



CIRCINARIA ¹

Gintaras Kantvilas ²

Circinaria Link., *Neues J. Bot.* 3: 5 (1809).

Type: *C. contorta* (Hoffm.) A.Nordin, Savić & Tibell.

Thallus mostly crustose and areolate, occasionally small-foliose, nodulose or fruticose, corticate, sometimes with a well-developed prothallus. Photobiont a unicellular green alga with roundish cells 8–20 µm diam. Ascomata apothecia, roundish, aspicilioid, sunken in the thallus surface and with a reduced thalline margin formed by the edge of the adjacent thallus, or becoming emergent, lecanoroid and with the margin ± distinct. Disc concave to plane, brown to black, occasionally pruinose. Proper exciple very thin and reduced, in section cupulate, poorly differentiated from adjacent tissues. Hypothecium hyaline. Hymenium hyaline, hemiamyloid and KI+ intense blue, overlain by a greenish to olive, K+ olive-brown, N+ green epithelial layer (*Aspicilia*-green). Asci clavate, 4–6(–8)-spored, of the *Aspicilia*-type: with a very well-developed, dome-like, non-amyloid or very weakly amyloid tholus, a thin, KI+ blue wall and a short, broad, ocular chamber. Paraphyses sparsely branched and anastomosed, moniliform in the upper part, of even thickness below. Ascospores simple, hyaline, broadly ellipsoid to globose, non-halonate, typically squashed and misshapen when within the ascus. Conidiomata pycnidia, immersed. Conidia shortly filiform. Chemistry: aspicilin usually present.

Circinaria is a segregate of the large “form genus” *Aspicilia*, with both having a chiefly crustose, areolate thallus, immersed, pseudolecanorine apothecia (termed aspicilioid), *Aspicilia*-type asci with a prominent, dome-like, non-amyloid tholus, simple, hyaline ascospores, a greenish, N+ green epithecium, moniliform paraphyses and filiform conidia. Although the morphological and anatomical differences between the two genera are sometimes blurred, their separation is supported by molecular data (Nordin *et al.* 2010). In general, *Circinaria* differs from *Aspicilia* by usually containing the fatty acid aspicilin, having a reduced number of mature ascospores in the ascus, and shorter (< 12 µm long) conidia. There are approximately 40 species known, occurring on rocks and soil, mostly in drier, steppe-like areas or in regions with a temperate to Mediterranean climate. The genus is uncommon and poorly known in Tasmania. In this account, two entities are recognised and classified, with considerable caution, under names based on Northern Hemisphere types.

Key references: Nordin *et al.* (2010); Nimis (2022).

- 1 Growing on non-calcareous rocks (e.g. dolerite, basalt or sandstone); asci predominantly 6-spored
Growing on limestone; asci predominantly 4-spored

1 *C. caesiocinerea*
2 *C. hoffmanniana*

1 *Circinaria caesiocinerea* (Nyl. ex Malbr.) A.Nordin, Savić & Tibell

Mycologia 102: 1341 (2010); —*Lecanora caesiocinerea* Nyl. ex Malbr., *Bull. Soc. Amis Sci. Nat. Rouen* 5: 320 (1869); *Aspicilia caesiocinerea* (Nyl. ex Malbr.) Arnold, *Verh. Kaiserl.-Königl. zool.-bot. Ges. Wien* 36: 67 (1886).

1 This work can be cited as: Kantvilas G (2023). *Circinaria*, version 2023:1. In MF de Salas (Ed.) *Flora of Tasmania Online*. 3 pp. (Tasmanian Herbarium, Tasmanian Museum and Art Gallery: Hobart). <https://flora.tmag.tas.gov.au/lichen-genera/circinaria/>

2 Tasmanian Herbarium, Tasmanian Museum & Art Gallery, PO Box 5058, UTAS LPO, Sandy Bay, TAS 7005, Australia.

Thallus crustose and areolate, or subsquamulose, pale to dull grey to olive-grey, lacking soredia and isidia, forming extensive, irregular thalli spreading to c. 15 cm across; prothallus black, effuse, usually visible at the thallus margins or between the areoles; individual areoles 0.5–1.8 mm wide, to 0.25–0.6(–1) mm thick, roundish, rhomboid to irregularly angular or lobed, plane to convex to bullate, contiguous but not imbricate and usually separated by deep cracks, typically tightly adnate but occasionally with the edges \pm free of the substratum, in section KI–. Apothecia 0.4–0.8 mm wide, usually immersed in highly convex areoles, roundish or occasionally deformed elongate-ovate, 1 per areole, typically remaining immersed but rarely becoming emergent and lecanoroid; thalline margin usually poorly developed and comprising a thin, rather ragged, erect to \pm incurved rim surrounding the disc, sometimes whitish-pruinose with calcium oxalate crystals, in section poorly differentiated from the thallus; disc concave, yellow-brown to grey-black to black, usually epruinose, or with a sparse white pruina; proper exciple in section poorly differentiated from adjacent tissues, hyaline. Hypothecium 30–60 μm thick, not inspersed or with occasional oil droplets. Hymenium 115–180 μm thick, not inspersed; asci (4–)6(–8)-spored, 100–120 \times 16–30 μm ; paraphyses 1.5–2.5 μm thick in the lower part, moniliform and 4–6 μm wide above. Ascospores (19–)20–23.2–28(–30) \times (13–)15–18.9–22(–23) μm . Pycnidia immersed in bullate squamules, opening by an irregular, white-pruinose tear or hole; conidia straight, 5–7(–10) \times 0.8–1 μm .

Chemistry: aspicilin usually present; occasionally lacking substances detectable by TLC; all spot tests of the cortex and medulla negative.

Widely scattered in drier areas on dolerite, sandstone or basalt, usually on exposed boulders, large rock outcrops or small stones, especially in nutrient-enriched habitats such as rough sheep pasture; widely distributed in the Northern Hemisphere. This name is applied with some caution as annotations on some Australian and Tasmanian specimens by B. Owe-Larsson (Uppsala, Sweden) suggest they are better placed under a separate, strictly Australian but as yet unpublished name.

Spiky Bridge, 42°11'S 148°04'E, 1984, G. Kantvilas 172/84a & P.W. James (HO); along the road to Bothwell, c. 1 km S of Apsley, 220 m, 1993, G. Kantvilas 267/93 & J. Elix (HO); Clairveaux Property, 42°24'S 146°51'E, 360 m, 1999, G. Kantvilas 163/99 (HO).

2 *Circinaria hoffmanniana* (S.Ekman & Fröberg ex R.Sant.) A.Nordin

In C. Roux, M. Bertrand & A. Nordin, *Bull. Soc. Linn. Provence* 67: 179 (2016); —*Aspicilia contorta* subsp. *hoffmanniana* S.Ekman & Fröberg ex R.Sant., *Lichens and Lichenicolous Fungi of Sweden and Norway*: 23 (1993).

Thallus crustose and areolate, dull whitish grey, lacking soredia and isidia, forming irregular thalli spreading to c. 10 cm across; prothallus black, effuse, usually visible at the thallus margins or between the areoles; individual areoles 0.4–1 mm wide, to 0.8 mm thick, roundish, generally strongly convex to bullate with apices white-pruinose with calcium oxalate crystals, contiguous or well-separated, tightly adnate to the substratum, in section KI–. Apothecia rare, to 1 mm wide, 1 per areole, emergent and lecanoroid, with a \pm distinct, white-pruinose thalline margin to c. 100 μm thick; disc plane, grey-black, densely white-pruinose; proper exciple in section poorly differentiated from adjacent tissues, hyaline. Hypothecium 60–70 μm thick, inspersed with occasional oil droplets. Hymenium 110–120 μm thick, not inspersed; asci 4-spored, 95–115 \times 22–30 μm ; paraphyses 1.5–2.5 μm thick in the lower part, moniliform and 4–6 μm wide above. Ascospores 20–25.0–28 (–30) \times (15–)17.5–20.9–26 μm . Pycnidia immersed, white-pruinose at the ostiole; conidia straight, 7–8 \times 1 μm .

Chemistry: aspicilin usually present; occasionally lacking substances detectable by TLC; all spot tests of the cortex and medulla negative.

Tentatively applied to Tasmanian specimens of *Circinaria* from limestone but, with limestone being uncommon in Tasmania, there are few specimens available for study. Asci appear to be invariably 4-spored and calcium oxalate is present and abundant in all specimens seen. The name *C. contorta* (Hoffm.) A.Nordin, Savić & Tibell has been widely applied to limestone-inhabiting specimens from mainland Australia and elsewhere but, according to Nimis (2022), this species has more dispersed, rounded areoles. Additional collections and study are required to fully resolve the identity of the Tasmanian entity.

Vale of Belvoir, 41°33'S 145°53'E, 840 m, 1987, G. Kantvilas 59/87 (HO); Maria Island, Fossil Cliffs, 42°34'S 148°05'E, 5 m, 2000, G. Kantvilas 191/00 (HO).

REFERENCES

- Nimis PL (2022) Keys to the lichens of Italy 57. Aspicilioid lichens. *ITALIC*. https://italic.units.it/flora/index.php?procedure=ext_key_home&key_id=3321. Accessed 17 October 2022.
- Nordin A, Savić S, Tibell L (2010) Phylogeny and taxonomy of *Aspicilia* and Megasporaceae. *Mycologia* **102** 1339–1349.

INDEX

A	
<i>Aspicilia</i>	1
<i>Aspicilia caesiocinerea</i>	1
<i>Aspicilia contorta</i> subsp. <i>hoffmanniana</i>	2
C	
<i>Circinaria</i>	1, 2
	<i>Circinaria caesiocinerea</i>
	1
	<i>Circinaria contorta</i>
	1, 2
	<i>Circinaria hoffmanniana</i>
	2
	L
	<i>Lecanora caesiocinerea</i>
	1