HETERODERMIA

John A. Elix[1]

Heterodermia Trevis., *Atti Soc. Ital. Sci. Nat.* 11: 613 (1868) *emend.* J.Poelt, *Nova Hedwigia* 9: 31 (1965)

From the Greek *heteros* (other, different) and *derma* (a skin or hide), in reference to the presence or absence of a lower cortex.

Type: *H. speciosa* (Wulfen) Trevis.

Thallus usually foliose, occasionally subfruticose, continuous, lobate, irregular or forming rosettes 2–10 cm wide, these occasionally combining to form extensive radiating mats or tangled clumps. Lobes discrete or contiguous, closely adnate and appressed to ascending and loosely attached, linear or linear-cuneate to spathulate, ±dichotomously to irregularly branched, often ciliate; cilia simple or densely branched. Upper surface whitish, grey to yellow-grey, plane to convex, or concave towards the periphery, dull or glossy, with or without isidia, soredia, phyllidia and lobules; pseudocyphellae absent; cortex prosoplectenchymatous, formed of longitudinally arranged hyphae. Hypothallus absent. Photobiont forming a continuous layer. Medulla well defined, white or partly yellow or shades of orange or brown. Lower surface with or without a cortex, white to whitish grey, or darkening to purple-grey or grey-black, ±yellow, orange or brownish in part; cortex, when present, prosoplectenchymatous. Rhizines white to black, simple to densely branched, occasionally long, marginal or extending beyond the lobe margins, rarely absent. Ascomata apothecia, lecanorine, laminal, rounded, sessile to stipitate; disc pale to dark brown or black, concave to ±plane, pruinose or not; thalline exciple prominent or reflexed, distinct and persistent. Epihymenium pale brown to brown-black; hymenium colourless, I+ blue; hypothecium usually colourless, rarely pale yellowish. Paraphyses branched; apical cells brown and expanded. Asci cylindrical to subclavate or clavate, *Lecanora*-type, with 8 ascospores; apex wall layers thickened; apex amyloid, with a distinct axial mass. Ascospores *Physcia*-, *Pachysporaria*- or *Polyblastidia*-type (with 1 or more sporoblastidia), grey-brown to brown or dark brown, ellipsoidal to oblong or fusiform, 1-septate, ±constricted at the septum, very thick-walled; internal apical wall thickenings becoming distinct only after the septum is formed (type-A ontogeny); torus thin or absent; spore surface smooth. Conidiomata immersed in the thallus or becoming emergent; conidiogenous cells in branched chains, short, cylindrical, enteroblastic. Conidia bacilliform to short-cylindrical.

Heterodermia, a cosmopolitan genus of c. 100 species, is most diverse in warm-temperate to subtropical and tropical regions, with most occurring in the Southern Hemisphere. Forty-two taxa are known from Australia where they grow on rocks, trees, shrubs, decorticated wood and, very rarely, on soil. It is distinguished from all other foliose genera in the Australian Physciaceae mainly by its prosoplectenchymatous upper cortex in combination with atranorin as a cortical substance.

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Key

1 Lower cortex present 2
1: Lower cortex absent 16

2 Thallus isidiate, lobulate or phyllidiate 3
2: Thallus lacking isidia, lobules and phyllidia 9

3 Isidia and phyllidia present; dissectic acid present 4
3: Isidia, lobules or phyllidia present; dissectic acid absent 5

4 Medulla K+ yellow then red; norstictic acid present ..... **12. H. dissecta**
4: Medulla K+ yellow; norstictic acid absent ..... **20. H. koyana**

5 Isidia present; lobules and phyllidia absent 6
5: Isidia absent; lobules and phyllidia present 8

6 Isidia marginal; medulla K+ yellow then red; norstictic, hypoconstictic and salazinic present ..... **3. H. antillarum**
6: Isidia marginal and laminal; medulla K+ pale yellow; norstictic, hypoconstictic and salazinic acids absent 7

7 Thallus 2–5 cm wide; lobes 0.1–0.5 mm wide; isidia becoming granular ..... **18. H. isidiophorella**
7: Thallus 5–20 cm wide; lobes 0.7–2.5 mm wide; isidia not becoming granular ..... **17. H. isidiophora**

8 Medulla K+ yellow then red; norstictic and connorstictic acids present ..... **9. H. coralloidea**
8: Medulla K+ pale yellow; norstictic and connorstictic acids absent ..... **22. H. lepidota**

9 Thallus sorediate 10
9: Thallus not sorediate 14

10 Thallus containing hypoconstictic and salazinic acids ..... **1. H. albicans**
10: Thallus not containing hypoconstictic and salazinic acids 11

11 Dissectic acid present; acetone extract forming a bright yellow spot on silica gel plate ..... **21. H. koyanoides**
11: Dissectic acid absent; acetone extract forming a colourless spot on silica gel plate 12

12 Medulla K+ yellow then red; norstictic and connorstictic acids present ..... **28. H. pseudospeciosa**
12: Medulla K+ pale yellow; norstictic and connorstictic acids absent 13

13 Laciniae linear-elongate; spores 30–37 × 14–18 µm ..... **32. H. speciosa**
13: Laciniae short, often flexuose-bent; spores 23–32 × 12–14 µm ..... **40. H. tremulans**

14 Medulla containing terpenes only ..... **11. H. diademata**
14: Medulla containing dissectic, ±norstictic, ±salazinic acids 15

15 Medulla K+ dark yellow; norstictic and ±salazinic acids absent ..... **41. H. verdonii**
15: Medulla K+ yellow then red; norstictic and ±salazinic acids present ..... **2. H. angustiloba**

16 Lobes with cilia along the margins 17
16: Lobes lacking marginal cilia 24

17 Lobes linear-elongate, dichotomously branched 18
17: Lobes shorter, subdichotomously branched 19

18 Medulla K+ yellow then red; salazinic acid present ..... **23. H. leucomela**
18: Medulla K+ pale yellow; salazinic absent ..... **6. H. boryi**

19 Soredia absent 20
19: Soredia present 22

20 Apothecial margin ciliate; testacein present ..... **38. H. tabularis**
20: Apothecial margin eciliate; testacein absent 21

21 Medulla K+ pale yellow; norstictic acid absent ..... **33. H. stellata**
21: Medulla K+ yellow then red; norstictic and/or salazinic acid present ..... **27. H. podocarpa**

22 Thallus foliose to subfruticose; upper surface ciliate ..... **8. H. comosa**
22: Thallus foliose; upper surface not ciliate 23

23 Lower surface variegated white and yellow; yellow pigment K+ purple ..... **34. H. subascendens**
23: Lower surface white to grey-white, K– ..... **5. H. archeri**

24 Thallus isidiate or densely phyllidiate 25
24: Thallus lacking isidia and dense phyllidia 30

25 Thallus isidiate ..... **36. H. subisidiosa**
25: Thallus densely phyllidiate 26

26 Lower surface yellow- or ochraceous-pigmented towards the apices ..... **39. H. tasmanica**
26: Lower surface not yellow- or ochraceous-pigmented 27

27 Medulla K+ yellow then red; norstictic acid present ..... **4. H. appendiculata**
27: Medulla K+ pale yellow; norstictic acid absent 28

28 Lower surface white, ±discoloured towards the centre; ascospores lacking sporoblastidia ..... **24. H. microphylla**
28: Lower surface striate brown or purple; ascospores with sporoblastidia 29

29 *Japonica* chemosyndrome present; ascospores with 2 or 3 sporoblastidia at either end ..... **14. H. fragilissima**
29: Leucotylin chemosyndrome present; ascospores with 0–2 sporoblastidia ..... **42. H. violostriata**

30 Soredia absent 31
30: Soredia present 33

31 Lower surface whitish to pale brown or, rarely, purple-black in the centre; K+ pigments absent ..... **29. H. queenslandica**
31: Lower surface yellow-brown to orange-brown; K+ violet pigments present 32

32 Upper medulla K+ pale yellow; norstictic acid absent ..... **13. H. flabellata**
32: Upper medulla K+ yellow then red; norstictic acid present ..... **10. H. corcovadoensis**

33 Medulla K+ pale yellow; norstictic and salazinic acids absent 34
33: Medulla K+ yellow then red; norstictic and/or salazinic acid present 40

34 Lower surface becoming subcorticate or corticate at the margin; soralia terminal, labriform 35
34: Lower surface ecorticate; soralia marginal 36

35 Lobes convex; lower surface corticate at the margin; spathulin absent ..... **7. H. chilensis**
35: Lobes plane to concave; lower surface subcorticate; spathulin present ..... **31. H. spathulifera**

36 Lower surface white to violet-black ..... **19. H. japonica**
36: Lower surface at least partly yellow, orange or orange-brown 37

37 Pigmented lower surface K– or K+ brownish green; hybocarpone present ..... **15. H. hybocarponica**
37: Pigmented lower surface K+ purple; hybocarpone absent, 7-chloroemodin present 38

38 *Japonica* chemosyndrome present; lower surface spotted yellow to yellow-orange ..... **37. H. subneglecta**
38: Leucotylin chemosyndrome present; lower surface yellow or orange-brown 39

39 Lobes plane to convex; soralia terminal; pigmented lower surface dark yellow to orange-brown ..... **26. H. obscurata**
39: Lobes concave to plane; soralia marginal; pigmented lower surface intensely yellow ... **35. H. subcitrina**

40 Lower surface white to violet-grey, lacking yellow pigments ..... **30. H. reagens**
40: Lower surface yellow, orange or orange-brown, at least in part 41

41 Medulla containing salazinic acid (major); hybocarpone present ..... **16. H. hypocaesia**
41: Medulla containing norstictic acid (major); hybocarpone ±trace ..... **25. H. neglecta**

1. **Heterodermia albicans** (Pers.) Swinscow & Krog, *Lichenologist* 8: 113 (1976)

Parmelia albicans Pers., *Annln Wetter. Ges.* 2: 17 (1811); *Physcia albicans* (Pers.) J.W.Thomson, *Beih. Nova Hedwigia* 7: 88 (1963), *non Anaptychia albicans* Kurok., *Beih. Nova Hedwigia* 6: 80 (1962). T: Santo Domingo: holo: L *n.v.*

Parmelia domingensis Ach., *Syn. Meth. Lich.* 212 (1814); *Hagenia domingensis* (Ach.) De Not., *Giorn. Bot. Ital.*, ser. 2, 1: 186 (1846); *Physcia domingensis* (Ach.) Nyl., *Mem. Soc. Imp. Sci. Nat. Cherbourg* 5: 106 (1857); *Squamaria domingensis* (Ach.) A.Massal., *Atti Reale Ist. Veneto Sci. Lett. Arti*, ser. 3, 5: 250 (1860): *Physcia stellaris* var. *domingensis* Ach.) Tuck., *Proc. Amer. Acad. Arts Sci.* 4: 396 (1860); *Heterodermia domingensis* (Ach.) Trevis., *Nuov. Giorn. Bot. Ital.* 1: 114 (1869). T: Santo Domingo; holo: H *n.v.*

For further synonymy, see Swinscow & Krog (1976).

Illustrations: S.Kuokawa, *Beih. Nova Hedwigia* 6: pl. 5, fig. 28 (1962), as *Anaptychia domingensis*; R.Moberg & W.Purvis, *Symb. Bot. Upsal.* 32(1): 190, fig. 1 (1997); I.M.Brodo, S.D.Sharnoff & S.Sharnoff, *Lichens of North America* 334, fig. 357 (2001); J.C.Lendemer, *Opusc. Philolich.* 6: 7, pl. 2, figs 1–3 (2009).

Thallus foliose, orbicular to irregularly spreading, comparatively small, adnate, to 4 cm wide. Lobes to 3 mm long, 0.5–1.0 mm wide, to c. 1.5–2.5 mm wide at the tips, ±plane to weakly convex, sublinear-elongate, usually richly dichotomously branched; lobe apices not ascending, eciliate, esorediate. Upper surface whitish grey to brownish grey, darker at the apices, occasionally sparsely pruinose; soredia white to bluish grey, forming small ±continous marginal soralia towards the thallus centre. Medulla white. Lower surface corticate, whitish to pale brown, rarely dark grey, ±canaliculate. Rhizines marginal and laminal, simple or irregularly branched, usually short (c. 1 mm long), pale to dark brown or black. Apothecia very rare, laminal, substipitate, 0.5–3.0 mm wide; margin becoming sorediate; disc concave, dark brown, epruinose. Ascospores *Pachysporaria*-type, narrowly ellipsoidal, 21–32 × 7–14 µm. Pycnidia ±common, immersed, with black weakly protruding apices; conidia bacilliform, 4–6 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow then red, C–, P+ yellow-orange; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (minor), leucotylin (minor), 6α-acetoxyhopane-16β,22-diol (trace), salazinic acid (major), hypoconstictic acid (submajor), 3-*O*-methylconsalazinic acid (minor), consalazinic acid (minor).

This species occurs on bark and more rarely on rocks in coastal and hinterland forests of south-eastern Qld; also in North, Central and South America, Macaronesia, South Africa, Thailand and China.

Qld: Burleigh Heads Natl Park, *J.A.Elix 1090* (CANB); Nanango Rd, Bunya Mtns State Forest, 64 km NE of Dalby, *J.A.Elix 37973* (CANB); Carnarvon Hwy, 4 km S of Bullaroo River bridge, 68 km N of Injune, *J.A.Elix 34067* (CANB).

Heterodermia albicans is characterised by lobes with a corticate lower surface, marginal soralia towards the thallus centre and the presence of salazinic acid and hypoconstictic acids in the medulla.

2. Heterodermia angustiloba (Müll.Arg.) D.D.Awasthi, *Geophytology* 3: 113 (1973)

Physcia speciosa var. *angustiloba* Müll.Arg., *Flora* 66: 78 (1883); *Pseudophyscia speciosa* var. *angustiloba* (Müll.Arg.) Müll.Arg., *Bot. Jahrb. Syst.* 20: 259 (1894); *Anaptychia speciosa* var. *angustiloba* (Müll.Arg.) Zahlbr., *Cat. Lich. Univ.* 7: 741 (1931); *Anaptychia angustiloba* (Müll.Arg.) Kurok., *Beih. Nova Hedwigia* 6: 39 (1962). T: Toowoomba, Qld, *C.H.Hartmann*: holo: G *n.v.*

Illustration: F.Schumm, *Pictures of Tropical Lichens*. http://www.tropicallichens.net/.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, 4–6 cm wide. Lobes short and narrow, 0.5–1.2 mm wide, rather flexuose and discrete at the periphery, ±plane to weakly convex, sublinear-elongate, repeatedly di- or trichotomously branched. Upper surface greyish white to grey, epruinose, lacking phyllidia, soredia and isidia. Medulla white. Lower surface corticate, whitish to pale brown, dark grey-brown near the centre. Rhizines mainly marginal, concolorous with the thallus or darkening near the apices, irregularly branched, 1–2 mm long. Apothecia laminal, substipitate to subsessile, 0.5–2.5 mm wide; margin ±crenate; disc concave, brown to blackish brown, weakly grey-pruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 25–30 × 13–15 µm. Pycnidia common, immersed; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow then red, C–, P+ yellow-orange; containing atranorin (major), zeorin (major), dissectic acid (submajor), 16β-acetoxyhopane-6α,22-diol (major), leucotylin (minor), 6α-acetoxyhopane-16β,22-diol (major), 6α,16β-diacetoxyhopane-22-ol (minor), norstictic acid (major), connorstictic acid (minor), salazinic acid (minor or trace).

Occurs on bark and, more rarely, on rocks in coastal and hinterland forests of eastern Qld and north-eastern N.S.W.; also in India, Nepal, Vietnam, China and Japan.

Qld: Mt Baldy, 4 km SW of Atherton, *H.Streimann 30645* (CANB). N.S.W.: Newell Falls, Dorrigo Mtn, *J.A.Elix 3488a* (CANB).

Characterised by the narrow, eciliate lobes with a corticate lower surface, the absence of isidia and soredia and the presence of norstictic acid and dissectic acids.

3. Heterodermia antillarum (Vain.) Swinscow & Krog, *Lichenologist* 8: 114 (1976)

Anaptychia granulifera var. *antillarum* Vain., *Ann. Acad. Sci. Fenn.*, ser. A, 6: 63 (1914); *Anaptychia tropica* var. *antillarum* (Vain.) Kurok., *Beih. Nova Hedwigia* 6: 36 (1962); *Anaptychia antillarum* (Vain.) Kurok., *J. Hattori Bot. Lab.* 37: 596 (1973). T: Camp Jacob, Guadalupe, on *Inga laurifolia*, alt. 500–800 m, *A.Düss 459 p.p.*; lecto: TUR *n.v.*, *fide* S.Kuokawa, *loc. cit.*

Illustration: F.Schumm, *Pictures of Tropical Lichens*. http://www.tropicallichens.net/.

Thallus foliose, orbicular to irregularly spreading, adnate, comparativelysmall, to 4 cm wide. Lobes to 3 mm long, 0.5–1.0 mm wide, to c. 1.5–2.5 mm wide at the tips, ±plane, sublinear-elongate, usually richly dichotomously branched, not ascending, eciliate; Upper surface whitish grey to brownish grey, darker at the lobe apices, occasionally sparsely pruinose, esorediate, isidiate; isidia laminal and marginal, marginal isidia prominent at the periphery of the thallus, flattened to cylindrical, eventually becoming coralloid. Medulla white. Lower surface corticate, whitish to pale brown, rarely dark grey. Rhizines marginal and laminal, simple or irregularly branched, usually short (c. 1 mm long), pale to dark brown or black. Apothecia rare, laminal, adnate to substipitate, 0.5–3.0 mm wide; margin becoming isidiate; disc concave, dark brown, epruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 23–30 × 12–18 µm. Pycnidia ±common, immersed; conidia bacilliform, 4–6 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow then red, C–, P+ yellow-orange; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (minor), leucotylin (minor), salazinic acid (major), hypoconstictic acid (submajor), 3-*O*-methylconsalazinic acid (minor), consalazinic acid (minor).

Usually on bark, and rarely on rock in coastal and hinterland forests of south-eastern Qld; also in Central America, the Caribbean, East Africa, South Africa, Thailand and the Galapagos Islands.

Qld: Burleigh Heads Natl Park, *J.A.Elix 1147* (CANB); near Flutter Ck, Pine Mountain S.F., 24 km SSW of Calliope, *J.A.Elix 34791* (CANB).

Characterised by the lobes having a corticate lower surface, laminal and marginal isidia and the presence of salazinic acid and hypoconstictic acids in the medulla.

4. **Heterodermia appendiculata** (S.Kurok.) Swinscow & Krog, *Lichenologist* 8: 114 (1976)

Anaptychia appendiculata Kurok., *Beih. Nova Hedwigia* 6: 61 (1962). T: 'Rocher aux Sacrifices', Cercle of Man, Mont Tonkoui, Ivory Coast, on *Hymenodictyon floribundum*, 14 Aug. 1954, *R.Santesson 10645a*; holo: UPS *n.v.*; iso TNS *n.v.*

Illustration: S.Kuokawa, *op. cit.* pl. 7, fig. 39, as *Anaptychia appendiculata*.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, 5–12 cm wide. Lobes 1.0–1.5 mm wide, broadening to c. 2–3 mm wide at the tips, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously to digitately branched, radiating, the apices not ascending, contiguous to discrete, eciliate. Upper surface greenish white, whitish grey to cream-coloured, epruinose, with marginal dorsiventral phyllidia, more rarely also laminal, usually minutely dissected, often granular near the tips or the whole phyllidia becoming granular and appearing sorediate. Medulla white. Lower surface ecorticate, arachnoid, violet-grey in the centre, violet-striate towards the apices; yellow pigments absent. Rhizines marginal, initially simple and concolorous with the lower surface, then black and squarrosely branched, 2–4 mm long. Apothecia laminal, adnate to substipitate, 1–4 mm wide; margin lobulate, the lobules becoming elongate and deeply dissected; disc concave, dark brown to blackish brown, ±thinly grey-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 0−2 sporoblastidia, 37–53 × 18–25 µm. Pycnidia common, initially immersed, becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow then red, C–, P+ yellow-orange; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), leucotylin (minor), 6α-acetoxyhopane-16β,22-diol (major), 6α,16β-diacetoxy-hopane-22-ol (minor), chloroatranorin (minor), norstictic acid (major), connorstictic acid (minor).

Rare on bark and on rocks in north-eastern Qld; also in Central America and the Caribbean, West and East Africa, Thailand and Malaysia and New Zealand.

Qld: Lamond Hill, Atherton Tableland, *S.Kurokawa 5698* (MEL, TNS); Kauri Ck, Danbulla Forest Drive, Danbulla S.F., 24 km NE of Tolga, *J.A.Elix 44212* (CANB).

This lichen is characterised by having lobes with an ecorticate, non-pigmented lower surface, marginal phyllidia, ascospores with sporoblastidia and the presence of terpenes and norstictic acid in the medulla.

5. **Heterodermia archeri** Elix, *Australas. Lichenol.* 68: 16 (2011)

T: Flaggy Ck, Black Mountain Rd, 9 km NNW of Kuranda, Qld, 16°47'S, 145°36'E, alt. 420 m, on felled trees along the rainforest margin, 7 July 1984, *J.A.Elix 17595 & H.Streimann*; holo: CANB.

Illustration: J.A.Elix, *op. cit.* 20, fig. 1.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, to 5 cm wide. Lobes 0.5–1.2 mm wide, broadening to c. 2−3 mm wide at the tips and becoming paddle-shaped, plane to weakly convex, sublinear-elongate, dichotomously to subpalmately branched, radiating; apices ±ascending, with cilia or marginal rhizines visible from above; cilia simple, white, 0.5–1.2 mm long. Upper surface greenish white, whitish to cream-coloured, sorediate; soredia farinose to granular, in labriform soralia, occasionally to 5 mm wide and spathulate. Medulla white. Lower surface ecorticate, whitish at the margins, darkening to pale brown centrally. Rhizines marginal, simple or becoming richly branched, white or creamish, 0.5–2.0 mm long. Apothecia and pycnidia not seen.

Chemistry: Cortex and medulla K+ yellow, C–, KC–, P+ pale yellow; containing atranorin (major), zeorin (major), 6α-acetoxyhopane-16β,22-diol (minor), 6α-acetoxy-16β,22-

dihydroxyhopane-25-oic acid (minor), 6α-acetoxy-22-hydroxyhopane-25-oic acid (trace), 16β-acetoxy-6α,22-dihydroxyhopane-25-oic acid (trace), leucotylin (trace), dissectic acid (trace), ±norbaeomycesic acid (trace), testacein (minor).

Rare on twigs and on bark in montane rainforest in north-eastern Qld; also in Papua New Guinea.

Qld: Kirrima S.F., Cardwell Ra., 24 km WNW of Cardwell, *J.A.Elix 15718 & H.Streimann* (CANB); Big Tableland, 26 km S of Cooktown, *J.A.Elix 17302 & H.Streimann* (CANB).

Characterised by the loosely adnate thallus with narrow, sublinear-elongate lobes with pale marginal cilia and spathulate soralia on some of the subascending lobe apices, a white, ecorticate lower surface and the presence of testacein.

6. **Heterodermia boryi** (Fée) K.P.Singh & S.R.Singh, *Geophytology* 6: 33 (1976)

Borrera boryi Fée, *Essai Cryptog. Écorc. Exot. Officin.* Introd. XCVI et tab. II, fig. 23 (1825); *Anaptychia boryi* (Fée) A.Massal., *Mem. Lichenogr*. 41 (1853). T: Île Bourbon [Réunion], *A.L.A.Fée s.n.*; holo: PC *n.v.*

Anaptychia neoleucomelaena Kurok., *J. Jap. Bot.* 36: 51 (1961); *Heterodermia neoleucomelaena* (Kurok.) Follmann & Redón, *Willdenowia* 6: 446 (1972). T: below Jamnotri Tehri Gormal, India, alt. 9000–9500 ft, on tree trunks, 6 June 1951, *D.D.Awasthi 902*; holo: LWU *n.v.*

For further synonymy, see Kurokawa (1998).

Illustrations: I.Yoshimura, *Lichen Fl. Japan in Colour* pl. 3, fig. 13 (1974), as *Anaptychia boryi*; T.D.V.Swinscow & H.Krog, *Lichenologist* 8: 125, fig. 2B (1976), as *Heterodermia leucomela* subsp. *boryi*.

Thallus foliose to subfruticose, often in loose rosettes or forming tangled mats, loosely adnate or, in part, unattached, 5–15 cm wide. Lobes 0.4–3.0 mm wide, separate, ±plane, linear-elongate, ribbon-like, tangled, dichotomously branched, often ascending at the apices or, occasionally, the apices reflexed, with conspicuous grey to black simple of sparingly branched cilia 5–15 mm long. Upper surface ivory to grey-white, smooth. Medulla white. Lower surface mostly ecorticate, canaliculate, arachnoid or powdery and then becoming sorediate, often with subapical soralia, white throughout or partially pinkish brown or rarely purple; yellow pigments absent; lower margins thickened, corticated. Apothecia rare, subapical to apical, sessile to substipitate, 1–5 mm wide; margin crenulate to lobulate, lobules to 2 mm long, often with sparse short black cilia; disc concave, dark brown, ±thinly white-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with numerous small and/or large sporoblastidia, 35–53 × 18–25 µm. Pycnidia rare, immersed, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P– or P+ pale yellow; containing atranorin (major), zeorin (major), japonin (minor or trace), anhydrofusarubin lactol (purple pigment, trace).

This species occurs on bark and more rarely on mossy rocks in coastal and hinterland forests of eastern Qld and N.S.W.; widespread in tropical to warm temperate regions.

Qld: Bunya Mountains S.F., 46 km S of Kingaroy, *J.A.Elix 38620* (CANB). N.S.W.: Toonumbar State Forest, 26 km NW of Kyogle, *H.Streimann 60771* (CANB).

Heterodermia boryi is distinguished by the tangled mass of elongate, linear lobes with long black marginal cilia; a largely ecorticate lower surface, but with thickened, corticate margins and subapical soralia, and by the presence of atranorin and zeorin.

7. **Heterodermia chilensis** (Kurok.) Swinscow & Krog, *Lichenologist* 8: 115 (1976)

Anaptychia chilensis Kurok., *Beih. Nova Hedwigia* 6: 65 (1962). T: Alto del Puerto, Valparaiso, Chile, on bare earth "at a rivulet in a creek", 14 Aug. 1940, *R.Santesson 2919*; holo: S; iso: KRK, UPS *n.v.*

Illustration: N.C.Scutari, *Mycotaxon* 39: 19, fig. 1 (1990).

Thallus foliose, orbicular to irregularly spreading, adnate, 2–5 cm wide. Lobes 0.7–1.5 mm wide, slightly broader at the apices, plane to weakly convex, sublinear to sublinear-elongate, dichotomously to digitately branched, weakly convex or weakly concave, not ascending at the apices, with a few short lateral branches, eciliate. Upper surface whitish grey to pale

yellow-brown, uneven, pruinose at the apices, sorediate; soralia apical, labriform. Medulla white. Lower surface largely ecorticate, arachnoid, white, lacking pigments, canaliculate, with thick corticate margins. Rhizines marginal, concolorous with the thallus to brown-black, simple to digitately divided, 0.7–2.0 mm long. Apothecia laminal, sessile to substipitate, 1.0–1.5 mm wide; margin pruinose; disc brown-black, Ascospores *Polyblastidia*-type, ellipsoidal, with 0–2 small sporoblastidia, 25–39 × 15–22 µm. Pycnidia initially immersed, later weakly emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P–; containing atranorin (major), zeorin (major), 6α-acetoxyhopane-16β,22-diol (minor), 6α-acetoxy-22-hydroxyhopane-25-oic acid (minor), 6α-acetoxy-16β,22-dihydroxyhopane-25-oic acid (minor).

Occurs on mossy rocks, rarely on tree bases, in montane areas of eastern Vic. Also in South America, South and East Africa, Thailand and New Zealand.

Vic.: trail to Venus Bath, 2 km SW of Halls Gap, Grampians, *J.A.Elix 11536* (CANB).

This lichen is characterised by the saxicolous habit, the apical, labriform soralia, the white, ecorticate lower surface with corticate margins, and by the presence of atranorin, zeorin and the *speciosa* chemosyndrome of triterpenes.

8. **Heterodermia comosa** (Eschw.) Follmann & Redón, *Willdenowia* 6: 446 (1972)

Parmelia comosa Eschw., *in* K.F.P. von Martius, *Icon. Pl. Cryptog.* 2: 26 (1828); *Anaptychia comosa* (Eschw.) A.Massal., *Mem. Lichenogr.* 39 (1853); *Physcia comosa* (Eschw.) Nyl., *Syn. Meth. Lich.* 1(2): 416 (1860). T: near Porta de Môz, Pará, Brazil, on branches of tree; not located but based on illustration tab. XII, fig. 1, *fide* S.Kurokawa, *Beih. Nova Hedwigia* 6: 103 (1962).

Illustration: T.D.V.Swinscow & H.Krog, *Macrolichens of East Africa* 91, fig. 40 (1988).

Thallus foliose to subfruticose, forming small rosettes or tufts of ascending lobes, to 3–7 cm wide. Lobes 0.7–5.0 (–8.0) mm wide, sublinear, spathulate or paddle-shaped, convex, rarely branched, ascending or suberect, partially imbricate, with rounded apices when sterile, ciliate; cilia prominent, usually simple, marginal and laminal, whitish, 2–4 mm long. Upper surface white to greyish white, sorediate; soredia on the undersides of lobe tips. Medulla white. Lower surface ecorticate, arachnoid, uniformly white (South American material partly yellow-brown), apically sorediate when sterile, erhizinate. Apothecia subterminal to terminal on ascending lobes, substipitate, 1–5 (–10) mm wide; margin crenate or lobulate, ciliate; disc dark brown, densely pruinose. Ascospores *Polyblastidia*-type, narrowly ellipsoidal to fusiform, with 2 or 3 small sporoblastidia, 31–35 × 13–16 µm. Pycnidia not seen.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P–; pigmented lower surface K+ violet; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (minor or trace), ±6α-acetoxyhopane-16β,22-diol (trace), ±unknown triterpene (trace), ±7-chloroemodin (trace).

Occurs on the twigs or trees and shrubs in hinterland forests of south-eastern Qld; also in North, Central and South America, Africa and Asia.

Qld: near Flutter Ck, Pine Mountain S.F., 24 km SSW of Calliope, *J.A.Elix 34802* (CANB); Nanango Rd, Bunya Mtns S.F., 64 km NE of Dalby, *J.A.Elix 37959* (CANB).

This lichen is characterised by the spathulate or paddle-shaped lobes with laminal and marginal cilia on the upper surface, and soredia beneath lobe apices. It is possible that the type race from South America, with the yellow-brown pigmented lower surface, is a different species to the Palaeotropical taxon.

9. **Heterodermia coralloidea** Elix, *Australas. Lichenol.* 69: 12 (2011)

T: Stoney Ck, Jervis Bay, 34 km SE of Nowra, N.S.W., 35°10’S, 150°45’E, alt. 2 m, on sandstone beside creek in dry sclerophyll forest with numerous shrubs and *Livistonia*, 8 Nov. 1990, *J.A.Elix 2642*; holo: CANB.

Illustration: J.A.Elix, *op. cit.* 20, fig. 1.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, 2–7 cm wide. Lobes 0.7–1.5 mm wide, ±plane, sublinear-elongate, dichotomously or irregularly branched, ±discrete to contiguous at the periphery, with short lateral lobes; apices not ascending, eciliate, but often with white marginal rhizines. Upper surface whitish grey, phyllidiate; phyllidia laminal and marginal, dissected and erumpent, forming dense, coralloid pseudoisidia that cover most of the upper surface, rarely becoming granular. Medulla white. Lower surface corticate, white to cream or pale tan near the centre. Rhizines white, concolorous with the thallus or becoming pale to dark brown towards the apices, simple to irregularly branched, numerous, 0.3–1.0 mm long, ±projecting beyond the lobe margins. Apothecia and pycnidia not seen.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow then red, C–, P+ dark yellow; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), leucotylin (minor), 6α-acetoxyhopane-16β,22-diol (trace), 6α-acetoxy-16β,22-dihydroxyhopane-25-oic acid (trace or absent), norstictic acid (major), connorstictic acid (trace).

This very rare, endemic, saxicolous lichen is known only from the coastal type locality in south-eastern N.S.W.

This lichen has a corticate lower surface, pale marginal rhizines and marginal and laminal, phyllidiate isidia that erupt to form dense, coralloid pseudoisidia; the medulla contains zeorin, norstictic acid and 16β-acetoxyhopane-6α,22-diol.

10. Heterodermia corcovadoensis (Kurok.) Elix, *Australas. Lichenol.* 68: 19 (2011)

Anaptychia flabellata var. *corcovadoensis* Kurok., *Beih. Nova Hedwigia* 6: 60 (1962). T: Corcovado, Rio de Janeiro, Brazil, 14 Aug. 1892, *G.O.A.Malme 60*; holo: S *n.v.*

Thallus foliose, orbicular to irregularly spreading, moderately to loosely adnate, to 5 cm wide, but often coalescing to form colonies to 15 cm wide. Lobes 0.7–2.5 mm wide, to c. 2–4 mm wide at the tips, plane to weakly convex, sublinear- to linear-elongate, dichotomously to irregularly branched, radiating; apices not ascending, contiguous to discrete, with short lateral lobes, eciliate. Upper surface grey-white to greenish white, ±partly blackened at the centre; soredia, isidia, phyllidia and pruina absent. Medulla white above; lower medulla dark yellow to orange-brown. Lower surface ecorticate, arachnoid, dark yellow to orange-brown. Rhizines marginal, black, simple or squarrosely branched, 1–2 mm long. Apothecia common, laminal, sessile to substipitate, 1–6 mm wide; margin initially crenate, lobulate at maturity; inner surface of lobules ecorticate, yellow-orange pigmented; disc concave, dark brown to brown-black, epruinose or weakly white-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 2 or 3 small sporoblastidia present at maturity, 27–40 × 12–19 µm. Pycnidia common, initially immersed, becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; upper medulla K+ yellow then red, C–, P+ dark yellow; pigmented medulla K+ violet; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), 6α-acetoxyhopane-16β,22-diol (minor), leucotylin (minor), norstictic acid (minor), connorstictic acid (trace), ±salazinic acid (minor or trace), 7-chloroemodin (minor), flavo-obscurins A, B1, B2 (minor), 5,7-dichloroemodin (trace), AO-1 anthrone (trace), AO-2 anthrone (trace), emodin (trace).

Very rare on bark in montane rainforest in north-eastern Qld; also in south-eastern Brazil and Sri Lanka.

Qld: Walter Hill Ra., 26 km SE of Ravenshoe, *J.A.Elix 17076 & H.Streimann* (CANB).

Characterised by the absence of a lower cortex, phyllidia, isidia and soredia, the dark yellow to orange-brown (K+ violet) lower surface, ascospores with sporoblastidia and norstictic acid in the non-pigmented medulla.

11. Heterodermia diademata (Taylor) D.D.Awasthi, *Geophytology* 3: 113 (1972)

Parmelia diademata Taylor, *London J. Bot.* 6: 165 (1847); *Physcia hypoleuca* var. *diademata* (Taylor) Müll.Arg., *Flora* 63: 277 (1880); *Physcia speciosa* var. *diademata* (Taylor) Müll.Arg., *Flora* 71: 197 (1888); *Pseudophyscia hypoleuca* var. *diademata* (Taylor) Hue, *Nuov. Arch. Mus.*, sér. 4, 1: 113 (1899); *Anaptychia diademata* (Taylor) Kurok., *Beih. Nova Hedwigia* 6: 28 (1962). T: Nepal, *N.Wallich*; FH-TAYL *n.v.*

Physcia major Nyl., *Flora* 41: 379 (1858); *Physcia speciosa* var. *major* (Nyl.) Müll.Arg., *Flora* 70: 60 (1887); *Anaptychia major* (Nyl.) Vain., *Dansk. Bot. Ark.* 4: 12 (1926). T: Orizaba, Mexico, *F.Müller*; holo: H-NYL *n.v.*; iso: G, *n.v.*

For further synonymy, see Kurokawa (1962, 1998).

Illustrations: I.Yoshimura, *Lichen Fl. Japan in Colour* pl. 3, fig. 5 (1974), as *Anaptychia diademata*; T.D.V.Swinscow & H.Krog, *Macrolichens of East Africa* 92, fig. 41 (1988); S.L.Thrower, *Hong Kong Lichens* 108 (1988); I.M.Brodo, S.D.Sharnoff & S.Sharnoff, *Lichens of North America* 336, fig. 360 (2001).

Thallus foliose, orbicular to irregularly spreading, adnate to loosely adnate, to 15 cm wide. Lobes 0.5–2.5 mm wide, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously to irregularly branched, contiguous or discrete at the periphery, radiating; apices not ascending, with short lateral lobes, eciliate; isidia and soredia absent. Upper surface greenish white, whitish or grey, pruinose or not, rarely with marginal lobules. Medulla white. Lower surface corticate, whitish to pale brown to dirty brown towards the centre. Rhizines sparse, marginal, concolorous with the thallus or darkening at the apices, irregularly or squarrosely branched. Apothecia laminal, sessile to substipitate, 1.5–5.5 mm wide; margin entire, crenulate to lobulate; disc concave, brown to brown-black, epruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 25−40 × 10−17 µm. Pycnidia common, immersed or slightly protruding; conidia bacilliform, 3–4 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P–; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), leucotylin (minor), 6α-acetoxyhopane-16β,22-diol (minor), 6α,16β-diacetoxyhopane-22-ol (minor or trace).

Grows on rock and on the bark of trees in lowland and montane forest in eastern Qld, N.S.W. and Vic.: also in North, Central and South America, Africa and Asia.

Qld: along Plath Rd, Hugh Nelson Ra., 15 km S of Atherton, *J.A.Elix 16414 & H.Streimann* (CANB). N.S.W.: along summit trail, Mt Warning, *J.A.Elix 2501A* (CANB). Vic.: Mt Ararat, *D.Sullivan s.n.* (G).

Characterised by the narrow, sublinear-elongate lobes with a corticate lower surface, the lack of soredia and isidia and the presence of atranorin, zeorin and triterpenes in the medulla.

12. Heterodermia dissecta (Kurok.) D.D.Awasthi, *Geophytology* 3: 113 (1973)

Anaptychia dissecta Kurok., *Beih. Nova Hedwigia* 6: 55 (1962). T: Mt Horaiji, Prov. Mikawa, Japan, 7 Jan. 1956, *S.Kurokawa 56029*; holo-TNS *n.v.*; iso: KRK, TNS *n.v.*

Illustration: I.Yoshimura, *Lichen Fl. Japan in Colour* pl. 3, fig. 7 (1974), as *Anaptychia dissecta*.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, 5–10 cm wide. Lobes 0.7–2.0 mm wide, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously to subdigitately branched; apices not ascending, ±discrete to contiguous at the periphery, with short lateral lobes, eciliate. Upper surface grey-white to grey, epruinose, with marginal phyllidiate isidia or dorsiventral lobules that are ±granular; marginal phyllidia usually minutely dissected, often granular near the tips, or entire phyllidia becoming granular and appearing sorediate. Medulla white. Lower surface corticate, white to greyish or pale brown at the centre. Rhizines numerous, mainly marginal, concolorous with the thallus or darkening and forming a dense black marginal mat, irregularly branched. Apothecia very rare, laminal, sessile to substipitate, 1–5 mm wide; margin lobulate-isidiate; disc concave, brown to brown-black, epruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 28–32 × 12–16 µm. Pycnidia initially immersed, becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow then red, C–, P+ dark yellow; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), 6α-acetoxyhopane-16β,22-diol (trace), leucotylin (minor), dissectic acid (minor), norstictic acid (major), connorstictic acid (trace).

Occurs on rocks and on the bark of trees in south-eastern Qld and in eastern and south-eastern N.S.W.; also in India, China and Japan.

Qld: Nanango Rd, Bunya Mountains S.F., 64 km NE of Dalby, *J.A.Elix 37953A* (CANB). N.S.W.: Buckenbowra River estuary, 7.5 km W of Batemans Bay, *J.A.Elix 10984 & H.Streimann* (CANB).

This lichen is characterised by the minutely dissected marginal lobules and/or phyllidia that often appear sorediate, the corticate lower surface and the presence of norstictic and dissectic acids.

13. **Heterodermia flabellata** (Fée) D.D.Awasthi, *Geophytology* 3: 113 (1973)

Parmelia flabellata Fée, *Essai Cryptog. Écorc. Exot. Officin.* 122 (1837); *Anaptychia flabellata* (Fée) A.Massal., *Mem. Lichenogr.* 41 (1853). T: ad corticem *Cinchonae lacifoliae*, [South America]; lecto: G *n.v.*, *fide* T.D.V.Swinscow & H.Krog, *Lichenologist* 8: 113 (1976).

For further synonymy, see Kurokawa (1962).

Illustration: S.Kurokawa, *Beih. Nova Hedwigia* 6: pl. 6, fig. 34 (1962).

Thallus foliose, orbicular to irregularly spreading, moderately to loosely adnate, to 5 cm wide, but often coalescing to form colonies up to 15 cm wide. Lobes 0.7–2.5 mm wide, to c. 2–4 mm wide at the tips, plane to weakly convex, sublinear- to linear-elongate, dichotomously to irregularly branched, radiating; apices not ascending, contiguous to discrete, with short lateral lobes, eciliate. Upper surface grey-white to greenish white, ±partly blackened in the centre, lacking soredia, isidia and pruina. Medulla white; lower medulla dark yellow to orange-brown. Lower surface ecorticate, arachnoid, dark yellow to orange-brown. Rhizines marginal, black, simple or squarrosely branched, 1–2 mm long. Apothecia common, laminal, sessile to substipitate, 1–6 mm wide; margin crenate at first, lobulate at maturity; inner surface of lobules ecorticate, yellow-orange pigmented; disc concave, dark brown to brown-black, epruinose or weakly white-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 2 or 3 small sporoblastidia present at maturity, 27–40 × 12–19 µm. Pycnidia common, immersed, then becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; upper medulla K+ yellow, C–, P–; lower surface K+ violet; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), leucotylin (minor), zeorin acetate (minor), 7-chloroemodin (minor), flavo-obscurins A, B1, B2 (minor), 5,7-dichloroemodin (trace), AO-1 anthrone (trace), AO-2 anthrone (trace), emodin (trace), dissectic acid (trace), chloroatranorin (trace).

Very rare on bark in montane forest in north-eastern Qld; also in North, Central and South America, Africa, Asia and Fiji.

Qld: Paluma–Hidden Valley road, Mount Spec S.F., 40 km S of Ingham, *H.Streimann 64268A* (CANB).

This lichen is characterised by the linear to sublinear-elongate lobes with an ecorticate lower surface, the absence of soredia and isidia and the dark yellow to orange-brown pigmented (K+ purple) lower surface.

14. **Heterodermia fragilissima** (Kurok.) J.-C.Wei & J.-M.Jiang, *Lich. Xizang* 111 (1986)

Anaptychia fragilissima Kurok., *Beih. Nova Hedwigia* 6: 60 (1962). T: Mt Koya, Prov. Kii, Japan, *Nuymaziri 679*; holo: TNS *n.v.*; iso: CANB.

Illustration: S.Kurokawa, *op. cit.* pl. 6, fig. 38.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, 5–12 cm wide. Lobes 1.0–1.5 mm wide, c. 2–3 mm wide at the tips, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously to digitately branched, radiating; apices not ascending, contiguous to discrete, eciliate. Upper surface greenish white, whitish grey to cream-coloured, epruinose, with marginal dorsiventral phyllidia, more rarely also laminal, usually minutely dissected, often granular near the tips, or entire phyllidia becoming granular and appearing sorediate. Medulla white. Lower surface ecorticate, arachnoid, violet-grey in the centre, violet-striate towards the apices; yellow pigments absent. Rhizines marginal, at first

simple and concolorous with the lower surface, then black and squarrosely branched, 2–4 mm long. Apothecia laminal, adnate to substipitate, 1–4 mm wide; margin lobulate, the lobules becoming elongate and deeply dissected; disc concave, dark brown to blackish brown, ±thinly grey-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 2 or 3 small sporoblastidia at either end, 36–50 × 16–20 µm. Pycnidia common, immersed, then becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P+ pale yellow; containing atranorin (major), zeorin (major), japonin (major), anaptychin-5 (minor), anaptychin-1 (trace), 6α-acetoxy-16β,22-dihydroxyhopane-25-oic acid (trace).

Occurs on rock and on trees in coastal and montane forest of eastern Australia Qld and N.S.W. and in Tas. Also in Guatemala, Tanzania, Thailand, China and Japan.

Qld: North Wallaman L.A., Lannercost S.F., 36 km NW of Ingham, *J.A.Elix 15824 & H.Streimann* (CANB); Lamb Ra., 21 km NE of Atherton, *J.A.Elix 16590 & H.Streimann* (CANB). N.S.W.: Clyde Mtn, Southern Tablelands, *J.A.Elix 1015* (CANB). Tas.: Bluff Hill, *G.Kantvilas 122/86* (CANB).

Characterised by the minutely dissected marginal phyllidia, the ecorticate lower surface and the presence of atranorin and triterpenes. This species is distinguished from *H. violostriata* by the longer, *Polyblastidia*-type ascospores with more numerous sporoblastidia and in containing the *japonica*-rather than the leucotylin-chemosyndrome of triterpenes.

15. **Heterodermia hybocarponica** Elix, *Australas. Lichenol.* 67: 3 (2010)

T: Fosters Gully Nature Walk, Morwell Natl Park, 16 km S of Morwell, Vic., 38°21'24"S, 146°23'27"E, alt. 230 m, on base of tree in wet *Eucalyptus* forest with *Pomaderris* understorey, 12 Apr. 2008, *J.A.Elix 39336*; holo: MEL; iso: CANB.

Illustration: J.A.Elix, *op. cit.* 9, fig. 1.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, to 5 cm wide, but often coalescing to form colonies up to 15 cm wide. Lobes 0.5–1.2 mm wide, to c. 2–3 (–5) mm wide at the tips, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously branched, radiating; apices ascending, usually discrete, ±lobulate along the lobe margins, the lobules ±rounded or sparingly branched, 0.3–0.8 mm wide, often with small soralia, eciliate or with very sparse cilia that are pale or ±blackened at the tips, 0.5–1.0 mm long. Upper surface greenish white, whitish to cream-coloured, sorediate; soredia farinose to granular, in labriform to capitate soralia on lateral or terminal lobes, occasionally spreading along lobe margins. Medulla white. Lower surface ecorticate, arachnoid, white to purple-black in the centre, ochraceous or yellow towards the apices. Rhizines marginal, black, simple or squarrosely branched, 1−3 (−7) mm long. Apothecia very rare, laminal, substipitate, 1–8 mm wide; margin lobulate, the lobules ecorticate, partly yellow on the lower surface, apically sorediate; disc concave, dark brown to blackish brown, ±thinly grey-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 2 or 3 small sporoblastidia, 40–45 × 20–23 µm. Pycnidia common, initially immersed, then becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P–; pigmented medulla K– or K+ brownish green; containing atranorin (major), zeorin (major), japonin (major), hybocarpone (major or minor), norhybocarpone (minor or trace), dissectic acid (trace), ±7-chloroemodin (trace), anaptychin-5 (minor), ±anaptychin-1 (trace), ±6α-acetoxy-16β,22-dihydroxyhopane-25-oic acid (trace).

This species occurs on bark, dead wood and on rocks in coastal and hinterland forests of south-eastern Australia (S.A., Qld, N.S.W., Vic. and Tas.); also in New Zealand.

S.A.: mouth of De Male R., 18 km SSE of Cape Borda, Kangaroo Is., *H.Streimann 55096* (CANB). Qld: Mt Baldy, 4 km SW of Atherton, *J.A.Elix 16320 & H.Streimann* (CANB). N.S.W.: Hakea Walk, Washpool Natl Park, Gibraltar Ra., *J.A.Elix 37263* (CANB); Batehaven, 1 km W of Surf Beach, *J.A.Elix 1806* (CANB). Vic.: Tarra River Falls, Tarra-Bulga Natl Park, 29 km S of Traralgon, *J.A.Elix 29675* (CANB).

This species is distinguished by lobes with an ecorticate, pigmented lower surface, labriform to capitate soralia, ascospores with sporoblastidia and the presence of hybocarpone in the lower medulla. The morphologically similar *H. hypocaesia* contains additional salazinic acid.

16. **Heterodermia hypocaesia** (Yasuda) D.D.Awasthi, *Geophytology* 3: 113 (1973)

Anaptychia hypocaesia Yasuda, *in* V.Räsänen, *J. Jap. Bot.* 16: 139 (1940). T: Hakone, Prov. Sagami, Japan, 15 Oct. 1922, *Y.Asahina* (as "*Yasuda 674*"); holo: H *n.v.*; iso: TI, TNS *n.v.*

[?*Heterodermia dendritica auct. non* (Pers.) Poelt: R.B.Filson & R.W.Rogers, *Lichens of South Australia* 54, 1979]

Illustration: F.Schumm, *Pictures of Tropical Lichens*. http://www.tropicallichens.net.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, to 5 cm wide, but often coalescing to form colonies up to 15 cm wide. Lobes 0.5–1.2 mm wide, to c. 2–3 (–5) mm wide at the tips, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously branched, radiating; apices ascending, usually discrete, ±lobulate along the lobe margins, the lobules ±rounded or sparingly branched, 0.3–0.8 mm wide, often with small soralia?], eciliate or with very sparse cilia that are pale or ±blackened at the tips, 0.5–1.0 mm long. Upper surface greenish white, whitish to cream-coloured, sorediate; soredia farinose to granular, in labriform to capitate soralia on lateral or terminal lobes, occasionally spreading along the lobe margins. Medulla white. Lower surface ecorticate, arachnoid, purple-black in the centre, white, ochraceous or yellow towards the apices. Rhizines marginal, black, simple or squarrosely branched, 1–3 (–5) mm long. Apothecia very rare, laminal, substipitate, 1–4 mm wide; margin lobulate, the lobules ecorticate, partly yellow on the lower surface, apically sorediate; disc concave, dark brown to blackish brown, ±thinly grey-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 2 or 3 small sporoblastidia, 35–45 × 16–20 µm. Pycnidia common, initially immersed, then becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow then red, C–, P+ yellow; pigmented medulla K– or K+ brownish green or K+ violet; containing atranorin (major), zeorin (major), japonin (major), salazinic acid (major), ±norstictic acid (trace), hybocarpone (minor), subhypocarpone (trace), 6α-acetoxy-22-hydroxyhopane-25-oic acid (trace), ±7-chloroemodin (trace).

This species occurs on bark, dead wood and on rock in coastal and hinterland forest of eastern Qld, N.S.W. and Vic.). Also in India, Nepal, Thailand, China, Japan and the Hawaiian Islands.

Qld: track to Mt Lewis, 19 km NNW of Mount Molloy, *J.A.Elix 16909 & H.Streimann* (CANB). N.S.W.: along the Armidale road, 17 km W of Dorrigo, Northern Tablelands, *J.A.Elix 2348* (CANB). Vic.: Alfred Natl Park, 19 km E of Cann River, East Gippsland, *J.A.Elix 5250* (CANB).

Characterised by lobes with an ecorticate, pigmented lower surface, labriform to capitate soralia, ascospores with sporoblastidia and the presence of medullary salazinic acid and hybocarpone ±7-chloroemodin in the lower pigmented medulla. A member of the *H. japonica* complex, it is distinguished by the presence of salazinic acid.

17. **Heterodermia isidiophora** (Nyl.) D.D.Awasthi, *Geophytology* 3: 114 (1973)

Physcia speciosa f. *isidiophora* Nyl., *Syn. Meth. Lich.* 1(2): 417 (1860); *Physcia domingensis* f. *isidiophora* (Nyl.) Nyl., *Acta Soc. Sci. Fenn.* 7: 440 (1863); *Heterodermia speciosa* f. *isidiophora* (Nyl.) Trevis., *Atti Soc. Ital. Sci. Nat.* 11: 614 (1868); *Heterodermia speciosa* var. *domingensis* f. *isidiophora* (Nyl.) Trevis., *Atti Soc. Ital. Sci. Nat.* 11: 614 (1868); *Pseudophyscia speciosa* var. *hypoleuca* f. *isidiophora* (Nyl.) Müll.Arg., *Bot. Jahrb.* 20: 260 (1894); *Anaptychia isidiophora* (Nyl.) Vain., *Bot. Mag. (Tokyo)* 32: 156 (1918); *Anaptychia speciosa* f. *isidiophora* (Nyl.) Zahlbr., *Bot. Mag. (Tokyo)* 41: 364 (1927). T: Antilles, West Indies, 390–700 m, 1868, *T.Husnot s.n.*; holo: H-NYL *n.v.*

For further synonymy, see Kurokawa (1962).

Illustrations: S.Kurokawa, *J. Jap. Bot.* 34: 118, fig. 2B (1959), as *Anaptychia isidiophora*; S.Kuokawa, *Beih. Nova Hedwigia* 6: pl. 5, fig. 27 (1962), as *A. isidiophora*; I.Yoshimura, *Lichen Fl. Japan in Colour* pl. 3, fig. 6 (1974), as *A. isidiophora*; T.D.V.Swinscow & H.Krog, *Macrolichens of East Africa* 95, fig. 43 (1988).

Thallus foliose, orbicular to irregularly spreading, loosely adnate, forming extensive colonies to 20 cm wide. Lobes 0.7–2.5 mm wide, ±plane, sublinear-elongate, dichotomously or irregularly branched, ±discrete to contiguous at the periphery, with short lateral lobes; apices not ascending, eciliate. Upper surface whitish grey, esorediate, isidiate; isidia marginal and

±laminal, cylindrical or occasionally somewhat flattened, simple to coralloid-branched. Medulla white. Lower surface corticate, white to greyish to pale brown near the centre. Rhizines numerous, concolorous with the thallus or becoming dark to brown-black towards the apices, irregularly branched, mainly marginal, forming a dense black mat. Apothecia rare, laminal, adnate to substipitate 1.5–5.0 mm wide; margin isidiate; disc concave, brown to brown-black, epruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 21–31 × 12–17 µm. Pycnidia immersed; conidia bacilliform, 4–6 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P–; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), 6α-acetoxyhopane-16β,22-diol (minor or trace), leucotylin (minor), 6α,16β-diacetoxyhopane-22-ol (minor or trace).

Occurs on bark and rock in coastal and hinterland forests of eastern Qld and N.S.W.; also in Central and South America, Africa, Asia and New Zealand.

Qld: Mt Baldy, 4 km SW of Atherton, *J.A.Elix 16291 & Streimann* (CANB); Wallicher Falls, Wooroonooran Natl Park, 35 km W of Innisfail, *J.A.Elix 44480* (CANB). N.S.W.: Hakea Walk, Washpool Natl Park, Gibraltar Ra., 78 km E of Glen Innes, *J.A.Elix 37301* (CANB).

This species is characterised by the laminal and marginal, simple to coralloid-branched isidia, the corticate lower surface with concolorous to brown-black rhizines and the presence of atranorin and triterpenes.

18. **Heterodermia isidiophorella** Elix, *Australas. Lichenol.* 69: 13 (2011)

T: Mount Windsor Tableland, 45 km NW of Mossman, Qld, 16°15'S, 145°01'E, alt. 1200 m, on *Flindersia* in stunted, open rainforest, 26 June 1984, *J.A.Elix 16465 & H.Streimann*; holo: CANB.

Illustration: J.A.Elix, *op. cit.* 21, fig. 2.

Thallus small-foliose, orbicular to irregularly spreading, adnate, 2–5 cm wide. Lobes 0.15–0.5 mm wide, ±plane, sublinear-elongate, dichotomously or irregularly branched, ±discrete to contiguous at the periphery, with short lateral lobes; apices not ascending, eciliate. Upper surface whitish grey, isidiate; isidia laminal and marginal, cylindrical, simple to sparingly branched, eventually becoming granular and appearing sorediate. Medulla white. Lower surface corticate, white to pale tan or brown near the centre. Rhizines white, concolorous with the thallus or becoming pale to dark brown towards the apices, simple to irregularly branched, numerous, mainly marginal, 0.5–1.0 mm long, ±projecting beyond the lobe margin. Apothecia not seen. Pycnidia immersed; conidia bacilliform, 4–6 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P–; containing atranorin (major), zeorin (major), 6α-acetoxyhopane-16β,22-diol (major), leucotylin (minor or trace), 16β-acetoxyhopane-6α,22-diol (trace), 6α-acetoxy-16β,22-dihydroxyhopane-25-oic acid (trace).

This endemic species occurs on bark, twigs and, rarely, on rocks in coastal and hinterland forests of eastern Qld and N.S.W.

Qld: along Plath Rd, Hugh Nelson Ra., 15 km S of Atherton, *J.A.Elix 16357 & H.Streimann* (CANB); Walter Hill Ra., 26 km SE of Ravenshoe, *J.A.Elix 17060 & H.Streimann* (CANB). N.S.W.: Brisbane Water Natl Park, overlooking Woy Woy, *J.A.Elix 761* (CANB).

Heterodermia isidiophorella is characterised by the diminutive thallus with very narrow lobes, the cylindrical, simple to sparingly branched isidia that become granular with age, the corticate lower surface with white to brown rhizines and the presence of atranorin and triterpenes.

19. **Heterodermia japonica** (Sato) Swinscow & Krog, *Lichenologist* 8: 122 (1976)

Anaptychia dendritica var. *japonica* Sato, *J. Jap. Bot.* 12: 427 (1936); *Anaptychia japonica* (Sato) Kurok., *Beih. Nova Hedwigia* 6: 58 (1962). T: Mingestu, Mt Arisan, Taiwan, 24 Jan. 1936, *M.Sato* (*Taiwan 10*); holo: TI *n.v.*

Anaptychia dendritica var. *propagulifera* Vain., *Philipp. J. Sci.*, sect. C, 8: 107 (1913); *Anaptychia subheterochroa* var. *propagulifera* (Vain.) Kurok., *J. Jap. Bot.* 35: 241 (1960); *Heterodermia dendritica* var.

propagulifera (Vain.) Poelt, *Nova Hedwigia* 9: 31 (1965); *Heterodermia propagulifera* (Vain.) Dey, *in* Parker & Roane, *Dist. Hist. Biota S. Appal.* 4: 403 (1977). T: Baguio, Benguet, Philippines, alt. 150 m, May 1911, *C.H.Robinson 14071*; holo: TUR-VAIN *n.v.*; iso: BM, FH *n.v.*

Illustrations: I.Yoshimura, *Lichen Fl. Japan in Colour* pl. 3, fig. 10 (1974), as *Anaptychia japonica*; J.C.Lendemer, *Opusc. Philolich.* 6: 21, pl. 10, figs 1–5 (2009); F.Schumm & A.Aptroot, *Seychelles Lichen Guide* 175 (2010).

Thallus foliose, rarely orbicular, usually irregularly spreading, loosely adnate, to 5 cm wide, often coalescing to form colonies up to 15 cm wide. Lobes 0.7–2.0 mm wide, to c. 2–4 (–5) mm wide at the tips, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously branched, radiating; apices ascending, usually discrete, ±lobulate along the lobe margins, the lobules ±rounded or sparingly branched, 0.3–0.8 mm wide, rarely with small soralia, eciliate. Upper surface greenish white, whitish to pale grey, sorediate; soredia farinose to granular, in labriform to capitate soralia on lateral and terminal lobes, occasionally spreading along lobe margins. Medulla white. Lower surface ecorticate, arachnoid, white to violet-black in the centre; yellow pigments absent. Rhizines marginal, black, simple or squarrosely branched, 1–3 (–7) mm long. Apothecia very rare, laminal, substipitate, 1–8 mm wide; margin lobulate, the lobules ecorticate, partly yellow on the lower surface, apically sorediate; disc concave, dark brown to brown-black, ±thinly grey-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 2 or 3 small sporoblastidia, 40–45 × 20–23 µm. Pycnidia common, immersed, then becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P–; containing atranorin (major), zeorin (major), japonin (major), 16β-acetoxyhopane-6α,22-diol (trace), 6α-acetoxy-22-hydroxyhopane-25-oic acid (trace), anaptychin 5 (minor).

Occurs on bark, dead wood and on rocks in coastal and hinterland forests of southern and eastern Australia (W.A., S.A., Qld, N.S.W., Vic. and Tas.). A pantropical and pantemprate species.

W.A.: track to Hayward Peak, 22 km ESE of Mt Barker, Porongurup Natl Park, Porongurup Ra., *J.A.Elix 41430* (B, CANB). S.A.: Hindmarsh Falls, Hindmarsh R., 12 km NNW of Victor Harbor, *H.Streimann 54835* (CANB). N.S.W.: Boonoo Boonoo Natl Park, 34.5 km NE of Tenterfield, *J.A.Elix 38297* (CANB). Vic.: trail to Venus Bath, 2 km SW of Halls Gap, Grampians, *J.A.Elix 11536a* (CANB). Tas.: Bluff Hill, *G.Kantvilas 122/86A* (CANB).

This species is characterised by the sorediate upper surface, ±radiating lobe apices, the absence of a lower cortex, the white to blackish violet lower surface, ascospores with sporoblastidia and the presence of atranorin and triterpenes.

20. Heterodermia koyana (Kurok.) Elix, *Australas. Lichenol.* 66: 61 (2010)

Anaptychia dissecta var. *koyana* Kurok., *J. Jap. Bot.* 34: 183 (1959); *Heterodermia dissecta* var. *koyana* (Kurok.) D.D.Awasthi, *Geophytology* 3: 113 (1973). T: Mt Koya, Prov. Kii, Japan, *S.Kurokawa s.n.*; holo: TNS *n.v.*; iso: TNS, US *n.v.*

Thallus foliose, orbicular to irregularly spreading, loosely adnate, 5–10 cm wide. Lobes 0.7–2.0 mm wide, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously to subdigitately branched; apices not ascending, ±discrete to contiguous at the periphery, with short lateral lobes, eciliate. Upper surface grey-white to grey, epruinose, with marginal phyllidiate isidia or dorsiventral lobules, rarely becoming granular; marginal lobules occasionally minutely dissected, rarely granular near the tips, or the entire lobule becoming granular and appearing sorediate. Medulla white. Lower surface corticate, white to greyish or pale brown in the centre. Rhizines numerous, mainly marginal, concolorous with the thallus or darkening and forming a dense black marginal mat, irregularly branched. Apothecia very rare, laminal, sessile to substipitate, 1–5 mm wide; margin lobulate-isidiate; disc concave, brown to brown-black, epruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 28–32 × 12–16 µm. Pycnidia initially immersed, then becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P–; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), 6α-acetoxyhopane-16β,22-diol (trace), leucotylin (minor), dissectic acid (minor).

Occurs on rocks and trees in montane forest in north-eastern Qld and north-eastern N.S.W.; also in Central America, India and Japan.

Qld: Mt Baldy, 4 km SW of Atherton, *J.A.Elix 16308 & H.Streimann* (CANB). N.S.W.: Jerusalem Creek Falls, Chichester State Forest, 19 km NNE of Dungog, *H.Streimann 38254* (CANB).

Characterised by the minutely dissected marginal lobules and/or phyllidiate isidia, the corticate lower surface, the presence of dissectic acid but the absence of norstictic acid. *Heterodermia dissecta* is morphologically very similar, but it contains additional norstictic acid and more commonly develops granular-sorediate phyllidiate isidia.

21. **Heterodermia koyanoides** Elix, *Australas. Lichenol.* 69: 14 (2011)

T: Mt Baldy, 4 km SW of Atherton, Qld, 17°16'S, 145°23'E, alt. 1080 m, on sapling along margin of regrowth rainforest, 25 June 1984, *J.A.Elix 16308 & H.Streimann*; holo: CANB.

Illustration: J.A.Elix, *op. cit.* 21, fig. 3.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, 5–10 cm wide. Lobes 0.7–2.0 mm wide, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously to subdigitately branched, ±discrete to contiguous at the periphery, with short lateral lobes; apices not ascending, eciliate. Upper surface whitish grey, sorediate; soralia marginal and at the apices of the lateral lobes, capitate, 0.5–1.2 mm wide; soredia granular. Medulla white. Lower surface corticate, white to greyish or pale brown in the centre. Rhizines numerous, predominantly marginal, concolorous with the thallus, ±irregularly branched, 0.3–1.0 mm long, ±projecting beyond the lobe margin. Apothecia and pycnidia not seen.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P+ yellow; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), leucotylin (minor), 6α-acetoxyhopane-16β,22-diol (trace), 6α-acetoxy-16β,22-dihydroxyhopane-25-oic acid (trace or absent), dissectic acid (major or minor).

This very rare, endemic, corticolous lichen is known only from the type locality in montane forest in north-eastern Qld.

This species is characterised by the corticate lower surface, the capitate soralia at the lobe margins and the apices of short lateral lobes, the absence of dissected marginal phyllidia and the presence of zeorin, dissectic acid and 16β-acetoxyhopane-6α,22-diol in the medulla.

22. **Heterodermia lepidota** Swinscow & Krog, *Lichenologist* 8: 122 (1976)

T: Mt Moroto, near Sogolomon, Matheniko County, Karamoja District, Uganda, 02°30'N, 34°45'E, alt. 2500 m, June 1970, *T.D.V.Swinscow 2U 36/12*; holo: BM *n.v.*; iso: O, MAK *n.v.*

Illustration: T.D.V.Swinscow & H.Krog, *op. cit.* 123, pl. 2A, B.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, forming extensive colonies to 20 cm wide. Lobes 0.7–2.5 mm wide, ±plane, sublinear, subdichotomously to irregularly branched, ±discrete to contiguous at the periphery, with short lateral lobes; apices not ascending, eciliate. Upper surface whitish grey, phyllidiate; phyllidia marginal and ±laminal, simple to dissected, ecorticate on the lower surface. Medulla white. Lower surface corticate, white to greyish to pale brown near the centre. Rhizines concolorous with the thallus or becoming dark brown to brown-black towards the apices, simple to sparingly branched, mainly marginal. Apothecia rare, laminal, adnate to substipitate 0.5–2.0 mm wide; margin crenulate to phyllidiate; disc concave, brown to brown-black, epruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 24–33 × 12–17 µm. Pycnidia immersed; conidia bacilliform, 4–6 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P–; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), 6α-acetoxyhopane-

16β,22-diol (minor or trace), leucotylin (minor), 6α,16β-diacetoxyhopane-22-ol (minor or trace).

Very rare on bark in coastal and hinterland forests of eastern N.S.W.; also in East Africa, Thailand, the Galapagos Islands and Venezuela.

N.S.W.: Sugarloaf Ck, Misty Mountain Rd, Currowan S.F., *J.A.Elix 21564* (CANB).

Characterised by the simple to dissected phyllidia, the corticate lower surface with pale to black rhizines and the presence of atranorin and triterpenes.

23. **Heterodermia leucomela** (L.) Poelt, *Nova Hedwigia* 9: 31 (1965)

Lichen leucomelos L., *Sp. Pl.*, 2nd edn, 2: 1613 (1763); *Parmelia leucomela* (L.) Ach., *Methodus* 256 (1803); *Physcia leucomelos* (L.) Michx., *Fl. Bor.-Amer.* 2: 326 (1803); *Borrera leucomela* (L.) Ach., *Lichenogr. Universalis* 499 (1810); *Anaptychia leucomelaena* (L.) A.Massal., *Mem. Lichenogr.* 35 (1853). T: America meridionalis [South America]; holo: LINN *n.v.*

Parmelia leucomela var. *angustifolia* Meyen & Flot., *Nova Actorum Acad. Caes. Leop.-Carol. Nat. Cur.* 19, Suppl.: 221, tab. 3, fig. 6 (1843); *Anaptychia leucomelaena* var. *angustifolia* (Meyen & Flot.) Müll.Arg., *Bot. Jahrb. Syst.* 20: 249 (1894). T: St. Christoval, near Lima, Peru, 6000–8000 ft; the illustration in Meyen & Flotow (1843) *n.v.*

Parmelia leucomela var. *angustifolia* f. *multifida* Meyen & Flot., *Nova Actorum Acad. Caes. Leop.-Carol. Nat. Cur.* 19, Suppl.: 221, tab. 3, fig. 7 (1843); *Anaptychia leucomelaena* var. *multifida* Vain., *Acta Soc. Fauna Fl. Fenn.* 7: 128 (1890). T: St. Christoval, near Lima, Peru, 6000–8000 ft; the illustration in Meyen & Flotow (1843) *n.v.*

Parmelia ophioglossa Taylor, *London J. Bot.* 6: 172 (1847); *Anaptychia leucomelaena* var. *ophioglossa* (Taylor) Zahlbr., *Cat. Lich. Univ.* 7: 733 (1931); *Anaptychia ophioglossa* (Taylor) Kurok., *J. Jap. Bot.* 35: 354 (1960). T: Monterrey, California, U.S.A., *Beechey*; holo: FH *n.v.*; iso: G, K *n.v.*

Physcia leucomela f. *albociliata* Nyl., *Ann. Sci. Nat., Bot.*, sér. 4, 19: 309 (1863); *Anaptychia leucomelaena* f. *albociliata* (Nyl.) Hue, *Nouv. Arch. Mus. Hist. Nat.*, sér. 4, 1: 107 (1899); *Anaptychia ophioglossa* f. *albociliata* (Nyl.) Kurok., J. Jap. Bot. 35: 357 (1960); *Heterodermia leucomela* f. *albociliata* (Nyl.) D.D.Awasthi, *Geophytology* 3: 114 (1973). T: Colombia, *Lindig 2508*; holo-H-NYL *n.v.*; iso: FH, G, K, M, PC, S *n.v.*

Anaptychia leucomelaena f. *verruculifera* Kurok., *Beih. Nova Hedwigia* 6: 76 (1962); *Heterodermia verruculifera* (Kurok.) W.A.Weber, *Mycotaxon* 13: 102 (1981). T: N of Berriozábal, Chiapas, Mexico, alt. 920 m, 22 Mar. 1960, *M.E.Hale 20160*; holo: US *n.v.*

For further synonymy, see Kuokawa (1962).

Illustrations: .T.D.V.Swinscow & H.Krog, *Macrolichens of East Africa* 96, fig. 44 (1988), as *H. leucomelos* subsp. *leucomelos*; I.M.Brodo, S.D.Sharnoff & S.Sharnoff, *Lichens of North America* 339, fig. 364 (2001); R.Moberg, *Biblioth. Lichenol.* 88: 457, fig. 2 (2004).

Thallus foliose to subfruticose, often in loose rosettes or forming tangled mats, loosely adnate or, in part, unattached, 5–15 cm wide. Lobes 0.5–4.0 mm wide, separate, ±plane, linear-elongate, ribbon-like, tangled, dichotomously branched, often ascending at the apices or, occasionally, the apices reflexed, with conspicuous long, grey to black simple or squarrosely branched cilia 5–15 mm long. Upper surface ivory to grey-white, smooth, epruinose. Medulla white. Lower surface predominantly ecorticate, but with thickened corticated margins, canaliculate, arachnoid or powdery and then becoming sorediate, often with subapical soralia, white throughout or partially pinkish brown or, rarely, purple; yellow pigments absent. Apothecia rare, subapical to apical, sessile to substipitate, 2–5 mm wide; margin crenulate to lobulate, the lobules to 3 mm long, often with sparse short black cilia along the margins of phyllidia; disc concave, dark brown to black, ±thinly white-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with numerous small or large sporoblastidia, 31–50 × 15–24 µm. Pycnidia rare, immersed, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow then red, C–, P+ dark yellow; containing atranorin (major), zeorin (major), japonin (minor or trace), salazinic acid (minor), consalazinic acid (trace), anhydrofusarubin lactol (minor or trace).

Occurs on bark and more rarely on mossy rocks in coastal and hinterland forests of north-eastern Qld; widespread in tropical to warm-temperate regions.

Qld: Lynches Crater, Atherton Tableland, 14 Aug. 1970, *E.Dahl* (CANB); between Millaa Millaa and Ravenshoe, *D.McVean 6387* (CANB).

Heterodermia leucomela is characterised by the tangled mass of elongate, linear lobes with long black marginal cilia, the ecorticate lower surface with thickened, corticate margins and subapical soralia and the presence of atranorin, zeorin and salazinic acid.

24. Heterodermia microphylla (Kurok.) Swinscow & Krog, *Lichenologist* 8: 132 (1976)

Anaptychia hypoleuca var. *microphylla* Kurok., *J. Jap. Bot.* 34: 123 (1959); *Anaptychia microphylla* (Kurok.) Kurok., *Beih. Nova Hedwigia* 6: 44 (1962). T: Sakakita-mura, Higashi-Tikuma-gun, Prov. Shinano, Japan, 28 July 1953, *Yamazaki s.n.*; holo: TNS; iso: TNS *n.v.*

Illustrations: S.Kurokawa, *J. Jap. Bot.* 34: 118, fig. 3 (1959), as *Anaptychia hypoleuca* var. *microphylla*; I.Yoshimura, *Lichen Fl. Japan in Colour* pl. 3, fig. 8 (1974), as *A. microphylla*.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, 5–15 cm wide. Lobes 0.5–2.0 mm wide, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously to subdigitately branched; apices not ascending, ±discrete to contiguous at the periphery, with short lateral lobes, eciliate. Upper surface grey-white to grey, epruinose, with marginal dorsiventral lobules, rarely also laminal, usually minutely dissected, often granular near the tips, or entire phyllidia becoming granular and appearing sorediate. Medulla white. Lower surface ecorticate, white to greyish or pale brown in the centre. Rhizines numerous, mainly marginal, concolorous with the thallus or darkening and forming a dense marginal mat, irregularly branched. Apothecia rare, laminal, sessile to substipitate, 3–5 mm wide; margin phyllidiate, the phyllidia becoming ±sorediate; disc concave, brown to brown-black, epruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 25–35 × 12–18 µm. Pycnidia initially immersed, becoming emergent, visible as black dots; conidia bacilliform, 3–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P+ pale yellow; containing atranorin (major), zeorin (major), aipolic acid (trace), 6α-acetoxyhopane-16β,22-diol (trace), japonin (trace), 6α-acetoxy-16β,22-dihydroxyhopane-25-oic acid (minor), ±16β-acetoxyhopane-6α,22-dihydroxyhopane-25-oic acid (trace), anaptychin 1 (trace).

Known from rocks and trees in coastal and montane forests of eastern Qld and N.S.W. Also in East Africa, South Africa, South, South-east and East Asia and New Zealand.

Qld: Clarke Ra., 46 km SSW of Proserpine, *J.A.Elix 20881 & H.Streimann* (CANB). N.S.W.: 4 km E of Robertson, Central Tablelands, *J.A.Elix 8893* (CANB).

This species is characterised by the minutely dissected marginal phyllidia, the ecorticate lower surface, the *Pachysporaria*-type ascospores and the presence of atranorin and the *japonica* chemosyndrome of triterpenes.

25. Heterodermia neglecta Lendemer, R.C.Harris & E.Tripp, *Bryologist* 110: 490 (2007)

T: trail to Sunset Rock, Ravenel Park, Highlands, Macon County, North Carolina, U.S.A., 35°02'49"N, 83°11'20"W, on *Quercus*, in *Rhododendron*-hemlock-hardwood forest, *J.C.Lendemer et al. 6999*; holo: NY *n.v.*: iso: CANB; iso: B, DUKE, MIN, TNS, UCR, Herb. Lendemer *n.v.*

[?*Heterodermia dendritica auct. non* (Pers.) Poelt: N.Sammy, *Mycotaxon* 35: 421, 1989, *p.p.*]

Illustrations: J.C.Lendemer, R.C.Harris & E.A.Tripp, *op. cit.* 491, figs 1, 3, 5 (2007); J.C.Lendemer, *Opusc. Philolich.* 6: 22, pl. 11, figs 1, 2, 4, 5 (2009).

Thallus foliose, usually irregularly spreading, rarely orbicular, loosely adnate, to 5 cm wide, but often coalescing to form colonies up to 15 cm wide. Lobes 0.7–2.0 mm wide, to c. 2–4 (–5) mm wide at the tips, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously branched, radiating; apices ascending, usually discrete, ±lobulate along the lobe margins, the lobules ±rounded or sparingly branched, 0.3–0.8 mm wide, eciliate. Upper surface greenish white, whitish to pale grey or blue-grey, sorediate; soredia farinose to granular, in labriform soralia on the lower surface of apices of lateral or terminal lobes, sometimes spreading along lobe margins. Medulla white. Lower surface ecorticate, arachnoid, white, partly yellow-orange- to orange-spotted, becoming dirty brown centrally as

pigmented hyphae age, occasionally dark brown to almost black. Rhizines marginal, black, simple or squarrosely branched, 1–3 (–7) mm long. Apothecia very rare, laminal, sessile to substipitate, 1–6 mm wide; margin sorediate; disc concave, dark brown to brown-black, ±thinly grey-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 2 or 3 small sporoblastidia, 35–45 × 15–23 µm. Pycnidia common, initially immersed, becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow then red, C–, P+ dark yellow; pigmented medulla K+ red; containing atranorin (major), zeorin (major), japonin (major), 6α-acetoxy-16β,22-dihydroxyhopane-25-oic acid (trace), anaptychin-5 (minor), norstictic acid (major), salazinic acid (minor), dissectic acid (trace), hybocarpone (minor), norhybocarpone (trace), chloroatranorin (trace), 7-chloroemodin (trace), anaptychin-1 (trace).

Occurs on bark and, more rarely, on mossy rocks in coastal and hinterland forests of eastern Qld and N.S.W.; also in eastern North America and East Africa.

Qld: Cooroo L.A., 16 km WNW of Innisfail, *J.A.Elix 16701 & H. Streimann* (CANB). N.S.W.: Shelleys Beach Reserve, Port Macquarie, *J.A.Elix 1078* (CANB); Long Beach, 3 km E of Batemans Bay, *J.A.Elix 2949* (CANB).

Characterised by the sorediate lobe apices, the absence of a lower cortex, the yellow- to orange-spotted lower surface, ascospores with sporoblastidia, and the presence of atranorin, norstictic acid, salazinic acid and triterpenes.

26. Heterodermia obscurata (Nyl.) Trevis., *Nuovo Giorn. Bot. Ital.* 1: 114 (1869)

Physcia obscurata Nyl., *Ann. Sci. Nat., Bot.,* sér. 4, 19: 310 (1863); *Heterodermia speciosa* var. *obscurata* (Nyl.) Trevis., *Atti Soc. Ital. Sci. Nat. Milano* 11: 614 (186); *Anaptychia obscurata* (Nyl.) Vain., *Acta Soc. Fauna Fl. Fenn.* 7: 137 (1890). T: *s. loc.*, Colombia, alt. 2900 m, *Lindig 704*: holo-H-NYL *n.v.*

For further synonymy, see S.Kuokawa (1962).

Illustrations: I.Yoshimura, *Lichen Fl. Japan in Colour* pl. 3, fig. 9 (1974), as *Anaptychia obscurata*; T.D.V.Swinscow & H.Krog, *Macrolichens of East Africa* 98, fig. 45 (1988); I.M.Brodo, S.D.Sharnoff & S.Sharnoff, *Lichens of North America* 340, fig. 365 (2001); R.Moberg, *Biblioth. Lichenol.* 88: 460, fig. 4 (2004); J.C.Lendemer, *Opusc. Philolich.* 6: 22, pl. 11, fig. 3 (2009).

Thallus foliose, orbicular to irregularly spreading, loosely adnate, to 5 cm wide, but often coalescing to form colonies up to 15 cm wide. Lobes 0.7–2.0 mm wide, c. 2–4 mm wide at the tips, plane to convex, sublinear-elongate, dichotomously to irregularly branched, radiating; apices not ascending, contiguous to discrete, with short lateral lobes, eciliate. Upper surface grey-white to greenish white, ±partly blackened in the centre, sorediate; soredia farinose to granular, in labriform to capitate soralia at the apices of lateral and terminal lobes, rarely spreading along lobe margins. Medulla white; lower medulla dark yellow to orange-brown. Lower surface ecorticate, arachnoid, dark yellow to orange-brown. Rhizines marginal, black, simple or squarrosely branched, 1–2 mm long. Apothecia rare, laminal, sessile to substipitate, 1–5 mm wide; margin initially crenulate, then sorediate; disc concave, dark brown to brown-black, epruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 2 or 3 small sporoblastidia, 25–35 × 15–19 µm. Pycnidia common, initially immersed, becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P–; lower surface K+ violet; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), leucotylin (minor), 7-chloroemodin (minor), flavo-obscurins A, B1, B2 (minor), 5,7-dichloroemodin (trace), AO-1 anthrone (trace), AO-2 anthrone (trace), emodin (minor).

Common on bark, dead wood and on rocks in coastal and hinterland forests of southern and eastern Australia (W.A., S.A., Qld, N.S.W., A.C.T., Vic. and Tas.); also in Europe, North, Central and South America, Africa, Asia and New Zealand.

W.A.: Mt Chudalup, 17 km SSE of Northcliffe, *J.A.Elix 41182, H.T.Lumbsch & H.Streimann* (CANB). S.A.: mouth of De Male R., 18 km SSE of Cape Borda, Kangaroo Is., *H.Streimann 55060* (CANB). Qld: Robinson Gorge, Expedition Natl Park, 73 km NW of Taroom, *J.A.Elix 35247* (CANB). N.S.W.: Whoota Whoota Hill, Wallingat S.F., 13 km SSW of Forster, *J.A.Elix 24653* (CANB). A.C.T.: Gudgenby River

Gorge, 4.5 km S of Tharwa, *J.A.Elix 10903* (CANB). Vic.: Cape Conran, 18 km E of Marlo, *J.A.Elix 5291* (CANB). Tas.: Boat Harbour, 10 km NW of Wynyard, *J.A.Elix 23817* (CANB).

Thi slichen is characterised by the sorediate lobe apices, the absence of a lower cortex, the dark yellow to orange-brown (K+ violet) lower surface, sporoblastidiate ascospores and the presence of atranorin, anthraquinones and triterpenes.

27. **Heterodermia podocarpa** (Bél.) D.D.Awasthi, *Geophytology* 3: 114 (1973)

Parmelia podocarpa Bél., *Voy. Indes Orient.*, Bot. 2, Crypt.: 122, pl. 13, fig. 1 (1834); *Anaptychia podocarpa* (Bél.) A.Massal., *Atti Reale Ist. Veneto Sci. Lett. Arti*, ser. 3, 5: 249 (1860). T: Sainte-Suzanne, Île Bourbon [Réunion], pl. 13, fig. 1 of Bélanger (1834); by the Forestry House, Amani, Usambara Mtns, Tanga Prov., Tanzania, 05°07'S, 38°38'E, alt. 900 m, on *Mangifera indica*, 10 Jan. 1971, *R.Moberg 1491e*; epi: UPS *n.v. fide* R.Moberg & T.H.Nash III, *Bryologist* 102: 9 (1999).

[*Physcia barbifera auct. non* Nyl.: F.M.Bailey, *Pap. & Proc. Roy. Soc. Tasmania* 1880–1881: 37, 1881]

Illustrations: T.D.V.Swinscow & H.Krog, *Macrolichens of East Africa* 99, fig. 46 (1988); R.Moberg & T.H.Nash III, *op. cit.* 10, fig. 11.

Thallus foliose to subfruticose, forming small rosettes or irregularly spreading, adnate to loosely adnate, 2–5 cm wide. Lobes 0.5–3.0 mm wide, sublinear, convex, irregularly branched, suberect or ascending at the apices, partially imbricate, discrete to contiguous, ciliate, with whitish simple cilia 1–2 mm long scattered along the margins, not mat-forming. Upper surface greyish white or grey, epruinose; soredia and isidia absent. Medulla white. Lower surface ecorticate, arachnoid, ±canaliculate, whitish. Rhizines simple or irregularly branched, whitish, 1–2 mm long. Apothecia common, substipitate to stipitate, 1–5 mm wide, subterminal on ascending lobes; margin crenate or with well-developed squamules, eciliate; disc brown to dark brown, often white-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 2 or 3 small sporoblastidia, 36–51 × 17–25 µm. Pycnidia common, immersed. then becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow then red, C–, P+ orange; yellow pigment on lower surface K+ violet; containing atranorin (major), zeorin (major), 6α-acetoxyhopane-16β,22-diol (minor), 6α-acetoxy-16β,22-dihydroxyhopane-25-oic acid (trace), leucotylin (trace), norstictic acid (major), connorstictic acid (minor), ±salazinic acid (minor).

Very rare on bark in montane forest in north-eastern Qld; also in Asia, North, Central and South America, Africa and Asia.

Qld: Mobo Ck, 21 km NE of Atherton, *H.Streimann 16951* (CANB).

Characterised by the ascending or suberect lobes with white marginal cilia, the subterminal, substipitate or stipitate apothecia, eciliate apothecial margins, the white, ecorticate lower surface, ascospores with sporoblastidia, and the presence of atranorin, zeorin and norstictic acid.

28. **Heterodermia pseudospeciosa** (Kurok.) W.L.Culb., *Bryologist* 69: 484 (1967)

Anaptychia pseudospeciosa Kurok., *Beih. Nova Hedwigia* 6: 25 (1962). T: Amagi Pass, Suisyoti, Prov. Izu, Japan, 20 Aug. 1956, *Y.Asahina*, *Lich. Jap. Exs.* No. 203; holo: TNS; iso: TNS, US *n.v.*

Illustrations: I.Yoshimura, *Lichen Fl. Japan in Colour* pl. 3, fig. 4 (1974), as *Anaptychia pseudospeciosa*; S.L.Thrower, *Hong Kong Lichens* 110 (1988); J.C.Lendemer, *Opusc. Philolich.* 6: 27, pl. 12, figs 1, 2 (2009).

Thallus foliose, orbicular to irregularly spreading, adnate to loosely adnate, 2–5 cm wide. Lobes 0.7–1.5 mm wide, plane to weakly convex, sublinear-elongate, dichotomously to subdigitately branched, usually discrete at the periphery, radiating; apices not ascending, minutely notched, eciliate. Upper surface greyish white to grey to brownish grey, ±darker at the lobe tips, pruinose or not, sorediate; soredia white to bluish grey, in subcapitate soralia at the apices of short lateral branches. Medulla white. Lower surface corticate, whitish to pale brown, rarely dark grey in the centre. Rhizines sparse, marginal, concolorous with the thallus or becoming dark or black near the apices, irregularly branched, to 1 mm long. Apothecia rare, laminal, adnate to sessile, 1–3 mm wide; margin initially crenulate, later sorediate; disc

concave, brown to brown-black, epruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 26–32 × 12–14 µm. Pycnidia immersed or slightly protruding; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow then red, C–, P+ dark yellow; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), leucotylin (minor), 6α-acetoxyhopane-16β,22-diol (trace), norstictic acid (major), connorstictic acid (minor), salazinic acid (trace).

This species occurs on bark and, more rarely, on mossy rocks in coastal and hinterland forests in eastern Qld and N.S.W.; also in North, Central and South America, Africa, Asia and New Zealand.

Qld: Mt Baldy, 4 km SW of Atherton, *J.A.Elix 16257 & H.Streimann* (CANB). N.S.W.: Currowan S.F., 12 km W of Nelligen, *J.A.Elix 3573a* (CANB).

This lichen is characterised by the sorediate lobe apices, the corticate lower surface, *Pachysporaria*-type ascospores and the presence of atranorin, zeorin and norstictic acid.

29. Heterodermia queenslandica Elix, *Australas. Lichenol.* 67: 5 (2010)

T: Mt Baldy, 4 km SW of Atherton, Qld, 17°17'S, 145°27'E, alt. 1080 m, on sapling along margin of regrowth rainforest, 25 June 1984, *J.A.Elix 16310 & H.Streimann*; holo: CANB.

[?*Heterodermia hypoleuca auct. non* (Ach.) Trevis.: R.B.Filson, *Fl. Australia, Supp. Ser.* 7: 55, 1996]

Illustration: J.A.Elix, *op. cit.* 9, fig. 2.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, to 8 cm wide. Lobes 0.5–2.0 mm wide, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously to subdichotomously branched, radiating; apices plane to subascending, usually discrete, with small lateral lobules, eciliate; isidia and soredia absent. Upper surface greenish white, whitish or grey, epruinose. Medulla white. Lower surface ecorticate, whitish to pale brown or, rarely, purple-black in the centre. Rhizines predominantly marginal or submarginal, pale grey to black, ±densely squarrosely branched, 1.0–4.5 mm long. Apothecia laminal, substipitate to stipitate, 2.5–5.5 mm wide; margin densely lobulate, the lobules to 2.5 mm long and 2 mm wide; disc concave, pale to dark brown, epruinose or sparsely grey-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 0–3 small sporoblastidia, 40–45 × 20–24 µm. Pycnidia common, immersed, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow then red, C–, P+ yellow-orange; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), leucotylin (hopane-6α, 16β,22-triol) (major), 6α-acetoxyhopane-16β,22-diol (minor), norstictic acid (major), salazinolide (major), consalazinolide (minor), salazinic acid (trace), dissectic acid (trace), connorstictic acid (trace), salazinic acid (trace).

Endemic to north-eastern Qld; rare on bark in montane rainforest.

Qld: between Millaa Millaa and Ravenshoe, *D.McVean 63109* (CANB).

This lichen is characterised by the narrow, sublinear-elongate lobes with an ecorticate lower surface, the absence of soredia and isidia, marginal lobules and the presence of atranorin, zeorin, norstictic acid, salazinolide and consalazinolide.

30. Heterodermia reagens (Kurok.) Elix, *Australas. Lichenol.* 67: 6 (2010)

Anaptychia japonica var. *reagens* Kurok., *J. Jap. Bot.* 35: 354 (1960). T: Mt Kintoki, Hakone, Sagami Prov., Japan, 26 Apr. 1958, *S.Kurokawa 58064*; holo: TNS *n.v.*: iso M, TNS, US *n.v.*

Illustration: S. Kurokawa, *J. Jap. Bot.* 35: 359, pl. 2a (1960).

Thallus foliose, usually irregularly spreading, rarely orbicular, loosely adnate, to 5 cm wide, but often coalescing to form colonies up to 15 cm wide. Lobes 0.7–2.0 mm wide, to c. 2–4 (–5) mm wide at the tips, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously branched, radiating; apices ascending, usually discrete, ±lobulate along the lobe margins, the lobules ±rounded or sparingly branched, 0.3–0.8 mm wide, eciliate, developing small soralia. Upper surface greenish white, whitish to pale grey, sorediate; soredia farinose to granular, forming labriform to capitate soralia on lateral or terminal

lobes, occasionally spreading along the lobe margin. Medulla white. Lower surface ecorticate, arachnoid, white to violet-black in the centre, lacking yellow pigments. Rhizines marginal, black, simple or squarrosely branched, 1–3 (–7) mm long. Apothecia very rare, laminal, substipitate, 1–8 mm wide; margin lobulate, the lobules ecorticate, partly yellow on the lower surface, apically sorediate; disc concave, dark brown to brown-black, ±thinly grey-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 2 or 3 small sporoblastidia, 40–45 × 20–23 µm. Pycnidia common, initially immersed, becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow then red, C–, P+ dark yellow; containing atranorin (major), zeorin (major), japonin (major), 16β-acetoxy-hopane-6α,22-diol (trace), 6α-acetoxy-22-hydroxyhopane-25-oic acid (trace), norstictic acid (minor), connorstictic acid (trace), ±salazinic acid (minor or trace), anaptychin-5 (minor), anaptychin-1 (trace).

This species occurs on bark and, more rarely, on mossy rocks in coastal and hinterland forests of southern and eastern Australia (W.A., Qld and N.S.W.); also in Central and South America, Africa and Asia.

W.A.: near summit of Nancys Peak, Porongorups Natl. Park, *N.Sammy 951354* (CANB, PERTH). Qld: 15 km NE of Yungaburra, along the Gillies Hwy, *J.A.Elix 2600* (CANB); track to Mt Lewis, Main Coast Ra., 19 km NNW of Mount Molloy, *J.A.Elix 16933* & *H.Streimann* (CANB). N.S.W.: near Brown Mtn lookout, Southern Tablelands, *J.A.Elix 1603* (CANB).

This lichen is characterised by the sorediate lobe apices, an ecorticate lower surface that lacks yellow pigments, ascospores with sporoblastidia, and the presence of atranorin, zeorin and norstictic acid. This is the depsidone-containing counterpart of *H. japonica*.

31. Heterodermia spathulifera Moberg & Purvis, *Symb. Bot. Upsal* 32(1): 192 (1997)

T: Furnas, St. Michel, Azores, on a tree in the park, 3 Apr. 1937, *H.Persson H2*; holo: UPS *n.v.*

Illustration: R.Moberg & W.Purvis, *loc. cit.* fig. 2.

Thallus foliose, forming small rosettes or irregularly spreading, tightly adnate, 2–4 cm wide. Lobes 0.5–1.2 mm wide, sublinear, ±broader at the tips, plane to weakly convex, irregularly branched, suberect or ascending, partially imbricate, discrete to contiguous, eciliate but with marginal rhizines visible from above, ±becoming lobulate in the thallus centre. Upper surface greyish white or yellowish grey, glossy, epruinose, sorediate; soralia labriform, occasionally to 5 mm wide, spathulate, in humid sites developing into lobules aggregating in the centre of the thallus. Medulla white. Lower surface ecorticate to indistinctly corticated, whitish at the margins, pale brown in the centre. Rhizines sparse, marginal, simple, concolorous with the thallus, darkening at the apices, 1–2 mm long, often extending beyond the lobe margins, rarely appearing as marginal cilia. Apothecia not seen in Australian material but reported to be very rare (Moberg & Nash, 2002). Ascospores *Pachysporaria*-type, ellipsoidal, 36–43 × 15–18 µm. Pycnidia not seen.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P– or P+ pale yellow; containing atranorin (major), zeorin (major), spathulin (major), 6α-acetoxyhopane-16β,22-diol (minor), leucotylin (trace), 6α-acetoxy-22-hydroxyhopane-25-oic acid (trace).

Known from bark and dead wood in coastal and hinterland forests of eastern Qld, N.S.W. and Vic.; also in North America, Macaronesia, eastern and southern Africa and New Zealand.

Qld: Best of All Lookout, Wunburra Ra., 4 km S of Springbrook, *J.A.Elix 2527* (CANB). N.S.W.: junction of Hickeys Creek Rd and Kempsey–Armidale road, 38 km NW of Kempsey, *J.A.Elix 44302* (CANB). Vic.: Club Terrace–Combienbar road, 6 km N of Club Terrace, East Gippsland, *J.A.Elix 19512* & *H.Streimann* (CANB).

Characterised by the narrow, glossy, firmly attached lobes with pale rhizines, large spathulate soralia and the distinctive chemistry.

32. Heterodermia speciosa (Wulfen) Trevis., *Atti Soc. Ital. Sci. Nat.* 11: 614 (1869)

Lichen speciosus Wulfen, *in* N.J. von Jacquin, *Collectanea* 3: 119 ('1789') [1791]; *Parmelia speciosa* (Wulfen) Ach., *Methodus* 198 (1803); *Anaptychia speciosa* (Wulfen) A.Massal., *Mem. Lichenogr.* 36 (1853); *Physcia speciosa* (Wulfen) Nyl., *Acta Soc. Linn. Bordeaux* 21: 307 (1856). T: Montis Calvariae, [Austria], *Wulfen*, *Collectanea* 3 t.7; lecto: *fide* R.Moberg, *Nordic Lichen Fl.* 2: 71 (2002); Tessin, 5 km S of Bellinzona, Switzerland, 1934, *G.Degelius*; epi: UPS *n.v.*, *fide* R.Moberg, *loc. cit.*

Illustrations: T.D.V.Swinscow & H.Krog, *Macrolichens of East Africa* 100, fig. 47 (1988); V.Wirth, *Die Flechten Baden-Württembergs*, 2nd edn 419 (1995); I.M.Brodo, S.D.Sharnoff & S.Sharnoff, *Lichens of North America* 340, fig. 366 (2001); J.C.Lendemer, *Opusc. Philolich.* 6: 27, pl. 12, figs 3–5 (2009).

Thallus foliose, orbicular to irregular, adnate to loosely adnate, 2–4 cm wide, often coalescing to form colonies up to 15 cm wide. Lobes 0.5–1.5 mm wide, plane to weakly convex, sublinear-elongate, often slightly broader towards the apices, dichotomously branched, ±discrete at the periphery, radiating; apices not ascending, minutely notched, with short lateral lobes, eciliate. Upper surface greyish white to grey, ±darker at the lobe tips, rarely pruinose, sorediate; soredia greyish to blue-grey, farinose to ±granular, forming labriform to subcapitate soralia at the tips of the short lateral lobes. Medulla white. Lower surface corticate, whitish to pale brown, rarely dark grey in the centre. Rhizines sparse, marginal and laminal, concolorous with the thallus or blackening, irregularly branched, to 1 mm long. Apothecia rare, laminal, sessile to substipitate, 3–8 mm wide; margin crenulate at first, subsequently sorediate; disc concave, brown to brown-black, epruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 25–37 × 14–18 µm. Pycnidia immersed or slightly protruding; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P– or P+ pale yellow; containing atranorin (major), zeorin (major), 6α-acetoxyhopane-16β,22-diol (minor), 6α-acetoxy-22-hydroxyhopane-25-oic acid (minor or trace), 6α-acetoxy-16β,22-dihydroxy-hopane-25-oic acid (minor), leucotylin (trace).

Scattered on rocks and trees in southern W.A. and eastern Qld and N.S.W.; also in Europe, North and South America, Africa, Asia, New Zealand.

W.A.: Ludlow Tuart Reserve, 8 km E of Busselton, *J.A.Elix 10735 & L.H.Elix* (CANB). Qld: Rainforest Motel grounds, 2.5 km S of Tolga, Atherton Tableland, *J.A.Elix 44640* (CANB). N.S.W.: Diehard Ck, Mann River Nature Reserve, 50 km E of Glen Innes, *J.A.Elix 37059* (CANB).

This lichen is characterised by the striking contrast between the blue-grey soralia and the paler thallus, and the presence of a lower cortex.

33. Heterodermia stellata (Vain.) W.A.Weber, *Mycotaxon* 13: 102 (1981)

Anaptychia podocarpa var. *stellata* Vain., *Acta Soc. Faun. Fl. Fenn.* 7: 131 (1890); *A. stellata* (Vain.) Kurok., *Beih. Nova Hedwigia* 6: 90 (1962). T: Sitio, Minas Gerais, Brazil, *E.A.Vainio* [*Lich. Bras. Exs.* No. 1080]; holo: TUR-VAIN *n.v.*; iso: BM *n.v.*

Illustration: J.A.Elix, *Australas. Lichenol.* 69: 25, fig. 8 (2011).

Thallus foliose, forming small rosettes to irregularly spreading, adnate to loosely adnate, 2–5 cm wide. Lobes 0.5–3.0 mm wide, plane to convex, short, sublinear, irregularly branched; apices plane to suberect or ascending, partially imbricate, discrete to contiguous, with whitish simple scattered cilia along the margins, 0.5–2.0 mm long, not mat-forming. Upper surface greyish white or grey, epruinose, lobulate; isidia and soredia absent; lobules marginal, more pronounced subapically, ±rounded to elongate, simple or sparingly branched, 0.05–0.30 mm wide. Medulla white. Lower surface ecorticate, arachnoid, ±canaliculate, whitish. Rhizines mainly marginal or submarginal, whitish to dark brown towards the apices, simple then digitately or fruticosely branched, 1–3 mm long. Apothecia common, subterminal, substipitate to stipitate, 1–8 mm wide; margin smooth to crenate or with ±well-developed squamules, eciliate; disc brown to dark brown, often white-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 2 or 3 small sporoblastidia at either end, 30–50 × 15–25 µm. Pycnidia common, initially immersed, becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ pale yellow; medulla K+ yellow, C–, P+ pale yellow; containing atranorin (major), zeorin (major), 6α-acetoxyhopane-16β,22-diol (minor), 6α-acetoxy-16β,22-dihydroxyhopane-25-oic acid (minor), leucotylin (trace), 16β-acetoxy-6α,22-dihydroxyhopane-25-oic acid (trace), ±testacein (minor).

Rare on bark in montane rainforest in north-eastern Qld and N.S.W.; also in Central and South America.

Qld: Yuccabine Ck, Kirrima Rd, Cardwell Ra., 27 km WNW of Cardwell, *J.A.Elix 15747* (CANB); Big Tableland, 26 km S of Cooktown, *H.Streimann 30751* (CANB). N.S.W.: Berrico Rd, Chichester S.F., 21 km SW of Gloucester, *J.A.Elix 25015* (CANB).

Characterised by lobes with white marginal cilia, the subterminal, substipitate or stipitate apothecia, the eciliate apothecial margin, the white, ecorticate lower surface, ascospores with sporoblastidia and by the presence of atranorin, zeorin and triterpenes.

34. Heterodermia subascendens (Asahina) Trass, *Folia Cryptog. Estonica* 29: 20 (1992)

Anaptychia subascendens Asahina, *J. Jap. Bot.* 33: 325 (1958). T: Kubota, Kaya-mati, Misima, Prov. Izu, Japan, July 1929, *Y.Asahina 208*; holo: TNS *n.v.*

Illustrations: S.Kurokawa, *Beih. Nova Hedwigia* 6: pl. 9, fig. 52 (1962); I.Yoshimura, *Lichen Fl. Japan in Colour* pl. 3, fig. 12 (1974), both as *Anaptychia subascendens*.

Thallus foliose, forming small rosettes or irregularly spreading, adnate to loosely adnate, 3–5 cm wide. Lobes 0.5–3.0 mm wide, sublinear, but widening up to 5 mm at the tips, spathulate or paddle-shaped, weakly convex, dichotomously or irregularly branched, suberect or ascending, partially imbricate, discrete to contiguous, eciliate, but ±with marginal rhizines that are visible from above. Upper surface greyish white or greenish grey, epruinose, sorediate on the undersides of lobe apices. Medulla white. Lower surface ecorticate, arachnoid, ±reticulately veined in the centre, variegated white and yellow. Rhizines simple, becoming sparsely branched, concolorous with the thallus, darkening at the apices, 1–3 mm long. Apothecia not seen in Australian material but reported to be very rare (Kurokawa, 1962), terminal to subterminal on the ascending lobes, stipitate, 1–3 mm wide; margin sorediate, eciliate; disc dark brown, weakly white-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 2 or 3 small sporoblastidia, 34–41 × 16–20 µm. Pycnidia not seen.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P– or P+ pale yellow; yellow pigment on lower surface K+ violet; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), leucotylin (minor), 7-chloroemodin (minor), skyrin (minor), dissectic acid (minor).

Very rare on bark in montane forest in north-eastern Qld; also in East Asia (Siberia, South Korea, Japan and Taiwan).

Qld: between Millaa Millaa and Ravenshoe, *D.McVean 6388* (CANB).

This lichen is characterised by the ascending or suberect lobes with marginal, sublabriform soralia and spathuliform apices, the white, ecorticate lower surface with yellow spots (K+ purple), ascospores with sporoblastidia, and the presence of atranoin, zeorin and skyrin.

35. Heterodermia subcitrina Moberg, *Symb. Bot. Upsal* 34(1): 266 (2004)

T: Soutrivier, c. 1 km WSW of Natures Valley, Eastern Cape Prov., South Africa, 33°59'S, 23°32'E, alt. c. 10 m, on *Pterocelastrus tricuspidata* on the seashore in the inlet, 11 Dec. 1996, *R.Moberg 11847*; holo: UPS *n.v.*

Illustrations: R.Moberg, *loc. cit.* fig. 2.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, to 5 cm wide, but often coalescing to form colonies up to 15 cm wide. Lobes 0.7–2.0 mm wide, ±widening to c. 2–4 mm wide at the tips, ±plane to concave, fragile, sublinear-elongate, dichotomously to irregularly branched, radiating; apices not ascending, contiguous to discrete, with short lateral lobes, eciliate. Upper surface grey-white to greenish white, sorediate; soredia farinose to granular, forming labriform soralia along the lobe margins. Medulla white. Lower surface

ecorticate, arachnoid, white but with intense yellow spots or patches. Rhizines marginal, black, simple or squarrosely branched, 1–2 mm long. Apothecia rare, laminal, sessile to substipitate, 1–5 mm wide; margin sorediate; disc concave, dark brown to brown-black, epruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 2 or 3 small sporoblastidia, 29–38 × 12–20 µm. Pycnidia common, initially immersed, becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P– or P+ pale yellow; yellow lower surface K+ violet; containing atranorin (major), zeorin (major), 6α-acetoxyhopane-16β,22-diol (trace), 16β-acetoxyhopane-6α,22-diol (major), leucotylin (minor), 16β-acetoxyhopane-22-ol (minor), 7-chloroemodin (minor), flavo-obscurins A, B1, B2 (minor), 5,7-dichloroemodin (trace), AO-1 anthrone, AO-2 anthrone (trace), emodin (trace).

Known from bark and dead wood in coastal and hinterland forests of eastern and south-eastern Australia (Qld, N.S.W. and Vic.); also in Central and South America and South Africa.

Qld: Nanango Rd, Bunya Mountains S.F., 64 km NE of Dalby, *J.A.Elix 37929* (CANB). N.S.W.: Duck Creek Rd, 22 km WNW of Buladelah, *J.A.Elix 24422* (CANB). Vic.: Deadcock Gorge, Mitchell River Natl Park, 26 km NW of Bairnsdale, *H.Streimann 50247*(CANB).

Characterised by the sorediate lobe margins, the ecorticate and yellow-spotted (K+ violet) lower surface, ascospores with sporoblastidia and the presence of atranorin, anthraquinones and triterpenes. The closely related *H. obscurata* has more rigid, plane to distinctly convex lobes with terminal, labriform soralia.

36. **Heterodermia subisidiosa** (Kurok.) Kurok., *Folia Cryptog. Estonica* 32: 23 (1998)

Anaptychia magellanica var. *pectinata* f. *subisidiosa* Kurok., *Beih. Nova Hedwigia* 6: 68 (1962). T: 8 km E of Teopisca, Chiapas, Mexico, on deciduous tree, alt. 2020 m, 24 Mar. 1960, *M.E.Hale 20354*; holo: US *n.v.*; iso: TNS *n.v.*

Illustration: J.A.Elix, *Australas. Lichenol.* 69: 24, fig. 9 (2011).

Thallus foliose, orbicular to irregularly spreading, loosely adnate, 5–15 cm wide. Lobes 0.5–2.0 mm wide, plane to weakly convex or weakly concave, sublinear- to linear-elongate, dichotomously to subdigitately branched; apices not ascending, ±discrete to contiguous at the periphery, with short lateral lobes, eciliate. Upper surface grey-white to grey, epruinose, with marginal isidia or minutely dissected subisidioid lobules. Medulla white. Lower surface ecorticate, white to greyish to pale brown in the centre. Rhizines numerous, predominantly marginal, concolorous with the thallus or darkening and forming a dense marginal mat, irregularly branched. Apothecia not seen in Australian material, but reported (Kuokawa, 1962) to be rare, laminal, substipitate, 0.3–5.0 mm wide; margin crenulate or lacinulate; disc concave, brown-black, weakly grey-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 0–2 sporoblastidia, 28–36 × 17–21 µm. Pycnidia not seen.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P+ pale yellow; containing atranorin (major), zeorin (major), japonin (minor or trace), 6α-acetoxyhopane-16β,22-diol (trace), 6α-acetoxy-16β,22-dihydroxyhopane-25-oic acid (trace), anaptychin 1 (trace), ±16β-acetoxy-6α,22-dihydroxyhopane-25-oic acid (trace).

Very rare on trees in north-eastern Qld; also in Mexico.

Qld: Mount Lewis S.F., 13 km WSW of Mossman, *H.Streimann 46078* (CANB).

This species is characterised by its marginal isidia, the white, ecorticate lower surface and the presence of atranorin and triterpenes.

37. **Heterodermia subneglecta** Elix, *Australas. Lichenol.* 68: 17 (2011)

T: Mount Hyland Nature Reserve, 20 km N of Hernani, 30°10'44"S, 152°25'19"E, alt. 1340 m, on fallen *Dorphora sassafras* in temperate rainforest, 30 Apr. 2005, *J.A.Elix 36543*; holo: CANB.

Illustration: J.A.Elix, *op. cit.* 21, fig. 2.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, to 5 cm wide, but often forming colonies to 15 cm wide. Lobes 0.5–1.2 mm wide, ±widening to c. 2–3 mm at the lobe junctions, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously branched, radiating; apices ascending, usually discrete, ±lobulate along the margins; lobules ±rounded or sparingly branched, 0.10–0.25 mm wide, eciliate; lobules along the margin developing small soralia. Upper surface greenish white, whitish to cream-coloured, sorediate; soredia farinose to granular, in labriform to capitate soralia on lateral or terminal lobes, occasionally spreading along lobe margin. Medulla white. Lower surface ecorticate, arachnoid, white, partly yellow- to yellow-orange-spotted, becoming dirty brown centrally as the pigmented hyphae age, occasionally dark brown to almost black. Rhizines marginal, black, simple or squarrosely branched, 1–3 (–7) mm long. Apothecia very rare, laminal, sessile to substipitate, 1–4 mm wide; margin sorediate; disc concave, dark brown to brown-black, ±thinly grey-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 2 or 3 small sporoblastidia, 32–42 × 15–22 µm. Pycnidia common, initially immersed, becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex and medulla K+ yellow, C–, KC–, P+ pale yellow; medulla K+ yellow then red, C–, P+ dark yellow; pigmented medulla K+ red; containing atranorin (major), zeorin (major), japonin (major), 6α-acetoxy-16β,22-dihydroxyhopane-25-oic acid (trace), 6α-acetoxy-22-hydroxyhopane-25-oic acid (trace), dissectic acid (trace), hybocarpone (trace), norhybocarpone (trace), chloroatranorin (trace), 7-chloroemodin (minor or trace), anaptychin-5 (minor), anaptychin-1 (trace).

Rare on bark and on mossy rocks in temperate rainforest of in south-eastern N.S.W. and eastern Vic.; also in North America.

N.S.W.: Goodenia Rainforest Walk, South East Forests Natl Park, 7 km ENE of Wyndham, *J.A.Elix 44264* (CANB). Vic.: Hensleigh Rd, Queensborough R., 13 km SE of Bendoc, *H.Streimann 43648A* (CANB).

Characterised by the sorediate lobe apices, the ecorticate and yellow-spotted undersurface, ascospores with sporoblastidia and the presence of atranorin and triterpenes. *Heterodermia neglecta* is morphologically very similar, but it contains additional norstictic and salazinic acids.

38. Heterodermia tabularis Elix, *Australas. Lichenol.* 69: 14 (2011)

T: Big Tableland, 26 km S of Cooktown, Qld, 15°43'S, 145°16'E, alt. 580 m, on stem of old lemon tree in grassland with scattered shrubs and treelets on gentle slope, 11 Dec. 1990, *H.Streimann 46346*; holo: CANB.

Illustration: J.A.Elix, *op. cit.* 22, figs 4, 5.

Thallus foliose to subfruticose, forming small rosettes or irregularly spreading, adnate to loosely adnate, 2–4 cm wide. Lobes 0.5–2.0 mm wide, sublinear, convex to ±plane or weakly concave, irregularly to subdichotomously branched, suberect or ascending at the apices, partially imbricate, discrete to contiguous, ciliate; cilia scattered along the margins, whitish, simple, 0.5–1.3 mm long, not forming a mat. Upper surface greyish white to whitish to cream-coloured, epruinose, lobulate, lacking soredia and isidia; lobules marginal, more pronounced subapically, ±rounded to elongate, simple or sparingly branched, 0.05–0.30 mm wide. Medulla white. Lower surface ecorticate, arachnoid, ±canaliculate, whitish. Rhizines simple to dichotomously or irregularly branched, whitish, 0.5–2.0 mm long, ±projecting beyond the margin. Apothecia common, subterminal on ascending lobes, stipitate, 1.0–3.5 mm wide; margin crenate or with well-developed lobules, ciliate; disc brown to dark brown, densely white-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with numerous sporoblastidia, 30–40 × 15–20 µm. Pycnidia common, initially immersed, becoming emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow then red, C–, P+ dark yellow or yellow-orange; containing atranorin (major), zeorin (major), 6α-acetoxy-hopane-16β,22-diol (minor), 6α-acetoxy-16β,22-dihydroxyhopane-25-oic acid (trace), leucotylin (trace), norstictic acid (major), connorstictic acid (minor), testacein (minor).

This very rare endemic species is known only from the type collection in north-eastern Qld.

Heterodermia tabularis is characterised by the ascending or suberect lobes with white marginal cilia, the lack of soredia and isidia, stipitate apothecia with ciliate margins, *Polyblastidia*-type ascospores with numerous sporoblastidia and the presence of atranorin, zeorin and norstictic acid.

39. Heterodermia tasmanica Elix, *Australas. Lichenol.* 69: 15 (2011)

T: Ferndene Gorge, 5 km S of Penguin, Tas., 41°09'S, 146°02'E, on dead wood in wet-sclerophyll forest, 21 Jan. 1979, *J.A.Elix 5685*; holo: CANB.

Illustration: J.A.Elix, *op. cit.* 23, fig. 6.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, to 5 cm wide, but often coalescing to form colonies up to 10 cm wide. Lobes 0.5–1.2 mm wide, widening to c. 2–3 mm wide at the tips, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously branched, radiating; apices ascending, usually discrete; isidia and soredia absent. Upper surface greenish white, whitish to cream-coloured, with marginal (and more rarely laminal) dorsiventral phyllidia that are ±rounded or sparingly branched, 0.1–0.8 mm wide, ±minutely dissected, often granular near the tips. Medulla white. Lower surface ecorticate, arachnoid, purple-black in the centre, white, ochraceous or yellowish towards the apices. Rhizines marginal, simple, black, 1–3 (–7) mm long. Apothecia and pycnidia not seen.

Chemistry: Cortex and medulla K+ yellow, C–, KC–, P+ pale yellow; containing atranorin (major), zeorin (major), japonin (major), hybocarpone (major or minor), norhybocarpone (minor or trace), ±7-chloroemodin (trace), dissectic acid (trace), chloroatranorin (minor), ±anaptychin-1 (trace).

This rare endemic species known only from the type locality in northern Tas., where it was collected on dead wood.

Characterised by the narrow, sublinear-elongate lobes, an ecorticate lower surface that is ochraceous or yellow towards the apices, the presence of marginal phyllidia that can become granular near the tips, and in containing atranorin, zeorin, hybocarpone and the *japonica*-chemosyndrome of triterpenes.

40. Heterodermia tremulans (Müll.Arg.) W.L.Culb., *Bryologist* 69: 485 (1967)

Physcia hypoleuca var. *tremulans* Müll.Arg., *Flora* 63: 277 (1880); *Anaptychia speciosa* var. *tremulans* (Müll.Arg.) Müll.Arg., *Bot. Jahrb. Syst.* 15: 505 (1893); *Pseudophyscia speciosa* var. *tremulans* (Müll.Arg.) Müll.Arg., *Bull. Soc. Bot. Belgique* 32: 130 (1893); *Anaptychia pseudospeciosa* var. *tremulans* (Müll.Arg.) Kurok., *Beih. Nova Hedwigia* 6: 25 (1962); *Anaptychia tremulans* (Müll.Arg.) Kurok., *J. Hattori Bot. Lab.* 37: 597 (1973). T: near Petropolis, Rio de Janeiro, Brazil, on mosses, *Deventer*; holo: G *n.v.*

Physcia speciosa f. *sorediosa* Müll.Arg., *Flora* 66: 78 (1883); *Pseudophyscia speciosa* f. *sorediosa* (Müll.Arg.) Müll.Arg., *Bot. Jahrb. Syst.* 20: 259 (1894); *Anaptychia speciosa* f. *sorediosa* (Müll.Arg.) Zahlbr., *Cat. Lich. Univ.* 7: 741 (1931). T: near Toowoomba, Qld, *C.H.Hartmann*; holo: G *n.v.*; iso: MEL.

For further synonymy, see Kurokawa (1962).

Thallus foliose, orbicular to irregularly spreading, adnate to loosely adnate, 2–7 cm wide, often coalescing and forming colonies to 15 cm wide. Lobes 0.7–1.5 mm wide, plane to slightly convex, sublinear, ±flexuose, dichotomously to subdigitately branched, usually discrete at the periphery, radiating; apices not ascending, with short lateral lobes, eciliate. Upper surface greyish white to grey to brownish grey, ±darker at the apices, pruinose or not, sorediate; soredia whitish or greyish, granular, forming labriform soralia at the tips of the main and lateral lobes. Medulla white. Lower surface corticate, whitish to pale brown, rarely dark grey in the centre. Rhizines sparse, marginal, concolorous with the thallus or becoming darker, or even black near the apices, irregularly branched, to 1 mm long. Apothecia rare, laminal, sessile to substipitate, 1–3 mm wide; margin initially crenulate, becoming sorediate; disc concave, brown to brown-black, epruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 23–32 × 12–14 µm. Pycnidia immersed or slightly protruding; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P– or P+ pale yellow; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), 6α-acetoxyhopane-16β,22-diol (major), 6α,16β-diacetoxyhopane-22-ol (minor), leucotylin (minor), chloroatranorin (minor).

This species occurs on bark, dead wood and rocks in coastal and hinterland forests of S.A., Qld, N.S.W., A.C.T., Vic. and Tas. A pantropical and pantemperate lichen.

S.A.: The Bluff, Victor Harbor, *J.A.Elix 8734* (CANB). Qld: Leichhardt Hwy, 8 km NNW of Taroom, *J.A.Elix 35080* (CANB). N.S.W.: Stuarts Pt, Old Macleay River estuary, *J.A.Elix 21345* (CANB). A.C.T.: Aranda oval, 5 km W of Canberra, *J.A.Elix 38889* (CANB). Vic.: Jungle Creek Falls, 11 km NW of Dargo, *H.Streimann 53140* (CANB). Tas.: Couta Rocks, 13.5 km S of Arthur River, *J.A.Elix 40250 & G.Kantvilas* (CANB).

Although this lichen has commonly been confused with *H. speciosa*, the latter has linear-elongate lobes and larger spores (25–37 × 14–18 µm), whereas *H. tremulans* has short, often flexuose lobes and smaller spores (23–32 × 12–14 µm).

41. Heterodermia verdonii Elix, *Australas. Lichenol.* 68: 18 (2011)

T: below Waihou trig. stn, 25 km NW of Coffs Harbour, N.S.W., 30°06'S, 153°02'E, alt. 340 m, on sandstone outcrop in closed *Tristania-Ficus* forest, 12 Oct. 1978, *D.Verdon 3814*; holo: CANB; iso: B.

Illustration: J.A.Elix, *op. cit.* 21, fig. 3.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, to 5 cm wide, but often forming colonies to 10 cm wide. Lobes 0.5–1.2 mm wide, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously branched, radiating; apices plane, usually discrete, eciliate; phyllidia, isidia and soredia absent. Upper surface greenish white, whitish to grey. Medulla white. Lower surface corticate, whitish to pale brown, dirty brown near the centre. Rhizines mainly marginal, concolorous with the thallus or darkening near the apices, irregularly branched, 1–2 mm long. Apothecia laminal, substipitate, 0.5–2.5 mm wide; margin ±crenate; disc concave, brown to blackish brown, ±thinly grey-pruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 20–30 × 13–15 µm. Pycnidia common, initially immersed, becoming emergent, visible as black dots; pynoconidia bacilliform, 4–5 × 1 µm

Chemistry: Cortex and medulla K+ yellow, C–, KC–, P+ yellow; containing atranorin (major), zeorin (major), dissectic acid (submajor), 16β-acetoxyhopane-6α,22-diol (major), leucotylin (minor), 6α-acetoxyhopane-16β,22-diol (major), 6α,16β-diacetoxyhopane-22-ol (minor).

This endemic lichen occurs on bark and rock in coastal and hinterland forests of eastern Qld and north-eastern N.S.W.

Qld: North Tamborine Natl Park, *J.A.Elix 1136* (CANB); Hugh Nelson Ra., along Plath Rd, 15 km S of Atherton, *J.A.Elix 16345 & H.Streimann* (CANB).

Characterised by the narrow, eciliate lobes with a corticate lower surface, the lack of isidia and soredia, and the occurrence of dissectic acid and triterpenes. *Heterodermia angustiloba* is morphologically very similar, but it contains additional norstictic acid.

42. Heterodermia violostriata Elix, *Australas. Lichenol.* 69: 16 (2011)

T: Paluma Village, Paluma Ra., 40 km S of Ingham, Qld, 19°01'S, 146°13'E, alt. 830 m, on stem of exotic tree in maintained garden, 29 Oct. 1995, *H.Streimann 58057*; holo: CANB.

Illustration: J.A.Elix, *op. cit.* 23, fig. 7.

Thallus foliose, orbicular to irregularly spreading, loosely adnate, 5–12 cm wide. Lobes 1.0–1.5 mm wide, c. 2–3 mm wide at the tips, plane to weakly convex or weakly concave, sublinear-elongate, dichotomously to digitately branched, radiating; apices not ascending, contiguous to discrete, eciliate. Upper surface greenish white, whitish grey to cream-coloured, epruinose, with marginal dorsiventral phyllidia, these rarely laminal, usually minutely dissected, often granular near the tips, or entire phyllidia becoming granular and appearing sorediate. Medulla white. Lower surface ecorticate, arachnoid, violet-grey in the centre, violet-striate towards the apices; yellow pigments absent. Rhizines marginal, at first

simple and concolorous with the lower surface, later black and squarrosely branched, 2–4 mm long. Apothecia laminal, adnate to substipitate, 1–4 mm wide; margin phyllidiate, the phyllidia becoming elongate and deeply dissected; disc concave, dark brown to blackish brown, ±thinly grey-pruinose. Ascospores *Polyblastidia*-type, ellipsoidal, with 0–2 small sporoblastidia, 30–45 × 15–25 µm. Pycnidia common, immersed, then emergent, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Cortex K+ yellow, C–, KC–, P+ yellow; medulla K+ yellow, C–, P+ pale yellow; containing atranorin (major), zeorin (major), 16β-acetoxyhopane-6α,22-diol (major), leucotylin (minor), 6α-acetoxyhopane-16β,22-diol (major or minor), 6α,16β-diacetoxy-hopane-22-ol (minor), chloroatranorin (minor).

This endemic species occurs on rocks and trees in coastal and montane forests of eastern Qld, N.S.W., Vic. and Tas.

Qld: Ellinjaa Falls, 5 km ENE of Millaa Millaa, *J.A.Elix 39621* (CANB); Arthur Bailey Rd, 9 km SSE of Ravenshoe, *H.Streimann 46155* (B, CANB). N.S.W.: Mount Hyland Nature Reserve, 20 km N of Hernani, *J.A.Elix 36630* (CANB). Vic.: Alfred Natl Park, 19 km E of Cann River, East Gippsland, *J.A.Elix 5251* (CANB). Tas.: Sumac Rd, spur 2, S of Arthur R., *J.A.Elix 40179, 40181 & G.Kantvilas* (CANB).

Characterised by lobes with an ecorticate, violet-grey to violet lower surface, marginal phyllidia, *Polyblastidia*-type ascospores and the presence of terpenes in the medulla. Previously misidentified as *H. appendiculata* or *H. microphylla*, the former is distinguished from *H. violostriata* by the presence of additional norstictic acid, while *H. microphylla* has a white lower surface, *Pachysporaria*-type ascospores and contains the *japonica* chemosyndrome of triterpenes.