Epifoliar fungi from Queensland, Australia

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Abstract. Collections of epifoliar ascomycete fungi from leaf surfaces in the tropical rain forests of Queensland, Australia, yielded 42 genera and 50 species, including one new genus (\textit{Dubujiana}), three new species (\textit{Dennisiela asetosa}, \textit{Dubujiana glandulifera}, \textit{Microxiphium pleomorphum}), three new combinations (\textit{Polychaeton purpurafaciens}, \textit{Seuratia australiensis}, \textit{Stomiopeltis gautheriae}), lectotypification of \textit{Micropeltis biseptata}, various emended descriptions, and new species records. Each species is described and compared with similar taxa, and the new species are illustrated.

Introduction

This paper presents a taxonomic treatment of epifoliar fungi, primarily from leaves of rainforest plants at the Tropical Crane Research site on Cape Tribulation, Queensland, Australia. We define epifoliar fungi as those specialised nutritional guilds found only at the surface of living plants, particularly the leaves (Gilbert and Reynolds 2002). Several polyphyletic groups, principally Ascomycetes, have evolved to this habitat, and include four main guilds: saprobes, plant parasites, fungal parasites (epimycota), and lichens. With the exception of lichens, all share common adaptive morphological traits including a dark, melinoid pigmentation and reproduction by both ascospores and mitospores. For the non-lichenised taxa, the habits and traits are convergent aposynapies that distinguish groups of fungi at family and ordinal levels (e.g. Capnodiaceae, Micropeltidaceae). In contrast, lichens have acquired the epifoliar habit at comparatively lower taxonomic levels (genus or species; Lücking 2002). This paper provides comparative taxonomic descriptions of 50 species of Queensland epifoliar fungi (GS Gilbert and DR Reynolds unpubl. data).

Epifoliar fungi are known from previous mycological studies in Queensland (Simmons 1966). Monographic literature on Queensland fungi extends back over a century, and includes works treating higher taxa (Batista 1959b; Müller and von Arx 1962; Batista and Ciferri 1962, 1963a, 1963b) as well as the more specific revisions cited below. Any assessment of regional biodiversity must place new collections into the body of available published collections; this often presents difficulties in reconciling modern and historical approaches to classification. There are historical difficulties for taxonomic treatments particular to these epifoliar fungi, and we provide related annotations in order to facilitate future work on these important ecological guilds.

The taxonomy of epifoliar fungi has been particularly plagued by (1) inadequate historical appreciation of intraspecific variation, that led to repeated description of the same species based on (2) minor morphological variation or (3) similar collections from different host plant species. Several factors have contributed to a proliferation of species. One problem is that many historical epifoliar fungal species are described based on only a single collection. For instance, the monotypic genus \textit{Plectopeltis} Sydow (Sydow 1927) was erected based on a single collection. Similarly, the monographic revisions of the Micropeltidaceae by Batista and co-workers (Batista 1959a; Batista and Peres 1963) include many descriptions of new species based on single collections. Often the specimen, which would also be the type specimen, is unavailable; many specimens were destroyed during wars. Those specimens that still exist are typically scattered world wide in herbaria, with their current location often unknown to the scientific community. In too many cases only the description in the literature, sometimes unaccompanied by illustrations, is available for an interpretation of the species concept and the designations of lectotypes. Second, because of these problems, the same biological species has often been described repeatedly, with only minor morphometric variations. The accounts of the
Examined fungi were primarily from pressed and dried leaves collected from Queensland, with many new species records, we attempt to provide a taxonomic treatment of epifoliar fungi from Queensland, or were obtained from other Australian collections is identified with a unique number suffixed with AUS.

While describing a new genus, several new species, and many new species records, we attempt to provide a more phylogenetically robust and ecologically useful taxonomic treatment of epifoliar fungi from Queensland, with a particular focus on those fungi associated with rainforest plants.

Materials and methods

Examined fungi were primarily from pressed and dried leaves collected from the Tropical Lowland Rain Forest at the Australian Canopy Crane Research Facility, at Cape Tribulation, far north Queensland, Australia (16° 08′ S, 145° 27′ E, altitude 31–55 m). The site averages 3600 mm rain annually, with most rain falling between December and April. Specimens were collected from ground level to the top of the forest canopy, vertical access being facilitated by the canopy access crane. The crane is managed by the Rainforest Cooperative Research Centre. Other specimens were collected from regional sites throughout northern Queensland, or were obtained from other herbaria (Holmgren et al. 1990, http://science.nysbg.org/science2/ IndexHerbariorum.asp, validated 2 February 2005). Each of our Australian collections is identified with a unique number suffixed with AUS.

Observations and measurements of fungal structures were made from fresh specimens mounted in lactophenol. Zeiss compound and light microscopes (Carl Zeiss International, Göttingen, Germany) and a Cambridge scanning electron microscope (Hitachi S-3000N, Hitachi Scientific Instruments Inc., Hachioji, Japan). Photomicrographs were taken with a Nikon Coolpix 4500 digital camera (Nikon, Tokyo, Japan). The 273 specimens collected at the crane site and 34 specimens from other Queensland areas utilised in this study, and cited in the Supplementary material (available online from the website of Australian Systematic Botany), are curated at the University Herbarium (UC) at the University of California, Berkeley, CA.

Key to families

1. Ascospores present, sometimes with mitospores ........................................ 2
   Mitospores only present .......................................................... 13
2. Ascus formed on individual, unmodified hyphae developing either flat on the surface or aerially ........................................ 3
   Ascus formed otherwise ................................................................ 4
3. Ascus discrete on surface mycelium, globose ...................................... 5
   Ascus flattened, hemispherical scutate or dimidiate ......................... 12
4. Ascus formed separately at periphery of a common gelatinous, hygroscopic thallus ......................................................... Senetariaceae
   Ascus attached to leaf hairs or parasitic on other fungi ......................... Pseudoperisporiaceae
5. Ascus apically deliquescent; ascospores 1-septate ................................ Engeliaceae
   Ascus without deliquescence ....................................................... 6
6. Hyphae without haustoria .................................................................. 7
   Hyphae with haustoria .................................................................. 8
7. Ascus formed on surface mycelium or borne aerially, not appendaged with shield ......................................................... 9
   Ascus covered by a mycelial shield ................................................. 10
8. Mycelium or ascus setose or not; ascus globose, ascospores 3–4 transaperturate, brown, rounded ends .................................... Meliolaceae
   Ascus roundish, elongate or linear ............................................... 11
9. Associated with rounded to obvoid, small pycnidia and hyphal mitospores .................................................. Asterinaceae
   Associated with stalked pycnidia .................................................... Capnodaceae
   Ascoma formed separately under a shield-like thallus, composed of radiating rows of cells in banded or circular pattern ........ Bredellidiaceae
10. Ascoma covered by a mycelial shield .................................................. 12
   Ascoma not radiate, upper layer sometimes formed from elaborated tips of paraphyses-like filaments ........................................... Schizothyriaceae
11. Ascus covered with wall of radiately arranged cells ......................... Asterinaceae
   Ascus not radiate, upper layer sometimes formed from elaborated tips of paraphyses-like filaments ........................................... Schizothyriaceae
12. Ascoma whole composed of hyphae radiating from central point .......... Microthyriaceae
   Ascoma flattened, hemispherical or compressed radiately extending hyphae ..................................................... Mitosporic Ascomycetes
13. Mitospores produced in a fruit body .................................................. 14
   Mitospores not produced from within a fruit body ............................. Mitosporic Ascomycetes
14. Mitospore fruit bodies hemispherical or dimidiate ................................ 15
   Mitospores formed in a globose pycnidium ..................................... 16
15. Mitospore fruit body resembling the ascoma of Asterinaceae ................. 17
   Mitospore fruit body resembling the ascoma of Microthyriaceae ......... 18
16. Pycnidium stalked ............................................................................. Microthyriaceae
   Pycnidium not stalked .................................................................. 17

1. Antennariaceae

Antennariella Batista & Ciferri Quaderno 2: 22 (1963)

Antennariella californica Batista & Ciferri Quaderno 2: 25 (1963)

Asbolinia citrina Batista & Ciferri, Quaderno 2: 38 (1963)

Description

Mycelium superficial, forming on the substrate mostly on the leaf surface, blackish-brown; pycnidia globose to pyriform, ostiolate, apically and laterally on aerial hyphae, 35–60 µm diameter; mitospores ovoid, continuous, hyaline, 3.5–4.5 µm × 2 µm.
Epiphyllar fungi from Queensland, Australia

Specimens examined
AU8031, AU8132, AU8133, DAR212643, DAR19744, DAR207255, URM2743, URM4850, URM5042, URM5292, URM9284, URM9505, URM9319, URM5348, URM10430.

Notes
McAlpine (1896, fig. 19) reported an 'Antennaria' form of pycnidial sooty mould from Victoria with simple, oval to ovate mitospores. Fisher (1933) reported two similar sooty moulds from Victoria that were placed in the genus Chaetothoma Cooke (1878). Fraser (1935b) found two pycnidial sooty moulds 'of the Antennularia type' in New South Wales. One was said to be associated with Capnodium moniliforme Fraser and the other with Limacinia concinna Fraser. Later, Batista and Ciferri (1963a) suggested that the Fraser collections determined as C. moniliforme fall within Antennariella californica Batista & Ciferri and that the collections assigned to L. concinna are Asbolisia citrina Batista & Ciferri.

Asbolisia and Antennuniariella are distinguished by Batista and Ciferri (1963b) in the formation of the pycnidia on erect hyphae. The species in both genera are distinguished by small differences in the size of the pycnidium and the mitospore. Asbolisia was typified with Asbolisia ampullula (Spegazzini) Spegazzini. The basionym was Chaetothoma ampullula Spegazzini (Spegazzini 1886). The new taxon was distinguished from Chaetothoma by an ostiole. Spegazzini (1918) designated A. ampullula (Spegazzini) Spegazzini as the type species in an alphabetised list of 11 names transferred from Chaetothoma. Petrak and Sydow (1935) transferred A. ampullula to the hypocreoid Cicinnobella P. Hennings emend. Petrak and Sydow (1927), a genus that von Höhnel (1911) had earlier found to be based on an immature ascomycete of the genus Persicaria, and similar to Limacinia Neger (Reynolds 1985).

Batista and Ciferri (1963b) utilised Asbolisia as a definitive taxon in the sense implied by the common designation of 'sooty mold' for the diversity of sexual and, as in this case, mitosporic species of the Capnodiacaeae. The major underlying attribute in this common name is the darkly pigmented mycelium and reproductive structures that characteristically occur on living plant surfaces. They excluded Spegazzini’s type, A. ampullula, from the genus because of its synonymy with Cicinnobella ampulla and inadmissibly designated a Brazilian species, A. citrina Batista, Nascimento & Ciferri, as a 'Lectotypus.' Sutton (1977) pronounced the name Asbolisia as 'dubious'; likewise, Kirk et al. (2001) declared the taxon a nomen dubium.

Hughes (1976), apparently unaware of the von Höhnel (1911) discovery, concurred with Petrak and Sydow (1927) and noted that Hansford (1946) regarded Cicinnobella species as the mitosporic component of hyperparasites of Dimeriacaeae genera in the Pleosporales. Hughes (1976) recognised the seven Batista and Ciferri (1963b) species of Antennulariella and selected A. unedonis (Maire & Saccardo) Batista & Ciferri as the generic type, with the assignment of the taxon to the Antennulariellaceaee. The pycnidia and mitospores of our collection from Cape Tribulation Beach closely resemble those of A. citrina; the pycnidia and mitospores are slightly smaller than the Fraser collections (Fraser 1935b) that Batista and Ciferri (1963b) assigned to Antennulariella. Examination of the type and other collections cited in Batista and Ciferri (1963b) and the somewhat convolute nomenclature of Asbolisia indicate that A. citrina should be regarded as a synonym of A. californica.

2. Asterinaceae

1. Ascosporas present .......................................................... 2
   Mitospores present ....................................................... 2

2. Hyphopodia lateral, septate or not, irregular in outline .............. A. cirrhata
   Hyphopodia circular, intercalary ....................................... A. cirrhata


Asterina eupomatiae Hennings, Hedwigia 42: 78 (1903)


Figs 1–3.

Description
Mycelium: dark brown, straight to flexuous hyphae, branching alternate or unilateral or opposite; hyphopodia unicellular to one septate, smooth to irregular in outline, alternate, unilateral or opposite; ascomas mostly singular, sometimes confluent, flat to convex, orbicular in outline, up to 170 µm diameter; the upper wall of parallel hyphae that radiates from centre towards slightly fimbriate edge, opening by stellate fissures; ascosporeiform, extenditunicate, 8-spored, up to 80 µm in length, paraphysate or not; ascospores slightly unequally 2-celled, 23 ± 10 µm, becoming dark brown, smooth, echinate to verrucose.

Specimens examined
AU8031, AU8132, AU8133, AU8165, AU8204, AU8215, AU8228, AU8235, AU8241, AU8246, AU8326, AU8336, AU8351, AU8357, AU8364, AU8372, AU8381, AU8398, AU8404, AU8411, AU8422, AU8447, AU8460, BRIP2796.

Notes
Asterina (Léveillé 1845) is a large, mostly tropical, genus of Ascomycetes with over 575 species (Hosagoudar and Abraham 2000). [The name Asterina Nardo is recognised for a genus of an echinoderm, the starfish (Nardo 1834), as a valid, earlier zoological homonym (Greuter et al. 2000)]. Asterina is morphologically distinguished from some 19 other genera in the family by the 2-celled ascospores, hyphopodiate hyphae, and a lack of setae (Hansford 1946).
In all, 21 *Asterina* names are reported from Australia (Hosagoudar and Abraham 2000). *Asterina kosciuskensis* Selkirk (1975) was reported from lower Miocene deposits found in New South Wales. Seventeen species have been recorded from Queensland. The characters separating the species are variations on spore size, hyphopodial position, and spore ornamentation. The associated vascular plant is assumed to be a primary attribute in all new taxa as is illustrated by this grouping in the Hosagoudar and Abraham (2000) list of *Asterina* species.
The ascoma and ascospore sizes and hyphopodial morphology variation in a group of our collections fall within seven known Australian species: *A. dictyolomatis* Hansford (Hansford 1954), *A. libertiae* (Batista and Ciferri 1959), *A. oritis* (Hansford 1954), *A. recisa* (Hansford 1953), *A. eupomatiae* (Hansford 1937), *A. dictyolomatis* P. Hennings (Hennings 1904), *A. eupomatiae* P. Hennings (Hennings 1903), *A. loranthica* Sydow, (Sydow and Sydow 1914), *A. reclinata* Sydow, (Sydow 1937a, 1937b), *A. recisa* (Saccardo) Sydow (Sydow 1937a, 1937b), *A. oritis* Hansford (Hansford 1954) and *A. diospyrina* Hansford (Hansford 1957). The variance in the defining morphological characters found in cited collections suggests that all of these names represent only one species. The Queensland species, *A. eupomatiae* is selected as the name for this group of our collections.

*Asterina rutilatissima* (Saccardo) Theissen, *Ann. Mycol.* 10: 22 (1912) emend Fig. 4.

**Description**

Mycelium absent. A circular shield is formed of two layers of radiating hyphae that originate from a central point, component hyphae form irregular patterns from parallel to prosenchytic tissue. The upper layer comprises darker hyphae than the lower layer that radiate in a loose to regular parallel pattern. Both ascogenous and mitosporic areas are formed beneath the mycelial shield. The surface over the fertile areas is somewhat raised and open with the disintegration of the apical wall covering; asci aparaphysate, extenditunicate, dehiscence scar, fuscous 14–21 × 10–11 µm, develop beneath the shield; conidiophores are very short or not apparent; mitospores ovoid, piriform or oblong, continuous, with basal dehiscence scar, fuscous 14–21 × 10–11 µm.

**Specimens examined**

AUS333, BRIP2800.

**Additional specimens examined**

BRIP2789, BRIP2790, BRIP2789, BRIP2792, BRIP2795, BRIP2798, BRIP2799, BRIP2801.

**Notes**

There is no free mycelium associated with the pleomorphic fruit bodies. There is no apparent invasion of the leaf surface by any hyphal formation associated with the fruit body. The ascospores and the mitospores are larger than those of *Asterina delicata* Doidge (Doidge 1920). The mitosporic form of the latter species fits *Asterostomella horrvida* Batista & Maia (Batista and Ciferri 1959) from the Philippines.

The mitosporic aspect of this fungus differs from *Asterostomula* (Theissen 1916) in lacking mycelium and the formation of a shield, under which both ascosporic and mitosporic fertile areas develop. A large vacuole in the central area of the mitospor gives the appearance of a light median band similar to that found in *Asterostomella veronicae* (Desmazières) Batista and Ciferri (1959), collected by L. Fraser in New South Wales.

On the same leaf, there are colonies composed of hyphae with hyphopodia. The individual fruit bodies have pyriform mitospores that are larger than those in the pleomorphic ascoma, measuring 19 × 10 µm. These are similar to BRIP2800, determined as *Asterina radiotissilis* by CG Hansford. G Rahayu (specimen annotation) found that the collection was mostly mitosporic fruit bodies with some immature ascemata. A comparison was made to the description by Doidge (1942) and was ‘considered as an anamorph of *A. radiotissilis*’.


**Description**

Mycelium superficial, fusoid, reticulate or radiate, capitate hypophodia 1–2-celled; pycnidia superficial, dimidiate, 75–130 µm diameter, the upper plate composed of radiate hyphae, dehiscence is irregularly stellate; hymenium is inverted; conidiophores are very short or not apparent; mitospores ovoid, piriform or oblong, continuous, with basal dehiscence scar, fuscous 14–21 × 10–11 µm.

**Specimens examined**

AUS338, AUS335, AUS339, AUS394, AUS414.

**Notes**

*Asterostomella* is a mitosporic taxon for presumed pleomorphic *Asterina* and *Parasterina* species. Batista and Ciferri (1959) place the taxa in the Asterinothrytaceae, a family in the order Peltasterales that they constructed for pyriform taxa mostly of epifoliar fungi. No ascosporic species were found in direct association with this mitosporic species in our collections. The distribution for the 29 named species and 14 synonyms (Batista and Ciferri 1959) is USA (Florida), the Caribbean, Central and South America, South-east Asia and Uganda. One species, *A. veronicae* (Desmazières) Arnaud, is cited as a specimen collected in New South Wales by L Fraser. The mitospores of *Asterostomella* have a distinctive ovoid, piriform to oblong shape with a reddish brown pigmentation; there is sometimes a non-pigmented band in the mid area of the mitospor. They are produced in a thriotheicum from the underside of an upper plate of radiate hyphae and are dispersed through
Cirsosia Arnaud, Ann. École Natl. Agric, Montpellier n.s. 16: 127 (1918)


**Description**

Mycelium with intercallary, circular hyphopodia; thyrthroecium initially roundish becoming longate, 300–500 × 190–240 µm, upper wall of parallel hyphae; ascus fissitunicate; ascospores fusoid, 2-celled, 30 × 20 µm.

**Specimen examined**

AUS384.

**Notes**

This species was described from the Philippines. It has been assigned to Lembosia Lév. (Patouillard and Hariot 1890), Asterina (Theissen 1912, 1919), Cirsosiella Arnaud (Arnaud 1918), and Asterothelbia Arnaud (Hansford 1948). The ascospores in our material are wider than those previously reported, including most recently from India (Hosagoudar and Pillai 1994).


Figs 5–11.

1. Ascospores present .................................................. Brefeldiella

2. Mitospores present .................................................. 2

3. Mitospores formed within a pycnidium ....................... 3

4. Mitospores formed on surface of mycelium ................. Trichothallus

5. Conidiophores short, mitospores bacillate to cylindrical Enthallopycnidium

6. Conidiophores absent, mitospores linear .................. Enthallopycnidium

**Description**

We recognise the Brefeldiellaceae as having a thallus comprised of flattened cells arranged radially and circularly in bands or in irregularly diverging rows. The ascomata are dispersed, forming below the thallus, round or elongate in outline, opening by the fissure of covering thallus cells; the asci are clavate, obovate or spherical, fissitunicate, and paraphysate; the ascospores are 1–3-celled, hyaline or brown.

Our Brefeldiella species is pleomorphic. The name for the teleomorph is Brefeldiella subcuticulosa (Cooke) Theissen and that of its anamorph is Trichopeltis reptans Spegazzini. This pleomorphic association occurs consistently in our sample site. The initial description (Spegazzini 1889) is that of a monomorphic and monotypic taxon; no species have been since added to the genus (Kirk et al. 2001, Index of fungi). Each pleomorphic state is discussed separately. Our collections exhibit both states in most specimens and either one or the other in some. The thallus is an easily recognisable common character from this locale.

**Brefeldiella subcuticulosa** (Cooke) Theissen, Ann. Mycol. 10: 16 (1912) emend

Asterina subcuticulosa Cooke, Grevillea 17: 81 (1896); Asterothelbia subcuticulosa (Cooke) Saccardo Syll. Fung. 9: 937 (1891) Figs 6, 8–11.

**Teleomorph description**

Mycelium absent; ascoma pelliculate, applanate, irregular to confluent, without mycelium, becoming darkly pigmented; paraphyses disintegrating at maturity; ascus fissitunicate, pyriform, 25 µm in length; ascospores elliptical-elliptate, 3-septate, hyaline, upper cell wider, 10–12 × 4 µm.

**Notes**

The etymology of the species epithet is not explained by Cooke (1889a, 1889b) or Theissen (1912). The name implies that some part of the morphological structure is below the cuticle, which is not the case in the material examined.

The saprobic hyphacea form a closely adhering, superficial membrane with a basic parallel pattern of generally outwardly radiating hyphae, often circular and with identifiable bands; ascoma dispersed, covered by the thallus, opening with a somewhat elongate surface tear of cover (Fraser 1936); ascus clavate to spherical, fissitunicate with apparent nasse apicale (Reynolds 1989).

The ascomata are identifiable by the distinctive brown coloration that contrasts with the lighter pigmentation of the covering parallel hyphae and a short hyphal radiation pattern from a rounded–elongate fissure that serves as a pore for ascospore dispersal. Other than the abrupt margins of the circular pigmentation areas in the hyphal bands, there is no distinction of the slightly raised fertile areas. The thallus development is apparently influenced by the contour of the subending living leaf surface in our material. The distinctive hyphal bands conjoin in a generally convergent linear extension, or form circular plate-like growths. The pigmentation of the hyphal strands ranges from a discernable brown to almost translucent.

Brefeldiella subcuticulosa is known from Australia from collections at ‘Gippsland Australiae (Luehmann).’ This is an area east of Melbourne in the state of Victoria. Fraser (1936) distinguished between Brefeldiella and Trichopeltis in her discussion of specimens from New South Wales, both assigned to the Trichopeltaceae. Brefeldiella brachysclena was recognised as having a circular or lobed thallus. The thalli of Trichopeltis reptans Spegazzini (1889) and Trichothallus hawaiensis Stevens (1925; Fig 20) were described as
Fig. 5. *Brefeldiella myrceugeniae* Stockholm F30018. This thallus is circular. ×10.

Fig. 6. *Brefeldiella subcuticulosa*, Kew 117421 from Melbourne. The thallus is effusive and rounded with indistinct margins. ×10.

Fig. 7. *B. philippensis* S F10886. The thallus is band-shaped. ×60.

Figs 8–11. Australian *B. subcuticulosa* thallus variation in Queensland specimens. Note the patterns of parallel hyphae in the banded thallus. The sporogenous area is darkly pigmented with a pore in the centre. Fig. 8. AUS349. ×60. Fig. 9. AUS435. ×135. Fig. 10. AUS245. ×270. Fig. 11. AUS201. ×135.

strap-shaped and branching. Bailey (1909) reported *Asterina reptan* Berkeley and Curtis (1869) from Australia; Stevens (1925) discussed and illustrated this species from Hawaii as *Trichopeltis reptans* Spegazzini. Hughes (1953) renamed the species as *Trichothyrium reptans* (Berkeley & M.A. Curtis) S Hughes. Hansford (1954) discussed *Trichopeltis* sp. from a New South Wales specimen as having a ‘dendritic’ mycelium under which thyriothecia formed with circular pores. A similar form, *Brefeldiella philippensis* Sydow (Fig. 7), has discrete bands; this species is represented
in Herbarium S with a ‘type’ specimen, but a description was apparently never published.

The epifoliar fungi that form rounded to irregularly diverging rows of radially arranged flattened cells are not well understood with regard to their phylogeny and taxonomic disposition. Theissen (1913b) recognised them in the family Trichopeltaceae with the subfamilies Trichopeltineae and Brefeldineae; they were distinguished by the circular or linear thalli. Subsequent systematic treatments of this group (von Höhnel 1910a; Stevens 1925; Saccardo 1926; Clements and Shear 1931; Hughes 1953; Müller and von Arx 1962; Luttrell 1973; von Arx and Müller 1975; Eriksson 1981; Sivanesan 1984; Barr 1987; Spooner and Kirk 1990; Kirk et al. 2001) have made varying distinctions based on the position of the ascoma above or below the hyphal band, ascospore morphology, and associated mitotic reproductive structures.

A contemporary interpretation of the Trichothyriaceae (Spooner and Kirk 1990) includes the taxa with a catathecium (von Höhnel 1917). The flattened ascoma of Trichothyrium with an upper and lower, single-cell thick layer occurring on the surface of parallel hyphal bands is an example. In contrast, the ascoma of Brefeldiella in our emended view is dispersed, somewhat rounded, opening via a somewhat fissure of the upper covering cells. Batista and Ciferri (1959) document a similar fruit body structure for mitosporic species that they organise in the Trichopeltaceae.

The Brefeldiella brasiliensis Spegazzini of von Arx and Müller (1957) included B. subcuticulosa as a synonym. The material cited, as well as B. myrceugeniae Sydow (Kessler 1927) utilised by Eriksson (1981) from Masatierra (= Juan Fernandez Island) Chile (Fig. 5), has a circular ascoma, as does Brefeldiella chilenensis Spegazzini (Spegazzini 1921; Mujica and Vergara 1945). The epifoliar pellicle of ‘Brefeldiella philippensis Rehm’ forms discrete, elongate, branching bands (Fig. 7).

Enthallopycnidium Stevens, B.P. Bishop Museum Bull. 19: 85 (1925)

Enthallopycnidium Gouldiae Stevens, B.P. Bishop Museum Bull. 19: 85 (1925)

Description
Thallus 1–3 mm diameter, consisting of radiating, flat plates formed by the somewhat parallel adherence of hyphal strands similar to that of Brefeldiella; individual fertile areas 40–90 µm, the ostiole ranges from a somewhat circular to an elliptical opening, surrounded with setae (≈ Trichothallus reptans); mitospores linear, hyaline, single-celled, 7–7.5 × 1 µm.

Specimens examined
AUS348, AUS377.

Notes
In our collections we found all three genera that Stevens (1925) included as members of the Trichopeltaceae, i.e. the mitosporic Enthallopycnidium and Trichothyllum as well as the ascosporic Trichopeltis Spegazzini. Hughes (1976) appropriated Trichothallus for his Euantennariaceae. He described Antennaula Fries ex Strauss mitosporic taxa as developed from undifferentiated hyphae, while Trichothallus mitospores formed on a hyphal plate, as originally described by Spegazzini (1889) from Cuba, and Stevens (1925) from Hawaii. He also found associated Plokamidomyces Batista et al. (1958) and Hormiscioniomyces Batista and Nascimento (1957) mitosporic taxa developing from undifferentiated hyphae and hyphal plates respectively. He found the subglobose, appended ascomas of Euantennaria and Trichopeltis associated with free hyphae and the hyphal bands; these taxa were morphologically distinguished on the basis of minor ascospore septation characters. Spooner and Kirk (1990) considered Trichopeltis a synonym of Trichothyrium.

We found no Plokamidomyces nor Trichopeltis ‘setae’ in our material. Rather, the Trichopeltis reptant ascoma is similar to those described by Stevens (1925). In addition, the hyphal bands produced the reproductive structures of Enthallopycnidium, which were said to have only pycnidia and no ‘setae’ on the thallus. The pycnidia of Polychaeton were present on some hyphal bands with the normally single, individual hyphal strands of the species being integrated in the flattened, one-layered mycelial layer. Fraser (1936) noted that New South Wales collections identified as Trichothallus hawaiensis have ‘... hyphae composed of cells growing upwards from the thallus at regular intervals.’ She speculated that they functioned as, ‘organs of propagation.’ Trichothallus is either a convergent taxon in the Trichopeltaceae and the Euantennariaceae definitions of Hughes (1976) or it is taxonomically misplaced in the latter.


Description
Thallus diverse and characteristic of Brefeldiella; locules dispersed, somewhat rounded, opening via a somewhat elongate pore; mitospores formed on roundish, hyaline cells on the inner surface of the shield, basicate to cylindrical, unicellular, hyaline, 5 × 1 µm.

Notes
Mitosporic reproduction occurs either with or without the presence of ascosporic hymenia in the same thallus. The mitospores are hyaline and unicellular and range in shape from oval to elongate. Batista and Ciferri (1959) recognised several genera based on the shape of the pellicle of
banded hyphae. Because of the apparent diversity in thallus morphology in our large sample from the collection site, we consider them synonymous as *Trichopeltulum* Spegazzini (Spegazzini 1889).

Several genera are similar to *Trichopeltulum*, differing only in the overall form of the thallus. Otherwise, the taxa are identical. Batista and Ciferri (1959) created the family *Trichopeltulaceae* for these *hialoamerospores* taxa including *Brefeldiopsis* Petrak & Ciferri (Petrak and Ciferri 1932), *Entallopuccidium* Stevens (Stevens 1925). *Pycnidiolepsis* Batista & Costa (Batista and Ciferri 1959), *Pycnothriella* Batista (1952), and *Stellopedis* Batista & Vital (Batista and Ciferri 1959) and the prototypic *Trichopeltulum*.

*Trichopeltulum* was assigned to the mitosporic *Trichopeltulaceae* of the Pelasterales by Batista and Ciferri (1959).

**Specimens examined**


**Notes**

The asexual spores of *Brefeldiella subcuticulosa* are present in AUS429 and the pycnidia of *Trichopeltulum pulchellum* are also found in AUS377.

The *Plokamidomyces* phialidic structures from Hughes (1976) have not been found. Hughes (1976) placed this genus in the *Euantennulariaceae* and associates it with *Trichopeltula*, which has 3–5-septate ascospores sometimes becoming muriform. The other taxa in this family are born on hyphal strands, which are sometimes aerial.

**4. Capnodiaceae**

1. **Ascomata present** ................................................................. 2

2. **Ascomata with three transsepta** ........................................ 3

3. **Ascoma surrounded by conidial pycnidia with 4–6 transsepta** .............................. *Aithaloderma*

Anamorph

Ascoma slightly stalked, ascospores with 3–5(–6) septa ................................. *Phaeocharoides*

4. **Mitosporic centrum formed at open end of synemmial stalk** .......................... *Calosporiothrix*

Mitosporic centrum formed in basal centrum of stalk ................................ *Phylographia*

5. **Mitosporic centrum formed in basal centrum of stalk** ................................. *Polysporia*

**Aithaloderma** P. Sydow, Ann. Mycol. 11: 256 (1913)

**Aithaloderma ferrugineum** Fraser, Proc. Linn. Soc. New South Wales 60: 98 (1935)

**Description**

Mycelium light brown; ascospore conical, 100–150 µm in diameter, apical pore surrounded by dark brown, tapering setae 70–140 µm in length; ascii fusitunicate, cylindrical or oblong, 40 µm; ascospores hyaline, 4–6-septate, slightly constricted at the septa, oblong, rounded at both ends, tapering slightly towards the base, 27 × 10 µm.

**Specimen examined**

AUS502.

**Notes**

The genus *Aithaloderma* was established (Sydow and Sydow 1913) from the Philippines (Los Baños) with material that had an ascospore with setae, an ascus with a thickened wall, and hyaline ascospores. The interpretation of the ascospore varies from a rounded ascospore like that of *Capnodium*, to one originating beneath a shield similar to that of *Chaetothyrium* (Batista and Ciferri 1957, 1962; Reynolds 1971; Hughes 1976; Poblad 1899), to a flattened shield-like structure covering the ascospore similar to that of *Microthyrium* of the Microthyriaceae (Sydow and Sydow 1913). The ascospore was said to be variably setose and producing either an ostiolar opening or radiate cracks for the release of the ascospores (Sydow and Sydow 1913; Hughes 1976).

Accordingly, the genus *Aithaloderma* has been assigned to several taxa. The sooty moulds, as the *Capnodiaceae* or *Capnodiaceae*, is the original designation (Sydow and Sydow 1913; Yamamoto 1954; Luttrell 1973; von Arx and Müller 1975; Hughes 1976; Sivanesan 1984; Barr 1987, 2001). Others considered *Aithaloderma* related to *Chaetothyrium*, a member of the family *Chaetothyriaceae* (Thiersen and Sydow 1917; Fraser 1935; Fisher 1939; Hansford 1946; Batista and Ciferri 1962) the order Chaetothyriales was determined with the use of molecular data to be related to the Plectomycetes
(Berbee 1996) rather than the morphologically defined Loculoascomycetes (Barr 2001). A similar phylogenetic position for Aithaloderma has yet to be determined.

Two Aithaloderma species were described from New South Wales (Frazer 1935a). The developmental life history of Aithaloderma ferruginea and Aithaloderma viridis was based on morphological states and depicted a mycelium that gave rise to a pycnidium. A similar origin was illustrated for the ascoma of Pleosphaeria citri Arnaud (Arnaud 1910).


*Leptosphaeria axillata* (Cook) S. Hughes, *Mycologia* 68: 748 (1976)

*Conidiocarpus axillatum* Cooke, *Kew Bull.* 17: 48 (1878)

*Caldariomyces* sp. 1 Fraser, *Proc. Linnean Soc., New South Wales* 60: 177 (1935)

*Caldariomyces* sp. 2 Fraser, *Proc. Linnean Soc., New South Wales* 60: 177 (1935)

**Description**

Pycnidium (synnemium) elongate, darkly pigmented; fertile area at apex of stalk cupulate, open, with individual hyphal strands often continuing as hyaline, acute projections; mitospores formed on enteroblastic phialidic, determinate, integrated cells; mitospores hyaline, aseptate, smooth, ellipsoid, 2–3 µm, becoming cylindrical, in the germination process acquiring septation and pigmentation with development of hyphal initial.

**Specimens examined**


**Notes**

Soote mould mitosporic taxa share attributes of ascomycetes in the Conidiocarpidaceae that are related to their evolution as an epiphyllar guild. The fruit body is basically a slender, upright pycnidium that develops from a superficial mycelium on living plant surfaces. Dark brown to blackish pigment resides in the mycelial and reproductive structure walls. Even though the sooty moulds are proving to be polyphyletic (D. Reynolds and J. Faull, unpubl. data), the mitospore taxa have a common spore dispersal strategy. Many genera have small, unicellular, hyaline mitospores. Others produce a multisepate mitospore that resembles the ascospore. They are adapted to distribution in the canopy flow-through water and have the ability to germinate quickly once dispersed. The mitospores are produced from a specialised area that is predictably positioned in several locations on the stalk (Olejnik et al. 1999). The mitospore production area of Polychaeton (Persoon) Lévêillé (Hughes 1976) is basal and usually somewhat elongate, with an apical continuation of the stalk as a neck through which the mitospores are dispersed. *Fumagospora* Arnaud (1911) and *Phaeosphaeria* Battista and Ciferri (1963b) are similar, but have darkly pigmented, septate mitospores. The spore production centre of *Conidiocarpus* Woronichin (Woronichin 1926) is in the middle region of the stalk, sometimes with the neck extension, sometimes not. *Scolecosporium* Ciferri & Battista (Ciferri et al. 1956) is a name given to a form of *Conidiocarpus* in which there is no apparent swelling of the stalk at the site of mitospore production. The *Caldivairyomyces* (= *Leptosphaeria sensu* Reynolds and Faull 2001) type of fruit body produces mitospores from an open area at the apex of the stalk, and has been deemed a synnemium (Zopf 1878; Hughes 1976; Roquebert and Bury 1988). The mitospores readily begin the germination process when moistened, and then can become arrested in various stages of morphological development of a hyphal initial.

The Battista and Ciferri (1963b) treatment of these mitosporic fungi as members of the Asbolisiaceae recognised numerous taxa for mitosporic sooty moulds with the four types of stalked conidigenous centers. JI. Faull (pers. comm.) found that the ITS sequences from a large number of isolates fall within several phylogenetic clusters. We recognise the name *C. axillatum*, for the collections reported here.

Frazer (1934, 1935b, 1937) studied the cultural behaviour of *Caldivairyomyces* sp. and reported two *Caldivairyomyces* species from New South Wales. Langdon specimen, BRIR2101 = BRIP2642, is labelled *Leptosphaeria* sp., and was originally determined by R.F. Langdon as *Caldivairyomyces*. We consistently find *Caldivairyomyces axillatum* associated with *Trichomerium grandisporum*.


*Conidiocarpus philippensis* Ciferri & Battista, comb. nov.

*Microxiphium philippensis* Ciferri & Battista in *Batista & Ciferri, Quaderno 2: 135 (1963)

*Microxiphium* sp. 1 Fraser, *Proc. Linnean Soc., New South Wales* 60: 175 (1935)

*Microxiphium* sp. 2 Fraser, *Proc. Linnean Soc., New South Wales* 60: 175 (1935)

**Description**

Mycelium effuse, of cylindrical cells 7–10 µm in length; pycnidia elongate, narrow, darkly pigmented, 500–1000 µm in length, 50–80 µm wide at the midstalk conidigenous swelling and otherwise 10–15 µm. The hyaline inner cells of the pycnidial column extend from the apex, giving the
appearance of a thin fringe of hairs; the mitospores are hyaline, ovoid, 6 × 3 µm.

Fraser (1935b) characterised the mitospores as 2-celled. Often the germination process begins while the mitospores are clustered at the apex of the fruit body in a droplet of hygrophilous fluid, or after its dilution and mitospore dispersal along the outer pycnidial length or to the substratum. This spore dispersal process is especially prominent in *Calderariomycetes* where hyphal formation begins with initial mitospore enlargement, cell division, and the acquisition of dark pigmentation.

**Specimens examined**

AUS038, AUS228, AUS360, AUS380, AUS396, AUS397, AUS493, AUS495, AUS504.

**Notes**

This specimen occurs in green tree ant (*Oecophylla smaragdina* Fabricius) nests, on living twig surfaces in the forest canopy. This sooty mould is also consistently associated with *Phragmocapnias betle* as was noted by Hughes (1976).

A second *Conidioecarpus* from New South Wales was described and illustrated by Fraser (1935a, 1935b, 1935c) as *Microxiphium* sp. 1, in a description of *Caldariomyces*. This species is similar to *Micoxyphium* sp., in a description of *Caldariomyces*. This spore dispersal process is especially prominent in *Calderariomycetes* where hyphal formation begins with initial mitospore enlargement, cell division, and the acquisition of dark pigmentation.

**Specimens examined**

AUS038, AUS103, AUS105, AUS124, AUS125, AUS126, AUS129, AUS130, AUS133, AUS140, AUS164, AUS208, AUS239, AUS240, AUS362, AUS367, AUS368, AUS380, AUS396, AUS397, AUS405, AUS412, AUS415, AUS428, AUS434, AUS435, AUS450, AUS452, AUS459.

**Notes**

This genus is traditionally assigned to the Capnodiaceae; molecular data (DR Reynolds, unpubl. data) indicate an affiliation with *Calderariomycetes* and membership on the black yeast clade (Berbee 1996). The setose *Trichomerium grandisporum* ascoma with 3-septate ascospores were in association with *Calderariomycetes* in our collections.

5. *Chaetothyriaceae*

**Chaetothyrium** *Spegazzini*, *Ann. Soc. Cient. Argent.* 26: 46 (1888)

**Notes**

Eleven species of *Chaetothyrium* have been reported from Australia (Fraser 1935c; Fisher 1939, 1940). *Chaetothyrium loganiense* (Saccardo) Theissen and Sydow (1917) was based on an Australian specimen collected by Logan on *Smilax* in Queensland originally described as *Meliola loganiense* Saccardo (Saccardo and Berlese 1885a, 1885b) von Holmèl (1910b) found non-setose, immature ascomata in the type material. The species later became the type of the genus *Zukalia* Saccardo (1891). Theissen and Sydow (1917) placed *Zukalia* as a synonym of *Chaetothyrium* *Spegazzini* (1888). Hansford (1953), in a discussion of *Meliola* species recorded
by Cooke (1892), suggested that this species ‘belongs to the Chaetothyriaceae’ and later excluded it from Meliola (Hansford 1961).


Dennisiella fusispora (Fraser) S. Hughes, Mycologia 68: 771 (1976)

Notes

The number of ascospore septa in this New South Wales species are described as 4–5(6), and the size is 19–25 × 4–5 µm. The ascospores of our collections have fewer septa and are not as long. Batista and Maia (1957) transfer this species to Ceramothyriaceae. The ascospores fit Ceramothyrium bocadimii Batista, Nascimento and Ciferri and C. europeum (Von Höhnel) Batista in size, but have more septa.


Vitala setofasciculata Batista, Vital & Ciferri in Batista & Ciferri (1962)

Description

Mycelium forming a thin pellicle; ascoma superficial, scattered, globose and sometimes flattened, 170–200 µm in width; setose, the setae straight or curved, faciculate, 70–225 µm in length; asci clavate to ellipsoidal, fissitunicate, 40–60 µm in length, apapraphysate; ascospores 32–48 × 5–7 µm, 7–9 septate.

Specimens examined

AUS174, AUS313, AUS366, AUS429, DAR12643, URM2750.

Notes

This species is characterised by faciculate setae on the depressed ascoma. The ascospores in our material are slightly longer than in Fraser’s description. Our species is similar to Vitalia setofasciculata Batista, Vital & Ciferri in Batista and Ciferri (1962). Vitalia was established with a mix of species from Chaetothyrium, Microxiphium, and Trichomerium von Arx and Müller (1975) considered Vitalia (Batista and Ciferri 1962) a synonym of Aithaloderma Sydow (1913). The two species of Aithaloderma, A. ferruginea Fraser and A. viridis Fraser (Fraser 1935a, 1935c), have ascomaic setae that are not faciculate, and smaller ascospores with fewer septa. Chaetothyrium fusisporum Fraser with setae at the base of the ascoma has been reassigned to Dennisiella fusispora (Fraser) S. Hughes.

3. Mitospores formed from a rosette of phialidic cells .............. 2

Mitospores present .................................................................................. 3

2. Ascospores with transverse septa ................................................. Dennisiella

Ascospores uniseriate ........................................................................... Limacinula

3. Mitospores formed from a rosette of phialidic cells ................ Microxiphium

Mitospores triradiate, septate mitospores ........................................ Bishyopeltis


Description

Fertile areas formed in areas beneath the mycelial pellicle; conidiophores forming a cluster of hyaline phialides producing 3–4-radiate, hyaline, septate mitospores.

This species was originally described as having a discrete fruit body.
Specimens examined
AUS064, AUS203, AUS205, L065884.

Notes
This fungus resembles Microxiphium fagi (Persoon) S. Hughes (1953) with non-septate setae and single-celled, hyaline mitospores. An Australian collection (DAOM 152130) of Microxiphium sp. was mentioned by Hughes (1976, fig. 20F) with curved hyphal tips. Hughes (1976) defined Microxiphium as non-septate mycelial setae ‘encircled by a cortex of hyphae bearing terminal rosettes of subglobose, phialides which produce an abundance of hyaline conidia in a mucilaginous head.’ The various collections he examined were noted to differ mostly in the setal morphology. Hughes (1976) cited species described with cortex enhanced setae, i.e. Vitalia cecropiae Batista, Vital & Ciferri (Batista and Ciferri 1962) and V. jaboatonensis Batista Nascimento & Ciferri (Batista and Ciferri 1962).

Our material in comparison with that observed by Dennis and Ellis (1952) and Hughes (1976) indicates that the occurrence of phialidic rosettes on the setae is variable. The generic description vaguely outlined by Hughes (1976) is emended to focus on the mitosporic element with the setae being regarded as a coincidental substratum for mitospore production. Microxiphium spp. were cited by Fisher (1933, 1939) from Victoria and Fraser (1935b) from New South Wales. Their generic concept is actually that of the elongated pycnidia of Conidiocarpus, rather than a seta bearing conidiophores that is associated with Dennisiella in the Chaetothyriaceae. Batista and Ciferri (1963b) placed a Peltasteraceae species described as Microxiphium viride Batista & Ciferri in association with Aithaloderma viridis (Fraser 1935a) from New South Wales.

Dennisiella Batista & Ciferri, Sydowia 338 (1962)

Dennisiella atesosa sp. nov.


Description
The mycelium comprises branching, brown-pigmented hyphae. The ascomata are scattered, sessile, semiglobose, eventually collabent, dark brown, uniloculate; the base of the ascus is connected to the mycelial pelliculum by hyphal growth that is somewhat similar to those of Limacina (Reynolds 1971). The asci are fissitunicate, 40–50 \( \mu \)m in length and associated with paraphyses. The ascospores are oblong, fusiform, ellipsoide to clavate, hyaline, with up to six traverse septa, 35 × 8 \( \mu \)m.

Holotype
AUS038.

Specimens examined
AUS038, AUS106, AUS109.

Notes
Dennisiella fusispora (Fraser) S. Hughes (1976) is based on Chaetothyrium fusisporum Fraser (1935c). This New South Wales species was described with setae that could develop around the base of the ascoma. Our collection lacks the mycelial setae that are characteristic of the seven species recognised by Hughes (1976). Also, the ascospores are larger than C. fusisporum and other Dennisiella species.


Limacina tenuis (Earle) Saccardo & Trotter, Syll. Fung. 22: 65 (1913)


Description
Fruit body 150–250 \( \mu \)m; ascospores hyaline, six transsepta, longisepta discontinuous, monostichous, 30 × 10 \( \mu \)m.

Notes
The ascomata of this collection are the typical collabent shape with the whitish to light-brown hyphae that extend individually from the lower portion of the ascoma wall into the subiculum (Reynolds 1971). Most of the ascomata are immature. Species reported from geographically nearby regions include Limacina javanica (Zimmerman) von Höhnel emend. Reynolds (Indonesia) and L. tenuis (Indonesia, Philippines, Samoa). These two species differ in the number of transsepta and in ascospore size.

Specimen examined
AUS496.

Microxiphium (Harvey ex Berkeley & Desmazières) Thümen emend. S. Hughes (1976)

Fig. 17.

Notes
This taxon is based on two mitosporic forms. The species is holomorphic rather than ‘pleoanamorphic’ (Reynolds 1993) and, therefore, should not be considered as a ‘pleoanamorph’ (Hennebert 1987).
Description
Mycelium forming a setose pellicle; mitosporic reproduction 2-fold, one a rosette of phialidic cells found in the mycelium or often as a cortex of hyphae surrounding the mycelial setae (Microxiphium pleomorphum), and the other as subpellicular areas producing triradiate, septate mitospores (Bisbyopeltis phoebei).

Microxiphium pleomorphum sp. nov.
Figs 14–18, 19.
Teges mycelialis superficialis, ex hyphis echinulatis profunde pigmentiferis implexis composita; phialides subglobosae pigmentiferae in pellicula praesentes vel ad instar corticis setas myceliales cingentes, rosulam mitosporarum 1–2-cellularium pigmentiferarum 5–10 µm longitudine producentes.

Description
Mycelial mat superficial, composed of interwoven, darkly pigmented, echinulate hyphae; Pigmented subglobose phialides located in the pellicle or encircling mycelial setae as a cortex, producing a rosette of pigmented 1–2-celled mitospores, 5–10 µm.

Holotype
AUS064.

7. Engerulaceae
Englerula Hennings, Bot. Jahrb. 34: 49 (1905)
Englerula macarangae P. Hennings, Bot. Jahrb. 34:49(1905)

Description
Superficial mycelium without hyphopodia; perithecium superficial on external mycelium, globoid, ‘gelatinising’ from apex downward. >180 µm; asci aparaphysate; ascospores 1-septate, darkly pigmented, 30 × 18 µm.

Specimen examined
AUS170.

8. Meliolaceae
Meliola Fries, Syst. orb. veg. p. 111 (1825)

Notes
Meliola is a highly problematic taxon that is need of serious monographic attention for some 1600 species and varieties of Meliola and sister taxa (Hansford 1961). An unquestioned co-evolution with associated vascular plants at a family level was assumed by Hansford (1961) that has been consistently followed in subsequent literature (Mibey and Hawksworth 1997). The result is a duplication of species because of an unfounded compartmentalisation into species groups determined by the associated vascular plant family as a major criterion.

Forty species and eight varieties of Meliola have been reported from Australia; 21 species and three varieties have been found in Queensland (Hansford 1961; Simmons 1966). Using Hansford’s specific vascular plant host concept, we could add two species to the record.

Our collections differ from the SE Asian species descriptions with the wider range of setal length and, appressorial traits. The species characters of our collections fit several described taxa when the unproven associated vascular plant constraint is removed. Eight similar species and three varieties comprise a closely related group of possible synonyms within Hansford’s artificial partition under the Apocynaceae. Altogether, 95 similar descriptions in 38 vascular plant families are found in Hansford (1961) that could be applied here.


Description
Mycelium branching opposite; setae simple, straight, rarely apically dentate, 165–235 µm; hyphopodia mixed, alternate, opposite to unilateral, head cell of capitiate hyphopodium 30 µm and its stalk cell 2.5 µm; ascospores 4 septate, 30–35 × 12–14 µm.

Specimens examined
AUS025, AUS097, AUS222, AUS223, AUS224, AUS225, AUS226, AUS227, BRIP2874, BRIP3034, BRIP3009, BRIP3010, BRIP3011, BRIP3012, BRIP3014, BRIP3015, BRIP3016, BRIP 3017, BRIP3018, BRIP3020, BRIP3021, BRIP3023, BRIP3024, BRIP3025, BRIP3026, BRIP3027, BRIP3028, BRIP3029, BRIP3030, BRIP3032, BRIP3033, BRIP3034, BRIP3035, BRIP3036, BRIP3037, BRIP 3038, BRIP3039, BRIP3040, BRIP3042.

Meliola bruguierae Sydow

Description
Mycelium branching opposite; mycelial setae simple, straight, 300–500 µm. Hyphopodia opposite to unilateral, head cell of capitiate hyphopodium 10–18 µm and its stalk cell 2.5–6 µm; ascospores 4 septate, 47–49 × 21 µm. The hyphal setae in collection AUS223 are shorter and a few have a slight dentate branching at the tip; the hyphopodia in AUS223 are longer and have more alternate positions.

Specimens examined
AUS233, AUS234.

9. Micropeltidiaceae

1. Ascospores present .................................................. 2
   Mitospores only present ........................................... 7
2. Ascoma blue green, ascospores 7–14-septate .......... Scolecopeltidium
   Ascoma brown .................................................. 3
Epifoliar fungi from Queensland, Australia

Australian Systematic Botany 279

3. Ascoma or hyphae setose ......................................................... Setopeltis
4. Ascospores 1–2-septate .......................................................... 5
5. 1–2-septate, paraphysate .......................................................... Micropeltis
6. Ascomata more than three septa .............................................. Chaetothyrina
7. Mitospores bacillate ............................................................... 8
8. Conidiophore filiform, branching ........................................... Micropeltis
9. Mitospores filiform ................................................................. Hymeniodiopeltis

Chaetothyria Theissen, Ann. Mycol. 11: 495 (1913)


Description
Mycelium superficial; mycelial setae simple, straight to curved; ascoma solitary, superficial, circular, brown, of non-parallel hyphae, ostiolate, 135–138 μm. Asci paraphysate, 25 μm length, clavate, 35–45 μm in length. Ascospores clavate-fusoid; 1-septate, constricted, hyaline, 10 × 5 μm.

Specimens examined
AUS121, AUS144, AUS231, AUS258, AUS266, AUS311, AUS315, AUS94, AUS95, AUS106, AUS109, AUS121, AUS144, AUS231, AUS258, AUS266, AUS311, AUS315, AUS324.

Notes
Batista (1959b) mistakenly attributed the genus to 'Speg. (sensu Bitancourt). He utilised the Micropeltidaceae sense of Chaetothyria established by Bitancourt’s (1936) developmental study of the ascoma rather than the Chytidiaceae placement of Petrak and Sydow (1935). The Batista (1959b) species concept recognised mycelial setae. Chaetothyria costaricensis (Stevens & Weeden) Batista (1959b) was originally described from Costa Rica (Stevens 1927) as the monotypic Ceratochaetopsis in the Capnodiaceae. C. costaricensis was described as having no mycelial setae and thus distinguishing it from Ceratochaetopsis. Our specimens have a setose mycelium. The ascospores are closer to C. costaricensis in size than other Chaetothyria species.


Hymeniodiopeltis major Farr, Mycologia 78: 275 (1986)

Description
Mycelium initially pale fuscus, later not evident; peridium dimidiate-scutiate, textura angularis, darkly pigmented, rounded, 40–60 μm in diameter, ostiolate; conidiophores are not apparent; mitospores hyaline filiform, 10 × 1 μm, with evident orientation towards the ostiole when microscopically viewed through the shield.

Specimens examined
AUS249, AUS297, AUS298, AUS300, AUS301, AUS302, AUS303, AUS312.

Notes
The fruit body is smaller than that described by Farr (1986). Also, the mitospores are longer.

Micropeltis MontagneinR. Sagra, Historia fis., pol. nat Cuba, fol. 6: 325 (1842) Micropeltidaceae

Notes
Micropeltis was monographed by Batista (1959b) with the recognition of 169 species and two varieties; 41 were new species. Forty additional Brazilian species were later described from Brazil (Batista and Peres 1963). Of the 128 species recognised in mycological literature, only three species have been described by other workers to date (Hino and Katomoto 1960, 1966). The Batista (1959b) approach to Micropeltis was to utilise the colour of the ascoma as a primary character. Within the 5 colour groups, ascoma diameter and ascospore size and septation were major characters. Most of the species were described from a single collection, mostly from Brazil. We found a range of associated vascular plants in the crane site and adjacent areas on Cape Tribulation. The ascospores were also apparently slow to mature in M. bambusina with the formation of first one septum and eventually more. These traits suggest that the species distinctions are not dependent on associated vascular plants and the ascospore morphology from a single collection may not represent the size range or the final measurement for a taxon.


Description
Mycelium absent; thryothecium superficial, scutulate, dark brown to black, 190–250 μm, ostiole rounded becoming stellate; ascus fissitunicate, 65–85 μm, paraphysate; ascospores initially 2- to 3-celled, becoming multisepate, hyaline, 24–30 μm length, 6–7 μm width.

Micropeltis biseptata von Höhnelt emend. Batista, Batista 1959, p. 75


Notes
Description
Thyriothecium diameter to 190 µm, ostiole becoming stellate; ascus 90 µm, larger than prototype; paraphysate; ascospore 2-celled, hyaline, 22.5–25 µm length, 5.4 µm width, larger than prototype in width and length.

Specimens examined
AUS080, AUS082, AUS121, AUS125, AUS166, AUS203, AUS233, AUS237, AUS263, AUS343, AUS344, AUS370, AUS390, AUS392, AUS416, AUS457, AUS461.

Notes
The ascospores are apparently 1-septate until almost full sized. The colour of the ascoma is a light brown, sometimes appearing greenish when young, becoming darker with the maturation of the ascospores.

The species was described from Java (von Höhnel 1909). Batista (1959a, 1959b) noted that Santesson (1952) considered the species a synonym of Porina corruscans (Rehm) R. Santesson. Porina sp. occurs in many specimens, but is distinguishable by the domed, light brown fruit body and the noticeable algal association. Our collection AUS166 has a Porina that is indeed similar to Micropeltis; the ascoma, asci and ascospores are very similar in size and shape; there are abundant paraphyses. However, there is a distinguishable algal association in the collections. A more typical and easily recognised Porina sp. also occurs in this specimen.

The von Höhnel type specimen was not seen by Santesson nor Batista. We have not been able to locate the type in any herbarium. Thus the collection is presumed lost, likely destroyed during war-time activity as were many other collections.

Collection AUS416 is selected to serve the lectotype from our material because of the apparent absence of von Höhnel’s holotype and paratype specimens.

Micropeltis bauhiniae Rehm, Leaf. Phil. Bot. 6: 1945 (1913)

Description
Mycelium absent; thyriothecium, superficial, scutulate, dark brown, 190–200 µm diameter, ostiole becoming stellate; ascus fissitunicate; ascospores, hyaline, 1-septate, 12.5 × 5 µm.

The ascospores of M. bauhiniae from the Philippine type are 2-celled. Our material might be immature.

Specimens examined
AUS141, AUS167, AUS259, AUS275, AUS277, AUS289, AUS312, AUS350, AUS409, AUS410, AUS419, AUS423.

Micropeltis biseptata von Höhnel emend. Batista, Batista 1959, p. 75


Description
Dark brown, thyriothecium diameter 190+ µm. The ostiole becomes stellate, ascus larger than prototype, paraphysate; ascospore 2-celled, hyaline, 22.5–25 µm length, 5.4 µm width, larger than prototype in width and length.

Specimens examined
AUS233, AUS237, AUS390AUS233, AUS237, AUS390.


Description
Mycelium absent; fruit body a cellular shield comprised of brown, non-parallel, pseudoparenchymatous hyphal strands, glabrous, ostiolate, described as subcuticular; conidiophores inapparent; mitospores bacillate, continuous, hyaline 3.5 × 1 µm.

Specimens examined
AUS233, AUS237, AUS390AUS233, AUS237, AUS390.

Notes
This fungus differs from Hansfordiopeltis Batista and Costa (1956) in the subcuticular habit and the fruit body tissue pattern. Hansfordiopeltis (Farr 1986) has a greenish fruit body. Batista and Ciferri (1959) placed this taxon in the Polystreles family Manginulaceae, which is considered to have a relationship to the Stigmataceae. von Arx and Müller (1975) note a relationship between the Stigmataceae and the Micropeltidaceae because of intermediates with a dimidiate ascoma.


Plectopeltis egenula Sydow, Ann. Mycol. 25: 125 (1927)

Description
Mycelium pelliculos, brown, the hyphae irregularly branched or reticulate; fruit body superficial, scutulate, brown, ostiolate, meanderform-reticulate, 60–90 µm diameter; conidiophores flabellate, composed of septate hyphae branching dichotomously; mitospores acropleurogenous to unilaterial, bacillate, continuous, hyaline 4.5 × 1 µm.
Epifoliar fungi from Queensland, Australia

Specimens examined
AUS229, AUS316, AUS320, AUS323, AUS359, AUS412, AUS452, AUS458.


Description
Mycelium in patches; pycnidia superficial, dimidiate, orbicular, glabrose, astomate, brown, plectenchymatous, 30–50 µm diameter; hymenium inverted; conidiophores inapparent; mitospores fusoid 6 × 1 µm.

Specimens examined
AUS229.

Notes
This species differs from the description of Brazilian material (Batista and Ciferri 1959) in the smaller pycnidia and in the pigmented mitospores. They place this fungus in the Peltastrales, Plenotrichiaceae with other mitosporic species that have a fruit body construction similar to species in the Micropeltidaceae.

**Scolecopeltis** Baker in Sydow, Mycol. Japon. 6: 232 (1917)

**Scolecopeltis bakeri** (Sydow) Cash & Watson, Mycologia 47: 731 (1955)

Description
Ascoma superficial, blue-green to fuscus, reticulate, up to 500 µm diameter, ostiolate; ascus fissitunicate, cylindrical, paraphysate; ascospores hyaline, fuscoid-elongate, 7–14-septate, 90–120 × 12–15 µm.

Specimens examined

Notes
The species was described in the genus *Scolecopeltis* (Sydow and Sydow 1917) from Philippine material. Stevens and Manter (1925) transferred the species to a new genus, *Scolecopeltidium*; we follow their nomenclature. Cash and Watson (1955) utilised different material, Fungi Malayana #586 and #587, to revise Sydow’s description and transfer the name to *Micropelis*. Batista (1959b) examined Fungi Malayana #586 and found in comparison with Stevens and Manter (1925) that the ascoma and ascospores were slightly larger. von Arx and Müller (1975) regarded *Scolecopeltis* Spegazzini (1889) and *Scolecopeltopsis* von Hönel (1909) as synonyms of *Micropelis* Montagne along with nine other genera, and without explanation. Batista (1959b) distinguished the two SCOlecosporous genera in his blue–green–black pigmented ascoma group, the Dictypeltidioideae, only by the presence or absence of paraphyses; they differ from *Micropelis* in a lesser number of ascospore septa.


Description
Mycelium superficial; ascoma superficial, scutulate, orbicular, tissue meandiform prosenchyma, 130–190 µm diameter, setae on ascoma longer 65–100 µm; asc 30–40 µm length, paraphysate; ascospores 1-septate, hyaline, 12.5–15×3.5–4 µm.

Specimen examined
AUS229.

Notes
The setae are longer than in the original description from Brazilian material (Batista 1959a, 1959b); the ascospores are longer.

**Stigmatodothis** H. Sydow, Philippine J. Sci. C. Bot. 9: 173 (1914)


Description
Stomata somewhat subcuticular, 1-loculate, black, above multilayered with an irregularly radiate context, non-ostiolate yet developing a rounded pore, basal layer tentative; ascoma somewhat subcuticular, black, multilayered with an irregularly radiate context, developing a rounded pore, 130–170 µm diameter; asc us obate-oblong, 26–30×14–16 µm; paraphyses cellular, submusoid; ascospores clavate, upper cell rounded, narrowed below, non-constricted, 3-septate, hyaline, 14–17 × 3.5–45 µm.

Specimens examined
AUS147, AUS152, AUS154, AUS155.

Notes
The species described from the Philippines was noted as having ascospores that were many-septate.
Stomiopeltis Theissen emend. Luttrell, Mycologia 38: 20 (1946)

Stomiopeltis gautheriae (Batista) comb. nov.

Description
Mycelium without hyphopodia and setae; ascoma dimidiate, circular, ostiolate, 150–175 \( \mu m \); asci 40 \( \mu m \) in length; ascospores hyaline, cylindrical and clavate to fuscoid, 14 \( \times 3 \) \( \mu m \).

Specimens examined
AUS034, AUS231, AUS250, AUS252, AUS260, AUS304, AUS305, AUS306, AUS307, AUS308, AUS309, AUS310, AUS312, AUS313, AUS314, AUS316, AUS317, AUS318, AUS319, AUS322, AUS373.

Notes
The ascoma size and the ascospore size of our material are close to this species concept. This species was described from Pennsylvania, USA, which has a temperate climate. von Arx and Müller (1975) merged Stomiopeltis and Stomiopeltella. Batista (1959b) distinguished the genera in the family by the presence or absence of paraphyses and in this genus by their absence. We generally found no paraphyses in most of our collections.

The type specimen was originally identified as Asterina gautheriae Curtis (Martin 1885). There was indeed a misidentification in that the hyphae are without hyphopodia and the construction of the ascoma is typically that found in the Micropeltidaceae.

10. Microthyriaceae

1. Mitospores septate ................................................................Dubujiana
Mitospores non-septate, with large vacuole ................................Elachopeltis

Dubujiana gen. nov.

Mycelium primo cuticulare, e glandibus folii in paginam emergens, thallos dispersos superficiales usque interdum confluentes, formans ambitu circulare, e strato basali hypharum brunearum ramosarum complanatarum compositos; filia hyphalia non-hyphopodiata singula e basi pycnidii elevati centralis super stratum basale et in substratum radiantia; areae conidiogenae elevatae minores in peripheria areae basalis praesentes; hymenium parietem interiorem areae elevatae obducens; mitospore fusiformes fuscae 1-septatae punctatae non constrictae.

Description
Mycelium initially subcuticular, emerging onto leaf surface from leaf glands forming scattered to occasionally confluent superficial thalli, circular in outline, composed of a basal layer of flattened, parallel, branching, brown hyphae; individual, non-hyphopodiate hyphal strands radiating from base of central, raised pycnidium over the basal layer and onto the substrate; smaller, raised conidiogenous areas in periphery of basal area; hymenium lining inner wall of raised areas; mitospore fusiform, fuscus, 1-septatae, punctate, non constricted.

Type species
Dubujiana glandulifera Reynolds & Gilbert

Etymology
Dubui is an Australian aboriginal word meaning ‘place of spirits.’ The collection site is the mesophyll vine forest on sand at the Dubuji Boardwalk on Cape Tribulation Road, Queensland. The origin of the ascoma from leaf glands seems unique.

Dubujiana glandulifera sp. nov.

Figs 12, 13.

Pelliculum myceliale 375–450 \( \mu m \) diametro, pycnidium centrale elevatum 100–125 \( \mu m \) diametro, pycnidia peripheralia usque ad 50 \( \mu m \) diametro. Mitospora 10–13 \( \times 3 \) \( \mu m \).

Holotype
AUS399.

Specimens examined
AUS395, AUS399, AUS401.

Notes
This taxon is distinguished by the rounded hyphal layer of parallel hyphae radiating from a central pycnidium and forming smaller pycnidia in the peripheral areas. The two-tiered hyphal layers contrast as a Microthyrium-like formation of parallel hyphae and as a sparse network of hyphal strands originating from the larger centrally located pycnidium. The mitospores differ from Thyriostomella Batista and Costa (Batista and Ciferri 1959) in the pigmentation; from Allothyriopsis Batista, Ciferri & Maia (Batista and Ciferri 1959) in the mitospore septation; and from Leprieuina Arnaud (1918) in spore morphology. The species would be assigned to the Peltasteraceae, Peltasterales (Batista and Ciferri 1959) as a mitosporic taxon.

Elachopeltis Sydow, Ann. Mycol. 25: 121 (1927)

Elachopeltis andinas Petrak, Sydowia 4: 560 (1950)

Description
Fruit body ostiolate, radiating hyphae, 90–100 \( \mu m \) diameter; mitospores continuous, ovoid, appearing to be septa because of large vacuoles, but continuous, hyaline, 12 \( \times 5 \) \( \mu m \).
Our collection has larger mitospores than *E. phoebes* and a stellate dehiscence of the fruit body.

**Specimens examined**

AUS372, AUS381.

**Notes**

The taxon was described by Sydow (1927) as having a superficial mycelium comprised of hyphae without hyphopodia. The ostiolate, dimidiate fruit body is formed by a shield of radiate hyphae. The mitospores are oblong-fuscoid, single-celled, hyaline, elongate to slightly curved. The type species, *E. phoebes* Sydow, was described with fruit bodies 80–120 µm in diameter and 25 µm in height. The mitospore dimensions given are 5–9 x 2–3.2 µm.

This genus was mentioned only in the key to the Pelasteraceae n. fam. by Batista and Ciferri (1959) in their extensive review of mitosporic fungi with ‘picnidiostromas with an inverted hymenium’ that they recognised in the Pelastrales. The taxon was characterised as having a non-hyphodiate mycelium, an ostiolate fruit body wall comprised of radiate hyphae, and sessile mitospores. Farr (1986) provided a review of 12 *Elachopeltis* species and one variety. Seven of the taxa were described by Batista and his colleagues from Brazil on the basis of sparse material.

### 11. Pseudoperisporiaceae

1. Ascomas formed on leaf hairs

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**Dimerina acronychiae** Sydow, Ann Mycol. 35: 27 (1937)

**Description**

Mycelium superficial, parasitic on leaf fungi; perithecium 70–100 µm, globose, glabrous, ostiolate; asci 40–46 µm; ascospores 1-septate, hyaline, oblong 21–24 x 5 µm.

**Specimen examined**

AUS357.


**Euderimeriolum acronychiae** (Sydow) Hansford, Mycol. Paper 15: 52 (1946)

**Description**

Mycelium pale olivaceous, irregularly branched, septate, without hyphopodia, ascomas scattered, solitary, superficial among leaf hairs, astomous, glabrous 70–100 x 65–80 µm; asci paraphysate; ascospores one septate hyaline, 21–24 x 4–5 µm.

**Specimen examined**

AUS238.

**Notes**

This species was reported from Australia by Sydow (1937a, 1937b) based on an L. Fraser specimen collected in New South Wales.
Fig. 14. Microxiphium. Setae formed over sporulating area of Bisbyopeltis phoebesii. ×150. Figs. 15, 16. Microxiphium. Mitospores of B. phoebesii. ×100. Fig. 17. Microxiphium. Seta with Microxiphium epiphytal growth. ×460. Fig. 18. Microxiphium. Rosettes of phialitic cells bearing 2-celled mitospores in the subiculum. ×1000. Fig. 19. Microxiphium. Echinulate hyphae.

12. Schizothyriaceae

Plochmopeltis Theissen, Broteria 12: 87 (1914)
Plochmopeltis ellisi von Arx, Persoonia 1: 3 (1959)

Description
Ascoma, flat, shield shaped, rounded, dark brown, 450–800 µm; ascus, fissitunicate, developing from a colourless basal shield, formed on the cuticular surface, ellipsoid to globose, 22–27 µm in length, surrounded by longer upright paraphyses with branched, darkly pigmented tips; ascospores 2-celled, hyaline, 13–16 × 4–5 µm.

Specimens examined
AUS120, AUS173, AUS236, AUS249, AUS274, AUS388, AUS389, AUS418, AUS503.

Notes
This is the first report of a species in this genus outside the Americas (von Arx 1959; Müller and von Arx 1962; Gomez-Acosta and Calzado 1996).

13. Seuratiaceae

Seuratia australiensis (Fisher) comb. nov.

Phycopsis Austroaliensis Fisher, Ann. Bot. n.s. 4: 197 (1940)

Description
Ascoma a gelatinous spherical, sometimes lobed, stroma 50–250 µm, the composite cells appear as a chain-like
formation of globose cells, often appearing to be separated by a short very thin isthmus; ascospores 11–14 × 3–5 µm. The branched, triradiate, asexual structures found in species of the genus *Atichia* are present.

**Specimens examined**

AUS064, AUS201, AUS494.

**Notes**

*Atichia* Flotow (1850) and the *Atichiaceae* (Raciborski 1900) were accepted as the ascosporic names by Müller and von Arx (1962) with *Seararia* Patouillard (1904) listed as a synonym. *Seararia* and the *Searariaceae* are the accepted ascosporic names with *Atichia* being used for the mitosporic form. Meeker (1975a, 1975b) accepted the reverse, using *Seararia* for the ascosporic morph and *Atichia* for the asexual state. Fisher (1933) studied an Australian isolate of *Phycopsis* in culture and obtained the ‘propagula.’ She described this as a new species from Victoria collections (Fisher 1940).

14. **Mitosporic Ascomycete**

| Mitospores single-celled, lenticular | *Cordella* |
| Mitospores 0–3-septate, cylindrical to elliptical | *Perciconella* |
| Mitospores 3–5-celled, the two middle cells dark brown | *Sporodesmium* |

Three noteworthy mitosporic fungi were found that show similar morphological adaptations to the plant surface as found in the epifoliar lineages.


**Description**

Colonies linear, darkly pigmented on leaf surface; mitospores originate from short, brown, non-septate, attenuated cells; conidia single-celled, dark brown, lenticular, circular in outline, smooth, 11–22 × 6–10 µm; peripheral rim is pale coloured, appearing as a distinctive line in a side view. As Subramanian (1962) noted, no mitospores were seen attached, but should be considered produced singly and acrogenously.

**Specimens examined**


**Notes**

This is one of the most common species in the crane site collections. Subramanian (1962) examined the types of the four Spegazzini species of *Cordella* located in Herbarium SPEG (1886). He noted that *C. conidosporioides* should be transferred to *Popularia*, but that the lenticular mitospores in the type material would place the species as a homonym of *C. vinosa* (Berkeley & MA Curtis) Mason (1933).

The mitospores in our material are consistent with those of *C. conidosporioides*, but somewhat smaller than those described for *C. vinosa*. The conidiophores are formed from a discrete mycelial growth and appear to be comprised of only a few cells. As noted by Subramanian (1962) and Mason (1933) the attachment of the mitospore to the conidigenous cell is difficult to observe. Hyaline, multicellular, lanceolate structures more typical of the illustrated conidiophores (Subramanian 1962) were observed in the outer areas of the mycelial growth.
Periconiella Saccardo apud Saccardo & Berlese, Atti Ist. Vetensk. Ser. 6, 3: 727 (1885)


Description
Hyphae partly immersed and partly superficial; superficial hyphae septate, brown; conidiophore single without lateral branches, erect, brown and paler at the apices, septate, up to 240 µm in height and 8 µm wide diameter; primary and secondary branches formed at apex, cylindrical, pale brown; mitospores single, on polytubic conidiogenous cells, cylindrical, elliptical, 0–3–septate, pale brown, with a basal scar, smooth, elliptical, 14–20 × 7–8 µm.

Specimens examined
AUS231, AUS258.

Notes
Priest (1991), described this species from Victoria. It was noted that the taxon is characterised by its pallid brown mitospores, which are smooth and wider than other Australian Periconiella.


Sporodesmium macrurum (Saccardo) M.B. Ellis, Mycol. Paper 70: 53 (1958)

Description
Mycelium superficial, non-hyphopodiate, non-setose; conidiophore percurrent, arising singly, terminally and laterally on the hypha, brown, with successive terminal proliferations; mitospores formed singly as blown out ends at apex of conidiophore, obclavate, brown–straw coloured, smooth, transversely septate, 3–5-celled, the two middle cells dark brown and the tapering cells are pale brown, 30–34 × 8–10 µm.

Specimen examined
AUS165.

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