



## BACTROSPORA <sup>1</sup>

Gintaras Kantvilas <sup>2</sup>

*Bactrospora* A.Massal., *Ric. Auton. Lich. Crost*: 133 (1852).

Type: *B. dryina* (Ach.) A.Massal.

Thallus crustose, thin and scurfy to thick and granular, ecorticate; prothallus absent or poorly developed. Photobiont trentepohlioid, usually in short chains with cells  $\pm$  globose, 8–20  $\mu\text{m}$  diam. Ascomata apothecia, biatorine, roundish, adnate or basally constricted. Disc black or dark brown, plane to convex, epruinose. Proper exciple well-developed and persistent or soon excluded, externally dark brown or carbonised, K+ olive, pale within, sometimes hemiamyloid, composed of conglutinated, poorly differentiated hyphae. Hypothecium hyaline to pale red-brown, hemiamyloid. Hymenium hyaline, weakly  $\pm$  hemiamyloid, KI $\pm$  very pale blue, not interspersed, separating easily in water. Asci 8-spored, of the *Bactrospora*-type: narrowly cylindrical, with a well-developed, non-amyloid tholus with a KI+ blue ring and a thin, KI+ very pale blue zone adjacent to the ascoplasm, a narrow ocular chamber and a rather prominent basal 'tail'. Paraphysoids sparsely branched and anastomosed, c. 2  $\mu\text{m}$  thick; apices mostly not expanded, with the terminal cells often pale reddish brown, K+ pale olive-grey. Ascospores transversely multi-septate or muriform, hyaline, acicular, thin-walled, filiform or fusiform, non-halonate, mostly fragmenting into segments. Conidiomata pycnidia, immersed or subimmersed, with walls dark brown or carbonised, K+ olive; conidia bacilliform to filiform, curved or straight, more rarely elongate-ellipsoid. Chemistry: mostly nil; gyrophoric acid present in one species.

A genus of approximately 30 species, widely distributed in temperate and tropical regions and found mostly on bark. Many species have highly restricted geographical distributions. Six species occur in Tasmania, of which four are endemic. Species of *Bactrospora* in Tasmania (and usually elsewhere) are frequently associated with old trees in forests and woodlands with a long ecological continuity. In Tasmania, most species are found in cool temperate rainforest.

*Bactrospora* is classified in the Roccellaceae s.lat. with *Lecanactis*, *Lecanographa*, *Cresponea*, *Schismatomma* and others, and shares with these genera features such as a trentepohlioid photobiont, bitunicate asci with fissitunicate dehiscence, hemiamyloid asci, transversely septate ascospores and brown, K+ olive apothecial pigments. However, apothecial features, in particular the lack of pruina, the distinctive asci and the extreme laxness of the asci and paraphysoids in water are not seen in other genera of the family, and the affinities of the genus are yet to be investigated with molecular methods. Egea & Torrente (1993) defined the taxonomic framework of the genus, including recognising a range of ascospore types. Of these, two are found in Tasmanian species: *patellarioides*-type, which are transversely septate, unconstricted and fragment outside the asci into multi-cellular segments with the locules longer than wide; and the *homalotropa*-type, which are transversely septate or muriform, usually slightly constricted here and there, and fragment into multi-cellular segments with the locules mostly wider than long.

Key references: Egea & Torrente (1993); Kantvilas (2004); Sobreira et al. (2015).

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

1	Thallus coarsely granular, C+ red (containing gyrophoric acid) Thallus crustose, effuse to ± absent, C- (lacking lichen substances)	2 <i>B. granularis</i> 2
2(1)	Ascospores transversely septate when young, soon becoming muriform Ascospores always only transversely septate	4 <i>B. metabola</i> 3
3(2)	Exciple in section KI-; ascospores of the <i>patellarioides</i> -type, with the locules longer than wide Exciple in section KI+ deep blue; ascospores of the <i>homalotropa</i> -type, with the locules wider than long	4 5
4(3)	Apothecia markedly convex and sessile; proper exciple in section mostly 20–60 µm thick laterally; a species of coastal woodland and swamps Apothecia plane to convex, at first immersed, becoming emergent; proper exciple in section mostly 15–25 µm thick laterally; a species of cool temperate rainforest	6 <i>B. paludicola</i> 1 <i>B. arthonioides</i>
5(3)	Apothecia 0.2–0.5 mm diam., rather urceolate when mature; ascospores 120–160 × 3–5 µm, 39–45-septate Apothecia 0.15–0.3 mm diam., ± subglobose to tuberculate when mature; ascospores 70–96 × 3–6 µm, 22–30-septate	3 <i>B. homalotropa</i> 5 <i>B. micareoides</i>

### 1 *Bactrospora arthonioides* Egea & Torrente

*Lichenologist* 25: 221 (1993). Type: Tasmania, near Strathgordon, Gordon River Gorge, downstream of the dam, on thick tree trunk, mixed forest with *Nothofagus* in sheltered valley, 300m, 30 August 1981, *H. Sipman* 16078 (holo—U!; iso—HO!)

Thallus crustose, effuse, whitish, forming irregular patches to c. 200 mm wide or more; medulla KI- or sometimes patchily and weakly KI+ pale blue. Apothecia 0.2–0.4 mm diam., at first immersed, soon erumpent, at length broadly adnate; disc black to dark red-brown, matt, plane to convex; proper exciple concolorous with the disc, typically with adhering thallus fragments, inconspicuous and soon ± excluded, in section opaque dark red-brown, K+ dark olive-green, KI-, 5–25 µm thick laterally, ± open at the base. Hypothecium pale yellow-brown, 70–100 µm thick. Hymenium 75–100 µm thick, overlain by a lumpy, amorphous, dark red-brown, K+ olive-green layer 10–30 µm thick; asci 65–82 × 11–14 µm; paraphysoids with apices sometimes slightly expanded and brownish. Ascospores of the *patellarioides*-type, filiform to very narrowly fusiform, tapering at the distal end, 40–60 × 2–4 µm, 10–16-septate. Pycnidia not found.

Chemistry: nil.

Endemic and locally common in Tasmania in the extensive rainforest stands of the west and north-west, where it occurs on relatively dry, fissured bark of mature trees, The flaky bark of old trunks of *Nothofagus cunninghamii* is a typical habitat, where this species associates with *Lecanactis abietina*, *L. mollis* and species of *Micarea*. Features which distinguish it from the superficially similar, coastal woodland species, *B. paludicola*, are discussed under that species.

Tayatea Road, S of Little Rapid River, 41°10'S 145°12'E, 230 m, 1982, *G. Kantvilas* 66/82 (BM, HO); road to Trial Harbour, 41°54'S 145°16'E, 230 m, 1989, *G. Kantvilas* 119/89 (HO); Savage River NP, E side of Baretop Ridge, 41°18'37"S 145°26'51"E, 580 m, 2015, *G. Kantvilas* 74/15 (HO).

### 2 *Bactrospora granularis* Kantvilas

*Symb. Bot. Upsal.* 34(1): 187 (2004). Type: Tasmania, Flannel Road near Arthur River, 41°20'S 145°29'E, on *Phyllocladus aspleniifolius* in rainforest, 360 m, 19 January 1982, *G. Kantvilas* 17/82 (holo—HO!; iso—BM!)

Thallus creamish white, widespreading in diffuse patches to c. 100 mm wide or more, at first scurfy-crustose but soon becoming coarsely granular, with the granules typically densely coagulated and forming a thick, uneven crust 1–2 mm thick; individual granules 50–80 µm diam., I+ violet blue, KI+ deep blue. Apothecia (0.2–)0.3–0.5 mm diam., ± globose to irregularly turbinate, markedly constricted at the base, superficial or nestling amongst the thallus granules; disc black to dark brown, rather glossy, convex, becoming ± verruculose when old; proper exciple concolorous with the disc or brown, inconspicuous and typically becoming ± excluded, in section pale red-brown, K+ olive-grey, KI+ intense blue, 40–60 µm thick laterally, 20–50 µm

thick at the base but rather poorly differentiated from the hypothecium and sometimes open. Hypothecium hyaline to very pale red-brown, 20–40(–160)  $\mu\text{m}$  thick. Hymenium 150–220  $\mu\text{m}$  thick; asci 140–200  $\times$  28–36  $\mu\text{m}$ , with a very pronounced basal “tail” to c. 30  $\mu\text{m}$  long; paraphysoids with apices slightly expanded to 3–4  $\mu\text{m}$ , minutely roughened. Ascospores of the *homalotropa*-type, narrowly fusiform, tapering at the distal end, 90–130  $\times$  6–10  $\mu\text{m}$ , 21–36-septate. Pycnidia not found.

Chemistry: gyrophoric acid; thallus K–, KC+ red, C+ red, P–.

Readily recognised as the only member of the genus known to have a thick, granular thallus containing gyrophoric acid (C+ red). In the field, these features, as well as the small, immarginate apothecia can be suggestive of a species of *Micarea*, although no Tasmanian species of that genus show any resemblance to *B. granularis*. Sterile thalli are not uncommon. *Bactrospora granularis* is known only from Tasmania, where it occurs in rainforest, mostly on mature trees with coarse, flaky bark, especially *Nothofagus cunninghamii* and *Phyllocladus aspleniifolius*.

Arthur River, S of Meunna, 41°08'S 145°28'E, 370 m, 1982, G. Kantvilas 57/82 (HO); Lower Pieman Dam Road near Huskisson River, 41°44'S 145°27'E, 260 m, 1989, G. Kantvilas 182/89 (HO); Rapid Road, c. 2 km NW beyond bridge over Rapid River, 41°09'S 145°06'E, 90 m, 1990, G. Kantvilas 277/90 (HO).

### 3 *Bactrospora homalotropa* (Nyl.) Egea & Torrente

*Biblioth. Lichenol.* 31: 185 (1989); —*Lecidea homalotropa* Nyl., *Flora* 50: 329 (1867).

Thallus crustose, effuse, dull whitish to indistinct, forming irregular patches to c. 10–20 mm wide; medulla KI+ pale blue. Apothecia 0.2–0.5 mm diam., superficial, basally constricted, rather urceolate when mature; disc black, matt, plane to slightly convex; proper exciple concolorous with the disc, prominent and inrolled when young, typically persistent and becoming rather ragged, in section opaque dark red-brown, K+ dark olive-green, KI+ intense blue, 40–80  $\mu\text{m}$  thick laterally, closed and 30–160  $\mu\text{m}$  thick at the base. Hypothecium pale yellow-brown, 60–80  $\mu\text{m}$  thick. Hymenium 180–200  $\mu\text{m}$  thick; asci 130–190  $\times$  14–16(–20)  $\mu\text{m}$ ; paraphysoids with apices sometimes slightly expanded and brownish. Ascospores of the *homalotropa*-type, filiform to very narrowly fusiform, tapering at the distal end, 120–160  $\times$  3–5  $\mu\text{m}$ , 39–45-septate. Pycnidia not found.

Chemistry: nil.

Known in Tasmania from multiple collections from smooth-barked understorey twigs in callidendrous rainforest, all from a single, general locality near Mt Murchison on the west coast. It is also known from cool temperate regions of Western Europe. This species is readily recognised by its  $\pm$  urceolate mature apothecia with a persistent margin, and by the very long, *homalotropa*-type ascospores.

Anthony Road, 41°49'S 145°38'E, 480 m, 1993, G. Kantvilas 229/93 (HO).

### 4 *Bactrospora metabola* (Nyl.) Egea & Torrente

*Mycotaxon* 53: 58 (1995); —*Melaspilea metabola* Nyl., *Bull. Soc. Linn. Normandie, sér. 2*, 2: 69 (1868); *Melampilidium metabolum* (Nyl.) Müll.Arg., *Bull. Herb. Boissier* 2, App. 1: 79 (1894).

Thallus whitish, effuse; medulla I+ red, KI+ blue. Apothecia 0.2–0.6 mm diam., constricted at the base; disc black to dark brown, matt, plane to convex; proper exciple black, typically persistent except in the oldest apothecia, in section reddish brown, K+ olive-grey, KI+ intense blue, 30–50(–80)  $\mu\text{m}$  thick laterally, open at the base. Hypothecium hyaline, 100–200  $\mu\text{m}$  thick. Hymenium 150–200  $\mu\text{m}$  thick; asci 100–135  $\times$  30–45  $\mu\text{m}$ ; paraphysoids with apices not enlarged. Ascospores of the *homalotropa*-type, fusiform and transversely septate when young, at maturity becoming densely muriform, broadly fusiform to oblong-ellipsoid and slightly constricted 1–2 times, 50–86(–95)  $\times$  (8–)10–14  $\mu\text{m}$ , typically fracturing into two or three segments; apices rounded or acute. Pycnidia very rare; conidia filiform, curved, 12–20  $\times$  0.5–1  $\mu\text{m}$ .

Chemistry: nil.

Distinguished by the muriform ascospores, which are unique for the genus. This species is widespread in the Indo-Pacific region but is extremely rare in Tasmania, where it has been recorded from old-growth coastal woodlands, growing on the trunks of *Banksia marginata* and *Melaleuca ericifolia*.

End of Robbins Island Track, 40°45'S 144°53'E, 1999, G. Kantvilas 263/99A (HO); Cape Pillar, c. 2 km W of Chasm Lookout, 43°13'S 148°00'E, 210 m, 2012, G. Kantvilas 281/12 (HO); Stony Head MTA, Ryans Hill, 41°01'05"S 147°01'43"E, 210 m, 2020, G. Kantvilas 214/20 (HO).

### 5 *Bactrospora micareoides* Kantvilas

*Symb. Bot. Upsal.* 34(1): 190 (2004). Type: Tasmania, W of Tahune Bridge, Warra Silvicultural Systems Trial area, "Coupe 1E", 43°06'S 146°41'E, on *Banksia marginata* in *Eucalyptus obliqua* wet forest, 100 m, 24 February 2004, G. Kantvilas 92/04 (holo—HO!; iso—UPS!).

Thallus crustose, effuse, dull whitish to ± absent, sometimes with a faint pinkish tinge when fresh and moist, forming irregular patches to c. 50 mm wide; medulla KI+ blue. Apothecia 0.15–0.3 mm diam., ± subglobose or contorted, becoming tuberculate, scattered or fused in irregular clusters to c. 0.5 mm wide, superficial and markedly constricted at the base; disc black, matt, markedly convex, usually minutely roughened and uneven; proper exciple inconspicuous and soon excluded, in section opaque dark red-brown, K+ dark olive-green, KI+ blue, 5–10 µm thick laterally, at the base 5–20 µm thick and closed. Hypothecium hyaline to pale brown, 90–120 µm thick. Hymenium (110–)140–160 µm thick, overlain by a lumpy, amorphous, dark red-brown, K+ olive-green layer 20–60 µm thick; asci 110–145 × 15–20 µm; paraphysoids with apices neither expanded nor pigmented. Ascospores of the *homalotropia*-type when mature, filiform to very narrowly fusiform, tapering at the distal end, 70–96 × 3–6 µm, 22–30-septate, with central constrictions slight and uncommon. Pycnidia not found.

Chemistry: nil.

Endemic to Tasmania and locally abundant in *Eucalyptus obliqua*-dominated wet forest in the Warra Silvicultural Systems Trial Area in the Southern Forests, where it grows on smooth-barked understorey trees such as *Banksia*, *Nematolepis* and *Pomaderris*. This species is well-characterised by the combination of tiny tuberculate apothecia, reminiscent of those of a *Micarea* species, and the *homalotropia*-type ascospores.

West of Tahune Bridge, Warra Silvicultural Systems Trial area, "Small Coupe", 43°06'S 146°42'E, 100 m, 1997, G. Kantvilas 262/97 (HO).

### 6 *Bactrospora paludicola* Kantvilas

*Symb. Bot. Upsal.* 34(1): 192 (2004). Type: Tasmania, end of Robbins Island Track, 40°45'S 144°53'E, on trunk of *Melaleuca ericifolia* in wet coastal swamp at sea-level, 26 June 1999, G. Kantvilas 263/99 (holo—HO!; iso—UPS!).

Thallus crustose, effuse, whitish, forming irregular patches to c. 200 mm wide or more; medulla KI- or sometimes weakly KI+ pale blue. Apothecia 0.2–0.5(–0.6) mm diam., superficial, slightly constricted at the base; disc black, matt, markedly convex; proper exciple concolorous with the disc, inconspicuous and soon ± excluded, in section opaque dark red-brown, K+ dark olive-green, KI-, (10–)20–60(–70) µm thick laterally, at the base 20–40 µm thick, less intensely pigmented and usually open. Hypothecium brown to yellow-brown, 50–140 µm thick. Hymenium 85–110 µm thick, overlain by a lumpy, amorphous, dark red-brown, K+ olive-green layer 10–30 µm thick; asci 70–90 × 12–20 µm; paraphysoids with apices neither expanded nor pigmented. Ascospores of the *patellarioides*-type, filiform to very narrowly fusiform, tapering at the distal end, (50–)55–73(–86) × 2–3(–3.5) µm, 13–17(–21)-septate. Pycnidia abundant, immersed, becoming crater-like, 0.05–0.08 mm wide; conidia curved or hooked, 8–12 × 0.8–1 µm.

Chemistry: nil.

Endemic to Tasmania and highly localised, mostly in coastal woodlands, especially in swampy communities dominated by *Melaleuca ericifolia*. *Bactrospora paludicola* shares several characters with the rainforest

species *B. arthonioides*, which differs in having erumpent apothecia, a thinner proper exciple, somewhat shorter ascospores, and lacks pycnidia.

Ringarooma Tier, 40°49'S 147°59'E, 100 m, 1995, G. Kantvilas 50/95 (HO); eastern side of Stanley Hwy, 40°47'S 145°16'E, 5 m, 2011, G. Kantvilas 458/11 (HO); Cape Portland, Musselroe Wind Farm, northern end of Musselroe Bay, 40°48'36"S 148°06'41" E, sea-level, 2019, G. Kantvilas 231/19 (HO).

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## INDEX

<b>B</b>			
<i>Bactrospora</i> .....	1	<i>Lecanactis mollis</i> .....	2
<i>Bactrospora arthonioides</i> .....	2, 5	<i>Lecanographa</i> .....	1
<i>Bactrospora dryina</i> .....	1	<i>Lecidea homalotropa</i> .....	3
<i>Bactrospora granularis</i> .....	2, 3	<b>M</b>	
<i>Bactrospora homalotropa</i> .....	3	<i>Melaleuca ericifolia</i> .....	4
<i>Bactrospora metabola</i> .....	3	<i>Melampilidium metabolum</i> .....	3
<i>Bactrospora micareoides</i> .....	4	<i>Melaspilea metabola</i> .....	3
<i>Bactrospora paludicola</i> .....	2, 4	<i>Micarea</i> .....	2-4
<i>Banksia</i> .....	4	<b>N</b>	
<i>Banksia marginata</i> .....	4	<i>Nematolepis</i> .....	4
<b>C</b>		<i>Nothofagus cunninghamii</i> .....	2, 3
<i>Cresponea</i> .....	1	<b>P</b>	
<b>E</b>		<i>Phyllocladus aspleniifolius</i> .....	3
<i>Eucalyptus obliqua</i> .....	4	<i>Pomaderris</i> .....	4
<b>L</b>		<b>R</b>	
<i>Lecanactis</i> .....	1	Roccellaceae.....	1
<i>Lecanactis abietina</i> .....	2	<b>S</b>	
		<i>Schismatomma</i> .....	1