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## The lichen genera *Parmelia* Ach. and *Punctelia* Krog, in Australasia

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**Abstract** Eight species of *Parmelia* Ach., with pseudocyphellae on the upper surface, and three species of *Punctelia* Krog, are recognised in the Australasian flora viz.: *Parmelia cunninghamii* Crombie, *P. erumpens* Kurokawa, *P. pseudotenuirima* Gyelnik, *P. saxatilis* (L.) Ach., *P. signifera* Nyl., *P. sulcata* Taylor, *P. tenuirima* J. D. Hook. et Taylor, and *P. testacea* Stirton; *Punctelia borrieri* (Sm.) Krog, *P. rudecta* (Ach.) Krog, and *P. subrudecta* (Nyl.) Krog. A key to species is given together with details of morphology, chemistry, habitats, and distribution. *Parmelia erimis* (Nyl.) Hillm., *P. crambidiocarpa* Zahlbr., and *P. rudior* Nyl., are reduced to synonymy with *P. testacea*; *Cetraria corallophora* Müll. Arg., *Parmelia laceratula* Nyl., *P. rutidota* var. *vestita* Zahlbr., and *P. subflava* Taylor to synonymy with *Punctelia rudecta*; and *Parmelia pseudocoralloidea* Gyelnik, *P. hypoleuca* f. *coralloidea* Müll. Arg., *P. novae hollandiae* f. *coralloidea* (Müll. Arg.) Zahlbr., and *P. victoriana* f. *coralloidea* (Müll. Arg.) Zahlbr., to synonymy with *Punctelia subrudecta*.

**Keywords** lichens; *Parmelia*; *Punctelia*; *Parmelia cunninghamii*; *Parmelia erumpens*; *Parmelia pseudotenuirima*; *Parmelia saxatilis*; *Parmelia signifera*; *Parmelia sulcata*; *Parmelia tenuirima*; *Parmelia testacea*; *Punctelia borrieri*; *Punctelia rudecta*; *Punctelia subrudecta*; descriptions; illustrations; chemistry; chemotaxonomy; key; New Zealand lichens; Australian lichens

## INTRODUCTION

Species of *Parmelia* Ach., with  $\pm$  prominent pseudocyphellae on the upper surface are widely distributed in Australasia on bark, rock, or soil from coastal to alpine habitats. They form a coherent natural group defined by the following characters:

*Thallus* foliose, lobate, dorsiventral, heteromerous, closely to loosely attached, rarely subscending. Lobes sublinear to subirregular, rarely broad and rounded, margins entire, without cilia, with or without soredia, isidia or phyllidia. Upper surface pseudocyphellate, pseudocyphellae effigurate or in patterns, often along reticulate ridges and most noticeable at the margins, covered with a perforated polysaccharide layer (Hale 1981), often maculate, with or without soredia or isidia, upper cortex paraplectenchymatous without a pored epicortex (Hale 1973). Photobiont green, *Trebouxia*. Lower surface black,  $\pm$  uniformly rhizinate. Rhizines black, simple to squarrosely branched. Apothecia emergent, sessile to subpedicellate, disc epruinose, concave to plane to subconvex, often perforate, thalline exciple maculate, isidiate, pseudocyphellate or sorediate. Ascospores simple, subglobose to ellipsoid, colourless, 8 per ascus. Conidia bifusiform (Krog 1982a, b). *Chemistry*:  $\beta$ -orcinol depsidones, salazinic acid, and protoce-traric acids are the major medullary compounds with atranorin and chloratranorin as constant cortical substances (Hale & Kurokawa 1964; Culber-son 1969, 1970; Culber-son et al. 1977; Elix 1982; Krog 1982).

In *Punctelia* (Krog 1982a) there are several distinct differences which distinguish species in this genus from those in *Parmelia* s.s. The pseudocyphellae of the upper surface are punctiform, minute and scattered randomly, and they lack a polysaccharide cover (Hale 1981). The lower surface is black or pale tan to whitish and the rhizines are mainly simple and concolorous with the lower surface, and there is very often a naked marginal zone. Conidia are unciform or filiform. *Chemistry*: orcinol depsides (lecanoric and gyrophoric acids), with various fatty acids are the major medullary compounds, with atranorin constantly occurring in the cortex (Krog 1982a).

KEY TO *PARMELIA* AND *PUNCTELIA* IN AUSTRALASIA

- |    |  |                                 |    |
|----|--|---------------------------------|----|
| 1  | Pseudocyphellae effigurate, often in patterns.....   | ( <i>Parmelia</i> )             | 2  |
|    | Pseudocyphellae punctiform, scattered, not in patterns.....  | ( <i>Punctelia</i> )            | 9  |
|    | Isidiate or sorediate.....   |                                 | 3  |
|    | Without isidia or soredia.....   |                                 | 7  |
| 3  | Isidiate.....  |                                 | 4  |
|    | Sorediate.....   |                                 | 5  |
| 4  | Lobes rather narrow, 4–12 mm wide, rhizinate or papillate to margins, mainly saxicolous.....         | <i>Parmelia saxatilis</i>       |    |
|    | Lobes broader (4–)8–20 mm wide, rhizinate centrally, margins naked, mainly corticolous.....          | <i>Parmelia pseudotenuirima</i> |    |
| 5  | Soredia marginal.....  | <i>Parmelia cunninghamii</i>    |    |
|    | Soredia laminal.....   |                                 | 6  |
| 6  | Soredia derived from elongated, ridged pseudocyphellae.....  | <i>Parmelia sulcata</i>         |    |
|    | Soredia derived from cracks in cortex, or from rupturing dactyls.....                                | <i>Parmelia erumpens</i>        |    |
| 7  | Thallus thick, leathery, on rocks or soil.....   | <i>Parmelia signifera</i>       |    |
|    | Thallus thin, ± papery, on bark.....   |                                 | 8  |
| 8  | Lobes narrow, 2–5 mm wide, elongate, pseudocyphellae sparse, lower surface rhizinate to margins..... | <i>Parmelia testacea</i>        |    |
|    | Lobes broad, 5–25 mm wide, rounded, pseudocyphellae frequent, margins of lower surface naked.....    | <i>Parmelia tenuirima</i>       |    |
| 9  | Lower surface black.....   | <i>Punctelia borneri</i>        |    |
|    | Lower surface pale tan to white.....   |                                 | 10 |
| 10 | Isidiate-phyllidiate.....  | <i>Punctelia rudecta</i>        |    |
|    | Sorediate.....   | <i>Punctelia subrudecta</i>     |    |

The three species of *Punctelia* found in Australasia are all cosmopolitan, whereas in *Parmelia* only two of the eight Australasian species are cosmopolitan, one is austral and five are known only from Australasia. Descriptions of some of the species discussed here, appear in a recently published account of *Parmelia* in southern Australia (Filson 1982)

## MATERIALS AND METHODS

This revision is based on examination of type and other material from the following herbaria: BM, CANU, CBG, CHR, E, FH, G, H-ACH, H-NYL, LINN, LINN-Sm, M, MEL, OTA, S, UPS, UPSV, W, and WELT, supplemented with a wide range of material from Australia and New Zealand.

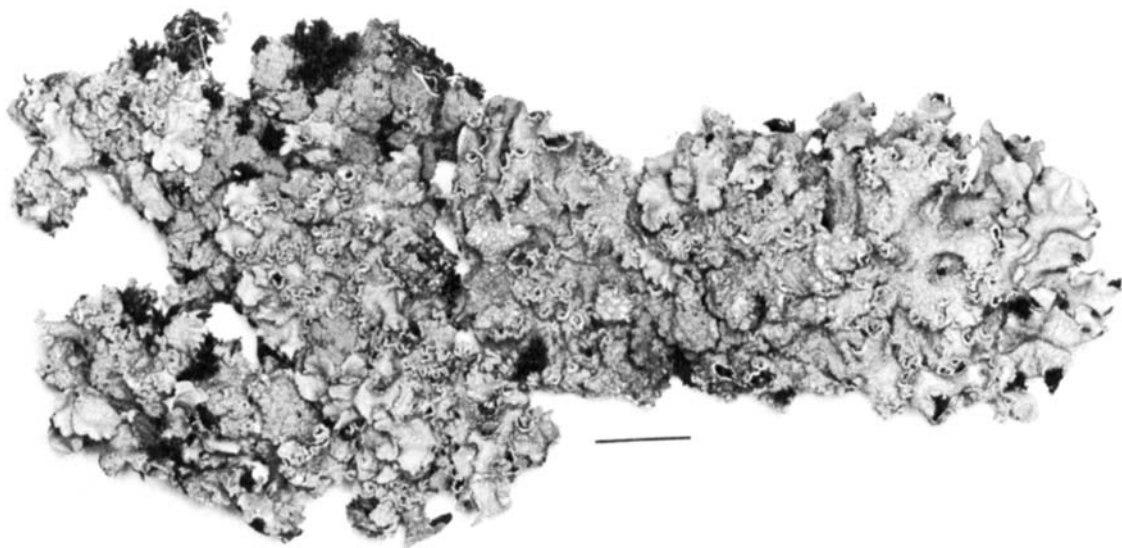
Hot acetone extracts of specimens were chromatographed in three solvent systems on pre-coated aluminium or silica gel plates according to standardised methods of thin-layer chromatography (Culbertson 1972, Walker & James 1980). Medullary and cortical spot tests were also routinely used.

## THE LICHENS

*Punctelia borneri* (Sm.) Krog, *Nord. J. Bot.* 2: 291 (1982). Fig. 1

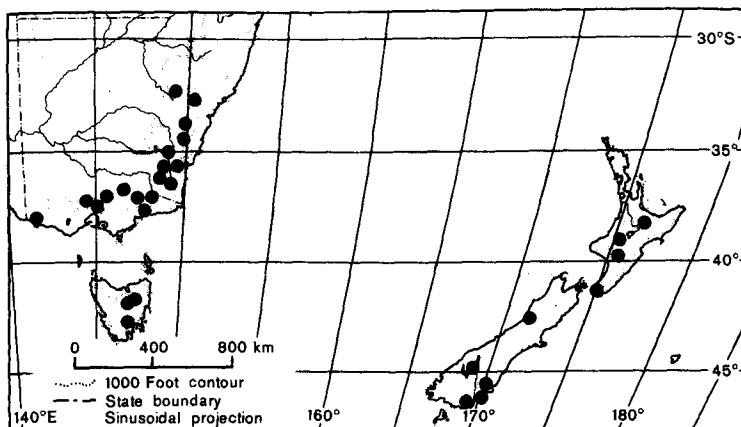
≡ *Lichen borneri* Sm., in Sm. & Sowerby, *Engl. Bot.* 25: tab. 1780 (1807).

Holotype: England. Sussex. *William Borrer*. BM!  
*Thallus* orbicular, closely attached, to 10 cm diam., corticolous, rarely saxicolous. Lobes broad, rounded 4–8 mm wide, somewhat dissected, often crowded, margins entire, sinuous. Upper surface green-grey to pale mineral grey, margins tinged brownish or sometimes white-pruinose, shining, smooth, wrinkled centrally, pseudocyphellae small, punctiform, most obvious at margins, becoming sorediate centrally. Soralia derived from pseudocyphellae, clustered centrally, sometimes marginal, punctiform to confluent, soredia fine, dusty, white to grey-white. Lower surface black, rhizinate. Rhizines simple, black or pale brown, numerous, to margins. *Apothecia* rare, subpedicellate to 8 mm diam., disc brown, matt, plane, imperforate, margins entire, pseudocyphellate and becoming sorediate, thalline exciple pseudocyphellate. Ascospores broadly ellipsoid, 15–18 × 12–15 µm.



**Fig. 1** *Punctelia borreri* (south of Countegany, New South Wales. *J. A. Elix* 1984). Scale: 1 cm.

**Fig. 2** Distribution of *Punctelia borreri* in Australasia.



**CHEMISTRY:** Cortex K+ yellow; medulla K-, C+ rose, KC+ rose, Pd-. Atranorin ( $\pm$ ), chloratranorin ( $\pm$ ), gyrophoric acid and orcynyl lecanorate ( $\pm$ ).

**DISTRIBUTION:** (Fig. 2) Australia: throughout eastern Australia (Queensland, New South Wales, and Victoria) and Tasmania. New Zealand: North I. south of Taupo and in the Manawatu. South I. Greymouth, and in coastal areas of Otago from Oamaru to Taieri Mouth. Rather seldom collected in New Zealand where it is known from bark, lignum, and rarely on rocks, but quite common in eastern Australia (Cosmopolitan).

*Punctelia borreri* is characterised by its black lower surface, pseudocyphellae which become sorediate, and by gyrophoric acid in the medulla (Hale & Kurokawa 1962, 1964; Hale 1965; Krog & Swinscow 1977). It is distinct from *P. subrudecta* which has a pale lower surface and lecanoric acid (C+ red) as the main medullary constituent

*Parmelia cunninghamii* Crombie, *J. Linn. Soc. Lond. Bot.* 15: 228 (1876).

**Fig. 3** Holotype: Fuegia. Island Harbour. On trunks of old trees, April 18, 1868. *R. O. Cunningham*. BM!

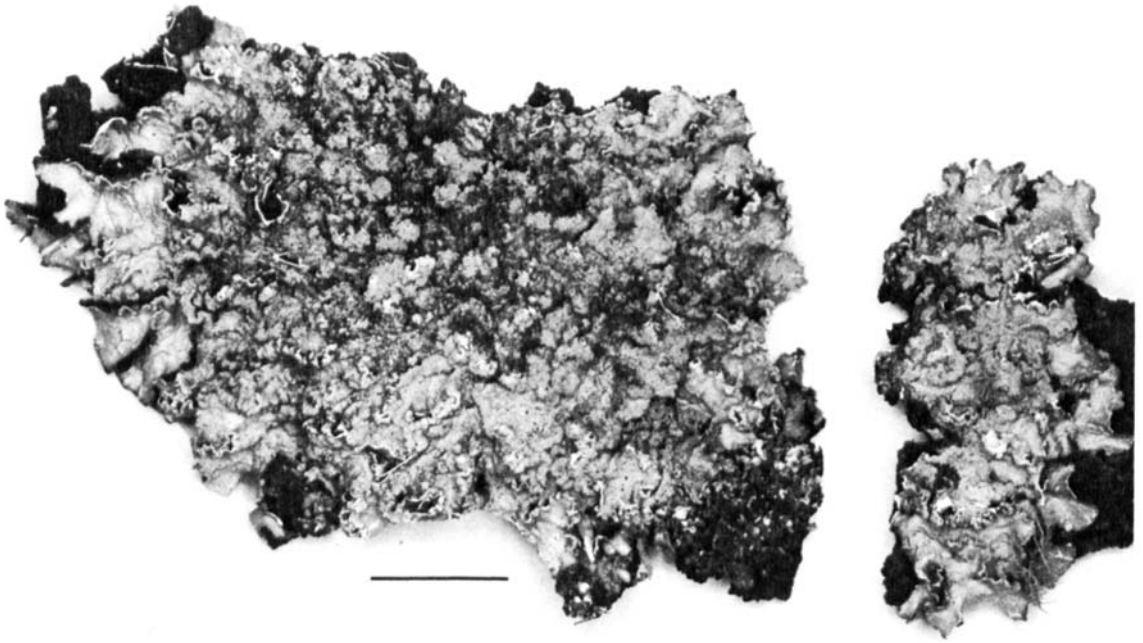


Fig. 3 *Parmelia cunninghamii* (Mt Lofty, South Australia. J. A. Elix 4901). Scale: 1 cm.

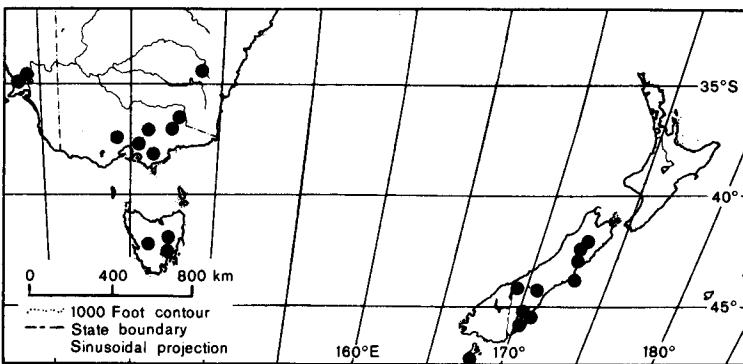


Fig. 4 Distribution of *Parmelia cunninghamii* in Australasia.

*Thallus* loosely attached, to 15 cm diam., rather thick, coriaceous, corticolous or saxicolous. Lobes rounded to broadly linear-lacinate (12–20 × 5 mm) undulate centrally, margins entire, sinuous or subcrenate, black and shining, often ascending and slightly thickened. Upper surface smooth, waxy, often white-pruinose, sometimes coarsely wrinkled, greenish grey (becoming distinctly yellowish on storage), pseudocyphellae rather few, small, fleck-like, mainly at margins. Soralia common, marginal, rarely laminal, globose to linear-confluent, soredia whitish, becoming grey-black with age, rather coarse and granular. Lower surface black, rhizinate, often with a smooth, naked, shining

brown zone at margins. Rhizines black, simple to squarrosely branched, sparse to dense. *Apothecia* rare, subpedicellate, 2–8 mm diam., disc plane to distinctly concave, matt, brown, imperforate, margins entire or shallowly incised, thalline exciple strongly wrinkled and pseudocyphellate, not sorediate. Ascospores ellipsoid 11–15 × 6.5–8.3 μm. Pycnidia minute, rare, black, punctiform, towards margins.

**CHEMISTRY:** Cortex K+ yellow; medulla K+ yellow → red, C–, KC+ red, Pd+ orange. Salazinic acid, atranorin, chloratranorin with (±) accessory lobaric acid. The type specimen lacks lobaric acid.

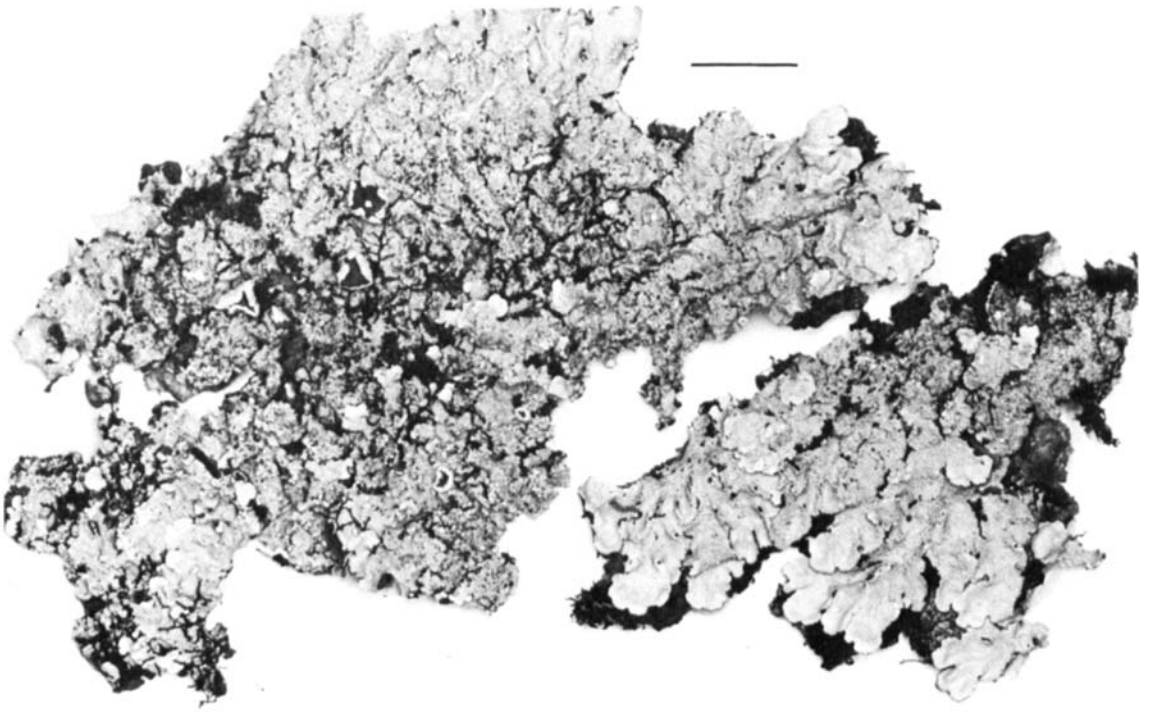


Fig. 5 *Parmelia erumpens* (Bungonia Creek, New South Wales. J. A. Elix 4921). Scale: 1 cm.

DISTRIBUTION: (Fig. 4) Australia: New South Wales, Victoria, South Australia, and Tasmania. New Zealand: South I. Lewis Pass to Fiordland east of the Main Divide and in coastal Marlborough to southern Otago. St. A. C. Ant. M. Also in Fuegia. (Austral).

From s.l. to 1000 m in New Zealand in areas of moderate to high rainfall. Although mainly a corticolous species *P. cunninghamii* also colonises rocks in some areas and was collected from rocks at high water mark in the Auckland Islands with *Xanthoparmelia australasica*. Most records in New Zealand are from *Nothofagus* forests east of the Main Divide, although it is known from twigs of *Myrsine* in the Antipodes and Auckland Islands, and in inland South I. localities is especially common as an epiphyte of *Discaria* on open river flats. In this habitat it associates with the lichens: *Haematomma babingtonii*, *Parmelina pruinata*, *Ramalina glaucescens*, *Teloschistes velifer*, *Usnea pusilla*, and *U. tenerior*. In Australia, *P. cunninghamii* is an epiphyte of both decorticated wood and living trees, *Eucalyptus* and *Leptospermum* being common substrates. This species favours corticolous habitats in temperate rain forests of southern New South Wales, Victoria, and Tasmania but also occurs in the Mt Lofty Ranges of South Australia.

It commonly associates with *Hypogymnia subphysodes*, *Pseudocyphellaria delisea*, and various species of *Usnea* in these localities.

*P. cunninghamii* has affinities with *P. sulcata*, but is distinguished from it by its larger, more undulate lobes, the smaller, scattered pseudocyphellae and by the marginal soralia which are not derived from pseudocyphellae. It has also differing ecological requirements, occurring in much wetter areas than *P. sulcata*. The species has a  $\pm$  constant morphology in all localities from which it is recorded in our area, and Australasian populations agree well with the Fuegian type.

*Parmelia erumpens* Kurok., *Lichenes Rariores et Critici Exsiccatae (Tokyo)*: 74 (1969). Fig. 5  
= *Parmelia tenuirima* f. *corallina* Müll. Arg., *Flora* 66: 46 (1883).

Lectotype: Australia. Mitchell River (Gippsland). C. Ross. G!

*Thallus* orbicular to spreading, loosely attached, to 20 cm diam., corticolous or saxicolous. Lobes rounded, 5–10 mm wide, subimbricate, margins entire, black, shining, often markedly imbricate forming a dense mat. Upper surface smooth, pale grey to whitish, ashy grey or greenish grey with a pale bluish tinge, pseudocyphellae prominent in a

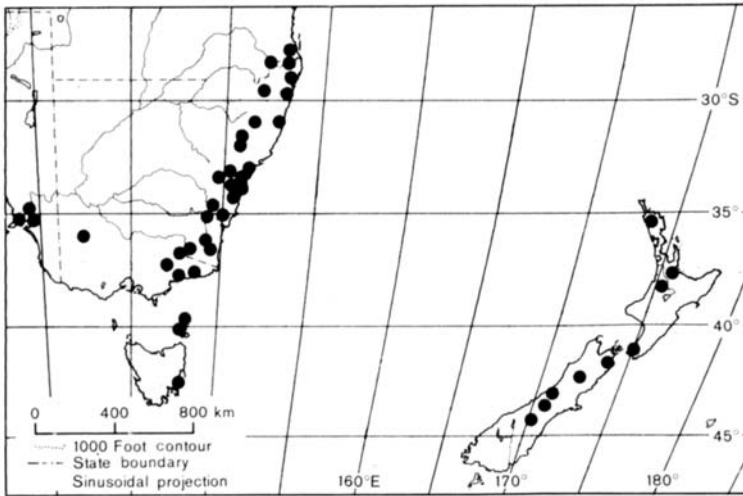


Fig. 6 Distribution of *Parmelia erumpens* in Australasia.

white reticulum, becoming deeply cracked in older lobes and distinctly white-maculate and often white-pruinose near lobe apices, sorediate-isidiate. Soralia laminal, rarely marginal, scattered, pustular-coralloid, clustered and deformed, granular or coralloid-isidiate erupting from the medulla near margins of cracks or pseudocyphellae, or originating from dactyls breaking open at apices and becoming sorediate. Lower surface shining, black, with a dark brown, naked marginal zone often present, rhizinate centrally. Rhizines black, simple or sparingly branched. Apothecia occasional, sessile to subpedicellate, to 15 mm diam., disc red-brown to dark brown, plane or concave, margins entire at first becoming fissured with age, sinuous or crenate often inflexed and obscuring disc, becoming sorediate-isidiate, thalline exciple strongly maculate-cracked, pseudocyphellate. Ascospores ellipsoid  $9.5\text{--}12 \times 6.5\text{--}8 \mu\text{m}$ .

CHEMISTRY: Cortex K+ yellow; medulla K+ yellow → red, C-, KC+ red, Pd+ orange. Salazinic acid, atranorin and chloratranorin.

DISTRIBUTION: (Fig. 6) Australia: Queensland (Stevens 1979, Stevens & Rogers 1979), New South Wales, Victoria, South Australia, and Tasmania. New Zealand: North I. North Auckland to Wellington. South I. Coastal Marlborough, Westland, inland east of the Main Divide in Canterbury, and Otago. A. (Australasian).

In New Zealand and the coastal forests of eastern Australia and Tasmania, this species is generally epiphytic on trees and shrubs in undisturbed forest or scrub habitats, whereas in the drier inland areas of New South Wales, Victoria, and South Australia, moist shaded rocks are the most common habitat.

*P. erumpens*, which appears to be the sorediate counterpart of *P. signifera* and *P. tenuirima*, is distinguished from both *P. cunninghamii* and *P. sulcata* in the nature and disposition of the pseudocyphellae and the soredia.

*Parmelia pseudotenuirima* Gyelnik, *Feddes Reperit.* 29: 289 (1931). Fig. 7

≡ *P. tenuirima* f. *isidiosa* Müll. Arg., *Bull. Herb. Boiss.* 4: 90 (1896).

Lectotype: Australia. Victoria, sine loco. F. R. M. Wilson 83. G!

*Thallus* orbicular, closely attached, 7–17 cm diam., corticolous. Lobes variable 2–6(–20) mm wide, apices rounded, margins entire, ± sinuous, scarcely imbricate. Upper surface relatively smooth to markedly faveolate, dull or shining towards margins, pale mineral grey to dark brownish grey, pseudocyphellae laminal, small, punctiform to curved, developing from elevated maculae, isidiate. Isidia developing directly from the upper cortex or more commonly along the edges of pseudocyphellae and cracks, delicate, cylindrical, ± richly branched and occasionally forming a dense mat over the surface of older lobes. Lower surface black, paler at margins, moderately to densely rhizinate except for a narrow, marginal zone which is completely devoid of rhizines and papillae. Rhizines black, simple or sparingly branched. Apothecia occasional to rare, sessile, to 10 mm diam., margins thin, inflexed at first but becoming deeply lacerate and distorted, pseudocyphellate, sometimes developing isidia on older fruits, disc dull, dark brown to almost black. Ascospores ellipsoid  $11\text{--}16 \times 7\text{--}10 \mu\text{m}$ .

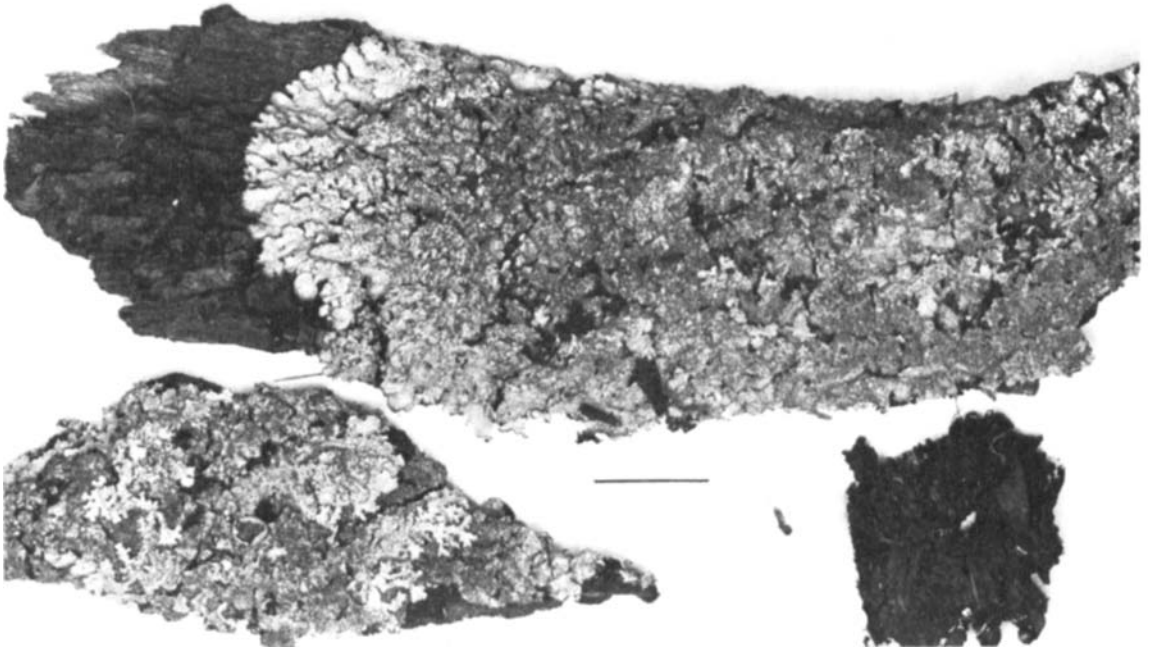
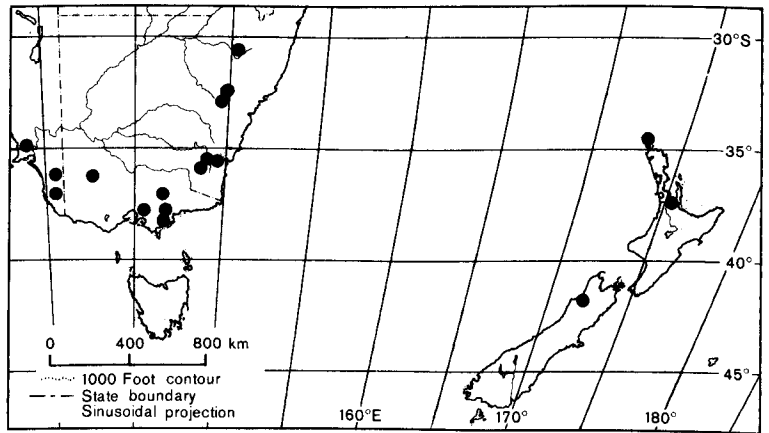


Fig. 7 *Parmelia pseudotenuirima* (north of Grenfell, New South Wales. J. A. Elix 4810). Scale: 1 cm.

Fig. 8 Distribution of *Parmelia pseudotenuirima* in Australasia



CHEMISTRY: Cortex K+ yellow; medulla K+ yellow → red, C-, KC+ red, Pd+ orange. Salazinic and (±) lobaric acids, atranorin and chloratranorin.

DISTRIBUTION: (Fig. 8) Australia: New South Wales, Victoria, and South Australia. New Zealand: North I. North Auckland and Auckland. South I. Westland. (Australasian).

In New Zealand mainly in coastal, lowland localities on *Dacrycarpus dacrydioides*, fenceposts, and rarely on rocks. In eastern and southern Australia

the species is very common on *Callitris* and *Casuarina* in areas of moderate rainfall.

*P. pseudotenuirima* closely resembles *P. saxatilis* in that both species have pseudocyphellae and isidia, and are chemically identical. The lower surface of *P. pseudotenuirima* has a pale marginal zone which is smooth and free of rhizines and papillae, whereas *P. saxatilis* is densely rhizinate to the margins with the rhizines normally protruding beyond the margins. Commonly the margin of the lower surface in *P. saxatilis* is somewhat paler, but this



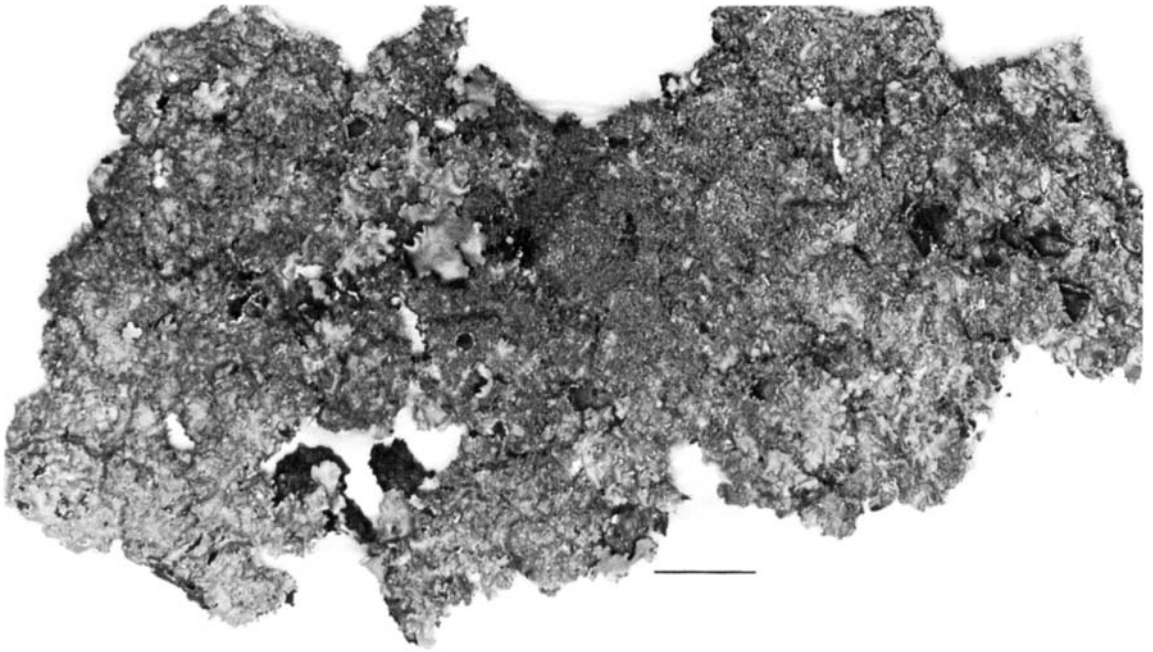


Fig. 9 *Punctelia rudecta* (eastern shore of Wallaga Lake, New South Wales. *J. A. Elix* 4559). Scale: 1 cm.

paler zone is rhizinate or papillate even at the extremities. The upper surface of the marginal lobes in *P. pseudotenuirima* lacks a reticulum of maculae, however such a reticulum is normally present on the marginal lobes of *P. saxatilis*. Isidiate maculae in *P. pseudotenuirima* are generally punctiform or irregularly extended or curved whereas in *P. saxatilis* isidia usually develop from well-defined elongate, maculate ridges on the upper surface (cf. soredia in *P. sulcata*). *P. pseudotenuirima* is restricted to corticolous substrates and decorticated wood whereas *P. saxatilis* colonises rocks as well as corticolous substrates.

*Punctelia rudecta* (Ach.) Krog, *Nord. J. Bot.* 2 : 291 (1982). Fig. 9

= *Parmelia rudecta* Ach., *Syn. Lich.* : 197 (1814).  
Holotype: North America. Sine loco. *Muhlenberg* 73.2. H-ACH!

= *Parmelia subflava* Taylor, *Hook. Lond. J. Bot.* 6 : 174 (1847).

Holotype: Van Diemen's Land (Tasmania). *Mr Borrer's Herb.* FH!

= *Parmelia laceratula* Nyl., *Mém. Soc. natn. Sci. nat. Cherbourg* 5 : 105 (1857).

Isotype: Australia. Queensland, Burnet, and Brisbane River. *Dr. Mueller.* BM!

= *Cetraria corallophora* Müll. Arg., *Bull. Soc. r. Bot. Belg.* 31 : 26 (1892).

Lectotype: New Zealand. Sine loco. *W. Stephenson.* BM!

= *Parmelia rutidota* var. *vestita* Zahlbr., *Denkschr. Akad. Wiss. Wien math.-naturwiss. Kl.* 104 : 355 (1941).

Lectotype: New Zealand. Southland, Otakou Bush near mouth of Oreti River, 22 July, 1933. *J. S. Thomson* ZA 217. CHR 241858!

For additional synonyms see Hale (1965), and Krog & Swinscow (1977).

*Thallus* spreading, closely attached 4–8(–20) cm diam., corticolous or saxicolous. Lobes rounded, crenate or regularly incised, dissected, somewhat crowded, margins, sinuous, black, shining, isidiate. Upper surface smooth, shining, glossy, wrinkled, becoming ± faveolate at or near margins, wrinkled-ridged centrally, pale greenish white or greenish grey or pale bluish grey, often brownish at margins, pseudocyphellae small, punctiform, mainly marginal, not becoming sorediate. Isidia flattened, lobate-squamiform, rarely terete and simple, becoming strongly dorsiventral, marginal in young lobes, spreading densely over the surface of older lobes. Lower surface uniform pale buff or tan with a smooth, pale, naked marginal zone. Rhizines central, simple, pale, long often densely developed. *Apothecia* occasional, pedicellate, to 10 mm diam., disc dark red-brown, matt, smooth, imperforate,

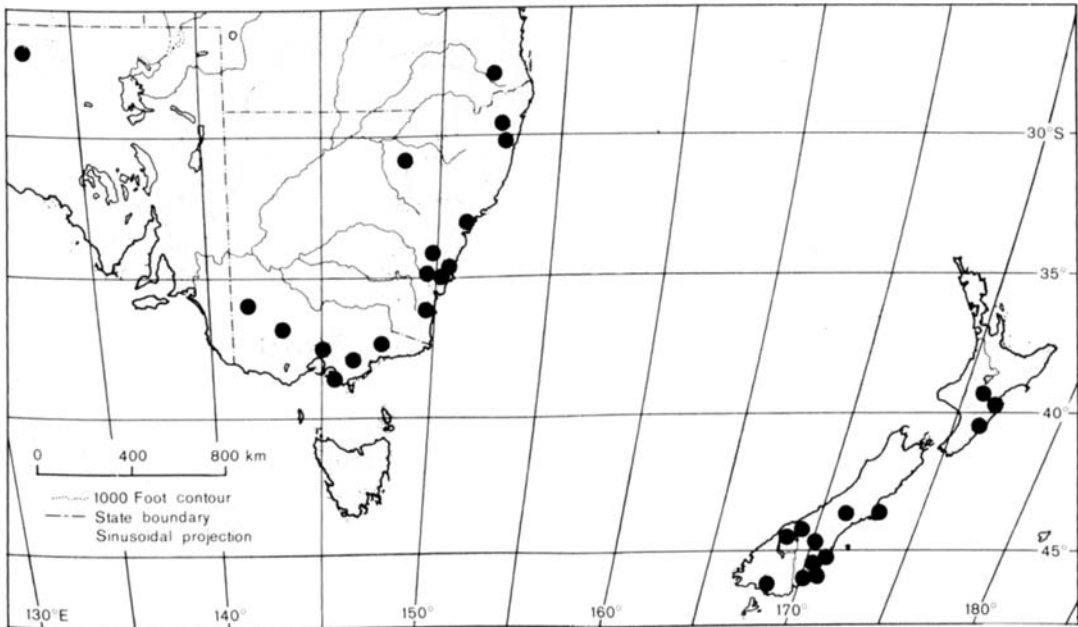


Fig. 10 Distribution of *Punctelia rudecta* in Australasia.

plane to deeply concave, thalline exciple concolorous with thallus, pseudocyphellate and isidiate. Ascospores subglobose to broadly ellipsoid,  $15\text{--}20 \times 10\text{--}12 \mu\text{m}$ .

CHEMISTRY: Cortex K+ yellow; medulla K-, C+ red, KC+ red, Pd-. Lecanoric acid, atranorin ( $\pm$ ) and chloratranorin (+).

DISTRIBUTION: (Fig. 10) Australia: Queensland, New South Wales, Victoria, South Australia, and Tasmania. New Zealand: North I. Wellington and Hawke's Bay, inland and coastal. South I. Canterbury to Southland, mainly coastal and lowland extending inland east of the Main Divide in the Dart and Matukituki valleys. (Cosmopolitan).

On decorticated wood (fenceposts etc.), tree bark, and rock, s.l. - 1000 m.

*P. rudecta* is characterised by the abundant lobular, squamiform isidia, the uniformly pale lower surface and the presence of lecanoric acid in the medulla (Culberson 1962, Hale 1965, Krog & Swinscow 1977). It is distinguished from *P. subrudecta* by the absence of soralia. Australian specimens previously referred to as *Parmelia subflava* differ only in the morphology of the isidia (short, terete, clustered, rarely simple becoming coralloid-branched, lobulate and eventually dorsiventral) and the presence of pycnidia, but appear to be within the range of variation of *P. rudecta* and *P. subflava* is included in the synonymy of that species.

*Parmelia saxatilis* (L.) Ach., *Meth. Lich.*: 204 (1803). Fig. 11

*Lichen saxatilis* L., *Sp. Pl.*: 1142 (1753).

Lectotype: Europae rupibus. LINN-1273.62 (second specimen from bottom of sheet, largest fertile specimen!)

*Thallus* orbicular, closely attached, 4–10 cm diam., corticolous or saxicolous. Lobes rather narrow (4–12 mm wide) elongate (to 30 mm long) with slightly broadened, incised apices, margins entire,  $\pm$  sinuous. Upper surface faveolate, shining towards margins, pale greyish or greenish, pseudocyphellae laminal, forming a prominent ridged reticulum of white lines, isidiate. Isidia coarse, blackened at apices, granular to elongate-branched, occurring mainly on ridges of pseudocyphellae reticulum and sometimes completely covering the whole upper surface. Lower surface black or dark brown, paler at margins, densely rhizinate. Rhizines black, simple or sparingly branched, commonly extending beyond margin, the marginal zone always rhizinate or papillate. *Apothecia* occasional to rare, subpedicellate, to 8 mm diam., disc concave to plane, dark brown, matt or slightly shining, centrally perforate, margins thin, crenate, isidiate, concolorous with thallus. Ascospores ellipsoid  $14\text{--}18 \times 7\text{--}9 \mu\text{m}$ .

CHEMISTRY: Cortex K+ yellow; medulla K+ yellow  $\rightarrow$  red, C-, KC+ red, Pd+ orange. Salazinic and lobaric acids, atranorin and chloratranorin.

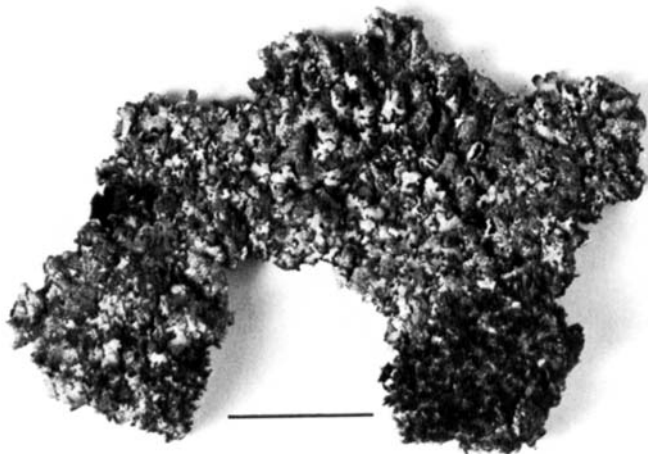


Fig. 11 *Parmelia saxatilis* (Old Man Range, Otago, New Zealand. CHR 374941). Scale: 2 cm.

**DISTRIBUTION:** Australia: although this species is reported from Australia (Weber & Wetmore 1972) and Tasmania (Wetmore 1963), no authentic collections were examined. New Zealand: South I. Old Man Range, Central Otago. (Cosmopolitan).

*P. saxatilis*, which appears genuinely rare in New Zealand, closely resembles *P. pseudotenuirima* and the distinctions between the two are detailed under the latter species. *P. saxatilis* var. *aizonii* recorded by Zahlbruckner (1941) is referable to *Xanthoparmelia australasica* (Galloway 1980).

***Parmelia signifera*** Nyl., *Lich. N.Z.* : 25 (1888).

Fig. 12, 13

≡ *Parmelia saxatilis* var. *signifera* (Nyl.) Müll. Arg. *Bull. Soc. r. Bot. Belg.* 3 : 30 (1892).

≡ *Imbricaria saxatilis* var. *signifera* (Nyl.) Jatta, *Nuovo G. bot. ital. nov. ser.* 9 : 469 (1902).

Holotype: New Zealand. *Sine loco*\*. Charles Knight 1882. H-NYL 34828!

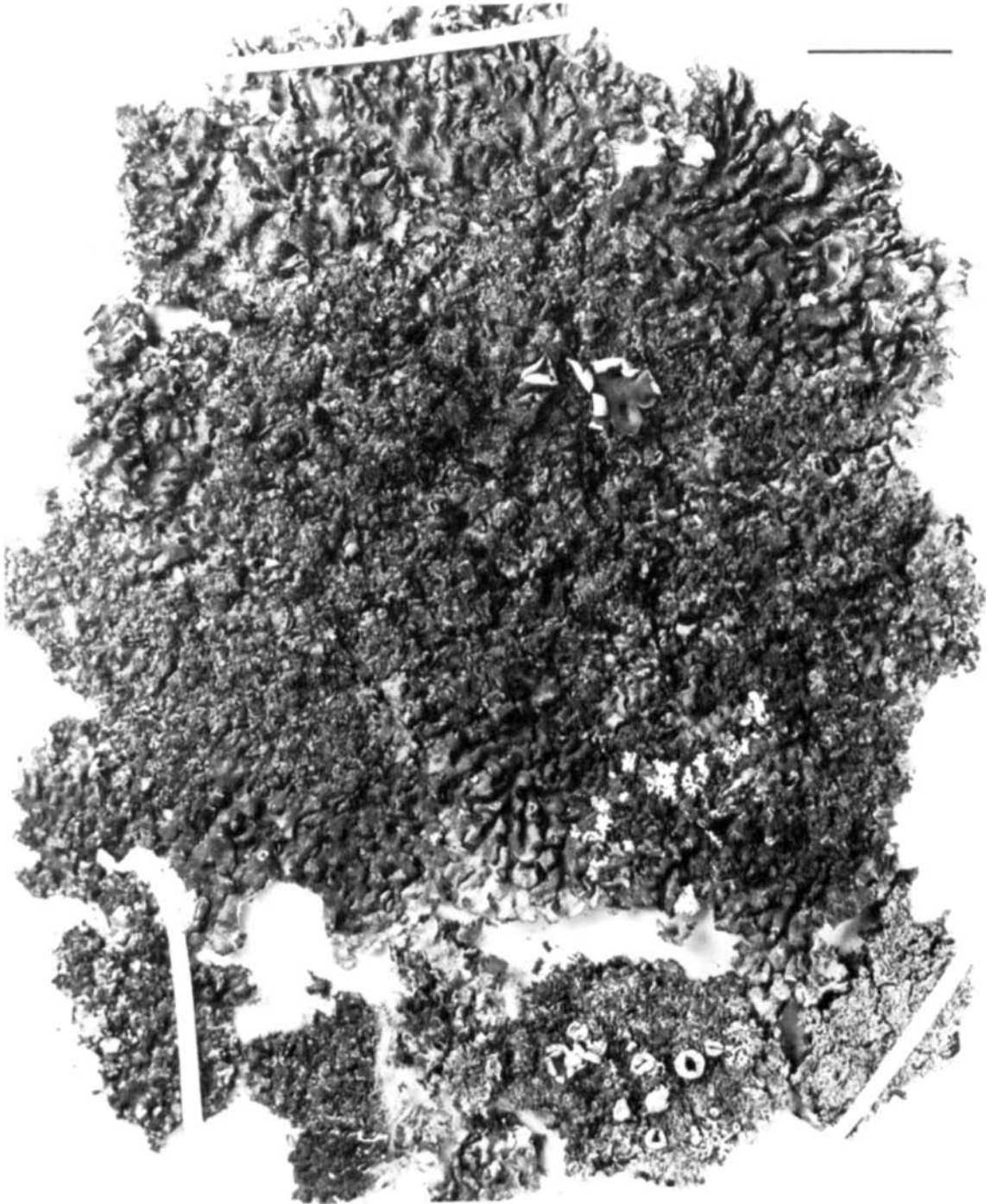
**Thallus** thick, coriaceous, orbicular to spreading, closely to loosely attached, saxicolous or terricolous, to 10 cm diam. Lobes narrow (5–10 mm wide)

\* In H-NYL there is a large specimen of *P. signifera* (No. 1645) named in Nylander's hand "P. tenuirimis". On the same packet in Knight's handwriting is "... on stones Lake Wakatipu", a rare annotation, for Knight in his lichen collections usually neglected to specify any locality other than his customary *Nova Zelandia*. Since the type of *P. signifera* is a Knight specimen also of 1882 and closely similar in appearance to the large specimen from Wakatipu, it is possible that the type is also from the Wakatipu collection even though Knight rarely travelled widely in South I., particularly in subalpine areas where *P. signifera* is most common. It is known that he was in southern New Zealand in 1882 in connection with the geodetic survey of the country and he may have visited the shores of Lake Wakatipu in connection with this project.

relatively short (to 25 mm long) often forming secondary, imbricate, clustered, ascending lobules at centre, margins entire to ± phyllidiate or lacerate, incised at apices, sinuous, often black and shining. Upper surface smooth, often wrinkled-convolute centrally, leathery, brownish grey or reddish brown or blackened, olive greenish brown to red brown at margins and there conspicuously white-maculate, mottled, pseudocyphellae evident towards lobe margins, sigmoid or forming a cracked reticulum of white lines in older parts. Lower surface smooth, black, moderately rhizinate. Rhizines black, simple or branched. *Apothecia* rare, subpedicellate, to 8 mm diam., disc dark red-brown, matt, plane or concave, imperforate, margins entire at first, becoming fissured with age, thalline exciple strongly maculate-cracked, pseudocyphellate. Ascospores ellipsoid 10–14(–16) × 7–8(–9) μm (Hillmann 1939, Filson 1982). Pycnidia rare, minute, black, punctiform, laminal.

**CHEMISTRY:** Chemodeme I: Cortex K+ yellow; medulla K+ yellow → red, C–, KC+ red, PD+ orange. Salazinic acid, atranorin and chloratranorin. Chemodeme II: Cortex K+ yellow; medulla K+ brown, C–, KC+ brown-purple, Pd+ orange. Protocetraric acid, atranorin and chloratranorin.

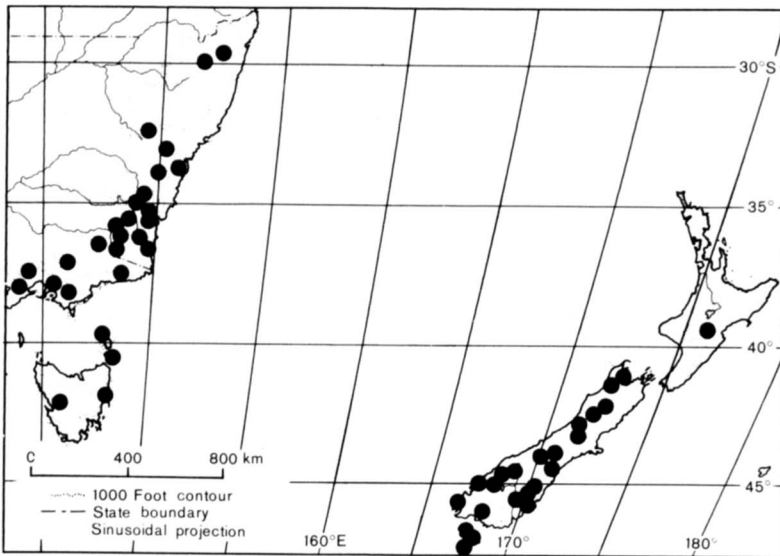
**DISTRIBUTION:** (Fig. 14) Australia: New South Wales, Victoria, South Australia, and Tasmania. New Zealand: North I. South Auckland, Kaimanawa Range. South I. Nelson to Southland. St. A. Coastal in southern New Zealand, and close to Main Divide in subalpine and alpine habitats. From s.l. (southern Stewart I. and near Dunedin) to 2500 m in the mountains east of the Main Divide in Canterbury, saxicolous or terricolous, rarely overgrowing prostrate vegetation on exposed alpine soils, but never on tree bark. (Australasian).



**Fig. 12** *Parmelia signifera* (New Zealand, *sine loco*. Charles Knight. BM). Scale: 2 cm.



**Fig. 13** *Parmelia signifera*, detail of marginal lobes. Scale: 3 mm.



**Fig. 14** Distribution of *Parmelia signifera* in Australia.

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*P. signifera* is the most commonly encountered *Parmelia* in the mountains of New Zealand and associates there with the following: *Alectoria nigricans*, *Bryoria austromontana*, *Coccocarpia palmicola*, *Coelocaulon aculeatum*, *Cetraria islandica* var. *antarctica*, *C. delisei*, *Hypogymnia lugubris*, *Menegazzia aeneofusca*, *M. inflata*, *Neuropogon acromelanus*, *N. ciliatus*, *N. subcapillaris*, *Ochrolechia frigida*, *Stereocaulon caespitosum*, *Usnea contexta*, *U. torulosa*, *Tonia bullata*, *Umbilicaria hyperborea*, *Xanthoparmelia scabrosa*, and *X. tasmanica*. *P. signifera* is also a particularly common saxicolous species in the subalpine and alpine areas of New South Wales, Victoria, and Tasmania and associates there with: *Hypogymnia tubularis*, *H. lugubris*, *Menegazzia platytrema*, *Umbilicaria cylindrica*, *Usnea torulosa*, *Xanthoparmelia scabrosa*, and *X. tasmanica*.

The absence of soredia and isidia distinguishes *P. signifera* from isidiate *P. saxatilis* and sorediate *P. sulcata*. It is closely related to *P. tenuirima* but is distinguished from it by the smaller spores, scarcity of pycnidia, imperforate apothecial discs, thicker thallus texture, smaller, crowded lobes with phyllidiate-lacerate margins and a pattern of white maculae or pseudocyphellae at the margins which do not expose medullary hyphae. It is also exclusively saxicolous or terricolous whereas *P. tenuirima* is  $\pm$  obligately corticolous.

Although reasonably constant in morphology, specimens of *P. signifera* show considerable variation in colour and texture, depending on the degree of exposure of the habitat. In damp, sheltered sites, lobes are thinner, larger, and paler coloured, whereas in exposed habitats lobes are thicker, more crowded, lobular-incised, generally smaller, and much darker coloured. The description of *P. tenuirima* in Filson & Rogers (1979, p. 138), in our opinion, refers to *P. signifera*.

*Punctelia subrudecta* (Nyl.) Krog, *Nord. J. Bot.* 2: 291 (1982). Fig. 15

$\equiv$  *Parmelia subrudecta* Nyl., *Flora* 69: 320 (1886).

Holotype: Île St Paul. Expedition astronomique aux Îles St. Paul et d'Amsterdam. Fenzl. H-NYL 35033!

$\equiv$  *Parmelia hypoleuca* var. *coralloidea* Müll. Arg., *Flora* 70: 317 (1887).

$\equiv$  *P. victoriana* f. *coralloidea* (Müll. Arg.) Zahlbr., *Cat. lich. univ.* 6: 222 (1929).

$\equiv$  *P. pseudocoralloidea* Gyelnik, *Feddes Repert.* 29: 288 (1931).

$\equiv$  *P. novae hollandiae* f. *coralloidea* (Müll. Arg.) Zahlbr., *Cat. lich. univ.* 8: 562 (1932).

Holotype: Australia. Lower Murray River. French. G!

For additional synonymy see Hale (1965), and Krog & Swinscow (1977).

*Thallus* orbicular to spreading, loosely attached, 5–10(–15) cm diam., corticolous, lignicolous, or saxicolous. Lobes rounded, dissected, crowded, margins sinuous, entire, darkening, becoming sorediate. Upper surface greenish grey to greenish blue, matt, shining at margins which are often suffused-brownish, conspicuously wrinkled, with scattered, punctiform pseudocyphellae towards centre, becoming copiously sorediate. Soralia irregular, soredia coarse, granular,  $\pm$  coralloid, off-white to greenish brown or blackish, derived from pseudocyphellae. Lower surface pale yellowish buff or buff brown or whitish, smooth or wrinkled, shining, sparsely rhizinate. Rhizines simple, pale, often to margins. *Apothecia* not seen in Australasian material. Filson (1982, pp. 570–571) has seen one fertile Australian specimen and gives the following data "... Apothecia rare, to 4 mm diam., disc deeply concave, pale brown to tan, margins at first inrolled pseudocyphellate becoming sorediose. Ascospores ellipsoidal, thick-walled 16–18  $\times$  9–15  $\mu$ m".

CHEMISTRY: Cortex K+ yellow; medulla K–, C+ red, KC+ red, Pd–. Lecanoric acid, atranorin ( $\pm$ ) and chloratranorin ( $\pm$ ).

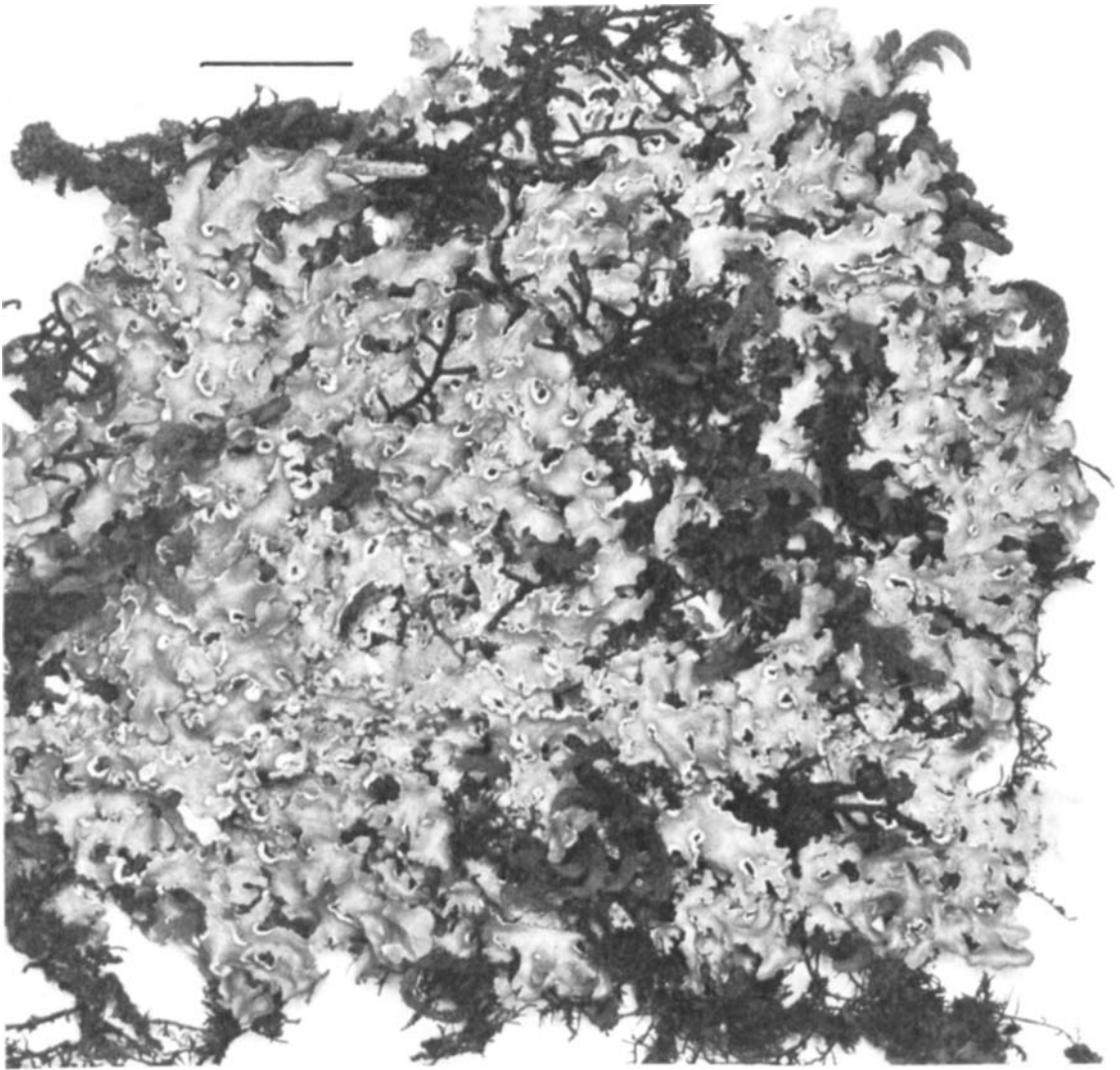
DISTRIBUTION: (Fig. 16) Australia: in all states except the Northern Territory. New Zealand: North I. South I. Stewart I. Throughout, lowland and coastal. (Cosmopolitan).

*P. subrudecta* is a rather polymorphic species, related to *Punctelia borreri* but differing in the colour of the lower surface, the marginal zone free of pseudocyphellae, and in lecanoric acid as the major medullary constituent. It is widely distributed throughout Australasia and is common in urban areas on introduced trees in parks and gardens, as well as on fenceposts, trees, and rocks in country areas. It is a good indicator of disturbed, eutrophic habitats and appears to be moderately resistant to high levels of atmospheric pollution, being the most common foliose lichen in polluted urban areas such as Christchurch city. It is frequently found in association with the following lichen genera: *Candelariella*, *Dirinaria*, *Hyperphyscia*, *Physcia*, *Pseudoparmelia*, *Ramalina*, *Teloschistes*, *Usnea*, and *Xanthoria*.

*Parmelia sulcata* Taylor, in Mack., *Flora Hibernica* 2: 145 (1936). Fig. 17

Lectotype: Ireland, Lough Bray, County Kerry. T. Taylor. FH – not seen.

*Thallus* orbicular to spreading, closely to loosely attached, 3–15 cm diam., saxicolous or corticolous. Lobes sublinear-elongate, subdichotomously branched, rather narrow, to 10 mm wide, margins



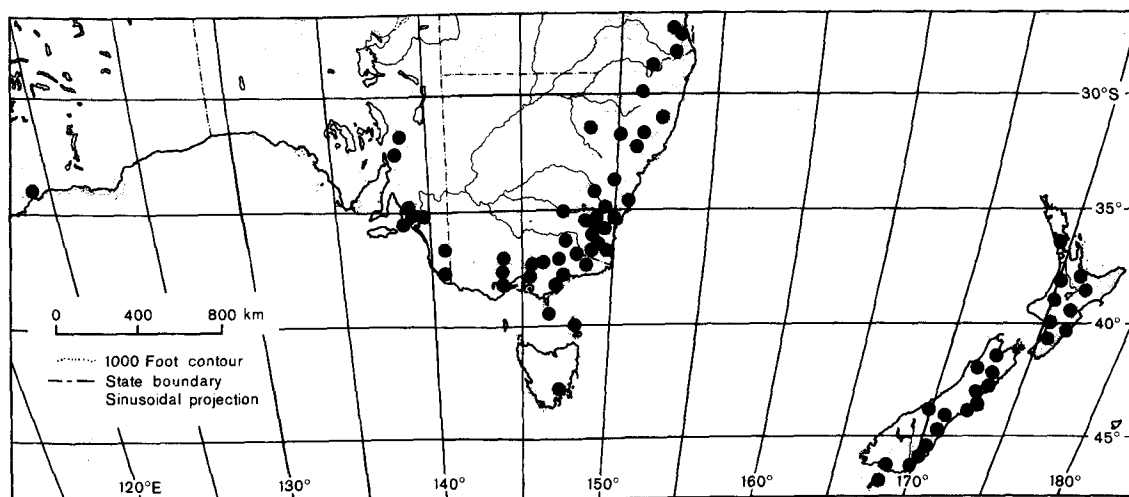
**Fig. 15** *Punctelia subrudecta* (Currowan State Forest, New South Wales. *J. A. Elix* 3571). Scale: 1 cm.

entire, sinuous. Upper surface pale greenish grey to grey-black, shining, emaculate, occasionally white-pruinose, wrinkled-faveolate, pseudocyphellae prominent, coarse, elongate and reticulate, soon becoming sorediate. Soredia derived from pseudocyphellae, in lines as a coarse reticulum, or becoming confluent. Lower surface black with little or no naked marginal zone, densely rhizinate. Rhizines black, simple to squarrosely branched. *Apothecia* not seen in Australasian material.

**CHEMISTRY:** Cortex K+ yellow; medulla K+ yellow → red, C-, KC+ red, Pd+ orange. Salazinic acid, atranorin and chloratranorin.

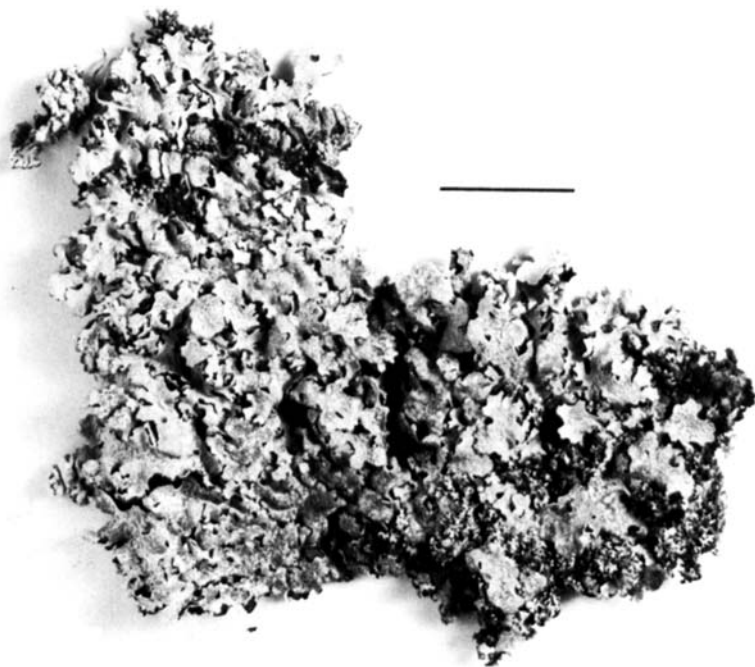
**DISTRIBUTION:** (Fig. 18): Australia: Victoria, Australian Capital Territory, and Tasmania. New Zealand: South I. (Alford Forest, Mt Peel. Old Man Range, Flagstaff Hill, Dunedin). St. A. On rock in subalpine or alpine grasslands and also in coastal habitats, in southern New Zealand, rare in Australia. (Cosmopolitan).

*P. sulcata* is similar to *P. saxatilis* and in New Zealand the two species (and *P. signifera*) tend to occupy similar habitats. It is however, easily distinguished by the development of soredia from the pseudocyphellae of the upper surface. The development of the soredia in *P. sulcata* also separate this species from *P. erumpens* where the erumpent,



**Fig. 16** Distribution of *Punctelia subrudecta* in Australasia.

**Fig. 17** *Parmelia sulcata* (Cluden, Otago, New Zealand. CHR 374940). Scale: 2 cm.



subcoralloid, isidiate soredia are not associated with pseudocyphellae or arranged in any reticulate pattern. *P. sulcata* although found mainly on rocks in New Zealand will also grow over terricolous bryophytes and elsewhere in its range may even be

corticolous. In New Zealand it is known from sea level habitats to 2000 m in alpine grassland habitats in Central Otago. Although genuinely rare in Australia, it is known from subalpine saxicolous habitats in south-eastern Australia.



*Parmelia tenuirima* J. D. Hook. et Taylor, *Hook.*

*Lond. J. Bot.* 3: 645 (1844). Fig. 19, 20, 21, 22

Lectotype: Van Diemen's Land (Tasmania). *Ronald Gunn*. BM! Isotypes BM! FH!

= *Parmelia tenuiscypha* Taylor, *Hook. Lond. J. Bot.* 6: 175 (1847).

Holotype: Australia. Macquarie River. *Mr Robert Ball's Herb.* FH! Isotype G!

= *Aspidelia beckettii* Sturton, *T.N.Z.I.* 32: 81 (1900).

Holotype: New Zealand. Canterbury, Oxford Bush. *T. W. N. Beckett*. May 1895. BM! *nom. inval.* (Culbertson 1966, see also below).

= *Parmelia tenuirima* var. *platyna* Zahlbr., *Denkschr. Akad. Wiss. Wien math.-naturwiss. Kl.* 104: 356 (1941).

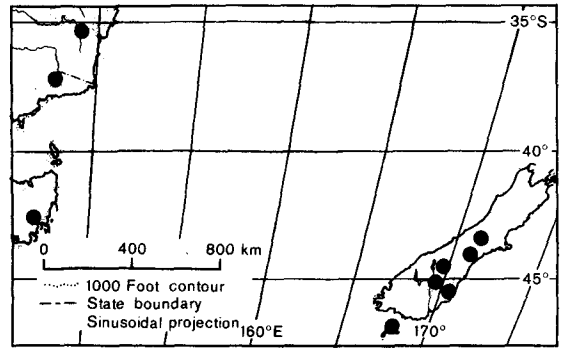


Fig. 18 Distribution of *Parmelia sulcata* in Australasia.

Type Specimen

1844. H. G. 1. 1663

(g. Hillmann msc., to whom a fragment was sent, V. 1835)  
L.H.E.



Fig. 19 *Parmelia tenuirima* (Tasmania. *Robert Gunn*. Lectotype - BM). Scale: 2 cm.

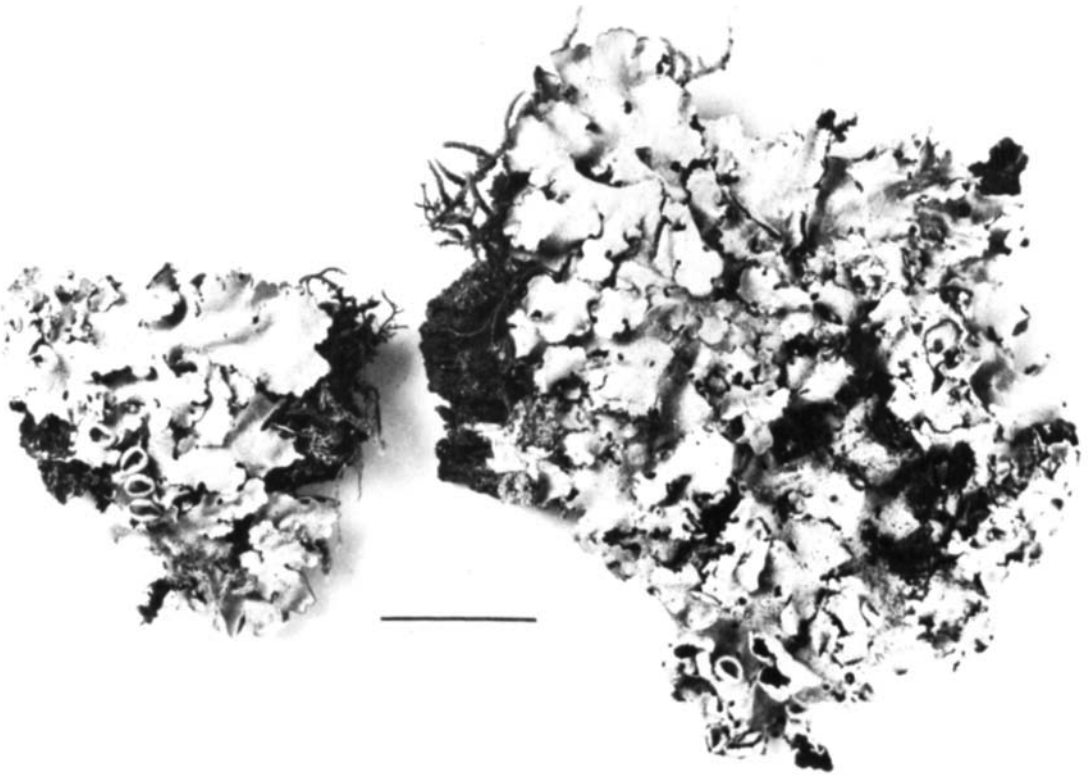


Fig. 20 *Parmelia tenuirima* (Maruia Valley, Nelson, New Zealand. F. J. Walker. BM). Scale: 2 cm.

Lectotype: New Zealand, Otago, Mt Cargill, Dunedin, On *Nothofagus*. J. S. Thomson ZA 56. CHR 160205!

*Thallus* thin and papery, orbicular to spreading,  $\pm$  loosely attached, often in very large patches, to 20(–40) cm diam., corticolous, very rarely saxicolous. Lobes broadly rounded, 5–25 mm wide, or slightly elongate-imbricate, margins rounded, entire, with a fine black or brown shining rim, occasionally developing crowded lobules centrally. Upper surface smooth, rarely faveolate-cracked centrally, shining, undulate, greyish green, not darker at margins, often with a bluish tinge, pseudocypbellae small, white, sigmoid, scattered evenly over upper surface, often minute and crowded at lobe margins but not forming a reticulum of white lines. Lower surface black, smooth, with a narrow, brown, naked marginal zone, rhizinate centrally. Rhizines black, sparse to numerous, simple to squarrosely branched. *Apothecia* common, pedicellate, to 15 mm diam., disc plane or subconcave, matt, reddish brown to yellow-brown, greenish blue in shaded specimens, often centrally perforate, margins entire, thalline exciple smooth, shining, concolorous with

thallus, maculate or pseudocypbellate. Ascospores ellipsoid  $13\text{--}18 \times 8\text{--}12 \mu\text{m}$ .

CHEMISTRY: Cortex K+ yellow; medulla K+ yellow  $\rightarrow$  red, C–, KC+ red, Pd+ orange. Salazinic acid, atranorin and chloratranorin.

DISTRIBUTION: (Fig. 23) Australia: Queensland, New South Wales, Victoria, Tasmania. New Zealand: North I. Hawke's Bay (Lake Waikaremoana) to Wellington. South I. Nelson to Fiordland. St. A. lowland to subalpine, in forest or forest remnants, in moderate to deep shade, rarely in full sunlight. (Australasian).

*P. tenuirima* is a corticolous species (occasionally it will overgrow boulders at the foot of a tree trunk) characterised by its broad, rounded, papery lobes, the mainly simple rhizines, the often perforate apothecial discs and the scattered pseudocypbellae. In New Zealand it is the largest *Parmelia* in *Nothofagus* forests of South I. and at forest margins the large rosettes are visually arresting. On *Nothofagus* and *Griselinia*, its two most common substrates in New Zealand, it associates with *Lobaria adscripta* and several species of *Pseudocypbellaria* and *Sphaerophorus*. It is rarely, if ever,

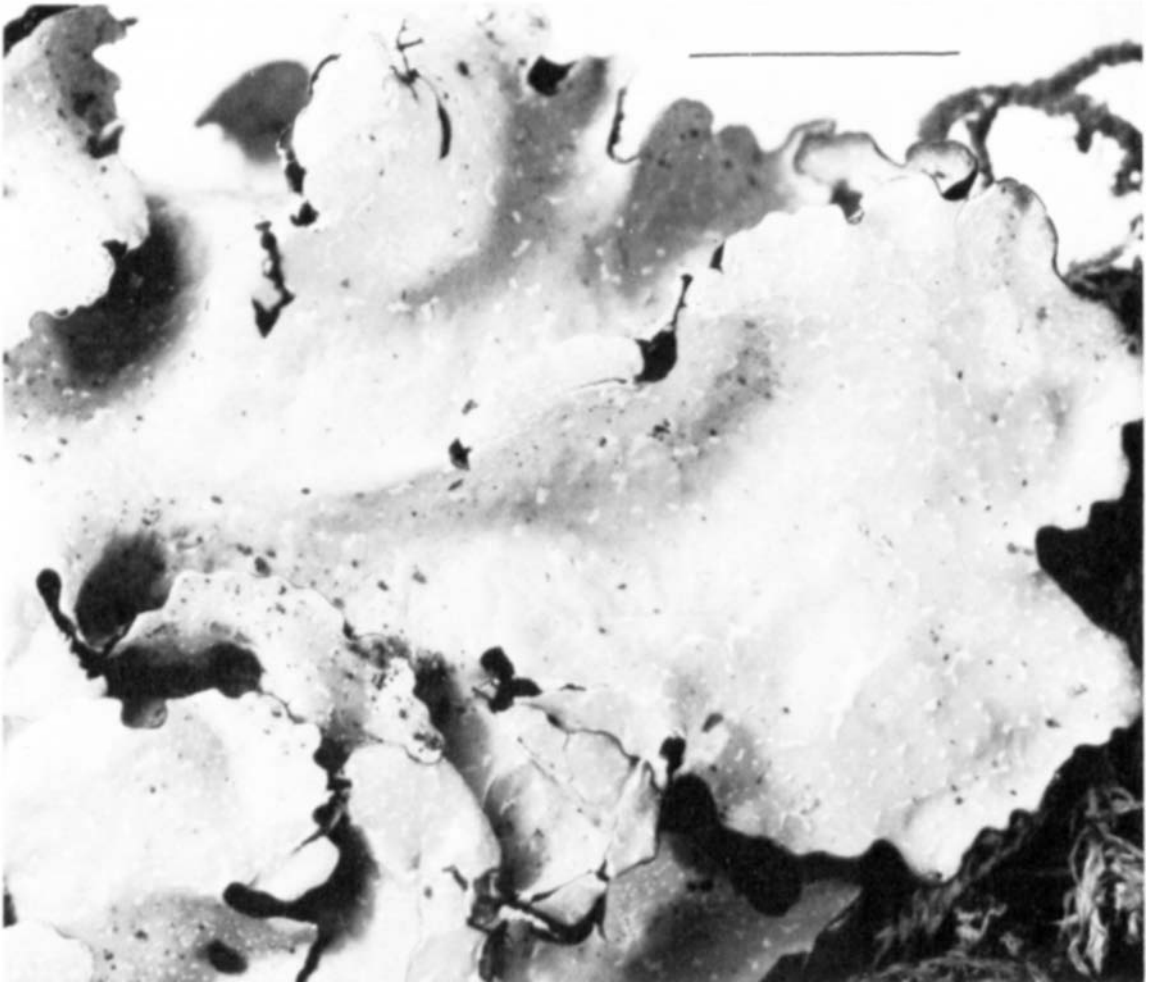


Fig. 21 *Parmelia tenuirima*, detail of marginal lobes. Scale: 5 mm.

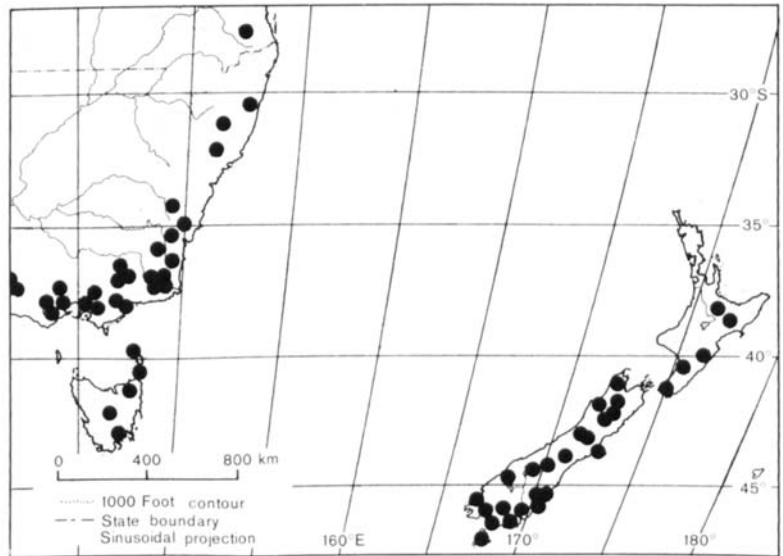
found on twigs, and appears more common in forests in South I., than those of North I. where it is frequently replaced by *Parmelia erumpens*. In Australia it is a common epiphyte of *Acacia* and *Leptospermum* in subalpine forest where it often associates with: *Menegazzia platytrema*, *Pseudoparmelia labrosa*, and *P. rutidota*. *Parmelia tenuirima* is discussed by Hillmann (1939) and by Filson (1982).

Culberson (1966) gives an account of the lichen genus *Aspidelia* Stirton and points out that *A. beckettii* is a synonym of *P. tenuirima*, besides being based on material parasitised by a lichenicolous fungus. Originally Stirton proposed to name this pathological material *Beckettia* in honour of the Christchurch orchardist T. W. N. Beckett who had collected the material in 1895 (Fig. 23), but he later

changed this to *Aspidelia*. A perusal of the correspondence books of T. W. N. Beckett (held at CHR) allows the naming of *Aspidelia* Stirton, to be traced thus:

In July 1895 Beckett wrote to Stirton "... Last month I had a few days botanizing in the Oxford Bush about 40 miles from here. The weather was very wintry and inclement and my original intention to camp out had in consequence to be dismissed. I always take a tent on my expeditions and camp in the bush. I obtained a few lichens which I have sent "parcel post" by the "SS Kaikoura" ..." On receipt of Beckett's lichens Stirton replied on 30 September 1895 "...No 29= *Parmelia*- no locality for this specimen but as I see a scrap of the

Fig. 22 Distribution of *Parmelia tenuirima* in Australasia.

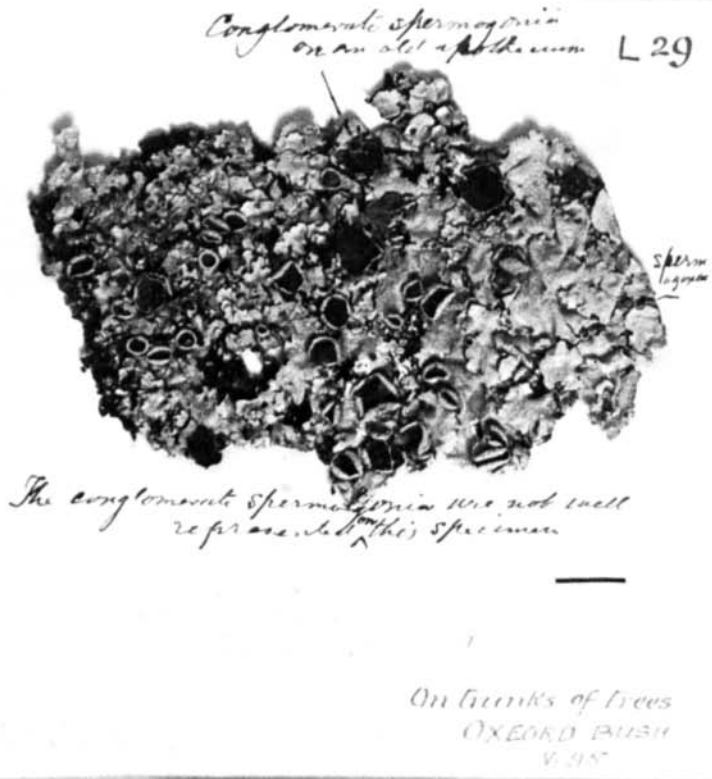


same growing on No. 22 I presume you got it from Oxford Bush. This is a very peculiar lichen which I may make the type of a new genus. This is owing to the very peculiar grouping of the Spermagonia. How would *Beckettia* do? Do not publish the matter meanwhile as I have not yet decided as regards the place of this lichen. I have a similar lichen from the Himalayas..." On 26 November, 1895 Beckett wrote to Stirton "... 29 *Parmelia*. I am glad to hear that this is new and that you think it will form the type of a new genus. I am much gratified at your proposing to honour me by giving it my name... Dr Karl Müller considered a New Zealand moss I sent him to be quite distinct and founded a new genus giving it the name *Beckettia*. On further examination of a large number of specimens I found that the particular character on which its claims to be separate from *Jattia vestus*; was not constant and so the name was never published... Dr Müller may have distributed some of my specimens or retained it in his herbarium under his name of *Beckettia* so that my name cannot be used..." This drew from Stirton the reply (3 January, 1896) "... Of course you should naturally like your name tagged on to a Moss rather than to a Lichen. In the circumstances detailed by you I do not see that there can be any obstacle to *Beckettia* amongst lichens. However I shall not do anything further until I hear from you again ..." Beckett wrote again to Stirton (2 January 1899) declining the use of *Beckettia* as a valid lichen genus name. "... I have nothing new

just now to send you but write to tell you that your new genus of New Zealand lichens cannot be called *Beckettia*. You will remember that some time ago when you proposed to do me the honour of naming a genus after me, that I wrote to you (in my letter of 27 November 1895) that Dr Karl Müller had intended to call a moss genus *Beckettia*, but that I had not published it as I did not think that the characters upon which he found this genus a very constant one. I have however lately received from Dr Müller a copy of his new work on Australian mosses "Symbolae ad Bryologiam Australiae" Hedwigia xxxvi (1897) and xxxvii (1898) and I find that there (ii p. 77) he has published a description of *Beckettia*. I am sorry therefore that you will have to give another name to your genus..." Stirton replied to this news in the following manner (19 June, 1899) "... the naming of new things is always a bore and I have not been so happy as usual in my selection of the specific distinctions. The new genus has bothered me not a little. I was anxious to get a title for it in conformity with *Parmelia* and *Aspidelia* will do provided the name is *not already* taken up. I have a suspicion that I have seen the name tagged on to some genus of ferns — have you? but I think the word ends in *-discus* in place of *-elia*. Could you ascertain this point for me? I am not in a position to determine the question without reference to a large library such as that of the University and my leisure is limited at present and my inclination more so ..."

CHR 374945 BOTANY DIVISION, D.S.I.R., NEW ZEALAND

Fig. 23 *Parmelia tenuirima* annotated by James Stirton as *Beckettia*. In Herb. T. W. N. Beckett. (CHR). Scale: 1 cm.



L29

Lichenes Novae Zealandiae.

*Beckettia*

LEG Jmms Oxford, Canterbury  
May 1895

HERB. T. W. NAYLOR BECKETT.

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Fig. 24 *Parmelia testacea* (Wellington, New Zealand. *J. Buchanan* 42. Isotype - WELT). Scale: 1 cm.



***Parmelia testacea*** Stirton, *Scott. Nat.* 4: 203 (1878). Fig. 24  
 Holotype: New Zealand. Prope Wellington. *J. Buchanan*. BM! Isotype in WELT\*  
 = *Parmelia rudior* Nyl., *Lich. N.Z.*: 24 (1888).  
 Holotype: New Zealand. *Sine loco*. Charles Knight No. 57, 1867. H-NYL 35287!  
 = *Parmelia tenuirimis* var. *erimis*. Nyl., *Flora* 68: 610 (1885).

= *P. erimis* (Nyl.) Hillmann, *Hedwigia* 78: 259 (1939).  
 Holotype: New Zealand. *Sine loco*. Charles Knight No. 55, 1867. H-NYL 35289!  
 = *Parmelia crambidiocarpa* Zahlbr., *Denkschr. Akad. Wiss. Wien math-naturwiss. Kl.* 104: 358 (1941). Fig. 25  
 Holotype: New Zealand. Taranaki, Mt Egmont. Behind Wilkies Pools, Dawson Falls. On dead *Pseudopanax sinclairii*, 1400 m, 19 January 1934. L. M. Cranwell ZA 205. W! Isotype CHR 160186!

\*The holotype (BM) is annotated by James Stirton "... New Zealand, near Wellington. Out of No. 42..." Buchanan's specimen 42 in WELT (Fig. 24) is labelled by Buchanan *P. tenuirima*, but is undoubtedly the same collection from which Stirton described *P. testacea*. It agrees in every respect with the BM type but is a larger and better preserved specimen. Buchanan gives as the locality of the collection, *Tinakori Hills*.

*Thallus* spreading,  $\pm$  loosely attached, to 10 cm diam., corticolous. Lobes variable, often rather narrow (2–5 mm wide) and elongate, to short and rounded-imbricate, dichotomously to irregularly branched, often clustered, imbricate at centre, apices blunt, pointed or rounded, margins entire, often devoid of algae in a narrow, white band. Upper surface greenish grey (often bluish in deep shade),

smooth, shining, rather thin and fragile when dry, often maculate at margins and apices, pseudocyphellae not well developed, mainly marginal, small, sparse and scattered. Lower surface black, wrinkled or smooth, shining, densely rhizinate. Rhizines black, squarrosely branched, often projecting beyond margins. *Apothecia* frequent, pedicellate, small, 2–4 mm diam., to large and lacerate-expanded (to 2 cm diam.), disc brown, pale and often maculate in shaded specimens, imperforate, margins entire to crenate-incised, thalline exciple strongly wrinkled to corrugate-verrucose and maculate, rather scabrid, often lacking algae, concolorous with thallus. Ascospores ellipsoid 13–18 × 8.5–11 µm. Pycnidia numerous, scattered, red-dish black, immersed, punctiform.

**CHEMISTRY:** *P. testacea* occurs in four distinct chemodemes (Elix 1982) all of which contain the cortical depsides atranorin and chloratranorin (K+ yellow). In addition:

Chemodeme I: Medulla K–, C–, KC–, Pd–. No lichen acids or an accessory lichen acid.

Chemodeme II: Medulla K+ yellow→red, C–, KC+ red, Pd+ orange. Salazinic and (±) an accessory unidentified acid. *P. testacea*, *P. rudior*, and *P. erimis* types have this chemistry, the two latter both containing the accessory unidentified compound.

Chemodeme III: Medulla K+ brown, C–, KC+ brown-purple, Pd+ orange. Protocetraric acid.

Chemodeme IV: Medulla K+ yellow, C–, KC+ pink, Pd+ orange. Echinocarpic acid and associated metabolites as well as the (±) accessory unidentified acid.

Although most specimens examined definitely belonged to one of the above chemodemes, about 5% of the specimens appeared to possess different combinations of the constituents mentioned above. For instance the type of *P. crambidiocarpa* contains both protocetraric acid and the echinocarpic acid complex. There is no consistent morphological differences between the chemodemes, although the taxon does exhibit considerable morphological variation.

**DISTRIBUTION:** (Fig. 26) New Zealand: throughout, coastal and lowland to subalpine inland, both east and west of the Main Divide in South I. In forests or forest remnants and subalpine scrub, from semi-shade to full sunlight. Also in Tasmania. (Australasian).

*P. testacea* is closely related to *P. tenuirima* but is distinguished by the narrower, ± branched lobes, imperforate apothecial discs, the verrucose scabrid thalline exciple, the abundant laminal pycnidia, the smaller, scattered, sparse pseudocyphellae and by

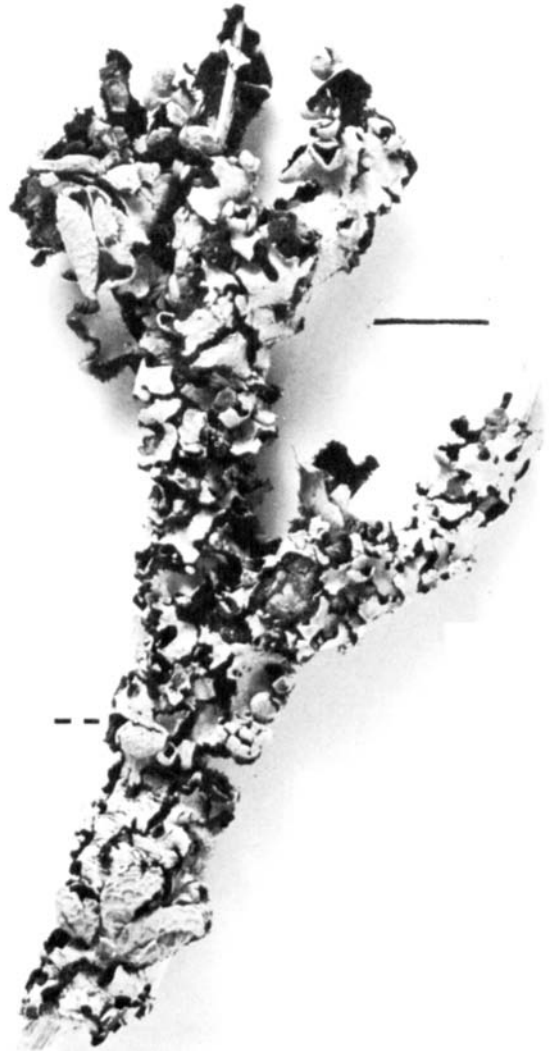
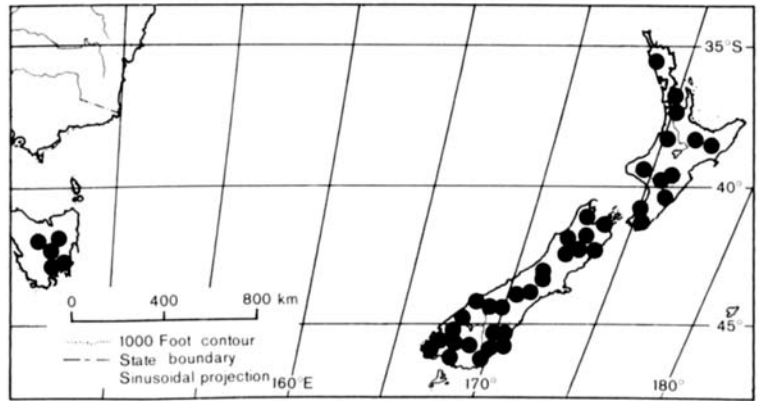


Fig. 25 *Parmelia crambidiocarpa* (Mt Egmont, Taranaki, New Zealand. L. M. Cranwell ZA 205. Isotype – CHR 160186). Scale: 1 cm.

the predominantly squarrosely branched rhizines which often protrude beyond the lobe margins.

The variation in chemistry shown by this species is not supported by any clear morphological differences which could serve to keep *P. crambidiocarpa*, for instance, a separate species. Although the type collection of *P. crambidiocarpa* has long, narrow lobes, copious laminal pycnidia and thick, black rhizines projecting from the lower surface almost like a prothallus, forms of similar morphology with salazinic acid are common. It appears that the development of narrow, branching lobes and copious rhizines is an adaptation to high-light, subalpine environments on twig substrates, since plants

Fig. 26 Distribution of *Parmelia testacea* in Australasia.



from canopy branches of *Nothofagus* and from subalpine scrub at treeline (often species of *Dra-cophyllum*) have this morphology. When *P. testacea* grows as an epiphyte in shaded sites, the lobes become shorter, more rounded and imbricate and rhizines much fewer. In beech forest at treeline it is possible to observe intergrades between rounded,  $\pm$  closely attached forms on the trunks, to elongate, branching,  $\pm$  loosely attached forms in the canopy twigs. Further studies on ecological factors influencing thallus form and chemistry in *P. testacea* are needed.

A similar variation in thallus chemistry, not clearly supported by distinct morphological differences is shown in New Zealand populations of *Anzia jamesii* (Galloway 1978).

*P. testacea* is strongly photophilous, being commonly collected from the canopy twigs of forest trees and from subalpine shrubs at treeline, though it will also tolerate reasonable shade. It associates with the following: *Lecanora atra*, *Lecidea cero-plasta*, *L. laeta*, *Menegazzia dielsii*, *M. circumso-rediata*, *M. pertransita*, *Ochrolechia pallescens*, *Pannoparmelia angustata*, *Pertusaria nothofagi*, *Psoroma pallidum*, *P. xanthomelanum*, *Thysanophoron stereocauloides*, *Usnea capillacea*, and *U. xanthophana*. In Tasmania it is known from the phorophytes: *Coprosma nitida*, *Nothofagus cunninghamii*, *Noklaea ligustrina*, and *Telopea truncata* in recent collections (1980–81) made by G. Kantvilas.

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