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## A key to the identification of the genera of lichenized fungi occurring in Thailand

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**ABSTRACT**—A key to the identification of the 258 genera of lichenized fungi in Thailand is presented. Species names are provided for genera for which only a single species has been recorded for Thailand. Recent available keys that include all species known from Thailand are referenced. The replacement name *Ionaspis aptrootii* is proposed for *I. tropica* Aptroot (non Riddle).

**KEY WORDS**—biodiversity, lichens, Southeast Asia, tropics

### Introduction

The lichen flora of Thailand has recently received considerable interest resulting in more than a doubling of the known species in only 15 years between a first catalogue (Wolseley & al. 2002) and a recent checklist (Buaruang & al. 2017). Moreover, several treatments of genera or species groups of lichenized fungi in East Asia or focused on Thai species have been published (cited below in the key) improving our knowledge of species diversity. Recently, numerous phylogenetic studies have dramatically changed our understanding of the evolution of lichenized fungi, with numerous taxonomic changes at the generic rank which are summarized elsewhere (Jaklitsch & al. 2016, Lücking & al. 2016a, 2017). However, only few keys to the

genera of tropical lichens, especially crustose taxa, are available, providing an impediment to the training of students and making species-based treatments for scientists less accessible. For these reasons, we are providing a key to the identification of lichen genera in Thailand and notes on some genera and species previously cited in the checklist by Buaruang & al. (2017).

**Notes**

Some genera listed in the checklist for Thailand (Buaruang & al. 2017) have since been shown not to occur in the country and are not included in this key. These include: *Arctomia* Th. Fr.— the Thai species is now placed in *Gabura* (Magain & al. 2020); *Hemithecium* Trevis.—the Thai species are currently classified in *Graphis* (Kalb & al. 2018); *Maronina* Hafellner & R.W. Rogers—the Thai species are currently accepted in *Neoprotoparmelia* (Singh & al. 2018); and *Rostania* Trevis.—the single species recorded from Thailand is now placed in *Collema* (Kosuthova & al. 2019). *Cryptothelium sepultum* (Mont.) A. Massal. is now accepted as *Astrothelium sepultum* Mont. (Lücking & al. 2016c); and *Spilonema* Bornet does not occur in Thailand (Spribille & al. 2014), where the Thai species is now classified in *Erinacellus*. Furthermore, *Arthonia ochrodes* Nyl. ex Willey has been referred to the lichenicolous fungus *Synarthonia* Müll. Arg. However, the Thai material does not agree with the type from Cuba and requires further study (van den Broeck & al. 2018). *Blastenia* A. Massal. is not keyed out, since its presence in Thailand is doubtful, and *B. testaceorufa* (Vain.) Zahlbr. does not belong to the genus as currently circumscribed (Arup & al. 2013). “*Lobariella isidiosa* Moncada & Lücking” was listed in the checklist by error—the material belongs to *Lobaria isidiosa* (Müll. Arg.) Vain., not *Lobariella isidiata* Moncada & Lücking; the genus *Lobariella* Yoshim. does not occur in Thailand. The genus *Sulzbacheromyces*, which has been recorded from Thailand since the publication of the checklist (Suwannarach & al. 2019), is included in this key.

**Key to the genera of Thai lichenized fungi**

- 1. Thallus foliose, fruticose, dimorphic or squamulose . . . . . 2
- 1. Thallus crustose, leprose, byssoid or filamentous . . . . . 93
- 2. Thallus foliose or squamulose . . . . . 3
- 2. Thallus fruticose or dimorphic . . . . . 79
- 3. Thallus gelatinous, with cyanobacteria, homoiomerous . . . . . 4
- 3. Thallus not gelatinous, with green algae or cyanobacteria, heteromerous . . . . . 7

4. Thallus corticate,  
 ascospores transversely septate to muriform . . . . . *Leptogium* (Ach.) Gray
4. Thallus ecorticate, ascospores simple or transversely septate to muriform . . . . . 5
5. Ascospores simple, thallus leathery, adnate, ≤10 cm wide . . . . . *Physma* A. Massal.
5. Ascospores transversely septate to muriform,  
 thallus tightly or loosely adnate to ±cushion-forming . . . . . 6
6. Thallus foliose, lobes >3 mm wide, not squamulose or subcrustose,  
 ascospores narrowly ellipsoidal to fusiform,  
 transversely septate or muriform . . . . . *Collema* Weber ex F.H. Wigg.
6. Thallus smaller, when foliose then lobes <3 mm wide, squamulose, shrubby or  
 crustose, ascospores transversely septate, thin-walled . . . . . *Gabura* Adans.  
 NOTE: One species known from Thailand: *G. fascicularis* (L.) P.M. Jørg.
7. Thallus squamulose . . . . . 8
7. Thallus foliose . . . . . 24
8. Ascomata perithecia, located between squamules,  
 ascospores muriform . . . . . *Agonimia* Zahlbr.  
 NOTE: Recent key to the genus available (Breuss 2020).
8. Ascomata an apothecium or thallus sterile . . . . . 9
9. Apothecia immersed . . . . . 10
9. Apothecia sessile to raised, or thallus sterile . . . . . 11
10. Asci polyspored, ascospores simple,  
 thallus containing cyanobacteria . . . . . *Peltula* Nyl.
10. Asci 8-spored, ascospores 1-septate,  
 thallus containing green algae . . . . . *Rolfidium* Moberg  
 NOTE: One species known from Thailand: *R. coccocarpioides* (Nyl.) Tindal
11. Photobiont a cyanobacterium, apothecia with a thalline margin . . . . . 12
11. Photobiont a green alga, apothecia lacking a thalline margin or sterile . . . . . 14
12. Thallus on a distinct blackish hypothallus . . . . . *Lepidocollema* Vain.
12. Thallus lacking a distinct hypothallus, often with lichen substances . . . . . 13
13. Thalline margin of apothecia excluded when mature,  
 asci with amyloid apical structures,  
 hymenium I+ red-brown . . . . . *Fuscopannaria* P.M. Jørg.  
 NOTE: One species known from Thailand: *F. siamensis* P.M. Jørg. & Wolseley
13. Thalline margin of apothecia prominent and persisting when mature,  
 asci without amyloid apical structures,  
 hymenium I+ dark blue . . . . . *Pannaria* Delise ex Bory  
 NOTE: One species known from Thailand: *P. dispartita* (Nyl.) Vain.
14. Thallus consisting of small ear-like squamules, with raised margins,  
 bluish grey . . . . . *Normandina* Nyl.  
 NOTE: One species known from Thailand: *N. pulchella* (Borrer) Nyl.
14. Thallus different . . . . . 15

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NOTE: One species known from Thailand: <i>H. crustosa</i> Aptroot	
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17. Thallus sterile and usually growing on soil or rocks . . . . .	18
17. Thallus with sessile or stalked apothecia lacking a thalline margin, growing on bark or rocks. . . . .	19
18. Lobes thick, greenish to greenish gray, usually >1 mm wide primary squamules of <i>Cladonia</i> spp.	
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NOTE: One species known from Thailand: <i>F. papillata</i> O.E. Erikss.	
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NOTE: One species known from Thailand: <i>G. coccocarpum</i> Nyl.	
19. Thallus with sessile, biatorine apothecia . . . . .	20
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20. Corticolous, ascospores 1-septate. . . . .	<i>Eschatogonia</i> Trevis.
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21. Apothecia biatorine. . . . .	22
22. Ascospores transversely septate, with up to 17 septa . . . . .	<i>Bacidiopsora</i> Kalb
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NOTE: Recent key to Asian species available (Kistenich & al. 2019).	
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24. Lower surface of thallus lacking cyphellae and pseudocyphellae. . . . .	29
25. Medulla yellow, lower surface with yellow pseudocyphellae with green algal photobiont. . . . .	<i>Crocodia</i> Link
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28. Lower surface of thallus with distinct cyphellae, thallus lacking secondary metabolites . . . . . *Sticta* (Schreb.) Ach.
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NOTE: One species known from Thailand: *M. terebrata* (Hoffm.) A. Massal.
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32. Thallus containing green algae as primary photobiont, cyanobacteria absent or present as secondary photobiont in cephalodia. . . . . 38
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34. Upper surface of thallus different . . . . . 36
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NOTE: One species known from Thailand: *L. solediatum* D.J. Galloway & P.M. Jørg.
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40. Thallus closely appressed to the substrate by the lower cortex or inconspicuous rhizines . . . . . 41

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NOTE: Recent key to Thai species is available (Mongkolsuk & al. 2012).

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42. Thallus with marginal cilia, upper surface finely maculate . . . . . *Parmotrema* A. Massal.

42. Thallus lacking marginal cilia, pseudocyphellae punctiform . . . . . *Cetrelia* W.L. Culb. & C.F. Culb.

43. Thallus with bulbate marginal cilia . . . . . 44

43. Thallus lacking bulbate cilia . . . . . 45

44. Thallus yellowish green, containing usnic acid . . . . . *Relicina* (Hale & Kurok.) Hale

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45. Thallus of different colors, containing a trebouxioid or non-trebouxioid photobiont, lacking cephalodia . . . . . 47

46. Thallus small-foliose, apothecia with thick thalline margin, ascospores simple, thick-walled with an epispore . . . . . *Gibbosporina* Elvebakk & al.  
NOTE: One species known from Thailand: *G. boninensis* (Kurok.) Elvebakk & P.M. Jørg.

46. Thallus larger, ascospores transversely septate, thin-walled . . . . . *Lobaria* (Schreb.) Hoffm.

47. Thallus containing a non-trebouxioid photobiont, lobes broad, lower surface whitish gray . . . . . *Ricasolia* De Not.  
NOTE: One species known from Thailand: *R. discolor* (Bory) Nyl.

47. Thallus containing a trebouxioid photobiont, lobes and lower surface variable . . . . . 48

48. Upper surface of thallus yellow-green to greenish yellow, containing usnic acid, apothecia with a thalline margin . . . . . 49

48. Upper surface of thallus whitish, gray, olive-green or brown to blackish brown, lacking usnic acid, apothecia with or without thalline margin . . . . . 54

49. Thallus with truncated lobe apices, rhizines squarrosely to dichotomously branched . . . . . *Hypotrachyna* (Vain.) Hale

49. Thallus with rounded or incised lobe apices, rhizines usually simple . . . . . 50

50. Thallus lobes broad, usually >2 mm wide .....51  
 50. Thallus lobes narrower, <2 mm wide .....52
51. Lobes apically rounded, on bark or rocks, loosely adnate,  
 Thai species sorediate ..... *Flavoparmelia* Hale  
 NOTE: One species known from Thailand: *F. caperata* (L.) Hale
51. Lobes  $\pm$ apically incised, on rocks,  
 Thai species not sorediate ..... *Xanthoparmelia* (Vain.) Hale
52. Thallus growing on rock. .... *Xanthoparmelia* (Vain.) Hale
52. Thallus growing on bark or wood. ....53
53. Thallus adnate, lobes sublinear, 0.5–1.5 mm wide, sorediate,  
 at high altitudes ..... *Parmeliopsis* (Nyl.) Nyl.  
 NOTE: One species known from Thailand: *P. ambigua* (Hofm.) Nyl.
53. Thallus adnate, lobes irregular to linear-elongate, contiguous in the center,  
 0.5–2 (–3) mm wide ..... *Relicina* (Hale & Kurok.) Hale
54. Thallus with broad lobes, >5 mm wide .....55
54. Thallus with narrower lobes, <5 mm wide .....57
55. Thallus with cilia in lobe axils, cilia c. 0.5 mm long. .... *Parmelinella* Elix & Hale
55. Thallus eciliate or with longer cilia (0.5–6 mm long). ....56
56. Thallus with a broad erhizinate margin, ciliate or eciliate,  
 chemistry variable. .... *Parmotrema* A. Massal.
56. Thallus erhizinate or with very few scattered rhizines, eciliate,  
 medulla containing fatty acids ..... *Platismatia* W.L. Culb. & C.F. Culb.  
 NOTE: One species known from Thailand: *P. erosa* W.L. Culb. & C.F. Culb.
57. Thallus with cilia at margins (or marginal rhizines that resemble cilia) .....58
57. Thallus eciliate. ....66
58. Medulla at least partly yellow to orange or orange-red .....59
58. Medulla white .....60
59. Thallus lobes narrow, usually less than 1 mm wide, dark gray to brownish gray,  
 lacking atranorin. .... *Phaeophyscia* Moberg
59. Thallus lobes 2–4 mm wide, whitish gray,  
 containing atranorin ..... *Myelochroa* (Asahina) Elix & Hale
60. Thallus lacking a lower cortex .....61
60. Thallus with a lower cortex .....62
61. Thallus with linear-elongate, often ribbon-like, dichotomously branched lobes,  
 loosely attached to the substrate. .... *Leucodermia* Kalb  
 NOTE: Recent key to Thai species is available (Mongkolsuk & al. 2015).
61. Thallus with suborbicular lobes, attached to the substrate .... *Polyblastidium* Kalb  
 NOTE: Recent key to Thai species is available (Mongkolsuk & al. 2015).

62. Thallus dark gray to brownish gray, lacking atranorin .....63

62. Thallus lighter, often whitish gray, containing atranorin.....64

63. Lower cortex of thallus prosoplectenchymatous,  
 lower surface white .....*Physciella* Essl.  
 NOTE: One species known from Thailand: *P. chloantha* (Ach.) Essl.

63. Lower cortex of thallus paraplectenchymatous,  
 lower surface usually dark.....*Phaeophyscia* Moberg

64. Thallus lobes short, richly dichotomously branched, lower surface black,  
 with short, richly dichotomously branched rhizines,  
 ascospores hyaline, non-septate .....*Remototrachyna* Divakar & A. Crespo

64. Thallus lobes either suborbicular or orbicular to spreading irregularly,  
 lower surface pale or brown, with different rhizines,  
 ascospores brown, 1-septate .....65

65. Upper cortex of thallus consisting of periclinal hyphae ..... *Heterodermia* Trevis.  
 NOTE: Recent key to Thai species is available (Mongkolsuk & al. 2015).

65. Upper cortex of thallus paraplectenchymatous. .... *Physcia* (Schreb.) Michx.

66. Thallus subfoliose-peltate, monophyllous, on siliceous rocks ... *Rolfidium* Moberg  
 NOTE: One species known from Thailand: *R. coccocarpioides* (Nyl.) Timdal

66. Thallus foliose, variable, on various substrates .....67

67. Thallus closely appressed to the substrate  
 by the lower cortex or inconspicuous rhizines .....68

67. Thallus not as closely attached to the substrate.....70

68. Thallus very small, tightly adhered to the substrate, lacking atranorin,  
 gray-green to dark brown ..... *Hyperphyscia* Müll. Arg.

68. Thallus larger, containing atranorin, lighter, usually whitish gray.....69

69. Thallus lobes not fusing laterally, often glossy ..... *Pyxine* Fr.  
 NOTE: Recent key to Thai species is available (Mongkolsuk & al. 2012).

69. Thallus lobes often fusing laterally, matt, often pruinose ... *Dirinaria* (Tuck.) Clem.

70. Thallus dark brown to green-brown, lacking atranorin.....71

70. Thallus lighter, mostly whitish gray to greenish gray, with or without atranorin ..72

71. Thallus small, on various substrates,  
 ascospores brown, 1-septate.....*Phaeophyscia* Moberg

71. Thallus larger, saxicolous,  
 ascospores hyaline, non-septate .....*Xanthoparmelia* (Vain.) Hale

72. Thallus lacking a lower cortex..... *Polyblastidium* Kalb  
 NOTE: Recent key to Thai species is available (Mongkolsuk & al. 2015).

72. Thallus with a lower cortex .....73

73. Upper cortex of thallus consisting of periclinal hyphae ..... *Heterodermia* Trevis.  
 NOTE: Recent key to Thai species is available (Mongkolsuk & al. 2015).

73. Upper cortex of thallus not consisting of periclinal hyphae, mostly  
 paraplectenchymatous .....74



74. Rhizines dichotomously branched .....75
74. Rhizines usually simple or squarrosely branched. ....76
75. Thallus lobes broad, irregular, rotund,  
irregularly branched ..... *Remototrachyna* Divakar & A. Crespo
75. Thallus lobes narrow, sublinear to linear-elongate, truncate,  
more or less dichotomously branched. .... *Hypotrachyna* (Vain.) Hale
76. Margin of thallus lower surface lacking rhizines at margins, lower surface  
black, ascospores hyaline, non-septate ..... *Canoparmelia* Elix & Hale
76. Lower surface of thallus lobes rhizinate to margins,  
lower surface pale, ascospores various. ....77
77. Lichen growing on dead wood at high altitudes, ascospores hyaline, non-  
septate. .... *Imshaugia* S.L.F. Mey.  
NOTE: One species known from Thailand: *I. placorodia* (Ach.) S.L.F. Mey.
77. Lichen growing on bark or rocks at different altitudes, ascospores brown,  
1-septate. ....78
78. Thallus foliose, appressed but loosely adnate, irregularly concave, rounded,  
upper surface bluish gray, pruinose, on rocks ..... *Culbersonia* Essl.  
NOTE: One species known from Thailand: *C. nubila* (Moberg) Essl.
78. Thallus foliose, suborbicular, radially lobate,  
on various substrates. .... *Physcia* (Schreb.) Michx.
79. Thallus yellow to orange, K+ red-purple,  
shrubby, sorediate. .... *Teloschistes* Norman  
NOTE: One species known from Thailand: *T. flavicans* (Sw.) Norman
79. Thallus not yellow or orange, not K+ red-purple .....80
80. Lichen forming clavarioid basidiomata, vegetative thallus crustose,  
undifferentiated. .... *Sulzbacheromyces* B.P. Hodk. & Lücking  
NOTE: One species known from Thailand: *S. yunnanensis* D. Liu & al. (Suwannarach  
& al. 2019).
80. Lichen forming ascomata or sterile .....81
81. Lichen consisting of a basal crustose or squamulose primary thallus and an erect  
secondary thallus .....82
81. Lichen uniformly fruticose, lacking a primary thallus .....83
82. Erect secondary thallus (podetia) hollow, lichenized, apothecia brown,  
yellow or red, primary thallus squamulose to ±foliose ..... *Cladonia* P. Browne
82. Erect part solid, not lichenized, apothecia pink to flesh-colored,  
primary thallus crustose ..... *Dibaeis* Clem.
83. Thallus containing a cyanobacterium as primary photobiont,  
blue-gray to dark brown .....84
83. Thallus containing a green algal primary photobiont, colors vary. ....86

- 84. Lichenized with the cyanobacterial genus *Hyphomorpha*  
 (trichomes with branches), thallus erect, with thread-like branches,  
 fungal hyphae enclosing photobiont in continuous sheath, the sheathing  
 fungal cells rectangular, no ascomata known . . . . . *Erinacellus* T. Sprib. & al.  
 NOTE: One species known from Thailand: *E. schmidtii* (Vain.) T. Sprib. & al.
- 84. Lichenized with the cyanobacterial genera *Nostoc* or *Scytonema*,  
 thallus shrub-like, richly branched, attached to substrate by a  
 basal holdfast, cortex well developed, apothecia biatorine, mostly lateral,  
 disc pale to dark brown, ascospores simple or 1-septate. . . . . 85
- 85. Lichenized with the cyanobacterial genus *Nostoc*,  
 occurrence in Thailand doubtful . . . . . *Polychidium* (Ach.) Gray
- 85. Lichenized with the cyanobacterial genus *Scytonema* . . . . . *Leptogidium* Nyl.  
 NOTE: One species known from Thailand: *L. dendricum* (Nyl.) Nyl. (Muggia & al.  
 2011)
- 86. Thallus leprose-sorediate, ecorticate, grayish white,  
 ascomata absent . . . . . *Lepraria* Ach.
- 86. Thallus not leprose-sorediate, corticate or ecorticate, colors variable . . . . . 87
- 87. Thallus hollow . . . . . 88
- 87. Thallus solid or filamentous, or tufted and rather delicate . . . . . 90
- 88. Thallus chalky white, not branched or sparingly branched, erect or decumbent, on  
 soil at high altitudes . . . . . *Thamnolia* Ach. ex Schaer.  
 NOTE: One species known from Thailand: *T. vermicularis* (Sw.) Schaer.
- 88. Thallus not chalky white, slightly to richly branched. . . . . 89
- 89. Thallus surface smooth, corticate, often glossy. . . . . *Cladia* Nyl.  
 NOTE: One species known from Thailand: *C. aggregata* (Sw.) Nyl.
- 89. Thallus surface rough, ecorticate . . . . . *Cladonia* P. Browne
- 90. Thallus filamentous, small, consisting of algal filaments of  
*Trentepohlia* surrounded by fungal hyphae,  
 ascospores 1-septate, hyaline . . . . . *Coenogonium* Ehrenb.  
 NOTE: Recent key to Thai species available (Kalb & al. 2016a).
- 90. Thallus fruticose, usually larger, corticate, ascospores variable . . . . . 91
- 91. Thallus terete with a cartilaginous axis, thallus pale green to green, or slightly  
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NOTE: One species known from Thailand: *P. nigropulvinata* Aptroot
163. Apothecial margin ragged, paraphyses branched, hypothecium hyaline,  
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172. Paraphyses simple . . . . . *Gyalidea* Lettau ex Vězda  
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176. Apothecia lecanorine or immersed in verrucae . . . . . 177
176. Apothecia biatorine or lecideine. . . . . 179
177. Apothecia lecanorine, discs red, K+ red,  
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177. Apothecia immersed in verrucae, discs not pigmented . . . . . 178
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 NOTE: One species known from Thailand: *L. lecanoriformis* Lumbsch & al.
179. Exciple poorly developed, consisting of paraphysis-like hyphae,  
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 NOTE: One species known from Thailand: *S. umbrinum* (Ach.) Lojka
179. Exciple well developed, ascospores and asci variable. . . . . 182
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180. Thallus lacking stalked soralia. . . . . 181
181. Asci of *Catillaria*-type, hypothecium dark,  
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181. Asci of *Bacidia*-type, hypothecium hyaline to pigmented,  
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182. Mazaedium present, asci prototunicate, ascospores brown . . . . . 183
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183. Ascospores 2-septate to submuriform . . . . . 184
183. Ascospores 1-septate . . . . . 186
184. Ascospores 2-septate, secondary metabolites lacking . . . . . *Heterocyphelium* Vain.  
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184. Ascospores 3-septate to submuriform . . . . . 185
185. Ascospores 3-septate . . . . . *Pyrgillus* Nyl.  
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185. Ascospores submuriform, containing norstictic acid . . . . . *Schistophoron* Stirt.  
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186. Exciple edge with a pale corona ..... *Nadvornikia* Tibell  
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189. Paraphyses simple, hymenium amyloid or not, asci cylindrical, unitunicate,  
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189. Paraphyses more or less branched and often anastomosing, rarely simple,  
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190. Ascospores thin-walled, non-septate or septate  
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190. Ascospores mostly thick-walled, transversely septate or muriform,  
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191. Ascospores non-septate, apothecia immersed in the thallus ..... *Ionaspis* Th. Fr.  
 NOTE: One species known from Thailand: *Ionaspis aptrootii* Poengs. & Lumbsch,  
**nom. nov.**, MB 835127; = *Ionaspis tropica* Aptroot, Biblioth. Lichenol. 64: 73. 1997,  
 nom. illeg., non *Ionaspis tropica* Riddle (Britton & Millspaugh 1920).
191. Ascospores transversely septate to muriform ..... 192
192. Proper exciple and hypothecium carbonaceous,  
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 NOTE: Recent key to species available (Staiger 2002).
192. Proper exciple and hypothecium not carbonaceous,  
 epihymenium not brown-granular ..... 193
193. Disc of mature apothecia plane and adnate,  
 or plane to convex and apothecia sessile ..... 194
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292. Ascospores very large, 3(–5)-septate, with a reduced endospore. . . . .	<i>Architrypethelium</i> Aptroot
NOTE: One species known from Thailand: <i>A. murisporum</i> Luangsuph. & al.	
292. Ascospores usually small to medium-sized. . . . .	293
293. Ascomata prominent to sessile, fully exposed and black, solitary, lacking pigments. . . . .	<i>Nigrothelium</i> Lücking & al.
NOTE: One species known from Thailand: <i>N. tropicum</i> (Ach.) Lücking & al.	

293. Ascomata immersed to prominent or in immersed to sessile stromata,  
at least partly covered by thallus,  
often with yellow-orange pigment . . . . . *Astrothelium* Eschw.
294. Ascomata in prominent stromata  
filled with yellow-orange pigments . . . . . *Bathelium* Ach.  
NOTE: Recent key to species available (Aptroot & Lücking 2016).
294. Ascomata immersed to sessile or in immersed to sessile stromata, at least partly  
covered by thallus, with or without pigments. . . . . 295
295. Ascomata in large, prominent to sessile stromata,  
red or yellow-orange warts . . . . . *Marcelaria* Aptroot & al.  
NOTE: Recent key to species available (Aptroot & Lücking 2016).
295. Ascomata immersed to prominent or in immersed to sessile stromata,  
lacking pigments or with a thin pigment layer  
. . . . . *Astrothelium* Eschw. & *Viridothelium* Lücking & al.  
NOTE: Recent key to species available (Aptroot & Lücking 2016).
296. Ascomata not well defined, asci weakly aggregated in clusters or  
scattered, broadly clavate, ascospores muriform . . . . . *Cryptothecia* Stirt.
296. Ascomata well defined, either apothecia or perithecia . . . . . 297
297. Ascomata with open discs (apothecia). . . . . 298
297. Ascomata opening with a small pore (perithecia) . . . . . 329
298. Apothecia lirellate . . . . . 299
298. Apothecia orbicular . . . . . 303
299. Apothecial margin carbonized, lacking algae . . . . . 300
299. Apothecial margin not carbonized, containing algae . . . . . 301
300. Photobiont trentepohlioid, asci bitunicate . . . . . *Opegrapha* Ach.
300. Photobiont chlorococcoid, asci unitunicate . . . . . *Aulaxina* Fée  
NOTE: Recent key to species available (Lücking 2008).
301. Ascospores muriform. . . . . *Gyalectidium* Müll. Arg.
301. Ascospores transversely septate . . . . . 302
302. Apothecial margin well-developed, ascospores 3–15-septate. . . . . *Enterographa* Fée  
NOTE: Recent key to species available (Seavey & Seavey 2014).
302. Apothecial margin reduced, ascospores 1–2-septate . . . . . *Arthonia* Ach.
303. Photobiont trentepohlioid . . . . . 304
303. Photobiont chlorococcoid . . . . . 307
304. Ascomata adnate and spot-like,  
asci obovate to globose, bitunicate . . . . . *Eremothecella* Syd. & P. Syd.  
NOTE: Recent key to species available (Jagadeśh Ram & Sinha 2019).
304. Ascomata immersed to erumpent or sessile,  
asci cylindrical to clavate, uni- or bitunicate. . . . . 305

305. Apothecial discs dark gray to black, asci bitunicate,  
paraphyses anastomosing . . . . . *Mazosia* A. Massal.  
NOTE: Recent key to species available (Lücking 2008).

305. Apothecial discs yellowish green, light gray or orange-red, asci unitunicate,  
paraphyses not anastomosing . . . . . 306

306. Apothecial margins recurved, prominent,  
ascospores transversely septate to muriform . *Chroodiscus* (Müll. Arg.) Müll. Arg.  
NOTE: Recent key to species available (Papong & al. 2009).

306. Apothecia biatorine, margins not recurved,  
ascospores 1-septate . . . . . *Coenogonium* Ehrenb.  
NOTE: Recent key to Thai species available (Kalb & al. 2016a).

307. Hymenium non-amyloid . . . . . 308

307. Hymenium amyloid . . . . . 318

308. Thallus corticate . . . . . 309

308. Thallus ecorticate . . . . . 310

309. Apothecia pale yellowish, exciple hyaline . . . . . *Asterothyrium* Müll. Arg.  
NOTE: Recent key to species available (Lücking 2008).

309. Apothecia black, exciple at least partly carbonized . . . . . *Psorotheciopsis* Rehm  
NOTE: One species known from Thailand: *P. patellarioides* (Rehm) R. Sant.

310. Sterile setae present . . . . . 311

310. Sterile setae absent but hyphophores often present . . . . . 312

311. Sterile setae pale . . . . . *Aderkomyces* Bat.

311. Sterile setae black . . . . . *Tricharia* Fée

312. Apothecial margin dark brown to black, exciple carbonized . . . . . *Aulaxina* Fée  
NOTE: Recent key to species available (Lücking 2008).

312. Apothecial margin pale, exciple not carbonized. . . . . 313

313. Proper exciple well-developed, covered by a cartilaginous layer . . . . . 314

313. Proper exciple reduced, with a thalline margin or immersed in thallus. . . . . 315

314. Paraphyses unbranched, hyphophores absent . . *Phyllogyalidea* Lücking & Aptroot  
NOTE: One species known from Thailand: *P. epiphylla* (Vězda) Lücking & Aptroot

314. Paraphyses branched, hyphophores common. . . . . *Gyalideopsis* Vězda  
NOTE: Recent key to species available (Xavier-Leite & al. 2018).

315. Hyphophores squamiform, ascospores muriform . . . . . *Gyalectidium* Müll. Arg.

315. Hyphophores setiform . . . . . 316

316. Apothecia adnate. . . . . *Echinoplaca* Fée  
NOTE: Recent key to species available (Lücking 2008).

316. Apothecia immersed-erumpent . . . . . 317

317. Hyphophores pale,  
ascospores transversely septate to muriform . . . . . *Calenia* Müll. Arg.
317. Hyphophores reddish brown,  
ascospores 1–3-septate . . . . . *Rolueckia* Papong & al.  
NOTE: One species known from Thailand: *R. siamensis* Papong & al.
318. Ascospores 1-septate . . . . . *Fellhanera* Vězda
318. Ascospores with more than 1 septum . . . . . 319
319. Ascospores transversely septate . . . . . 320
319. Ascospores muriform . . . . . 328
320. Ascospores narrowly cylindrical to filiform . . . . . *Bacidina* Vězda  
NOTE: One species known from Thailand: *B. pallidocarnea* (Müll. Arg.) Vězda
320. Ascospores ellipsoid to cylindrical . . . . . 321
321. Apothecial margin composed of loosely interwoven hyphae . . . . . *Byssoloma* Trevis.
321. Apothecial margin different . . . . . 322
322. Exciple with crystals . . . . . 323
322. Exciple lacking crystals . . . . . 325
323. Conidia produced in campylidia . . . . . *Badimia* Vězda  
NOTE: One species known from Thailand: *B. multiseptata* Papong & Lücking
323. Conidia produced in pycnidia . . . . . 324
324. Apothecial margin distinct, whitish, conidia ellipsoid-  
fusiform . . . . . *Eugeniella* Lücking & al.  
NOTE: One species known from Thailand: *E. micrommata* (Kremp.) Lücking & al.
324. Apothecial margin thin, gray, conidia pyriform . . . . . *Fellhanera* Vězda
325. Conidia produced in pycnidia . . . . . 326
325. Conidia produced in campylidia . . . . . 327
326. Apothecia sessile . . . . . *Fellhanera* Vězda
326. Apothecia adnate and spot-like . . . . . *Byssolecania* Vain.  
NOTE: Recent key to species available (Lücking 2008).
327. Apothecial discs black, hypothecium brown, K+ purple . . . . . *Tapellaria* Müll. Arg.  
NOTE: One species known from Thailand: *T. nigrata* (Müll. Arg.) R. Sant.
327. Apothecial discs grayish brown, hypothecium brown, K- . . . . . *Calopadia* Vězda  
NOTE: Recent key to species available (Lücking 2008).
328. Thallus verrucose, conidia non-septate . . . . . *Sporopodium* Mont.
328. Thallus smooth, conidia multi-septate . . . . . *Lasioloma* R. Sant.  
NOTE: One species known from Thailand: *L. phycophilum* (Vain.) R. Sant.
329. Asci unitunicate . . . . . 330
329. Asci bitunicate . . . . . 332
330. Perithecia white to pale pink, photobiont trebouxiod . . . . . *Aspidothelium* Vain.
330. Perithecia yellowish to green, brown or black, photobiont trentepohlioid . . . . . 331

331. Perithecia glabrous or, if hairy, then involucrellum yellowish to brown *Porina* Ach.  
 331. Perithecia with black hairs or spines, involucrellum mostly pigmented ..... *Trichothelium* Müll. Arg.  
 332. Paraphyses absent in perithecia ..... *Microtheliopsis* Müll. Arg.  
 NOTE: One species known from Thailand: *M. uleana* Müll. Arg.  
 332. Paraphyses present in perithecia. .... 333  
 333. Paraphyses unbranched or slightly branched apically, photobiont *Cephaleuros* or *Phycopeltis*. .... 334  
 333. Paraphyses branched, photobiont various. .... 337  
 334. Perithecial wall not carbonized. .... *Puigariella* Speg.  
 NOTE: One species known from Thailand: *P. nemathora* (Mont.) S.H. Jiang & al.  
 334. Perithecial wall at least partially carbonized. .... 335  
 335. Thallus supracuticular, photobiont *Phycopeltis*. .... *Phylloporis* Clem.  
 NOTE: Recent key to species available (Jiang & al. 2020).  
 335. Thallus subcuticular, photobiont *Cephaleuros* or *Trentepohlia*. .... 336  
 336. Thallus olive-brown to dark green, perithecia covered by thin thallus layer around ostiolum. .... *Racoplaca* Fée  
 NOTE: Recent key to species available (Jiang & al. 2020).  
 336. Thallus bright green to grey-green, perithecia black, not covered by thallus ..... *Strigula* Fr.  
 337. Pycnidia setose, conidia in rectangular packages. .... *Caprettia* Bat. & H. Maia  
 337. Pycnidia globose to conical, conidia in irregular masses ..... *Anisomeridium* (Müll. Arg.) M. Choisy

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