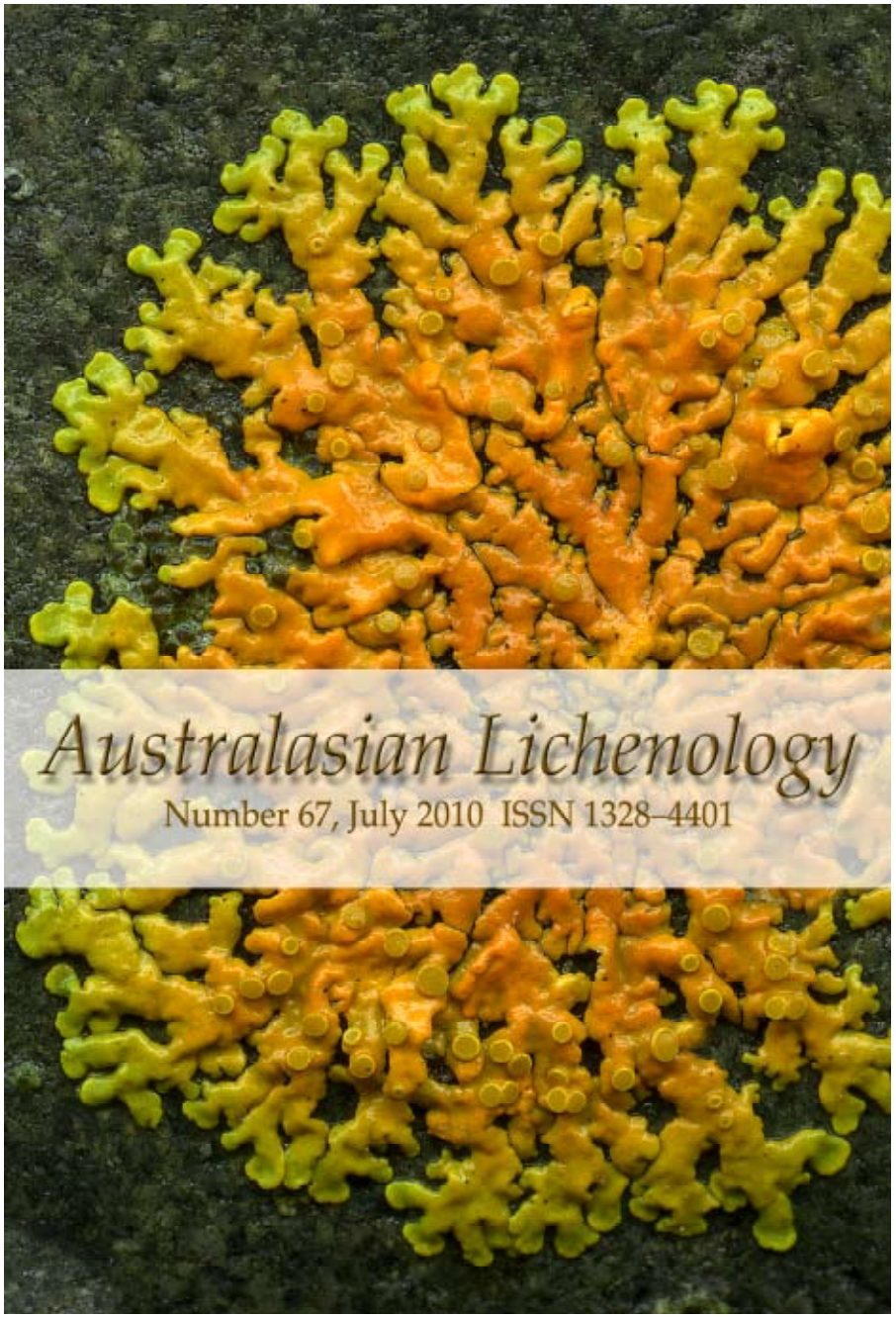


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*Xanthoria ligulata* colonizes coastal rock, often forming a seamless yellow-orange zone above the high-tide mark. Common in coastal areas throughout New Zealand and in some parts of Australia, it also aggressively colonizes roofing tiles, brick, concrete, mortar, fibre-cement, and other man-made building materials.

**CONTENTS**

# Two new species, a new combination and new chemical data for *Heterodermia* (Physciaceae: Ascomycota)

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**Abstract**: *Heterodermia hybocarponica* Elix (from Australia and New Zealand) and *H. queenslandica* Elix (from tropical Australia) are described as new to science. The new combination *Heterodermia reagens* (Kurok.) Elix is made for *Anaptychia japonica* var. *reagens* Kurok., and the secondary metabolites hybocarpone, salazinolide, consalazinolide and testacein are reported for the first time for *Heterodermia*.

*Heterodermia* Trevis., a cosmopolitan genus of c. 93 species included in the family Physciaceae (Eriksson 2005), is most diverse in warm-temperate to subtropical and tropical regions, with most taxa occurring in the Southern Hemisphere (Swinscow & Krog 1976, Kashiwadani *et al.* 1990, Galloway 2007). The genus is distinguished from most other foliose genera in the Physciaceae mainly by its prosoplectenchymatous upper cortex in combination with atranorin as a cortical substance. The main characters employed in species circumscription are (1) thallus, lobe and cilia morphology, (2) the mode of reproduction (apothecia versus soredia or isidia), (3) the presence or absence of a lower cortex, (4) the presence or absence of accessory lumina (sporoblastidia) in the ascospores, and (5) the medullary chemistry and pigmentation of the lower surface.

In his fundamental work, Kurokawa (1962, 1973) accepted a relatively narrow circumscription of species, but in a number of more recent treatments of *Heterodermia*, chemical characters have been largely discounted (Moberg 1990; Moberg & Purvis 1997; Moberg & Nash 1999, 2002; Moberg 2004a, 2004b). However, very recent phylogenetic studies utilizing molecular phylogenetic analyses of ITS sequences have confirmed that both medullary chemistry and pigmentation (and associated chemistry) of the lower surface are indeed important species characters (Lücking *et al.* 2008), and those characters are utilized in the present work. Chemical constituents were identified by thin-layer chromatography (Elix & Ernst-Russell 1993), high performance liquid chromatography (Elix *et al.* 2003) and comparison with authentic samples.

## The new species

**Heterodermia hybocarponica** Elix, sp. nov. Fig. 1
Sicut *Heterodermia hypocaesia* sed acidum salazinicum deficiens differt.

Type: Australia. *Victoria*: Morwell National Park, Fosters Gully Nature Walk, 16 km S of Morwell, 38°21′24″S, 146°23′27″E, 230 m, on base of tree in wet *Eucalyptus* forest with *Pomaderris* understorey, *J.A. Elix 39336*, 12.iv.2008 (holotype – MEL; isotype – CANB).

*Thallus* foliose, orbicular to irregularly spreading, loosely adnate, to 5 cm wide but often coalescing to form colonies up to 15 cm wide. *Lobes* 0.5–1.2 mm wide but ±widening to c. 2–3(–5) mm wide at the tips, flat to weakly convex or weakly concave, sublinear-elongate, dichotomously branched, radiating, the lobe-tips ascending, usually discrete, ±lobulate along the lobe margins, lobules ±rotund or sparingly branched, 0.3–0.8 mm wide, eciliate or with very sparse cilia, cilia pale or ±blackened at the tips, 0.5–1.0 mm long; lobules along the margin developing small soralia. *Upper surface* greenish white, whitish to cream-coloured, sorediate; soredia farinose to granular, in labriform to capitate soralia, on lateral or terminal lobes, sometimes spreading along lobe margins. *Medulla* white. *Lower surface* ecorticate, arachnoid, purple-black in the centre, white, ochraceus or yellow towards the apices, rhizinate;

rhizines marginal, simple, black, 1–3(–7) mm long. *Apothecia* very rare, laminal, substipitate, 1–8 mm wide; thalline exciple persistent, concolorous with the thallus, lacinulate; disc concave, dark brown to blackish brown, ±thinly grey-pruinose. Asci cylindrical to subclavate, 8-spored. Ascospores *Pachysporaria*-type, ellipsoid, sporoblastidia present, 40–45 × 20–23 µm. Pycnidia common, initially immersed, becoming emergent, visible as black dots; pycnoconidia bacilliform, 4–5 × 1 µm.
*Chemistry*: Cortex and medulla K+ yellow; containing atranorin [major], zeorin [major], 6α-acetoxyhopane-16β,22-diol[major],hybocarpone[majororminor],norhybocarpone [minor or trace], dissectic acid [trace], ±7-chloroemodin [trace], hopane-6α,16β,22-triol [trace], ±16β-acetoxyhopane-6α,22-diol [trace], unknown triterpene [trace].

*Etymology*. The specific epithet refers to the presence of the pigment hybocarpone in this species.

**Notes:** In Australia, this new species has previously been confused with the common corticolous *Heterodermia hypocaesia* Yasuda because of their very similar morphology. The two are distinguished by the presence or absence of salazinic acid (present in *H. hypocaesia*, absent in *H. hybocarponica*). Both belong to the *H. obscurata–H. japonica* group, where molecular studies have confirmed that both medullary chemistry and the pigmentation of the lower surface are good distinguishing characters (Lücking *et al.* 2008). Hybocarpone is a unique bis-nathaquinone derivative, first isolated from the cultivated mycobiont of *Lecanora hybocarpa* (Tuck.) Brodo (Ernst-Russell *et al.* 1999). It has since been detected in several species, including *Allocetraria endochrysea* (Lynge) Kärnefelt & A.Thell (Randlane *et al.* 2001), *Lecanora hypocrocinoides* Lumbsch and *Mycoblastus kalioruber* Kantvilas (Kantvilas 2009).

At present this new species is known from bark, dead wood and rocks in coastal and hinterland forests in a number of localities in eastern and southern Australia and New Zealand's South Island. Commonly associated species include *Dirinaria applanata* (Fée) D.D.Awasthi, *Heterodermia hypocaesia*, *H. neglecta* Lendemer, R.C.Harris & E. Tripp, *Megalaria grossa* (Pers. ex Nyl.) Hafellner, *Pannaria microphyllizans* (Nyl.) P.M.Jørg., *P. sphinctrina* (Mont.) Hue, *Parmotrema reticulatum* (Taylor) M.Choisy, *P. tinctorum* (Nyl.) Hale, *Pertusaria novaezelandiae* Szatala and *Pyxine sorediata* (Ach.) Mont.

SPECIMENS EXAMINED
*Queensland*: • Cook district, Great Dividing Range, Mt Baldy, 4 km SW of Atherton, 17°17′S, 145°27′E, 1080 m, on sapling along margin of regrowth rainforest, *J.A. Elix 16320 & H. Streimann*, 25.vi.1984 (CANB).
*New South Wales*: • Washpool National Park, Gibraltar Range, Hakea Walk, 78 km E of Glen Innes, 29°28′10″S, 152°21′01″E, 895 m, on fallen *Acacia* in mixed rainforest with scattered *Eucalyptus*, *J.A. Elix 37263*, 2.v.2005 (CANB); • Clyde Mountain, 33 km SE of Braidwood, S of summit below road, 35°34′S, 149°57′E, 690 m, on base of large *Eucalyptus* in wet sclerophyll forest, *J.A. Elix 981*, 19.vi.1975 (CANB); • Southern Tablelands, Brown Mountain lookout, 36°36′S, 149°23′E, 945 m, on base of *Eucalyptus* in wet sclerophyll forest, *J.A. Elix 1588*, 20.i.1976 (CANB); • South Coast, Batehaven, 1 km W of Surf Beach, 35°44′S, 150°13′E, 3 m, on bark of *Acacia* in coastal forest, *J.A. Elix 1806*, 29.i.1976 (CANB).
*Victoria*: • Coquhoun State Forest, 9 km E of Lakes Entrance, 20 m, on dead wood in rainforest gully, *J.A. Elix 5345*, 22.x.1978 (CANB); • Tarra-Bulga National Park, Tarra River Falls, 29 km S of Traralgon, 38°28′S, 146°32′E, 350 m, on roadside rocks in disturbed wet sclerophyll forest on steep slope, *J.A. Elix 29675*, 13.iv.1993 (CANB).
*South Australia*: • Kangaroo Island, mouth of De Male River, 18 km SSE of Cape Borda, 35°43′S, 136°46′E, 20 m, on semi-shaded rock face in dry sclerophyll forest with *Casuarina* on rocky slope, *H. Streimann 55096*, 30.ix.1994 (CANB).
NEW ZEALAND. • South Island, *Westland*: 8 km E of Westport, 15 m, on *Podocarpus totara* in mixed podocarp forest, *J.A. Elix 7315*, 27.ii.1980 (CANB).



**Heterodermia queenslandica** Elix, sp. nov. Fig. 2
Sicut *Heterodermia hypoleuca* sed ascosporis majoribus et acidum norsticticum, consalazinolidicum et salazinolidicum continente differt.

*Type*: Australia. *Queensland*: Cook district, Great Dividing Range, Mt Baldy, 4 km SW of Atherton, 17°17′S, 145°27′E, 1080 m, on sapling along margin of regrowth rainforest, *J.A. Elix 16310 & H. Streimann*, 25.vi.1984 (holotype – CANB).

*Thallus* foliose, orbicular to irregularly spreading, loosely adnate, up to 8 cm wide. *Lobes* 0.5–2.0 mm wide, flat to weakly convex or weakly concave, sublinear-elongate, dichotomously to subdichotomously branched, radiating, the lobe tips flat to subascending, usually discrete, with small adventive lateral lobules, eciliate; isidia and soredia absent. *Upper surface* greenish white, whitish or grey, epruinose. *Medulla* white. *Lower surface* ecorticate, whitish to pale brown or rarely purple-black, rhizinate; rhizines mainly marginal or submarginal, pale to black, ±densely sqarrosely branched, 1–4.5 mm long. *Apothecia* laminal, substipitate to stipitate, 2.5–5.5 mm wide; thalline exciple concolorous with the thallus, margin densely lobulate, lobules up to 2.5 mm long and 2 mm wide; disc concave, pale to dark brown, epruinose or sparsely grey pruinose. Asci cylindrical to subclavate, 8-spored. Ascospores brown, 1-septate, *Pachysporaria*-type, ellipsoid, sporoblastidia present or rarely absent, 40–45 x 20–24 µm. Pycnidia common, immersed, visible as black dots; pycnoconidia bacilliform, 4–5 × 1 µm. *Chemistry*: Cortex and medulla K+ yellow, C–, P+ yellow or orange; containing atranorin [major], zeorin [major], 16β-acetoxyhopane-6α,22-diol [major], leucotylin [hopane-6α,16β,22-triol] [major], 6α-acetoxyhopane-16β,22-diol [minor], norstictic acid [major], salazinolide [major], consalazinolide [minor], salazinic acid [trace], dissectic acid [trace], connorstictic acid [trace], salazinic acid [trace].

*Etymology*. The specific epithet refers to the known distribution of this species.

**Notes:** *Heterodermia queenslandica* is characterized by the narrow, sublinear-elongate lobes with an ecorticate lower surface, the lack of soredia and isidia, marginal lobules and the presence of atranorin, zeorin, triterpenes and the depsidones norstictic acid, salazinolide and consalazinolide. This is the first reported natural occurrence of the depsidones salazinolide [6α-deoxysalazinic acid] and consalazinolide [6α-deoxyconsalazinic acid]. Those two substances exhibit the following standard $R_F$ values on TLC [salazinolide – A 0.18; B 0.12; C 0.08; consalazinolide – A 0.03; B 0.04; C 0.02], and after treatment with sulfuric acid and heat initially develop a colouration similar to that shown by protocetraric acid [blue-grey] but this fades to yellow upon standing; their respective standard HPLC data are $R_T$ 20.7, 17.4 min; $R_I$ 13, 7. Morphologically this species resembles the well-known *Heterodermia hypoleuca* (Ach.) Trevis. present in Asia, North America, East Africa, Papua New Guinea and Australia. However, *H. queenslandica* is distinguished by its much larger ascospores [40–45 × 20–24 µm vs. 20–36 × 10–17 µm] as well as by chemistry. *Heterodermia hypoleuca* normally lacks depsidones, but Kurokawa (1962) reported a rare chemical strain that contained norstictic and salazinic acids.

At present this new species is known from several localities in north-east Queensland, where it occurs on bark in montane rainforest. Commonly associated species include *Dirinaria applanata* (Fée) D.D.Awasthi, *Heterodermia hypocaesia*, *H. hybocarponica*, *H. speciosa* (Wulfen) Trevis., *Menegazzia fissicarpa* P.James, *Pseudocyphellaria desfontainii* (Delise) Vain., *P. intricata* (Delise) Vain., *Parmotrema reticulatum* (Taylor) M. Choisy, *P. tinctorum* (Nyl.) Hale, *Pertusaria velata* (Turner) Nyl., *Sticta sayeri* Müll.Arg. and *Usnea pectinata* Taylor.

SPECIMENS EXAMINED
*Queensland*: • type locality, on branches of *Araucaria cunninghamii* in old *Araucaria* plantation and regrowth rainforest, *J.A. Elix 16241 & H. Streimann*, 25.vi.1984 (CANB); • between Millaa Millaa and Ravenshoe, on trees in open rainforest, *D. McVean 63109*, xi.1963 (CANB).

**New combination**

**Heterodermia reagens** (Kurok.) Elix, comb. nov.
Basionym: *Anaptychia japonica* var. *reagens* Kurok., *J. Jap. Bot.* **35**, 354 (1960)
Previously this taxon was included in *H. japonica sens. lat.* as the depsidone-containing race [i.e. norstictic and ±salazinic acids present] (Swinscow & Krog 1976, Moberg 2004b).
*Chemistry*: Atranorin [major], zeorin [major], 6α-acetoxyhopane-16β,22-diol [major], norstictic acid [minor], connorstictic acid [trace], ±salazinic acid [minor or trace].

SPECIMENS EXAMINED
AUSTRALIA. *Queensland*: • 15 km NE of Yungaburra, along the Gillies Highway, 17°14′S, 145°37′E, 780 m, on rainforest tree, *J.A. Elix 2600*, 27.viii.1976 (CANB); • Cook district, Herberton-Petford Road, 4 km W of Herberton, 17°23′S, 145°21′E, 1000 m, on tree in *Eucalyptus*-dominated grassland, *J.A. Elix 16643 & H. Streimann*, 27.vi.1984 (CANB); • Cook district, Main Coast Range, track to Mt Lewis, 19 km NNW of Mt Molloy, 16°31′S, 145°16′E, 1200 m, on fallen tree in rainforest, *J.A. Elix 16933 & H. Streimann*, 30.vi.1984 (CANB).
*New South Wales*: • Southern Tablelands, near Brown Mountain lookout, 36°36′S, 149°23′E, 944 m, on base of *Eucalyptus* in wet sclerophyll forest, *J.A. Elix 1603*, 20. i.1976 (CANB).
MALAYSIA. • Perak, Bukit Larut (Maxwell Hill), 9 km E of Taiping, 4°50′N, 100°48′E, 1035 m, on rocks in montane rainforest, 26.vi.1999, *L.B. Din BLT 10* (CANB).
NEW ZEALAND. • North Island, *North Auckland*: 2.5 km S of Kaweka on road to Thames, on tree trunk in gully with remnant lowland forest with *Phyllocladus*, *Podocarpus*, tree ferns and *Leptospermum*, *J. Johnston 2198*, 18.iii.1985 (CANB).

**New chemical data**

1. **Heterodermia albicans** (Pers.) Swinscow & Krog, *Lichenologist* **8**, 113 (1976)
This species was previously reported to contain atranorin, zeorin, salazinic acid and an unknown substance (Swinscow & Krog 1976). The unknown is now known to be hypoconstictic acid.
*Chemistry*: Atranorin [major], zeorin [major], 16β-acetoxyhopane-6α,22-diol [minor], leucotylin [minor], 6α-acetoxyhopane-16β,22-diol [trace], salazinic acid [major], hypoconstictic acid [submajor], 3-*O*-methylconsalazinic acid [minor], consalazinic acid [minor].

SPECIMENS EXAMINED
AUSTRALIA. *Queensland*: • Burleigh Heads National Park, 28°05′S, 153°27′E, 8 m, on tree trunk in coastal forest, *J.A. Elix 1090*, 22.viii.1975 (CANB); • Bunya Mountains State Forest, Nanango Road, 64 km NE of Dalby, 26°51′49″S, 151°38′51″E, 670 m, on tree trunk in mixed *Eucalyptus-Araucaria* forest, *J.A. Elix 37973*, 7.vi.2005 (CANB).
UNITED STATES OF AMERICA. • *Louisiana*: Tangipahoa Parish, along mouth of Tangipahoa River on N shore of Lake Pontchartrain, on cypress and hardwoods, *S.C. Tucker 25099B*, 2.x.1982 (CANB).

2. **Heterodermia antillarum** (Pers.) Swinscow & Krog, *Lichenologist* **8**, 114 (1976)

*Chemistry*: Atranorin [major], zeorin [major], 16β-acetoxyhopane-6α,22-diol [minor], leucotylin [minor], salazinic acid [major], hypoconstictic acid [submajor], 3-*O*-methylconsalazinic acid [minor], consalazinic acid [minor].
This species was previously reported to contain atranorin, zeorin, salazinic acid and an unknown substance (Swinscow & Krog 1976). The unknown has been shown to be hypoconstictic acid.



SPECIMEN EXAMINED
*Queensland*: • Burleigh Heads National Park, 28°05′S, 153°27′E, 6 m, on basalt rocks in coastal forest, *J.A. Elix 1147*, 30.viii.1975 (CANB).

3. **Heterodermia casarettiana** (A.Massal.) Trevis., *Atti Soc. Ital. Sci. Nat. Milano* **11**, 624 (1868)

*Chemistry*: Atranorin [major], zeorin [major], ±6α-acetoxyhopane-16β,22-diol [minor], norstictic acid [major], salazinic acid [minor], hybocarpone [major], norhybocarpone [trace] and dissectic acid [trace].
The pigments present in this species were previously thought to be pulvinic acid derivatives (Kurokawa 1973, Lücking *et al.* 2008), but have now been shown to be hybocarpone and norhybocarpone.

SPECIMEN EXAMINED
UNITED STATES OF AMERICA. • *Georgia*: Walker Co., Chattahoochee National Forest, Johns Mountain Overlook at end of Forest Service Road 208, 34°37′N, 85°07′W, 550 m, on *Quercus* in pine-hardwood forest along ridge, *R.C. Harris 28218*, 23.ix.1992 (CANB).

4. **Heterodermia translucens** (Kurok.) D.Hawksw., in Hawksworth & Shaw, *Res. Bull. Dept Primary Industries, Port Moresby* **33**, 252 (1984)

*Chemistry*: Atranorin [major], zeorin [major], testacein [minor], unknown terpene [minor or trace].
Testacein is a phenolic metabolite of unknown structure, first reported as occurring in *Parmelia testacea* Stirt. (Hale 1987 – as unknown #27). In the Physciaceae, testacein is known from several *Pyxine* species (Kalb 2004, Elix 2009), but this is the first report of the substance in *Heterodermia*.

SPECIMEN EXAMINED
PAPUA NEW GUINEA. • Morobe Province, Heads Hump Logging Area, 4 km ESE of Bulolo, 7°13′S, 146°41′E, 780 m, on *Araucaria hunsteinii* in lower montane forest, *J.A. Elix 11911 & H. Streimann*, 3.xii.1982 (CANB).

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Fig. 1. *Heterodermia hybocarponica* (holotype in CANB). Bar = 5 mm

Fig. 2. *Heterodermia queenslandica* (holotype in CANB). Bar = 5 mm

**Two segregates from *Flavoparmelia rutidota sens. lat.* (Parmeliaceae, lichenized Ascomycota) in Australia**

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**Abstract**: The new species *Flavoparmelia virensica* Elix, O.Blanco & A.Crespo is described from Western Australia, and the new combination *Flavoparmelia caperatula* (Nyl.) Elix, O.Blanco & A.Crespo is made.

During the ongoing effort to describe and document the biodiversity of Australian lichens, we have encountered several new taxa, two of which are described below. The lichen family Parmeliaceae is particularly well represented in Australia, and has been investigated intensively over the past 25 years (see Orchard 1994, McCarthy 2010), but the lichens of some difficult species complexes remain to be elucidated. *Flavoparmelia rutidota* (Hook.f. & Taylor) Hale *sens. lat.* is one such species complex. This highly variable species has a long list of synonyms (Hale 1976, Elix 1994). Two segregates of *F. rutidota* are recognized at species level and described in detail in the present paper. Chemical constituents were identified by thin-layer chromatography (Elix & Ernst-Russell 1993), high-performance liquid chromatography (Elix *et al.* 2003) and comparison with authentic samples.

**Flavoparmelia virensica** Elix, O.Blanco & A.Crespo, sp. nov. Fig. 1
Sicut *Flavoparmelia rutidota* sed conidiis fusiformibus et acidum virensicum continente differt.
*Type*: Australia. *Western Australia*: Lookout between Koolyanobbing township and Dowd Hill, 30°48′40″S, 119°31′31″E, 390 m, on *Casuarina* with *Acacia* and *Brachychiton* in *Eucalyptus* woodland with ironstone rock outcrops, *J.A. Elix 32411*, 27.iv.2004 (holotype – MAF; isotype – PERTH).

*Thallus* corticolous, adnate, up to 6 cm wide. *Lobes* laterally imbricate to ±contiguous, irregularly branched, 1–5 mm wide; apically subrotund to rotund. *Upper surface* yellow-green, broadly undulate, rugose centrally, dull to slightly shiny, often with reticulate white maculae towards the lobe apices, margins black, lacking soredia, dactyls, pustules and isidia. *Medulla* white. *Lower surface* black, shiny, wrinkled, with a brown, erhizinate marginal zone; rhizines sparse, simple. *Apothecia* scattered, sessile to subpedicillate, 1–4 mm wide; disc concave then undulate-distorted, cinnamon-brown to dark brown; thalline exciple strongly involute at first, smooth. Ascospores ellipsoidal, 14–16 × 7–8 μm. *Pycnidia* common, punctiform, immersed. *Conidia* fusiform, 8–9 × 1 μm.
*Chemistry*: Cortex K–; medulla K– or K+ dirty yellow-brown, C–, KC+ pink-red; P+ deep orange-red; containing usnic acid, protocetraric acid [major], virensic acid [submajor or minor], conprotocetraric acid [trace], convirensic acid [trace], subvirensic acid [trace], physodalic acid [trace].



*Etymology*. The specific epithet refers to the presence of significant quantities of the depsidone virensic acid in this species.

Superficially *Flavoparmelia virensica* closely resembles *F. rutidota* and *F. caperatula* (see below). All three species have similar yellow-green thalli that lack vegetative propagules and become distinctly rugose on the upper surface of older lobes (towards the centre of the thallus), and produce medullary protocetraric acid. However, they can be separated by their chemical constituents and by the morphology of their ascospores and/or conidia. Whereas *F. rutidota* contains usnic acid [minor], protocetraric acid [major], caperatic acid [major], atranorin [trace], conprotocetraric acid [trace], convirensic acid [trace], subvirensic acid [trace], ±protolichesterinic acid [minor], ±lichesterinic acid [minor] and ±secalonic acid A [minor], *F. virensica* differs in having substantial quantities of virensic acid and in lacking caperatic, protolichesterinic and lichesterinic acids and secalonic acid A. In addition, *F. virensica* has fusiform rather than bacilliform conidia as observed in *F. rutidota*. Molecular studies based on nu rDNA ITS have confirmed that *F. rutidota* and *F. virensica* are not very closely related (Blanco & Crespo, unpublished data).

*Flavoparmelia virensica* appears to be scattered in south-western Western Australia, where it grows on dead and burnt wood and *Allocasuarina, Acacia* and *Hakea* bark. Associated species include *Buellia reagenella* Elix, *B. tetrapla* (Nyl.) Müll.Arg., *Flavoparmelia caperatula, F. rutidota, Physcia jackii* Moberg, *Punctelia subalbicans* (Stirt.) D. J.Galloway & Elix, *P. subflava* (Taylor) Elix & J.Johnst., *Ramalina inflata* subsp. *australis* G.N.Stevens, *Ramboldia brunneocarpa* Kantvilas & Elix, *Teloschistes chrysophthalmus* (L.) Th.Fr. and *Tephromela alectoronica* Kalb.

SPECIMENS EXAMINED
*Western Australia*: • Southern Cross-Koolyanobbing road, 21.5 km S of Koolyanobbing, 30°58′50″S, 119°28′32″E, 330 m, on dead shrub in *Eucalyptus* woodland with saltbush and shrub understorey, *J.A. Elix 32446*, 27.iv.2004 (CANB); • Bullfinch-Evanston road, 24.7 km N of Bullfinch, 30°47′14″S, 119°09′28″E, 345 m, on dead *Acacia* in *Eucalyptus* woodland with saltbush and shrub understorey, *J.A. Elix 32481*, 28.iv.2004 (CANB); • Bullfinch-Evanston road, 51.3 km N of Bullfinch, 30°37′19″S, 119°13′37″E, 360 m, on *Acacia* in *Eucalyptus-Callitris* woodland with *Acacia* understorey, *J.A. Elix 32488, 32501*, 28.iv.2004 (CANB, HO); • Kalbarri National Park, Murchison River Gorge, trail to Natures Window from The Loop carpark, 38 km NE of Kalbarri township, 27°33′25″S, 114°26′41″E, 150 m, on dead *Acacia* in *Casuarina-Acacia* woodland with sandstone outcrops, *J.A. Elix 33743*, *33747*, 3.v.2004 (CANB, HO); • Depot Hill, 13 km along the Depot Hill road NW of Mingenew, 29°08′38″S, 115°21′02″E, 150 m, on dead *Acacia* in *Eucalyptus-Acacia* woodland with laterite outcrops, *J.A. Elix 33790*, 4.v.2004 (CANB); • Cockatoo Canyon, junction of Bunney Road and Nebru Road, 33 km NE of Eneabba, 29°33′51″S, 115°27′04″E, 245 m, on dead twigs in mallee *Eucalyptus* woodland with *Melaleuca, Acacia* and *Callitris, J.A. Elix 33820*, 5.v.2004 (CANB); • Darling Range, Walyunga National Park, 40 km NE of Perth, 31°43′55″S, 116°04′29″E, 280 m, on dead *Dryandra* in *Eucalyptus-Dryandra* woodland beside river, *J.A. Elix 36033*, 7.v.2004 (CANB).

**Flavoparmelia caperatula** (Nyl.) Elix, O.Blanco & A.Crespo, comb. nov. Fig. 2
Basionym: *Parmelia caperata* var. *caperatula* Nyl., *Syn. Meth. Lich.* **1**(2), 377 (1860).
Type: Swan River, Western Australia, *Preiss* [H-NYL 35731! – lectotype; FH – isolectotype *fide* M. E. Hale, *Smithsonian Contr. Bot.* **31**, 45 (1976)].
Synonym: *Parmelia caperatula* (Nyl.) Nyl., *Flora* **68**, 606 (1885).

*Thallus* corticolous, adnate, up to 6 cm wide. *Lobes* laterally imbricate to ±contiguous, irregularly branched, 1–5 mm wide; apically subrotund to rotund. *Upper surface* yellow-green, broadly undulate, rugose centrally, dull to slightly shiny, often with reticulate white maculae towards the lobe apices, margins black, lacking soredia, dactyls, pustules and isidia. *Medulla* white. *Lower surface* black, shiny, wrinkled, with

a brown erhizinate marginal zone; rhizines sparse, simple. *Apothecia* scattered, sessile to subpedicillate, 1–4 mm wide; disc concave then undulate-distorted, cinnamon-brown to dark brown; thalline exciple strongly involute at first, smooth. Ascospores ellipsoidal, often biguttulate, 17–22 × 8–12 µm. *Pycnidia* common, punctiform, immersed. *Conidia* fusiform, 7–9 × 1 µm.
*Chemistry.* Cortex K–; medulla K– or K+ dirty yellow-brown, C–, KC+ pink-red; P+ deep orange-red; containing usnic acid [minor], protocetraric acid [major], atranorin [trace], conprotocetraric acid [trace], convirensic acid [trace], subvirensic acid [trace], ±protolichesterinic acid [minor], ±lichesterinic acid [minor] and ±secalonic acid A [minor].

Superficially *Flavoparmelia caperatula* closely resembles *F. rutidota* in that both have similar yellow-green thalli that lack vegetative propagules and become distinctly rugose on the upper surface of older lobes (towards the centre of the thallus), and produce medullary protocetraric acid. However, they can be separated by their chemical constituents and by the size of their ascospores. Chemically *F. caperatula* differs from *F. rutidota* in lacking caperatic acid. In addition, *F. caperatula* has consistently longer ascospores than does *F. rutidota* (17–22 µm versus 12–16 µm long). Molecular studies based on nu rDNA ITS have confirmed that *F. rutidota* and *F. caperatula* are not very closely related (Blanco & Crespo, unpublished data).

SPECIMENS EXAMINED
*Western Australia*: • Summit of Mount Brown, 3 km SE of York, 31°53′16″S, 116°47′07″E, 295 m, on *Acacia* in remnant *Acacia* woodland with scattered *Eucalyptus* and granite outcrops, *J.A. Elix 31648*, 21.iv.2004 (CANB); • Gwambygine Nature Reserve, 11 km S of York, 31°58′24″S, 116°48′38″E, 245 m, on *Acacia* in *Acacia acuminata* woodland with scattered *Melaleuca* on river flats, *J.A. Elix 31749*, 22.iv.2004 (CANB, MAF); • Charles Gardner Flora Reserve, north track, 18 km SW of Tammin on old York Road, 31°46′38″S, 117°28′26″E, 300 m, on *Hakea* in mallee *Eucalyptus* woodland with *Casuarina* understorey and laterite pebbles, *J.A. Elix 31814*, 22.iv.2004 (CANB, MAF); • Korda North West Road, 1 km W of Korda, 30°49′06″S, 117°28′16″E, 320 m, on *Melaleuca* in *Casuarina* woodland with scattered *Acacia* and *Melaleuca*, *J.A. Elix 32619*, 29.iv.2004 (CANB); • Korda North West Road, 10 km W of Korda, 30°48′45″S, 117°24′14″E, 340 m, on shrub in *Casuarina-Eucalyptus* woodland with scattered *Acacia* and *Melaleuca*, *J.A. Elix 32640*, 29.iv.2004 (CANB); • Great Northern Highway, 72 km NE of Wubin, 29°39′53″S, 117°07′11″E, 350 m, on *Acacia* in *Eucalyptus-Acacia* woodland, *J.A. Elix 33474, 33479*, 29.iv.2004 (CANB); • Great Northern Highway, 23 km NE of Wubin, near Rabbit Proof Fence Road, 30°00′17″S, 116°49′15″E, 350 m, on dead *Acacia* in *Eucalyptus-Acacia* woodland, *J.A. Elix 33562*, 30.iv.2004 (CANB); • Dally (Dalwallinu) North Road, 14 km SE of Wubin, 30°13′40″S, 116°44′50″E, 305 m, on *Casuarina* in *Eucalytus* woodland with *Acacia, Casuarina* and Santalaceae, *J.A. Elix 33573*, 30.iv.2004 (CANB); • Burma Road, 29 km SE of junction with Walaway-Nangetty road, 29°04′07″S, 115°09′26″E, 240 m, on *Melaleuca* in roadside heath with *Melaleuca* and laterite outcrops, *J.A. Elix 33774*, 4.v.2004 (CANB); • Coolimba-Eneabba road, Nature Reserve, 20 km W of Eneabba, 29°52′30″S, 115°05′41″E, 70 m, on dead *Acacia* in *Eucalyptus* woodland with *Melaleuca, Acacia* and *Patersonia*, *J.A. Elix 28906*, 5.v.2004 (CANB); • Cockatoo Canyon, junction of Bunney Road and Nebru Road, 33 km NE of Eneabba, 29°33′51″S, 115°27′04″E, 245 m, on dead twigs in mallee *Eucalyptus* woodland with *Melaleuca, Acacia* and *Callitris*, *J.A. Elix 33822*, 5.v.2004 (CANB); • Walebing, Quarrell Range, Moora-New Norcia road, 22 km S of Moora, 30°41′38″S, 116°12′19″E, 280 m, on dead *Acacia* in remnant *Eucalyptus-Acacia* woodland with basalt outcrops, *J.A. Elix 28988, 36017*, 7.v.2004 (CANB); • Darling Range, Walyunga National Park, 40 km NE of Perth, 31°43′55″S, 116°04′29″E, 280 m, on dead *Dryandra* in *Eucalyptus-Dryandra* woodland beside river, *J.A. Elix 36042*, 7.v.2004 (CANB); • Western Flora camp area, 20 km N of Eneabba, 29°37′30″S, 115°13′30″E, 250 m, on *Acacia* in mallee *Eucalyptus* woodland with *Melaleuca* and *Acacia*, *E. McCrum WF256*, 4–6.vi.2005 (CANB).



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Fig. 1. *Flavoparmelia virensica* (*J.A. Elix 32488* in CANB). Bar = 5 mm

Fig. 2. *Flavoparmelia caperatula* (*J.A. Elix 33573* in CANB). Bar = 5 mm

## Three new species and four new reports in the Australian Pertusariaceae

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**Abstract:** *Pertusaria bagoensis* Elix & A.W.Archer, *P. leucophaea* Elix & A.W.Archer and *P. trichosa* Elix & A.W.Archer are described as new to science and compared with similar known species. *Pertusaria albissima* Müll.Arg., *P. alboaspera* A.W.Archer & Elix var. *tetraspora* Jariangprasert, *P. depressa* (Fée) Mont. & Bosch and *P. texana* Müll.Arg. are reported from Australia for the first time.

As part of a continuing study of the genus *Pertusaria* in Australia (Archer & Elix 2009a, b, and references therein), a number of specimens from Queensland and New South Wales have been examined and found to include new taxa or new records for Australia. In addition, the chemistry of the Australian specimens and type specimens from the Conservatoire et Jardin Botaniques, in Geneva, Switzerland, was studied by thin-layer chromatography (Elix & Ernst-Russell 1993), high-performance liquid chromatography (Elix *et al*. 2003) and comparison with authentic samples.

1. **Pertusaria bagoensis** Elix & A.W.Archer, sp. nov. Figs 1 & 2

Similis *Pertusaria palumensis* Elix & A.W.Archer sed 2-chlorolichexanthone et substantias affines continens. Apothecia ignota.
Type: Australia. *New South Wales*: Bago Bluff National Park, Scrub Road, 7 km W of Wauchope, 31°28′45″S, 152°39′36″E, alt. 25 m, on *Eucalyptus* in mixed regrowth *Eucalyptus* forest near rainforest gully, *J.A. Elix 43284*, 8.viii.2008 (holotype: CANB).

Thallus corticolous, off-white, thin, surface smooth and dull, isidiate, soredia absent. Isidia crowded, cylindrical, simple or rarely terminally branched, 0.3–0.5 mm tall, 0.05–0.08 mm diam. Apothecia not seen.
*Chemistry*: 2-chlorolichexanthone (minor), 2,4-dichlorolichexanthone (minor), 2,5-dichlorolichexanthone (minor), 2,4,5-trichlorolichexanthone (minor), ± 2,5-dichloro-3-*O*-methylnorlichexanthone (minor), stictic acid (major), peristictic acid (minor), cryptostictic acid (minor-trace), ± norstictic acid (minor), ± constictic acid (minor-trace), ± confluentic acid (minor), ± 2′-*O*-methylperlatolic acid (major-minor), ± 2-*O*-methylperlatolic acid (minor).

*Etymology:* The specific epithet *bagoensis* is derived from Bago Bluff, the type locality.

**Remarks**

*Pertusaria bagoensis* is characterized by the isidiate thallus, the presence of 2-chlorolichexanthone and its polychlorinated derivatives, stictic acid, perlatolic acid derivatives and the absence of apothecia. Other sterile isidiate species of Australian *Pertusaria* with chlorolichexanthones contain 4,5-dichlorolichexanthone as the sole chlorolichexanthone, with the exception of *P. palumensis* Elix & A.W.Archer from Queensland (Archer & Elix 2009a), which contains 4,5-dichlorolichexanthone and 2,4,5-trichlorolichexanthone but lacks perlatolic acid derivatives. *Pertusaria pilosula* A.W.Archer & Elix from New South Wales (Archer 1997) has simple isidia and contains 2′-*O*-methylperlatolic acid (major), stictic acid (major) and constictic acid (minor) but 4,5-dichlorolichexanthone (minor) rather than 2-chlorolichexanthone and its polychlorinated derivatives.

At present this new species is known from the bark of *Acacia* and *Eucalyptus* in coastal forests and woodland in northern New South Wales and northern Queensland.



ADDITIONAL SPECIMENS EXAMINED
*Queensland*: • Rocky Point, 13 km NE of Mossman, 16°23′06″S, 145°21′01″E, alt. 3 m, on *Acacia* in rocky coastal area, *J.A. Elix 43416*, 1.viii.2006 (CANB).
*New South Wales*: • Bago Bluff National Park, Scrub Road, 7 km W of Wauchope, 31°28′45″S, 152°39′36″E, alt. 25 m, on dead wood in mixed regrowth *Eucalyptus* forest near rainforest gully, *J.A. Elix 43279*, 8.viii.2008 (CANB); • *ibid.*, on base of *Eucalyptus grandis*, *J.A. Elix 43285, 43286*, 8.viii.2008 (CANB).

2. **Pertusaria leucophaea** Elix & A.W.Archer, sp. nov. Figs 3 & 4

Similis *Pertusaria microstoma* Müll.Arg. sed ostiolis pallidis mammiformibusque, et 4,5-dichlorolichexanthone solum continens.
Type: Australia: *Queensland*: Jondaryan-Mt Tyson road, opposite the Oakey Golf Club, 27°23′05″S, 151°36′44″E, alt. 390 m, on *Pittosporum* in remnant *Eucalyptus-Pittosporum* woodland, *J.A. Elix 39777*, 5.v.2005 (holotype: BRI, isotype: CANB).

Thallus corticolous, off-white to ash-grey, surface dull and conspicuously cracked, lacking soredia and isidia. Apothecia verruciform, conspicuous, scattered, flattened-hemispherical, 0.7–1.2 mm diam. Ostioles pale, initially flat, becoming mammiform, 1 per verruca. Ascospores 4 per ascus, ellipsoid, hyaline, rough-walled, 80–110 × 30–34 μm.
*Chemistry*: 4,5-dichlorolichexanthone (major).

*Etymology:* the specific epithet *leucophaea* is from the Latin *leucophaeus*, pale gray, in reference to the colour of the thallus.

**Remarks**

*Pertusaria leucophaea* is characterized by the verruciform apothecia, the mammiform ostioles, asci with four rough-walled ascospores and the presence of 4,5-dichlorolichexanthone as the sole lichen substance. The tropical species *P. microstoma* Müll. Arg. (Müller 1882) has ascospores similar to those of *P. leucophaea*, but is distinguished from it by an olive-green thallus, conspicuous black ostioles and the presence of 2′-*O*-methylperlatolic and stictic acids in addition to 4,5-dichlorolichexanthone.

At present the new species is known only from the type locality. Commonly associated species include *Chrysothrix xanthina* (Vain.) Kalb, *Dirinaria subconfluens* (Fr.) D.D.Awasthi, *Flavoparmelia rutidota* (Hook.f. & Taylor) Hale, *Parmotrema austrosinense* (Zahlbr.) Hale, *P. subsumptum* (Nyl.) Hale, *Pyxine petricola* Nyl., *P. subcinerea* Stirt., *Teloschistes sieberianus* (Laurer) Hillmann and *Usnea scabrida* subsp. *elegans* (Stirt.) G.N.Stevens.

3. **Pertusaria trichosa** Elix & A.W.Archer, sp. nov. Figs 5 & 6

Similis *Pertusaria barbatica* A.W.Archer & Elix sed isidiis tenuioribus et acidum thamnolicum vice acidum barbaticum continens. Apothecia ignota.
Type: Australia. *New South Wales*: Bago Bluff National Park, Scrub Road, 7 km W of Wauchope, 31°28′45″S, 152°39′36″E, alt. 25 m, on dead wood in mixed regrowth *Eucalyptus* forest near rainforest gully, *J.A. Elix 43276*, 8.viii.2008 (holotype: CANB).

Thallus corticolous, off-white to pale fawn, thin, surface smooth and dull, isidiate, soredia absent. Isidia crowded, cylindrical, thin, simple, pale fawn, becoming brown at the tips, 0.2–0.4 μm tall, 0.03–0.05 mm diam. Apothecia not seen.
*Chemistry*: thamnolic acid (major).

*Etymology:* the specific epithet is derived from the Greek *tryco*, hair, a reference to the thin isidia.

**Remarks**

*Pertusaria trichosa* is characterized by the thin isidia, the presence of thamnolic acid and the absence of apothecia. It is the second Australian sterile isidiate species with a β-orcinol depside, the other being *P. barbatica* A.W.Archer & Elix, which contains barbatic acid (Archer 1997). The new species is distinguished from the chemically

similar isidiate species from the Northern Hemisphere, *P. corallina* (L.) Arn., by the thinner isidia, (0.03–0.05 versus 0.1–0.3 mm thick), and the lignicolous substratum (*P. corallina* is saxicolous (Poelt & Vězda 1981)).

At present the species is known only from the type locality in New South Wales. Commonly associated lichens include *Chrysothrix xanthina* (Vain.) Kalb, *Letrouitia coralloidea* (Müll.Arg.) Hafellner, *Ochrolechia africana* Vain., *Parmotrema reticulatum* (Taylor) M.Choisy, *Pertusaria georgeana* A.W.Archer & Elix var. *georgeana* and *Trapeliopsis granulosa* (Hoffm.) Lumbsch.

ADDITIONAL SPECIMEN EXAMINED
*New South Wales*: • type locality, *J.A. Elix 43280,* 8.vii.2008 (CANB).

**New Reports**

1. **Pertusaria albissima** Müll.Arg. *Flora* **67**, 350 (1884) Figs 7 & 8
Type: New Zealand, *sine loc., C. Knight s.n., "Pertusaria leucodeoides* Knight" *nom. nud.* (lectotype: G) (Archer & Elix 1994).

Thallus corticolous, off-white, surface smooth and dull, lacking isidia and soredia. Apothecia verruciform, concolorous with the thallus, conspicuous, numerous, sometimes confluent, flattened-hemispherical, 1–2 mm diam., ostioles inconspicuous, pale, translucent. Ascospores 8 per ascus, hyaline, uniseriate, ellipsoid, smooth, 50–74 × 20–26 μm.
*Chemistry*: no lichen compounds detected.

**Remarks**
*Pertusaria albissima* is characterized by the verruciform apothecia with inconspicuous ostioles, the absence of lichen compounds and, in particular, the eight uniseriate ascospores (Fig. 8). A detailed account of *P. albissima* and related taxa from New Zealand is given elsewhere (Archer & Elix 1994). The species is corticolous in both New Zealand and Australia, but has been reported growing on rock in the Auckland Islands (Fineran 1971). The species is illustrated in Malcolm & Galloway (1997: 102).

SPECIMEN EXAMINED
Australia. *New South Wales*: Queens Head Area, Limeburners Creek Nature Reserve, 15 km S of Crescent Head, 31°19′09″S, 152°58′05″E, alt. 5 m, on *Casuarina* in coastal scrub with *Casuarina* and palms, *J.A. Elix 43610*, 7.viii.2008 (CANB).

2. **Pertusaria alboaspera** A.W.Archer & Elix var. **tetraspora** Jariangprasert, *Mycotaxon* **91**, 280 (2005) Figs 9 & 10
Type: Thailand: Loei Province, Phu Luang Wildlife Sanctuary, near Pha Chang Phan Cliff, in oak/dipterocarp forest, alt. 1510 m, *S. Jariangprasert 2248*, 3.ii.2002 (holotype: QBG).

Thallus corticolous, off-white to pale fawn, surface subtuberculate and slightly glossy, lacking isidia and soredia. Apothecia numerous, scattered, conspicuous, flattened-hemispherical, rarely confluent, 0.6–1.5 mm diam. Ostioles hyaline, inconspicuous, 1–2 per verruca. Ascospores 4 per ascus, hyaline, smooth-walled, ellipsoid, 80–85 × 30–35 μm.
*Chemistry*: Lichexanthone (major-minor), 2,2′-di-*O*-methylstenosporic acid (major), planaic acid (trace), methyl 2,2′-di-*O*-methylstenosporate (trace), stictic acid (major), constictic acid (minor).

**Remarks**
This variety is characterized by asci with four ascospores and the presence of lichexanthone, 2,2′-di-*O*-methylstenosporic acid and stictic acid. It is distinguished from var. *alboaspera* (Archer & Elix 1993) by the 4-spored asci (eight in var. *alboaspera*). It is widely distributed in northern and north-eastern Thailand between 1400 and 1600 m, but is so far known in New South Wales from only one collection. The apothecia and ascospores of this variety have been illustrated by Jariangprasert (2005).

SPECIMEN EXAMINED
Australia: *New South Wales*: • Mount Warning National Park, by side of track near foot of mountain, *A.W. Archer P514*, 31.viii.1992 (NSW).

3. **Pertusaria depressa** (Fée) Mont. & Bosch, in F. Miquel, *Pl. Junghuhn.* **4**, 482 (1855) Figs 11 & 12
*Porina depressa* Fée, *Essai Crypt. Écorc. Officin.*: 80 (1824)
Type: tropical America, ad *Cinchonarum* cortices, *n.v.*
*Pertusaria depressa* (Fée) Müll.Arg. *Flora* **67**, 288 (1884), *nom. superfl.*
Müller refers to, but does not cite, specimens collected in Brazil by Glaziou, from Barbacenam and Rio de Janeiro, and by Puiggari from Apiahy. The following specimens were examined: Brazil: Apiahy, *Puiggari 1470* p.p. (G); *ibid., Puiggari s.n.,* June 1881 (G); *Puiggari s.n.,* March 1881 (G); *Puiggari s.n.,* December 1881 (G); *Puiggari s.n.,* 1882 (G); *Puiggari s.n.,* May 1880 (G); *Puiggari 2194,* 1882 (G); *Puiggari s.n.,* no date (G).

*Pertusaria leioplaca* DC. var. *depressula* Müll.Arg. *Flora* **64**, 517 (1881)
Type: Brazil, Apiahy, *Puiggari 1470,* no date (holotype: G).

*Pertusaria melaleuca* var. *tetramera* Müll.Arg. *Flora* **67**, 287 (1884)
Syntypes: Brazil: Apiahy, *Puiggari s.n.* (G); Cuba: C. *Wright s.n.* (G); *ibid.* Lichenes Cubenses ser. II, 171, *collector unknown* (G).

*Pertusaria modesta* Müll.Arg. *Flora* **67**, 352 (1884)
Type: Venezuela: Caracas, *Dr. Ernst s.n.,* 1878 (holotype: G).

Thallus corticolous, pale fawn, surface glossy and cracked, lacking isidia and soralia. Apothecia verruciform, conspicuous, concolorous with the thallus, hemispherical, scattered, sometimes confluent, 0.7–1.0 mm diam. Ostioles black, conspicuous, 2–4 per verruca, 0.05–0.1 mm diam. Ascospores 3–4 per ascus, hyaline, smooth, ellipsoid, 100–120 × 40–50 μm wide.
*Chemistry*: 2-chlorolichexanthone (major-minor), lichexanthone (minor), 2-*O*-methylhyperlatolic acid (major-minor), 2-*O*-methylsuperlatolic acid (major), ± 2-*O*-methylperlatolic acid (minor), ± methylplanaiate (minor), ± stenosporic acid (trace), perlatolic acid (trace).

**Remarks**
*Pertusaria depressa* is characterized by verrucae with conspicuous black ostioles, asci with 3–4 smooth-walled ascospores and the presence of 2-chlorolichexanthone and higher homologues of the more common 2-*O*-methylperlatolic acid. The species is known from Brazil, Indonesia and Australia.

SPECIMEN EXAMINED
Australia. *New South Wales*: • Toonumbar State Forest, Poor Bullocks Road, Eden Creek Falls Picnic Area, c. 26 km WNW of Kyogle, 28°31′S, 152°46′E, alt. 400 m, on fallen tree. *A.W. Archer P438,* 2.ix.1992 (NSW).

4. **Pertusaria texana** Müll.Arg. *Flora* **67**, 399 (1884) Figs 13 & 14
Type: U.S.A.: Texas, Dallas County, near Dallas, *Bolander s.n.*, 1867 (holotype: G)

Thallus corticolous, pale yellowish white to pale fawn, cracked, surface smooth and dull, lacking isidia and soredia. Apothecia numerous, concolorous with the thallus, scattered, rarely confluent, 0.6–1.3 mm diam. Ostioles pale yellowish fawn, 1–3 per verruca. Ascospores 8 per ascus, biseriate, hyaline, ellipsoid, 75–95 × 28–37 μm.
*Chemistry*: thiophaninic acid (major), stictic acid (major) and constictic acid (minor).

**Remarks**

*Pertusaria texana* is characterized by the verruciform apothecia, the pale yellowish ostioles, the eight biseriate ascospores and the presence of thiophaninic and stictic acids. It resembles the chemically similar *P. leioplacella* Nyl., but that species has shorter (52–72 µm long) uniseriate ascospores. The Australian species *P. thiophaninica* A.W.Archer resembles *P. texana* in morphology, ascospore size and distribution, but it lacks stictic acid (Archer 1997). *Pertusaria texana* is known from the southern United States, the Galapágos Islands, the Seychelles, Papua New Guinea and eastern Australia.

SPECIMENS EXAMINED

Australia: *Queensland*: • Rocky Point, 13 km NE of Mossman, 16°23′06″S, 145°21′01″E, alt. 3 m, on dead tree in rocky coastal area with *Acacia, J.A. Elix 43422,* 1.viii.2006 (CANB).

*New South Wales*: • Findon Creek Road, 28°25′S, 152°54′E, c. 27 km NNW of Kyogle, on *Casuarina* by side of Findon Creek, *A.W. Archer P478,* 8.ix.1992 (NSW); • Border Ranges National Park, track by side of Terrace Creek, 28°24′20″S, 152°59′E, alt. 250 m, c. 27 km NNW of Kyogle, on base of old *Eucalyptus*, *A.W. Archer P579,* 29.viii.1992 (NSW); • Kuringai Chase National Park, by side of Cockle Creek, 33°40′S, 151°08′E, alt. 3 m, c. 27 km NNW of Sydney, on *Avicennia*, *A.W. Archer P754,* 25.ii.1995 (NSW); • Park Beach, Coffs Harbour, 30°17′S, 153°07′E, 1 m, on bark of shrub in coastal sand dunes, *J.A. Elix 3415,* 29.vi.1977 (CANB); • Temagog, 30°58′S, 152°59′E, on *Casuarina* in open woodland, *J.A. Elix 33163,* 14.vii.1992 (CANB).

Papua New Guinea. *Central Province*: • Owen Stanley Range, Naduri village, 9°08′S, 147°41′E, alt. 1600 m, *A. Aptroot 38109,* 19–20.x.1995 (herb. Aptroot).

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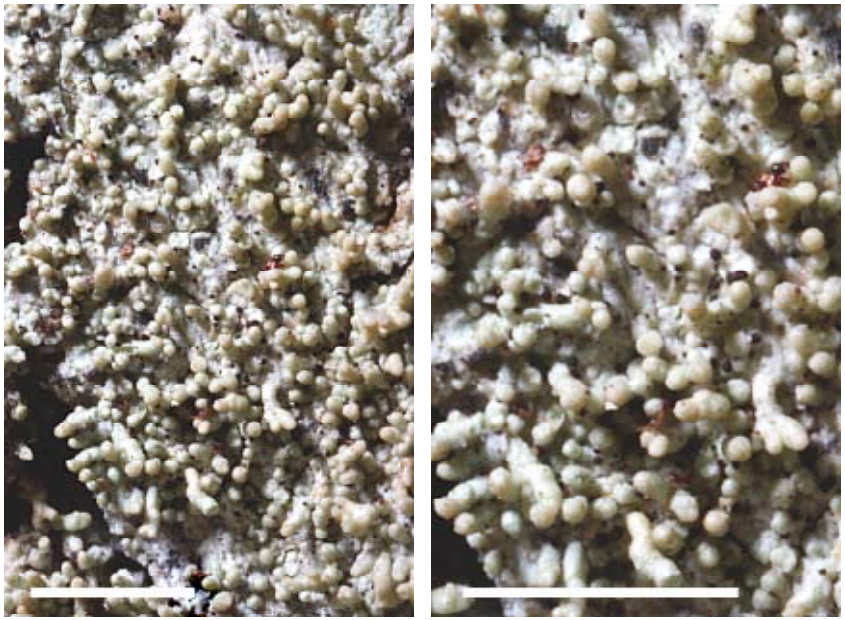
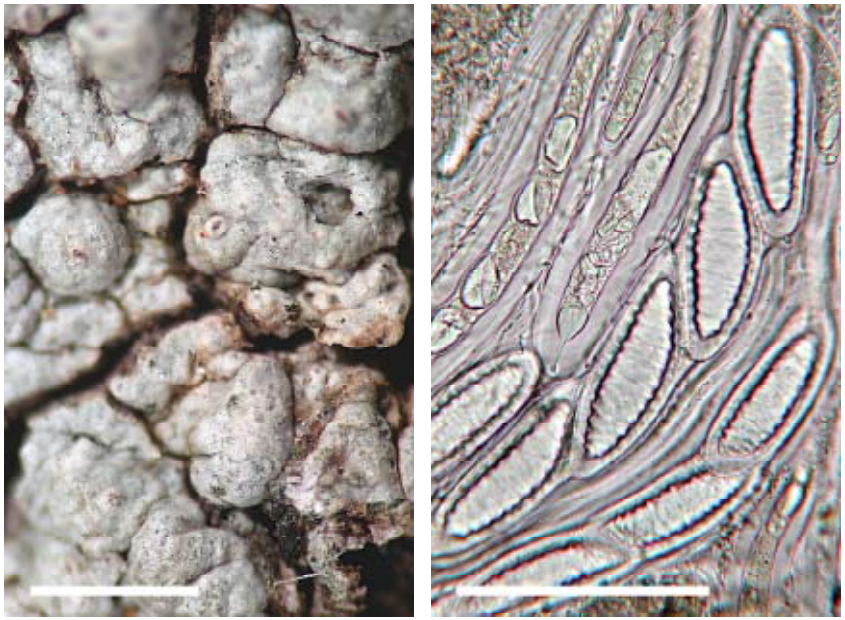
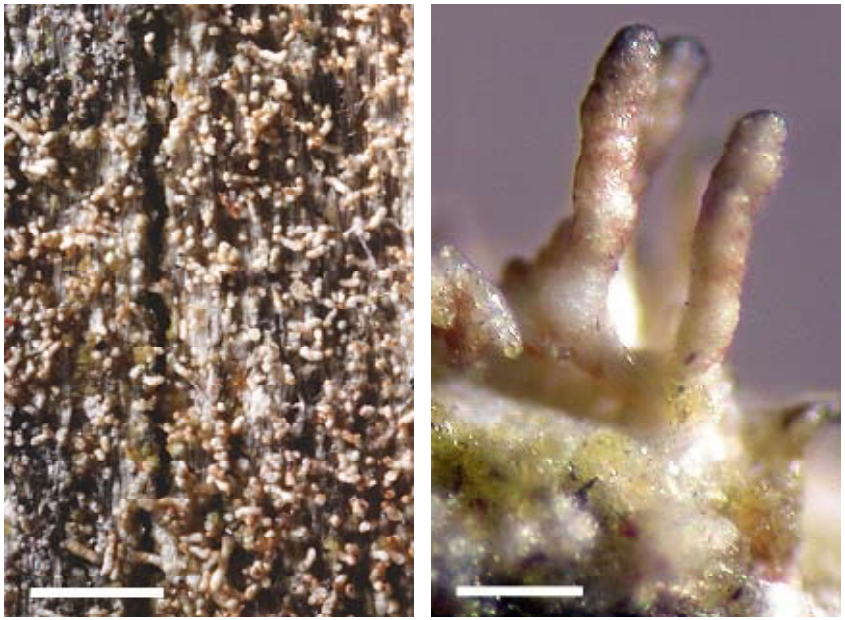


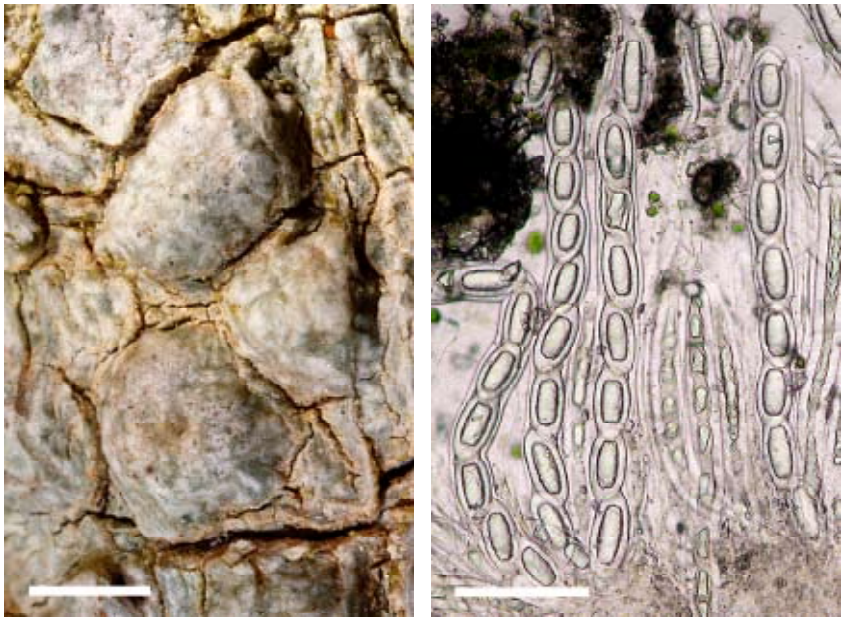
Figs 1, 2. *Pertusaria bagoensis,* holotype, Elix 43284. Bars = 1 mm.



Figs 3, 4. *Pertusaria leucophaea,* holotype, Elix 39777. Bars = 1 mm, 100 µm.



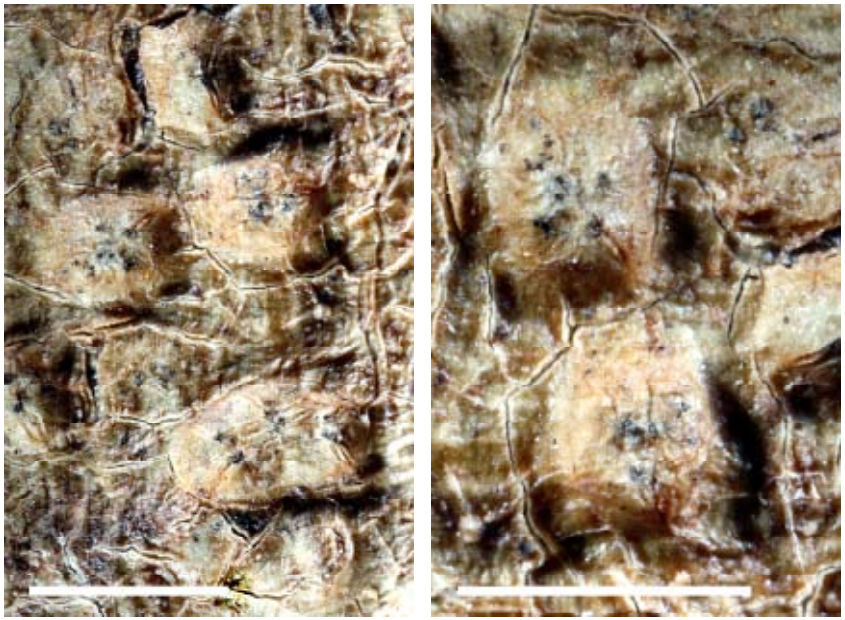
Figs 5, 6. *Pertusaria trichosa,* holotype, Elix 43276. Bars = 1 mm, 0.1 mm



Figs 7, 8. *Pertusaria albissima,* Elix 43610. Bars = 1 mm, 100 μm



Figs 9, 10. *Pertusaria alboaspera* var. *tetraspora,* Archer P514. Bars = 1 mm



Figs 11, 12. *Pertusaria depressa,* Archer P438. Bars = 1 mm.

Figs 13, 14. *Pertusaria texana,* Archer P579. Bars = 1 mm.



## *Austrographa*, a new genus in the Roccellaceae with three species from Australia

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**Abstract:** The genus *Austrographa* is described in the Roccellaceae. Although the new genus shows affinities with both *Chiodecton* and *Enterographa*, it differs from *Chiodecton* by the strongly branched excipulum hyphae, frequently branched paraphysoids and the absence of roccellic acid and byssoid or fibrous structures, and from *Enterographa* by the acicular, thin-walled ascospores, distinctly cylindrical asci and a carbonized hypothecium. *Austrographa kurriminensis*, *A. pseudopallidella* and *A. skyrinica* are described from a single mangrove stand on the east coast of Queensland, Australia.

### Introduction

*Chiodecton* and its allied genera have been monographed by Thor (1990). Since that time three additional species have been described, namely *Chiodecton applanatum* G.Thor (Thor 2007), *C. montanum* G.Thor (Kantvilas & Thor 1993) and *C. papillosum* G.Thor (Henssen & Thor 1998). All known species of *Chiodecton* contain roccellic acid, and most are thinly pruinose or byssoid and possess a fibrous prothallus. *Enterographa* was monographed by Sparrius (2004), and several additional species have been described since then, all having a non-carbonized excipulum or hypothecium, rather thick-walled ascospores and clavate to subcylindrical asci. In this paper, we describe the new genus *Austrographa* that shows clear affinities with *Chiodecton* and *Enterographa*, but has characteristics that differ from both (Table 1). The three new species of *Austrographa* are compared in Table 2.

**Austrographa** Sparrius, Elix & A.W.Archer gen. nov.
*Chiodectonum* et *Enterographam* similis est. Thallus non byssoideus, sine acidum roccellinum. Paraphysoides *c.* 1.0 lates, frequentem furcatae. Pseudostromata lirelliformes vel furcatae. Hypothecium atrum, excipulum hyalinum. Ascosporae 45–60 × 2.5–3.0 µm, 3-septatae.

*Thallus* crustose, corticolous, firmly attached to the substratum, smooth, water-repellent, to 0.5 mm thick, densely filled with fine crystals, with a cortical gel. Prothallus bordering the thallus, thin or indistinct. Photobiont *Trentepohlia*. *Ascomata* rounded to lirellate, usually aggregated in linear or rounded pseudostromata. Excipulum hyaline, composed of richly branched periclinal hyphae, filled with crystals. Thalline margin slightly paler than the thallus. Epithecium orange to straw-coloured, containing crystals or not, K–. Hypothecium carbonized, dark brown, K– or K+ green or violet. Hymenium hyaline, KI+ deep blue. *Paraphysoids* frequently branched and anastomosed, *c.* 1.0 µm thick, apices *c.* 1.2 µm thick. *Asci* 8-spored, cylindrical, *Opegrapha*-type (Grube 1998), wall uniformly thickened towards the apex, with a distinct apical dome, 60–90 × 12–17 µm. Apical dome KI+ blue. *Ascospores* acicular, 45–60 × 2.0–3.0 µm, 3-septate, hyaline, curved, thin-walled, perispore not visible. *Conidiomata* not seen.
*Chemistry*: Thallus K–, C–, P–, UV–. No secondary substances detected by TLC (solvents A, C) or HPLC. One species contains skyrin in the ascomata.

*Etymology*. The generic epithet *Austrographa* derives from Australia where the genus was found.

**Austrographa kurriminensis** Sparrius, Elix & A.W.Archer, sp. nov. Figs 1, 4a
Thallus corticolus, sine acidis lichenis, epruinatus. Pseudostromata lirelliformes, non furcatae. Ascosporae 45–55 × 2.5–2.8 µm, 3-septatae.

*Type*: Australia. *Queensland*: Kurrimine Beach, just N of Caravan Park, 17°46′31″S, 146°06′35″E, 1–2 m alt., on *Rhizophora* in mangroves, *J.A. Elix 38347*, 30.vii.2006 (BRI – holotype; L – isotype); *ibid. J.A. Elix 38339, 38340* (CANB, hb Sparrius–paratypes).

*Thallus* 0.2–0.4 mm thick, cream-coloured. *Ascomata* rounded to ellipsoid, punctate, 0.10–0.25 × 0.15–0.40 mm; disc open above, dark orange-brown, in groups of 5–15 in linear pseudostromata 5–10 mm diam., raised 0.2–0.3 mm above the thallus. Thalline margin 0.2–0.3 mm wide. Epithecium 20–30 µm tall, with crystals 2 µm diam., K–. Hypothecium 50–70 µm tall, K–. Hymenium 100–130 µm tall. *Asci* 70–90 × 12–15 µm. *Ascospores* acicular, 45–55 × 2.5–2.8 µm.

*Etymology*. The specific epithet derives from the Latin suffix *-ensis* (place of origin) and the type locality Kurrimine Beach.

*Remarks*. This species is characterized by the cream-coloured thalli and the rounded to ellipsoid ascomata with dark, orange-brown, punctate open discs grouped in raised, linear pseudostromata. At present this new species is known only from the type locality where it occurs on the bark of *Rhizophora* in a mixed stand of mangroves and strand vegetation. Associated lichen species included *Cratiria lauricassiae* (Fée) Marbach, *Diorygma hieroglyphicum* (Pers.) Staiger & Kalb, *D. rufopruinosum* (A.W.Archer) Kalb, Staiger & Elix, *Dirinaria picta* (Sw.) Schaer. ex Clem., *D. subconfluens* (Fr.) D.D.Awasthi, *Graphis geraensis* Redinger, *G. rimulosa* (Mont.) Trevis., *Haematomma accolens* (Stirt.) Hillmann, *H. stevensiae* R.W.Rogers, *Lecanora tropica* Zahlbr., *Pertusaria velata* (Turner) Nyl., *Pyxine fallax* (Zahlbr.) Kalb and *Sarcographa tricosa* (Leight.) Müll. Arg. as well as the two other new species of *Austrographa* described below.

**Austrographa pseudopallidella** Sparrius, Elix & A.W.Archer, sp. nov. Figs 2, 4b
Thallus corticolus, epruinatus, sine acidis lichenis. Pseudostromata lirelliformes, furcatae. Ascosporae 45–60 × 2.0–2.5 µm, 3-septatae.

*Type*: Australia. *Queensland*: Kurrimine Beach, just N of Caravan Park, 17°46′31″S, 146°06′35″E, 1–2 m alt., on *Rhizophora* in mangroves, *J.A. Elix 38359*, 30.vii.2006 (BRI – holotype).

*Thallus* 0.2–0.4 mm thick, brownish grey. *Ascomata* richly branched lirellae, 0.5–2.5 × 0.1–0.2 mm; disc dark red-brown, not distinctly grouped. Thalline margin 0.1–0.2 mm wide, level with the thallus. Excipulum 12–15 µm thick, dark brown, ±carbonized. Epithecium orange-brown, 15–20 µm tall, with crystals of 2 µm diam., K+ green. Hypothecium 25–30 µm tall, K+ green. Hymenium *c.* 150 µm tall. *Paraphysoids* frequently branched and anastomosed, *c.* 1.0 µm thick, apices *c.* 1.2 µm thick. *Asci* 60–75 × 12–17 µm. *Ascospores* acicular, 45–60 × 2.0–2.5 µm.

*Etymology*. The growth form of this species closely resembles that of *Enterographa pallidella* (Nyl.) Redinger, which occurs in the same habitat.

*Remarks*. This new species differs from *Enterographa pallidella* by the negative C reaction, the dark hypothecium and thin-walled ascospores. In contrast, the thallus of *E. pallidella* reacts C+ red due to the presence of gyrophoric acid, has a colourless hypothecium and smaller, clavate to fusiform, often slightly curved, 6–15-septate ascospores, 22–33 × 2.5–3.5 µm (Sparrius 2004).



**Austrographa skyrinica** Sparrius, Elix & A.W.Archer, sp. nov. Figs 3, 4 c
Thallus corticolus, sine acidis lichenis, epruinatus. Pseudostromata lirelliformes, furcatae. Hypothecium cum skyrino. Ascosporae 45–55 × 2.5–3.0 µm, 3-septatae.

*Type*: Australia. *Queensland*: Kurrimine Beach, just N of Caravan Park, 17°46′31″S, 146°06′35″E, 1–2 m alt., on dead tree in mangrove and strand vegetation, *J.A. Elix* 38393, 30.vii.2006 (BRI – holotype; L – isotype).

*Thallus* 0.3–0.5 mm thick. *Ascomata* lirellate and branched, 0.10–0.15 × 0.2–2.0 mm; disc dark brown to black, each branched lirella forming a rounded to ellipsoid pseudostroma 5–10 mm diam., raised 0.2–0.5 mm above the thallus. Thalline margin 0.3–0.4 mm wide. Excipulum 20–25 µm thick, black-brown, carbonized, K+ violet. Epithecium orange to straw-coloured, 10–15 µm tall, without crystals. Hypothecium 50–100 µm tall, extending downwards to the substratum, K+ violet. Hymenium 180–200 µm tall. *Asci* 70–80 × 12–17 µm. *Ascospores* acicular, 45–55 × 2.5–3.0 µm, slightly curved. *Chemistry*: Traces of skyrin by HPLC.

*Etymology*. The specific epithet *skyrinica* refers to the presence of skyrin in this species.

*Remarks*. Skyrin also occurs in *Chiodecton sublaevigatum* Kremp., but is restricted to the thallus in that species (Thor, 1990). *Chiodecton sublaevigatum* is further distinguished by its loosely attached, white-pruinose thallus and distinct prothallus with a whitish inner part and a brown outer part. In contrast, the prothallus of *Austrographa skyrinica* is indistinct, and the epruinose thallus is firmly attached to the substratum. Further, the ascomata are perithecioid and aggregated in distinctly elevated stroma-like structures in *C. sublaevigatum* rather than being lirellate as in *A. skyrinica.*

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**Table 1.** *Austrographa, Chiodecton* (Thor 1990) and *Enterographa* (Sparrius 2004) compared.

| *character* | *Austrographa* | *Chiodecton* | *Enterographa* |
|---|---|---|---|
| **prothallus** | indistinct or thin and smooth | thin or thick and fibrous | indistinct or thin and smooth |
| **paraphysoid width** | *c.* 1.0 µm | < 1.0 µm | mostly < 1.0 µm |
| **paraphysoid branching** | frequent | sparse | frequent |
| **hypothecium** | carbonized | carbonized | hyaline |
| **ascus shape** | cylindrical | clavate to subcylindrical | clavate to subcylindrical |
| **perispore** | absent | absent | present |
| **ascospore septation** | 3 | 3(–7) | (3–)15 |
| **excipulum hyphae** | periclinally arranged richly branched | anticlinally arranged sparsely branched | periclinally arranged richly branched |

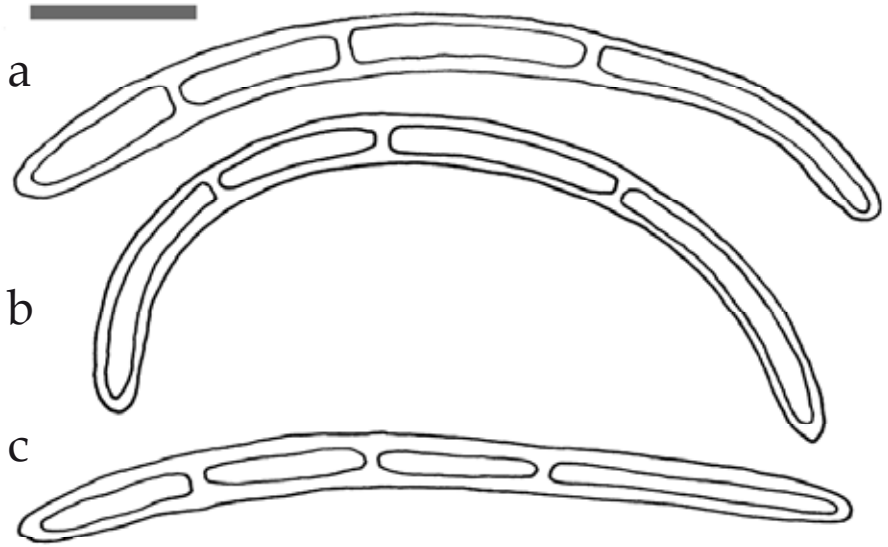
**Table 2.** The three *Austrographa* species compared.

| *character* | *A. kurriminensis* | *A. pseudopallidella* | *A. skyrinica* |
|---|---|---|---|
| **secondary metabolites** | none | none | skyrin in excipulum |
| **hypothecium in KOH** | negative | green | violet |
| **spore length** (µm) | 45–55 | 45–60 | 45–55 |
| **ascomata colour** | dark orange-brown dots | pale orange dots | pale orange dots |
| **ascomata aggregation** | lines | branched lines | branched lines |

Fig. 1. *Austrographa kurriminensis* habit (type). The blackened ascomata are infected with *cf. Intralichen christiansenii*. Bar = 1 mm.

Fig. 2. *Austrographa pseudopallidella* habit (type). Bar = 1 mm.

Fig. 3. *Austrographa skyrinica* habit (type). Bar = 1 mm.






**Additional lichen records from Subantarctica 2. New taxa and combinations from Îles Kerguelen, Prince Edward Islands and Heard Island**

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**Abstract**:
*Cladonia pseudotapperi* Øvstedal is described from Îles Kerguelen in the southern Indian Ocean, and *Steinera radiata* subsp. *edwardiensis* Øvstedal is described from Prince Edward Island. The new combination *Collemopsidium heardense* (C.W.Dodge & Rudolph) Øvstedal is based on *Xanthopyrenia heardensis* C.W.Dodge & Rudolph, which is known only from Heard Island.

**Introduction**
In recent years N. Gremmen has collected lichens on several subantarctic islands in the southern Indian Ocean**:** the Prince Edward Islands (Øvstedal & Gremmen 2001, 2007, 2008a), Heard Island (Øvstedal & Gremmen 2006, 2008b) and Îles Kerguelen (Øvstedal & Gremmen 2009). These rather small and remote islands have highly oceanic, cold temperate climates. Their terrestrial ecosystems are generally classified as tundra and polar desert (Lewis Smith 1984).
In this paper a new species of *Cladonia* is described from Kerguelen, a new subspecies of *Steinera radiata* is described from the Prince Edward Islands, and *Xanthopyrenia heardensis* C.W.Dodge & Rudolph, endemic to Heard Island, is transferred to *Collemopsidium***.**

**Methods**
Specimens were examined using a Zeiss Stemi 2000C microscope and a Zeiss Axiolab compound microscope. Microscopical details were obtained by examining hand-cut sections or squashed material. The sections were mounted in diluted lactophenol cotton blue. Measurements were made on sections mounted in 10% KOH. Chemical constituents were identified by thin-layer chromatography (after Elix & Ernst-Russell 1993).

**Cladonia pseudotapperi** Øvstedal sp. nov. Fig. 1
*Cladonia tapperi* similis, sed squamulae podetiis minoribus et finis podetiis ramificatus differt.

Type: Îles Kerguelen, Île Australia, 49°28'41.5"S, 69°53'35.5"E, alt. 23 m, on bryophytes in lowland feldmark, *N.J.M. Gremmen K-390*, 27.xii.2003 (holotype BG).

Thallus as scattered basal squamules and podetia. Basal squamules persistent, very thin, pale yellow-ochre above, whitish below, 2–2.5 mm long and broad, incised, half-ascending, often coalescing to form a plate around the base of the podetium. Margin of squamules upturned. Podetia erect, 10–14 mm high, pale ochre to pale yellow-ochre, 0.7–0.8 mm wide in the middle, when young tapering to a blunt point**;** mature podetia dividing 1.7–2.7 mm below the apex; axil closed, with 2–4 side branches, each ending in dark brown pycnidia. Lower levels of podetia with small squamules; upper levels coarsely granulose. Scyphi not seen. Weak longitudinal striations visible on levels of podetia that lack squamules.

*Chemistry*: Fumarprotocetraric and stictic acids.

*Ecology and distribution*. This species is known only from Île Australia, Golfe du Morbihan, in the Kerguelen Archipelago; it grows on (sometimes moribund) bryophytes in heathland and feldmark communities from near sea level to 129 m.

*Remarks*.
This lichen differs in morphology and chemistry from all *Cladonia* species previously recorded from the subantarctic islands**.** *Cladonia anserina* Ahti and *C. tapperi* Krog & Swinscow also contain fumarprotocetraric and stictic acids (Stenroos 1993, Øvstedal & Gremmen 2009), and all three species apparently belong in the subsection *Podostelides* (Wallr.) Matt. The podetia of *C. anserina* are not ramified and always end in a large apothecium. *Cladonia tapperi*, which was described from the mountains of Ethiopia (Swinscow & Krog 1988) and which is also found on Marion Island (specimens in AAS, reported in Øvstedal & Gremmen 2008), has somewhat larger podetia covered in squamules, and with no ramifications in the uppermost part (holotype in O studied). All have podetia that are longitudinally furrowed. Another somewhat similar species with a chemotype of fumarprotocetraric and stictic acids is *C. corniculata* Ahti & Kashiw., which occurs in Tierra del Fuego, the Falkland Islands, Africa, New Zealand and Australia (Stenroos 1993). We have studied a specimen from the Falkland Islands (*H.A.Imshaug 42309 & R.C.Harris*, MSC); it has larger, whitish, smooth, finely sorediate podetia that are not or only little divided at the tips, and some of the podetia have apothecia.

ADDITIONAL SPECIMENS EXAMINED
Kerguelen: *Île Australia*: • 49°28′52.8″S, 69°53′35.4″E, alt. 12 m, on bryophytes in *Festuca-Azorella* heathland vegetation on coastal outcrop, *Gremmen K-413, K-418*, 1.i.2004 (BG); • 49°28′40.7″S, 69°53′35.0″E, alt. 15 m, on bryophytes in lowland *Festuca* heathland, *Gremmen K-511*, 27.xii.2003 (BG); • 49°28′39.2″S, 69°53′38.9″E, alt. 19 m, on bryophytes in lowland *Blechnum penna-marina* heathland, *Gremmen K-523*, 27.xii.2003 (BG); • 49°28′08.8″S, 69°53′03.5″E, alt. 129 m, on bryophytes in wet *Azorella* feldmark on exposed plateau, *Gremmen K-413*, 31.xii.2003 (BG).

**Steinera radiata** P.James & Henssen subsp. **edwardiensis** Øvstedal subsp. nov. Fig. 2
Differt ad *Steinera radiata* subsp. *radiata* et subsp. *aucklandica* in sporae dimensionae.

Type: Prince Edward Islands: Prince Edward Island, near Wolkberg, 46°38′57.6″S, 37°57′34.7″E, alt. 543 m, on loose lava rocks in open *Azorella* feldmark vegetation, *N.J.M. Gremmen G03-06a*, 01.iv.2003 (BG).

Thallus placodioid, pale grey-ochre, up to 28 mm diam., faint orange in some areas, rimose-areolate. Lobe-ends indistinct, ±cuneate. Apothecia in inner part of thallus, up to 0.5 mm wide, at first sunk in the thallus, later ±emergent**;** disc vivid brown**;** thalline margin thin, concolorous with the thallus, smooth. Hymenium 60–65 μm high. Ascospores 0(–1)-septate, 8 per ascus, ellipsoid, 8–12 × 3.5–4 μm. Paraphyses tips not branched, slightly swollen.
*Chemistry*: Negative (no substances detected by t.l.c.)

*Ecology and distribution*. This subspecies is known from only the subantarctic Prince Edward Islands, where it grows on rock.

*Comments*. The simple, small ascospores in combination with several other characters place this taxon in *Steinera radiata*, a species previously known only from New Zealand and the Auckland Islands (Henssen & James 1982). However, because of the form and size of the ascospores, it is not easily placed in either of the two known



subspecies (see Henssen & James 1982: 241). *Steinera radiata* subsp. *radiata* has broadly elliptic ascospores (8–10.5 × 6.5–7.5 μm, whereas *S. radiata* subsp. *aucklandica* has ascospores that are elongate-elliptic (12–14 × 4–5 μm), and the present subspecies has ascospores intermediate between those two (8–12 × 3.5–4 μm; Fig. 2). However, all the subspecies should be studied by molecular methods to elucidate their relationship.

**Collemopsidium heardense** (C.W.Dodge & Rudolph) Øvstedal comb. nov.
Basionym: *Xanthopyrenia heardensis* C.W.Dodge & Rudolph, *Annals Missouri Bot. Garden* **42**, 132 (1955).

Thallus crustose, 2–3 cm wide, thin, a flaky, pale brown to yellow-brown, wax-like crust. Photobiont a cyanobacterium, forming a ±continous layer of cells, 6–8 μm diam., with a thick, yellow-brown sheath (most probably *Hyella*). Perithecia loosely attached to the thallus by thick, hyaline hyphae, globose, non-carbonized, lacking an involucrellum, semi-immersed, dark brown, 0.15–0.25 mm diam. In section the exciple is 25–30 μm thick, uniformly brown, with thick-walled, angular cells with dark brown walls and a pale brown interior. Asci *c.* 100 × 15 μm, subcylindrical to clavate; ocular chamber indistinct (only young ones seen). Paraphysoids anastomosing from base to apex. No periphysoids seen. Ascospores 8 per ascus, hyaline, smooth, thin-walled, 1-septate, slightly constricted at the septum, one cell larger than the other, 23–25 × 11–13 μm.

*Ecology and distribution*: This lichen is known from only Heard Island, growing on rock probably under the influence of salt spray.

*Remarks*: The type and only available material contains very few perithecia. However, because it matches *Collemopsidium* very closely, it has been transferred to that genus. *Collemopsidium* is characterized by an often gelatinous thallus with *Hyella* (or other cyanobacteria, and once with a chlorococcoid alga), a perithecium with or without an involucrellum, an exciple that is brown and usually paler in the lower part of the perithecium, carbonized or not, anastomosing paraphysoids, fissitunicate asci with endotunica thickened in the upper half of the ascus, with a ±developed ocular chamber, and hyaline, 1-septate ascospores, with a thin, smooth wall, and with one cell larger (Grube 2005). *Collemopsidium heardense* fits that description, except that the excipulum is uniformly coloured, and no mature ascospores have been observed. Most of the species previously placed in *Pyrenocollema* have now been transferred to *Collemopsidium* (Coppins & Aptroot 2008, McCarthy 2009). There are three groups **of** species with different photobionts: (1) maritime or marine with *Hyella caespitosa* as photobiont, (2) terrestrial or aquatic species (on rock and soil) with other Chroococcales as photobiont, and (3) also terrestrial, with a green photobiont (*C. chlorococcum*). *Hyella caespitosa* was first identified in a *Collemopsidium* by Tschermak-Woess (1976), and later workers have assumed on morphological grounds that the other maritime and marine species have the same photobiont. In *C. heardense*, the morphology of the cyanobacteria matches that found in northern European maritime *Collemopsidium* species, but the comparatively old material could not be cultured.

SPECIMEN EXAMINED
Heard Island: • North of Cape Laurens, at base of black cliffs (*c.* 52°59′S, 73°15′E)**,** *A. N.A.R.E. 76***,** 13.iv.1949 (FH-Dodge, holotype).

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Fig. 1. *Cladonia pseudotapperi*. Holotypus (BG). Scale 5 mm.

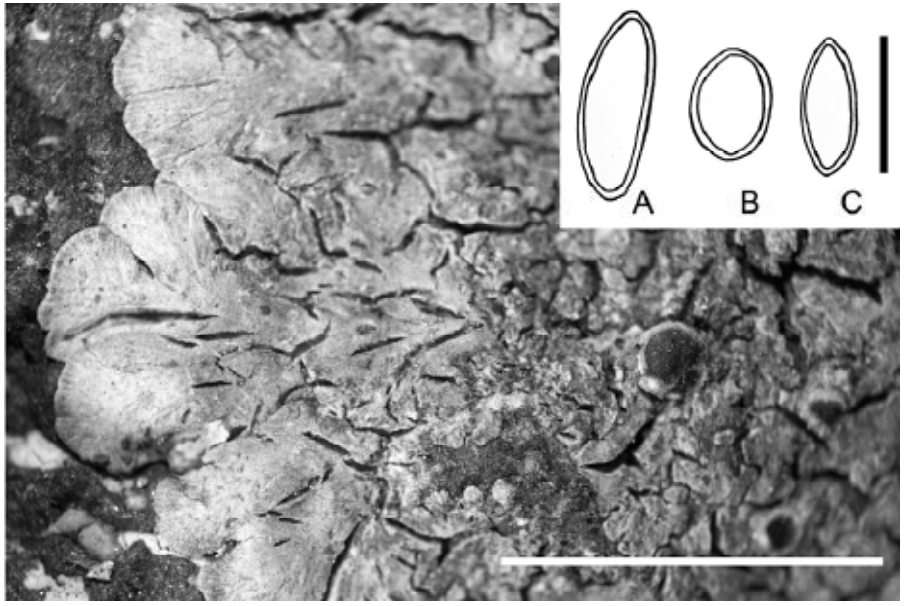


Fig. 2. *Steinera radiata* subsp. *edwardiensis*. Holotypus. Scale 5 mm. Inset: ascospores of **A**: *S. radiata* subsp. *aucklandica*, **B**: *S. radiata* subsp. *radiata*, **C**: *S. radiata* subsp. *edwardiensis* (in part from Henssen & James (1982). Scale 10 μm.

*The Lichens of Great Britain and Ireland*, edited by C.W. Smith, A. Aptroot, B.J. Coppins, A. Fletcher, O.L. Gilbert, P.W. James and P.A. Wolseley. British Lichen Society, London. 2009. 1046 pp. Hardback. ISBN 978-0-9540418-8-5. £65, discounted to £45 plus £7 postage to BLS members.

The recent publication of a new lichen *Flora* for Great Britain and Ireland should not pass without comment for Australasian lichenologists. This tome is a much-enlarged and extensive revision of *The Lichen Flora of Great Britain and Ireland*, edited by William Purvis and colleagues and published in 1992. That work was rightly described by Sir David Smith as an "outstanding achievement of British Lichenology". Its successor is certainly worthy of the same accolade. It boasts 1873 species in 327 genera (compared to 1487 in 255 genera in the 1992 book), written by more than 50 contributors scattered throughout the world and edited by a team of leading British lichenologists joined by André Aptroot from the Netherlands. In addition, the individual generic accounts have been peer-reviewed, drawing on the global talent of lichenology, and the whole project overseen by a steering committee of BLS stalwarts.

Before expanding on the merits and contents of this revised edition, it is pertinent to reflect on its predecessor. Over many years, when asked to recommend a lichen text to people interested in the flora of cool temperate Australasia, this reviewer would unequivocally recommend the British *Flora*. True, there are many other valuable and indeed indispensible books – David Galloway's *Flora of New Zealand Lichens*, the multi-volume *Flora of Australia* series, and a plethora of specialist monographs, to name but a few. However, for me the British *Flora* somehow never made it to the bookshelf, and no sooner was it put away than it was brought back to the desk or laboratory bench, and years of intense use soon made the cover and contents part company. There, in a single volume, were probably one of the better introductory accounts on lichens, an excellent glossary, superb (and accurate) anatomical illustrations, and a comprehensive bibliography. And much, much more.

It is true that to make sense of a *Xanthoparmelia, Pseudocyphellaria, Menegazzia*, or *Bunodophoron*, the British *Flora* offers little or no help at all. The same applies to many of the more "tropical-flavoured" groups such as graphids or thelotremes. That said, however, the overlap among the lichen floras of oceanic, temperate Britain and places such as Tasmania and moist, cooler parts of mainland Australia is remarkable at the species level and even more so at the genus level. Then there are the numerous instances of closely related taxa occupying identical niches at opposite ends of the globe. Much of the British *Flora*'s utility, admittedly, is therefore in the crustose groups, but it is there that most of the taxonomic questions lie, where the literature is limited and scattered, and where the keys are often weakest. So, if you want to make sense of an *Arthonia*, *Aspicilia*, or *Buellia*, the British *Flora* might not necessarily get you to the right answer, but it will get you close, or to at least a related species, and could point to possible avenues for further exploration. It will also alert you to the useful characters for a particular genus, such as the photobiont, the structure of the excipulum, the ascus and the pycnidia—characters all too frequently omitted from many descriptions. Likewise it is excellent for untangling the complexities of the lecideoid genera, or navigating through the myriad of tiny gyalectoid groups. Its generic accounts in particular are outstanding, offering solid information and many leads to follow up. Much of the information it draws together is already available, for such is the very nature of *Flora*s, but all too frequently that information is dispersed in expensive or not widely available sources, or for English speakers is in German, Spanish, or other languages. It is by using the British *Flora* (with reference to reliably determined herbarium specimens) that this reviewer has discovered in Tasmania such genera as *Coppinsia, Absconditella, Japewia*, and *Thelocarpon*, and recorded for the first time several species of *Arthonia* and *Bacidia*, to name but a few examples.



These comments are made largely with reference to having used and worn out a much-loved copy of the 1992 edition, but all apply equally to the new volume. The 2009 edition has all those features and offers still more. More genera are now included—especially many pesky "little" ones such as *Ainoa, Agyrium, Bilimbia, Bryophagus*, and *Clauzadeana*, all of which occur in Australasia but remain poorly known. The British *Flora* has taken a refreshingly pragmatic approach by including those organisms that lichenologists study, as distinct from those that are strictly lichens in a biological sense (the approach followed in the Australian lichen checklist for example). Thus, nestling amongst the "true" lichens are such non-lichenized or doubtfully lichenized genera as *Chaenothecopsis, Julella*, and *Microcalicium*. However, it has not taken the next step, as has David Galloway in his *New Zealand Flora*, to include the lichenicolous fungi. The 1992 edition clung desperately to some conservative classification with respect to Parmeliaceae, but the 2009 edition has adopted the current taxonomy in that family as well as most others. It essentially follows the classification of Lumbsch and Huhndorf (*Myconet* 13, 2007), although because the arrangement of the book is alphabetical, that hardly matters.

*Flora*s inevitably contain mistakes, and this one is no exception. The editors are well aware of that, and I understand a list of *errata* is being compiled to be distributed through the BLS *Bulletin*. Sadly such mistakes are a fact of life, especially when numerous authors and several editors are working to a strict deadline. I prefer not to dwell on that unfortunate situation, and to counter it with the observation that for a book of more than 1000 pages, it is remarkably clean. With respect to technical matters, it is a well-bound, hard-backed volume, without a paper dust jacket to become torn over the years. The layout is clear but compact, which also means that it fits within a single, albeit 7 cm-thick volume.

In summary, I really like this book. Already it has found a home near my microscope and is destined to remain there indefinitely. I use it regularly as a first port-of-call for any crustose lichen I haven't seen, or to flesh out data on almost any other genus. It is not a book for the beginner. It is not a lavishly illustrated field guide, a niche well-filled by numerous other books. But for the professional, for the serious and not inexperienced person, for someone who wants to take that next step into lichenology and the challenging world of crustose lichens, this book is indispensible.

*Gintaras Kantvilas*

## 19th meeting of Australasian Lichenologists, Narooma, N.S.W., April 10–11, 2010

A small but enthusiastic group of lichenologists congregated at the Narooma Visitor Information Centre and Lighthouse Museum. Narooma is a small seaside town on the Eurobodalla coast in southern New South Wales.

The six participants in the meeting represented four Australian States and Territories, with Ray Cranfield from Western Australia, Jack Elix and Patrick McCarthy from the A.C.T., Eric and Rowena Whiting from N.S.W., and Simone Louwhoff from Victoria. Some of the "usual suspects" were unable to attend and were sorely missed. However, all participants enjoyed excellent weather, good lichen habitats, and each other's company.

**Saturday**

The first stop was at Box Cutting Rainforest Walk in Bodalla State Forest. Although only 700 metres long, the track managed to keep us occupied for two hours. It was not unlike walking with toddlers, in that both they and lichenologists "on the prowl" examine every tree, rock, bit of soil, and leaf. The track took us into a gully of grey myrtle (*Backhousia myrtifolia*) rainforest where Jack and Patrick drew our attention to some of the foliicolous species. Those included the common *Sporopodium flavescens*, abundantly fertile but also with numerous pycnidia and bright yellow campylidia, as well as *Tapellaria phyllophila*, *Mazosia phyllosema*, and about a dozen other leaf-inhabiting species. Photographs of those and many other lichen species seen during the meeting can be viewed at:

http://www.anbg.gov.au/abrs/lichenlist/Recent%20photos.html.

*Phlyctis subuncinata* forms a white crust, typically on smooth bark, has sorediate clusters, and a K+ yellow reaction due to the presence of stictic acid. Jack also showed us a species of *Heterodermia* with sorediate margins, to be described as new in the next issue of *Australasian Lichenology*.



The second stop of the day was at Mummaga Lake Walk, also in Bodalla State Forest. The track took us through wet *Eucalyptus* forest along the shore of Lake Mummaga (a coastal inlet) for approximately 2 km. Lichens seen along the walk included *Byssoloma subdiscordans* (foliicolous), *Pertusaria velata* (white with raised verrucae), *Cladonia praetermissa* (with large squamules, growing on soil alongside the track), and *Usnea rubicunda* (readily distinguishable, as the name suggests, by the reddish cortex). Saxicolous lichens included *Pertusaria xanthoplaca* (with yellowish soredia), the foliose *Relicina limbata* (with a bright yellow upper cortex), and *Lecanora margarodes* (with a thick thallus and salmon-coloured apothecia). I was pleased to see an "old friend", *Parmotrema tinctorum*, a large foliose, whitish green species with isidia and a C+ red medulla (lecanoric acid).

The day finished with the Meeting Dinner, held at Sorriso Italian Restaurant in Narooma—good food accompanied by some lovely wine (almost as many bottles as there were participants, but thankfully not all were opened…).

**Sunday**

Most of Sunday was spent near 1080 Beach at Mystery Bay, in the Eurobodalla National Park. Once again not many miles were covered, but many lichens were seen! A highlight was the recently described genus *Jackelixia*, pointed out by Jack himself.

We also saw *Buellia homophylia*, with the type from the area around Sydney, which is speckled like a *Rhizocarpon geographicum* but white/black instead of yellow/black, and K+ red (norstictic acid). *Tylothallia pahiensis* forms a thick, white, crusty thallus with raised, black, lecideine apothecia. There were the characteristic black seashore lichens (*Verrucaria* and *Lichina*), and the southern hemisphere equivalent of *Ochrolechia parella*, which will be described as a new species.

After lunch we made our goodbyes and dispersed. The 20th meeting of Australasian Lichenologists will take place in April, 2012, and some wonderfully exotic localities were mentioned for potential fieldtrips. Should you be visiting this part of the world around that time, it would be great to have you along!

*Simone Louwhoff*

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