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Number 44, January 1999

ANNOUNCEMENTS AND NEWS
Malcolm, W—Discussion and field meeting, Dunedin, NZ 2

ADDITIONAL LICHEN RECORDS FROM AUSTRALIA
McCarthy, PM; Kantvilas, G (**37**)—*Strigula albicascens* (Nyl.) R.C. Harris 4
Ralston, K (**38**)—*Enterographa bella* R. Sant. 6
Archer, AW (**39**)—*Cyclographina platyleuca* (Nyl.) Awasthi & Joshi 7

ADDITIONAL LICHEN RECORDS FROM NEW ZEALAND
West, CJ; Polly, B (**29**)—*Megalospora lopadioides* from Campbell Island 8

ARTICLES
Elix, JA; Wardlaw, JH; Archer, AW—New depsides from *Pertusaria* lichens 9
Elix, JA; Ralston, K—Lichens of the Kimberley region, Western Australia 16

RECENT LITERATURE ON AUSTRALASIAN LICHENS 34

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Australasian Lichenology

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Brigantiaea chrysosticta (J.D. Hook. & Taylor) Hafellner & Bellemère
1 mm

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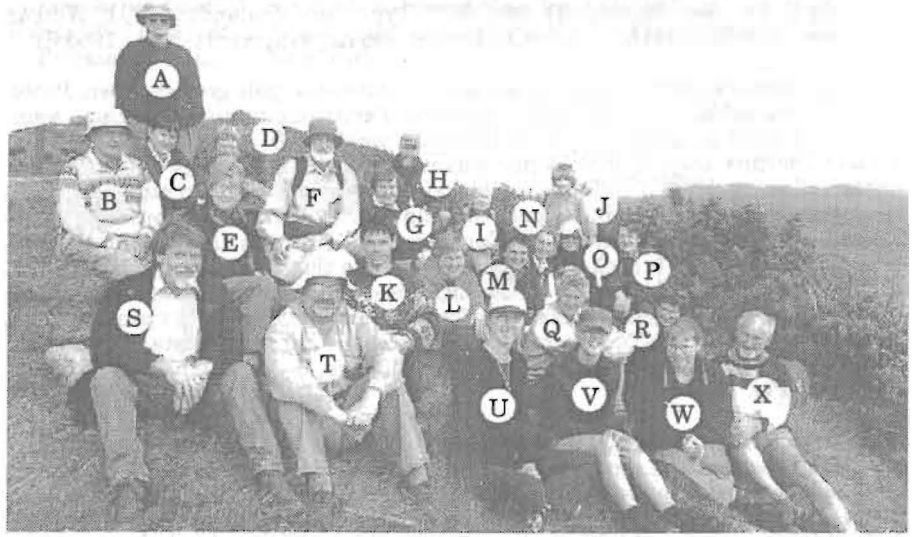
Last November's lichen field meeting in Dunedin's University of Otago was a great success, with five participants coming from Australia. David Galloway kicked off the activities with an introduction to lichen identification, and later led collecting trips to sites ranging from coastal and lowland scrub to montane forest and sub-alpine scrub. The indoor sessions were given over to talks and slide-shows on a wide variety of topics, including the history of lichenology in Otago, lichen conservation, foliicolous lichens, the lichens of Rarotonga, wetland lichens, the lichen floras of two types of Australian forests, and the chemistry of natural products in lichens. One of the evenings was set aside for a public lecture and slide-show on lichens by David Galloway, Peter Johnson, and Bill Malcolm, and another to a splendid restaurant meal. Jennifer Bannister organized and ran the field meeting, tirelessly looking after the myriad details of meals, accommodation, and transport, ably aided by John Steele, Peter Johnson, and David Galloway. Professor Peter Bannister generously lent the use of the laboratories at Otago University's Botany Department. A most enjoyable and memorable event.

Above from left to right, Jennifer Bannister, David Galloway, and Pat McCarthy. Photos by Nancy Malcolm

Above left, Jennifer Bannister sees *Ramalina fimbriata* for the first time, Otago Peninsula. Above right, Pat McCarthy among stream pyrenocarps, Bethunes Gully. Photos by Peter Johnson.



Mt Cargill field trip: A. Carol West, Invercargill; B. John Parr, Ettrick; C. Jane Wright, Dunedin; D. Rachel Stringer, Nelson; E. Barbara Polly, Wellington; F. Bill Malcolm, Nelson; G. Enny Manning, Alexandra; H. David Galloway, Millers Flat; I. Howard Lintott, Christchurch; J. Wyn Jones, Dunedin; K. Tom Myers, Dunedin; L. Kath Ralston, Melbourne; M. Liz Lintott, Christchurch; N. Allison Knight, Dunedin; O. Nancy Malcolm, Nelson; P. Jennifer Bannister, Dunedin; Q. John Whitehead, Te Anau; R. Judy Broom, Dunedin; S. Peter Johnson, Dunedin; T. Pat McCarthy, Canberra; U. Sharon Ford, Melbourne; V. Simone Louwhoff, Canberra; W. Susan Dopson, Wellington; X. Neill Simpson, Queenstown. Other participants not in the photo: Elizabeth Brown, Sydney; Kevin Farndon, Dunedin; Valerie Lovis, Christchurch, John Steel, Dunedin, Alison Stringer, Dunedin. Photo by Peter Johnson.

Additional lichen records from Australia 37. *Strigula albicascens* (Nyl.) R.C. Harris

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Although foliicolous and saxicolous species of *Strigula* Fr. (Strigulaceae) are reasonably well-known in tropical and subtropical regions of eastern Australia, corticolous species were not reported until Aptroot (1997) listed collections of *S. phaea* (Ach.) R.C. Harris from Queensland and Tasmania. Here we report the first Australian specimens of *S. albicascens* (Nyl.) R.C. Harris, a species which was originally described from New Zealand.

Strigula albicascens (Nyl.) R.C. Harris, *More Florida Lichens*: 154 (1995). *Verrucaria albicascens* Nyl., *Fl. Nov. Zel.*: 129 (1888); *Porina albicascens* (Nyl.) Müll. Arg., *Bull. Soc. Bot. Belgique* **31**, 38 (1892). Type: New Zealand, 1867, *C. Knight*; lectotype: H–NYL. 1354A (!), *fide* R.C. Harris, *loc. cit.*; syntype: H–NYL. 1983 (!).

Thallus endophloeodal to thinly epiphloeodal, continuous, pale greyish green. Photobiont *Trentepohlia*. Prothallus not apparent. Perithecia numerous, black, semi-immersed to 2/3-immersed, (0.23–)0.28(–0.33) mm diam. [$n = 26$], orbicular to ellipsoidal in outline, leaving shallow pits surrounded by blackish rings (involucrellum bases) following decay. Involucrellum blackish, 35–65 µm thick, arching away from the excipulum and extending almost to excipulum base level. Excipulum hyaline to medium brown, 12–15 µm thick. Centrum 0.15–0.26 mm diam. Hamathecium of simple to sparingly branched paraphyses, to 1 µm thick. Asci elongate-ellipsoidal to cylindrical, 8-spored, 65–70 × 12–14 µm; apical wall with a minute ocular chamber. Ascospores colourless, elongate-fusiform or more rounded at the proximal end, irregularly biseriate, (3–)5(–6)-septate, slightly constricted at the septa, (16–)25(–32) × (4.5–)6(–7.5) µm [$n = 85$]. Microconidia bacilliform, 3–4 × 0.5 µm; macroconidia not seen. (Fig. 1).

This species is characterized by its pale endophloeodal thallus and small perithecia and by the size and septation of the ascospores. *Strigula phaea* has minute 1-septate ascospores (Harris 1995), while the New Zealand species *S. indutula* (Nyl.) R.C. Harris (holotype H–NYL. 1981!) has a rather thick epiphloeodal thallus and 5–7-septate ascospores 14–20 µm long.

Strigula albicascens is a very inconspicuous lichen known from several widely scattered forest localities in the high-rainfall areas (>1000 mm per annum) of southern Tasmania. It has been recorded from *Atherosperma*-dominated, cool-temperate rainforest and *Eucalyptus*-dominated, wet sclerophyll forest. Despite extensive floristic studies in recent years, it has not been recorded from *Nothofagus*-dominated, cool-temperate rainforest. The species occurs on thin foliage-bearing twigs in the shaded forest understorey, and to date is known from *Atherosperma moschatum*, *Acacia mucronata*, and *Phebalium squameum*, all trees with relatively thin smooth bark. It is an occasional member of a typically rich assemblage of tiny crustose lichens including *Coccotrema cucurbitula*, *Opegrapha stellata*, *Porina hyperleptalea*, *P. impolita*, *Thelotrema* aff. *suecicum*, and as yet undetermined species of *Anisomeridium*, *Arthonia*, *Arthothelium*, *Melaspilea*, and *Pyrenula*.

SPECIMENS EXAMINED
Tasmania: •South-eastern slope of McGregor Peak, 42°59'S, 147°57'E, alt. *c.* 400 m, on twigs of *Atherosperma moschatum* in *Atherosperma*-dominated rainforest, *G. Kantvilas 357/89*, 19.i.1989 (HO 321105); •Gordon Road (site EW23), *c.* 2 km N of Frodshams Pass, 42°48'S, 146°24'E, alt. 600 m, on *Acacia mucronata* in *Eucalyptus nitida*-dominated wet forest, *G.Kantvilas 111/97*, 8.iv.1997 (HO 320777); •W of Tahune Bridge, 'Strips' Coupe CFI plot in the Warra SST, 43°06'S, 146°41'E, alt. 90 m, on *Phebalium squameum* in *Eucalyptus obliqua*-dominated wet forest, *G. Kantvilas 156/98*, 5.v.1998 (HO 326002).

Acknowledgment
We are grateful to the Mycological Museum, University of Helsinki, for the loan of Nylander types.

References
Aptroot, A (1997): Additional lichen records from Australia 30. New records of pyrenocarps. *Australasian Lichenological Newsletter* **40**, 4–7.
Harris, RC (1995): *More Florida Lichens Including the 10¢ Tour of the Pyrenolichens*. Privately published, New York.

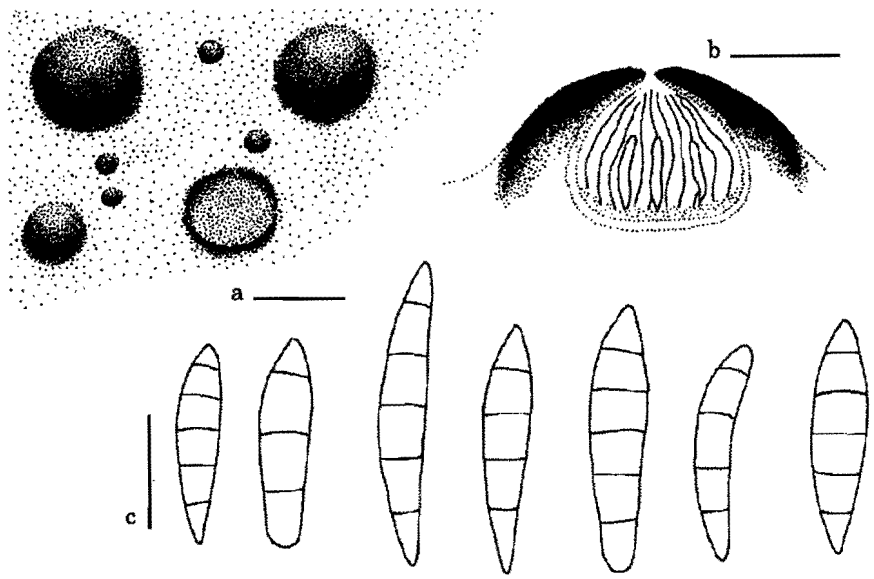

Fig. 1. *Strigula albicascens* (HO 320777). **a**, habit of perithecia and conidiomata. **b**, sectioned perithecium. **c**, ascospores. Scales: a = 0.2 mm; b = 0.1 mm; c = 10 µm.

Additional lichen records from Australia 38.
Enterographa bella R. Sant.

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Enterographa bella R. Sant., *Symbolae Botanicae Upsalienses* **12** (1): 106 (1952).

Thallus foliicolous, 3–4 mm diam., circular at first then confluent, greenish-grey with a yellow tinge, shiny. Lirellae linear, irregularly curved or undulate, often somewhat branched, 0.5–0.8 mm long, 0.15–0.2 mm broad, brownish tan, slightly raised; ascospores colourless, irregularly arranged, 7-septate, broadest at the third or fourth cell, 21–25 × 4–5 µm, with a distinct halo. For a fuller description and illustration, see Santesson (1952).

Enterographa bella R. Sant. has long been regarded as endemic to New Zealand (Santesson 1952, Galloway 1985). The holotype occurred on leaves of *Polystichum hispidum* at Colonial Knob, Wellington, N.Z., and the species has since been found at another site near Wellington and at two sites on the West coast of the South Island. All were in humid lowland forest.

This specimen was found on leaves of *Acmena smithii* in a temperate rainforest area at Wilsons Promontory, Victoria, which is the most southern occurrence of *A. smithii* in Australia.

Twenty-one per cent of Victoria's known vascular flora occurs at Wilsons Promontory in diverse vegetation communities, including temperate rainforest, tall open forests, woodlands, heathlands, and swamp and coastal communities (Anon. 1997). The climate is comparatively mild, with the mean maximum temperature at Tidal River ranging from 24.3°C in February to 13.3° in July, while the mean minimum temperature ranges from 13.2° in February to 5.9° in August. The annual rainfall is approximately 1000 mm on the west and south coasts and up to 1500 mm on the highest mountains (Ashton & Webb 1977).

No other foliicolous lichens were found at Wilsons Promontory.

SPECIMEN EXAMINED
Victoria: •Wilsons Promontory National Park, Lilly Pilly Gully, on adaxial surface of leaf of *Acmena smithii*, 39°01'S, 146°19'E, *K. Ralston 733*, 31.x.1997 (MEL). Chemistry: psoromic acid (major), dimethylpsoromic acid (minor), with traces of an unknown substance.

Acknowledgments: Thank you to Sharon Ford for her help with the identification and to Professor J. Elix for the chemical analysis and for confirmation of the identification.

References
Anon. (1997): Wilsons Promontory National Park Management Plan. Parks Victoria, Melbourne.
Ashton, DH; Webb, RN (1977): The ecology of granite outcrops at Wilsons Promontory, Victoria. *Australian Journal of Ecology* **2**, 269–296.
Galloway, DJ (1985): *Flora of New Zealand Lichens*, PD Hasselberg, Wellington.
Santesson, R (1952): Foliicolous Lichens I. A revision of the taxonomy of the obligately foliicolous lichenized fungi. *Symbolae Botanicae Upsalienses* **12** (1), 1–590.

Additional lichen records from Australia 39.
Cyclographina platyleuca (Nyl.) Awasthi & Joshi

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During the recent thirteenth meeting of the Australasian Lichenologists at Coffs Harbour, a field trip was arranged to various localities in the region. At one of the sites, in the Conglomerate State Forest, a conspicuous *Graphina* specimen was collected, and similar specimens were collected later from nearby locations. Further examination showed them to contain protocetraric acid, and they proved to be *Cyclographina platyleuca* (Nyl.) Awasthi & Joshi, hitherto unreported from Australia.

Cyclographina platyleuca (Nyl.) Awasthi & Joshi, *Norwegian Journal of Botany* **26**: 174, (1979).
Graphina platyleuca (Nyl.) Zahlbr., *Cat. Lich. Univ.* **2**: 420 (1923).
Helminthocarpon platyleucum (Nyl.) Müll. Arg., *Flora* **70**: 423 (1887).
Graphis platyleuca Nyl., *Bull. Soc. Linn. Normand. sér. 2*, **2**: 75 (1868).

Type: NEW CALEDONIA, Ins. Loyalty, Lifu, D. Thiébaut s.n., 1865; holotype: H-NYL 6980.

Thallus greenish-white, corticolous, surface smooth and dull. Apothecia lirelliform, white, conspicuous, open, immersed, irregularly ellipsoid, straight or curved, 1–4 mm long, 0.5–1 mm wide, sometimes with a conspicuous thalline margin, surface of disc densely white pruinose; proper exciple thin or absent, complete, reddish-brown to black; hymenium 150–200 µm tall; ascospores hyaline, densely muriform, 1 per ascus, (100–)125–150(–175) µm long, 20–30 µm wide.

Chemistry: thallus Pd+ orange-red; tlc: protocetraric acid.

Illustration: D. Awasthi & M. Joshi, loc. cit., p. 174, Figs. 35-36; M. Wirth & M.E. Hale, *Smithsonian Contributions to Botany*, no. **40**: 62, plate 9e (1978) (as *Graphina platyleuca*).

SPECIMENS EXAMINED:
New South Wales: •Conglomerate State Forest, Anderson Mountain Road, 30°06'S, 153°03'E, alt. *ca.* 250 m, *ca.* 24 km NNW of Coffs Harbour, *A. W. Archer G205*, 19.iv.1998 (CANB, NSW); •Track to Dangar Falls, 30°19'30"S, 152°43'E, alt. 700 m, 2 km N of Dorrigo, *A. W. Archer G195*, 20.iv.1998 (NSW); •Dorrigo National Park, Wonga Walk, 30°23'S, 152°43'30"E, alt. *ca.* 700 m, *ca.* 40 km WSW of Coffs Harbour, on fallen branches, *A. W. Archer G240*, 20.iv.1998 (NSW); •Urunga, Hun-gry Head, 30°31'S, 153°01'S, alt. 5 m, from tree by side of inlet behind beach, 25 km SSW of Coffs Harbour, *A. W. Archer G185*. 21.iv.1998 (NSW).

Cyclographina platyleuca is characterized by the greenish-white thallus, the conspicuous, open, densely white pruinose, immersed lirellae, and the presence of protocetraric acid. The species is conspicuous, and was particularly common along the track to Dangar Falls. The lirellae may appear black if the pruina is removed by abrasion. First described from New Caledonia (Nylander 1868, loc. cit.), the species was also reported from Dominica and Puerto Rico by Wirth & Hale (loc. cit.). It superficially resembles *Graphis innata* Knight (1889) (syn: *G. baileyana* Müll. Arg., 1893), which also occurs in the same area as *C. platyleuca*, but the *Graphis* species has 15–19-septate ascospores and contains norstictic acid.

Key to the *Cyclographina* species reported from Australia:

1a. Thallus Pd–ve, ascospores 120–190 µm long ..... *C. lojkana* (Müll. Arg.) Awasthi & Joshi

1b. Thallus Pd+ve, orange 2

2a. Ascospores 80–105 µm long; salazinic acid present ..... *C. pruinosa* (Eschw. in Mart.) Awasthi

2b. Ascospores 125–150 µm long; protocetraric acid present ..... *C. platyleuca* (Nyl.) Awasthi & Joshi

References

Knight, C in Shirley, J (1889): Lichen Flora of Queensland, part III continued. *Proceedings of the Royal Society of Queensland* **6**, 201.

Müller, J (1893): Lichenes exotici II. *Hedwigia* **3**, 132.

Additional lichen records from New Zealand 29. *Megalospora lopadioides* from Campbell Island

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In January and February 1995, CW collected lichens in Campbell Island, the southernmost part of the New Zealand Botanic Region. All of the crustose and some of the foliose species were referred to BP for identification. From these, one species was tentatively identified as *Megalospora lopadioides*, new to New Zealand. The identification was confirmed by Harrie Sipman.

Megalospora lopadioides Sipman, *Bibliotheca Lichenologica* **18**: 165 (1983).

The species is described in detail in Sipman (1983). Characteristic features are thin-septate, muriform ascospores and a high frequency of degenerated apothecia. This latter feature, where small apothecia form on top of larger old ones, has been used to distinguish *M. lopadioides* from *M. gompholoma* macroscopically (Sipman 1983).

SPECIMEN EXAMINED

Campbell Island: Azimuth Saddle, 52°30'S, 169°08'E, alt. 450 m, on rock outcrop by pool, 24 January 1995, *C.J. West 95082* (WELT L5511).

M. lopadioides was previously thought to be endemic to Tasmania (Kantvilas 1994). The Campbell Island collection reported here extends the known range of the species more than 2000 km to the SE. In Tasmania it grows on the bark of a wide range of trees and shrubs in cool temperate rainforest and marginal scrub and heathland. On Campbell Island it was collected from rock in tussock-herbfield in an environment which is frequently misty.

References

Kantvilas, G (1994): Additions to the family Megalosporaceae in Tasmania and mainland Australia. *Lichenologist* **26**, 349–366.

Sipman, HJM (1983): A monograph of the lichen family Megalosporaceae. *Bibliotheca Lichenologica* **18**, 117–183.

New depsides from *Pertusaria* lichens

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Abstract

The new depsides methyl 2-*O*-methyldivaricatate (1), methyl 2-*O*-methylperlatolate (2), methyl 2,2'-di-*O*-methyldivaricatate (3), methyl 2,2'-di-*O*-methylstenosporate (4), methyl planaiate (5), methyl hyperplanaiate (6), and methyl isohyperplanaiate (7) have been detected in several *Pertusaria* species.

The lichen genus *Pertusaria* has proved to be a rich source of lichen substances, particularly of depsides, depsones and depsidones (Archer 1993, 1997). In a continuation of our chemotaxonomic investigation of this genus, we have recently encountered seven new lichen metabolites, all of which are depside methyl esters. They include methyl 2-*O*- methyldivaricatate (1), methyl 2-*O*-methylperlatolate (2), methyl 2,2'-di-*O*-methyldivaricatate (3), methyl 2,2'-di-O-methylstenosporate (4), methyl planaiate (5), methyl hyperplanaiate (6), and methyl isohyperplanaiate (7) (Figure 1).

Materials and Methods

Authentic material of the methyl esters (1)–(6) was obtained by brief treatment (1 minute) of the corresponding acids (Elix 1974; Elix *et al.* 1985, 1993, 1994) with excess ethereal diazomethane. After decomposition of the unreacted diazomethane with acetic acid, the resultant esters were purified by radial chromatography over silica gel using 1–10% ethyl acetate–light petroleum as eluant. The methyl ester (7) was obtained by treatment of the corresponding acid (Elix *et al.* 1994) with dimethyl sulfate and anhydrous potassium carbonate followed by the same purification procedure as described above.

Methyl 2-O-Methyldivaricatate (1) (87%) was obtained as colourless crystals, m.p. 80–82° (Found: C, 66.3; H, 6.7. $C_{23}H_{28}O_7$ requires C, 66.3; H, 6.8%) ^{1}H n.m.r. ($CDCl_3$) δ 0.97, 0.98, 2t, *J* 7.3 Hz, $(CH_2)_2$**Me**; 2.67, 2.90, 2t, *J* 7.8, 7.7 Hz, 2 × $ArCH_2$; 3.84, 3.86, 2s, 2 × OMe; 3.97, s, CO_2Me; 6.36, 6.38, 2d, *J* 2.1 Hz, H3',5'; 6.61, 6.75, 2d, *J* 2.3 Hz, H3,5; 11.45, s, 2-OH. Mass spectrum *m/z* 416 (M, 0.3%), 208 (24), 207 (100). Standard TLC R_F values: R_F (A) 0.75; R_F (B) 0.54; R_F (C) 0.70; R_F (E) 0.60. Standard HPLC: R_T 28.78 min; R_I 0.28.

Methyl 2-O-Methylperlatolate (2) (94%) was obtained as a colourless oil (Found: C, 67.4; H, 7.9; mol. wt. 472.2458. $C_{27}H_{36}O_7$ 0.5$H_2$0 requires C, 67.3; H, 7.7%; $C_{27}H_{36}O_7$ requires mol. wt. 472.2461) ^{1}H n.m.r. ($CDCl_3$) δ 0.88, 0.91, 2t, *J* 7.1, 6.7 Hz, $(CH_2)_4$**Me**; 2.68, 2.90, 2t, *J* 7.8, 7.9 Hz, 2 × $ArCH_2$; 3.84, 3.86, 2s, 2 × OMe; 3.97, s, CO_2Me; 6.36, 6.38, 2d, *J* 2.0 Hz, H3',5'; 6.61, 6.74, 2d, *J* 2.3 Hz, H3,5; 11.45, s, 2-OH. Mass spectrum *m/z* 472 (M, 0.2%), 236 (37), 235 (100). Standard TLC R_F values: R_F (A) 0.76; R_F (B) 0.60; R_F (C) 0.75; R_F (E) 0.68. Standard HPLC: R_T 32.51 min; R_I 0.45.

Methyl 2,2'-Di-O-methyldivaricatate (3) (54%) was obtained as colourless crystals, m.p. 63–64° (Found: mol. wt. M-H 429.1914. $C_{24}H_{29}O_7$ requires mol. wt. 429.1913). ^{1}H n.m.r. ($CDCl_3$) δ 0.94, 0.98, 2t, *J* 7.3, 7.4 Hz, $(CH_2)_2$**Me**; 2.55, 2.68, 2t, *J* 7.8 Hz, 2 × $ArCH_2$; 3.83, 3.84, 3.86, 3s, 3 × OMe; 3.91, s, CO_2Me; 6.37, 6.39, 2d, *J* 2.1 Hz, H3',5'; 6.65, 6.70, 2d, *J* 1.9 Hz, H3,5. Mass spectrum *m/z* 430 (M, 0.1%), 429 (0.2), 208 (26), 207 (100), 177 (12), 135 (19). Standard TLC R_F values: R_F (A) 0.64; R_F (B) 0.42; R_F (C) 0.64; R_F (E) 0.48. Standard HPLC: R_T 28.05 min; R_I 0.27.

Methyl 2,2'-Di-O-methylstenosporate (4) (74%) was obtained as colourless crystals, m.p. 56–57° (Found: mol. wt. M-H 457.2216. $C_{26}H_{33}O_7$ requires mol. wt. 457.2226). ^{1}H n.m.r. ($CDCl_3$) δ 0.88, 0.98, 2t, *J* 6.9, 7.3 Hz, $(CH_2)_2$**Me**, $(CH_2)_4$**Me**; 2.56, 2.68, 2t, *J* 7.9 Hz, 2 × $ArCH_2$; 3.83, 3.84, 3.86, 3s, 3 × OMe; 3.90, s, CO_2Me; 6.37, 6.39, 2d, *J* 2.1 Hz, H3',5'; 6.65, 6.69, 2d, *J* 1.9 Hz, H3,5. Mass spectrum *m/z* 458 (M, 0.3%), 457 (0.9), 427 (2.2), 209 (10), 208 (34), 207 (100), 177 (11), 135 (13). Standard TLC R_F values: R_F (A) 0.66; R_F (B) 0.44; R_F (C) 0.66; R_F (E) 0.50. Standard HPLC: R_T 30.23; R_I 0.36.

Methyl Planaiate (S) has been prepared previously by Huneck (1965) and exhibited standard TLC R_F values: R_F (A) 0.70; R_F (B) 0.47; R_F (C) 0.70; R_F (E) 0.52. Standard HPLC values: R_T 31.79 min; R_I 0.40.

Methyl Hyperplanaiate (6) (93%) was obtained as colourless crystals, m.p. 53° (Found: C, 69.7; H, 7.9. $C_{30}H_{42}O_7$ requires C, 70.0; H, 8.2%) ^{1}H n.m.r. ($CDC1_3$) δ 0.87, 0.88, 2t, *J* 7.0, 6.9 Hz, $(CH_2)_4$**Me**, $(CH_2)_6$**Me**; 2.56, 2.69, 2t, *J* 7.9, 8.0 Hz, 2 × $ArCH_2$; 3.82, 3.84, 3.86, 3s, 3 × OMe; 3.90, s, CO_2Me; 6.37, 6.39, 2d, *J* 2.1 Hz, H3',5'; 6.64, 6.69, 2d, *J* 2.0 Hz, H3,5. Mass spectrum m/z 514 (M, 0.06%), 513 (0.1), 483 (0.4), 236 (28), 235 (100), 149 (8). Standard TLC R_F values: R_F (A) 0.72; R_F (B) 0.49; R_F (C) 0.72; R_F (E) 0.55. Standard HPLC: R_T 33.28; R_I 0.50.

Methyl Isohyperplanaiate (7) (49%) was obtained as colourless crystals, m.p. 60–61° (Found: C, 69.8; H, 8.6. $C_{30}H_{42}O_7$ requires C, 70.0; H, 8.2%) ^{1}H n.m.r. ($CDC1_3$) δ 0.86, 0.88, 2t, *J* 6.7, 7.5 Hz, $(CH_2)_4$**Me**, $(CH_2)_6$**Me**; 2.56, 2.68, 2t, *J* 7.9 Hz, 2 × $ArCH_2$; 3.82, 3.84, 3.86, 3s, 3 × OMe; 3.90, s, CO_2Me; 6.37, 6.38, 2d, *J* 2.2 Hz, H3',5'; 6.64, 6.69, 2d, *J* 1.9 Hz, H3,5. Mass spectrum *m/z* 514 (M, 0.1%), 513 (0.2), 264 (35), 263 (100). Standard TLC R_F values: R_F (A) 0.74; R_F (B) 0.51; R_F (C) 0.72; R_F (E) 0.58. Standard HPLC: R_T 33.32; R_I 0.50.

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 solorinic acid controls (Elix *et al.* 1997, 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. For each new substance the correlation of ultraviolet spectre of the synthetic and natural material was greater than 99.9%.

Discussion and Results

We have now confirmed the occurrence of the methyl esters (1)–(7) in several *Pertusaria* species. Although the corresponding carboxylic acids are well-known lichen metabolites (Huneck & Yoshimura 1996), the methyl esters (1)–(7) have not hitherto been recorded as occurring in Nature.

Comparisons were conducted between the synthetic esters (1)–(7) and the total acetone extracts from the various *Pertusaria* species by TLC in four independent solvent systems and by HPLC coupled to a photodiode array detector for ultraviolet spectroscopic comparisons.

In this manner, extracts of the lichen *Pertusaria oraraensis* Archer & Elix were shown to contain divaricatic acid (major), methyl 2-*O*-methyldivaricatate (1) (minor), methyl 2,2'-di-*O*- methyldivaricatate (3) (minor), and 2-chlorolichexanthone (minor) (see Figure 2). Similarly, extracts of *Pertusaria xenismota* Archer & Elix were shown to contain 2-*O*-methylperlatolic acid (major), planaic acid (minor), methyl 2-*O*-methylperlatolate (2) (minor), and 4,5-dichlorolichexanthone.

Pertusaria subplanaica Archer was found to contain 2,2'-di-*O*-methylstenosporic acid as the major metabolite, together with minor quantities of 2,2'-di-*O*-methyldivaricatic acid, 2'-*O*-methylstenosporic acid, 2'-*O*-methylperlatolic acid, the new depside-ester methyl 2,2'-di-*O*-methylstenosporate (4), atranorin, and 4,5-dichlorolichexanthone.

Finally, *Pertusaria manamensis* Archer & Elix was shown to contain 2-*O*-methylsuperlatolic acid (major) together with smaller quantities of hyperplanaic acid, isohyperplanaic acid, superplanaic acid, and the new depside-esters methyl planaiate (5), methyl hyperplanaiate (6), and methyl isohyperplanaiate (7) (Figure 3).

SPECIMENS EXAMINED

Pertusaria manamensis A.W. Archer & Elix, *Mycotaxon* **67**: 164 (1988).
PAPUA NEW GUINEA. *Madang Province*: •Manam Island, near Bogia, 4°07'S, 145°00'E, 50 m, in gardens near Budua, *H. Sipman 34902*, 22.vii.1992 (holotype, B).

Pertusaria oraraensis A.W. Archer & Elix, *Bibliotheca Lichenologica* **69**: 117 (1997).
AUSTRALIA. *New South Wales*: Orara State Forest, 23 km WNW of Coffs Harbour, 30°15'S, 152°55'E, 600 m, on *Acacia* in clearing by side of road, *A. W. Archer P857*, 17.xi.1996 (holotype, NSW). •Orara State Forest, 7 km NNE of Coffs Harbour, *A. W. Archer P851* (NSW).

Pertusaria subplanaica A.W. Archer & Elix, *Mycotaxon* **45**: 422 (1992).
AUSTRALIA. *New South Wales*: •Dorrigo National Park, Wonga Walk, *ca.* 40 km WSW of Coffs Harbour, on rainforest tree in clearing, *A. W. Archer P874*, 15.xi.1996 (NSW). •New England National Park, 72 km E of Armidale, on *Nothofagus* twigs, *J.A. Elix 33930*, 17.viii.1993 (CANB). PAPUA NEW GUINEA. *Northern Province*: •Owen Stanley Range, surroundings of Naduri Village, 9°08'S, 147°41'E, 1600 m, secondary vegetation and gardens, *A. Aptroot 38148*, 19–20 October 1995 (herb. Aptroot).

Pertusaria xenismota A.W. Archer & Elix, *Bibliotheca Lichenologica* **69**: 170 (1997). AUSTRALIA. *New South Wales*: •Red Rock, south side of Corinda River, 38 km NNE of Coffs Harbour, 30°00'S, 153°15'E, 3m, on *Casuarina, A. W. Archer P889*, 22.xi.1996 (holotype, NSW). •S side of Moonee Creek, 12 km NNE of Coffs Harbour, *A. W. Archer P909* (NSW). PAPUA NEW GUINEA. *Eastern Highlands Province*: •Mount Kisskiss, 1 km E of Goroka, 6°04'S, 145°24'E, 1700 m, *H. Sipman 22308*, 18.iii.1987 (B). •Madang Province: Kakar Island, NW side, S of airfield at Kinim Station, 4°35'S, 145°55'E, 300 m, on *Cocos* palms in plantation, *H. Sipman 24225* (B).

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Huneck, S (1965): Über Flechteninhaltsstoffe, XVII. Konstitution der Planasäure, eines neuen Depsides aus *Lecidea plana* (Lahm ex Koerb.) Nylander. *Zeitschrift für Naturforschung* **20b**, 1119–1122.
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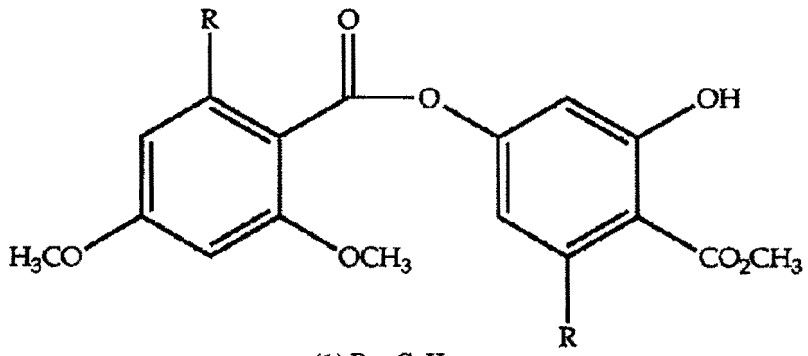
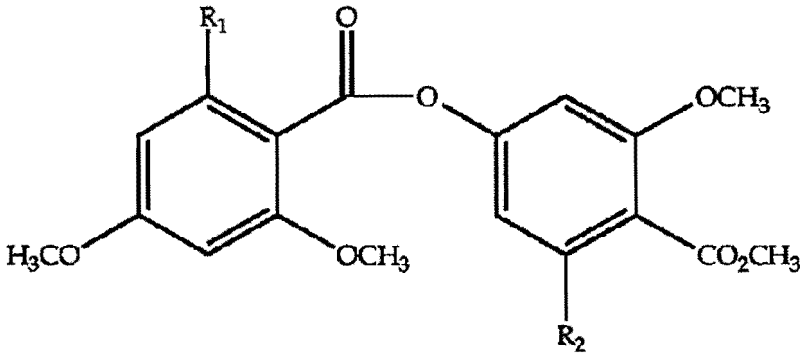


(1) R = C_3H_7

(2) R = C_5H_{11}



(3) $R_1 = R_2 = C_3H_7$

(4) $R_1 = C_3H_7$, $R_2 = C_5H_{11}$

(5) $R_1 = R_2 = C_5H_{11}$

(6) $R_1 = C_5H_{11}$, $R_2 = C_7H_{15}$

(7) $R_1 = C_7H_{15}$, $R_2 = C_5H_{11}$

Figure 1. Stuctures of new depsides identified in *Pertusaria* species.

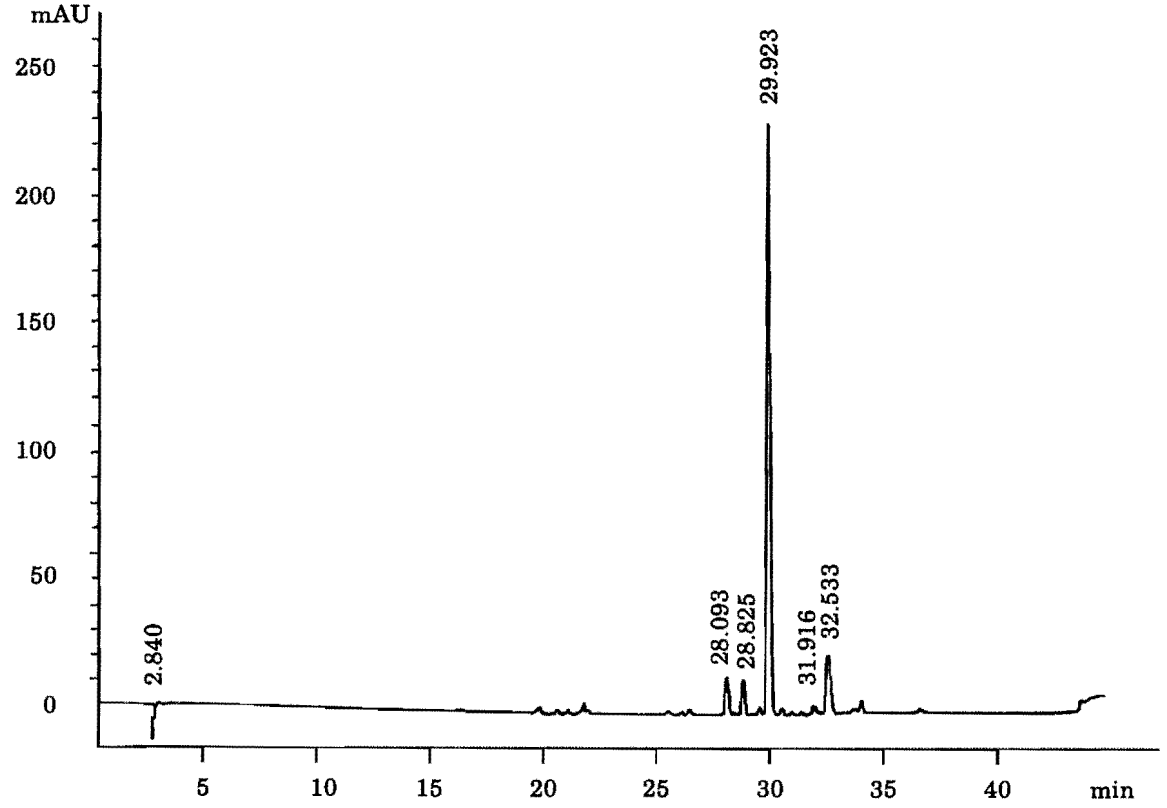


Figure 2. HPLC trace of acetone extract of *Pertusaria oraraensis* Archer & Elix (*Archer P857*). R_T 28.093 = methyl 2,2'-di-*O*-methyldivaricatate; R_T 28.825 = methyl 2-*O*-methyldivaricatate; R_T 29.923 divaricatic acid; R_T 31.916 = stenosporic acid; RT 32.533 = 2-chlorolichexanthone.

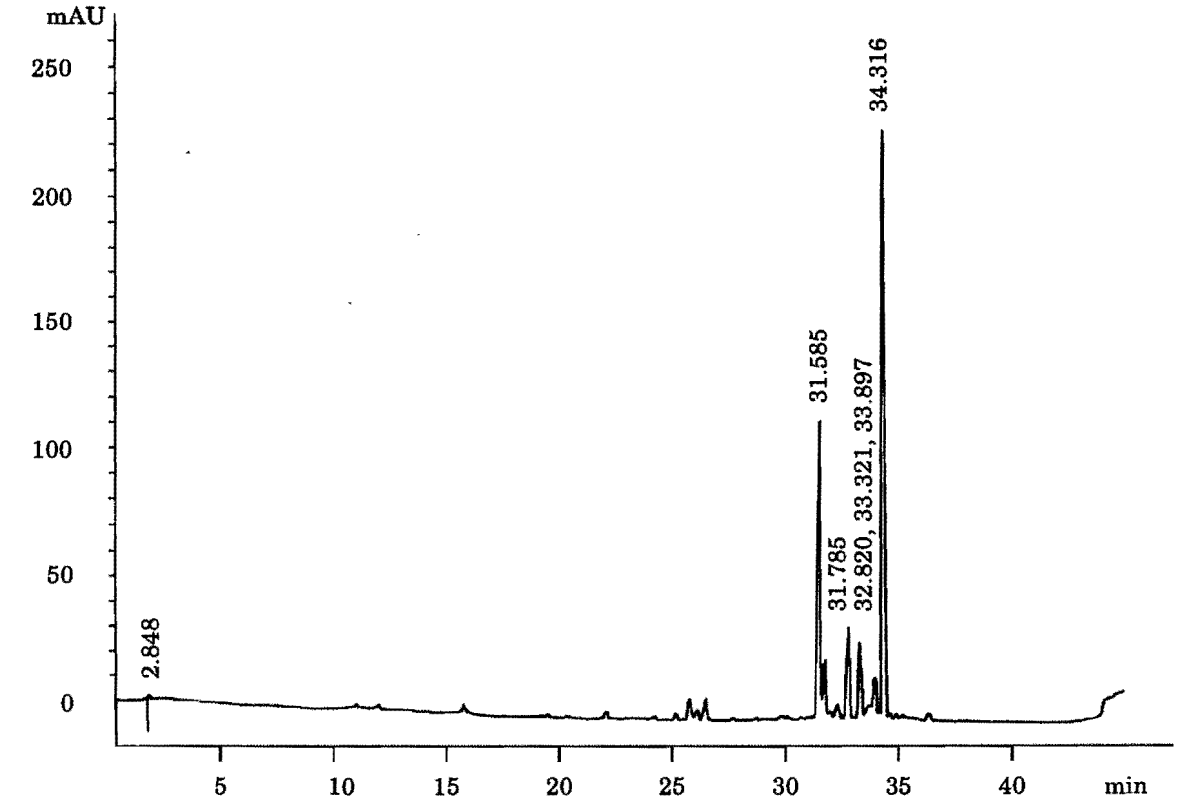


Figure 3. HPLC trace of acetone extract of *Pertusaria manamensis* Archer & Elix (*Sipman 34902*). R_T 31.585 = isohyperplanaic acid and hyperplanaic acid; R_T 31.785 = methyl planaiate; R_T 32.820 = superplanaic acid; R_T 33.321 = methyl hyperplanaiate and methyl isohyperplanaiate; R_T 33.897 = unknown; 34.316 = 2-*O*-methylsuperlatolic acid.

Lichens of the Kimberley Region, Western Australia

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The Kimberley region of Western Australia is approximately 300,000 km^2 in area, with spectacular gorges, rivers, waterfalls, ravines and escarpments cutting through huge tracts of savanna grassland and woodland. The region is larger than the State of Victoria, and extends from the Great Sandy Desert in the south to the Timor Sea in the north, and in the east extends to the Keep River National Park in the Northern Territory (Fig.1). The region is classed as semi-arid in the south to dry hot-tropical in the north (Wheeler 1992).

While a few lichen studies have been conducted in Australia's arid and semi-arid regions, particularly on terricolous lichens (Rogers 1971, 1972a, 1972b; Eldridge 1996; Eldridge & Tozer 1997a, 1997b), most have concentrated on regions in south-eastern Australia. Only a few (Büdel *et al.* 1993; Sammy 1975, 1983) relate specifically to lichens of the Kimberley. However, a number of collections from the Kimberley region are recorded in several more broad-based studies of Australian lichens (Archer 1997; Büdel & Elix 1997; Elix 1989, 1990, 1992, 1993; Lumbsch 1994; Matzer *et al.* 1997; Mayrhofer *et al.* 1996; Rambold 1989).

This paper is largely based on lichens collected by JA Elix & H Streimann during May, 1988, by JA Elix, HT Lumbsch, and H Streimann during July, 1991, and on a collection by K Ralston during July–September, 1997.

The climate

The climate of the Kimberley is described as semi-arid and arid-monsoonal, and is characterized by warm, dry winters, "the dry season", and hot, wet summers, "the wet season". Almost all of the rainfall occurs between November and the end of March, with the annual rainfall ranging from 250–500 mm in the arid south to 700–1600 mm in the tropical north. The temperatures during the wet season usually exceed 35°C, with temperatures frequently over 40°C late in the dry season. The maximum temperatures in the dry season are slightly lower at approximately 32°C (Beard 1979, Wheeler 1992).

Phytogeographic districts and major collecting sites

Beard (1979) recognized four phytogeographic districts in the Kimberley: the Gardner District in the north, the Fitzgerald District in the centre, and the Dampier and Hall Districts in the south. The following descriptions are taken from Beard (1979) and Wheeler (1992), and the major collection sites for this study are noted within each district.

The Gardner district (north Kimberley) is a dissected plateau (Kimberley Plateau) with mesas and ranges, including the King Leopold Range to the south. To the west the plateau dips to form a drowned valley coastline. The geology consists of Proterozoic rocks of the Kimberley Basin, mainly sandstones, shales and volcanics. The vegetation is predominantly savanna woodland, with *Eucalyptus* species dominating the tree layer. Summer rainfall is >700 mm per annum. The major collecting sites included the Keep River National Park (in the Northern Territory), Hidden Valley (Mirima) National Park, sites between Kununurra and Wyndham, the Cockburn Range, Drysdale River Station and various sites along the Gibb River Road.

The Fitzgerald district (central Kimberley) includes the south-eastern part of the Kimberley Plateau and the rugged escarpments of the King Leopold and Durack Ranges, which are dissected by deep gorges. The geology consists mainly of siliceous rocks, Proterozoic sandstones, Archaean granite, shale and acid volcanics. The vegetation is predominantly savanna woodland or tree savanna, with *Eucalyptus* species dominating the tree layer. Summer rainfall is 400–700 mm per annum. The major collecting sites included the King Leopold and Durack Ranges, sites along the Gibb River Road, and sites along the Northern Highway between Fitzroy Crossing and Halls Creek.

The Dampier District (south-west Kimberley) consists mainly of low-lying sandplains and dunefields over Jurassic sandstones. To the north, the plains are bounded by the Devonian reef limestones of the Napier and Oscar Ranges. The geology is Quaternary sandplains and alluvia with local outcrops of Phanerozoic sandstone and reef limestone. The predominant vegetation is pindan woodland dominated by *Acacia* species, with an emergent tree layer of *Eucalyptus* species. Vine thickets and mangals occur along the coast. Summer rainfall is 400–800 mm per annum. The major collecting sites included coastal areas from Broome to Cape Leveque, the Oscar Range, and sites along the Great Northern Highway between Derby and Fitzroy Crossing.

The Hall district (south-east Kimberley) has extensive plains with occasional plateaux and sandstone ranges, including the Osmond Range, the Bungle Bungle massif, and the Albert Edward Range. The geology is Archaean and Proterozoic rocks, including both sandstone and basalt, extensive basalt and limestone of Cambrian age, and Devonian sandstone. The predominant vegetation is tall-grass savanna, almost treeless, on cracking clay plains and spinifex steppe on hilly, mountainous, and rocky country. Summer rainfall is 350–600 mm per annum. Few collections were made in this district, and only a small collection was made at the Bungle Bungle (Purnululu) National Park.

The Kimberley lichens

Approximately 60 lichen species were found during these three Kimberley expeditions (see below) which, considering the vastness of the area, confirms the prediction that the northern wet-dry areas of Australia are poor in lichen species (Rogers 1992). One explanation given for that phenomenon is the apparent sensitivity of lichens to heat when their thallus is wet. That premise is based on studies by Lange (1953) and Rogers (1971), who found that lichens are not easily damaged by high temperature if air-dry, but are sensitive and often damaged by high temperatures when wet.

We suggest that the regular fire regime initiated by pastoralists, Aborigines and National Park personnel in the extensive grassland-dominated areas of the Kimberley could also contribute to the paucity of lichens.

The most common lichen substrata and habitats were rocks, particularly sandstone, in sheltered ravines, escarpments, and small rainforest pockets in gorges. Rock outcrops in sheltered savanna-type woodlands were also excellent lichen habitats, as were the sandstone "beehive" formations of the Hidden Valley (Mirima) National Park, Kununurra.

Few corticolous lichens occurred in the region, and were restricted to trees in sheltered rainforest pockets in gorges and, more commonly, in vine thickets and mangals near the coast on the Dampier Peninsula.

Unlike the semi-arid areas of south-eastern Australia where terricolous lichens play such an important part, few terricolous lichens were found in the Kimberley region, and that can reasonably be attributed to the soaking of the soil during the wet season. The lichens that were encountered (*Catapyrenium squamulosum, Heppia despreauxii, Paraporpidia glauca, Peltula* spp., *Psora crystallifera,* and *Trapelia coarctata*), were rare and were always associated with rock, in either creek flats or stony soil.

The fossilized Devonian Reef limestone of the Windjana Gorge appear devoid of lichens, and only a non-lichenized fungus, *Lichenothelia* sp., was found on this limestone stratum.

Many lichens were found in only one location. They included *Acarospora citrina, Canoparmelia owariensis, Coccocarpia pellita, Diploschistes sticticus, Gloeoheppia turgida, Lecanora flavidomarginata, L. leprosa, L. subimmersa, L. tropica, Parmelina conlabrosa, Parmotrema pseudonilgherrense, Peltula cylindrica, P. langei, P. omphaliza, P. rodriguesii, P. zahlbruckneri, Pyxine convexior, Relicinopsis rahengensis, Rinodina thiomela, R. xanthomelana, Trapelia coarctata, Xanthoparmelia congensis, X. consociata, X. globulifera, X. isidiigera, X. mexicana,* and *X. parvoincerta.* Of the seven species of *Xanthoparmelia* found, only *X. mougeotina* was found in more than one location.

Crustose lichens

Crustose saxicolous lichens were the most common lichens, with *Biatoria sorediosa, Paraporpidia glauca,* and *Tephromela arafurensis* the most frequently collected.

Seven species of the crustose genus *Lecanora* occurred: *L. arnhemica, L. flavidomarginata, L. leprosa, L. plumosa, L. pseudistera, L. subimmersa,* and *L. tropica. Lecanora flavidomarginata* and *L. leprosa* occurred only rarely on trees in the Dampier Peninsula, while all other *Lecanora* species were saxicolous, including the recently described *L. arnhemica,* and occurred in escarpments and woodlands throughout the region, mainly on sandstone.

Two recently described crustaceous saxicolous lichens from tropical Australia, *Dimelaena elevata* (Mayrhofer *et al.* 1996) and *Australiaena streimannii* (Matzer *et al.* 1997), were scattered throughout the region. Both species were found mainly on sandstone in savannas and open dry sclerophyll forests.

Caloplaca cupulifera is a new record for Australia and occurred on sheltered rocks beside creeks, rivers and springs.

Squamulose lichens

Eleven species of the genus *Peltula* were collected: *P. bolanderi, P. cylindrica, P. euploca, P. impressa, P. langei, P. obscurans, P. omphaliza, P. patellata, P. placodizans, P. rodriguesii,* and *P. zahlbruckneri.* They were the most common non-crustose saxicolous lichens found in the region, and inhabited sheltered rock crevices, often along water channels or seepages (Büdel *et al.* 1993). Even so, many were found only once.

Foliose lichens

The most common foliose genus was *Dirinaria. Dirinaria applanata, D. confluens,* and *D. picta* occurred on trees in the pindan woodland and coastal vine thickets in Dampier Peninsula, while *D. batavica* and *D. confluens* occurred on rocks across the Kimberley region.

Parmotrema praesorediosum occurred quite frequently, mainly on sandstone but also on bark.

Fruticose lichens

The only fruticose lichens found were of the *Ramalina subfraxina* complex, which were locally common on mangrove trees, particularly *Cereops tagal,* in the Dampier Peninsula.

Conclusion

While these combined studies have extended the knowledge of the lichen flora of the Kimberley region, there are still many areas which remain to be investigated.

The lichens of the Bungle Bungle (Purnululu) National Park remain poorly known as, due to unforseen circumstances, only a short time was spent there. Considering the comparatively rich lichen flora on the similar, although much smaller Devonian sandstone "beehive" formations at the Hidden Valley (Mirima) National Park, Kununurra, it can be assumed that a more comprehensive study of the Bungle Bungle National Park will uncover an even richer lichen flora.

All three expeditions described here were conducted during the dry season, and it is suggested that similar studies should be conducted during the wet season. Although that will be logistically difficult, such studies could well unearth new knowledge about lichens of the wet-dry tropical region that are masked during the dry season.

LICHEN SPECIES

***Acarospora citrina* (Taylor) Zahlbr. ex Rech.**, *Denkschr. Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl.* **88**: 28 (1911)

Very rare on lateritic rocks with a SW aspect along the escarpment.

Erskine Ra., Great Northern Hwy, between Derby and Fitzroy Crossing, 17°51'S, 124°20'E, 120 m, *Elix 22298 & Streimann*, 1988 (CANB).

***Australiaena streimannii* Matzer, H. Mayrhofer & Elix**, *Lichenologist* **29**: 36 (1997)
Previously reported in Matzer, Mayrhofer, & Elix (1997).

Common on sheltered rocks, mainly sandstone, in savannas and open dry sclerophyll forests.

Bell Ck, Bell Gorge, 17°00'S, 125°12'E, *Ralston 331*, 1997 (MEL); Jarrnarm Camping Area, Keep River N.P., N.T., 15°45'S, 129°05'E, *Ralston 622*, 1997 (MEL); Gibb River Road, E of Durack River Stn, 15°49'S, 127°31'E, *Ralston 624*, 1997 (MEL).

***Biatora sorediosa* Rambold**, *Biblioth. Lichenol.* **34**: 75 (1989)

Common, mainly on sandstone in sheltered treed areas.

King Leopold Ra., gorge 3 km NW of Silent Grove, 63 km NE of Lennard River Crossing, along the Gibb River Road, 17°06'S, 125°24'E, 350 m, *Elix 22258, Streimann & Galloway*, 1988 (CANB); Mt Cockburn South, Cockburn Ra., 45 km S of Wyndham, 15°55'S, 128°09'E, 300 m, *Elix 22448 & Streimann*, 1988 (CANB); Stuart Hwy, Hayes Ck, 40 km NW of Pine Ck, 13°38'S, 131°35'E, 200 m, *Elix 22059 & Streimann*, 1988 (CANB); Lake Argyle Road, 35 km SE of Kununurra, 16°01'S, 128°59'E, 140 m, *Elix 22474 & Streimann*, 1988 (CANB); Jacks Waterhole, Durack River Homestead, 15°49'S, 127°24'S, *Ralston 322*, 1997 (MEL); El Questro Gorge, El Questro Stn, Gibb River Road, 16°01'S, 128°01'E, *Ralston 323*, 1997 (MEL); Mini Palm Trail, Bungle Bungle (Purnululu) N.P., *Ralston 701*, 17°19'S, 128°23'E, 1997 (MEL).

***Caloplaca cinnabarina* (Ach.) Zahlbr.**, in A. Engler & K. Prantl, *Nat. Pflanzenfam.* **1**, 1: 228 (1907)

Rare on shaded rocks in escarpments.

Lake Argyle Road, 31 km SE of Kununurra, 15°59'S, 128°56'E, *Elix 27788, Lumbsch & Streimann*, 1991 (CANB); Lake Argyle Road, 35 km SE of Kununurra, 16°01'S, 128°59'E, 140 m, *Elix 22467 & Streimann*, 1998 (CANB).

***Caloplaca cupulifera* (Vain.) Zahlbr.**, *Cat. Lich. Univ.* **7**: 226 (1931)
New record for Australia, determined by C.M. Wetmore. Occurs in Mexico, the Caribbean, the Galapagos Islands, and Brazil. For description, see Wetmore & Kärnefelt (1998).

Scattered on rock, mainly sandstone and conglomerate in south-facing or shaded areas near creeks, rivers or springs.

Gibb River Crossing, Kalumburu Road, 16°05'S, 126°30'E, *Ralston 328*, 1997 (MEL); El Questro Gorge, El Questro Stn, Gibb River Road, 16°01'S, 128°01'E, *Ralston 822*, 1997 (MEL); Zebadee Springs, El Questro Stn, Gibb River Road, 16°01'S, 128°01'E, *Ralston 819*, 1997 (MEL); Galvins Gorge, 9 km SW of Mt Barnett Stn, Gibb River Road, 16°48'S, 125°50'E, *Ralston 818*, 1997 (MEL); Silent Grove, Bell Ck, Mt Hart Stn, 17°00'S, 125°12'E, *Ralston 821*, 1997 (MEL); Mimi Palm Trail, Bungle Bungle (Purnululu) N.P., 17°19'S, 128°23'E, *Ralston 815, 817*, 1997 (MEL).

***Caloplaca leptozona* (Nyl. in Crombie) Zahlbr.**, *Cat. Lich. Univ.* **7**: 154 (1931)
New record for W.A. Previously reported for N.T. by Wetmore (1996).

Common on sheltered rocks beside creeks or rivers, but also on exposed coastal rock.

Couchman Ra., 16 km NW of King Edward River Stn (Doongan Stn), 15°17'S, 126°12'E, 400 m, *Elix 27983, Lumbsch & Streimann*, 1991 (CANB); Mini Palm Walk, Bungle Bungle (Purnululu) N.P., 17°19'S, 128°23'E, *Ralston 297*, 1997 (MEL); Silent Grove, Mt Hart Stn, Bell Ck, 17°00'S, 125°12'E, *Ralston 300*, 1997 (MEL); Hidden Valley (Mirima) N.P., Kununurra, 15°45'S, 128°45'E, *Ralston 301*, 1997 (MEL); El Questro Gorge, El Questro Stn, Gibb River Road, 16°01'S, 128°01'E, *Ralston 303, 305, 332*, 1997 (MEL); Roebuck Bay, 500 m W of Broome Bird Observatory, Broome, 17°58'S, 122°20'E, *Ralston 309*, 1997 (MEL); Nganlong Track, Keep River N.P., N.T., 15°48'S, 129°06'E, *Ralston 295*, 1997 (MEL).

***Canoparmelia owariensis* (Asahina) Elix**, *Mycotaxon* **47**: 127 (1993)
New record for W.A.

Rare on basalt rock outcrop in *Eucalyptus*-dominated flat grassland.

Gibb R., Kalumburu Road, 5 km S of Drysdale River Stn, 15°46'S, 126°22'E, 370 m, *Elix 27950, 27953, Lumbsch & Streimann*, 1991 (CANB).

***Catapyrenium squamulosum* (Ach.) O. Breuss**, *Ber. Deutsch. Bot. Ges.* **98**: 389 (1985)

Rare on rocky soil or creek flats.

7 km NW of Drysdale River Stn, 15°40'S, 126°19'E, *Elix 27985, Lumbsch & Streimann*, 1991 (CANB); 11 km NW of Drysdale River Stn, 15°41'S, 136°17'E, 400 m, *Elix 28003, Lumbsch & Streimann*, 1991 (CANB).

***Chrysothrix candelaris* (L.) J.R. Laundon**, *Lichenologist* **13**: 110 (1981)

Rare on rock and on bark of *Celtis philippensis* var. *philippensis* in coastal vine thickets.

Between Quondong Point and James Price Point, 17°31'S, 122°08'E, *Ralston 562*, 1997 (MEL); Western Walk, Keep River N.P., N.T., 15°45'S, 129°05'E, *Ralston 618*, 1997 (MEL).

***Coccocarpia pellita* (Ach.) Müll Arg.**, *Symb. Bot. Upsal.* **12**(1): 420 (1952)
New record for W.A.

Very rare on bark of tree in sheltered south-facing ravine.

Hidden Valley (Mirima) N.P., Kununurra, 15°45'S, 128°45'E, *Ralston 347*, 1997 (MEL).

***Dimelaena elevata* Elix, Kalb & Wippel**, *Mycotaxon* **58**: 298 (1996)
Previously reported in Mayrhofer, Matzer, Wippel & Elix (1996).

Scattered on sheltered boulders of various siliceous rock types, but predominantly on sandstone in savannas and open dry sclerophyll forests.

Lake Argyle Road, 31 km SE of Kununurra, 15°59'S, 128°56'E, 160 m, *Elix 27786, 27811, Lumbsch & Streimann*, 1991 (CANB); Gibb River Road, 69 km SW of Wyndham, 15°50'S, 127°35'E, 280 m, *Elix 27857, Lumbsch & Streimann*, 1991 (CANB); King Leopold Ra., Ferny Ck, 61 km NE of Lennard River Crossing, Gibb River Road, 17°10'S, 125°10'E, 400 m, *Elix 22205, 22213, Streimann & Galloway*, 1988 (CANB); Gurrondalng Walk, Keep River N.P., N.T., 15°52'S, 129°03'E, *Ralston 345*, 1997 (MEL); Gibb Ra., Gibb River Road, 37 km NE of Gibb River Stn, 16°06'S, 126°35'E, 440 m, *Streimann 48443*, 1991 (CANB).

***Diploschistes almbornii* C.W. Dodge**, *Beih. Nova Hedwigia* **12**: 106 (1964)

Rare on exposed sandstone.

Gibb River Ra., Gibb River Road, 38 km NE of Gibb River Stn, 16°06'S, 126°36'E, 480 m, *Elix 27941, Lumbsch & Streimann*, 1991 (CANB); Gibb River Road, 18 km W of Ellenbrae Stn, 380 m, 15°58'S, 126°54'E, *Lumbsch 8816a, Elix & Streimann*, 1991 (CANB).

***Diploschistes sticticus* (Körb.) Müll. Arg.**, *Bull. Herb. Boissier* **2**, append. 1: 52 (1894)

Very rare on sandstone rocks in *Eucalyptus*-dominated grasslands.

Gibb River Road, 74 km SW of Wyndham, 15°44'S, 127°31'E, 300 m, *Elix 27877, Lumbsch & Streimann*, 1991 (CANB).

***Dirinaria applanata* (Fée) D.D. Awasthi**, *J. Indian Bot. Soc.* **49**: 135 (1970)

Scattered locally on trees in pindan woodland and coastal vine thickets.

James Price Point, 17°29'S, 122°08'E, *Ralston 370, 599*, 1997 (MEL); 1 km N of Gnamagum Well, Cape Leveque, 16°25'S, 122°54'E, *Ralston 595*, 1997 (MEL); Broome Bird Observatory, Broome, 17°58'S, 122°20'E, *Ralston 600, 604*, 1997 (MEL); Bardi Aboriginal Community, One Arm Point, 16°26'E, 123°03'S, *Ralston 602, 607*, 1997 (MEL).

***Dirinaria batavica* D.D. Awasthi**, *Biblioth. Lichenol.* **2**: 42 (1975)

Scattered on rock, usually south-facing sandstone or conglomerate.

Gibb River Road, 74 km SW of Wyndham, 300 m, 15°49'S, 127°31'E, *Lumbsch 8774c, Elix & Streimann*, 1991 (CANB); Gibb River Crossing, Kalumbaru Road, 16°06'S, 126°30'E, *Ralston 589*, 1997 (MEL); 7 km W of Durack River Homestead, Gibb River Road, 15°51'S, 127°22'E, *Ralston 596*, 1997 (MEL); Mimi Palm Trail, Bungle Bungle (Purnululu) N.P., 17°19'S, 128°23'E, *Ralston 605*, 1997 (MEL); Hidden Valley (Mirima) N.P., Kununurra, 15°45'S, 128°45'E, *Ralston 612*, 1997 (MEL); Nganlong Track, Keep River N.P., N.T., 15°48'S, 129°06'E, *Ralston 349*, 1997 (MEL).

***Dirinaria confluens* (Fr.) D.D. Awasthi**, *Biblioth. Lichenol.* **2**: 281 (1975)

Very common on rock in grasslands, escarpments and ravines and on trees.

Oscar Ra., 43 km NW of Fitzroy Crossing, 17°55'S, 125°17'E, 190 m, *Elix 22113, 22114, 22118, 22119 & Streimann*, 1988 (CANB); Sawpit Gorge, Black Elvine R., Albert Edward Ra., 27 km SE of Halls Creek, 340 m, 18°26'S, 127°49'E, *Elix 22371 & Streimann*, 1988 (CANB); Great Northern Hwy, 3 km SW of Ord River Crossing, between Halls Creek and Turkey Creek, 320 m, 17°30'S, 127°56'E, *Elix 22387, 22388, 22394 & Streimann*, 1988 (CANB); Lake Argyle Road, 35 km SE of Kununurra, 140 m, 16°01'S, 128°59'E, *Elix 22468, 22473, 22479, 22488 & Streimann*, 1988 (CANB); Duncan Hwy, near Old Halls Creek, 14 km ESE of Halls Creek, 340 m, 18°16'S, 127°48'E, *Elix 22377, 22379, 22383, 22384 & Streimann 39440*, 1988 (CANB); Djarindjin Aboriginal Community, 20 km SW of Cape Leveque, *Ralston 369*, 1997 (MEL); Broome Bird Observatory, Broome, 17°58'S, 122°20'E, *Ralston 587, 608*, 1997 (MEL).

***Dirinaria picta* (Sw.) Schaer. ex Clem.**, *Gen. Fung.*: 323 (1931)

Scattered on bark of trees, predominantly *Diospyros* species.

Between Qandang and James Price Point, 17°19S, 122°08E, *Ralston 367*, 1997 (MEL); James Price Point, 17°29'S, 122°08'E, *Ralston 586, 597*, 1997 (MEL); Roebuck Plains Stn, Broome, 17°58'S, 122°20'E, *Ralston 593*, 1997 (MEL); One Arm Point, Bardi Aboriginal Community, 16°26'S, 123°03'E, *Ralston 588, 598, 601*, 1997 (MEL); 1 km N of Gnamagun Well, Cape Leveque, 16°25'S, 122°54'E, *Ralston 606, 609*, 1997 (MEL).

***Endocarpon pallidum* Ach.**, *Lichenogr. Universalis*: 301 (1810)
Previously reported in McCarthy (1991)

Very rare on siliceous rock.

Lennard River Gorge and Fan Fern Gorge, King Leopold Ra., *Beaglehole 52601*, 1976 (MEL).

***Gloeoheppia turgida* (Ach.) Gyeln.**, *Repert. Spec Nov. Regni Veg.* **38**: 312 (1935)
New to Australia, determined by B. Büdel. A detailed description is given in Hensen (1995).

Very rare on calcareous sandstone.

Wombarella Gap, Napier Ra., 11 km NE of Lennard River Crossing on Gibb River Road, 70 m, 17°18'S, 124°46'E, *Elix 22149 & Streimann*, 1988 (CANB).

***Heppia despreauxii* (Mont.) Tuck.** *Gen. Lich.*: 46 (1872)
New record for N.T. and W.A.

Rare on soil or sandstone.

Hidden Valley (Mirima) N.P., Kununurra, 15°45'S, 128°45'E, *Ralston 633*, 1997 (MEL); Nganlang Track, Keep River N.P., N.T., 15°48'S, 129°06'E, *Ralston 344*, 1997 (MEL); Gurrondalng Walk, Keep River N.P., N.T., 15°52'S, 129°03'E, *Ralston 354*, 1997 (MEL).

***Lecanora arnhemica* Lumbsch**, *J. Hattori Bot. Lab.* **77**: 68 (1994)

Scattered on rock, mainly sandstone, in escarpments and *Eucalyptus*-dominated woodland.

King Edward R., 54 km NNW of King Edward River Stn (Doongan Stn), 280 m, 14°54'S, 126°12'E, *Elix 27971, Lumbsch & Streimann,* 1991 (CANB); Mt Cockburn South, Cockburn Ra., 45 km S of Wyndham, 300 m, 15°55'S, 128°09'E, *Elix 22416, 22439 & Streimann*, 1988 (CANB); Kununurra-Timber Creek Hwy, 25 km SW of Kununurra, 15°54'S, 128°56'E, 100 m, *Lumbsch 8765b, Elix & Streimann*, 1991 (CANB); Donkey Escarpment, head of Donkey Ck, 27 km S of Drysdale River Stn, 15°58'S, 126°22'E, 420 m, *Lumbsch 8811b, Elix & Streimann*, 1991 (CANB); 7 km NW of Drysdale River Stn, *Lumbsch 8804h, Elix & Streimann* (hb. Lumbsch) (CANB); 74 km SW of Wyndham, *Lumbsch 8774g, Elix & Streimann* (hb. Lumbsch); 38 km NE of Gibb River Stn, *Lumbsch 8787, Elix & Streimann* (hb. Lumbsch).

***Lecanora flavidomarginata* B. de Lesd.**, *Lich. Mexique*: 14 (1914)

Very rare on bark of *Lysiphyllum cunninghamii* in pindan woodland.

Broome Bird Observatory, Roebuck Bay, Broome, 17°58'S, 122°20'E, *Ralston 366*, 1997 (MEL).

***Lecanora helva* Stizenb.**, *Ber. Tätigk. St. Gallischen. Naturwiss. Ges.* 1888–89: 218 (1890)

Very rare.

1.5 km N of Kalumburu Mission, Northern Kimberley, *Taylor 60A* (NT).

***Lecanora leprosa* Fée**, *Essai Crypt. Écorc.*: 118 (1824)
New record for W.A.

Very rare on the bark of trees in vine thickets and near mangal.

James Price Point, 17°29'S, 122°8'E, *Ralston 450*, 1997 (MEL); Roebuck Bay, 6 km W of Broome Bird Observatory, Broome, 17°57'S, 122°16'E, *Ralston 561*, 1997 (MEL).

***Lecanora plumosa* Müll. Arg.**, *Flora* **65**: 484 (1882)

Rare on rock.

King Edward R., 54 km NNW of King Edward River Stn, 14°54'S, 126°12'E, 280 m, *Lumbsch 8793g, Elix & Streimann*, 1991 (CANB); Gibb River Road, *Lumbsch 8776k, Elix & Streimann* (hb. Lumbsch).

***Lecanora pseudistera* Nyl.**, *Flora* **55**: 354 (1872)

Scattered on rock.

Lake Argyle Road, 31 km SE of Kununurra, 160 m, 15°59'S, 128°56'E, *Elix 27794, Lumbsch & Streimann* (CANB); Jacks Water Hole, Durack R., 55 km NE of Karunjie

Stn, 260 m, 15°50'S, 127°25'E, *Elix 27912, 27917, Lumbsch & Streimann*, 1991 (CANB); 7 km NW of Drysdale River Stn, 390 m, 15°40'S, 126°19'E, *Elix 28002, Lumbsch & Streimann*, 1991 (CANB); Great Northern Hwy, 25 km E of Christmas Hills Stn, between Halls Creek and Fitzroy Crossing, 250 m, 17°54'S, 126°10'E, *Elix 22344 & Streimann*, 1988 (CANB); Sawpit Gorge, Black Elvine R., Albert Edward Ra., 27 km SE of Halls Creek, 340 m, 18°26'S, 127°49'E, *Elix 22367 & Streimann*, 1988 (CANB).

***Lecanora subimmersa* (Fée) Vain.**, *Étud. Class. Lich. Brésil* **1**: 98 (1890)

Rare on rock.

Drysdale River N.P., *K.F. Kenneally* (PERTH); Hidden Valley (Mirima) N.P., Kununurra, 15°45'S, 128°45'E, *Ralston 566*, 1997 (MEL).

***Lecanora tropica* Zahlbr.**, *Cat. Lich. Univ.* **5**: 589 (1928)

Very rare on rock.

Couchman Ra., *Lumbsch 8801c, Elix & Streimann* (hb. Lumbsch) (CANB).

***Paraporpidia glauca* (Taylor) Rambold**, *Biblioth. Lichenol.* **34**: 246 (1989)

Scattered on rocky soil and various types of rocks and boulders.

Bindoola Ck, Gibb River Road, 53 km SW of Wyndham, 15°49'S, 127°48'E, 130 m, *Elix 27840, Lumbsch & Streimann*, 1991 (CANB); Donkey Escarpment, head of Donkey Ck, 27 km S of Drysdale River Stn, 420 m, 15°58'S, 126°22'E, *Elix 28020, Lumbsch & Streimann*, 1991 (CANB); Sawpit Gorge, Black Elvine R., Albert Edward Ra., 27 km SE of Halls Creek, 340 m, 18°26'S, 127°49'E, *Elix 22368 & Streimann*, 1988 (CANB); Erskine Ra., Great Northern Hwy, between Derby and Fitzroy Crossing, 17°51'S, 124°20'E, 120 m, *Elix 22331 & Streimann*, 1988 (CANB); Great Northern Hwy, 26 km SW of Halls Creek, 18°22'S, 127°29'E, 400 m, *Elix 22124 & Streimann*, 1988 (CANB); Great Northern Hwy, 25 km E of Christmas Hills Stn, between Halls Creek and Fitzroy Crossing, 17°54'S, 126°10'E, 250 m, *Elix 22340, 22341, 22342, 22354 & Streimann*, 1988 (CANB).

***Parmelina conlabrosa* (Hale) Elix & J. Johnst.**, *Brunonia* **9**: 159 (1986)

Very rare on bark in *Eucalyptus* woodland.

Escarpment, head of Donkey Ck, 27 km S of Drysdale River Stn, 15°58'S, 126°22'E, 420 m, *Elix 28011, Lumbsch & Streimann*, 1991 (CANB).

***Parmotrema praesorediosum* (Nyl.) Hale**, *Phytologia* **28**: 338 (1974)

Scattered on mainly sandstone but also on bark.

3 km E of Kununurra, 15°47'S, 128°46'E, 70 m, *Elix 22102, 22102b, 22106, 22107, 22108 & Streimann*, 1988 (CANB); Mt Cockburn South, Cockburn Ra., 45 km S of Wyndham, 15°55'S, 128°09'E, 300 m, *Elix 22413, 22414, 22415, 22419, 22424 & Streimann*, 1988 (CANB); 500 m SW of Gibb River Crossing, Kalumbaru Road,

16°06'S, 126°30'E, *Ralston 313*, 1997 (MEL); Mimi Palm Trail, Bungle Bungle (Purnululu) N.P., 17°19'S, 128°23'E, *Ralston 314, 316*, 1997 (MEL); Emma Gorge, El Questro Stn, Gibb River Road, 16°01'S, 128°01'E, *Ralston 319*, 1997 (MEL); Nganlang Track, Keep River N.P., N.T., 15°48'S, 129°06'E, *Ralston 318, 348*, 1997 (MEL).

***Parmotrema pseudonilgherrense* (Asahina) Hale**, *Mycotaxon* **5**: 441 (1977)

Very rare on sandstone in savanna woodland.

Donkey Ck, 27 km S of Drysdale River Stn, 15°58'S, 126°22'E, 420 m, *Elix 28035 & Streimann*, 1991 (CANB)

***Peltula bolanderi* (Tuck.) Wetmore**, *Ann. Missouri Bot. Gard.* **57**: 179 ("1970") [1971]
Previously reported in Büdel *et al.* (1993)

Scattered on various types of sheltered rock.

Sawpit Gorge, Black Elvine R., Albert Edward Ra., 27 km SE of Halls Creek, 18°26'S, 127°49'E, 340 m, *Elix 22369 & Streimann*, 1988 (CANB); Mt Cockburn South, Cockburn Ra., 45 km S of Wyndham, 15°55'S, 128°09'E, 300 m, *Elix 22443 & Streimann*, 1988 (CANB); King Leopold Ra., 3 km NW of Silent Grove, 63 km NE of Lennard River Crossing, Gibb River Road, 17°06'S, 125°24'E, 350 m, *Eix 22244, Streimann & Galloway*, 1988 (CANB); Ferny Ck, King Leopold Ra., 61 km NE of Lennard River Crossing, Gibb River Road, 17°10'S, 125°16'E, 400 m, *Elix 22199, 22207, Streimann & Galloway*, 1988 (CANB); road to Mt Joseph Yard, 25 km E of Lennard River Crossing, along the Gibb River Road, 17°23'S, 125°00'E, 100 m, *Elix 22289, Streimann & Galloway*, 1988 (CANB).

***Peltula cylindrica* Wetmore**, *Ann. Missouri Bot. Gard.* **57**: 182 ("1970") [1971]
Previously reported in Büdel *et al.* (1993)

Very rare on rock.

Road to Mt Joseph Yard, 25 km E of Lennard River Crossing, along Gibb River Road, 17°23'S, 125°00'E, 100 m, *Elix 22292*, 1988 (CANB).

***Peltula euploca* (Ach.) Poelt ex Ozenda & Clauzade**, *Les Lichens*: 324 (1970)
Previously reported in Büdel *et al.* (1993)

Scattered on sheltered and semi-exposed rocks.

Erskine Ra., Great Northern Hwy, between Derby and Fitzroy Crossing, 120 m, 17°51'S, 124°20'E, *Elix 22323 & Streimann*, 1988 (CANB); Mt Cockburn South, Cockburn Ra., 45 m S of Wyndham, 300 m, 15°55'S, 128°09'E, *Elix 22435, 22437 & Streimann*, 1988 (CANB); Great Northern Hwy, 2 km N of Mary River Crossing, between Halls Creek and Fitzroy Crossing, 18°43'S, 127°52'E, 270 m, *Elix 22361 & Streimann*, 1988 (CANB); Duncan Hwy near Old Halls Creek, 14 km ESE of Halls Creek, 18°16'S, 127°48'E, 340 m, *Elix 22382 & Streimann*, 1988 (CANB); Wombarella Gap, Napier Ra., 11 km N of Lennard River Crossing, Gibb River Road, 17°18'S, 124°46'E, 70 m, *Elix 22150, 22151, 22155, Streimann & Galloway*, 1988

(CANB); Gibb River Road, 54 km NNE of Karumjioe Stn, 270 m, 15°51'S, 127°25'E, *Streimann 48395*, 1991(CANB).

***Peltula impressa* (Vain.) Swinscow & Krog**, *Norw. J. Bot.* **26**: 219 (1979)
Previously reported in Büdel *et al.* (1993)

Rare on sheltered rocks.

Oscar Ra., 43 km NW of Fitzroy Crossing, 17°55'S, 125° 17'E, 190 m, *Elix 22110, 22111, 22126 & Streimann*, 1988 (CANB); Great Northern Hwy, 25 km E of Christmas Hills Stn, between Halls Creek and Fitzroy Crossing, 17°54'S, 126°10'E, 250 m, *Elix 22347, 22356, 22362 & Streimann*, 1988 (CANB); Great Northern Hwy, 2 km N of Mary River Crossing, between Halls Creek and Fitzroy Crossing, 18°43'S, 127°52'E, 270 m, *Elix 22362 & Streimann*, 1988 (CANB); road to Mt Joseph Yard, 25 km E of Lennard River Crossing, along the Gibb River Road, 17°23'S, 125°00'E, 100 m, *Elix 22288, Streimann & Galloway*, 1988 (CANB).

***Peltula langei* Büdel & Elix**, *Biblioth. Lichenol.* **67**: 3 (1997)

Very rare on sheltered rocks.

Erskine Ra., Great Northern Hwy, between Derby and Fitzroy Crossing, 17°51'S, 124°20'E, 120 m, *Elix 22316 & Streimann*, 1988 (CANB—holotype).

***Peltula obscurans* (Nyl.) Gyeln.**, *Repert. Spec. Nov. Regni Veg.* **38**: 308 (1935)
Previously reported in Büdel *et al.* (1993)

Rare on sandstone and schistose rock.

Wombarella Gap, Napier Ra., 11 km N of Lennard River Crossing, Gibb River Road, 17°18'S, 124°46'E, 70 m, *Elix 22153, Streimann & Galloway*, 1988 (CANB); road to Mt Joseph Yard, 25 km E of Lennard River Crossing, Gibb River Road, 17°23'S, 125°00'E, 100 m, *Elix 22284, Streimann & Galloway*, 1988 (CANB).

***Peltula omphaliza* (Nyl. in Eckfeldt) Wetmore**, *Ann. Missouri Bot. Gard.* **57**: 179 ("1970") [1971]
Previously reported in Büdel *et al.* (1993)

Very rare on calcareous sandstone.

Wombarella Gap, Napier Ra., 11 km N of Lennard River Crossing, Gibb River Road, 17°18'S, 124°46'E, 70 m, *Elix 22151, Streimann & Galloway*, 1988 (CANB).

***Peltula patellata* (Bagl.) Swinscow & Krog**, *Norw. J. Bot.* **26**: 221 (1979)
Previously reported in Büdel *et al.* (1993)

Rare on rock or on soil among rocks.

Erskine Ra., Great Northern Hwy, between Derby and Fitzroy Crossing, 17°51'S, 124°20'E, 120 m, *Elix 22308, 22336 & Streimann*, 1988 (CANB); road to Mt Joseph

Yard, 25 km E of Lennard River Crossing, along the Gibb River Road, 17°23'S, 125°00'E, 100 m, *Elix 22279, Streimann & Galloway*, 1988 (CANB); Jacks Waterhole, Drysdale R., 55 km NE of Karunjie Stn, 260 m, 15°50'S, 127°25'E, *Lumbsch 8779, Elix & Streimann*, 1991 (CANB).

***Peltula placodizans* (Zahlbr.) Wetmore**, *Ann. Missouri Bot. Gard.* **57**: 179 ("1970") [1971]
Previously reported in Büdel *et al.* (1993)

Common on sheltered rocks of various types.

Erskine Ra., Great Northern Hwy, between Derby and Fitzroy Crossing, 17°51'S, 124°20'E, 120 m, *Elix 22307, 22313, 22320 & Streimann*, 1988 (CANB); Lake Argyle Road, 35 km SE of Kununurra, 16°01'S, 128°59'E, 140 m, *Elix 22471 & Streimann*, 1988 (CANB); King Leopold Ra., 22 km NE of Lennard River Crossing, Gibb River Road, 17°15'S, 124°54'E, 150 m, *Elix 22170, Streimann & Galloway*, 1988 (CANB); March Fly Glen, 66 km NE of Lennard River Crossing, along the Gibb River Road, 17°10'S, 125°18'E, 370 m, *Elix 22267, 22269, Streimann & Galloway*, 1988 (CANB); Gibb River Road, 69 km SW of Wyndham, 280 m, 15°50'S, 127°35'E, *Lumbsch 8770d, Elix & Streimann*, 1991 (CANB).

***Peltula rodriguesii* (Cromb.) Büdel**, *Lichenologist* **21**: 293 (1989)

Very rare.

Carlton Ridge, 5 km SSE of Kununurra, 15°47'S, 128°46'E, 70 m, *Rambold 5253*, 1988 (M).

***Peltula zahlbruckneri* (Hasse) Wetmore**, *Ann. Missouri Bot. Gard.* **57**: 205 ("1970") [1971]
Previously reported in Büdel *et al.* (1993)

Very rare on calcareous sandstone.

Wombarella Gap, Napier Ra., 11 km N of Lennard River Crossing on Gibb River Road, 17°18'S, 124°46'E, 70 m, *Elix 22146*, 1988 (CANB).

***Pertusaria remota* A.W. Archer**, *Mycotaxon* **41**: 238 (1991)

Scattered on sheltered sandstone.

Kununurra-Timber Creek Hwy, 25 km SE of Kununurra, 15°54'S, 128°56'E, 100 m, *Elix 27838, Lumbsch & Streimann*, 1991 (CANB); 74 km SW of Wyndham, 15°49'S, 127°31'E, 300 m, *Lumbsch 8774d, Elix & Streimann*, 1991 (CANB); Lake Argyle Road, 35 km SE of Kununurra, 16°01'S, 128°59'E, 140 m, *Streimann 39486*, 1988 (CANB); Gibb Ra., Gibb River Road, 37 km NE of Gibb River Stn, 16°06'S, 126°35'E, 440 m, *Streimann 48442*, 1991 (CANB); Donkey Escarpment, head of Donkey Ck, 27 km S of Drysdale River Stn, 15°58'S, 126°22'E, 420 m, *Streimann 48490*, 1991 (CANB).

***Psora crystallifera* Müll. Arg.**, *Flora* **71**: 140 (1888)

Scattered on soil, usually in rocky conditions.

7 km NW of Drysdale River Stn, 15°40'S, 126°19'E, 390 m, *Elix 27984, Lumbsch & Streimann*, 1991 (CANB); Lake Argyle Road, 31 km S of Kununurra, 16°03'S, 128°45'E, 160 m, *Elix 27776, Lumbsch & Streimann*, 1991 (CANB); 43 km NW of Fitzroy Crossing, 17°55'S, 125°17'E, 190 m, *Elix 22125 & Streimann*, 1988 (CANB).

***Pyxine australiensis* Kalb**, *Herzogia* **10**: 61 (1994)
New record for W.A.

Rare on bark of trees.

Mt Cockburn South, Cockburn Ra., 45 km S of Wyndham, 15°55'S, 128°09'E, 300 m, *Elix 22423, 22425 & Streimann*, 1988 (CANB); March Fly Glen, King Leopold Ra., 64 km ENE of Lennard River Crossing on Gibb River Road, 17°10'S, 125°18'E, 350 m, *Streimann 39380*, 1988 (CANB).

***Pyxine convexior* (Müll. Arg.) Swinscow & Krog**, *Norw. J. Bot.* **22**: 52 (1975)
New record for W.A.

Very rare on sheltered lateritic rocks along escarpment.

Erskine Ra., Great Northern Hwy, between Derby and Fitzroy Crossing, 17°51'S, 124°20'E, 120 m, *Elix 22332 & Streimann*, 1988 (CANB).

***Pyxine pungens* Zahlbr.**, *Ann. Cryptog. Exot.* **1**: 210 (1928)
New record for W.A.

Rare on sheltered rocks.

King Leopold Ra., 3 km NW of Silent Grove, 63 km NE of Lennard River Crossing, along the Gibb River Road, 17°06'S, 125°24'E, 350 m, *Elix 22247, Streimann & Galloway*, 1988 (CANB); March Fly Glen, 64 km NE of Lennard River Crossing, along Gibb River Road, 17°10'S, 125°18'E, 350 m, *Elix 22217, 22220, Streimann & Galloway*, 1988 (CANB).

***Ramalina subfraxinea* Nyl.**, *Bull. Soc. Linn. Normandie*, sér. 2, **4**: 139 (1870)

Locally common on bark of *Ceriops tagal*, landward edge of mangal.

Crab Creek Road, Roebuck Bay, Broome, 17°57'S, 122°16'E, *Ralston 579, 582, 632*, 1997 (MEL); Willie Ck, 17°45'S, 122°12'E, *Ralston 580, 581*, 1997 (MEL).

***Ramalina subfraxinea* var. *norstictica* G.N. Stevens**, *Bull. Brit. Mus. (Nat. Hist.), Bot.* **16**: 208 (1987)

Scattered but locally common on bark of trees in or close to mangals.

Crab Creek Road, Broome, 17°57'S, 122°16'E, *Ralston 631*, 1997 (MEL); Roebuck Bay, 6 km W of Broome Bird Observatory, Broome, 17°57'S, 122°16'E, *Ralston 583*, 1997 (MEL); Barred Ck, 17°39'S, 122°11'E, *Ralston 584*, 1997 (MEL); Pauline Bay, E coast of Vansittart Bay, North Kimberley, *Willis s.n.*, 1984 (CANB).

***Relicinopsis rahengensis* (Vain.) Elix & Verdon**, *Mycotaxon* **27**: 282 (1986)
New record for W.A.

Rare on bark of *Callitris* species.

Donkey Escarpment, head of Donkey Ck, 27 km S of Drysdale River Stn, 15°58'S, 126°22'E, 420 m, *Elix 28012, 28013, Lumbsch & Streimann*, 1991 (CANB).

***Rinodina thiomela* (Nyl.) Müll. Arg.**, *Flora* **64**: 515 (1881)
New record for N.T.

Very rare on sandstone.

Western Walk, Keep River N.P., N.T., 15°45'S, 129°05'E, *Ralston 355*, 1997 (MEL).

***Rinodina xanthomelana* Müll. Arg.**, *Nuovo Giom. Bot. Ital.* **23**: 390 (1891)
New record for W.A.

Very rare on shaded rocks.

Lake Argyle Road, 35 km SE of Kununurra, 16°01'S, 128°59'E, 140 m, *Elix 22484 & Streimann*, 1988 (CANB).

***Tephromela arafurensis* Rambold**, *Biblioth. Lichenol.* **34**: 145 (1989)

Common on sheltered and exposed rocks in open savanna grasslands and on escarpments.

Erskine Ra., Great Northern Hwy, between Derby and Fitzroy Crossing, 17°51'S, 124°20'E, 120 m, *Elix 22335 & Streimann*, 1988, (CANB); King Leopold Ra., gorge 3 km NW of Silent Grove, 63 km NE of Lennard River Crossing, along the Gibb River Road, 17°06'S, 125°24'E, 350 m, *Elix 22253, 22260, Streimann & Galloway*, 1988 (CANB); Kununurra-Timber Creek Hwy, 25 km SE of Kununurra, 100 m, 15°54'S, 128°56'E, *Lumbsch 8765j, Elix & Streimann*, 1991 (CANB); El Questro Gorge, El Questro Stn, Gibb River Road, 16°01'S, 128°01'E, *Ralston 334*, 1997 (MEL); Gibb River Road, 69 km SW of Wyndham, 15°50'S, 127°35'E, 28 m, *Streimann 48375*, 1991 (CANB).

***Trapelia coarctata* (Sm.) M. Choisy in R.-G. Werner**, *Bull. Soc. Sci. nat. Maroc.* **12**: 160 (1932)

Very vare on soil in shaded area of dry creekbed.

Mimi Palm Trail, Bungle Bungle (Purnululu) N.P., 17°19'S, 128°23'E, *Ralston 540*, 1997 (MEL).

***Trypethelium eluteriae* Spreng.**, *Anleit. Kenntn. Gew.* **3**: 351 (1804)
New record for W.A.

Locally common on bark of trees in vine thickets and mangals.

1 km N of Gnamagum Well, Cape Leveque, 15°25'S, 122°54'E, *Ralston 371*, 1997 (MEL); Willie Ck, 17°45'S, 122°12'E, *Ralston 465*, 1997 (MEL); between Quandong Point and James Price Point, 17°31'S, 122°08'E, *Ralston 466*, 1997 (MEL); One Arm Point, 16°26'S, 123°03'E, *Ralston 467*, 1997 (MEL).

***Xanthoparmelia congensis* (J. Steiner) Hale**, *Phytologia* **28**: 486 (1974)

Very rare on sandstone.

Lake Argyle Road, 31 km SE of Nununurra, 15°59'S, 128°56'E, 16 m, *Elix 27785, Lumbsch & Streimann*, 1991 (CANB).

***Xanthoparmelia consociata* (Elix) Elix & J. Johnst.** *in* J.A. Elix *et al., Bull. Brit. Mus. (Nat. Hist.) Bot.* **15**: 214 (1986)

Very rare on sandstone in *Eucalyptus* woodland.

Donkey Escarpment, head of Donkey Ck, 27 km S of Drysdale River Stn, 15°58'S, 126°22'E, 420 m, *Elix 28036, Lumbsch & Streimann*, 1991 (CANB).

***Xanthoparmelia globulifera* (Kurok. & Filson) Hale**, *Mycotaxon* **20**: 79 (1984).

Very rare on sheltered lateritic rocks.

Erskine Ra., Great Northern Hwy, between Derby and Fitzroy Crossing, 17°51'S, 124°20'E, 120 m, *Elix 22295 & Streimann*, 1988 (CANB).

***Xanthoparmelia isidiigera* (Müll. Arg.) Elix & J. Johnst.** *in* J.A. Elix *et al., Bull. Brit. Mus. (Nat. Hist.), Bot.* **15**: 272 (1986)

Very rare on sandstone in *Eucalyptus* woodland.

Donkey Escarpment, head of Donkey Ck, 27 km S of Drysdale River Stn, 15°58'S, 126°22'E, 420 m, *Elix 28038, Lumbsch & Streimann*, 1991 (CANB).

***Xanthoparmelia mexicana* (Gyeln.) Hale**, *Phytologia* **28**: 488 (1974)

Very rare on sheltered rocks at base of escarpment.

Great Northern Hwy, 25 km E of Christmas Hills Stn, between Halls Creek and Fitzroy Crossing, 17°54'S, 126°10'E, 250 m, *Elix 22337, 22338, 22339 & Streimann*, 1988 (CANB)

***Xanthoparmelia mougeotina* (Nyl.) D.J. Galloway**, *New Zealand Journal of Botany* **18**: 538 (1981)

Rare on sandstone.

Donkey Escarpment, head of Donkey Cr, 27 km S of Drysdale River Stn, 15°58'S, 126°22'E, 420 m, *Elix 28027, 28024, 28036, 28039, Lumbsch & Styreimann*, 1991 (CANB; Mt Cockburn South, Cockburn Ra., 45 km S of Wyndam, 15°55'S, 128°09'E, 300 m, *Elix 22411, 22412 & Streimann*, 1988 (CANB).

***Xanthoparmelia parvoincerta* Elix & J. Johnst.** *in* J.A. Elix *et al., Bull. Brit. Mus. (Nat. Hist.) Bot.* **15**: 304 (1986)

Very rare on sandstone in *Eucalyptus*-dominated grassland.

Gibb River Road, 45 km SSE of Wyndham, 15°53'S, 128°14'E, 140 m, *Elix 28058, Lumbsch & Streimann*, 1991 (CANB).

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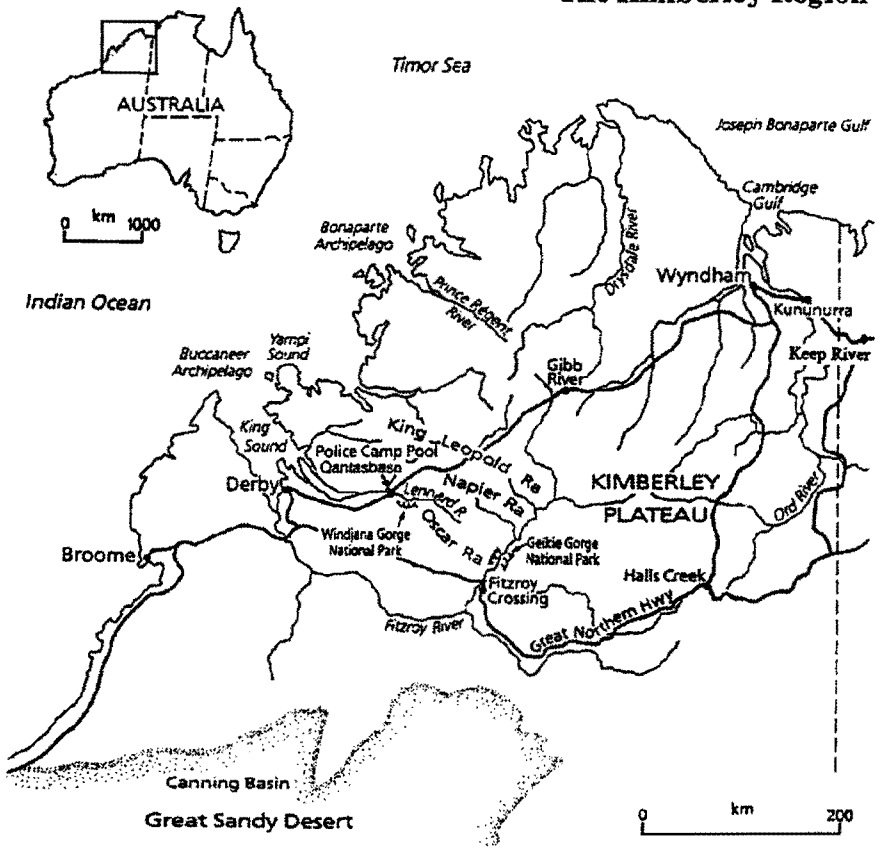
The Kimberley Region



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