



# Australasian Lichenology

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The foliicolous graphid *Enterographa bella* has been collected in Australia (Victoria and Tasmania) and New Zealand, usually on hosts with long-lived leaves such as the lancewood (*Pseudopanax crassifolius*) and nikau palm (*Rhopalostylis sapida*). Its photobiont is a species of *Phycopeltis*.

1 mm 

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## INFORMATION FOR AUTHORS

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Research papers submitted to *Australasian Lichenology* must be original and on some aspect of Australasian lichens or allied fungi, and they are refereed. The journal also welcomes newsworthy items on lichenologists who are studying Australasian lichens or who are visiting the region. Manuscripts can be submitted as single hard-copies to W.M. Malcolm at Box 320, Nelson, NZ (no computer disks, please), or e-mailed (nancym@clear.net.nz) as .pdf files designed to be opened with Acrobat (no IBM-generated word processor files, please). See a recent issue for a guide to text formatting and reference citations.

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*Australasian Lichenology* is the official publication of the Australasian Lichen Society, and formerly was named the *Australasian Lichenological Newsletter*. Its Editorial Board is W.M. Malcolm, J.A. Elix, G. Kantvilas, and P.M. McCarthy.

The 17th meeting of Australasian Lichenologists was held at Manjimup, Western Australia, on Saturday and Sunday, 8–9 April, 2006. Four people attended, with two from Manjimup, one from Perth, and one from Canberra. Apologies were received from Simone Louwhoff and Alan Archer. The meeting was similar to the previous gathering with no formal talks presented, and concentrated on relaxed lichen forays to several different habitats near Manjimup.

Saturday was mild and sunny, and the foray began with a leisurely drive south of Manjimup to Rooney's Bridge on the Warren River to look at a riverine area with frequent winter mists. Heading further south-east, we collected at Lake Muir in a habitat dominated by tall paper bark shrubs fringing the lake foreshore. We ate lunch at the site in the Department of Environment and Conservation's lake observation facility. In the afternoon, we proceeded to a swamp habitat further south of Lake Muir to collect in a low shrub area. At all of the sites, Jack Elix made a number of interesting collections, and his frequent observations and comments on species enthralled the local audience of Eric McCrum, Richi Robinson, and Ray Cranfield.

On Saturday night, a group dinner was held at the Kingsley Motel in Manjimup, and everybody enjoyed a very relaxed social evening.

Sunday's excursion concentrated on a granite outcrop and forest fringe to the NE of Manjimup. The day was mild with an occasional light shower that freshened the lichen flora. In the diversity of the rock flora, Jack found several species new to Western Australia. In the afternoon, we drove east to the Kingston Forest Block to look at a dry sclerophyll forest habitat with a stream and localized sump area.

The next meeting is planned for April 2008 in Gippsland, Victoria. *Ray Cranfield*

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## RECENT LITERATURE ON AUSTRALASIAN LICHENS

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- Aptroot, A (2007): New species, combinations, lectotypifications and synonyms in Australian Pyrenulaceae. *Australasian Lichenology* **60**, 34–41.
- Archer, AW; Elix, JA (2006): A new species of *Pertusaria* from Australia. *Mycotaxon* **94**, 133–135.
- Archer, AW (2007): *Graphis coenensis* A.W.Archer, a new name for *Graphis celata* (A.W.Archer) A.W.Archer. *Australasian Lichenology* **60**, 13.
- Elix, JA (2005): New species of sterile crustose lichens from Australia. *Mycotaxon* **94**, 219–224.
- Elix, JA (2007): Additional lichen records from Australia 62. *Australasian Lichenology* **60**, 6–12.
- Elix, JA (2007): Four new crustose lichens (lichenized Ascomycota) from Australia. *Australasian Lichenology* **60**, 14–19.
- Elix, JA; Archer, AW (2007): Four new species of *Pertusaria* (lichenized Ascomycota) from Australia. *Australasian Lichenology* **60**, 20–25.
- Elix, JA (2007): Notes on the taxonomy of *Lecanora aberrata* comb. nov. (lichenized Ascomycota) *Australasian Lichenology* **60**, 42–43.
- Elvebakk, A; Elix, JA (2006): *Pannaria isidiosa*, a new Australian lichen with a new chemosyndrome. *Lichenologist* **38**, 557–563.
- Fryday, AM (2007): Additional lichen records from New Zealand 46. *Australasian Lichenology* **60**, 4–5.
- Rogers, RW (2006): Soil surface lichens on a 1500 kilometer climatic gradient in subtropical eastern Australia. *Lichenologist* **38**, 565–576.
- van den Boom, PPG; Mayrhofer, H (2007): Notes on *Lecania* species from Australasia, with the description of a new variety and a new combination in *Halecania*. *Australasian Lichenology* **60**, 26–33.

**Additional Lichen Records from New Zealand 46**  
***Degelia symptychia* (Tuck.) P.M.Jørg.**

**Alan M. Fryday**  
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**Abstract:** *Degelia symptychia* is reported as new to the New Zealand mycobiota from collections made by Henry Imshaug on the Auckland Islands in 1972. It is also new to Australasia, being previously known only from southern South America.

**Introduction**

Henry A. Imshaug collected lichens from the Auckland Islands during the austral summer of 1972–73, making a total 1636 collections (Fryday & Prather 2001). Those collections are housed in the herbarium of Michigan State University (MSC), and were for a long time unavailable to other investigators. However, two recent awards to the university from the U.S. National Science Foundation (NSF) (PI: Alan Prather) have led to the reactivation of this important collection and to the digitization of the label data, which are now fully available and searchable on-line [http://www.herbarium.msu.edu/Database]. Among Dr Imshaug's collections from the Auckland Islands is a species reported here for the first time from New Zealand.

***Degelia symptychia* (Tuck.) P.M.Jørg.**, *Biblioth. Lichenol.* **88**, 233 (2004).  
Basionym: *Pannaria symptychia* Tuck., *Proc. Amer. Acad. Arts Sci.* **12**: 168. 1877. –Type: Chile, Juan Fernandez, T. Hill (Hassler Exp. 1876; holotype–FH).  
= *Parmeliella cuprea* Malme, *Ark. Bot.* **20A**: 4 (1925). –Type: Chile, Patagonia occ., Isla Desolacion, Puerto Angosto, [1896], P. Dusén 191 (holotype–S).  
= *Degelia fluvatilis* P.M.Jørg. & P.James, *Biblioth. Lichenol.* **38**: 272 (1990). –Type: Chile, X Region, Parque Nacional Vicente Perez Rosales, Petrohue, above falls, 12.x.1986, B.J. Coppins, D.J. Galloway, G. Guzmán & P.W. James 415 (holotype–SGO; isotypes BG, BM, E).

*Illustrations:* Jørgensen & James (1990; 263, as *D. fluvatilis*), Jørgensen (2004: 234).

*Degelia symptychia* is a foliose to placodioid saxicolous species forming closely adpressed thalli (Jørgensen & James 1990, Jørgensen 2004) with a distinctive fawnish to pale brown colour. Apothecia are rare, being absent from the Auckland Islands collection and only two being present on one of the four collections from Isla Desolacion (Chile) in MSC, but when present are up to 2 mm diam., black with a thick proper concolorous margin, and with ascospores 10–15 × 6–10 μm (Jørgensen & James 1990). The collection from the Auckland Islands was correctly identified by Imshaug, who annotated the packet *Parmeliella symptychia*, a name that he never published.

*Degelia symptychia* belongs to a small but distinctive group of species for which Jørgensen (2004) erected the sect. *Frigidae* P.M.Jørg. Those species are saxicolous, inhabit alpine–subantarctic regions, have a thick, paraplectenchymatous cortex, and apothecia that lack a thalline “corona”. Jørgensen (2004) mentions that *Degelia calcicola* P.M.Jørg. & Kantvilas, known only from Tasmania, could also be referable to this section, because it has a similarly thick paraplectenchymatous cortex, but he did not include it there because it is not known with apothecia and was geographically isolated from the other species in the section. However, with the expansion of the range of *D. symptychia* to Australasia, *D. calcicola* is no longer geographically isolated and its inclusion in sect. *Frigidae* is less problematic.

The Campbell Plateau–southern Chile disjunct distribution shown by *Degelia symptychia* is shared by a small number of other saxicolous species (e.g. *Fuscidea subasbolodes*

Kantvilas and *Lithographa olivacea* Fryday). Some of those species are known also from Tasmania, but have not been reported from any of the other southern subpolar islands or from South Island, New Zealand. They clearly belong to the paleoaustral element of the Austral biota, which is considered to represent primitive Gondwanan groups poorly adapted for transoceanic dispersal. Galloway (1991) presents evidence to suggest that the paleoaustral element is derived from the Cretaceous (or earlier) when the Protopacific margin of Gondwanaland, where cool-temperate conditions prevailed, was available for colonization, and where a vegetated West Antarctica could link the South America and South Pacific landmasses. The disjunct pattern between the Campbell Plateau and SW Chile is possibly especially pronounced, because evidence suggests that the Campbell Plateau is a remnant of Gondwanaland bordering the Panthalassic Ocean (the Protopacific) that split away from West Antarctica in the vicinity of Marie Byrd Land (in the late Cretaceous) some 81 Ma (Adams 1986, Korsch & Wilkman 1988). Fife (1986) suggests that the Campbell Plateau region could have provided a refuge for a cold-adapted flora forced out of West Antarctica by advancing continental ice-sheets developed in Antarctica during the Oligocene.

**SPECIMEN EXAMINED**

**Auckland Islands:** Adams Island: • End of ridge from Magnetic Station leading to central ridge, [c. 50°53'S, 166°00'E] 1600 ft [488 m], 27.xii.1972, H.A. Imshaug 56924 (MSC).

**Acknowledgements**

I gratefully acknowledge financial support from the US National Science Foundation (NSF) for Awards No. DBI-9808735 and DBI-0237-401 (Alan Prather, PI) to Michigan State University that facilitated access to Dr Imshaug's extensive collections. I also thank Prof. Dr P.M. Jørgensen (Bergen) for confirming the identity of *Degelia symptychia* and for helpful comments on the draft manuscript.

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Korsch, RJ; Wilkman, HW (1988): The geological evolution of New Zealand and the New Zealand region. In: *The Oceanic Basins and Margins, 7B: The Pacific Ocean* (A. E.M. Naim, F.G. Stehli & S. Uyeda, eds): 411–482. Plenum Press, New York.

## Additional lichen records from Australia 62

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**Abstract:** *Lepraria nigrocincta*, *Phyllopsora africana*, *P. isidiotyla*, *Punctelia novozelandica* and *Squamacidia janeirensis* var. *endococcinea* are reported as new to Australia. In addition, new state or territory records are listed for 25 other species.

### NEW RECORDS FOR AUSTRALIA

1. *Lepraria nigrocincta* Diederich, Sérusiaux & Aptroot, in Aptroot *et al.*, *Bibliotheca Lichenologica* **64**, 78 (1997).

*Lepraria nigrocincta* is characterized by a whitish, leprose sorediate thallus, a well-developed white to blackish prothallus on which whitish soredia are formed, by the presence of divaricatic acid (major), stenosporic acid (minor),  $\pm$ nordivaricatic acid,  $\pm$ sekikaic acid, and the lack of zeorin and atranorin. This species was known previously from Papua New Guinea and Africa (Aptroot *et al.* 1997). A detailed description is given in Aptroot *et al.* (1997).

#### SPECIMENS EXAMINED

*New South Wales:* • Bouddi National Park, near Mt Bouddi, 33°31'S, 151°24'E, on mosses over charred wood in *Eucalyptus* woodland, *J.A. Elix* 4680, 7.v.1978 (CANB); • Cottan-Bimbang National Park, junction of Oxley Highway and Tobins Road, c. 70 km E of Walcha, 31°22'22"S, 152°03'37"E, 1040 m, on base of *Eucalyptus* in wet *Eucalyptus* forest with tree fern understorey, *J.A. Elix* 36414, 28.iv.2005 (CANB); • Mt Hyland Nature Reserve, 20 km N of Hernani, 30°10'44"S, 152°25'19"E, 1340 m, over bryophytes on tree in temperate rainforest, *J.A. Elix* 36606, 30.iv.2005 (CANB).

2. *Phyllopsora africana* Timdal & Krog, *Mycotaxon* **77**, 64 (2001).

*Phyllopsora africana* is characterized by the squamiform thallus with marginal cylindrical isidia, a thick upper cortex, pale to medium brown apothecia with a usually darker and glabrous margin, ellipsoid ascospores and the presence of chlorophylloporin and argopsin (Timdal & Krog 2001). This species was known previously from East Africa and the Mascarene Islands. A detailed description is given in Timdal & Krog (2001).

#### SPECIMENS EXAMINED

*Queensland:* • Between Spring and Charleys Creek, 23 km WSW of Proserpine, 20°28'S, 148°22'E, 120 m, on base of tree in deep seasonal creek surrounded by *Ficus*, *Drypetes* and *Diospyros*, *J.A. Elix* 21136 & *H. Streimann*, 2.vii.1986 (CANB); • Cape Tribulation, Cape Tribulation National Park, 44 km NNE of Mossman, 16°05'S, 145°29'E, on base of treelet in narrow band of strand vegetation, *H. Streimann* 45767, 4.xii.1990 (CANB).

3. *Phyllopsora isidiotyla* (Vain.) Riddle, *Mycologia* **15**, 81 (1923).

*Phyllopsora isidiotyla* is characterized by the minute squamules (c. 0.1 mm wide), the dominant, irregular-cylindrical, finely branched isidia and the presence of atranorin and zeorin. This species was known previously from North, Central and South America (Brako 1991). A detailed description is given in Brako (1991).

#### SPECIMEN EXAMINED

*Northern Territory:* • Arnhem Land, 19 km ENE of Jabiru, 12°37'S, 133°03'E, on *Buchanania* trunk in *Calophyllum* sil- and *Buchanania arborescens*-dominated deep gorge, *H. Streimann* 42195, 18.iv.1989 (CANB).

4. *Punctelia novozelandica* Elix & J. Johnst., *Mycotaxon* **31**, 501 (1988).

This species is characterized by the terete, cylindrical to slightly flattened isidia which can become lobulate with age, the jet-black lower surface and the presence of atranorin and lecanoric acid. The morphologically similar species, *P. subflava* (Taylor) Elix & J. Johnst. has an ivory to pale tan lower surface. This species was known previously from New Zealand, and a detailed description is given in Elix & Johnston (1988).

#### SPECIMEN EXAMINED

*New South Wales:* • Dapper Nature Reserve, 37 km NE of Wellington, 10 km N of Goma turnoff, 32°18'58"S, 149°11'58"E, 520 m, on *Callitris* in mixed *Eucalyptus-Callitris* woodland, *J.A. Elix* 36093, 25.iv.2005 (CANB).

5. *Squamacidia janeirensis* var. *endococcinea* (Zahlbr.) Brako, *Mycotaxon* **35**, 10 (1989).

*Squamacidia janeirensis* var. *endococcinea* is distinguished from *S. janeirensis* var. *janeirensis* (Elix 2006a) by the straw- or scarlet-coloured pigment in the medulla, and the frequent occurrence of atranorin. It was previously known from Central and South America (Brako 1989). The Australian specimen was found to contain lobaric acid (major), secalonic acid A (submajor), norlobaric acid (minor), furfuraceic acid (minor), and an unknown pigment (minor). A detailed description is given in Brako (1989).

#### SPECIMEN EXAMINED

*Queensland:* • Kennedy North district, Conway State Forest, 18 km E of Proserpine, 20°21'S, 148°45'E, 180 m, on *Albizia* in lowland rainforest, *J.A. Elix* 20780 & *H. Streimann*, 28.vi.1986 (CANB).

### NEW STATE AND TERRITORY RECORDS

1. *Buellia aeruginosa* A. Nordin, Owe-Larsson & Elix, *Mycotaxon* **71**, 400 (1999).

This species was previously known only from the type locality in New South Wales (Nordin *et al.* 1999, McCarthy 2006).

#### SPECIMEN EXAMINED

*South Australia:* • Kangaroo Island, Stokes Bay, 35°37'S, 137°12'E, 2 m, on schist rocks along the foreshore, *J.A. Elix* 19660 & *L.H. Elix*, 27.x.1985 (CANB).

2. *Cladonia angustata* Nyl., *Ann. Sci. Nat., Bot.*, sér. 4, **11**, 236 (1859).

This species was previously known from Hawai'i, Japan, New Zealand, Queensland, Western Australia and Tasmania (Archer 1992, McCarthy 2006).

#### SPECIMEN EXAMINED

*New South Wales:* • Bomera, 7 km W of Premer, 31°27'19"S, 149°50'04"E, 417 m, on base of charred stump in mixed *Eucalyptus-Callitris* woodland, *J.A. Elix* 36206, 26.iv.2005 (CANB).

3. *Cladonia enantia* Nyl., in Zwackh-Holzhausen, *Rev. Cladonia*: 1 (1888).

This species was previously known from New Zealand, Tasmania and the Australian Capital Territory (Archer 1992, McCarthy 2006).

## SPECIMEN EXAMINED

*Western Australia*: • Drummonds Reserve, Bibby Road, Badgingarra National Park, 30°29'15"S, 115°26'07"E, 200 m, on base of *Macrozamia* in open *Eucalyptus* woodland with *Xanthorrhoea* and *Calothamnus*, *J.A. Elix* 28939, 6.v.2004 (CANB).

4. *Crocynia pyxinoidea* Nyl., *Sert. Lich. Trop. Labuan Singapore*: 37 (1891).

In Australia, this pantropical species was previously known from Queensland (McCarthy 2006).

## SPECIMEN EXAMINED

*Northern Territory*: • Palmerston, c. 20 km SE of Darwin, along the Elizabeth River, 12°26'S, 130°40'E, 2 m, on *Rhizophora stylosa* in mangroves, *K. & A. Kalb* 30744, 7.ix.1992 (CANB) (det. K. Kalb).

5. *Cryptothecia scripta* Thor, *Symb. Bot. Upsal.* 32(1), 285 (1997).

This species was previously known from Papua New Guinea, Queensland and the Northern Territory (Thor 1997).

## SPECIMEN EXAMINED

*New South Wales*: • North Coast, Tooloom Nature Reserve, Plantation Road, 24 km NNE of Kyogle, 28°30'S, 152°23'E, 660 m, on semi-shaded treelet stem in temperate forest, *H. Streimann* 60990, 23.iv.1998 (B, CANB).

6. *Dimelaena australiensis* H.Mayrhofer & Sheard, in Sheard & Mayrhofer, *Bryologist* 87, 247 (1984).

In Australia this species is known from all states and the Northern Territory (McCarthy 2006).

## SPECIMEN EXAMINED

*Australian Capital Territory*: • Molonglo Gorge, 5 km N of Queanbeyan, 35°19'46"S, 149°15'13"E, 700 m, on metamorphosed, NE-exposed sandstone, *M. Lambauer* 0095 & *J. Elix*, 13.x.2003 (CANB, GZU) (det. M. Lambauer & H. Mayrhofer).

7. *Heterodermia dissecta* (Kurok.) D.D.Awasthi, *Geophytology* 3, 113 (1973).

Although this species has been reported from Australia previously, no precise locality was specified (McCarthy 2006). This species is also known from India, Japan and Central America (Kurokawa 1962).

## SPECIMEN EXAMINED

*New South Wales*: • Mt Warning National Park, track to summit, 28°23'S, 153°16'E, 1090 m, on mossy rocks in rainforest, *J.A. Elix* 2489, 19.viii.1976 (CANB).

8. *Hyperphyscia adglutinata* (Flörke) H.Mayrhofer & Poelt, *Herzogia* 5, 62 (1979).

In Australia this cosmopolitan species has been reported from Northern Territory, Queensland, New South Wales, Australian Capital Territory, Victoria and Tasmania (McCarthy 2006).

## SPECIMEN EXAMINED

*Western Australia*: • 3 km NNE of Bullen Well, Little Sandy Desert, 24°50'40"S, 120°38'26"E, on *Melaleuca* in open grassland with shrubland fringe, *R.J. Cranfield* 18278, 5.ix.2002 (PERTH).

9. *Hyperphyscia pruinoso* Moberg, *Nordic J. Bot.* 7, 723 (1987).

This species has been reported from Queensland and Africa (Moberg 1987, McCarthy 2006).

## SPECIMEN EXAMINED

*Australian Capital Territory*: • Cotter Caves, 20 km W of Canberra, 35°21'S, 148°56'E, 580 m, on limestone in open *Eucalyptus* woodland, *J.A. Elix* 9084, 23.vi.1981 (CANB) (det. R. Moberg).

10. *Hyperphyscia syncolla* (Tuck. ex Nyl.) Kalb, *Lich. Neotrop. Exsicc.* 6, [230] (1983).

In Australia this species has been reported from the Northern Territory, Queensland, New South Wales and South Australia (McCarthy 2006).

## SPECIMEN EXAMINED

*Australian Capital Territory*: • Aranda Oval, Aranda, 5 km W of Canberra, 35°16'S, 149°05'E, 640 m, on trunk of *Ulmus* in cultivated park, *J.A. Elix* 36483, 14.v.2006 (CANB).

11. *Hypocnomyce foveata* Timdal, *Nordic J. Bot.* 4, 98 (1984).

This endemic Australian species has been reported from Queensland, New South Wales, Australian Capital Territory, Victoria, Tasmania and South Australia (McCarthy 2006).

## SPECIMENS EXAMINED

*Western Australia*: • Drummonds Reserve, Bibby Road, Badgingarra National Park, 30°29'15"S, 115°26'07"E, 200 m, on charred wood in open *Eucalyptus* woodland with *Xanthorrhoea* and *Calothamnus*, *J.A. Elix* 28945, 6.v.2004 (CANB, PERTH); • Koodi-woodle Range, near Bibberabbie Hill, 19 km NE along Scenic Drive off Rowes Road, 30°48'14"S, 115°48'34"E, 200 m, on dead wood in remnant *Eucalyptus ficifolia* woodland with *Macrozamia* and *Xanthorrhoea* along roadside, *J.A. Elix* 28949, 6.v.2004 (CANB, PERTH).

12. *Lepraria coriensis* (Hue) Sipman, *Herzogia* 17, 28 (2004).

This species was reported previously from Korea, India, China (Hong Kong, Taiwan), and in Australia from Northern Territory, New South Wales, South Australia and Western Australia (Laundon 2003, Sipman 2004, Elix 2006b).

## SPECIMENS EXAMINED

*Tasmania*: • Bluff River, 42°35'S, 147°42'E, 60 m, on soil on exposed dolerite, *G.C. Bratt & M.H. Bratt* 70/114, 21.ii.1970 (HO); • Grasstree Hill, 8 km from Risdon, 42°47'S, 147°21'E, on sandstone and soil, *G.C. Bratt & G. Degelius* 70/401, 15.v.1970 (HO); • Cascades, South Hobart, 42°54'S, 147°17'E, 130 m, on unstable clay bank in garden, *G. Kantvilas* 625/02, 26.xii.2002 (HO).

13. *Lepraria eburnea* Laundon, *Lichenologist* 24, 332 (1992).

*Lepraria eburnea* was previously known from Europe, North America (Orange 1997) and in Australia from Victoria (Elix 2006a).

## SPECIMEN EXAMINED

*New South Wales*: • Mt Hyland Nature Reserve, 20 km N of Hernani, 30°10'44"S, 152°25'19"E, 1340 m, over mosses on base of rainforest tree, *J.A. Elix* 36577, 30.iv.2005 (CANB).

14. *Melanelia piliferella* (Essl.) Essl., *Mycotaxon* 7, 48 (1978).

This endemic Australian species was known previously from New South Wales, Australian Capital Territory, Victoria and Tasmania (Elix 1994, McCarthy 2006).

## SPECIMEN EXAMINED

*Western Australia*: • Darling Range, Walyunga National Park, 40 km by road NE of

Perth, 31°43'55"S, 116°04'29"E, 280 m, on dead *Dryandra* in *Eucalyptus*, *Melaleuca*, *Dryandra* beside river, *J.A. Elix* 36032, 7.v.2004 (PERTH).

15. *Pertusaria conioophora* Elix & A.W.Archer, in Elix *et al.*, *Mycotaxon* **64**, 20 (1997). This endemic Australian species was reported previously from Victoria (Archer 2004, McCarthy 2006). Contrary to previous reports, it contains perlatolic acid (major),  $\pm$ superlatolic acid (trace),  $\pm$ stenosporic acid (trace). The chemistry was confirmed by re-examining the holotype specimen.

#### SPECIMEN EXAMINED

*New South Wales*: • Cottan-Bimbang National Park, Myrtle Gully Road, Cells River Picnic Ground, c. 75 km E of Walcha, 31°23'25"S, 152°01'58"E, 695 m, on fallen branch in wet *Eucalyptus* forest, *J.A. Elix* 36393, 28.iv.2005 (CANB).

16. *Pertusaria georgeana* A.W.Archer & Elix, in Archer, *Biblioth. Lichenol.* **69**, 68 (1997). This Australian species was reported previously from Queensland (Archer 2004, McCarthy 2006). The type material contains 4,5-dichlorolichexanthone (minor) and 2-*O*-methylperlatolic acid (major), but some specimens have been found to contain additional 2,4-di-*O*-methylolivetic acid as a minor or major constituent.

#### SPECIMENS EXAMINED

*Australian Capital Territory*: • Kowen Forest, 16 km E of Canberra, 35°15'S, 149°16'E, 700 m, on trunk of *Eucalyptus* in open *Eucalyptus* woodland, *J.A. Elix* 33213, 16.viii.1992 (CANB).

*New South Wales*: • Bomera, 7 km W of Premer, 31°27'19"S, 149°50'04"E, 417 m, on *Callitris* in mixed *Callitris-Eucalyptus* woodland, *J.A. Elix* 36198, 26.iv.2005 (CANB); • Goonoo State Forest, Modriguy Forest Road, 5 km E of Modriguy, 23 km NNE of Dubbo, 32°04'16"S, 148°42'53"E, 330 m, on dead wood or at the base of *Eucalyptus* in *Eucalyptus-Callitris* woodland, *J.A. Elix* 36750, 36751, 36752, 36763, 36764, 11.x.2005 (CANB).

17. *Pertusaria remota* A.W.Archer, *Mycotaxon* **41**: 238 (1991). This species was reported previously from the Philippines, Northern Territory and Western Australia (Archer 2004, McCarthy 2006).

#### SPECIMEN EXAMINED

*New South Wales*: • Dangars Gorge, Oxley Wild Rivers National Park, 18.5 km SSE of Armidale, 30°40'27"S, 151°43'35"E, 945 m, on schist in *Eucalyptus-Casuarina* woodland along stream with exposed schist rocks, *J.A. Elix* 36457, 29.iv.2005 (CANB).

18. *Pertusaria rigida* Müll.Arg., *J. Linn. Soc., Bot.* **29**, 221 (1893). This species was reported previously from India, New South Wales and Queensland (Archer 2004, McCarthy 2006).

#### SPECIMEN EXAMINED

*Western Australia*: • Kalbarri National Park, along the road to The Loop and Z-Bend, 24 km NE of Kalbarri township, 27°37'13"S, 114°23'13"E, 210 m, on *Melaleuca* in low heath with emergent *Melaleuca*, *Eucalyptus* and *Acacia*, *J.A. Elix* 33651, 2.v.2004 (CANB) (det. A.W. Archer).

19. *Phyllopsora buettneri* (Müll.Arg.) Zahlbr., *Cat. Lich. Univ.* **4**, 396 (1926). This tropical species was known previously from Africa, Papua New Guinea, the Philippines, Tahiti and Queensland (Brako 1991). In Australia, it contains pannarin and zeorin or dechloropannarin and zeorin.

#### SPECIMEN EXAMINED

*New South Wales*: • Bruxner Park, 9 km NW of Coffs Harbour, 30°15'S, 153°06'E, 180 m, on tree trunk in rainforest, *J.A. Elix* 3500, 1.vii.1977 (CANB).

20. *Phyllopsora foliata* (Stirt.) Zahlbr., *Cat. Lich. Univ.* **4**, 397 (1926) var. *foliata*. This endemic species was known previously from Queensland (McCarthy 2006).

#### SPECIMEN EXAMINED

*New South Wales*: • Robertson, 34°36'S, 150°34'E, 700 m, on tree trunk in remnant temperate forest reserve, *H. Streimann* 47175, 18.iii.1991 (CANB).

21. *Phyllopsora rappiana* (Brako) Elix, *Australas. Lichenol.* **58**, 6 (2006). This species was known previously from North, Central and South America (Brako 1991), Queensland and the Northern Territory (Elix 2006a).

#### SPECIMEN EXAMINED

*New South Wales*: • Buckenbowra River Estuary, 7.5 km W of Batemans Bay, 35°42'S, 150°06'E, 1 m, on base of tree in rainforest along tidal creek, *J.A. Elix* 23341, 29.xi.1989 (CANB).

22. *Psilolechia lucida* (Ach.) M.Choisy, *Bull. Mens. Soc. Linn. Soc. Bot. Lyon* **18**, 142 (1949). In Australia, this cosmopolitan species was previously known from Queensland, New South Wales, Australian Capital Territory, Victoria and Tasmania (McCarthy 2006).

#### SPECIMEN EXAMINED

*Western Australia*: • Trail to Toolbrunup Peak, Stirling Ranges, Stirling Ranges National Park, 40 km SW of Borden, 34°23'S, 118°03'E, 740 m, on volcanic rocks in dry sclerophyll forest with pockets of denser shrub vegetation, *J.A. Elix* 41494, 17.ix.1994 (CANB).

23. *Pyrrhospora arandensis* Elix, *Australas. Lichenol.* **55**, 26 (2004). This species was known previously from the Australian Capital Territory (Elix 2004, McCarthy 2006).

#### SPECIMENS EXAMINED

*New South Wales*: • Central-west slopes, Weddin Mountains National Park, 15 km SW of Grenfell, 33°54'S, 148°01'E, 430 m, on base of *Eucalyptus* in *Callitris-Eucalyptus* woodland, *J.A. Elix* 25086, 31.v.1990 (CANB); • Goonoo State Forest, Modriguy Forest Road, 5 km E of Modriguy, 23 km NNE of Dubbo, 32°04'16"S, 148°42'53"E, 330 m, on dead wood in *Eucalyptus-Callitris* woodland, *J.A. Elix* 36766, 11.x.2005 (CANB). *Western Australia*: • Darling Range, John Forrest National Park, 25 km E of Perth, 31°53'19"S, 116°05'14"E, 250 m, on dead wood in *Eucalyptus* woodland, *J.A. Elix* 36044, 8.v.2004 (PERTH).

24. *Tephromela bunyana* Kalb & Elix, in Kalb, *Biblioth. Lichenol.* **88**, 319 (2004). This species was known previously from Queensland (Kalb 2004, McCarthy 2006).

#### SPECIMEN EXAMINED

*New South Wales*: • Bruxner Park, 9 km NW of Coffs Harbour, 30°15'S, 153°06'E, 180 m, on branch of rainforest tree, *J.A. Elix* 3497, 1.vii.1977 (CANB).

25. *Trapelia involuta* (Taylor) Hertel, *Herzogia* **2**, 508 (1973). In Australia this cosmopolitan species was known previously from New South Wales (McCarthy 2006). It has been found to differ chemically from the more common *T.*

*coarctata* (Sm.) M.Choisy by containing 5-O-methylhiassic acid (major), gyrophoric acid (minor), lecanoric acid (minor) and 2-O-methylperlatolic acid (minor or trace).

#### SPECIMENS EXAMINED

*Australian Capital Territory*: • Along the Molonglo River, 0.5 km W of Coppins Crossing, 8.5 km W of Canberra, 35°17'14"S, 149°01'58"E, 430 m, on moist rock ledge on granitic rock outcrops in pasture, *J.A. Elix* 36635, 36636, 24.vi.2006 (CANB).

*Victoria*: • Lake Nillahcootie, 32 km S of Benalla, 36°51'20"S, 146°00'26"E, 280 m, on consolidated soil along foreshore, *J.A. Elix* 36510, 5.v.2006 (CANB).

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#### *Graphis coenensis* A.W.Archer, a new name for *Graphis celata* (A.W.Archer) A.W.Archer

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**Abstract:** The new name *Graphis coenensis* A.W.Archer is proposed for the now invalid name *Graphis celata* (A.W.Archer) A.W.Archer.

In 2001, a new saxicolous species in the Australian Graphidaceae was published as *Graphina celata* A.W.Archer (Archer 2001), the epithet referring to the somewhat concealed lirellae. As a result of the recent rearrangement of the Graphidaceae (Staiger 2002), the species was transferred to the genus *Graphis* as *Graphis celata* (A.W.Archer) A.W.Archer (Archer 2005), thus inadvertently creating a later homonym of the earlier *Graphis celata* Stirton (Stirton 1879), a corticolous species described from India. In order to validate the Australian species, the name *Graphis coenensis* is proposed.

**Graphis coenensis** A.W.Archer, nom. nov.

Type: AUSTRALIA, Queensland:McIlwraith Range, 27 km NE of Coen, *H. Streimann* 56807, 17.x.1995, holotype—CANB.

= *Graphina celata* A.W.Archer, *Mycotaxon* **77**, 166 (2001).

= *Graphis celata* (A.W.Archer) A.W.Archer, *Telopea* **11**, 72 (2005), *nom. inval.* (*non Graphis celata* Stirton 1879).

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## Four new crustose lichens (lichenized Ascomycota) from Australia

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**Abstract:** *Brigantiaea lordhowensis* Elix, *Cresponea litoralis* Elix, *Cryptothecia australasica* Elix and *Hafellia microspora* Pusswald are described as new to science.

The examination of various collections of crustose lichens in preparation for a further lichen volume of the *Flora of Australia* has led to the identification of several undescribed species. Four such new taxa are described in the present paper: *Brigantiaea lordhowensis* Elix, *Cresponea litoralis* Elix, *Cryptothecia australasica* Elix and *Hafellia microspora* Pusswald. 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.

***Brigantiaea lordhowensis*** Elix, sp. nov.

Fig. 1

Sicut *Brigantiaea leucoxantha* sed ascosporis majoribus et 7-choroemodinum continente differt.

Type: Australia. New South Wales, Lord Howe Island, Goat House Cave at base of Mt Lidgbird escarpment, 31°33'50"S, 159°05'15"E, 420 m, on twigs in moist subtropical rainforest with *Dracophyllum* and *Cyathea*, *J.A. Elix* 42185, 7.ii.1995 (holotype CANB).

Thallus crustose, corticate, superficial, smooth at first then markedly verrucose, white to whitish grey, thin, spreading to 7 cm wide; soralia and lobules absent. Photobiont a unicellular green alga. Apothecia common and dispersed over the thallus, sessile, constricted at the base, 0.4–2.0 mm wide; disc vivid orange, ±flat, often with yellow-orange pruina; margin prominent, rather fragile, vivid orange; exciple biatorine, penetrated by orange crystals, medullary layer colourless or indistinct. Epithymenium orange to orange-brown, with orange-red to brownish crystals, K+ carmine (in section); hymenium colourless, clear, 100–150 μm high; hypothecium colourless to pale brown, 50–100 μm wide. Asci broadly clavate, of the *Brigantiaea*-type, 95–120 × 35–55 μm. Paraphyses thin, septate, rarely branched, 1.5–2 μm wide, not or only slightly thickened at the apex. Ascospores 1 per ascus, muriform, colourless, ellipsoid to oblong, large, 90–115 × 30–50 μm, surrounding spore wall thicker than septa, without a prominent endospore. Pycnidia not seen.

**Chemistry:** Thallus K+ yellow, C–, P–; apothecia K+ reddish purple; apothecial sections, exciple and epithymenium K+ carmine. Thallus containing atranorin (major), zeorin (major), parvifoliellin (minor), ±traces of other triterpenes; apothecia containing 7-chloroemodin (minor).

**Etymology.** The specific epithet is derived from the Latin *-ensis* (place of origin) and the type locality on Lord Howe Island.

**Notes.** Morphologically, *B. lordhowensis* closely resembles *B. leucoxantha* (Spreng.) R. Sant. & Hafellner in that both species have initially smooth then markedly verrucose, white to whitish grey, corticate thalli which lack lobules and are characterized by vivid orange, biatorine apothecia, with orange anthraquinone crystals deeply penetrating the exciple such that apothecia damaged by grazing or erosion show an orange interior (Hafellner 1997). However, *B. lordhowensis* can be distinguished by its larger ascospores (90–115 × 30–50 μm cf. 65–105 × 22–40 μm) and by its chemistry. Thus, *B.*

*leucoxantha* lacks parvifoliellin and contains parietin as the major apothecial anthraquinone rather than 7-chloroemodin.

At present this new species is known only from the type locality and surrounding areas, where it is common on trees and rocks in subtropical rainforest. Common associated species include *Dirinaria applanata* (Fée) D.D.Awasthi, *Lecanora helva* Stizenb., *L. melacarpella* Müll.Arg., *Parmotrema reticulatum* (Taylor) M.Choisy, *Pertusaria lordhowensis* A.W.Archer & Elix, *P. montpittensis* A.W.Archer, *Pyxine cocoes* (Sw.) Nyl., *Ramalina pacifica* Asahina and *R. peruviana* Ach.

### ADDITIONAL SPECIMENS EXAMINED

*New South Wales:* • Lord Howe Island, type locality, on base of forest tree, *J.A. Elix* 42214, 7.ii.1995 (CANB); • along track to Goat House Cave, 31°33'48"S, 159°05'11"E, 380 m, on basalt in moist subtropical forest with *Dracophyllum* and *Cyathea* at base of Mt Lidgbird escarpment, *J.A. Elix* 42107, 7.ii.1995 (CANB); • along trail to Goat House Cave, NW face of Mt Lidgbird, 400 m, on bark of *Linoseira*, *W.A. Weber s.n.*, 19.viii.1981 (Lichenes Exsiccati no. 615, CANB).

***Cresponea litoralis*** Elix, sp. nov.

Fig. 2

Sicut *Cresponea macrocarpoides* sed apotheciis et ascosporis tenuioribus differt.

Type: Australia. Queensland, Forrest Beach, 18 km ESE of Ingham, 18°43'02"S, 146°17'50"E, 2 m, on dead stump in remnant strand vegetation with *Pandanus* and *Allocasuarina*, 23.vii.2006, *J.A. Elix* 36792 (holotype BRI; isotypes CANB, HO).

Thallus crustose, whitish, continuous, thin, effuse, poorly developed, mostly endophloedal, forming extensive, irregularly spreading patches to 10 cm wide, not delimited, hypothalline line not apparent. Photobiont cells solitary or a few aggregated, 10–15 μm wide. Apothecia 0.1–0.5 mm wide, sessile, roundish, ±constricted at the base; margin lecidine, ±undulating, prominent, raised above the level of the disc, smooth to dentate; disc plane or slightly concave, black, sparsely pale yellow-green-pruinose; exciple persistent or receding with age, 75–110 μm thick, black, epruinose; hymenium colourless, 75–100 μm thick, I+ reddish; hypothecium pale brown, 25–40 μm thick, I+ reddish; paraphysoids septate, simple or sparsely branched, with little or no anastomosing, 1.6–2.0 μm wide, apical cells thickened to 3–4 μm wide, with a distinct dark brown cap which is formed in the outer part of the cell wall. Asci 8-spored, clavate, 80–100 × 10–12 μm. Ascospores very narrowly fusiform, 6–13-septate, 35–60 × 2.0–2.5 μm; cell walls not thickened at septa. Pycnidia not seen.

**Chemistry:** Thallus K– C–, KC–, PD–, no lichen substances detected; pruina containing an unknown pigment related to simonyellin.

**Etymology.** The specific epithet is derived from the Latin *litoralis* (pertaining to the sea-shore) in reference to the habitat of this species.

**Notes.** *Cresponea litoralis* is characterized by the whitish, thin, effuse, poorly developed, mostly endophloedal thallus, the abundant, black roundish apothecia, and the very narrow, 6–13-septate, fusiform ascospores. The thallus of this new species closely resembles that of *C. macrocarpoides* (Zahlbr.) Egea & Torrente, but the apothecia of the latter are larger (0.2–1.0 mm cf. 0.1–0.5 mm wide) and the ascospores significantly broader (3.5–5.0 μm cf. 2.0–2.5 μm wide) (Egea & Torrente 1993). Moreover, the pruina present on young apothecia of *C. macrocarpoides* is ochre-coloured but mature apothecia are epruinose, whereas the apothecia of *C. litoralis* are persistently but sparsely yellow-green-pruinose. Furthermore, the habitat and distribution of the two species is very different—*C. macrocarpoides* is known only from the mountains of Taiwan.

At present this new species is known only from the type locality, where it occurred on dead wood in depauperate strand vegetation. Common associated species included *Dirinaria confluens* (Fr.) D.D.Awasthi, *Hafellia bahiana* (Malme) Sheard, *Lecanora helva* Stizenb., *Pyxine australiensis* Kalb, *P. cocoes* (Sw.) Nyl. and *Ramalina confirmata* (Nyl.) Elix.

**Cryptothecia australasica** Elix, sp. nov.

Fig. 3

Sicut *Cryptothecia philippinum* sed acidum psoromicum continente differt.

Type: Australia. Queensland, Mossman-Mount Molloy road, 1 km S of Lions Lookout, 20 km N of Mount Molloy township, 16°32'05"S, 145°22'59"E, 390 m, on leaves of roadside treelet at margin of rainforest, 4.viii.2006, J.A. Elix 36920 (holotype BRI; isotypes CANB).

Thallus crustose, corticolous, adnate to the substratum, ecorticate, pale grey to grey or greenish grey, with scattered paler slightly raised areas, continuous, thin (to 0.3 mm thick), effuse, forming irregularly spreading patches to 2 cm wide; prothallus very thin, byssoid, comprising interwoven hyphae, whitish or becoming red-orange pigmented, with red crystals forming on the surface. Photobiont a species of *Trentepohlia*; cells rounded to oblong, 7–12 × 5–8 µm, cells solitary or a few cells aggregated. Medulla white. Isidia present, cylindrical or rarely subglobose, unbranched or sparsely branched, 0.1–1.0 × 0.05–0.1 mm. Ascomata and pycnidia not seen.

**Chemistry:** Thallus K–, C–, KC–, P+ yellow; containing psoromic acid (major), 2'-O-demethylpsoromic acid (trace), subpsoromic acid (trace), and an unknown quinone (trace).

**Etymology.** The specific epithet is derived from the distribution of this species.

**Notes.** *Cryptothecia australasica* is characterized by the loosely attached, grey to greenish-grey thallus that reacts P+ yellow (psoromic acid) and by the presence of cylindrical isidia. The morphology of this new species closely resembles that of *C. philippinum* (Vain.) G.Thor, but the latter reacts C+ red because of the presence of gyrophoric acid. Further, *C. philippinum* lacks pigmentation in the prothallus, and is known only from corticolous substrata (Thor 1997) whereas *C. australasica* is both corticolous and foliicolous. *Cryptothecia rubrotinctoides* G.Thor is another isidiate species that develops an orange-red pigmented prothallus, but the latter differs in being obligately corticolous and in containing ovoic acid (major), gyrophoric acid (minor), lecanoric acid (trace) and an unknown quinone (trace).

At present *C. australasica* is known from tropical and subtropical rainforests. Corticolous species associated with the tropical collections included *Bulbothrix tabacina* (Mont. & Bosch) Hale, *Haematommata sorediatum* R.W.Rogers, *Laurera meristospora* (Mont. & Bosch) Zahlbr., *Parmotrema gardneri* (C.W.Dodge) Hale, *Pertusaria scaberula* A.W.Archer, *Pyxine copelandii* Vain. and *P. fallax* (Zahlbr.) Kalb. Common associates of the corticolous collection included *Cryptothecia bartlettii* G.Thor, *C. scripta* G.Thor, *Flavoparmelia euplecta* (Stirton) Hale, *Lepraria atrotomentosa* Orange & Wolsey, *L. cori-ensis* (Hue) Sipman, *Leprocaulon australasicum* Elix, *Parmotrema tinctorum* (Nyl.) Hale and *Pertusaria cyathicola* Elix.

ADDITIONAL SPECIMENS EXAMINED

**Queensland:** • Type locality, on the leaves of roadside treelets at margin of rainforest, 4.viii.2006, J.A. Elix 36912, 36916, 36921 (CANB).

**Norfolk Island:** • Norfolk Island National Park, West Palm Glen Track, 29°01'06"S, 167°56'33"E, 140 m, on dead *Cyathia* stump in subtropical rainforest on moderate slope, 16.vi.1992, J.A. Elix 29071 (CANB).

**Hafellia microspora** Pusswald, sp. nov.

Fig. 4

Thallus corticolous, crustosus, tenuis, albidus vel albido-cinereus, continue membranaceus ad fissuratus, K–, plus minusve brialmontinum 1 et 2 continente. Apothecia 0.1–0.4 mm in diametro, lecideina, atra, superficialia, sessilia, plerumque dispersa; disco plano margine tenui distincto, demum convexo magine indistincto. Excipulum obscure brunneum. Epithemium obscure brunneum, 10–20 µm altum, K–. Hymenium non inspersum, ad 100 µm altum. Hypothecium brunneum, ad 80 µm altum. Paraphyses ramosae, 1–2 µm latae, extremis clavatis, 3–4 µm latis, apicibus brunneis. Asci ascosporis octonis vel paucioribus. Ascospores ut in *Hafellia demutans*, tumoribus septalibus tenuissimis et tumoribus apicalibus, 12–17 × 5–7 µm, anguste ellipsoidae, brunneae, bicellulares, rarissime quadricellulares, saepe toro instructae, superficie laevi. Conidiogona obpyriformia, immersa, brunnea, ad 50 µm diam. Conidia bacilliformia, 5 × 1 µm.

Type: Australia. Western Australia, Tuttaning Reserve, Pingelly, J. Kruiskamp s.n. (holotype MEL).

Thallus crustose, continuous, thin, smooth to indistinctly areolate, with a roughened, occasionally warty surface, off-white to pale grey or pale green. Prothallus not apparent. Apothecia lecideine, sessile, 0.1–0.4 mm wide; disc black, flat to weakly convex; margin concolorous with the disc, usually persistent, becoming excluded in convex apothecia; exciple of radiating hyphae, rim more distinctly pigmented than the inner part; epithemium brown, 10–20 µm thick, K–; hymenium colourless, without oil droplets, 70–100 µm thick; hypothecium brown, c. 80 µm thick; paraphyses 1–2 µm thick, occasionally branched, septate, with clavate apices, 3–4 µm thick, brown. Asci 8-spored or sometimes fewer, broadly clavate. Ascospores brown, *Callispora*-type, with moderately strong apical wall thickenings but narrow septal wall thickenings, 1-septate (rarely 2-septate when senescent), narrowly ellipsoid, 12–17 × 5–7 µm; outer surface smooth. Pycnidia obpyriform, immersed, brown, to 50 µm diam. Conidia bacilliform, 5 × 1 µm.

**Chemistry:** Thallus K–, C–, KC–, PD–; containing ±brialmontin 1 (minor), ±brialmontin 2 (minor).

**Etymology.** The specific epithet refers to very small ascospores (Greek, *micro* = little or small).

**Notes.** The growth habit, apothecial anatomy and ascospores of this species closely resemble those of *Hafellia reagens* Pusswald, but *H. reagens* can readily be distinguished by the distinctly yellowish upper surface (pale grey, pale green or off-white in *H. microspora*), the K+ violet reaction of the epithemium (K– in *H. microspora*) and by the chemistry. Whereas *H. reagens* contains 4,5-dichlorolichexanthone, *H. microspora* contains only accessory brialmontins 1 and 2. Pusswald (1995) and Marbach (2000) reported *Hafellia reagens* to contain atranorin and diploicin, but that is erroneous because re-analysis of the holotype confirmed that 4,5-dichlorolichexanthone was present. In the field, this species might be mistaken for a *Lecidella* species, but is readily distinguished by the brown, 1-septate *Callispora*-type ascospores.

At present this species is known from a number of localities in temperate and subarid areas of southern Australia, where it is corticolous on *Melaleuca* and *Acacia*. Common associated species include *Flavoparmelia rutidota* (Hook.f. & Taylor) Hale, *Hafellia dissia* (Stirt.) H.Mayrhofer & Sheard, *H. reagens* Pusswald, *Pertusaria gibberosa* Müll.Arg., *P. trimera* (Müll.Arg.) A.W.Archer, *Physcia jackii* Moberg, *Punctelia subalbicans* (Stirt.) D.J.Galloway & Elix, *Ramalina inflata* subsp. *australis* G.N.Stevens, *Ramboldia brunneo-carpa* Kantvilas & Elix and *Usnea scabrida* Taylor.

#### ADDITIONAL SPECIMENS EXAMINED

*Victoria*: • Dimboola, Murray Mallee, 36°27'S, 142°01'E, *F. Reader*, 18.vii.1896 (NSW); • Camperdown, 38°13'S, 143°09'E, on trees, *F.R.M. Wilson*, i.1885 (NSW); • Melbourne, Oakleigh, 37°55'S, 145°07'E, on trees, *F.R.M. Wilson*, 18.iii.1886 (NSW).

*Tasmania*: • summit of MacGregor Peak, 42°59'S, 147°57'E, 590 m, on *Hakea lissosprema* in scrubby woodland, *G. Kantvilas* 473/02, 15.ix.2002 (NSW).

*South Australia*: • Dark Island Heath near Kieth, on mallee broombush twigs, *R.L. Specht*, 30.xii.1982 (BRI).

*Western Australia*: • Wotto Nature Reserve, First North Road, 21 km by road NE of Eneabba, 29°42'29"S, 115°24'37"E, 275 m, on *Melaleuca* in *Eucalyptus* woodland with *Melaleuca* and laterite rocks, *J.A. Elix* 28873, 5.v.2004 (CANB, PERTH).

#### Acknowledgements

I thank Neal McCracken of ANU Photography for preparing the photographs, and Dr Christine Cargill and Ms Judith Curnow, curators at the CANB cryptogamic herbarium, for their assistance. I also thank Dr W. Pusswald and Prof. Dr. H. Mayrhofer (Graz) for generously supplying me with the results of their unpublished work on the Australian species of *Hafellia* and for permitting me to publish *H. microspora* in this paper.

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1. *Brigantiaea lordhowensis* (holo–CANB). 2. *Cresponea litoralis* (iso–CANB).



3. *Cryptothecia australasica* (iso–CANB). 4. *Hafellia microspora* (Elix 28873–CANB).

## Four new species of *Pertusaria* (lichenized Ascomycota) from Australasia

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**Abstract:** *Pertusaria alectoronica* Elix & A.W.Archer, *P. coniophorella* Elix & A.W.Archer, *P. dennistonensis* Elix & A.W.Archer and *P. neutriconica* Elix & A.W.Archer are described as new to science.

The Australasian region has a rich and diverse flora belonging to the lichen genus *Pertusaria* DC. (Archer 1997, 2004; Archer & Elix 1993, 1994, 1998a, b; Archer *et al.* 1995; Elix *et al.* 1997; Galloway 1985; McCarthy 2006). The species are prominent on the bark of trees and shrubs, dead wood, non-calcareous rock surfaces, and more rarely on soil from alpine to temperate and tropical areas. The paucity of collections from some remote or little-studied habitats in Australasia has meant that a number of species remain to be described. This report presents descriptions of four new species from the region. 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 by comparison with authentic samples.

***Pertusaria alectoronica*** Elix & A.W.Archer, sp. nov.

Fig. 1

Thallus ut in *Pertusaria muricata* sed acidum alectoronicum et 4,5-dichlorolichexanthonicum continente differt.

**Etymology:** The specific epithet refers to the secondary metabolite alectoronic acid present in this species.

**Type: Australia:** New South Wales: Goonoo State Forest, Modriguy Forest Road, 5 km E of Modriguy, 23 km NNE of Dubbo, 32°04'16"S, 148°42'53"E, 330 m, on dead wood in *Eucalyptus-Callitris* woodland, J.A. Elix 36767, 11.x.2005; holo: NSW; iso: CANB.

Thallus pale grey-green to grey-white, thick, cracked-areolate, lignicolous, surface verrucose, dull to slightly shiny, lacking soredia, isidiate. Isidia numerous, simple and cylindrical at first, ultimately becoming densely coralloid-branched, dark grey-green, the apices ±swollen and becoming dark brown to black-tipped, 0.5–2.0 mm tall, 0.1–0.2 mm diam. Apothecia and pycnidia not seen.

**Chemistry:** Cortex K–; medulla K–, C–, KC+ red, P–; containing alectoronic acid (major), 4,5-dichlorolichexanthone (minor).

*Pertusaria alectoronica* is characterized by the sterile, isidiate thallus and the unique thalline chemistry. Alectoronic acid, the major metabolite present, is very rare in the genus *Pertusaria* (Dibben 1980). Morphologically this new species closely resembles *P. muricata* J.C.David, *P. umbricola* A.W.Archer & Elix, and *P. neutriconica* (described below), but all four species can be distinguished by their respective chemistries, *P. muricata* containing the stictic acid chemosyndrome, *P. umbricola* containing protocetraric acid, and *P. neutriconica* containing neutricone as major metabolites.

At present, this distinctive new species is known only from the type locality, where it occurs on dead wood on the forest floor. Associated species include *Hypogymnia billardieri* (Mont.) Filson, *Pannoparmelia wilsonii* (Räsänen) D.J.Galloway, *Parmelina conlabrosa* (Hale) Elix & J.Johnst., *Pertusaria georgeana* A.W.Archer & Elix, *Pyrrhospora arandensis* Elix, and *Ramboldia brunneocarpa* Kantvilas & Elix.

***Pertusaria coniophorella*** Elix & A.W.Archer, sp. nov.

Fig. 2

Thallus ut in *Pertusaria coniophora* sed superfice pustulatis et sorediatibus differt.

**Etymology:** The specific epithet derives from the Latin *ellus* (resembling, but smaller) and *Pertusaria coniophora*, the species which it most closely resembles.

**Type: Australia:** New South Wales: Cottan-Bimbang National Park, junction of Oxley Highway and Tobins Road, c. 70 km E of Walcha, 31°22'22"S, 152°03'37"E, 1040 m, on dead wood in wet *Eucalyptus* forest with tree fern understorey, J.A. Elix 36398, 28.iv.2005; holo: CANB.

Thallus crustose, off-white to duff fawn or pale olive green, corticolous or lignicolous, surface areolate and cracked, smooth or subtubercular, somewhat shiny, lacking isidia, sorediate. Soralia conspicuous, numerous, white, initially pustulate, composed of granular soredia, hemispherical, c. 0.2 mm wide, soon spreading over the thallus surface. Apothecia and pycnidia not seen.

**Chemistry:** Thallus K–, C–, KC–, P–; containing perlatolic acid (major), stenosporic acid (trace), and superlatolic acid (trace).

This species is characterized by the pustulate-sorediate upper surface and the presence of perlatolic acid (major) together with traces of stenosporic and superlatolic acids. This new species is chemically identical with the isidiate *P. coniophora* Elix & A.W.Archer. Previously *P. coniophora* was reported to contain perlatolic acid (major), confluent acid (minor) and 2-O-methylconfluent acid (minor), but re-examination of the holotype specimen has shown that to be erroneous, and the latter two substances are absent. *Pertusaria coniophora* can readily be distinguished by the presence of densely packed, fragile isidia which do not become sorediate (Elix *et al.* 1997), whereas the upper surface of *P. coniophorella* is granular-sorediate, with the soralia originating from pustules in the upper surface.

At present the new species is known from several localities in New South Wales, where it occurs on bark and dead wood in montane forests from 1000 to 1400 m. Commonly associated species include *Haematomma africanum* (J.Steiner) C.W.Dodge, *Hypogymnia pulverata* (Nyl.) Elix, *Hypotrachyna ossealba* (Vain.) Y.S.Park & Hale, *Lecanora achroa* Nyl., *Pertusaria erythrella* Müll.Ärg., *P. scaberula* A.W.Archer, *Usnea dasaea* Stirt. and *U. rubicunda* Stirt.

### SPECIMENS EXAMINED

**New South Wales:** • Great Dividing Range, 2 km N of Parkers Gap, 10 km E of Captains Flat, 35°38'S, 149°31'E, 1260 m, on twigs of *Tasmannia* in wet *Eucalyptus* woodland, J.A. Elix 33065B, 12.vii.1992 (CANB); • Mount Hyland Nature Reserve, 20 km N of Hernani, 30°10'44"S, 152°25'19"E, 1340 m, on fallen *Doryphora sassafras* in temperate rainforest, J.A. Elix 36568, 30.iv.2005 (CANB); • on base of *Eucalyptus laevopinea* in temperate rainforest, J.A. Elix 36633, 30.iv.2005 (CANB).

***Pertusaria dennistonensis*** Elix & A.W.Archer, sp. nov.

Fig. 3

Thallus ut in *Pertusaria dactylina* sed acidum sticticum et acidum consticticum continente differt.

*Etymology.* The specific epithet derives from the Latin *-ensis* (place of origin) and the Denniston Plateau, the type locality.

*Type: New Zealand. South Island:* Nelson, Denniston Plateau, 3 km S of Denniston township, 16 km E of Westport, 41°45'S, 171°49'E, 670 m, on dead moss and peaty soil in boggy heath, *J.A. Elix 7409*, 27.ii.1980; holo: CHR.

Thallus crustose, pale fawn, thin, growing on dead moss and peat, surface smooth, continuous, engulfing the substratum, lacking soredia, densely isidiate. Isidia simple to sparingly branched, globose then short-cylindrical, 0.5–1.5 mm tall, 0.15–0.25 mm diam. Apothecia and pycnidia not seen.

*Chemistry:* Thallus K<sup>+</sup> yellow, C<sup>-</sup>, P<sup>+</sup> orange-red; containing stictic acid (major), constrictic acid (minor), menegazziaic acid (minor), peristictic acid (minor).

The most characteristic features of this new species are the isidia and the presence of the stictic acid chemosyndrome. *Pertusaria muricata* J.C.David is another sterile, isidiate species which contains the stictic acid complex, but that species occurs on bark in tropical forests, has shorter, narrower isidia (0.2–0.8 mm tall, 0.05–0.1 diam.), and lacks menegazziaic acid (Archer 1997, 2004). Morphologically and ecologically *P. dennistonensis* closely resembles *P. dactylina* (Ach.) Nyl., which is not uncommon in the South Island of New Zealand. However, *P. dactylina* contains medullary fumarprotocetraric acid (major) and protocetraric acid (minor) rather than the stictic acid complex.

At present the new species is known only from the type locality, where associated species on the very wet, peaty soils include *Austropeltum glareosum* Henssen, Döring & Kantvilas, *Cladia inflata* (F. Wilson) D.J.Galloway, *Cladonia southlandica* W.Martin, *Neophyllis melacarpa* (F.Wilson) F.Wilson, *Pycnothelia caliginosa* D.J.Galloway & P.James, *Siphula decumbens* Nyl. and *S. fragilis* (Hook.f & Taylor) J.Murray.

***Pertusaria neotriconica* Elix & A.W.Archer, sp. nov.**

Fig. 4

Thallus ut in *Pertusaria muricata* sed neotriconicum, acidum salazinicum, acidum norsticticum, acidum norperisticticum et acidum protocetraricum continente differt.

*Etymology:* The specific epithet refers to the rare secondary metabolite neotricone present in this species.

*Type: Australia: New South Wales:* Mount Hyland Nature Reserve, 20 km N of Hernani, 30°10'44"S, 152°25'19"E, 1340 m, on base of tree in temperate rainforest, *J.A. Elix 36570*, 30.iv.2005; holo: NSW; iso: CANB.

Thallus creamy white to pale glaucous, thick, cracked-areolate, corticolous, surface verrucose, dull to slightly shiny, lacking soredia, isidiate. Isidia numerous, simple, cylindrical, very fragile, concolorous with the thallus, 0.5–1.0 mm tall, 0.05–0.1 mm diam. Apothecia and pycnidia not seen.

*Chemistry:* Cortex K<sup>+</sup> yellow; medulla K<sup>+</sup> yellow then red, C<sup>-</sup>, KC<sup>-</sup>, P<sup>+</sup> deep orange-red; containing neotricone (major), norstictic acid (minor), salazinic acid (minor), norperistictic acid (minor), protocetraric acid (minor).

*Pertusaria neotriconica* is characterized by the sterile, isidiate thallus and the unique thalline chemistry. Neotricone, the major metabolite present, is a very rare orcinol depsidone previously known only from *Phaeographis neotricosus* Redinger (Elix *et al.* 2003) and *Usnea* sp. (Lumbsch *et al.*, unpublished data). Morphologically the new species closely resembles *P. muricata* and *P. umbricola* A.W.Archer & Elix, but all three species can be distinguished by their respective chemistries, *P. muricata* containing

the stictic acid chemosyndrome, and *P. umbricola* containing protocetraric acid as the major metabolite.

At present this distinctive new species is known only from the type locality, where it occurs on the bark of rainforest trees. Associated species include *Haematomma infuscum* (Stirt. ex F.M.Bailey) R.W.Rogers, *Hypogymnia pulverata* (Nyl.) Elix, *Hypotrachyna ossealba* (Vain.) Y.S.Park & Hale, *Lecanora achroa* Nyl., *Parmelia erumpens* Kurok., *Pertusaria erythrella* Müll.Arg., *P. scaberula* A.W.Archer and *Usnea dasaea* Stirt.

#### SPECIMENS EXAMINED

*New South Wales:* • type locality, on base of rainforest tree, *J.A. Elix 36584*, 30.iv.2005, (CANB); • type locality, on tree trunk in temperate rainforest, *J.A. Elix 36599*, 30.iv.2005 (CANB).

#### Acknowledgements

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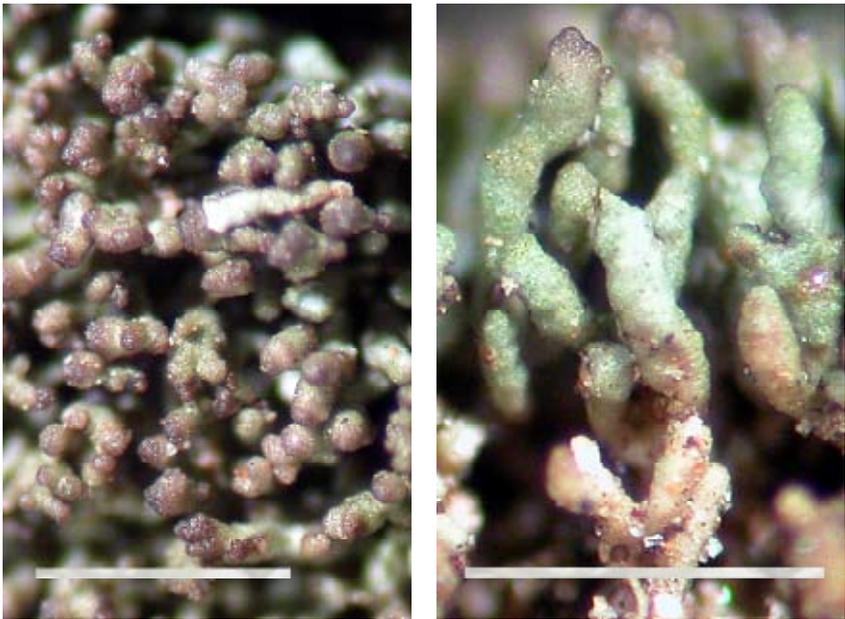


Figure 1. *P. alectoronica* (holotype in NSW). Scale bar = 1 mm.

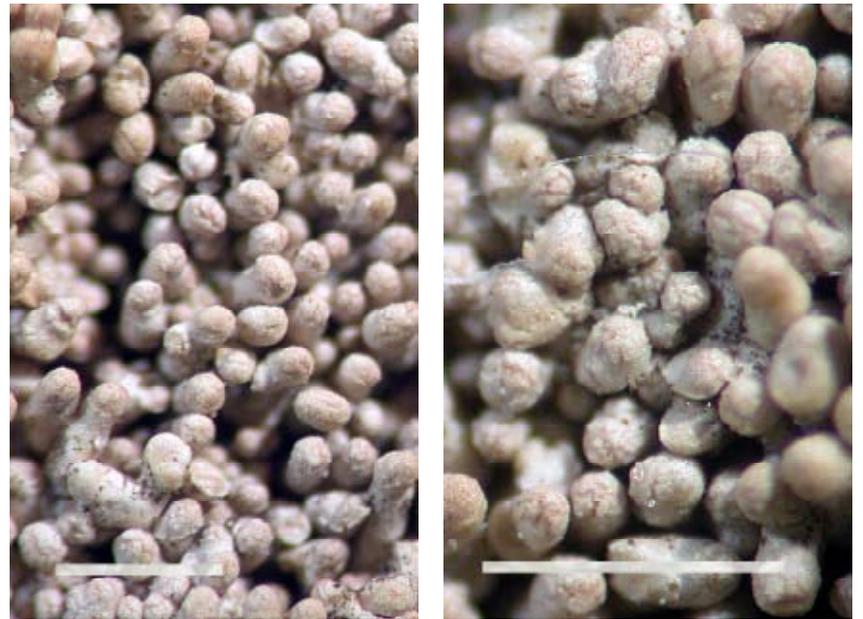


Figure 3. *P. dennistonensis* (holotype in CHR). Scale bar = 1 mm.

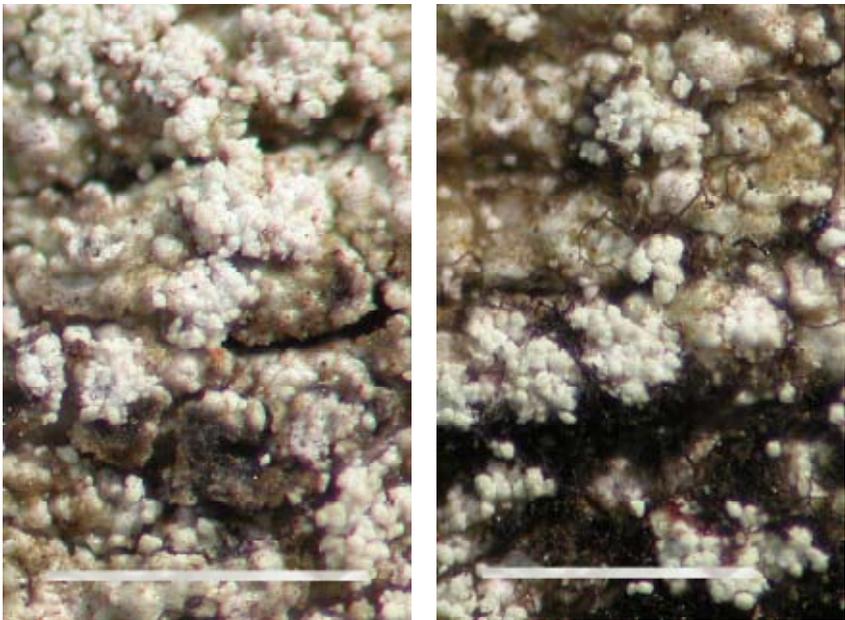


Figure 2. *P. coniophorella* (holotype in CANB). Scale bar = 1 mm.

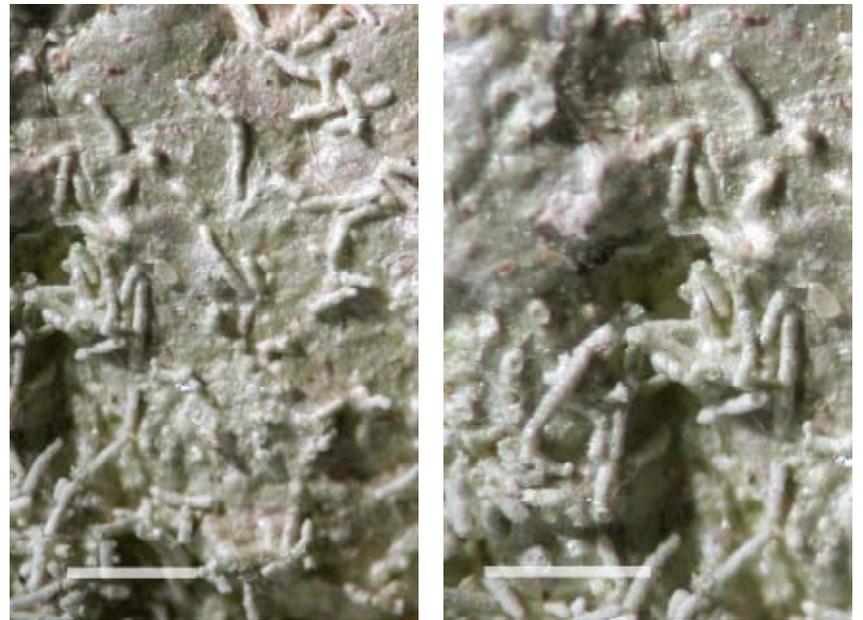


Figure 4. *P. neutriconica* (holotype in NSW). Scale bar = 1 mm.

Notes on *Lecania* species from Australasia, with the description of a new variety and a new combination in *Halecania*

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**Abstract:** *Lecania* specimens from Australia and New Zealand, mainly collected by the second author, were studied along with *Lecania* types from Australia and South America. *Lecania fructigena*, *L. rabenhorstii* and *L. sylvestris* are reported as new to Australasia. *Lecania turicensis* var. *macrocarpa*, from New Zealand, is newly described, and the combination *Halecania subsquamosa* is introduced for *H. australis*. With one exception, all of the 19th century types examined are referable to other genera.

### Introduction

The checklist of New Zealand fungi (Pennycook & Galloway 2004) includes four *Lecania* species (*L. cyrtella*, *L. erysibe*, *L. naegelii* and *L. vallata*). The *Catalogue of Australian Lichens* lists ten taxa (McCarthy 2003), and the *Checklist of the Lichens of Australia and its Island Territories* eleven taxa (McCarthy 2006). A further species, *L. turicensis*, is listed in Cranfield (2004) from Western Australia. Four of those species, *L. cyrtella*, *L. erysibe*, *L. inundata* and *L. turicensis*, are rather well known and widely distributed. The most recent published records from Australia refer to *L. erysibe* (Richardson & Richardson 1982), *L. inundata* (Kantvilas 1989), *L. cyrtella* (Allen *et al.* 2001) and *L. turicensis* (Cranfield 2004). The remaining species belong to other genera: *Lecania chlaronoides* and *L. fabacea* are referable to *Lecanora*; *L. molliuscula* could be related to *Byssoloma*, and *L. sanguinolenta* could, based on its description, also represent a *Lecanora*. The identity of *Lecania muelleriana* remains unclear because of a lack of type material. *Lecania heardensis* and *L. johnstonii* are described from Heard Island and Macquarie Island, respectively (Dodge 1948), and are not treated.

In this paper, the following species are recorded for Australasia for the first time: *Lecania fructigena*, *L. cf. nylanderiana*, *L. rabenhorstii* and *L. sylvestris*. In addition, the new variety *Lecania turicensis* var. *macrocarpa* is described from New Zealand, and the new combination *Halecania subsquamosa* is introduced for the recently described *Halecania australis* Lumbsch (Lumbsch & Feige 1994).

The genus *Lecania* is characterized by a crustose, squamulose or rarely bullate thallus, marginate to occasionally immarginate apothecia, hyaline 1–3(–5)-septate ascospores, asci of the *Bacidia*-type and filiform conidia. The species occur on acidic or calcareous rocks, stones, artificial substrata such as old walls and gravestones, and bark (van den Boom & Ryan 2004).

### Material and methods

The examined specimens are kept in GZU. Some duplicates are in the private herbarium of P. van den Boom and in CHR, PERTH and WELT. In addition, type specimens from G have been examined by means of standard microscopy. The secondary compounds of selected specimens were checked by TLC according to Culberson & Ammann (1979) and Culberson & Johnson (1982), and by HPLC according to Elix *et al.* (2003).

### The species

#### *Lecania cyrtella* (Ach.) Th. Fr.

This corticolous species is cosmopolitan, and has been widely reported, for example from the British Isles (James & Purvis 1992), Austria (Hafellner & Türk 2001), Sweden and Norway (Santesson *et al.* 2004), the Iberian Peninsula and Balearic Islands (Llimona & Hladun 2001), Turkey (John & Breuss 2004), Syria (John *et al.* 2004), the Canary Islands (Hafellner 1995) and Morocco (Egea 1996). Van den Boom & Ryan (2004) provide a detailed description for this species from southwestern U.S.A. It was previously recorded for Australia by Müller (1893, as *Patellaria cyrtella*). The specimens mentioned below are abundantly fertile.

#### SPECIMENS EXAMINED

**Australia.** *New South Wales:* • Eurobodalla, Cape Dromedary S of Mystery Bay, S of Narooma, 36°18'S, 150°08'E, coastal shrubs, on *Banksia* sp., 27.vii.1992, D. & H. Mayrhofer 11566 & E. Hierzer (GZU). *South Australia:* • Mount Barker summit, 32 km SE of Adelaide, 35°04'S, 138°55'E, on branches, 11.viii.1981, M. & H. Mayrhofer 2693 (GZU).

**New Zealand.** *South Island:* Otago: • on *Hebe*, Brighton, Brighton Beach, S of Dunedin, 45°56'48"S, 170°19'59"E, 2 m, 22.iii.2001, C. Edler s.n. (GZU).

#### *Lecania fructigena* Zahlbr.

*Lecania fructigena* is known exclusively from coastal areas in western North America and Mexico (van den Boom & Ryan 2004) and from maritime habitats in western Europe (van den Boom & Brand 2005). The Australasian specimens are rather well developed.

*Lecania fructigena* is characterized by two-celled ascospores, the mainly papillate thallus, sessile to almost stipitate apothecia and numerous pycnidia (van den Boom & Ryan 2004).

#### SPECIMEN EXAMINED

**New Zealand.** *North Island:* • North Auckland: Leight, Goats Island Beach to Cape Rodney, coastal rocks, 0–20 m, 20°16'S, 174°48'E, 7.i.1985, H. Mayrhofer 6755 & G.J. Samuels (GZU). *South Island:* Otago: • Kaka Point, SE of Balclutha, coastal rocks, 13.ii.1985, H. Mayrhofer 7383 & H. Hertel (GZU).

#### *Lecania inundata* (Hepp ex Körb.) M. Mayrhofer

This species, reported for Australia by Kantvilas (1989), is easily mistaken for a diminutive *L. fructigena*. One specimen from New Zealand is heavily infected by a lichenicolous fungus belonging to the genus *Stigmidium*. The perithecia of the fungus are 70–90 µm in diam., and the ascospores are hyaline and measure 11–12 × 3.5–4 µm. The species is a new record for New Zealand.

*Lecania inundata* is characterized by its small papillae on the surface of the nodules and areoles (van den Boom & Ryan 2004).

#### SPECIMENS EXAMINED

**Australia.** *New South Wales:* • Cabonne, roadside, c. 5 km S of Molong, c. 600 m, on limestone, 12.viii.1988, D., M. & H. Mayrhofer 8012 (GZU). *South Australia:* • Kapunda Reservoir, 8 km NW of Kapunda, c. 350 m, 34°18'S, 138°51'E, 1981, M. & H. Mayrhofer 2775 (GZU).

**New Zealand.** *North Island:* Hawkes Bay: • Mata Peak SE of Havelock North, on limestone, 39°42'S, 176°55'E, c. 370 m, 17.viii.1992, H. Mayrhofer 12226 & E. Hierzer (GZU). *South Island:* Canterbury: • close to Montunau Beach Road near Coringa, 43°01'58"S, 173°01'55"E, 83 m, in pasture across the river, on low limestone rocks, 3.xi.2003, M. Lambauer 0136 & C.D. Meurk (GZU). *Southland:* • Clifden, road to Lake

Hauroko, 46°02'05"S, 167°42'36"E, 70 m, in pasture, SE exposed, on limestone boulders, 10.xi.2003, *M. Lambauer 0192* (GZU).

***Lecania cf. nylanderiana*** A. Massal.

The specimens treated here belong to the *Lecania suavis*-group with 4(–more)-celled ascospores. However, the specimens are not well developed, and the excipulum sometimes contains prosoplectenchymatous cells that are strongly conglomerate but not always clearly present. The ascospores and the pruinose apothecia accord more-or-less with *L. nylanderiana* as described by Mayrhofer (1988). However, this species has rarely been collected in Australasia, and further material is needed to confirm its presence in the region.

SPECIMENS EXAMINED

**New Zealand.** *South Island:* Canterbury: • Cave Stream and Flock Hill above Cave Stream, limestone outcrop in tussock grassland with scattered *Discaria toumatou*, 43°12'S, 171°45'E, 9.ix.1981, *H. Mayrhofer 2302* (GZU); • Castle Hill Basin, Cave Stream, c. 650–750 m, 43°12'S, 171°45'E, on limestone, 22.i.1985, *H. Mayrhofer 7459*, *H. Hertel*, *C.D. Meurk & H.W. Lintott* (GZU).

***Lecania rabenhorstii*** (Hepp) Arnold

This species is very common in some parts of western Europe (van den Boom 1992), but it is rare in western North America (van den Boom & Ryan 2004). It is a new record for Australia and New Zealand.

*Lecania rabenhorstii* is characterized by its plane to slightly uneven upper areole surface, and numerous convex to convex-hemispherical apothecia with a thin amphithecium that often becomes excluded. It closely resembles *L. inundata* in anatomy, but that species has more bullate-papillate areoles (van den Boom & Ryan 2004).

SPECIMENS EXAMINED

**Australia.** *Australian Capital Territory:* • Cotter Reserve, c. 20 km W of Canberra, 500 m, 10.viii.1988, *H. Mayrhofer 8955 & H. Streimann* (GZU).

**New Zealand.** *North Island:* Hawkes Bay: • between Whirinaki Beach and Tangoio, N of Napier, coastal rocks, 39°21'S, 176°55'E, 16.viii.1992, *H. Mayrhofer 12194*, 12196, & *E. Hierzer* (GZU), same locality, *H. Mayrhofer 12197 & E. Hierzer* (CHR), same locality, *H. Mayrhofer 12204 & E. Hierzer* (WELT); • Otatara Pa near Taradale, SW of Napier, 39°33'S, 176°50'E, 17.viii.1992, *H. Mayrhofer 12229 & E. Hierzer* (GZU); • 4 km NW of Pourerere, E of Waipukurau, 40°05'S, 176°50'E, 17.viii.1992, *H. Mayrhofer 11574 & E. Hierzer* (GZU). *South Island:* Nelson: • Golden Bay, Mt Burnett foothill, NW of Collingwood, on limestone outcrops, c. 100 m, 40°39'S, 172°39'E, 27.viii.1992, *H. Mayrhofer 12345 & N. & W. Malcolm* (GZU), same locality, *H. Mayrhofer 12354 & N. & W. Malcolm* (CHR).

***Lecania sylvestris*** (Arnold) Arnold

This species appears to be rather variable in Europe. Description of the Australian material: thallus partly endolithic or very thin and rimose to areolate; apothecia up to 0.8 mm diam., initially plane and clearly marginate with a lecidine appearance, becoming convex to globose and constricted at the base; margin initially relatively thick and ±slightly white-pruinose, becoming excluded; excipulum dark brown laterally, red-brown below, ±paraplectenchymatous; paraphyses rather thick, up to 2.5 µm diam.; ascospores 10–14(–15) × 4.5–5 µm.

SPECIMEN EXAMINED

**Australia.** *Western Australia:* • Yanchep State Forest, Roadside, Picnic Area N of Yanchep National Park, N of Perth, on limestone, 28.viii.1988, *D., M. & H. Mayrhofer 8047* (GZU).

***Lecania turicensis*** (Hepp) Müll.Arg. var. ***turicensis***

This taxon is widely distributed in Europe, where it is the most common saxicolous species (Mayrhofer 1988, van den Boom 1992). It is also reported from western North America, where it seems to be rare (van den Boom & Ryan 2004). Mayrhofer (1988) also reported it from Africa and Asia. This is a new record for New Zealand.

*Lecania turicensis* is characterized by apothecia with a whitish amphithecium that often becomes excluded, pruinose discs, and a white-gray thallus (van den Boom & Ryan 2004).

SPECIMENS EXAMINED

**Australia.** *New South Wales:* • Wellington, roadside on Mitchell Hwy near Wellington Caves S of Wellington, c. 350 m, 13.viii.1988, *D., M. & H. Mayrhofer 8233* (GZU); • Newcastle, 1 km S of Newcastle Bath, coastal rocks, on waratah sandstone, c. 20 m, 22.vii.1992, *E. Hierzer, S. & R. Filson, D. & H. Mayrhofer 11175* (GZU); • 1 km N of Molong, close to the road, on limestone, 33°04'26"S, 148°51'40"E, 550 m, 20.x.2003, *M. Lambauer 0065* (GZU). *South Australia:* • roadside, Morgan to Blanchetown road, 9 km N of Blanchetown, 34°19'S, 139°37'E, c. 100 m, 13.viii.1981, *H. Mayrhofer 2746* (GZU). *Western Australia:* • Perth region, Burns Beach, N of Perth, coastal rocks, on limestone, 28.viii.1988, *D., M. & H. Mayrhofer 7763* (GZU), same locality, *D., M. & H. Mayrhofer 7765* (PERTH).

**New Zealand.** *South Island:* Nelson: • Pig Valley S of Wakefield, SW of Nelson, on limestone outcrops, 41°28'S, 173°03'E, 25.viii.1992, *H. Mayrhofer 12322 & W. Malcolm & B. Polly* (GZU); • Golden Bay, Tata Beach NE of Pohara, coastal rocks, 40°49'S, 172°55'E, 28.viii.1992, *H. Mayrhofer 10780* (GZU). Canterbury: • Weka Pass NW of Waipara, c. 250 m, limestone in disused railway cutting, 43°S, 172°43'E, 10.ix.1981, *H. Mayrhofer 2347* (GZU); • Napenape road/Stoneyhurst road, 21 km from Main North Road, 42°56'45"S, 173°14'51"E, 10 m, close to the sea, low rock outcrops in grassland, on limestone, 3.xi.2003, *M. Lambauer 0127 & C.D. Meurk* (GZU); • end of Reeces Road SE of Omihi, Montserrat, limestone outcrops, c. 400–500 m, 43°04'S, 172°56'E, 2.ix.1992, *H. Mayrhofer 12135 & C.D. Meurk* (GZU), same locality, *H. Mayrhofer 12136 & C.D. Meurk* (CHR). Southland: • Clifden, limestone, 46°02'S, 167°41'E, 11.ii.1985, *H. Mayrhofer 7371 & H. Hertel* (GZU); • Clifden, Suspension Bridge, 46°01'44"S, 167°42'55"E, 50 m, under the bridge at the river bank, N-exposed, on limestone, 10.xi.2003, *M. Lambauer 0189* (GZU).

***Lecania turicensis*** var. ***macrocarpa*** van den Boom & H. Mayrhofer, var. nov.

Habitu *Lecaniae turicensis* s. str., sed differt apotheciis majoribus (ad 1.2 mm diam.) parum vel dense pruinosis, excipulo haud vel rarissime excluso, et ascosporis majoribus, (13–)15–18 × (4–)4.5–5.5 µm.

Type: New Zealand, *South Island.* Canterbury: Rangitata Valley, Coal Creek, 43°45'S, 171°09.5'E, on limestone, 17.i.1985, *H. Mayrhofer 7395*, *H. Hertel*, *C.D. Meurk & B.P.J. Molloy* (GZU–holotype).

Thallus effuse, granular-areolate or areolate, rather variable in thickness, 0.2–0.6(–1.2) mm. Areoles mostly sharply angular, 0.3–2 mm wide. Upper surface warted and uneven, epruinose, matt, glaucous-white, whitish gray or pale brownish gray, not discoloured when wet. Upper cortex sometimes present but not well developed, c. 20 µm thick, consisting of weakly developed paraplectenchymatous cells covered by an epinecral layer to c. 15 µm high, without crystals. Algal layer irregular, with cells 7–17 µm diam. Apothecia broadly sessile, numerous, scattered to crowded and often deformed, plane to moderately convex, 0.3–0.9(–1.2) mm diam. Disc dark reddish brown to black, densely gray-white-pruinose, when moist becoming slightly paler and ±dark-spotted, with a dark-pigmented edge. Thalline exciple narrow (< 0.1 mm wide), same level with the disc, not or rarely becoming excluded, with a differentiated

algal layer and in part, a narrow, alga-free cortical zone covered by a thin epinecral layer to 10 µm thick. Proper exciple visible from above as a more persistent densely pruinose rim, narrow, to c. 50 µm towards the outer edge, ±paraplectenchymatous, cells c. 3–5 µm wide towards outer part and strongly encrusted with a dark brown pigment. Hypothecium hyaline, to 70 µm deep in centre, composed of unoriented hyphae. Hymenium 65–80 µm high. Epihymenium dark reddish brown, with pigment occasionally partly extending deeper into the hymenium along the conglutinated paraphyses. Paraphyses unbranched, or rarely branched at the upper parts, c. 1.5–2 µm wide in mid-hymenium cells, apically strongly swollen, with the terminal 1–2 cells clavate; apices to 6 µm wide, with an external pigment, coherent in groups in a gelatinous matrix. Asci clavate, c. 40–50 x 12–15 µm, of the *Bacidia*-type, 8-spored. Ascospores somewhat ellipsoid to ellipsoid-fusiform, straight, not constricted at the septum, (13–)15–18 x (4–)4.5–5.5 µm, 1-septate, thin-walled. Pycnidia inconspicuous, immersed, pale brown around the ostiole, hyaline below, c. 200 µm diam. Conidia filiform, slightly to strongly arcuate, 16–22 x 0.8 µm.

*Chemistry*: Spot tests: all negative; chemical compounds not tested by TLC.

*Substrata and ecology*: The new taxon occurs on inland calcareous rock outcrops and is known from a few localities in New Zealand. Accompanying species include (in the type specimen) *Lecanora* aff. *dispersa*, *Physcia adscendens*, *Caloplaca* sp., *Candelariella* sp., and *Verrucaria* sp. in small amounts.

*Note*: This taxon resembles a specimen of *Lecania turicensis* with overmature apothecia. The new variety is characterized by the mainly densely pruinose apothecia that are somewhat larger than those of var. *turicensis*, the conspicuous persistent white outer rim of the proper excipulum, and the thalline margin that is rarely excluded. In var. *turicensis* the thalline exciple is often excluded. The ascospores are relatively long, 15–18 µm, and ellipsoid to ellipsoid-fusiform; the ascospores of var. *turicensis* are 10–13 µm long.

Two further specimens collected at the same locality are rather different from the holotype. Specimen 7404 has a less healthy thallus with a dusty appearance, and the apothecia are weakly pruinose. However, the anatomy of the apothecia corresponds to the description above. Specimen 7405 possesses a thicker thallus (up to 1.2 mm) and less frequent apothecia, and contains many pycnidia.

#### ADDITIONAL SPECIMENS EXAMINED

**New Zealand.** *North Island*: Hawkes Bay: • Mata Peak, SE of Havelock North, 39°42'S, 176°55'E, on limestone, 17.viii.1992, H. Mayrhofer 12215 & E. Hierzer (GZU). *South Island*: Canterbury: • Rangitata Valley, Coal Creek, 43°45'S, 171°09.5'E, on limestone, 17.i.1985, H. Mayrhofer 7404, H. Hertel, C.D. Meurk & B.P.J. Molloy (CHR); same locality, H. Mayrhofer 7405, H. Hertel, C.D. Meurk & B.P.J. Molloy (GZU); • end of Reeces Road SE of Omihi, Montserrat, c. 400–450 m, 43°04'S, 172°56'E, on limestone, 2.viii.1992, H. Mayrhofer 12098, 12133, 12135 & C.D. Meurk (GZU). *Southland*: • Waiaru River Valley, Clifden, N Tuatapere, 46°02'S, 167°42'E, on limestone, 22.ix.1981, H. Mayrhofer 2194 (GZU); • Clifden, 46°02'S, 167°41'E, on limestone, 11.ii.1985, H. Mayrhofer 7371 & H. Hertel (GZU).

#### Notes on some type specimens of *Lecania* from Australia and South America

***Lecania chloronoides*** Müll.Arg., *Bull. Herb. Boissier* 3: 634 (1895).

Type: Australia, New South Wales, 1887, Knight 43 (G-holotype).

Thallus corticolous, very thin and somewhat uneven, grey, 2.5 x 1.5 cm. Apothecia 0.2–0.9 mm diam., dispersed, grouped or rarely crowded; disc reddish brown, plane to slightly concave, epuinose; margin concolorous with the thallus, slightly glossy and raised, 0.05–0.10(–0.15) mm, persistent; epithecium yellowish, with fine crystals,

with epipsamma, large crystals in apothecium medulla, paraphyses thin, simple, branched and ±anastomosed, tips hyaline to sometimes dark-coated. Ascospores 8 per ascus, simple or weakly septate (pseudoseptate), elongate-ellipsoid, 12–17 x 4.5–5 µm.

*Note*: This species is a member of the *Lecanora subfusca* group, and has been considered a *Lecania* species because of the septation of the ascospores. However, such pseudosepta are present in only degenerate or overmature ascospores. The typical large crystals in the medulla of the apothecium are not characteristic of the genus *Lecania*.

***Lecania fabacea*** (Müll.Arg.) Müll.Arg., *Bull. Herb. Boissier* 3: 634 (1895).

Bas.: *Lecanora fabacea* Müll.Arg., *Hedwigia* 32: 124 (1893).

Type: Australia, Victoria, Upper Yarra, 1892, French s.n. (G-holotype).

Thallus corticolous, pale gray to whitish, K+ yellowish (weak), in acetone extract or in GAW with many small roundish crystals. Apothecia 0.3–0.8 mm diam., erumpent; disc dark, ±plane, brownish black; thalline margin filled with fine (to 8 µm) crystals. Paraphyses branched and anastomosed, thin (1.5–2 µm), apices not widened. Ascospores 18–20 x 8–9 µm, slightly curved, sometimes with a thin pseudoseptum.

*Note*: This very small specimen (10 x 5 mm) belongs to the genus *Lecanora*.

***Lecania molliuscula*** Müll.Arg., *Hedwigia* 34: 29 (1895).

Type: Australia, Victoria, 1893, Wilson 1372 (G-holotype).

Thallus corticolous, farinose, pale gray to whitish. Apothecia to 0.6 mm in diam., loosely attached, dispersed or crowded; disc reddish brown; margin neither thalline nor lecidine but (weakly) white-tomentose-arachnoid. Epithecium with fine crystals, yellowish to pale brown. Paraphyses strongly branched and sometimes anastomosed, irregular, to 3 µm wide; apices hyaline, not or slightly swollen, only rarely ±dark-coated. Ascospores 8 per ascus, fusiform, 14–16 x 2.5–2.8 µm. No pycnidia detected.

*Note*: This is a very poorly developed specimen with only a few apothecia. It belongs to an unknown genus, but probably is related to *Byssoloma*. The ascospores are not so wide as were reported in the original description.

***Lecania muelleriana*** Zahlbr., *Cat. Lich. Univ.* 5: 736 (1928).

Bas.: *Lecania subsquamosa* Müll.Arg., *Bull. Herb. Boissier* 3: 634 (1895) non Müll.Arg., *Nuov. Giorn. Bot. Ital.* 21: 355 (1889).

Type: not seen (not in G).

*Note*: The description by Müller (1895) refers to a corticolous species, and is different from *L. subsquamosa* Müll.Arg. (Müller 1889) because of its 1–4-septate ascospores, which are obtuse-attenuate and 18–21 x 5.5 µm. Müller (1893) also cited the taxon from Victoria, but he referred to the description in Müller (1889). These saxicolous specimens could also belong to *Halecania subsquamosa*.

***Lecania subsquamosa*** Müll.Arg., *Nuov. Giorn. Bot. Ital.* 21: 355 (1889).

Type: South America, Brasilia, prov. Rio de Janeiro, 1889, Glaziou s.n. (G-lectotype, designated here; G, GZU-isotypes).

*Note*: This taxon is conspecific with *Halecania australis* Lumbsch, recently described from Australia by Lumbsch & Feige (1994). Following Article §11.4 of the International Code of Botanical Nomenclature (Saint Louis Code), we introduce the following new combination.

**Haleciana subsquamosa** (Müll.Arg.) van den Boom & H.Mayrhofer, comb. nov.  
Bas.: *Lecania subsquamosa* Müll.Arg., *Nuov. Giorn. Bot. Ital.* **21**: 355 (1889).

Note: *Haleciana subsquamosa* is known from Australia (including Tasmania) and New Zealand (Lumbsch & Feige 1994; Vězda 1996, 1999; van den Boom & Elix 2005; Obermayer 2006, all as *H. australis*). Van den Boom & Ryan (2004, as *H. australis*) recorded it from western North America.

**Lecania subsquamosa** var. **leprosa** (Müll.Arg.) Zahlbr., *Cat. Lich. Univ.* **5**: 745 (1928).  
Bas.: *Lecania selenospora* var. *leprosa* Müll.Arg., *Bull. Herb. Boissier* **3**: 634 (1895).  
Type: Australia, prov. Victoria, 1893, *Wilson 1741* (G–holotype).

Thallus saxicolous, areolate, with angular areoles; upper surface uneven, somewhat granular. Apothecia 0.2–0.5 mm diam.; margin excluded; disc dark brown-black, moderately to strongly convex. Paraphyses partly strongly swollen at the apices, to 5 µm wide.

Note: The specimen is in a very poor condition, but the thallus is not leprose. The material is close to *Lecania rabenhorstii*.

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**New species, combinations, lectotypifications and synonyms in Australian Pyrenulaceae**

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**Abstract:** The new species *Lithothelium hieroglyphicum*, *Pyrenula howeana* and *P. xanthominuta*, based on Australian specimens, are described as new to science. The new combinations *Anthracothecium gregale*, *A. toowoombense*, *Lithothelium decumbens*, *L. nanosporum*, *Pyrenula shirleyana*, *P. subumbilicata* and *P. subvariolosa* are made. *Pyrenula neoculata* is proposed as a new name for *Anthracothecium oculatum*. A further 38 species are newly synonymized. Three lectotypes are designated. All are either based on Australian types or are synonymized with Australian taxa.

**Introduction**

The taxonomy of the Australian species of the large lichen family Pyrenulaceae (c. 250 species worldwide) has received comparatively little attention in recent years. Towards the end of the 19th century, numerous publications were at least partly devoted to this group, building to a total of c. 100 species known from Australia, many apparently endemic. A comprehensive enumeration of the Queensland species (from where nearly all Australian species are known) was provided by Müller (1895). In recent decades, almost 1000 specimens have been collected in Australia, but few have been identified to species level, and even fewer records have been published. This is in marked contrast to the Pyrenulaceae of, for example, Papua New Guinea, which were documented by Aptroot *et al.* (1997). Therefore, a systematic revision of this group is overdue. During the preparation of a treatment of the Pyrenulaceae for the *Flora of Australia*, numerous Australian types were investigated, and while many turned out to be synonyms of palaeotropical or even pantropical species, for some the Australian name became the oldest epithet. The apparent endemism of other taxa was confirmed, and while some of these were originally described in genera that are now considered redundant (e.g. *Parmentaria*), some are transferred here to other genera. Moreover, three species of *Lithothelium* and *Pyrenula* are described as new.

**Anthracothecium Hampe ex A.Massal.**

All species reported from Australia have been investigated, and most were found to belong to the genus *Pyrenula*. In contrast, most species which were described in *Parmentaria*, *Pleurothelium*, *Pleurotheliopsis* and *Plagiothelium* turned out to be true *Anthracothecium*, with thick-walled, euseptate-muriform ascospores (cf. Aptroot 1991). At the moment, only the five species listed below are accepted for the Australian flora.

**Key to the Australian species of Anthracothecium**

- 1 Ascomata solitary ..... 2
- 1: Ascomata mostly grouped with a shared ostiole ..... 4
- 2 Ostiole lateral; ascospores 1 or 2 per ascus, > 120 µm long ..... **A. australiense**
- 2: Ostiole apical ..... 3
- 3 Ascospores 8 per ascus, < 120 µm long ..... **A. prasinum**
- 3: Ascospores 2–4 per ascus, > 120 µm long ..... **A. macrosporum**
- 4 Ascospores 8 per ascus, < 120 µm long ..... **A. gregale**
- 4: Ascospores 1 or 2 per ascus, > 110 µm long ..... **A. toowoombense**

**Anthracothecium australiense** (Müll.Arg.) Aptroot, in A. Aptroot, P. Diederich, E. Sérusiaux & H.J.M. Sipman, *Biblioth. Lichenol.* **64**, 17 (1997)

*Pleurothelium australiense* Müll.Arg., *Nuovo Giorn. Bot. Ital.* **23**, 401 (1891); *Pleurotheliopsis australiensis* (Müll.Arg.) Zahlbr., *Cat. Lich. Univ.* **1**, 513 (1922). T: [Qld] F.M. Bailey 562 (holotype G).

*Parmentaria subastroidea* var. *subsimplax* Müll.Arg., *Rep. Australas. Assoc. Advancem. Sci.* **1895**, 463 (1895). T: [Qld] J. Shirley 1875 (isotype BRI), *syn. nov.*

*Pleurotheliopsis nana* Zahlbr., *Ann. Mycol.* **33**, 40 (1935); *Parmentaria nana* (Zahlbr.) R.C. Harris, in R.S. Egan, *Bryologist* **90**, 164 (1987); *Anthracothecium nanum* (Zahlbr.) R.C. Harris, *Mem. New York Bot. Gard.* **49**, 79 (1989). T: U.S.A., Florida, Sanford, Rapp 72 (lectotype W, n.v.), *syn. nov.*

**Anthracothecium gregale** (C.Knight) Aptroot, *comb. nov.*

*Trypethelium gregale* C.Knight, in F.M. Bailey, *Syn. Queensland Fl., Suppl.* **1**, 77 (1886); *Parmentaria gregalis* (C.Knight) Müll.Arg., *Flora* **70**, 426 (1887). T: [Qld] Toowoomba, C.H. Hartmann 224 (isotype BRI).

*Trypethelium subplanum* C.Knight, in F.M. Bailey, *Syn. Queensland Fl., Suppl.* **1**, 77 (1886); *Parmentaria subplana* (C.Knight) Müll.Arg., *Flora* **70**, 426 (1887). T: [Qld] Toowoomba, C.H. Hartmann (isotype BRI), *syn. nov.*

**Anthracothecium macrosporum** (Hepp) Müll.Arg., *Linnaea* **63**, 44 (1880)

*Verrucaria macrospora* Hepp, in H. Zollinger, *Syst. Verz.: 5* (1854), *non* (Werner) Breuss (1994). T: Indonesia, Java, Tjikoya, H. Zollinger 147 (isotype L).

*Anthracothecium columellatum* (Vain.) Zahlbr., *Cat. Lich. Univ.* **8**, 121 (1937); *Bottaria columellata* Vain., *Ann. Acad. Sci. Fenn., ser. A*, **15**(6), 325 (1921). T: Philippines, Palawan, Taytay, G. Merrill 9031 (holotype TUR-Vain, n.v.), *syn. nov.*

**Anthracothecium prasinum** (Eschw.) R.C. Harris, in R.S. Egan, *Bryologist* **90**, 163 (1987)

*Verrucaria prasina* Eschw., in C.F.P. von Martius, *Fl. Bras. Enum. Pl.* **1**, 124 (1833); *Anthracothecium eschweileri* Müll. Arg., *Flora* **67**, 662 (1884), *nom. superfl.* T: Brazil, near Pará, C.F.P. von Martius (lectotype M, n.v.).

*Trypethelium pallidum* C.Knight, in F.M. Bailey, *Syn. Queensland Fl., Suppl.* **1**, 76 (1886); *Parmentaria pallida* (C.Knight) Shirley, *Lich. Fl. Queensland* **4**, 163 (1889). T: [Qld] Toowoomba, Main Range, C.H. Hartmann (isotype BRI), *syn. nov.*

**Anthracothecium toowoombense** (Müll.Arg.) Aptroot, *comb. nov.*

*Parmentaria toowoombensis* Müll.Arg., *Ann. K.K. Naturhist. Hofmus.* **7**, 305 (1892). T: [Qld] Toowoomba, C.H. Hartmann 108 (holotype G).

*Parmentaria grossa* Müll.Arg., *Rep. Australas. Assoc. Advancem. Sci.* **1895**, 464 (1895). T: [Qld] C. Knight 100 p.p. (holotype G), *syn. nov.*

*Parmentaria subastroidea* Müll.Arg., *Rep. Australas. Assoc. Advancem. Sci.* **1895**, 463 (1895). T: [Qld] J.S. Shirley 1863 (holotype G), *syn. nov.*

*Plagiothelium australiense* Stirt., *Trans. & Proc. Roy. Soc. Victoria* **17**, 75 (1881); *Parmentaria australiensis* (Stirt.) Müll.Arg., *Nuovo Giorn. Bot. Ital.* **23**, 401 (1891). T: [Qld] F.M. Bailey 58 (isotype BRI, n.v.), *syn. nov.*

The epithet *australiense* is the oldest, but it cannot be used in the genus *Anthracothecium* because the combination is already taken by *Anthracothecium australiense* (Müll.Arg.) Aptroot, in A. Aptroot, P. Diederich, E. Sérusiaux & H.J.M. Sipman, *Biblioth. Lichenol.* **64**, 17 (1997).

**Lithothelium** Müll.Arg.

An updated key and enumeration of species of this genus was recently published (Aptroot 2006). It treated three Australian species, two of which are endemic. Subsequently, three further species were found to occur in Australia; all share red-brown ascospores and are corticolous.

- Key to the corticolous, red-brown-spored Australian species of *Lithothelium***
- 1 Ascospores 3-septate..... **L. decumbens**  
 1: Ascospores submuriform.....2  
 2 Ascomata mostly grouped with shared lateral ostioles ..... **L. nanosporum**  
 2: Ascomata mostly laterally fused but with separate, apical ostioles.....  
 ..... **L. hieroglyphicum**

**Lithothelium decumbens** (Müll.Arg.) Aptroot, *comb. nov.*

*Parathelium decumbens* Müll.Arg., *Hedwigia* **32**, 134 (1893); *Pyrenula decumbens* (Müll.Arg.) Upreti, *Nova Hedwigia* **66**, 568 (1998). T: [Qld] Brisbane, F.M. Bailey 161 (holotype G).

**Lithothelium hieroglyphicum** Aptroot, *sp. nov.*

Figures 1–3

Thallus et ascomata ut in *Lithothelium nanosporum* sed ascomatis aggregatis, stromatis irregularis hieroglyphis similariter, ostioles separatis.

Type: AUSTRALIA. *New South Wales*: Middle Brother, Middle Brother State Forest, 31 km NE of Taree, H. Streimann 43357, 4.i.1990 (holotype CANB).

*Etymology.* The specific epithet refers to the irregular, hieroglyph-like outline of the stromata.

Thallus corticate, brownish, somewhat oily in appearance. Ascumata densely aggregated in large groups with irregular outlines which are to 4 mm long and 2 mm wide, with fused walls and separate ostioles, hemispherical, superficial on the substratum, not covered by thallus, c. 0.4–0.9 mm diam. Ostiole pale, mostly apical. Hamathecium IKI+ blue. Asci with a sagittiform to rounded ocular chamber, 80–100 × 10–15 µm. Ascospores 8 per ascus, red-brown, regularly uniseriate, irregularly submuriform with 5–10 locules, fusiform with rounded ends, (15–)17–19(–22) × (6–)7–8 µm; lumina rounded, although lumina of immature, 1–3-septate, hyaline ascospores diamond-shaped to angular. Pycnidia abundant, black, 0.1–0.2 mm diam. Conidia filiform, curved, 15–25 × 0.5 µm.

This species, which differs from *Lithothelium nanosporum* only in the melanothecioid ascomatal organization, is so far only known from the type collection.

**Lithothelium nanosporum** (C.Knight) Aptroot, *comb. nov.*

*Trypethelium nanosporum* C.Knight, in F.M. Bailey, *Syn. Queensland Fl.*, Suppl. **1**, 78 (1886), non *Pyrenula nanospora* (A. Singh) Upreti (1998); *Parmentaria microspora* Müll.Arg., *Flora* **70**, 427 (1887), *nom. superfl.*, non *Pyrenula microspora* (Nagarkar & Patw.) Upreti (1998); T: [Qld] Toowoomba, C. Knight (isotype BRI).

*Lithothelium submuriforme* R.C.Harris & Aptroot, in A. Aptroot, *Biblioth. Lichenol.* **44**, 69 (1991). T: South Africa, Natal, Distr. Nkandhla, forest S of Nkandhla, O. Almborn 8161 (holotype LD), *syn. nov.*

**Pyrenula Ach.**

This is by far the largest genus in the family, both worldwide and in Australia. Most of the following entries represent nomenclatural novelties or newly recognised synonymy.

**Pyrenula aspistea** (Ach.) Ach., *Syn. Meth. Lich.*: 123 (1814)

*Verrucaria aspistea* Ach., *Methodus*: 121 (1803). T: Guinea (syntype H-Ach, *n.v.*).

*Pyrenula nigrocincta* Müll.Arg., *Nuovo Giorn. Bot. Ital.* **23**, 404 (1891). T: [Qld] Brisbane, F.M. Bailey 474 (isotype BRI), *syn. nov.*

*Pyrenula indusiata* Müll.Arg., *Rep. Australas. Assoc. Advancem. Sci.* **1895**, 456 (1895). T: [Qld] Shirley 1878 (holotype G), *syn. nov.*

**Pyrenula astroidea** (Fée) R.C.Harris, *Mem. New York Bot. Gard.* **49**, 87 (1989)

*Parmentaria astroidea* Fée, *Essai Crypt. Écorc.*: 70 (1824). T: America (syntype PC).

*Parmentaria baileyana* Müll.Arg., *Hedwigia* **30**, 54 (1891) [often as '*Parmentaria baileyi*']. T: [Qld] Bellenden Ker, F.M. Bailey 543 p.p. (isotype BRI), *syn. nov.*

**Pyrenula bicuspidata** Müll.Arg., *Hedwigia* **32**, 136 (1893)

T: [Qld] Brisbane, Mount Perry, F.M. Bailey 233 (isotype BRI).

*Melanotheca oxyspora* Müll.Arg., *Rep. Australas. Assoc. Advancem. Sci.* **1895**, 462 (1895). T: [Qld] C. Knight 127 (holotype G), *syn. nov.*

This Australian endemic is characterized by bicornute ascospores.

**Pyrenula cruenta** (Mont.) Vain., *Étud. Class. Lich. Brésil* **2**, 197 (1890)

*Trypethelium cruentum* Mont., *Ann. Sci. Nat., Bot.*, sér. 2, **8**, 537 (1837); *Melanotheca cruenta* (Mont.) Müll.Arg., *Bot. Jahrb. Syst.* **6**, 397 (1885). T: French Guiana, F.M.R. Leprieur 14 (syntype PC).

*Trypethelium rubrum* C.Knight, in F.M. Bailey, *Proc. Roy. Soc. Queensland* **1**, 152 (1884); *Melanotheca rubra* (C.Knight) C.Knight, in J. Shirley, *Lich. Fl. Queensland* **4**, 167 (1889). T: Australia, Queensland (isotype BRI).

*Trypethelium cinnabarina* C.Knight, in F.M. Bailey, *Syn. Queensland Fl.*, Suppl. **1**, 76 (1886); *Melanotheca cinnabarina* (C.Knight) C.Knight, in J. Shirley, *Lich. Fl. Queensland* **4**, 167 (1889). T: Australia, Queensland (isotype BRI), *syn. nov.*

*Melanotheca rubescens* C.Knight, in J. Shirley, *Lich. Fl. Queensland* **4**, 167 (1889). T: Australia, Queensland; *n.v.*, *syn. nov.*

*Verrucaria circumrubens* var. *rubrotecta* Stirt., *Trans. & Proc. Roy. Soc. Victoria* **17**, 74 (1881); *Pyrenula circumrubens* var. *rubrotecta* (Stirt.) Shirley, *Lich. Fl. Queensland* **4**, 179 (1889); T: [Qld] Brisbane, F.M. Bailey 124 (holotype G, *n.v.*), *syn. nov.*

**Pyrenula dermatodes** (Borrer) Schaer., *Enum. Critic. Lich. Europ.* (Bern): 213 (1850)

*Verrucaria dermatodes* Borrer, in W. Hooker & J. Sowerby, *Suppl. Engl. Bot.* **1**, pl. 2607, fig. 2 (1831). T: Great Britain (holotype BM, *n.v.*).

*Pyrenula micromma* Shirley, *Lich. Fl. Queensland* **4**, 180 (1890), *nom. illeg.* T: Australia, Queensland; *n.v.*, *syn. nov.*

*Pyrenula annulata* Müll.Arg., *Bull. Herb. Boissier* **1**, 64 (1893). T: [Vic.] Black Spur, F.R.M. Wilson 1668; *n.v.*, *syn. nov.*

*Verrucaria occulta* C.Knight, *Trans. Linn. Soc. Lond. Ser. 2, Bot.* **1**, 279 (1894); *Pyrenula occulta* (C.Knight) Müll.Arg., *Bull. Herb. Boissier* **2**, Append. 1: 94 (1894). T: New Zealand, C. Knight (holotype BM, *n.v.*), *syn. nov.*

*Pyrenula chloroplaca* Shirley, *Pap. & Proc. Roy. Soc. Tasmania* **1893**, 219 (1894). T: [Tas.] St. Crispins, W.A. Weymouth 114 (lectotype BRI), *syn. nov.*

*Pseudopyrenula galactina* Shirley, *Pap. & Proc. Roy. Soc. Tasmania* **1893**, 219 (1894); *Pyrenula galactina* (Shirley) Kantvilas, *Proc. Roy. Soc. Tasmania* **122**, 66 (1988). T: [Tas.] St. Crispins, W.A. Weymouth 113 (holotype BRI), *syn. nov.*

**Pyrenula finitima** Müll.Arg., *Flora* **70**, 429 (1887).

T: [Qld] Toowoomba, C.H. Hartmann (holotype G).

*Pyrenula oxysporiza* Zahlbr., *Cat. Lich. Univ.* **1**, 449 (1922); *Pyrenula oxyspora* Müll.Arg., *Rep. Australas. Assoc. Advancem. Sci.* **1895**, 456 (1895), *nom. illeg.*, non (Nyl.) Hepp (1857). T: Australia, [Cairns] Trinity Bay, Sayer (holotype G), *syn. nov.*

This species seems to be an Australian endemic.

**Pyrenula howeana** Aptroot, *sp. nov.*

Figures 4–6

Thallus et ascomata ut in *Pyrenula subcongruens* sed hamathecium iodo inactivum et ascomata extus cum anthraquinonis.

*Etymology.* The specific epithet refers to the type locality, Lord Howe Island.

Type: AUSTRALIA. *New South Wales*: Lord Howe Island, track to Mt Eliza, *H. Streimann* 55819, 6.ii.1995 (holotype: CANB).

Thallus corticate, yellowish to cream-coloured, without pseudocyphellae, not pruinose. Ascomata simple, conical, erumpent from the substratum, at least partly covered with red pruina, sides often partly covered by thallus, c. 0.5–1.0 mm diam. Ascomatal wall without crystals, up to 100 µm thick. Ostiole black, apical. Hamathecium interspersed with oil droplets, IKI–. Ascospores 8 per ascus, irregularly biseriate, 3-septate, ellipsoid with truncate ends, 15–20 × 7–10 µm, with angular lumina; terminal lumina not separated from the exospore. Pycnidia occasional, black, c. 0.1 mm diam. Conidia filiform, straight to curved, 15–20 × 0.5 µm.

*Chemistry:* Apothecia with red, UV+ orange, KOH+ violet anthraquinone.

This species differs from *Pyrenula subcongruens* Müll.Arg. only by the anthraquinone on the ascomata and by the negative IKI-reaction. The recently described *Pyrenula aurantiopileata* Aptroot (Aptroot *et al.* 2007) agrees also in most characters, but has the anthraquinone pruina also extending all over the thallus, and a hamathecium reacting IKI+ blue. This species is so far only known from forest and scrub on Lord Howe Island, where it is apparently not rare.

#### ADDITIONAL SPECIMENS EXAMINED

*Lord Howe Island*: • ridge to Malabar Hill, *H. Streimann* 50029, 23.vi.1992 (CANB); • track to Goat House Cave, *J.A. Elix* 42117, 42183 & 42124, 7.ii.1995 (B, CANB); • junction of Kims Lookout and Max Nicholls tracks, *J.A. Elix* 42064, 6.ii.1995 (CANB); • Intermediate Hill via track to North Hummock, *J.A. Elix* 42026, 5.ii.1995 (CANB).

**Pyrenula mamillana** (Ach.) Trevis., *Consp. Verruc.*: 13 (1860)

*Verrucaria mamillana* Ach., *Methodus*: 120 (1803). T: (holotype UPS-Ach., *n.v.*).

*Melanotheca subsimplex* Müll.Arg., *Hedwigia* 30, 55 (1891). T: [Qld] Bellenden Ker, *F.M. Bailey* 546 (isotype BRI), *syn. nov.*

**Pyrenula microcarpa** Müll.Arg., *Bot. Jahrb. Syst.* 6, 412 (1885)

T: Cuba, *C. Wright*, *Verr. Cub.* 80; holo: G, *n.v.*

*Pyrenula melaleuca* Müll.Arg., *Nuovo Giorn. Bot. Ital.* 23, 403 (1891). T: [Qld] Brisbane, *F.M. Bailey* 519 (isotype BRI), *syn. nov.*

*Pyrenula microcarpoides* Müll.Arg., *Rep. Australas. Assoc. Advancem. Sci.* 1895, 457 (1895). T: [Qld] Mount Perry, *J. Shirley* 1872 (isotype BRI), *syn. nov.*

*Pyrenula conspurcata* Müll.Arg., *Bull. Herb. Boissier* 3, 326 (1895). T: [N.S.W.] *C. Knight* 16 *p.p.* (holotype G), *syn. nov.*

**Pyrenula neoculata** Aptroot, *nom. nov.*

*Anthracothecium oculatum* Müll.Arg., *Nuovo Giorn. Bot. Ital.* 23, 404 (1891), *non Pyrenula oculata* A.Singh & Upreti (1987). T: [Qld] Brisbane, *F.M. Bailey* 509 (holotype G).

This is one of the most common *Pyrenula* species in Australia, characterized by large, distoseptate-muriform ascospores. It is at least palaeotropical.

**Pyrenula quassiaeicola** Fée, *Essai Crypt. Écorc.*, Suppl.: 79 (1837)

T: America (holotype PC).

*Verrucaria flaventior* Stirt., *Trans. & Proc. Roy. Soc. Victoria* 17, 74 (1881); *Pyrenula flaventior* (Stirt.) Müll.Arg., *Flora* 70, 429 (1887). T: [Qld] *J. Stirton* 244 (isotype BRI), *syn. nov.*

*Pyrenula defossa* Müll.Arg., *Flora* 65, 518 (1882). T: [Qld] Toowoomba, *C.H. Hartmann* (holotype G), *syn. nov.*

*Verrucaria baileyi* C.Knight, in *F.M. Bailey*, *Proc. Roy. Soc. Queensland* 1, 91 (1884); *Pyrenula baileyi* (C.Knight) Shirley, *Lich. Fl. Queensland* 4, 179 (1889). T: [Qld] Helidon, *F.M. Bailey* (isotype BRI), *syn. nov.*

*Trypethelium papillatum* C.Knight, in *F.M. Bailey*, *Syn. Queensland Fl.*, Suppl. 1, 76 (1886); *Parmentaria papillata* (C.Knight) Shirley, *Lich. Fl. Queensland* 4, 161 (1889). T: [Qld] Toowoomba, Main Range, *C.H. Hartmann* (isotype BRI), *syn. nov.*

*Pyrenula nitidans* Müll.Arg., *Hedwigia* 30, 56 (1891). T: [Qld] Bellenden Ker, *F.M. Bailey* (isolectotype (here designated) BRI), *syn. nov.*

*Pyrenula pulchella* var. *cinerascens* Müll.Arg., *Rep. Australas. Assoc. Advancem. Sci.* 1895, 458 (1895); *Pyrenula adacta* var. *cinerascens* (Müll.Arg.) Zahlbr., *Cat. Lich. Univ.* 1, 422 (1922). T: [Qld] *J. Shirley* (iso-lectotype (here designated) BRI), *syn. nov.*

**Pyrenula ravenelii** (Tuck.) R.C.Harris, *Mem. New York Bot. Gard.* 49, 99 (1989)

*Pyrenastrum ravenelii* Tuck., *Amer. J. Sci. Arts*, ser. 2, 25, 429 (1858); *Parmentaria ravenelii* (Tuck.) Müll.Arg., *Flora* 68, 249 (1885). T: U.S.A., South Carolina, Santee Canal, *H.W. Ravenel* 236 (lectotype FH-Tuck., *n.v.*).

*Verrucaria pyrenastroides* C.Knight, *Trans. Linn. Soc. (London)* 23, 100 (1860); *Astrothelium pyrenastroides* (C.Knight) C.Knight, *Trans. & Proc. New Zealand Inst.* 8, 322 (1876); *Parmentaria pyrenastroides* (C.Knight) Müll.Arg., *Bull. Herb. Boissier* 2, Append. 1: 78 (1894); *Pyrenula pyrenastroides* (C.Knight) D.J.Galloway, *New Zealand J. Bot.* 42, 115 (2004). T: New Zealand, *C. Knight* 310a (lectotype BM, *n.v.*), *syn. nov.*

**Pyrenula shirleyana** (Müll. Arg.) Aptroot, *comb. nov.*

*Microthelia shirleyana* Müll. Arg., *Rep. Australas. Assoc. Advancem. Sci.* 1895, 455 (1895). T: [Qld] *J. Shirley* 1776 (isolectotype (Hawksworth, 1986) BRI).

This is an unequivocally lichenized species of *Pyrenula*, contrary to the observations of Hawksworth (1986), who reported that it is a non-lichenized fungus. It is characterized by the dark brown, ellipsoid, distoseptate ascospores with lumina that are wider than long.

**Pyrenula subcongruens** Müll.Arg., *Rep. Australas. Assoc. Advancem. Sci.* 1895, 457 (1895)

T: [Qld] *C. Knight* 135 (lectotype (here designated) G).

*Pyrenula pileata* Vain., *Ann. Acad. Sci. Fenn.*, ser. A, 15(6), 336 (1921)

T: Philippines, Luzon, Rizal, *T. Ramos* (holotype TUR-Vain., *n.v.*), *syn. nov.*

This is one of the most common species in Australia, characterized by an interspersed hamathecium and ascospores with the end lumina directly against the outer ascospore wall. It is at least palaeotropical.

**Pyrenula subumbilicata** (C.Knight) Aptroot, *comb. nov.*

*Trypethelium subumbilicatum* C.Knight, in *F.M. Bailey*, *Syn. Queensland Fl.*, Suppl. 1, 76 (1886); *Parmentaria subumbilicata* (C.Knight) Müll.Arg., *Flora* 70, 426 (1887). T: [Qld] Toowoomba, *C.H. Hartmann* (isotype BRI).

*Pyrenula immersa* Müll.Arg., *Flora* 70, 429 (1887). T: [Qld] Toowoomba, *C.H. Hartmann* (isotype BRI), *syn. nov.*

This strictly Australian species is characterized by the irregularly submuriform ascospores with end locules simple, only a few medial cells longitudinally septate and the lateral, often fused ostioles.

**Pyrenula subvariolosa** (C.Knight) Aptroot *comb. nov.*

*Anthracothecium subvariolosum* C.Knight, in J. Shirley, *Lich. Fl. Queensland* **4**, 182 (1889); *Verrucaria subvariolosa* C.Knight, in F.M. Bailey, *Syn. Queensland Fl.*, Suppl. **1**, 78 (1886). T: [Qld] J. Shirley (isotype BRI).

*Trypethelium planum* C.Knight, in F.M. Bailey, *Syn. Queensland Fl.*, Suppl. **1**, 77 (1886); *Parmentaria plana* (C.Knight) Shirley, *Lich. Fl. Queensland* **4**, 162 (1889). T: [Qld] C. Knight; *n.v.*, *syn. nov.*

*Trypethelium umbilicatum* C.Knight, in F.M. Bailey, *Syn. Queensland Fl.*, Suppl. **1**, 77 (1886); *Parmentaria umbilicata* (C.Knight) Shirley, *Lich. Fl. Queensland* **4**, 161 (1889); *Bottaria umbilicata* (C.Knight) Müll.Arg., *Rep. Australas. Assoc. Advancem. Sci.* **1895**, 462 (1895). T: [Qld] Toowoomba, Main Range, C.H. Hartmann (isotype BRI), *syn. nov.*

This apparently endemic Australian species is characterized by the irregularly submuriform ascospores with simple end locules, only a few medial cells longitudinally septate and the separate, apical ostioles.

**Pyrenula xanthominuta** Aptroot, *sp. nov.*

Figures 7–8

*Pyrenula* ascosporis minutis, thallo crystallifero, lichexanthonicum continens.

*Etymology.* The specific epithet refers to the minute ascospores and the presence of a xanthone in the thallus.

Type: AUSTRALIA. Queensland: Fitzroy Island, A.&M. Aptroot 22303, iii.1988 (holotype CANB; isotype ABL).

Thallus corticate, brownish to olive-green, with many colourless crystals and some minute pseudocypheae. Ascomata simple, subglobose, erumpent from the substratum, totally or mostly covered by thallus, c. 0.3–0.5 mm diam. Ascomatal wall with crystals, up to 60 µm thick. Ostiole pale to brown, apical. Hamathecium not interspersed with oil droplets, IKI–. Ascospores 8 per ascus, irregularly biseriata, 3-septate, fusiform with rounded ends, 9–11 x 6.5–8 µm; lumina angular, wider than long, sometimes not aligned; terminal lumina separated from the exospore by an endospore layer. Pycnidia unknown.

*Chemistry:* Thallus UV+ yellow or negative, lichexanthone detected with TLC.

This species is chiefly characterized by the short but relatively wide ascospores. It is known only from coastal areas of northern Australia.

ADDITIONAL SPECIMEN EXAMINED

Northern Territory: • Melville Island, Conder Point, H. Streimann 42496, 27.iv.1989 (CANB).

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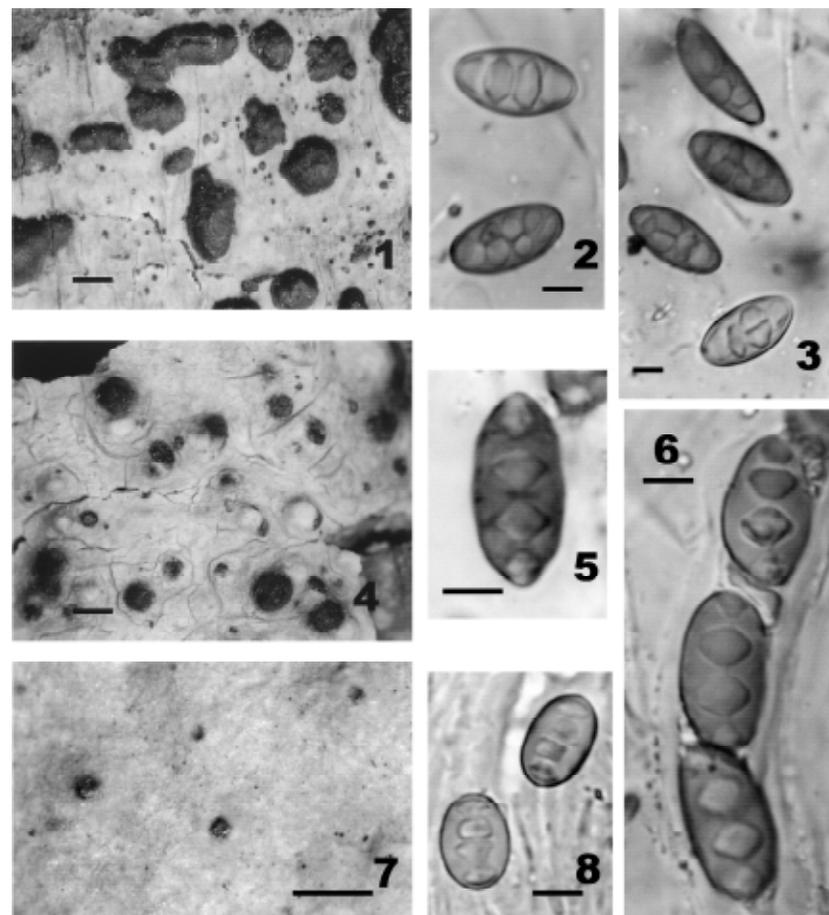
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Figures 1–3. *Lithothelium hieroglyphicum*: 1. Habitats; 2–3. Ascospores. 4–6. *Pyrenula howeana*: 4. Habitats; 5–6. Ascospores. 7–8. *Pyrenula xanthominuta*: 7. Habitats; 8. Ascospores. All from holotypes; Bar = 1 mm in figs 1 & 4; 5 µm in figs 2, 3, 5, 6 & 8; 0.5 mm in fig. 7.

## Notes on the taxonomy of *Lecanora aberrata* comb. nov. (lichenized Ascomycota)

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**Abstract:** The new combination *Lecanora aberrata* (Stirt.) Elix is proposed, and a detailed description is presented.

The lichen *Lecidea aberrata* Stirt. was first described from a single corticolous collection from Taylor Range, near Brisbane in southern Queensland (Stirton 1881). Although the species is often sterile, bearing copious pulverulent, granular soredia, the type material is fertile, and Stirton reported the apothecia to be “sessilia, plana et tunc quasi thallino-marginata demum convexa et immarginata” [sessile, plane and as if thalline-marginate but eventually convex and immarginate]. The apothecial margins of *Lecanora* species usually include algal cells, and are generally conspicuous and concolorous with the thallus, but in some species they are inconspicuous and reduced or become excluded (Lumbsch & Elix 2004). Such is the case with *L. aberrata*, as detailed in the description below. In addition, the apothecia of this species were found to have *Lecanora*-type asci, so it is here transferred to *Lecanora*.

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.

***Lecanora aberrata*** (Stirt.) Elix, comb. nov.

Basionym: *Lecidea aberrata* Stirt., *Trans. & Proc. Roy. Soc. Victoria* **17**, 71 (1881).

*Type:* Australia. Queensland: Brisbane, on bark of *Eucalyptus crebra*, F.M. Bailey 190 (GLAM-lectotype *vide* R.W. Rogers, *Austrobaileya* **1**, 502–510 (1982) – not seen; BRI-isotype!).

Thallus crustose, grey-white to creamy white, corticolous, up to 7 cm wide, thin at first but soon becoming thicker and verrucose, surface shiny and corticate, but verrucae soon erumpent and developing into a thick, granular sorediate mass, granules 60–80  $\mu\text{m}$  wide, consoredia 150–350  $\mu\text{m}$  wide, becoming  $\pm$ corticate in part and forming coralloid pseudoisidia. Apothecia rare, pale red-brown to orange-brown, 0.6–1.3 mm wide, sessile,  $\pm$ flat or becoming convex. Apothecial margins concolorous with the thallus, thick at first, becoming  $\pm$ verrucose, densely sorediate and reduced. Hymenium colourless, I+ intense blue; epihymenium reddish brown, K–; hypothecium colourless; paraphyses slightly branched and slightly thickened apically. Asci of the *Lecanora*-type, 8-spored. Ascospores simple, colourless, ellipsoid, 8.5–11.0  $\times$  5.0–6.5  $\mu\text{m}$ . Pycnidia not seen.

*Chemistry:* Thallus K+ pale yellow, C+ orange, KC–, P+ orange-red; containing atranorin (minor), pannarin (major or minor), arthothelin (minor or major), norpannarin (minor), 2,4-chloronorlichexanthone (trace), 4,5-dichloronorlichexanthone (trace),  $\pm$ thiophanic acid (major, minor or trace).

### Remarks

This species is characterized by the grey-white to creamy white thallus, the densely granular sorediate upper surface and the presence of atranorin, pannarin, and the arthothelin chemosyndrome. *Lecanora aberrata* could be considered the sorediate counterpart of *L. neoqueenslandica* Lumbsch (Lumbsch 1994, Lumbsch & Elix 2004), in that the two species have identical chemistry and similar apothecial anatomy, although the latter has slightly larger ascospores (9.5–12.5  $\times$  5.0–7.0  $\mu\text{m}$ ).

*Lecanora aberrata* is a relatively rare species that occurs on bark in subtropical and tropical rainforest. Associated species included *Coccocarpia palmicola* (Spreng.) Arv. & D.J. Galloway, *Hafellia bahiana* (Malme) Sheard, *Lecanora helva* Stizenb., *Phyllopsora conwayensis* Elix, *P. homosekikaica* Elix, *Relicina demethylbarbatica* Elix & J. Johnst., *Relicinaopsis malaccensis* (Nyl.) Elix & Verdon and *R. rahengensis* (Vain.) Elix & Verdon.

### ADDITIONAL SPECIMEN EXAMINED

*Queensland:* • Conway State Forest, 18 km E of Proserpine, on *Albizia* in lowland rainforest, 28.vi.1986, J.A. Elix 20781 & H. Streimann (CANB).

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