

Australasian Lichenology

Number 52, January 2003



Pertusaria celata was described in 1994 by Archer & Elix from a specimen collected near Auckland by John Bartlett. It's known to occur in both major islands of New Zealand. Its epithet (which means *hidden* or *concealed* in Latin) refers to its distinctive verrucae—they're torn, revealing the apothecia hidden beneath.

5 mm 

CONTENTS

ARTICLES

- McCarthy, PM—A new parasitic species of *Verrucaria* in New South Wales 3
Elix, JA; Wardlaw, JH; Obermayer, W—2-Hydroxyconviresnic acid, a new
depsidone from the lichen *Sulcaria sulcata* 6
Zakaria, Z; Din, LB; Samsudin, MW; Dazni, A—Chemical constituents of the
lichen *Ramalina dumeticola* from Fraser's Hill, Peninsular Malaysia 9
Aptroot, A; Tibell, L—*Chaenotheca papuensis*, a new species from huts in a
mountain village in Papua New Guinea 12
- ADDITIONAL LICHEN RECORDS FROM AUSTRALIA
- Archer, AW (50)—Graphidaceae from Christmas Island 14
McCarthy, PM (51)—Some aquatic pyrenolichens from Kosciuszko National
Park, Snowy Mountains, New South Wales 16
Archer, AW; Elix, JA (52)—The genus *Sclerophyton* 19
- ADDITIONAL LICHEN RECORDS FROM OCEANIA
- McCarthy, PM (9)—Foliicolous Trichotheliaceae from the Solomon Islands
and Vanuatu 20
- ADDITIONAL LICHEN RECORDS FROM NEW ZEALAND
- Fryday, AM (39)—*Fuscidea subasbolodes* Kantvilas and *Porpidia platycarp-*
oides (Bagl.) Hertel 25
- RECENT LITERATURE ON AUSTRALASIAN LICHENS 27



Australasian Lichenology

Number 52, January 2003 ISSN 1328-4401



A new parasitic species of *Verrucaria* in New South Wales

P.M. McCarthy

Australian Biological Resources Study,
GPO Box 787, Canberra, A.C.T. 2601, Australia

Introduction

At least 15 taxa in the genus *Verrucaria* are known to parasitize other lichens, most commonly species of *Caloplaca* and *Staurothele*, as well as *Aspicilia*, *Lecanora* and *Diplotomma* (Zehetleitner 1978, Clauzade & Roux 1984, 1985, Navarro-Rosinés & Roux 1987, McCarthy 1988, Menard & Roux 1991, Breuss 1994, 1998). The parasite displaces the host mycobiont and incorporates the protococcoid algal cells into a new and independent *Verrucaria* thallus. The habit of a parasitic *Verrucaria* (small- or large-areolate, subsquamulose or placoid) as well as thalline and areolar dimensions are largely determined by the growth-form of the host species. Most have been regarded as strictly host-specific, and this attribute has been given considerable taxonomic weight. However, this is not always the case, and these lichens are known to infect up to six host species at a single locality (McCarthy 1988).

The greatest diversity of parasitic *Verrucariae* is found in central and southern Europe, with smaller numbers of taxa in northern and north-western Europe and western North America. This paper documents a new species that parasitizes the endemic calcicolous lichen *Buellia pruinosa* in eastern New South Wales.

Verrucaria buelliicola P.M. McCarthy, sp. nov.

Thallus epilithicus, determinatus, areolatus, griseus, parasiticus *Buelliae pruinosa*, areolis planis vel leviter convexis, (0.3-)0.6-1.0(-1.5) mm latis. Perithecia atra, semimmersa vel plusminusve immersa, 0.14-0.22(-0.25) mm diametro, excipulo fuscoviridi vel nigrofulco. Periphyses 10-20 × 2-4 µm. Asci 60-70 × 17-22 µm. Ascosporae ellipsoideae vel latae-ellipsoideae, (13-)17(-20) × (7-)9.5(-12) µm.

Type: Australia: New South Wales: 12 km NE of Canowindra, near Canowindra-Orange road, Grove Creek, 33°28'S, 148°46'E, alt. c. 430 m, highly metamorphosed limestone outcrops, parasitic on *Buellia pruinosa* Müll. Arg. (Physciaceae), P.M. McCarthy 1850 & J.A. Elix, 17.xii.2002 (Holo: CANB). (Fig. 1)

Thallus crustose, parasitic on *Buellia pruinosa*, pale to medium greenish grey, of scattered or contiguous areolae, or forming torbicular, areolate thalli 4-10 mm wide. Areolae (0.3-)0.6-1.0(-1.5) mm wide, 0.15-0.25(-0.35) mm thick, ±isodiametric to irregular, sharply angled and plane when closely arranged in a discrete thallus, or the margins more rounded and the surface slightly to strongly convex when areolae are solitary or in small clusters; surface dull, minutely uneven, sometimes rimulose; isolated areolae often markedly attenuated towards the base. Epinecral layer hyaline, 10-20(-30) µm thick. Cortex 1-2 cells thick, pseudoplectenchymatous; cells moderately thick-walled, with the uppermost part of the wall dark brown, 4-8 µm diam. Photobiont layer 40-80(-120) µm deep; cells protococcoid, bright pale green, 5-10(-16) µm diam.; interstitial mycobiont cells 3-6 µm wide. Medulla white in surface view, Lugol's I-; hyphae richly branched, short-celled, 2-4(-5) µm wide.

Perithecia very numerous, 1-4(-8) in most areolae, dull black, semi-immersed to almost completely immersed, 0.14-0.22(-0.25) mm diam., slightly convex to hemispherical above, lacking an involucrellum. Perithecial apex rounded or ±plane; ostiole inconspicuous or in a shallow, 15-30(-40) µm wide depression. Excipulum dark greenish brown to ±black and 30-55 µm thick near the apex, initially hyaline

to pale brown at the sides and base, but becoming dark greenish brown to brown-black and 12–20 μm thick. *Centrum* globose to broadly pyriform, 0.12–0.18 mm diam. *Periphyses* 10–20 \times 2–4 μm , sparingly branched; apices often somewhat swollen, to 5 μm wide. *Paraphyses* absent. *Hymenial gel* Lugol's I+ red-brown. *Asci* 8-spored, clavate to cylindroclavate or narrowly obclavate, 60–70 \times 17–22 μm . *Ascospores* simple, hyaline, mostly ellipsoid to broadly ellipsoid, massed or irregularly biseriate in the ascus, (13–)17(–20) \times (7–)9.5(–12) μm [$n = 70$]; contents occasionally sparsely granulose and usually 1–3-guttulate.

Conidiomata not seen.

Notes: While most parasitic species of *Verrucaria* have a hyaline or pale brown excipulum and ascospores in the range 8–15 \times 4–8 μm , *V. buelliicola* has a dark excipulum and larger ascospores. *Verrucaria helveticorum* Zehetl. has very similar ascospores, but it also has a pale excipulum, and the medulla is Lugol's I+ blue; *V. aspiculicola* R. Sant. has black-rimmed areolae and ascospores 19–26 \times 6–8 μm long.

The new species is known only from the type locality on the boundary of the Central Tablelands and Central-western Slopes of New South Wales. Lichens growing with *Verrucaria buelliicola* and *Buellia pruinosa* at Grove Creek include *Caloplaca* spp., *Lepraria* sp., *Lobothallia radiosa*, *Placynthium subradiatum*, *Thelidium* aff. *papulare*, *Verrucaria baldensis* and *V. nigrescens*. Also present is *V. compacta* [McCarthy 1851 (CANB), and a new record for New South Wales], which is primarily free-living but also weakly parasitic on *B. pruinosa* (see McCarthy 2001 for description).

References

- Breuss, O (1994): Über einige wenig bekannte *Verrucaria*-Arten (Lichenes, Verrucariaceae). *Österreichische Zeitschrift für Pilzkunde* 3, 15–20.
- Breuss, O (1998): On the taxonomy of "*Catapyrenium*" *plumbeum* (lichenized Ascomycetes, Verrucariaceae), *Annalen des Naturhistorischen Museums in Wien* 100B, 671–676.
- Clauzade, G; Roux, C (1984): Deux espèces nouvelles de lichens méditerranéens: *Lecanora poeltiana* Clauz. et Roux sp. nov., *Verrucaria poeltiana* Clauz. et Roux sp. nov. *Beiheft zur Nova Hedwigia* 79, 187–201.
- Clauzade, G; Roux, D (1985): Likeno de Okcidenta Eŭropo. Illustrita Determinlibro. *Bulletin de la Société Botanique du Centre-Ouest, Nouvelle Série, Numéro Spécial* 7, 1–893.
- McCarthy, PM (1988): New and interesting species of *Verrucaria* II. *Lichenologist* 20, 245–251.
- McCarthy, PM (2001): *Verrucaria*. *Flora of Australia* 58A, 176–196.
- Menard, T; Roux, C (1991): *Verrucaria irrubescens* Menard et Roux sp. nov., espèce nouvelle de lichen. *Biocosme Mésogéen* 8, 1–10.
- Navarro-Rosinés, P; Roux, C ('1987') [1988]: *Verrucaria hladuniana* Nav.-Ros. et Roux sp. nov., nova likenspecio cœmara mediteranea. *Bulletin de la Société Linéenne de Provence* 39, 129–134.
- Zehetleitner, G (1978): Über einige parasitische Arten der Flechtengattung *Verrucaria*. *Nova Hedwigia* 29, 683–734.

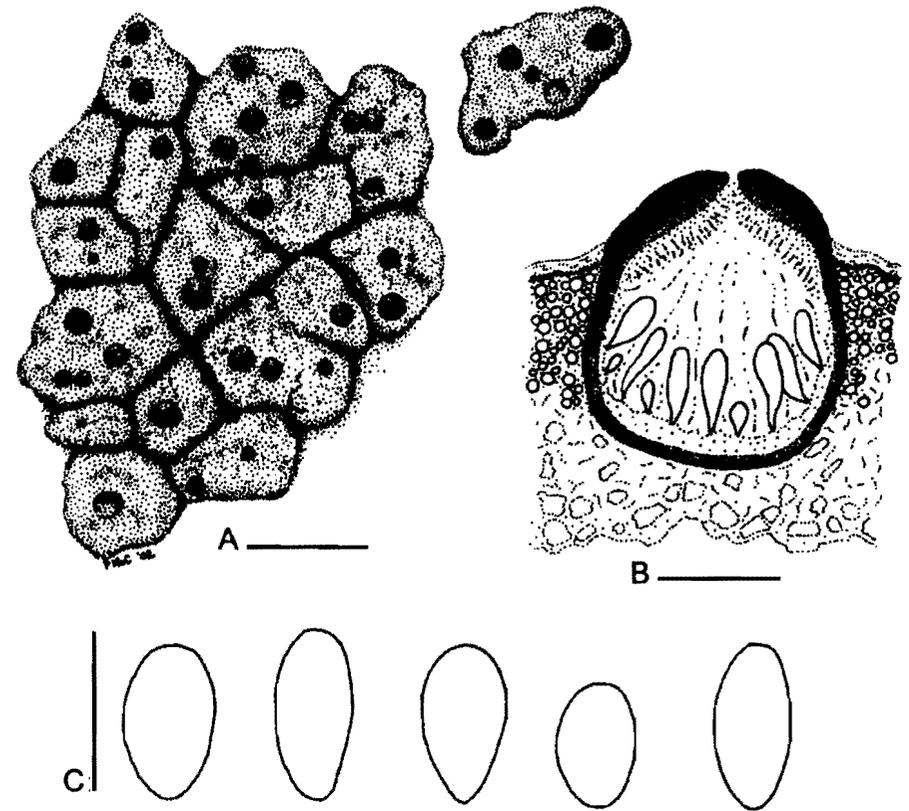


Fig. 1. *Verrucaria buelliicola* (holotype). A, Habit of thallus and perithecia; B, Vertical section of perithecium and adjacent thallus (semi-schematic); C, Ascospores. Scales A = 1 mm, B = 0.2 mm, C = 20 μm .

2-Hydroxyconvirensic acid, a new depsidone
from the lichen *Sulcaria sulcata*

John A. Elix and Judith H. Wardlaw
Department of Chemistry, Faculty of Science,
Australian National University, Canberra, A.C.T. 0200, Australia

Walter Obermayer
Institut für Botanik, Karl-Franzens-Universität Graz,
Holteigasse 6, A-8010 Graz, Austria

Abstract: A new depsidone, 2-hydroxyconvirensic acid, has been detected in a chemical race of the lichen *Sulcaria sulcata*, and the structure confirmed by partial organic synthesis.

The lichen *Sulcaria sulcata* (Lev. apud Jacqem.) Bystrek ex Brodo & D. Hawksw. (Parmeliaceae) is well known for its chemical diversity, and has recently been shown to exhibit at least six major chemical races (Obermayer & Elix 2002). In a continuation of our chemotaxonomic investigations of this species (Elix *et al.* 1999, Elix *et al.* 2000), we have recently encountered the new lichen metabolite 2-hydroxyconvirensic acid (3), together with its congeners virensic acid (1) and 2-hydroxyvirensic acid (2) in chemical race 3 (Figure 1).

Materials and Methods

Authentic material of 2-hydroxyconvirensic acid (3) was synthesized in the following manner. Sodium triacetoxymethylborohydride (42 mg, 0.20 mmol) was added to a solution of 2-hydroxyvirensic acid (2) (15 mg, 0.04 mmol) in anhydrous dioxane (14 ml), and the mixture stirred and heated at 80°C for 20 hours. The dioxane was then evaporated under reduced pressure, the residue dissolved in ethyl acetate and the solution washed in turn with dilute sulfuric acid, water (×2) and dried (MgSO₄). Evaporation of the solvent afforded 2-hydroxyconvirensic acid (8.0 mg, 53%) as a colourless solid. ¹H n.m.r. (CD₃COCD₃) δ 2.18, 2.30, 2.70, 3s, ArMe; 5.13, s, CH₂. Mass spectrum *m/z* 273 (24%, 231, (23), 200 (26), 172 (39), 142 (41), 137 (25), 132 (31), 129 (28), 121 (27), 119 (25), 115 (23), 111 (24), 109 (31), 107 (30), 105 (57), 104 (43) and 91 (100). Standard TLC R_F values: R_F (A) 0.05; R_F (B') 0.22; R_F (C) 0.04; R_F (G) 0.28. Standard HPLC: R_T 18.2 min.; R_t 0.20.

Chromatography

Natural compounds were characterized by thin-layer chromatography (TLC) according to the methods standardized for lichen products (Culberson 1972, Elix & Ernst-Russell 1993), and by high-performance liquid chromatography (HPLC) with retention index values (R_I) calculated from benzoic acid and solerinic acid controls (Elix *et al.* 2002, Feige *et al.* 1993). The HPLC was coupled to a photodiode array detector for ultraviolet spectroscopic comparisons. By this means, the ultraviolet spectra observed for the various components eluting in the HPLC chromatogram were recorded and computer-matched against a library of ultraviolet spectra recorded for authentic metabolites under identical conditions. In the present case, the correlation of ultraviolet spectra of the synthetic depsidone (3) with that of the lichen metabolite was greater than 99.9%.

Lichen Material

Sulcaria sulcata (Lev. apud Jacqem.) Bystrek ex Brodo & D. Hawksw.

China. Tibet, prov. Xizang, Nyainqentanglha Shan, 360 km E of Lhasa, near bend of the river Tsangpo, N side of Gyala Peri: •5 km S of Tongjug village, 29°56'N, 94°54'E, 3350 m, on dead *Salix*, W. Obermayer 06848, 18.viii.1994 (GZU); •9 km S

of Dongjug village, 29°54'N, 94°52'E, 3200–3500 m, on *Prunus* in *Rhododendron-Abies* forest, W. Obermayer 06462, 20.viii.1994 (GZU).

Discussion and Results

We have now confirmed the co-occurrence of atranorin and the depsidones (1)–(3) in a chemical race of *Sulcaria sulcata*. Although the depsidones virensic acid (1) and 2-hydroxyvirensic acid (2) are known lichen metabolites (Elix *et al.* 2000, Huneck & Yoshimura 1996), 2-hydroxyconvirensic acid (3) has not hitherto been recorded as occurring in nature. Comparisons were conducted between the synthetic depsidone (3) and the total acetone extracts from the several specimens of *Sulcaria sulcata* by TLC in four independent solvent systems and HPLC coupled to a photodiode array detector for ultraviolet spectroscopic comparisons. By this means, extracts of *Sulcaria sulcata* (chemical race 3) were shown to contain atranorin (minor), virensic acid (1) (minor), 2-hydroxyvirensic acid (2) (major) and 2-hydroxyconvirensic acid (3) (minor) (Figure 2).

Acknowledgments

We thank the Australian Research Council for their financial support of this work. The expedition by W.O. to southeastern Tibet was kindly financed by the Austrian Science Fund, project number P09663-BIO.

References

- Culberson, CF (1972): Improved conditions and new data for the identification of lichen products by a standardized thin-layer chromatographic method. *Journal of Chromatography* **72**, 113–125.
- Elix, JA; Ernst-Russell, KD (1993): *A Catalogue of Standardized Thin-Layer Chromatographic Data and Biosynthetic Relationships for Lichen Substances*, (2nd ed.), Australian National University, Canberra.
- Elix, JA; Wardlaw, JH; Archer, AW; Obermayer, W (1999): 2-Methoxypsoromic acid, a new lichen depsidone from *Pertusaria* and *Sulcaria* species. *Australian Journal of Chemistry* **52**, 717–719.
- Elix, JA; Wardlaw, JH; Obermayer, W (2000): 2-Hydroxyvirensic acid, a new depsidone from the lichen *Sulcaria sulcata*. *Australian Journal of Chemistry* **53**, 233–235.
- Elix, JA; Wardlaw, JH; Liu, X-W (2002): A new depsidone from the lichen family Parmeliaceae. *Australasian Lichenology* **51**, 4–6.
- Feige, GB; Lumbsch, HT; Huneck, S; Elix, JA (1993): The identification of lichen substances by a standardized high-performance liquid chromatographic method. *Journal of Chromatography* **646**, 417–427.
- Huneck, S; Yoshimura, I (1996): *Identification of Lichen Substances*. Springer-Verlag, Berlin, Heidelberg, New York.
- Obermayer, W; Elix, JA (2002): Notes on chemical races in *Sulcaria sulcata* from southeastern Tibet and adjacent regions. *Bibliotheca Lichenologica* (in press).

Chemical constituents of the lichen *Ramalina dumeticola*
from Fraser's Hill, Peninsular Malaysia

Zuriati Zakaria, Laily B. Din, Mohd Wahid Samsudin, Asma Dazni
Faculty of Science and Technology, Universiti Kebangsaan Malaysia,
43000, Bangi, Malaysia

John A. Elix

Department of Chemistry, The Faculties,
Australian National University, Canberra, A.C.T. 0200, Australia

Abstract: The morphology and the chemical constituents of the lichen *Ramalina dumeticola* from Fraser's Hill are described. This lichen is a new record for Malaysia.

In 1991, the lichen *Ramalina cannonii* Elix *et al.* was discovered in the Cameron Highlands, and chemical analysis established the presence of eight secondary metabolites, including usnic acid, homosekikaic acid, sekikaic acid, 4'-O-methylnorhomosekikaic acid, 4'-O-methynorsekikaic acid, 4'-O-demethylsekikaic acid, hyperhomosekikaic acid, and ramalinolic acid (Elix *et al.* 1991). The collection, identification and chemical analysis of lichens from various parts of the country are part of our continuing study of these organisms in Malaysia (Zakaria *et al.* 2000, Din *et al.* 2002). During a scientific expedition by researchers from the Universiti Kebangsaan Malaysia to Fraser's Hill in November, 2000, more than 50 lichen specimens were collected. One of those specimens, *Ramalina dumeticola* Krog & Swinscow, was found to be very abundant on the pine trees in open woodland at Fraser's Hill. Up to the present, there are no records of this lichen occurring in Malaysia, nor an investigation of its chemistry. In this paper, we report the morphology and chemistry of the Malaysian collections of *R. dumeticola*, and compare its constituents with those of other local *Ramalina* species.

Materials and Methods

The lichen *Ramalina dumeticola* Krog & Swinscow (= *Ramalina nervulosa* var. *dumeticola* (Krog & Swinscow) N. Stevens) was collected from Fraser's Hill, Pahang, 3°46'N, 111°43'E, 1300 m (voucher specimen BFR1) and deposited at the Herbarium Universiti Kebangsaan Malaysia (UKMB).

Thallus corticolous, fruticose, to 4 cm long but often shorter, moderately branched, the branching dichotomous with wide angles (Figure 1), pale yellow to pale greenish-grey, solid, flattened near the base, angular to rounded at the apices, 0.3–0.8 mm wide, tapering towards the apices, with marginal pseudocyphellae and indistinct laminal striae, with occasional perforations and longitudinal cracks in the cortex; soredia present; soralia marginal, ellipsoid or becoming confluent and then irregularly elongate; apothecia rare, lateral, stipitate, 1.0–2.5 mm wide, flat or convex; ascospores fusiform, 3-septate, straight or slightly curved, 16–22 × 5–6 μm.

The lichen fragments were freed as far as possible from any trace of organic substratum, and the sample (0.5 g for each lichen) was extracted with warm acetone for thin layer chromatography (TLC) using Merck Kieselgel 60 F₂₅₄ plates (20 × 20 cm) as the stationary phase, and the solvent system C (toluene : acetic acid = 200 : 30). The spots (compounds) on the TLC plates were detected under ultraviolet light (λ 254 nm) and by spraying with 10% H₂SO₄ followed by heating on a hot plate. The compounds were characterized using the methods standardized for lichen products (Culberson 1972, Culberson & Johnson 1982, Elix & Ernst-Russell 1993).

- (1) R₁ = CHO, R₂ = H
- (2) R₁ = CHO, R₂ = OH
- (3) R₁ = CH₂OH, R₂ = OH

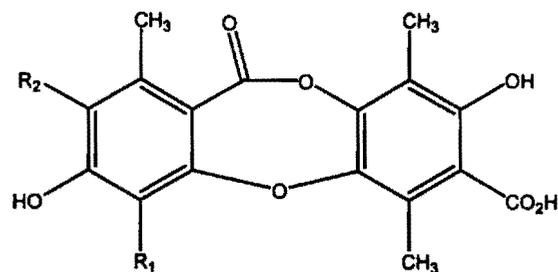


Figure 1. Structure of depsidones present in *Sulcaria sulcata*, chemical race 3.

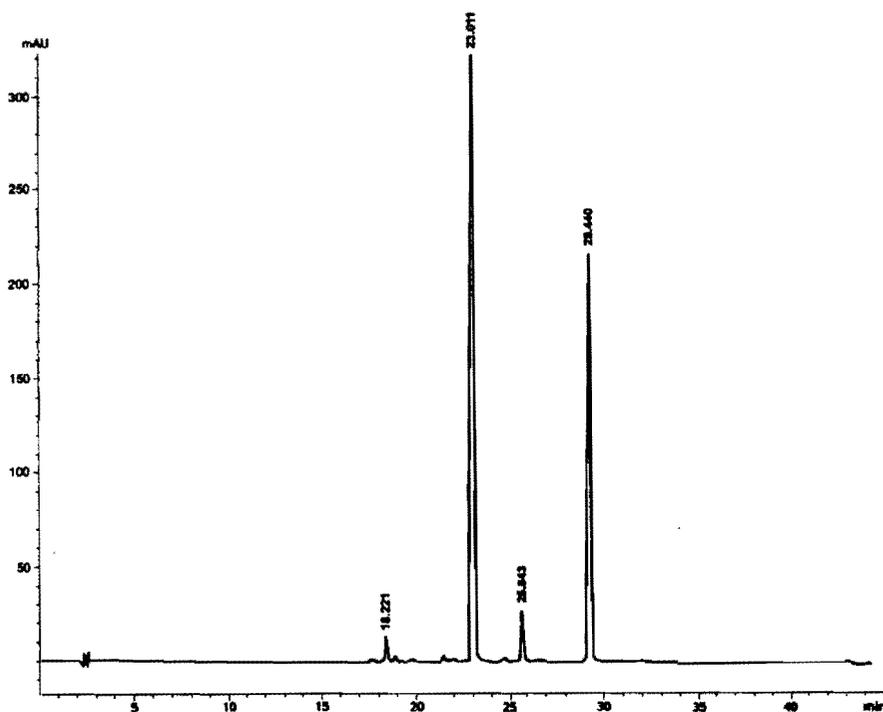


Figure 2. HPLC of methanol extract of *Sulcaria sulcata* (chemical race 3) [W. Obermayer 06848 (GZU)]; R_T 18.2 min = 2-hydroxyconviresnic acid (3); R_T 23.2 min = 2-hydroxyviresnic acid (2); R_T 25.8 min = viresnic acid (1); R_T 29.4 min = atranorin.

The lichen material (71.7 g) was extracted with chloroform (3 × 250 ml). The combined chloroform extracts were evaporated to afford the crude product as a yellowish green powder (1.22 g). The crude extract was purified by column chromatography using silica gel 60 as the stationary phase and a mixture of hexane containing increasing proportions of ethyl acetate as the eluent. The eluent was collected in 20-ml fractions which were monitored by thin-layer chromatography. Fractions containing compounds with similar R_F values were combined and further purified by preparative layer chromatography. Two major compounds were separated using this technique. The more mobile component was recrystallized from ethyl acetate to afford usnic acid (6.9 mg) as yellow needles, R_F 0.70 in solvent C (Culberson 1972 reports R_F 0.71) and m.p. 200°C (Culberson 1979 reports m.p. 203°C); 1H NMR ($CDCl_3$) δ 1.75 (3H, s, Me), 2.10 (3H, s, Ar-Me), 2.65 (3H, s, COMe), 2.67 (3H, s, COMe), 5.97 (1H, s, CH), 11.03 (1H, s, Ar-OH) and 13.31 (1H, s, Ar-OH). The less mobile component isolated was identified as homosekikaic acid (3.4 mg) which crystallized from the eluent in colourless needles, R_F 0.57 in solvent C (Culberson 1971 reports R_F 0.56), m.p. 132–135°C (Culberson 1979 reports m.p. 133–137°C); 1H NMR ($CDCl_3$) δ 0.92 (3H, t, Me of pentyl chain) 0.99 (3H, t, Me of propyl chain), 1.60–1.76 (8H, m, CH_2CH_2Me and $CH_2(CH_2)_3Me$), 2.92–3.00 (4H, m, 2Ar CH_2), 3.81 (3H, s, OMe), 3.88 (3H, s, OMe), 6.37 (2H, s, Ar-H) and 6.43 (1H, s, Ar-H).

Discussion and Results

The thin-layer chromatographic (TLC) profile of *Ramalina dumeticola* showed the presence of two major spots at R_F 0.70 (yellow) and R_F 0.57 as well as a number of minor or trace spots (as detected by UV 254 nm). The R_F values of the spots are in agreement with those reported for usnic acid and homosekikaic acid (Culberson 1972). High-performance liquid chromatography (HPLC) confirmed those findings, but also indicated the presence of sekikaic acid (major) and 4'-O-methylnorhomosekikaic acid (minor) in significant quantities. The separation and purification of the two major compounds were carried out using column chromatographic and preparative thin-layer chromatographic techniques. The structure of compounds (1) and (2) was confirmed by comparison of their 1H NMR with the literature values (Din *et al.* 1989, Elix & Norfolk 1975). Based on our findings, it is apparent that usnic acid (1) and homosekikaic acid (2) are common metabolites in the genus *Ramalina*.

Acknowledgment

This work was made possible by a research grant (S/4/97) from Universiti Kebangsaan Malaysia and IRPA (09-02-02-0077), for which the authors are indebted.

References

- Culberson, CF (1972): Improved conditions and new data for the identification of lichen products by thin-layer chromatographic method. *Journal of Chromatography* **72**, 113–125.
- Culberson, CF (1979): *Chemical and Botanical Guide to Lichen Products*. The University of North Carolina Press.
- Culberson, CF; Johnson, A (1982): Substitution of methyl *tert*-butyl ether for diethyl ether in the standardised thin-layer chromatography method for lichen products. *Journal of Chromatography* **238**, 438–487.
- Din, LB; Zakaria, Z; Samsudin, MW; Latiff, A (1989): Kajian Liken Malaysia III: RMN Asid Stiktik dan Usnik daripada *Usnea misaminensis*. *Sains Malaysiana* **18**, 9–17.

- Din, LB; Zakaria, Z; Latiff, A; Elix, JA (2002): Chemical constituents of the lichens *Heterodermia flabellata* and *H. leucomelos* (Physciaceae) in Peninsular Malaysia. *Malayan Nature Journal* **56**, 1–3.
- Din, LB; Ismail, G; Elix, JA (1998): The lichens in Bario Highlands: their natural occurrence and secondary metabolites. In G. Ismail & L.B. Din (eds), *A Scientific Journey Through Borneo. The Kelabit Highlands of Sarawak*. Pelanduk Publications, Petaling Jaya, pp. 155–160.
- Elix, JA; Norfolk, S (1975): Synthesis of *meta*-divarinol and olivetol depsides. *Australian Journal of Chemistry* **28**, 399–411.
- Elix, JA; Ernst-Russell, KD (1993): *A Catalogue of Standardised Thin-layer Chromatographic data and Biosynthetic Relationships for Lichen Substances* (2nd ed). Australian National University, Canberra.
- Elix, JA; Din, LB; Samsudin, MW (1991): New species of *Ramalina* (lichenized Ascomycotina) from Australia and Malaysia. *Mycotaxon* **40**, 41–44.
- Sipman, HJM (1993): Lichens from Mount Kinabalu. *Tropical Bryology* **8**, 281–314.
- Zakaria, A; Din, LB; Latiff, A; Elix, JA (2000): Notes on the morphology and chemical constituents of the lichen *Cladia aggregata* (Sw.) Nyl. in Peninsular Malaysia. *Malayan Nature Journal* **54**, 27–30.



Ramalina dumeticola Krog & Swinscow

Chaenotheca papuensis, a new species from huts
in a mountain village in Papua New Guinea

André Aptroot

Centraalbureau voor Schimmelcultures,
P.O. Box 85167, NL-3508 AD Utrecht, The Netherlands

Leif Tibell

Department of Systematic Botany, Evolutionary Biology Centre,
Uppsala University, Norbyvägen 18D, S-752 36 Uppsala, Sweden

Abstract: The new lichen species *Chaenotheca papuensis* is described from wood and bark of huts in a mountain village in Papua New Guinea.

Introduction

Species of Caliciales occur worldwide in suitable habitats, and are most abundant on lignum and dry bark in temperate to boreal areas. However, they also occur in tropical regions, where they are most abundant in mountain habitats. Many species are fairly widespread, and most species known from Papua New Guinea (Tibell 1987) occur in both hemispheres. An exception is *Calicium bullatum* Aptroot & Tibell, which was described from PNG (Aptroot *et al.* 1997) but has not been found elsewhere.

Huts made of local wood (in part often with the bark still attached) form a suitable habitat for Caliciales in addition to standing lignum snags in forest, and often exhibit a similar flora. The huts in Myola, a remote village in the Owen Stanley Range at around 2100 m altitude, support Caliciales, including a new species that is described here. Myola is one of the richest areas in PNG, and probably in the world, for lichen species. It is home to the tree from which the still unsurpassed total of 173 corticolous lichen species has been reported (Aptroot 1997).

Chaenotheca papuensis Aptroot & Tibell sp. nov.

Type: Papua New Guinea, Northern Province, Owen Stanley Range, Myola 9°09'S, 147°46'E, 2100 m alt., on bark of hut, 14–19.x.1995, A. Aptroot 37215 (UPS-holotype; ABL-isotype).

Thallus superficialis, cinereus, KOH et PD flavescens. Algae trebouxioideae. Apothecia mediocria, stipitata, nigra. Pruina densa, citrina, acido vulpinico continens. Ascospores globosae, 3.5–4.5 µm, verrucosae. Fig. 1.

Thallus superficial, pale grey, minutely verrucose to areolate. *Photobiont* trebouxioid. *Apothecia* medium-sized but sturdy, 0.7–1.0 mm high. *Stalk* 0.06–0.14 mm in diam., black, covered by a dense citrine yellow, crystalline pruina in all its length, consisting of medium brown, longitudinally arranged, parallel hyphae. *Capitulum* lenticular to spherical, 0.20–0.36 mm in diam., with a well-developed, almost spherical mazaedium, at the base enclosed by a reduced, cupular excipulum. Excipulum poorly developed as a cup at the base of the capitulum, 28–42 µm thick, consisting of periclinally arranged brown hyphae and covered by a thick layer of yellow pruina. Hypothecium medium brown, strongly convex. *Asci* formed singly, cylindrical, with well-developed stalks, 11–16 × 1.5–2.2 µm, with uniseriately arranged spores. *Spores* globose or slightly ellipsoidal, 3.5–4.5 µm, with an ornamentation of irregular, polygonal areas delineated by irregular cracks.

Chemistry: Thallus K+ yellow, C-, KC-, PD+ yellow, and an unidentified substance. The pruina of the apothecia consists of vulpinic acid.

ADDITIONAL MATERIAL EXAMINED

Same locality, but on wood of hut, A. Aptroot 37213 (ABL).

Chaenotheca papuensis is characterized by the rather sturdy apothecia, the very thick, citrine yellow pruina of the lower side of the capitulum and the stalk, the association with *Trebouxia*, and the rather small, spherical to slightly elongated, areolated spores. It is somewhat similar to *C. chloroxantha* Tibell, described from South Africa. That species, however, has slender and much taller apothecia, larger spores and asci, and a K-, PD- thallus. It is also similar to some phenotypes of *C. chlorella* (Ach.) Müll. Arg., but that differs in being associated with *Stichococcus*, in having a less well-developed pruina, predominately ellipsoidal and more coarsely ornamented spores, and a K-, PD- thallus.

References

- Aptroot, A (1997): Lichen biodiversity in Papua New Guinea, with the report of 173 species on one tree. *Bibliotheca Lichenologica* 68, 203–213.
Aptroot, A; Diederich, P; Sérusiaux, E; Sipman, HJM (1997): Lichens and lichenicolous fungi from New Guinea. *Bibliotheca Lichenologica* 64, 1–220.
Tibell, L (1987): Australasian Caliciales. *Symbolae Botanicae Upsalienses* 27(1), 1–279.



Figure 1. *Chaenotheca papuensis*— holotype. 1 mm

Additional lichen records from Australia 50.
Graphidaceae from Christmas Island

Alan W. Archer
National Herbarium of New South Wales,
Mrs Macquaries Road, Sydney, N.S.W. 2000, Australia

Abstract: Seven species in the genera *Graphina*, *Graphis*, *Phaeographina* and *Phaeographis* (Graphidaceae) are reported for the first time from Christmas Island, Indian Ocean.

Introduction

During a visit to Christmas Island in 2000 by P. McCarthy and H. Lepp, a number of specimens of Graphidaceae were collected (McCarthy & Elix 2002). Seven species have been identified and are reported here. All the Christmas Island specimens are in CANB. Ascospore dimensions are those of the specimens from Christmas Island.

The Species

Graphina rubens Müll. Arg., *Flora* 65, 386 (1882)

The species is characterized by inconspicuous immersed lirellae, initially fissurine but becoming semi-immersed and revealing the red-brown exciple, an uncarbonized proper exciple, ascospores 30–38 × 10 µm, 8–10 × 2–4-locular, and the presence of norstictic acid. The species was previously known from Indonesia (Müll. Arg., *loc. cit.*).

SPECIMEN EXAMINED

•c. 1 km S of North East Point, The Grotto, 10°25'25"S, 105°42'110"E, alt. 20 m, on living branch in mixed tropical forest, *Lepp* 70038, 23.vii.2000.

Graphis descissa Müll. Arg., *Bull. Herb. Boissier* 3, 318 (1895)

The species is characterized by predominantly simple, semi-immersed lirellae, a completely carbonized proper exciple, ascospores 32–40 × 6–8 µm, 10–12-locular, and the presence of stictic acid. The species was previously known from Queensland and northern New South Wales (Archer 1999).

SPECIMEN EXAMINED

c. 1 km WSW of North East Point, 10°24'55"S, 105°41'50"E, alt. 20 m, on dead wood in mixed tropical forest, *Lepp* 70026, 23.vii.2000.

Graphis immersella Müll. Arg., *Bull. Herb. Boissier* 3, 319 (1895)

The species is characterized by thin, simple, immersed, black lirellae, visible as a thin black line on the thallus surface, with a laterally carbonized proper exciple, ascospores 28–36 × 6–8 µm, 8–10-locular, and the presence of stictic acid. The species was previously known from Queensland (Archer 1999).

SPECIMEN EXAMINED

•near Daniel Roux Cave, 10°26'35"S, 105°39'40"E, alt. 70 m, on dead twig in moderately dense primary forest, *Lepp* 70261, 29.vii.2000.

Graphis nakanisheana Patwardhan & Kulkarni, *Norw. J. Bot.* 26, 46 (1979)

The species is characterized by numerous, white, branched, semi-immersed lirellae with conspicuous thalline margins, an uncarbonized proper exciple, ascospores 32–42 × 10 µm, 8–11-locular, and the presence of norstictic acid. The species was previously known from India (Patwardhan & Kulkarni, *loc. cit.*).

SPECIMEN EXAMINED

•start of West White Beach walking track, 10°28'15"S, 105°34'45"E, alt. 270 m, on living tree trunk in moderately dense primary forest, *Lepp* 70159, 27.vii.2000.

Graphis treubii Zahlbr., *Ann. Cryptog. Exot.* 1, 129 (1928)

The species is characterized by black, conspicuous, subimmersed lirellae, a laterally (or sometimes apically) carbonized proper exciple, the remaining exciple red-brown, ascospores 40–44 × 6–8 µm, 10–11-locular, and the presence of stictic acid. The species was previously known from Indonesia, the Northern Territory, Queensland and northern New South Wales (Archer 2001).

SPECIMEN EXAMINED

•Irvine Hill Road, c. 800 m SW of Irvine Hill, 10°26'30"S, 105°40'20"E, alt. 290 m, on dead wood in fern-dominated secondary growth, *Lepp* 70059, 24.vii.2000.

Phaeographina lamii Redinger, *Rev. Bryol. Lichénol.* 9, 102 (1936).

Syn.: *Graphina repleta* (Stirt.) Shirley var. *macrospora* A.W. Archer, *Telopea* 8, 291 (1999)

The species is characterized by conspicuous, off-white, grooved, sessile lirellae, an uncarbonized proper exciple, brown muriform ascospores 100–120 × 25–32 µm, and the presence of stictic acid. The species was previously known from Indonesia, the Andaman Islands (Makhija *et al.* 1992), and, as *Graphina repleta* var. *macrospora*, from Queensland and northern New South Wales (Archer 1999).

SPECIMEN EXAMINED

•c. 1 km N of Grants Well, 10°28'25"S, 105°39'10"E, alt. 270 m, on fallen branch in moderately dense primary forest, *Lepp* 70213, 28.vii.2000.

Phaeographis colligata (Stirt.) Zahlbr., *Cat. Lich. Univ.* 2, 366 (1924)

The species is characterized by conspicuous black, open, immersed, stellate lirellae with an epruinose epithecium, a thin, completely carbonized proper exciple, brown ascospores 15–18 × 6–8 µm, 4-locular, and the absence of lichen compounds. The species was previously known from India (Singh & Awasthi 1979), and is here also reported from Fiji. It is distinguished from two similar *Phaeographis* species with stellate lirellae by the length of the ascospores. In *P. ceratoides* (Vain.) Zahlbr., the ascospores are 10–12 µm long, and in *P. asteriformis* (Zahlbr.) Nakanishi, they are 24–42 µm long.

SPECIMEN EXAMINED

•c. 1 km N of Grants Well, 10°28'25"S, 105°39'10"E, alt. 270 m, on fallen branch in moderately dense primary forest, *Lepp* 70214, 28.vii.2000.

Fiji. •s. *loc.*, *F. Wilson s.n.*, 1892 (NSW L-4998).

Acknowledgments

I thank Heino Lepp for permission to examine his specimens, and also Judith Curnow for arranging the loan to NSW.

References

- Archer, AW (1999): The lichen genera *Graphis* and *Graphina* (Graphidaceae) in Australia. 1. Species based on Australian type specimens. *Telopea* 8, 273–295.
Archer, AW (2001): The lichen genus *Graphis* in Australia. *Australian Systematic Botany* 14, 245–271.
Makhija, U; Kekre, S; Patwardhan, PG (1992): Materials for a lichen flora of the Andaman Islands: VII. The family Graphidaceae. *Biouvigyanam* 18, 12–20.
McCarthy, PM; Elix, JA (2002): Additional lichen records from Australia 48. Miscellaneous taxa in Christmas Island. *Australasian Lichenology* 50, 10–22.
Singh, KP; Awasthi, DD (1979): Lichen genus *Phaeographis* in India. *Bulletin of the Botanical Survey of India* 21, 97–120.

Additional lichen records from Australia 51. Some aquatic pyrenolichens from Kosciuszko National Park, Snowy Mountains, New South Wales

P.M. McCarthy

Australian Biological Resources Study,
GPO Box 787, Canberra, A.C.T. 2601, Australia

Abstract: Four aquatic pyrenolichens, *Porina fluminea*, *Verrucaria aethiobola*, *V. funckii* and *V. rheitrophila*, are reported for the first time from Australia. *Polyblastia cruenta*, *Porina guentheri* and *Verrucaria inconstans* are new records for New South Wales.

Introduction

In January, 2002, the biodiversity of Kosciuszko National Park in the Snowy Mountains of south-eastern New South Wales was surveyed under the auspices of the New South Wales National Parks and Wildlife Service. Subsequently, *Verrucaria cootapatambensis* P.M. McCarthy sp. nov. was described from a narrow, snow-melt creek below the summit of Mt Kosciuszko (McCarthy 2002). Additional new and interesting records of aquatic pyrenolichens are documented here.

All of the specimens are held in CANB. They were collected from aquatic and semi-aquatic granite in the sheltered and tree-lined Thredbo River (1370–1480 m) and in creeks on the open plateau above the nearby tree-line (c. 1830 m) south of Mt Kosciuszko (2229 m), the highest point in Australia.

The Species

Polyblastia cruenta (Körb.) P. James & Swinscow, in Swinscow, *Lichenologist* 5, 110 (1971)

This lichen is known from several localities in Tasmania (McCarthy 2001b), and it also occurs in southern New Zealand, Arctic Eurasia, central and western Europe and North America.

SPECIMENS EXAMINED

New South Wales: •Kosciuszko National Park, Thredbo R., 1.7 km ENE of Dead Horse Gap, 36°31.4'S, 148°16.2'E, alt. 1470 m, *McCarthy 1818*, 13.i.2002; •Rams Head Range, tributary of Thredbo R., 36°29.7'S, 148°17.0'E, alt. 1940 m, *McCarthy 1841*, 14.i.2002.

Porina fluminea P.M. McCarthy & P.N. Johnson, *Nova Hedwigia* 61, 499 (1995)

This species is characterized by a comparatively dark thallus, small but prominent, blackish perithecia with a thin thalline covering, and persistently 5-septate ascospores (McCarthy & Johnson 1995). It was previously known from New Zealand (Wellington and Otago).

SPECIMENS EXAMINED

New South Wales: •Kosciuszko National Park, Thredbo R., 1.3 km ENE of Dead Horse Gap, 36°31.5'S, 148°16.0'E, alt. 1480 m, *McCarthy 1814*, 13.i.2002; •Thredbo R., 2 km ENE of Dead Horse Gap, 36°31.3'S, 148°16.6'E, alt. 1460 m, *McCarthy 1828* (part), 13.i.2002; •Thredbo R., 1 km WSW of Thredbo, 36°30.8'S, 148°17.8'E, alt. 1390 m, *McCarthy 1847*, 13.i.2002.

Porina guentheri (Flotow) Zahlbr., *Cat. Lich. Univ.* 1, 384 (1922)

Porina guentheri is known from damp and aquatic siliceous rocks in temperate regions of both hemispheres and sporadically in the tropics; its distribution includes Tasmania and Western Australia (McCarthy 2001a).

SPECIMENS EXAMINED

New South Wales: •Kosciuszko National Park, Thredbo R., 1.7 km ENE of Dead Horse Gap, 36°31.4'S, 148°16.2'E, alt. 1470 m, *McCarthy 1822*, 13.i.2002; •Thredbo R., 2 km ENE of Dead Horse Gap, 36°31.3'S, 148°16.6'E, alt. 1460 m, *McCarthy 1828* (part), 13.i.2002.

Verrucaria aethiobola Wahlenb., in Acharius, *Methodus*: 17 (1803)

The thallus of the Australian specimen is rather thick, rimose and dark reddish brown. The perithecia are 0.4–0.55 mm diam., convex to hemispherical, with a thick spreading involucrellum that is partly to almost completely overgrown by the thallus. The ellipsoidal ascospores are 20–27 × 10–13 µm. *Verrucaria aethiobola* is also known from temperate and boreal Eurasia and North America (see description in Hawksworth *et al.* 1992).

SPECIMEN EXAMINED

New South Wales: •Kosciuszko National Park, Thredbo R., 2 km ENE of Dead Horse Gap, 36°31.3'S, 148°16.6'E, alt. 1460 m, *McCarthy 1828* (part), 13.i.2002.

Verrucaria funckii (Spreng.) Zahlbr., *Cat. Lich. Univ.* 1, 41 (1921).

Verrucaria funckii has a thick, smooth, deeply rimose and blackish thallus. The small perithecia are completely immersed, their apices flush with the thallus surface. The involucrellum is ±contiguous with the excipulum, and the ascospores are elongate-ellipsoidal to subcylindrical and 21–30 × 6–10 µm. This lichen is also known from temperate and boreal Europe and North America (see description in Hawksworth *et al.* 1992).

SPECIMENS EXAMINED

New South Wales: •Kosciuszko National Park, Thredbo R., 1.7 km ENE of Dead Horse Gap, 36°31.4'S, 148°16.2'E, alt. 1470 m, *McCarthy 1816* (part), 13.i.2002; •Thredbo R., 1 km WSW of Thredbo, 36°30.8'S, 148°17.8'E, alt. 1390 m, *McCarthy 1847*, 13.i.2002.

Verrucaria inconstans P.M. McCarthy, *Lichenologist* 21, 109 (1995)

Verrucaria inconstans was previously known from Tasmania (McCarthy 2001c) and southern New Zealand.

SELECTED SPECIMENS EXAMINED

New South Wales: •Mt Kosciuszko National Park, Thredbo R., 1.7 km ENE of Dead Horse Gap, 36°31.4'S, 148°16.2'E, alt. 1470 m, *McCarthy 1817*, 13.i.2002; •Thredbo R., 2 km ENE of Dead Horse Gap, 36°31.3'S, 148°16.6'E, alt. 1460 m, *McCarthy 1825*, 13.i.2002; •Rams Head Ra., tributary of Thredbo R., 36°29.7'S, 148°17.0'E, alt. 1940 m, *McCarthy 1845*, 14.i.2002.

Verrucaria rheitrophila Zschacke, *Verhandl. Bot. Ver. Brandenburg* 64, 108 (1922)

The thallus is rather thick, smooth, continuous to sparingly rimose, dark green to blackish, and often richly black-punctulate. The minute perithecia are immersed, the involucrellum is predominantly apical, and most ascospores are in the range 10–15 × 6–9 µm. *Verrucaria rheitrophila* occurs in temperate and boreal Eurasia and North America; it is also rather common on aquatic rocks in southern New Zealand (McCarthy 1991).

SPECIMENS EXAMINED

New South Wales: •Kosciuszko National Park, Thredbo R., 1.3 km ENE of Dead Horse Gap, 36°31.5'S, 148°16.0'E, alt. 1480 m, *McCarthy 1812*, 13.i.2002; •Thredbo R., 2 km ENE of Dead Horse Gap, 36°31.3'S, 148°16.6'E, alt. 1460 m, *McCarthy 1828* (part), 13.i.2002.

Acknowledgment

I am grateful to Ken Green and the New South Wales National Parks and Wildlife Service for the opportunity to visit Kosciuszko National Park.

References

- Hawksworth, DL; McCarthy, PM; Fletcher, A (1992): *Verrucaria* Schrader (1794). In *The Lichen Flora of Great Britain and Ireland* (O.W. Purvis *et al.* eds), pages 630–644. Natural History Museum Publications, London.
- McCarthy, PM (1991): A new species and new records of *Verrucaria* (lichenized Ascomycotina, Verrucariaceae) from New Zealand. *New Zealand Journal of Botany* 29, 283–286.
- McCarthy, PM; Johnson, PN (1995): New and interesting lichens from New Zealand. *Nova Hedwigia* 61, 497–508.
- McCarthy, PM (2001a): Trichotheliaceae. *Flora of Australia* 58A, 105–157.
- McCarthy, PM (2001b): *Polyblastia*. *Flora of Australia* 58A, 171–172.
- McCarthy, PM (2001c): *Verrucaria*. *Flora of Australia* 58A, 176–196.
- McCarthy, PM (2002): A new aquatic species of *Verrucaria* from alpine Australia. *Lichenologist* 34, 207–210.

Additional lichen records from Australia 52. The genus *Sclerophyton*.

Alan W. Archer

National Herbarium of New South Wales,
Mrs Macquaries Road, Sydney, N.S.W. 2000, Australia

John A. Elix

Department of Chemistry, Faculty of Science,
Australian National University, Canberra, A.C.T., 0200, Australia

Abstract: The lichen genus *Sclerophyton* Eschw. (Opegraphaceae) is reported for the first time from Australia, along with the corticolous *S. rostratum* Egea & Torrente (Northern Territory), and the saxicolous *S. circumscriptum* (Taylor) Zahlbr. (Lord Howe Island).

The Species

Sclerophyton circumscriptum (Taylor) Zahlbr., in Engler & Prantl, *Nat. Pflanzenfam.* I, I, 105 (1905)

Verrucaria circumscripta Taylor in Mackay, *F. Hibern.* 2, 96 (1836)

Sclerophyton circumscriptum is characterized by the saxicolous habit, the small, simple, immersed lirellae, which are 0.5–1.5 mm long and 0.15–0.2 mm wide in the Australian specimens, the oblong-fusiform ascospores 24–30 × 4–6 μm, (5–)6(–8)-locular, dark grey to dark brown, and the presence of psoromic acid as the major lichen compound. A detailed description of the species and illustrations are given by Egea & Torrente (1995).

This is a widely distributed coastal species, found in Mexico, the Antilles, Great Britain, Ireland, the Mediterranean region, and Macaronesia.

SPECIMENS EXAMINED

New South Wales: •Lord Howe Island, between Little Island and The Cross, 31°34'18"S, 159°04'30"E, alt. 120 m, on basalt rock, *J.A. Elix 42291, 42310*, 8.ii.1995 (CANB).

Sclerophyton rostratum Egea & Torrente, *Bryologist* 98, 214 (1995)

Sclerophyton rostratum is characterized by the corticolous habit, small, immersed, punctiform apothecia, aggregated in slightly elevated stroma-like structures, which sometimes become united and lirellate, ellipsoid-fusiform ascospores, hyaline but becoming brown at maturity, narrowing at one end, 32–36 × 6–9 μm, 7-locular, and the presence of psoromic acid as the major lichen substance.

This recently described species was known from only the type locality in Mexico (Baja California) on dry, rough bark in a coastal shrub community. A detailed description and illustrations are given by Egea & Torrente (1995). A similar but unnamed species with larger, 44–54 × 7–8 μm, 11–14-locular ascospores is known from the Solomon Islands [Santa Isabel Island, *D.J. Hill 11022* (BM)].

SPECIMEN EXAMINED

Northern Territory: •Rapid Creek, 8 km NNW of Darwin, 12°23'S, 130°52'E, alt. 1 m, on mangroves. *J.A. Elix 22606*, 26.v.1988 (CANB).

Reference

Egea, JM; Torrente, P (1995): The lichen genus *Sclerophyton* in the Sonoran Desert. *Bryologist* 98, 207–217.

Additional lichen records from Oceania 9.
Foliicolous Trichotheliaceae from the Solomon Islands and Vanuatu

P.M. McCarthy

Australian Biological Resources Study,
GPO Box 787, Canberra, A.C.T. 2601, Australia

Abstract: Eighteen foliicolous species of *Porina* and *Trichothelium* (Trichotheliaceae) are reported for the first time from the Solomon Islands and/or Vanuatu in the south-western Pacific Ocean.

Introduction

McCarthy (2000) reported seven corticolous species of *Porina* collected in Vanuatu by H. Streimann and P. Ala. Subsequently, Lücking *et al.* (2001) described the foliicolous *P. vanuatuensis* from Espiritu Santo, and provided the first reports of *P. cerina*, *P. conica*, *P. mirabilis*, *P. virescens* and *Trichothelium alboatrum* from Vanuatu. McCarthy (2002) documented six corticolous and saxicolous *Porina* species collected by D.J. Hill on the 1965 Royal Society expedition to the Solomon Islands.

This paper is based on additional Hill collections from the Solomon Islands (in BM) and Streimann and Ala specimens from Vanuatu (in CANB). It brings the number of Trichotheliaceae known from all substrata in the Solomon Islands to 19, with 21 known from Vanuatu. The combined diversity in the two island groups is 30 taxa; 22 of these also occur in Australia, 18 in Papua New Guinea, and 13 in New Caledonia, and 10 are common to both.

Particularly noteworthy records reported here include a marked extension of the range of *P. subapplanata* northward from temperate Australia and New Zealand, the first collections of *P. canthi-carpa* and *P. tolgensis* outside north-eastern Queensland, and further collections of the recently described *P. vanuatuensis* from Vanuatu and the Solomon Islands.

The Species

1. *Porina atriceps* (Vain.) Vain., *Ann. Acad. Sci. Fenn.*, ser. A 15(6), 364 (1921)
The range of this pantropical species includes Indonesia, Papua New Guinea, Australia (Queensland), New Caledonia and Fiji (Santesson 1952, Lücking & Vězda 1998, McCarthy 2001).

SELECTED SPECIMENS EXAMINED

Solomon Islands. Guadalcanal: •NW end, Mt Gallego, Hidden Valley, alt. c. 500–750 m, *Hill 8378* (part), 10.vii.1965; *Kolombangara:* •ridge W of Kolombangara River, alt. c. 350–700 m, *Hill 10776* (part), 8.ix.1965; *San Cristobal:* •N of Ugi I., near Pawa School, jungle track, alt. 0–30 m, *Hill 8743* (part), 12.viii.1965.

2. *Porina canthi-carpa* P.M. McCarthy, *Fl. Australia* 58A, 228 (2001)

This species was recently described from montane rainforest and rainforest remnants in north-eastern Queensland (McCarthy 2001).

SPECIMEN EXAMINED

Vanuatu. Efate: •Forari Logging area, 17 km ENE of Port Vila, 17°38'S, 168°27'E, alt. 300 m, lowland rainforest, *Streimann 63016A* (part) & *Ala*, 25.x.1998.

3. *Porina conica* R. Sant., *Symb. Bot. Upsal.* 12(1), 232 (1952)

This Palaeotropical lichen is also known from West Africa, India, Sri Lanka, South-east Asia, Malesia, Australia (Queensland and New South Wales), New Caledonia and Vanuatu (Santesson 1952, Lücking & Vězda 1998, McCarthy 2001).

SELECTED SPECIMENS EXAMINED

Solomon Islands. Guadalcanal: •NW end, Umasani River, alt. c. 30–110 m, *Hill 8051* (part), 3.vii.1965; •NW end, Mt Gallego, Hidden Valley, alt. c. 500–750 m, *Hill 8378* (part), 10.vii.1965; *Kolombangara:* •ridge W of Kolombangara River, alt. c. 350–700 m, *Hill 10777* (part), 8.ix.1965; *San Cristobal:* •N of Ugi I., near Pawa School, jungle track, alt. 0–31 m, *Hill 8743* (part), 12.viii.1965.

4. *Porina epiphylla* (Fée) Fée, *Essai Crypt. Écorc.*, Suppl. 1, 76 (1837)

Porina epiphylla is one of the most common and frequently collected pantropical lichens. It is currently known from 67 tropical countries and island territories (Santesson 1952, Lücking & Vězda 1998, McCarthy 2001).

SELECTED SPECIMENS EXAMINED

Solomon Islands. Guadalcanal: •NW end, Mt Gallego, between bottom of Hidden Valley and top of Monitor Creek, alt. c. 250–350 m, *Hill 8250* (part), 3.vii.1965; *Kolombangara:* •ridge W of Kolombangara River, alt. c. 350–700 m, *Hill 10777* (part), 8.ix.1965.

Vanuatu. Efate: •Forari Logging area, 17 km ENE of Port Vila, 17°38'S, 168°27'E, alt. 300 m, lowland rainforest, *Streimann 63016A* (part) & *Ala*, 25.x.1998.

5. *Porina fulvella* Müll. Arg., *Flora* 66, 335 (1883)

The range of this pantropical lichen includes Indonesia, Papua New Guinea and Australia (Queensland and New South Wales) (Santesson 1952, McCarthy 2001).

SPECIMENS EXAMINED

Vanuatu. Espiritu Santo: •Big Bay–Luganville road, 29 km NW of Luganville, 15°18'S, 167°01'E, alt. 290 m, lowland forest, *Streimann 62777* (part), *62723* (part) & *Ala*, 21.x.1998.

6. *Porina lucida* R. Sant., *Symb. Bot. Upsal.* 12(1), 240 (1952)

The range of this pantropical lichen includes Malaysia, Indonesia, Papua New Guinea, Australia (Queensland and New South Wales) and New Caledonia (Santesson 1952, Lücking & Vězda 1998, McCarthy 2001).

SPECIMENS EXAMINED

Solomon Islands. Guadalcanal: •NW end, Mt Gallego, between bottom of Hidden Valley and top of Monitor Creek, alt. c. 250–350 m, *Hill 8250* (part), 3.vii.1965; *San Cristobal:* •N of Ugi I., near Pawa School, jungle track, alt. 0–30 m, *Hill 8743* (part), 12.viii.1965.

7. *Porina minutissima* Henssen, Lücking & Vězda, *in* Lücking & Vězda, *Willdenowia* 28, 211 (1998).

The Palaeotropical *P. minutissima* is also known from Madagascar, Christmas Island, Malaysia, Vietnam, Papua New Guinea and Australia (Queensland) (Santesson 1952, Lücking & Vězda 1998, McCarthy 2001).

SPECIMEN EXAMINED

Solomon Islands. Guadalcanal: •NW end, Umasani River, alt. c. 30–110 m, *Hill 8051* (part), *8075*, 3.vii.1986.

8. *Porina pallescens* R. Sant., *Symb. Bot. Upsal.* 12(1), 263 (1952)

Porina pallescens has a scattered distribution throughout the Palaeotropics, including West and East Africa, India, Christmas Island and Malaysia (Santesson 1952).

SPECIMENS EXAMINED

Solomon Islands. *Guadalcanal*: •NW end, Mt Gallego, between bottom of Hidden Valley and top of Monitor Creek, alt. c. 250–350 m, *Hill 8250* (part), 3.vii.1965; *San Cristobal*: •Wainoni region, coastal path E of Wainoni Mission, alt. 0 m, *Hill 8767* (part), 13.viii.1965.

Vanuatu. *Espíritu Santo*: •Big Bay–Luganville road, 29 km NW of Luganville, 15°18'S, 167°01'E, alt. 290 m, lowland forest, *Streimann 62777* (part) & *Ala*, 21.x.1998.

9. *Porina perminuta* Vain., *Univ. California Publ. Bot.* 12, 14 (1924)

A minute and very inconspicuous foliicolous lichen with a distinctive distribution, *P. perminuta* is known mainly from low elevations on oceanic islands in the Indian and Pacific Oceans, including the Seychelles, Chagos Archipelago, Christmas Island, Northern Mariana Islands, New Caledonia, Cook Islands and Tahiti (Santesson 1952).

SPECIMEN EXAMINED

Vanuatu. *Espíritu Santo*: •Big Bay–Luganville road, 29 km NW of Luganville, 15°18'S, 167°01'E, alt. 290 m, lowland forest, *Streimann 62723* (part) & *Ala*, 21.x.1998.

10. *Porina rufula* (Kremp.) Vain., *Acta Soc. Fauna Fl. Fenn.* 7(2), 227 (1890)

The range of this pantropical species includes Japan, the Philippines, Papua New Guinea, Australia (Queensland and New South Wales), New Caledonia, Western Samoa and Lord Howe Island (Santesson 1952, Lücking 1996, McCarthy 2001).

SELECTED SPECIMENS EXAMINED

Solomon Islands. *Guadalcanal*: •NW end, Mt Gallego, between bottom of Hidden Valley and top of Monitor Creek, alt. c. 250–350 m, *Hill 8250* (part), 3.vii.1965; *Kolombangara*: •ridge W of Kolombangara River, alt. c. 800 m, *Hill 10602* (part), 4.ix.1965; *Malaita*: •Maramasaike Passage, Matangassi village, alt. c. 350 m, *Hill 10242*, 26.xi.1965; *San Cristobal*: •N of Ugi I., near Pawa School, jungle track, alt. 0–30 m, *Hill 8743* (part), 12.viii.1965.

Vanuatu. *Espíritu Santo*: •Butmas, 25 km NW of Luganville, 15°22'S, 167°00'E, alt. 620 m, on pinnae of shaded *Angiopteris*, *Streimann 62520* (part) & *Ala*, 10.x.1998.

11. *Porina semecarpa* Vain., *Ann. Acad. Sci. Fenn.*, ser. A, 15, 367 (1921)

The eastern part of the range of this common Palaeotropical lichen includes Japan, Vietnam, the Philippines, Indonesia, Malaysia, Papua New Guinea, Australia (Queensland and New South Wales) and French Polynesia (Santesson 1952, McCarthy 2001).

SPECIMEN EXAMINED

Vanuatu. *Espíritu Santo*: •Big Bay–Luganville road, 29 km NW of Luganville, 15°18'S, 167°01'E, alt. 290 m, lowland forest, *Streimann 62777* (part) & *Ala*, 21.x.1998.

12. *Porina subapplanata* Malcolm, Vězda, P.M. McCarthy & Kantvilas, *Australas. Lichenol.* 45, 22 (1999)

Porina subapplanata is rather common in lowland southern Australia (New South Wales, Victoria and Tasmania) and New Zealand (Nelson, Canterbury and Westland) (Malcolm *et al.* 1999). This unexpected extension of its range into the tropics is understandable given its occurrence in Guadalcanal at an altitude of c. 2300 m.

SPECIMEN EXAMINED

Solomon Islands. *Guadalcanal*: •summit of Mt Popomanaseu, alt. c. 2300 m, *Hill 9378*, 1.xi.1965.

13. *Porina tolgensis* P.M. McCarthy, *Fl. Australia* 58A, 228 (2001)

This lichen was recently described from north-eastern Queensland (McCarthy 2001), and this eastward extension of its known distribution closely matches that of the saxicolous *P. crassa* (McCarthy 2002).

SELECTED SPECIMENS EXAMINED

Solomon Islands. *Kolombangara*: •ridge W of Kolombangara River, alt. c. 800 m, *Hill 10602* (part), 4.ix.1965; *Guadalcanal*: •NW end, Umasani River, alt. c. 30–100 m, *Hill 8049* (part), 8075, 3.vii.1965.

14. *Porina vanuatuensis* Lücking, in Lücking *et al.*, *Lichenologist* 33, 206 (2001)

Readily identifiable by its rather large “Mexican hat-shaped” perithecial verrucae, *P. vanuatuensis* is already known from its type locality in Espiritu Santo, Vanuatu (Lücking *et al.* 2001). It is also rather common in lowland forest in Efaté (Vanuatu) and the Solomon Islands.

SELECTED SPECIMENS EXAMINED

Solomon Islands. *Guadalcanal*: •NW end, Mt Gallego, between bottom of Hidden Valley and top of Monitor Creek, alt. c. 250–350 m, *Hill 8250* (part), 3.vii.1965; *Kolombangara*: •ridge W of Kolombangara River, alt. c. 350–700 m, *Hill 10777* (part), 8.ix.1965; *San Cristobal*: •N of Ugi I., near Pawa School, jungle track, alt. 0–30 m, *Hill 8743* (part), 12.viii.1965.

Vanuatu. *Efaté*: Forari Logging area, 17 km ENE of Port Vila, 17°38'S, 168°27'E, alt. 300 m, lowland rainforest, *Streimann 63016A* (part) & *Ala*, 25.x.1998.

15. *Porina virescens* (Kremp.) Müll. Arg., *Flora* 66, 331 (1883)

Porina virescens is a very common and conspicuous foliicolous lichen throughout the eastern Palaeotropics, but it is not known from Africa or the Neotropics (Santesson 1952, Lücking & Vězda 1998, McCarthy 2001). It was reported from Espiritu Santo, Vanuatu, by Lücking *et al.* (2001).

SELECTED SPECIMENS EXAMINED

Solomon Islands. *Guadalcanal*: •NW end, Mt Gallego, between bottom of Hidden Valley and top of Monitor Creek, alt. c. 250–350 m, *Hill 8250* (part), 3.vii.1965; *Kolombangara*: •ridge W of Kolombangara River, alt. c. 3250–700 m, *Hill 20777* (part), 8.ix.1965; *San Cristobal*: •N of Ugi I., near Pawa School, jungle track alt. 0–30 m, *Hill 8743* (part), 12.viii.1965.

16. *Trichothelium assurgens* (Cooke) Aptroot & Lücking, *Mycol. Res.* 103, 511 (2001)

The eastern Palaeotropical and temperate Australasian *T. assurgens* is known from Tasmania and the South Island of New Zealand north to Japan and east to the Hawaiian Islands (McCarthy 2001). Until very recently, this minute lichen was known as *T. marianense* Harada in Micronesia and Japan and as *T. nanum* Malcolm & Vězda in Australasia.

SPECIMEN EXAMINED

Solomon Islands. *San Cristobal*: •N of Ugi I., near Pawa School, jungle track, alt. 0–30 m, *Hill 8743* (part), 12.viii.1965.

17. *Trichothelium epiphyllum* Müll. Arg., *Bot. Jahrb. Syst.* 6, 418 (1885)
The range of this predominantly Neotropical species (Lücking 1998) includes the Philippines and Papua New Guinea.

SELECTED SPECIMENS EXAMINED

Solomon Islands. *Guadalcanal*: •NW end, Umasani River, alt. c. 30–110 m, *Hill 8052* (part), 3.vii.1965; *Kolombangara*: •ridge W of Kolombangara River, alt. c. 350–700 m, *Hill 10777* (part), 8.ix.1965.

18. *Trichothelium javanicum* (F. Schill.) Vězda, *Nova Hedwigia* 58, 139 (1994).
A common foliicolous lichen in the eastern Palaetropics and south-eastern Australasia, *T. javanicum* is already known from Thailand, Indonesia, Christmas Island, Australia (Queensland, New South Wales, Victoria and Tasmania), Lord Howe Island, southern New Zealand and the Hawaiian Islands (Santesson 1952, McCarthy 2001).

SPECIMENS EXAMINED

Vanuatu. *Espiritu Santo*: •Butmas, 25 km NW of Luganville, 15°22'S, 167°00'E, alt. 620 m, on pinnae of shaded *Angiopteris*, *Streimann 62520* (part) & *Ala*, 10.x.1998; •Big Bay–Luganville road, 29 km NW of Luganville, 15°18'S, 167°01'E, alt. 290 m, lowland forest, *Streimann 62722* (part) & *Ala*, 21.x.1998.

Acknowledgment

I thank Simone Louwhoff (BM) for organizing the loan of the Solomon Islands specimens.

References

- Lücking, R (1996): Taxonomic studies in foliicolous species of the genus *Porina*. I. The *Porina rufula* aggregate. *Botanica Acta* 109, 248–260.
Lücking, R (1998): Additions and corrections to the knowledge of the foliicolous lichen flora of Costa Rica. The genus *Trichothelium* (lichenized Ascomycetes: Trichotheliaceae). *Nova Hedwigia* 66, 375–417.
Lücking, R; Vězda, A (1998): Taxonomic studies in foliicolous species of the genus *Porina* (lichenized Ascomycotina: Trichotheliaceae). II. The *Porina epiphylla* group. *Willdenowia* 28, 181–225.
Lücking, R; Streimann, H; Elix, JA (2001): Further records of foliicolous lichens and lichenicolous fungi from Australasia, with an updated checklist for continental Australia. *Lichenologist* 33, 195–210.
Malcolm, WM; Vězda, A; McCarthy, PM; Kantvilas, G (1999): *Porina subapplanata*, a new species from New Zealand and Australia. *Australasian Lichenology* 45, 22–27.
McCarthy, PM (2000): Additional lichen records from Oceania 6. Some corticolous pyrenolichens from Vanuatu. *Australasian Lichenology* 47, 26–29.
McCarthy, PM (2001): Trichotheliaceae. *Flora of Australia* 58A, 105–157.
McCarthy, PM (2002): Additional lichen records from Oceania 8. Some corticolous and saxicolous pyrenolichens from the Solomon Islands. *Australasian Lichenology* 51, 40–43.
Santesson, R (1952): Follicolous lichens I. A revision of the taxonomy of the obligately foliicolous, lichenized fungi. *Symbolae Botanicae Upsalienses* 12(1), 1–590.

Additional lichen records from New Zealand 39. *Fuscidea subasbolodes* Kantvilas and *Porpidia platycarpoides* (Bagl.) Hertel

Alan M. Fryday

Herbarium, Department of Plant Biology,
Michigan State University, East Lansing, Michigan, 48824–1312, USA

Introduction

Henry A. Imshaug collected lichens from Campbell Island (with Richard C. Harris) during the summer of 1969–1970, and from the Auckland Islands during the summer of 1972–1973, making a total of 4634 collections (Fryday & Prather 2001). Among those collections are the two species reported here for the first time from New Zealand. All specimens cited are housed in MSC.

Fuscidea subasbolodes Kantvilas, *Biblioth. Lichenol.* 78, 185 (2001)

Anatomically, this species closely resembles *F. asbolodes* (Nyl.) Hertel & V. Wirth, but differs from it in having larger, innate apothecia and a thallus containing norstictic acid (K+ red acicular crystals in section).

Kantvilas (2001) described *Fuscidea subasbolodes* as endemic to Tasmania, although he also mentioned a collection of *F. asbolodes* from the Auckland Islands (Hertel 1985) that contained norstictic acid as a possible occurrence. There are, in fact, a number of collections of this taxon in MSC from both the New Zealand shelf islands (Campbell Island and the Auckland Islands) and southern South America (the Falkland Islands [Islas Malvinas] and Isla de los Estados [Staten Island]). *Fuscidea subasbolodes* would thus appear to have a circum-Subantarctic distribution similar to that of *F. asbolodes*. The New Zealand and Falkland Islands collections are all from alpine habitats, whereas the collection from Isla de los Estados is from a stream valley.

SPECIMENS EXAMINED

New Zealand. *Auckland Islands*: •summit of Cloudy Peak, 466 m, 7.i.1973, *H.A. Imshaug 57561*. *Campbell Island*: •rock outcrops in tussock grassland at summit and summit ridge of S Col Peak, 300 m, 22.xii.1969, *H.A. Imshaug 45962*; •rock outcrops on west end of Lyall Ridge, 365 m, 26.xii.1969, *H.A. Imshaug 46139, 46178*; •rock outcrops on summit of Moubray Hill, 244 m, 12.i.1970, *H.A. Imshaug 46929*.

Argentina. *Isla de los Estados*: •Puerto Hoppner, 54°47'S, 64°25'W, 5–10 m, *Astelia* bog in stream valley behind inner bay, 9.xi.1971, *H.A. Imshaug 53816*.

Falkland Islands (Islas Malvinas). *East Falkland*: •Stanley, UTM Grid 21F VC 2374, 460 m, cliffs on rock dome at summit of Mt Kent, 14.i.1968, *H.A. Imshaug 40438, 40467, 40477*. *West Falkland*: •Weddell Island, UTM Grid 21F TC 2941, 335 m, rock dome on summit of peak NE of Mt Weddell, 6.ii.1968, *H.A. Imshaug 41991*.

Porpidia platycarpoides (Bagl.) Hertel, in Nimis & Poelt, *Studia Geobot.* 7 (Supplement 1) 187 (1987)

Basionym: *Lecidea platycarpoides* Bagl., *Nuovo Giorn. Bot. Ital.* 11, 99 (1879)

Porpidia platycarpoides is usually characterized as containing norstictic acid. However, it is better characterized by morphological features, principally an exciple with a pale interior and wide hyphae (6–8 µm), and the thecium usually having a blue tinge (especially visible during sectioning, in the portion of the apothecium left attached to the thallus).

The Campbell Island collections all produce stictic acid (detected by tlc) and one (*Imshaug 46511*) also produces norstictic acid. It is not uncommon for species which usually produce norstictic acid to produce stictic acid instead, for example, *P.*

albocaerulescens (Wulfen) Hertel & Knoph (Gowan 1989), *Rhizocarpon reductum* Th.Fr. (Fryday 2000), and *R. cinereovirens* (Müll. Arg.) Vain. (Fryday, in press). I have seen several specimens from the Northern Hemisphere which agree morphologically with the norstictic acid chemotype but which contain stictic acid only. Because the morphological features of the Campbell Island collections agree well with Northern Hemisphere specimens, I have no hesitation in including them in *P. platycarpoides*.

SPECIMENS EXAMINED

Campbell Island: •rock outcrops and feldmark at summit of Mt Honey, 570 m, 31.xii.1969, H.A. Imshaug 46360; •cliffs around Mt Lyall pyramid, 395 m, 2.i.1970, H.A. Imshaug 46480, 46511; •rock outcrops at summit of Mt Azimuth, 385 m, 3.i.1970, H.A. Imshaug 46583.

Acknowledgment

The US National Science Foundation is thanked for Award No. DBI-9808735 (PI—Alan Prather) for the re-activation of the lichen collection at Michigan State University that facilitated the author's access to Dr Imshaug's collections.

References

- Fryday, AM (2000): On *Rhizocarpon obscuratum* (Ach.) Massal., with notes on some related species in the British Isles. *Lichenologist* 32, 207–224.
 Fryday, AM (2003): A revision of the species of the *Rhizocarpon hochstetteri* group occurring in the British Isles. *Lichenologist* 35, (in press).
 Fryday, AM; Prather, LA (2001): The lichen collection of Henry Imshaug at Michigan State University Herbarium (MSC). *Bryologist* 104, 464–467.
 Gowan, SP (1989): The lichen genus *Porpidia* (Porpidiaceae) in North America. *Bryologist* 92, 25–59.
 Hertel, H (1985): New or little-known New Zealand lecideoid lichens. *Mitteilungen der Botanischen Staatssammlung München* 21, 301–337.
 Kantvilas, G (2001): The lichen family Fuscideaceae in Tasmania. *Bibliotheca Lichenologica* 78, 169–192.

- Aptroot, A; Tibell, L (2003): *Chaenotheca papuensis*, a new species from huts in a mountain village in Papua New Guinea. *Australasian Lichenology* 52, 12–13.
 Archer, AW (2001): New taxa and new reports in the lichen family Graphidaceae (Ascomycotina) from Australia. *Mycotaxon* 80, 367–374.
 Archer, AW (2001): The lichen genera *Phaeographis* and *Phaeographina* (Graphidaceae) in Australia 3: *Phaeographis*—new reports and new species. *Telopea* 9, 663–667.
 Archer, AW (2003): Additional lichen records from Australia 50. Graphidaceae from Christmas Island. *Australasian Lichenology* 52, 14–15.
 Archer, AW; Elix, JA (2003): New lichen records from Australia 52. The genus *Sclerophyton*. *Australasian Lichenology* 52, 19.
 Breuss, O (2001): *Catapyrenium*. *Flora of Australia*. Volume 58A, Lichens 3. ABRS/CSIRO Australia, Melbourne. pp. 160–161.
 Breuss, O (2001): *Heteroplacidium*. *Flora of Australia*. Volume 58A, Lichens 3. ABRS/CSIRO Australia, Melbourne. p. 168.
 Breuss, O (2001): *Placidium*. *Flora of Australia*. Volume 58A, Lichens 3. ABRS/CSIRO Australia, Melbourne. pp. 168–170.
 Büdel, B (2001): *Peltulaceae*. *Flora of Australia*. Volume 58A, Lichens 3. ABRS/CSIRO Australia, Melbourne. pp. 24–32.
 Elix, JA (2001): *Lobaria*. *Flora of Australia*. Volume 58A, Lichens 3. ABRS/CSIRO Australia, Melbourne. pp. 39–47.
 Elix, JA (2001): A revision of the lichen genus *Paraparmelia* Elix & J. Johnst. *Bibliotheca Lichenologica* 80.
 Elix, JA; Bawingan, PA; Giores, YG (2002): A new species and further new records in the lichen family Parmeliaceae (Ascomycotina) from the Philippines. *Mycotaxon* 81, 251–256.
 Elix, JA; Wardlaw, JH; Obermayer, W (2003): 2-Hydroxyconviresnic acid, a new depsidone from the lichen *Sulcaria sulcata*. *Australasian Lichenology* 52, 6–8.
 Ferraro, LI; Lücking, R; Sérusiaux, E (2001): A world monograph of the lichen genus *Gyalectidium* (Gomphillaceae). *Botanical Journal of the Linnean Society* 137, 311–345.
 Fryday, AM (2003): Additional lichen records from New Zealand 39. *Fuscidea sub- asbolodes* Kantvilas and *Porpidia platycarpoides* (Bagl.) Hertel. *Australasian Lichenology* 52, 25–26.
 Galloway, DJ (2001): “*Dendriscoaulon*”. *Flora of Australia*. Volume 58A, Lichens 3. ABRS/CSIRO Australia, Melbourne. pp. 38–39.
 Galloway, DJ (2001): Lobariaceae. *Flora of Australia*. Volume 58A, Lichens 3. ABRS/CSIRO Australia, Melbourne. p. 37.
 Galloway, DJ (2001): *Sticta*. *Flora of Australia*. Volume 58A, Lichens 3. ABRS/CSIRO Australia, Melbourne. pp. 78–97.
 Galloway, DJ; Kantvilas, G; Elix, JA (2001): *Pseudocyphellaria*. *Flora of Australia*. Volume 58A, Lichens 3. ABRS/CSIRO Australia, Melbourne. pp. 47–77.
 Hammer, S (2001): Additions to the lichen family Cladoniaceae in Australia. *Bryologist* 104, 560–575.
 Hawksworth, DL (2001): A record number of ascomycetes on one tree. *Mycological Research* 105, 642–643.
 Johnston, J (2001): Baeomycetaceae. *Flora of Australia*. Volume 58A, Lichens 3. ABRS/CSIRO Australia, Melbourne. pp. 14–16.
 Johnston, J (2001): Icmadophilaceae. *Flora of Australia*. Volume 58A, Lichens 3. ABRS/CSIRO Australia, Melbourne. pp. 17–23.

- Jørgensen, PM; Sipman, HJM (2002): A new species in the lichen genus *Fuscoderma* from New Guinea. *Lichenologist* 34, 33–37.
- Louwhoff, SHJJ; Elix, JA (2002): *Hypotrachyna* (Parmeliaceae) and Allied Genera in Papua New Guinea. *Bibliotheca Lichenologica* 81.
- Lud, D; Huiskes, AHL; Ott, S (2001): Morphological evidence for the symbiotic character of *Turgidosculum complicatulum* Kohlm. & Kohlm. (= *Mastodia tessellata* Hook. f. & Harvey). *Symbiosis* 31, 141–151.
- Lumbsch, HT; McCarthy, PM; Malcolm, WM (2001): Key to the Genera of Australian Lichens: Apothecial Crusts. *Flora of Australia* Supplementary Series 11, Australian Biological Resources Study, Canberra.
- McCarthy, PM (2001): *Agonimia*. *Flora of Australia*. Volume 58A, Lichens 3. ABR/CSIRO Australia, Melbourne. pp. 159–160.
- McCarthy, PM (2001): *Endocarpon*. *Flora of Australia*. Volume 58A, Lichens 3. ABR/CSIRO Australia, Melbourne. pp. 161–167.
- McCarthy, PM (2001): Key to the genera of crustose pyrenocarpous lichens in Australia. *Flora of Australia*. Volume 58A, Lichens 3. ABR/CSIRO Australia, Melbourne. pp. 197–203.
- McCarthy, PM (2001): Myeloconaceae. *Flora of Australia*. Volume 58A, Lichens 3. ABR/CSIRO Australia, Melbourne. pp. 104–105.
- McCarthy, PM (2001): *Polyblastia*. *Flora of Australia*. Volume 58A, Lichens 3. ABR/CSIRO Australia, Melbourne. pp. 171–172.
- McCarthy, PM (2001): *Staurothelae*. *Flora of Australia*. Volume 58A, Lichens 3. ABR/CSIRO Australia, Melbourne. pp. 173–174.
- McCarthy, PM (2001): *Thelidium*. *Flora of Australia*. Volume 58A, Lichens 3. ABR/CSIRO Australia, Melbourne. pp. 174–175.
- McCarthy, PM (2001): Trichotheliaceae. *Flora of Australia*. Volume 58A, Lichens 3. ABR/CSIRO Australia, Melbourne. pp. 105–157.
- McCarthy, PM (2001): *Verrucaria*. *Flora of Australia*. Volume 58A, Lichens 3. ABR/CSIRO Australia, Melbourne. pp. 176–196.
- McCarthy, PM (2001): Verrucariaceae. *Flora of Australia*. Volume 58A, Lichens 3. ABR/CSIRO Australia, Melbourne. pp. 158–196.
- McCarthy, PM (ed.) (2001): *Flora of Australia*. Volume 58A. Lichens 3. ABR/CSIRO Australia, Melbourne.
- McCarthy, PM (2003): A new parasitic species of *Verrucaria* in New South Wales. *Australasian Lichenology* 52, 3–5.
- McCarthy, PM (2003): New lichen records from Australia 51. Some aquatic pyrenolichens from Kosciuszko National Park, Snowy Mountains, New South Wales. *Australasian Lichenology* 52, 16–18.
- McCarthy, PM (2003): Additional lichen records from Oceania 9. Foliicolous Trichotheliaceae from the Solomon Islands and Vanuatu. *Australasian Lichenology* 52, 20–24.
- Obermayer, W (2001): Arthrorhaphidaceae. *Flora of Australia*. Volume 58A, Lichens 3. ABR/CSIRO Australia, Melbourne. pp. 33–36.
- Pharo, EJ; Beattie, AJ (2002): The association between substrate variability and bryophyte and lichen diversity in eastern Australian forests. *Bryologist* 105, 11–26.
- Wedin, M (2001): Sphaerophoraceae. *Flora of Australia*. Volume 58A, Lichens 3. ABR/CSIRO Australia, Melbourne. pp. 1–13.
- Zakaria, Z; Din, LB; Samsudin, MW; Dazni, A (2003): Chemical constituents of the lichen *Ramalina dumeticola* from Fraser's Hill, Peninsular Malaysia. *Australasian Lichenology* 52, 6–8.