Arthonia banksiae (lichenised Ascomycota) and its synonyms

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Abstract

Arthonia banksiae, a widespread lichen known from the central and eastern Victorian coast, is lectotypified, described, and illustrated from modern collections. *Mycoporellum microspermum* and *Asteroporum rimale*, the latter name previously shrouded in some confusion, are synonyms of *A. banksiae*; the latter species is also lectotypified. *Arthonia microsperma* has been recorded for Australia in error and should be deleted from the Australian lichen census.

Keywords: *Arthonia*, taxonomy, lichenised Ascomycota.

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Introduction

One of the key problems confounding researchers of incompletely documented lichen floras such as Australia's concerns the existence of names which have yet to be ascribed to any recently-collected and identified specimens, and for which there are no comprehensive descriptions beyond century-old, often ambiguous diagnoses. Such names persist in checklists but there is usually little notion of what entity they actually represent. This is particularly the case with crustose lichens, which may have been described within genera that today are either not in use, or whose delimitation has been tightened; the 'dustbin' genera such as *Lecidea, Bacidia* and *Catillaria* are typical of the latter. To resolve the identity of such taxa requires a study of types or authentic material, which are almost inevitably in foreign herbaria, sometimes in poor condition or cannot be traced.

Three such lichens, which have been cited in all Australian checklists since that of Weber and Wetmore (1972), are *Arthonia banksiae* Müll. Arg., *Mycoporellum microspermum* Müll. Arg. and *Asteroporum rimale* Müll. Arg. The first author first encountered and examined authentic material of *A. rimale*, collected by the 19th Century lichenologist, F.R.M. Wilson, in London's Natural History Museum in 1994. Almost fifteen years later, very rich material of what was clearly the same taxon was collected by the second author in Victoria. In the meantime, following a revision of the Pyrenulaceae for Australia by Aptroot (2009), *A. rimale* was recognised as a dubious name and removed from the Australian lichen checklist (McCarthy 2010). The availability of material sufficient for thorough anatomical examination inspired a more detailed reappraisal of this taxon. In the process, we unearthed several synonyms for this species, enabling a clarification of its rather convoluted taxonomy.

Material and methods

The study is based on specimens housed in the Natural History Museum (BM), the National Herbarium of Victoria (MEL), the Conservatoire et Jardin botaniques (G) and the Tasmanian Herbarium (HO).

The description given is based on hand-cut sections of the thallus and ascomata, mounted in water, 15% KOH, Lugols Iodine, ammoniacal

erythrosin or Lactophenol Cotton Blue, and examined with high-power, light microscopy. Dimensions of asci and ascospores are based on 25 and 100 observations respectively; the latter are presented in the format: smallest measurement–*mean*–largest measurement.

General discussion

Müller (1884) described the genus *Asteroporum* to accommodate a calciphilous, saxicolous species from Palestine (*A. perminimum* Müll.Arg.). His description suggests a pyrenocarpous taxon with perithecioid, subglobose ascomata, simple paraphyses and hyaline, trans-septate ascospores. Therein he discussed the affinities of his new genus to *Mycoporum* Flot. ex Nyl. and *Mycoporellum* Müll. Arg. The corticolous *Asteroporum rimale* from Australia (Müller 1895) and *A. deformatum* Zahlbr. from decorticated eucalypts in Java (Zahlbruckner 1928) were subsequently newly described, whereas Zahlbruckner (1926) transferred to the genus some species that had initially been described by Müller in *Astrotrema* Müll. Arg. Since these early papers, the name *Asteroporum* has not been applied, and today the genus is ascribed with some uncertainty to the Pyrenulales (Lumbsch and Huhndorf 2007), a position consistent with the salient characters indicated in the original description.

Even the briefest examination of specimens labelled as *A. rimale* indicates that this species has no connection with the Pyrenulales, as it lacks perithecia and has indistinct, anastomosing paraphyses. Rather, it has well-developed ascomata lacking a well developed excipulum and globose asci of the *Arthonia*-type (Grube and Matzer 1997; Grube 1998), characters indicative of the genus *Arthonia* Ach. With this in mind, our investigation was extended into *Arthonia*, a genus that, in Australia, is rich in taxa and for which numerous described names (often of uncertain application) exist. The earlier name *Arthonia banksiae* Müll. Arg. was found to be appropriate for this species.

The nomenclatural history of these taxa is quite confusing. Müller (1893) described *A. banksiae* from two specimens, numbered 885 '*pr.p.*' and 1585, sent to him by the Australian lichenologist F.R.M. Wilson (Fig. 1). These specimens are housed at the Conservatoire et Jardin botaniques in Geneva (G), and have been located and studied. They display all the salient features of the species, especially its curious, lirella-like ascomata. Specimen 885 appears to consist

Figure 1. Lectotype of *Arthonia banksiae* Müll. Arg. (G).
Figure 2. Isolectotype of *Asteroporum rimale* Müll. Arg. (= *Arthonia banksiae*) (MEL 5810).

of two separate parts glued together, with the number '885' attached to a specimen and card also bearing the inscription 'Wilson n. 175'. Two years later, Müller (1895) described *Asteroporum rimale*, also basing it on Wilson's no. 885 collection in G, '*pr.p.*', albeit a different fragment of bark in a different packet, as well as on two specimens from New South Wales collected by Charles Knight. Wilson's no. 885 is a rich collection with duplicates housed in the National Herbarium of Victoria (MEL) (Fig. 2) and the National Herbarium of New South Wales (NSW). We have not located or studied the Knight specimens, but Müller (1895) referred to them being originally identified by the collector as *Mycoporum*, a genus of pyrenocarpous lichens with no relationship to *Arthonia*. In the same paper and on the basis of a further specimen, also numbered '885 *pr.p*', Müller (1895) then described *Mycoporellum microspermum*. This specimen had been previously cited as *Arthonia microsperma* (Fée) Nyl. in an earlier paper (Müller 1893: p. 59). This record is the source of the inclusion of *A. microsperma* in Australian lichen lists. When Müller changed his mind and described the same specimen as *Mycoporellum microspermum*, on the label he just wrote the new determination over the old one. The type of *Mycoporellum microspermum* has rounded, typically arthonioid ascomata but, on the basis of anatomy, it is conspecific with *Arthonia banksiae*.

Curiously, the description of *A. rimale* makes no reference to *A. banksiae*, even though it comments on other related or similar species. It is impossible to unravel the reasons for this convoluted taxonomy, but the key issue is that *Arthonia banksiae* is a valid name for a conspicuous species in the Victorian flora, and that *Asteroporum rimale* and *Mycoporellum microspermum* are its synonyms. To avoid the confusion surrounding Wilson's specimen no. 885, it is his no. 1585 that is selected as the lectotype of *A. banksiae*. A detailed description of the species follows.

Taxonomy

Arthonia banksiae Müll. Arg., *Bull. Herb. Boissier* 1: 59 (1893)

Type: "Corticola ad ramos *Banksiae serratae*, Mordialloc: Wilson n. 885, Lakes Entrance: Wilson 1585, et prope Cheltenham: Wilson n. 885 pr.p."; lectotype, here designated: Lakes Entrance, Victoria, on *Banksia serrata*, 1892, *Rev. F.R.M. Wilson* 1585, G!; syntype: Mordialloc, Victoria, on *Banksia serrata*, 1892, *F.R.M. Wilson* 885, G!.

Asteroporum rimale Müll. Arg., *Bull. Herb. Boissier* 3: 324 (1895)

Type: "Corticola, New South- Wales: Knight n. 6 et 26 ... et in prov. Victoria ad Cheltenham: Rev. Wilson n. 885 pr.p."; lectotype, here designated: Cheltenham, near the sea, Victoria, *F.R.M. Wilson* 885 *p.p.*, G!; isolectotypes, MEL!, NSW.

Mycoporellum microspermum Müll. Arg., *Bull. Herb. Boissier* 3: 325 (1895)

Type: "Corticola ad truncos *Banksiae* ad Cheltenham prope mare in prov. Victoria: Wilson n. 885 pr.p."; holotype: Cheltenham, near the sea, Victoria, *F.R.M. Wilson* 885 *p.p.*, G!; isotype: "on *Banksia*. Cheltenham, Victoria. *F.R.M.Wilson* s.n.", MEL!.

Thallus crustose, smooth, pale pink-brown to cream, not delimited, ecorticate, very thin, mostly to 10–20 µm, but barely differentiated from underlying bark cells, apparently not lichenised; photobiont absent but occasionally a few coccoid green cells present. *Ascomata* very variable, irregularly roundish, most commonly elongate, curved, flexuose or stellate, 0.3–1.5 mm long, 0.2–0.4 mm wide, blackish brown to black, often with a thin, darker margin and appearing lirelliform, in section 40–60 µm thick and with a well-developed, lateral, exciple-like zone, 10–20 µm thick, dull olive-green, intensifying in K, composed of conglutinated pigmented hyphae 3–5 µm wide. *Hypothecium* colourless, poorly differentiated from the hymenium, *c.* 10–20 µm thick. *Hymenium* 30–50 µm thick, mainly colourless but diffusely olive-greenish in the upper part or with the pigment in a discrete layer and ± continuous with the exciple, I+ red, K/I+ blue; paraphysoids highly branched and anastomosing, rather knobbly and of uneven thickness, 1.5–2.5(–3) µm thick, with apices usually pigmented greyish green; *asci* 25–36 × 17–25 µm, of the *Arthonia*-type: broadly ovate to globose, mostly with a short 'foot' at the base and a well-developed tholus I-, KI-, lacking or at best with a barely discernible, faintly amyloid ring-structure; apex of ascoplasm variable with age,

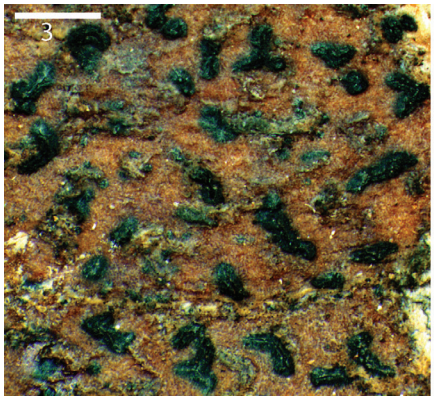
concave, rounded or extending in a beak-like ocular chamber. *Ascospores* colourless, 1-septate, 10–*12.8*–15 × 4–*5.3*–6 µm, broadly ellipsoid, sometimes slightly constricted at the septum. *Pycnidia* immersed, speck-like, black, resembling incipient ascomata, in section pigmented olive-green; conidia rod-shaped, 6–7.5 × 0.8 µm. *Chemistry* nil. Figs 3–4.

Additional specimens examined: **Australia. Victoria:** Queenscliff, 13 April 1896, *F.R.M. Wilson s.n.* (BM); Beaumaris, foreshore reserve, 37°59′08″S 145°01′28″E, 1m altitude, 6 July 2008, *V. Stajsic 4617* (HO, MEL2324321); Seaford, foreshore reserve, 38°06′21″S 145°07′32″E, 15 January 2009, *V. Stajsic 4926* (HO, MEL2327882); Seaford, Kananook Creek Reserve, 38°06′08″S 145°07′40″E, 15 January 2009, *V. Stajsic 4934* (HO, MEL2327905); Walkerville Coastal Reserve, 38°51′22″S 145°59′50″E, 16 March 2009, *V. Stajsic 5139* (HO, MEL2334233); Walkerville North, Walkerville Coastal Reserve, 38°50′12″S 146°00′14″E, 19 March 2009, *V. Stajsic 5128* (HO, MEL2334222); Croajingolong National Park, mouth of Shipwreck Creek, 37°38′54″S 149°41′54″E, 24 July 2009, *V. Stajsic 5455* (HO, MEL2342601); Cape Conran Coastal Park, 37°47′57″S 148°41′43″E, 25 July 2009, *V. Stajsic 5458* (HO, MEL2342604).

Also examined: Arthonia excipienda: **United Kingdom.** Mull, 1 mile east of Achronich, 11 May 1968, *P.W. James* (BM). ***Arthonia microsperma***: ad corticem *Bonplandia trifoliata*, *Fée 266* (G).

Distribution and ecology: *Arthonia banksiae* is currently known only from Victoria, where it is widespread along the coastline from Queenscliff on the Bellarine Peninsula to Shipwreck Creek in Croajingolong National Park in the far eastern part of the State (Fig. 5). It is a corticolous species, and has only been observed growing on *Banksia integrifolia* L.f. subsp. *integrifolia*, sometimes forming extensive patches on the younger (i.e. several years old) branchlets that have not developed the rough bark typical of larger branches of this tree.

Although the notes on F.R.M. Wilson's collections from Cheltenham (a south-eastern suburb of Melbourne, Victoria) indicate that they were collected from the bark of *B. serrata* L.f., it is more likely that their host was *B. integrifolia*: this tree is indigenous to the Cheltenham area, and supports *Arthonia banksiae* today. The same is true for Mordialloc, a south-eastern suburb of Melbourne. In Victoria, *Banksia serrata* is confined to the east of Waratah Bay. Thus it is possible that Wilson's specimen from Lakes Entrance is from *B. serrata* as stated, although the area is within the range of *B. integrifolia* as well. However, limited survey of *B. serrata* in the field (for example, at Holey Plains and several sites in East Gippsland) did not reveal any *Arthonia banksiae* on this host. It remains to be seen whether *A. banksiae* also occurs on *Banksia integrifolia* subsp. *compar* (R.Br.)K.R.Thiele (coastal Queensland, between Proserpine and Brisbane), on subsp. *monticola* K.R.Thiele (New South Wales, between New England National Park and Blue Mountains), or on the related species *B. saxicola* AS.George (Victoria: Grampians, and Wilson's Promontory). It has also been searched for in south-eastern Tasmania, Kangaroo Island and in Victoria on *Banksia marginata* Cav., without success.



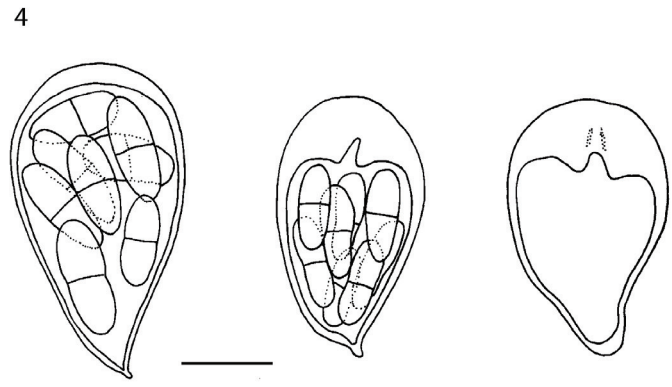


Figure 3. Habit of *Arthonia banksiae*, showing elongate, lirella-like ascomata (MEL 5810). Scale = 500 µm.
Figure 4. Asci and ascospores of *Arthonia banksiae* (*Stajsic* 4617).
Note the faint amyloid ring in the youngest ascus (right). Scale = 20 µm.

Given the broad distribution of *A. banksiae* in Victoria, and its known host preference (which is distributed from coastal south-east Queensland to King and Flinders Islands north of the main island of Tasmania), it is likely that its distribution will prove to be more extensive than currently known. It is often a common species at the sites where it occurs, and is not considered to be under any threat.

Remarks: This is a very conspicuous species, characterised by the dull cream or pinkish-tinged thallus, speckled with numerous black ascomata. The shape of the ascomata is highly variable, and whereas some are of a roundish, typically arthonioid form, stellate or elongate ones are invariably present also. The latter are distinctive but enigmatic in that the central part of the disc is often slightly abraded, whereas the margins remain intact, conveying the appearance of the exciple of lirellae such as seen in species of *Opegrapha* Ach. When dry, this 'exciple' is black and concolorous with the rest of the surface of the ascoma, but when moist, it remains black whereas the inner, 'disc' becomes a paler brown-black, accentuating the lirella-like appearance. Müller certainly noted this in his original description of *A. banksiae*, and it was perhaps this feature that subsequently prompted him to coin the epithet '*rimale*'. In section, the structure differs starkly from the true exciple of *Opegrapha*, which is opaque, encloses the hymenium laterally and usually extends continuously beneath the hypothecium; *Opegrapha* also has different asci.

Arthonia banksiae is probably related to the widespread *A. dispersa* (Schrad.) Nyl., a relationship also noted by Müller (1893), which also has a non-lichenised thallus and 1-septate ascospores of a very similar size. What makes *A. banksiae* distinctive is the presence of the rudimentary but nevertheless conspicuous 'exciple' bordering the ascomata. Thus its closest relative is perhaps the Northern Hemisphere's *A. excipienda* (Nyl.) Leight., which has almost identical ascomata with a similar exciple. The significance of this structure, and how it underpins the differences between *A. dispersa* and *A. excipienda* (and thereby *A. banksiae*) is discussed in detail by Coppins (1989).

Arthonia banksiae and *A. excipienda* differ superficially, with the former being more coarse and robust, but this can possibly be attributed to habitat differences, with the latter occurring mainly on thin, young twigs with smooth bark, whereas the former is found mostly on older branches. Critically, *A. excipienda* differs further in having somewhat larger ascospores, 14–20 × 5–8 µm (this study).

In his original description of *A. banksiae*, Müller also noted similarities to the tropical species, *A. microsperma*, from which his new species differed by

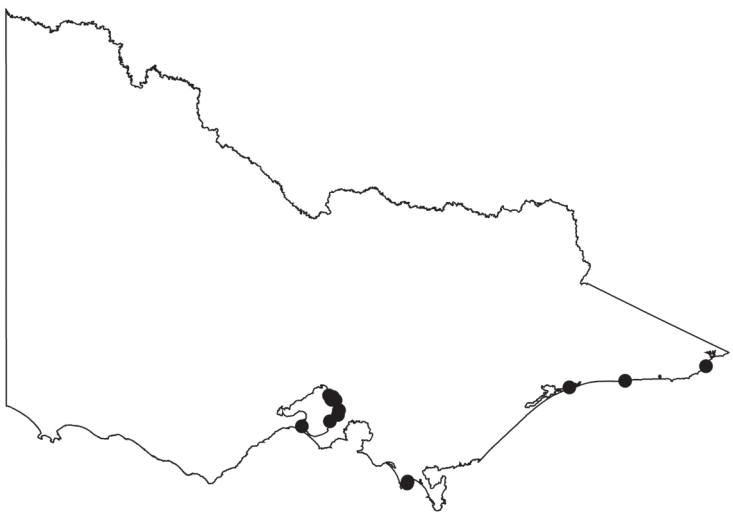


Figure 5. Distribution of *Arthonia banksiae*.

having "more linear apothecia and larger spores" (Müller Arg. 1893). However, in the same paper, he also records *A. microsperma* from Victoria. We have examined the type of *A. microsperma* (from G) and can confirm Müller's observations: it has typically arthonioid, rounded ascomata and 1-septate ascospores, 7–10 × 4–4.5 µm. However, the Australian specimen under this name is *A. banksiae*, albeit a youngish individual with rounded rather than elongate ascomata. The smaller ascospores reported by Müller were not observed and these may perhaps be attributable to the immaturity of the specimen. Consequently, *A. microsperma* can be deleted from the Australian lichen census.

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