4 µm. Nr. 46369 is pycnidiate; conidia 3 x 1 µm, curved.

***Mycoporum* sp.?** – (5e) *ST 45879* [B, SING].

Myeloconis erumpens P.M.McCarthy & Elix – (6) *SM 45948* [B, SING]; (10) *SMT 46123* [B, SING].

Myriotrema albocinctum Hale – Bukit Timah Nature Reserve, 1989, *Aptroot 25988* [Hb. Aptroot].

Myriotrema glaucophaenum (Kremp.) Hale – (5e) *ST 45897* [B, SING], *45910* [SING], *45926* [B]; (6) *SM 45945* [B, SING].

TLC: psoromic acid (*45910*).

Myriotrema microporellum (Nyl.) Hale – (5e) *ST 45913* [B, SING].

TLC: hypoprotocetraric acid.

Myriotrema subconforme (Nyl.) Hale – (3b) *S 45646* [SING]; (3c) *S 45647* [SING]; (3m) *S 45680* [B, SING]; (3p) *S 45703* [B]; (3t) *S 45716* [B, SING]; (3ah) *S 45789* [SING]; (3ay) *S 45849* [B, SING]; (4) *S 45824* [SING]; Bukit Timah nature reserve, 1989, *Aptroot 25989* [Hb. Aptroot !].

TLC: none (*45646, 45647, 45789, 45824, 45913*).

Ocellularia cavata (Ach.) Müll.Arg. – on the trunks of dead trees, 1861-1865, *Maingay* [Nylander and Crombie, 1884: 53 as *Thelotrema*]; Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 19 as *Thelotrema*].

These records need reinvestigation to establish their current taxonomic position.

Ocellularia crocea (Kremp.) Overeem & D.Overeem – (3n) *S 45687* [B, SING]; (3u) *S 45718* [B, SING]; (3an) *obs.*, in *S 45810* [SING] (= *Chiodecton leptospermum*); (3ay) *S 45847* [SING]; (4) *obs.*; (5a) *ST 45857* [B, SING]; (5d) *ST 45875* [B, SING]; (5e) *ST 45882* [B, SING], *45894* [SING], *45901* [SING], *45905* [B], *45918* [B, SING]; (6) *ST 46382* [B, SING], *SM 45953* [B], *45966* [SING], *45980* [SING], *SF 46083* [B, SING]; (10) *SMT 46118* [SING], *46127* [B], *46142* [B], *46146* [SING]; (10a) *SMT 46163* [B, SING], *46165* [B, SING]; (11) *SMT 46214* [SING]; (14) *ST 46330* [B]; (14e) *ST 46313* [SING]; (15) *SM 46363* [SING]; ad cortices, *Beccari 261* [Krempelhuber, 1875: 60 as *Ascidium*]; Sentosa, along the southern shore, on trunk, 1980, *Tibell 8859* [UPS L-057801]; Bukit Timah nature reserve, 1989, *Aptroot 25991* [Hb. Aptroot].

Morphologically very similar to *O. papillata*, and hard to separate when the characteristic, yellow pigment is scarce. TLC: traces (pigment) (*45687, 45718, 45857, 45918, 46083, 46127, 46165*).

Ocellularia dolichotata (Nyl.) Zahlbr. – (6) *SM 45972* [SING]; (10a) *SMT 46152* [B, SING]; Vega expedition, corticola, 1879, *Almquist* [H-Nyl. 22748 lectotype, S isolectotype, not seen; Nylander, 1891: 19 as *Thelotrema*; Hale, 1981: 303].

TLC: none (45972).

Ocellularia feigei Sipman – (6) *SM 45964* [B holotype, SING isotype]; (10) *SMT 46121* [B].

For details see Sipman (2003).

Ocellularia interponenda (Nyl.) Hale – (6) *ST 46379* [SING]; (10) *SMT 46129* [B, SING], *46140* [B, SING]; Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 20 as *Ascidium*, type description]; Nu Soon Forest Reserve, in tropical forest remnant, on trunk, 1980, *Tibell 8834* [UPS L-057782].

Ocellularia nylanderiana Hale – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 20 as *Ascidium majorinum* var. *longius*, type description].

Ocellularia orthomastia (Kremp.) Zahlbr. – (5e) *ST 45912* [B, SING]; ad corticem, *Beccari 247* [Krempelhuber, 1875: 60 as *Ascidium*, type description].

TLC: none (45912).

Ocellularia papillata (Leight.) Zahlbr. – (3m) *S 45675* [SING] (vs., poor material); (4) *S 45821* [SING], *45827* [B, SING]; (5e) *ST 45903* [B, SING], *45915a* [B, SING]; (5f) *ST 45928* [B, SING]; (6) *ST 46381* [B, SING], *SM 45951* [SING], *45955* [SING], *45958* [B, SING], *45969* [B], *45974* [SING], *SF 46085* [B, SING], *46094* [SING]; (10) *SMT 46132* [SING], *46137* [B], *46139* [SING]; (10a) *SMT 46158* [B, SING], *46160* [B, SING] cf.; (11) *SMT 46209* [SING]; (14) *ST 46346* [B, SING]; (15) *SM 46365* [SING]; Nu Soon Forest

Reserve, in tropical forest remnant, on trunk of *Lithocarpon*, 1980, *Tibell 8810* [UPS L-057767]; ibidem, on bark of *Macaranga*, 1980, *Tibell 8827* [UPS L-057777].

Very similar to *O. crocea*, and differring by the absence of pigment. Since the pigment concentration seems variable, the delimitation between the two species is not always clear. TLC: none (*45827, 45915a, 45928, 45969, 46085, 46137, 46346*).

Ocellularia tanii Sipman – (5e) *ST 45923* [B, SING]; (6) *SF 46081* [B, SING], *46084* [B, SING]; (10a) *SMT 46151* [B holotypus, SING isotypus].

For details see Sipman (2003).

Ocellularia terebrata (Ach.) Müll.Arg. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 19 as *Thelotrema terebratum typicum*]; ad corticem, *Beccari 255* [Krempelhuber, 1875: 60 as *Thelotrema olivaceum*].

Ocellularia terebrata (Ach.) Müll.Arg. f. ***subeminescens*** (Nyl.) Zahlbr. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 19 as *Thelotrema terebratum* f. *subeminescens*].

This record needs reinvestigation to establish its current taxonomic position.

Ocellularia triglyphica (Kremp.) Zahlbr. – Ad cortices, *Beccari 256* [Krempelhuber, 1875: 60 as *Ascidium*].

Ocellularia xanthostromiza (Nyl.) Zahlbr. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 20 as *Ascidium*, type description].

This record needs reinvestigation to establish its current taxonomic position, it may be conspecific with *O. crocea*.

***Ocellularia* sp. A** – (3p) *S 45706* [B, SING].

Ascospores muriform, 1/ascus. TLC: none.

***Ocellularia* sp. B** – (5e) *ST 45890* [B, SING].

Like *O. papillata*, but without columella. TLC: none.

Opegrapha graphidiza Nyl. – (8) *ST 46072* [B, SING].

Identification kindly provided by D. Ertz (Meise), for more details see his forthcoming publication in Bibliotheca Lichenologica.

Opegrapha irosina Vain. – (4) *S 45832* [B].

Identification kindly provided by D. Ertz (Meise), for more details see his forthcoming publication in Bibliotheca Lichenologica.

Opegrapha medusulina Nyl. – (15) *SM 46376* [B, SING].

Identification kindly provided by D. Ertz (Meise), for more details see his forthcoming publication in Bibliotheca Lichenologica.

Opegrapha subrimulosa Nyl. – (2a) *S 45517* [B, SING]; (2d) *S 45568* [B].

Identification kindly provided by D. Ertz (Meise), for more details see his forthcoming publication in Bibliotheca Lichenologica.

Opegrapha subvulgata Nyl. – (1d) *SM 45463* [B].

Identification kindly provided by D. Ertz (Meise), for more details see

his forthcoming publication in Bibliotheca Lichenologica.

Opegrapha varia Pers. – (11) *SMT 46217* [B, SING].

Identification kindly provided by D. Ertz (Meise), for more details see his forthcoming publication in Bibliotheca Lichenologica.

Opegrapha vegae R.Sant. – (5e) *ST 45941* [SING]; (6) *SM 45982* [B, SING], *45983* [B, SING], *45985* [B, SING]; (6a) *SF 46104* [B, SING]; (10b) *SMT 46174* [B, SING]; Vega expedition, foliicola, 1879, *Almquist 37a* [S, UPS, not seen; Nylander, 1891: 22 as *O. phyllobia*; Santesson, 1952: 100]; 1879, *Almquist* [UPS L-025868 isotypus, not seen].

Nr. *46174* deviates by the presence of 7-septate ascospores.

Pallidogramme chrysenteron (Mont.) Staiger, Kalb & Lücking – (14a) *ST 46274* [B, SING]; on bark of old trees, without ascospores, 1861-1865, *Maingay* [Nylander and Crombie, 1884: 58 as *Graphis chrysentera*?].

TLC: stictic acid (*46274*).

Parmeliella pannosa (Sw.) Müll.Arg. – Botanical Garden, on *Cupressus*, 1980, *Tibell 8889a* [UPS L-057819]; Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 19 as *Pannaria*]; ad lignum (vel corticem) putridum, *Beccari 234a* [Krempelhuber, 1875: 60 as *Pannaria*].

Parmotrema gardneri (C.W.Dodge) Sérus. – (3o) *S 45701* [B, SING]; (14c) *ST 46282* [B, SING]; Botanic Gardens, 1949, *Lemaitre* [SING]; Botanical Garden, on *Peltophorum ferrugineum*, 1980, *Tibell 8879* [UPS L-057814]; ibidem, on *Cupressus* sp., 1980, *Tibell 8891* [UPS L-057822].

TLC: atranorin, protocetraric acid (*45701, 46282*).

Parmotrema praesorediosum (Nyl.) Hale – (3ab) in *S 45766* [SING] (= *Parmotrema tinctorum*); (3aj) *S 45804* [B, SING]; (12) *SMT 46218* [SING]; (13) *S 46262* [SING]; (14) *ST 46324* [B]; (18) *ST 46401* [B, SING]; Vega expedition, corticola, 1879, *Almquist* [H-Nyl 35547 holotype, S isotype, not seen; Nylander, 1891: 18 as *Parmelia*]; Government House Domain, on telephone line insulator, 1959, *Burkill 2130* [SING 500253].

TLC: atranorin, 3 fatty acids (*45804, 46218, 46262, 46324, 46401*).

Parmotrema saccatilobum (Tayl.) Hale – (3m) *S 45684* [SING]; (3aj) *S 45801* [B, SING]; (13) in *S 46242* [SING] (= *Trypethelium subeluteriae*); (14c) *ST 46290* [B, SING]; Elix, 1994: 156; Louwhoff and Elix, 1999: 111; on trunk in rubber plantation, 2000, *B.C. Tan* [SING].

TLC: atranorin, protocetraric acid (*45684, 45801, 46290*).

Parmotrema tinctorum (Despr. ex Nyl.) Hale – (3o) *S 45702* [B, SING]; (3ab) *obs., S 45766* [SING]; (3aj) *S 45803* [B, SING]; (14) *obs.*; Singapore Botanic Gardens, 1949, *Lemaitre* [SING]; Singapore Botanic Gardens, 1959, *Burkill 2171* [SING]; on rocks, 1861-1865, *Maingay* [Nylander and Crombie, 1884: 51 as *Parmelia*; Nylander, 1891: 18 as *Parmelia*]; Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 18 as *Parmelia*]; Singapore Botanical Garden, on *Cedrela glaziovii* (Nr. D6), 1959, *Burkill 2176* [SING 500375]; ibidem,

on *Araucaria cunninghamii*, 1980, *Tibell 8874* [UPS L-057809]; ibidem, on *Peltophorum ferrugineum*, 1980, *Tibell 8876* [UPS L-057811]; ibidem, on *Harpullia zanguebarica*, 1980, *Tibell 8882* [UPS L-057815]; ibidem, Jungle, on *Sterculia rubiginosa*, 1980, *Tibell 8870* [UPS L-058096].

TLC: atranorin, lecanoric acid (*45702, 45766, 45803*).

Phaeographina alutacea Zahlbr. – In horto botanico, *Schiffner 3053* [W, not seen; Redinger, 1936: 94].

This record needs reinvestigation to establish its current taxonomic position.

Phaeographina flexans (Nyl.) INED. –Vega expedition, corticola, 1879, *Almquist* [H-Nyl. 7975, not seen; Nylander, 1891: 24 as *Lecanactis*, type description; Egea and Torrente, 1994: 183 as Graphidaceae].

This record needs reinvestigation to establish its current taxonomic position. The species is poorly known and no formal recombination is presented here without an investigation of the type.

Phaeographina prosiliens (Mont. & v.d.Bosch) Müll.Arg. – (10a) *SMT 46155* [B, SING].

TLC: none.

Phaeographina subrigida (Nyl.) Zahlbr. – On Jack-fruit trees, 1861-1865, *Maingay* [H, not seen; Nylander and Crombie, 1884: 58 as *Graphis*, type description; Redinger, 1936: 98]; Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 24 as *Lecanactis*].

These records need reinvestigation to establish their current taxonomic position.

Phaeographis caesioradians (Leight.) A.W.Archer – (2) *S 45621a* [SING]; (2e) *S 45597* [B, SING]; (3o) *S 45700* [SING]; (3ag) *S 45784* [SING]; (3ai) *S 45797* [B]; (5e) *ST 45881* [SING]; (7) *ST 46029* [B, SING], *46038* [B, SING], in *ST 46007* [SING] (= *Diorygma rufopruinosum*)? (no spores); (7a) *ST 45998* [SING]; (8) *ST 46075* [B, SING]; (13) *S 46235* [SING]; (14a) *ST 46268* [B, SING], *46269* [B, SING]; (14c) in *ST 46283* [B, SING] (= *Phaeographis intricans*); (15) in *SM 46370* [B, SING] (= *Lecanora helva*).

TLC: none (*45597, 45621a, 45700, 45797, 45881, 46029, 46075, 46269*). Externally similar to *Phaeographis* sp. C, but with muriform ascospores.

Phaeographis circumscripta (Kremp.) Zahlbr. – Pulo Pusang, ad cortices, *Beccari 243b* [M, not seen; Krempelhuber, 1875: 62 as *Graphis (Fissurina)*; Redinger, 1936: 78].

This record needs reinvestigation to establish its current taxonomic position.

Phaeographis dendroides (Leight.) Müll.Arg. – (3ab) S 45759 [B, SING].

TLC: stictic acid.

Phaeographis diversula (Nyl.) Zahlbr. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 24 as *Lecanactis diversa*].

Lecanactis diversa is not synonymized here with *Graphina obtrita* (Fée) Müll.Arg. as indicated by Zahlbruckner (1923: 416), because its ascospores seem in conflict with this. Instead the synonymisation of "*Graphis diversa* Kremp." in Redinger (1936: 89) is followed. The record needs reinvestigation to establish its current taxonomic position.

Phaeographis intricans (Nyl.) Staiger – (1) in *SM 45473* [SING] (= *Phaeographis* sp. C); (1g) *SM 45487* [B, SING]; (1j) *SM 45508* [SING]; (2) *S 45622* [SING], *S 45623* [B, SING]; (2b) *obs.*, in *S 45531* [B, SING] (= *Trypethelium eluteriae*); (2d) *obs.*, in *S 45556* [SING] (= *Pyxine cocoes*); (2e) *S 45587* [B, SING], *45594* [B, SING]; (2f) *S 45602* [B, SING], *45607* [B, SING]; (2g) in *S 45630* [SING] (= *Lecanora helva*); (3o) *obs.*, *S 45698* [SING]; (3p) *S 45704* [SING]; (3ab) *S 45756* [SING]; (3ao) *S 45812* [B]; (5e) *ST 45880* [B, SING]; (6) *SM 45967* [SING]; (7) *obs.*, *ST 46011* [B, SING], *46019* [SING], *46032* [B, SING], *46034* [B], *46037* [B, SING]; (7a) *ST 45996* [B, SING]; (8) *ST 46073* [B, SING]; (13) in *S 46260* [SING] (= *Dirinaria picta*); (14) *obs.*; (14a) *ST 46271* [B, SING]; (14c) *ST 46283* [B, SING]; (15) *obs.*; (18) *obs.*; Sentosa, along the southern shore, on trunk,1980, *Tibell 8857* [UPS L-057799]; Kusu Island, 1989, *Aptroot 25980, 25982* [Hb. Aptroot].

TLC: none (*45487, 45587, 45602, 46073*). The material is very variable and the identification provisional. Noteworthy is the presence of specimens with guttulate hymenium: in *45473, 45508, 45623, 45704, 45996*.

Phaeographis maeandrata (Kremp.) Zahlbr. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 24 as *Lecanactis serpentosa*].

This record needs reinvestigation to establish its current taxonomic position.

Phaeographis punctiformis* var. *nylanderi (Vain.) Redgr.? – (2e) *S 45593* [B, SING], *45599* [B, SING]; (2g) in *S 45630* [SING] (= *Lecanora helva*); (8) *ST 46050* [B, SING]; (13) *S 46234* [SING]; (13a) *S 46225* [SING]; Sentosa, along the southern shore, on trunk, 1980, *Tibell 8858 pp* [UPS L-057800, *Graphis insulana*].

TLC: norstictic acid (*45593, 46050, 46234*). The material deviates clearly from *P. punctiformis* s. str. and the identification is provisional.

Phaeographis ramigera Redgr. – *Beccari 268* [M, not seen; Redinger, 1936: 71].

This record needs reinvestigation to establish its current taxonomic position.

Phaeographis scalpturata (Ach.) Staiger – (3ag) *S 45783* [SING]; (3ai) *S 45791* [B, SING]; (5e) *ST 45887* [B, SING]; (10a) *SMT 46157* [B, SING]; Sentosa, along the southern shore, on trunk, 1980, *Tibell 8856* [UPS L-057798].

TLC: none (*45791, 45887, 46157*). The identification of *45783* is uncertain in the absence of ascospores.

***Phaeographis* sp. A** – (3ak) *S 45805* [B, SING].

Ascospores submuriform, *ca* 25 × 10 µm; TLC. norstictic acid.

***Phaeographis* sp. B** – *Benjamin Lee* [SING].

***Phaeographis* sp. C** – (1) *SM 45473* [SING]; (2) *S 45621* [B, SING]; (2f) *S 45608* [B, SING]; (3ad) *S 45775* [B, SING].

Externally similar to *Phaeographis caesioradians*, but with transversely septate ascospores. TLC: none (*45608, 45621, 45775*).

***Phaeographis* sp. D** – (14e) *ST 46306* [B, SING].

Ascospores bacillar, *ca* 4/ ascus, 30-50 × 10-12 µm; TLC: none.

Phyllopsora parvifolia (Pers.) Müll.Arg. – ad lignum putridum, *Beccari 233, 234* [Krempelhuber, 1875: 60 as *Lecidea parvifolia* var. *fibrillifera*].

***Phyllopsora*? sp.** – (14) *ST 46328* [B, SING].

TLC: stictic acid. A squamulose lichen deviating from *Phyllopsora* by the absence of prothallus and from *Eschatogonia* by the absence of a lower cortex; in the absence of apothecia its affinities are unclear.

Physcia* cf. *tribacioides Nyl. – (3ab) *S 45768* [B, SING]; (3aj) *S 45800* [B, SING].

***Physcia* sp.** – (3d) *S 45653* [B, SING]; (3x) *S 45729* [B, SING]; (14) *ST 46264* [B, SING], *46320* [B, SING], *46332* [B, SING]; (18) *ST 46400* [B, SING]; Nu Soon forest reserve, in tropical forest remnant, on trunk, 1980, *Tibell 8845* [UPS L-057788]; St. John's Island, 1989, *Aptroot 26003* [Hb. Aptroot].

A small-lobed species with marginal soralia and without lower cortex. It is apparently widespread and common in cultivated areas in the Malesian area and specimens are available in B from Indonesia and the Philippines.

Physma byrsaeum (Ach.) Tuck. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 18 as *Dichodium byrsinum*]; Singapore Botanical Garden, treestem, 1920, *Kiah 6038* [SING].

Platygramme flexuosa (Nyl.) INED. – (7) *ST 46045* [SING]; (7a) *ST 45997* [B, SING]; (8) *ST 46070* [B, SING]; Sentosa, along the southern shore, on tree trunk, 1980, *Tibell 8855* [UPS]**;** Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 25 as *Lecanactis*; Redinger, 1936: 98 as *Phaeographina*].

TLC: none (*45997, 46070*). No formal combination is presented without investigation of the type.

***Platythecium* sp.?** – *Beccari 235* [M, not seen; Krempelhuber, 1875: 61 as *Graphis grammitis* var. *seductilis*, type description; Redinger, 1936: 62] as *Graphis grammitis* var. *seductilis*.

This record needs reinvestigation to establish its current taxonomic position.

***Platythecium* sp.** – (6) *SM 45968* [B, SING].

TLC: stictic acid.

Pocsia mucronata P.M.McCarthy – (1a) *SM 45441b* [B, SING], *45441e* [B, SING].

Polyblastiopsis augescens (Nyl.) Zahlbr. – On bark of trees, 1861-1865, *Maingay* [Nylander and Crombie, 1884: 60-61 as *Verrucaria*, type description; Nylander, 1891: 25 as *Verrucaria*].
Porina atropunctata Lücking & Vězda – (10b) *SMT 46190a* [B, SING], *46190b* [B, SING].
Porina* cf. *canthicarpa P.M.McCarthy – (10b) *SMT 46180* [B, SING].

Algal cells rectangular, in closed, radiating plates; ascospores 3-septate, 20 x 2.5 μm.

Porina chlorotica (Ach.) Müll.Arg. – (16) *ST 46386* [B, SING].

On granitic rock.

Porina epiphylla (Fée) Fée – (10b) *SMT 46190* [B, SING], *46190c* [B, SING].
Porina internigrans (Nyl.) Müll.Arg. – (5e) *ST 45920* [B, SING]; (6) *SM 45960* [B, SING]; (10) *SMT 46134* [B, SING]; (10a) *SMT 46148* [B, SING].
Porina mirabilis Lücking & Vězda – (10b) *SMT 46167* [SING] cf., *46195* [SING].
Porina monocarpa (Kremp.) Schilling – ad folia coriacea, *Beccari 269e* [Krempelhuber, 1875: 63 as *Verrucaria*,]; *Beccari 269b* [M, holotype, G, not seen; Krempelhuber, 1875: 63 as *Verrucaria*; Santesson, 1952: 256].
Porina semecarpi Vain. – (10b) *SMT 46181* [B, SING].
Porina tetracerae (Malme) R.Sant. – (1d) in *SM 45460* [SING] (= *Pyrenula* sp.), *SM 45467* [B, SING]; (1j) *SM 45512* [B, SING]; (3m) *S 45678* [SING]; (3ac) in *S 45773* [B] (= *Porina* cf. *tetracerae*); (4) *S 45816* [SING], in *S 45822* [B, SING] (= *Thelotrema* sp. B), *S 45830* [B, SING]; (5e) *ST 45919* [B, SING]; (6) *SM 45961* [B, SING]; (6a) *SF 46113* [SING]; (10) *SMT 46138* [B, SING]; (10b) *SMT 46179* [B, SING].

While most specimens are isidiate and without ascocarps, the frequency of ascocarps and isidia is very variable and there seemed no reason to separate isidiate from non-isidiate specimens as proposed by some other authors.

Porina* cf. *tetracerae (Malme) R.Sant. – (3m) in *S 45678* [SING] (= *Porina tetracerae*); (3ac) *S 45773* [B]; (4) *S 45825* [B, SING]; (13) *S 46252* [B, SING]; (14) *ST 46334* [B, SING].

These specimens deviate by the absence of cortex on the propagules, which remain usually short and granular. No specimen with ascocarps was seen, so that the classification is tentative and based on superficial resemblance.

Porina tetramera Vain. – (17a) *ST 46388c* [B, SING].
Porina virescens (Kremp.) Müll.Arg. – (10b) *SMT 46192* [B, SING].
***Porocyphus* sp.?** – (2) *S 45582* [B, SING].

A gelatinous algal cover on concrete, which may be lichenized because a few ascocarps seem present.

***Psorotichia* sp.?** – (2) in *S 45584* [SING] (= *Endocarpon pallidum*).
Pyrenula anomala (Ach.) Vain. – on trunks of trees, 1861-1865, *Maingay* [Nylander and Crombie, 1884: 61 as *Trypethelium platystomum*]; ad cortices, *Beccari 236b* [Krempelhuber, 1875: 63 as *Trypethelium platystomum*]; Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 25 as *Verrucaria aggregata*].
Pyrenula aspistea (Ach.) Ach. – (5e) *ST 45904* [B, SING]; (5f) *ST 45930* [B, SING]; (6) *SM 45978* [SING], *SF 46092* [B, SING]; (11) in *SMT 46210* [B, SING] (= *Pyrenula santensis*) (no spores), *SMT 46212* [B, SING]; Bukit Timah nature reserve, 1989, *Aptroot 25992* [Hb. Aptroot].
Pyrenula concatervans (Nyl.) R.C.Harris – (1a) *SM 45443* [B, SING]; (1i) *SM 45502* [B, SING]; (3a) *S 45640* [B, SING]; (8) *ST 46059* [SING]; (13a) *S 46222* [B].

The ascospores are variable, from 4-loculate and 6-loculate to submuriform, 6 x 1-2 locules, and muriform, 8 × 2-3 locules, and range in size from 18 x 8 to 25 x 10 µm. However, they are much smaller than the related species with muriform ascospores, *P. macularis* (Zahlbr.) R.C.Harris.
Pyrenula mamillana (Ach.) Trev. – (14) *ST 46341* [B, SING].
Pyrenula nitidula (Bres.) R.C.Harris – (2f) *S 45610* [B, SING].
Pyrenula ochraceoflava (Nyl.) R.C.Harris – (1a) *SM 45442* [B, SING]; (1c) in *SM 45456* [SING] (= *Chrysothrix xanthina*); (1e) *SM 45476* [SING]; (1g) *SM 45492* [SING]; (1i) *SM 45499* [B]; (1j) *SM 45506* [SING], *45510* [B, SING]; (2a) in *S 45519* [B] (= *Graphis caesiella*); (2d) *S 45570* [B, SING]; (2g) in *S 45624* [SING] (*Pyrrhospora quernea*), in *S 45631* [B] (*Amandinea efflorescens*), in *S 45635* [SING] (parasite); (3) *obs.*; (3a) in *S 45642* [SING] (= *Graphis insulana*); (3ab) *S 45742* [B], *45743* [SING]; (3ag) *S 45782* [SING]; (3av) *S 45841* [SING]; (5c) *ST 45870* [SING]; (7) *obs.*, *ST 46044* [B], *46047* [SING]; (7a) *ST 46000* [B]; (8) *ST 46056* [SING], *46057* [B]; (13) *obs.*; (13a) *S 46221* [SING]; (14) *obs.*, *ST 46342* [B], *46343* [SING]; (14c) *ST 46295* [SING]; (15) *obs.*, *SM 46377* [B, SING]; Fort Canning Park, 1989, *Aptroot 25958* [Hb. Aptroot]; Sentosa, along the southern shore, outskirts of forest along the beach, on trunk, 1980, *Tibell 8862* [UPS L-057804]; Fort Canning Park, 1989, *Aptroot 25960* [Hb. Aptroot].

This species is conspicuous by the presence of yellow to red anthraquinone pigments. However, their concentration is very variable, perhaps depending on vitality of the thallus and shading. Some specimens seem to lack pigments completely, while in others it is restricted to a reddish pigment on the ascocarps. Both look very different from the modal form with yellowish thallus and perithecia but agree in anatomical characters. TLC: 2 anthraquinones (*45499, 46000*); 4 anthraquinones (*45570*).
Pyrenula santensis (Nyl.) Müll.Arg.? – (11) *SMT 46210* [B, SING].

The specimen lacks ascospores.

Pyrenula santensis* var. *murina INED. – ad cortices, *Beccari 257, 265* [Krempelhuber, 1875: 63 as *Verrucaria santensis* Tuck. var. *murina*].

This record needs reinvestigation to establish its current taxonomic position.

Pyrrhospora quernea (Dicks.) Körb. – (2f) *S 45618* [B, SING]; (2g) *S 45624* [SING], in *S 45637* [B, SING] (= *Lecanora helva*); (7a) *ST 45987* [B, SING]; (7b) *ST 46004* [B, SING]; (8) S*T 46049* [B, SING]; (13) *S 46248* [B, SING]; (14) *obs.*; (15) *obs.*; (18) *ST obs*.

TLC: thiophanic acid, tr. arthothelin (*45618, 45987, 46004, 46049, 46248*). Surprisingly this material is morphologically and chemically identical with a species known until recently only from temperate and mediterranean climate areas, where it is not uncommon. Apothecia, desirable for confirmation of the taxonomic position, were not found. It is also reported from Hong Kong by Aptroot and Seaward (1999).

Pyxine cocoes (Sw.) Nyl. – (1j) *SM 45514* [B, SING]; (2d) *S 45556* [SING]; (13) *S 46259* [B, SING]; (13a) *S 46227* [SING]; (15) *obs.*; Fort Canning Park, 1989, *Aptroot 25950* [Hb. Aptroot]; Sentosa, close to the ferry, on trunk of broad-leved tree, 1980, *Tibell 8846, 8847* [UPS L-057789, L-057790]; ibidem, on trunk of *Tamarindum indica*, 1980, *Tibell 8849* [UPS L-057792].

Pyxine farinosa Kashiw. – (3a) in *S 45643* [B, SING] (= *Cryptothecia scripta*), *S 45644* [B]: (3aj) *S 45798* [SING]; (8) *ST 46068* [B, SING]; (14c) *ST 46281* [SING]; Pulau Terkukor, 1960, *Burkill 2566* [SING]; 1949, *Lemaitre* [SING]; St. John's Island, 1989, *Aptroot 26001* [Hb. Aptroot]; Kusu Island, 1989, *Aptroot 25965* [Hb. Aptroot].

Ramonia microspora Vězda – (14) *ST 46350* [SING].

Rinodina cinereovirescens (Harm.) Zahlbr. – (14) *ST 46265* [B, SING].

Rinodina oxidata (A.Massal.) A.Massal. – (14) *ST 46267* [B, SING].

TLC: atranorin, gyrophoric acid.

Sarcographa concisa (Kremp.) Zahlbr. – ad cortices, *Beccari 262* [M, not seen; Redinger, 1936:108; Krempelhuber, 1875: 31, 61 as *Graphis concisa*].

This record needs reinvestigation to establish its current taxonomic position.

Sarcographa heteroclita (Mont.) Zahlbr. – (3q) *S 45712* [B, SING]; (3af) *S 45780* [SING]; (5e) *ST 45892* [SING]; (10) *SMT 46115* [B, SING]; (11) *SMT 46213* [B, SING].

Two specimens have pycnidia and lack ascocarps, *45780* and *45712*; conidia 5-6 x 0.5 µm, slightly curved. TLC: stictic, tr. hypostictic acid (*45892, 46115*); stictic acid (*46213*).

Sarcographa labyrinthica (Ach.) Müll.Arg. – (5e) *ST 45896* [SING], *45911* [B]; (10) *SMT 46117* [B, SING]; (14e) *ST 46304* [SING]; Bukit Timah, 1959, *Burkill 2172* [SING]; on Betel-palms, 1861-1865, *Maingay* [Nylander and Crombie, 1884: 59 as *Glyphis*]; Vega expedition, corticola, 1879, *Almquist*

[Nylander, 1891: 25 as *Glyphis*; Redinger, 1936: 107]; Pulau Pinang, ad corticem, *Beccari 241* [Krempelhuber, 1875: 62 as *Glyphis labyrinthica* var. *insulata*]; Nee Soon forest reserve, tropical forest remnant, on bark of *Macaranga*, 1980, *Tibell 8826* [UPS L-057776].

TLC: stictic, tr. cryptostictic acids (*45896, 46304*).

Sarcographa lactea Müll.Arg. – *Beccari 241* [M, not seen; Redinger 1936: 109].

This record needs reinvestigation to establish its current taxonomic position.

Sarcographa protracta (Kremp.) Zahlbr. – Pulo Pinang, ad cortices, *Beccari 242* [M, not seen; Redinger, 1936: 110; Krempelhuber, 1875: 63 as *Acanthoglyphis*, type description].

This record needs reinvestigation to establish its current taxonomic position. Probably this is not a Singapore record.

Sarcographa ramificans (Kremp.) Staiger – (5e) *ST 45914* [B, SING]; (10a) *SMT 46162* [B, SING]; ad cortices, *Beccari 268* [Krempelhuber, 1875: 61 as *Graphis*]; Nu Soon Forest Reserve, tropical forest remnant, on trunk of *Macaranga*, 1980, *Tibell 8807, 8825* [UPS L-057765, L-057775]; Vega expedition, corticola, 1879, *Almquist* [H, not seen; Nylander, 1891: 25 as *Glyphis duodenaria*, type description; Redinger, 1936: 112, as *S. heteroclita* var. *duodenaria*].

TLC: stictic acid (*46162*).

Sarcographa tricosa (Ach.) Müll.Arg. – on Betel-palms, 1861-1865, *Maingay* [Nylander and Crombie, 1884: 58 as *Medusula*]; Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 25 as *Medusula*].

Sarcographina glyphiza (Nyl.) K.Singh & Awasthi – (3o) *S 45695* [B, SING]; (3v) *S 45720* [SING]; (3y) *S 45734* [B]; (3ab) *S 45760* [B, SING]; (3ai) *S 45796* [SING]; (4) *S 45831* [B]; (6) *SF 46088* [SING]; (14c) *ST 46284* [B]; (14e) *ST 46303* [SING]; Singapore Botanical Garden, on *Harpullia zanguebarica*, 1980, *Tibell 8883* [UPS L-057816]; ad corticem *Arecae*, *Maingay* [H, not seen; Redinger, 1936: 113 as *Sarcographina gyrizans*]; on Betel-palms, 1861-1865, *Maingay* [Nylander and Crombie, 1884: 59 as *Glyphis circumplexa*, type description; Nylander, 1891: 25 as *Glyphis circumflexa*].

TLC: stictic, tr. cryptostictic acids (*45695, 45760, 46088*). This species is not treated by Staiger (2002), and its generic position in the new systematic arrangement of Graphidaceae seems unsettled.

Sclerophyton dendrizans (Nyl.) Zahlbr. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 23 as *Chiodecton*, type description; Redinger, 1936: 117].

This record needs reinvestigation to establish its current taxonomic position. Sparrius (2004) suggests its affinity to *Phaeographis* but did not investigate the type.

Septotrapelia triseptata (Hepp) Aptroot – Economic Gardens, 1920, *Hippance 5935* [SING]; Reformatory Road, 1920, *Chipp 6191* [SING].
***Sporopodium* sp.** – (10b) *SMT 46198* [B, SING]; (14f) *ST 46360* [B, SING]; (17a) *ST 46388d* [B, SING]; Nee Soon forest reserve, tropical forest remnant, on leaves of *Nephelium lappaceum*, 1980, *Tibell 8803* [UPS L-057764].

The specimens have campylidia and no apothecia, and cannot be identified with certainty at species level. The may belong to more than one species.
Stegobolus berkeleyanus Mont. – (6) *SM 45947* [B, SING].
Stegobolus croceoporus (Hale) A.Frisch – (10) *SMT 46131* [SING].
Strigula concreta (Fée) R.Sant. – (5e) *ST 45944* [B, SING]; (6a) *SF 46111* [SING]; (14f) *ST 46357* [B, SING].
Strigula* vs. *nemathora Mont. – (6a) *SF 46109* [B]; (10b) *SMT 46201* [SING].

The identification is tentative because the specimens are in poor condition.
Strigula nitidula Mont. – (1a) *SM 45441f* [B, SING]; (6a) *SF 46110* [B, SING]; (10b) *SMT 46200* [B, SING].

The identification of *46110* is tentative because it contains only pycnidia.
Strigula orbicularis Fr. – (1a) in *SM 45441f* [B, SING] (= *Strigula nitidula*); (15) *SM 46364* [B, SING].
Strigula smaragdula Fr. – (1a) *SM 45441d* [B, SING]; 1879, *Almquist 38* [S, not seen; Santesson, 1952: 169 as *S. elegans*].
***Strigula* sp.?** – Vega expedition, foliicola, 1879, *Almquist* [Nylander, 1891: 26 as *Strigula actinoplaca*].

This record needs reinvestigation to establish its current taxonomic position.
Syncesia* cf. *glyphisoides (Fée) Tehler – (14) *ST 46345* [B, SING].

TLC: lichexanthone, traces.
***Thalloloma* sp. A** – (6) *SM 45959* [B, SING].

TLC: indet. substance.
Thelidium quinqueseptatum (Nyl.) Arnold – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 26 as *Verrucaria*, type description.
Thelotrema aggregatum (Hale) Hale – Nee Soon Forest Reserve, tropical forest remnant, on bark of *Gonystylis*, 1980, *Tibell 8820* [UPS L-057774].
Thelotrema diplotrema Nyl. – (5e) *ST 45902* [B, SING].

TLC: none.
Thelotrema isidiophorum (Kremp.) Zahlbr. – ad cortices, *Beccari 264* [Krempelhuber, 1875: 43, 60 as *Ascidium*; Krempelhuber, 1877: 134 as *Ascidium*].
Thelotrema santessonii Hale – (10) *SMT 46120* [B, SING].

TLC: stictic acid.

***Thelotrema* sp. A** – Nee Soon Forest Reserve, tropical forest remnant, on bark of *Garcinia*, 1980, *Tibell 8809* [UPS L-057766].

***Thelotrema* sp. B** – (4) *S 45822* [B, SING].

Ascospores muriform, hyaline, 8/ascus, ca. 60 x 20 µm, I-negative.

Thysanothecium scutellatum (Fr.) D.J. Gallow. – (3p) *S 45707* [B, SING]; (3ap) *S 45813* [B, SING]; (14c) *ST 46293* [B, SING].

TLC: divaricatic acid (*45813, 45707*).

Trapelia* cf. *involuta (Tayl.) Hertel – (3) *S 45814* [SING].

***Tricharia* sp.** – (5e) in *ST 45942* [SING] (= *Anisomeridium throwerae*); (10b) *SMT 46188* [SING]; ad folia coriacea, *Beccari 232a, 269d* [Krempelhuber, 1875: 64 as *T. orbicularis*, type description; Santesson, 1952: 379].

The new collections lack apothecia.

Trypethelium deformis Makhija & Patwardhan – 1861-1865, *Maingay 165* [BM holotype, not seen; Makhija and Patwardhan, 1992: 240].

Trypethelium eluteriae Spreng. – (2b) *S 45531* [B, SING]; (2e) *S 45588* [SING]; (2f) *S 45606* [B, SING]; (2g) in *S 45630* [SING] (= *Lecanora helva*); (3) *obs.*; (7) *ST 46020* [SING], *46022* [SING]; (14) *ST 46338* [SING]; (14a) *ST 46272* [B]; (18) in *ST 46405* [SING] (= *Trypethelium subeluteriae*); Fort Canning Park, 1989, *Aptroot 25957* [Hb. Aptroot]; nahe der Philippinischen Botschaft, 1999, *Schumm & Schwarz* [Hb. Schumm 5850].

The colour of *46272* suggests that it has a deviating pigment composition.

Trypethelium epileucodes Nyl. – (3) *S 45655* [SING]; (3g) *S 45659* [B]; (3o) *S 45693* [B]; (3aa) *S 45739* [SING]; (5e) *ST 45885* [B, SING], *45924* [SING]; (8) *ST 46061* [SING]; (10) *SMT 46116* [SING]; (10a) *SMT 46150* [B, SING], *46154* [SING]; Bukit Timah nature reserve, 1989, *Aptroot 25993* [Hb. Aptroot].

Trypethelium* cf. *platystomum Mont. – (2b) *S 45533* [B, SING]; (2e) *S 45595* [SING]; (2f) *S 45605* [B]; (8) *ST 46060* [SING]; (13) *S 46242* [SING]; (14) *ST 46344* [B]; (14e) *ST 46311* [B]; (18) *ST 46405* [SING].

Trypethelium stramineum Kremp. – ad corticem, *Beccari 246* [Krempelhuber, 1875: 63].

This record needs reinvestigation to establish its current taxonomic position.

Trypethelium straminicolor Nyl. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 26].

This record needs reinvestigation to establish its current taxonomic position.

Trypethelium tropicum (Ach.) Müll.Arg. – (1b) in *SM 45452* [B, SING] (= *Graphis caesiella*); (1g) *SM 45488* [B, SING]; (2b) *S 45522* [B, SING]; (2e) in *S 45595* [SING] (= *Trypethelium subeluteriae*) (no spores); (3k) in *S 45668*

[B, SING] (= *Enterographa pallidella*); (3q) *S 45711* [B, SING]; (3av) *S 45842* [SING]; (5e) in *ST 45904* [B, SING] (*Pyrenula aspistea*) (no spores); (8) in *ST 46060* [SING] (= *Trypethelium subeluteriae*) (no spores); (13) *obs.*; (13a) *S 46223* [SING]; (18) *ST 46406* [B, SING]; Fort Canning Park, 1989, *Aptroot 25956* [Hb. Aptroot]; on wild Lime-trees, 1861-1865, *Maingay* [Nylander and Crombie, 1884: 60 as *Verrucaria*; Nylander, 1891: 25 as *Verrucaria*]; nahe der Philippinischen Botschaft, 1999, *Schumm & Schwarz* (Hb. Schumm 6689); Botanical Garden, on trunk of *Pangium edule*, 1964, *Degelius As-497* [UPS L-056602]; crossing Oxley Road/Oxley Rise, roadside trees, 1994, *Diederich 12224* [Hb. Aptroot].

Trypethelium variolosum Ach. – (2b) *S 45532* [B, SING], *45538* [B, SING]; (3) *S 45656* [B]? (no spores; c. pycn.); (3q) *S 45710* [B, SING]; (3ab) *S 45746* [SING], *45747* [B]; (3ad) *S 45774* [SING]; (3ah) *S 45787* [SING]; (5e) *ST 45888* [B]; (13) *S 46241* [B]; (14c) *ST 46294* [SING]; (18) *ST 46403* [B], *46404* [B, SING]; Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 26 as *T. ochroleucum*].

***Trypethelium* sp. A** – Sentosa, along the southern shore, on trunk, 1980, *Tibell 8860* [UPS L-057802].

***Tylophoron* sp.** – (1h) *SM 45493* [B, SING].

The specimen lacks ascocarps and contains thalloconidia.

Verrucaria mundula P.M.McCarthy – (1i) *SM 45500* [B, SING].

***Vezdaea* sp.?** – (2) *S 45586* [B, SING].

The specimen has immature ascocarps without spores and the identification is therefore uncertain.

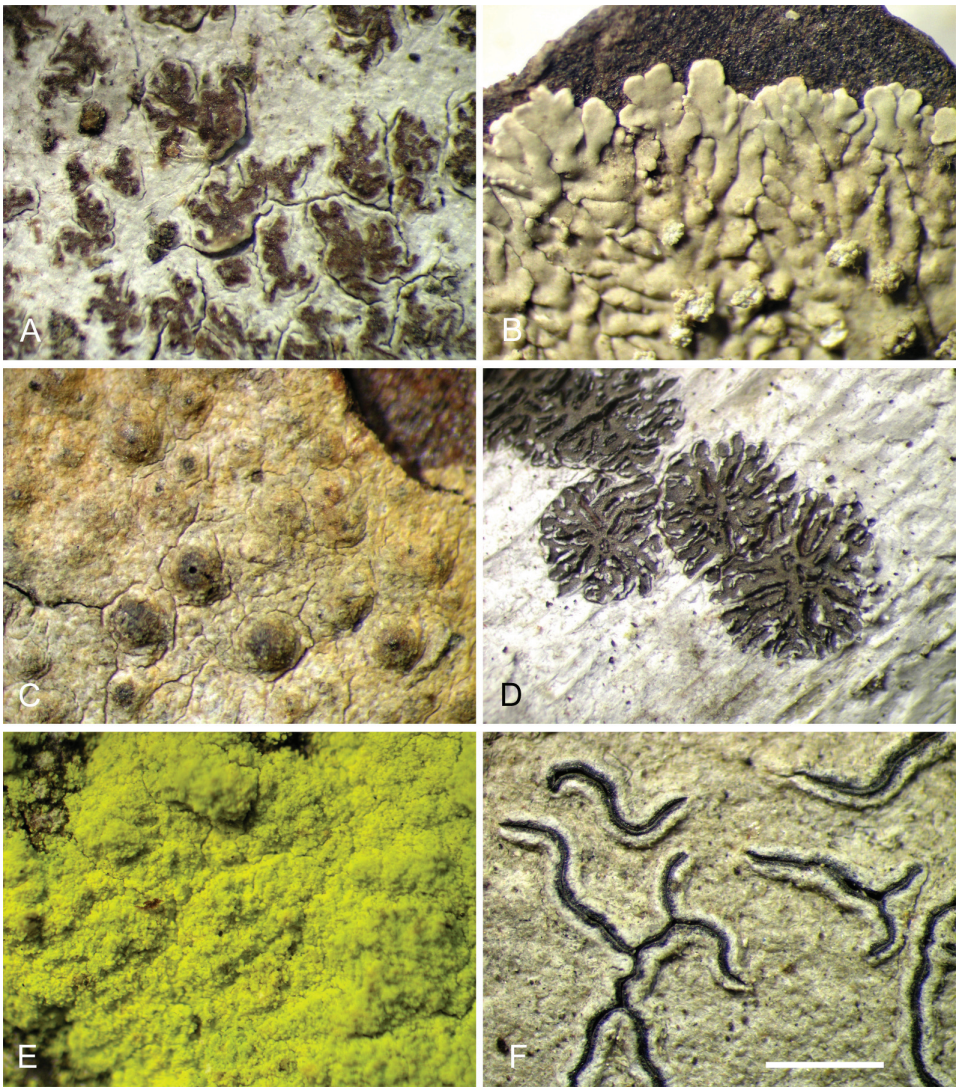

Figure 1. Some of the commonest lichens in Singapore. A. *Arthonia catenatula* (*SM 45498*); B. *Dirinaria picta* (*SM 45454*); C. *Pyrenula ochraceoflava* (*S 45499*); D. *Phaeographis intricans* (*ST 46283*); E. *Chrysothrix xanthina* (*S 45603*); F. *Graphis insulana* (*S 45679*). Scale for all: bar = 1 mm.

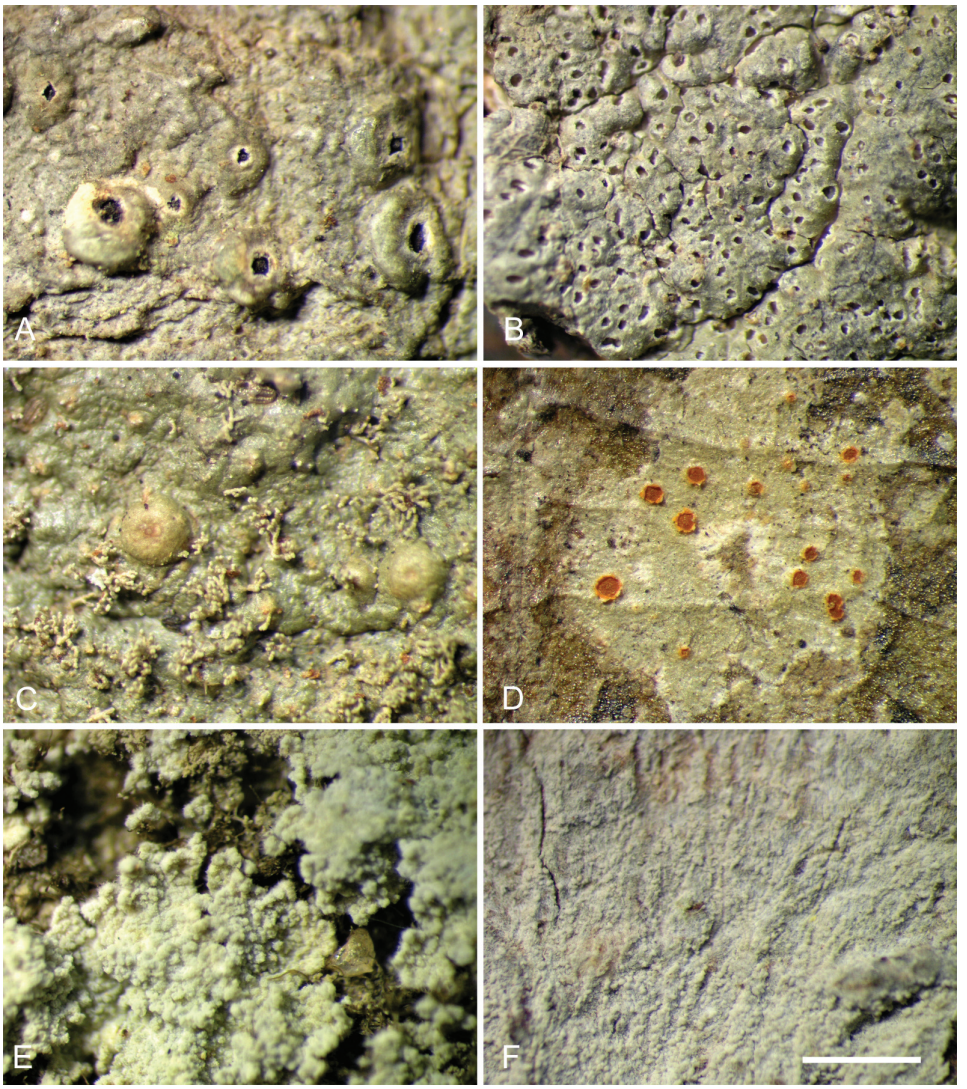

Figure 2. A-C. Forest-inhabiting lichens. A. *Ocellularia crocea* (*ST 45905*); B. *Myriotrema subconforme* (*S 45646*); C. *Porina tetracerae* (*ST 45919*). D. *Chroodiscus australiensis*, a foliicolous lichen (*SMT 46193*). E-F. Two lichen species recently described from Singapore. E. *Lepraria usnica* (*S 45651*); F. *Herpothallon granulare* (*SM 45490*). Scale for all: bar = 1 mm.

Figure 3. Diversity of Graphidaceae in Singapore. A. *Diorygma rufopruinosum* (*SM 46373*); B. *Dyplolabia afzelii* (*S 45697*); C. *Fissurina* cf. *dumastii* (*S 46456*); D. *Glyphis cicatricosa* (*S 45785*); E. *Glyphis scyphulifera* (*S 46220*); F. *Graphis glaucescens* (*S 45562*); G. *Graphis librata* (*SM 45462*); H. *Pallidogramme chrysenteron* (*ST 46274*); I. *Phaeographina prosiliens* (*SM 46155*); J. *Phaeographis caesioradians* (*ST 46029*); K. *Phaeographis punctiformis* var. *nylanderi* (*S 46234*); L. *Sarcographa heteroclita* (*SMT 46115*). Scale for all pictures: bar = 1 mm.

Synonyms used in published records

Acanthoglyphis protracta Kremp. = *Sarcographa protracta*.
Arthonia aleurella Nyl. = *Cryptothecia aleurella*.
Arthothelium aleurellum (Nyl.) Zahlbr. = *Cryptothecia aleurella*.
Ascidium croceum Kremp. = *Ocellularia crocea*.
Ascidium interponendum Nyl. = *Ocellularia interponenda*.
Ascidium isidiophorum Kremp. = *Thelotrema isidiophorum*.
Ascidium majorinum Nyl. var. *longius* Nyl. = *Ocellularia nylanderiana*.
Ascidium orthomastium Kremp. = *Ocellularia orthomastia*.
Ascidium triglyphicum Kremp. = *Ocellularia triglyphica*.
Ascidium xanthostromizum Nyl. = *Ocellularia xanthostromiza*.
Buellia efflorescens Müll.Arg. = *Amandinea efflorescens*.
Chiodecton dendrizans Nyl. = *Sclerophyton dendrizans*.
Coccocarpia ciliolata Mont. = *Coccocarpia erythroxyli*.
Cryptothecia granularis Sipman = *Herpothallon granulare*.
Dichodium byrsinum (Ach.) Nyl. = *Physma byrsaeum*.
Graphis afzelii Ach. = *Dyplolabia afzelii*.
Glyphis circumflexa Nyl. (misspelling for "*circumplexa*") = *Sarcographina glyphiza*.
Glyphis circumplexa Nyl. = *Sarcographina glyphiza*.
Glyphis duodenaria Nyl. = *Sarcographa ramificans*.
Glyphis labyrinthica Ach. = *Sarcographa labyrinthica*.
Glyphis labyrinthica var. *insulata* Kremp. = *Sarcographa labyrinthica*.
Graphis atroalba Kremp. = *Dyplolabia afzelii*.
Graphis chrysentera Mont. = *Pallidogramme chrysentera*.
Graphis circumscripta Kremp. = *Phaeographis circumscripta*.
Graphis concisa Kremp. = *Sarcographa concisa*.
Graphis ramificans Kremp. = *Sarcographa ramificans*.
Graphis singaporina Nyl. = *Carbacanthographis candidata*.
Graphis subrigida Nyl. = *Phaeographina subrigida*.
Gyalecta lutea Dicks. = *Coenogonium luteum*.
Lecanactis diversa Nyl. = *Phaeographis diversula*.
Lecanactis flexans Nyl. = *Phaeographina flexans*.
Lecanactis flexuosa Nyl. = *Platygramme flexuosa*.
Lecanactis serpentosa Nyl. = *Phaeographis maeandrata*.
Lecanactis subrigida (Nyl.) Nyl. = *Phaeographina subrigida*.
Lecanora epiphylla Auct., non Fée = *Byssoloma tricholomum*.
Lecanora punicea Ach. = *Haematomma* sp.
Lecidea parvifolia Pers. var. *fibrillifera* Nyl. = *Phyllopsora parvifolia*?
Lecidea rubello-virens Nyl. = *Bacidia rubellovirens*.
Lecidea sophodina Nyl. = *Lopadium sophodinum*.

Medusula tricosa (Ach.) = *Sarcographa tricosa*.
Opegrapha phyllobia auct., non Nyl. = *Opegrapha vegae*.
Pannaria pannosa (Sw.) Nyl. = *Parmeliella pannosa*.
Parmelia praesorediosa Nyl. = *Parmotrema praesorediosum*.
Parmelia tinctorum Despr. = *Parmotrema tinctorum*.
Phaeographina flexuosa (Nyl.) Müll.Arg. = *Platygramme flexuosa*.
Physcia picta (Sw.) Nyl. = *Dirinaria picta*.
Physcia picta (Sw.) f. *sorediata* (Hepp) = *Dirinaria applanata*.
Sarcographa heteroclita (Mont.) Zahlbr. var. *duodenaria* (Nyl.) Redgr. = *Sarcographa ramificans*.
Sarcographina gyrizans (Leight.) Müll.Arg. = *Sarcographina glyphiza*.
Strigula actinoplaca Nyl. = *Strigula* sp.?
Strigula elegans (Fée) Müll.Arg. = *Strigula smaragdula*.
Thelotrema cavatum Ach. = *Ocellularia cavata*.
Thelotrema dolichotatum Nyl. = *Ocellularia dolichotata*.
Thelotrema olivaceum Mont. = *Ocellularia terebrata*.
Thelotrema terebratum Ach. = *Ocellularia terebrata*.
Thelotrema terebratum Ach. f. *subeminescens* Nyl. = *Ocellularia terebrata* f. *subeminescens*.
Tricharia orbicularis Kremp. = *T.* sp.
Trypethelium ochroleucum Eschw. = *Trypethelium variolosum*.
Trypethelium ochrothelizum Nyl. = *Astrothelium ochrothelizum*.
Trypethelium platystomum Mont. = *Pyrenula anomala*.
Verrucaria aggregata Fée = *Pyrenula anomala*.
Verrucaria augescens Nyl. = *Polyblastiopsis augescens*.
Verrucaria monocarpa Kremp. = *Porina monocarpa*.
Verrucaria quinque-septata Nyl. = *Thelidium quinqueseptatum*.
Verrucaria santensis Tuck. var. *murina* Kremp. = *Pyrenula* sp.
Verrucaria tropica Ach. = *Trypethelium tropicum*.

Rejected records

Collema flaccidum Ach. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 17]. Erroneous record (Degelius, 1974), perhaps mistake for *C. leptaleum*.

Parmelia dilatata Vain. – *Johnson A-109* [US, not seen; Hale, 1965: 247]. This record needs reinvestigation, it was given in a study (Hale, 1965) where the similar *Parmotrema gardneri* was not recognized and most probably it represents that species.

Parmelia perforata Ach. – Vega expedition, corticola, 1879, *Almquist* [Nylander, 1891: 18]. This record needs reinvestigation to establish its current taxonomic position, the species name has been much misapplied.

List of collectors of Singapore lichens

Ernst ALMQUIST: Vega expedition; 1879; collections in S, H-Nyl.
André & Mariette APTROOT: Nrs. 25950-26005?, 21-31 June 1989; collections in Herb. Aptroot.
O. BECCARI: collections in M.
H. M. BURKILL: Nrs. 2139, 2171-2180?, 2566; dd. 1959, 1960; collections in SING.
T. R. CHIPP: Nr. 4915, 5801, 6191; dd. 1919-1920; collections in SING.
Gunnar DEGELIUS: Nrs. As 485-497?; 25-26 Mar. 1964; collections in UPS.
Paul DIEDERICH: 1994; in Hb. Diederich.
FARIDA: NUS student collaborator with H. Sipman.
HARMAND (?): collections in M.
JOHNSON: Nr. A-109; collection in US.
KIAH: Nr. 5846, 6038; 1920; collection in SING.
Aino M. LEMAITRE ("Lamaitre"): 1949; collections in H, SING.
Benjamin LEE: 2000; collections in SING.
A. C. MAINGAY: 1861-1865; collections purchased by Sir Joseph Hooker, now in BM?, pp. in H-Nyl.?
H. MÖLLER: collections in S, TUR.
D. H. MURPHY: collaborator with H. Sipman.
M. NOOR: Nr. 5663; 1920; collection in SING.
H. N. RIDLEY: Nr. A 54; 189x; collections in SING.
G. RIDORET: Nr. 5657; 1920; collection in SING.
Felix SCHUMM: 199; Hb. Schumm
Uwe SCHWARZ: collaborator with F. Schumm.
Harrie J. M. SIPMAN: Nr. 45661-46412; 4-25 Nov. 2000; collections in B, SING.
Benito C. TAN: 2000; collections in SING; collaborator with H. Sipman.
Leif TIBELL: Nrs. 8800-8872?, 13925; 16-18 Sept. 1980, 5 Oct. 1983; collections in UPS.

Discussion

The list of lichen species reported for Singapore contains 296 taxa. A discussion of the significance of this biodiversity is given in Sipman (2009). However, the figure is only preliminary. On one hand it contains some old reports, which need verification and may turn out to be synonyms of other listed species. On the other hand there are several dozens of samples are left unidentified and may well represent another 25 species. Many are vegetatively reproducing thalli without ascocarps to help establish their affinity. Some

very characteristic and frequent types have recently been described as new species (Sipman, 2003): *Lepraria usnica*, *Cryptothecia granularis* (cf. Table 3), but many less frequent forms without clear affinities are still awaiting treatment. Also some of the better sites in Singapore could be rewarding for additional investigation, e.g., the Nee Soon swamp. Moreover, at least 84 species are identified with certainty to genus level only. This suggests that the currently documented lichen diversity of Singapore amounts to over 300 species, perhaps even 325. Remarkably 68 taxa were found only before 1985. In view of the much more intense sampling during the author's field work in Singapore, it is unlikely that so many species have been overlooked. This leaves the suggestion that many may have become extinct in the meantime (for discussion see Sipman in prep.), so that the currently present figure may be only 250 species.

For an impression of the distribution of the lichens within Singapore, the species numbers per locality are compared in Table 5. It shows that the Botanical Garden is the most important habitat for lichens in Singapore. The importance of botanic gardens for lichen diversity is a common feature in urbanized areas, and was observed also in, e.g., Berlin (Sipman and Aptroot, 2008). Also the ecologically rather stable and varied landscape of Pulau Ubin appears favorable for lichens. Among the areas with primary forest relics, the Nee Soon swamp is clearly better than Bukit Timah. Notably poor in lichens are the rainforest remnant in the Botanical Garden, the Bukit Brown Cemetery, and the abandoned quarry at Bukit Timah. Cemeteries and abandoned quarries are often sites with high lichen diversity, but apparently not in Singapore.

When looking at the numbers of species found only once (Table 5, third column), the sequence changes slightly. Nee Soon Swamp comes on the first place. This depends mainly on the many foliicolous lichens (specialized for growing on leaves) that have been found only here. Also the NUS campus ranks higher, probably because more time was involved in the study of its lichen flora than elsewhere, so that more rare or inconspicuous species were found.

Table 5. Number of lichen species and of unique finds per locality.

Singapore Botanical Garden	81	10
Pulau Ubin (island E of Singapore)	74	12
Nee Soon (nature reserve with swamp forest)	61	17
MacRitchie Reservoir (secondary forest)	57	7
Bukit Timah (primary forest relic)	51	4
NUS university campus	48	9
Sungei Buloh (nature reserve)	41	5
Fort Canning Park (city park)	41	4

Lazaro Island (small island S of Singapore)	33	3
Labrador Park (at the coast, W-side)	27	2
Sembawan Park (near the coast, E-side)	25	2
Kusu Island (small island S of Singapore)	24	2
Lower Peirce Reservoir (secondary forest)	16	1
Botanical Garden - Rainforest (primary forest relic)	15	2
Bukit Brown Chinese Cemetery	8	3
Bukit Timah quarry	3	1

Most lichens were observed on free standing trees, mostly in parks. Foliicolous lichens were observed mostly in Nee Soon, and less commonly in other forest remnants. Saxicolous lichens, so common in the cold climatic zones of the world, are very uncommon in Singapore. Only occasionally a few thalli were found on hard, crystalline stone, on anthropogenic occurrences. Concrete, now so common as constructing material, is usually devoid of lichens; these were found only occasionally in half-shade situations, perhaps depending on a certain degree of weathering. It could be speculated that increased weathering and arrival of new immigrant species will cause an increase in the number of saxicolous species.

Special attention was paid to the relation with phorophytes (supporting trees). However, the high number of different tree species involved makes any correlation insignificant. Nevertheless the information is presented in the species list to make it available for monitoring of future changes in the lichen growth. With this purpose also the tree numbers in the Singapore Botanical Garden have been added. The observations confirm the great significance of SBG for the maintenance of biological diversity in Singapore. Not only it houses a higher number of species than any other site, for many interesting species it appears to be the only site, like *Chiodecton leptospermum*, *Crocynia pyxinoides*, *Enterographa subserialis*, and *Jamesiella perlucida*.

Acknowledgements

The generous support provided by Dr. B.C. Tan (at NUS then) is to be mentioned first here. He suggested the project, kindly arranged many details of the study visit, including the required financial resources, and provided research facilities. P.-M. Jörgensen kindly allowed publishing his identification of *Lecidopyrenopsis*, D. Ertz his *Opegrapha* identifications (all except *O. vegae*). For loan of specimens, A. Aptroot, P. Diederich, F. Schumm and the curators of SING and UPS are gratefully acknowledged. Prof. C.H. Murphy and Ms Farida kindly provided fieldwork support and pleasant company. The National Parks Board and Singapore Botanic Gardens helpfully provided the necessary permits for the fieldwork and the

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