Appendix 1.– Characters and character state definitions used in the morphology-based phylogenetic binning analysis, based on Lücking et al. (2005) and modified. All characters are binarily coded (abs = absent, pre = present). The numbers correspond to those used by Lücking et al. (2005) and in the present data matrix (see Appendix 3); added characters are marked with asterisks at their place of insertion.

**Lichenization**

1 Lichenization: 0 = pre / 1 = abs (lichenicolous)

**Substrate**

2 Anorganic: 0 = abs / 1 = pre

3 Organic: 0 = abs / 1 = pre

4 Leaves: 0 = abs / 1 = pre

5 Gomphillaceae: 0 = abs / 1 = pre

6 Pilocarpaceae: 0 = abs / 1 = pre

**Habitat and microsite**

7 In tropical climates: 0 = abs / 1 = pre

8 In tropical montane climates: 0 = abs / 1 = pre

9 In tropical alpine climates: 0 = abs / 1 = pre

10 In subtropical climates: 0 = abs / 1 = pre

11 In temperate climates: 0 = abs / 1 = pre

12 In sheltered microsites: 0 = abs / 1 = pre

13 In semi-exposed microsites: 0 = abs / 1 = pre

14 In fully exposed microsites: 0 = abs / 1 = pre

**Thallus shape and size**

15 Dispersed: 0 = abs / 1 = pre

16 Smaller than 1 mm: 0 = abs / 1 = pre

17 Larger than 3 mm: 0 = abs / 1 = pre

18 Convex elements: 0 = abs / 1 = pre

19 Bullate elements: 0 = abs / 1 = pre

**Thallus surface structure**

20 Small verrucae: 0 = abs / 1 = pre

21 Large verrucae: 0 = abs / 1 = pre

22 Radiate ridges: 0 = abs / 1 = pre

23 Areoles: 0 = abs / 1 = pre

24 Papillae: 0 = abs / 1 = pre

25 Thick white layer: 0 = abs / 1 = pre

**Thallus surface color**

26 Green: 0 = abs / 1 = pre

27 Grey: 0 = abs / 1 = pre

28 White: 0 = abs / 1 = pre

29 Yellow: 0 = abs / 1 = pre

30 Glossiness: 0 = abs / 1 = pre

31 Marginal zonation: 0 = abs / 1 = pre

**Prothallus**

32 Non-algiferous prothallus: 0 = abs / 1 = pre

33 White: 0 = abs / 1 = pre

34 Dark: 0 = abs / 1 = pre

**Thallus crystals**

35 Calcium oxalate: 0 = abs / 1 = pre

36 'furcata' type: 0 = abs / 1 = pre

37 'atrofusca' type: 0 = abs / 1 = pre

38 'papillifera' type: 0 = abs / 1 = pre

**Thallus cortex**

39 Corticiform layer: 0 = abs / 1 = pre

40 Cellular cortex: 0 = abs / 1 = pre

41 Cellular cortex: 0 = irregular arrangement / 1 = radiating cell rows

**Sterile setae occurrence**

42 Sterile setae: 0 = abs / 1 = pre

43 Sterile setae (always present): 0 = abs / 1 = pre

44 On thallus: 0 = abs / 1 = pre

45 Clustered around apothecia: 0 = abs / 1 = pre

46 On prothallus: 0 = abs / 1 = pre

**Sterile setae color**

47 Redbrown: 0 = abs / 1 = pre

48 Black: 0 = abs / 1 = pre

**Sterile setae structure and shape**

49 Stiffness: 0 = abs / 1 = pre

50 Calcium oxalate crystals: 0 = abs / 1 = pre

51 Longer than 0.5 mm: 0 = abs / 1 = pre

52 Longer than 1.0 mm: 0 = abs / 1 = pre

53 Lateral ramifications: 0 = abs / 1 = pre

54 Apical ramifications: 0 = abs / 1 = pre

**Sterile setae second type**

55 Sterile setae second type: 0 = abs / 1 = pre

**Sterile setae second type color**

56 Redbrown: 0 = abs / 1 = pre

57 Black color: 0 = abs / 1 = pre

**Sterile setae second type structure and shape**

58 Shorter than 0.5 mm: 0 = abs / 1 = pre

59 Longer than 1. mm: 0 = abs / 1 = pre

**Soralia occurrence**

60 Soralia: 0 = abs / 1 = pre

**Apothecia occurrence**

61 Apothecia: 0 = abs / 1 = pre

**Apothecia shape and size**

62 Basal stipe: 0 = abs / 1 = pre

63 Basal constriction: 0 = abs / 1 = pre

64 Strong horizontal growth: 0 = abs / 1 = pre

65 Strong vertical growth: 0 = abs / 1 = pre

66 Level with thallus surface: 0 = abs / 1 = pre

67 Immersion: 0 = abs / 1 = pre

68 Angular outline: 0 = abs / 1 = pre

69 Lobular outline: 0 = abs / 1 = pre

70 Lirelliform elongation: 0 = abs / 1 = pre

71 Aggregation: 0 = abs / 1 = pre

72 Apothecia > 0.3 mm: 0 = abs / 1 = pre

73 Apothecia > 0.8 mm: 0 = abs / 1 = pre

**Apothecia disc color**

74 White: 0 = abs / 1 = pre

75 Yellow: 0 = abs / 1 = pre

76 Red: 0 = abs / 1 = pre

77 Brown: 0 = abs / 1 = pre

78 Grey: 0 = abs / 1 = pre

79 Black: 0 = abs / 1 = pre

80 Green: 0 = abs / 1 = pre

81 Dark coloration: 0 = abs / 1 = pre

82 Translucence: 0 = abs / 1 = pre

**Apothecia disc structure and shape**

83 Convexity: 0 = abs / 1 = pre

84 Concavity: 0 = abs / 1 = pre

85 Pruina: 0 = abs / 1 = pre

86 Pruina dark pigment: 0 = abs / 1 = pre

**Apothecia thalline margin**

87 Non-algiferous thalline rim: 0 = abs / 1 = pre

88 Non-algiferous lobules: 0 = abs / 1 = pre

89 Algiferous margin: 0 = abs / 1 = pre

90 Algiferous margin: 0 = entire / 1 = lobulate

91 Slight prominence: 0 = abs / 1 = pre

92 Strong prominence: 0 = abs / 1 = pre

93 Carbonization: 0 = abs / 1 = pre

**Apothecia proper margin**

94 Thin in young apothecia: 0 = abs / 1 = pre

95 Thick in young apothecia: 0 = abs / 1 = pre

96 Thin in mature apothecia: 0 = abs / 1 = pre

97 Thick in mature apothecia: 0 = abs / 1 = pre

98 Prominence: 0 = abs / 1 = pre

99 Formation of teeth or lobes: 0 = abs / 1 = pre

100 Basal-lateral expansion: 0 = abs / 1 = pre

101 Color different from disc: 0 = abs / 1 = pre

102 Paler: 0 = abs / 1 = pre

103 Darker: 0 = abs / 1 = pre

104 Black: 0 = abs / 1 = pre

105 Pruina: 0 = abs / 1 = pre

106 Pruina dark pigment: 0 = abs / 1 = pre

**Excipulum**

107 Columella: 0 = abs / 1 = pre

108 Well-developed excipulum: 0 = abs / 1 = pre

109 Prosoplectenchymatous: 0 = abs / 1 = pre

110 Paraplectenchymatous: 0 = abs / 1 = pre

111 Slight pigmentation: 0 = abs / 1 = pre

112 Strong pigmentation: 0 = abs / 1 = pre

113 Fissure at thalline margin: 0 = abs / 1 = pre

**Hypothecium, epithecium and hymenium**

114 Well-developed hypothecium: 0 = abs / 1 = pre

115 Slight pigmentation: 0 = abs / 1 = pre

116 Strong pigmentation: 0 = abs / 1 = pre

117 Well-developed epithecium: 0 = abs / 1 = pre

118 Strong pigmentation: 0 = abs / 1 = pre

119 Epithecial algae: 0 = abs / 1 = pre

120 Paraphyses ramifications: 0 = abs / 1 = pre

121 Paraphyses anastomoses: 0 = abs / 1 = pre

122 Cylindrical asci: 0 = abs / 1 = pre

123 Ovoid asci: 0 = abs / 1 = pre

**Ascospores number**

124 Degeneration of 0: 0 = abs (8) / 1 = pre (1-8)

125 Degeneration of 2: 0 = abs (6-8) / 1 = pre (1-6)

126 Degeneration of 4: 0 = abs (4-6) / 1 = pre (2-4)

127 Degeneration of 6: 0 = abs (2-4) / 1 = pre (1-2)

128 Degeneration of 7: 0 = abs (1-2) / 1 = pre (1)

129 Polyspory: 0 = abs / 1 = pre

**Ascospores septation**

130 More than 1 transverse: 0 = abs / 1 = pre

131 More than 3 transverse: 0 = abs / 1 = pre

132 More than 7 transverse: 0 = abs / 1 = pre

133 More than 15 transverse: 0 = abs / 1 = pre

134 0–3 longitudinal: 0 = abs / 1 = pre (submur.)

135 3–7 longitudinal: 0 = abs / 1 = pre (muriform)

**Ascospores shape and size**

136 Vermiform: 0 = abs / 1 = pre

137 Filiform-acicular: 0 = abs / 1 = pre

138 Ovoid: 0 = abs / 1 = pre

139 Longer than 10 µm: 0 = abs / 1 = pre

140 Longer than 20 µm: 0 = abs / 1 = pre

141 Longer than 30 µm: 0 = abs / 1 = pre

142 Longer than 50 µm: 0 = abs / 1 = pre

143 Spiral distortion: 0 = abs / 1 = pre

144 Apical widening: 0 = abs / 1 = pre

145 Septa thickening: 0 = abs / 1 = pre

146 Wall thickening: 0 = abs / 1 = pre

**Hyphophores occurrence**

147 Hyphophores: 0 = abs / 1 = pre

148 Marginal on thallus: 0 = abs / 1 = pre

149 On prothallus: 0 = abs / 1 = pre

**Hyphophore type**

150 Setiform type: 0 = pre / 1 = abs

151 Squamiform type: 0 = abs / 1 = pre

152 'Thlasidioid' type: 0 = abs / 1 = pre

**Stipe size**

153 Longer than 1.0 mm: 0 = abs / 1 = pre

154 Shorter than 0.5 mm: 0 = abs / 1 = pre

155 Reduction: 0 = abs / 1 = pre

**Diahyphal bunch position**

156 Subapical: 0 = abs / 1 = pre

157 Capitate: 0 = abs / 1 = pre

**Setiform hyphophore apex shape**

158 Acute: 0 = abs / 1 = pre

159 Thickened: 0 = abs / 1 = pre

160 Widened: 0 = abs / 1 = pre

161 Lanceolate: 0 = abs / 1 = pre

162 Spatulate: 0 = abs / 1 = pre

163 Arrow-shaped: 0 = abs / 1 = pre

164 Mussle-shaped: 0 = abs / 1 = pre

165 Hand-shaped: 0 = abs / 1 = pre

166 Hooked: 0 = abs / 1 = pre

167 Coronate: 0 = abs / 1 = pre

168 Umbellate: 0 = abs / 1 = pre

169 Basal pigmentation: 0 = abs / 1 = pre

170 Apical pigmentation: 0 = abs / 1 = pre

171 Carbonization: 0 = abs / 1 = pre

172 Calcium oxalate crystals: 0 = abs / 1 = pre

173 Hairs or tomentum: 0 = abs / 1 = pre

**Squamiform hyphophore scale shape**

174 Scale: 0 = abs / 1 = pre

175 Division into subscales: 0 = abs / 1 = pre

176 Widened: 0 = abs / 1 = pre

177 Strongly widened: 0 = abs / 1 = pre

178 Narrowed: 0 = abs / 1 = pre

179 Division into setae: 0 = abs / 1 = pre

180 Campylidioid: 0 = abs / 1 = pre

181 Apex acute: 0 = abs / 1 = pre

182 Apex with horns: 0 = abs / 1 = pre

183 Apex dentate: 0 = abs / 1 = pre

184 Oblique orientation: 0 = abs / 1 = pre

185 Horizontal orientation: 0 = abs / 1 = pre

186 Translucity: 0 = abs / 1 = pre

187 Dark pigmentation: 0 = abs / 1 = pre

**Thlasidioid hyphophores shape and color**

188 Lateral expansion: 0 = abs / 1 = pre

189 Dark pigment: 0 = abs / 1 = pre

**Diahyphal mass shape**

190 Bell-shaped: 0 = abs / 1 = pre

191 Globose: 0 = abs / 1 = pre

192 Applanate: 0 = abs / 1 = pre

192 Disc-shaped: 0 = abs / 1 = pre

194 Division into subelements: 0 = abs / 1 = pre

195 Gelatinous matrix: 0 = pre / 1 = abs

196 Hyphal cord: 0 = abs / 1 = pre

**Diahyphae structure**

197 Constrictions (apical)- monili: 0 = abs / 1 = pre

198 Constrictions (throughout)- m: 0 = abs / 1 = pre

199 Bacillar segments: 0 = abs / 1 = pre

200 Thickened hyphae: 0 = abs / 1 = pre

201 Basal branching only - filif: 0 = abs / 1 = pre

202 Slight apical differentiation: 0 = abs / 1 = pre

203 Strong apical differentiation: 0 = abs / 1 = pre

204 Spermatozoid end segments: 0 = abs / 1 = pre

205 Branched end segments: 0 = abs / 1 = pre

206 Fusiform end segments: 0 = abs / 1 = pre

207 Flagelliform end segments: 0 = abs / 1 = pre

208 1–3-septate end segments: 0 = abs / 1 = pre

209 Multiseptate end segments: 0 = abs / 1 = pre

210 Constricted end segments: 0 = abs / 1 = pre

211 Flagelliform appendages: 0 = abs / 1 = pre

212 'lucernifera' type hyphae: 0 = abs / 1 = pre

213 Associated algal cells: 0 = abs / 1 = pre

**Pycnidia occurrence**

214 Pycnidia presence: 0 = abs / 1 = pre

215 Pycnidia position: 0 = laminal / 1 = marginal

**Pycnidia color and shape**

216 Pycnidia color: 0 = pale / 1 = carbonized (black)

217 Pycnidia beak: 0 = absent / 1 = present

218 Pycnidia shape: 0 = conical to wart-shaped / 1 = applanate

**Pycnidia conidia shape, septation and size**

219 Conidia shape: 0 = bacillar to elongate / 1 = filiform

220 Conidia septa: 0 = absent / 1 = present

221 Conidia length: 0 = up to 10 um / 1 = 10-20 um

222 Conidia length: 0 = up to 20 um / 1 = 20-30 um

223 Conidia length: 0 = up to 30 um / 1 = 30-50 um