

# Twenty-five lichen species new to the Seychelles

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**Abstract:** The study presents twenty-five additional species that are new for the lichen flora of the Seychelles, collected on the island of Mahé. A complete species list of all recorded taxa during a stay of the second author in the year 2015 is provided.

**Zusammenfassung:** Die Studie stellt fünfundzwanzig zusätzliche Arten zur Flechtenflora der Seychellen vor, gesammelt auf der Insel Mahé. Eine komplette Liste aller während des Aufenthaltes der Co-Autorin im Jahre 2015 registrierten Arten wird bereitgestellt.

**Key words:** Palaeotropics, lichenized ascomycetes, lichen collection, taxonomy.

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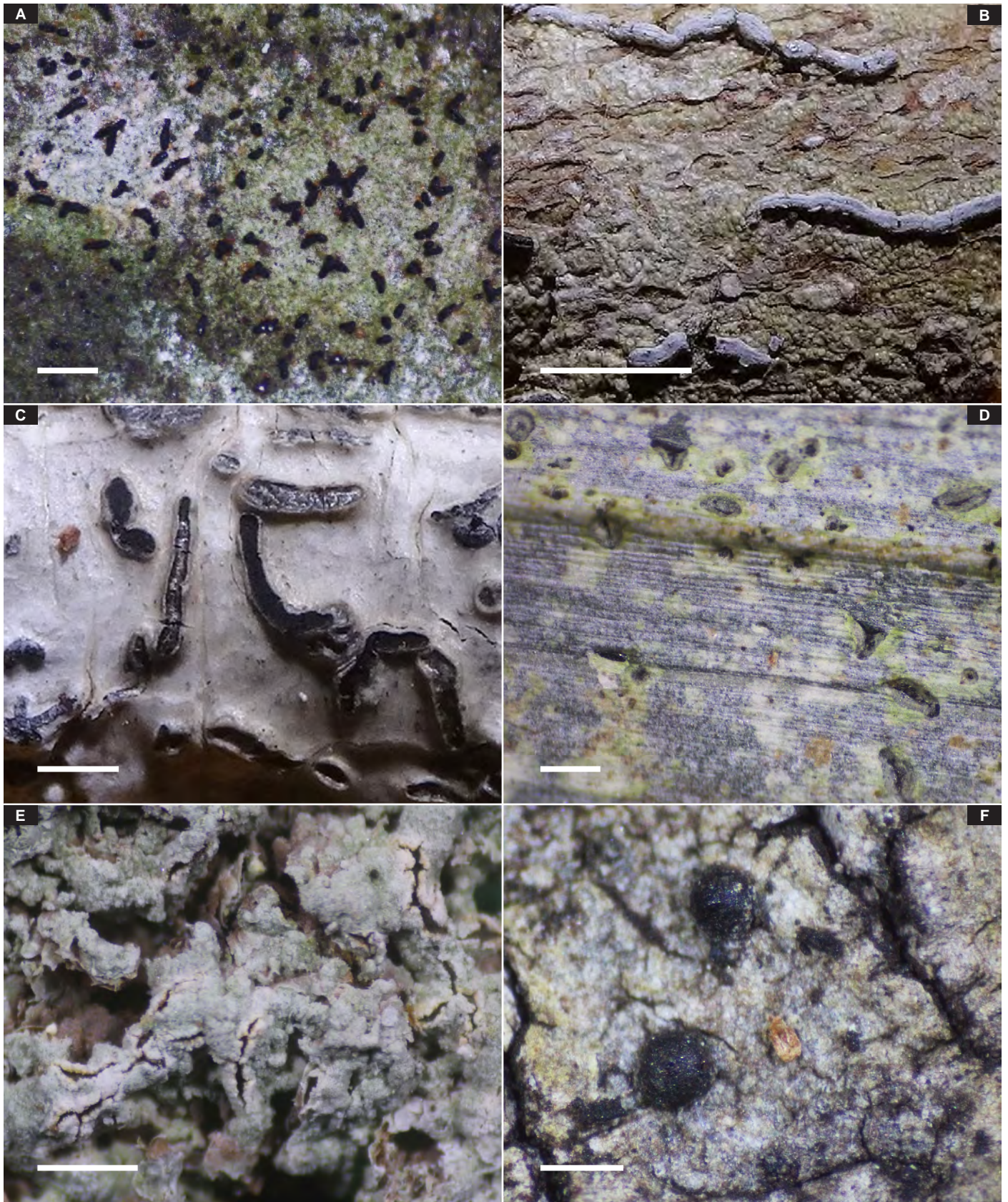
## INTRODUCTION

The lichen flora of the Seychelles has been poorly investigated and only a few studies treated the lichen diversity on the islands. Most data were reported by SEAWARD et al. (1996, 2002) and SEAWARD & APTROOT (2003, 2004, 2006), followed by a checklist by SEAWARD & APTROOT (2009), including 376 species on which this study has been based on. A comprehensive work on this subject was carried out by SCHUMM & APTROOT (2011), showing anatomical details of well-known and some new lichen species from the region. Three lichen species, described as new to science, have already been published: *Cryptothecia stockeri* (NEUWIRTH & APTROOT 2016), *Platythecium seychellense* (NEUWIRTH et al. 2017) and *Tapellaria palaeotropica* (NEUWIRTH & STOCKER-WÖRGÖTTER 2017). The latest research has been done by DIEDERICH et al. (2017) presenting the comprehensive results of a collecting trip in 2015 and including many species new to science.

## MATERIAL AND METHODS

Morphological characters were examined on dry material under a dissecting microscope Euromex Mic 1642 ZHT. The sections for studying anatomical features and ascospores dimensions were investigated with a Reichert Neovar compound microscope. The chemistry of the specimens was tested by spot reactions with KOH, C, KC, Pd and Lugol's solution. Two specimens were identified by HPLC carried out by the second author. All photographs were taken by the first author using a Canon EOS 600D-camera connected to an LM-Scope camera adapter and a Sony Cyber-shot camera. Unfortunately several specimens remain unidentified because of their bad condition the species could not be clarified undoubtedly.

Specimens will be deposited in hb. Stocker and GZU. Furthermore, specimens will be sent to SEY, to support the Seychelles herbarium.



**Fig. 1:** Habitus and ascomata of species. A – *Arthonia orbyniae*; B – *Carbacanthographis marcescens*; C – *Leiorreuma hypomelae-num*; D – *Fouragea viridistellata*; E – *Thalloloma janeirense*; F – *Bogoriella miculiformis*. Scale bars: A=0.5 mm, B=3 mm, C=2 mm, D=0.2 mm, E=2 mm, F=0.3 mm.



**Fig. 2:** Habitus and ascomata of *Graphis* species. A – *G. aperiens*; B – *G. cincta*; C – *G. conferta*; D – *G. duplicata*; E – *G. immersicans*; F – *G. leptoclada*. Scale bars: A=5 mm, B=3 mm, C=1 mm, D=2 mm, E=2 mm, F=2 mm.

**Collecting sites, with abbreviations used in the text**

(coordinates follow Google Earth Pro)

- L1: Northern part of Mahé, San-Soucis Road, near Mission Lodge, 4°39'21"S, 55°26'43"E; 7 Feb. 2015.
- L2: Morne Blanc trail, Morne Seychellois National Park, 4°39'22"S, 55°26'14"E; 6 Feb. 2015.
- L3: Montagne Posée Road, Montagne Brulée, Glacis La Reserve, Top Forest, 4°42'26.31"S, 55°30'34.13"E; 12 Feb. 2015.
- L4: Morne Seychellois National Park, Port Glaud, Rivière de Cascade, mangroves, 4°39'19.57"S, 55°24'23.49"E; 8 Feb. 2015.
- L5: North Coast Road to North Point, "Glacis Beach", 4°35'29.96"S, 55°25'57.62"E; 7 Feb. 2015.
- L6: Mont Fleuri Seychelles National Botanical Gardens, Victoria; 4°37'50.08"S, 55°27'07.23"E; 9 Feb. 2015.
- L7: Coast Beau Vallon, near Meridien Hotel, Fisherman's Cove, 4°36'57.68"S, 55°25'18.82"E; 10 Feb. 2015.
- L8: North Point, close to the property of Katy Beaver's House, 4°34'01"S, 55°26'04.35"E; 9 Feb. 2015.

**RESULTS AND NOTES**

The analyses of the material resulted in a total of 136 species, 25 of them turned out to be new to the Seychelles. Furthermore we determined the lichenicolous fungus *Biatoropsis usnearum* s.l., which is member of a complex including different species (MILLANES et al. 2016). All specimens: leg.: E. Stocker-Wörgötter, det: G. Neuwirth. Abbr. S=collecting number, L=location.

*Arthonia orbygniae* BAT. & J. L. BEZARRA (S 25/ L7, hb. Stocker-Wörgötter 3001; Fig. 1A).

A small, foliicolous species, easy to overlook, occurring in the Neotropics and tropical Africa. Lit.: LÜCKING (2008).

*Bogoriella miculiformis* (NYL. ex MÜLL. ARG.) APTROOT & LÜCKING (S 1/L7, hb. Stocker-Wörgötter 3002; Fig. 1F, 4G). Corticolous; pantropical. Lit.: APTROOT & LÜCKING (2016).

*Carbacanthographis marcescens* (FÉE) STAIGER & KALB (S 74/ L2, hb. Stocker-Wörgötter 3003; Fig. 1B). Corticolous, pantropical. Lit.: STAIGER (2002).

*Fouragea viridistellata* (SERUS., LÜCKING & SPARRIUS) ERTZ & FRISCH (S 39/ L1, hb. Stocker-Wörgötter 3004, Fig. 1D, 4E). Foliicolous; palaeotropical. Lit.: FRISCH et al. (2014).

*Graphis aperiens* MÜLL. ARG. (S 59/ L3, L4, hb. Stocker-Wörgötter 3005; Fig. 2A, 4C), *Graphis cincta* (PERS.) APTROOT (S 53/ L4, hb. Stocker-Wörgötter 3006; Fig. 2B), *Graphis conferta* ZENKER (S 30/ L1, hb. Stocker-Wörgötter 3007; Fig. 2C, 4B), *Graphis duplicata* ACH. (S 56/ L1, hb. Stocker-Wörgötter 3008; Fig. 2D), *Graphis furcata* FÉE (S 56/ L1, S 158/ L3, S 59/ L4, S 4,19/L7; hb. Stocker-Wörgötter 3009), *Graphis immersicans* A. W. ARCHER (L3, hb. Stocker-Wörgötter 3010; Fig. 2E), *Graphis leptoclada* MÜLL. ARG. (L3, hb. Stocker-Wörgötter 3011; Fig. 2F, 4A), *Graphis tenella* MÜLL. ARG. (S 30/ L1, hb. Stocker-Wörgötter 3012).

All cited taxa of *Graphis* are well-known members of the Graphidaceae family on the bark of trees, but haven't been reported so far from the Seychelles Islands. Lit.: LÜCKING (2009); LÜCKING, APTROOT & ARCHER (2009).

*Leiorreuma hypomelaenum* (MÜLL. ARG.) STAIGER (S 81/ L2, hb. Stocker-Wörgötter 3013; Fig. 1C). Corticolous, pantropical. Lit.: STAIGER (2002).

*Melanotrema platystomum* (MONT.) FRISCH (S 118/ L3, hb. Stocker-Wörgötter 3014). Corticolous, common pantropical species extending into subtropical and temperate regions in both hemispheres. Lit.: FRISCH et al. (2006).

*Ocellularia cavata* (ACH.) MÜLL. ARG. (S 75/ L2, hb. Stocker-Wörgötter 3015; Fig. 3B).

A common corticolous species, pantropical. Lit.: FRISCH, A. & OHMURA, Y. (2012).

*Pertusaria albopunctata* A.W. ARCHER & ELIX (S 37,38/ L1, hb. Stocker-Wörgötter 3016; Fig. 3D). Corticolous. Stictic acid chemosynthetic detected by the second author (HPLC). The species had been recorded from Australia and Vanuatu so far. Lit.: ARCHER & ELIX (2009).

*Pertusaria scaberula* A.W. ARCHER (S 121/ L3, hb. Stocker-Wörgötter 3017).

Corticolous. The HPLC by the second author showed thamnolic acid as major lichen substance, but no lichexanthone. Africa, Australia, Papua New Guinea and Norfolk Islands. Lit.: ARCHER (1991), ARCHER et al. (2009).

*Phaeographis subdividens* (LEIGHT.) MÜLL. ARG. (S 79,81/ L2, hb. Stocker-Wörgötter 3018).

A corticolous species found in Australia, India, Sri Lanka, the Solomon Islands and the Republic of Korea. Lit.: ARCHER (2006), SANTOSH JOSHI et al. (2012).

*Physcia undulata* (ARN.) NYL. (S 61/ L4, hb. Stocker-Wörgötter 3019; Fig. 3C).

Corticolous, pantropical. Lit.: MOBERG 1990.

*Platygramme muelleri* (A. W. ARCHER) STAIGER (S 158/ L3, hb. Stocker-Wörgötter 3020; Fig. 3A, 4I).

Corticolous. Reported from Australia, East Africa (STAIGER 2002) and from Panama (v. d. BOOM & SIPMAN 2013).

*Polymeridium subcinereum* (NYL.) R. C. HARRIS (S 33/ L1, hb. Stocker-Wörgötter 3021; Fig. 3F). Corticolous. Pantropical and extending into the Subtropics (APTROOT & LÜCKING 2016).

*Thallolooma janeirensis* STAIGER (S 45/ L1, hb. Stocker-Wörgötter 3022; Fig. 1E, 4F)

Corticolous. A relatively rare species in the Graphidaceae. Reported from Brazil (STAIGER 2002) and Fiji (LUMBSCH et al. 2014).

*Thelotrema diplotrema* NYL. (S 103/ L3, hb. Stocker-Wörgötter 3023; Fig. 3E).

Pantropical. Lit.: FRISCH, A., KALB, K. & GRUBE M. (2006).

*Thelotrema porinoides* MONT. & BOSCH. (S 29,31,35/ L1, hb. Stocker-Wörgötter 3024; Fig. 4H). Common species on bark; pantropical.

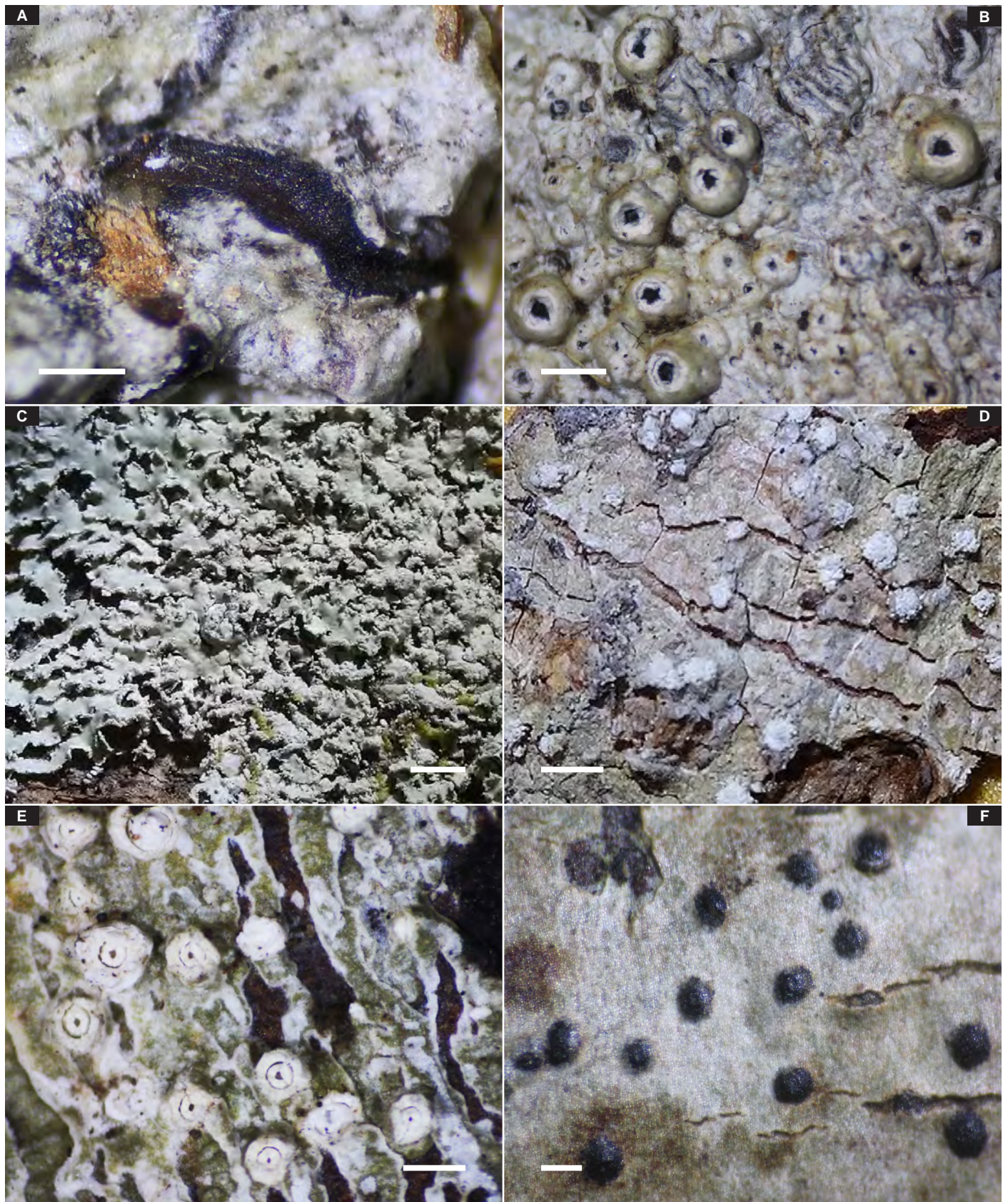
*Wirthiotrema glaucopallens* (NYL.) RIVAS PLATA, KALB & FRISCH (S 59/ L4, hb. Stocker-Wörgötter 3025; Fig. 4J). Pantropical on bark of trees in lowland to lower montane rainforests. Lit.: RIVAS PLATA et al. (2010).

## SPECIES LIST SEYCHELLES

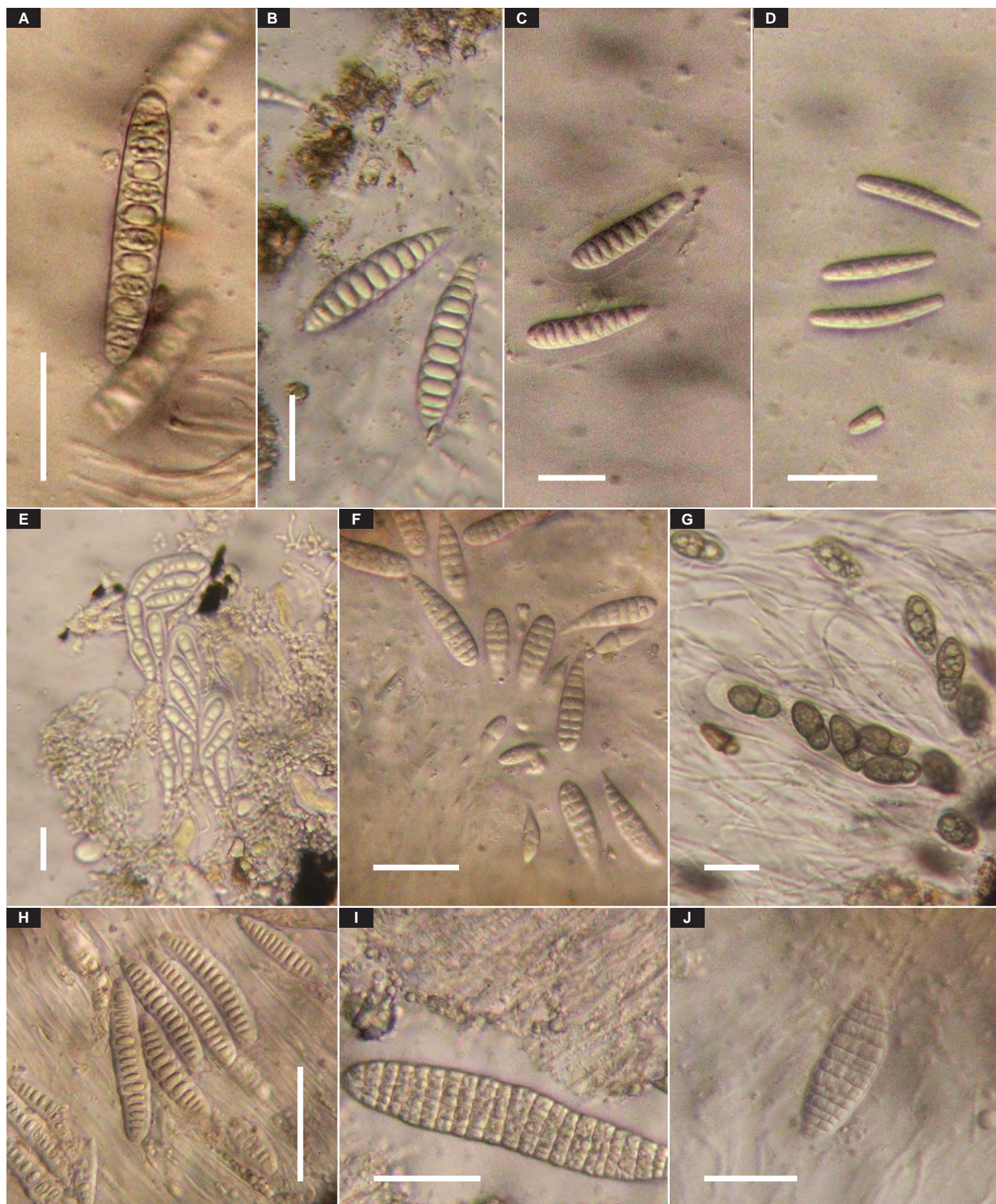
(collection leg. E. Stocker-Wörgötter)

\* new to the Seychelles (25), \*\*rare species (1). S=collection number, L= location.

1. *Arthonia antillarum* (FÉE) NYL. S 11/L7
2. *Arthonia catenatula* NYL. S 159/L5
3. *Arthonia cinnabarina* (DC.) WALLR. S 18/L4
4. *Arthonia orbygniae* BAT. & J. L. BEZARRA \* S 25/L8
5. *Astrothelium nitidisculum* (NYL.) APTROOT & LÜCKING S 117,120,151/L3
6. *Bacidia medialis* (TUCK. ex NYL.) B. DE LESD. S 13/L7
7. *Badimia polillensis* (VAIN.) VÉZDA S 95/L3
8. *Bogoriella miculiformis* (NYL. ex MÜLL. ARG.) APTROOT & LÜCKING \* S 1/L7
9. *Bulbothrix goebelii* (ZENKER) HALE S 155,157,158,160/L3
10. *Byssoloma chlorinum* (VAIN.) ZAHLBR. S 122/L3
11. *Byssoloma leucoblepharum* (NYL.) VAIN. S 40/L1
12. *Byssoloma subdiscordans* (NYL.) P. JAMES S 40/L1; S 85/L2; S 42,95,107,122,123/L3
13. *Calenia solorinoides* LÜCKING S 44/L1
14. *Calopadia puiggarii* (MÜLL. ARG.) VÉZDA S 68/L1
15. *Caloplaca bassiae* (ACH.) ZAHLBR. S 158/L5
16. *Carbacanthographis marcescens* (FÉE.) STAIGER & KALB \* S 74/L2
17. *Chiodecton leptosporum* MÜLL. ARG. S 51/ L1
18. *Chiodecton papillosum* G. THOR \*\* (only Madagascar). S 49/L1
19. *Chrysotrix xanthina* (VAIN.) KALB S 8/L8, S 67/L6
20. *Cryptothecia subnidulans* SIPMAN S 58/L4
21. *Coenogonium dilucidum* (KREMP.) KALB & LÜCKING S 29,55/L1
22. *Coenogonium luteum* (DICKS.) KALB & LÜCKING S 23/L8
23. *Coenogonium subluteum* (REHM) KALB & LÜCKING S 23/L7
24. *Coenogonium* sp. (no ascocarps) S 115/L3
25. *Cresponea flava* (VAIN.) EGEE & TORRENTE S 11, S 12, S 13/L7
26. *Cresponea proximata* (NYL.) EGEE & TORENTE S 158/L3; S 53,59,63,64,67/L4.
27. *Collema rugosum* Kremp. S 159/L5
28. *Dichosporidium brunthaleri* (ZAHLBR.) THOR S 27,69/ L1; S 80/L2
29. *Dichosporidium latisporum* G. THOR & HENSSEN S 109/L3
30. *Diorygma junghuhnii* (MONT. & v. D. BOSCH) KALB, STAIGER & ELIX S 16/L7
31. *Dirinaria applanata* (FÉE) D. D. AWASTHI S 5, S8/L7
32. *Dirinaria picta* (Sw.) SHEAR & CLEM. S 17, S 20/L8
33. *Dolichousnea trichodeoides* (VAIN. ex MOTYKA) ARTICUS S 150,158,160/L3
34. *Enterographa* sp. S 97/L3
35. *Enterographa pallidella* (NYL.) REDINGER S 1, S 3/L7
36. *Fellhanera bouteillei* (DESM.) VÉZDA S 28, 41,44/ L1
37. *Fellhanera ivoriensis* LÜCKING & R. SANT. S 85/L2
38. *Fellhanera rhapsidophylli* (REHM) VÉZDA S 85,88/L2
39. *Fissurina dumastii* FÉE S 47/L1; S 103/L3
40. *Fouragea viridistellata* (SERÜS., LÜCKING & SPARRIUS) ERTZ & FRISCH \* S 39/L1
41. *Gassicurtia subpulcella* (VAIN.) MARBACH S 151/L3
42. *Graphis aperiens* MÜLL. ARG. \* S 59/L4
43. *Graphis cincta* (PERS.) APTROOT \* S 53/L4
44. *Graphis conferta* ZENKER \* S 30/L1
45. *Graphis crebra* VAIN. S 54/L4; S 53,60/L4
46. *Graphis dracaena* VAIN. S 81/L2
47. *Graphis dupaxana* VAIN. S 158/L3
48. *Graphis duplicata* ACH. \* S 56/L1
49. *Graphis furcata* FÉE \* S 56/L1; S 158/L3; S 59/L4; S 4/L7; S 19/L8
50. *Graphis glaucescens* FÉE S 116/L3
51. *Graphis insulana* (MÜLL. ARG.) LÜCKING S 50/L1; S 105/L3
52. *Graphis immersicans* A. W. ARCHER \* S 16/L7
53. *Graphis leptoclada* MÜLL. ARG. \* S 16/L7
54. *Graphis librata* C. KNIGHT. S 158/L3
55. *Graphis longula* KREMP. S 76/L2
56. *Graphis oxyclada* MÜLL. ARG. S 76/L2
57. *Graphis pinicola* ZAHLBR. (cited as *G. palmyrensis*) S 13/L7
58. *Graphis tenella* MÜLL. ARG. \* S 30/L1
59. *Graphis* sp. S 7/L7
60. *Hemitecium chlorocarpoides* (NYL.) STAIGER S 158/L3
61. *Hemitecium chrysenteron* (MONT.) TREVIS S 46,48/L1; S 90/L2; S100,106,111,151,152,155/L3; S 53/L4
62. *Hemitecium laubertianum* (FÉE) STAIGER S 73/L2
63. *Heterodermia japonica* (M. SATO) SWINSCOW & KROG. S 90/L2



**Fig. 3:** Habitus and ascomata of species: A – *Platygramme muelleri*; B – *Ocellularia cavata*; C – *Physcia undulata*; D – *Pertusaria albopunctata*; E – *Thelotrema diplotrema*; F – *Polymeridium subcinereum*. Scale bars: A=1 mm, B=1 mm, C=1 mm, D=1 mm, E=1 mm, F= 0.3 mm.



**Fig. 4:** Ascospores. A – *Graphis leptoclada*; B – *Graphis conferta*; C – *Graphis aperiens*; D – *Enterographa* sp.; E – *Fouragea viridistellata*; F – *Thallolooma jareinense*; G – *Bogoriella miculiformis*; H – *Thelotrema porinoides*; I – *Platygramme muelleri*; J – *Wirthiotrema glaucopallens*. Scale bars: A=20  $\mu$ m, B=20  $\mu$ m, C=10  $\mu$ m, D=20  $\mu$ m, E=15  $\mu$ m, F=20  $\mu$ m, G=15  $\mu$ m, H=50  $\mu$ m, I=30  $\mu$ m, J=30  $\mu$ m.

64. *Lecanora achroa* NYL. S 150,152,154/L3  
 65. *Lecanora arthothelinella* LUMBSCH S 158/L3  
 66. *Lecanora helva* STIZENB. S 150/L3  
 67. *Lecanora symmicta* (ACH.) ACH. S 150/L3  
 68. *Lecanora thysanophora* H. C. HARRIS S 61/L4  
 69. *Lecanora tropica* ZAHLBR. S 158/L3  
 70. *Leiorreuma exaltatum* (MONT. & V. D. BOSCH) STAIGER S 154,157/L3; S 53/L4  
 71. *Leiorreuma hypomelaenum* (MÜLL. ARG.) STAIGER \* S 81/L2  
 72. *Leucodecton compunctum* (NYL.) A. FRISCH S 114/L3; S 64,67/L4  
 73. *Malmidea subgranifera* (KALB & ELIX) KALB & ELIX S 33/L1  
 74. *Mazosia phyllosema* (NYL.) ZAHLBR. S 55/L1  
 75. *Mazosia pseudobambusae* KALB & VEZDA S 122/L3  
 76. *Melanotrema platystomum* (MONT.) FRISCH \* S 118/L3  
 77. *Ocellularia cavata* (ACH.) MÜLL. ARG. \* S 75/L2  
 78. *Ocellularia* sp. S 23/L8  
 79. *Opegrapha anguinella* (NYL.) ERTZ & DIEDERICH S 152/L3  
 80. *Opegrapha subrimulosa* NYL. S 2/L7; S 67/L6  
 81. *Parmotrema cristiferum* (TAYLOR) HALE S 153/L3  
 82. *Parmotrema tinctorum* (DESPR. ex NYL.) HALE S 158,160/L3  
 83. *Pertusaria albopunctata* A. W. ARCHER & ELIX \* S 37,38/L1  
 84. *Pertusaria scaberula* A. W. ARCHER \* S 121/L3  
 85. *Pertusaria tetrathalamia* (FÉE) NYL. S 159/L5  
 86. *Pertusaria texana* MÜLL. ARG. S 158/L3  
 87. *Phaeographis neotricosa* REDINGER S 157/L3  
 88. *Phaeographis nylanderii* (VAIN.) ZAHLBR. S 152,154/L3  
 89. *Phaeographis planiuscula* (MONT. & BOSCH) MÜLL. ARG. S 108,150/L3  
 90. *Phaeographis punctiformis* (ESCHW.) MÜLL. ARG. S 150,152/L3  
 91. *Phaeographis smithii* (LEIGHT.) B. DE LESD. S 152,155,158/L3  
 92. *Phaeographis subdividens* (LEIGHT.) MÜLL. ARG. \* S 79,81/L2  
 93. *Phyllopsora buettneri* (MÜLL. ARG.) ZAHLBR. S 102/L3  
 94. *Phyllopsora corallina* (ESCHW.) MÜLL. ARG. S 115/L3  
 95. *Phaeographis smithii* (LEIGHT.) B. DE LESD. S 152,168/L3  
 96. *Phyllopsora halei* (TUCK.) ZAHLBR. S 125/L3  
 97. *Physcia dimidiata* (ARN.) NYL. S 67/L6  
 98. *Physcia krogiae* MOBERG S 152/L3; S 159/L5, S6/L7  
 99. *Physcia soresiosa* (VAIN.) LYNGE S 61/L4  
 100. *Physcia undulata* (ARN.) NYL. \* S 61/L4  
 101. *Physma byrsaeum* (ACH.) TUCK. S 36/L1  
 102. *Platygramme discurrens* (NYL.) STAIGER S 84,89,90/L2; S 100/L3  
 103. *Platygramme muelleri* (ARCHER) STAIGER \* S 158/L3  
 104. *Polymeridium subcinereum* (NYL.) R. C. HARRIS \* S 33/L1; S 160/L3  
 105. *Porina internigrans* (NYL.) MÜLL. ARG. S 70/L1  
 106. *Porina conspersa* MALME S 71/L1  
 107. *Porina epiphylla* FÉE S 32/L1  
 108. *Porina nitidula* MÜLL. ARG. S 44,68/L1  
 109. *Pseudopyrenula subgregaria* MÜLL. ARG. S 87/L2  
 110. *Pseudopyrenula subnudata* MÜLL. ARG. S 87/L2  
 111. *Pyrenula confinis* (NYL.) HARRIS S 59/L4  
 112. *Pyrenula fulva* (KREMP.) MÜLL. ARG. S 45/L1; S 78/L2  
 113. *Pyrenula microcarpa* MÜLL. ARG. S 53/L4  
 114. *Pyrenula ochraceoflava* (NYL.) R. C. HARRIS S 5,8,11,17,20/L7  
 115. *Pyrenula parvinuclea* (MEYEN & FLOTOW) APTROOT S 13/L7  
 116. *Pyrgillus javanicus* (MONT. & V. D. BOSCH) NYL. S 99/L3  
 117. *Pyxine copelandii* VAIN. S 157,158/L3  
 118. *Pyxine retirugella* NYL. S 58/L3, S 21/L8  
 119. *Ramalina celastri* (SPRENG.) KROG & SWINSCOW S 159/L5  
 120. *Ramalina fecunda* KROG. & SWINSCOW S 108,150,156/L3  
 121. *Rinodina guianensis* APTROOT S 1/L7  
 122. *Sarcographa intricans* (NYL.) MÜLL. ARG. S 106,150/L3  
 123. *Sarcographa labyrinthica* (ACH.) MÜLL. ARG. S 100,106,110,126/L3  
 124. *Sporopodium aurantiacum* (MÜLL. ARG.) LÜCKING S 88/L2  
 125. *Sporopodium phyllocharis* (MONT.) A. MASSAL. S 86/L2  
 126. *Sporopodium subflavescens* LÜCKING & LUMBSCH S 88/L2  
 127. *Stereocaulon japonicum* TH. FR. S 92/L2  
 128. *Sticta cyphellulata* (MÜLL. ARG.) HUE S 159/L5  
 129. *Stirtonia schummii* APTROOT S 131/L7  
 130. *Strigula phyllogena* (MÜLL. ARG.) R. C. HARRIS S 122/L3  
 131. *Tephromela atra* (HUDS.) HAFELLNER S 151/L3  
 132. *Thallolooma janeirensis* STAIGER \* S 45/L1  
 133. *Thelotrema diplotrema* NYL. \* S 103/L3  
 134. *Thelotrema porinoides* MONT. & BOSCH \* S 29,31,35/L1  
 135. *Tricharia* sp. S 94/L1  
 136. *Wirthiotrema glaucopallescens* (NYL.) RIVAS PLATA, KALB & FRISCH \* S 59/L4

Lichenicolous fungus: *Biatoropsis usnearum* s.l. RASÄNEN



## ACKNOWLEDGEMENT

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E. Stocker-Wörgötter collected the specimens listed in this paper, using a research and collection permit from the Seychelles Bureau of Standards, issued by Mr. Elvis Nicette (managed by Mrs Katy Beaver, Conservation Action Group) during a stay on the Seychelles Islands in February 2015.

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