

PHYSICIA

John A. Elix¹

Physcia (Schreb.) Michx., *Fl. Bor.-Amer.* 2: 326 (1803)

The name originated from the Greek *physké*, used to describe the large intestine, a sausage or a blister and referring to thalli with hollow lobes (effectively a misnomer since species such as '*Physcia physodes*' [= *Hypogymnia physodes*] are no longer included in the genus).

Type: *P. tenella* (Scop.) DC.

Thallus foliose, continuous, lobate, irregular or forming rosettes 2–8 cm wide, sometimes combining to form more extensive colonies. Lobes discrete or contiguous, closely adnate and appressed to ±ascending and loosely attached, sublinear to sublinear-elongate, dichotomously to irregularly branched, ±with marginal cilia. Upper surface greenish grey or whitish grey to dark grey, occasionally with a whitish pruina, plane to convex, dull to glossy, white-maculate or emaculate; isidia, dactyls, pustules, soredia and lobules present or absent; upper cortex pseudoparenchymatous. Hypothallus absent. Medulla well defined, white or partly yellow. Lower surface corticate, white to whitish grey, pale tan or brown-black; lower cortex prosoplectenchymatous or pseudoparenchymatous, rhizinate. Rhizines white to brown or brown-black, simple to irregularly branched. Ascomata apothecia, lecanorine, laminal, orbicular, sessile to stipitate; disc brown to black, concave to plane or weakly convex, often white-pruinose; thalline exciple prominent or reflexed, distinct and persistent, occasionally with a white pruina; hairs absent or present at the base of the apothecia. Epithemium pale brown; hymenium and hypothecium colourless. Paraphyses simple or sparingly branched near the tips; apices clavate, pale brown with a thin dark brown cap. Asci cylindrical to clavate, *Lecanora*-type, 8-spored; apex wall layers thickened; apex amyloid, with a distinct axial mass. Ascospores *Physcia*- or *Pachysporaria*-type, 1-septate, grey-brown to brown or dark brown, ellipsoidal, thick-walled. Conidiomata pycnidial, immersed in the thallus, with colourless walls except for the dark ostiolar region (appearing as black dots on the lobe surface); conidiogenous cells arranged in branched chains, short, cylindrical, enteroblastic, arogenous or pleurogenous. Conidia bacilliform.

Physcia is a cosmopolitan genus of c. 75 species. It is distinguished from most other foliose Physciaceae mainly by its pseudoparenchymatous upper cortex in combination with atranorin as a cortical substance.

The genus is represented in Australia by 31 species that grow on rock, the bark of trees and shrubs and on wood.

References

- Edwards, B.W. & Coppins, B.J. (2009), *Physcia* (Schreb.) Michx. (1803), *The Lichens of Great Britain and Ireland* 698–703 (2009).
- Elix, J.A. (2011), New species of *Physcia* (Physciaceae: Ascomycota) from Australasia, *Australas. Lichenol.* 68: 28–37.
- Elix, J.A. (2011), Further new species and new records of *Physcia* (Physciaceae: Ascomycota) from Australia, *Australas. Lichenol.* 69: 25–29.
- Elix, J.A., Corush, J. & Lumbsch, H.T. (2009), Triterpene chemosyndromes and subtle morphological characters characterize lineages in the *Physcia aipolia* group in Australia (Ascomycota), *Syst. & Biodiv.* 7: 479–487.

¹ Research School of Chemistry, Building 33, Australian National University, Canberra, Australian Capital Territory 0200.

- Galloway, D.J. & Moberg, R. (2005), The lichen genus *Physcia* (Schreb.) Michx. (Physciaceae: Ascomycota) in New Zealand. *Tuhinga* 16: 69–102.
- Moberg, R. (1977), The lichen genus *Physcia* and allied genera in Fennoscandia, *Symb. Bot. Upsal.* 22(1): 1–108).
- Moberg, R. (1986), The genus *Physcia* in East Africa, *Nordic J. Bot.* 6: 843–864.
- Moberg, R. (1990), The lichen genus *Physcia* in Central and South America, *Nordic J. Bot.* 10: 319–342.
- Moberg, R. (2001), The lichen genus *Physcia* in Australia, *Biblioth. Lichenol.* 78: 289–311.
- Moberg, R. (2002), *Physcia*, *Lichen Fl. Greater Sonoran Desert Region* 1: 358–373.
- Moberg, R. (2002), *Physcia*, *Nordic Lichen Fl.* 2: 33–38.
- Moberg, R. (2004), Notes on foliose species of the lichen family *Physciaceae* in southern Africa, *Symb. Bot. Upsal.* 34(1): 257–288.
- Moberg, R., & Nash III, T.H. (1997), The genus *Physcia* in the Sonoran Desert and adjacent areas, *Symb. Bot. Upsal.* 32(1): 163–186.
- Poelt, J. (1965), Zur Systematik der Flechtenfamilie Physciaceae, *Nova Hedwigia* 9: 21–32.

Key

1	Thallus with soredia, pustules or dactyls.....	2
1:	Thallus lacking soredia, pustules and dactyls.....	26
2	Thallus pustulate and/or dactylate.....	3
2:	Thallus sorediate; pustules and dactyls absent.....	7
3	Upper surface frosted-pruinose.....	4
3:	Upper surface not frosted-pruinose.....	5
4	Pustules present; dactyls absent; <i>speciosa</i> chemosyndrome present.....	17. P. krogiae
4:	Dactyls present; pustules present or absent; leucotylin chemosyndrome present.....	10. P. dactylifera
5	Pustules or dactyls marginal; lower surface black.....	25. P. solediosa
5:	Pustules or dactyls laminal; lower surface brown to black.....	6
6	Cortex intact; lobe apices rounded; hopane-15 α ,22-diol present.....	8. P. clementei
6:	Cortex fragile; upper surface becoming decorticate; lobe apices truncate; zeorin present.....	11. P. decorticata
7	Soralia helmet-shaped.....	1. P. adscendens
7:	Soralia not helmet-shaped.....	8
8	Lower surface brown or black.....	9
8:	Lower surface white to grey or pale tan.....	12
9	Soralia mainly marginal.....	25. P. solediosa
9:	Soralia mainly laminal.....	10
10	Upper surface frosted-pruinose; soralia maculiform.....	17. P. krogiae
10:	Upper surface not frosted-pruinose; soralia crateriform.....	11
11	Lower surface pale to dark brown; lower cortex prosoplectenchymatous.....	30. P. verdonii
11:	Lower surface brown-black to black; lower cortex pseudoparenchymatous.....	13. P. erumpens
12	Soralia predominantly laminal.....	13
12:	Soralia marginal or terminal.....	18
13	Soralia maculiform; lower cortex pseudoparenchymatous.....	2. P. albata
13:	Soralia crateriform or capitate; lower cortex prosoplectenchymatous or pseudoparenchymatous.....	14
14	Soralia distinctly crateriform.....	15
14:	Soralia capitate to callus-like.....	16
15	Lower surface white to cream; thallus usually corticolous; <i>speciosa</i> chemosyndrome present.....	22. P. poncinsii
15:	Lower surface pale to dark brown; thallus usually saxicolous; leucotylin chemosyndrome present.....	30. P. verdonii

16	Soralia capitate to callus-like; lower cortex pseudoparenchymatous; <i>speciosa</i> chemosyndrome present; thallus saxicolous or corticolous	27. P. tribacoides
16:	Soralia capitate to subcapitate, not callus-like; lower cortex prosoplectenchymatous; <i>tropica</i> or 20 α -acetoxyzeorin chemosyndrome present; thallus usually saxicolous.....	17
17	Soralia capitate; <i>tropica</i> chemosyndrome present; zeorin present.....	4. P. austrocaesia
17:	Soralia crateriform or, rarely, capitate; 20 α -acetoxyzeorin chemosyndrome present; zeorin absent.....	7. P. caesiopsis
18	Upper surface frosted-pruinose	19
18:	Upper surface not frosted-pruinose	20
19	Lower surface not striate; leucotylin chemosyndrome present	29. P. undulata
19:	Lower surface distinctly striate; <i>speciosa</i> chemosyndrome present	3. P. atrostriata
20	Lower cortex pseudoparenchymatous; thallus lacking zeorin	21
20:	Lower cortex prosoplectenchymatous; zeorin present or absent.....	22
21	Lobes rounded; soralia marginal	9. P. crispa
21:	Lobes elongate; soralia terminal	26. P. tribacia
22	Zeorin absent; soralia terminal.....	12. P. dubia
22:	Zeorin present; soralia marginal or terminal.....	23
23	Soralia terminal	16. P. kantvilasii
23:	Soralia marginal.....	24
24	Upper surface emaculate, areolate-scabrid; apices pruinose; 6- α -acetoxyhopane-16 β ,22-diol present ..	20. P. nubila
24:	Upper surface white-maculate; apices pruinose or not; leucotylin or <i>speciosa</i> chemosyndrome present	25
25	Soralia sublinear or spreading; apices epruinose; <i>speciosa</i> chemosyndrome present	19. P. neonubila
25:	Soralia semi-circular to crescent-shaped in lobe sinuses; apices pruinose; leucotylin present. 24. P. rolfii	
26	Lower surface black	27
26:	Lower surface white, grey or brown.....	28
27	Upper surface glossy, epruinose; lower cortex pseudoparenchymatous	14. P. integrata
27:	Upper surface dull, frosted-pruinose; lower cortex prosoplectenchymatous	21. P. phaeocarpa
28	Upper surface frosted-pruinose; apices rounded; zeorin present	31. P. verrucosa
28:	Upper surface not frosted-pruinose; apices truncate; zeorin present or absent	29
29	Medulla K-; zeorin absent	30
29:	Medulla K+ yellow; zeorin present	31
30	Margins of apothecia crenulate; triterpenes absent	6. P. biziana
30:	Margins of apothecia smooth; 20 α -acetoxyzeorin present	5. P. austrostellaris
31	Thallus on coastal rocks.....	18. P. littoralis
31:	Thallus usually on bark or wood	32
32	Disc medium brown, epruinose; N.T.	28. P. tropica
32:	Disc black or black-brown, pruinose; southern and eastern Australia.	33
33	Upper surface white-maculate; leucotylin chemosyndrome present.....	15. P. jackii
33:	Upper surface areolate-scabrid, emaculate; <i>speciosa</i> chemosyndrome present.....	23. P. rolandii

1. *Physcia adscendens* (Fr.) H.Olivier, *Fl. Lich. Orne* 79 (1882)

Parmelia stellaris var. *adscendens* Fr., *Summ. Veg. Scand.* 105 (1845). T: Sweden, *E.Acharius*; H-ACH 1428, *typ. cons. n.v.*

Illustrations: R.Moberg, *Symb. Bot. Upsal.* 22(1): 50, fig. 23 (1977); V.Wirth, *Die Flechten Baden-Württembergs*, 2nd edn 727 (1995); I.M.Brodo, S.D.Sharnoff & S.Sharnoff, *Lichens of North America* 550, pl. 658 (2001); R.Moberg, *Nordic Lichen Fl.* 2: 97 (2002).

Thallus orbicular or irregularly spreading, loosely adnate, to 5 cm wide, or confluent with other thalli. Lobes 0.8–2.0 mm wide, broader at the tips, sublinear, irregularly branched, weakly convex; marginal cilia white, pale grey to brown-black, 0.4–2.0 mm long, often grey-brown to dark brown or brown-black at the tips. Upper surface whitish grey to grey or dark grey, usually emaculate, rarely indistinctly white-maculate, smooth, matt, rarely white-pruinose. Soralia usually abundant, helmet-shaped, beginning as openings just beneath the lobe tips, usually expanding on the underside and forming rounded elevations visible from

the upper side; soredia coarse, granular, white or greenish white. Lower surface white to greyish or pale brown; rhizines sparse, white to black; cortex prosoplectenchymatous. Apothecia very rare (not seen in Australian material), laminal, 0.5–2.0 mm wide, sessile or becoming substipitate; margin persistent, entire, smooth; disc brown-black to black, often white-pruinose. Ascospores *Physcia*-type, ellipsoidal, 16–23 × 7–10 µm. Pycnidia rare, immersed, visible as black dots; conidia bacilliform, 4–6 × 1 µm.

Chemistry: Cortex K+ yellow; medulla K–; containing atranorin.

This cosmopolitan species is common in south-eastern Australia (S.A., N.S.W., A.C.T., Vic. and Tas.) on both native and introduced trees and shrubs, but especially common on fruit and ornamental trees in gardens and on roadsides, wood, fence posts and more rarely on rocks; also in Europe, Asia, Africa, North and South America, New Zealand, Macquarie Island and the Hawaiian Islands.

S.A.: Chinamans Well, Yorke Penin., *J.A.Elix* 3698 (CANB). N.S.W.: Windellama, 15 km E of L. Bathurst, *J.A.Elix* 4960 (CANB). A.C.T.: Aranda Primary School, 5 km W of Canberra, *J.A.Elix* 39204 (CANB). Vic.: Cribb Pt, Westernport Bay, *G.N.Stevens* 2354 (BRI). Tas.: Plenty, Derwent Valley, *G.Degelius A-318* (UPS).

Physcia adscendens is characterised by the long, white cilia that often darken towards the tips and by the inflated lobe apices with helmet-shaped soralia. Macromolecular studies have indicated that the Australian material is phylogenetically distinct from Northern Hemisphere populations and probably had an independent evolution, despite their morphologically identical appearance (Elix *et al.*, 2009).

2. *Physcia albata* (F.Wilson) Hale, *Bryologist* 66: 73 (1963)

Parmelia albata F.Wilson, *Pap. & Proc. Roy. Soc. Tasmania* 1892: 173 (1893). T: Mt William, near Ararat, Vic., Nov. 1888, *F.R.M.Wilson s.n.*; lecto: MEL, *vide* R.Moberg, *Nordic J. Bot.* 6: 851 (1986).

Parmelia alboplumbea Taylor, *J. Bot. (Hooker)* 6: 161 (1847); *Physcia alboplumbea* (Taylor) Nyl., in A.M.Hue, *Nouv. Arch. Mus. Hist. Nat.*, sér. 2, 2: 319 (1890). T: Swan River, W.A., 1843, *J.Drummond s.n.*; lecto: BM *n.v.*, *vide* R.Moberg, *loc. cit.*; isolecto: BM, H-NYL *n.v.*

Illustrations: R.Moberg, *op. cit.* 852, figs 10, 11; T.D.V.Swincow & H.Krog, *Macrolichens of East Africa* 223, fig. 107 (1988), both as *P. alboplumbea*.

Thallus orbicular or irregularly spreading, adnate to loosely attached, very variable in size, usually 5–10 cm wide. Lobes comparatively broad, 2–5 mm wide, ±plane, irregularly branched; apices rounded and incised, ±with marginal lobules, eciliate. Upper surface whitish grey, darkening at the apices, emaculate, smooth, very rarely white-pruinose. Soralia usually laminal, rarely marginal, maculiform, beginning as small eroding pustules, papillae or cracks that join to form larger confluent patches, often exposing areas of white medulla; soredia whitish, becoming very coarsely granular and somewhat corticate to form pseudoisidia. Lower surface white to ash-grey, rarely darker; rhizines numerous, pale grey to grey-black, simple. Upper and lower cortices pseudoparenchymatous. Apothecia rare, laminal, 1–3 mm wide, sessile; margin persistent, smooth to crenulate, occasionally dissolving into soredia; disc brown-black to black, epruinose. Ascospores *Pachysporaria*-type, 17–29 × 8–12 µm. Pycnidia rare, immersed, visible as black dots; conidia bacilliform, 4–6 × 1 µm.

Chemistry: Upper cortex and medulla K+ yellow; containing atranorin and zeorin.

Occurs on trees and rocks in coastal and hinterland forest in southern Australia (W.A., S.A., Vic. and Tas.); also in New Zealand, South America, eastern and southern Africa and the Hawaiian Islands.

W.A.: Mt Chudalup, 51.7 km S of Pemberton, *S.Kurokawa* 6692 (TNS). S.A.: Dudley Penin., W end of Antechamber Bay, Kangaroo Is., *J.A.Elix* 19689 & *L.H.Elix* (CANB). Vic.: E slopes of Black Mtn, 8 km S of Suggan Buggan, *S.Kurokawa* 6569 (TNS). Tas.: Doctors Rocks, near Wynyard, *G.Kantvilas* 749/80 (BM, HO).

This species has broad, rounded lobes with entire margins, a smooth, matt, epruinose upper surface and soralia in spreading patches, arising from eroding pustules or papillae and often exposing areas of white medulla.

3. *Physcia atrostriata* Moberg, *Nordic J. Bot.* 6: 853 (1986)

T: Forestry House, Amani, Usambara Mtns, Tanga Province, Tanzania, 05°07'S, 38°38'E, alt. 900 m, on *Spathodea* bark, 1971, *R.Moberg 1495a*; holo: UPS *n.v.*

Illustrations: R.Moberg, *Nordic J. Bot.* 6: 846, fig. 5; 847, fig. 6e, f; 849, fig. 8a; 853, fig. 12 (1986); T.D.V.Swinscow & H.Krog, *Macrolichens of East Africa* 224, fig. 108 (1988); I.M.Brodo, S.D.Sharnoff & S.Sharnoff, *Lichens of North America* 551, pl. 661 (2001).

Thallus orbicular or irregularly spreading, adnate, 1–4 cm wide, often coalescing and forming irregular patches 5–8 cm wide. Lobes 0.5–2.0 mm wide, ±plane to weakly convex, irregularly branched, imbricate or not; apices rounded, incised and often ascending, ±with marginal lobules, eciliate. Upper surface whitish grey to pale greenish grey, emaculate, smooth to shallowly undulate, frosted-pruinose, especially towards the apices. Soralia marginal, labriform-undulate, developing around sinuses between lobes, but spreading over extensive areas of upper and lower surfaces; soredia farinose, greenish white to white. Lower surface mainly ecorticate, white at the margins, pale tan or brownish centrally, with conspicuous red-brown to brown-black corticate ribbed or nerve-like longitudinal striations; rhizines conspicuous, brown or black, simple, occasionally forming a short squarrose tuft at the apices, 0.5–1.5 mm long; cortex prosoplectenchymatous. Apothecia not seen in Australian material but reported to be rare, laminal, 1–2 mm wide, sessile; margin crenulate and sorediate; disc brown-black to black, epruinose. Ascospores *Pachysporaria*-type, 22–31 × 8.5–12.0 μm (Moberg, 1986). Pycnidia not seen.

Chemistry: Upper cortex and medulla K⁺ yellow; containing atranorin (major), zeorin (major), 6α-acetoxy-16β,22-dihydroxyhopane-25-oic acid (minor), 6α-acetoxyhopane-16β,22-diol (minor), 6α-acetoxy-22-hydroxyhopane-25-oic acid (trace), 16β-acetoxy-6α,22-dihydroxyhopane-25-oic acid (trace), leucotylin (trace).

Occurs on bark and rocks in moist coastal areas of N.T., Qld and N.S.W.; also in South America, East and South Africa, Christmas Island (Indian Ocean) and New Zealand.

N.T.: Black Jungle, c. 42.5 km ESE of Darwin, *G.Thor 5797* (S, UPS). Qld: 2 km W of Bargara, *R.W.Rogers 2816* (BRI). N.S.W.: Minnamurra Natl Park, 12 km NW of Kiama, *R.Moberg & B.Owe-Larsson A74:15* (CANB, UPS).

This species is characterised by the whitish grey to pale greenish grey, frosted-pruinose upper surface, marginal soredia that are especially well developed in the lobe sinuses and the brown to brown-black, longitudinal striations on the undersurface.

4. *Physcia austrocaesia* Elix, *Australas. Lichenol.* 68: 28 (2011)

T: Molonglo Gorge Forest Park, 15 km SE of Canberra, A.C.T., 35°19'46"S, 149°14'59"E, alt. 650 m, on moist sandstone ledge along river bank, 15 Oct. 2008, *J.A.Elix 39206*; holo: CANB; iso: HO.

Illustration: J.A.Elix, *op. cit.* 36, fig. 1.

Thallus orbicular or irregularly spreading, adnate throughout or ±loosely adnate at the margins, 1–6 cm wide. Lobes 0.5–2.0 (–2.5) mm wide, contiguous, imbricate or, rarely, separate, irregularly or pinnately branched, weakly to distinctly convex; lobe margins entire; tips rounded to shallowly incised. Upper surface whitish grey to grey or bluish grey, distinctly white-maculate with somewhat raised maculae, occasionally greyish white-pruinose at the apices. Soralia laminal and ±marginal, capitate, 0.5–1.0 mm wide, often coalescing and spreading over the surface, sometimes eroded and becoming crateriform and exposing the medulla or lower cortex; soredia coarsely granular, greenish when wet, whitish to grey or blue-grey when dry. Lower surface off-white to pale brown or dark brown centrally; rhizines simple or fasciculate at the tips, often scattered at the lobe apices to densely crowded and tangled centrally, whitish, grey or brown, 0.4–0.9 mm long; cortex prosoplectenchymatous. Apothecia very rare or absent, laminal, 0.2–1.0 mm wide, sessile and constricted at the base; margin entire, smooth; disc plane, black to brown-black, matt, epruinose or with grey-white pruina. Ascospores *Pachysporaria*-type, broadly ellipsoidal, 18–23 × 7.5–10.0 μm. Pycnidia sparse to common, immersed, visible as black dots; conidia subcylindrical, 4–5 × 1 μm.

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

Common on rocks, rarely on twigs in W.A., Qld, N.S.W., A.C.T., Vic. and Tas.; also in New Zealand.

W.A.: Mt Clarence, Albany, *J.A.Elix* 41384, *H.T.Lumbsch* & *H.Streimann* (CANB). Qld: Wyberba, junction of old highway and Eukey road, 23 km SSW of Stanthorpe, *J.A.Elix* 35840, 35841 (CANB). N.S.W.: W face of Mt Canobolas, 8 km SW of Orange, *J.A.Elix* 6257 (CANB). A.C.T.: Gudgenby River Gorge, 4.5 km S of Tharwa, *J.A.Elix* 6096 (CANB, UPS). Vic.: Mt Korong, 13 km SE of Wedderburn, *H.Streimann* 59106 (CANB). Tas.: Cockatoo Gully Rd, Harry Walker Tier, 6.5 km W of Dysart, *J.A.Elix* 40345 & *G.Kantvilas* (CANB).

Characterised by the distinctly white-maculate upper surface, convex lobes, the laminal and capitate soralia, and thallus chemistry. *Physcia poncinsii* differs in having an emaculate or weakly maculate upper surface, distinctly crateriform soralia and a different cohort of triterpenes (the *speciosa* chemosyndrome). See comparison with *P. austrocaesia* below.

5. *Physcia austrostellaris* Elix, in J.A.Elix, J.Corush & H.T.Lumbsch, *Syst. & Biodiv.* 7: 482 (2009)

T: Uriarra Crossing, Murrumbidgee R., 17 km NW of Canberra, A.C.T., 35°15'S, 148°57'E, alt. 500 m, on fallen *Allocasuarina cunninghamiana*, 28 June 2008, *J.A.Elix* 38829; holotype: CANB; isotype: F, HO.

Illustration: J.A.Elix, J.Corush & H.T.Lumbsch, *op. cit.* 483, fig. 3.

Thallus orbicular or irregularly spreading, loosely adnate, to 5 cm wide. Lobes 0.8–3.0 mm wide, radiating, plane to weakly concave or convex; lobe margins often paler; tips \pm rounded, not ascending, eciliate. Upper surface whitish grey to grey or dark grey, usually emaculate, rarely indistinctly white-maculate, lacking pruina, soredia and isidia. Lower surface off-white to pale brown; rhizines sparse to moderately dense, whitish to pale brown, to 0.6 mm long; cortex pale grey, prosoplectenchymatous; cells \pm short and thick-walled. Apothecia laminal, abundant in the centre of the thallus, 0.5–4.0 mm wide, sessile and constricted at the base or becoming substipitate; margin entire, smooth to crenulate, thick; disc brown-black to black, glossy, but often greyish white-pruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 14–28 \times 6.5–12.0 μ m. Pycnidia common, initially immersed, becoming emergent, visible as black dots; conidia subcylindrical, 4–6 \times 1 μ m.

Chemistry: Cortex K⁺ yellow; medulla K[–]; containing atranorin (major), 20 α -acetoxyhopane-6 α ,22-diol [20- α -acetoxyzeorin] (major), hopane-6 α ,20 α ,22-triol (trace), \pm zeorin (trace), \pm 6 α -acetoxyhopane-20 α ,22-triol (trace).

This endemic species grows on the bark of *Allocasuarina*, *Eucalyptus* and exotic trees in open woodland and cultivated parks, in S.A., N.S.W., A.C.T. and Vic.

S.A.: Corrynton Park Rd, 8 km W of Eden Valley, Mount Lofty Ra., *J.A.Elix* 37224 (CANB). N.S.W.: Mother of Ducks Lagoon Nature Reserve, Guyra, *J.A.Elix* 36682, 36690 (CANB); Native Dog Ck, 4 km NNW of Wee Jasper, Southern Tablelands, *R.Moberg* A63:5 & *B.Owe-Larsson* (CANB). A.C.T.: Coppins Crossing, 8.5 km W of Canberra, *J.A.Elix* 626 (CANB). Vic.: N end of windbreak, S side of Yallourn Storage Dam, *R.B. & S.Filson* 15292 (MEL).

This lichen is characterised by the often broad and comparatively weakly maculate lobes, the absence of soredia and isidia, the often pruinose apothecia and the distinctive chemistry (20- α -acetoxyzeorin chemosyndrome).

6. *Physcia biziana* (A.Massal.) Zahlbr., *Österr. Bot. Zeit.* 51: 348 (1901)

Squamaria biziana A.Massal., *Misc. Lichenol.* 5 (1856). T: Ragusa, Dalmatia, [Dubrovnik, Croatia], on rock, *P.Micheletti*; holotype: PAD *n.v.*

For further synonymy, see Moberg (1986).

Illustrations: R.Moberg, *Nordic J. Bot.* 6: 854, fig. 12 (1986); I.M.Brodo, S.D.Sharnoff & S.Sharnoff, *Lichens of North America* 552, pl. 662 (2001).

Thallus orbicular or irregularly spreading, loosely adnate, to 4 cm wide. Lobes 0.8–3.0 mm wide, ±imbricate, plane to weakly concave or convex; lobe apices noticeably wider and slightly ascending. Upper surface brownish grey to grey or cream-coloured, emaculate, usually densely pruinose; soredia and isidia absent. Lower surface off-white to pale brown or brown; rhizines scattered, white to dark grey, to 0.7 mm long; cortex prosoplectenchymatous, but the lowermost cells occasionally rounded and ±pseudoparenchymatous. Apothecia common, laminal, 0.5–2.0 mm wide, sessile and constricted at the base or becoming substipitate; margin entire, crenulate when immature; disc brown to black, usually white-pruinose. Ascospores ellipsoidal, of *Physcia*-type, *Pachysporaria*-type or intermediate between the two, 16–24 × 7.5–11.0 µm. Pycnidia common, immersed, visible as black dots; conidia bacilliform, 4–6 × 1 µm.

Chemistry: Upper cortex K⁺ yellow; medulla K⁻; containing atranorin.

Occurs on tree trunks and on branches in open situations in arid areas of W.A., S.A., N.T. Qld and N.S.W.; also in North and South America, Europe and Africa.

W.A.: Lillimilura ruins, 23 km ESE of the Lennard River Crossing, Windyana Gorge Natl Park, Napier Ra., *J.A.Elix* 22235, *H.Streimann* & *D.J.Galloway* (CANB). S.A.: near Saltia Hill, South Flinders Ra., 17 km ENE of Port Augusta, *J.A.Elix* 41857 (CANB). N.T.: 16 km NW of West Baines River Crossing, Pinkerton Ra., *J.A.Elix* 22085 & *H.Streimann* (CANB); Larapinta Drive, 1 km W of Jays Creek, Macdonnell Ra., *J.A.Elix* & *L.A.Craven* 11242, 11301 (CANB). Qld: walk to Mountain Rock Hole, c. 12 km S of Idalia HS, Idalia Natl Park, *R.W.Purdie* 4213 (CANB). N.S.W.: Silver City Hwy, 26 km N of Wentworth, *J.A.Elix* 30759 (CANB).

This species is characterised by the pruinose upper surface, the K⁻ medulla and the comparatively small apothecia with (initially) crenulate margins.

7. *Physcia caesiopsis* Elix, *Australas. Lichenol.* 68: 30 (2011)

T: First Moonbi Lookout, 30 km N of Tamworth, N.S.W., 30°58'33"S, 151°05'58"E, alt. 740 m, on granite rocks in remnant *Eucalyptus* woodland, 27 Apr. 2005, *J.A.Elix* 36231; holotype: CANB.

Illustration: *J.A.Elix, op. cit.* 37, fig. 2.

Thallus orbicular or irregularly spreading, adnate throughout or ±loosely adnate at margins, to 3 cm wide. Lobes 0.5–2.5 mm wide, contiguous to imbricate, or remaining separate, irregularly or pinnately branched, weakly to strongly convex; lobe margins entire, the tips rounded to shallowly incised. Upper surface whitish grey to grey or brownish grey, distinctly white-maculate with somewhat raised maculae, rarely greyish white-pruinose at the apices. Soralia usually laminal, rarely marginal, crateriform or, rarely, capitate, 0.3–1.0 mm wide, often coalescing and spreading over the surface; soredia coarsely granular, greenish when wet, whitish or grey when dry. Lower surface off-white to pale brown or pale grey centrally; rhizines simple, scattered, whitish, grey to brown or grey-brown, 0.2–0.9 mm long; cortex prosoplectenchymatous. Apothecia not seen. Pycnidia sparse to common, initially immersed, then emergent, visible as black dots; conidia subcylindrical, 4–5 × 1 µm.

Chemistry: Cortex K⁺ yellow; medulla K⁺ yellow; containing atranorin (major), 20α-acetoxyhopane-6α,22-diol (major), 6α-acetoxyhopane-20α,22-diol (minor), ±zeorin (trace), ±hopane-6α,20α,22-triol (trace).

This endemic species occurs on rocks in montane areas of north-eastern N.S.W.

N.S.W.: Bolivia Hill Nature Reserve, 12.8 km N of Deepwater, Northern Tablelands, *J.A.Elix* 39944 (CANB).

Characterised by the maculate upper surface, convex lobes, laminal crateriform soralia and by chemistry. It can be confused with *P. austrocaesia* (see above), but it has smaller thalli, distinctly crateriform soralia that only rarely become capitate, and by its distinctive chemistry (containing the 20α-aceoxyzeorin chemosyndrome).

8. *Physcia clementei* (Sm.) Lyngby, *Rabenh. Krypt.-Fl.*, 2nd edn, 9: 93 (1935)

Lichen clementi Sm., in J.E. Smith & J. Sowerby, *Engl. Bot.* 25: tab. 1779 (1807). T: tab. 1779 of J.E. Smith & J. Sowerby (1807); lecto, *vide* R. Moberg, *Lichen Fl. Greater Sonoran Desert Region* 1: 362 (2002); epitype: la gare de la Ligne du Conquet, Brest, Finistère, Bretagne, France, 12 Apr. 1931, *G. Degelius* (UPS).

Illustration: R.Moberg, *Lichen Fl. Greater Sonoran Desert Region 1*: 362, fig. 71 (2002).

Thallus orbicular or irregularly spreading, ±firmly adnate, 2–3 cm wide. Lobes 0.3–0.6 (–1.0) mm wide, contiguous to imbricate in the centre, ±radiating at the periphery, sparingly branched, plane to weakly concave; lobe margins entire, the truncate or crenulate, occasionally ascending, eciliate. Upper surface whitish grey to grey, rarely dark grey, dull, emaculate, epruinose near apices, pustulate. Pustules laminal, resembling papillae or isidia, often erumpent or eroding into soralia or craters that can coalesce and cover large parts of the upper surface; soredia granular, whitish or grey-white; cortex pseudoparenchymatous. Lower surface cream to pale brown, dark brown or brown-black (inner parts); rhizines sparse, concolorous with the lower surface, 0.05–0.20 mm long; cortex prosoplectenchymatous to indistinctly pseudoparenchymatous. Apothecia not seen in Australian material, but reported to be rare (Moberg, 2002; Edwards & Coppins, 2009), laminal, 0.5–2.0 mm wide, sessile and constricted at the base; margin entire, smooth to often crenulate; disc brown to black, ±thinly pruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 15–22 × 8–11 µm. Pycnidia not seen.

Chemistry: Upper cortex and medulla K⁺ yellow; containing atranorin (major), hopane-15 α ,22-diol (major), 15 α -acetoxyhopane-22-ol (minor or trace).

Very rare on trees in hinterland areas of north-eastern Qld; also in Europe and North America.

Qld: near junction of Moore Rd and Russell Rd, 8 km NE of Malanda, *H.Streimann 46629C* (CANB).

Physcia clementei is characterised by having pustules on the upper surface resembling isidia or papillae, these eroding or erupting to form granular soralia, the pale brown to brown-black lower surface and the unique triterpene chemistry (lacking zeorin).

9. *Physcia crispa* Nyl., *Syn. Meth. Lich.* 1(2): 423 (1860)

T: Vale de Taio-ha, Noukahova [Nuku Hiva], Îles Marquises [Marquesas Is.], *D.Jardin*: lecto: H-NYL 32199 *n.v.*, *fide* R.Moberg, *Nordic J. Bot.* 6: 854 (1986).

Illustration: R.Moberg, *loc. cit.* fig. 14.

Thallus orbicular or irregularly spreading, adnate to loosely adnate, thin (rarely more than 150 µm thick), often undulate, 2–3 cm wide or coalescing to form colonies to 10 cm wide. Lobes narrow, 0.4–1.2 mm wide, contiguous to ±imbricate, plane to weakly concave or convex; lobe apices ascending, usually crenulate, with small protrusions towards the margin which become isidia-like and dissolve into soredia, eciliate. Upper surface grey to blue-grey or cream-coloured, emaculate, rarely pruinose, not isidiate. Soralia marginal, well developed towards the centre of the thallus, linear; soredia granular, white to greenish. Lower surface white to cream-coloured; rhizines scattered, whitish, to 0.6 mm long; cortex pseudoparenchymatous. Apothecia unknown in Australian material, but reported to be very rare and poorly developed and with ellipsoidal ascospores 17–23 × 7.5–12.0 µm (Moberg, 1986). Pycnidia not seen.

Chemistry: Upper cortex K⁺ yellow; medulla K[–]; containing atranorin.

This corticolous species is known only from a very small coral island on the southern Great Barrier Reef, Qld; also in East Africa, South America, Baja California and the South Pacific.

Qld: Masthead Is., Capricorn Group, 50 km E of Gladstone, *H.Prendergast* (CANB).

This species is characterised by the small, thin and often undulate thallus with sorediate lobe margins as well as a pseudoparenchymatous lower cortex. Some specimens can resemble *P. undulata* (*q.v.*), but the latter contains zeorin and has a prosoplectenchymatous lower cortex.

10. *Physcia dactylifera* Elix, *Australas. Lichenol.* 69: 25 (2011)

T: Cooktown road, 3 km NW of Mount Molloy, Qld, 16°40'S, 145°19'E, alt. 450 m, on granite rocks in *Eucalyptus*-dominated grassland, 3 June 1984, *J.A.Elix 17197* & *H.Streimann*; holo: CANB.

Illustration: J.A.Elix, *op. cit.* 29, fig. 1.

Thallus orbicular or irregularly spreading, adnate throughout, 2–8 cm wide. Lobes 0.8–1.5 mm wide, contiguous to imbricate in the centre, radiating at the periphery, irregularly branched, plane to weakly convex; lobe margins entire; lobe apices truncate, weakly ascending, eciliate. Upper surface whitish grey to grey or dark grey, dull, emaculate, white-pruinose and appearing frosted especially near apices, with dactylate isidia. Dactyls laminal, 0.2–0.5 mm wide, becoming erumpent and developing into elevated pustules, stalked soralia or craters that occasionally coalesce to cover large parts of the upper surface; soredia coarsely granular, whitish or grey. Upper cortex pseudoparenchymatous. Lower surface brown to dark brown or brown-black; rhizines sparse, concolorous with the lower surface, 0.4–0.6 mm long; cortex prosoplectenchymatous. Only juvenile apothecia seen; ascospores not developed. Pycnidia uncommon, initially immersed, then emergent, visible as black dots; conidia subcylindrical, $4\text{--}6 \times 1 \mu\text{m}$.

Chemistry: Upper cortex and medulla K⁺ yellow; containing atranorin (major), zeorin (major), 16 β -acetoxyhopane-6 α ,22-diol (major), 6 α -acetoxyhopane-16 β ,22-diol (minor), leucotylin (minor), 6 α ,16 β -diacetoxyhopane-22-ol (minor), 6 α -acetoxy-16 β ,22-dihydroxyhopane-25-oic acid (minor), 16 β -acetoxy-6 α ,22-dihydroxyhopane-25-oic acid (trace).

Occurs on trees and rocks in coastal and hinterland areas of north-eastern Qld; also in Central and South America and South Africa.

Qld: track to Luggar Bay, 17 km E of Tully, *H.Streimann 45436* (CANB).

The diagnostic combination of characters includes the dactylate-pustulate upper surface, lobes that are frosted-pruinose subapically, the intact upper cortex, the brown to brown-black lower surface and the presence of the leucotylin chemosyndrome of triterpenes.

11. *Physcia decorticata* Moberg, *Nordic J. Bot.* 10: 329 (1990)

T: c. 10 km (by road) NNE of Palca, Tarma, Junin, Peru, 11°18'S, 75°32'W, alt. c. 2600 m, 17 Feb. 1981, *R. & B.Santesson & R.Moberg P12:73*; holotype: S n.v.; iso: UPS n.v.

Illustration: R.Moberg, *loc. cit.* fig. 6.

Thallus orbicular or irregularly spreading, adnate throughout, 2–8 cm wide. Lobes 0.5–1.5 mm wide, contiguous to imbricate in the centre, radiating at the periphery, irregularly branched, plane to weakly convex; lobe margins entire; lobe apices truncate, weakly ascending, eciliate. Upper surface whitish grey to grey or dark grey, glossy or, occasionally, with a metallic lustre, emaculate, \pm pruinose near the apices; dactyls and pustules present. Pustules laminal, 0.2–0.5 mm wide, beginning as hollow warts (dactyls) that become erumpent, \pm forming stalked soralia or craters that can coalesce to cover large parts of the upper surface; soredia granular, whitish or grey. Upper cortex fragile and cracked, eroding in part. Lower surface brown to dark brown or brown-black; rhizines sparse, concolorous with the lower surface, 0.4–0.6 mm long; cortex prosoplectenchymatous to indistinctly pseudoparenchymatous. Apothecia not seen in Australian material but reported (Moberg, 1990) to be rare, laminal, 0.5–2.0 mm wide, sessile and constricted at the base; margin entire, smooth to often crenulate; disc brown to black, rarely pruinose. Ascospores *Pachysporaria*-type, ellipsoidal, $17\text{--}29 \times 8.5\text{--}12.0 \mu\text{m}$. Pycnidia uncommon, immersed, then emergent, visible as black dots; conidia subcylindrical, $4\text{--}6 \times 1 \mu\text{m}$.

Chemistry: Upper cortex and medulla K⁺ yellow; containing atranorin (major), zeorin (major), 6 α -acetoxyhopane-16 β ,22-diol (major or minor), 6 α -acetoxy-16 β ,22-dihydroxyhopane-25-oic acid (minor), 6 α -acetoxy-22-hydroxyhopane-25-oic acid (minor), leucotylin (minor), 6 α -acetoxyhopane-22-ol (minor), 16 β -acetoxy-6 α ,22-dihydroxyhopane-25-oic acid (trace).

Occurs on trees and rocks in coastal and hinterland areas of north-eastern Qld; also in Central and South America and South Africa.

Qld: Green Is., 27 km NE of Cairns, *J.A.Elix 2594* (CANB); Cooktown road, 3 km NW of Mount Molloy, *J.A.Elix 17197 & H.Streimann* (CANB); Bingil Bay, Bicton Hill Natl Park, 1978, *G.N.Stevens* (BRI).

Characterised by the dactylate-pustulate upper surface, the fragile upper cortex, the brown to brown-black lower surface and the presence of the *speciosa* chemosyndrome of triterpenes.

12. *Physcia dubia* (Hoffm.) Lettau, *Hedwigia* 52: 254 (1912)

Lobaria dubia Hoffm., *Deutschl. Fl.* 156 (1796). T: Ehingen, Germany, 1897, *Rieber* (F.C.G. Arnold, *Lich. Exs.* No. 1724); neo: UPS *n.v.*, *fide* R. Moberg, *Symb. Bot. Upsal.* 22(1): 76 (1977).

Illustrations: V. Wirth, *Die Flechten Baden-Württembergs*, 2nd edn 733 (1995); I.M. Brodo, S.D. Sharnoff & S. Sharnoff, *Lichens of North America* 554, pl. 665 (2001); R. Moberg, *Nordic Lichen Fl.* 2: 98 (2002).

Thallus orbicular or irregularly spreading, adnate centrally, 0.5–6 cm wide. Lobes 0.4–1.2 mm wide, 1–3 mm long, contiguous, crowded to \pm imbricate in the centre, discrete at the periphery, plane to weakly convex; margins slightly thickened and in places \pm inrolled; lobe apices loosely adnate, \pm free and ascending, bifurcate to irregularly and minutely dissected, eciliate. Upper surface pale mineral-grey to grey-white, darkening to blackish at the apices, dull, minutely verruculose to papillate to \pm coarsely areolate-scabrid, epruinose. Soralia terminal, often on small secondary lobes, labriform; soredia greenish, grey-white to somewhat blackened, coarse, granular. Upper cortex pseudoparenchymatous. Lower surface whitish to pale buff-pink, darkening slightly towards centre; rhizines scattered, whitish to brownish or somewhat blackened, simple, 0.5–1.2 mm long; cortex prosoplectenchymatous. Apothecia and pycnidia not seen in Australian material.

Chemistry: Upper cortex K⁺ yellow; medulla K⁻; containing atranorin.

Rare on rock ledges, underhangs and soil in upland to alpine areas of N.S.W., Vic. and Tas.; widespread and common in Europe, North America, northern Asia and New Zealand.

N.S.W.: 2 km NW of Charlottes Pass, Mount Kosciuszko Natl Park, *J.A.Elix* 6536 (CANB); old Kiandra cemetery, New Chums Hill, Mount Kosciuszko Natl Park, *J.A.Elix* 19130 & *H.Streimann* (CANB). Vic.: Mt McKay, 16 km SSE of Mt Beauty, Alpine Natl Park, *J.A.Elix* 40596 & *H.Streimann* (B, CANB). Tas.: Lake Augusta Dam, Central Plateau, *J.A.Elix* 40068 & *G.Kantvilas* (CANB).

This lichen is characterised by the narrow lobes with terminal, labriform soralia most commonly produced on small secondary lobes, the dull mineral-grey, epruinose upper surface, noticeably darker at the apices, the K⁻ medulla and the prosoplectenchymatous lower cortex. *Physcia tribacia* differs in having a glossy upper surface and a pseudoparenchymatous lower cortex.

13. *Physcia erumpens* Moberg, *Nordic J. Bot.* 6: 856 (1986)

T: c. 5 km W of Ruhuruini Park Gate, Aberdare Natl Park, Kenya, 00°02'S, 36°7'E, alt. 2550 m, on trunk of *Neoboutonia macrocalyx*, 1979, *R.Moberg* 4419a; holo: UPS *n.v.*

Illustrations: R. Moberg, *Nordic J. Bot.* 6: 857, fig. 16 (1986); T.D.V. Swinscow & H. Krog, *Macrolichens of East Africa* 227, fig. 110 (1988); T.H. Nash III, C. Gries & F. Bungartz, *Lichen Fl. Greater Sonoran Desert Region* 3: colour plate (2007).

Thallus orbicular or irregularly spreading, adnate, 1–5 cm wide. Lobes 0.5–1.5 mm wide, subimbricate to contiguous or separate at the apices, densely imbricate in the centre, plane to weakly convex; margins entire, shallowly notched, \pm irregularly lobulate; apices incised or truncate; eciliate. Upper surface grey-white, pale to medium grey or pale brownish grey, smooth, dull or glossy, \pm white-pruinose, minutely white-maculate in older parts. Soralia mostly laminal, rounded, usually crateriform, rarely capitate, becoming confluent and eroding, beginning as cracks in the upper cortex; soredia pale greenish to white, coarsely granular. Lower surface brown-black to black, paler at the apices; rhizines simple to squarrose tipped, grey to brown-black, sparse to numerous, 0.2–0.8 mm long. Upper and lower cortices pseudoparenchymatous. Apothecia very rare, laminal, 0.5–2.0 mm wide, sessile and constricted at the base; margin persistent, swollen, smooth to crenulate, often sorediate; disc red-brown to black, \pm pruinose. Ascospores ellipsoidal, *Pachysporaria*-type, 19–27 \times 8.5–12.5 μ m. Pycnidia rare, immersed, visible as black dots; conidia bacilliform, 4–6 \times 1 μ m.

Chemistry: Cortex K⁺ yellow; medulla K⁺ yellow; containing atranorin (major), zeorin (major), 16 β -acetoxypopane-6 α ,22-diol (major or minor), 6 α -acetoxypopane-16 β ,22-diol (minor), leucotylin (minor), 6 α ,16 β -diacetoxypopane-22-ol (minor), 6 α -acetoxy-16 β ,22-dihydroxypopane-25-oic acid (trace).

Scattered on coastal trees, and rarely on rocks, in eastern N.S.W.; also in southern Europe, Macaronesia, North and South America, Africa and New Zealand.

N.S.W.: Stuarts Pt, Old Macleay River estuary, *J.A.Elix* 21367 (CANB); Queens Head area, Limeburners Creek Nature Reserve, 15 km S of Crescent Head, *J.A.Elix* 43582, 43590 (CANB).

Characterised by the brown-black to black lower surface and the usually crateriform, laminal soralia.

14. *Physcia integrata* Nyl., *Syn. Meth. Lich.* 1(2): 424 (1860)

T: Orizaba, Mexico, *F.Müller*; holo: H-NYL 32211 *n.v.*

Illustrations: R.Moberg, *Nordic J. Bot.* 6: 858, fig. 18 (1986); T.D.V.Swinscow & H.Krog, *Macrolichens of East Africa* 229, fig. 112 (1988).

Thallus orbicular or irregularly spreading, adnate throughout, 3–6 cm wide, occasionally coalescing to form larger colonies. Lobes 0.5–2.0 mm wide, usually densely imbricate, irregularly or pinnately branched, plane to weakly convex or undulate; lobe margins entire; tips rounded, often slightly downrolled; occasionally the inner parts of the thallus becoming dissected into small lobules, 0.3–0.6 mm wide. Upper surface whitish grey to grey or bluish grey, with or without distinct white maculae, often greyish white-pruinose at the apices; soredia and isidia absent. Lower surface black (apart from the pale lobe tips); rhizines simple, dense, black, 0.4–0.7 mm long; cortex pseudoparenchymatous, with thick black cell walls. Apothecia rare to abundant, laminal, 0.5–2.0 mm wide, broadly adnate; margin entire, smooth; disc dark brown to black, dull, epruinose or with white pruina. Ascospores *Pachysporaria*-type, broadly ellipsoidal, 18–32 × 8.5–14.0 µm. Pycnidia immersed, visible as black dots; conidia bacilliform, 4–5 × 1 µm.

Chemistry: Upper cortex and medulla K⁺ yellow; containing atranorin (major), zeorin (major), 16β-acetoxypopane-6α,22-diol (trace), 6α-acetoxypopane-16β,22-diol (trace), leucotylin (trace).

Rare on coastal rocks in eastern N.S.W.; also in Mexico, South America, East Africa and Christmas Island (Indian Ocean).

N.S.W.: Broken Head Nature Reserve, 8 km S of Byron Bay, *J.A.Elix* 21258 (CANB); Hat Head, 21 km E of Kempsey, *R.Moberg* & *B.Owe-Larsson* 491:2 (UPS).

This species is characterised by its black pseudoparenchymatous lower cortex, the upper surface which is often greyish white-pruinose at the apices and the absence of soredia and isidia.

15. *Physcia jackii* Moberg, *Biblioth. Lichenol.* 78: 298 (2001)

T: Uriarra Crossing, Murrumbidgee R., 17 km NW of Capital Hill, Canberra, A.C.T., 35°15'S, 148°57'E, alt. 400 m, on river bank with *Casuarina cunninghamii* forest and open rocky outcrops, on fallen *Casuarina*, 12 Mar. 1992, *R.Moberg* & *B.Owe-Larsson* 467:1; holo: CANB.

Illustrations: W.M.Malcolm & D.J.Galloway, *New Zealand Lichens[:]* Checklist, Key, and Glossary 135, 143 (1997), as *P. stellaris*; *R.Moberg, op. cit.* 299, fig. 1.

Thallus orbicular or irregularly spreading, uniformly adnate, 1–7 cm wide. Lobes (0.5–) 1.0 (–2.0) mm wide, plane to weakly concave or convex, contiguous to imbricate; margin entire, shallowly notched, incised or scalloped; lobe tips ±truncate and crenulate. Upper surface whitish grey when dry, pale greenish grey or blue-grey when moist, usually glossy, indistinctly white-maculate, white-pruinose or not; soredia and isidia absent. Lower surface whitish at the margins to pale buff or creamish centrally, smooth; rhizines concolorous, sparse to numerous, simple to squarrosely branched at the apices, white to pale tan, 0.4–1.0 mm long; cortex prosoplectenchymatous, with the lowermost part gradually forming rounded cells (pseudoparenchymatous). Apothecia laminal, often crowded at the centre of the thallus, sessile and constricted at the base, 0.2–2.0 mm wide; margin entire, smooth to crenulate-striate; disc dull dark brownish black, often white-pruinose. Ascospores *Pachysporaria*-type or *Physcia*-type, ellipsoidal, 18–27 × 7.5–12.0 µm. Pycnidia common, immersed in the thallus and visible as black dots; conidia subcylindrical, 4–5 × 1 µm.

Chemistry: Upper cortex and medulla K⁺ yellow; containing atranorin (major), zeorin (major), 16 β -acetoxyhopane-6 α ,22-diol (major or minor), 6 α -acetoxyhopane-16 β ,22-diol (minor), leucotylin (minor), 6 α ,16 β -diacetoxyhopane-22-ol (minor), 6 α -acetoxy-16 β ,22-dihydroxyhopane-25-oic acid (trace).

Common on the bark of trees, shrubs and on lignum in open woodland in southern W.A., S.A., eastern Qld, N.S.W., A.C.T., Vic. and Tas.; also in South Africa and New Zealand.

W.A.: First North Rd, Wotto Nature Reserve, 21 km NE of Eneabba, *J.A.Elix 28862* (CANB). S.A.: 4 km E of Chinamans Well, Yorke Penin., *J.A.Elix 3779* (CANB). Qld: Palmerston Hwy, 5 km E of Ravenshoe, *H.Streimann 46174* (CANB). N.S.W.: along banks of Endrick R., 5 km NE of Nerriga, *J.A.Elix 3117* (CANB). A.C.T.: Cotter Caves, 20 km W of Canberra, *J.A.Elix 9079* (CANB). Vic.: Willis, Snowy River Natl Park, *R.Moberg A58:1* & *B.Owe-Larsson* (CANB); Oakleigh, 1886, *F.R.M.Wilson* (NSW). Tas.: Boat Harbour, 10 km NW of Wynyard, *J.A.Elix 23822* (CANB).

Physcia jackii is characterised the comparatively narrow and weakly maculate lobes with truncate apices, the absence of soredia and isidia, the pruinose apothecia, and by its preference for corticolous and lignicolous substrata. For differences from *P. littoralis*, see below.

16. *Physcia kantvilasii* Elix, *Australas. Lichenol.* 69: 26 (2011)

T: Robbins Island Track, just N of Denium Hill, 25 km NW of Smithton, Tas., 40°44'S, 144°53'E, alt. 2 m, on *Bursaria* bark in *Melaleuca* swamp, 10 Dec. 1993, *J.A.Elix 40291* & *G.Kantvilas*; holo: CANB.

Illustration: J.A.Elix, *op. cit.* 29, fig. 2.

Thallus orbicular or irregularly spreading, adnate, to 1–3 cm wide. Lobes 0.8–1.5 mm wide, broader at the tips, weakly to markedly convex, sublinear, irregularly branched; lobe tips often ascending, with sparse simple marginal cilia; cilia whitish, darkening at the tips or black, 0.2–0.7 mm long. Upper surface greenish white, whitish to cream-coloured, usually emaculate, rarely indistinctly white-maculate, smooth, dull, rarely white-pruinose. Soralia sparse, labriform on the underside of the lobe tips; soredia coarse, granular, white or greenish white; upper cortex pseudoparenchymatous. Lower surface white to pale brown; rhizines sparse to moderately dense subapically, simple to sparsely branched, whitish to brown or brown-black, 0.2–0.7 mm long; lower cortex prosoplectenchymatous to indistinctly pseudoparenchymatous. Apothecia and pycnidia not seen.

Cortex and medulla K⁺ yellow; containing atranorin (major), zeorin (major), 6 α -acetoxyhopane-16 β ,22-diol (minor), 6 α -acetoxy-16 β ,22-dihydroxyhopane-25-oic acid (minor), leucotylin (trace).

This very rare, corticolous endemic is known only from the type locality in north-western Tas.

This lichen is characterised by the narrow, sublinear, convex lobes with ascending lobe apices, the sparse marginal cilia, the presence of terminal, labriform soralia, the K⁺ yellow medulla and in containing atranorin, zeorin, and the *speciosa* chemosyndrome of triterpenes.

17. *Physcia krogiae* Moberg, *Nordic J. Bot.* 6: 858 (1986)

T: confluence of River Chanya and River Thika, Thika, Fort Hall District, Central Province, Kenya, 01°03'S, 34°05'E, alt. c. 1500 m, on bark of giant Leguminosae tree, 1979, *R.Moberg 4595*; holo: UPS *n.v.*

Illustrations: R.Moberg, *op. cit.* 845, figs 2, 3; 847, fig. 6d; 849, fig. 8b; 859, fig. 19.

Thallus orbicular or irregularly spreading, adnate to loosely adnate, 1–5 cm wide. Lobes 0.8–2.5 mm wide, plane to weakly concave or convex, irregularly branched, discrete to imbricate; margins entire, smooth to sinuose or irregular; apices rounded, plane. Upper surface grey-white to bluish grey, often paler at the margins, dull, \pm white-maculate in the centre, frosted-pruinose especially near the apices. Soralia laminal or submarginal, maculiform, beginning as small eroding pustules or cracks in the upper cortex, ultimately forming \pm capitate soralia that can coalesce to cover large parts of the thallus; soredia farinose to granular, white to grey-white. Lower surface pale brown at the margins to dark brown or brown-black in the

centre; rhizines sparse, concolorous with the lower surface, 0.4–0.6 mm long; cortex pseudoparenchymatous. Apothecia and pycnidia not seen.

Chemistry: Upper cortex and medulla K⁺ yellow; containing atranorin (major), zeorin (major), 6 α -acetoxyhopane-16 β ,22-diol (major or minor), 6 α -acetoxy-16 β ,22-dihydroxyhopane-25-oic acid (minor), 6 α -acetoxy-22-hydroxyhopane-25-oic acid (trace), leucotylin (minor), 16 β -acetoxy-6 α ,22-dihydroxyhopane-25-oic acid (trace).

Occurs on trees and rocks in coastal and hinterland areas of northern N.T. and eastern Qld; also in East Africa, and Central and South America.

N.T.: Umbrawarra Gorge, 22 km SW of Pine Creek, *J.A.Elix 22519* & *H.Streimann* (CANB). Qld: Robinson Gorge, Expedition Natl Park, 73 km NW of Taroom, *J.A.Elix 35266* (CANB); Cabbagtree Ck, 42 km ENE of Taroom, *J.A.Elix 35399* (CANB).

Characterised by the frosted-pruinose upper surface (especially near the apices), the laminal pustulate soralia and the brown to brown-black lower surface.

18. *Physcia littoralis* Elix, in J.A.Elix, J.Corush & H.T.Lumbsch, *Syst. & Biodiv.* 7: 484 (2009)

T: Grassy Head, 5 km N of Stuarts Pt, North Coast, N.S.W., 30°48'S, 153°00'E, alt. 6 m, on exposed coastal rocks, 24 Jan. 1988, *J.A.Elix 21825*; holo: CANB.

Illustration: J.A.Elix, J.Corush & H.T.Lumbsch, *loc. cit.* fig. 4.

Thallus orbicular or irregularly spreading, loosely adnate, to 8 cm wide. Lobes 0.5–1.2 mm wide, plane to weakly convex or weakly concave, often sublinear-elongate towards the margins, lobulate along the lobe margins and in the thallus centre; lobules \pm rounded or sparingly branched, 0.10–0.25 mm wide; lobe tips \pm truncate and crenulate, eciliate. Upper surface off-white to pale grey, usually glossy, indistinctly white-maculate, epruinose or rarely sparsely so; soredia and isidia absent. Lower surface usually white, rarely pale brown; rhizines sparse to numerous, white to brown-black, simple or often fasciculate, to 0.7 mm long; cortex prosoplectenchymatous, with the lowermost part becoming pseudoparenchymatous. Apothecia laminal, abundant at the centre of the thallus, 0.3–1.2 mm wide, sessile and constricted at the base to substipitate; margin entire, smooth; disc plane, brown-black to black, dull, \pm thinly grey-pruinose. Ascospores *Pachysporaria*-type or *Physcia*-type, ellipsoidal, 17–23 \times 8–13 μ m. Pycnidia common, initially immersed, later emergent, visible as black dots; conidia bacilliform, 4–5 \times 1 μ m.

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

This endemic species occurs on seashore rocks and in coastal forest in N.S.W.

N.S.W.: Shelleys Beach Reserve, Port Macquarie, *J.A.Elix 1077* (CANB); 1 km S of Scotts Head, North Coast, *J.A.Elix 39024, 39025* (CANB); Mystery Bay, South Coast, *J.A.Elix 2090* (CANB).

This species is characterised by the narrow, weakly maculate lobes, the absence of soredia and isidia and the pruinose apothecia. *Physcia littoralis* differs in having loosely adnate thalli (adnate in *P. jackii*) that develop lobules along the lobe margins and in the thallus centre, in having shorter ascospores, and in its preference for saxicolous substrata.

19. *Physcia neonubila* Elix, *Australas. Lichenol.* 68: 31 (2011)

T: Molonglo Gorge Forest Park, 15 km SE of Canberra, A.C.T., 35°19'46"S, 149°14'59"E, alt. 650 m, on *Melaleuca* shrubs along the river bank in dry *Eucalyptus-Callitris* woodland, 25 Oct. 2008, *J.A.Elix 39207*; holo: CANB.

Illustration: J.A.Elix, *op. cit.* 37, fig. 3.

Thallus orbicular or irregularly spreading, adnate throughout, 1–6 cm wide. Lobes narrow, 0.5–1.5 mm wide, densely imbricate to separate, irregularly branched, weakly concave to plane or weakly convex; lobe margins delicately scalloped, notched or incised; apices \pm plane. Upper surface white, cream-coloured to grey-white or dark grey, matt, \pm minutely

roughened, usually distinctly white-maculate, rarely faintly maculate, glabrous at the apices. Soralia marginal, but spreading towards the inner parts of lobes, erumpent-erose, occasionally coalescing and forming extensive sorediate patches centrally; soredia coarsely granular, white or grey-white. Lower surface creamy white to pale buff, with a narrow darker marginal zone, smooth; rhizines scattered, rather sparse at the margins, more numerous centrally, concolorous with the lower surface, simple, with an apical squarrose tuft, 0.5–0.8 mm long; cortex prosoplectenchymatous. Apothecia absent or very rare, laminal, sessile, constricted at the base, 0.5–1.0 (–1.5) mm diam.; margin persistent, thick, swollen, entire to ±scalloped, not becoming sorediate; disc concave to plane, matt, dark brown to black, epruinose or with grey-white pruina. Ascospores *Pachysporaria*-type, broadly ellipsoidal, (16.5–) 20.0–23.0 × 8.0–10.5 μm. Pycnidia occasional to common, immersed, visible as black dots; conidia subcylindrical, 4–5 × 1 μm.

Chemistry: Upper cortex K⁺ yellow; medulla K⁺ yellow; containing atranorin (major), zeorin (major), 6α-acetoxypopane-16β,22-diol (trace), 6α-acetoxy-16β,22-dihydroxypopane-25-oic acid (minor), leucotylin (minor or trace), 6α-acetoxy-22-hydroxypopane-25-oic acid (trace), 16β-acetoxy-6α,22-dihydroxypopane-25-oic acid (trace).

This endemic species occurs mainly on bark, more rarely on rocks and lignum, in southern and eastern Australia (W.A., S.A., Qld, N.S.W., A.C.T. and Vic.).

W.A.: South Coast Hwy, Ravensthorpe Ra., 9 km E of Ravensthorpe, *J.A.Elix 41608* (CANB, UPS). S.A.: summit of Mt Crawford, Mount Lofty Ra., *J.A.Elix 3835* (CANB). Qld: Carnarvon Hwy, 39 km NNW of Roma, *J.A.Elix 34011* (CANB). N.S.W.: Mullion Track to the Pinnacle, Coolah Tops Natl Park, 33 km E of Coolah, *J.A.Elix 36185* (CANB). A.C.T.: Aranda Primary School, 5 km W of Canberra, *J.A.Elix 38831* (CANB). Vic.: Reef Hills State Park, 7 km SSW of Benalla, *J.A.Elix 37183* (CANB).

Physcia neonubila has narrow lobes with marginal soralia, a concave to weakly convex, and often distinctly white-maculate upper surface which is usually glossy and smooth at the apices; it is also characterised by the presence of the *speciosa* chemosyndrome. In contrast, the upper surface of *P. nubila* is convex, emaculate, areolate-scabrid to densely pruinose at the apices, and it contains the leucotylin chemosyndrome.

20. *Physcia nubila* Moberg, *Nordic J. Bot.* 10: 335 (1990)

Heterodermia desertorum Kalb, *Lich. Neotrop. Exs.* 8: [10] (1984). T: coastal desert at Huacho, c. 150 km N of Lima, Peru, alt. c. 200 m, on small rocks in the mist zone, 1979, K.Kalb & G.Plöbst; holo: Herb. Kalb; iso: UPS, Herb. Kalb.

Illustration: R.Moberg, *loc. cit.* fig. 12.

Thallus orbicular to irregularly spreading, adnate, 1–6 cm wide. Lobes variable, 0.3–5.0 mm wide, discrete to contiguous or imbricate, irregularly branched; lobe margins delicately scalloped, notched or incised, or minutely lobulate; apices slightly down-curved. Upper surface white, creamish to grey-white, occasionally suffused grey-black at lobe apices, areolate-scabrid, emaculate, occasionally densely white-pruinose. Soralia marginal, sometimes along the entire length of the lobe, labriform at lobe sinuses, rarely eroding and spreading over the upper surface; soredia coarsely granular, white or grey-white; upper cortex pseudoparenchymatous. Lower surface white to brownish or graphite-grey; margins often ecorticate; soralia sometimes eroding the underside; rhizines few and robust, usually darker than the underside; lower cortex prosoplectenchymatous. Apothecia usually rare, sessile, constricted at the base, rounded, 0.5–1.5 mm wide; margin persistent, thick, swollen, entire to ±scalloped, not becoming sorediate; disc brown to black, usually white-pruinose. Ascospores *Pachysporaria*-type, broadly ellipsoidal, with obtuse apices, 16.5–26.0 × 7.5–12.0 μm. Pycnidia occasional to common, laminal, immersed, black, punctiform, minute; conidia bacilliform, 4–5 × 1 μm.

Chemistry: Upper cortex K⁺ yellow; medulla K⁺ yellow; containing atranorin (major), zeorin (minor), 6α-acetoxypopane-16β,22-diol (major), leucotylin (minor), ±16β-acetoxypopane-6α,22-diol (trace).

Physcia nubila grows on trees and, more rarely, on rocks in the more arid regions of W.A., S.A., Qld, N.S.W. and Vic.; also in East and South Africa, South America and New Zealand.

W.A.: Ghooli, 15 km E of Southern Cross along the Great Eastern Hwy, *J.A.Elix* 32009 (CANB). S.A.: L. Salmon, S of L. Torrens, c. 32 km N of Yadlamaka HS, *D.Verdon* 4756 (CANB, UPS). Qld: Carnarvon Hwy, 88 km ENE of St. George, *J.A.Elix* 33980 (CANB). N.S.W.: Cookamidgera S.F., 3.5 km SSW of Cookamidgera, *J.A.Elix* 39083 (CANB). Vic.: Piangil Rd, 3 km NE of Walpeup, *J.A.Elix* 43312 (CANB).

Characterised by the convex lobes with marginal soralia, the emaculate, areolate-scabrid to densely pruinose upper surface and the presence of the zeorin-leucotylin chemosyndrome.

21. *Physcia phaeocarpa* (Nyl.) Hue, *Nouv. Arch. Mus. Hist. Nat.*, sér. 3, 2: 318 (1890)

"*Physcia dilatata* ***Ph. phaeocarpa*" Nyl., *Syn. Meth. Lich.* 1(2): 424 (1860). T: Minas Geraes, Brazil, *Vauthier*; lecto: H-NYL 32181 n.v., *fide* R.Moberg, *Nordic J. Bot.* 10: 336 (1990).

Illustration: R.Moberg, *Nordic J. Bot.* 10: 337, fig. 14 (1990).

Thallus orbicular or irregularly spreading, adnate to loosely adnate, 3–5 cm wide. Lobes 0.7–2.0 mm wide, discrete and radiating at the margins, contiguous to imbricate and occasionally becoming verrucose and bullate towards the centre; margins notched or crenulate, sometimes becoming dissected and lobulate, the lobules rounded to irregular and 0.2–0.5 mm wide. Upper surface silvery grey to greyish brown, frosted-pruinose, especially at the lobe margins, lacking soredia and isidia. Lower surface brownish to very dark grey or black, except for a contrasting white marginal zone; rhizines brown to black, scattered, simple, 0.3–0.6 mm long; cortex prosoplectenchymatous, of brown to black cylindrical hyphal cells. Apothecia sessile, constricted at the base, 0.5–3.0 mm wide; margin persistent, thick, swollen, often crenulate on larger apothecia; disc brown to black, epruinose. Ascospores *Pachysporaria*-type, broadly ellipsoidal, 21–27 × 9.5–11.0 μm. Pycnidia occasional to common, laminal, immersed, black, punctiform; conidia bacilliform, 4–5 × 1 μm.

Chemistry: Upper cortex and medulla K⁺ yellow; containing atranorin (major), zeorin (major), 6α-acetoxypopane-16β,22-diol (major or minor), 6α-acetoxypopane-16β,22-dihydroxypopane-25-oic acid (minor), 6α-acetoxypopane-22-hydroxypopane-25-oic acid (minor), leucotylin (minor), 6α-acetoxypopane-22-ol (minor), 16β-acetoxypopane-6α,22-dihydroxypopane-25-oic acid (trace).

Occurs on the bark of trees in rather open, often moist situations in tropical coastal areas of the N.T. and north-eastern Qld; also in South America.

N.T.: Black Jungle, c. 42.5 km ESE of Darwin, *G.Thor* 5968 (S, UPS). Qld: Mt Leswell, 32 km S of Cooktown, *J.A.Elix* 17358, 17403 & *H. Streimann* (CANB); N slopes of Mt Catherina, 10 km NE of Ingham, *J.A.Elix* 17656 & *H. Streimann* (CANB).

Characterised by the frosted-pruinose upper surface, the brownish to very dark grey or black lower surface and the prosoplectenchymatous lower cortex. The broadly similar *P. verrucosa* has a pale undersurface.

22. *Physcia poncinsii* Hue, *Bull. Soc. Bot. France* 63, Mém. 28: 10 (1917)

T: Voisinage de La Rivière Tika [Thika, alt. c. 1500 m], [Fort Hall District, Central Province, Kenya], *Poncins*; lecto: PC n.v., *fide* R.Moberg, *Nordic J. Bot.* 6: 859 (1986).

Illustrations: R.Moberg, *Nordic J. Bot.* 6: 860, fig. 20 (1986); T.D.V. Swinscow & H.Krog, *Macrolichens of East Africa* 230, fig. 113 (1988); P.M. McCarthy & W.M. Malcolm, *Key to the Genera of Australian Macrolichens* 56 (2004).

Thallus orbicular or irregularly spreading, adnate throughout, 2–5 cm wide. Lobes 0.3–2.5 mm wide, imbricate to separate, irregularly or pinnately branched, weakly concave to ±plane or convex; lobe margins entire to delicately incised, but lacking soredia; lobe tips usually truncate, also rounded, often slightly downrolled. Upper surface whitish grey to grey or dark grey, emaculate to distinctly white-maculate and with somewhat raised maculae, often grey-white pruinose at apices. Soralia laminal, crateriform with flaring margins to almost capitate, 0.1–1.0 mm wide, usually orbicular, beginning from cracks in the upper cortex, ±coalescing and spreading over the surface; soredia coarsely granular, white to greenish white. Lower surface white near the margins to cream-coloured or pale brown centrally; rhizines often scattered at the apices to densely crowded and tangled centrally, simple to squarrose-branched, whitish, tan to grey or brown, 0.4–0.9 mm long; cortex prosoplectenchymatous.

Apothecia absent or very rare, laminal, 0.2–1.5 mm wide, sessile and constricted at the base; margin entire, smooth or becoming soredate; disc initially concave, then plane, brown-black to black, with a fine grey-white pruina. Ascospores *Pachysporaria*-type, broadly ellipsoidal, $17\text{--}26 \times 7.5\text{--}11.0 \mu\text{m}$. Pycnidia sparse, immersed, visible as black dots; conidia bacilliform, $4\text{--}5 \times 1 \mu\text{m}$.

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

Common on tree trunks and on wood, less so on rock, in open situations in southern and eastern Australia (W.A., S.A., Qld, N.S.W., Vic. and Tas.); also in East Africa, southern North America, South America, Norfolk Island and New Zealand.

W.A.: Jurien Rd, Drovers Cave Natl Park, 6 km NE of Jurien Bay, *J.A.Elix* 28922 (CANB). S.A.: Ferries-McDonald Conservation Park, 10 km S of Monarto, *J.A.Elix* 39387 (CANB). Qld: path between Cherry Plain Picnic Area and Cherry Plain Lookout, Bunya Mountains Natl Park, *R.Moberg* & *B.Owe-Larsson* A104:1 (UPS). N.S.W.: Burruga Swamp, Allyn River Forest Park, *G.Kantvilas* 221/88 (HO, NSW). Vic.: E of lighthouse, Cape Schanck, Mornington Penin., *R.Moberg* & *B.Owe-Larsson* A36a:9 (UPS). Tas.: Fingal, Malahide, *G.Degelius* A-389 (UPS).

This species is characterised by the distinctive crateriform soralia and the white to cream or pale brown lower surface. It is a rather variable lichen, with corticolous specimens having thinner and flatter lobes, while those of saxicolous specimens are thicker, convex and more noticeably maculate.

23. *Physcia rolandii* Elix, *Australas. Lichenol.* 68: 32 (2011)

T: Boundary Rd, 10 km N of Tailem Bend, S.A., 35°10'18"S, 139°27'57"E, alt. 20 m, on *Leptospermum* in remnant mallee *Eucalyptus* woodland, 3 June 2010, *J.A.Elix* 44005; holo: AD; iso: CANB.

Illustration: *J.A.Elix*, *op. cit.* 38, fig. 4.

Thallus usually orbicular, rarely irregularly spreading, adnate, 1–6 cm wide. Upper surface off-white to pale grey, indistinctly white-maculate, \pm with distinct pruina. Lobes 0.5–1.2 mm wide, plane to weakly convex, often becoming strongly rugulose and bullate-areolate in the centre of older lobes, occasionally with a distinct white margin; lobe tips \pm truncate and crenulate; soredia and isidia absent. Lower surface off-white to pale brown; rhizines sparse to numerous, pale brown to brown-black, to 0.6 mm long; cortex prosoplectenchymatous or indistinctly pseudoparenchymatous. Apothecia laminal, at the centre of the thallus, abundant, 0.5–3.5 mm wide, sessile, constricted at the base; margin, entire, smooth to crenulate; disc initially plane, becoming undulate-distorted, brown-black to black, densely grey-white pruinose. Ascospores *Pachysporaria*-type to *Physcia*-type, ellipsoidal, $17\text{--}30 \times 7\text{--}12 \mu\text{m}$. Pycnidia common, at first immersed, later emergent, visible as pale brown to black dots; conidia bacilliform, $4\text{--}5 \times 1 \mu\text{m}$.

Chemistry: Upper cortex and medulla K⁺ yellow; containing atranorin (major), zeorin (major), 6 α -acetoxyhopane-16 β ,22-diol (trace), 6 α -acetoxy-16 β ,22-dihydroxyhopane-25-oic acid (minor), leucotylin (minor or trace), 6 α -acetoxy-22-hydroxyhopane-25-oic acid (trace), 16 β -acetoxy-6 α ,22-dihydroxyhopane-25-oic acid (trace).

This endemic species grows on trees and shrubs in open situations in the subarid areas of southern and eastern Australia (W.A., S.A., Qld, N.S.W. and Vic.).

W.A.: Halfway Rocks, 17.6 km SE of Bullfinch, *J.A.Elix* 32564 (CANB). S.A.: just N of Ferries-McDonald Conservation Park, 10 km S of Monarto, *J.A.Elix* 39392, 39393 (CANB). Qld: Millmerran–Inglewood road, Bringalily S.F., 41 km S of Millmerran, *J.A.Elix* 43650 (CANB). N.S.W.: Brennans Rd, Lincoln S.F., 15 km ENE of Bellodoran, 21 km SE of Gilgandra, *J.A.Elix* 38449 (CANB). Vic.: Piangil Rd, 3 km NE of Walpeup, *J.A.Elix* 43309, 43310 (CANB).

Characterised by the comparatively narrow, weakly maculate lobes with truncate apices, the lack of soredia and isidia and the pruinose apothecia. It differs chemically from the more common *P. jackii* in containing the *speciosa* chemosyndrome rather than the zeorin-leucotylin chemosyndrome and, ecologically, in its preference for drier regions of Australia.

24. *Physcia rolffii* Moberg, *Nordic J. Bot.* 10: 337 (1990)

T: 17 km (by road) W of Huanuco, valley of Rio Higueras, Huanuco, Peru, 09°55'S, 76°22'W, alt. 2300 m, on rocks, 1981, *R.Santesson & Moberg R.P48:21*; holo: *S.n.v.*; iso: UPS.

Illustration: R.Moberg, *op. cit.* 338, fig. 15.

Thallus orbicular or irregularly spreading, adnate throughout, 4–6 cm wide. Lobes 0.5–1.5 mm wide, separate to imbricate, irregularly branched, plane to weakly convex; lobe margins delicately incised; apices ±plane, becoming sorediate. Upper surface grey-white to dark grey, dull, usually distinctly white-maculate, usually pruinose towards the apices. Soralia marginal, well delimited, in the lobe sinuses, semicircular to upwardly curved or labriform, rarely coalescing; soredia coarsely granular, white or grey-white. Lower surface white to pale grey or pale brown, smooth; rhizines scattered, rather sparse, concolorous with the lower surface or somewhat darker, simple, with an apical squarrose tuft, 0.5–0.8 mm long; lower cortex prosoplectenchymatous to indistinctly pseudoparenchymatous. Apothecia uncommon, laminal, sessile, constricted at the base, rounded, 0.5–1.2 mm diam.; thalline exciple persistent, thick, swollen, entire to ±scalloped, concolorous with the thallus, occasionally becoming sorediate; disc concave to plane, matt, dark brown to black, often greyish white-pruinose. Ascospores *Pachysporaria*-type, broadly ellipsoidal, 17–25 × 9–14 μm. Pycnidia uncommon, immersed, visible as black dots; conidia bacilliform, 4–5 × 1 μm.

Chemistry: Upper cortex and medulla K⁺ yellow; containing atranorin (major), zeorin (major), 6α-acetoxypopane-16β,22-diol (minor or trace), 6α-acetoxypopane-16β,22-dihydroxypopane-25-oic acid (trace), leucotylin (minor), 16β-acetoxypopane-6α,22-dihydroxypopane-25-oic acid (trace).

This lichen is very uncommon on bark and even rarer on rock in eastern Qld; also in South America.

Qld: Lolworth Ck, Red Falls, 58 km WNW of Charters Towers, *J.A.Elix 20521 & H.Streimann* (CANB); Whitecliff Gorge Ck, Hann (The Lynd) Hwy, 56 km NNE of Hughenden, *J.A.Elix 20745 & H.Streimann* (CANB).

Physcia rolffii has narrow lobes with semicircular marginal soralia, and a plane to weakly convex and often distinctly white-maculate surface. The thallus contains the zeorin-leucotylin chemosyndrome.

25. *Physcia sorediosa* (Vain.) Lynge, *Vidensk.-Selsk. Skrifter*, I Math.-Naturv. Kl. 16: 27 (1924)

Physcia integrata var. *sorediosa* Vain., *Acta Soc. Fauna Fl. Fenn.* 7: 142 (1890). T: Rio de Janeiro, Brazil, 1885, *E.A.Vainio*; lecto: TUR-V *n.v.*, *vide* R.Moberg, *Nordic J. Bot.* 10: 339 (1990); isolecto: UPS, E.A.Vainio, *Lich. Brasil. Exs.* No. 155 *n.v.*

Physcia fragilesceus Zahlbr., *Ann. Cryptog. Exot.* 1: 211 (1928). T: Batavia, Java, [Indonesia], 1893–94, *V.Schiffner 2892*; lecto: W *n.v.*, *vide* R.Moberg, *Nordic J. Bot.* 6: 857 (1986).

Illustrations: R.Moberg, *Nordic J. Bot.* 6: 858, fig. 17 (1986), as *P. fragilesceus*; I.M.Brodo, S.D.Sharnoff & S.Sharnoff, *Lichens of North America* 557, pl. 671 (2001); F.Schumm & A.Aptroot, *Seychelles Lichen Guide* 256 (2010).

Thallus orbicular or irregularly spreading, loosely adnate, 2–5 cm wide. Lobes 0.5–2.0 mm wide, contiguous or imbricate, irregularly branched, usually broader at the apices, eciliate. Upper surface whitish grey to grey, glossy, rarely pruinose, ±distinctly white-maculate. Soralia and/or dactyls marginal, often best developed in lobe axils; soralia small and delimited, occasionally enlarged and capitate, rarely confluent and laminal; dactyls becoming pustulate and ultimately sorediate; soredia farinose, white or grey-white. Lower surface black, partly dark grey and even paler at the lobe tips; rhizines black, simple, 0.4–0.6 mm long; cortex pseudoparenchymatous. Apothecia usually rare, sessile, constricted at the base, 0.5–2.0 mm wide; thalline exciple concolorous with the thallus; margin persistent, crenulate or, occasionally, dissolving into soredia; disc black, ±white-pruinose. Ascospores *Pachysporaria*-type, broadly ellipsoidal, 17–23 × 8–11 μm. Pycnidia uncommon, laminal, immersed, black, punctiform; conidia bacilliform, 4–5 × 1 μm.

Chemistry: Upper cortex and medulla K⁺ yellow; containing atranorin (major), zeorin (major), 6 α -acetoxyhopane-16 β ,22-diol (trace), 6 α -acetoxy-16 β ,22-dihydroxyhopane-25-oic acid (minor), leucotylin (trace).

Occurs on trees and rocks in rather moist, coastal areas of Qld; also on Lord Howe Island and Norfolk Island, and in North, Central and South America, SE Asia and the Seychelles.

Qld: slopes of Mt Whitfield, Cairns, *J.A.Elix 2565a* (CANB); Mission Beach North, *G.N.Stevens 2668* (BRI); near Sunshine Beach, Noosa Natl Park, *R.W.Rogers 7756, 7758, 7759* (BRI).

This lichen is characterised by the black, pseudoparenchymatous lower cortex, marginal dactyls and/or soralia containing farinose soredia.

26. *Physcia tribacia* (Ach.) Nyl., *Flora* 62: 48 (1874)

Lecanora tribacia Ach., *Lichenogr. Universalis*: 415 (1810). T: Anglia [England]; lecto: H-ACH 1115 *n.v.*, *vide* R.Moberg, *Nordic J. Bot.* 6: 860 (1986).

Physcia tribacia var. *tenuis* Müll.Arg., *Flora* 69: 257 (1886). T: “supra saxa ad Clarendon prope St. Vincents Gulf Australiae”, [S.A.], *J.G.O.Tepper 581*; type not located.

Illustrations: R.Moberg, *Nordic J. Bot.* 6: 850, fig. 9; 861, fig. 21 (1986).

Thallus usually irregularly spreading, rarely orbicular, loosely adnate to adnate centrally, 0.5–3.0 cm wide. Lobes 0.4–1.5 mm wide, contiguous, crowded to \pm imbricate in the centre, not radiating at the periphery, plane to weakly convex, eciliate; lobe margins crenulate or with minute horizontal lobules; lobule apices often dissolving into granular soredia. Upper surface pale whitish grey to cream-coloured or dark grey, emaculate, glossy and epruinose or, rarely, weakly pruinose. Soralia usually terminal, beginning on the lower side of the lobe tips, eroding the tips and occasionally also the lower surface, often on small secondary lobules, labriform; soredia greenish, grey-white to somewhat blackened, coarse, granular. Lower surface whitish or weakly rose-coloured to greyish brown, darkening slightly towards the centre; rhizines scattered, whitish to brownish or somewhat blackened, simple, 0.5–1.2 mm long; cortex pseudoparenchymatous. Apothecia rare, laminal, 0.5–2.0 mm wide, sessile and constricted at the base; margin sorediate in part; disc dark brown to black, epruinose. Ascospores ellipsoidal, of *Physcia*-type, *Pachysporaria*-type or intermediate between the two, 15–24 \times 7.5–13.0 μ m. Pycnidia \pm common, immersed, visible as black dots; conidia bacilliform, 4–6 \times 1 μ m.

Chemistry: Upper cortex K⁺ yellow; medulla K⁻; containing atranorin.

Common on exposed rocks in upland areas of southern W.A., S.A., N.S.W., A.C.T., Vic. and Tas.; also in Europe, North and South America, Asia, Africa, Macaronesia and New Zealand.

W.A.: Boulder Rock Forest Reserve, Darling Ra., 35 km SE of Perth, *J.A.Elix 10527A & L.H.Elix* (CANB). S.A.: St. Mary Peak, Flinders Ranges Natl Park, *G.Rambold 5548* (M). N.S.W.: 13 km S of Countegany along the Nimmitabel road, *J.A.Elix 1975* (CANB). A.C.T.: Coppins Crossing, 8.5 km W of Canberra, *J.A.Elix 39205* (CANB). Vic.: peak due E from Pretty Valley Pond, Bogong High Plains, *R.B.Filson 9565* (MEL). Tas.: Cataract Gorge, Launceston, *G.Kantvilas 678/84* (HO).

Physcia tribacia is characterised by the combination of terminal, labriform soralia, the glossy upper surface and the pseudoparenchymatous lower cortex.

27. *Physcia tribacoides* Nyl., *Flora* 57: 307 (1874)

T: St. Sauveur de Vicomte France, *R.Lenormand*; lecto: H-NYL 32197, *vide* R.Moberg, *Nordic J. Bot.* 6: 861 (1986).

Illustrations: H.Kashiwadani, *Ginkgoana* 3: 38, fig. 7; pl. 4, fig. 2 (1975); R.Moberg, *op. cit.* 849, fig. 8d; 861, fig. 22.

Thallus orbicular or irregularly spreading, adnate, 1–5 cm wide, occasionally coalescing to form more extensive patches. Lobes 0.5–2.0 mm wide, crowded, usually imbricate, weakly convex; lobe margins entire, \pm weakly incised, irregularly lobulate to crenate, especially at the tips, with or without projecting rhizines from the lower surface, eciliate; marginal lobes usually with distinctly flared and incised apices. Upper surface off-white to pale to medium grey, smooth to weakly undulate, usually epruinose, emaculate. Soralia mostly laminal,

strongly convex, subcapitate to capitate, often confluent, a few soralia apical and capitate on short lateral lobes, occasionally beginning as small marginal patches, then expanding and becoming callus-like; soredia white, farinose. Lower surface white at or near the margins, darkening to ash-grey or brownish in inner parts; rhizines simple to squarrosely branched, white, grey or brown, usually sparse, 0.5–0.8 mm long. Upper and lower cortices pseudoparenchymatous, the lower layer with thick cell walls. Apothecia very rare, laminal, 0.4–1.6 mm wide, sessile and constricted at the base; margin persistent, swollen, smooth, rarely becoming soredate; disc red-brown, epruinose. Ascospores ellipsoidal, *Pachysporaria*-type, $17\text{--}23 \times 7\text{--}10 \mu\text{m}$. Pycnidia rare, immersed, visible as black dots; conidia bacilliform, $4\text{--}6 \times 1 \mu\text{m}$.

Chemistry: Upper cortex and medulla K+ yellow; containing atranorin (major), zeorin (major), 6 α -acetoxyhopane-16 β ,22-diol (minor or trace), 6 α -acetoxy-16 β ,22-dihydroxy-hopane-25-oic acid (trace), leucotylin (trace), $\pm 6\alpha,16\beta,22$ -trihydroxyhopane-25-oic acid (trace).

Occurs on trees and rocks in eastern Qld and in eastern and south-eastern N.S.W.; also in Europe, East Africa, Asia and New Zealand.

Qld: Brickworks Rd, Kallangur, *R.W.Rogers & N.Scarlett 6676* (MEL); Burleigh Heads Natl Park, Moreton district, *J.A.Elix 1141, 1157* (CANB). N.S.W.: near Mt Bouddi, Bouddi Natl Park, *J.A.Elix 4666* (CANB); Maria River Rd, 9 km S of Crescent Head, *J.A.Elix 44034* (CANB).

Characterised by the subcapitate to capitate soralia and the crenate crenate to weakly incised lobes.

28. *Physcia tropica* Elix, in J.A.Elix, J.Corush & H.T.Lumbsch, *Syst. & Biodiv.* 7: 485 (2009)

T: below Florence Falls, Litchfield Natl Park, 42 km SW of Batchelor, N.T., 13°05'58"S, 130°47'05"E, alt. 75 m, on dead *Acacia* in monsoon forest, 6 Aug. 2005, *J.A.Elix 37730*; holotype: CANB; iso: DNA.

Illustration: J.A.Elix, J.Corush & H.T.Lumbsch, *loc. cit.* fig. 5.

Thallus usually orbicular in outline, rarely irregularly spreading, adnate, 4–10 cm wide. Lobes 0.5–1.2 mm wide, plane to weakly convex, often becoming strongly rugulose and bullate-areolate in the centre of older lobes, occasionally with a distinct white margin; lobe tips \pm truncate and crenulate. Upper surface off-white to pale grey, usually glossy, indistinctly white-maculate, \pm distinctly pruinose subapically; soredia and isidia absent. Lower surface off-white to pale brown; rhizines sparse to numerous, simple, pale brown to brown-black, 0.2–0.6 mm long; cortex prosoplectenchymatous to indistinctly pseudoparenchymatous. Apothecia laminal, at the centre of the thallus, abundant, 0.5–1.5 mm wide, sessile, constricted at the base; margin persistent, entire, smooth to crenulate; disc plane, pale brown to brown-black, glossy, epruinose. Ascospores *Physcia*-type, ellipsoidal, $17\text{--}30 \times 7\text{--}12 \mu\text{m}$. Pycnidia common, immersed, later emergent, visible as pale brown to black dots; conidia bacilliform, $4\text{--}5 \times 1 \mu\text{m}$.

Chemistry: Upper cortex and medulla K+ yellow; containing atranorin (major), zeorin (major), 6 α -acetoxy-22-hydroxyhopane-25-oic acid (major or minor), 6 α -acetoxy-16 β ,22-dihydroxyhopane-25-oic acid (minor), 6 α -acetoxyhopane-16 β ,22-diol (minor), 16 β -acetoxyhopane-6 α ,22-diol (trace).

Endemic on trees and dead branches in monsoon vine forest in northern N.T.

N.T.: Howard Springs Nature Park, 37.5 km SE of Darwin, *J.A.Elix 36733* (CANB); Berry Springs Nature Park, 47 km S of Darwin, *J.A.Elix 37320, 37345* (CANB).

This lichen is characterised by a thallus that lacks soredia and isidia but becomes markedly rugulose and bullate-areolate in the centre; also brown, epruinose apothecial discs, *Physcia*-type ascospores and the distinctive thallus chemistry.

29. *Physcia undulata* Moberg, *Nordic J. Bot.* 6: 861 (1986)

T: Ngong Hills, Kajiado District, Rift Valley Province, Kenya, 01°26'S, 36°39'E, alt. 2170 m, 1971, *R.Moberg 1406c*; holotype: UPS.

Illustration: R.Moberg, *op. cit.* 862, fig. 23.

Thallus orbicular or irregularly spreading, adnate to loosely adnate, 1–4 cm wide. Lobes 1–2 mm wide, plane to convex, irregularly branched, discrete to imbricate; margins entire to notched, incised or crenulate, slightly to markedly raised, conspicuously sorediate; apices rounded or truncate. Upper surface grey-white to dark grey, dull, smooth to shallowly undulate, \pm white-maculate in the centre, frosted-pruinose especially near apices. Soralia marginal, linear, undulate, eroding the margins and \pm extending to the lower surface, usually not reaching the lobe tips; soredia coarsely granular, white to greenish. Lower surface whitish to grey-white at the margin, pale brown in the centre; rhizines white to brown or grey-black, denser at the margins, simple with a squarrose tuft at the tip, 0.4–0.8 mm long; cortex intermediate in anatomy. Apothecia uncommon, 0.5–2.0 mm wide, sessile, constricted at the base; margin persistent, sorediate; disc brown to black, \pm weakly white-pruinose. Ascospores *Pachysporaria*-type, 19–22 \times 8.0–9.5 μ m. Pycnidia uncommon, immersed, subsequently emergent, visible as pale brown to black dots; conidia bacilliform, 4–5 \times 1 μ m.

Chemistry: Upper cortex and medulla K⁺ yellow; containing atranorin (major), zeorin (major), 16 β -acetoxyhopane-6 α ,22-diol (major), 6 α -acetoxyhopane-16 β ,22-diol (trace), leucotylin (minor or trace).

Grows on rocks and trees in open situations in southern and eastern Australia (W.A., Qld, N.S.W. and Vic.); also in Central and South America, East Africa, Christmas Island (Indian Ocean) and New Zealand.

W.A.: Thomson Bay, Rottnest Is., *L.Tibell 14237* (UPS). Qld: road to Bunya Mtns, c. 12 km NNE of Mt Mowbray, 1988, *K.Kalb & R.W.Rogers* (Herb. Kalb). N.S.W.: near Melville Pt, 13 km S of Batemans Bay, *R.Moberg & B.Owe-Larsson A69:1a* (UPS). Vic.: near Bluff Lookout, Mitchell River Natl Park, *R.Moberg & B.Owe-Larsson A51:1* (UPS).

This lichen is characterised by the marginal, undulate soralia, the frosted-pruinose upper surface (especially near the apices), and the white to pale brown lower surface. *Physcia atrostriata* is morphologically similar, it has distinctive brown-black striations on the lower surface.

30. *Physcia verdonii* Elix, *Australas. Lichenol.* 68: 34 (2011)

T: Bunga, just W of Mimosa Rocks Natl Park, 18 km S of Bermagui, N.S.W., 36°33'S, 150°03'E, alt. 50 m, on weathered granite rocks in pasture, 17 Oct. 2002, *J.A.Elix 32648*; holo: CANB.

Illustration: J.A.Elix, *op. cit.* 38, fig. 5.

Thallus orbicular or irregularly spreading, adnate throughout, to 6 cm wide. Lobes 0.3–1.5 mm wide, imbricate or remaining separate, irregularly or pinnately branched, weakly to distinctly convex or \pm plane; lobe margins entire to delicately notched or incised, esorediate; lobe tips rounded to \pm truncate, often slightly rolled under. Upper surface whitish grey to grey or dark grey, emaculate, often greyish white-pruinose at the apices. Soralia laminal, crateriform, with flaring margins to almost capitate, 0.1–1.0 mm wide, usually orbicular, arising from cracks in the upper cortex, \pm coalescing and spreading over the surface; soredia coarsely granular, greenish white to white. Lower surface pale brown near the margins to grey-brown or dark brown within; rhizines often scattered at the apices to densely crowded and tangled centrally, simple to squarrose-branched, whitish, tan to grey or brown, 0.4–0.9 mm long; cortex prosoplectenchymatous. Apothecia absent or very rare, laminal, 0.2–1.0 mm wide, sessile and constricted at the base; margin entire, smooth or becoming sorediate; disc initially concave, becoming plane, brown-black to black, with a fine grey-white pruina. Ascospores *Pachysporaria*-type, broadly ellipsoidal, 17–22 \times 7.5–10.0 μ m. Pycnidia sparse to common, immersed, visible as black dots; conidia subcylindrical, 4–5 \times 1 μ m.

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

Endemic to coastal rocks and trees in south-eastern N.S.W., Vic. and Tas.

N.S.W.: Guerilla Bay, 11.5 km S of Batemans Bay, *J.A.Elix 2052* (CANB). Vic.: Cape Conran, 18 km E of Marlo, East Gippsland, *J.A.Elix 5287, 5305* (CANB). Tas.: Sleepy Bay, Freycinet Natl Park, *J.A.Elix 5507* (CANB).

Physcia verdonii has crateriform soralia and a medium to dark brown lower surface. It can be confused with *P. poncinsii*, but the latter has a cream-coloured to pale greyish undersurface, and it contains the *speciosa* chemosyndrome of triterpenes.

31. *Physcia verrucosa* Moberg, *Nordic J. Bot.* 6: 862 (1986)

T: Traveller's Rest Hotel, Kisoro, Bufumbira, Kigezi District, Uganda, 01°17'S, 29°41'E, alt. 1900 m, on branch of a tree in the garden, 1971, *T.D.V.Swinscow 3U59/1*; holotype: BM.

Illustration: R.Moberg, *op. cit.* 863, fig. 24.

Thallus orbicular to irregularly spreading, adnate to loosely adnate, 2–5 cm wide. Lobes 0.5–2.0 mm wide, radiating at the margins but contiguous in the centre, irregularly branched, plane to weakly convex, often becoming strongly rugulose, verrucose and bullate in the thallus centre, with a distinct white margin, the lobe tips rounded and ±crenulate. Upper surface grey to greyish brown, often with brownish patches, emaculate, distinctly frosted-pruinose, with silvery white margins; soredia and isidia absent. Lower surface off-white to pale brown; rhizines sparse to frequent, simple, white to grey-black, 0.2–0.6 mm long; cortex ±prosoplectenchymatous. Apothecia laminal, 0.5–3.0 mm wide, sessile, constricted at the base; margin persistent, entire, smooth to crenulate; disc plane, black to brown-black, glossy, epruinose. Ascospores *Pachysporaria*-type, ellipsoidal, 15–35 × 7–16 μm. Pycnidia common, immersed, becoming emergent, visible as pale brown to black dots; conidia bacilliform, 4–5 × 1 μm.

Chemistry: Upper cortex and medulla K⁺ yellow; containing atranorin (major), zeorin (minor), 6α-acetoxypopane-16β,22-diol (major or minor), leucotylin (minor), ±16β-acetoxypopane-6α,22-diol (trace).

Rare on trees and rocks in open situations in south-western W.A. and the Eyre Peninsula, S.A.; also in East Africa.

W.A.: Morgans View, path to Nancys Peak, Porongurups Natl Park, *R.Moberg & B.Owe-Larsson A22b:3* (UPS). S.A.: Mangalo, 22 km NE of Cleve, Eyre Penin., *J.A.Elix 41840* (CANB).

This lichen is characterised by the absence of soredia and isidia, the frosted-pruinose upper surface, broad lobes that become verrucose to bullate in the thallus centre, the pale lower surface and *Pachysporaria*-type ascospores.