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Eucalyptus silvestris

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NOTES ON AUSTRALIAN VERRUCARIACEAE (LICHENISED ASCOMYCOTINA): 3

P. M. McCarthy*

ABSTRACT

McCarthy, P.M. Notes on Australian Verrucariaceae (lichenised Ascomycotina): 3. **Muelleria 8(2): 99–105 (1994).** — *Verrucaria meridionalis* P.M.McCarthy *sp. nov.* is described from maritime rock in southern New South Wales. *Endocarpon pallidulum* (Nyl.) Nyl. and *V. lecideoides* var. *minuta* Hepp are reported for the first time from Australia. New state records are provided for *Thelidium papulare* (Fr.) Arnold (Tasmania), *V. australiensis* P.M.McCarthy (Victoria and Tasmania) and *V. subdiscreta* P.M.McCarthy (New South Wales).

INTRODUCTION

Research on the lichen family Verrucariaceae continues to improve its known representation in Australia. In this paper, a new species is described and new national and state records of five others are documented.

TAXONOMY

1. Endocarpon pallidulum (Nyl.) Nyl., *in* Hue, *Nouv. Archiv. du Museum, sér. 3,* 4: 106 (1892). — *Verrucaria pallidula* Nyl., *Flora* 57: 73 (1874). — *Paracarpidium pallidulum* (Nyl.) Müll. Arg., *Flora* 66: 346 (1883).

Typus: Peru (San Martin Province), Tarapoto, on sandy soil, 1866, *R..Spruce 196* (Holotypus: H-NYL 2280!; Isotypus: G!).

Thallus terricolous or corticolous, squamose. *Squamae* closely appressed to bark, more loosely attached to soil, shallowly and irregularly lobate, contiguous to imbricate, plane to slightly convex, pale grey-green to medium olive-brown, becoming darker and more intensely green when wetted, 0.5–2(–2.5) mm wide, 0.08–0.1(–0.12) mm thick; lobes, in turn, frequently producing rounded, 0.1–0.2 mm wide, marginal lobules; surface smooth, matt; margin plane, smooth to lightly crenulate. *Cortex* (25–)30–40 µm thick, uniformly hyaline and paraplectenchymatous; cells thin-walled, more or less polygonal, 6–10(–12) µm wide. *Algal layer* 35–50 µm thick, continuous; cells green, ellipsoid to globose, (6–)8–12(–14) × 6–12 µm; interstitial cells thin-walled, 5–8(–10) µm diam. *Medulla* 20–30(–40) µm thick; hyphae loosely arranged, 2.5–4 µm wide, prosoplectenchymatous and with numerous air-spaces to almost paraplectenchymatous and with polygonal, 3–6 µm wide cells. *Lower surface* consisting of a 15–25 µm thick layer of pale to dark brown cells from which concolorous or paler, 3–4.5 µm wide rhizohyphae develop. *Perithecia* simple, immersed, usually solitary, 2–5(–8) per squama. *Perithecial apex* convex, concolorous with the thallus to dark brown, becoming noticeably darker when wetted with water, 0.1–0.16 mm diam. *Ostiole* inconspicuous to slightly depressed. *Centrum* obpyriform, 0.13–0.23 mm diam. *Excipulum* pale to dark brown at the base, becoming medium brown to brown-black near the apex, 15–20 µm thick. *Paraphyses* absent. *Periphyses* 25–35 µm long, simple to sparingly branched; lumina 1–2 µm wide; walls becoming gelatinized when wetted, 2–3 µm thick. *Hymenial algae* green, globose-cuboid, 2.5–3.5(–4) µm wide. *Hymenial gel* and subhymenium Lugol's I+ deep brown-red. *Asci* fissitunicate, bisporous, clavate to cylindroclavate, 60–74 × 14–18 µm.

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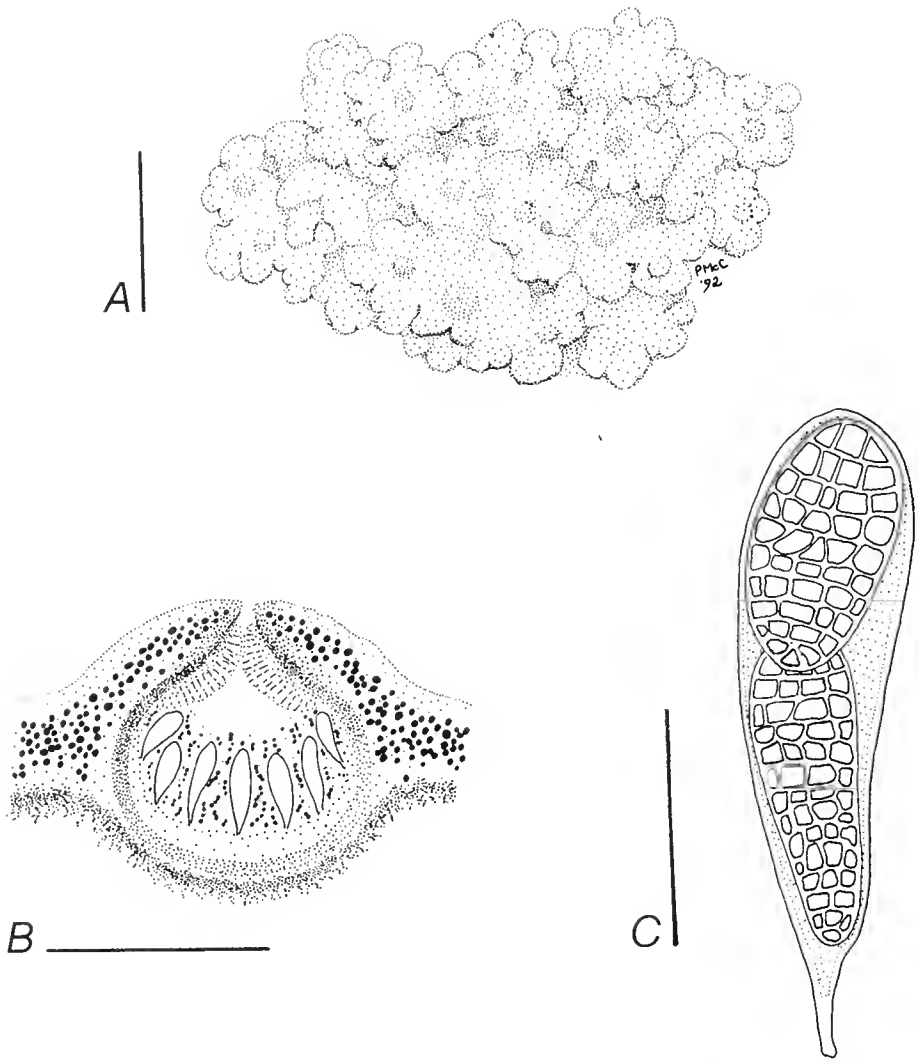


Fig. 1. *Endocarpon pallidulum*. a — habit; scale 0.5 mm. b — vertical section of perithecium and adjacent thallus; scale 0.2 mm. c — Mature ascus; scale 20 µm. (All from *Aptroot 22132*).

Ascospores muriform, colourless to pale yellowish-brown, broadly ellipsoid to elongate-ellipsoid to subcylindrical, with 9–12 transverse divisions and 3–4 longitudinal divisions, (22–)29.5(–36) × (9–)12.5(–16) µm (70 measured). *Conidiomata* not seen. (Fig. 1)

NOTES

Endocarpon pallidulum has minute, closely appressed squamae and proportionately small perithecia that produce very small and persistently pale ascospores. It is known from sandy soil in its type locality in the foothills of the Peruvian Andes, from soil in Cuba (Müller 1885) and Japan (Nylander 1890) and, now, from tree-bark in north-eastern Queensland.

Among the *Endocarpon* species already known from Australia, *E. pallidulum* is most similar to the terricolous and saxicolous *E. pallidum* Ach. which has very small, pale squamae and colourless to pale brown ascospores in bisporous asci. However, the latter also has a broader, brown to brown-black perithecial apex and a 0.24–0.28 mm diam. centrum. Moreover, the asci and ascospores are 74–97 ×

19–26 µm and 25–49.5 × 14.5–19 µm, respectively (McCarthy 1991a). A depauperate corticolous specimen from Victoria cited by McCarthy (1991a) is unlikely to be conspecific with *E. pallidum* because, not only does the former have larger and more deeply lobate squamae, its ascospores are brown, even when immature.

This lichen is exceptional, not only in terms of its morphology, but also in its substratum and tropical location. The ten taxa hitherto known from Australia are predominantly terricolous and are mostly restricted to arid to cool-temperate habitats in central and southern latitudes (McCarthy 1991a).

Additional Specimens Examined

Australia — *Queensland* — Cairns, Botanical Garden, near Centenary Lakes, alt. 5 m, on the bark of a cultivated tree, Mar. 1988, *A. & M.Aptroot 22230* (MEL 1057427, Herb. Aptroot); Cairns, on cultivated tree on The Esplanade, Mar. 1988, *A. & M.Aptroot 22132* (MEL 1057428, Herb. Aptroot).

Cuba — on soil, 1856–58, *C.Wright* [*Verrucariae Cubenses* 188, 189, Ser. 2: 536 (G, H-NYL 2277)].

2. Thelidium papulare (Fr.) Arnold, *Flora* 68: 147 (1885).

Earlier papers in this series (McCarthy 1990, 1991b) noted the occurrence of *T. papulare* in New South Wales and Victoria. The first Tasmanian record, reported here, has a somewhat thicker thallus than those of the mainland specimens; perithecial characters, however, are almost identical.

Specimen Examined

Tasmania — Vale of Bellevoir, on limestone outcrop in buttongrass (*Gymnoschoenus*) moorland, alt. 840 m, 16 May 1987, *G.Kantvilas 62/87* (HO 122951).

3. Verrucaria australiensis P.M.McCarthy, *Muelleria* 7: 320 (1991)

First described from coastal limestone in South Australia (McCarthy 1991b), *V. australiensis* has since been collected in similar habitats in Victoria and on Erith Island in the Bass Strait. The thalli of the recent collections are endolithic and the perithecia are simple and semi-immersed in the substratum. While the perithecia of the Tasmanian specimen are virtually identical in all respects to those of the type, in the Victorian lichen they are somewhat larger [(0.12–)0.17 (–0.2) mm diam.] and contain ascospores of (7.5–)9(–11.5) × (4–)5.5(–7) µm.

Specimens Examined

Victoria — Mornington Peninsula, Blairgowrie, Cape Schanck Coastal Park, Spray Point, on dune limestone in the upper supralittoral, alt. 5 m, 5 Jan. 1990, *P.M.McCarthy 355* (MEL).

Tasmania — Bass Strait, Kents Group, Erith I., south-western coast, on sheltered limestone, 26 Oct. 1992, *J.S.Whinray 2682* (MEL).

4. Verrucaria lecideoides var. minuta Hepp, *Lich. Eur.*: 683 (1860).

Typus: (Germany, Bayern, 40 km NNE of Nürnberg), Streitberg, on limestone, *F.C.G.Arnold* (Isotypus: MEL!).

Thallus crustose, epilithic, determinate, pale to medium greenish grey to grey-brown, areolate, 80–120 µm thick. *Areolae* (0.1–)0.15–0.35(–0.6) mm wide, angular (when contiguous) to rounded (when scattered), plane to slightly convex; surface matt, smooth. Side-walls of closely packed areolae pallid to dark brown; walls tend to be pallid when areolae are more scattered. *Epinecral layer* uniformly 10–30 µm thick or uneven. *Cortex* composed of 1–2 layers of 2.5–4 µm diam. cells, with thick, hyaline to brown walls. *Algae* green, globose, 7–12(–15) µm diam.; interstitial cells thin-walled, 2–4 µm diam. *Prothallus* dark grey to black or not apparent. *Hypothallus* not apparent. *Perithecia* very numerous, 2/3–1/3 immersed to almost superficial, at the margins of, or between areolae, usually solitary, (0.12–)0.17(–0.24) mm diam. *Perithecial apex* slightly to strongly convex. *Ostiole* inconspicuous or in a 20–40 µm wide depression. *Involucrellum*

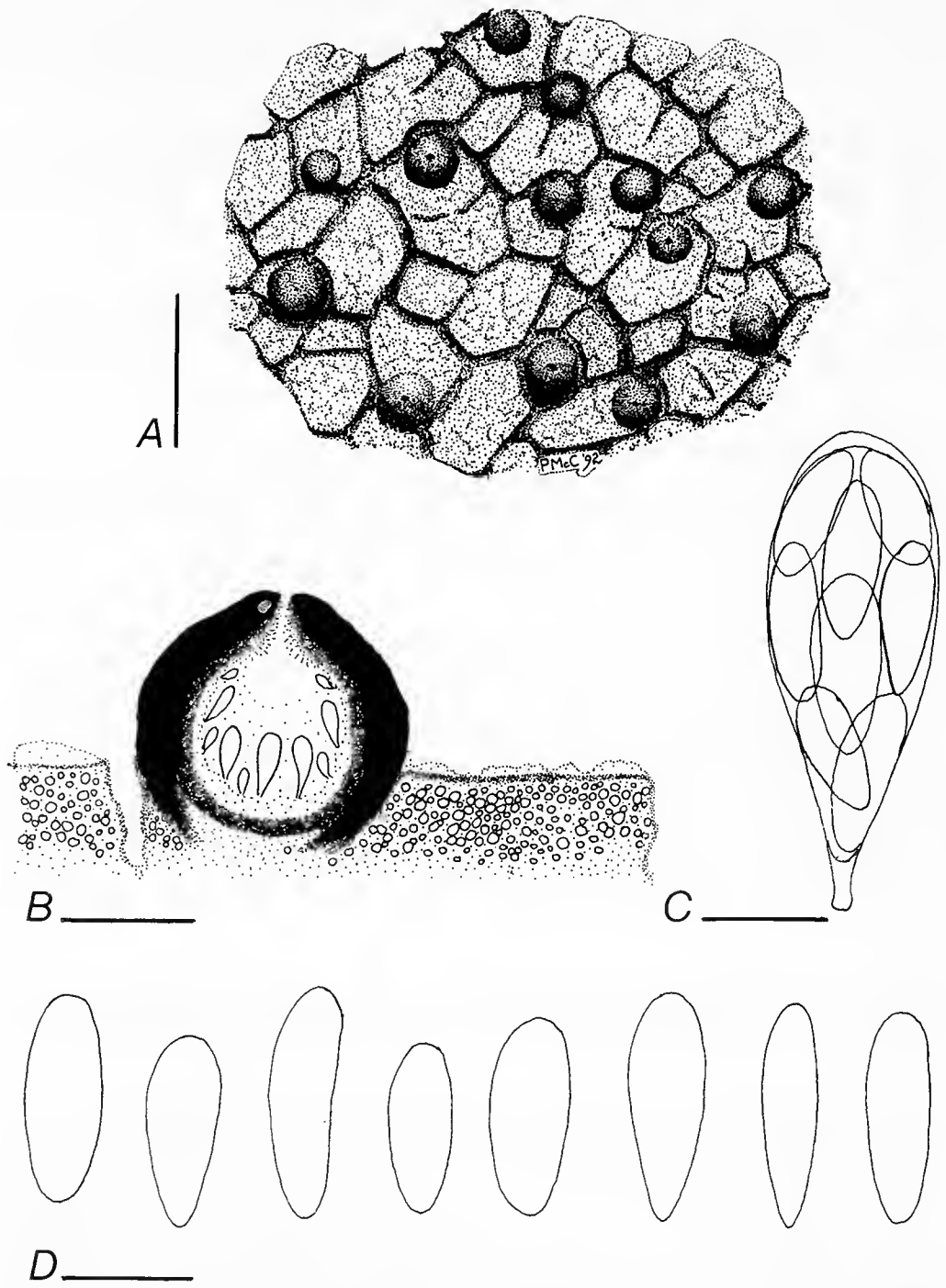


Fig. 2. *Verrucaria lecideoides* var. *minuta* . a — habit; scale 0.5 mm. b — vertical section of perithecium and adjacent thallus; scale 0.1 mm. c — ascus; scale 10 µm. d — ascospores; scale 10 µm. (All from *Ewers 6957*).

black, contiguous with the excipulum and extending to excipulum-baselevel, 25–45 µm thick. *Excipulum* hyaline to greenish black, 15–20 µm thick. *Centrum* globose to obpyriform, 0.08–0.12 mm diam., IKI+ red-brown. *Periphyses* simple, 15–20 × 2–3 µm. *Paraphyses* absent. *Asci* fissitunicate, clavate, 8-spored, 39–53 ×

13–17 µm. *Ascospores* simple, colourless, narrowly to broadly ellipsoid, massed or irregularly biseriate in the asci, (9–)13(–18) × (5–)6.5(–8) µm (73 measured); contents clear to granular-guttulate. (Fig. 2).

NOTES

Verrucaria lecideoides var. *minuta* has a deeply areolate thallus, minute perithecia and rather small ascospores. Its most distinctive character is the occurrence of the perithecia at the margins of and, frequently, between areolae. While this last feature readily distinguishes it from other *Verrucaria* species known from Australia, it is an attribute common to several Eurasian taxa.

Verrucaria lecideoides var. *lecideoides* (Massal.) Trevisan and *V. gebennica* Nyl. have larger and more deeply immersed perithecia with thicker, strongly flattened involucrella (Servít 1954, Wirth 1980, Clauzade & Roux 1985, McCarthy 1988; specimens examined in G, GZU, H, UPS and W). *Verrucaria beltraminiana* (Massal.) Trevisan, known from limestone in Germany and Italy, has a thicker, paler thallus with a well-defined medulla. The perithecia are larger, but more deeply immersed, the asci are discontinuously longer and the ascospores are longer and broader (Zschacke 1933, Servít 1952, Wirth 1980, Clauzade & Roux 1985). *Verrucaria fraudulosa* Nyl, the only obligately silicolous member of this group, has strongly convex areolae, 0.2–0.34 mm diam. perithecia and 13–22 µm long ascospores [TYPUS: Germany, Heidelberg, on granite, 1860, *W.R. von Zwackh* (SYNTYPUS: H-NYL 2741!)].

Verrucaria lecideoides var. *minuta* has been reported from Poland, Czechoslovakia, Germany, Switzerland, Austria, Italy and from the northern and Mediterranean coasts of France (Zschacke 1933, Lettau 1940, Servít 1954, Nowak & Tobolewski 1975, Roux 1984 and others). While almost all reports have cited calcareous substrata, Lettau (1940) listed a specimen on sandstone from Thüringia, Germany.

The Australian specimens are exceptional in that all are silicolous in areas that are more arid than those hitherto reported for this lichen. However, the environmental anomalies are outweighed by a similarities in thalline anatomy and by uniformity in the placement and structure of the perithecia.

SPECIMENS EXAMINED

South Australia — Arkaroola, on hard siliceous rocks, 18 June 1990, *W.H.Ewers 6957* (MEL).

New South Wales — 5 miles [8 km] E of Cooma, by road to Numeralla, on granite outcrops in grassland, 2 Oct. 1967, *W.A.Weber & D.McVean* (COLO-L 49061); Sofala, on parapet of Crossley Bridge, over Turon R., on sandstone pebbles embedded in cement, 11 Feb. 1991, *P.M.McCarthy* (MEL).

5. Verrucaria meridionalis P.M.McCarthy, *sp. nov.*

Thallus epilithicus, viridis vel viridiater, continuus, madefactus gelatinosus, (15–)20–25(–30) µm crassus. Perithecia hemisphaerica vel subglobosa, (0.24–)0.35(–0.45) mm diametro. Apex perithecii convexus. Involucrellum atrum, ad basim excipuli descendens. Centrum 0.15–0.2 mm diametro. Excipulum fuscoatrum, 18–25 µm crassum. Periphyses simplices, 25–40 × 1.5–2.5 µm. Asci 36–42 × 12–17 µm. Ascosporae ellipsoideae vel globosae, (7–)10(–12.5) × (5.5–)8(–10.5) µm.

TYPUS: Australia, New South Wales, Narooma District, Bodalla State Forest, 7 km E of Narooma, Wagonga Inlet picnic site, on shale in the upper littoral, 5 Feb. 1991, *P.M.McCarthy 475* (HOLOTYPUS: MEL 1055262; ISOTYPUS: NSW).

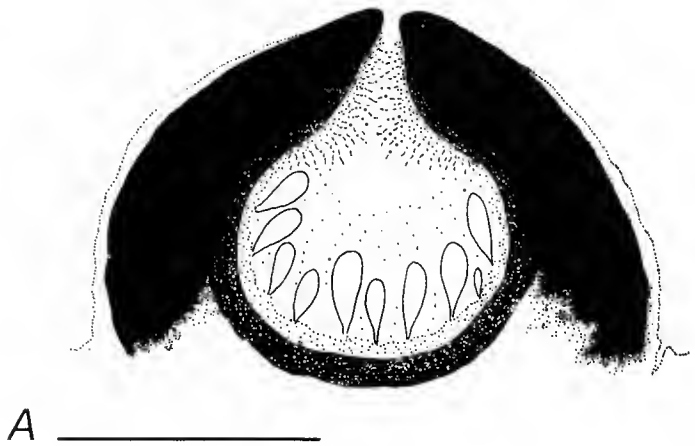
Thallus crustose, epilithic, effuse to determinate, dark olive green to black, continuous, filmy, gelatinous when wetted, (15–)20–25(–30) µm thick, the uppermost 5–8 µm darkly pigmented. *Algae* green; cells broadly ellipsoid to globose, 4–6(–7) × 4–6 µm. *Hyphae* 3–4(–5) µm wide. *Prothallus* black, discontinuous. *Perithecia* compound, superficial, hemispherical to subglobose, numerous, usually solitary, (0.24–)0.35(–0.45) mm diam. *Perithecial apex* rounded. *Ostiole*

inconspicuous. *Involucrellum* black, contiguous with the excipulum and extending to excipulum base-level, 30–60 µm thick near the apex, 70–100 µm thick at the base, frequently with a 15–20 µm thick thalline covering. *Centrum* globose to obpyriform, 0.15–0.2 mm diam., IKI+ red-brown. *Excipulum* brown-black, 18–25 µm thick. *Periphyses* simple, 25–40 × 1.5–2.5 µm. *Paraphyses* absent. *Asci* fissitunicate, clavate, 8-spored, 36–42 × 12–17 µm. *Ascospores* simple, colourless, ellipsoid to globose, massed or irregularly biseriate in the asci, (7–)10(–12.5) × (5.5–)8(–10.5) µm (80 measured); contents clear to coarsely granular-guttulate. (Fig. 3)

NOTES

Verrucaria meridionalis has a very thin, filmy thallus, moderately large and superficial perithecia with a thick, smooth involucrellum and, importantly, mostly subglobose ascospores.

The new lichen is rather similar in appearance to the maritime New Zealand species *V. sessilis* P.M.McCarthy (1991c). That lichen, however, has a markedly



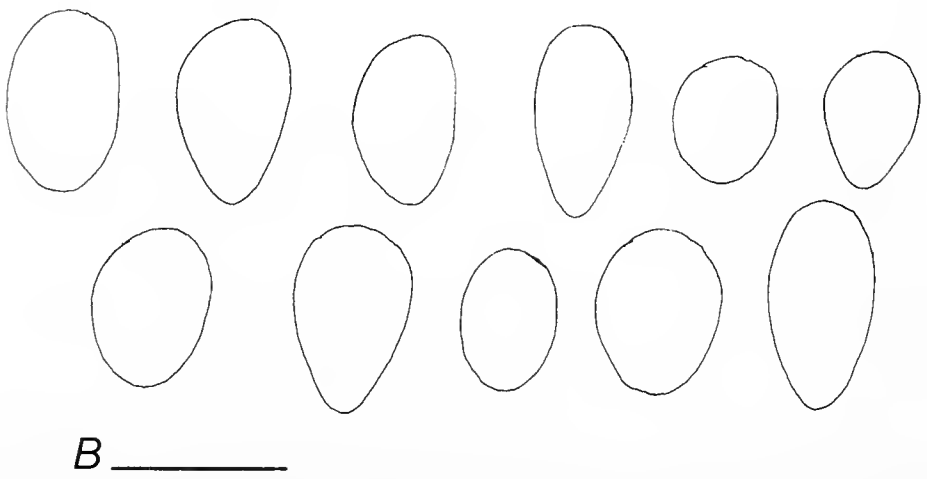


Fig. 3. *Verrucaria meridionalis* . a — vertical section of perithecium; scale 0.2 mm. b — ascospores; scale 10 µm. (All from Holotypus.)

crateriform perithecial apex, an entire involucrellum, thicker excipulum, longer asci and persistently ellipsoid ascospores of 9–16 × 6–8 μm (McCarthy 1991a). Among other marine and maritime *Verrucaria* species known from Australia, *V. striatula* Wahlenb. shares rather prominent perithecia, but is readily distinguishable from *V. meridionalis* mainly by its normally more robust thallus and smaller, narrowly ellipsoid ascospores (McCarthy 1991b).

Verrucaria meridionalis is known only from intertidal rocks in a sheltered inlet on the south coast of New South Wales where it grows near barnacles and below *V. subdiscreta.*

6. Verrucaria subdiscreta P.M.McCarthy, *Muelleria* 7: 327 (1991).

Verrucaria subdiscreta is known from supralittoral rocks on coasts of Western Australia, South Australia, Victoria, Tasmania and Macquarie Island (McCarthy 1991c). It is reported for the first time from New South Wales where it inhabits upper littoral rocks in a sheltered inlet.

Specimen Examined

New South Wales — Narooma District, Bodalla State Forest, 7 km E of Narooma, Wagonga Inlet picnic site, on soft shale in the upper littoral, 5 Feb. 1992, *P.M.McCarthy 475* [part (MEL 1055262)].

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Manuscript accepted 24 December 1992

POMADERRIS BREVIFOLIA (RHAMNACEAE), A NEW SPECIES FROM SOUTH-WEST WESTERN AUSTRALIA

N. G. WALSH*

ABSTRACT

Walsh, N.G. *Pomaderris brevifolia* (Rhamnaceae), a new species from south-west Western Australia. **Muelleria 8(2): 107–111 (1994).** — A new species *Pomaderris brevifolia* N.G.Walsh, formerly included in *P. myrtilloides* Fenzl, is described and illustrated. *P. myrtilloides* is circumscribed and contrasted with the new species.

INTRODUCTION

The name *P. myrtilloides* Fenzl has been applied to a varied assemblage of shrubs, mostly occurring on limestone or lateritic substrates or on sand dunes near the southern coast of Western Australia, extending from Albany eastward to near Eucla on the South Australian border. *P. myrtilloides sens. lat.* has most readily been distinguished from other Western Australian species of *Pomaderris* in having flowers with narrow-linear petals. Other petaloid species of *Pomaderris* in Western Australia have distinctly obovate or spathulate petals. Considerable variation in leaf shape, size and indumentum has been attributed to *P. myrtilloides*, but field observation and examination of herbarium specimens indicates the existence of two entities, readily separable on foliar, floral and fruit characters.

TAXONOMY

Pomaderris brevifolia N.G.Walsh, *sp. nov.*

P. myrtilloide Fenzl affinis foliis parvioribus, crassis, margine recurvatis vel revolutis, inflorescentibus et floribus minoribus, et sepalis persistentibus differt.

TYPUS: Western Australia, south-west, Susetta River, 34°00′S, 119°27′E, 13 July 1970, *A.S.George 10000* (HOLOTYPUS: MEL; ISOTYPUS: PERTH)

Slender shrub, to *c.* 1.5 m high. *Young branchlets*, petioles and pedicels covered with pale, short, semi-appressed silky hairs. *Stipules* paired, fused toward base, narrowly triangular, *c.* 1 mm long, silky pubescent on abaxial surface, glabrous adaxially. *Leaves* shortly petiolate, lamina obovate, cuneate or obcordate, 3–7 mm long, 2–4 mm wide; apex rounded, truncate or retuse, the midvein commonly minutely exserted; lateral veins not apparent; upper surface smooth and glabrous, or with a line of short hairs along the impressed midvein, or (rarely) shortly hispid over the entire surface; lower surface densely covered by a mat of fine stellate hairs, overlain by short appressed or slightly spreading simple hairs; margins thickened or recurved to revolute, forming a conspicuous border around the lower surface. *Inflorescence* an umbel-like cyme, to *c.* 15 mm diam., with *c.* 10–20 flowers; pedicels 2–5 mm long, subtended by stipule-like bracts. *Flowers* cream to pale pink; sepals 1.3–2 mm long, silky pubescent abaxially, glabrous adaxially; petals linear to narrowly oblanceolate, 0.8–1.2 mm long, 0.1–0.3 mm wide, usually glabrous, sometimes with a few appressed silky hairs on the abaxial surface. *Stamens* shortly exceeding petals; anthers 0.3–0.5 mm long. *Style* 0.7–1 mm long, 3-lobed apically, the lobes to 0.3 mm long. *Ovary* summit densely covered by short erect simple hairs, encircled by a raised glabrous rim. *Capsule* obovoid, 3.5–4.5 mm long, exserted for about 1/2 of its length from the level of

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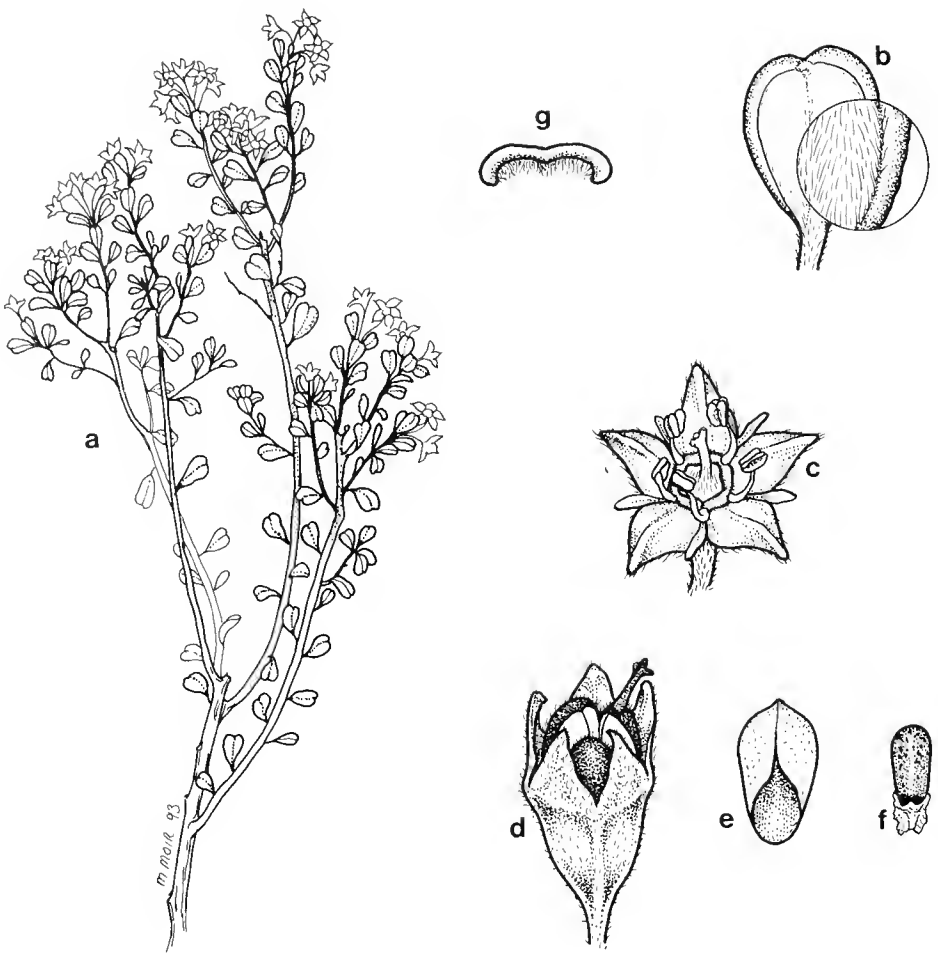

Fig. 1. *Pomaderris brevifolia*. a — flowering branch ×1. b — abaxial surface of leaf ×5, with enlargement ×10. c — flower ×5. d — mature capsule ×5. e — coccus of mature capsule viewed from inner face ×5. f — seed, dorsal view ×5. g — leaf transverse section ×5. a-c from *A.S.George 10000* (MEL), d-g from *R.D.Spencer 430* (MEL).

insertion of the sepals, obscurely 5-angled in the lower part; sepals persistent in fruit. *Seed* flattened oblong-ovoid, *c.* 2 mm long, with a short basal aril. (Fig. 1)

Representative Specimens (33 specimens examined)

Western Australia — From Israelite Bay to Eyre relief sand flares, 1863, *Maxwell* (MEL); E side of Mt Desmond, SE of Ravensthorpe, 21 Apr. 1962, *A.S.George 3665* (PERTH); Mt Short, *c.* 8 miles [*c.* 13 km] NNW of Ravensthorpe, 25 May 1963, *A.S.George 4444* (PERTH); Gordon Inlet, 18 Apr. 1965, *K.Newbey 1788* (PERTH); SE of Mt Ragged, 20 Jan. 1966, *A.S.George 7452* (PERTH); 4 miles [*c.* 6.5 km] S of Bluff Knoll, 1 May 1966, *K.Newbey 2431* (PERTH); 19 miles [*c.* 30.5 km] NW of Bremer Bay, 9 Mar. 1970, *A.S.George 9844* (PERTH); W of lower Fitzgerald R., 12 July 1970, *A.S.George 9943* (PERTH); Wittenoom Hills, 9 June 1972, *T.Daniells* (PERTH); Cape Arid National Park, 19 Sep. 1976, *R.J.Hnatiuk 761078* (PERTH); 9 km N of Gibson, 14 Mar. 1983, *A.Strid 22423* (PERTH); Fitzgerald R. National Park, Point Ann Rd, 8 Nov. 1989, *R.D.Spencer 430* (MEL, CANB).

Distribution and Conservation Status

Pomaderris brevifolia has been recorded from near Bluff Knoll in the Stirling Range eastward to near Mt Ragged inland from Israelite Bay. Unlike *P. myrtilloides*, it appears to occur rarely very near the coast and occurs up to 50 km or more inland (e.g. in the Stirling Range, Ravensthorpe and Gibson areas). It does

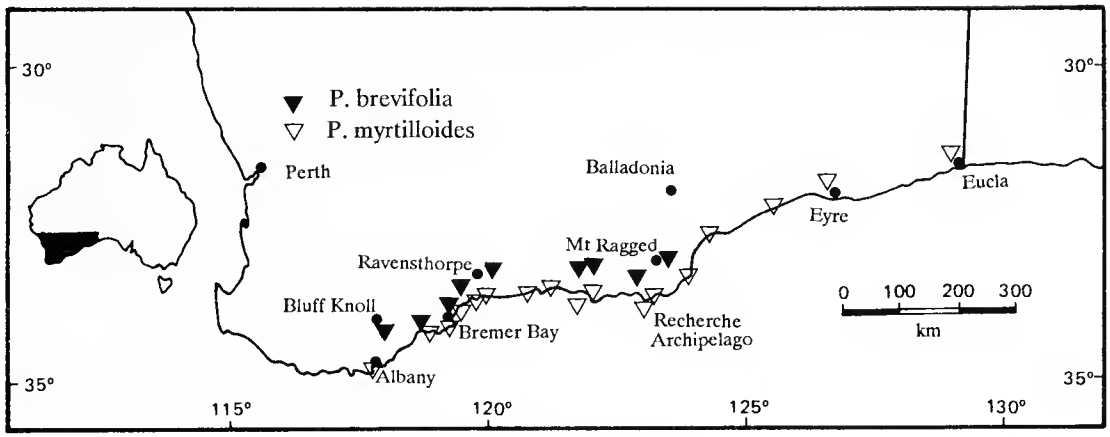

Fig. 2. Distribution of *Pomaderris brevifolia* and *P. myrtilloides*.

not appear to be rare, and is represented in the Stirling Range, Fitzgerald River and Cape Arid National Parks. (Fig. 2)

HABITAT

Pomaderris brevifolia is an occasional component of mallee scrub and open heath, commonly on laterite-rich clay soils, amongst rocks or, less commonly, on sandy substrates. Most occurrences are away from areas of direct coastal influence, the most nearly coastal collections being from beside large protected inlets or estuaries (*e.g.* Beaufort Inlet, Wellstead Estuary, Gordon Inlet).

ETYMOLOGY

The specific epithet of the new species refers to its small leaves, the smallest of any Western Australian *Pomaderris* and amongst the smallest known for the genus.

NOTES

Although closely related to the more widespread *P. myrtilloides* (which extends along the coast from Albany almost to the South Australia border), *P. brevifolia* is distinguished by its smaller leaves which have conspicuously thickened, recurved or revolute margins. Variants of *P. brevifolia* with leaves shortly hispid above have no equivalent in *P. myrtilloides*, although forms of the latter exist with leaves either glabrous or stellate-pubescent on the adaxial surface (see below). The inflorescences and flowers of *P. brevifolia* are smaller. The few fruiting specimens of *P. brevifolia* available show the sepals to be persistent in fruit and the capsule exserted for about 1/2 its length, unlike fruiting specimens of *P. myrtilloides* in which the sepals fall before the fruit matures and the capsule is exserted for about 2/3 of its length.

Most material of *Pomaderris brevifolia* at PERTH had been segregated from *P. myrtilloides* and tentatively determined as '*Pomaderris* sp. 1'.

CIRCUMSCRIPTION OF *POMADERRIS MYRTILLOIDES*

In the protologue of the species, Fenzl (1837: 22) described the leaves of *P. myrtilloides* as being under one inch ('*foliis uncia brevioribus*'), obovate, with apices entire and rounded or retuse, glabrous on the upper surface and with dense, short tomentum on the lower surface, stems and flowers. The inflorescence is described as a small terminal corymbose cyme, and the flowers as having narrow, linear-lanceolate, entire and bearded petals.

Mueller (1862: 69) described *P. stenopetala* from specimens collected by Oldfield at Point Henry (near Bremer Bay), agreeing with Fenzl's description in all but leaf shape (ovate to ovate-lanceolate) and dimension (2/3–1 1/3 inches). Surprisingly, in his description he made no reference to Fenzl's *P. myrtilloides*.

Bentham's (1863: 419) description of *P. myrtilloides* gives the leaves varying 'from obovate to obovate-oblong, very obtuse or almost acute, slightly emarginate, mostly about 1/2 in. long, in the original specimens . . . glabrous above and quite entire'. There is no reference to the petals being bearded or otherwise as noted by Fenzl and Mueller. Bentham's description is followed by a brief diagnosis of a new variety *major*, with 'leaves larger, often 1 in. long; flowers larger' equating it with Mueller's *P. stenopetala* and citing the same type specimen.

The type specimen of *P. myrtilloides* is a twig in bud, with obovate leaves, obtuse or truncate at the apex, 8–12 mm long and c. 4–7 mm wide, glabrous on the adaxial surface and with a dense indumentum of fine stellate hairs overlain by short silky simple hairs on the abaxial surface.

Examination of herbarium material of *P. myrtilloides* at PERTH, CBG and MEL indicates a continuum of leaf and flower sizes from those represented by the type through to those which would accord with *P. stenopetala* F.Muell. (= *P. myrtilloides* var. *major* Benth.). Within the range of leaf sizes exist specimens with leaves adaxially glabrous and others with leaves finely stellate-pubescent on the adaxial surface — the latter form not hitherto included in descriptions of *P. myrtilloides*. Specimens at PERTH with adaxially hairy leaves had been segregated as potentially an undescribed entity, but in the absence of other correlating characters, I regard these as merely variants. The habitats and ranges of both variants appear to be largely overlapping, with the adaxially pubescent form perhaps more common on deep sand and the adaxially glabrous form more common on limestone-derived substrates.

The nomenclature and a brief description of *Pomaderris myrtilloides* follows. Only those features which differ substantially from *P. brevifolia* are indicated.

Pomaderris myrtilloides Fenzl in Endl. *et al.*, Enum. Pl. 22 (1837). TYPE: 'Ora orientalis, Ferd. Bauer'; HOLOTYPE: W.

Pomaderris stenopetala F.Muell., Fragm. 3: 69 (1862). TYPE: Pt Henry, Oldfield.; SYNTYPES & ISOSYNTYPES: K (2 sheets); MEL (2 sheets).

Pomaderris myrtilloides var. *major* Benth., Fl. Austral. 1: 419 (1863). SYNTYPES & ISOSYNTYPES as above.

Many-branched shrub, from 0.3–2 m high. *Stipules* narrowly triangular to subulate, 1–4 mm long. *Leaves* shortly petiolate, lamina obovate, elliptic or cuneate, 10–26 mm long, 7–15 mm wide; upper surface smooth and glabrous, or with a line of short hairs along the impressed midvein, or entirely covered by a mat of minute stellate hairs; margins plane, not differentiated on abaxial surface. *Inflorescence* 1.5–3.5 cm diam.; pedicels 3–8 mm long. *Flowers* cream to pale pink; sepals 2–3 mm long; petals narrowly lanceolate to oblanceolate, 1.3–2 mm long, 0.2–0.5 mm wide, glabrous or more commonly sparsely to densely silky pubescent abaxially. *Anthers* 0.5–0.8 mm long. *Style* 1–1.5 mm long, 3-lobed apically, the lobes to 0.3 mm long. *Capsule* obovoid, 4–4.5 mm long, exserted for about 2/3 of its length from the level of insertion of the sepals, 5-angled in the lower part; sepals deciduous in fruit. *Seed* flattened oblong-ovoid *c.* 2.5 mm long with a short basal aril.

ACKNOWLEDGEMENTS

I am grateful to Barbara Rye of PERTH for sharing her comments and notes on Western Australian *Pomaderris* species, to Roger Spencer and Mark Lee of the Royal Botanic Gardens, Melbourne, for their cooperation while on a collecting trip in south-west Western Australia, to Western Mining Pty Ltd for funding the trip, and to Mali Moir who prepared the accompanying illustration.

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Manuscript accepted 18 May 1993

SENECIO PSILOCARPUS (ASTERACEAE), A NEW SPECIES OF ERECHTHITOID *SENECIO* FROM WESTERN VICTORIA AND SOUTH-EASTERN SOUTH AUSTRALIA

R. O. Belcher[1] & D. E. Albrecht[2]

ABSTRACT

Belcher, R.O. & Albrecht, D.E. *Senecio psilocarpus* (Asteraceae), a new species of erechthitoid *Senecio* from western Victoria and south-eastern South Australia. **Muelleria 8(2): 113–117 (1994).** — A new erechthitoid species, *Senecio psilocarpus*, from western Victoria and south-eastern South Australia is described and illustrated with notes on distribution, conservation status, habitat and relationship to *S. squarrosus* A. Rich.

TAXONOMY

Senecio psilocarpus Belcher & Albr. *sp. nov.*

Senecio squarroso A.Rich similis. A *Senecio squarroso* foliis utrinque glabratis vel sparse hispidulis ad marginem nec subter arachnoideis nec insuper breviter hispidulis, bracteolis calyculorum dorsalibus glabratis non arachnoideis, cypselis glabris rubellis nitidis non piliferis nigris differt.

Holotypus: Victoria — SW edge of bushland reserve W of Mumbannar along Princes Highway, 37°54′12″S, 141°07′32″E, 13 Mar. 1992, *D. Frood 1/92* (MEL 2012639).

Perennial almost glabrous herbs with remnants of multiple erect stems from successive years, mostly unbranched below inflorescences, to 80 cm tall, often clonal in habit from laterally spreading rhizomes and rooting stem bases. *Leaves* alternate, simple, glabrous or occasionally sparsely hispid along margin, oblanceolate or the uppermost sometimes lanceolate, to 12 cm long and 13 mm wide, reducing in length and width towards inflorescence, acute to briefly acuminate, remotely dentate or denticulate; lower leaves subpetiolate; mid-cauline and upper leaves semiamplexicaul, auriculate, auricles lobed to rather coarsely toothed. *Inflorescence* suberect, with 2–20(–34) capitula, initial internodes of the lowest branches unusually long, to 20 cm or more. *Bracts* of the inflorescence alternate, long linear-lanceolate, auriculate, auricles coarsely multi-toothed; peduncles (0.4–) 1–5 cm long, only slightly divergent; peduncular bracteoles few (1–3), usually inserted above the mid-point of the peduncle; calycular bracteoles 6–10, all within the distal 2 mm of the peduncle and mostly not on the receptacle until the apex of the peduncle greatly dilates at post-fructescence, narrowly linear-lanceolate, to 3mm long and 0.5 mm broad, appressed or the apices free, backs glabrous, margins ciliolate. *Capitula* cylindrical; involucres of 12–16(–21) narrowly triangular flat phyllaries, (4.5–)5–6.5(–7.5) mm long with apices more or less recurved as in *S. squarrosus*. *Marginal and submarginal pistillate florets c.* 27–40, without staminodes, very slenderly filiform, 5–6(–6.8) mm long, 0.2 mm in diameter above short slightly swollen incrassate base, apex scarcely dilated, teeth (3–)4, 0.1–0.35 (–0.4) mm long and 0.1–0.2 mm broad, tips scarcely thickened. *Disk florets* perfect, only slightly larger, to 6(–7) mm long and 0.2–0.3 mm in diameter, apices slightly dilated, scarcely infundibuliform, teeth 0.25–0.3 mm long, 0.15–0.2 mm broad; outer (submarginal) disk florets *c.* 7–18, 3–4-fid

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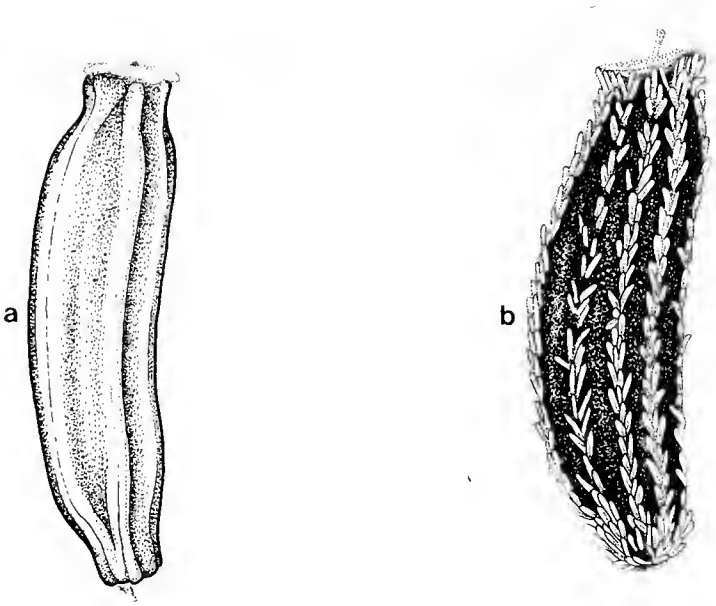

Fig. 1. Comparison of cypselas of *Senecio psilocarpus* and *S. squarrosus*. a — *S. psilocarpus* × 30, from Holotype. b — *S. squarrosus* × 30, from *A.C. Beauglehole 62419* (MEL 616098).

with 4 adnate stamens, rarely with 4 or fewer free stamens; inner disk florets *c.* 5–11, 4–5-fid with 4–5 adnate stamens; all filaments balusteriform. *Cypselas* 1.8–2.5 mm long, 0.5–0.6 mm diameter, cylindrical, often curved, both base and apex slightly constricted, entirely glabrous, shiny brown to reddish-brown (*cf.* Fig. 1); pappus hairs slender, apical teeth two and divergent, rarely retrorse. (Fig. 1)

Flowering Period

November to March.

Fruiting Period

January to April.

Etymology

The specific epithet is derived from the Greek *psilo-*, bald, and *-carpus*, fruit, descriptive of the characteristic glabrous cypsela. Although this character state is not unique in the genus it is important for distinguishing *S. psilocarpus* from allied species.

Specimens Examined

Victoria — **Wannon Region**: Lower Glenelg River area, Red Gum Swamp S of Greenwald, Jan. 1969, *A.C.Beauglehole 37882* (MEL 540875, AD 97907230, CANB 297861, NSW *s.n.*); 100 m E of Dartmoor-Casterton Road, opposite Wild Horse Flat, 2.6 km S of Kill-Mac Road, 15 Feb. 1992, *D.Frood 2/92* (MEL 2012640); 16.5 km SSW of Casterton, 28 Mar. 1984, *A.C.Beauglehole 76570* (MEL 1580010). **Midlands Region**: Lal Lal, between roadside and railway line, just N of township, 7 Feb. 1992, *R.Thomas s.n.* (MEL 2012638, EMC *s.n.*). **Victorian Volcanic Plain Region**: Rail Reserve, Herne's Swamp, Wallan East, to near S of 45 km rail post, 14 Nov. 1989, *D.Frood 75/89* (MEL 2012641). **Otway Plain Region**: *c.* 18 km SW of Colac P.O., E of junction of East West Road and Rankin Lane, 1 Nov. 1974, *A.C.Beauglehole 49539* (MEL 539523).

South Australia — **South-eastern Region**: Honans Scrub, 19 Nov. 1989, *R.Bates 21583* (AD 98948219); Honans Scrub, 26 Apr. 1987, *R.Bates 9866* (AD *s.n.*); Piccaninnie Ponds, Nov. 1970, *K.Alcock 2* (AD 97545345).

Distribution and Conservation Status

The species is known from about ten sites scattered between Wallan (*c.* 45 km N of Melbourne) and Honans Scrub in south-eastern South Australia (Fig. 2).

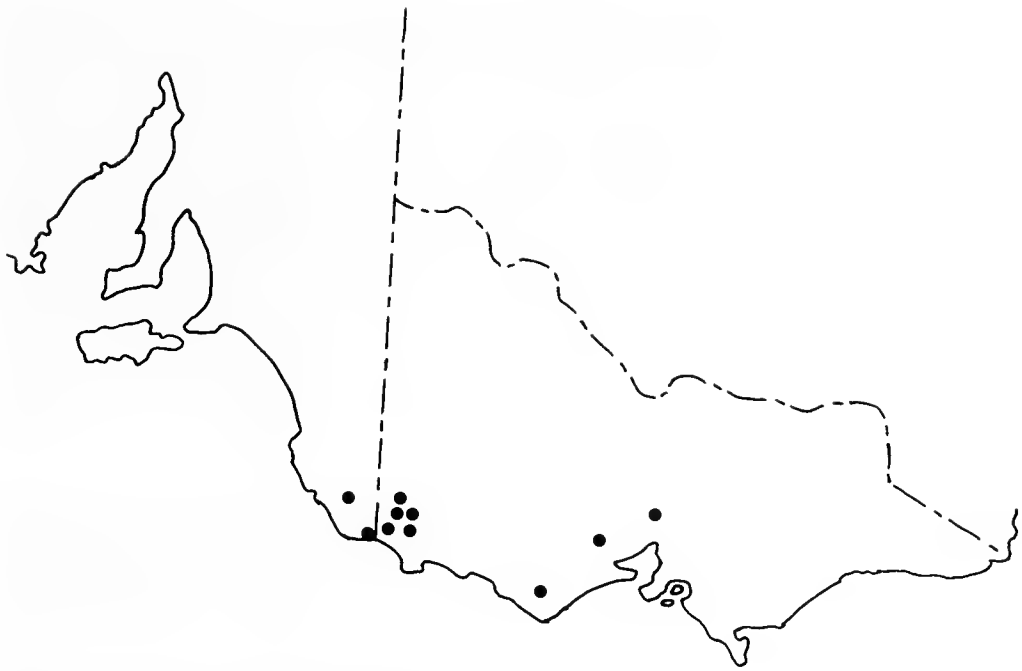

Fig. 2. Map showing distribution of *Senecio psilocarpus*.

Doubtless it was more common in western Victoria prior to widespread vegetation clearance.

Although detailed information is not available for all extant populations, indications are that populations occur over a very limited area, often occupying less than 1 acre (*c.* 0.4 ha). Aerial stems are often locally common to abundant, but assessment of population size on the basis of the number of aerial stems may be misleading as individual plants tend to be clonal, each producing several to many aerial stems from 'rhizomes' spreading laterally for as much as *c.* 0.5m from the origin.

Senecio psilocarpus is poorly reserved in Victoria as only one population occurs within a gazetted biological reserve. This population, at Red Gum (Cordover) Swamp in the Lower Glenelg National Park, is important in terms of the conservation of the species because it appears to be more variable than other populations. However, it does not encompass the entire range of morphological variation observed in the species. Other Victorian populations occur within rail reserves, bushland reserves, state forest or uncommitted public land where conservation of biological resources is not the primary objective. We see land status reclassification (to biological reserve status) and population monitoring, for as many as possible of the remaining sites, as important steps in ensuring the survival of the species.

Little is known about the conservation status of the South Australian populations, but it appears that the Piccaninnie Ponds population occurs within the Piccaninnie Ponds Conservation Park.

The Risk Code (*sensu* Briggs & Leigh, 1989) for *Senecio psilocarpus* is assessed as 3VCi.

Habitat

Senecio psilocarpus is restricted to high quality herb-rich wetlands on plains. During winter such sites can be inundated with up to 0.6 m or more of water, but almost dry in summer. A tree canopy is absent from most sites or rarely *Eucalyptus*

camaldulensis is the overstorey species in a woodland formation. The understorey is rich in grasses and sedges and miscellaneous aquatics.

A preliminary floristic classification of wetland vegetation in Victoria suggests that *Senecio psilocarpus* occurs in at least two wetland communities that are floristically, edaphically and geographically distinct (Frood pers. comm.). The basalt plain populations at Lal Lal and Wallan East grow on grey to black silty clay soils and occur in vegetation characterised by the presence of most of the following species: *Danthonia duttoniana, Craspedia paludicola, Glyceria australis, Helichrysum* aff. *rutidolepis, Eryngium vesiculosum, Agrostis avenacea* var. *perennis* and *Stellaria palustris*. Populations from south-western Victoria (and probably also south-eastern South Australia) grow on peatier soils in vegetation characterised by the presence of most of the following species: *Hydrocotyle muscosa, Asperula subsimplex, Isolepis fluitans* and *Agrostis avenacea* var. *perennis*. Species commonly occurring in both communities include *Poa labillardieri, Baumea arthrophylla* and *Eleocharis acuta*.

Discussion

Senecio psilocarpus most closely resembles *S. squarrosus* and until recently has been included within that species. Our conviction that it constitutes a new taxon distinct from *S. squarrosus* is a view shared by several active Victorian ecologists who independently arrived at the same conclusion. The entity recognised as *Senecio* sp. aff. *squarrosus* (South West Swamps) in Ross (1993) is *S. psilocarpus*.

Senecio psilocarpus and *S. squarrosus* are readily separated on fruit colour and fruit indumentum, the former having shiny reddish-brown to brown entirely glabrous cypselas, the latter having very dark brown to black puberulent cypselas. *S. psilocarpus* appears to form colonial masses with the ultimate erect flowering stems arising from underground 'rhizomes' and from decumbent stem bases that root at the nodes. This growth habit has not been observed in *S. squarrosus*. There are also several partially overlapping characters that are often useful for distinguishing the two species. *Senecio psilocarpus* has 12–16 phyllaries (rarely to 21 in the Red Gum Swamp population) that are 4.5–6.5 mm long (rarely to 7.5 mm long in the Red Gum Swamp population), whereas *S. squarrosus* has 16–21 phyllaries (rarely as few as 13–14) that are 7–8.5 (–9.5) mm long (rarely as short as 6.5 mm long). The leaves of *S. psilocarpus* are glabrate or occasionally inconspicuously hispid on the upper surface near the margin (*cf.* typically shortly hispid above and arachnoid below in *S. squarrosus*, but occasionally glabrate). The backs of the calycular bracteoles, phyllary bases and receptacle are also glabrate in *S. psilocarpus* (*cf.* arachnoid or occasionally glabrate in *S. squarrosus*). On the basis of few samples, bruised leaves of *S. psilocarpus* have a strong carrot-like smell, whereas those of *S. squarrosus* have a tomato-like smell. Further sampling is required to establish the usefulness of this character. *S. psilocarpus* is exclusively a plant of wetlands, whereas *S. squarrosus* has a broader ecological amplitude, occurring in dry to wet conditions.

As the majority of specimens of *Senecio psilocarpus* have a lower phyllary number than *S. squarrosus*, plants may uneasily key to *S. tenuiflorus* using Lawrence & Belcher (1986), but *S. tenuiflorus*, like *S. squarrosus*, has minutely hairy cypselas and a non-clonal habit, and has leaves with a moderate to dense indumentum on the underside.

ACKNOWLEDGEMENTS

We thank the curators of herbaria cited (AD, CANB, MEL, NSW) for access to their collections and for the use of loans. We are particularly grateful to Doug Frood (Department of Conservation and Natural Resources) for detailed information on the habitat of *Senecio psilocarpus* and for his collections; to Margaret Lawrence for her initial confirmation of the distinctiveness of the new

taxon; to Roger Thomas for collections; to Neville Scarlett and Kath Alcock for information, and to Mali Moir for preparing Fig. 1.

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Manuscript submitted 30 June 1993.

A NEW SPECIES OF *PULTENAEA* (FABACEAE) FROM SOUTH-EAST AUSTRALIA

M. G. Corrick*

ABSTRACT

Corrick, M.G. A new species of *Pultenaea* (Fabaceae) from south-east Australia. **Muelleria 8(2): 119–122 (1994).** — *Pultenaea lapidosa* Corrick *sp. nov.* from north-east Victoria and central tablelands of New South Wales is described as new.

PULTENAEA LAPIDOSA

Pultenaea lapidosa Corrick *sp. nov.*

Pultenaeae subspicatae Benth. et *Pultenaeae aristatae* Sieber *ex* DC. similis, a priore foliis acuminibus longis infirmis terminatibus, a posteriore bracteolis trilobatis late differt.

Typus: Victoria, Eastern Highlands, 16 km ENE Omeo township on Old Track, NE of its junction with Scrubby Creek Track, 23 Nov. 1986, *M.G.Corrick 10029* (Holotypus: MEL; Isotypi: PERTH, CBG, NSW, K, BRI, HO.)

Low growing erect to decumbent shrub, 0.3–0.6 m high (rarely to 1 m high), young stems with sparse, pale hairs, old stems glabrous but retaining prominent stipular scars. *Leaves* alternate, petiole 1–1.5 mm long, appressed to stem, lamina spreading, linear to narrow elliptic, 6–16 mm long, 0.5–2 mm wide terminating in a long, fragile recurved tip, margin incurved, surfaces usually discolorous when dry, lower surface with sparse, long, tubercle-based hairs and midrib slightly raised, upper surface glabrous and midrib inconspicuous. *Stipules* dark brown to black, 4–5 mm long, joined behind the petiole and with long, slender recurved tip and very torn margin. *Inflorescence* a condensed, terminal, leafy raceme of 10–25 flowers, each flower subtended by a slightly reduced leaf with enlarged stipules. *Bracts* absent. *Calyx* 10–11 mm long including pedicel of 1 mm, tube glabrous, lobes acuminate 5–6 mm long narrowing abruptly into long slender tips and covered with long, pale hairs, upper two lobes very slightly broader and less deeply divided than lower three. *Bracteoles* brown, 5–6 mm long, attached to pedicel immediately below calyx tube, trifid due to the presence of bracteolar stipules, central lobe covered with long pale hairs and extending one-third to half way along length of calyx lobes, stipular lobes glabrous and scarious, all lobes terminating in fine, hair-like tips. *Standard* 11–12 mm long and 9–10 mm wide, deep orange with a paler central patch at the base surrounded by dark red lines, reverse side dark orange-red. *Wings* 10–11 mm long × 2.5–3 mm wide, deep orange. *Keel* 10–11 mm long × 3.5 mm wide, deep orange-red with dark brick-red shading along the abaxial suture. (In dried specimens the whole keel appears very dark brick-red.) *Ovary* sessile, 2 ovulate, 1.5 mm long. *Style* slender and gently curved, 7–8 mm long, summit of ovary surrounded by a tuft of pale, soft hairs otherwise glabrous. *Pod* ovate, 6–7 mm long, not protruding beyond calyx lobes, with a few long, fine hairs along adaxial suture at base of style. *Seed* obliquely ovoid 2.5–3 mm long × 2 mm wide, dark brown with an intricately lobed aril. (Fig. 1)

Etymology

The specific name is taken from the Latin, *lapidus*, referring to the favoured habitat on rocky slopes.

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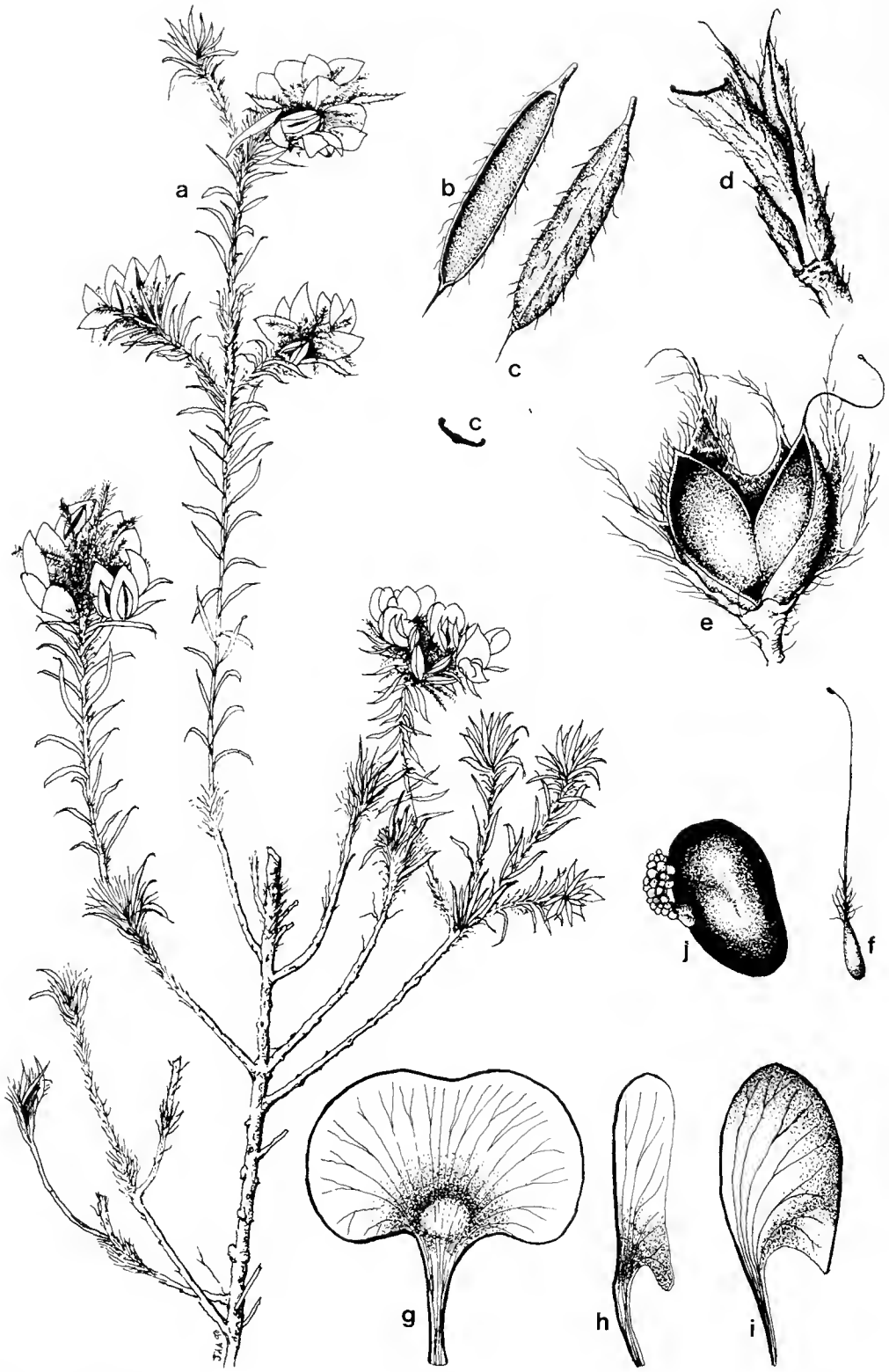

Fig. 1. *Pultenaea lapidosa*. a — flowering twig × 1. b — leaf, upper surface × 4. c. — leaf, lower surface and transverse section × 4. d — petiole section showing stipules × 8. e — calyx with empty pod × 4. f — gynoecium × 4. g — standard × 4. h — wing petal × 4. i — keel petal × 4. j — seed, side view × 8. (a-i from *M.G.Corrick 10029*; j from *J.Studwick 776*)

Other Specimens Examined (total number examined 36)

Victoria — 16 km ENE Omeo, 11 Dec. 1984, *G.W.Carr 10268* (CBG,MEL); Myrtleford Lookout, 29 Nov. 1989, *W.S.Wilson s.n.* (MEL 1579965).

New South Wales — Hill End, south side of Bald Hill, 31 July 1911, *R.H.Cambage 2761* (NSW); Mt Canobolas, 10 miles [16 km] SW of Orange, 8 Nov. 1960, *E.F.Constable s.n.* (NSW 52794); Eastern side of Warrumba Range, 12 Oct. 1973, *R.Coveny 5245* (NSW); 9 km W of Bell, 6 Nov. 1963, *R. Coveny 5323* (NSW); Mudgee Road, southern outskirts of Ilford, 14 Oct. 1978, *Mrs U.Johnson s.n.* (NSW 257617); Barton Nature Reserve, near Orange, 1974, *C.H.Pratten 16* (NSW); Napoleon's Reef, near Wallerawang, 4 Oct 1969, *J.H.Willis s.n.* (MEL 711446).

Distribution

Pultenaea lapidosa is known from two areas in Victoria, the type locality north-east of Omeo where two small, slightly disjunct populations have been seen, and the other near Beechworth. It has also been recorded over an area of the central tablelands of New South Wales roughly bounded by Grenfell, Ilford and Lithgow with most collections coming from round Bathurst and Orange. (Fig. 2)

Habitat

In Victoria *P. lapidosa* is confined to dry sclerophyll woodland on stony slopes with a sparse, low, shrub understorey. I have not seen the plant in the field in New South Wales but collectors notes (when present) confirm that most habitats there are similar.

Discussion

Pultenaea lapidosa is included in Ross (1993) as *P.* sp. aff. *subspicata* Benth. and in Weston (1991) as *P.* sp. F. It most closely resembles *P. subspicata*, which

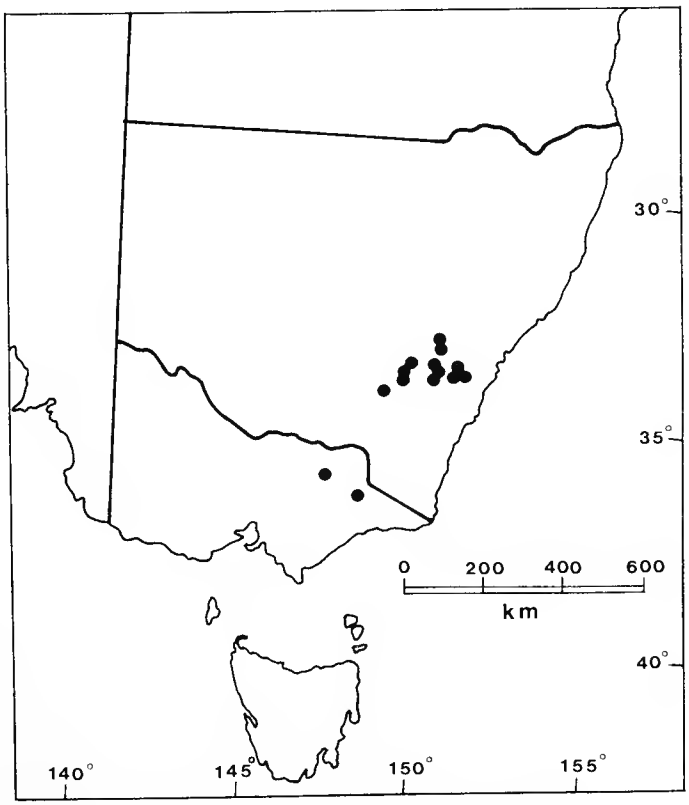

Fig. 2. Distribution of *Pultenaea lapidosa*.

differs in having smaller flowers and shorter obtuse leaves which lack the long, hair-like tip of *P. lapidosa*. *P. subspicata* also has shorter stipules more closely appressed to the stem and which lack the long, recurved tips of *P. lapidosa*.

Some collcctions have been annotated in the past as *P.* sp. aff. *aristata* Sieber *ex* DC. but the latter differs in having linear bracteoles without stipules and scabrid leaves with stellate hairs on young growth; simple hairs, when present are confined to the leaf margin.

P. lapidosa is a rare species. The two known localities in Victoria are on unreserved Crown Land; the population near Myrtleford adjoins a pine plantation and will need careful management to protect it from forestry operations.

In New South Wales *P. lapidosa* was first collected from Bald Hill near Hill End in 1911. The most recent collection sighted was from near Ilford in 1978. Several collections have come from Bathurst and Orange district, including one from Barton Nature Reserve suggesting its existence in at least one secured area.

ACKNOWLEDGEMENTS

I am most grateful to Jim Ross and staff at MEL for assistance and access to the collections and facilities at MEL, to Neville Walsh for the Latin diagnosis, to the Curators of CBG and NSW for loan of specimens and to John Armstrong for executing the accompanying illustration.

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LOMANDRA OREOPHILA (LOMANDRACEAE) — A NEW SPECIES IN THE *L. MICRANTHA* GROUP

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ABSTRACT

Conn, Barry J. & Quirico, Anna-Louise. *Lomandra oreophila* (Lomandraceae) — a new species in the *L. micrantha* group. **Muelleria 8(2): 123–132 (1994)**. — An evaluation of the morphological variation within *Lomandra micrantha* revealed that the taxon represented by *Lomandra micrantha* var. *sororia* (F.Muell. *ex* Benth.) H. Williamson should be regarded as a distinct species. Since the epithet '*sororia*' is already occupied (*L. sororia* (F. Muell. *ex* Benth.) Ewart), the new name *L. oreophila* Conn & Quirico is here provided. Although infraspecific variation within *L. micrantha* suggested that redefinition of the subspecific taxa may be necessary, the morphological characters used here were not sufficiently robust to clarify completely the infraspecific variation of this species.

INTRODUCTION

During the preparation an account, by one of us (BJC), of the genus *Lomandra* for the *Flora of Victoria* project (Conn, *in press*), it became evident that the current circumscription of *L. micrantha* (Everett 1986, Lee & Macfarlane 1986) did not deal adequately with the infraspecific variation. In particular, *L. micrantha* subsp. *teretifolia* in Victoria was difficult to distinguish from *L. micrantha* subsp. *micrantha*, and the inclusion of *L. micrantha* var. *sororia* (F.Muell. *ex* Benth.) H. Williamson under synonymy with *L. micrantha* subsp. *tuberculata* Everett appeared to be incorrect. A detailed multivariate morphometric analysis was used to determine: (1) the status of the currently recognised infraspecific taxa of *L. micrantha*, and (2) the status of *L. micrantha* var. *sororia*.

METHODS AND PRESENTATION

These investigations have been based on herbarium material of *Lomandra micrantha s. lat.* as held at MEL, NSW and PERTH (abbreviations as designated in Holmgren *et al.* 1990) and limited field studies. As a comparison, it would have been useful to have included *L. drummondii* in the analyses, but insufficient material was available of this taxon. One hundred and thirty collections were used for the numerical analyses.

The distribution summary and the citation of specimens examined for *L. oreophila* are grouped according to Conn (1992 & 1993). Inflorescence terminology follows Briggs & Johnson (1979).

CHARACTERS

The morphological features used in the analysis of *L. micrantha* (*s. lat.*) are listed below, together with the alphabetic code used in figure 2. These features include those used by Everett (1986) and Lee & Macfarlane (1986).

1. Leaf shape (see note below)(LS)
2. Leaf length (mm)(LL)
3. Leaf width (mm)(LW)
4. Leaf base length (Sheath)(mm)(see note below)(LBL)
5. Leaf twist (present or absent)(LT)

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6. Inflorescence axis surface (scape)(see note below)(BU)
7. Inflorescence axis surface projections (see note below)(IB)
8. Inflorescence length (scape plus rachis)(mm)(IL)
9. Inflorescence length to leaf length ratio(ILL)
10. Scape (exposed or hidden by leaf-bases)(S)
11. Tepal length (mm)(TW)

Character 1 (leaf shape) is a 4-state variable, characters 5 (leaf twist), 6 (inflorescence axis surface) and 10 (scape) are 2-state variables, and character 7 (inflorescence axis surface projections) is a 3-state variable. All other characters (characters 2–4, 8, 9 & 11) were absolute measurements (averaged) on a continuous scale, and these are quantitative variables. It is assumed that these quantitative characters are generally self-explanatory. However, some of these, together with the 2-, 3- and 4-state characters are further discussed below.

Leaf shape: this character describes the cross-sectional shape of the leaves. It was scored as (0) flat, (1) plano-convex, (2) concavo-convex, or (3) semi-terete or terete. Flat leaves had both the abaxial and adaxial surfaces flat; plano-convex leaves are semi-circular (in cross-section), with the abaxial surface convexly curved (in cross-section) and the adaxial surface ± flat; concavo-convex leaves have the abaxial surface convex (in cross-section) and the adaxial surface concave (in cross-section). Semi-terete or terete leaves have been treated as one category because of the difficulty of consistently distinguishing between these two leaf shapes. Although most leaves can be classified as one of the above leaf shapes, an occasional leaf may be intermediate between some of these categories. Therefore, the cross-sectional shape of three to five leaves was recorded and the most frequent shape was used in the analysis.

Leaf base length (Sheath)(mm): since the sheath is frequently torn and/or shredded, it is frequently difficult to measure. Therefore, although this character is probably of taxonomic value, its measurement was not always made with confidence. This character is usually easier to measure on living material than on herbarium specimens.

Leaf twist: this character describes the presence or absence of a longitudinal twist in the leaves; (0) not twisted, (1) twisted. Similar to leaf shape (see above), occasional leaves may not be twisted on plants that are otherwise characterised by leaves that are twisted. Therefore, the most common character-state was used in the analysis.

Scape: the scape is either enclosed by the basal leaf sheath and hidden, or it extends beyond the leaf sheath and is clearly visible. It was scored as (0) scape exposed, (1) scape hidden.

Inflorescence axis surface (scape)(mm): the surface of the scape is either smooth or papillose to warty (tuberculate)(refer next character, below). The length of the surface projections was measured (mm). When the surface was smooth it was recorded as 0 mm long. This character was treated as a continuous quantitative character.

Inflorescence axis surface projections: this character descibes the type of surface projections on the inflorescence axis (scape). It is scored as (0) projections absent and so axis smooth, (1) papillae present, (2) tubercles present.

DATA ANALYSIS

Analyses were carried out using the PATN pattern analysis package (Belbin 1987, 1989). The data were standardised by range. Gower metric association measures between individual collections were submitted to ordination and clus-

tering techniques to assist in the interpretation of morphological patterns within the data. Ordination by Multidimensional Scaling (MDS) was used in this study. The linear correlation between each of the morphological characters and the axes in the MDS ordination space was investigated using principal axis correlation. Correlation coefficients (r) were calculated for each character and these quantified the significance of the association. The direction of the correlation indicated the usefulness of the characters to differentiate the various taxa in the analysis. Clustering of the morphometric data using the fusion criterion of unweighted pair-group method using arithmetic averages (UPGMA) was carried out for comparison with the ordination results. Cramer association values (V) were calculated for each of the characters. As for the correlation coefficients, the Cramer values also quantified the usefulness of each character. The rationale for the use of these multivariate techniques is provided by Belbin (1987, 1989) and Crisp (1991).

RESULTS

Morphological variation within *Lomandra micrantha* (*s. lat.*).

The nonmetric MDS ordination of *Lomandra micrantha* in two dimensions provides a useful simplification of the data with five groups discernible. The scatter diagram (eigenvector 1 versus eigenvector 2) of the MDS analysis, with the overall stress reduced to 0.1611, is presented in Figure 1. The five groups distinguished by the MDS analysis include: *L. micrantha* subsp. *micrantha s. str.* (here referred to as '*micrantha 1*'), *L. micrantha* subsp. *micrantha* ('*micrantha 2*'), *L. micrantha* subsp. *teretifolia*, *L. micrantha* subsp. *tuberculata* and *L. oreophila* (formerly *L. micrantha* var. *sororia*). The vectors showing the direction of maximum linear correlation between each of the characters and the MDS ordination space are illustrated in Figure 2. The cluster analysis of the specimens (Fig. 3 — simplified by truncation at the five-group level) also supports the groupings derived from the MDS analysis.

The morphological variation of the specimens within *L. micrantha* (*s. str.* — without *L. oreophila*) was further investigated using clustering and ordination analyses as described above. Male and female plants were also analysed separately, particularly because male inflorescences are usually longer than female inflorescences. Although not presented here, these analyses supported the groupings obtained from the full data (refer Figs 1 & 3) without offering further infraspecific resolution. The '*micrantha 2*' subgroup was recognised in all analyses.

TAXONOMIC CONCLUSIONS

Bentham suggested that *Xerotes micrantha* var. *sororia* F. Muell. *ex* Benth. (*Lomandra micrantha* var. *sororia* (F. Muell. *ex* Benth.) H. Williamson) was 'perhaps a distinct species' from *X. micrantha s. str.* (Bentham 1878, p. 103). The collections representing *Lomandra micrantha* var. *sororia* can be distinguished readily from the remainder of *L. micrantha* (Figs 1 & 3), and are sufficiently distinct to be recognised as a species (*L. oreophila*) separate from *L. micrantha* (*s. str.*). The reduction of this taxon by Everett (1986) to synonymy under *L. micrantha* subsp. *tuberculata* is not supported by our work (refer Figs 1 & 3). Based upon the characters used, *L. oreophila* and *L. micrantha* subsp. *tuberculata* are the most dissimilar taxa in this study. Although not included in this analysis, the affinities of *L. oreophila* are more likely to be with *L. drummondii* (refer 'Relationships' under *L. oreophila*). *Lomandra oreophila* is characterised by the following features: the leaves are flat (leaf shape variable: $r = 0.655$; $V = 0.843$), whereas the leaves of *L. micrantha* vary from terete to concavo-convex; the leaves are generally wider than *L. micrantha* (leaf width: $r = 0.738$; $V = 0.864$); the leaves are not twisted, whereas those of *L. micrantha* are, often strongly so (leaf twist: $r = 0.917$; $V = 0.949$); the scape is tuberculate (a character state shared with

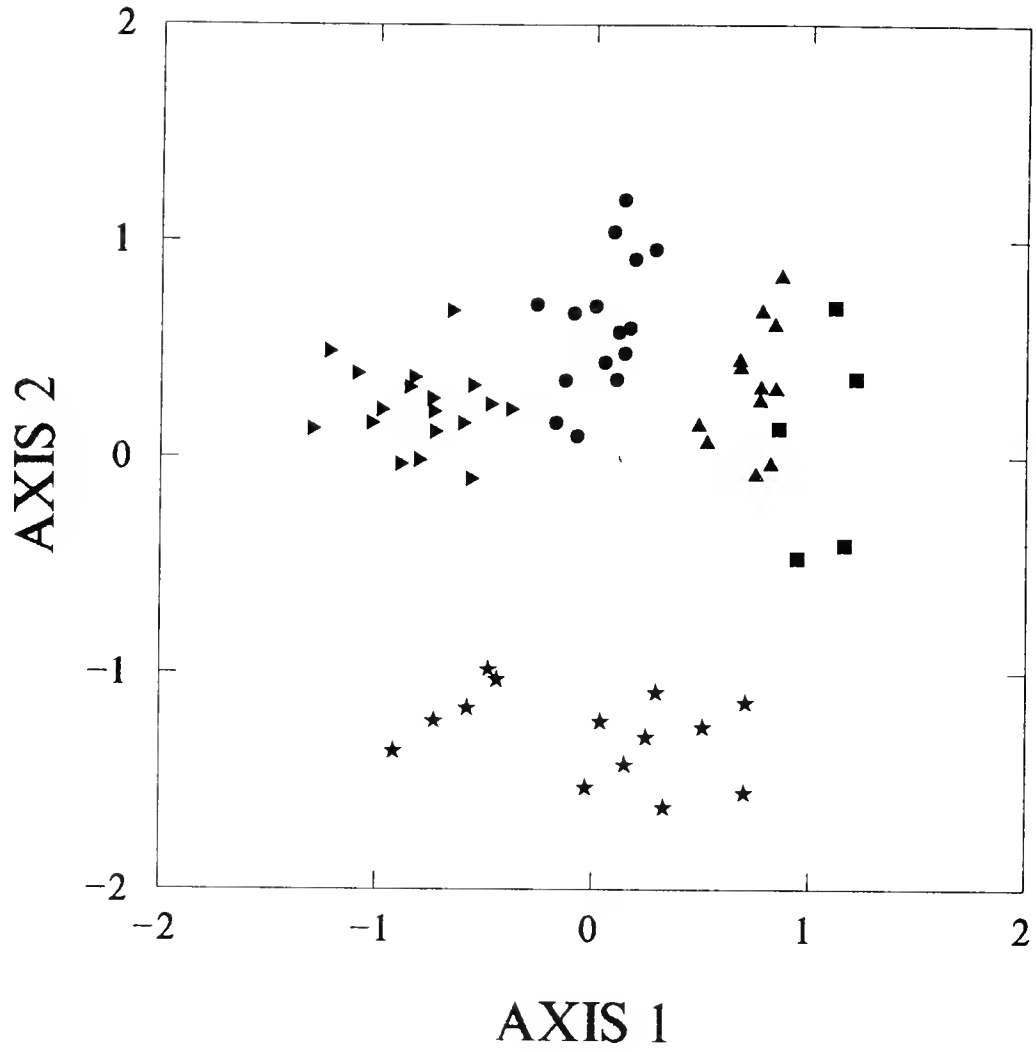

Fig. 1. Morphometric analysis of *Lomandra micrantha s. lat.*: scatter plot of individuals on the first two eigenvectors from a non-metric Multidimensional Scaling (MDS) ordination derived from Gower metric association matrix. Symbols: *Lomandra micrantha* subsp. *micrantha* ('*micrantha 1*') (▲); *L. micrantha* subsp. *micrantha* ('*micrantha 2*') (●); *L. micrantha* subsp. *teretifolia* (■); *L. micrantha* subsp. *tuberculata* (►); *L. oreophila* (★).

L. micrantha subsp. *tuberculata*), whereas the other taxa are either smooth (lacking projections) or papillate (inflorescence surface projections: r = 0.858; $V = 0.880$); and the scape is usually hidden by the bases of the leaves (a character state shared with *L. micrantha* subsp. *micrantha* ('*micrantha 1*') and subsp. *teretifolia*), whereas it is usually extended beyond the leaf bases in *L. micrantha* subsp. *micrantha* ('*micrantha 2*') and subsp. *tuberculata* (scape: r = 0.879; $V = 0.890$).

The investigation of the morphological variation within *L. micrantha* (excluding *L. oreophila*) revealed two main groups: (1) '*tuberculata*', and (2) '*teretifolia/micrantha*'. The '*tuberculata*' group is equivalent to *L. micrantha* subsp. *tuberculata* (excluding *L. oreophila*). It is characterised by the following features: scapes tuberculate and scape exposed (refer discussion of *L. oreophila* above); and inflorescence axis with projections usually larger than for the other taxa (except those of *L. oreophila* become as large)(r = 0.789; $V = 0.850$).

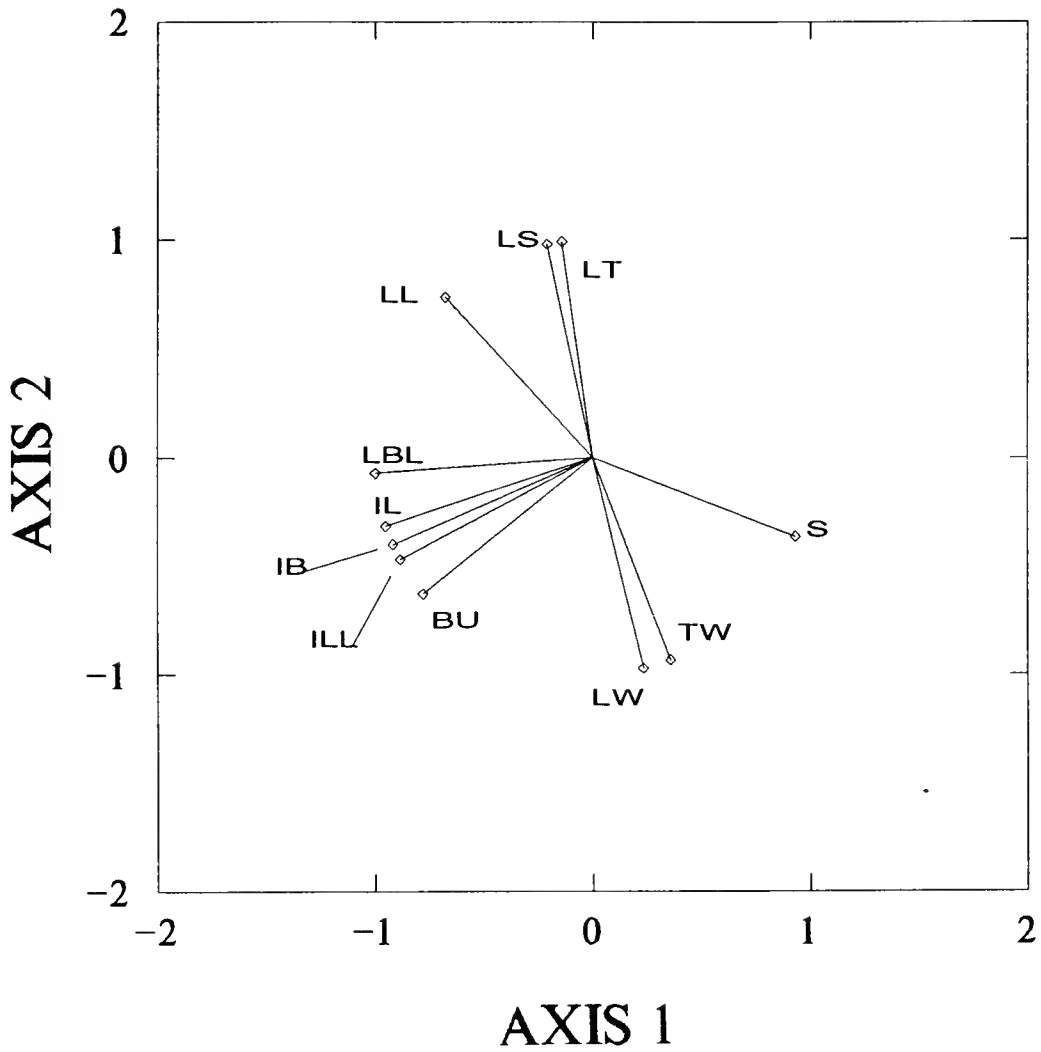

Fig. 2. Vectors showing direction of maximum linear correlation between each of the eleven characters and the MDS ordination space. Character name abbreviations are those listed in the 'Methods & presentation' section.

Our study suggests that the '*teretifolia/micrantha*' group consists of two subgroups: one comprising '*teretifolia*' and '*micrantha 1*'; and the other '*micrantha 2*'. However, we believe that it would be premature to recognise these subgroups formally as defined by the morphological characters used in this study. It is believed that the interpretation of some characters may have blurred the distinction between '*teretifolia*' and '*micrantha 1*'. For example, although the semi-terete leaves of '*micrantha 1*' are morphologically indistinguishable from those of '*teretifolia*', a preliminary investigation of the leaf anatomy of *L. micrantha* (*s. lat.*) suggests that they are not homologous. It appears that subsp. *teretifolia* (as defined here) is probably not closely related to *L. micrantha* (*s. str.*).

The '*teretifolia*' part of the first subgroup is equivalent to *L. micrantha* subsp. *teretifolia* (as defined in this paper). It is characterised by having longer and broader semi-terete to terete leaves (leaf length: $r = 0.086$; $V = 0.541$; leaf width: $r = 0.738$; $V = 0.864$). The inflorescence length to leaf length ratio for subsp. *teretifolia* tends to be smaller than for '*micrantha 1*' and '*micrantha 2*' ($r = 0.749$;

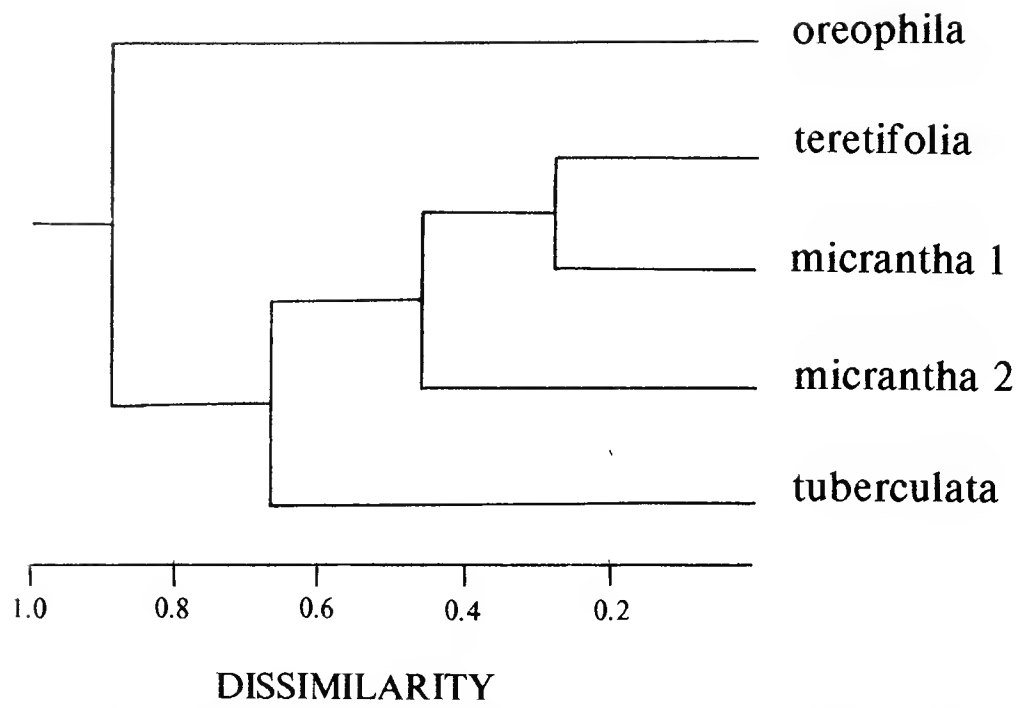

Fig. 3. Cluster analysis (UPGMA) of morphometric variation in *Lomandra micrantha s. lat.*, simplified by truncation at the five-group level.

$V = 0.636$). That is, the inflorescence of subsp. *teretifolia* tends to be much shorter than leaves.

The recognition of two '*micrantha*' groups was unexpected, especially since the analyses suggest that '*micrantha 1*' is more similar to subsp. *teretifolia* than to '*micrantha 2*'. The differences between these two '*micrantha*' groups appear to be slight, but the additive effect results in the analyses recognizing them as distinct. When compared to the '*micrantha 2*' group, the '*micrantha 1*' group (= *L. micrantha* subsp. *micrantha*) has slightly shorter, narrower leaves, with slightly shorter leaf bases, and slightly shorter inflorescences. The scape is generally hidden in '*micrantha 1*' and exposed in '*micrantha 2*'. The '*micrantha 2*' group consists of Western Australian collections, plus one Victorian collection (*Willis s.n.*, MEL 20869a & b) that have been identified by some botanists as belonging either to *L. micrantha* subsp. *micrantha* or to subsp. *teretifolia*. Further work is required to evaluate the status of the '*micrantha 2*' group.

The broad subspecific circumscription generally applied to subsp. *teretifolia* is not supported by this study. We conclude that much of the material currently identified as subsp. *teretifolia* is better placed in subsp. *micrantha* (both the '*micrantha 1*' and '*micrantha 2*' groups). Subspecies *teretifolia* does not occur in Victoria, but is restricted to Western Australia. The taxonomic status of *Lomandra micrantha* subsp. *micrantha* ('*micrantha 1*' and '*micrantha 2*') is unclear, and further study is required to clarify the '*teretifolia/micrantha*' group.

Although, the morphological characters used were not sufficiently 'robust' to clarify completely the taxonomic status of the taxa in *L. micrantha* (*s. lat.*), several conclusions are possible. (1) *Lomandra oreophila* is a species distinct from *L. micrantha* (2) the currently recognised subspecies of *L. micrantha* are supported, except that (a) subsp. *tuberculata* should be redefined to exclude the taxon here treated as *L. oreophila*; (b) a narrower circumscription of subsp. *teretifolia* is necessary as the current definition includes part of subsp. *micrantha s. str.* (here

referred to as '*micrantha 1*') and part of the '*micrantha 2*' group; and (c) an additional subgroup (*viz.* '*micrantha 2*' group) suggests that redefinition of the subspecific taxa of *L. micrantha* may be necessary.

CIRCUMSCRIPTION OF *LOMANDRA OREOPHILA*

Lomandra oreophila Conn & Quirico *nom. & stat. nov.*

Basionym: *Xerotes micrantha* var. *sororia* F. Muell. *ex* Benth., *Fl. Austral.* **7**: 103 (1878); *Lomandra micrantha* var. *sororia* (F. Muell. *ex* Benth.) H. Williamson, *Victorian Naturalist* **45**: 37 (1928). Lectotype **(here chosen)**: Victoria (East Gippsland), 'Xerotes laxa R. Br.' 'Mount Wellington, Gipps Land' [in Mueller's hand], *F. Mueller s.n.*, [Nov 1854] (K); Isolecto: 'Xerotes micrantha Endl. var. sororia' 'Mount Wellington, Gippsland' [on 'Phytologic Museum of Victoria' label, in Mueller's hand], *F. Mueller s.n.*, [Nov 1854] (K); probable Isolecto: 'In montibus subalpinis . . . prope montum Wellington' [in Mueller's hand], 'Gippsland alps, about 4000′ [feet] high', *F. Mueller s.n.*, Nov [18]54 (MEL 20866), 'Lower part of Mount Wellington, Gipps Land' [probably written by C. Wilhelmi], *F. Mueller s.n.*, [Nov 1854] (MEL 20867)(refer Typification).

Leaves stiff and erect, 250–500 mm long, (2.5–)3.3–4(–5.5) mm wide, glabrous, flat with margin usually ± incurved, or slightly concavo-convex (in cross-section), not twisted; margin with a conspicuous marginal zone; basal sheath with margin intact or occasionally slightly torn, 45–60 mm long; apex rounded to almost truncate, or with two lateral teeth (often caused by ageing of apex) (see Notes). *Inflorescence* (0.2–)0.3–0.5(–0.7) times as long as leaves with non-flowering axis (scape) hidden or exposed; axes conspicuously covered with tubercles 0.04–0.08 mm long. *Male and female inflorescences* similar; male inflorescences 14–30 cm long; female inflorescences 7–21 long. *Male flowers* with tepals 1.9–2.6 mm long; *female flowers* with tepals 3–4.5 mm long. *Fruit* ovoid, *c.* 3 mm diameter, pale brown. (Fig. 3)

Typification

Everett & Lee (determinavit slips) concluded that the type material of this species (*viz. Xerotes micrantha* var. *sororia* F. Muell. *ex* Benth.) was held at MEL and regarded MEL 20866 as the holotype and MEL 20867 the isotype. This view was followed by Lee and Macfarlane (1986). Whether Bentham actually examined these specimens is not known, but two herbarium sheets of this taxon are held at K in the Hooker Herbarium. These are best considered as type material and the lower right specimen on the sheet with 'Xerotes laxa R. Br.' 'Mount Wellington Gipps Land' 'Dr ferd. Mueller' [in Mueller's hand] is here chosen as the lectotype. The other two specimens on this sheet and the specimen on the other sheet are here regarded as isolectotypes. The material held at MEL is here regarded as probable isolectotypes.

Nomenclature

With the status of this taxon being raised to specific level, the epithet '*sororia*' can not be used because the new combination (*L. sororia*) would be a later homonym of *L. sororia* (F. Muell. *ex* Benth.) Ewart. Therefore, the new name *L. oreophila* based on the type of *Xerotes micrantha* Endl. var. *sororia* F. Muell. *ex* Benth. (as discussed above) is here proposed.

Other Specimens Examined

Victoria — **Eastern Highlands**: Moroka Range, 2 Nov. 1973, *Beauglehole 43470* (MEL 1515703); 2.2 km NW of confluence [*sic*] of O'Keefe Gully and Aberfeldy Road, near Aberfeldy, 18 Oct. 1978, *Walsh 161* (MEL 547912). **Snowfields**: Mt Howitt, 5 km SSE of Mt McDonald, 17 Jan. 1973, *Beauglehole 41219* (MEL 1515700); Mt Useful, Natural Feature — Scenic Reserve, 25 Apr. 1985, *Beauglehole 79278* (MEL 682530); Mt Skene, 24 Feb. 1949, *Willis s.n.* (MEL 20868). **East**

Gippsland: Mt Tingaringy, 24 Oct. 1973, *Beauglehole 43409 & 43410* (MEL 1515701 & 1515702); Mt Tower, 6 Oct. 1984, *Cheal s.n.* (MEL 1563395); Upper Rodger River, 21 Feb. 1983, *Chesterfield s.n.*, (MEL 626304).

DISTRIBUTION

Endemic to Victoria (Eastern Highlands, Snowfields, East Gippsland)(Fig. 5).

HABITAT

This species occurs in alpine and subalpine *Eucalyptus pauciflora* and *E. dives* Woodlands.

CONSERVATION STATUS

The conservation status of this species is not known.

NOTES

Although the leaf apex is usually rounded (Fig. 4b) to almost truncate, older leaves are often irregularly two-toothed (Fig. 4a). This is unexpected because two-toothed apices are characteristic of the *L. longifolia* Labill. group, *L. rigida* Labill. and *L. effusa* (Lindley) Ewart, rather than the *L. micrantha* group. However, the two lateral teeth of the leaves of this latter group are irregularly formed as part of an aging process.

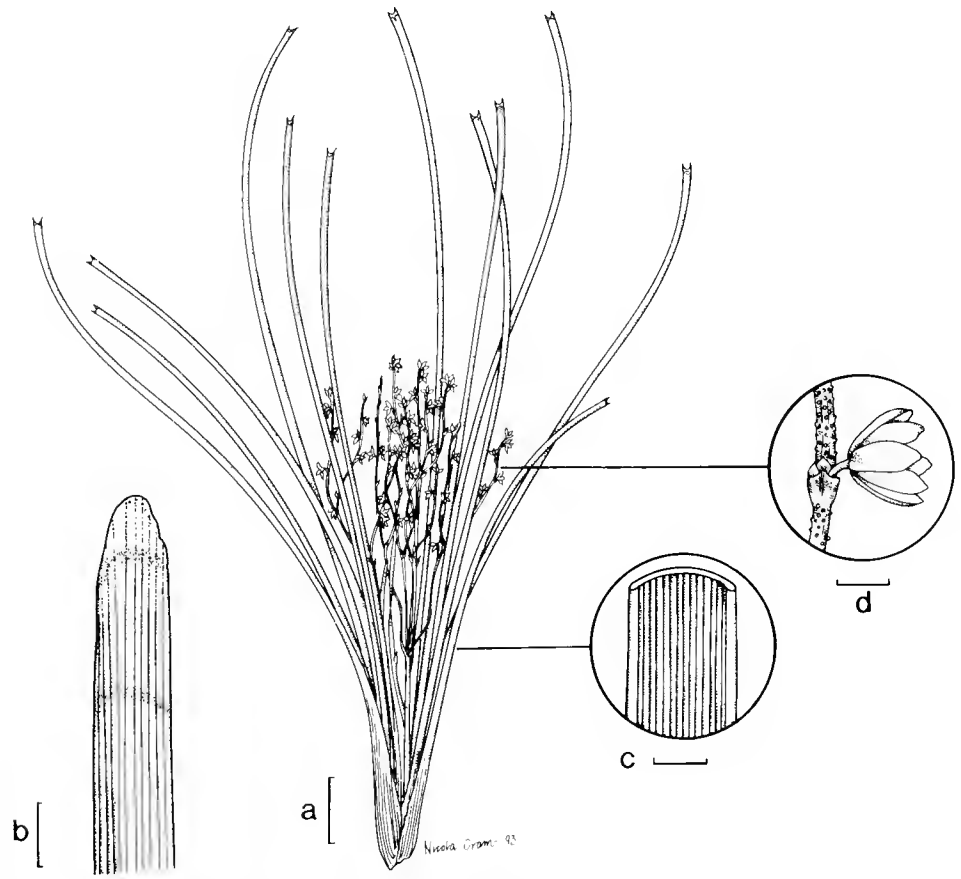

Fig. 4. *Lomandra oreophila* a — habit of female plant showing leaves and inflorescence (Note: leaf apex with two lateral teeth due to aging). b — detail of rounded leaf apex. c — detail of leaf surface and leaf shape. d — female flowers and detail of tuberculate inflorescence axis. (a, c & d *Beauglehole 43409*; b *Beauglehole 43470*). Scale bar: a = 3 cm; b = 5 cm; c & d = 1.5 mm.

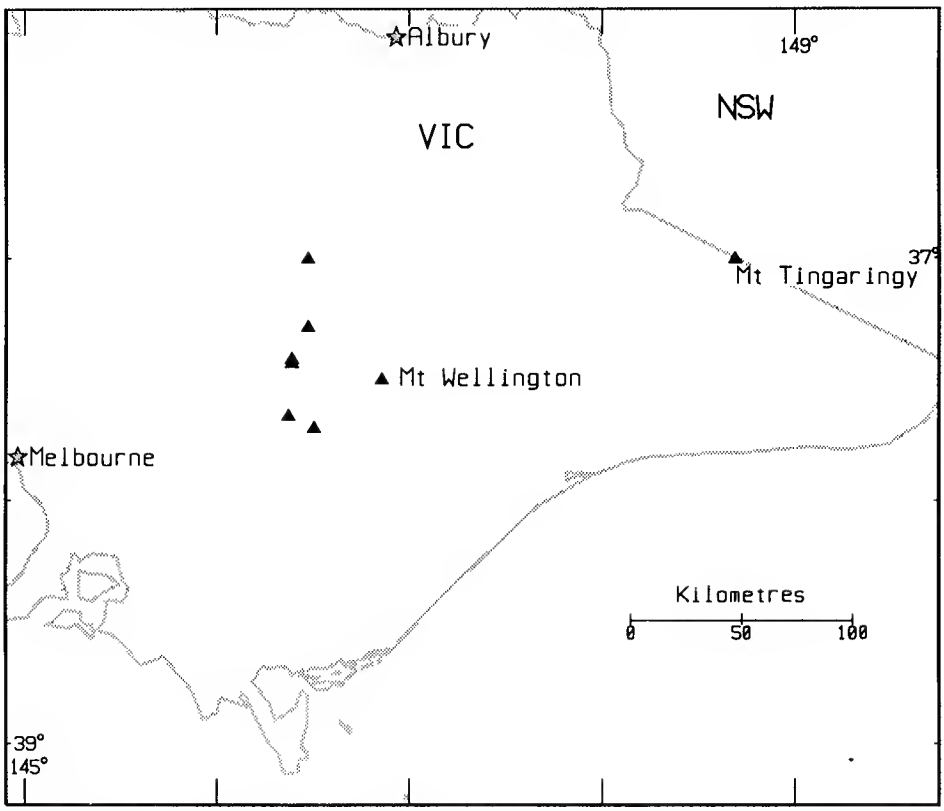

Fig. 5. Distribution map of *Lomandra oreophila* in Victoria, Australia.

RELATIONSHIPS

The affinities of this species appear to be with *L. drummondii* (F. Muell. ex Benth.) Ewart. Considering all the species of *Lomandra* section *Lomandra* series *Sparsiflorae* (Benth.) A. Lee, the relatively broad leaves of *L. oreophila* are reminiscent of *L. drummondii* of south-western Western Australia and *L. laxa* (R. Br.) A. Lee of coastal eastern Australia. *Lomandra drummondii* and *L. oreophila* share many features in common. Both species have male flowers with similar sepals and petals; both have male and female inflorescences that are similar and shorter than the leaves; both have a conspicuous marginal zone on the leaves and more or less rounded leaf apices. The most distinctive difference between these two species is that the axes of the inflorescence are warty in *L. oreophila*, whereas they are papillose (scaberulous, *sensu* Lee & Macfarlane 1986) in *L. drummondii*. Furthermore, although the papillae of *L. drummondii* are often as large (up to 0.07 mm long) as the tubercles of *L. oreophila*, they are usually substantially shorter (0.01–0.02 mm long).

Lomandra laxa has several features that are different from *L. oreophila* and these two species are not regarded as closely related. One of the more important differences is that the male sepals of *L. laxa* differ from the petals, whereas they are similar in *L. oreophila*. The former species also differs by having a creamy-white perianth, whereas *L. oreophila* has flowers with greenish-yellow to dark reddish sepals and petals.

ETYMOLOGY

The specific epithet, '*oreophila*' refers to the preference for this species to occur in the mountainous regions of eastern Victoria.

KEY TO TAXA OF THE *LOMANDRA MICRANTHA* COMPLEX

In the 'Key to species' of the genus in the *Flora of Australia* account (Lee & Macfarlane 1986), *Lomandra oreophila* is included under *L. micrantha*. The following key distinguishes this species from the subspecies of *L. micrantha*. Since we believe that it is premature to recognise formally the '*micrantha 1*' taxon from '*micrantha 2*', these two are included in *L. micrantha* subsp. *micrantha* until the *teretifolia/micrantha* group is clarified (refer 'Taxonomic conclusions', above).

1 Inflorescence axes conspicuously covered with wart-like projections
  2 Leaves flat, not twisted, often with margin incurved, or slightly concavo-convex, (2.5–)3.3–4(–5.5) mm wide..... **Lomandra oreophila**
  2: Leaves semi-circular (in cross-section), or concavo-convex to folded (in cross-section), gently twisted longitudinally, (0.8–)1–2(–2.5) mm wide..... ..... **Lomandra micrantha** subsp. **tuberculata**
1: Inflorescence axes smooth or papillose to minutely scabrid
  3 Leaves semi-circular or transversely narrow-elliptic (in cross-section), or flat, (0.4–)0.8–2(–2.5) mm wide, or if less than 0.6 mm wide then subterete, ± firm, but never rigid..... **Lomandra micrantha** subsp. **micrantha**
  3: Leaves terete, *c.* 3.5–4 mm diameter, rigid .... **Lomandra micrantha** subsp. **teretifolia**

ACKNOWLEDGEMENTS

We wish to sincerely thank Joy Everett (NSW) and Terry Macfarlane (PERTH) for commenting on the manuscript. The illustration of *Lomandra oreophila* was provided by Nicola Oram (Figure 4a, c & d) and Sophie Smyth (Figure 4b). Neville Walsh (MEL) provided additional information on the *Lomandra* collections held at MEL. Jim Ross (MEL) and Doris Sinkora (*ex* MEL) kindly commented on F.J.H. von Mueller's handwriting. Merrin Tozer (NSW) and Katie Bowman prepared the figures for publication.

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HAFELLIA DISSA AND *H. LEVIERI* (LICHENISED ASCOMYCETES, PHYSCIACEAE), TWO CORTICOLOUS AND LIGNICOLOUS SPECIES IN TASMANIA

WALBURGA PUSSWALD[1], GINTARAS KANTVILAS[2] AND HELMUT MAYRHOFER[1]

ABSTRACT

Pusswald, Walburga, Kantvilas, Gintaras and Mayrhofer, Helmut. *Hafellia dissa* and *H. levieri* (lichenised Ascomycetes, Physciaceae), two corticolous and lignicolous species in Tasmania. **Muelleria 8(2): 133–140 (1994).** — A taxonomic revision of two corticolous and lignicolous species of *Hafellia* from Tasmania is presented. *Hafellia levieri* is a new combination. The main characters are discussed and notes on the known distribution in Australia are provided.

INTRODUCTION

The lichen genus *Hafellia* belongs to the family Physciaceae. It is characterized by a crustose thallus which may be corticolous, lignicolous or saxicolous. Its apothecia are lecideine with a heavily carbonised excipulum, pigmented hypothecium, and an hymenium often inspersed with oil droplets and opaque even in thin sections. The asci are of the *Buellia*-type (Rambold, Mayrhofer & Matzer, in prep.) and 2- to 8-spored, with 2- to 4-celled ascospores, dark brown at maturity and with subapical, lateral wall thickenings of the *Callispora*-type (Mayrhofer 1984). Its conidia are bacilliform. The genus is closely related to the *Buellia disciformis* complex which differs mainly by its spores which lack *Callispora*-type thickenings.

Hafellia was described by Kalb, Mayrhofer & Scheidegger in Kalb (1986) to accomodate two species of *Buellia* with *Callispora*-type ascospores, i.e. *Hafellia leptoclinoides* and *H. parastata*. Sheard (1992) revised the genus in North America where five corticolous species occur, although one of the species recognised, *H. bahiana*, does not actually belong in the genus (Kalb, pers. comm.). Sheard (*op. cit.*) also made new combinations for two Southern Hemisphere species, *H. dissa* and *H. procellarum*, which Mayrhofer (1984) had previously placed in the genus *Rinodina* on account of their unequally thickened ascospore walls.

The present paper reports on two species of *Hafellia* which occur in Tasmania.

THE SPECIES

Hafellia dissa (Stirton) Mayrhofer & Sheard in Sheard, *Bryologist* 95(1): 87 (1992).

Lecidea dissa Stirton, *Trans. Glasgow Soc. Field Natural.* 4: 94 (1876). *Buellia dissa* (Stirton) Zahlbruckner, *Cat. Lich. Univ.* 7: 357 (1931). *Rinodina dissa* (Stirton) Mayrhofer, *Beih. Nova Hedwigia* 79: 532 (1984); TYPE: Australia: 'ad ligna decorticata in Tasmania',1875, *H. Paton* (HOLOTYPE: GLAM; ISOTYPE: BM!).

ICON: Mayrhofer (1984: 513, 531, 536); figs. 1–2, 5, 6.

Thallus corticolous, crustose, thin, continuous, membranous to areolate, with a roughened, occasionally warty surface, whitish, whitish grey to pale ochraceous. *Prothallus* not apparent. *Apothecia* 0.2–1.0 mm diam., lecideine, adnate to sessile, rarely contiguous; disc black, persistently plane or becoming convex; margin concolorous with the disc, usually persistent, becoming excluded in convex apothecia.

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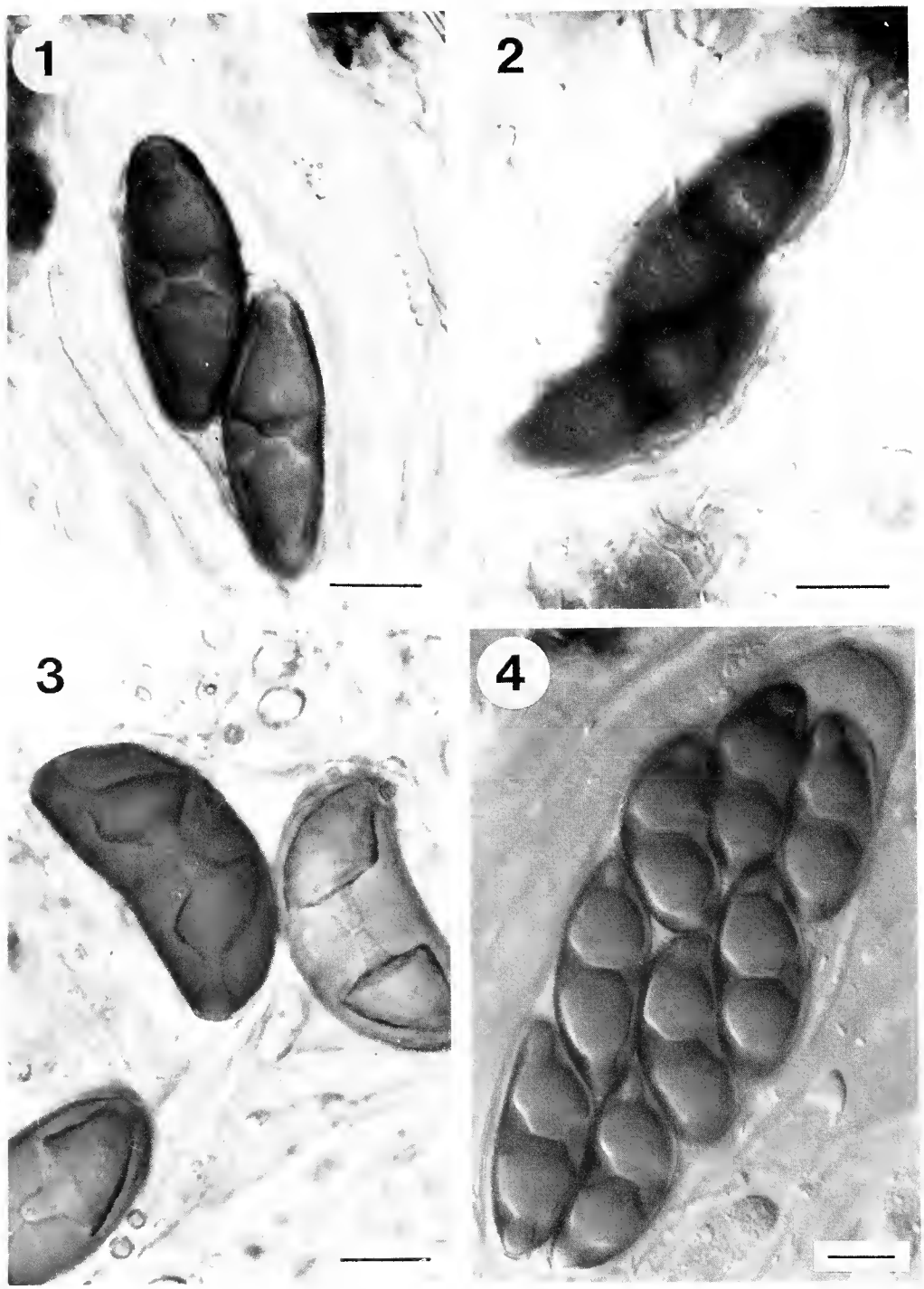

Figs. 1–2. *Hafellia dissa* (MEL 1031109). 1. Ascus with two mature ascospores. 2. Ascospores in different focusing showing the spore wall-ornamentation. Fig. 3. *H. parastata* (*Hafellner* 16726). Mature ascospores. Fig. 4. *H. levieri* (*Kantvilas s.n.*). Ascus with eight mature ascospores. Scales = 10 μm.

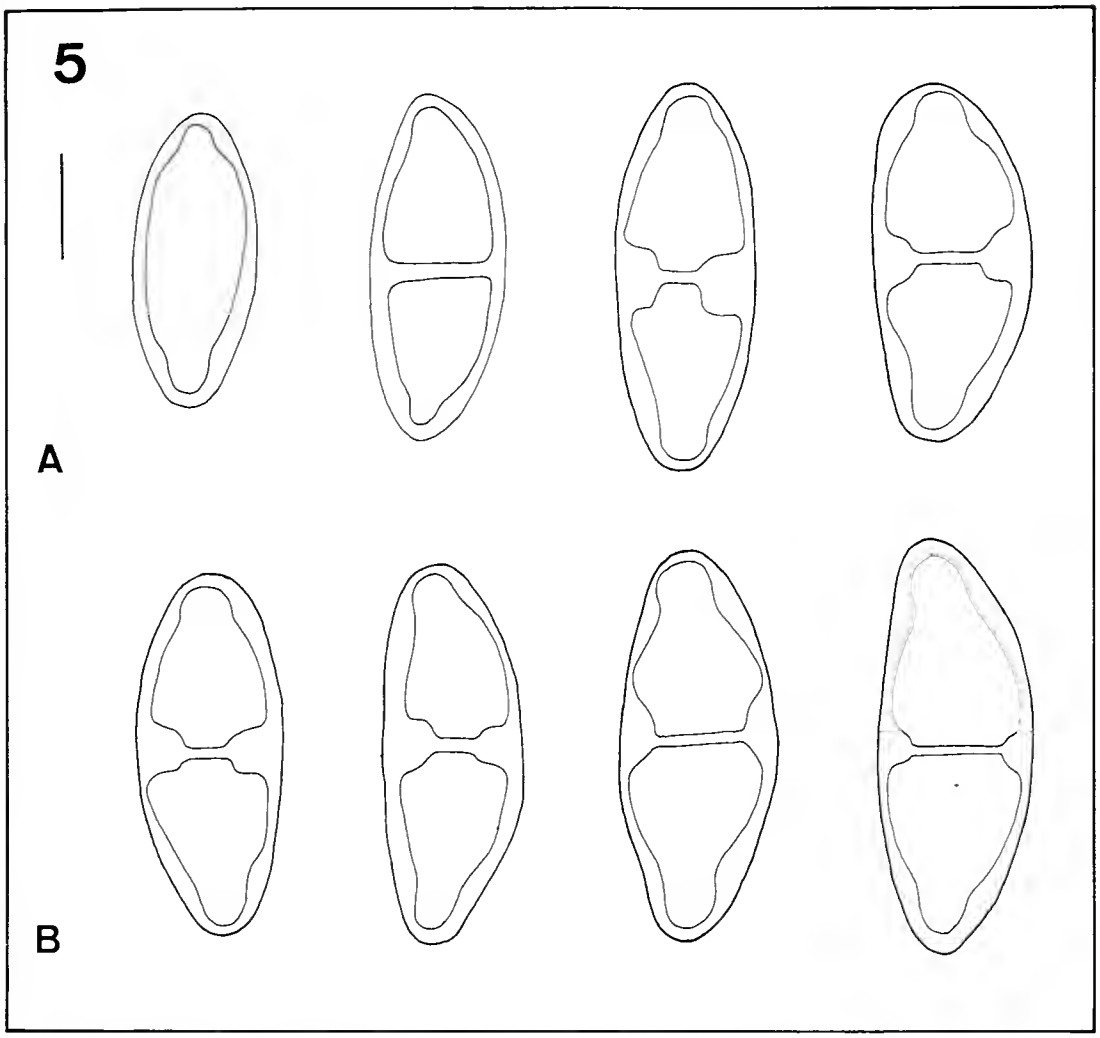

Fig. 5. *Hafellia dissa* (MEL 1013109). A. Ontogeny of ascospores. B. Mature ascospores. Scale = 10 µm.

Exciple composed of radially arranged hyphae, carbonized, dark red-brown, paler in the inner part. *Epihymenium* 10–20 µm thick, brown to red-brown, K−. *Hymenium* 80–120 µm thick, inspersed with oil droplets, inspersion striate. *Hypothecium* to *c.* 150 µm thick, dark red-brown. *Paraphyses* 1–2 µm thick, occasionally branched, with clavate apices, 3–5 µm thick, brown to red-brown. *Asci* 2-spored. *Ascospores* of the *Callispora*-type (Figs. 1 and 6) with regular apical and septal wall thickenings, 1-septate, ellipsoid, brown, rugulate (Fig. 2), lacking a torus, (22–)26–40(–42) × (10–)11–16 µm, length to breadth ratio: 2.5. *Pycnidia* pyriform, immersed, dark-brown. *Conidia* bacilliform, 5 × 1 µm.

Chemistry: Atranorin and diploicin; thallus K+ yellow, C−, P+ yellow.

REMARKS

Hafellia dissa is characterised by its two-spored asci (Fig. 1), its rugulate ascospores (Fig. 2) with relatively poorly developed wall thickenings (Fig. 5) and by an exciple which, together with the hypothecium, forms a more or less closed structure consisting of non-radially arranged hyphae in its central part (Fig. 6 A). It thus differs from the related *H. callispora* (Knight) Mayrhofer & Sheard which

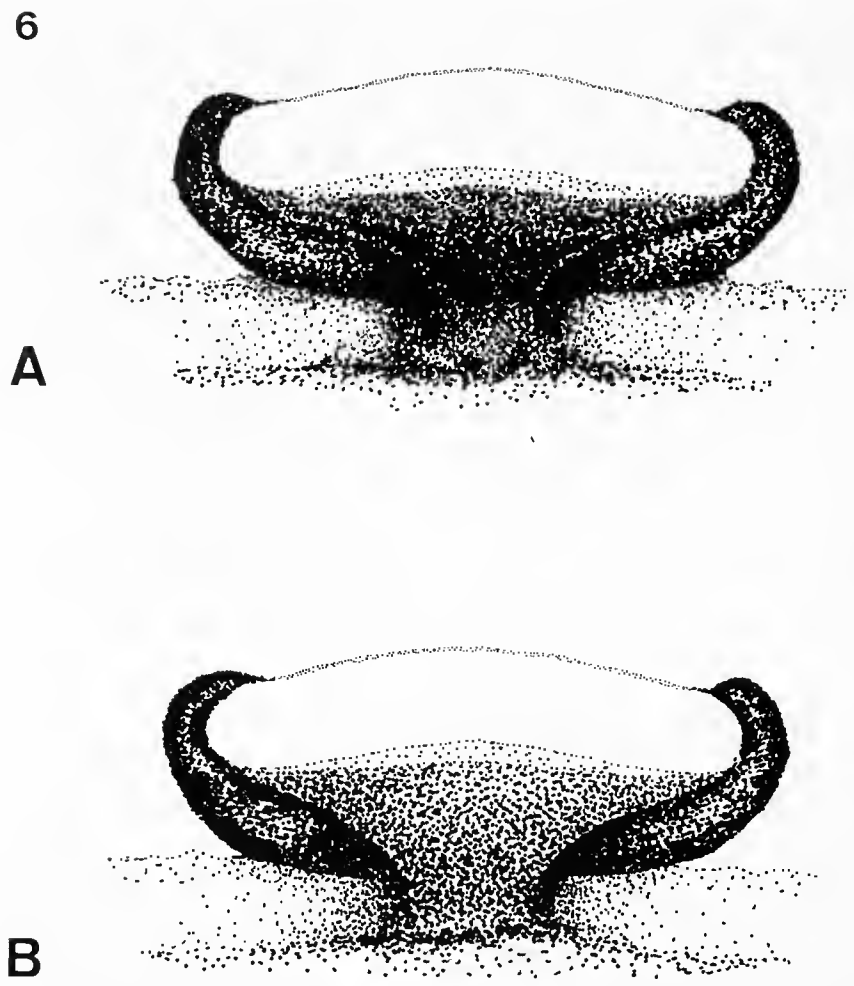

Fig. 6. Longitudinal sections of ascocarps (half schematic). A. *Hafellia dissa* with highly carbonised hypothecium. B. *H. callispora* with paler hypothecium ('open' exciple).

has eight-spored asci and an 'open' exciple (Fig. 6 B), and from *H. parastata* (Nyl.) Kalb which has eight-spored asci and smooth-walled ascospores with strongly developed wall-thickenings (Figs. 3 and 8).

Distribution and Ecology

Hafellia dissa occurs in the cool temperate regions of southern Australia and has been recorded from Tasmania, Victoria, South Australia and south-western Western Australia (Fig. 9). It is apparently confined to dry sclerophyll forest and woodland where it occurs on the bark of a variety of trees and shrubs, including species of *Eucalyptus*, *Acacia*, *Casuarina, Callitris*, *Melaleuca* and the exotic *Crataegus*, as well as on dead, decorticated wood. Lichens with which it may be associated include *Buellia disciformis*, *Pertusaria trimera*, *P. gibberosa*, *Usnea inermis*, *Ramalina celastri*, *R. glaucescens*, *Flavoparmelia rutidota*, *Candelariella xanthostigmoides*, *Punctelia subrudecta* and *Pyrrhospora laeta.*

Several other lichens display a similar, southern Australian, essentially mediterranean-climate distribution, including *Heterodea muelleri* (Filson 1978), *Teloschistes chrysophthalmus* and *T. sieberianus* (Filson 1969), *Menegazzia caesio-*

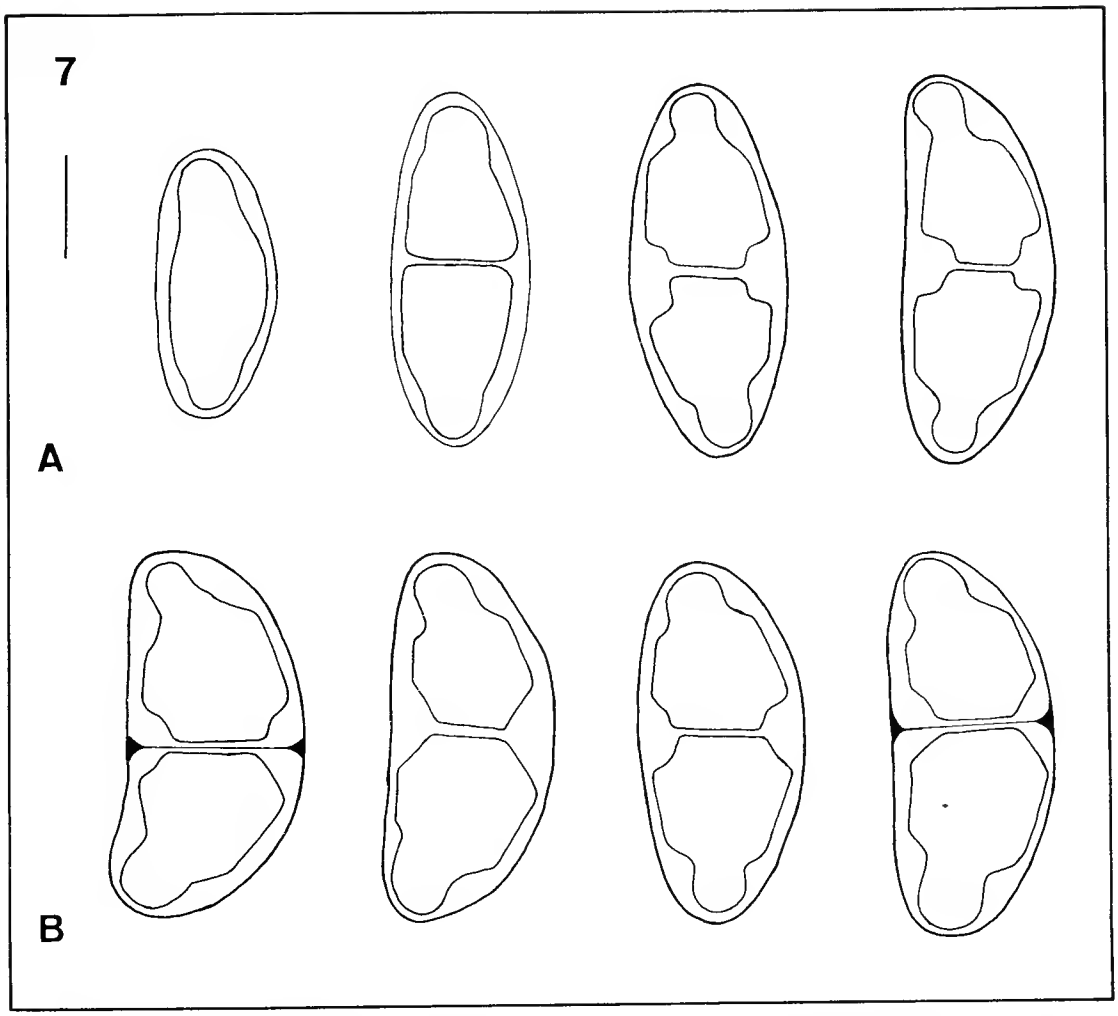

Fig. 7. *Hafellia levieri* (*Kantvilas s.n.*). A. Ontogeny of ascospores. B. Mature ascospores. Scale = 10 µm.

pruinosa (James & Galloway 1992) and several species of *Xanthoparmelia*, for example *X. metaclystoides*, *X. furcata* and *X. neotinctina* (Elix *et al.* 1986).

Additional Specimens Examined

Tasmania — Bushy Park Road near Plenty, on *Crataegus* in sheltered gully, 16 June 1969, *G.C. Bratt & M.H. Bratt 69/531* (HO); Hummocky Hills, 200–470 m a.s.l., 20 Sep. 1992, *A.V. Ratkowsky s.n.* (HO); *c.* 5 km south of Beaconsfield, 80 m a.s.l., on *Acacia dealbata* in pasture, 23 May 1980, *G. Kantvilas 221/80* (HO).

Bass Strait — Flinders Island, mountain to the west of Palana, growing on fallen timber, 16 Apr. 1965, *R.B. Filson 7082* (MEL 1031109); Kent Group, Dover Island, 550 m at 11° East of South of the Squashway, 85 m a.s.l., 16 Dec. 1970, *J.S. Whinray* (MEL 1012827).

Western Australia — Yanchep State Forest, Roadside, Picnic Area north of Yanchep National Park, north of Perth, on *Eucalyptus* sp., *Acacia* sp., *Melaleuca* sp., 28 Aug. 1988, *M. & H. Mayrhofer 8566* (HO), *8567* (ANUC), *8572* (PERTH), *8579* (GZU).

South Australia — Fred Rattei's Scrub, 7 km west of Springton, 500–530 m a.s.l., on *Eucalyptus* sp., 12 Aug. 1981, *M. & H. Mayrhofer 2699* (ANUC), *6660* (GZU).

Victoria — Copi flats, south side of Wyperfeld National Park, 125 km north of Horsham, on *Callitris* sp., 18 Aug. 1981, *M. & H. Mayrhofer 4713* (GZU); Shire of Dimboola, Mallee scrub, on twigs, 30 July 1894, *J.M. Reader* (MEL 7503).

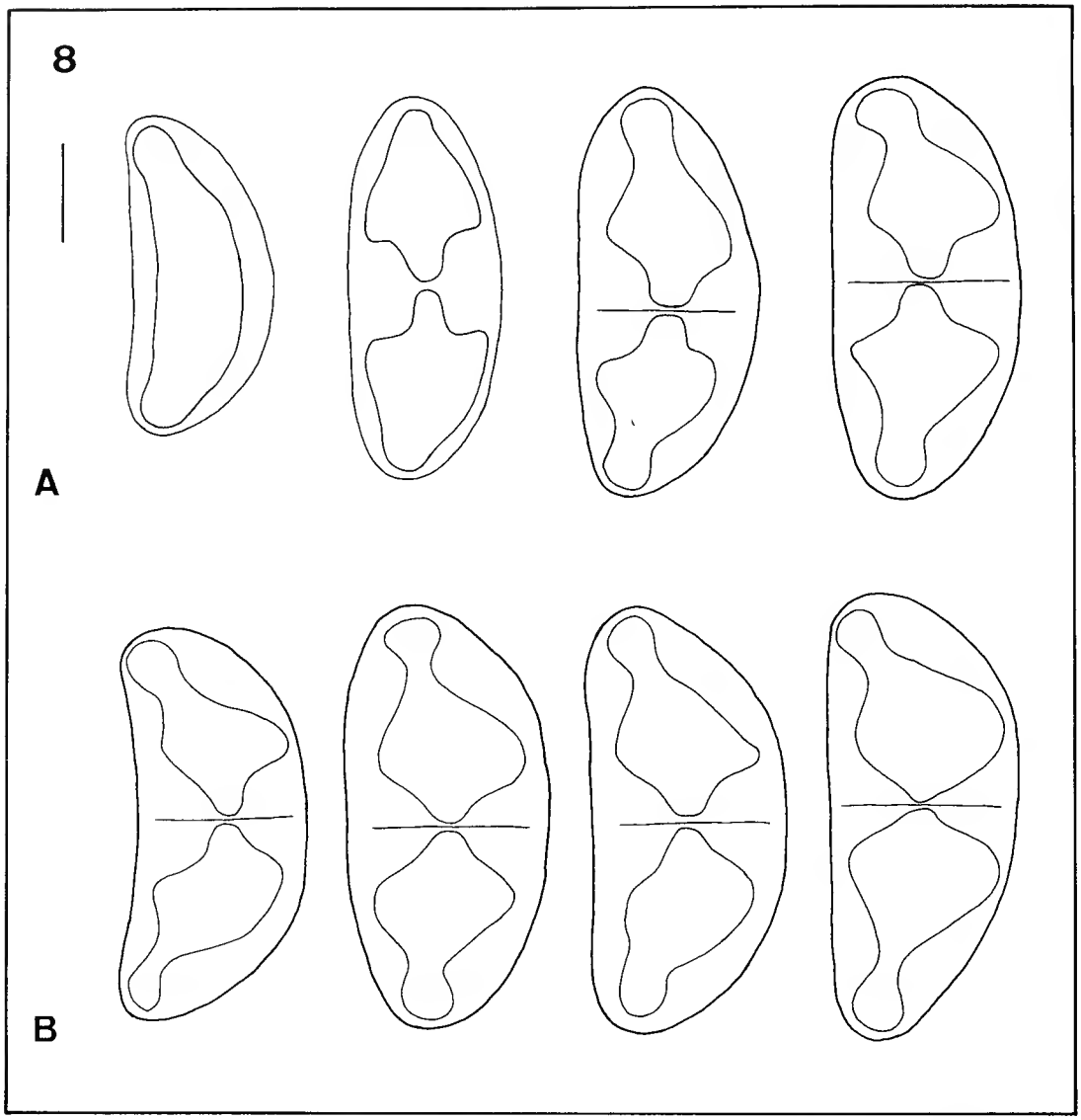

Fig. 8. *Hafellia parastata* (*Hafellner* 16726). A. Ontogeny of ascospores. B. Mature ascospores. Scale = 10 µm.

Hafellia levieri (Jatta) Pusswald & Kantvilas *comb. nov.*

BASIONYM: *Buellia levieri* Jatta, *Boll. Soc. bot. ital.*: 258 (1911); TYPE: [Australia, Tasmania,] 'ad truncos prope Geeveston, alt 800 p' [240 m], *W.A. Weymouth* (HOLOTYPE: NAP!).

ICON: Figs. 4, 7

Thallus corticolous, crustose, thin, continuous, membranous, uneven, rimose to areolate, sordid-white to pale ochraceous, delimited by a black, discontinuous prothallus. *Apothecia* 0.2–0.8 mm diam., lecideine, sessile, dispersed; disc black, persistently plane or very slightly concave; margin concolorous with the disc, thick and ± inrolled when young, persistent. *Exciple* composed of radially arranged hyphae, heavily carbonized, dark red-brown. *Epihymenium* 10–20 µm thick,

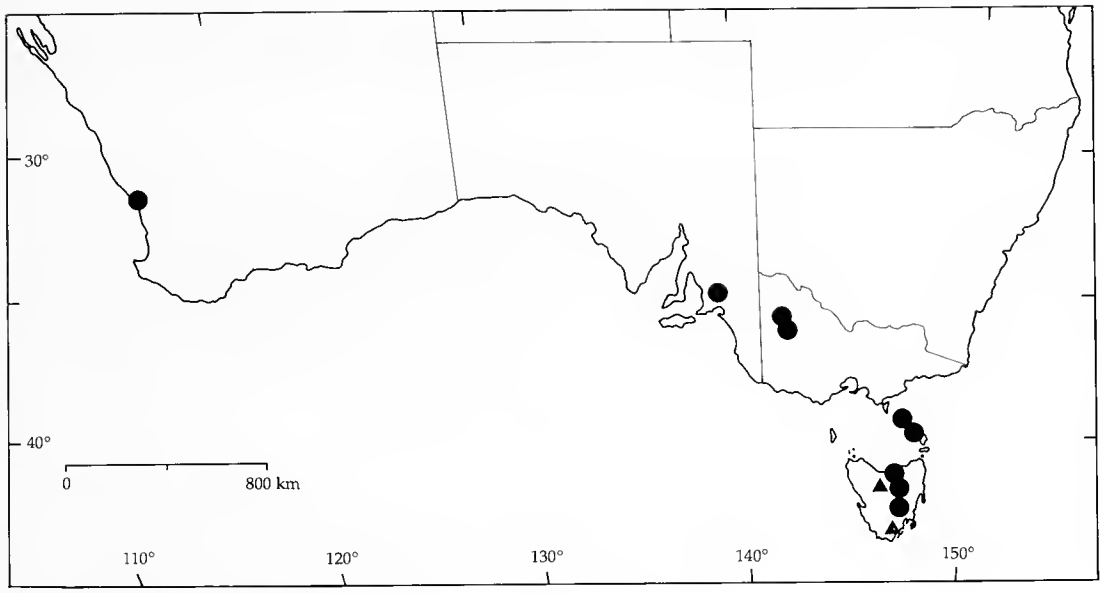

Fig. 9. Distribution of *Hafellia dissa* (●) and *H. levieri* (▲).

brown, K−. *Hymenium* 100–125(–150) µm thick, hyaline, inspersed with oil droplets, inspersion striate. *Hypothecium* to *c.* 50 µm thick, dark brown. *Paraphyses* occasionally branched, 2 µm thick, apices clavate, 4 µm thick, brown. *Asci* usually 8-spored, occasionally with fewer than 8 spores. *Ascospores* of the *Callispora*-type (Figs. 4 and 7), with apical and septal wall thickenings, ellipsoid to slightly curved, brown to dark brown, smooth, 30–38.5 × 12.5–16.0 µm, length to breadth ratio: 2.3; cell lumina somewhat angular; torus often developed. *Pycnidia* not seen.

Chemistry: containing no substances detectable by t.l.c. or h.p.l.c.

Remarks

Hafellia levieri is characterized by its eight-spored asci, smooth-walled ascospores with somewhat angular cell-lumina (Figs. 4, 7), an exciple, which together with the hypothecium, forms a more or less closed structure consisting of non-radially arranged hyphae in its central part (Fig. 5 A), and by the absence of any detectable thallus chemistry. It is most closely related to an undescribed taxon from the rainforests of northern New South Wales and south-eastern Queensland which differs mainly by the presence of norstictic acid. It is also similar to *H. parastata* which has broader (30–[–40] × 15–20 µm) and different shaped ascospores (Figs. 3 and 8) and contains atranorin and diploicin.

The type specimen is a tiny fragment of smooth bark less than 1 cm wide but bearing abundant, well-developed apothecia.

Distribution and Ecology

Hafellia levieri is known only from Tasmania where it has been recorded from cool temperate rainforest, growing on the upper branches of *Nothofagus cunninghamii* with *Menegazzia weindorferi, Parmelia salcrambidiocarpa, P. cunninghamii, P. tenuirima, Pertusaria truncata, Usnea oncodes* and *Catillaria tasmanica*. The habitat of the type collection is unknown but is likely to be from wet forest also (Fig. 9).

That only two collections of this species are known, despite extensive recent collecting activity in Tasmania, particularly in wet forests, suggests that it is extremely rare.

Additional Specimen Examined

Tasmania — Little Fisher River, on *Nothofagus cunninghamii* in rainforest, 850 m a.s.l., 1983, *G. Kantvilas s.n.* (HO).

ACKNOWLEDGEMENTS

We thank Dr. habil. Klaus Kalb (Neumarkt/OPf.) and Prof. John W. Sheard (Saskatoon) for stimulating discussions and valuable comments, Prof. John A. Elix (Canberra) for chemical analysis of selected specimens, Prof. Pier Luigi Nimis (Trieste) for arranging the loan from NAP, as well as Mag. Mario Matzer (Graz) for his assistance in various ways during the preparation of the manuscript. We are grateful to the curators of BM, GZU, MEL, and NAP as well as to Dr Josef Hafellner (Graz) for the loan of specimens. The support of the Fonds zur Förderung wissenschaftlicher Forschung — Project P8500-BIO (H.M.) and the Office of the National Estate (G.K.) is gratefully acknowledged.

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TYPE COLLECTIONS OF AFRICAN ASCLEPIADACEAE IN THE NATIONAL HERBARIUM OF VICTORIA (MEL)

PAUL I. FORSTER*

ABSTRACT

Forster, Paul I. Type collections of African Asclepiadaceae in the National Herbarium of Victoria (MEL). **Muelleria 8(2): 141–149 (1994).** — Forty-one previously unrecognised putative type collections of African Asclepiadaceae held in the National Herbarium of Victoria (MEL) are documented. Lectotypes are selected for *Dichaelia pygmaea* Schltr. and *Gomphocarpus macroglossus* Turcz.

INTRODUCTION

The National Herbarium of Victoria (MEL) is estimated to hold at least 1 000 000 specimens, although the precise number is indeterminable at present (J.H.Ross, pers. comm. 1993). MEL is mainly composed of specimens originating from Australia; however, there are also significant holdings from Malesia and Africa. Many of these collections, particularly those collected in the 1800's, were part of private herbaria purchased during Mueller's long reign as Government Botanist (Short 1990).

Many of these non-Australian collections have remained unmounted and uncurated, hence it has never been determined whether they contained specimens of important scientific significance, especially types. In this paper I offer a first approximation at documenting the types of African Asclepiadaceae that are present in MEL. This exercise will hopefully draw attention to these type holdings and may stimulate others to search for types in groups with which they are familiar.

MATERIALS AND METHODS

The African holdings of Asclepiadaceae in MEL were examined *in situ* during May 1993. These collections were mainly unmounted and still in folders that probably originated from the Sonder and Steetz collections (*cf.* Short 1990, Short & Sinkora 1988). The current search was restricted to African types because of the availability of literature and my familiarity with the genera concerned; however, some other types from Asia and the New World were also encountered. These other types are not documented here, as it is likely that others exist (*e.g.* those based on *C.Pringle* collections) and the few extracted are but a subset of the potential total.

All collections that were considered for type canditure (with the exception of *Taccazea pedicellata* K.Schum., recognised later) were extracted, labelled, and subsequently mounted and placed in red type folders.

Original protologues were consulted in all instances and compared with label data on the specimens. Full details of localities for the various *Ecklon* or *Zeyher* collections, beyond that given by Meyer (1838) or Turczaninow (1848, 1852), are not given here, but can be found by referring to the Appendix in Gunn and Codd (1981). Altitudinal details (e.g. Schlechter 1895) on the various *R.Schlechter* collections are not repeated in the presentations of protologue data. Where I have mentioned under the heading — OTHER TYPES: 'not determined', this is an indication that I have not been able to determine from the literature the existence or whereabouts of duplicates of the collection.

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RESULTS

Forty-one collections that are considered to represent types of African Asclepiadaceae were located.

1. Asclepias reenensis N.E.Br., Fl. Cap. 4(1): 1131 (1909).
PROTOLOGUE: Natal; near Van Reenen, 5000–6000 ft., Wood, 8635!
LABEL: Natal. Van Reenen, 16.xii.1898, J.M. Wood 8635.
STATUS: Isotype.
OTHER TYPES: K (holotype); GRA, NH, PRE, SAM (isotypes). Cited by Nicholas & Goyder (1992: 32).
NOTES: Recombined as *Aspidonepsis reneensis* (N.E.Br.) A.Nicholas & D.J.Goyder (but lacking basionym reference, although it is to be corrected by the authors).

2. Aspidoglossum biflorum E.Mey., Comm. Pl. Afr. Austr. 201 (1838).
PROTOLOGUE: In asperis ad montem Windvogelberg, alt. 4500 ped. (I, a).
LABEL: 1837, Drège.
STATUS: Possible isolectotype.
OTHER TYPES: K: Drège 3427 (lectotype).
NOTES: The MEL specimen was located in a folder labelled 'Aspidoglossum biflorum'. Lectotype listed by Kupicha (1984: 638), but apparently previously designated. Name in current use.

3. Aspidoglossum heterophyllum E. Mey., Comm. Pl. Afr. Austr. 200 (1838).
PROTOLOGUE: In montosis graminosis asperisque a) prope Roodemuur, alt. 2000–2500 ped. (IV, A); b) ad latera septemtrionalia montium Zuurebergen, alt. 2000–3000 ped. (V, a).
LABEL: E.m.a., 1837, Drège.
STATUS: Possible isolectotype.
OTHER TYPES: K (lectotype); BM, CGE, E, MO (isolectotypes). Lectotypified by Kupicha (1984: 645).
NOTES: The MEL specimen was in a folder labelled 'Aspidoglossum heterophyllum'. Name in current use.

4. Brachystelma circinatum E. Mey., Comm. Pl. Afr. Austr. 196 (1838).
PROTOLOGUE: In collibus graminosis prope Rietvalei ad radices montium Witbergen, alt. 5000 ped. (I, a).
LABEL: Drège.
STATUS: Possible Isotype.
OTHER TYPES: K (Isotype). Listed by Dyer (1980).
NOTES: The MEL specimen was in a folder labelled 'Brachystelma circinatum' and is possibly a fragment of Drège 3440, considered the type of this name by Dyer (1980). Name in current use.

5. Brachystelma crispum E.Mey., Comm. Pl. Afr. Austr. 196 (1835) [*non* Grah. 1830]
PROTOLOGUE: In collibus asperis prope Hamerkuil, alt. 3000–3500 ped. (II, b).
LABEL: Drège.
STATUS: Probable holotype.
OTHER TYPES: Not known. "no specimen of this now exists in E.Meyer's herbarium" (Brown 1908).
NOTES: This is an illegitimate name as it is a later homonym for *B. crispum* Grah. The specimen was in a folder labelled 'Brachystelma crispum' and appears conspecific with *B. tuberosum* (Meerburg) R.Br. *ex* Sims (Forster 1986); however, it is very poor and consists of some leaves, a follicle and a tuber.

6. Brachystelmaria longifolia Schltr., Bot. Jahrb. Syst. 20, Beibl. 51: 50 (1895).
PROTOLOGUE: In saxosis montium Elandspruitbergen, 5.Dec.1893 — n.3873.
LABEL: Elandspruit Abergeu, 5.xii.1893, R. Schlechter 3873.
STATUS: Isolectotype.
OTHER TYPES: BOL (lectotype). Chosen by Dyer (1980).
NOTES: Recombined as *Brachystelma longifolium* (Schltr.) N.E.Br.

7. Ceropegia ampliata E.Mey., Comm. Pl. Afr. Austr. 194 (1838).
PROTOLOGUE: Crescit iisdem locis una cum praecedente.
LABEL: 1837, Drège.
STATUS: Possible isotype.
OTHER TYPES: W (holotype); K, P (isotypes). Listed by Dyer (1980).
NOTES: This specimen was included in a folder labelled 'Ceropegia ampliata' and is the only Drège collection cited for this taxon by Huber (1957). It is likely that it is an unnumbered duplicate of *Drège 4949* the type collection of this name (Dyer 1980). Name in current use.

8. Ceropegia bowkeri Harv., Thes. Cap. 1: 9, t.14 (1859).
PROTOLOGUE: Transkei, Bowker 12.
LABEL: [1] Caffraria; [2] Krellis Country, Caffra.
STATUS: Isotype.
OTHER TYPES: K (?holotype). Listed by Dyer (1980: 49).
NOTES: The MEL specimens were in a folder labelled 'Ceropegia bowkeri'. Dyer (1980) gives the type of this name as 'Transkei, *Bowker 12*', whereas Brown (1908) gives in his specimen citation 'Transkei, Krellis Country, *Bowker 12*! Caffraria, *Bowker*!'. Hence it may be concluded that the two loose (at time of observation) specimens represent duplicates of those seen by Brown, with the "Krellis Country, Caffra" one representing an isotype of the name.

9. Ceropegia sororia Harv. *ex* J.D.Hook., Curtis's Bot. Mag. 92: t. 5578 (1866).
PROTOLOGUE: flowered by Dr. Moore, of Glasnevin, in May, 1865, from seeds sent by Mrs. F.W.Barber, from Kaffraria.
LABEL: Ad flumen Bashee, H.Bowker.
STATUS: Probable isotype.
OTHER TYPES: K (holotype). Listed by Dyer (1980).
NOTES: The MEL specimen was in a folder labelled 'Ceropegia sororia'. Recombined as *Ceropegia bowkeri* subsp. *sororia* (Harv. *ex* J.D.Hook) R.A.Dyer (Dyer 1980). Mrs Barber was formerly Miss Bowker!

10. Ceropegia stenantha K.Schum., Bot. Jahrb. Syst. 17: 152 (1893).
PROTOLOGUE: im Lande de Djur bei der großen Seriba Ghattas: Schweinfurth n. 2104 — im Juli blühend.
LABEL: Djur: Seriba Ghattas, 20.vii.1869, G. Schweinfurth 2104.
STATUS: Isolectotype.
OTHER TYPES: K (lectotype); S, UW (isolectotypes). Designated by Huber (1957: 125).
NOTES: Name in current use.

11. Daemia garipensis E.Mey., Comm. Pl. Afr. Austr. 220 (1838).
PROTOLOGUE: In asperis ad fluvium Garip prope Verleptpram, infra 500 ped. ait. (III, B.).
LABEL: Orange rivier, Zeyher 1155.
STATUS: Isotype.
OTHER TYPES: Not determined.

NOTES: The MEL specimen was in a folder labelled 'Daemia garipensis'. Recombined as *Pergularia garipensis* (E.Mey.) N.E.Br. (Liede 1990). Brown (1908) gives in his specimen citation 'by the Orange River at Verleptpram, Drège!'.

12. Dichaelia pallida Schltr., Bot. Jahrb. 20, Beibl. 51: 49 (1895).
PROTOLOGUE: In saxosis prope Kl. Olifant-Rivier, 27.Nov.1893 — n. 3810.
LABEL: Middelburg, 27.xi.1893, R. Schlechter 3810.
STATUS: Isotype.
OTHER TYPES: Z (Isotype). Cited by Dyer (1980).
NOTES: Considered a synonym of *Brachystelma circinatum* E.Mey. (Dyer 1980, 1983).

13. Dichaelia pygmaea Schltr., J. Bot. 32: 262 (1894).
PROTOLOGUE: In regionibus orientalibus Coloniae Capensis, verisimiliter Kaffrariae, legit Mrs Barber.
LABEL: Brachystelma lineare, Mrs. F.W.Barber 88.
STATUS: Lectotype **(here designated)**.
OTHER TYPES: None found (Dyer 1980).
NOTES: The MEL specimen was in a folder labelled 'Brachystelma lineare'. The epithet 'Brachystelma lineare' is a *nomen nudum*. The specimen is clearly conspecific with the taxon delimited by Dyer (1980, 1983) for which a type had not been located. As it appears to fulfill the necessary requirements for a type, it is here designated as lectotype of the name. Recombined as *Brachystelma pygmaeum* (Schltr.) N.E.Br. (Dyer 1980).

14. Dregea rubicunda K.Schum., Bot. Jahrb. Syst. 17: 147 (1893).
PROTOLOGUE: Centralafrika; im Lande der Dinka bei Lâo: Schweinfurth III. n. 33 — im Juni blühend und bei Meschera am Gazellenflusse; Schweinfurth n. 1255 — im März fruchtend. — Englisch — Ostafrika; auf der Insel Mombassa: Hildebrandt n. 1944 u. 2024 im Juli blühend.
LABEL: Bahrel Ghazas, Ceffera el Rek, 2.iii.1869, G. Schweinfurth 1255.
TYPE: Syntype.
OTHER TYPES: Not determined.
NOTES: Recombined as *Marsdenia rubicunda* (K.Schum.) N.E.Br. The name has been lectotypified with *Hildebrandt 2024* (Bullock 1956: 515).

15. Ectadiopsis cryptolepioides Schltr., Bot. Jahrb. Syst. 20, Beibl. 51: 10 (1895).
PROTOLOGUE: Inter frutices scandens prope Botsabelo, 29.Dec.1893 — n. 4082; in fruticetis montium Elandspruitbergen, Dec.1893; in umbrosis montium Magalisbergen prope Aapies — Rivier, Jan.1894.
LABEL: Transvaal. near Botsabelo, 29.xii.1893, R.Schlechter 4082.
STATUS: Syntype.
OTHER TYPES: Not determined.
NOTES: Recombined as *Cryptolepis cryptolepioides* (Schltr.) Bullock.

16. Gomphocarpus diploglossus Turcz., Bull. Soc. Nat. Moscou 21: 258 (1848).
PROTOLOGUE: C. b. spei. Eckl. coll. n. 23.13.12.
LABEL: Eckl. Zehy. no. 23.13.12.
STATUS: Isotype.
OTHER TYPES: KW (holotype); PRE (isotype). Cited by Nicholas & Goyder (1992: 26).
NOTES: Recombined as *Aspidonepsis diploglossus* (Turcz.) A.Nicholas & D.J.Goyder.

17. Gomphocarpus macroglossus Turcz., Bull. Bot. Soc. Moscou 1: 259 (1848).
PROTOLOGUE: C. b. spei Eckl. no. 34.
LABEL: Ecklon Zeyh. no. 34.

STATUS: Lectotype (**here designated**).
OTHER TYPES: Not seen by Smith (1988) in her revision of *Pachycarpus*, hence the present lectotypfication.
NOTES: Considered a synonym of *Pachycarpus appendiculatus* E.Mey. (Smith 1988). The specimen appears conspecific with the concept of *P. appendiculatus* given by Smith (1988).

18. Gomphocarpus meyerianus Schltr., Bot. Jahrb. Syst. 20, Beibl. 51: 33 (1895).
PROTOLOGUE: In campis graminosis prope Colenso, 27.Sept.1893 — n. 3378.
LABEL: Colenso, 27.ix.1893, R.Schlechter 3378.
STATUS: Isotype.
OTHER TYPES: Not determined.
NOTES: Name in current use.

19. Gomphocarpus oxytropis Turcz., Bull. Soc. Nat. Moscou 21: 259 (1848).
PROTOLOGUE: C. b. spei. Eckl. n. 28.8.11.
LABEL: Eckl. 28.8.11.
STATUS: Isotype.
OTHER TYPES: Not determined.
NOTES: Synonym of *Gomphocarpus gibbus* Dietr. (Brown 1908: under *Asclepias gibbus*).

20. Gomphocarpus rivularis Schltr., Bot. Jahrb. Syst. 20, Beibl. 51: 36 (1895).
PROTOLOGUE: In rivulis prope Middleburg, 25.Nov.1893 — n. 3789.
LABEL: Middleburg, 25.xi.1893, R. Schlechter 3789.
STATUS: Isotype.
OTHER TYPES: Not determined.
NOTES: Name in current use.

21. Gomphocarpus schinzianus Schltr., Bot. Jahrb. Syst. 20, Beibl. 51: 37 (1895).
PROTOLOGUE: In saxosis prope Heidelberg, 24.Nov.1893 — n. 3528.
LABEL: Heidelberg, 21.x.1893, R. Schlechter 3528.
STATUS: Isotype.
OTHER TYPES: BOL, K, NH, PRE (isotypes). Cited by Smith (1988: 408).
NOTES: Recombined as *Pachycarpus schinzianus* (Schltr.) N.E.Br.

22. Gomphocarpus undulatus Turcz., Bull. Soc. Nat. Moscou 21: 259 (1848).
PROTOLOGUE: C. b. spei Eckl. n. 36.10.12.
LABEL: Eckl. Zeyh. no. 36.10.12.
STATUS: Isotype.
OTHER TYPES: Not determined.
NOTES: Status uncertain. Not mentioned in Brown (1908).

23. Lagarinthus barbatus Turcz., Bull. Soc. Nat. Moscou 21: 257 (1848).
PROTOLOGUE: C. b. sp. Eckl. coll. n. 24.13.12.
LABEL: Eckl. Zeyher no. 24.13.12.
STATUS: Isotype.
OTHER TYPES: Not determined.
NOTES: Recombined as *Sisyranthus barbatus* (E.Mey.) N.E.Br.

24. Lagarinthus gracilis E.Mey., Comm. Pl. Afr. Austr. 206 (1838).
PROTOLOGUE: a) In montosis asperis Dutoitskloof, alt. 800 2000 ped. (III, A, e); b) Ado in collibus graminosis, alt. 1000 — 1500 ped.; c) inter Boschbergen et Vetkuil, alt. 2500 ped. (V, a); d) In graminosis inter Omsamculo et Omcomas, alt. 400 ped. (V, c).
LABEL: E.m.d., 1837, Drège.
STATUS: Possible isolectotype.

OTHER TYPES: K (lectotype); BM (isolectotype). Designated by Brown 1907: 656).
NOTES: The MEL specimen was in a folder labelled 'Lagarinthus gracilis'. Recombined as *Aspidoglossum gracile* (E.Mey.) Kupicha.

25. Lagarinthus interruptus E.Mey., Comm. Pl. Afr. Austr. 208 (1838).
PROTOLOGUE: Witbergen, in rupestribus graminosis, alt. 5000 ped. (I, a).
LABEL: Dr.
STATUS: Possible isolectotype.
OTHER TYPES: K (lectotype); BM, CGE, K, MO (isolectotypes). Designated by Kupicha (1984: 658).
NOTES: The MEL specimen was in a folder labelled 'Lagarinthus interruptus'. Despite the lack of label data, it is probable that this is a isolectotype as no other Drège collections were cited by Kupicha (1984). Recombined as *Aspidoglossum interruptum* (E.Mey.) Bullock.

26. Lagarinthus microdon Turcz., Bull. Soc. Nat. Moscou 25: 317 (1852).
PROTOLOGUE: Caput bonae spei. Zeyher coll. n. 3402.
LABEL: Zeyher 3402.
STATUS: Isotype.
OTHER TYPES: Not determined.
NOTES: Status uncertain (Kupicha 1984).

27. Lagarinthus tenellus Turcz., Bull. Soc. Nat. Moscou 21: 256 (1848).
PROTOLOGUE: C. b. sp. Eckl. coll. n. 20.78.
LABEL: Ecklon — Zeyher no. 20.(78.)
STATUS: Isotype.
OTHER TYPES: Not determined.
NOTES: Status uncertain (Kupicha 1984).

28. Pachycarpus concolor E. Mey., Comm. Pl. Afr. Austr. 210 (1837).
PROTOLOGUE: Locis graminosis a) inter Schalumna et Kachu, alt. 1000 — 2000 ped. (V, b); b) inter Omsamculo et Omcomas, infra 500 ped. alt. (V, c).
LABEL: 1837, Drège.
STATUS: Possible isotype.
OTHER TYPES: K (lectotype). Chosen by Smith (1988: 411).
NOTES: The MEL specimen was in a folder labelled 'Pachycarpus concolor'. There is only the one collection by Drège of this species cited by Smith (1988), hence it is probable that this is a duplicate of the type collection. Name in current use.

29. Pachycarpus rigidus E.Mey., Comm. Pl. Afr. Austr. 211 (1837).
PROTOLOGUE: In collibus asperis prope Rietvalei, alt. 5500 ped. (I, a).
LABEL: Drège.
STATUS: Possible isotype.
OTHER TYPES: K (isotype). Cited by Smith (1988: 421).
NOTES: The MEL specimen was in a folder labelled 'Pachycarpus rigidus'. There is only the one collection by Drège of this species cited by Smith (1988), hence it is probable that this is ìa duplicate of the type collection. Name in current use.

30. Periglossum kässnerianum Schltr., Bot. Jahrb. Syst. 20, Beibl. 51: 40 (1895).
PROTOLOGUE: In depressis humidis prope Kl. — Olifant-Rivier, 22.Dec.1893 — n.4043.
LABEL: Olifants River, 22.xii.1893, R. Schlechter 4043.
STATUS: Isotype.
OTHER TYPES: Not determined.
NOTES: Name in current use.

31. Raphionacme obovata Turcz., Bull. Soc. Nat. Moscou 21: 250 (1848).
PROTOLOGUE: Ecklon coll. Cap. n. 64.
LABEL: 64.10.11 107.11
STATUS: Isotype.
OTHER TYPES: Not determined.
NOTES: A synonym of *Raphionacme divaricata* Harv. (Brown 1908).

32. Raphionacme zeyheri Harv., London J. Bot. 1: 23 (1842).
PROTOLOGUE: Uitenhage, C. Zeyher....in a field by the Zwart Kops River.
LABEL: Zwartkopsrivier, Zeyh. 3385.
STATUS: Isotype.
OTHER TYPES: Not determined.
NOTES: Name in current use.

33. Rhombonema luridum Schltr., Bot. Jahrb. Syst. 20, Beibl. 51: 41 (1895).
PROTOLOGUE: In planitie graminosa ad pedem montium Magalisbergen, 3.Nov.1893 — n.3610.
LABEL: Transvaal. Magalisbergu, 3.xi.1893, R.Schlechter 3610.
STATUS: Isotype.
OTHER TYPES: Not determined.
NOTES: A synonym of *Parapodium costatum* E.Mey. (Brown 1908).

34. Sarcostemma tetrapterum Turcz., Bull. Soc. Nat. Moscou 21: 255 (1848).
PROTOLOGUE: C. bon. Spei. Eckl. coll. n. 56. 82.
LABEL: Eckl. Zeyh. no. 56.82.
STATUS: Isolectotype.
OTHER TYPES: MO (lectotype). Designated by Liede (1991: 114).
NOTES: A synonym of *Sarcostemma viminale* (L.) R.Br. (Liede 1991).

35. Schizoglossum altissimum Schltr., Bot. Jahrb. Syst. 20, Beibl. 51: 13 (1895).
PROTOLOGUE: In ripis rivulorum prope Lydenburg, 11.Dec.1893 — n.3944.
LABEL: Lydenburg, 11.xii.1893, R.Schlechter 3944.
STATUS: Isolectotype.
OTHER TYPES: K (lectotype); BM, BR, GRA, K, NH, Z (isolectotypes). Designated by Kupicha (1984: 658).
NOTES: A synonym of *Aspidoglossum interruptum* (E.Mey.) Bullock.

36. Schizoglossum bilamellatum Schltr., Bot. Jahrb. Syst. 20, Beibl. 51: 15 (1895).
PROTOLOGUE: In collibus graminosis ad flumen Waterval — Rivier, 17.Oct.1893 — n.3478.
LABEL: Waterval Rivier, 17.x.1893, R.Schlechter 3478.
STATUS: Isotype.
OTHER TYPES: BOL (lectotype); BM, K, NH, Z (isolectotypes). Designated by Kupicha (1984: 664).
NOTES: A synonym of *Aspidoglossum lamellatum* (Schltr.) Kupicha.

37. Schizoglossum hirsutum Turcz., Bull. Soc. Nat. Moscou 21: 256 (1848).
PROTOLOGUE: C. b. sp. Eckl. coll. n. 63.32.10.
LABEL: 63.32.10.
STATUS: Isotype.
OTHER TYPES: Not determined. None seen by Kupicha (1984: 608).
NOTES: A synonym of *Schizoglossum cordifolium* E.Mey. (Kupicha 1984).

38. Schizoglossum periglossoides Schltr., Bot. Jahrb. Syst. 20, Beibl. 51: 20 (1895).
PROTOLOGUE: In palude prope Kl. Olifant River, 21.Dec.1893 — n.4027; in humidis, Mendts Farm prope Pretoria, 5.Jan.1894 — n.4142.

LABEL: Pretoria, 5.i.1894, R.Schlechter 4142.
STATUS: Syntype.
OTHER TYPES: Not determined.
NOTES: Thought to belong in *Stenostelma*, however, current status uncertain (Kupicha 1984: 668).

39. Schizoglossum tenuissimum Schltr., Bot. Jahrb. Syst. 20, Beibl. 51: 23 (1895).
PROTOLOGUE: In clivis montium Elandspruitbergen, 19.Dec.1893 — n.3996.
LABEL: Transvaal. Elandspruitbergen, 19.xii.1893, R. Schlechter 3996.
STATUS: Isolectotype.
OTHER TYPES: BOL (lectotype); BM, GRA, K, NH, PRE, Z (isolectotypes). Designated by Kupicha (1984: 660).
NOTES: A synonym of *Aspidoglossum glabrescens* (Schltr.) Kupicha.

40. Tacazzea pedicellata K.Schum., Bot. Jahrb. Syst. 17: 115 (1893).
PROTOLOGUE: Central-Afrika im Lande der Monbuttu bei Munsa: Schweinfurth n. 3483 und 3488; im April blühend.
LABEL: Monbuttu. Munsa, 3.iv.1870, G. Schweinfurth 3488.
STATUS: Syntype.OTHER TYPES: K (syntypes). Cited by Bullock (1954: 361).
NOTES: Recombined as *Zacateza pedicellata* (K.Schum.) Bullock.

41. Xysmalobium prunelloides Turcz., Bull. Soc. Nat. Moscou 21: 255 (1848).
PROTOLOGUE: Habitat ad cap bonae spei. Eckl. coll. n. 41.13.12.
LABEL: 41.13.12. Eckl.
STATUS: Isotype.
OTHER TYPES: Not determined.
NOTES: Name in current use.

DISCUSSION

It is possible that further types of African aslepiads are present in MEL. Nevertheless those found are of some significance, particularly with regards to the lectotypification of several names, both in this paper and for future workers. There appears to be a particularly strong representation of types for taxa described in Meyer (1838), Schlechter (1895) and Turczaninow [African taxa] (1848, 1852).

Drège, *Ecklon* and *Zeyher* types appear to relatively widespread in herbaria with many in K and other European and southern African herbaria (*e.g.* Kupicha 1984, Smith 1988, Nicholas & Goyder 1992). Several asclepiad types are apparently present only in MEL or may represent scarce second duplicates (*cf.* Liede 1991), hence holdings in other families should be considered when searching for types based on their collections.

R. Schlechter types from southern Africa are relatively widespread in herbaria and he is considered to have collected large sets while in the region (Gunn & Codd 1981) where he specialised in Orchidaceae and Asclepiadaceae. Although Schlechter's prolific output in the Asclepiadaceae for Africa is well known (Nicholas 1992), there are proportionally very few types of his African collections in MEL with other herbaria in Europe and southern Africa obviously receiving more complete sets. Schlechter's well duplicated African collections contrasts with his later activities in Malesia where few duplicates seem to have been made of many of his collections in the Asclepiadaceae or Orchidaceae (*cf.* Christenson 1987a,b, Cribb & Robbins 1990, Forster, unpubl.), resulting in recurring problems in the typification of many of his taxa from these areas. The large duplication evident in his southern African collections may be directly related to the relatively amenable logistics of his time there, as he was based at Cape Town in the precursor to the Bolus Herbarium (BOL) for much of his initial stay (Nicholas 1992).

His later trips to places such as Indonesia and New Guinea were probably undertaken in field conditions of great adversity, both of climate, terrain and hostile inhabitants — hardly conducive to leisurely collecting.

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SPHAEROLOBIUM ACANTHOS (FABACEAE: MIRBELIEAE), A NEW SPECIES FROM THE GRAMPIANS, VICTORIA

MICHAEL D. CRISP*

ABSTRACT

Crisp, Michael D. *Sphaerolobium acanthos* (Fabaceae: Mirbelieae), a new species from the Grampians, Victoria. **Muelleria 8(2): 151–154 (1994).** — *Sphaerolobium acanthos*, which is restricted to the Grampians in western Victoria, is described as new. It is distinguished from *S. daviesioides*, which occurs in Western Australia. A key to eastern Australian species of *Sphaerolobium* is presented.

SPHAEROLOBIUM ACANTHOS

Sphaerolobium acanthos Crisp, *sp. nov.*

Sphaerolobium daviesioides auct. non Turcz.; J.H. Willis, *Handbook Pl. Victoria* 2: 256 (1972).

Frutices caulibus ramisque vestitis ramulis numerosis regulatim dispositis divaricatis brevibus (1–2 cm) spinescentibus (1–)3(–5)-furcatis scaberulis, stylo longitudinaliter sinuoso et lateraliter torto, stigma pilorum caespite. *S. daviesioides* Turcz. similis est sed differt ramulis irregularibus laevibus e partibus infernis caulium ramorumque absentibus, stylo sursum flexo nec sinuoso nec torto, stigma pilis nullis.

HOLOTYPUS: Victoria, Grampians, Victoria Valley, 37°17′30″S, 142°22′30″E, 6 January 1977, *J. Lewenberg s.n.* (MEL 523881).

Rigid, wiry shrubs, 0.2–1 m high, faintly ribbed and minutely scabrous on stems and branches; branches few, ascending, rather long; branchlets numerous, divaricate, often recurved, short (up to 15 mm), commonly 3–5-forked at the tips. *Leaves* scattered to sub-whorled, subulate, 2–3 mm long, caducous, leaving a scale-like persistent base. *Flowers* (1)2 on a very short (up to 0.5 mm) peduncle which is produced into a subulate tip between the flowers; bracts and bracteoles obovate, caducous. *Calyx* campanulate, 3.5–4.5 mm long, divided within 1–1.5 mm of base, uniformly lead-grey; upper lip cuneate, emarginate, with acuminate outcurved tips; lower three lobes uniform, subulate. *Corolla* dull reddish-brown or orange; *standard* transversely broad-elliptic, emarginate, cordate, 7–7.5 mm long and broad including the 1–1.5 mm claw, yellow at centre; *wings* narrow-obovate, 6–7 × 2–2.5 mm including the 1 mm claws, with an adaxial lobe at the base; *keel* obliquely broad-obovate, 6–7 × 3.5 mm including the 1.5 mm claws, with an adaxial lobe at the base. *Stamens* 10, free, uniform; anthers versatile, with conspicuous brownish connective. *Gynoecium* glabrous, with a 1.5 mm stipe; *style* sinuous, twisted 90–180°, strongly compressed, distal portion erect and adaxially winged; wing narrowly cuneate, 1.5–2 mm long, membraneous, ciliate on margin; *stigma* terminal, marked by a tuft of hairs; *ovary* turgid, with two marginal ovules. *Pod* turgid, broadly obovoid-ellipsoid, somewhat oblique, *c.* 4.5 mm long, *c.* 3.5 mm diam., somewhat pruinose; immature *seed* obliquely very broad-ovoid, not developing an aril. (Figs. 1, 2a-b)

FLOWERING PERIOD

December to January, or rarely November.

FRUITING PERIOD

January to February.

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Figure 1. The holotype of *Sphaerolobium acanthos*.

Etymology

The specific epithet is from the Greek *akanthos*, meaning a prickly plant.

Selected Specimens (total examined 15)

Victoria — Grampians: Mt William walking track, 9.2 km N of Serra Rd/Halls Gap-Dunkeld Rd intersection, 22 Dec. 1989, *D.E. Albrecht 3913* (MEL 233907); no precise locality, Nov. 1892, *W.R.A.*

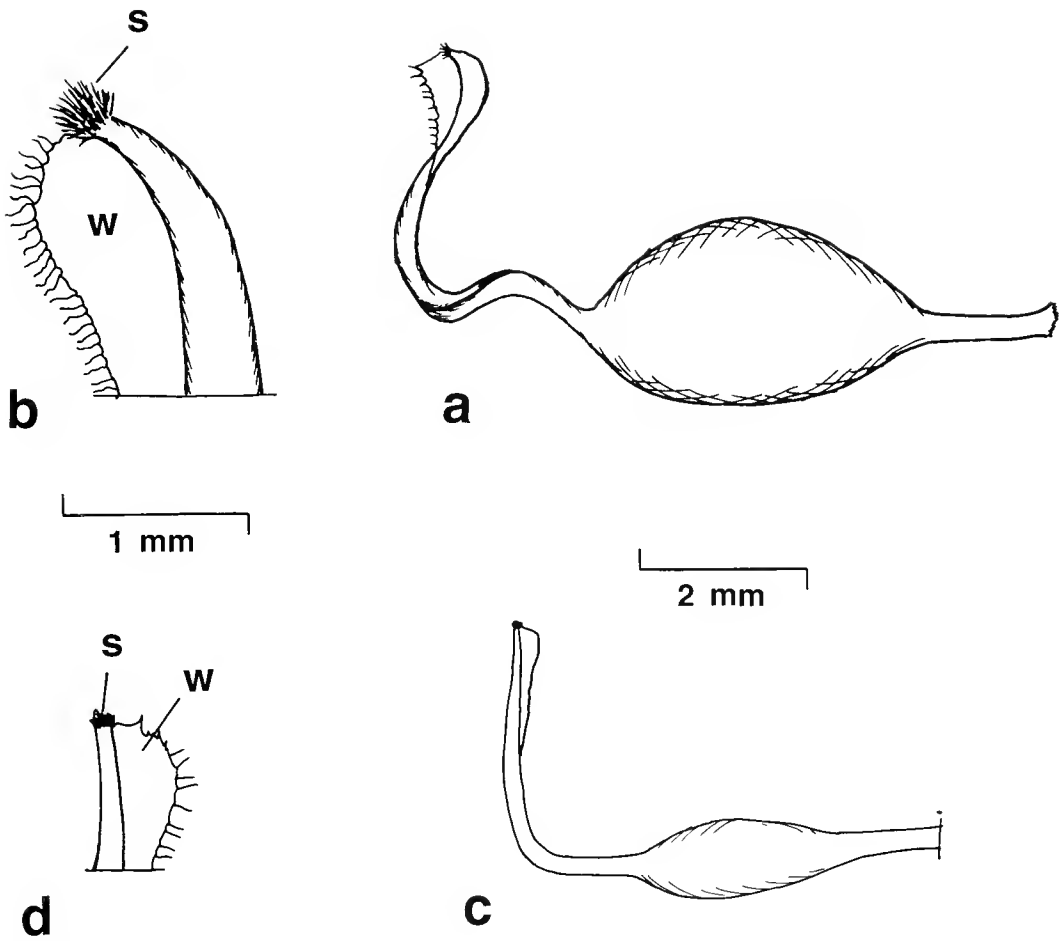

Figure 2. a–b *Sphaerolobium acanthos*. a — gynoecium (stipe at right, style at left). b — distal portion of style, showing membraneous wing (w) and stigma (s) with tuft of hairs. c–d *S. daviesioides*. c — gynoecium. d — distal portion of style showing wing (w) and glabrous stigma (s). a–b drawn from *Albrecht 3919* (MEL); c–d drawn from *Taylor 1686* (CBG).

Baker s.n. (MEL 1517581); Mt William, NW slope, 14 Nov. 1966, *A.C. Beauglehole 15919* (MEL 516945); Mt Rosea Ck, above Calectasia Falls, 27 Jan. 1969, *A.C. Beauglehole 30374* (MEL 516946); Mt William, 19 km SSE of Halls Gap, 15 Dec. 1975, *H. Streimann 3070* (A, BISH, CBG, L, MO, PERTH, US).

Distribution and Conservation Status

Sphaerolobium acanthos is restricted to the Grampians, in western Victoria, where it has been recorded only from the Halls Gap — Mt William area and the Victoria Valley. The species is clearly rare (by virtue of its restricted distribution) but its conservation status should be evaluated by thorough field survey. One collector (*Albrecht 3913*) indicated that he saw only three plants. However, the plants flower in summer when collectors are less active, and therefore some populations may have been overlooked. All known populations are reserved.

Habitat

This species is recorded from lower slopes, gullies and near streams. Associated vegetation comprises sclerophyll forest, woodland or heath, including taxa such as *Eucalyptus* aff. *aromaphloia*, *E. willisii*, *Callitris*, *Leptospermum*, *Banksia*, *Pultenaea*, *Hakea*, *Bossiaea*, *Astrotricha* and *Brachyscome*.

AFFINITY

Hitherto, *S. acanthos* has been confused with *S. daviesioides*. However, the latter is endemic to the south coast of Western Australia, where it is found between the Stirling Range and the western end of the Great Australian Bight. *S. daviesioides* differs in having smooth (not scaberulous) stems and branchlets, and its spinescent lateral branchlets are undivided and concentrated near the stem apices, so that the lower portion of the stems and main branches are naked. In *S. acanthos*, the lateral branchlets are often 3–5-forked, and they are evenly spaced (*c.* 1 cm apart) all along the stems and branches. Whereas the style of *S. acanthos* is sinuous longitudinally as well as twisted laterally through 90–180° (Fig. 2a), that of *S. daviesioides* differs in simply being flexed upwards at 90° from a little below the middle (Fig. 2c). Also, the stigma of *S. acanthos* is furnished with a tuft of hairs (Fig. 2b), whilst that of *S. daviesioides* has none (Fig. 2d).

There appear to be other differences between these species, but evidence is less reliable. For instance, on petal colour, Willis (1973: 256) reports those of *S. acanthos* (under '*S. daviesioides*') to be 'brownish', and on the specimen *Albrecht 3913*, they are described as '*Chorizema* orange with yellow centre in standard'; whilst a specimen of *S. daviesioides sensu stricto* records its flowers as simply 'yellow'. Also, *S. acanthos* flowers in summer (December and January), while *S. daviesioides* flowers in spring (September and October).

Until recently, only two species of *Sphaerolobium* were recognised in eastern Australia, and both were considered to occur in Western Australia as well, viz. *S. daviesioides* and *S. vimineum* (Hnatiuk 1990). Now it appears that there are three species endemic in the east: *S. acanthos*, *S. minus* and *S. vimineum* (Crisp 1993). The following key distinguishes these.

KEY TO EASTERN AUSTRALIAN SPECIES OF *SPHAEROLOBIUM*

1 Branchlets numerous, short (to 15 mm), divaricate, spinescent.... **S. acanthos**
1: Branchlets few, long (several cm), ascending, not pungent..... 2

2 Calyx and bracteoles darkly punctate; wings longer than and enclosing keel; style with a membranous wing nearly as broad as long and < 1/4 length of style ..... **S. vimineum**
2: Calyx and bracteoles uniformly lead-grey; wings equal to and exposing keel; style with wing much longer than broad, tapering down from apex to 1/3 to 1/2 length of style ..... **S. minus**

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A REVISED CHECKLIST OF THE TASMANIAN LICHEN FLORA

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ABSTRACT

Kantvilas, Gintaras. A revised checklist of the Tasmanian lichen flora. **Muelleria 8(2): 155–175 (1994)**. — A total of 762 taxa of lichens and lichenicolous fungi in 210 genera are recorded from Tasmania and its offshore islands. A revised list of names of taxa deleted from the census is provided. Seventeen species represent new records for Tasmania.

INTRODUCTION

Ongoing research on the lichen flora of Tasmania and nearby regions has led to the description of many new taxa, the clarification of many others and the discovery of numerous previously unrecorded species. This increase in knowledge of the island's flora and the growing interest in it's conservation status has hastened the need for a revision of the previous checklist of Tasmanian lichens (Kantvilas 1989).

The present paper lists 762 taxa in 210 genera, including 33 taxa whose Tasmanian distribution is confined to the Bass Strait Islands. A further 97 names, mainly synonyms or misidentifications, are deleted from the Tasmanian census.

Literature pertaining to Tasmanian lichens (see also McCarthy 1992) was reviewed briefly by Wetmore (1963) and subsequently by Kantvilas (1989). Since that time, new taxa from Tasmania have been described in the genera *Arthonia* (Kantvilas & Vězda 1992, Wedin 1993a), *Arthothelium* (Kantvilas & Vězda 1992), *Austropeltum* (Henssen *et al.* 1992), *Bactrospora* (Egea & Torrente 1993), *Canoparmelia* (Elix 1993), *Chiodecton* (Thor 1990), *Dibaeis* (Gierl & Kalb 1993), *Diploicia* (Elix *et al.* 1988), *Gyalideopsis* (Kantvilas & Vězda 1992), *Hypogymnia* (Elix & Jenkins 1989), *Laurera* (McCarthy & Kantvilas 1993a), *Lecanactis* (Kantvilas & Vězda 1992), *Leptogium* (Verdon 1990), *Micarea* (Coppins & Kantvilas 1990), *Menegazzia* (James & Galloway 1992), *Neofuscelia* (Kantvilas & Elix 1992), *Pannaria* and *Parmeliella* (Jørgensen & Galloway 1992), *Pertusaria* (Kantvilas 1990b, Archer 1991a, Archer & Elix 1992), *Porina* (McCarthy 1990, 1993b, McCarthy & Kantvilas 1993b), *Roccellinastrum* (Kantvilas 1990a), *Sphaerophorus* (Kantvilas & Wedin 1992), *Thelenella* (Mayrhofer & McCarthy 1991), *Siphulastrum* (Jørgensen & Galloway 1992), *Siphulella* (Kantvilas *et al.* 1992), *Usnea* (Stevens 1992), *Verrucaria* (McCarthy 1991a) and *Xanthoparmelia* (Elix 1993).

Regional or world monographs with relevance to Tasmania have been completed for *Bactrospora* (Egea & Torrente 1993), *Endocarpon* (McCarthy 1991b), *Fuscoderma* (Jørgensen & Galloway 1989), *Leproloma* (Laundon 1989), *Lithographa* and *Rimularia* (Hertel & Rambold 1990), *Degelia* (Jørgensen & James 1990), *Rimelia* (Hale & Fletcher 1990), *Rimeliella* (Kurokawa 1991), *Toninia* (Timdal 1991) and *Xanthoparmelia* (Hale 1990).

Nomenclatural changes and revisions of taxa occurring in Tasmania have also occurred in the genera *Bacidia* (Kantvilas 1993, Kantvilas & Jarman 1993), *Cladonia* (Ahti *et al.* 1990), *Cladina* (Ruoss & Ahti 1989), *Hafellia* (Sheard 1992), *Pertusaria* (Archer 1991b, Archer & Elix 1992), *Pyrrhospora* (Kalb & Hafellner 1992), *Microthelia* (Hawksworth 1985a), *Pyrgillus* (Aptroot 1991) and *Usnea* (Rogers & Stevens 1988). In addition, taxa previously placed in the genus *Sphaerophorus* have been assigned to *Bunodophoron* or *Leifidium* (Wedin 1993b).

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New records from Tasmania have been published by McCarthy (1991c, 1993a, 1993b), Kantvilas & Jarman (1991, 1993), Kantvilas (1991), Vězda (1992), Kantvilas & Elix (1992), Kantvilas & James (1991), Kantvilas & Thor (1993), Hertel (1987, 1989, 1990), Verdon (1990, 1992), Archer (1989, 1991b, 1991c, 1992a), James & Galloway (1992) and Jørgensen & Galloway (1992).

This checklist also includes some non-lichenised fungi which have been associated with the lichens taxonomically or ecologically, for example *Biatoropsis, Cornutispora, Dactylospora, Globosphaeria, Lichenothelia, Plectocarpon, Polycoccum, Rhynchomeliola, Stromatopogon* and members of the Caliciales. Contributions in these groups have been published by Triebel (1989), Henssen & Kantvilas (1985), Hawksworth (1985b, 1990), Gierl & Kalb (1993) and Diederich (1992)

The following taxa are recorded for Tasmania for the first time in the present paper (see Appendix 1):

Arthroraphis grisea Th. Fr., *Biatoropsis usnearum* Räsänen, *Buellia punctata* (Hoffm.) Massal., *Candelariella xanthostigmoides* (Müll.Arg.) R.W.Rogers, *Cladonia subsubulata* Nyl., *Collema fasciculare* var. *microcarpum* (Müll.Arg) Degelius, *Massalongia carnosa* (Dickson) Körber, *Omphalina umbellifera* (L. *ex* Fr.) Quélet, *Pannaria subimmixta* Knight, *Rinodina pyrina* (Ach.) Arn., *Sphaerophorus tibellii* Wedin, *Usnea confusa* Asahina, *U. nidulifera* Motyka, *U. oncodes* Stirton, *U. pycnoclada* Vainio, *U subeciliata* (Motyka) Swinsc. & Krog and *U. undulata* Stirton.

These are based on the author's collections, collections of other lichenologists, including A.Aptroot, the late G.C.Bratt and H.Mayrhofer, studies of herbarium material, and the unpublished revisionary work of G.N.Stevens.

METHODS

As with the previous census (Kantvilas 1989), names based on a type specimen from Tasmania are indicated in **bold** type. Those whose known Tasmanian distribution is confined to the Bass Strait islands and which have not been recorded from the Tasmanian 'mainland' are enclosed in square brackets. Non-lichenised fungi are preceded by an asterisk. Names which are based on uncertain, mainly nineteenth century literature records are followed by a (+).

The list of deleted names and justifications for the deletions includes names based on a Tasmanian type specimen, plus any names excluded since the list of Kantvilas (1989).

CHECKLIST OF TASMANIAN LICHENS AND ALLIED FUNGI

Acarospora citrina (Taylor) Zahlbr. *ex* Rech.
***A. tasmanica* Räsänen**

Alectoria nigricans (Ach.) Nyl.

***Arthonia apteropteridis* Kantvilas & Vězda**
A. cinereopruinosa Schaerer *s.lat.*
A. cinnabarina (DC.) Wallr. (+)
A. ilicina Taylor
A. miserula Nyl. (+)
A. pseudocyphellariae Wedin
A. radiata (Pers.) Ach. (+)
***A. sagenidii* Vězda & Kantvilas**
***A. tasmanica* Kantvilas & Vězda**

Arthopyrenia anisoloba Müll.Arg.

Arthothelium ampliatum (Knight & Mitten) Müll.Arg.
A. interveniens (Nyl.) Zahlbr.
A. macrothecium (Fée) Massal. (+)
***A. subspectabile* Vězda & Kantvilas**

Arthrorhaphis alpina (Schaerer) R. Sant.
A. citrinella (Ach.) Poelt
A. grisea Th. Fr.

***Austroblastenia pauciseptata* (Shirley) Sipman**
A. pupa Sipman

Austropeltum glareosum Henssen, Döring & Kantvilas

Bacidia albidoplumbea (J.D. Hook. & Taylor) Hellbom
B. buchananii (Stirton) Hellbom
B. leucocarpa Knight (+)
***B. vallatula* (Jatta) Kantvilas**

***Bactrospora arthonioides* Egea & Torrente**

***Baeomyces heteromorphus* Nyl. *ex* Church. Bab. & Mitten**

Bellemerea alpina (Sommerf.) Clauz. & Roux

**Biatoropsis usnearum* Räsänen

Blastenia carnella (Nyl.) Müll.Arg. (+)
B. pulcherrima Müll.Arg.

[*Buellia coniops* (Wahlenb. *ex* Ach.) Th.Fr.] (+)
B. disciformis (Fr.) Mudd
***B. levieri* Jatta**
B. punctata (Hoffm.) Massal.
[*B. subalbula* (Nyl.) Müll.Arg.] (+)

Bunodophoron australe (Laurer) Massal.
***B. flaccidum* (Kantvilas & Wedin) Wedin**
B. imshaugii (Ohlsson) Wedin
B. insigne (Laurer) Wedin
B. macrocarpum (Ohlsson) Wedin
B. murrayi (Ohlsson) Wedin
B. notatum (Tibell) Wedin
B. patagonicum (Dodge) Wedin
B. ramuliferum (Lamb) Wedin
B. scrobiculatum (Church. Bab.) Wedin
B. tibellii (Wedin) Wedin

Byssoloma subdiscordans (Nyl.) P.James

Calicium abietinum Pers.
***C. adspersum* Pers. ssp. *australe* Tibell**
C. glaucellum Ach.
C. salicinum Pers.
C. trabinellum (Ach.) Ach.
C. tricolor F.Wilson
C. victorianum (F.Wilson) Tibell ssp. *victorianum*

Caloplaca aurantiaca (Lightf.) Th.Fr. f. *lignicola* (Nyl.) Th.Fr. (+)
C. cerinella (Nyl.) Flagey (+)
C. chrysophthalma Degelius (+)
C. cinnabarina (Ach.) Zahlbr. (+)
C. citrina (Hoffm.) Th.Fr. (+)
***C. cribrosa* (Hue) Zahlbr.**
C. ferruginea (Huds.) Th.Fr. (+)
C. flavorubescens (Huds.) Laundon (+)
C. holocarpa (Hoffm.) Wade (+)
C. rugulosa (Nyl.) Zahlbr. (+)
C. saxicola (Hoffm.) Nordin (+)
C. sublobulata (Nyl.) Zahlbr. (+)

Candelaria concolor (Dickson) B.Stein

Candelariella xanthostigmoides (Müll.Arg.) R.W.Rogers

Canoparmelia norpruinata Elix & Johnston
[*C. whinrayi* Elix]

Carbonea vorticosa (Flörke) Hertel

Catapyrenium lachneum (Ach.) R.Sant.

Catillaria contristans (Nyl.) Zahlbr.
C. kelica (Stirton) Zahlbr.
C. pulverea (Borrer) Lettau
***C. tasmanica* Räsänen**
C. trachonoides (Nyl.) Zahlbr. (+)
***C. umbratilis* Jatta**

Catinaria laureri (Hepp *ex* Th.Fr.) Degelius

Cetraria aculeata (Schreb.) Fr.
C. australiensis W.Weber *ex* Kärnefelt
C. islandica (L.) Ach. ssp. *antarctica* Kärnefelt

Chaenotheca brachypoda (Ach.) Tibell
C. brunneola (Ach.) Müll.Arg.
C. carthusiae (Harm.) Lettau
C. chlorella (Ach.) Müll.Arg.
C. ferruginea (Turn. *ex* Smith) Migula
C. gracillima (Vainio) Tibell
C. hispidula (Ach.) Zahlbr.
C. stemonea (Ach.) Müll.Arg.
C. trichialis (Ach.) Th.Fr.

**Chaenothecopsis debilis* (Turn. *ex* Borrer) Tibell
**C. haematopus* Tibell
**C. nigra* Tibell
**C. pusilla* (Ach.) A.Schmidt
**C. sagenidii* Tibell
**C. savonica* (Räsänen) Tibell
***C. tasmanica* Tibell**
**C. viridireagens* (Nádv.) A.Schmidt

Chiodecton colensoi (Massal.) Müll.Arg.
***C. flavovirens* Thor**
C. montanum Thor

Chroodiscus megalophthalmus (Müll.Arg.) Vězda & Kantvilas

Chrysothrix candelaris (L.) Laundon

Cladia aggregata (Sw.) Nyl.
***C. fuliginosa* Filson**
***C. inflata* (F.Wilson) D.Galloway**
***C. moniliformis* Kantvilas & Elix**
***C. retipora* (Labill.) Nyl.**
***C. schizopora* (Nyl.) Nyl.**
C. sullivanii (Müll.Arg.) Nyl.

Cladina confusa (R.Sant.) Follm. & Ahti
C. mitis (Sandst.) Hustich
C. tasmanica (Ahti) Ahti

Cladonia angustata Nyl.
C. bimberiensis Archer
C. capitellata (J.D.Hook. & Taylor) Church.Bab. var. *capitellata*
C. capitellata var. *interhiascens* (Nyl.) Sandst.
C. capitellata var. *squamatica* Archer
C. cervicornis (Ach.) Flotow ssp. *verticillata* (Hoffm.) Ahti
C. chlorophaea (Flörke) Sprengel
C. corniculata Ahti & Kashiwadani
C. cornuta (L.) Hoffm.
C. crispata (Ach.) Flotow var. *cetrariiformis* (Delise) Vainio
C. cryptochlorophaea Asahina
C. ecmocyna Leighton
C. enantia Nyl.
C. fimbriata (L.) Fr.
C. floerkeana (Fr.) Flörke
C. furcata (Huds.) Schrader
C. gracilis (L.) Willd. ssp. *tenerrima* Ahti
C. humilis (With.) Laundon var. *humilis*
C. humilis var. *bourgeanica* Archer
C. krempelhuberi Vainio
C. kuringaiensis Archer
C. macilenta Hoffm.
C. merochlorophaea Asahina
C. murrayi W.Martin
C. neozelandica Vainio
C. ochrochlora Flörke
C. paeminosa Archer
C. pertricosa Krempelh.
C. pleurota (Flörke) Schaerer
C. praetermissa Archer var. *praetermissa*
C. praetermissa var. *modesta* (Ahti & Krog) Kantvilas & Archer
C. pyxidata (L.) Hoffm.
C. ramulosa (With.) Laundon
C. rigida (J.D.Hook. & Taylor) Hampe var. *rigida*
C. rigida var. *acuta* (Taylor) Archer
C. sarmentosa (J.D.Hook. & Taylor) Dodge
C. scabriuscula (Delise) Leighton
C. southlandica W.Martin
C. staufferi des Abb.
C. subsubulata Nyl.
C. sulcata Archer var. *sulcata*
C. sulcata var. *wilsonii* (Archer) Archer
C. tessellata Ahti & Kashiwadani
C. ustulata (J.D.Hook & Taylor) Leighton
***C. weymouthii* F. Wilson *ex* Archer**

Cliostomum griffithii (Sm.) Coppins

Coccocarpia erythroxyli (Sprengel) Swinsc. & Krog
C. palmicola (Sprengel) Arvidsson & Galloway

Coccotrema cucurbitula (Mont.) Müll. Arg.
C. porinopsis (Nyl.) Imshaug *ex* Yoshimura

Coenogonium implexum Nyl.

Collema coccophorum Tuck.
C. crispum (Huds.) Weber
C. durietzii Degelius
C. fasciculare (L.) Wigg. var. *fasciculare*
C. fasciculare var. *colensoi* Church.Bab.
C. fasciculare var. *microcarpum* (Müll. Arg.) Degelius
C. flaccidum (Ach.) Ach.
C. glaucophthalmum Nyl. var. *glaucophthalmum*
C. glaucophthalmum var. *implicatum* (Nyl.) Degelius
C. laeve J.D.Hook. & Taylor var. *laeve*
C. laeve var. *senecionis* (F.Wilson) Degelius
***C. leucocarpum* J.D.Hook. & Taylor**
C. quadriloculare F.Wilson var. *quadriloculare*

***C. quadriloculare* var. *tasmaniae* F.Wilson**
C. subconveniens Nyl.
C. subflaccidum Degelius

***Conotremopsis weberiana* Vězda**

****Cornutispora ciliata* Kalb**

Cystocoleus ebeneus (Dillwyn) Thwaites

**Dactylospora australis* Triebel & Hertel

Degelia duplomarginata (P.James & Henssen) Arvidsson & Galloway
D. durietzii Arvidsson & Galloway
D. gayana (Mont.) Arvidsson & Galloway
D. novaezelandiae (Dodge) Jørgensen & Galloway
D. rosulata Jørgensen & Galloway

Dendriscocaulon dendriothamnodes Dughi in Galloway

Dibaeis absoluta (Tuck.) Kalb & Gierl
D. arcuata (Stirton) Kalb & Gierl

Dictyonema sericeum (Sw.) Berkley

Dimerella lutea (Dickson) Trevisan

Diploicia canescens (Dickson) Massal. ssp. *canescens*
[*D. canescens* ssp. *australasica* Elix & Lumbsch]

Diploschistes muscorum (Scop.) R.Sant. ssp. *bartlettii* Lumbsch
D. ocellatus (Vill.) Norman
D. scruposus (Schreber) Norman
D. sticticus (Körber) Müll.Arg.

[*Diplotomma alboatrum* (Hoffm.) Flotow (+)]

Dirinaria picta (Sw.) Clem. & Shear

Endocarpon helmsianum Müll.Arg.
E. simplicatum (Nyl.) Nyl. var. *simplicatum*
E. simplicatum var. *bisporum* McCarthy

Ephebe fruticosa Henssen
E. lanata (L.) Vainio

Eremastrella crystallifera (Taylor) G.Schneider

Erioderma sorediatum Galloway & Jørgensen

[*Flavoparmelia euplecta* (Stirton) Hale]
F. haysomii (Dodge) Hale
***F. rutidota* (J.D.Hook. & Taylor) Hale**
[*F. soredians* (Nyl.) Hale]

Fulgensia fulgens (Sw.) Elenkin (+)
F. subbracteata (Nyl.) Poelt (+)

Fuscidea absolodes (Nyl.) Hertel & Wirth

Fuscoderma amphibolum (Knight) Jørgensen & Galloway
F. limbatum Jørgensen & Galloway

****Globosphaeria jamesii* D.Hawksw.**

Graphina subvelata (Stirton) Zahlbr.

Graphis angustata Eschw. (+)
G. insidiosa (Knight & Mitten) J.D.Hook.
G. librata Knight

Gyalecta jenensis (Batsch) Zahlbr. (+)

Gyalidea hyalinescens (Nyl.) Vězda

***Gyalideopsis graminicola* Vězda & Kantvilas**

Haematomma infuscum (Stirton) R.W. Rogers
H. sorediatum R.W.Rogers

***Hafellia dissa* (Stirton) Mayrhofer & Sheard**

Heterodea muelleri (Hampe) Nyl.

Heterodermia comosa (Eschw.) Follm. & Redon (+)
[*H. hypoleuca* (Ach.) Trevisan (+)]
[*H. japonica* (Sato) Swinsc. & Krog (+)]
H. microphylla (Kurok.) Swinsc. & Krog
H. obscurata (Nyl.) Trevisan
H. speciosa (Wulf.) Trevisan (+)

Hymenelia lacustris (With.) M.Choisy

Hyperphyscia adglutinata (Flörke) Mayrhofer & Poelt

Hypocenomyce australis Timdal
H. foveata Timdal

***Hypogymnia billardierei* (Mont.) Filson**
H. enteromorphoides Elix
H. kosciuskoensis Elix
H. lugubris (Pers.) Krog var. *lugubris*

H. lugubris var. *compactior* (Zahlbr.) Elix
***H. lugubris* var. *sublugubris* (Müll.Arg.) Elix**
***H. mundata* (Nyl.) Rassad.**
H. pulchrilobata (Bitter) Elix
***H. pulverata* (Nyl.) Elix**
H. subphysodes (Krempelh.) Filson var. *subphysodes*
H. subphysodes var. *austerodioides* Elix
***H. tasmanica* Elix**
H. tubularis (Taylor) Elix
H. turgidula (Bitter) Elix

Hypotrachyna laevigata (Sm.) Hale (+)
H. reducens (Nyl.) Hale
H. revoluta (Flörke) Hale
H. sinuosa (Sm.) Hale

Imshaugia aleurites (Ach.) S.F.Meyer

***Knightiella splachnirima* (J.D.Hook. & Taylor) Gyelnik**

***Laurera robusta* McCarthy & Kantvilas**

Lecanactis abietina (Ach.) Körber
L. subfarinosa (Knight) Hellbom (+)
***L. subpremnea* Kantvilas & Vězda**

***Lecanora atrella* Jatta**
L. austrooceana Hertel & Leuckert
L. blanda Nyl.
L. broccha Nyl.
L. caesiorubella Ach. (+)
L. carpinea (L.) Vainio (+)
L. cenisia Ach. (+)
L. crenulata (Dickson) Hook.
L. lineolata Müll.Arg. (+)
L. rupicola (L.) Zahlbr.
[*L. subcoarctata* (Knight) Hertel]
L. subfusca (L.) Ach. (+)
[*L. varia* (Hoffm.) Ach. (+)]

***Lecidea aniptiza* Stirton f. *intersociella* Stirton**
L. atromorio Knight
L. canorufescens Krempelh. (+)
***L. cerarufa* Shirley**
L. contigua Fr. (+)
L. enteroleuca Ach. (+)
***L. flindersii* Crombie**
***L. hypersporella* Sirton**
L. hypnorum Libert (+)
L. immarginata R.Br. *ex* Crombie
L. lapicida (Ach.) Ach. var. *lapicida*
L. leptoloma Müll.Arg. (+)
L. minutula Müll.Arg. (+)
L. sarcogynoides Körber
***L. stuartii* Hampe**
***L. subnexa* Stirton**
***L. subtecta* Stirton**
L. turgidula Fr. (+)

Lecidella stigmatea (Ach.) Hertel & Leuckert

Leifidium tenerum (Laurer) Wedin

Leioderma duplicatum (Müll. Arg.) Galloway & Jørgensen
L. pycnophorum Nyl.
L. sorediatum Galloway & Jørgensen

Lepraria incana (L.) Ach.
L. lobificans Nyl.

Leprocaulon arbuscula (Nyl.) Nyl.
L. microscopicum (Vill.) Gams *ex* D. Hawksw.

Leproloma membranaceum (Dickson) Vainio
L. vouauxii (Hue) Laundon

Leptogium biloculare F.Wilson
L. coralloideum (Mey. & Flotow) Vainio
L. crispatellum Nyl.
L. cyanescens (Ach.) Körber
L. limbatum F.Wilson
L. menziesii (Sm. *ex* Ach.) Mont.
L. pecten F.Wilson
L. philorheuma F.Wilson
L. rogersii Verdon
***L. tasmanicum* F.Wilson**
L. victorianum F.Wilson

Leptotrema lepadodes (Tuck.) Zahlbr. (+)
***L. lepadodes* var. *endochrysoides* (Jatta) Zahlbr.**

[**Lichenothelia solitarioides* Henssen]

Lichina confinis (O.F. Müll.) Agardh
***L. tasmanica* Henssen**

Lithographa subantarctica Hertel & Rambold

Lobaria scrobiculata (Scop.) DC.

Lopadium biferum (Nyl.) Zahlbr. (+)
L. disciforme (Flotow) Poelt & Vězda
***L. hepaticola* Döbbeler, Vězda & Poelt**

Maronea constans (Nyl.) Hepp

Massalongia carnosa (Dickson) Körber

Megalaria grossa (Pers. *ex* Nyl.) Hafellner

Megaloblastenia marginiflexa (J.D.Hook. & Taylor) Sipman

Megalospora campylospora (Stirton) Sipman
M. gompholoma (Müll.Arg.) Sipman ssp. *fuscolineata* Sipman
***M. lopadioides* Sipman**
M. subtuberculosa (Knight) Sipman

Melampilidium metabolum (Nyl.) Müll.Arg. (+)

Melanelia piliferella (Esslinger) Esslinger
M. subglabra (Räsänen) Esslinger

***Melaspilea circumserpens* Nyl.**
M. gemella (Eschw.) Nyl. (+)

Menegazzia aeneofusca (Müll.Arg.) R.Sant.
***M. caesiopruinosa* P.James**
M. caliginosa P.James & Galloway
M. castanea P.James & Galloway
***M. confusa* P.James**
***M. corrugata* P.James**
***M. elongata* P.James**
M. eperforata P.James & Galloway
M. fertilis P.James
M. globulifera R.Sant.
***M. inactiva* P.James & Kantvilas**
***M. kantvilasii* P.James**
***M. minuta* P.James & Kantvilas**
***M. myriotrema* (Müll.Arg.) P.James**
***M. neozelandica* (Zahlbr.) P.James**
M. nothofagi (Zahlbr.) P.James & Galloway
M. platytrema (Müll.Arg.) R.Sant.
***M. prototypica* P.James**
***M. subbullata* P.James & Kantvilas**
M. subpertusa P.James & Galloway
M. testacea P.James & Galloway
M. ultralucens P.James & Galloway
***M. weindorferi* (Zahlbr.) R.Sant.**

Metus conglomeratus (F.Wilson) Galloway

***Micarea austroternaria* Coppins & Kantvilas**
***M. flagellispora* Coppins & Kantvilas**
***M. isabellina* Coppins & Kantvilas**
***M. mutabilis* Coppins & Kantvilas**
M. prasina Fr.
***M. prasinella* (Jatta) Lamb**

**Microcalicium arenarium* (Hampe *ex* Massal.) Tibell
**M. conversum* Tibell

Miltidea ceroplasta (Church.Bab.) Galloway & Hafellner

Multiclavula mucida (Pers.) R.H.Petersen
M. vernalis (Schw.) R.H.Petersen

**Mycocalicium albonigrum* (Nyl.) Tibell
**M. subtile* (Pers.) Szatala
**M. victoriae* (Knight *ex* F.Wilson) Tibell

Mycoporellum obscurum (Pers.) A.L.Smith (+)

[*Neofuscelia glabrans* (Nyl.) Esslinger]
N. imitatrix (Taylor) Esslinger
***N. loxodella* (Esslinger) Esslinger**
N. parviloba (Esslinger) Esslinger
N. pulla (Ach.) Esslinger
N. stygiodes (Nyl. *ex* Crombie) Esslinger
***N. subloxodella* Elix & Kantvilas**
N. verrucella (Esslinger) Esslinger

Neophyllis melacarpa (F.Wilson) F.Wilson

Nephroma australe Richard
N. cellulosum (Ach.) Ach. var. *cellulosum*
N. cellulosum var. *isidioferum* J.Murray
N. rufum (Church.Bab.) P.James

Normandina pulchella (Borrer) Nyl.

Ochrolechia androgyna (Hoffm.) Arn.
O. frigida (Sw.) Lynge
O. pallescens (L.) Massal. (+)
O. parella (L.) Massal. (+)
***O. weymouthii* Jatta**

Omphalina umbellifera (L. *ex* Fr.) Quélet

***Opegrapha agelaeina* Jatta**
O. agelaeoides Nyl.
O. stellata Knight
O. viridis Pers. *ex* Ach.

Pannaria decipiens Jørgensen & Galloway
P. elixii Jørgensen & Galloway
P. fulvescens (Mont.) Nyl.
P. immixta Nyl.

P. subimmixta Knight

Pannoparmelia angustata (Pers. in Gaud.) Zahlbr.
P. wilsonii (Räsänen) Galloway

Paraparmelia conranensis (Elix) Elix & Johnston
P. lithophiloides (Kurok.) Elix & Johnston
[*P. mongaensis* (Elix) Elix & Johnston]

***Paraporpidia leptocarpa* (Church.Bab. & Mitten) Rambold & Hertel**

Parmelia cunninghamii Crombie
P. erumpens Kurok.
P. protosulcata Hale
P. salcrambidiocarpa Hale
P. signifera Nyl.
P. sulcata Taylor
***P. tenuirima* J.D.Hook. & Taylor**
P testacea Stirton

Parmeliella granulata Lamb
P. ligulata Jørgensen & Galloway
P. nigrocincta (Mont.) Müll.Arg.
P. thysanota (Stirton) Zahlbr.

Parmelina conlabrosa (Hale) Elix & Johnston
P. labrosa (Zahlbr.) Elix & Johnston
***P. pseudorelicina* (Jatta) Kantvilas & Elix**

Parmelinopsis afrorevoluta (Krog & Swinsc.) Elix & Hale
P. horrescens (Taylor) Elix & Hale (+)
P. minarum (Vainio) Elix & Hale
P. neodamaziana (Elix & Johnston) Elix & Hale
P. spumosa (Asahina) Elix & Hale (+)
P. subfatiscens (Kurok.) Elix & Hale

Parmeliopsis ambigua (Wulf.) Nyl.

Parmotrema chinense (Osbeck) Hale & Ahti
[*P. cristiferum* (Taylor) Hale]

Peltigera canina (L.) Willd.(+)
P. canina f. *leucorhiza* (Flörke) Flörke (+)
***P. degenii* Gyelnik f. *tasmaniae* Gyelnik**
P. didactyla (With.) Laundon
P. dolichorhiza (Nyl.) Nyl.
P. horizontalis (Huds.) Baumg. (+)
P. membranacea (Ach.) Nyl. (+)
P. polydactyla (Neck.) Hoffm. (+)
P. pusilla (Fr.) Körber (+)
P. rufescens (Weis) Humb. (+)

Peltula euploca (Ach.) Poelt *ex* Ozenda & Clauz.

Pertusaria alpina Hepp *ex* Ahles (+)
[*P. erythrella* Müll.Arg.]
***P. gibberosa* Müll.Arg.**
***P. gymnospora* Kantvilas**
***P. jamesii* Kantvilas**
[*P. leioplacella* Nyl.]
P. lophocarpa Körber
***P. norstictica* Archer**
P. novaezelandiae Szatala
***P. pertractata* Stirton**
***P. pseudodactylina* Archer**
[*P. subdactylina* Nyl.]
[*P. thiospoda* Knight]
P. trimera (Müll.Arg.) Archer
P. truncata Krempelh.
[*P. whinrayi* Archer]
P. xanthostoma (Somm.) Fr.

Phaeographis australiensis Müll.Arg.
P. exaltata (Mont. & v.d. Bosch) Müll.Arg.

Phaeophyscia endococcinodes (Poelt) Esslinger
P. orbicularis (Neck.) Moberg

Phlyctis subuncinata Stirton

Physcia adscendens (Fr.) Oliver
P. aipolia (Ehrh. *ex* Humb.) Fürnr. (+)
[*P. alba* (Fée) Müll.Arg. (+)]
P. albata (F.Wilson) Hale (+)
[*P. albicans* (Pers.) Thomson (+)]
P. caesia (Hoffm.) Fürnr.
P. clementei (Sm.) Lynge
P. stellaris (L.) Lynge
[*P. tribacia* (Ach.) Nyl. (+)]

Physconia grisea (Lam.) Poelt (+)

Physma chilense Hue

Placopsis cribellans (Nyl.) Räsänen
P. gelida (L.) Lindsay
P. parellina (Nyl.) Lamb
P. parellina f. *microphylla* Lamb
P. perrugosa (Nyl.) Nyl.
P. rhodocarpa (Nyl.) Wetmore
P. trachyderma (Krempelh.) P.James var. *clavifera* (Lamb) P.James

Placynthium nigrum (Huds.) S.F.Gray

***Platygrapha congerens* Nyl.**

**Plectocarpon pseudosticta* (Fée) Fée

Poeltiaria coromandelica (Zahlbr.) Hertel & Rambold
P. corralensis (Räsänen) Hertel
P. turgescens (Körber) Hertel

Polychidium contortum Henssen

****Polycoccum jamesii* D.Hawksw.**

***Porina aptrootii* McCarthy**
P. chlorotica (Ach.) Müll. Arg.
***P. constrictospora* McCarthy & Kantvilas**
P. corrugata Müll.Arg.
***P. decrescens* McCarthy & Kantvilas**
P. elegantula Müll.Arg.
P. guentheri (Flotow) Zahlbr.
P. heterocarpa McCarthy
***P. hyperleptalea* McCarthy & Kantvilas**
***P. kantvilasii* McCarthy**
P. leptalea (Durieu & Mont.) A.L.Smith
***P. sylvatica* McCarthy & Kantvilas**
***P. tasmanica* McCarthy**
[*P. whinrayi* McCarthy]

Porpidia albocaerulescens (Wulfen) Hertel & Knoph
P. crustulata (Ach.) Hertel & Knoph

Protoblastenia rupestris (Scop.) Steiner

Protoparmelia badia (Hoffm.) Hafellner
***P. petraeoides* (Nyl. *ex* Hue) Hertel**

Pseudephebe pubescens (L.) Choisy

Pseudocyphellaria ardesiaca Galloway
P. argyracea (Delise) Vainio
P. aurata (Sm.) Vainio
***P. billardierei* (Delise) Räsänen**
P. colensoi (Church.Bab.) Vainio
P. coronata (Müll.Arg.) Malme
P. crocata (L.) Vainio
P. dissimilis (Nyl.) Galloway & P.James
P. faveolata (Delise) Malme
P. glabra (J.D.Hook. & Taylor) Dodge
P. granulata (Church.Bab.) Malme
P. insculpta (Stizenb.) Galloway
P. intricata (Delise) Vainio
P. multifida (Nyl.) Galloway & P.James
P. neglecta (Müll.Arg.) Magnusson
***P. rubella* (J.D.Hook. & Taylor) Galloway & P.James**

Psilolechia clavulifera (Nyl.) Coppins
P. lucida (Ach.) Choisy
***P. purpurascens* Coppins & Purvis**

Psora decipiens (Hedw.) Hoffm. (+)

Psoroma allorhizum (Nyl.) Hue (+)
P. asperellum Nyl.
P. durietzii P. James & Henssen
P. euphyllum Nyl.
P. hypnorum (Vahl) S.F. Gray var. *hypnorum*
P. hypnorum var. *paleaceum* (Fr.) Rostrup
P. leprolomum (Nyl.) Räsänen
P. microphyllizans (Nyl.) Galloway
P. pallidum Nyl. (+)
P. pholidotoides (Nyl.) Trevis.
P. pholidotum (Mont.) Müll.Arg.(+)
***P. soccatum* R.Br.**
P. xanthomelanum Nyl. (+)

Psoromidium aleuroides (Stirton) Galloway
P. versicolor (J.D.Hook. & Taylor) Galloway

Punctelia borreri (Sm.) Krog
***P. subflava* (Taylor) Elix & Johnston**
P. subrudecta (Nyl.) Krog

Pycnothelia caliginosa Galloway & P.James

Pyrenocollema halodytes (Nyl.) R.C.Harris

***Pyrenopsis tasmanica* Nyl.**

***Pyrenula chloroplaca* Shirley**
***P. galactina* (Shirley) Kantvilas**
P. marginata J.D.Hook.
P. ravenellii (Tuck.) R.C.Harris

Pyrgillus indicus (Krempelh.) Aptroot

***Pyrrhospora laeta* (Stirton) Hafellner**

Pyxine nubila Moberg

Ramalea cochleata Müll.Arg.

***Ramalina caespitella* G.N.Stevens**
[*R. canariensis* Steiner]
R. celastri (Sprengel) Krog & Swinsc. ssp. *celastri*
***R. celastri* ssp. *ovalis* (J.D.Hook. & Taylor) G.N.Stevens**

R. fimbriata Krog & Swinsc.
R. fissa (Müll.Arg.) Vainio
R. glaucescens Krempelh.
R. inflata (J.D.Hook. & Taylor) J.D.Hook. & Taylor ssp. *inflata*
R. inflata ssp. *australis* G.N.Stevens
R. unilateralis F.Wilson
***R. whinrayi* G.N.Stevens**

Ramalodium succulentum Nyl.

Relicina limbata (Laurer) Hale
R. subnigra Elix & Johnston

Rhizocarpon badioatrum (Flörke *ex* Sprengel) Th. Fr. f. *atroalbum* (L.) Malme (+)
R. geographicum (L.) DC.
R. petraeum (Wulfen) Massal. (+)

****Rhynchomeliola lichenicola* Henssen & Kantvilas**

Rimelia cetrata (Ach.) Hale & Fletcher
R. reticulata (Taylor) Hale & Fletcher

Rimeliella subcaperata (Krempelh.) Kurokawa

Rimularia psephota (Tuck.) Hertel & Rambold

***Rinodina asperata* (Shirley) Kantvilas**
R. bischoffii (Hepp) Massal.
***R. brattii* Mayrhofer**
R. conradii Körber
R. exigua (Ach.) S.F.Gray (+)
R. gennarii Bagl.
R. murrayii Mayrhofer
R. occulta (Körber) Sheard
R. peloleuca (Nyl.) Müll.Arg.
R. procellarum (Massal.) Mayrhofer
R. pyrina (Ach.) Arn.
R. subcrustacea (Müll.Arg.) Zahlbr.
***R. tasmanica* Mayrhofer**
R. thiomela (Nyl.) Müll.Arg.

[*Roccellina expectata* Tehler]

***Roccellinastrum flavescens* Kantvilas**
***R. lagarostrobi* Kantvilas**
R. neglectum Henssen & Vobis

Sagenidium molle Stirton

***Sarrameana tasmanica* Vězda & Kantvilas**

Scoliciosporum pruinosum (P.James) Vězda

Siphula complanata (J.D.Hook. & Taylor) R.Sant.
S. decumbens Nyl.
***S. foliacea* D.Galloway**
***S. fragilis* (J.D.Hook. & Taylor) J.Murray**
***S. jamesii* Kantvilas**

***Siphulastrum granulatum* Jørgensen & Galloway**
S. mamillatum (J.D.Hook. & Taylor) Galloway

***Siphulella coralloidea* Kantvilas, Elix & James**

**Sphinctrina leucopoda* Nyl.
**S. tubaeformis* Massal.

Staurothele fissa (Taylor) Zwackh

Stephanocyclos henssenianus Hertel

Stereocaulon caespitosum Redinger
S. corticatulum Nyl. var. *corticatulum*
S. corticatulum var. *humile* (Müll.Arg.) Lamb
S. corticatulum var. *subcorticatum* (Räsänen) Lamb
S. gregarium Redinger
S. ramulosum (Sw.) Räuschel

***S. trachyphloeum* Lamb**
S. vesuvianum Pers.

Sticta damaecornis (Sw.) Ach. (+)
S. fuliginosa (Dickson) Ach.
S. limbata (Sm.) Ach.
S. macrophylla Delise (+)
S. querzicans Delise (+)
S. stipitata Knight
S. subcaperata (Nyl.) Nyl. (+)
S. sublimbata (Steiner) Swinsc. & Krog
S. sylvatica (Huds.) Ach. (+)
S. weigellii (Ach.) Vainio (+)

**Stromatopogon baldwinii* Zahlbr.

Synalissa cancellata F. Wilson (+)

Teloschistes chrysophthalmus (L.) Th.Fr.
[*T. flavicans* (Sw.) Norm.]
T. sieberianus (Laurer) Hillm.
***T. spinosus* (J.D.Hook. & Taylor) J.Murray**
T. spinosus f. *subteres* Filson
T. velifer F.Wilson
[*T. velifer* f. *nodulosa* (J.Murray) Filson]

Tephromela atra (Huds.) Hafellner

Thamnolia vermicularis (Sw.) Ach. var. *vermicularis*
T. vermicularis var. *subuliformis* (Ehrh.) Schaerer

***Thelenella tasmanica* Mayrhofer & McCarthy**

Thelidium papulare (Fr.) Arnold

Thelotrema decorticans Müll.Arg.
T. lepadinum (Ach.) Ach.
T. subdenticulatum (Zahlbr.) G.Salisb.
***T. subgranulosum* Jatta**
T. sueicicum (H.Magn.) P.James

Thysanothecium hookeri Mont. & Berk.
T. scutellatum (Fr.) Galloway

Tomasellia ischnobella (Nyl.) Keissl.

Toninia bullata (Meyen & Flotow) Zahlbr.

Trapelia coarctata (Sm.) M.Choisy
T. mooreana (Carroll) P.James

Trapeliopsis colensoi (Church.Bab.) G.Schneider
T. congregans (Zahlbr.) Brako
T. flexuosa (Fr.) Coppins & P.James
T. granulosa (Hoffm.) Lumbsch

Tremolecia atrata (Ach.) Hertel

Tuckermannopsis chlorophylla (Willd.) Hale

Turgidosculum complicatulum (Nyl.) J.Kohlmeyer & E.Kohlmeyer

Tylothallia pahiensis (Zahlbr.) Hertel & Kilias

Umbilicaria cylindrica (L.) Delise *ex* Duby
U. hyperborea (Ach.) Hoffm.
U. polyphylla (L.) Baumg.
U. propagulifera (Vainio) Llano
U. subglabra (Nyl.) Harm.

Usnea acromelana Stirton
U. angulata Ach.
U. articulata (L.) Hoffm.
U. baileyi (Stirton) Zahlbr.
U. confusa Asahina
U. inermis Motyka
U. maculata Stirton
U. molliuscula Stirton
U. nidulifera Motyka
U. oncodes Stirton
U. pycnoclada Vainio
U. rubicunda Stirton
***U. scabrida* Taylor ssp. *tayloriana* Stevens**
***U. spilota* Stirton**
U. subcapillaris (Galloway) F.J.Walker
U. subeciliata (Motyka) Swinsc. & Krog
U. torulosa (Müll.Arg.) Zahlbr.
U. undulata Stirton
U. xanthopoga Nyl.

Verrucaria baldensis Massal.
[*V. dufourii* DC.]
V. maura Wahlenb. *ex* Ach.
V. microsporoides Nyl.
[*V. muralis* Ach.]
V. striatula Wahlenb.
***V. subdiscreta* McCarthy**
***V. tessellatuloidea* McCarthy**

***Vezdaea obscura* Döbbeler**

***Wawea fruticulosa* Henssen & Kantvilas**

Xanthoparmelia alexandrensis Elix & Johnston
X. amphixantha (Müll.Arg.) Hale
X. amplexula (Stirton) Elix & Johnston
X. antleriformis (Elix) Elix & Johnston
X. arapilensis (Elix & P.Armstr.) Filson
X. australasica Galloway
X. austroconstrictans Elix
X. bungendorensis (Elix) Elix & Johnston
X. cheelii (Gyelnik) Hale
X. congesta (Kurok. & Filson) Elix & Johnston
X. cordillerana (Gyelnik) Hale
X. dichotoma (Müll.Arg.) Hale
X. digitiformis (Elix & P.Armstr.) Filson
X. dissitifolia Kurok. *ex* Elix & Johnston
X. elixii Filson
X. exillima (Elix) Elix & Johnston
X. filarszkyana (Gyelnik) Hale
X. flaviscentireagens (Gyelnik) Galloway
X. furcata (Müll.Arg.) Hale

X. glareosa (Kurok. & Filson) Elix & Johnston
X. hybridiza Elix & Johnston
[*X. incerta* (Kurok. & Filson) Elix & Johnston]
X. isidiigera (Müll.Arg.) Elix & Johnston
X. isidiosa (Müll.Arg.) Elix & Johnston
[*X. lineola* (Berry) Hale]
X. mannumensis (Elix) Elix & Johnston
X. metaclystoides (Kurok. & Filson) Elix & Johnston
X. mexicana (Gyelnik) Hale
X. mougeotina (Nyl.) Galloway
X. multipartita (R.Br.) Hale
X. neotinctina (Elix) Elix & Johnston
X. notata (Kurok.) Hale
X. phillipsiana (Filson) Elix & Johnston
X. pseudohypoleia (Elix) Elix & Johnston
X. pustuliza (Elix) Elix & Johnston
[*X. remanens* (Elix) Elix & Johnston]
X. rubrireagens (Gyelnik) Hale
X. scabrosa (Taylor) Hale
X. streimannii (Elix & P. Armstr.) Elix & Johnston
X. subnuda (Kurok.) Hale
X. substrigosa (Hale) Hale
X. taractica (Krempelh.) Hale
***X. tasmanica* (J.D.Hook. & Taylor) Hale**
X. tegeta Elix & Johnston
X. thamnoides (Kurok.) Hale
X. trirosea Elix
X. verdonii Elix & Johnston
***X. vicaria* Elix & Johnston**
X. willisii (Kurok. & Filson) Elix & Johnston

Xanthoria ligulata (Körber) P.James
X. parietina (L.) Th.Fr.

Zahlbrucknerella calcarea (Herre) Herre

DELETIONS

Arthonia complanata Fée. This record was based on a collection by W.A. Weymouth which has been redetermined as *Arthothelium ilicinum* (Taylor) P.James.
Arthonia epipastoides Leighton = *A. radiata* (Pers.) Ach.
***Arthonia multiformis* Shirley** = *A. ilicina* Taylor
Arthonia tumidula (Ach.) Ach. = *A. cinnabarina* (DC.) Wallr.
Arthopyrena sublittoralis (Leighton) Arnold. This record refers to *Pyrenocollema halodytes* (Nyl.) R.C.Harris (A. Aptroot pers. comm.).
***Arthothelium ferax* Müll.Arg** = *A. interveniens* (Nyl.) Zahlbr.
Arthothelium ilicinum (Taylor) P.James = *Arthonia ilicina* Taylor
Bacidia luteola (Schrader) Mudd. This name has been misapplied to *B. buchananii* (Stirton)Hellbom.
***Bacidia melasemoides* (Jatta) Zahlbr.** = *B. albidoplumbea* (J.D.Hook. & Taylor) Hellbom
Bacidia millegrana (Taylor)Zahlbr. The collection on which this record is based (see Bratt & Cashin 1976) has been redetermined as *B. albidoplumbea* (J.D.Hook. & Taylor) Hellbom (Kantvilas 1993).
Bacidia otagoensis* (Nyl.) Hellbom var. *tasmanica (Jatta) Zahlbr. = *B. albidoplumbea* (J.D.Hook. & Taylor) Hellbom
***Bacidia weymouthii* (Shirley) Zahlbr.** = *B. albidoplumbea* (J.D.Hook. & Taylor) Hellbom
Bactrospora dryina (Ach.) Massal. Not recorded for Tasmania by Egea & Torrente (1993). The species appears to be confined to Europe and North America.
Baeomyces absolutus Tuck. = *Dibaeis absoluta* (Tuck.) Kalb & Gierl
Baeomyces arcuatus Stirton = *Dibaeis arcuata* (Stirton) Kalb & Gierl
***Baeomyces squamarioides* Nyl. = *Knightiella splachnirima* (J.D. Hook. & Taylor) Gyelnik**
***Biatora byssacea* Hampe.** The type material of this taxon does not include any lichen (Kantvilas & Elix, unpublished data).

***Buellia polospora* (Leighton) Shirley var. *asperata* Shirley = *Rinodina asperata* (Shirley) Kantvilas**

Candelariella reflexa (Nyl.) Lettau. Refers to *C. xanthostigmoides* (Müll.Arg) R.W.Rogers in Australia (Filson 1992a).

Catillaria grossulina (Stirton) Zahlbr. Erroneously recorded from Tasmania. The species is known only from Stirton's type collection from Victoria.

Catinaria grossa (Pers. *ex* Nyl.) Vainio = *Megalaria grossa* (Pers. *ex* Nyl.) Hafellner

Catinaria pulverea (Borrer) Vězda & Poelt = *Catillaria pulverea* (Borrer) Lettau

Cetraria chlorophylla (Willd.) Vainio = *Tuckermannopsis chlorophylla* (Willd.) Hale

Chaenotheca chrysocephala (Turn. *ex* Ach.) Th.Fr. = *C. chlorella* (Ach.) Müll.Arg.

Cladonia arbuscula ssp. *stictica* Ruoss. In Australasia, this taxon is included in *Cladina mitis* (Archer 1992b) and is not accepted until an appropriate combination in the genus *Cladina* is made to accomodate stictic acid-containing populations.

***Cladonia coniodendroides* F.Wilson.** The type material of this taxon has not been located and hence its true identity remains unknown.

Cladonia crispata (Ach.) Flotow. Tasmanian specimens belong to *C. crispata* var. *cetrariiformis* (Delise) Vainio.

***Cladonia decurva* Taylor ex Church. Bab. & Mitten** = *C. scabriuscula* (Delise) Nyl. (A.W. Archer, pers. comm.).

Cladonia subdigitata Nyl. = *C. ustulata* (J.D.Hook & Taylor) Leighton (See Stenroos 1993).

Clathroporina eminentior (Nyl.) Müll. Arg. The Tasmanian record of this essentially tropical taxon is based on Mueller (1887). No authentic material can be located and the record appears to be erroneous (P.M.McCarthy pers. comm.).

Coelocaulon aculeatum (Schreb.) Link = *Cetraria aculeata* (Schreb.) Fr. See Kärnefelt *et al.* (1993).

Collema implicatum Nyl. Filson (1992b) offers no supporting discussion for his decision to treat this taxon at species rank. Accordingly, in this checklist, this lichen is retained as *C. glaucophthalmum* var. *implicatum* (Nyl.) Degelius after Degelius (1974).

Crocynia gossipina (Sw.) Massal. *Crocynia* is a mainly tropical genus (Hawksworth *et al.* 1983) and this name has most probably been misapplied to a species of *Lepraria.*

Cystocoleus niger (Huds.) Hariot = *C. ebeneus* (Dillwyn) Thwaites

Diploschistes subocellatus (Nyl.) Zahlbr. = *D. ocellatus* (Vill.) Norm. (H.T. Lumbsch, pers. comm.).

***Heterothecium pauciseptatum* Shirley = *Austroblastenia pauciseptata* (Shirley) Sipman**

Graphis scripta (L.) Ach. This name has been misapplied in Tasmania to *G. librata* Knight (Kantvilas & James 1991).

***Laurera megasperma* (Mont.) Zahlbr. var. *tasmanica* (Jatta) Zahlbr.** = *Pyrenula ravenellii* (Tuck.) R.C.Harris (McCarthy & Kantvilas 1993a).

***Lecania vallatula* Jatta = *Bacidia vallatula* (Jatta) Kantvilas**

Lecidea coromandelica Zahlbr. = *Poeltiaria coromandelica* (Zahlbr.) Rambold & Hertel

Lecidea elabens Fr. All Australian collections are referrable to either *L. stuartii* Hampe or *L. subnexa* Stirton (G.Kantvilas & J.Elix, unpublished).

***Lecidea laeta* Stirton = *Pyrrhospora laeta* (Stirton) Hafellner**

***Lecidea lampra* Stirton = *L. stuartii* Hampe** (G.Kantvilas & J.Elix, unpublished).

***Lecidea leptocarpa* Nyl. *ex* Church.Bab. & Mitten = *Paraporpidia leptocarpa* (Church.Bab. & Mitten) Rambold & Hertel**

Lecidea petraeoides **Nyl. *ex* Hue = *Protoparmelia petraeoides* (Nyl. *ex* Hue) Hertel**

Lecidella elaeochroma (Ach.) Choisy. Erroneously recorded from Tasmania; specimens so named by Kantvilas (1989) are referrable to an undescribed genus.

Leioderma amphibolum (Knight) Galloway & Jørgensen = *Fuscoderma amphibolum* (Knight) Jørgensen & Galloway

Megalospora biclipea **(Shirley) Zahlbr.** Type specimen lost (Kantvilas 1988) but this species is probably better referred to *Catillaria* or *Megalaria.*

Megalospora tasmanica **(Jatta) Zahlbr.** Sipman (1983) observed that the type specimen has acicular spores and is therefore not a *Megalospora.*

Megalospora taylori **Dodge =** *Megalospora gompholoma* ssp. *fuscolineata* Sipman

Menegazzia bullata (Stirton) Bitter. This material is now correctly included under *M. corrugata* P.James.

Menegazzia circumsorediata R.Sant. = *M. neozelandica* (Zahlbr.) P.James

Menegazzia retipora **(Stirton) Bitter = *M. myriotrema* (Müll.Arg.) P.James**

Microthelia analtiza (Stirton) Zahlbr. Incorrectly recorded from Tasmania by Zahlbruckner (1922). Hawksworth (1985a) states that this specimen is from New South Wales and is referable to the fungus, *Didymosphaeria futilis* (Berk. & Broome) Rehm.

Pannaria mariana (Fr.) Müll.Arg. This record appears to be very doubtful because the species is essentially tropical-subtropical and occurs in the rainforests of Queensland (Jørgensen & Galloway 1992). The alleged Tasmanian collection (in the Greville Herbarium, E) is attributed to the collector Henderson, a name not connected to any other Tasmanian lichen collections (Kantvilas 1983).

Pannaria pezizoides (Web.) Trevisan. Erroneously applied to specimens of *P. decipiens.*

Pannaria rubiginosa (Thunb. *ex* Ach.) Delise. The occurrence of this species in Australia is not supported by recent revisionary studies (*e.g.* Jørgensen & Galloway 1992).

Parmelia concors **Krempelh.** = *Parmotrema cristiferum* (Taylor) Hale

Parmelia pseudorelicina **Jatta = *Parmelina pseudorelicina* (Jatta) Kantvilas & Elix**

Parmeliella microphylla (Sw.) Müll.Arg. The occurrence of this species in Australia is not supported by the recent work of Jørgensen & Galloway (1992).

Parmeliella rubiginascens **(Nyl.) Müll.Arg.** = *P. thysanota* (Stirton) Zahlbr.

Parmeliella subgranulata Galloway & Jørgensen. The record of this species from King Island by Galloway & Jørgensen (1987) is incorrect and is based on a poorly developed specimen of *Pannaria elixii* (Jørgensen & Galloway 1992).

Parmelina stevensiana Elix & Johnston = ***P. pseudorelicina*** **(Jatta) Kantvilas & Elix**

Parmentaria gregalis (Knight) Müll.Arg. Refers to *Pyrenula ravenellii* (Tuck.) R.C.Harris in Tasmania (P.M.McCarthy pers. comm.).

Parmotrema reticulatum (Taylor) M.Choisy = *Rimelia reticulata* (Taylor) Hale & Fletcher

Parmotrema subcaperatum (Krempelh.) Hale = *Rimeliella subcaperata* (Krempelh.) Kurokawa

Pertusaria aggregata Müll.Arg. Not present in Tasmania (A.W.Archer, pers. comm.).

Pertusaria commutata Müll.Arg. Not present in Tasmania (A.W.Archer, pers. comm.).

Pertusaria lacerans Müll.Arg. Not present in Tasmania; Jatta's (1911) record refers to *P. novaezelandiae.*

Pertusaria leucostoma (Bernh.) Massal. Not present in Tasmania; all records are referrable to *P. gibberosa* and related taxa.
Pertusaria meridionalis Müll.Arg. var. *xanthostoma* Müll.Arg. Records of this taxon now refer to *P. leioplacella* Nyl. (Archer & Elix 1992).
Pertusaria ornatula Müll.Arg. Not present in Tasmania (A.W. Archer, pers. comm.).
Pertusaria paratropa Müll.Arg. Not present in Tasmania (A.W. Archer, pers. comm.).
Pertusaria superba Zahlbr. = *P. lophocarpa* Körber
Pertusaria trypetheliformis Nyl. Not present in Tasmania (A.W.Archer, pers. comm.).
Phyllopsora congregans (Zahlbr.) Galloway = *Trapeliopsis congregans* (Zahlbr.) Brako
Phyllopsora parvifolia (Pers.) Müll.Arg. All Tasmanian specimens found under this name are *Neophyllis melacarpa* (F.Wilson) F.Wilson.
Porina leptaleina (Nyl.) Müll.Arg. Tasmanian collections are now referred to *P. hyperleptalea* McCarthy & Kantvilas (McCarthy & Kantvilas 1993b).
Porina nucula Ach. Tasmanian collections are now referred to *P. sylvatica* McCarthy & Kantvilas (McCarthy & Kantvilas 1993b).
***Pseudopyrenula galactina* Shirley = *Pyrenula galactina* (Shirley) Kantvilas**
Psoroma hirsutulum Nyl. *ex* Crombie. Not present in Tasmania (Jørgensen & Galloway 1992).
Psoroma paleaceum (Fr.) Nyl. = *P. hypnorum* var. *paleaceum* (Fr.) Rostrup
Psoroma sphinctrinum (Mont.) Nyl. Not present in Tasmania (Jørgensen & Galloway 1992).
Pyrenula kunthii (Fée) Fée = *P. marginata* J.D.Hook.
Pyrgillocarpon indicum (Krempelh.) Nádv. in Tibell = *Pyrgillus indicus* (Krempelh.) Aptroot
***Rinodina dissa* (Stirton) Mayrhofer = *Hafellia dissa* (Stirton) Mayrhofer & Sheard**
***Schismatomma congerens* (Nyl.) Zahlbr.** According to Tehler (1993), this taxon belongs in a genus of the Lecanorales and hence, for the time being, it is included herein under its basionym ***Platygrapha congerens* Nyl.**
Siphulastrum triste Müll.Arg. Not present in Tasmania (Jørgensen & Galloway 1992). Probably conspecific with or misapplied to *S. mamillatum.*
***Sphaerophorus flaccidus* Kantvilas & Wedin = *Bunodophoron flaccidum* (Kantvilas & Wedin) Wedin**
Sphaerophorus imshaugii Ohlsson = *Bunodophoron imshaugii* (Ohlsson) Wedin
Sphaerophorus insignis Laurer = *Bunodophoron insigne* (Laurer) Wedin
Sphaerophorus macrocarpus Ohlsson = *Bunodophoron macrocarpum* (Ohlsson) Wedin
Sphaerophorus melanocarpus (Sw.) DC. = *Bunodophoron australe* (Laurer) Massal.
Sphaerophorus murrayi Ohlsson = *Bunodophoron murrayi* (Ohlsson) Wedin
Sphaerophorus notatus Tibell = *Bunodophoron notatum* (Tibell) Wedin
Sphaerophorus patagonicus (Dodge) Ohlsson = *Bunodophoron patagonicum* (Dodge) Wedin
Sphaerophorus ramulifer Lamb = *Bunodophoron ramuliferum* (Lamb) Wedin
Sphaerophorus scrobiculatus (Church. Bab.) Sato = *Bunodophoron scrobiculatum* (Church. Bab.) Wedin
Sphaerophorus tener Laurer = *Leifidium tenerum* (Leurer) Wedin
Sphaerophorus tibellii Wedin = *Bunodophoron tibellii* (Wedin) Wedin
Stereocaulon leptaleum Nyl. = *S. corticatulum* Nyl.
***Stereocaulon macrocarpoides* Nyl.** = *S. ramulosum* (Sw.) Räuschel
Toninia microlepis (Müll.Arg.) Zahlbr. This taxon belongs in the genus *Buellia* (Timdal 1991).
Usnea capillacea Motyka = *U. articulata* (L.) Hoffm. (G.N.Stevens *in litt.*).

Usnea ceratina Ach. Not present in Tasmania (G.N.Stevens *in litt.*).
Usnea contexta Motyka = *U. articulata* (L.) Hoffm. (G.N.Stevens *in litt.*)
Usnea hirta (Müll.Arg.) Weber *emend.* Motyka. Not present in Tasmania (G.N.Stevens *in litt.*).
Usnea leprosa Motyka. Not present in Tasmania (G.N.Stevens *in litt.*); misapplied to *U. oncodes.*
Usnea ramulosissima Stevens & Rogers. Not present in Tasmania (Stevens 1992).
Usnea scabrida Taylor. Refers to *U. scabrida* ssp. *tayloriana* Stevens in Tasmania.
***Usnea tasmanica* (Müll.Arg.) Zahlbr.** = *U. baileyi* (Stirton) Zahlbr.
Usnea torquescens Stirton = *U. angulata* Ach. (G.N.Stevens *in litt.*).
Usnea trichodea Ach. Not present in Tasmania (G.N.Stevens *in litt.*).
Xanthoparmelia adhaerens (Nyl.) Hale. This name now belongs in the African genus *Karoowia* (Hale 1989). All Australian material is referrable to *Xanthoparmelia xanthomelaena.*
Xanthoparmelia constrictans (Nyl. *ex* Crombie) Hale. This species is confined to South Africa and all Australian records refer to *X. austroconstrictans* Elix (see Elix 1993).
***Xanthoria spinosa* (J.D.Hook. & Taylor) Du Rietz = *Teloschistes spinosus* (J.D.Hook. & Taylor) J.Murray**
***X. spinulosa* (Krempelh.) Hillm. = *Teloschistes spinosus* (J.D.Hook. & Taylor) J.Murray**

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APPENDIX 1 — NEW RECORDS FOR TASMANIA

1. *Arthrorhaphis grisea* Th.Fr.

This species occurs on the thallus of *Baeomyces heteromorphus* and is recognised by its black lecideine apothecia to *c.* 0.5 mm wide and by its multiseptate, acicular spores, 50–70 × 2–2.5 μm.

SPECIMENS EXAMINED: *Tasmania* — Hartz Mountains, on plateau, 800 m a.s.l., 9 Aug. 1981, *G.Kantvilas 522/81* (HO, BM); McPartlan Pass, 360 m a.s.l., 8 Mar. 1991, *G.Kantvilas 82/91* (HO, GZU); Lake Osborne Track, 9 Aug. 1981, *P.W.James s.n.* (HO, BM).

2. *Biatoropsis usnearum* Räsänen

This widely distributed gall-forming lichenicolous fungus occurs on the thallus of species of *Usnea*.

SPECIMEN EXAMINED: *Tasmania* — Brady's Sugarloaf, 980 m a.s.l., on thallus of *Usnea torulosa*, growing on dolerite outcrops in eucalypt forest, 11 Jan. 1992, *G.Kantvilas 90/92* (HO).

3. *Buellia punctata* (Hoffm.) Massal.

SPECIMEN EXAMINED: *Tasmania* — between Shelly Point and Buxton Point, south of Swansea, on driftwood on coastal rocks, 18 Feb. 1985, *H.Mayrhofer 9641 & H.Hertel* (GZU).

4. *Candelariella xanthostigmoides* (Müll.Arg.) R.W.Rogers

Referred to in previous Tasmanian literature as *C. reflexa* (Nyl.) Lettau and recognised by its granular, corticolous thallus and eight-spored asci (see Filson 1992a). The species is common in dry sclerophyll forest.

SELECTED SPECIMENS EXAMINED: *Tasmania* — Carr Villa Cemetery, Launceston, 80 m a.s.l., 6 Feb. 1992, *A.V.Ratkowsky s.n.* (HO); Hummocky Hills, 200–470 m a.s.l., *A.V.Ratkowsky s.n.* (HO); Brown Mountain Road, Campania, 220 m a.s.l. 16 Aug. 1981, *G.Kantvilas & P.W.James 742/81* (HO, BM); Hunting Grounds, *c.* 4.5 km west of Dysart, 400 m a.s.l., 7 Aug. 1981, *G.Kantvilas & P.W.James 461/81* (HO, BM).

5. *Cladonia subsubulata* Nyl.

This species name is used herein to accomodate *C. crispata*-type specimens containing thamnolic acid with additional barbatic acid in their apothecia. Archer (1992b) includes such material within *C. crispata* var. *cetrariiformis*. However, that taxon contains squamatic acid as the major chemical constituent (Stenroos 1988). In Tasmania at least, the two chemical races show subtle morphological differences and, pending further study, each is treated as a distinct taxon. *C. subsubulata* is common in Tasmania in wet heathland, sedgeland and forest, and occurs on peat, soil or, occasionally, on wood. It ranges from lowland to alpine altitudes. In some earlier literature it was also referred to as *C. aueri* Räsänen.

SELECTED SPECIMENS EXAMINED: *Tasmania* — Mt Dial, 480 m a.s.l., 25 May 1991, *G.Kantvilas 239/91* (HO); Mt Wedge, 1140 m a.s.l., 17 Oct. 1981, *G.Kantvilas 859/81* (HO, BM); Twilight Tarn, 1000 m a.s.l., 9 Mar. 1980, *G.Kantvilas 5/80* (HO, BM); Pelion Plains, 890 m a.s.l., 11 Mar. 1992, *G.Kantvilas 255/92* (HO); Jane River Track, *c.* 1 km north of Loddon River, 520 m a.s.l., 1 Feb. 1986, *G.Kantvilas 29/86* (HO, NSW).

6. *Collema fasciculare* var. *microcarpum* (Müll. Arg.) Degelius

Recognised by its pulvinate thallus with abundant, granular to wart-like isidia, minute apothecia to *c.* 0.3 mm diam., and acicular spores to 170 µm long (see Degelius 1974 for full description), this species is common in wet scrub at the margins of rainforest.

SELECTED SPECIMENS EXAMINED: *Tasmania* — North-East Ridge Track to Mt Anne, 12 Dec. 1982, *G.Kantvilas 295/82* (HO); Mt Dundas Track, 460 m a.s.l., 14 Dec. 1988, *G.Kantvilas 540/88* (HO); Junction Creek, 260 m a.s.l., 14 Dec. 1984, *G.Kantvilas 723/84* (HO).

7. *Massalongia carnosa* (Dickson) Körber

This bipolar species resembles a species of *Parmeliella* but is distiguished by its small reddish brown thallus and septate spores [see Galloway (1985) and Purvis *et al.* (1992)] for full descriptions. It is rare in Tasmania where it occurs amongst mosses on rocks in alpine woodland.

SPECIMEN EXAMINED: *Tasmania* — Ouse River near Liawenee Canal, 1080 m a.s.l., 26 May 1983, *G.Kantvilas 67/83* (HO).

8. *Omphalina umbellifera* (L. *ex* Fr.) Quélet

See Lumbsch & Ewers (1992) for a brief discussion of this lichenised basidiomycete in Australia. The species has a granular *Botrydina*-type thallus and has been frequently illustrated in handbooks of fungi under the synonym, *O. ericetorum* (Fr.) M.Lange.

SPECIMEN EXAMINED: *Tasmania* — Sumac Road, Spur 2, south of Arthur River, 170 m a.s.l., on rotting log of *Nothofagus cunninghamii* in rainforest, 30 Jan. 1992, *G.Kantvilas, B.Fuhrer & J.Jarman 86/92* (HO).

9. *Pannaria subimmixta* Knight

Known also from eastern Australia and New Zealand, this species is locally common in the drier south-eastern parts of Tasmania where it occurs on sandstone outcrops in dry sclerophyll forest (see Jørgensen & Galloway 1992 full description).

SPECIMENS EXAMINED: *Tasmania* — Grass Tree Hill, 400 m a.s.l., 29 Sep. 1981, *G.Kantvilas 1009/81* (HO); Hunting Grounds at Dysart, 400 m a.s.l., 7 Aug. 1981, *G.Kantvilas & P.James 467/81* (BM, HO); Levendale, 360 m a.s.l., 1 Aug. 1981, *G.Kantvilas 445/81* (BM, HO).

10. *Rinodina pyrina* (Ach.) Arn.

This species occurs very abundantly on a variety of exotic trees and shrubs in parks and gardens.

SPECIMENS EXAMINED: *Tasmania* — The Cascades, Hobart, 120 m a.s.l., on *Malus* and *Ficus* in garden, 13 Aug. 1989, *G.Kantvilas 208/89, 209/89* (HO); same locality, on *Salix babylonica* in pasture, 17 Apr. 1990, *G.Kantvilas 180/90* (HO).

11. *Sphaerophorus tibellii* Wedin

For a summary of diagnostic characters of this rare species, see Kantvilas & Wedin (1992) (under 'species A') and Wedin (1992).

SPECIMEN EXAMINED: *Tasmania* — Arve Loop, near Geeveston, 360 m a.s.l., 3 May 1981, *G.Kantvilas 271/81* (HO).

12. *Usnea confusa* Asahina

SPECIMENS EXAMINED: *Tasmania* — Balts Spur, Tasman Peninsula, 7 Jan. 1983, *G.Kantvilas 11/83* (HO); Newmans Creek, 16 Mar. 1891, *W.A.Weymouth 12 p.p.* (HO).

13. *Usnea nidulifera* Motyka

SPECIMENS EXAMINED: *Tasmania* — Cape Sorell, June 1974, *M.Gilbert* (HO); Sumac Road, Spur 2, south of Arthur River, 170 m a.s.l., 24 Nov. 1980, *G.Kantvilas 668/80* (HO).

14. *Usnea oncodes* Stirton

This appears to be one of the most common and frequently collected species of *Usnea* from wet forests; it contains usnic and salazinic acids.

SPECIMENS EXAMINED: *Tasmania* — Lake Fenton, 1000 m a.s.l., 26 Mar. 1980, *G. Kantvilas 59/80* (BM, COLO, HO); Port Davey, 19 Mar. 1980, *S.J.Jarman 61/80* (HO,BM); Tiger Road, Florentine Valley, 550 m a.s.l., 6 Sep. 1980, *G.Kantvilas 362/80* (HO, BM).

15. *Usnea pycnoclada* Vainio

SPECIMEN EXAMINED: *Tasmania* — Calverts Lagoon, 31 Aug. 1980, *G. Kantvilas 339/80 p.p.* (HO).

16. *Usnea subeciliata* (Motyka) Swinsc. & Krog

SPECIMENS EXAMINED: *Tasmania* — Diddleum Plains, 640 m a.s.l., 3 Nov. 1980, *G. Kantvilas 534/80* (HO, BM); Julius River, 120 m a.s.l., 26 Nov. 1980,

G.Kantvilas 696/80 (HO, BM); Trevallyn State Recreation Area, 200 m a.s.l., 12 Feb. 1992, *A.V.Ratkowsky s.n.* (HO).

17 *Usnea undulata* Stirton

SPECIMENS EXAMINED: *Tasmania* — Julius River, 120 m a.s.l., 26 Nov. 1980, *G.Kantvilas 695/80* (HO, BM); Telopea Road near Ben Nevis, 870 m a.s.l., 5 Nov.1980, *G.Kantvilas 549/80 B* (HO); Mount Barrow Chalet, 600 m a.s.l., 30 Jan. 1965, *G.C.Bratt & M.H.Bratt 3224* (HO).

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NEW SPECIES OF ORCHIDACEAE FROM SOUTH-EASTERN AUSTRALIA

DAVID L. JONES*

ABSTRACT

Jones, David L. New species of Orchidaceae from south-eastern Australia. **Muelleria 8(2): 177–192 (1994).** — Nine new species of Orchidaceae from south-eastern Australia (with one extending to New Zealand) are described as new: *Caladenia amoena*, *C. atrata*, *C. hillmanii*, *Diuris ochroma*, *Prasophyllum suaveolens*, *Pterostylis atrans*, *P. commutata*, *P. monticola* and *P. tasmanica*. The new combination, *Pterostylis valida*, is made for *Pterostylis squamata* var. *valida* Nicholls.

INTRODUCTION

Continuing research into the systematics of Australian Orchidaceae has revealed the following species, described here, as new. All are from New South Wales, Victoria or Tasmania, with one extending to New Zealand. The descriptions facilitate the preparation of accounts for the *Flora of Australia*, the *Orchid Atlas of Tasmania*, the *Flora of Victoria*, and the *Catalogue of New Zealand Orchidaceae*.

TAXONOMY

Caladenia amoena D.L.Jones *sp. nov.*

C. concinnae (Rupp) D.L.Jones et M.Clements affinis sed floribus parvioribus, petalis et sepalis lateralis pendentibus, osmophoris sepalorum glandulosis minus, labello parviore, callis rubrioribus congestis minus, callis basalibus angustioribus et columna anguste differt.

TYPUS: Victoria: cult ex Wattle Glen, 37°39′10″S, 145°11′45″E, 24 Sept. 1992, *P.Branwhite s.n.* (*D.L.Jones 10160*) (HOLOTYPUS: CBG; ISOTYPUS: MEL).

Hirsute, tuberous, terrestrial herb growing singly or in loose groups. *Leaf* lanceolate, 3–8 cm × 7–9 mm, erect, dull green, purple-blotched at the base, densely hirsute with patent, eglandular trichomes to 4 mm long. *Inflorescence* 5–12 cm tall, wiry, reddish towards the base, densely hirsute with trichomes similar to those on the leaf mixed with shorter glandular trichomes. *Sterile bract* narrowly obovate-spathulate, 15–18 mm × 4–5 mm, involute, spreading, externally hirsute, obtuse. *Fertile bract* ovate-elliptical, 13–15 mm × 6–7 mm, closely sheathing, externally hirsute, subacute. Flower usually solitary, *c.* 12–14 mm across, cream-green heavily suffused with red, osmophores very small, floral fragrance undetectable; dorsal sepal erect and incurved, lateral sepals and petals downcurved close to the ovary. *Dorsal* sepal linear to linear-lanceolate, 20–25 mm × 2.5–3 mm, narrowed to a linear-involute section just before the osmophore; osmophore 1.5–2.5 mm × 0.5–0.7 mm, with uncrowded, sessile, dark brown, ellipsoid to globular glandular cells. *Lateral sepals* oblong-lanceolate, 17–23 mm × 3–3.5 mm, slightly falcate, narrowed to a linear, involute section then terminated by an osmophore similar to that on the dorsal sepal. *Petals* linear-lanceolate, 15–18 mm × 1.3–1.6 mm, long-acuminate. *Labellum* articulated on a short claw *c.* 2 mm × 1.3 mm, yellowish green with a reddish mid-lobe and reddish calli, 3-lobed. *Lamina* cordate in outline when flattened, 9–12 mm × 8–11 mm, obliquely erect in proximal half, strongly recurved in distal third; lateral lobes 3–4 mm across, obliquely erect, proximal margins entire, distal margins with 1–5 obliquely erect, flat, linear

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lobes 0.6–1.2 mm long; mid-lobe deltate when flattened, 4–4.5 mm × 3.5–4 mm, margins with 6–8 pairs of broad, porrect, obtuse teeth, decrescent towards the apex. *Lamina calli* in 4 irregular rows, moderately congested and occupying about 1/3 of the ventral surface of the lamina, dark reddish, those in proximal half stalked, decresent and sessile towards the apex; basal calli *c.* 3 mm long, stalked, head elongate-clavoid, *c.* 0.8 mm across, surface very irregular; longest lamina calli *c.* 1.8 mm long, hockey-stick-shaped, stalked, irregular in shape when viewed from above, surface irregular. *Column* erect and incurved, 8–9 mm × 3.3–3.5 mm, transparent with fine reddish striae and markings, lower dorsal surface with stalked, glandular trichomes, broadly winged; basal glands asymmetrically ellipsoid, *c.* 2 mm × 0.6 mm, shiny yellow with a red base. *Anther c.* 3 mm × 2.5 mm, yellow, with a linear rostrum *c.* 0.6 mm long. *Pollinia* 4, *c.* 2.5 mm long, broadly boomerang-shaped, flat, yellow. *Stigma* more or less circular, *c.* 2 mm wide, sunken. *Capsule* not seen. (Fig. 2 a–c)

Distribution and Habitat

Endemic to southern Victoria where known from a few localities near Melbourne. It grows on ridges and sheltered slopes in dry sclerophyll forest in shallow clay loam over Silurian siltstone.

Flowering Period

Late August to early October.

Notes

Caladenia amoena is similar in many respect to *C. concinna* but can be distinguished by its generally smaller flowers with the lateral sepals and petals downcurved close to the ovary and imparting a drooping appearance. It also has sepalline osmophores which are very short and sparsely glandular (prominent, relatively long and moderately dense in *C. concinna*), a smaller labellum with reddish, less congested calli, narrower basal calli on the labellum and a narrower column. *Caladenia concinna* has flowers 22–26 mm across, labellum 13–16 mm long, and column 5.5–6 mm wide. *Caladenia toxochila* also has some similarities but its flowers are darker coloured with prominent sepalline osmophores and much thicker, blackish, congested lamina calli. The distribution of each of these taxa is distinct with *C. concinna* being confined to the south-western Plains of New South Wales, *C. toxochila* occurring in north-western Victoria and South Australia and the new species from southern Victoria. A recently discovered group of *C. amoena* on private land was destroyed during clearing operations soon after its discovery (C.Beardsell pers. comm.).

Conservation Status

Reduced to great rarity by alienation of its habitat, and apparently now known only from private land; suggest 2E by criteria of Briggs & Leigh (1988).

Etymology

From the Latin *amoenus*, pleasant, delightful.

Caladenia atrata D.L.Jones *sp. nov.*

C. cucullatae Fitzg. affinis sed statura humiliore, floribus 1 vel 2, segmentis perianthii angustioribus, denigratis per glandes densas, callis labellorum sparsim dipositis differt.

Typus: Tasmania, hill 2.5 km north-east of Ferntree, 42°55′S, 147°16′E, 29 Oct. 1990, *D.L.Jones 6805 & C.H.Broers* (Holotypus: CBG; Isotypi: CBG, HO, MEL, NSW, AD).

Hirsute, tuberous, terrestrial herb growing in loose groups. *Leaf* 6–13 cm × 3–3.5 mm, linear, erect, dark green, sparsely hirsute with a mixture of patent,

transparent eglandular trichomes to 1.5 mm long and shorter glandular trichomes. *Inflorescence* 12–20 cm tall, very slender, wiry, densely beset with short glandular and eglandular trichomes similar to those on the leaf. *Sterile bracts* 6–8 mm × 2.5–3 mm, narrowly obovate-lanceolate, closely sheathing, subacute, externally hirsute. *Fertile bracts* similar. *Flowers* one to four, *c.* 1.8 cm across, white internally, blackish externally from a dense covering of sessile, ovoid, black glands, the mid-lobe of the labellum dark purple; dorsal sepal erect and strongly incurved, lateral sepals porrect and divergent, petals spreading, curved forwards and often upcurved in distal third. *Dorsal sepal* 10–12 mm × 2.4–3 mm, obovate, cucullate, apex broadly obtuse, apiculate. *Lateral sepals* 10–14 mm × 2–2.5 mm, asymmetrically lanceolate, falcate, divergent, apex subacute to acute. *Petals* 10–13 mm × 2–2.5 mm, linear-lanceolate, falcate, acuminate. *Labellum* articulated on a short claw, white or pinkish with dark purple spots and a dark, purple mid-lobe. *Lamina* 4.5–6 mm × 3.5–4.5 mm, ovate in outline when flattened, erect in proximal half then curved forwards, apex recurved; lateral lobes *c.* 1 mm wide, erect and column-embracing, lateral margins entire, apical margins entire or with a short lobe; mid-lobe *c.* 2.5 mm long, recurved, with *c.* 3 pairs of marginal calli similar to those on the lateral lobes and another three or four pairs of flat blunt teeth decrescent and reduced to denticulations at the apex. *Lamina calli* in four irregular rows extending two-thirds of the length of the mid-lobe, stalks white, heads purplish-black; basal calli 2, *c.* 0.7 mm long, shortly stalked, head elongate-ovoid, densely papillate; longest lamina calli *c.* 1 mm long, long-stalked (to 0.7 mm long), head ovoid, erect or curved forwards, densely papillate. *Column* 5.5–6.5 mm × *c.* 2.3 mm, erect and recurved, gibbous in the distal half, broadly winged, greenish with red blotches, a few stalked glandular trichomes on the dorsal surface; central ridge *c.* 0.7 mm wide. *Anther c.* 1 mm × 1 mm, cream, papillate, with a short linear rostrum. *Pollinia* 4, *c.* 1.8 mm long, cream, flat. *Stigma c.* 1 mm wide, ± circular, sunken, green. *Capsule* not seen. (Fig. 1 a–g).

Distribution and Habitat

Endemic in Tasmania where apparently restricted to southern areas. *Caladenia atrata* is typically found in hilly districts and grows in stunted open forest with a sparse understorey. Soils are commonly skeletal, grey to white, powdery when dry and developed on Permian mudstone and occasionally sandstone (D.Ziegeler pers. comm.). Occasionally the species grows on loams (H.Wapstra pers. comm.).

Flowering Period

Late October to December.

Notes

Caladenia atrata is closest to *C. cucullata* Fitzg. but can be readily distinguished by its shorter habit (to 35 cm tall in *C. cucullata*), flowers which are intensely white inside and blackish or dark reddish outside from a dense vestiture of sessile, ovoid black to red-black glands on the exterior surface of the tepals (sparse greenish to brown glands in *C. cucullata*), narrower (2.3 mm rather than 4 mm), more distinctly pointed tepals and fewer, sparser calli on the labellum. The flowers of *C. cucullata* exude a lemony fragrance while that from *C. atrata* has been likened to the smell of Cointreau (D. Ziegeler pers. comm.). *Caladenia atrata* is endemic to southern Tasmania whereas *C. cucullata* is widely distributed in the mainland states of south-eastern Australia and is absent from Tasmania. *Caladenia atrata* has been wrongly linked to *C. gracilis* by workers in Tasmania. *Caladenia gracilis* can be distinguished from both *C. cucullata* and *C. atrata* by its much larger flowers which exude a strong musky fragrance and a labellum which has very broad lateral lobes and a small, relatively narrow mid-lobe.

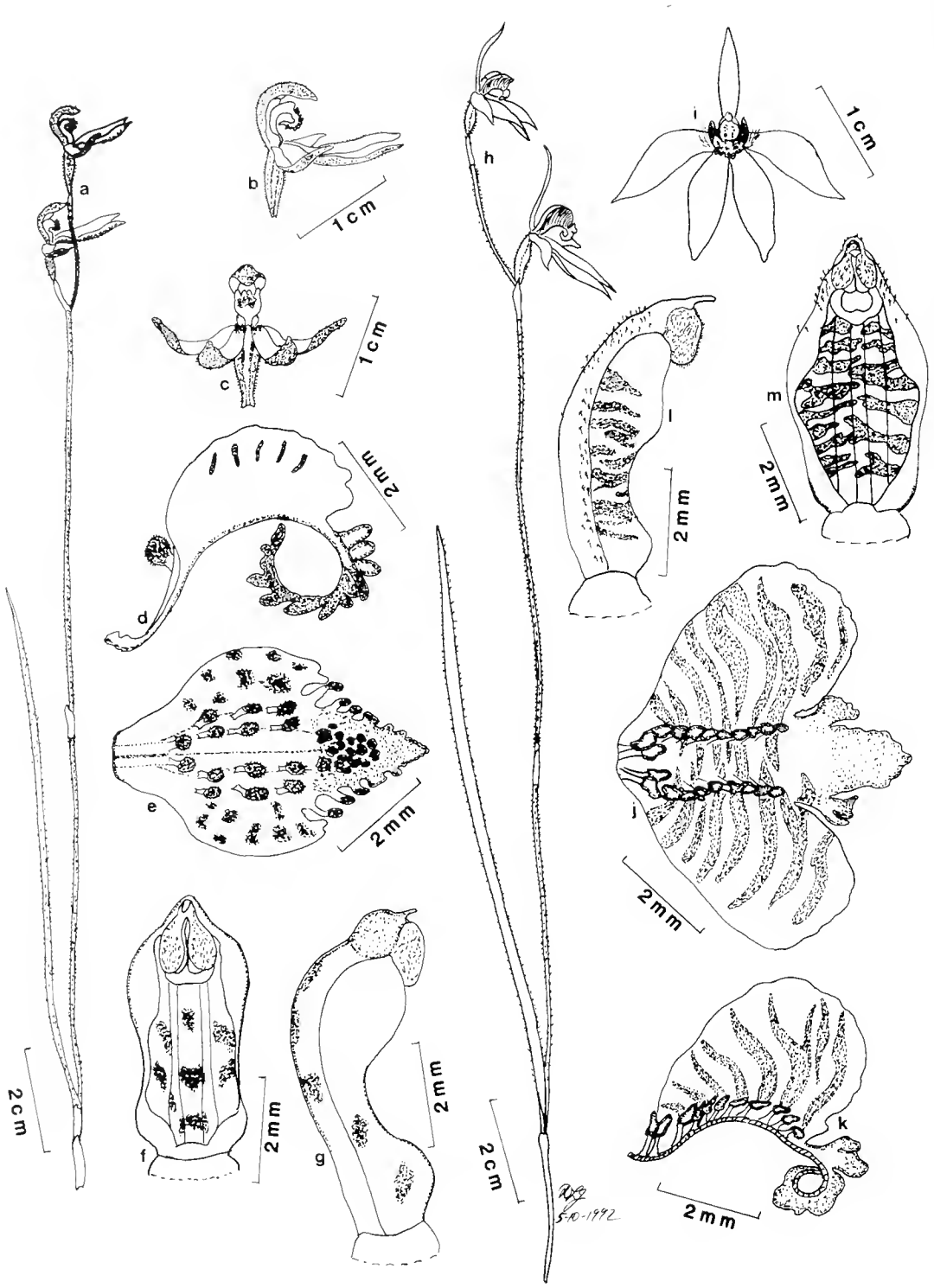

Fig. 1. a–g *Caladenia atrata* a — plant. b — flower from side. c — flower from front. d — labellum from side. e — labellum flattened out, from above. f — column from front. g — column from side. (drawn from the type collection). h–k *Caladenia hillmanii* h — plant. i — flower from front. j — labellum flattened out, from above. k — longitudinal section of labellum. l — column from side. m — column from front. (drawn from the type collection).

Conservation Status

Locally common but poorly conserved (one state reserve — D.Ziegeler pers. comm.).

Etymology

From the Latin *atratus*, dressed in black, in reference to the blackish exterior of the flowers resulting from the dense covering of glands.

Caladenia hillmanii D.L.Jones, *sp. nov.*

C. carneae R.Br. affinis sed labello latiore quam longiore atro-purpureo vel atro-rubro et margine labelli non dentata sed ad basin cum 2 lobis promentibus planis, differt.

Typus: New South Wales, Shoal Bay, 32°43′S, 152°10′E, 7 Sept. 1990, *D.L.Jones 6404, C.Broers & G.Hillman* (Holotypus: CBG; Isotypi: CBG, SYD, BRI, MEL).

Hirsute, solitary terrestrial herb. *Leaf* 6–12 cm × 3–4 mm, linear, semi-erect, dark green, sparsely hirsute with transparent, patent, eglandular trichomes to 2 mm long. *Inflorescence* 15–25 cm tall, slender, wiry, green, with patent glandular trichomes *c.* 0.5 mm long mixed with eglandular trichomes similar to those on the leaf. *Sterile bracts* 10–15 mm × 3–4 mm, linear-oblanceolate, erect and hardly sheathing, acuminate, externally hirsute with trichomes similar to those on the stem. *Fertile bracts* 8–15 mm × 3–4 mm, linear-oblong, obtuse, closely sheathing, externally hirsute. *Ovary* 10–13 mm long, linear obovoid, densely glandular. *Flowers* 1 or 2, *c.* 25 mm across, bright pink internally with a dark reddish purple labellum, externally greenish or brownish from dense glands, a darker central stripe apparent on each segment, floral odour undetectable; dorsal sepal erect, lateral sepals porrect, hardly divergent, petals widely spreading, curving forwards slightly in distal half. *Dorsal sepal* 13–18 mm × 2–3.5 mm, linear-lanceolate, acute to acuminate, internally glabrous, externally densely covered with sessile and shortly stalked, ovoid to globular, brownish glands. *Lateral sepals* 13–20 mm × 3–6 mm, asymmetrically lanceolate, slightly falcate, subacute, internally glabrous, externally glandular. *Petals* 12–17 mm × 3–5.5 mm, obliquely lanceolate, slightly falcate, curved slightly forwards in distal half, acute, internally glabrous, externally glandular. *Labellum* articulated on a short claw *c.* 0.3 mm × 0.6 mm, dark reddish pink to reddish purple, with prominent, narrow, dark red transverse bars, deeply 3-lobed. *Lamina* 6–8 mm × 8–10 mm, transversely ovate to almost reniform in outline when flattened, erect in proximal third, curved forwards in distal two-thirds, apex porrect or recurved; lateral lobes *c.* 3.5 mm wide, erect and loosely column-embracing, entire; mid-lobe *c.* 3 mm long, linear-deltate, porrect or more usually recurved, bright yellow, basal margins with a large, flat pair of dark yellow, blunt, marginal calli, distally the margins slightly crenulate-undulate to the apex. *Lamina calli* yellow, in 2 rows extending just onto the base of the mid-lobe; basal calli 4, head ovoid, *c.* 0.5 mm across, papillate, stalk *c.* 0.5 mm long, white; longest lamina calli *c.* 1 mm long, head *c.* 0.4 mm across, ovoid, erect to flat, papillate, stalk *c.* 0.4 mm long, white. *Column* 6.5–7 mm × 3.5–3.7 mm, erect, curved forwards in distal third, greenish stained with purple and with numerous, prominent, dark red, transverse, anterior bands, broadly winged, with stalked glandular trichomes scattered on the dorsal surface; central anterior ridge *c.* 1.3 mm wide. *Anther c.* 1.2 mm × 1.2 mm, pink to mauve, densely papillate, with a prominent linear rostrum. *Pollinia* 4, *c.* 1.2 mm long, flat, yellow, mealy. *Stigma c.* 1.2 mm wide, more or less circular, sunken, green. *Capsule* not seen. (Fig. 1 h–m).

Distribution and Habitat

Endemic to New South Wales where widely distributed but sporadic in coastal districts between Nelson Bay and Ulladulla. This species, which may be

locally common, is restricted to light coastal forests on deep, white to grey sandy soils.

FLOWERING PERIOD
September and October.

NOTES
Caladenia hillmanii is a distinctive member of the *C. carnea* complex. It can be readily recognised by its dark purple red to dark red labellum which is broader than long (obvious when flattened), and with the marginal teeth of the labellum mid-lobe being reduced to two, prominent flat structures situated near the base. The new species may grow sympatrically with *C. carnea* in some localities but hybrids are unknown.

ETYMOLOGY
Named after George Hillman of Nelson Bay who has recognised the distinctiveness of this taxon for many years and has been of valuable assistance to my research.

Diuris ochroma D.L.Jones *sp. nov.*

D. venosae Rupp affinis sed floribus luteolis minus striatis, lobis lateralibus labelli angustioribus, et callo labelli majoribus cum costis inconspicuis in lobum medium laminae radiantibus, differt.

TYPUS: Victoria, Wonnangatta River valley, 16.5 km north of Wonnangatta Homestead ruins, 37°10′S, 146°47′E, 530 m, 30 Nov. 989, *J.Taylor 2650 & M.Crisp* (HOLOTYPUS: CBG).

Glabrous, terrestrial, solitary herb. *Leaves* 3 or 4, basal, linear, 18–30 cm × 3–5 mm, obliquely erect to lax, involute, green. *Inflorescence* 25–40 cm tall, slender. *Sterile bracts* 7–10 cm × 5–7mm, lanceolate, acuminate, closely sheathing. *Fertile bracts* 15–35 mm × 3–5 mm, lanceolate, acuminate, closely sheathing. *Flowers* 1–4, *c.* 25 mm across, semi-erect to semi-pendant, pale yellow with dark reddish purple striae. *Pedicels* 15–45 mm long, slender, straight or curved. *Dorsal sepal* ovate, 10–13 mm × 7–9 mm, projected forwards, cucullate and tightly column-embracing in the proximal half, then obliquely erect, obtuse, pale yellow with prominent dark reddish purple striae. *Lateral sepals* oblanceolate to ensiform, 14–19 mm × 1.5–3.5 mm, obliquely deflexed below the labellum, parallel to slightly divergent, margins involute, acuminate, green with reddish purple, longitudinal striae. *Petals* incurved or spreading horizontally; lamina asymmetrically ovate, 7–9 mm × 4–5 mm, obtuse, anterior surface pale yellow, dorsal surface with reddish purple striae at the base; claw 6–8.5 mm long, linear, green to purplish, widening just near the apex. *Labellum* 13–16 mm long, porrect in proximal fifth then obliquely decurved, pale yellow with reddish purple striae on the lateral lobes, deeply 3-lobed; lateral lobes more or less oblong, 2.5–3 mm × *c.* 1.5 mm, obliquely erect, divergent, pale yellow with prominent dark reddish purple striae, apex shortly and irregularly laciniate, margins densely beset with short, clear, siliceous cells; mid-lobe broadly ovate in outline when flattened (8.5–11 mm across), more or less flat with an erect, rounded central ridge, pale yellow with some purplish markings, obtuse, margins slightly irregular, purplish, basal margins beset with short, siliceous cells. *Labellum callus* complex, consisting of 2–4 more or less parallel, rounded ridges, incurved near the apex, densely beset with clear, acicular siliceous cells, the central ridges coalescing near the expanded part of the mid-lobe and extending as a more or less single ridge to the apex, faint ridges radiating laterally onto the mid lobe. *Column c.* 4 mm × 3 mm, projected forwards from the end of the ovary. *Anther c.* 2.5 mm × 2.5 mm, broadly ovate, cream and pale brown. *Pollinarium c.* 3 mm × 2 mm; pollinia linear-clavoid, white; viscidium *c.* 0.4 mm across, more or less oblong. *Column* wings *c.* 3 mm long, linear-oblong,

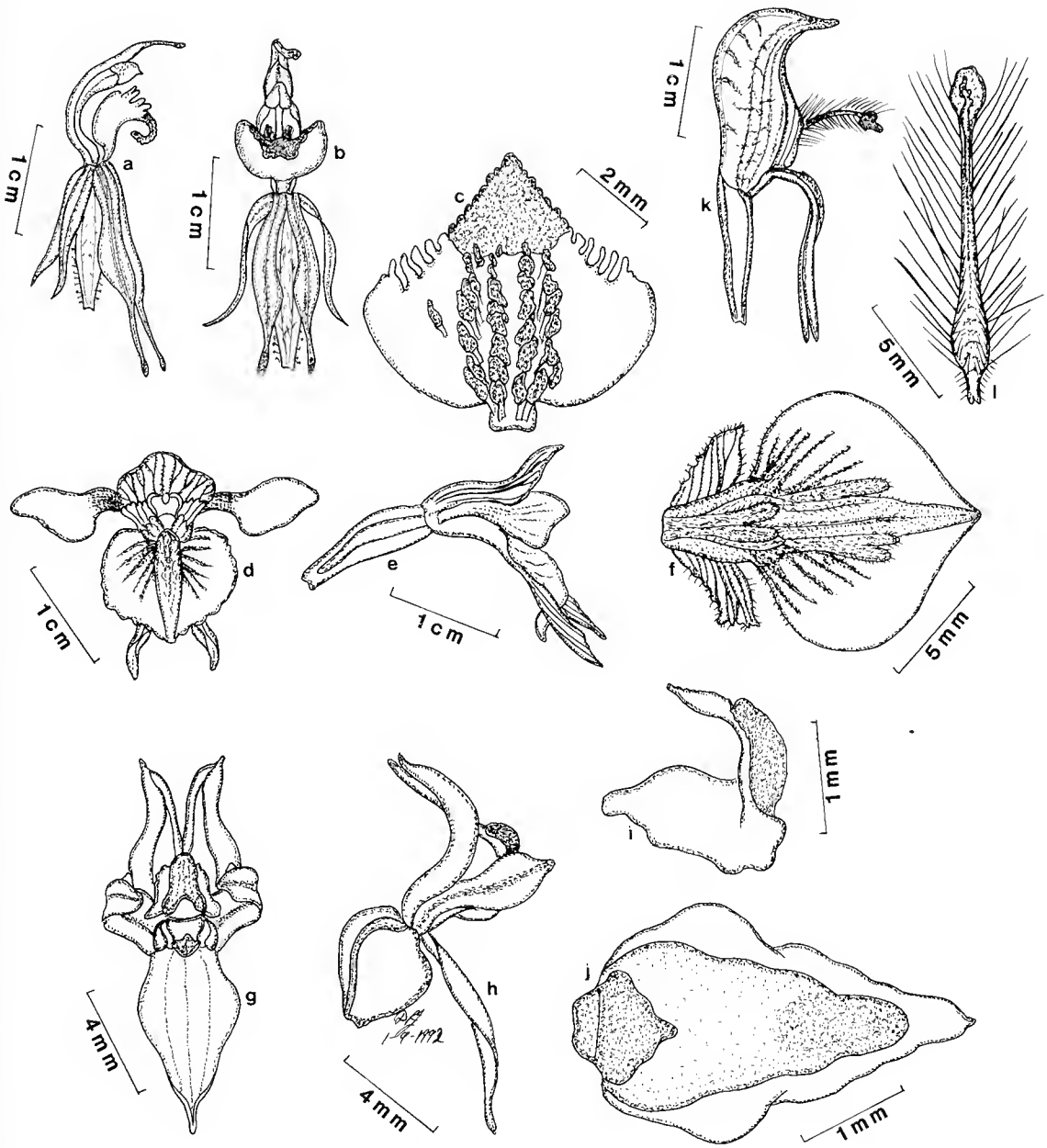

Fig. 2. a–c *Caladenia amoena* a — flower from side. b — flower from front. c — labellum flattened out, from above. (drawn from the type collection). d–f *Diuris ochroma* d — flower from front. e — flower from front. f — labellum flattened out, from above. (drawn from the type collection). g–j *Prasophyllum suaveolens* g — flower from front. h — flower from side. i — labellum from side. j — labellum flattened out, from above. (drawn from the type collection). k–l *Pterostylis tasmanica* l — flower from side. l — labellum flattened out, from above. (Badger Head Rd, Tasmania, 20 Oct 1986, *H. Ronken*, CBG).

tapered near the apex, irregularly lobed, white with purple markings, about as long as the anther. *Stigma* higher than anther, white with purple markings. *Capsule* 10–12 mm × 4–5 mm, obovoid. (Fig. 2 d–f)

Distribution and Habitat

Locally abundant in the Wonnangatta Valley, north-eastern Victoria but probably more widespread and overlooked due to confusion with other species. It grows in herbfield in silty clay to peaty soils.

Flowering Period

November and December.

Notes

Diuris ochroma has affinities with *D. venosa* but can be immediately distinguished by its pale yellow flowers (mauve, lilac or bluish in *D. venosa*) which have fewer and less prominent striae. It also has shallowly incised lateral lobes on the labellum and a much larger, more complex lamina callus which has faint accessory ridges radiating onto the lamina of the mid-lobe. *D. ochroma* is well isolated from *D. venosa* which is restricted to altitudes above 1500 m on the Northern Tablelands of New South Wales. In Victoria the new species has been linked with *D. lanceolata*. It can be distinguished from that species by the dark striae on the tepals and the lamina callus which is more complexely lobed and with faint accessory ridges radiating onto the midlobe. The callus of *D. lanceolata* consists of 2 main lobes with a third extending onto the midlobe but without any associated radiating ridges.

Conservation Status

Poorly known but locally common and not conserved; suggest 2K by the criteria of Briggs and Leigh (1989).

Etymology

From the Greek *ochroma*, pale, wan; in reference to the pale yellow flowers.

Prasophyllum suaveolens D.L.Jones & R.Bates *sp. nov.*

P. fusco R.Br. affinis sed statura humiliore, floribus parvioribus fragrantissimis, callo labellorum laevi incrassato in tertia parte distali, et columna brevi lata proportione differt.

Typus: Victoria, Vite Vite, 37°53′S, 143°11′E, 29 Nov. 1992, *D.L.Jones 10872, P.Barnett & G.Beilby* (Holotypus: CBG; Isotypi: CBG, MEL, AD, NSW).

Slender terrestrial tuberous herb 10–25 cm tall. *Tuberoids* ovoid to obovoid, 6–10 mm across. *Leaf* linear-terete, 15–20 cm long, bright green, base reddish, free lamina erect, often partially withered at anthesis. *Floral bracts* broadly ovate-elliptical, *c.* 1.5 mm × 1.3 mm, subacute. *Ovary* obovoid-pyriform, *c.* 3 mm × 2.5 mm, shiny green, set at about 40 degrees to the rhachis, sessile. *Inflorescence* a narrow, loose spike 5–10 cm long, consisting of 10–25 flowers. flowers 4–5 mm across, green to yellowish green with some reddish markings, opening widely, strongly fragrant. *Dorsal* sepal linear ovate-lanceolate, 4–5 mm × 2–2.3 mm, green with reddish striae, subacute. *Lateral* sepals linear-lanceolate, 2–3 mm × 1–1.2 mm, free or connate at the base, strongly recurved, subacute, distal margins involute. *Petals* narrowly obovate, 4–4.5 mm × *c.* 1.5 mm, green with a reddish central stripe, obliquely erect, incurved, subacute. *Labellum* ovate-lanceolate in outline when flattened, greenish-cream to pinkish green, narrowed to a short basal claw, slightly gibbous at the base when viewed from the side, porrect in proximal half, distal half recurved at right angles, with entire or slightly irregular margins, the apex often recurved, apiculate; callus ovate-lanceolate, fleshy, green, shallowly channelled, margins entire, prominently thickened and fleshy in distal third,

extending nearly to the labellum apex. *Column c.* 1.3 mm × 1.5 mm, porrect from the end of the ovary, hardly visible from the side in the open flower; appendages linear-oblong, *c.* 1 mm × 0.5 mm, pale green, truncate or emarginate. *Anther* ovate, *c.* 1 mm × 1 mm, purplish. *Pollinarium c.* 0.9 mm long; viscidium ovate, *c.* 0.13 mm long, white; hamulus ligulate, *c.* 0.2 mm long; pollinia 4, linear-clavoid, *c.* 0.7 mm long, yellow, sectile. *Stigma* transversely quadrate, *c.* 1 mm × 0.6 mm, the rostellum slightly higher than the appendages. *Capsules* obovoid, *c.* 3.5 mm × 2 mm, shiny, green or reddish. (Fig. 2 g–j)

Distribution and Habitat

Endemic in south-western Victoria where it grows in open grassland and sparse woodland in red-brown loam. The vegetation is dominated by tussock grasses, particularly species of *Danthonia* and *Themeda triandra.*

Flowering Period

Mid October to mid November.

Notes

This species, part of the *Prasophyllum fuscum* complex, can be distinguished by its dwarfish stature, much smaller, strongly fragrant flowers, a broad, smooth labellum callus which is prominently thickened in the distal third and a short, proportionately broad column. It has been linked with *Prasophyllum* sp. A *sensu Flora of Victoria* Vol. 2. but is readily distinguished from that species by its much smaller flowers. The flowers of *P. suaveolens* readily emit a strong, spicy fragrance in warm weathcr.

Conservation Status

Apparently once widespread but now restricted to small relict areas of grassland, principally along roadsides and in railway reserves. About 6 localities in addition to the type locality have been located (K.McDougall pers. comm.), but the identity of the species at each site needs to be confirmed. Suggest 2RC according to Briggs and Leigh (1989).

Etymology

From the Latin *suaveolens*, fragrant, smclling sweetly.

Pterostylis atrans D.L.Jones *sp. nov.*

P. obtusae R.Br. affinis sed floribus parvioribus, suggestu sinus protrudenti minus, apicibus petalorum et sepalorum dorsalium rubro-fuscis, petalis angustioribus, sepalis lateralis apicibus discretis clavigeris leniter et sepalo dorsali apice longiore filiformi differt.

Typus: Australian Capital Territory, Brindabella Ranges, *c.* 4.3 km along Bendora Dam Rd from Bulls Head, 35°25′S, 148°45′E, 22 Feb. 1992, *D.L.Jones 9092 & B.E.Jones* (Holotypus: CBG; Isotypi: CBG, MEL, NSW, HO).

Tuberous terrestrial herb growing in colonies. *Rosette* separate; leaves 3–5, ovate-oblong, 1–3.5 cm × 1–2 cm, dark green, entire or slightly irregular, obtuse; petioles 4–15 mm × *c.* 1 mm, not winged. *Flowering plants* 15–30 cm tall. *Scape* slender, smooth. *Cauline leaves* 4 or 5, 1–3 cm × 3–5 mm, ovate-lanceolate, sheathing at the base, long-acuminate, basal 1 or 2 reduced and bract-like. *Flower* solitary (rarely 2), 1.4–2 cm long, translucent white, striped and suffused with green, red-brown towards the apex of the galea; galea gibbous at the base then erect before bending forwards then strongly decurved to the apex. *Dorsal sepal* 2.5–3.2 cm × 8–12 mm, inflated at the base then constricted and tapered to the apex, with a linear-filiform apical point 5–9 mm long, translucent white with dark green stripes, red-brown towards the apex. *Lateral sepals* erect, tightly embracing the galea; sinus protruding as a prominent platform-like bulge when viewed from the

side, flat, slightly notched or raised when viewed from the front; conjoined part 8–12 mm × 8–12 mm, narrowed to *c.* 3 mm across at the base, white with dark green stripes and suffusions, the upper margins involute, suddenly tapered into the free points; free points 15–20 mm long, linear-clavoid, involute, erect, held high above the galea. *Petals* obliquely oblong-lanceolate, 1.5–2.5 cm × 4–5 mm, falcate, subacute, central part white, green in proximal half, red-brown towards the apex; flange *c.* 1 mm across, flat, obtuse. *Labellum* erect, curved forwards in the distal third, the tip obscure or just protruding above the sinus in the set position; lamina oblong-elliptical, 4–5 mm × 2.5–3 mm, green and light brown, dark brown towards the apex, broadly obtuse; callus *c.* 0.8 mm across, slightly raised, expanded at the apex; basal appendage 3.5–4 mm long, linear, sharply incurved near the middle, apex penicillate. *Column* 9–11 mm long, bent away from the ovary at about 50 degrees then erect, green. *Column wings* 3.5–4 mm long; basal lobe *c.* 1.2 mm × 1 mm, at an angle of about 40 degrees, inner margins incurved, sparsely adorned with short white cilia, apex obtuse; mid section *c.* 2 mm long, dark green to red-brown; apical lobe *c.* 0.6 mm long. *Stigma* oblong-ovate, *c.* 3 mm × 1.8 mm, raised. *Anther c.* 1 mm long, shortly rostrate. *Pollinia* 1.2–1.4 mm long, linear to linear-clavate, yellow, mealy. *Capsule* obovoid, 1.2–1.6 cm × 3–5 mm. (Fig. 3 a–d)

Distribution and Habitat

Widely distributed in southern New South Wales, Australian Capital Territory, Victoria and Tasmania. The new species typically occurs in high rainfall regions and usually grows in tall forests in the ranges and foothills. In some localities it may also extend to coastal woodlands. Soils are commonly well-structured krasnozems but the species may also grow in grey clay loams and sandy loams.

Flowering Period

November to April.

Notes

Pterostylis atrans has been commonly confused with *P. obtusa* R.Br. (e.g. Willis 1970, Curtis 1979), but that species is now known to be restricted to central and northern New South Wales and possibly also Queensland. *Pterostylis atrans* can be distinguished by its smaller flowers with a less prominent sinus platform, red-brown colouration in the tips of the petals (green in *P. obtusa*) and dorsal sepal, narrower petals (6–7 mm in *P. obtusa*), slightly clavoid free points on the lateral sepals and a longer filiform tip on the dorsal sepal (3–6 mm long in *P. obtusa*). It is also superficially similar to *P. decurva* R.Rogers but with much smaller flowers and a much shorter labellum the tip of which is obscure or just visible above the sinus in the set position. Sporadic hybrids may occur between *P. atrans* and *P. decurva* where the two grow in close proximity.

Conservation Status

Widespread and well conserved.

Etymology

From the Latin *atrans*, darkening, in reference to the dark red-brown colouration towards the apex of the galea.

Pterostylis commutata D.L.Jones *sp. nov.*

P. bisetae Blackmore et Clemesha affinis sed floribus viridibus, sepalis lateralibus ellipticis angustioribus, petalis latioribus, et labello obovato-spathulato tenuo prope basin contstrictam differt.

Typus: Tasmania, Charlton, Ross district, 42°06′S, 147°31′E, 14 Jan. 1987, *L.Gilfedder* (Holotypus: HO).

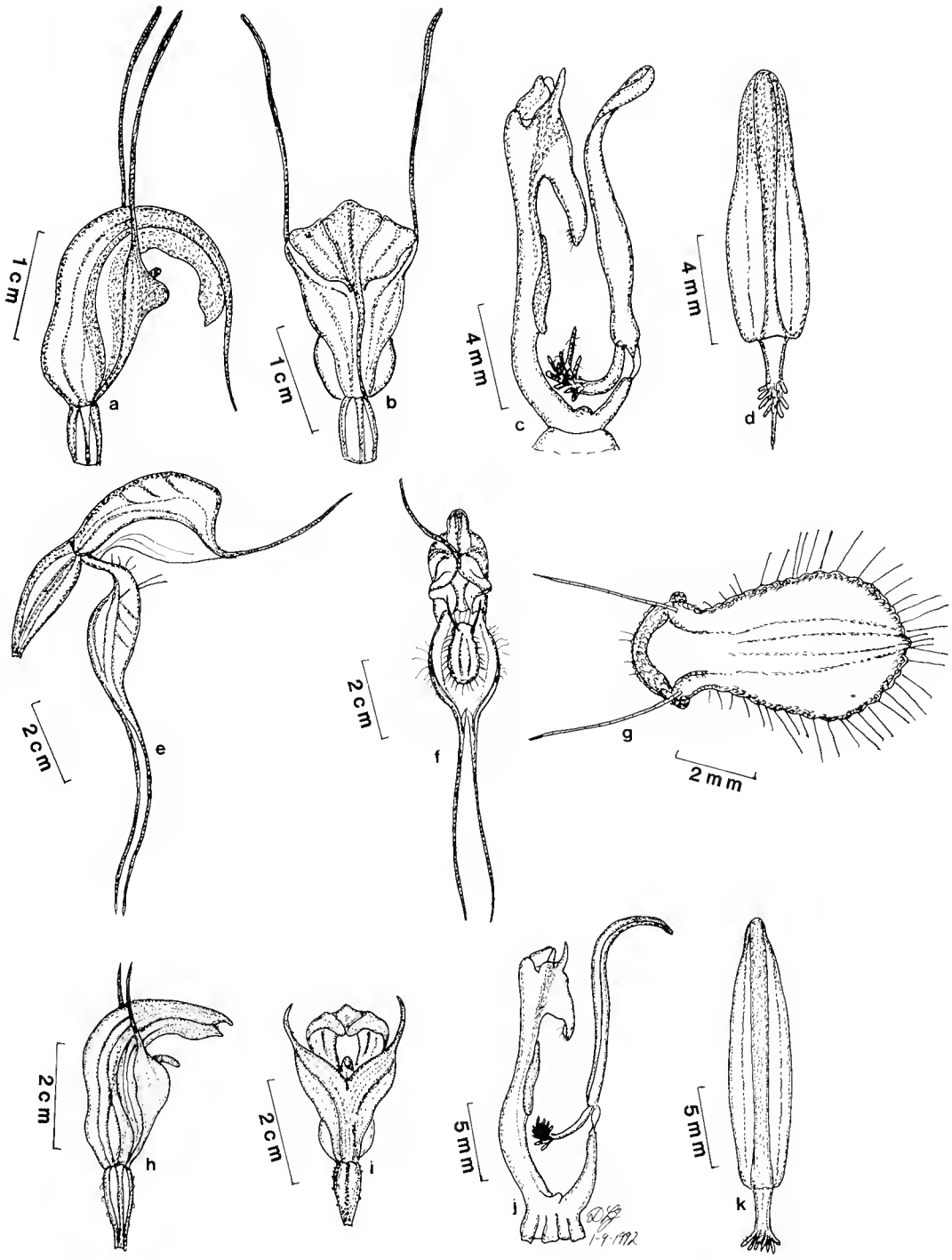

Fig. 3. a–d *Pterostylis atrans*. a — flower from side. b — flower from front. c — column and labellum from side. d — labellum flattened out, from above. (drawn from the type collection). e–g *Pterostylis commutata*. e — flower from side. f — flower from front. g — labellum flattened out, from above. (Ross, Tasmania, 5 Jan. 1987, *H. Ronken*, CBG). h–k *Pterostylis monticola*. h — flower from side. i — flower from front. j — column and labellum from side. k — labellum flattened out, from above. (drawn from the type collection)

Solitary, tuberous, terrestrial herb. *Leaves* narrowly elliptical to narrowly obovate, 15–30 mm × 4–8 mm, sessile to subsessile, subacute to acute, 6–10 in a sparse, radical, stem-encircling rosette, usually senescent at flowering. *Scape* 10–22 cm tall, slender, with 3 or 4 closely sheathing, ovate to lanceolate, acute to acuminate stem leaves. *Pedicels* 6–12 mm long, slender, curved. *Ovary* 5–8 mm long. *Flowers* 1–5, transparent with bright green lines and patches in the galea and lateral sepals, porrect; galea gibbous at the base, more or less gently curved, decurved suddenly to the apex; proximal petal flanges well developed but not closing off the base of the galea. *Dorsal sepal* 16–19 mm long, cucullate, obliquely erect, abruptly decurved in distal quarter, green with dark green lines and transparent areas, apical point 15–20 mm long, filiform, acuminate, upcurved. *Lateral sepals* deflexed, green with dark green lines and transparent areas; conjoined part deeply concave, 9–12 mm × 7–8 mm, the margins slightly incurved, with numerous white trichomes *c.* 1 mm long; sinus narrow, the lobes nearly parallel; free points 22–30 mm long, filamentous, more or less parallel. *Petals* broadly obovate-lanceolate, 17–21 mm × 5–6 mm, narrowed and curved at the base, apex long-acuminate to filiform, transparent with green lines, dorsal ridge with numerous trichomes; proximal flange moderately well developed. *Labellum* highly irritable on a curved claw *c.* 3 mm long; lamina obovate-spathulate, 6–7 mm × 3.5–4 mm, dark green, very thin-textured, prominently constricted in proximal quarter, widest towards the apex, margins irregularly undulate-sinuate, apex upcurved; lateral margins with 15–22 pairs of short, stiff, spreading white trichomes *c.* 1 mm long; basal lobe hardly raised, sloped backwards, a pair of prominent, erect trichomes *c.* 3.5 mm long arising from a swollen area near the constriction; underside with a narrow central channel extending nearly to the apex. bordered by a band of pale green, siliceous cells. *Column* 16–18 mm long, curved evenly throughout. *Column wings c.* 4.2 mm × 3 mm, more or less rectangular, anterior margins incurved, ciliate; barrier cilia moniliform, entire. *Stigma* 7–8 mm × 2–2.3 mm, elliptical, upper margins irregularly crenate. *Anther c.* 1.3 mm long, obtuse. *Pollinia c.* 2 mm long, linear to linear-clavate, yellow, mealy. *Capsule* not seen (Fig. 3 e–g).

Distribution and Habitat

Endemic in Tasmania where confined to the lowest rainfall region in the state (*c.* 500 mm per annum), being known only from the vicinity of Ross in the midlands. It grows in red-brown loam amid grasses and low shrubs, sometimes amongst rocks.

Flowering Period

Deccmber to February.

Notes

Pterostylis commutata is part of the complex of taxa surrounding *P. biseta* Blackmore and Clemesha. It can be distinguished from *P. biseta* by its greenish flowers (brown in *P. biseta*), narrower, elliptical lateral sepals, broader petals and a very thin-textured, obovate-spathulate labellum markedly constricted near the base. *Pterostylis biseta* has lateral sepals 14–16 mm across and petals 7–8 mm wide. The new species also has similarities with *P. planulata* D.L.Jones & M.A. Clem. but this species has the conjoined part of the lateral sepals nearly flat and an oblong-obovate labellum hardly constricted at the base.

Conservation Status

Very restricted, rare and conserved in Tunbridge Nature Reserve; suggest 2VC according to Briggs & Leigh (1989).

ETYMOLOGY

From the Latin *commutatus*, changed, altered, in reference to adaptation of the species following isolation from related taxa.

Pterostylis monticola D.L.Jones *sp. nov.*

P. alpinae R.Rogers affinis, robustiore et floribus maximis, sinu e latere visa protrudenti curvarto leniter, et apicibus discretis sepalorum erectis supra galeam differt.

TYPUS: Australian Capital Territory, Brindabella Ranges, just south of Bendora Arboretum, 35°25′S, 148°48′E, 14 Feb. 1993, *D.L.Jones 11355 & B.E.Jones* (HOLOTYPUS: CBG; ISOTYPI: CBG, MEL, NSW).

Tuberous terrestrial herb growing in colonies. *Rosette* semi-basal around the scape to cauline; leaves 3–5, elliptical, lanceolate or oblanceolate, 4–9 cm × 1.5–2.5 cm, dark green above, paler beneath, entire or slightly undulate, obtuse to subacute; petioles 2–10 mm × 2–3 mm, prominently winged. *Scape* 20–45 cm tall, slender, prominently scabrid. *Sterile bract* lanceolate, 3–6 cm × 9–15 mm, sheathing at the base. *Fertile bract* similar. *Ovary* 8–12 mm long, ribbed, scabrid. *Flower* solitary, 40–50 mm long, translucent white striped and suffused with dark green; galea gibbous at the base then erect before curving forwards, then flat or slightly decurved to the apex. *Dorsal sepal* 4–6 cm × 18–23 mm, inflated at the base then constricted and tapered to the acute apex, white with a broad, dark green median stripe, green margins and apex and about 8 prominent green nerves. *Lateral sepals* erect, loosely embracing the galea leaving a slight lateral gap; sinus protruding as a slight bulge when viewed from the side, broadly vee-ed when viewed from the front; conjoined part 14–18 mm × 12–16 mm, narrowed to *c.* 4 mm across at the base, green with darker stripes, the ventral surface minutely scabrid, the upper margins inrolled, gradually tapered into the free points; free points 15–20 mm long, filiform, involute, erect, held high above the galea. *Petals* obliquely oblong-lanceolate, 3–5 cm × 7–9 mm, falcate, acute, proximal central area white, rest green; flange *c.* 1.3 mm across, flat, obtuse. *Labellum* erect, curved forwards prominently in the distal quarter, the apex protruding prominently through the sinus in the set position; lamina narrowly elliptical-lanceolate to narrowly oblong-elliptical, 16–20 mm × 3–4.5 mm, tapered to the obtuse apex, greenish with brown margins in the proximal half, becoming wholly dark brown towards the apex; callus *c.* 1 mm across, raised, slightly expanded at the apex; basal appendage 3–3.5 mm long, broadly linear, shallowly curved, apex deeply penicillate. *Column* 18–22 mm long, bent away from the ovary at about 50° then erect, pale green with brown markings. *Column wings* 6–7 mm long; basal lobe 3–3.5 mm × *c.* 2.2 mm, white, at an angle of about 45°, apex obtuse, inner margins incurved, sparsely adorned with short white cilia; mid-section *c.* 3.5 mm long, dark green; apical lobe linear, *c.* 1.6 mm long, curved, subacute. *Stigma* oblong-elliptical, 5–6 mm × *c.* 2 mm, raised. *Anther c.* 2 mm long, shortly rostrate. *Pollinia* linear-clavate, 2–2.2 mm long, yellow, mealy, 22–26 mm × 10–12 mm, obovoid, ribs slightly scabrid. (Fig. 3 h–k).

DISTRIBUTION AND HABITAT

Occurs in eastern Victoria, Australian Capital Territory and south-eastern New South Wales with a disjunct northern population at Barrington Tops. The species grows in montane forests and subalpine shrubland, usually in moist, grassy areas, soaks and near streams. Soils are usually well-structured loams and krasnozems.

FLOWERING PERIOD

December to March.

NOTES

Pterostylis monticola has been confused with *P. alpina* but has much larger flowers (4–5 cm long) with the sinus protruding in a shallow curve when viewed from the side and the free points of the sepals erect above the galea. By contrast the flowers of *P. alpina* are about 3 cm long, with the sinus protruding prominently in an abrupt curve when viewed from the side and the free points of the sepals reflexed behind the galea. *Pterostylis monticola* flowers in summer whereas *P. alpina* is spring flowering (August to October). *Pterostylis monticola* also has similarities with *P. furcata* Lindley but whereas the latter has a smooth scape, that of the new species is scabrid. *Pterostylis monticola* grows at much higher elevations than *P. alpina*, with the latter mainly occurring in the foothills and lower slopes of the main ranges.

CONSERVATION STATUS

Widespread, locally common and conserved in National Parks.

ETYMOLOGY

From the Latin *mons*, a mountain, and *cola*, dweller; in reference to the montane habitat.

Pterostylis tasmanica D.L.Jones *sp. nov.*

P. plumosae L.Cady affinis statura humiliore, foliis et floribus parvioribus, floribus autogamatis, labello plumosiore dense et apice galeae breviore non-attenuata differt.

TYPUS: Tasmania, Rebecca Creek, north of Temma, 41°11′S, 144°40′E, 5 Nov. 1990, *D.L.Jones 7030 & C. H. Broers* (HOLOTYPUS: CBG; ISOTYPI: HO, MEL).

Tuberous terrestrial herb growing in loose groups. *Leaves* 8–14, ovate-elliptical to elliptical-lanceolate, 1–2.4 cm × 3–7 mm, dark green, some with a few whitish variegations, the lower ones petiolate, arranged in a tight rosette, distal ones sessile and closely stem-embracing, apex acuminate; petioles 1–8 mm × 1–1.5 mm, narrowly winged. *Flowering plants* 8–14 cm tall. *Scape* slender, smooth. *Flower* solitary (rarely 2), 1.8–2.5 cm long, translucent green with darker green longitudinal and transverse veins, brownish towards the apex of the galea and lateral sepals; galea erect in proximal two-thirds then obliquely erect or curved forwards nearly at right angles. *Dorsal sepal* 18–24 mm × 12–13 mm, inflated at the base and tapered to the apex, with a short apical point 0.5–1.5 mm long. *Lateral sepals* deflexed; conjoined part 7–9 mm × 3–4 mm, narrowed to *c.* 2 mm across at the base, with a thickened, dark green central pad, the margins incurved; free points 7–11 mm long, linear, thickened, usually brown, parallel or slightly divergent, apex subacute. *Petals* strongly asymmetric, falcate, 15–20 mm × 1.5–2 mm, dark green, narrowed in the distal half to an attenuated, long-acuminate apex; flange *c.* 0.5 mm across, obscure. *Labellum* porrect, curved, filiform, densely beset with yellow hairs, with an apical knob; lamina linear-filiform, 13–15 mm × *c.* 0.5 mm, widened into a narrowly ovate, slightly wrinkled base *c.* 1.5 mm across, then suddenly tapered into a short beak, tapered slightly from the base to the apex; trichomes 2–4 mm long, yellow, irregularly moniliform, a series of short, whitish erect hairs on the basal swelling; apical knob irregular, *c.* 2 mm × 1.3 mm, dark brown. *Column* 12–14 mm long, porrect from the end of the ovary. *Column wings* 4–5 mm long; basal lobe 1.5 mm × 1 mm, at an angle of about 20°, inner margins incurved, sparsely adorned with white cilia, apex obtuse; mid-section *c.* 3 mm long, transparent; apical lobe 3–4 mm, linear. *Stigma c.* 6–7 mm × 2.5 mm, elliptical, raised. *Anther c.* 1.8 mm long, shortly rostrate. *Pollinia c.* 2 mm long, oblong, yellow, mealy. *Capsule* obovoid, 1.2–1.6 cm × 6–8 mm, asymmetrical. (Fig. 2 k–l).

DISTRIBUTION AND HABITAT

Occurs in southern Victoria, Tasmania (widespread) and New Zealand (North Island and northern parts of South Island). It commonly grows in wood-

land and heathland in coastal and near-coastal localities. Soils are usually sandy loams derived from Tertiary sediments.

Flowering Period
October to December.

Notes
Pterostylis tasmanica has been included with *P. plumosa* L.Cady but is readily distinguished by the shorter habit, smaller leaves arranged in a relatively tight rosette and smaller, self-pollinating flowers with a more densely plumose labellum and a short apical point on the galea, imparting a blunt appearance to the flower. *Pterostylis plumosa* grows up top 25 cm tall, has leaves to 4 cm × 10 mm arranged in a relatively loose rosette and flowers to 4.5 cm long with an apical point on the dorsal sepal to 4 mm long. *Pterostylis plumosa* is widespread in south-eastern Australia whereas *P. tasmanica* is restricted to southern Victoria, Tasmania and New Zealand.

Conservation Status
Widespread and well conserved.

Etymology
In reference to the distribution of the species being centred around Tasmania and the Tasmanian Basin.

NEW COMBINATION

Recent studies into the *rufa* group of *Pterostylis* by the author have clarified the status of *P. boormanii* Rupp, *P. squamata* R.Br. and *P. excelsa* M.A.Clem. The following species has been linked with all of these taxa but is distinct and requires recognition in its own right.

Pterostylis valida (Nicholls) D.L.Jones *comb. & stat. nov.*

Basionym: *Pterostylis squamata* var. *valida* Nicholls, *Victorian Naturalist* 58:115, f. A-E (1941): Holotypus: Victoria: Mt Tarrengower, Maldon, *J. von Bibra*, 23 Oct. 1941 (MEL!).

Distribution and Habitat
Endemic in Victoria where known only from the type collection.

Flowering Period
October and November

Notes
This species is part of the *P. excelsa* complex (Clements 1989), but can be distinguished from all other related taxa by the narrower green flowers, a narrower labellum attenuated at the apex, fewer marginal cilia and a less developed basal lobe which lacks any cilia. The species is well preserved by excellent type material and has been clearly illustrated (Nicholls 1969, plate 342). This species is apparently a narrow endemic and as the type locality is completely alienated, the species is presumed to be extinct.

Etymology
From the Latin *validus*, strong, robust.

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Revised manuscript received 4 October 1993.

EUCALYPTUS SILVESTRIS, A NEW SPECIES OF *EUCALYPTUS* (MYRTACEAE) FOR VICTORIA AND SOUTH AUSTRALIA AND NOTES ON VICTORIAN OCCURRENCES OF *EUCALYPTUS ODORATA*

K. RULE*

ABSTRACT

Rule, K. *Eucalyptus silvestris*, a new species of *Eucalyptus* (Myrtaceae) for Victoria and South Australia and notes on Victorian occurrences of *Eucalyptus odorata*. **Muelleria 8(2): 193–199 (1994).** — *Eucalyptus silvestris* K.Rule is described and its distribution, affinities and conservation status are discussed. As well, comparisons with *E. odorata* Behr, and other mallee-box species are made and clarifications about several Victorian collections previously referred to as *E. odorata* are given.

INTRODUCTION

The original description of *Eucalyptus odorata* Behr was made in 1847 following a collection from near Nuriootpa in the Barossa Valley of South Australia. Locally referred to as Peppermint Box, its features included mallee or small tree habit, dark grey box-like bark, dull blue-green or green adult foliage, somewhat glaucous juvenile leaves of varying widths and slightly angular buds and fruits. Since then numerous other collections have been attributed to *E. odorata* from South Australia (the Eyre Peninsula, Kangaroo Island, the Fleurieu Peninsula, the Northern and Southern Flinders Ranges, and the Upper South-east) and Victoria (the Wimmera and North-central regions).

The taxonomic history of *E. odorata* has been highlighted by the naming of several taxa whose integrities could not be sustained. After Behr's original description, *E. cajuputea* Muell. *ex* Miq. (1851) and *E. fruticitorum* Muell. *ex* Miq. (1856) were named, both of which are now regarded as synonyms of *E. odorata*. Blakeley's 1934 treatment of the species produced a number of varieties which also have been unsustainable. In the opinion of Pryor and Johnson (1971) the var. *angustifolia* is the one exception.

The erection of *Eucalyptus wimmerensis* K.Rule (1990), marked the beginning of the dissection of the mallee-boxes, particularly *E. odorata*. In the course of that study,it became apparent to both this author and Mr M.I.H. Brooker of Canberra that populations of the Upper South-east of South Australia in the vicinity of Bordertown and of adjacent areas of the Victorian Wimmera were inconsistent with the typical form.

TAXONOMY

Eucalyptus silvestris K.Rule *sp. nov.*

> *Eucalyptus odorata* affinis a qua alabastris fructibusque parvioribus, foliis juvenilibus latioribus et foliis adultis lamprophyllis. A *E. wimmerensi* cortice aspero habitu arboreo et foliis juvenilibus adultisque latioribus differt.

HOLOTYPUS: Victoria, 6.8 km south of Yanac by road towards Nhill, 36°10′S, 141°27′E, 23 Apr. 1990, *K.Rule 9016* (MEL).

Tall, robust mallees or small spreading trees to 12 m. *Bark* grey, fibrous, irregularly chunky to major branches, smooth grey-brown above. *Seedling leaves* opposite for 3 or 4 pairs, narrowly elliptical or narrowly ovate, shortly petiolate, slightly discolorous dull, blue-green. *Juvenile leaves* narrowly lanceolate, lanceo-

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late or ovate-lanceolate, dull, blue-green or green, concolorous, petiolate, alternate, semi-erect, glandular, acute, 5–8 × 1.4–3 cm; intramarginal and lateral veins conspicuous, 2–3 mm from margin; bases tapered; petioles slightly flattened, 0.6–1.2 cm long. *Intermediate leaves* similar to the juvenile leaves, becoming sublustrous and slightly broader. *Adult leaves* lanceolate, olive-green or green, lustrous, glandular, acute, uncinate, semi-erect in relation to axis, 6–10 × 1.2–2.2 cm; petioles slightly flattened to 1.5 cm long; intra-marginal veins conspicuous, to 2 mm from margins. *Branchlets* angled. *Inflorescences* simple, axilliary, along the main axis or more often in short sometimes leafy, terminal branchlets; peduncles slightly angled, to 1.0 cm long floral buds (5) 7 (9), fusiform or clavate, distinctly pedicellate, unscarred, to 0.5 × 0.4 cm; sepaline and petaline opercula adnate, conical, shorter than hypanthium; hypanthium tapered, slightly angled; pedicels to 0.6 cm long; filaments irregularly flexed, all fertile, white; anthers adnate, basifixed, globoid, dehiscing by subterminal slits; style to 0.4 cm. long, with a disc-like stigma. *Fruits* obconical, subcylindrical or cupular, sometimes lightly ribbed or angled, smooth or lightly rugulose when dry, distinctly pedicellate, often burnished, to 0.4–0.5 × 0.3–0.4 cm.; pedicels slightly angled, as long as fruit; disc descending; locules (3) 4 (5). *Fertile seeds* dark brown, ovoid to slightly cuboid, with dorsal surface shallowly reticulate and hilum ventral. (Fig. 1)

Flowering Period

Autumn.

Specimens Examined

Victoria — 3 miles [5 km] north-east of Kaniva, 10 Sep. 1949, *J.H.Willis* (MEL 1526769); 6.9 km South of highway 8 on Edenhope Road, 8 Mar. 1986, *K.Hill 1678, L.A.S.Johnson and K.Wilson*, (MEL); 1.3 km east of the Serviceton turn-off on the Western Hwy, 16 May 1986, *K.Rule* (MEL); 14.7 km west of Kaniva on the Western Hwy, 16 May 1986, *K.Rule* (MEL).

South Australia — 3.7 km west of Wolesley turn-off on highway west of Bordertown, 6 Sep. 1989, *M.I.H.Brooker 10284*, (MEL 118428); 1.4 km north of Bangham turn-off on Frances-Bordertown Road, 29 Sep. 1992, *K.Rule 9265* (MEL); 7.5 km south of Bordertown towards Frances by road, 29 Sep. 1992, *K.Rule 9266* (MEL); 2.6 km south of Bordertown by road, 29 Sep. 1992, *K. Rule 9267* (MEL).

Distribution

Eucalyptus silvestris occurs sporadically on well-drained loams on rises in undulating farming country. Its known distribution in South Australia is in the vicinity of Bordertown and in Victoria between Serviceton and Yanac. (Fig. 2)

Etymology

The epithet of the new species is derived from Latin and refers to its woodland habitat.

Conservation Status

Within Victoria, nowhere is the new species plentiful, however, in South Australia, it is relatively abundant on roadside verges and farms between Bordertown and Bangham. The bulk of the Victorian populations are close to the border in the vicinity of Serviceton but other pockets have been located to the east near Kaniva and Yanac. In terms of its total distribution, *E. silvestris* is a species with a relatively restricted distribution whose populations are depleted to the extent that it should be considered rare. In accordance with the criteria prescribed by Briggs and Leigh (1989), it is suggested that the code 2RCa be designated for the species.

Associated Species

Eucalyptus silvestris grows in pure stands but *E. microcarpa* Maiden, *E. largiflorens* Muell. and two forms of *E. leucoxylon* (ssp. *stephaniae* K.Rule and an unnamed, large-fruited, waxy subspecies) may be found in the vicinity. The pre-

Fig. 1. *Eucalyptus silvestris* a — branchlet with flowers and mature buds ×1. b — mature fruits ×1. c — seedling leaves ×0.75.

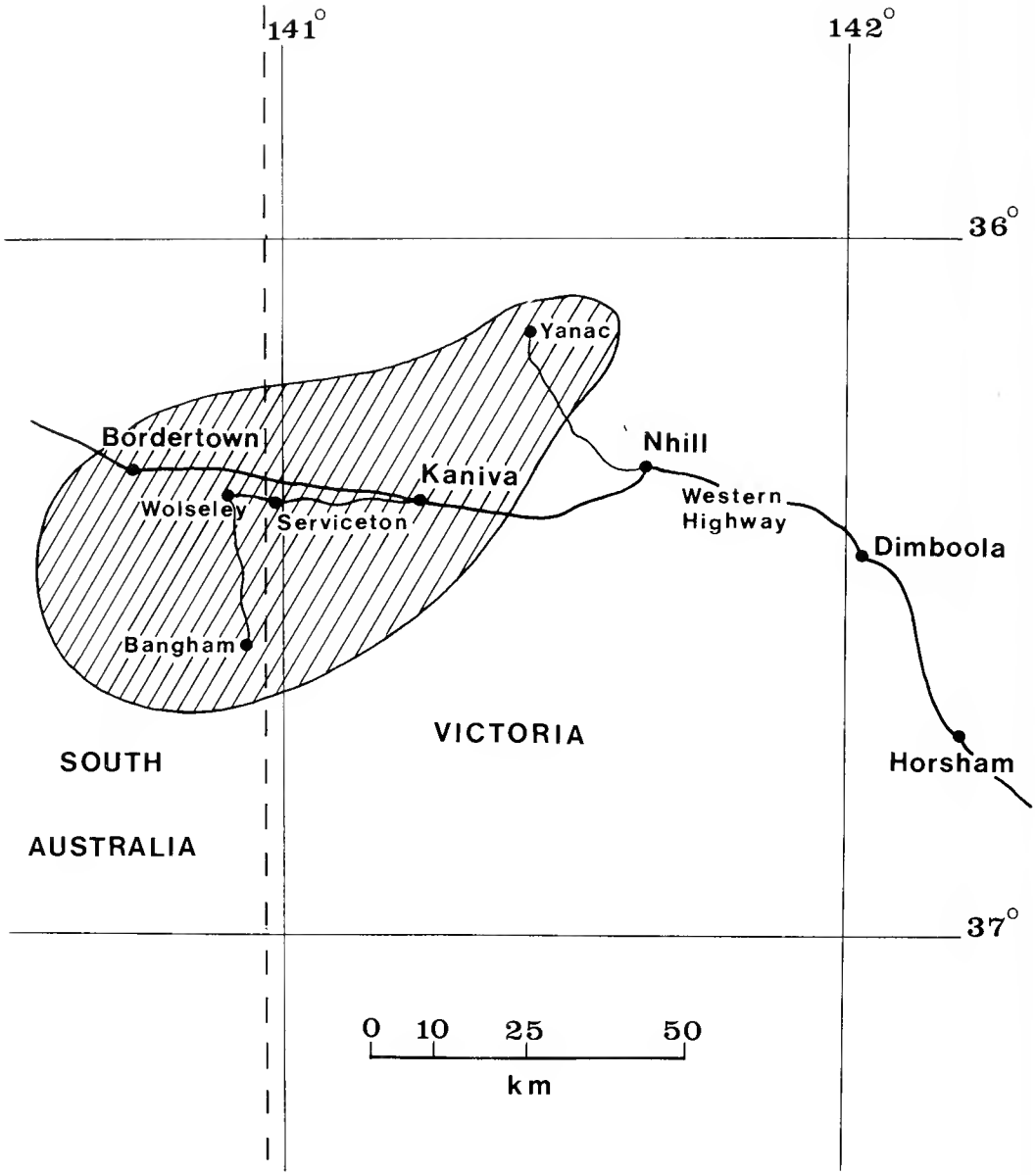

Fig. 2. Distribution of *Eucalyptus silvestris*.

ferred habitat of the new species segregates it from several mallee species also occurring in the area. Seedling trials have confirmed the existence of hybrids with *E. largiflorens* at two sites near Bordertown.

Discussion

Several critical features clearly place *E. silvestris* in the Series Subbuxeales Blakely. Included are its simple, axillary inflorescences which occur along the main axis or on often leafy terminal branchlets, its non-scarred bud with adnate sepaline and petaline opercula, its basifixed, adnate anthers and its small, dark brown, shallowly reticulate seeds. The dull, bluish juvenile leaves with their observable minor veins and abundant oil glands suggest that *E. silvestris* is closely related to *E. odorata*, *E. wimmerensis* (Table 1) and *E. polybractea*. Collectively,

these taxa constitute a natural group which is best accommodated by the informal Superspecies odorata of Pryor and Johnson (1971).

Although *E. silvestris* resembles *E. odorata*, it is different in having smaller buds and fruits and conspicuously lustrous instead of dull adult leaves. As well, its juvenile leaves generally are broader and have longer petioles. The new species has an autumn flowering period whereas *E. odorata* usually flowers during winter.

The new species occurs in the same region as *E. wimmerensis*, however the two are readily separable in the field in habitat and both juvenile and adult morphologies. Whereas *E. silvestris* occurs on well, drained loams in terrain valued for farming, *E. wimmerensis* prefers infertile ridges or sandy rises. *E. wimmerensis* also is different in being a small mallee with box bark limited to the base or lower trunk. Other differences in adult morphology include *E. silvestris* having more lustrous and generally larger adult leaves. The juvenile leaves of the two contrast well, with those of *E. wimmerensis* being smaller and having shorter petioles and a less conspicuous venation pattern (Table 1).

The erection of *E. silvestris* eliminates *E. odorata* from Victoria and adjacent areas of South Australia and sets its eastern limits as the Tailem Bend area. At the same time, this study provides a clarification regarding Peppermint Box 'look-a-likes' in Victoria. Further, of equal importance, it has responded to an expressed conservationist need, not only to provide a taxonomic treatment for the new species, but to identify and survey its remnant populations.

Key to species in the informal Superspecies *odorata*

1 Adult leaves dull
  2 Juvenile leaves waxy ..... **E. polybractea**
  2: Juvenile leaves non-waxy ..... **E. odorata**

1: Adult leaves sub-lustrous or lustrous
  3 Stems box-baked ..... **E. silvestris**
  3: Box bark basal or confined to lower stem ..... **E. wimmerensis**

NOTES ON THE OCCURRENCE OF *E. ODORATA* IN VICTORIA

Blakely (1934) described *E. odorata* as occurring in North-central Victoria and collections held in MEL from the St. Arnaud, Avoca, Inglewood and Bendigo areas have been attributed to the species. These have been persued in the field and found to be neither *E. odorata* nor *E. silvestris*. Two specimens, one from to the south-west of St. Arnaud and the other from Avoca, previously diagnosed as *E. odorata*, appear to have given rise to beliefs regarding the presence of that species in North-central Victoria. Field studies and seedling trials have shown these to be derived from a form of *E. microcarpa* with relatively narrow, somewhat glossy leaves which is one of several forms of Grey Box in the state.

Mallee-box populations to the north of St. Arnaud also have been referred to as *E. odorata*. They too are considered to be neither that species nor *E. silvestris* but a rough-barked, broad-leaved form of *E. polybractea*.

In the Inglewood area there are other narrow-leaved populations of *E. microcarpa* that abut stands of *E. polybractea* on the fringes of mallee communities. Obvious hybrids between the two, which could be mistaken for *E. odorata*, have been observed in the field. These populations of *E. microcarpa*, in part, appear to account for Blakely's references to Victorian populations of the now defunct *E. woolsiana* R.T.Baker.

A collection from the Bendigo Whipstick held in MEL under *E. odorata*, which has not been found in the field, even after three searches, is believed to be an aberrant, broad-leaved form of *E. viridis*.

A single mallee fitting the description of the presumed hybrid, *E. blackburniana* Blakely (considered by Blakely as a relative of *E. odorata*) has been

Table 1. Comparison of *E. silvestris* and related mallee-boxes

Characters	**E. silvestris**	**E. odorata**	**E. wimmerensis**
JUVENILE LEAVES			
Colour	Green to blue-green, dull	Grey-green to blue-green, dull	Blue-green, dull
Surface wax	Absent	Absent or present	Absent
Size (5–15 node)	To 8 × 3 cm	To 9 × 2.2 cm	To 6.5 × 1.6 cm
Secondary venation	Conspicuous	Conspicuous	Visible
Petiole length	0.6–1.2 cm	0.2–1.0 cm	0.2–0.8 cm
ADULT LEAVES			
Colour (canopy)	Olive-green or green, lustrous	Grey-green or olive-green, dull	Olive-green, less often blue-green, sub-lustrous
Surface wax (inc. petioles)	Absent	Absent in typical form, present in northern populations	Absent
Size	To 10 × 2.2 cm	To 12 × 2 cm	To 8 × 1.5 cm
Petiole length	To 1.5 cm	To 1.5 cm	To 1.3 cm
FLORAL BUDS			
Pedicel length	To 0.6 cm	To 0.7 cm	To 0.5 cm
Size	To 0.5 × 0.4 cm	To 0.8 × 0.5 cm	To 0.6 × 0.4 cm
PEDUNCLE LENGTH	To 1.0 cm	To 1.0 cm	To 1.3 cm
FRUIT			
Pedicel length	To 0.4 cm	To 0.4 cm	To 0.3 cm
Size	0.4–0.5 × 0.3–0.4 cm	0.5–0.8 × 0.4–0.6 cm	0.4–0.6 × 0.4–0.6 cm
BARK	Box-bark to at least major branches	Box-bark to at least major branches	Smooth with basal box-bark
HABIT	Large mallees or small, spreading trees	Large mallees or small spreading trees	Small, often shrubby mallees

located at Wedderburn. Trial seedlings of this eucalypt have segregated and clearly indicate *E. polybractea* and *E. leucoxylon* F.Muell. ssp. *pruinosa* Boland as the parents.

Other collections from near Mt. Arapiles area held in MEL fit the general description of *E. odorata*. Previously, Rule (1990) diagnosed these as being a part of a hybrid swarm involving *E. wimmerensis* and a locally abundant form of Grey Box. Recent searches have located neither *E. odorata* nor *E. silvestris* in the area.

ACKNOWLEDGEMENTS

The contributions of Ian Brooker of the Australian National Herbarium, Canberra, Don Foreman and David Albrecht of the National Herbarium of Victoria, Melbourne, have been greatly appreciated, as have those of Beverley Overton of Kangaroo Island and Dean Nicolle of Adelaide. The excellent line drawings of Mali Moir also have been greatly appreciated.

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Amended manuscript received 27 October 1993

NOTES ON WESTERN AUSTRALIAN *BOSSIAEA* SPECIES (FABACEAE): 1

J. H. Ross*

ABSTRACT

Ross, J.H. Notes on Western Australian *Bossiaea* species (Fabaceae): 1. **Muelleria 8(2): 201–209 (1994).** — *Bossiaea aquifolium* Benth. and *B. laidlawiana* Tovey & P.Morris are found to be conspecific. Subspecies *aquifolium* and subsp. *laidlawiana* are recognized within *B. aquifolium*.

BOSSIAEA AQUIFOLIUM BENTH. AND *B. LAIDLAWIANA* TOVEY & P.MORRIS

Bentham (1864) based his description of *B. aquifolium* on material collected by Drummond (second collection number 130 and unnumbered collections) and on material collected by Clarke from Harvey River. In describing *B. aquifolium*, Bentham was recognizing the glabrous shrub in which the margins of the opposite leaves are pungent-pointed and deeply sinuate that occurs as a common understorey plant in the jarrah (*Eucalyptus marginata* Donn *ex* Sm.) and marri (*E. calophylla* R.Br. *ex* Lindl.) forests south of Perth.

Tovey and Morris (1922) described *B. laidlawiana* to accommodate material from the Pemberton and Manjimup area which differed from *B. aquifolium* in having tomentose young stems, differently shaped leaves, calyces and standards and differences in flower colour and size. Tovey and Morris based their description on material collected by Max Koch at Pemberton in October and November 1918 and numbered 2244 and on a collection in MEL without collecting locality or collector. It is clear from Koch's notes which accompany MEL 651289 that he made some effort to collect ample material to demonstrate the distinctness of the taxon. This is borne out by the presence of eleven sheets of Koch material in MEL, four in PERTH, three in NSW and more in other herbaria. Koch drew attention to the large geographical disjunction that separated populations of *B. aquifolium* from the populations of the taxon he was studying near Pemberton and Manjimup.

Since *B. laidlawiana* was described, a large quantity of material has accumulated, much of it collected by my former colleague Margaret Corrick and by Terry Macfarlane of the Western Australian Herbarium. Examination of available collections has revealed that the distinctness of *B. aquifolium* and *B. laidlawiana* is not as absolute as implied by Tovey and Morris; most of the characters used to differentiate *B. laidlawiana* intergrade with *B. aquifolium*. The differential characters employed by Tovey and Morris are considered briefly.

INDUMENTUM

Typical *B. aquifolium* has the young stems and leaves glabrous or almost so and occurs in the Darling Range east of Perth southwards to the Harvey River. From the vicinity of Tallanalla southwards specimens occur, for example *Corrick 9733, 9734* (MEL), which resemble typical *B. aquifolium* in every respect except that the young stems are sparingly to densely clothed with hairs. There is a tendency from near Tallanalla southwards to Balingup and south-westwards to Yallingup and north of Margaret River for the degree of pubescence on the young stems to increase. This indumentum varies from appressed antrorse hairs in *Corrick 8357, 9733, 9734* (MEL) and *Mueller s.n.* (MEL 651306), to short curled hairs in *Macfarlane 1721* (MEL, PERTH), or a dense cover of short curled hairs

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and longer scattered hairs up to 1 mm long in *J.Forrest s.n.* (MEL 651305). The indumentum sometimes varies on a single shoot; in *Corrick 9734* the extremity of one shoot is quite glabrous whereas the slightly older growth is clothed with appressed antrorse hairs. On some of the densely pubescent specimens the upper and lower surfaces of the leaves, and especially the lower surfaces, bear long spreading hairs, for example, *J.Forrest s.n.* (MEL 651305) from Blackwood River and *R.D.Royce 5114* (PERTH) from Yallingup siding. The range of variation in the indumentum on specimens which agree with material of *B. aquifolium* in all other respects is much greater than implied by Tovey and Morris and there is no discontinuity on the basis of the indumentum between specimens of *B. aquifolium* and those of *B. laidlawiana.*

Flowers

Tovey and Morris indicated that their new species differed from *B. aquifolium* in flower size and colour and in the shape of the calyx and standard. I have not noted any significant differences between *B. aquifolium* and *B. laidlawiana* in flower size or in the shape of the calyx or standard. However, flower colour in typical *B. aquifolium* does differ from that in typical *B. laidlawiana* and the flowers of the latter tend to be more sweet-scented.

In typical *B. aquifolium* the standard is deep yellow internally with a dark red or reddish-brown fringe around a basal greenish-yellow throat, and the wings and keel petals are dark red or red-brown. In typical *B. laidlawiana* the standard is a paler yellow internally and the red fringe around the basal greenish-yellow throat is discontinuous, being interrupted in the centre by the yellow throat which extends vertically into the main yellow body of the standard. A small red spot is sometimes present in the centre (in the centrefold of the standard) of the gap in the red fringe. The wings are yellow distally and red basally and the keel petals are red.

The colouration found in typical *B. aquifolium* also occurs in some of the specimens which are fairly densely clothed with appressed pubescence, for example *Corrick 9729* (MEL), from the Glen Mervyn dam. However, the distal portions of the wings in many flowers on the same specimen are orange rather than red.

Examination of material of *B. aquifolium* indicates that flower colour tends to change to the south. The continuous red fringe found on the internal surface of the standard in *B. aquifolium* gradually narrows in the centre until it becomes discontinous as in the case of *B. laidlawiana,* and this change is accompanied by a change in the colour of the wing petals. Despite the existence of this differential tendency, flower colour does not provide a convincing means of separating the taxa.

Leaf Shape

In *B. aquifolium* the leaves are distinctly angular, each angle terminating in a prominent pungent point and the margins are usually distinctly sinuate between the pungent points, especially between the apical point and the nearest lateral point on either side of it. The leaves typically have 5–9 pungent points but some specimens have occasional leaves with as few as 3, for example *Corrick 9376* (MEL), in which case they are almost hastate in shape. Other specimens may have occasional leaves with as many as 13 pungent points, for example *Corrick & Ross 9198* (MEL). Leaf shape in *B. aquifolium* is basically broadly depressed ovate and the leaf base is usually slightly cordate and somewhat truncate. (Fig. 1)

In *B. laidlawiana* the leaves are very broadly ovate to semi-orbicular and are not usually as distinctly angular as in *B. aquifolium.* The apex has a pungent point but the margins tend to have more numerous (12–25) points or teeth and are dentate rather than deeply sinuate and pungent-pointed. Leaf shape often varies quite markedly on a single specimen. The leaf base is often slightly cuneate rather than truncate.

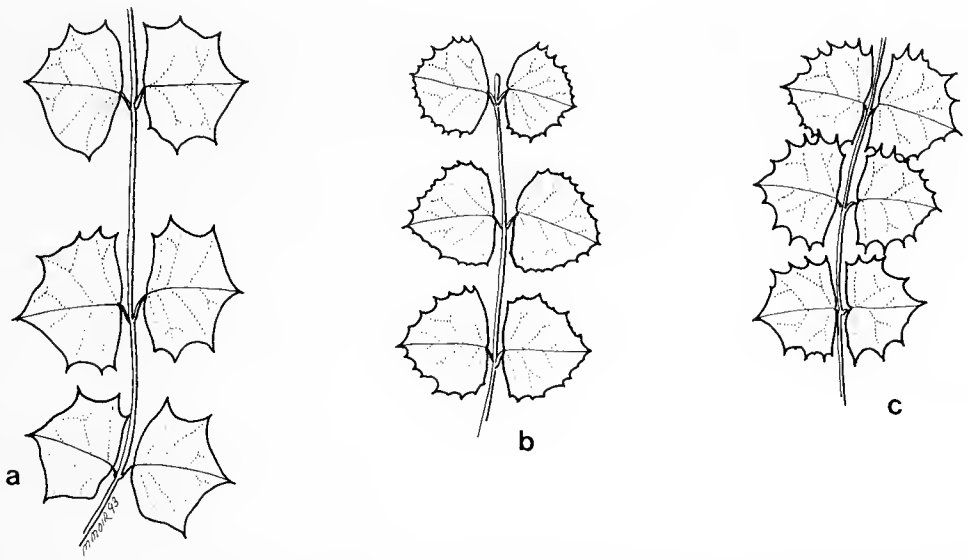

Fig. 1. Leaf shape. a — typical *B. aquifolium*, ×1, from *M.G.Corrick 9199 & J.H. Ross* (MEL); b — typical *B. laidlawiana*, ×1, from *A.C.Beauglehole 12637* (MEL); c — intermediate, ×1, from *M.G.Corrick 9242* (MEL).

Leaf shape permits most specimens to be referred to either one taxon or the other quite readily over the entire range of the two taxa except for an area to the south and south-east of Nannup. In this latter area specimens occur, for example *Corrick 9233, 9242, 10554* (MEL), which are difficult to assign to either taxon with certainty on the basis of leaf shape. The variation in leaf shape appears to be most pronounced along the north-western portion of Davidson Road which links the Vasse Highway south of Nannup and Manjimup.

Ecological Preferences

B. aquifolium and *B. laidlawiana* are dominant understorey shrubs or small trees. *B. aquifolium* usually occurs in drier areas in association with *Eucalyptus marginata* and *E. calophylla* whereas *B. laidlawiana* favours moister areas and is usually associated with *E. diversicolor*. However, although each species has slightly different ecological preferences, there is no absolute distinction as *B. laidlawiana* is sometimes associated with *E. marginata* (*Corrick 9239*), with *E. marginata* and *E. calophylla* (*Corrick 9241*) or with even stands of *E. diversicolor*, *E. marginata* and *E. calophylla* (*Macfarlane 2043*).

The material collected since *B. laidlawiana* was described has reduced significantly the size of the geographic discontinuity that was thought by Koch to separate the two taxa.

Conclusions

As *B. aquifolium* and *B. laidlawiana* grade into one another, and as specimens exist which are difficult to refer to either with confidence, it is inappropriate to continue to recognize the two as distinct species. Given the uniformity of *B. aquifolium* in the northern part of its range on the one hand, and the uniformity of *B. laidlawiana* in the Manjimup-Pemberton area on the other, it is proposed to accord the two taxa subspecific rank on the basis of the differential tendencies exhibited by each and to treat *B. laidlawiana* as a subspecies of *B. aquifolium*.

As each of the characters relied upon by Tovey and Morris to separate the taxa breaks down, it is necessary to assess how the two taxa are best circumscribed and the characters upon which most reliance can be placed. As leaf shape and the degree of pubescence of the young stems is not always necessarily correlated, a

choice must be made between grouping specimens together on the basis of leaf shape regardless of the degree of indumentum of the young stems, or, alternatively, grouping them together on the degree of pubescence of the young stems regardless of leaf shape. The occurrence of a fairly dense indumentum on some specimens that are typical of *B. aquifolium* in all other respects suggests that leaf shape provides a more reliable and meaningful character to differentiate the taxa than does the degree of pubescence. Accordingly, emphasis is placed on leaf shape, together with ecological preferences, in separating the two subspecies.

Bossiaea aquifolium Benth., Fl. Austral. 2: 157 (1864).

SYNTYPES: Western Australia, *J.Drummond 2nd coll. no. 130* (BM, K, MEL, NSW, PERTH); *J.Drummond s.n.* (K, MEL); Harvey River, Western Australia, *W.Clarke s.n.* (K).

Slender shrub or small tree to 8 m high; *branchlets* glabrous or sparingly to densely clothed with appressed antrorse hairs or curled hairs, the latter sometimes with longer spreading hairs up to 1 mm long interspersed, terete, slender. *Leaves* opposite, unifoliolate, lamina depressed ovate or broadly ovate to semi-orbicular, the apex terminating in a pungent point, distinctly angular with each angle terminating in a pungent point and the margins distinctly sinuate between the pungent points or not distinctly angular and the margins dentate, (0.5) 0.8–2.2 cm long, (0.5) 0.8–2 (2.6) cm wide, wider than long, slightly cordate basally, glabrous throughout or with scattered hairs; petiolule 0.9–2.2 mm long, glabrous to densely pubescent. *Stipules* triangular, 0.7–1.8 mm long, 0.5–0.9 mm wide, glabrous to densely pubescent. *Flowers* axillary, solitary or in pairs, shortly pedicellate, the pedicel exceeding the two outer basal bracts; the two inner bracts enclosing the flower buds elliptic, 6–10 mm long, rigid, brown, longitudinally striate, margins conspicuously ciliate especially apically, the outer one cucullate apically, fugacious; the two outer bracts persistent, the outer of the two broadly ovate, 1.4–2.3 mm long, 1.5–2.4 mm wide, longitudinally striate, pubescent basally and with marginal cilia or sometimes sparingly pubescent throughout, the inner bract completely encircling the pedicel, broadly ovate, 1.5–2.4 mm long, 2.3–3.4 mm wide, longitudinally striate, pubescent basally and with marginal cilia; bracteoles absent. *Calyx* glabrous throughout except for marginal cilia or with occasional scattered hairs: 2 upper lobes 4–5.7 mm long including the tube 2.3–4.2 mm long, lobes rounded-truncate and only slightly emarginate apically, 3 lower lobes 0.8–1.5 mm long, 1.3–1.7 mm wide. *Standard* more or less orbicular, 11.8–18 mm long including a basal claw 2–3.2 mm long, 10.8–18.5 mm wide, emarginate apically, yellow or deep yellow internally with a dark red, red or reddish-brown continuous fringe around a basal greenish-yellow throat or the fringe discontinuous, being interrupted by the yellow throat which extends vertically and joins the main body of the yellow standard; *wings* 9.7–13.7 mm long including a claw 2.3–3.3 mm long, auricled, 2.4–4.2 mm wide, dark red or reddish-brown throughout or orange or yellow apically; *keel petals* 10–13 mm long including a claw 2.5–3.2 mm long, auricled, 3.2–4.8 mm wide, red or reddish-brown. *Stamen-filaments* 7.4–11 mm long. *Ovary* 3.5–5.5 mm long, on a stipe 2.6–3.7 mm long, glabrous, 2–4-ovulate. *Pods* stipitate, ovate-oblong to oblong-elliptic, 1.1–2.4 cm long, 0.7–1.1 cm wide, thickened along the upper suture, glabrous. *Seeds* ellipsoid, 3.2–3.5 mm long, 2.1–2.5 mm wide, chocolate-brown, the small hilum covered by a hooded cap-like aril.

DISTRIBUTION

Occurs in the Darling Botanical District of the Southwestern Botanical Province of Western Australia as defined by Beard (1980) from the vicinity of Mundaring east of Perth southwards to near Margaret River and eastwards to Manjimup.

NOTES

B. aquifolium plays a very important role in the ecology of the *Eucalyptus marginata*, *E. diversicolor* and *E. calophylla* forests where it is often a conspicuous element of the understorey. *B. aquifolium* is one of the species referred to as 'fire weeds' (Bell *et al.*, 1989). If seed is present in the soil, the passage of a hot fire stimulates abundant regeneration of fire weeds (Shea *et al.*, 1979). Data from sites in experimental burns near Dwellingup indicated that the numbers of *B. aquifolium* 'were greatly increased following soil heating and still remained more than double the pre-fire level after 5 years' (Bell *et al.*, 1989).

The vernacular name 'water-bush' is used for *B. aquifolium* in a broad sense which is very apt. After rain, water collects in the axils of the opposite leaves and, when the branches are brushed against or bumped in passing, the reward is a shower of water. However, for plants in the Manjimup and Pemberton areas (i.e. subsp. *laidlawiana*), the name 'netic' is used (T.D. Macfarlane, pers. comm.)

The rust fungus *Aecidium eberneum* McAlpine occurs commonly on the green pods of both subspecies of *B. aquifolium* (Shivas, 1989; Macfarlane, pers. comm.).

I am under no illusions about the difficulties involved in attempting to place some specimens. Reliance on vegetative characters to differentiate the two subspecies imposes limitations and it is sometimes difficult to differentiate between a pungent point and a tooth. The placement of some specimens will be somewhat arbitrary. Because of the variation in leaf shape on some individual specimens, it may be helpful when keying out specimens to select leaves that exhibit the mid-point in the range of variation rather than the extremes.

KEY TO SUBSPECIES OF *BOSSIAEA AQUIFOLIUM*

1 Leaves distinctly angular, each angle terminating in a pungent point, the margins usually with (3) 5–11 pungent points and usually distinctly sinuate between the points (especially between the apical and the nearest lateral points); branchlets glabrous or sparingly to densely pubescent; associated with *Eucalyptus marginata* and/or *E. calophylla* ..... **subsp. aquifolium**

1: Leaves not as distinctly angular, the apex with a pungent point but the margins with numerous (11–25) teeth or points and not deeply sinuate; branchlets sparingly to densely pubescent; usually associated with *Eucalyptus diversicolor*, but sometimes with *E. marginata* or *E. calophylla* or even stands of all three species ..... **subsp. laidlawiana**

Bossiaea aquifolium subsp. aquifolium

B. aquifolium Benth., Fl Austral. 2: 157 (1864)

Glabrous or sparingly to densely pubescent shrub or small tree; leaves distinctly angular, usually with (3) 5–11 pungent points and the margin usually distinctly sinuate, especially between the apical and nearest lateral points; standard deep yellow or yellow internally with a continuous dark red or red-brown fringe around a basal yellow throat or the fringe discontinuous and interrupted by the yellow throat which extends vertically into the main yellow body of the standard; wings red or reddish-brown throughout or orange or yellow apically.

DISTRIBUTION AND ECOLOGICAL PREFERENCES

Occurs from the vicinity of Mundaring in the Darling Range east of Perth southwards to the vicinity of Margaret River and eastwards to Collie and Nannup. Favours lateritic soils and clay loam. A common understorey species in *Eucalyptus marginata* and *E. calophylla* forest. (Figs. 2 & 3)

REPRESENTATIVE SPECIMENS (62 examined)

Western Australia — Darling Range, Mundaring Weir Road, 5 Oct. 1984, *M.G.Corrick 9199 & J.H.Ross* (MEL, PERTH); Mt Dale Road, SE of Carinyah, 6 Nov. 1983, *M.G.Corrick 9028* (AD, CBG,

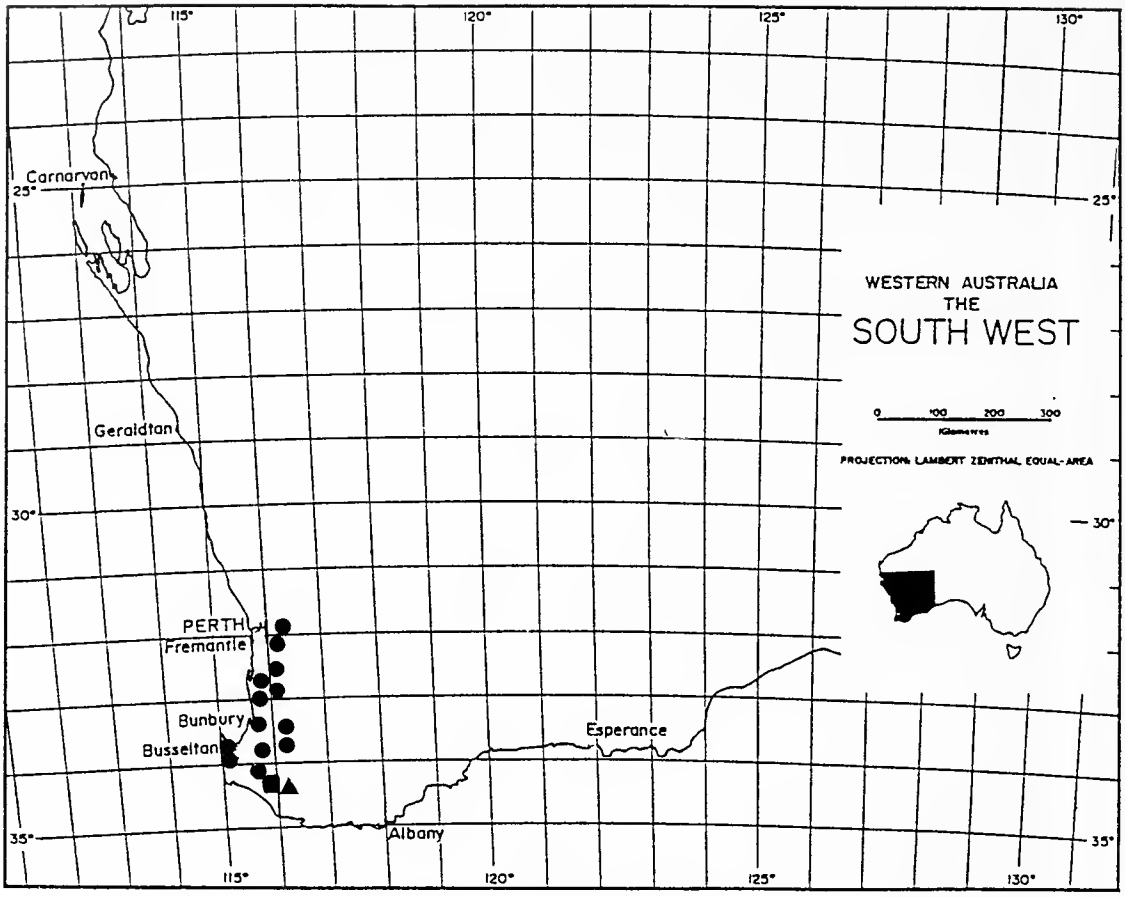

Fig. 2. Distribution of *B. aquifolium* subsp. *aquifolium* (●); *B. aquifolium* subsp. *laidlawiana* (▲); *interzone* (■).

HO, MEL, NSW, PERTH); Coalfields Road, 2 km W of Allanson, 12 Sep. 1979, *J.Koch s.n.* (PERTH); Glen Mervyn Dam, 22 Oct. 1985, *M.G.Corrick 9729* (MEL, PERTH); near Newlands, *c.* 10 km S of Donnybrook, 4 Oct. 1982, *M.G.Corrick 8342* (MEL); 12 km S of Nannup on Vasse Hwy, 10 Oct. 1984, *M.G.Corrick 9231* (MEL, PERTH).

NOTES

Typical subsp. *aquifolium* with the young stems and leaves glabrous or almost so occurs in the Darling Range east of Perth and southwards to the Harvey River. From the vicinity of Tallanalla southwards to Balingup and south-westwards to Yallingup and north of Margaret River specimens occur which resemble typical subsp. *aquifolium* in every respect except the young stems are sparingly to densely clothed with hairs. These specimens are included in subsp. *aquifolium*.

The specimen *A.N.Rodd 4798 & G.Fensom* (PERTH) from 10.6 km E of Kelmscott on the Brookton Highway shows unusual variation in leaf shape. Some leaves have the typical angular shape with each angle terminating in a pungent point, others are not angled apart from the apical point, and occasional leaves are almost hemispherical or reniform and lack even the apical point. The latter leaves are reminiscent of those found in *B. webbii* but the margins are not denticulate as in that species.

Bossiaea aquifolium subsp. laidlawiana (Tovey & P. Morris) J.H.Ross, *comb. et stat. nov.*

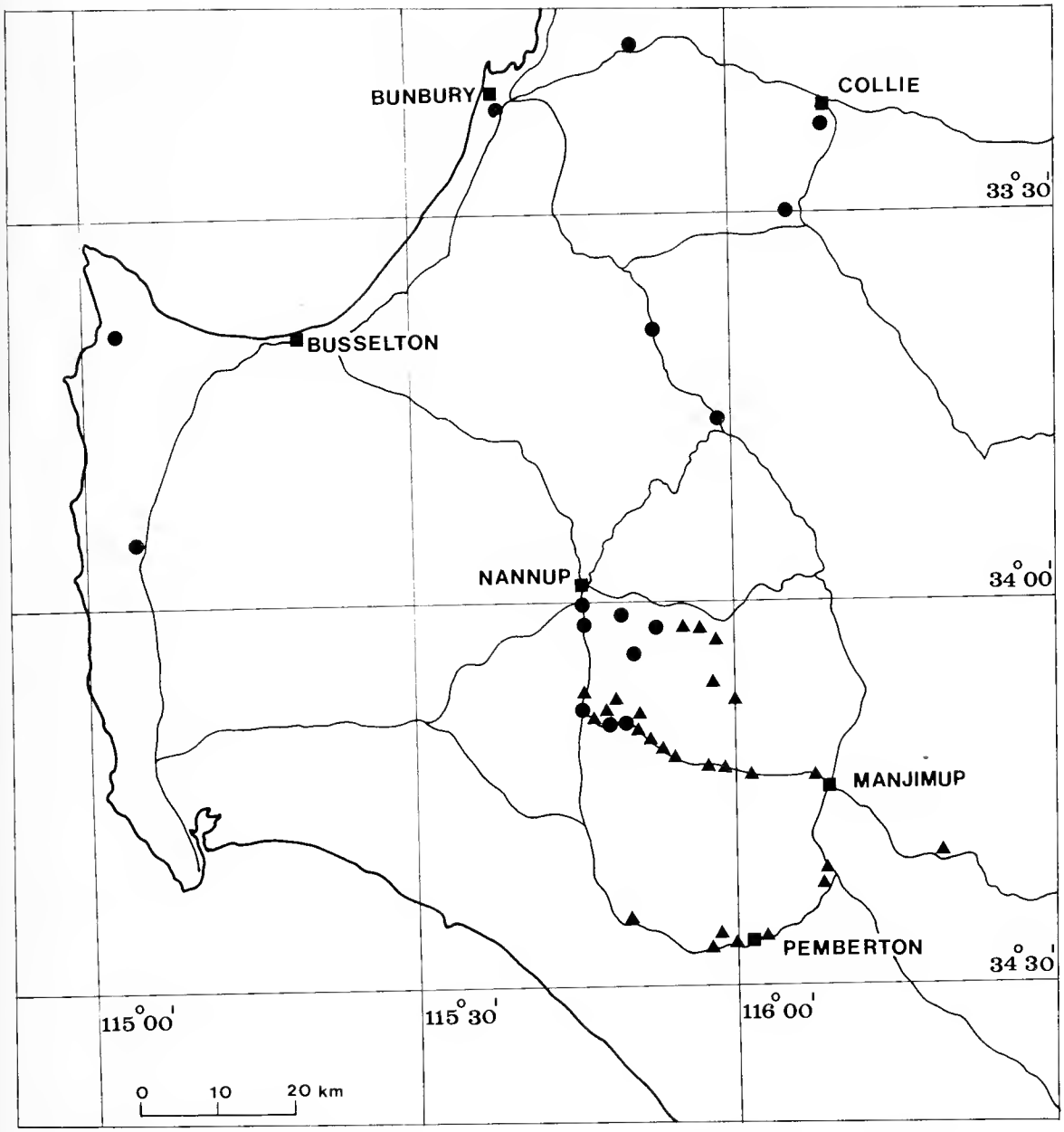

Fig. 3. Distribution of *B. aquifolium* subsp. *aquifolium* (●) and *B. aquifolium* subsp. *laidlawiana* (▲) in the area centred on Nannup where the distributions overlap.

Bossiaea laidlawiana Tovey & P.Morris, Proc. Roy. Soc. Victoria new ser. 34:207 (1922). TYPE: Pemberton (Big Brook), Warren District, Western Australia, Oct.-Nov. 1918, *M.Koch 2244* (MEL 651289, LECTOTYPE, **here chosen**; AD, ISOLECTOTYPE.).

Sparingly to densely pubescent shrub or small tree; leaves not as distinctly angular, the apex with a pungent point but the margins with numerous (11–25) teeth or points and not deeply sinuate; standard yellow internally with a discontinuous red fringe around a greenish-yellow throat, the red fringe interrupted by the yellow throat which extends vertically into the main yellow body of the standard, usually with a red spot in the centre (the centrefold of the standard) of the gap in the red fringe; wings yellow apically and red basally.

Distribution and Ecological Preferences

Occurs from the vicinity of Nannup south and south-eastwards to Pemberton and just south-east of Manjimup. There is a solitary specimen, *A.R.Fairall 641* (PERTH) collected on 13 Oct. 1962, from the Valley of the Giants, east of Nornalup. This represents a considerable disjunct eastward extension of the range of the species which is thought to be unnatural; it is possible that it may be the result of seed being dispersed by road-making machinery. (Figs. 2 & 3)

Favours clay-loam soils which sometimes contain gravel. Most commonly encountered as an understorey to *Eucalyptus diversicolor*, but sometimes found with *E. marginata* and *E. diversicolor*, with *E. marginata* and *E. calophylla,* or in even stands of all three species.

Representative Specimens (57 examined)

Western Australia — Davidson's Road (W of Manjimup) near corner of Coronation Road, 10 Oct. 1984, *M.G.Corrick 9239* (MEL, PERTH); Beedelup Falls, Beedelup National Park, 9 Sep. 1965, *A.C.Beauglehole 12637* (MEL); Pemberton, Oct. 1963, *W.Rogerson 83* (PERTH); 12.7 km NE of Pemberton on Vasse Hwy, 14 Oct. 1985, *J.H. Ross 2997* (MEL, PERTH); Muirs Hwy, 0.3 km E of Nyamup turnoff, Oct. 1992, *T.D.Macfarlane 2141* (MEL, PERTH).

Typification

Tovey and Morris based their description of *B. laidlawiana* on material collected in the Warren District in October and December 1918 by M. Koch numbered 2244 and on an undated collection in MEL from Western Australia without locality or a collector's name. There are in MEL three sheets (MEL 651289, 651290, 651293) of *Koch 2244* collected in October (flowering material) and December (fruiting material) 1918. In addition, there is an undated collection numbered *Koch 2244* (MEL 651291), a collection numbered 2244 dated October 1921 (MEL 651292), and unnumbered collections dated Jan. 1921 (MEL 651315), July 1921 (MEL 651314), August 1921 (MEL 651312), September 1921 (MEL 651311), October 1921 (MEL 651313), November 1921 (MEL 651310). Koch's numbers are not collecting numbers which explains why number 2244 appears on specimens collected on different dates.

In PERTH there are two sheets numbered *Koch 2244* dated October 1916, an undated sheet numbered 2244, and an undated unnumbered Koch sheet. In K there is a sheet numbered 2244 dated October 1917 and an undated sheet numbered 2244. In NSW there are two sheets numbered 2244 dated October 1916 and an unnumbered sheet dated October 1921.

From the dates of collection given in the protologue, only three of the Koch sheets in MEL (MEL 651289, 651290, 651293) numbered 2244 and the sheet lacking locality and collector (MEL 651309) are regarded as syntypes. A sheet of Koch material numbered 2244 in AD (formerly part of J.M.Black's herbarium and distributed from MEL) labelled 'Pemberton (Big Brook) Warren district, fl. Oct., fr. Dec. 1918' is also a syntype. It is quite likely that at least one of the PERTH sheets and the undated sheet in K represent syntype material but this cannot be proven. I here select *Koch 2244* (MEL 651289), which is acompanied by Koch's notes, from among the syntypes as the lectotype of *B. laidlawiana*.

Notes

Several specimens from an area south and south-east of Nannup, for example *Corrick 9233, 9242, 10554* (MEL), are difficult to place with certainty. These specimens, and other intermediate specimens, have been referred with some doubt to subsp. *laidlawiana*.

Ashby 2675 (PERTH) from Pemberton has sub-reniform leaves and shows a close superficial resemblance to *B. webbii*. However, the young stems are densely pubescent unlike those of *B. webbii*.

The seasonal variation in nodule production and nitrogen fixation by subsp. *laidlawiana* in *Eucalyptus diversicolor* forest is discussed by Grove & Malajczuk (1992).

ACKNOWLEDGEMENTS

I am most grateful to Dr P.S.Short for arranging for type specimens to be photographed at K; to Margaret Corrick for collecting a range of interesting material over a period of several years; and to Mali Moir for executing the illustration which accompanies this paper. It is a pleasure to acknowledge the assistance of Dr. T.D.Macfarlane who commented on an earlier draft of this paper, sampled populations, confirmed the variation described in the Nannup-Manjimup area, and drew my attention to some of the ecological works cited in the references.

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Revised paper received 3 November 1993.

NOTES ON WESTERN AUSTRALIAN *BOSSIAEA* SPECIES (FABACEAE): 2

J. H. Ross*

ABSTRACT

Ross, J. H. Notes on Western Australian *Bossiaea* species (Fabaceae): 2. **Muelleria 8(2): 211–221 (1994)**. — The type material of *B. rufa* R.Br. in the Natural History Museum (BM) is found to consist of two different taxa. In view of the existence of these discordant elements, a lectotype is selected for *B. rufa* and a description of the species is provided. As no already published name is available for the second taxon, it is here described as *B. praetermissa* sp. nov.. *B. modesta* from the Mt Dale area in the Darling range is described as new.

THE APPLICATION AND LECTOTYPIFICATION OF THE NAME *BOSSIAEA RUFA* R.Br.

Bossiaea rufa R.Br. (1812) was the first of the Western Australian flat-stemmed species of *Bossiaea* to be described. The description of *B. rufa* in the protologue is as follows:

> ". . . ramis complanatis linearibus aphyllus : denticulis floriferis, carina fimbriata, bracteis superioribus caducis ab inferioribus remotis, calycibus glaberrimis. *Brown mss.*
> Red-flower'd flat-stem'd Bossiaea.
> *Nat.* of the South-West Coast of New Holland.
> *Introd.* 1803, by Mr. Peter Good.
> . . ."

It is not clear from the protologue whether R.Brown based his description of *B. rufa* on a plant raised at Kew Gardens from seed introduced by Peter Good in 1803, on his own specimens collected on the south-west coast of Western Australia, or whether it was based on elements of both. The absence in BM of any cultivated material of *B. rufa* suggests that the description was based on Brown's own material of which there is one sheet. The sheet of R. Brown material in BM numbered 4831 consists of 4 pieces of plant material which represent two different taxa. The piece of material on the left hand side of the sheet, to the left of which is a label in Brown's hand which reads "Platylobium = Bossiaea/King George III^{d} Sound" represents one taxon. Below this label is another in Bentham's hand which reads "Bossiaea rufa R.Br.". The three other pieces of material to the right represent the second taxon. Mounted at the foot of the sheet on top of the blue printed label is a label in Brown's hand which reads "Platylobium pubescens/King George III^{d} S^{d}." In view of the presence of these discordant elements, it is necessary to determine which one most closely accords with the protologue so that the application of the name *B. rufa* can be established.

Superficially the two taxa are very similar so it is not surprising that they have been confused for a very long time. However, careful examination enables material to be sorted quite readily. The two taxa are differentiated most easily on the basis of whether the paired bracteoles on the pedicel are rapidly deciduous or persistent, by the nature of the indumentum, when present, on the calyx, and on whether or not the apices of the keel petals are glabrous or densely pubescent (see also Table 1).

In respect of the differential characters, in the material of the taxon represented on the left hand side of the sheet, the paired bracteoles are still evident on the

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pedicels of the young fruits which are at an early stage of development, the calyces are sparingly but distinctly pubescent, and the keel petals on the solitary remaining flower appear to be glabrous apically. In the material of the taxon represented on the right, the bracteoles are rapidly deciduous, the calyces are glabrous, and the keel petals are distinctly woolly apically.

Brown adopted the vernacular name "Red-flower'd flat-stem'd Bossiaea" for *B. rufa*. As indicated, the material on the left hand side of the Brown material in BM possesses the remains of the keel petals on a solitary inconspicuous flower and a few young fruits at a very early stage of development. In contrast, the central of the three pieces of material representing the taxon on the right bears a number of conspicuous relatively large flowers. It is almost a certainty that Brown adopted this vernacular name on the basis of this floriferous material of the taxon represented on the right hand side of the sheet.

It is clear that the taxon represented on the right hand side of the sheet of R.Brown material named *B. rufa* in BM is the one that agrees most closely with the protologue. This being the case, the material on the right hand side of the sheet is here chosen as the lectotype of *B. rufa*. The sheet of R.Brown material in CANB contains the same two elements that are found on the BM sheet. In the case of the CANB sheet, however, the plant material on the left hand side of the sheet accords with the protologue and is regarded as an isolectotype. The R.Brown material named *B. rufa* in MEL and PERTH consists entirely of the taxon represented on the left hand side of the sheet in BM which is described below as *B. praetermissa*.

BOSSIAEA RUFA SENSU BENTHAM (1864)

In his account of *Bossiaea* in Flora Australiensis, Bentham (1864) adopted a broad circumscription of *B. rufa* and included within it several species that had been recognized earlier. As justification for his decision to do so, Bentham commented 'The following forms, different as they look, pass much into each other; . . .' Confirmation of the difficulty that Bentham experienced is found in his letter to Mueller dated 12–16th October 1863 in which he wrote '16th I have just finished Bossiaea and have had a great deal of trouble with the aphyllous ones — Habit goes for little in Kew for without flowers it is difficult to distinguish Bossiaeas from some Brachysemas or from plants of quite different families — . . .'

Following the broad circumscription adopted by Bentham, the name *B. rufa* has been applied subsequently to both of the taxa represented by Brown's material. The lectotypification above preserves the application of the name *B. rufa*, but in a narrower sense.

The more abundant and better material now available indicates that three of the four taxa accorded varietal rank by Bentham merit specific rank.

The taxa recognised by Bentham were:

1. *B. rufa* var. *normalis* Benth.. This is the typical form of *B. rufa*.
2. *B. rufa* var. *oxyclada* (Turcz.) Benth.. This represents a flat-stemmed species (*B. oxyclada* Turcz.) which differs from *B. rufa* in being a more rigid and intricately branched shrub with spine-tipped branches. *B. oxyclada* is little-known and apparently seldom collected but its affinities are with another currently unnamed flat-stemmed species rather than with *B. rufa*.
3. *B. rufa* var. *foliosa* Benth.. This taxon differs from *B. rufa* in being a leafy rigid shrub with spine-tipped branches and was featured under the name *B. paucifolia* by Lindley (1842). The correct name for this taxon at species rank is *B. spinescens* C.F.W.Meissn.
4. *B. rufa* var. *virgata* (Hook.) Benth.. This is the same taxon as typical *B. rufa*.

It is unfortunate that the names *B. paucifolia* Benth. (1841) and *B. virgata* Hook. (1842) also apply to the taxon now known as *B. rufa* as this means that no

existing name is available for the second taxon collected by Brown. In order to remedy this deficiency, the name *B. praetermissa* is here adopted for this taxon which is described below.

As neither *B. oxyclada* nor *B. spinescens* is closely allied to *B. rufa*, they are not considered further here as they will be dealt with elsewhere. *B. rufa* and *B. praetermissa* are considered in some detail.

BOSSIAEA RUFA AND *BOSSIAEA PRAETERMISSA*

Bossiaea rufa R.Br. in W.T.Aiton, Hortus Kewensis edn 2, 4:267 (1812); DC., Prodr. 2:117 (1825). TYPE: King Georges Sound, Western Australia, *R.Brown 4831* (BM, the three pieces of plant material mounted on the right hand side of the sheet **here selected as the lectotype**).

Bossiaea paucifolia Benth. in Lindley, Edwards's Bot. Reg. 27 misc.: 53, no. 108 (1841), *non sensu* Lindley, Edwards's Bot. Reg. 29:63 (1843); Walp., Repert. Bot. Syst. 1:578 (1842); C.F.W. Meissn. in Lehm., Pl. Preiss. 1:81 (1844). TYPE: Swan River, Western Australia, 1839, *J. Drummond* (CGE, **lectotype here chosen**).

Bossiaea virgata Hook., Bot. Mag. t.3986 (1842); Walp., Repert. Bot. Syst. 2:833 (1843). *Bossiaea rufa* var. *virgata* (Hook.) Benth., Fl. Austral.2:166 (1864). TYPE: Swan River, Western Australia, *J.Drummond 56* (K, **lectotype here chosen**).

Bossiaea rufa var. *normalis* Benth., Fl. Austral 2:166 (1864). TYPE: as for *B. rufa*.

Lax many-stemmed shrub to 2 m high, stems erect or straggling and supported by surrounding vegetation, flattened, winged and up to 10 mm wide, incised at the nodes, leafless or with copious leaves, especially on the younger growth, glabrous or sparingly pubescent with appressed or slightly spreading hairs especially when young. *Leaves* unifoliolate: lamina obovate, obovate-oblong, elliptic to narrow-elliptic, 7–29 mm long, 2.2–10 mm wide, rounded, obtuse, emarginate or mucronate apically, glabrous throughout or with occasional scattered appressed hairs below; petiolule 1.5–4.5 mm long, glabrous. *Stipules* 1–3 mm long, (0.4)0.7–1 mm wide, ovate or narrowly ovate, often oblique and asymmetric basally, longitudinally striate, usually glabrous apart from marginal cilia and scattered hairs towards the apex, sometimes the opposing stipules united laterally for much of their length. *Flowers* solitary or paired, axillary when leaves present, pedicellate, the pedicels (3)5–10 mm long, glabrous or sometimes sparingly pubescent. *Bracts* ovate, 1–2 mm long, 0.6–1.2 mm wide, usually rapidly deciduous and only visible in young bud, scarious, glabrous or with marginal cilia, longitudinally striate. *Bracteoles* narrow-elliptic, 1.3–2.5(3.5) mm long, 0.8–1.2 mm wide, rapidly deciduous and only visible in young bud, scarious, glabrous or with marginal cilia, often inserted above the middle of the pedicel. *Calyx* glabrous or sparingly pubescent especially towards the apices of the lobes; 2 upper lobes 3.7–5.2 mm long including the tube 2–3.6 mm long, the apices of the lobes diverging, 3 lower lobes 1.2–1.8 mm long. *Standard* 9.5–12.2 mm long including a claw 3.5–4.2 mm long, 8.6–11.7 mm wide, deep yellow internally with a deep purplish-red horse-shaped flare around a basal yellow throat, yellow with maroon, red or white striations externally sometimes giving a somewhat marbled appearance. *Wings* 8.1–8.9 mm long including a claw 3.2–3.5 mm long, 2.3–2.5 mm wide, reddish. *Keel* petals 7.2–7.5 mm long including a claw 3.2–3.7 mm long, 2.5–3 mm wide, reddish, densely pubescent or woolly apically. *Stamen-filaments* 6.2–8.7 mm long. *Ovary* 5–6.8 mm long, stipitate, (5)7–10-ovulate, glabrous. *Pods* oblong, 2.5–3.8 cm long, 0.6–0.7 cm wide, the stipe about as long as or exceeding the persistent calyx, valves thin, inconspicuously transversely striate, glabrous. *Seeds* ellipsoid, 2.3–2.5 mm long, 1.4–1.7 mm wide, uniformly reddish-brown, small hilum covered by a hooded cap-like aril.

Distribution

Occurs in the Darling (? and Eyre) Botanical Districts of the Southwestern Botanical Province of Western Australia as defined by Beard (1980) from Roleystone on the Canning River south-east of Perth south to Augusta and eastwards to near Albany with an outlier at Phillips River. The Phillips River record is based on a specimen (MEL 664669) bearing the name *B. rufa* in Mueller's hand which lacks a collector or date. As this record is so far east of other known occurrences of the species, it is not inconceivable that the label and specimen do not belong together. Confirmation of the existence of *B. rufa* in the Phillips river area is desired. (Fig. 1)

Habitat

Favours moist situations in sandy, alluvial or peaty soils or amongst rocks along stream banks and near swamps.

Representative Specimens (47 examined)

Western Australia — Blackwood River, *A.Olfield s.n.* (MEL 664706); Serpentine River, 1 Dec. 1877, *F.Mueller s.n.* (MEL 563561); Canning River, Croydon rd., Roleystone, 8 Oct. 1967, *G.Heinsohn 147* (PERTH); St John Brook at Cambray, 26 Nov. 1975, *A.S.George 14224* (PERTH); Frankland River bridge, 16 Nov. 1978, *E.Wittwer 2241* (PERTH); on Alamo Creek, Conveyor Belt route crossing, Bell Block, 29 Aug. 1980, *A.S.Weston 12635* (PERTH); 6 km SE of Donnelly River Mill, 14 Dec. 1980, *G.J. Keighery 3650* (PERTH); Glenoran Pool, Donnelly River near One Tree Bridge, *c.* 20 km W of Manjimup along Graphite road, 10 Jan. 1993, *T.D.Macfarlane 2140* (MEL, PERTH).

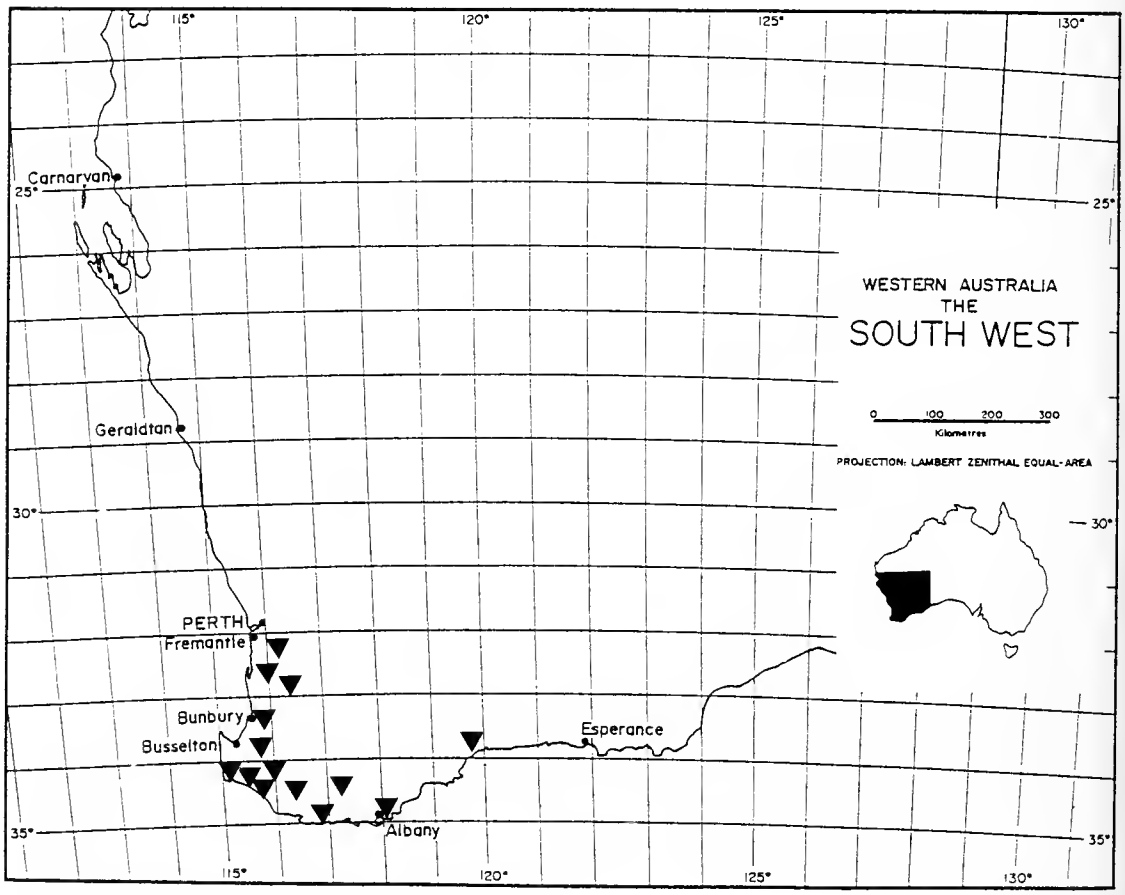

Fig. 1 The known distribution of *Bossiaea rufa*.

TYPIFICATION

The protologue of *B. paucifolia* Benth. reads 'A little Swan River bush, . . . I have been favoured with specimens by R. Mangles, Esq. of Sunning Hill, and by Messrs. Lowe & Co. of Clapton, and it has also flowered in the garden of the Horticultural Society.' I have been unable to examine the material at CGE but Peter Weston kindly did so on my behalf. There are at CGE no specimens named *B. paucifolia* collected by Mangles or associated with the nursery of Lowe & Co. or the Horticultural Society. However, there is a Drummond specimen which formed part of Lindley's herbarium labelled 'Swan River, Drummond, 1839' which bears the annotation 'Bossiaea pauciflora *Bentham mss.*/_____ virgata *Bot. Mag.*'

The label of a specimen of Drummond 258 at K reads 'Bossiaea rufa Br. ex Meisn./B. paucifolia ? Benth. fide Meisn./. . . virgata Hook./ Sw. riv.' but there is no means of knowing whether this is part of the same set as the unnumbered Drummond specimen at CGE.

In the absence of a specimen at CGE associated with Mangles, Lowe & Co. or the Horticultural Society, and in the absence of reference to a published plate in the protologue of *B. paucifolia*, the Drummond specimen at CGE assumes much significance. It was collected two years prior to the publication of the name, bears the annotation 'Bossiaea paucifolia Bentham mss.', and is labelled 'Swan River'. Circumstantial evidence suggests that the specimen formed one of the elements used in formulating the concept of the species. In the absence of any other material that can be associated more directly with the protologue, and in the absence of any information to the contrary, I here select the Drummond specimen at CGE as the lectotype of *B. paucifolia.*

The protologue of *B. virgata* Hook. reads 'A Swan River species, detected and introduced to this country by Mr. James Drummond, by seeds, received by Mr. Murray in the Glasgow Botanic Garden, where the plant flowered in June, 1842. Specimens have also been sent over for the Herbarium, marked in Mr. Drummond's first collections, No. 56.' I have not located a specimen taken from the plant cultivated in the Glasgow Botanic Garden. I here select Drummond No. 56 from Swan River in Herbarium Hookerianum at K as the lectotype of *B. virgata.*

Bentham based his description of *B. rufa* var. *normalis* on R.Brown's material from King Georges Sound, Drummond 5th series No. 84 or 87, and a Maxwell collection from Phillips River. I here select the material mounted on the right hand side of the sheet of the R.Brown collection numbered 4831 in BM from among these syntypes as the lectotype of *B. rufa* var. *normalis.*

NOTES

B. rufa and *B. praetermissa* are superficially very similar and have long been confused. *B. praetermissa* differs from *B. rufa*, however, in that the paired bracteoles on the pedicels persist and are present even when the young fruits are developing, whereas in *B. rufa* the bracteoles are rapidly deciduous and are visible only when the flower-buds are young. In addition, there are a number of other differential tendencies. In *B. rufa* the pedicels tend to be longer, the nature of the indumentum on the calyx, when present, differs, the stipules tend to be larger and more conspicuously longitudinally striate, the standard petals tend to be larger, and the keel petals are invariably densely woolly pubescent apically. The differences are listed in Table 1.

Flowering time in the two species appears to differ. *B. praetermissa* usually flowers during September and October although flowering specimens have been collected as early as July and as late as early November, whereas *B. rufa* usually flowers in November and December.

B. rufa tends to be a more robust plant and favour moister sites than *B. praetermissa* and the leaves tend to be more numerous and longer.

Table 1. Differences between *B. rufa* and *B. praetermissa*

Characters	**B. praetermissa**	**B. rufa**
Bracteoles	0.6–1.5 mm long, 0.2–0.5 mm wide, persistent.	1.3–2.5(3.5) mm long, 0.8–1.2 mm wide, rapidly deciduous.
Pedicels	2–5 mm long, clothed with short spreading hairs.	(3)5–10 mm long, glabrous or sometimes sparingly pubescent.
Calyx	clothed with short spreading hairs.	glabrous or sparingly pubescent, especially towards the apices of the lobes.
Stipules	0.7–2.5 mm long, 0.2–0.5 mm wide, narrowly triangular, sometimes oblique basally, not conspicuously striate.	1–3 mm long, (0.4)0.7–1 mm wide, ovate or narrowly ovate, often oblique and asymmetric basally, conspicuously longitudinally striate.
Standard	7.5–9.5 mm long, 7–9 mm wide.	9.5–12.2 mm long, 8.6–11.7 mm wide.
Keel petals	usually glabrous apically but sometimes sparingly ciliate or pubescent apically.	densely pubescent or woolly apically.
Flowering	September-October (early November).	November-December (early January).

The distributions of *B. rufa* and *B. praetermissa* overlap in the south-west from approximately Scott River to Albany (see Figs. 1 & 2).

Bossiaea praetermissa J.H.Ross *sp. nov.*

Bossiaea rufa sensu Maund, Botanist 2:t.81 (1838), *non* R.Br. (1812).

Bossiaea ensata sensu C.F.W.Meissn. *in* Lehm., Pl. Preiss. 1:81 (1844), *non* Sieb. *ex* DC. (1825).

B. rufae R.Br. affinis, a qua planta multo minori debiliore, bracteolis semipersistentibus, calycibus pubescentibus et carinis plerumque apicibus glabris.

TYPUS: Western Australia, Albany, hillside above Middleton Beach, 18 Oct. 1985, *M.G.Corrick 9689* (HOLOTYPUS: MEL; ISOTYPI: K, PERTH)

Lax many-stemmed shrub to 1 m high, stems prostrate or straggling and often supported by surrounding vegetation, flattened, winged and up to 7 mm wide, incised at the nodes, leafless or with scattered leaves, glabrous or sparingly appressed pubescent with antrorse appressed hairs especially when young or occasionally the hairs spreading and up to 0.25 mm long. *Leaves* unifoliolate: lamina rotund, obovate, or obovate- to elliptic-oblong, 6–18 mm long, (3.5)6–10(12) mm wide, rounded, obtuse, emarginate or slightly mucronate apically, glabrous throughout or with scattered appressed hairs below especially basally; petiolule 1–3.5 mm long, glabrous. Stipules 0.7–2.5 mm long, 0.2–0.5 mm wide, narrowly triangular, sometimes oblique basally, not or inconspicuously longitudinally striate. *Flowers* solitary or paired at the nodes (rarely in threes), axillary when leaves present, pedicellate, the pedicels 2–5 mm long, clothed with short spreading hairs. *Bracts* ovate or oblong, 0.7–1.5 mm long, 0.4–1 mm wide, usually pubescent at least apically and margins ciliate, inconspicuously longitudinally striate. *Bracteoles* oblong, 0.6–1.75 mm long, 0.2–0.5 mm wide, persistent even when in young fruit, inserted towards the middle of the pedicel, often pinkish-red, margins ciliate, inconspicuously longitudinally striate. *Calyx* usually densely clothed with short spreading hairs but sometimes the hairs very sparse, often pinkish-red; 2 upper lobes 4–5 mm long including the tube 2.7–3.5 mm long, the apices of the lobes diverging, 3 lower lobes 1.1–1.5 mm long. *Standard* 7.5–9.5 mm long including a claw 3.5–4.5 mm long, 7–9 mm wide, deep yellow internally with a deep purplish-red or brown horse-shoe shaped flare around a basal yellow throat, yellow with maroon, red or pale striations externally sometimes giving a somewhat marbled appearance. *Wings* 6.5–8.3 mm long including a claw 3–3.5 mm

long, 1.5–2.8 mm wide, reddish or maroon. *Keel* petals 6.4–7.8 mm long including a claw 3–3.7 mm long, 2.2–3 mm wide, reddish, usually glabrous apically but sometimes sparingly ciliate or pubescent. *Stamen-filaments* 5.5–8.2 mm long. *Ovary* 5–6.1 mm long, stipitate, 7- or 8-ovulate, glabrous. *Pods* oblong, 2–2.5 cm long, 0.5–0.6 cm wide, stipe shorter than to as long as the persistent calyx, valves thin, inconspicuously transversely striate, glabrous. *Seeds* ellipsoid, 2.1–2.4 mm long, 1.3–1.4 mm wide, uniformly reddish-brown or sometimes mottled, small hilum covered by a hooded cap-like aril.

Distribution

Occurs in the Darling and Eyre Botanical Districts of the Southwestern Botanical Province of Western Australia as defined by Beard (1980) from near Yallingup west of Busselton to Mt Ragged north-east of Esperance. (Fig. 2)

Habitat

Found most commonly in sandy soils in coastal heath but also recorded in peaty or sandy clay on the margins of swamps, in mallee and jarrah woodland, on limestone rises and on granitic ridges.

Representative Specimens (48 examined):

Western Australia — 16 km E of Manjimup, 24 Oct. 1947, *R.D.Royce 2358* (PERTH); near Bremer Bay, 27 Oct. 1965, *A.S.George 6943* (PERTH); *c.* 12 km S of Yallingup, 2 Sep. 1982, *C.E.Woolcock s.n.* (MEL 651248); Scott River Plains, 1 km N of Brennan's Ford on Courtney road, 3 Oct. 1982,

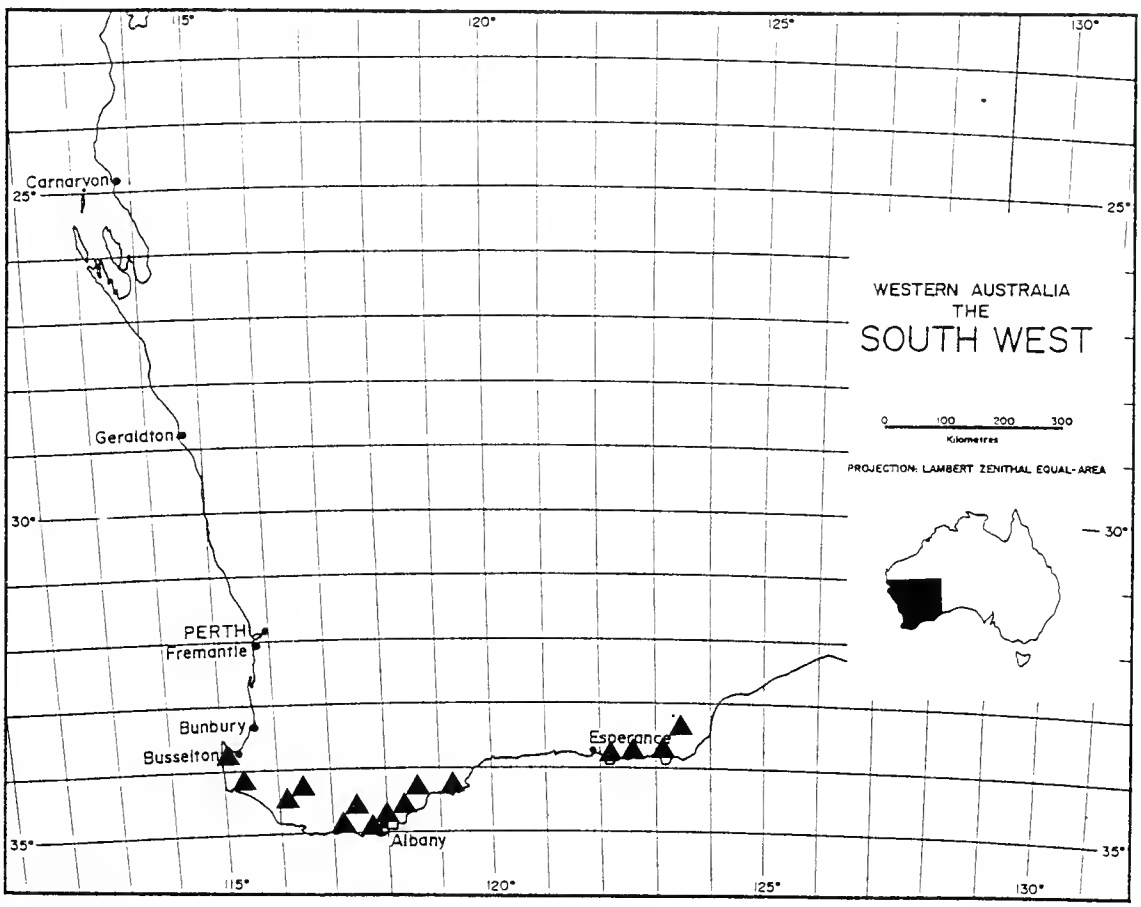

Fig. 2 The known distribution of *Bossiaea praetermissa*.

G.J. Keighery 5577 (PERTH); Hay River crossing on Albany-Denmark road, 19 Sep. 1983, *J. Taylor 1965 & P. Ollerenshaw* (CBG, MEL); Cape Le Grande National Park, Rossiter Bay, 24 Sep. 1985, *M.G.Corrick 9527* (MEL); Salt River Rd., near Camel Lake, Stirling Range, 14 Sep. 1987, *G.J.Keighery 9764* (PERTH); 12 km toward Denmark from Muir Highway on Denmark-Mt Barker road, 28 Nov. 1992, *T.D.Macfarlane 2081 & H.R.White* (MEL, PERTH).

NOTES

In the absence of a preserved specimen, it is difficult to determine whether or not the plant featured under the name *B. rufa* in Lodd., Bot. Cab. 12:t.1119 (1826), is in fact *B. praetermissa* rather than *B. rufa*. It is referred here to *B. praetermissa* with some hesitation.

The specific epithet alludes to the fact that the existence of this taxon appears to have been overlooked since the first specimen was collected almost two hundred years ago.

BOSSIAEA MODESTA

Bossiaea modesta J.H.Ross *sp. nov.*

Affinitatis incertae, forsan *B. rufae* R. Br. et *B. praetermissae* J.H. Ross affinis, a qua uterque planta multo minori debili caulibus gracilibus leviter applanatis ad 2mm latis qua non profunde nodus incisus, differt; qua *B. rufae* bracteolis semipersistentibus et *B. praetermissae* carinis apicibus dense lanatis, differt.

TYPUS: Western Australia, Darling Range, Mt Dale area, 6 Nov. 1983, *M.G. Corrick* 9020 (HOLOTYPUS: MEL; ISOTYPI: CBG, PERTH)

Subshrub, stems lax, slender, trailing and twining and only becoming erect when supported by surrounding plants, subterete basally but the extremities somewhat flattened, up to 2.0 mm wide, glabrous or with scattered hairs. *Leaves* alternate, unifoliolate: lamina linear- to elliptic- or obovate-oblong, 0.9–2.8 cm long, 0.25–0.6 cm wide, apex obtuse and mucronate, glabrous throughout or with occasional scattered hairs on margins and midrib; petiolule 0.5–2.0 mm long, glabrous. *Stipules* 0.5–1.6 mm long, 0.2–0.4 mm wide, usually almost as long as the petiolule, obliquely triangular or subulate, glabrous throughout or pubescent apically. *Flowers* axillary, solitary, pedicellate, the filiform pedicels 1.2–2.5 cm long, glabrous throughout or with scattered hairs. *Bracteoles* 0.8–1.6 mm long, 0.3–0.5 mm wide, inserted just below the calyx and more or less appressed to the pedicel or base of the calyx while the flowers are young, scarious, glabrous or with scattered hairs, persisting at least until the young fruits are initiated; bract 0.9–1.8 mm long, 0.3–0.5 mm wide, inserted at the base of the pedicel, scarious, rapidly deciduous, glabrous except for apical cilia. *Calyx* glabrous or with occasional scattered hairs externally apart from marginal cilia; 2 upper lobes 4.2–5 mm long including the tube 2.8–3.5 mm long, the apices of the lobes diverging, 3 lower lobes triangular, 1.5–1.6 mm long, 1.0–1.1 mm wide. *Standard* 9.8–10.0 mm long including a basal claw 3 mm long, 9 mm wide, deep yellow internally with a deep red flare around a paler yellow throat, with numerous red to purplish longitudinal striations externally and sometimes having a somewhat marbled appearance; *wing petals* 8 mm long including a claw 2.6 mm long, 2.1 mm wide, red; *keel petals* 8–8.3 mm long including a claw 2.8–3.3 mm long, 2.5–2.9 mm wide, greenish-white basally, red apically, with a dense woolly apical fringe of hairs. *Stamen-filaments* 6.2–8.2 mm long. *Ovary* on a stipe 2–2.5 mm long, 4.5–4.8 mm long, glabrous, 6–8-ovulate; style 1.7–2 mm long. *Pods* oblong, up to 3.5 cm long including a stipe up to 1 cm long which greatly exceeds the persistent calyx in length, 0.4–0.5 cm wide, glabrous. *Seeds* ellipsoid, olive-brown, 1.5–1.8 mm long, 1.0–1.3 mm wide, the small hilum covered by a hooded cap-like aril. (Fig. 3)

DISTRIBUTION

Restricted in distribution to the Mt Dale area in the Darling Range south-east of Perth where it occurs in State Forest.

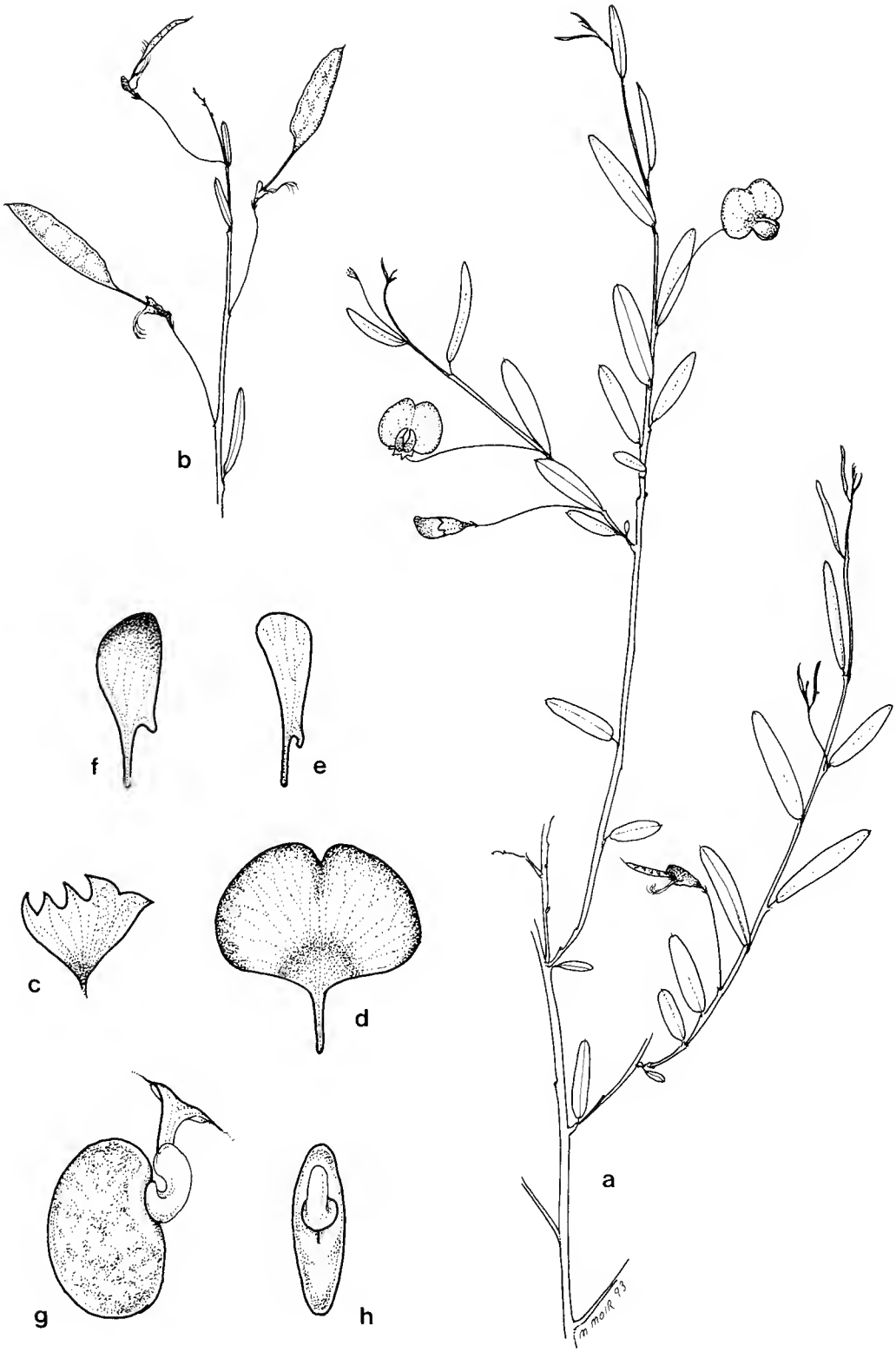

Fig. 3. *Bossiaea modesta*. a — flowering twig, ×1; b — fruiting twig, ×1; c — calyx opened out (upper lobes on right), ×3; d, — standard, ×3; e — wing petal, ×3; f — keel petal, ×3; g — seed, side view, ×15; h — seed, hilar view, ×15. a from *M.G.Corrick 10970A*; b, g & h from *M.G.Corrick 11025*; c-f from *M.G.Corrick 9020*.

HABITAT

Favours the banks of small creeks and damp sites in open *Eucalyptus marginata — E. calophylla* forest where the stems trail amongst surrounding plants. Often found in association with *Xanthorrhoea* spp..

CONSERVATION STATUS

Poorly known, CALM Priority 2. The species is known only from two small populations 1.8 km apart, although it is not inconceivable that a thorough search will disclose further populations near some of the small creeks that feed into the Canning River. A visit by Margaret Corrick to the area in September 1992 revealed that the habitat at one site had deteriorated since a previous visit and was heavily trampled. The population was threatened further by maturing plants of the introduced *Eucalyptus grandis* W.Hill *ex* Maiden.

SPECIMENS EXAMINED

Western Australia — Darling Range, Mt Dale area, 10 Oct. 1985, *M.G.Corrick 9646, 9647, 9648* (MEL, PERTH); 27 Nov. 1992, *M.G.Corrick 10970A* (MEL); 20 Dec. 1992, *M.G.Corrick 11025* (MEL).

FLOWERING PERIOD

October to December.

NOTES

The affinities of *B. modesta* are not clear. *B. modesta* is possibly allied to *B. rufa* and to *B. praetermissa* from each of which it differs in being a much smaller weaker plant with slightly flattened stems up to 2 mm wide which are not as conspicuously incised at the nodes. The leaves of *B.modesta* and the long filiform pedicels are reminiscent of *B. rufa*, but, unlike *B. rufa* where the bracteoles are rapidly deciduous, the bracteoles of *B. modesta* persist at least until the young fruits start developing. The apices of the keel petals in *B. modesta* are densely woolly, as is the case in *B. rufa*.

The bracteoles in both *B. modesta* and *B. praetermissa* persist at least until the young fruits start developing. In *B. modesta*, however, the bracteoles are inserted just below the calyx and tend to be more or less appressed to the pedicel or base of the calyx while the flowers are very young, whereas in *B. praetermissa* the bracteoles are inserted towards the middle of the pedicel. *B. praetermissa* differs also in that the apices of the keel petals are usually glabrous.

B. modesta is unusual amongst the Western Australian *Bossiaea* species in being a weak-stemmed lax subshrub. It is an inconspicuous element of the understorey and easily overlooked. The specific epithet alludes to the inconspicuous nature of the species.

The colouration of the standard petal is reminiscent of that of some of the *Isotropis* spp.

This species was first collected by Margaret Corrick in 1983 who, as far as I know, is the only person to have collected the species. She has returned to the area several times over the years and collected the range of excellent flowering and fruiting material upon which the description has been based.

ACKNOWLEDGEMENTS

I am most grateful to Dr P.S.Short for arranging for type specimens to be photographed at K; to Dr P.H.Weston for examining and photographing type material at BM and CGE; to Margaret Corrick and Dr T.D.Macfarlane for making special collections of *B. rufa* and *B. praetermissa*; to Margaret Corrick for sharing her knowledge of *B. modesta*; to the Keepers of the Herbarium, Royal Botanic Gardens, Kew, and the Department of Botany, Natural History Museum,

London, for the loan of specimens; to the Acting Director of PERTH for access to the collections; to my colleague Neville Walsh for checking the Latin diagnoses; and to Mali Moir for executing the illustration of *B. modesta*.

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THREE NEW ENDEMIC SUBSPECIES OF SNOW GUM FOR VICTORIA AND NOTES ON THE TAXONOMY OF THE INFORMAL SUPERSPECIES *PAUCIFLORA* L.D.PRYOR AND L.A.S.JOHNSON

K. RULE*

ABSTRACT

Rule, K. Three new endemic subspecies of Snow gum for Victoria and notes on the taxonomy of the informal superspecies *pauciflora* L.D.Pryor and L.A.S.Johnson. **Muelleria 8(2): 223–233 (1994).** — Three new subspecies within *Eucalyptus pauciflora* Sieb. *ex* Spreng. of restricted distribution in Victoria are described. These are *E. pauciflora* ssp. *acerina* Rule, a small-fruited, non-waxy form of the Baw Baw Plateau and nearby Mt Useful, *E. pauciflora* ssp. *hedraia* Rule, a large-fruited, markedly waxy form of the Falls Creek area and *E. pauciflora* ssp. *parvifructa* Rule, another small-fruited yet waxy form of the Grampians' Mt William Range. These taxa are compared with other snow gums and their conservation statuses discussed. In addition comments concerning taxonomic perspectives and problems of snow gums are given.

INTRODUCTION

Historically, the taxonomy of alpine snow gums has focussed on populations in New South Wales and the Australian Capital Territory and have been preoccupied with issues regarding the specific integrities of *E. niphophila* Maiden & Blakely and *E. debeuzevillei* Maiden to the extent that divergent forms within the Victorian alpine regions have been overlooked.

Only a recent study by Williams and Ladiges (1985) has provided a Victorian perspective. Although largely concerned with other taxonomic issues, these researchers found considerable diversity within the Victorian alpine populations selected for study. They suggested that these alpine forms had evolved differently in response to localised, severe environmental pressures.

Preliminary investigations using seedling trials and field observations confirmed the presence of a number of divergent alpine snow guns in Victoria and gave rise to the present study. One such form analysed by Williams and Ladiges is of the Mt William Range in the Grampians. The other two alpine snow gums are located on the Baw Baw Plateau and Mt Useful of West Gippsland and at Falls Creek and adjacent localities in north-east Victoria. In this paper, all three forms are regarded as altitudinal variants or 'end-points' of *E. pauciflora* and are recognised as subspecies.

This study also has focussed on problems associated with the level of formal recognition that these snow gums should be given. Appreciable differences in morphology between the typical form of the species and alpine forms and between the alpine forms themselves were identified, but it is the preference of this paper that these forms not be accorded specific statuses. Such a position is consistent with a well-established convention regarding clinal variation. Obviously, the issue of the taxonomy of the snow gums requires urgent attention, particularly in view of recent taxonomic decisions by Hill and Johnson (1991), and is discussed in a later segment.

TAXONOMY

Eucalyptus pauciflora Sieb. *ex* Spreng. ssp. **acerina** Rule *ssp. nov.*

A subspecie typica foliis juvenilibus adultisque, alabastris fructibusque parvioribus differt;

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a subspecie *niphophila* alabastris fructibusque parvioribus et glaucedinem deficienti differt; a *E. gregsoniana* foliis juvenilibus latioribus et fructibus majoribus differt.

HOLOTYPUS: The summit of Mt Erica, Jan. 1905, *C.S.Sutton* (MEL).

Mallee with robust, erect trunks, from 5 to 12 m; branchlets semi-erect. *Bark* smooth throughout, lustrous, grey-green; old bark shed in light brown ribbons. *Juvenile leaves* broadly lanceolate, ovate-lanceolate or elliptical, petiolate, alternate, semi-erect, dull, blue-green or grey-green, concolorous, moderately glandular, apiculate or acuminate, slightly uncinate, to 10 × 4 cm; petioles rarely waxy, to 1.2 cm long; venation sub-parallel; nodes moderately crowded. *Coppice leaves* similar to the juvenile leaves only slightly larger. *Adult leaves* lanceolate, broadly lanceolate or ovate-lanceolate, semi-pendulous, lustrous, green, concolorous, conspicuously glandular, coriaceous, acuminate or acute, uncinate, to 10 × 3 cm; petioles non-waxy, to 2 cm; venation sub-parallel; canopy crowded. *Inflorescences* 7 or 9-flowered; peduncles terete, 3–6 mm long. *Buds* clavate or slightly pyriform, pedicellate, warty, non-waxy, to 8 × 4 mm; opercula burnished, hemispherical. *Fruits* hemispherical or slightly obconical, subsessile or sessile, 4–5(6) × 5–7(8) mm; disc level with rim or slightly ascending; locules 3(4). *Seeds* black, cuboidal or pyramidal, somewhat smooth on the dorsal surface (as in other subspecies), to 2 mm long. (Fig. 1)

SPECIMENS EXAMINED

Victoria — Mt St Gwinear Car Park, 17 Jan. 1980, *M.I.H.Brooker 6834* (MEL 648630); Along walking track 2 km west of Mt St Gwinear, 25 Jan. 1986. *S.J.Forbes 2995* (MEL 557318); Summit of Mt Erica, 20 Mar. 1990, *K.Rule 9001* (MEL); Mt Baw Baw Ski Village, 23 Apr. 1991, *K.Rule 9148* (MEL); Summit of Mt Useful, 23 Feb. 1992, *K.Rule 9224* (MEL).

FLOWERING PERIOD

Spring or early summer.

DISTRIBUTION

Eucalyptus pauciflora ssp. *acerina* is known only from the Baw Baw Plateau and the nearby Mt Useful, both of which are located in Victoria's West Gippsland region. The plateau, which is dominated by several mountains including Baw Baw, Erica and St Gwinear, rises above 1500 m. Mt Useful is of a similar altitude. These sites are geographically segregated from other mountains in the vicinity, for example, Mt Matlock and Lake Mountain, which are a part of the Great Dividing Range and which contain populations of conspicuously waxy snow gums with fruits larger than *E. pauciflora* ssp. *acerina*. Such populations mark the western extremity of *E. pauciflora* ssp. *niphophila*. (Fig 2.)

CONSERVATION STATUS

The Baw Baw Plateau is elongated with a somewhat east-west orientation and is relatively extensive, being approximately 12 km long. The populations of *E. pauciflora* ssp. *acerina* are abundant and secure within the Baw Baw National Park. In contrast, however, the Mt Useful population, although secure in a protected flora reserve, is relatively small.

ASSOCIATED SPECIES

On the Baw Baw Plateau *E. pauciflora* ssp. *acerina* grows in pure stands. At its lower limits it abuts *E. glaucescens* Maiden and Blakely, *E. delegatensia* R.T.Baker and *E.nitens* (Deane and Maiden) Maiden. On Mt Useful *E. kybeanensia* Maiden and Cambage is an associated species.

ETYMOLOGY

The subspecific epithet is derived from Latin and refers to the absence of observeable surface wax in the adult stage, a feature which contrasts well with other alpine snow gums.

Fig. 1. *Eucalyptus pauciflora* ssp. *acerina*. a — fruiting branchlet ×1. b — buds ×2. c — seedling leaves ×0.6.

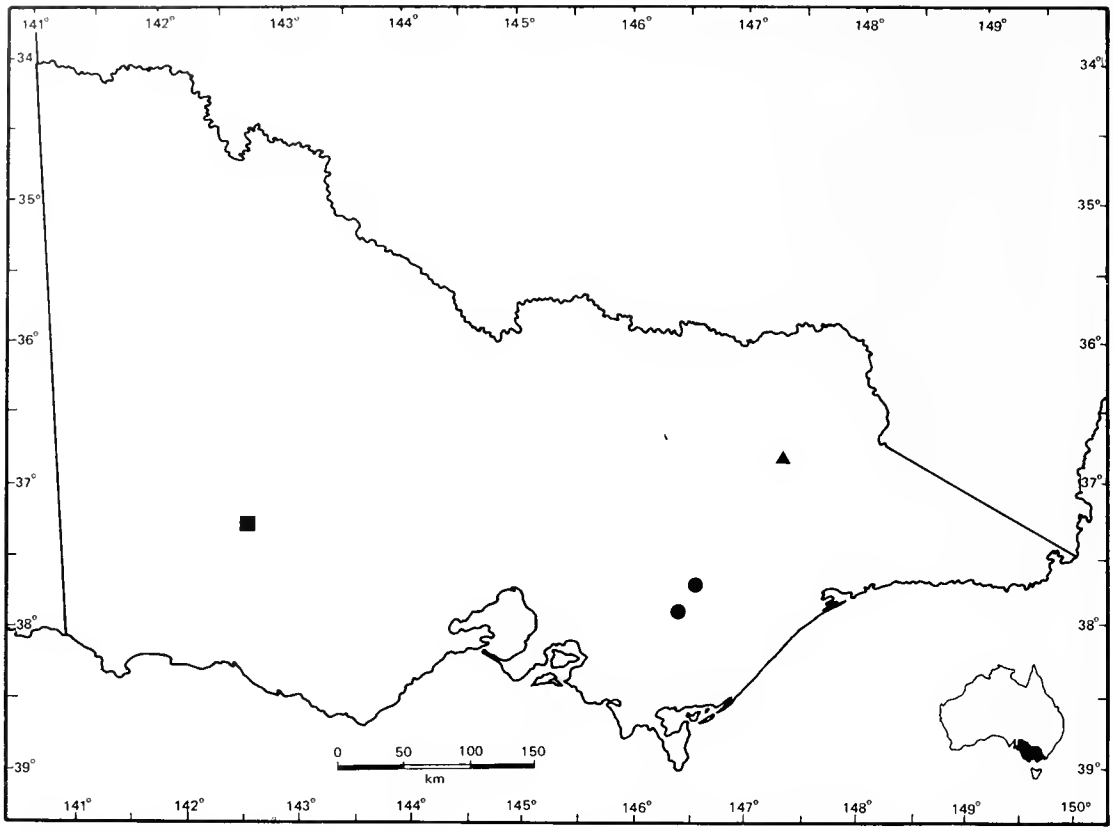

Fig. 2. Distribuion of *Eucalyptus pauciflora* ssp. *acerina* (●), *Eucalyptus pauciflora* ssp. *hedraia* (▲), and *Eucalyptus pauciflora* ssp. *parvifructa* (■).

Discussion

Collections of *E. pauciflora* ssp. *acerina* in herbaria are few. It is surprising that it has been ignored until recently, particularly as it occurs on the popular Mt Baw Baw snowfield which is relatively close to Melbourne. A few local observers have given it attention by incorrectly referring to it as 'var. *nana*', a name originally applied to *E. gregsoniana* Johnson & Blaxall. Such confusion appears to be dervied from inaccurate comparisons of fruit sizes as those of ssp. *acerina* are generally smaller. Other differences include ssp. *acerina* having broader yet shorter juvenile leaves and having inflorescences borne on shorter peduncles.

E. pauciflora ssp. *acerina* has been mistaken for *E. pauciflora* ssp. *niphophila* because of its alpine, mallee habit, small coriaceous adult leaves and crowded canopy. Yet it is readily separable from that form in being completely non-waxy in adult characters and rarely do its seedlings display a hint of wax around the nodes (observed only in the Mt Useful population). Most conspicuous is its glossy-green canopy which contrasts markedly from the bluish one of *E. pauciflora* ssp, *niphophila* (resulting from the copious amounts of wax on buds, fruits and branchlets). The *E. pauciflora* ssp. *acerina* also is different in having shorter peduncles, smaller buds with hemispherical opercula and smaller fruits. The shortness of the peduncles sometimes causes the fruits to become stem-clasping as they mature. A further difference is in seedling morphology with the stems of *E. pauciflora* ssp. *niphophila* becoming markedly waxy as the seedlings mature.

Eucalyptus pauciflora ssp. *acerina* has been mistaken for *Eucalyptus pauciflora* ssp. *pauciflora*, most likely because it is non-waxy. However, it differs from that form in being a mallee with erect trunks and a dense canopy (the effect of

crowded nodes) rather than a spreading tree with a somewhat pendulous, open canopy. It is also different in having shorter peduncles, smaller buds with regularly hemispherical opercula, smaller fruits and shorter, coarser, more glandular adult leaves. Further, as alluded to above, the seedling leaves of *Eucalyptus pauciflora* ssp. *acerina* are more crowded along the axis and its juvenile leaves are usually smaller and do not become pendulous as the seedlings mature, as occurs in the typical form.

The only other snow gum to have fruits as consistently small as *Eucalyptus pauciflora* ssp. *acerina* is a waxy, narrow-leaved form growing on the Mt William Range and the Major Mitchell Plateau in Western Victoria's Grampian Ranges, a description of which is given below as *E. pauciflora* ssp. *parvifructa* Rule.

Eucalyptus pauciflora Sieb. *ex* Spreng. ssp. **hedraia** *ssp. nov.* Rule.

A subspecie typica alabastris fructibusque majoribus et sessilis et glaucedine copiosa differt; a subspecie *debeuzevillei* alabastris sessilis, fructibusque sessilis majoribus, et a subspecie *niphophila* alabastris fructibusque majoribus sessilis differt.

HOLOTYPUS: Victoria, Falls Creek Ski Village, 36°51′S, 147°16′E, 14 Jan. 1982, *S. Forbes 821* (MEL 612462).

Mallee, shrubby or robust, upright or spreading, from 5–10 m high; branchlets semi-erect. *Bark* smooth throughout, grey or brown; old bark shed in grey-brown ribbons. *Juvenile leaves* broadly ovate, oblong or elliptical, alternate, petiolate, semi-erect, dull, grey-green, concolorous, moderately glandular, acuminate or apiculate, uncinate, to 12 × 5 cm; venation conspicuous, sub-parallel; petioles waxy, to 1.5 cm long; nodes moderately crowded or crowded. *Coppice leaves* similar to juvenile leaves. *Adult leaves* broadly lanceolate, ovate or elliptical, dull or semi-lustrous, blue-green or grey-green, glandular, coriaceous, acuminate or acute, uncinate, to 13 × 4 cm; petioles waxy, slightly angular, to 2 cm long; venation conspicuous, sub-parallel; canopy moderately crowded or crowded. *Inflorescences* 7–11-flowered; peduncles slightly angled, to 7 mm long. *Buds* ovoid, sessile, markedly waxy, warty, round in cross-section or sometimes angular, to 8 × 7 mm; opercula conical or hemispherical. *Fruits* hemispherical or slightly cupular, sessile, non-angled, waxy, 7–10 × 10–14(15)mm; diam. level with rim; peduncle 2–4mm long; locules 3 (4). *Seed morphology* as in other subspecies, to 3 mm long. (Fig. 3.)

FLOWERING PERIOD

Spring or early summer.

SPECIMENS EXAMINED

Victoria — Mt Bogong, 22 Oct. 1944, *Brig.Chapman* (MEL); Mt Mackay, 3 km west of Falls Creek, *L.G.Adams and G.C.Pierson 2646* (MEL 571904); Falls Creek Village, 17 Dec. 1981, *H.van Rees 285* (MEL 617716); Summit of Mt Arthur, 3 Jan. 1980, *N.T.Rossiter 101* (MEL 6947580); Falls Creek Village, 19 Feb. 1986, *D.E.Albrecht 2478* (MEL 1124700); Above Rocky Valley Dam, along track to Mt Mackay, 13 Apr. 1982, *K.Rule 9233* (MEL).

DISTRIBUTION

The known concentration of populations of *E. pauciflora* ssp. *hedraia* occupies several square kilometres around the site of the Falls Creek Ski Village which is located in the Victorian Alps. The altitude of the village is approximately 1700 m and its aspect is a mountainside facing northwards. Other collections have been made in the vicinity; on Mt Bogong and Mt Arthur. (Fig. 2)

ASSOCIATED SPECIES

Eucalyptus pauciflora ssp. *hedraia* grows in pure stands except along its boundaries where it mixes with *E. pauciflora* ssp. *niphophila*. A small number of individuals intermediate between the two subspecies have been observed. This

Fig. 3. *Eucalyptus pauciflora* ssp. *hedraia*. a — flowering branchlet ×1. b — fruits ×1. c — seedling leaves ×1.

suggests some previous yet limited interbreeding. At its lower limits of altitude it abuts *E.* aff. *dalrympleana* Maiden.

Etymology

The name is derived from Greek and refers to the sessile nature or the species' buds and fruits.

Conservation Status

Eucalyptus pauciflora ssp. *hedraia* is regarded as restricted although its numbers are locally abundant. The species does not appear to be threatened as it is secure in the Alpine National Park, even though the area is exploited for skiing. However, it is recommended that the authorities controlling the area give careful consideration to the effect of future clearing programs.

Discussion

Eucalyptus pauciflora ssp. *hedraia*, being markedly waxy and possessing fruits that are appreciably large by snow gum standards, has been confused with *E. pauciflora* ssp. *debeuzevillei* Johnson & Blaxall, for example, Chippendale (1988). However, it differs from that subspecies in both bud and fruit morphology. It has shorter peduncles, ovoid, sessile buds instead of clavate, angular, pedicellate one and has hemispherical or slightly cupular, non-angular, sessile fruits rather than cupular or subcylindrical, lightly angled, shortly pedicellate ones. The occurrence of angled buds in *E. pauciflora* ssp. *hedraia* is inconsistent and random and appears to be derived from their compaction in the early stages of development. Angled buds also have been observed in the snow gum populations of the Mt Buffalo Plateau which also have been referred to as *E. pauciflora* ssp. *debeuzevillei*. These populations differ from *E. pauciflora* ssp. *hedraia* in having pedicellate buds and elongated fruits. Their morphology appears intermediate between *E. pauciflora* ssp. *debeuzevillei* and *E. pauciflora* ssp. *niphophila*.

Eucalyptus pauciflora ssp. *hedraia* also has been confused with ssp. *niphophila*. However, it is distinguished from that subspecies by its larger juvenile leaves. Its adult leaves also are generally larger and duller. *E. pauciflora* ssp. *hedraia* is further different in having larger, sessile, ovoid buds and markedly larger, hemi-spherical or slightly cupular fruits.

Eucalyptus pauciflora Sieb. *ex* Spreng. ssp. **parvifructa** Rule *ssp. nov.*

A subspecie typica foliis juvenilibus adultisque, alabastris fructibusque parvioribus differt; a subspecie *acerina* petiolis pruinosis et foliis juvenilibus angustioribus differt; a subspecie *niphophila* alabastris et a *E. gregsoniana* glaucedine et alabastris fructibusque parvioribus differt.

Holotypus: Near the summit of Mt William, 37°18′S, 142°36′E, Nov. 1970, *R.Turner* (MEL).

Small trees and mallees, to 5 m high rarely taller; *branchlets* semi-erect. *Bark* smooth, whitish, with limited basal debris. *Juvenile leaves* lanceolate or broadly lanceolate, alternate, petiolate, semi-erect, dull, grey-green,concolorous, acuminate or acute, to 11 × 3 cm; petioles waxy, to 10 mm long; venation sub-parallel; nodes moderately crowded. *Coppice leaves* similar to juvenile leaves. *Adult leaves* narrowly lanceolate, lanceolate or ovate-lanceolate, lustrous, green, glandular, sub-coriaceous, acuminate or acute, uncinate, semi-erect, to 10 × 2 cm; venation sub-parallel but mid-vein usually conspicuous; petioles sometimes lightly waxy, slightly angular, to 15 mm long; canopy crowded. *Inflorescences* 7 rarely 9-flowered; peduncles slender, flattened, to 8 mm long. *Buds* clavate, subsessile, lightly warty, sometimes lightly waxy, to 9 × 3.5 mm; opercula conical or hemispherical. *Fruits* hemispherical, slightly obconical or cupular, sessile or subsessile, 5–8 × 6–8 mm; disc level with rim; locules 3 (4). *Seed morphology* as in other subspecies, to 2.5 mm long. (Fig. 4)

Fig. 4. *Eucalyptus pauciflora* ssp. *parvifructa*. a — branchlet with buds ×1, b — fruits ×1, c — seedling leaves ×0.5.

Flowering Period

Late Spring or early summer.

Other Specimens Examined

Victoria — Summit of Mt William, 25 Sept. 1955, *S.Kelly* (MEL 2000855); Major Mitchell Plateau, 10 Dec. 1967, *A.C.Beauglehole 16517* (MEL 532467); Major Mitchell Plateau, 30 Oct. 1971, *J.H.Willis* (MEL 501858); Mt William Range, 20 Mar. 1975, collector unknown (MEL); the extreme southern edge of the Major Mitchell Plateau, 8 Mar. 1987, *D.Albrecht 3116* (MEL 705255); 200 m south-west of the Telecom station, Mt William, *K.Rule 9249* (MEL).

Distribution

Eucalyptus pauciflora ssp. *parvifructa* is known only from the Mt William Range, which is a linear sandstone formation in the Grampians of Western Victoria and which includes the relatively broad Major Mitchell Plateau. The populations of snow gum occur at altitudes between 900 m and 1100 m. (Fig. 2)

Conservation Status

Although restricted in its distribution, *E. pauciflora* ssp. *parvifructa* is locally abundant and secure within the Gariwerd (Grampians) National Park. It is most common on the southern extremity of the Major Mitchell Plateau.

Associated Species

Eucalyptus baxteri (Benth.) Maiden & Blakely *ex* Black and *E. alpina* Lindley are associated species, neither of which are known to hybridise with *E. pauciflora* ssp. *parvifructa.*

Etymology

The subspecific epithet refers to the size of the fruits in relation to the typical form and is derived from Latin.

Discussion

This subspecies is clearly an altitudinal cline which shows considerable divergence from lowland populations in the region. It has smaller buds, fruits and leaves than the typical form and is always smaller in habit. Furthermore, its semi-erect, branchlets and markedly crowded nodes are features that separate the two forms.

Eucalyptus pauciflora ssp. *parvifructa* has been referred to as *E. pauciflora* ssp. *niphophila.* For example, Chippendale (1988) included it within that form's distribution. However, *E. pauciflora* ssp. *parvifructa* is different in having shorter peduncles, smaller, less waxy buds and fruits and narrower juvenile and adult leaves.

Eucalyptus gregsoniana and *E. pauciflora* ssp. *acerina* are two other small-fruited snow gums with which *E. pauciflora* ssp. *parvifructa* could be confused. From the former is it is different in having observable wax on the petioles, particularly in pre-adult leaf stages (although surface wax is markedly abundant on dried adult branchlets). It is further different in having generally smaller buds, fruits and adult leaves. From *E. pauciflora* ssp. *acerina*, also a non-waxy form, it differs in having narrower juvenile and adult leaves, generally a dwarf rather than a robust habit and whitish rather than grey-green bark.

Key to the Snow Gums

1 Wax present on adult structures 2

2 Branches markedly pendulous ..... **E. lacrimans**
2: Branches not markedly pendulous 3

3 Buds sessile ..... **E. pauciflora** ssp. **hedraia**
3: Buds pedicellate 4

4 Buds angular ..... **E. pauciflora** ssp. **debeuzevillei**
4: Buds not angular 5

5 Longest adult leaves 12–22 cm long, relatively sparse on the axis ..... **E. pauciflora** ssp. **pauciflora**
5: Longest adult leaves less than 12 cm long, crowded on the axis 6

6 Adult leaves narrow-lanceolate, lanceolate or ovate- lanceolate, less than 2 cm wide ..... **E. pauciflora** ssp. **parvifructa**
6: Adult leaves broad-lanceolate, ovate or elliptical, wider than 2 cm ..... **E. pauciflora** ssp. **niphophila**

1: Wax absent from adult structures 7

7 Fruits 8–12 × 7–11 mm ..... **E. pauciflora** ssp. **pauciflora**
7: Fruits 4–7 × 5–9 mm 8

8 Juvenile leaves with conspicuously waxy petioles ..... **E. pauciflora** ssp. **parvifructa**
8: Juvenile leaves not as above 9

9 Juvenile leaves lanceolate, with a long-tapered apex, to 12 × 2.5 cm ..... **E. gregsoniana**
9: Juvenile leaves broadly lanceolate, ovate or elliptical, apex not long-tapered, to 10 × 4 cm ..... **E. pauciflora** ssp. **acerina**

NOTES ON THE TAXONOMY OF THE INFORMAL SUPERSPECIES PAUCIFLORA L.D.Pryor & L.A.S.Johnson

The first description of *E. pauciflora* Sieb. *ex* Spreng occurred in 1827. The type specimen is believed to have been collected in New South Wales relatively close to Sydney but its exact origins remain uncertain. Blakely's 1934 descriptions included two alpine species; *E. debeuzevillei* and *E. niphophila*. However, researchers such as Pryor (1957) and Green (1969) concluded that both these snow gums were high-altitudinal clines of *E. pauciflora*.

On this basis, Pryor and Johnson (1971) suggested they be reduced to subspecies within *E. pauciflora* and this was formalised by Johnson and Blaxall (1973). Later, with particular reference to these snow gums, Pryor (1976) noted, 'There is, of course, no discontinuity in morphological variation between the form described as *E. niphophila* and *E. pauciflora* and it is not biologically acceptable to separate snow gums into two species on this basis.'

These infraspecific taxa prevailed until recently when Hill and Johnson (1991), in their treatment of *E. lacrimans* Johnson & Hill, reinstated *E. niphophila* and *E. debeuzevillei* as species. However, it was extremely unfortunate that no published justification was provided for the reassessments. On that basis, and in view of the much-documented evidence provided by Pryor and others, it is preferred herein that both *E. niphophila* and *E. debeuzevillei* not be accepted as species. Furthermore, in that context, it is preferred that the taxa treated above also be accorded subspecific statuses.

To some experts, Hill and Johnson (1991) have eliminated a taxonomic anomaly which has plagued the snow gums in recent years, at the centre of which has been the much-publicised continuous variation between lowland and alpine forms. The extent of this variation is such that the extremities are sufficiently divergent that it is extremely difficult to recognise them as one species. This is particularly evident in juvenile morphology. Conversely, however, the old

anomaly surrounding the so-called 'intermediates', which Pryor and others sought to eliminate, has been resurrected.

Like Pryor's 'var. *montana*', Victoria has its share of 'intermediate' populations which occur in Central Victoria along the Great Dividing Range at medium altitudes (between 800 m and 1100 m). Such sites include Mt Buangor, Mt Macedon and Sugarloaf Peak in the Cathedral Range. In most respects these populations conform to *E. pauciflora* ssp. *pauciflora* but exhibit varying amounts of survace wax in the seedling stage and sometimes on buds and fruits. Similar populations exist in Tasmania. At higher altitudes, populations such as on Mt Matlock and Lake Mountain are somewhat closer to typical *E. pauciflora* ssp. *niphophila* in adult morphology but possess juvenile leaves consistent with the populations of lower peakes.

No doubt in the near future other botanists will accept the lure of the snow gums. Obviously a study that has a wider focus than this one is required. Such a study should re-examine the specific integrities of both *E. gregsoniana* and *E. lacrimana.* Unfortunately and inescapably, any such study will be confronted with the dilemma of how to treat the forms occupying the 'middle' altitudes. Ultimately, decisions regarding taxonomic status will depend upon the philosophical positions of the researchers or even perhaps upon the standards they wish to exercise.

Obviously, the level at which these new taxa are treated has some value, particularly to taxonomists, but of considerably more importance is the fact that their genetic diversity be recognised.

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MORPHOMETRIC STUDIES OF THE GENUS *TASMANNIA* (WINTERACEAE) IN VICTORIA, AUSTRALIA

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ABSTRACT

Raleigh, R.E., Ladiges, P.Y., Entwisle, T.J. & Drinnan, A.N. Morphometric studies of the genus *Tasmannia* (Winteraceae) in Victoria, Australia. **Muelleria 8(2): 235–256.** — Collections of *Tasmannia xerophila* (P.Parm.) Gray (Alpine Pepper) and *T. lanceolata* (Poir.) A.C.Smith (Mountain Pepper) were made to test the validity of infrageneric taxa of various circumsciptions and rank that have been applied to populations of *Tasmannia* occurring in Victoria. Populations were compared using morphological attributes analysed by phenetic methods, and by examining flavonoid composition. The name *T. vickeriana* (A.C.Smith) A.C.Smith is reinstated for a variant restricted to the Baw Baw Ranges. It is a compact shrub to *c.* 1 m, with leaves less than 2 cm long (rarely to 2.5 cm), burgundy-coloured aggregate fruit, and white aborted ovules. A robust form of *T. xerophila* from Errinundra Plateau reaching 2.5–4.0 m in height, with leaves to 14 cm long and 3 cm wide and generally thinner than those of *T. xerophila s. str.* has been recognised at subspecific rank, as *T. xerophila* subsp. *robusta*. *Tasmannia lanceolata* differs from all these taxa in having leaves with usually acute apices; flowers with three or more tepals (cf. two in all members of the *T. xerophila* complex); stamen filaments with a distally branched vascular trace between pollen sacs; and solitary, globose berries bearing a distinct stigmatic furrow. The flavonoid compositions of *T. xerophila* subsp. *xerophila, T. xerophila* subsp. *robusta* and *T. vickeriana* are almost identical, with the sole descriminator being a three-fold decrease in one unidentified compound in *T. vickeriana*. Leaf flavonoid composition of *T. lanceolata* was distinct, having only one flavonoid in common with the other taxa studied. *Tasmannia xerophila* and *T. lanceolata* are sympatric in several localities, but no hybrids were detected by morphometric and biochemical analyses, and flowering times of the two taxa do not overlap.

INTRODUCTION

This study was initiated to clarify the circumscription and number of taxa in *Tasmannia* for the forthcoming *Flora of Victoria* treatement of Winteraceae. Using morphological and biochemical data, the status of taxa within *T. xerophila s. lat.* is reassessed and their separation from *T. lanceolata* verified. Flower and fruit structure and development are detailed because of their likely importance in phylogenetic studies of the family.

HISTORICAL REVIEW

In 1808, Jean L.M. Poiret (in Lamarck 1808) described a new genus *Winterana* (as '*Winterania*'), including the species *W. lanceolata* which was based on a Labillardière collection from 'côtes de la Nouvelle-Hollande'. This was the beginning of considerable nomenclatural confusion (Table 1). The same taxon was named *Tasmannia aromatica* by de Candolle in 1818 (from a manuscript name of Robert Brown), and then transferred to *Drimys* (as *D. aromatica*) by Mueller (1862) with a description so broad that it easily encompasses the two taxa presently known as *T. lanceolata* (Poir.) A.C.Smith and *T. xerophila* (P. Parm.) M.Gray. Baillion (1868) resurrected the valid epithet '*lanceolata*', renaming the

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Table 1. History of nomenclatural changes for Victorian species of *Tasmannia*

Publication	*T. lanceolata*	*T. xerophila*	*T. vickeriana*
Poiret 1808	*Winterania lanceolata* Poir.	—	—
dc Candolle 1818	*Tasmannia aromatica* R.Br. *ex* DC.	—	—
F. Mueller 1862	*Drimys aromatica* (R.Br. *ex* DC.) F. Muell.	*D. aromatica*	—
Baillion 1868	*D. lanceolata* (Poir.) Baill.	—	—
P. Parmentier 1896 (as *in sched.*)	*D. xerophila* [*aromatica*] var. *aromatica* P. Parm.	*D. aromatica*	*D. xerophila* [*aromatica*] var. *alpina* F. Muell. *ex* P. Parm.
Vickery 1937	*D. lanceolata*	*D. lanceolata*	*D. lanceolata* var. *parvifolia* Vickery
Smith 1943	*D. lanceolata*	*D. lanceolata*	*D. vickeriana* A.C. Smith
Willis 1957	*D. lanceolata*	*D. xerophila*	*D. xerophila*
Smith 1969	*T. lanceolata* (Poir.) A.C. Smith	*T. lanceolata*	*T. vickeriana* (A.C. Smith) A.C. Smith
Vink 1970	*D. lanceolata*	*D. piperita* entity 39 '*xerophila*'	*D. piperita* entity 39 '*xerophila*'
Willis 1972	*D. lanceolata*	*D. xerophila*	*D. xerophila*
Gray 1976	[*T. lanceolata*]	*T. xerophila* (P. Parm.) M. Gray	*T. xerophila*
Ross 1990	*T. lanceolata*	*T. xerophila* *T.* sp. (Errinundra Plateau)	*T. xerophila*

taxon *D. lanceolata* (Poir.) Baill. Until 1896, only one taxon was recognized from Victoria.

In an ambiguous paper, Parmentier (1896) delineated *D. aromatica, D. xerophila* P.Parm., and two varieties, var. *β aromatica* P.Parm. and var. *alpina* F.Muell. *ex* P.Parm., all occurring in Victoria. In what seems a perplexing error, the variety names were published under *D. aromatica*, although it seemed to be Parmentier's intention to rank the two varieties under his new species *D. xerophila. Drimys xerophila* var. *alpina* was described briefly as a small-leaved plant growing in the Baw Baw Ranges, but its type incorrectly cited (Parmentier 1896, p. 226) as from Mt Bischoff in Tasmania (see Willis 1957 and Vink 1970).

Since the early 1900s only two taxa have been recognised for Victoria, but under various names and circumscriptions. In 1937, *D. aromatica* (synonymous with Parmentier's *D. xerophila* var. *β aromatica*) was renamed *D. lanceolata* and *D. xerophila* considered a synonym (Vickery 1937, Smith 1943). The small-leaved *D. xerophila* var. *alpina* was renamed *D. lanceolata* var. *parvifolia* in 1937 by Vickery and then elevated to specific rank as *D. vickeriana* by Smith (1943). Willis (1957) declared *D. lanceolata* and *D. xerophila* 'good' taxa but judged the small-leaved *D. vickeriana* to be synonymous with *D. xerophila*. Willis noted it as an 'unusually small-leaved, small-flowered state of *D. xerophila*', and considered it merely a polymorphism induced by environmental factors. *Tasmannia* was reinstated by Smith (1969) who maintained two taxa, *T. vickeriana* and *T. lanceolata*. However, Vink (1970) retained the generic name *Drimys*, referring *D. xerophila* to one of many 'entities' in the highly polymorphic *D. piperita* (with *D. vickeriana* as a synonym). Willis (1972) maintained his 1957 nomenclature, but in 1976, *Drimys xerophila* was transferred to *Tasmannia* by Gray. In the third edition of *A Census of the Vascular Plants of Victoria* (Ross 1990), three taxa are listed: *T. lanceolata*, *T. xerophila* and *T.* sp. (Errinundra Plateau), the latter an un-named taxon based on a population at Goonmirk Rocks. The designations

used in the fourth edition of the *Census* (Ross 1993) follow the conclusions of the current study.

MATERIALS AND METHODS

Sites and sampling

Three main collection sites were located at Mt Baw Baw and in the Mt Buffalo and Errinundra Plateau National Parks, Victoria. Three localities in Errinundra National Park were sampled, viz. Frosty Hollow, Goonmirk Rocks and Mt Ellery; *Tasmannia lanceolata* and *T. xerophila* are sympatric at the latter two areas (Fig. 1). Five male and five female plants were sampled at each locality. Single collections were made from a range of other sites including Mt Kosciusko, Brindabella Range, Mt Selwyn (NSW), the Grampians and Otway Range. Flowering material of *T. xerophila s. lat.* was collected between December 1991 and January 1992, and of *T. lanceolata* during September 1992. Fruiting material from all taxa was collected between April 1992 and June 1992. Collection details are included with the taxonomic summary. Voucher specimens were lodged at The University of Melbourne Herbarium (MELU) with duplicates at the National Herbarium of Victoria (MEL).

Leaves, flowers and fruit from all taxa were preserved in either FAA (Formalin: glacial acetic acid: 85% ethanol in the proportions 2:1:17) or in MAA (as for FAA but substituting Mirsky's fixative (National Diagnostics) for formalin). Leaves and fruit were collected and dried in paper bags in a drying cabinet. Fresh material was stored at 4°C until examined. Twenty leaves (up to 50 for the small-leaved *Tasmannia*) were removed from each of 10 plants sampled at each site and dried in paper bags for analysis of leaf flavonoids.

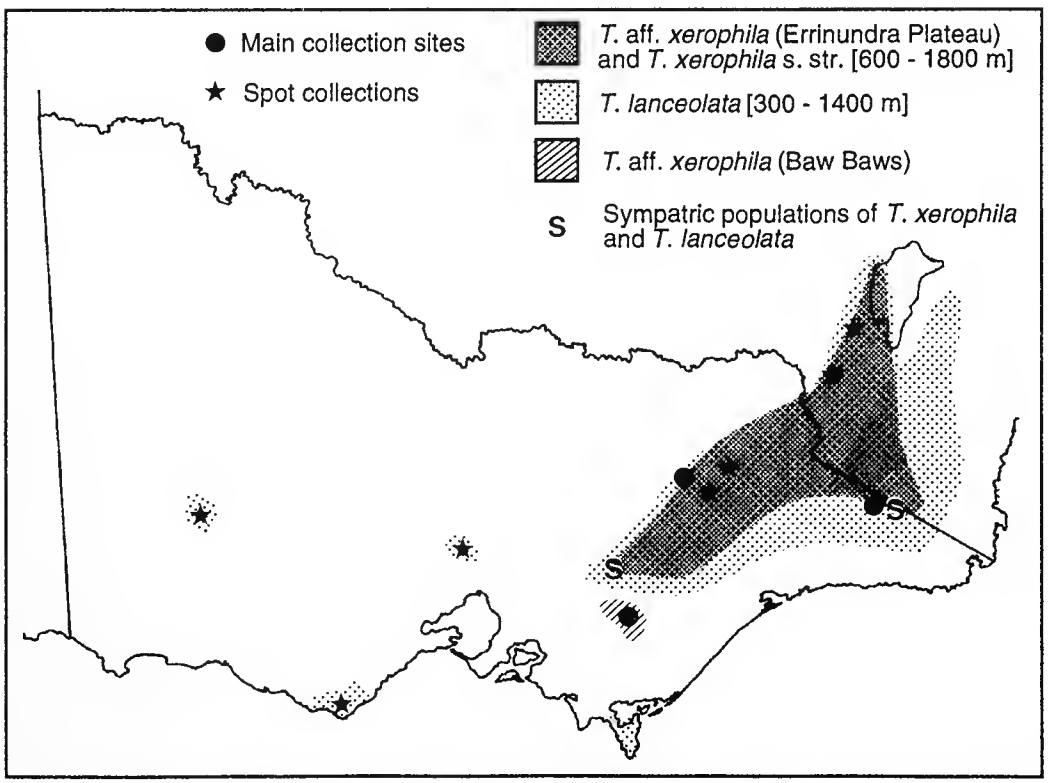

Fig. 1. Geographic distribution of *Tasmannia* in Victoria and south-eastern New South Wales.

Approximately 300 specimens from herbaria were examined, including type specimens from the Muséum National d'Histoire Naturelle (P), *T. xerophila* from the National Herbarium of New South Wales (NSW) and all Victorian *Tasmannia* held at MEL.

Microscopy

Leaf fragments, flowers, stamens and carpels examined by scanning electron microscopy were first critical point dried and sputter-coated with gold. Pollen for scanning electron microscopy was air dried. Carpels examined by light microscopy were embedded in London Resin, sectioned at 4 µm on a glass knife and stained with Toludine Blue. Whole flowers were cleared in a solution of 1% Basic Fuchsin in 10% NaOH at 60°C following the procedure of Fuchs (1963).

Morphological measurements

Measurements were analysed from a total of 84 plants for which 10 mature leaves, 10 inflorescences, 10 flowers and 10 fruiting pedicels were available. Dried leaves were re-hydrated by soaking in hot water for 30 min. Twenty-six morphological characters were scored: 4 qualitative and 22 quantitative (Table 2). The score for each quantitative character was the mean of 10 measurements. Linear measurements and derived ratios describing shape were included in the data set. Some controversy has been associated with using ratios as characters; however, since it was not known *a priori* whether taxa would differ in size or shape or a combination of both, the use of ratio as shape characters was considered justifiable and appropriate (Hills 1978).

Data were analysed phenetically using the PATN computer package (Belbin 1987). Quantitative data were range-standardised and qualitative data were unstandardised. The Manhattan metric (Williams 1976) association measure was

Table 2. Characters included in analyses

Quantitative characters
1. Leaf length (L mm)
2. Leaf width (W mm)
3. Distance to widest point of leaf (DWP mm)
4. Petiole length (LP mm)
5. L/W
6. L/DWP
7. L/LP
8. Fruit diameter (FD mm)
9. Fruit pedicel length (FPL mm)
10. Stigmatic furrow length (LSC mm)
11. Flower pedicel length (PL mm)
12. Fruit per pedicel (FP)
13. Fruit scars per pedicel (FSP)
14. Carpels per flower (CNo.)
15. Ovules per carpel (ONo.)
16. Aborted ovules per fruit (ANo.)
17. Seed per fruit (SNo.)
18. SNo./ONo.
19. Flowers per inflorescence (FNo.)
20. Tepals per flower (PNo.)
21. Stamens per flower (STNo.)
22. Sterile carpels per male flower (SCF)
Qualitative characters
23. Ovule colour (OC): pink (1), not pink (0)
24. Fruit colour:
Black (FCBl/0.33), not black (0)
Burgundy-grey (FCBg/0.33), not burgundy-grey (0)
Burgundy-red (FCBr/0.33), not burgundy-red (0)
25. Fruit groove (FT): indistinct (1), distinct (0)
26. Tubercles on stem (STEM): present (1), absent (0).

used to calculate a dissimilarity matrix and individual plants were clustered using both Unweighted Pair-Group Method using arithmetic Averages (UPGMA) and Weighted Pair-Group Method using arithmetic Averages (WPGMA). Cramer values were calculated to determine which characters best discriminated the final groups identified. The dissimilarity matrix was also used for ordination by Hybrid Multi-Dimensional Scaling (HMDS; Faith *et al.* 1987). Since multi-dimensional scaling is sensitive to locally minimal solutions depending upon the starting point used (Kruskal 1964a, 1964b), 20 ordination analyses were performed using different random starting configurations. Each ordination was similar and the result with the lowest stress value (i.e. with the 'best fit') is presented.

A second matrix, a subset of 53 individuals and 22 quantitative characters that excluded populations of small-leaved *Tasmannia* and *T. lanceolata*, was analysed in the same way. This matrix was restandardised by range because extreme values were different. Those characters that were constant for all individuals were removed.

Flavonoid chromatography

Leaves were dried for at least 4 days, then ground to a fine powder. Samples of 1–6 g were placed in air-tight 30 ml glass vials with 80% aqueous methanol submerging the material by 10 mm. After 24 hours the supernatant was decanted and leaf extracts applied to sheets of Whatman 3MM (46 × 57 cm) chromatography paper and run in two dimensions (Mabry *et al.* 1970). The first run (for 36 hours) used tertiary butyl alcohol (TBA) and the second run used acetic acid (for 12–24 hours). Dry chromatograms were viewed in normal light and under UV light (336 nm) in the presence of ammonia vapour, and all spots noted. Spots on different sheets were considered to represent the same compound if they exhibited the same colours under both viewing conditions and their positions on the paper were the same. No attempt was made to chemically characterize any compound.

RESULTS

To simplify comprehension, the names accepted as a result of this study are used throughout the remainder of the paper: i.e. *T. xerophila* subsp. *robusta* for '*T. xerophila*' from the Errinundra Plateau, *T. vickeriana* for '*T. xerophila*' from the Baw Baws, *T. xerophila* var. *xerophila* for the remaining plants referable to *T. xerophila*, and *T. xerophila s. lat.* for all plants previously included within *T. xerophila.*

Distribution, habitat & habit

Tasmannia lanceolata is widespread, extending from Tasmania, through Victoria to New South Wales and Australian Capital Territory (Fig. 1). It grows as a shrub to small tree (1.5–4.0 m) at altitudes of between 300–1400 m in sites of high annual rainfall (mostly > 1000 mm). In several localities (e.g. Lake Mountain and Goonmirk Rocks), *T. lanceolata* is sympatric with *T. xerophila s. lat.* but it grows generally in wetter soils and at lower altitudes. Habitats range from dry open-forest to wet tall open-forest and rainforest. *Tasmannia lanceolata* is usually single-stemmed, although plants in disturbed areas may have 4–5 stems. Young branchlets are red and tubercules are absent. At Mt Ellery, Goonmirk Rocks and in the Grampians, *T. lanceolata* grows among granite outcrops, and at other sites is often found along watercourses.

Tasmannia xerophila s. lat. occurs throughout the central highlands of Victoria, mostly as a common understorey shrub (0.6–2 m) in subalpine *Eucalyptus pauciflora s. lat.* woodland at altitudes between 600 and 1800 m. Its range extends into New South Wales and the western edge of Australian Capital Territory. A robust form of *T. xerophila*, *T. xerophila* subsp. *robusta*, is found at high rainfall

sites (mostly >1500 mm) in East Gippsland (e.g. Goonmirk Rocks and Mt Ellery) where plants grow to 4 m in height. At these sites this robust form is sympatric with *T. lanceolata*, and it has been suggested that it may be of hybrid origin. Small-leaved *Tasmannia*, *T. vickeriana*, has the most restricted distribution of all Victorian species of *Tasmannia* and is only found in the Baw Baw Ranges, where it grows as a small shrub (0.6–1.2 m) under *E. pauciflora s. lat.*

Although *Tasmannia xerophila* subsp. *xerophila* grows generally in subalpine *Eucalyptus pauciflora* woodland, it also occurs in open-forest and as isolated plants in subalpine grasslands. Plants often grow amongst granite boulders or along watercourses. Individual plants are clumped as a result of root suckering near the base of each plant. The only seedlings found were growing in *Sphagnum* along a water channel near Falls Creek. Most plants have many stems, with up to 30 stems counted in one area, possibly indicating considerable age. Stems are finely tuberculate and ochre to brown in colour; young branchlets are red. At Mt Buffalo in the area around 'The Horn', which was burnt between 1986–1987, plants of *T. xerophila* subsp. *xerophila* are only *c.* 0.8 m in height but have numerous stems, suggesting regeneration from rootstock rather than from seed.

Tasmannia xerophila subsp. *robusta* grows in wet tall open forest and at slightly lower altitude than *T. xerophila* subsp. *xerophila* At Goonmirk Rocks, it grows 2–4 m in height and forms multistemmed, clumped individuals amongst *Podocarpus lawrencei* Hook. f.

Tasmannia vickeriana occupies a similar habitat to *T. xerophila* subsp. *xerophila* at altitudes between 1300–1500 m in *Eucalyptus pauciflora* woodland. It forms clumped individuals up to 1.5 m across but rarely more than 1.2 m in height, and has a more compact habit than *T. xerophila* subsp. *xerophila.* Stems are finely tuberculate and young branchlets are red. Mature stems are ochre to brown. No juvenile plants were found.

Leaf morphology and anatomy

Leaves of most *T. xerophila s. lat.* range in length between 3–9 cm, but are up to 14 cm in *T. xerophila* subsp. *robusta* and as short as 0.8 cm in *T. vickeriana.* Leaves are coriaceous, usually with obtuse apices and between 2–30 mm wide. The adaxial surface of the leaf is dark green, the abaxial surface paler and glaucous. Veins of the leaf are usually obscured in *T. xerophila* subsp. *xerophila* but more obvious in *T. xerophila* subsp. *robusta.* The leaves of these two taxa are *c.* 450 μm thick and the epidermis consists of a single row of cells (Fig. 2a). Leaf anatomy of *T. vickeriana* (Fig. 2b) is similar to that of *T. xerophila* subsp. *xerophila* and *T. xerophila* subsp. *robusta* but leaves are thicker (*c.* 540 μm), as is the cuticle. Leaves of *T. vickeriana* are coriaceous and seldom exceed 2 cm in length (some leaves on a bush may reach 2.5 cm) and 6 mm in width.

Leaves of *T. lanceolata* range in length from 4–12 cm with usually acute apices. However, a few herbarium specimens collected from areas such as

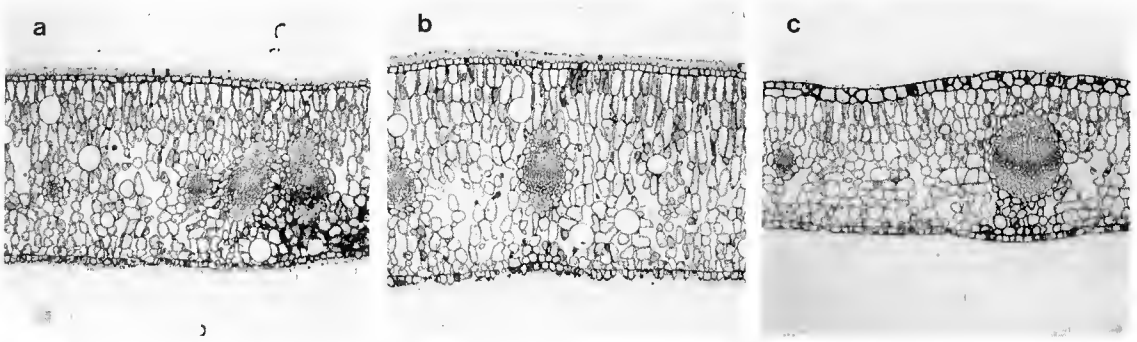

Fig. 2. Leaf sections (light micrographs) ×70. a — *T. xerophila* subsp. *xerophila.* b — *T. vickeriana.* c — *T. lanceolata.*

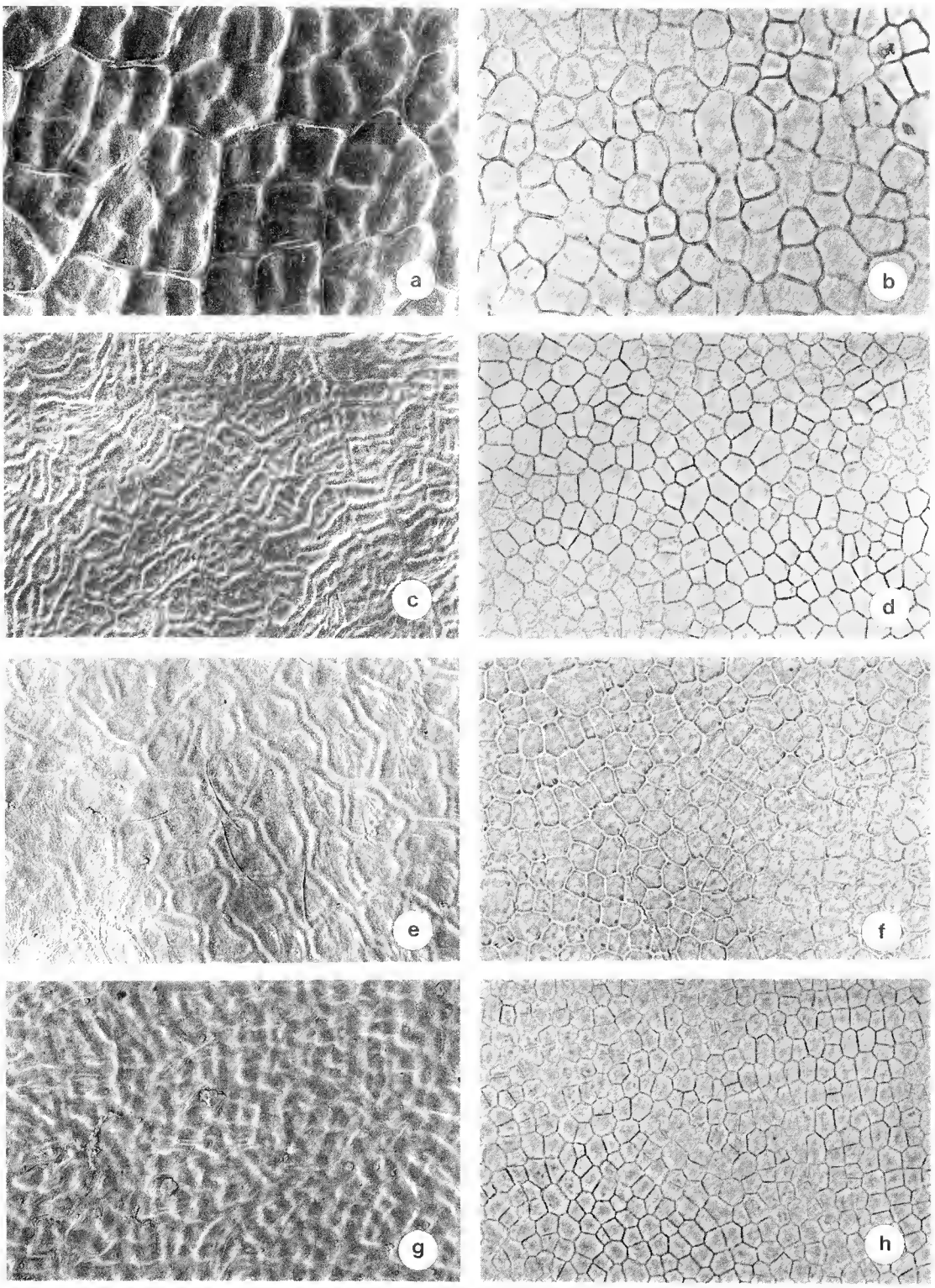

Fig. 3. Leaf upper surfaces and epidermal cells ×200 (a,c,e,g — scanning electron micrographs; b,d,f,h — light micrographs). a,b — *T. lanceolata*. c,d — *T. xerophila* subsp. *xerophila* e,f — *T. xerophila* subsp. *robusta*. g,h — *T. vickeriana*.

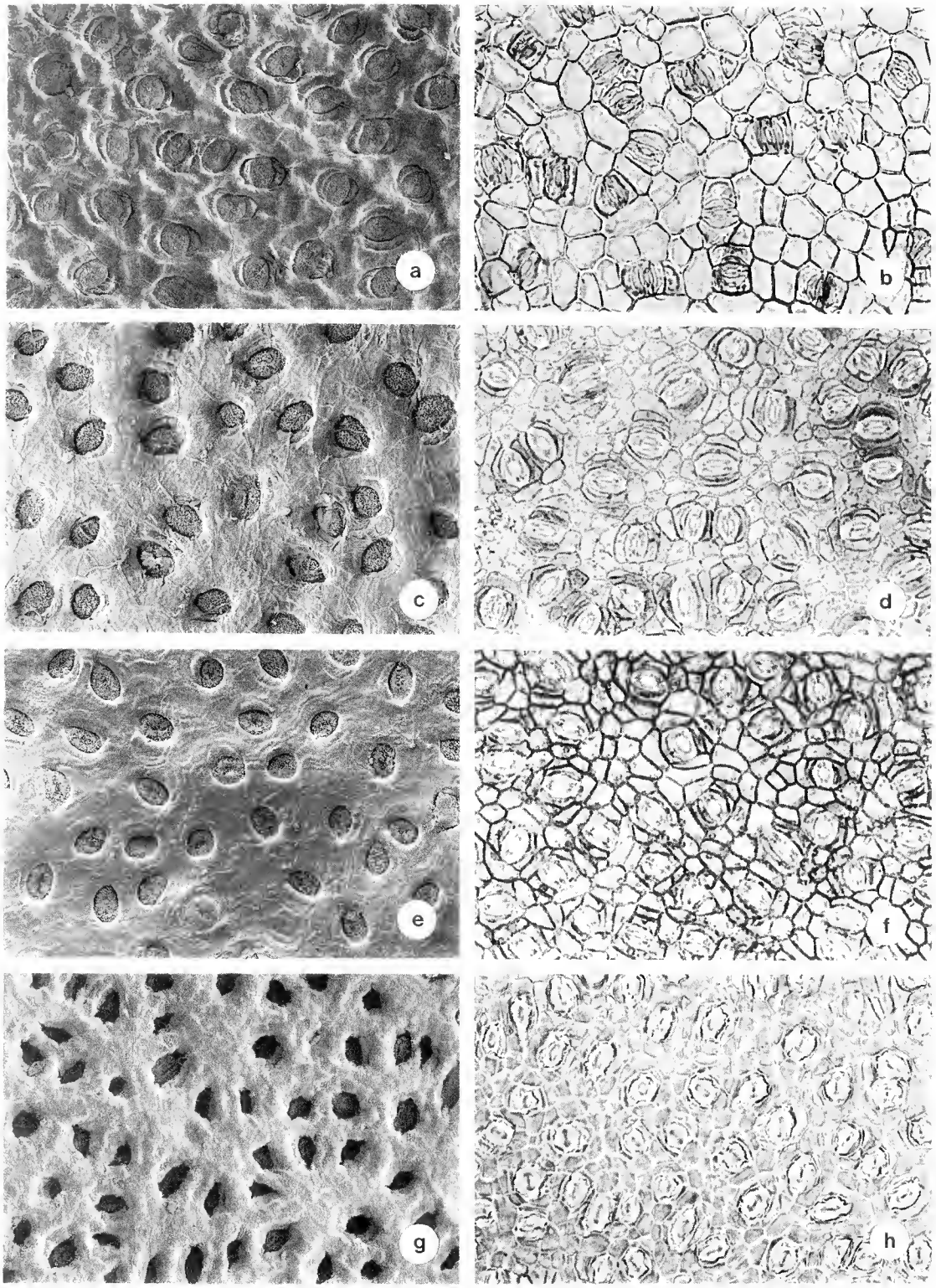

Fig. 4. Stomata on lower leaf surface ×200 (a,c,e,g — scanning electron micrographs, b,d,f,h — light micrographs). a,b — *T. lanceolata*. c,d — *T. xerophila* subsp. *xerophila* e,f — *T. xerophila* subsp. *robusta*. g,h — *T. vickeriana*, note indented margins of epidermal cells.

Mt Field and Mt Wellington in Tasmania and referred to *T. lanceolata* (based on fruit characteristics) have stout, thick leaves with obtuse apices. The adaxial surface of the leaf of *T. lanceolata* is paler than that of *T. xerophila s. lat.* but similarly glaucous on the abaxial surface. Veins of the leaf are prominent. Leaf width is 8–35 mm and leaves are thinner (*c.* 340 μm) than those of *T. xerophila s. lat.* Leaves of *T. lanceolata* have thin cuticles (Fig. 2c) and the epidermis of the adaxial surface is characterised by multiple layers of cells. All taxa had well-defined palisade and spongy mesophyll confirming the findings of Sampson *et al.* (1988), but contrary to Willis (1957) who reported a well defined palisade layer only in *T. lanceolata.*

Leaves examined by scanning electron microscopy revealed different epidermal cell shapes and sizes between taxa (Figs 3a,c,e,g). The patterns are similar in *T. xerophila* subsp. *xerophila* and *T. xerophila* subsp. *robusta*, but upper leaf surfaces of *T. vickeriana* are more similar to those of *T. lanceolata*, although with much smaller cells. Adaxial epidermal cells of *T. lanceolata* (Fig. 3b) are about twice the size of epidermal cells of *T. xerophila s. lat.* (Figs 3d,f,h), but there is no obvious variation within the latter.

Stomata are always found on the abaxial leaf surface in *Tasmannia* and are heavily occluded by waxy material in all variants of *T. xerophila s. l.* (Figs 4c,e,g). Stomata of *T. lanceolata* are either completely clear or only lightly occluded by waxy material (Fig. 4a). Guard cells of *T. lanceolata* are prominent (Fig. 4a) but those of *T. xerophila* subsp. *xerophila* and *T. xerophila* subsp. *robusta* are usually obscured by a thicker cuticle (Figs 4c,e), the guard cells of *T. vickeriana* being totally hidden by a very thick cuticle (Fig. 4g). Stomata in the *T. vickeriana* are overhung by epidermal cells with indented margins (Fig. 4h). Stomatal density is similar in all forms of *T. xerophila* (Fig. 4d,f,h) but lower in *T. lanceolata* (Fig. 4b).

Floral morphology and phenology

Flowers of *T. xerophila s. lat.* are arranged in a pseudo-terminal inflorescence below a dormant vegetative bud. Pistillate flowers are white in bud and arise from the axil of a bract. The outer bracts of the immature inflorescence are largest and continue to enclose flower buds as they develop. The prophylls (calyx) recurve backwards after flowers have opened. Pistillate flowers have two creamy, strap-shaped tepals (sometimes with a greenish tinge) inserted alternate to the prophylls (Fig. 5a). When there are three tepals, the third tepal is often intermediate between a tepal and a carpel, in the position of a carpel. In *T. xerophila* subsp. *xerophila* and *T. xerophila* subsp. *robusta*, the number of carpels per flower varies from 2–11 (most often 3–6), while in *T. vickeriana*, carpels vary from 1–6 per flower (most often 1 or 2). Carpels are D-shaped and the stigmatic crest is positioned along the apex of the carpel along the distal portion of the ventral suture (Figs 5b,c). In *T. xerophila* subsp. *xerophila* and *T. xerophila* subsp. *robusta*, carpels contain 2–9 ovules arranged in two rows along the ventral line; carpels of *T. vickeriana* contain 3–6 ovules similarly arranged. All populations of *Tasmannia xerophila* flower between early December and early February when *T. lanceolata* is already in fruit.

Tasmannia lanceolata commences flowering in late September and finishes in late November. Each flower arises from the axil of a bract and is arranged in a more compact inflorescence than those of the other taxa. The outer bracts of the inflorescence are smaller than the inner bracts and all bracts fall from the inflorescence as buds mature. All observed buds had pinkish prophylls that recurve backwards once flowers opened. Tepals are strap-shaped, cream with a greenish tinge and number between three and nine per flower, usually four or five. Tepals are inserted laterally to the median line of the flower (the median line being the plane along which the prophylls fuse). Pistillate flowers have one globose carpel (occasionally two fused together) containing 9–18 ovules. The stigmatic crest is sunken into a distinct furrow along the ventral suture of the carpel. A flange of

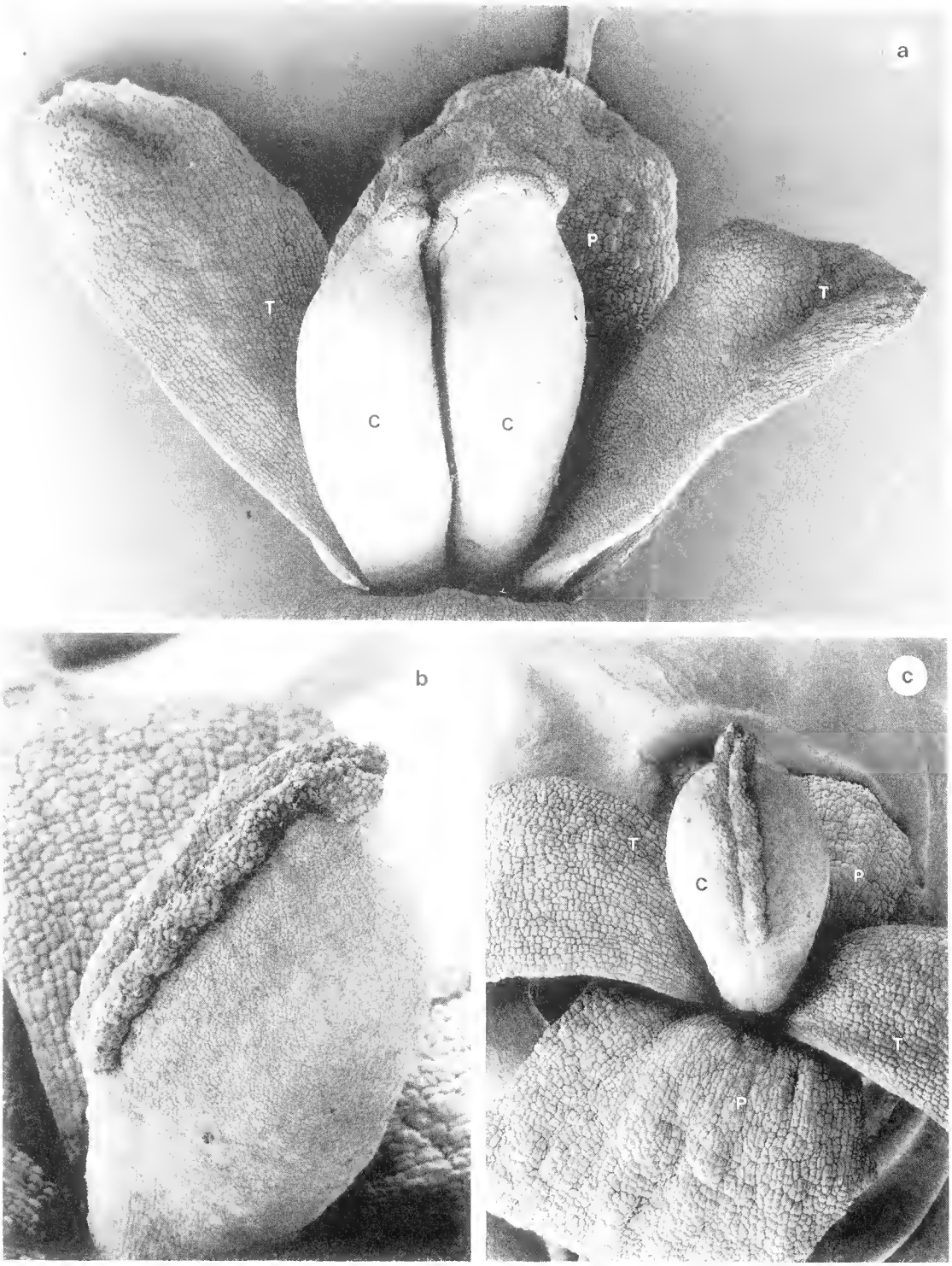

Fig. 5. Pistillate flowers and carpels of *T. xerophila* (scanning electron micrographs); C = carpel, T = tepal, P = prophyll. a — *T. xerophila* subsp. *xerophila* ×35. b — *T. xerophila* subsp. *xerophila* ×50, showing carpel with papillate stigmatic crest. c — *T. vickeriana* ×30.

tissue similar to that seen at the base of single carpels of *T. vickeriana* is located at the base of the carpel. An exudate was observed on the stigma of pistillate flowers of plants grown from cuttings.

In both *T. xerophila s. lat.* and *T. lanceolata*, buds of staminate flowers are larger than pistillate flowers. Each staminate flower has a single sterile carpel at the centre (Figs 6a,b). In *T. lanceolata*, sometimes two sterile carpels are present and occasionally none. The sterile carpels of all forms of *T. xerophila s. lat.* are similar in morphology, and smaller than the fertile carpels of corresponding pistillate flowers. The sterile carpel in flowers of *T. lanceolata* are more globose than D-shaped (Fig. 6c) and are also smaller than carpels of pistillate flowers. Pollen was observed adhering to the stigmatic crest of staminate flowers of *T. vickeriana*

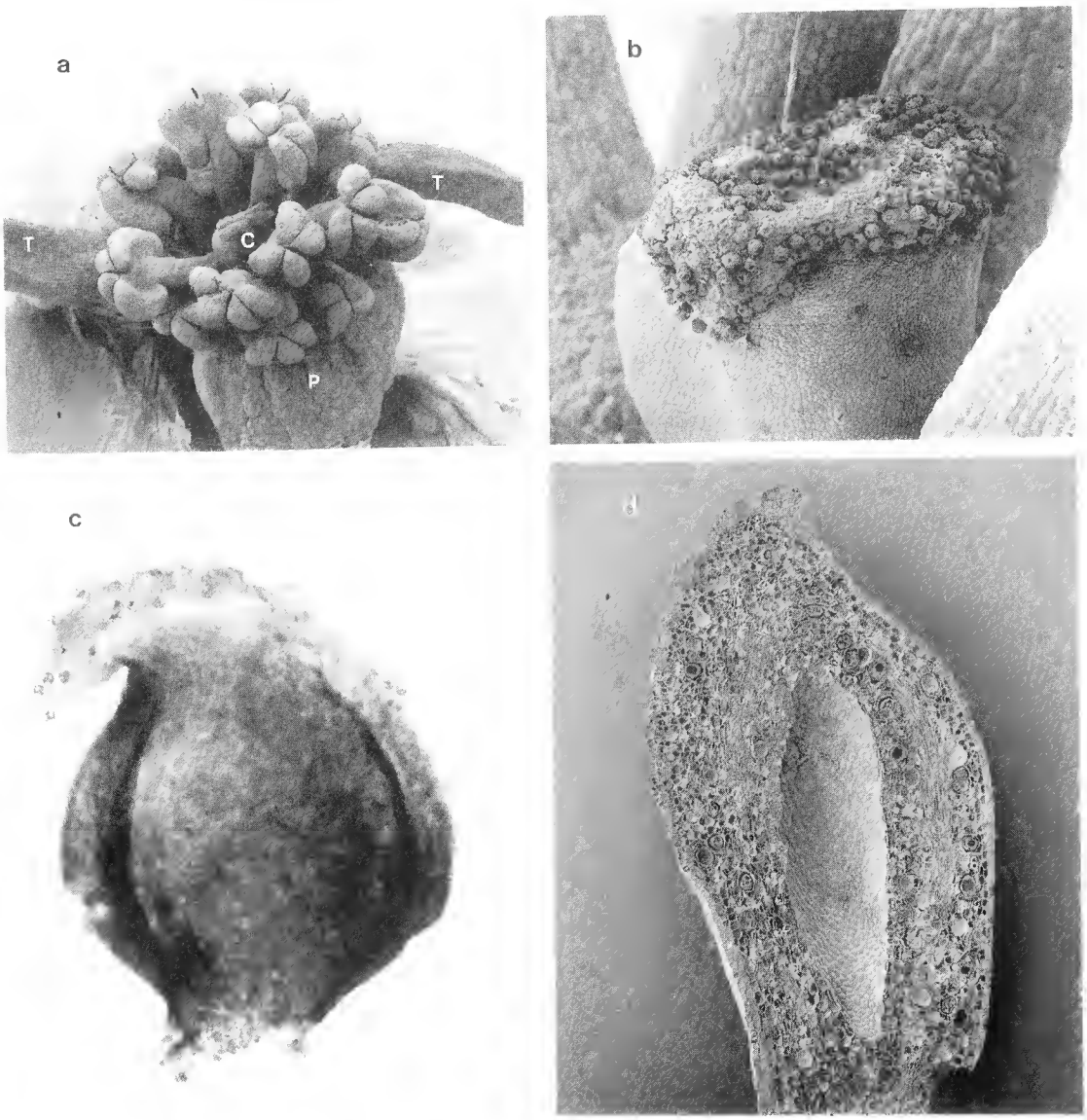

Fig. 6. Staminate flowers (a,b,c — scanning electron micrographs; c — light micrograph); C = carpel, T = tepal, P = prophyll. a — *T. vickeriana* ×12, note sterile carpel. b — *T. vickeriana* ×70, note pollen adhering to stigmatic crest of the sterile carpel. c — *T. lanceolata*, ×50, note sterile carpel with stigmatic crest overtopping the carpel. d — *T. xerophila* subsp. *xerophila* ×100, section through sterile carpel (ovules are absent).

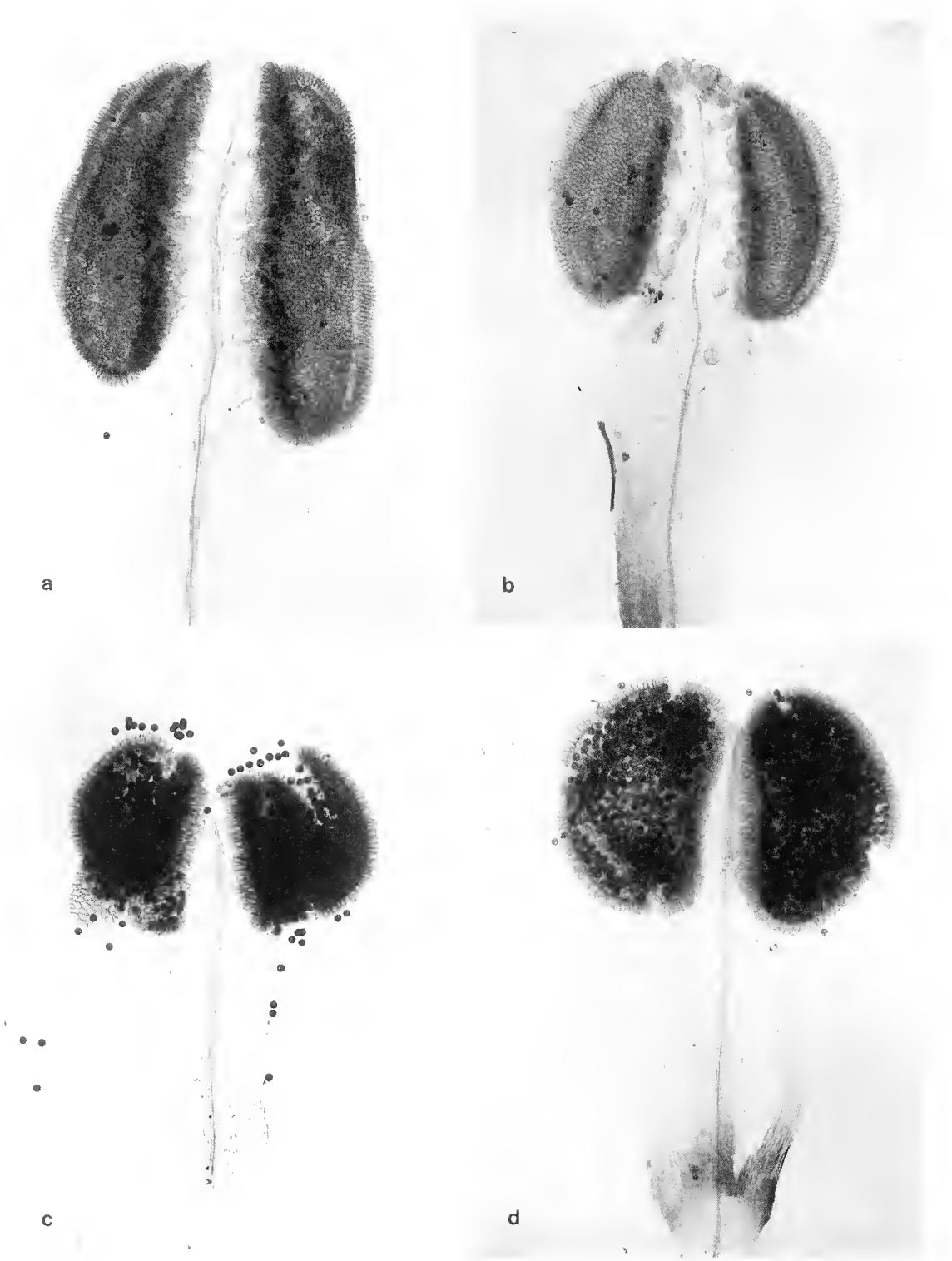

Fig. 7. Cleared and stained stamens ×50 (light micrographs). a — *T. lanceolata*, stamen with a distally branched vascular trace between two elongated anther sacs. b — *T. xerophila* subsp. *xerophila*, dehisced stamen with an unbranched vascular trace between two anther sacs (darkly staining cells are oil bodies). c — *T. xerophila* subsp. *robusta*, stamen with an unbranched vascular trace. Thickened cells of the anther wall are clearly visible (darkly staining spots are pollen). d — *T. vickeriana*, stamen with an unbranched vascular trace and anther cell walls clearly visible.

(Fig. 6b). Closer inspection revealed the presence of exudate, with the majority of pollen germinated and pollen tubes growing through the stigmatic surface. These sterile carpels lack ovules (Fig. 6d). The number of stamens per staminate flower varies from 7–30 in *T. xerophila s. lat.* and from 18–27 in *T. lanceolata*.

Populations of *T. xerophila s. lat.* all have the same stamen structure. However, a significant difference was noted between stamens of these taxa and those of *T. lanceolata*. The single vascular trace is branched distally between the anther sacs in *T. lanceolata* (Fig. 7a) but unbranched in the other taxa (Figs 7b–d). *Tasmannia glaucifolia* is the only other Australian species reported with an unbranched vascular trace (Sampson *et al.* 1988). Anther sacs are also more elongate. Cells of the anther wall in all taxa are thickened by bands of a lignin-like substance that stains with Basic Fuchsin (like xylem and pollen) when anthers are cleared. Pollen consists of four grains, with a reticulate exine, arranged tetrahedrally in permanent meiotic tetrads and is similar in all taxa. Fiser & Walker (1967) came to the same conclusion after a much broader and more detailed study of *Tasmannia* pollen.

Fruit and seed morphology

Tasmannia xerophila subsp. *xerophila* and *T. xerophila* subsp. *robusta* both have an aggregate fruit with 1–11 berries per pedicel. Berries are green when immature and black at maturity. The stigmatic crest is positioned sub-apically (Fig. 8a). Pedicels with single berries usually have scars where additional berries were attached or where carpels failed to develop. Three berries per pedicel is most common in both taxa. Berries range in length from 6.5–11 mm. Up to seven seeds per berry are found with an ovule to seed conversion ratio of between 45–90%; aborted ovules are pink.

The fruit of *T. vickeriana* is very like that of other members of *T. xerophila s. lat.*, with a similar berry shape and stigmatic crest; however, its colour is burgundy rather than black when mature, and the number of berries per pedicel is 1–4 (most commonly 1 or 2). Up to five seeds per berry are set in *T. vickeriana* with an ovule to seed conversion ratio of 60–86%; aborted ovules are white.

Fruit of *T. lanceolata* is black at maturity, although immature berries are reddish to dark maroon. Each pedicel bears one globose berry (occasionally two)

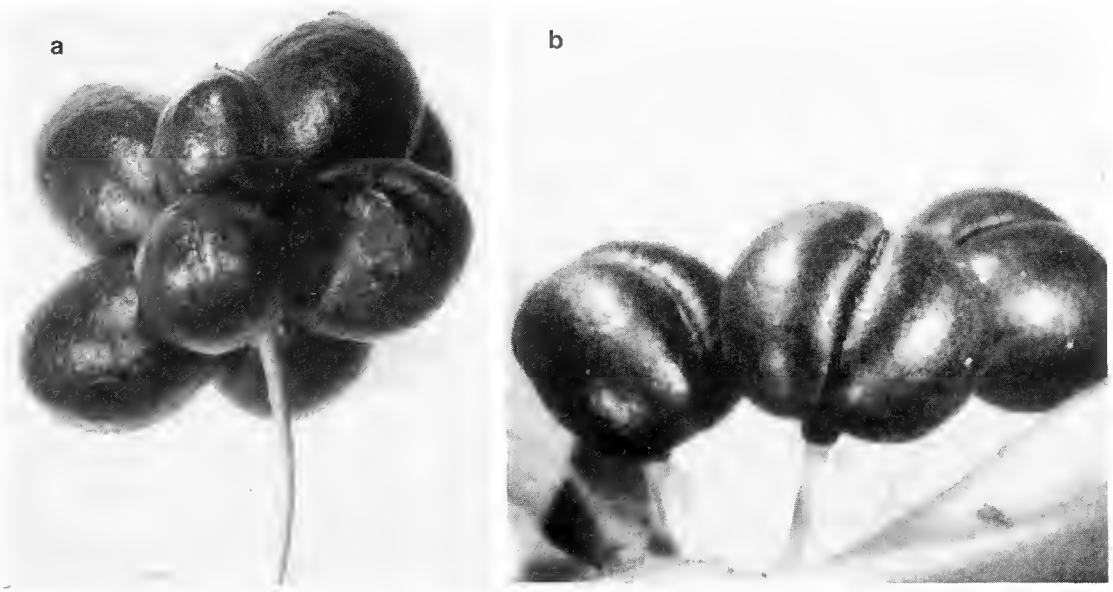

Fig. 8. Mature fruit ×3 (light micrographs). a — *T. xerophila* subsp. *xerophila*, aggregate fruit consisting of sub-ovoid berries with sub-apical stigmatic crest. b — *T. lanceolata*, singular, globose berries with distinct furrow and sunken stigmatic crest.

marked with a distinct furrow along the median line (Fig. 8b). The stigmatic crest is sunken into this furrow and reaches nearly to the base of each berry. Berries are 5.5–7.0 mm in diameter. Up to 13 seeds per berry are set in *T. lanceolata* with an ovule to seed conversion ratio from 23–88%.

The seeds of all taxa are shiny black with a smooth outer surface. Seed of *T. lanceolata* are large and irregular in shape, unlike the rounded seed of *T. xerophila s. lat.*; the seed of *T. vickeriana* is slightly smaller and more rounded than that of other members of *T. xerophila s. lat.* Attempts to grow all four taxa from seed were unsuccessful.

Morphometric analyses

UPGMA clustering of 84 plants was truncated at the 4-group level (Fig. 9). Group 1 consists of 41 plants of *T. xerophila* subsp. *xerophila* from six localities; Group 2 of 13 plants of *T. xerophila* subsp. *robusta* from Mt Ellery and Goonmirk Rocks; Group 3 of 17 plants of *T. vickeriana* from Mt Baw Baw; and Group 4 of 14 plants of *T. lanceolata* from five localities. Groups from WPGMA (Fig. 10) are similar to those from UPGMA, with some differences in the hierarchical clustering. Group 3 and Group 4 are in reverse positions, and three plants from the UPGMA Group 2 are placed in WPGMA Group 1 (Fig. 10).

The ordination of principal axes 1 and 2 (Fig. 11) confirms the pattern from the UPGMA cluster analyses. Within *T. xerophila*, three mostly non-overlapping clusters (groups 1–3) are evident, and clearly isolated from these is *T. lanceolata* (group 4).

Flavonoid compounds

Ten flavonoid compounds were detected, of which only the most abundant one was shared between all taxa (Table 3). As in the morphological analyses,

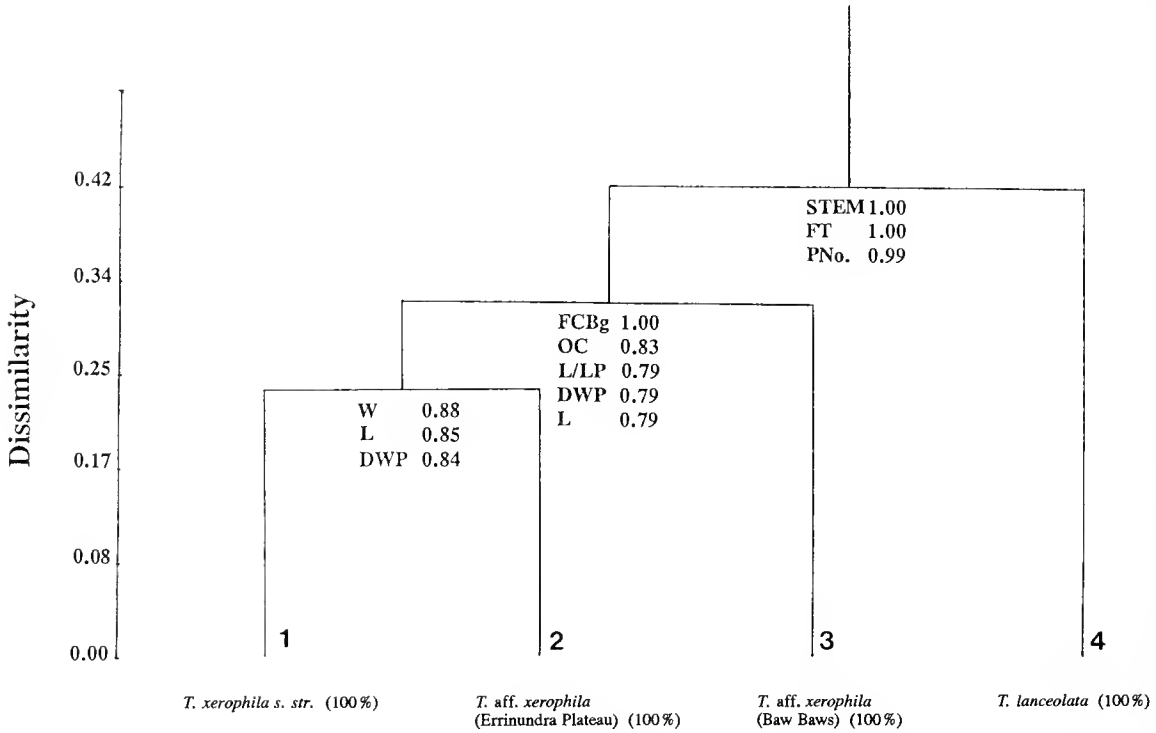

Fig. 9. Dendrogram of individuals of *Tasmannia* based on UPGMA, truncated at the four-group level. Percentages of individuals of each form are given in parentheses and nodes are labelled with characters that correlate most highly with the dichotomy. For abbreviations see Table 2.

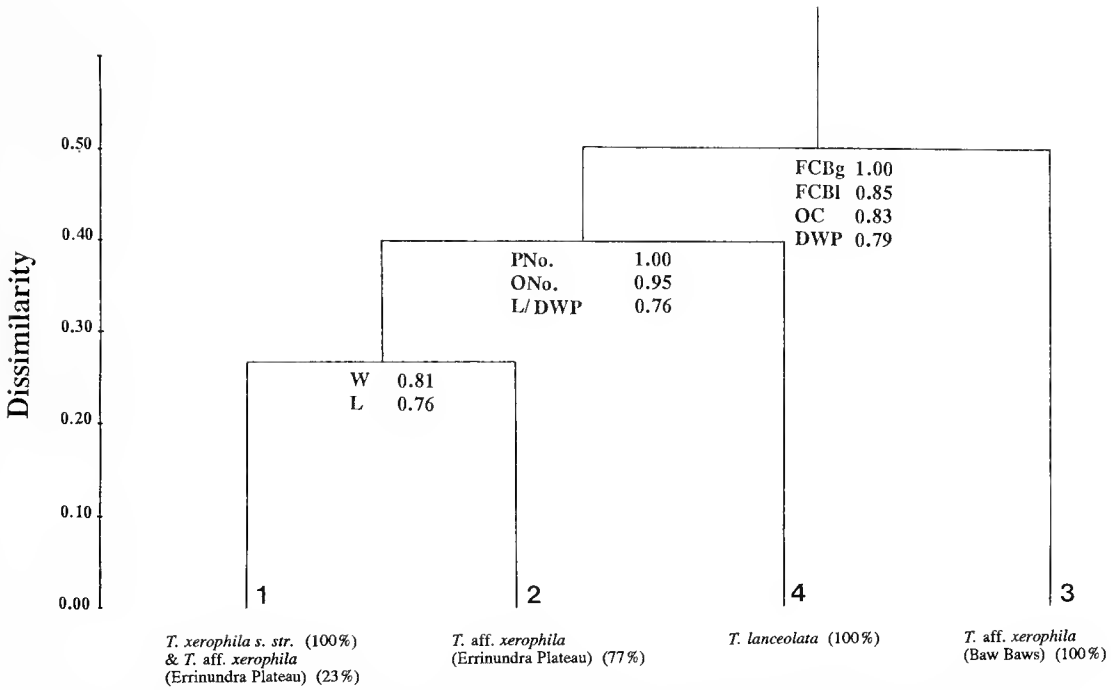

Fig. 10. Dendrogram of individuals of *Tasmannia* based on WPGMA, truncated at the four-group level. Percentages of individuals of each form are given in parentheses and nodes are labelled with characters that correlate most highly with the dichotomy. For abbreviations see Table 2.

T. lanceolata was distinct from *T. xerophila s. lat.* Three compounds were unique to *T. lanceolata* and one was otherwise only found in one plant of *T. xerophila* subsp. *robusta*. The flavonoid profile of *T. lanceolata* was uniform, with no differences between individuals from four populations.

All variants of *Tasmannia xerophila s. lat.* possessed four compounds which were not found in *T. lanceolata*. One compound was found in only a single plant of *T. xerophila* subsp. *xerophila* from Falls Creek. The only difference in flavonoid profiles was quantitative in that *T. vickeriana* consistently showed three-fold less of one compound (indicated by a spot three-fold smaller in diameter than the same spot in other taxa and no change in diameter of other spots on the chromatogram).

DISCUSSION

Classification and ordination analyses demonstrated that the pattern of variation based on morphology includes a number of discrete groups and not a continuum of variation. *Tasmannia lanceolata* is clearly distinct from other taxa in leaf anatomy (having a multi-layered epidermis), stamen venation (branched vascular trace), berry morphology and colour, leaf thickness and shape, and number of tepals.

Within *T. xerophila s. lat.*, *T. vickeriana* is the least variable on morphological characters and forms a relatively uniform cluster with all analyses. It is similar to *T. xerophila* subsp. *xerophila* and *T. xerophila* subsp. *robusta* in floral and berry morphology but different in having burgundy-coloured fruit with white aborted ovules, lower carpel number and ovule number, and consistently smaller leaves. Plants from the Lake Mountain and Mt Buller areas may approach *T. vickeriana* in leaf size but fall within the range expressed by the more variable *T.* aff. *xero-*

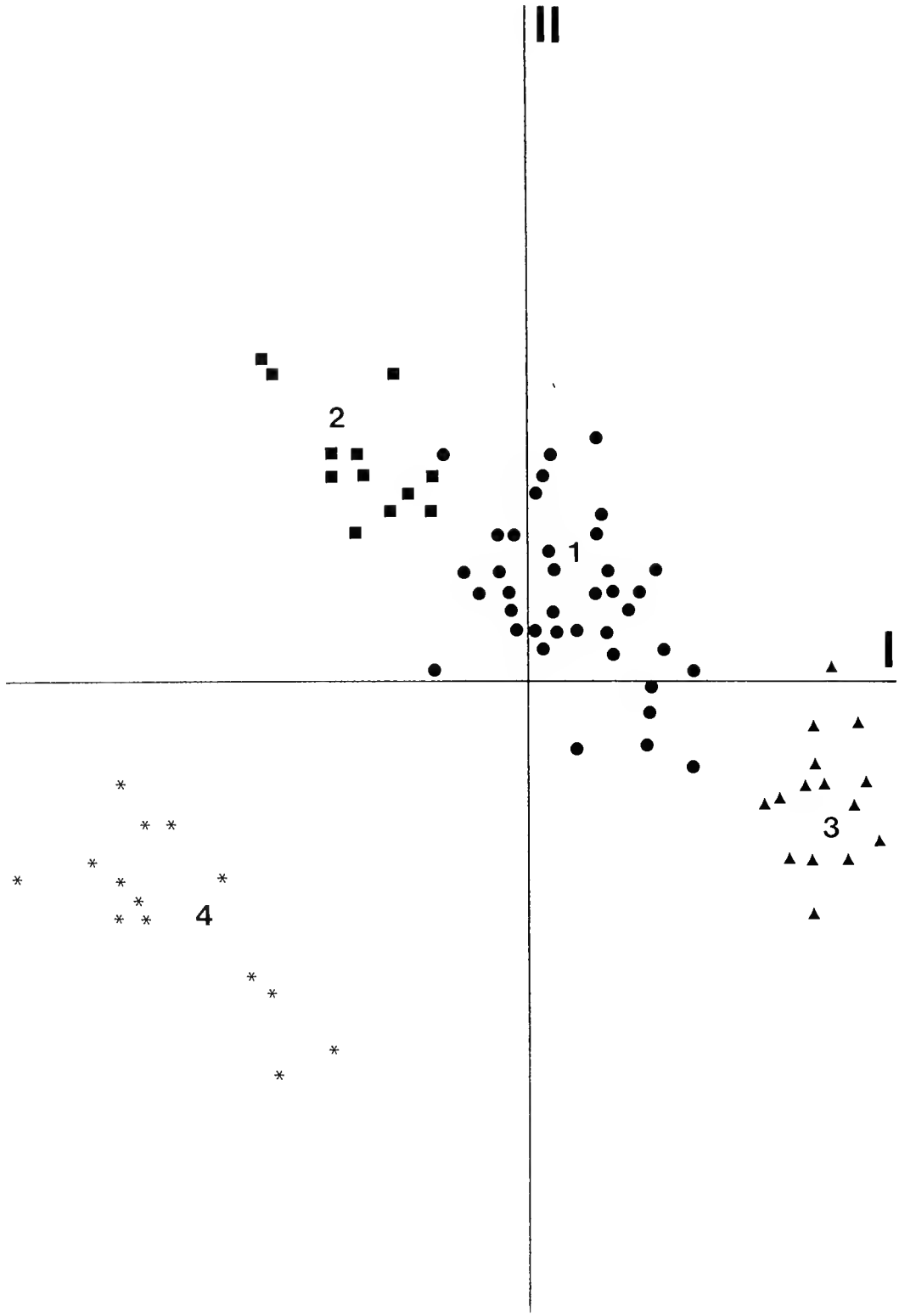

Fig. 11. Ordination of individual specimens using multi-dimensional scaling showing vector I against vector II, 1 (circles) = *T. xerophila* subsp. *xerophila*, 2 (squares) = *T. xerophila* subsp. *robusta*, 3 (triangles) = *T.* aff. *xerophila* (Baw Baws), 4 (asterisks) = *T. lanceolata*.

Table 3. Flavonoid/chalcone compounds

Taxon	Collection No.	Flavonoid/chalcone compounds 1	2	3	4	5	6	7	8	9	10
T. lanceolata	RER21	+	+	+	+	+					
	RER24	+	+	+	+	+					
	RER45	+	+	+	+	+					
	RER47	+	+	+	+	+					
	RER49	+	+	+	+	+					
	RER52	+	+	+	+	+					
	RER55	+	+	+	+	+					
	RER57	+	+	+	+	+					
	RER113	+	+	+	+	+					
	RER114	+	+	+	+	+					
T. xerophila subsp. *xerophila*	RER1	+					+	+	+		+
	RER4	+					+	+	+		+
	RER5	+					+	+	+		+
	RER7	+					+	+	+		+
	RER10	+					+	+	+		+
	RER31	+					+	+	+		+
	RER33	+					+	+	+		+
	RER36	+					+	+	+		+
	RER37	+					+	+	+		+
	NGW3289	+					+	+	+		+
T. xerophila subsp. *robusta*	RER19	+		+			+	+	+		+
	RER20	+					+	+	+		+
	RER26a	+					+	+	+		+
	RER27	+					+	+	+		+
	RER40	+					+	+	+		+
	RER44	+					+	+	+		+
T. vickeriana	RER92	+					+	+	+		+
	PYL1403	+					+	+	+		+
	PYL1404	+					+	+	+		+
	PYL1405	+					+	+	+		+
	PYL1407	+					+	+	+		+
	PYL1408	+					+	+	+		+
	PYL1410	+					+	+	+		+
	PYL1412	+					+	+	+		+

phila subsp. *xerophila*. The leaves of *T. vickeriana* are not only smaller but *c.* 90 μm thicker than leaves of *T. xerophila* subsp. *xerophila* and *c.* 200 μm thicker than leaves of *T. lanceolata*. The thick cuticle is also characteristic but could be phenotypic, with thicker cuticles related to growth at higher or colder localities. However, since *T. vickeriana* grows under *Eucalyptus pauciflora* with some of the same understorey species that occur with *T. xerophila* subsp. *xerophila* at Mt Buffalo (*e.g. Bossiaea foliosa*), and the altitudinal range at Mt Baw Baw and Mt Buffalo is similar, as is soil type (granite bedrock of Devonian age), rainfall and temperature, the differences may be genetically based.

Tasmannia xerophila subsp. *xerophila* and *T. xerophila* subsp. *robusta* differ only in leaf morphology and habit, and the two are indistinguishable on the bases of floral, fruit and leaf anatomical characters. *Tasmannia xerophila* subsp. *robusta* has leaves which are generally larger (7–14 cm cf. 3–9 cm long, and 20–30 mm cf. 7–17 mm wide) and often thinner, and is usually a more robust shrub (to small tree). The relatively sheltered conditions at Goonmirk Rocks (*T. xerophila* subsp. *robusta*) compared with the more open site at Frosty Hollow (*T. xerophila* subsp. *xerophila*) may allow the development of larger shrubs, although snow damage seems to result in most large specimens of *T. xerophila* subsp. *robusta* collapsing at the base. Alternatively, the area may be a local 'isolated' site and differences in plant form may be genetically based. Given that *T. xerophila* from the Errinundra Plateau is recognisably different, we have given it subspecific status.

Flavonoid compositions of all taxa support the findings of morphological analyses. A recent study of essential oils in Australian species of *Tasmannia* (Southwell & Brophy 1992) shows the distinctiveness of *T. lanceolata* from *T. xerophila* subsp. *xerophila*, but unfortunately the study did not include any plants of *T. vickeriana* or *T. xerophila* subsp. *robusta*. Flavonoid compositions of *T. xerophila* subsp. *xerophila* and *T. xerophila* subsp. *robusta* highlight the similarities between them. None of flavonoid data, morphological data or phenology supports a hybrid origin for *T. xerophila* subsp. *robusta*.

TAXONOMIC & NOMENCLATURE CONCLUSIONS

On the basis of this study, three distinct species of *Tasmannia* are recognised in Victoria: *T. lanceolata*, *T. xerophila* and *T. vickeriana*, the latter name reinstated for *T.* aff. *xerophila* (Baw Baws). *Tasmannia* aff. *xerophila* (Errinundra Plateau) is here recognised as *T. xerophila* subsp. *robusta*.

Key to Victorian taxa of *Tasmannia*

1. Mature leaves usually less than 2 cm long, occasionally some to 2.5 cm long; mature berries burgundy (leaf apices obtuse, lamina coriaceous with veins obscure; stems finely tuberculate; tepals 2; forming aggregate fruit) ..... **3. T. vickeriana**
1. Mature leaves 2 cm long or more (usually longer than 3 cm); mature berries black 2

2. Leaf apices acute, lamina thin, drying olive-green; stems smooth; tepals 3 or more; mature berries solitary, marked with a distinct furrow ..... **1. T. lanceolata**

2. Leaf apices obtuse to subacute, lamina coriaceous, drying brownish rubescent; stems finely tuberculate; tepals 2; mature berries forming an aggregate fruit ..... **2. T. xerophila**

1. Tasmannia lanceolata (Poir.) A.C.Smith, *Taxon* 18: 287 (1969).

Basionym: *Winterana* (as '*Winterania*') *lanceolata* Poir., *Encycl.* 8: 799 (1808). Type[1]: '*Labillardière s.n.* in herb. Desfontaines (*non vidi*), isotype (*ex* herb. Poiret) (P)' (see Vink 1970, p. 305).

Homotypic synonym: *Drimys lanceolata* (Poir.) Baill., *Hist. Pl.* 1: 159 (1868).

Heterotypic synonyms: *Tasmannia aromatica* R.Br. *ex* DC., *Syst.* 1: 445 (1817). *Drimys aromatica* (R.Br. *ex* DC.) F. Mueller, *Pl. Indig. Col. Vict.* 1: 20 (1860). Lectotype: Van Diemens Land [Tasmania], *R. Brown s.n.* in herb. DC. (G).

Drimys xerophila ['*aromatica*'] var. *β aromatica* P. Parm., *Bull. Sc. Fr. & Belg.* 27: 226, 300 (1896). Type: Mt Bischoff, Tasmania, *collector unknown* (P).

Bushy shrub often pyramidal in shape 1.5–4 m high, dioecious, single stemmed (sometimes up to 5-stemmed), stems smooth, reddish when young, older stems brownish red. *Leaves* alternate, blades lanceolate, 4–12 cm long, 8–35 mm wide, apex acute to subacute, grass green above, pale green and glaucous below; margins of blade flat, petiole 3–6 mm long; midrib and veins prominent. *Flowers* 3–6 per inflorescence; 1 flower per bract, with the outer bracts increasing in length and width acropetally; pedicels to 20 mm long. *Male flowers* with stamens up to

1. All typification based on annotated herbarium sheets (and in accordance with Willis 1957, pp. 188–9 and Vink 1970, p. 307). Types given in Parmentier (1896) are confused and some have been omitted.

Fig. 12. Habit drawings ×0.65, some with fruit. a — *T. lanceolata,* drawn from *R.E. Raleigh 109* (MELU). b — *T. xerophila* subsp. *xerophila,* enlargement (×4) shows tuberculate stem surface; drawn from *R.E. Raleigh 16* (MELU). c — *T. xerophila* subsp. *robusta,* drawn from holotype (MEL). d — *T. vickeriana,* drawn from *R.E. Raleigh 91* (MELU).

21, sterile carpels 1 (rarely 0 or 2). *Female flowers* 5–12 mm diameter; tepals 3–5 (rarely to 9) inserted laterally to the medial line 6.0–10 mm long, 1.5–2 mm wide; stamens absent; carpels 1 (rarely 2 fused) with 10–18 ovules, grooved. *Fruits* 1 (rarely 2) per pedicel, globose and deeply furrowed, 5.5–7.0 mm in diameter, deep maroon to glossy black when mature; pedicels to 25 mm long; seeds 4–13 per berry, black. (Fig. 12a)

Specimens Collected During Study

Victoria — Bonang Hwy, Martins Ck, alt. 320 m, *R.E.Raleigh 11*; Delegate River, Gunmark Rd, *R.E.Raleigh 13, 97*; Goonmirk Rocks, Errinundra NP, alt. 1100–1200 m, *R.E.Raleigh 21–24, 108, 109*; Frosty Hollow, Errinundra NP, alt. 970–1000 m, *R.E.Raleigh 28*; Mt Ellery, Errinundra NP, alt. 1291 m, *R.E.Raleigh 45–49*; Major Mitchell Plateau, Grampians NP, alt. 1080 m), *R.E.Raleigh 50, 52–59*; Beauty Spot, Otways, *R.E. Raleigh 113, 114*; Pirianda Gardens, Dandenong Ra., *R.E.Raleigh 115.*

New South Wales — Brindebella Ra., alt. 1646 m, *M.Duretto 111–120.*

2. Tasmannia xerophila (P.Parm.[2]) M.Gray, *Contr. Herb. Austral.* no. 26: 8 (1976).

Basionym: *Drimys xerophila* P.Parm., *Bull. Sci. France Belgique* 27: 225–6, 299–300 (1896). Type: Australian Alps, Victoria/New South Wales, *F. Mueller s.n.* (P).

Bushy spreading shrub to small tree, 0.6–4 m tall, dioecious; usually with clumped growth habit the result of root suckering, stems finely tuberculate, reddish when young, older stems ochre to reddish brown. *Leaves* alternate, becoming pseudo-whorled below the resting buds; blades oblanceolate to narrowly oblanceolate, (2–)3–14 cm long, 5–30 cm wide, coriaceous to rigid, apex obtuse to subacute; dark green above, pale green glaucous below; midrib prominent to obscured and finely tuberculate; margins of blade flat to slightly recurved; petiole 2–6 cm long. *Flowers* 1–16 per inflorescence; one flower per bract, with the outer of these bracts decreasing in length and width acropetally and caducous before new leaves have matured. *Pedicels* 7–12 mm long (male flowers), 7–15 mm long (female flowers). *Male flowers* with stamens 9–30, sterile carpels 1, rarely 2. *Female flowers* 4–8 mm diameter (excluding tepals); prophylls situated in the median plane orbicular to ovate, 3–6 mm long, tepals mostly 2, very rarely 3 or 4, inserted alternate to the prophylls, 5–7 mm long, 1–2 mm wide; stamenoids absent, carpels 1–8 (rarely to 11), with 2–9 ovules. *Fruits* 2–6 (rarely to 11) per pedicel, globose to short ovoid, 6.5–11 mm long, 5–10 mm broad, glossy black to glaucous at maturity, flesh near skin dark purple, white towards centre; pedicels 5.5–14 mm long; seeds 2–7 per berry, 2.5–3.5 mm long, 2–2.5 mm broad, black; aborted ovules pink.

Key to the subspecies

1. Shrub to 2.5 m tall; leaves (2–)3–9 cm long, 5–17 mm wide ..... **2a.** subsp. **xerophila**
1. Shrub to small tree, 2.5–4 m tall; leaves 7–14 cm long, 20–30 mm wide; Goonmirk Rocks and Mt Ellery only ..... **2b.** subsp. **robusta**

2. Parmentier (1896) treats *Drimys aromatica* in part as synonymous with *D. xerophila* but does not include the type of *D. aromatica* in *D. xerophila*, nor does he list *D. aromatica* as a synonym of *D. xerophila*. He does, however, list *D. xerophila* ['*aromatica*'] var. *β aromatica* (with a different type to *D. aromatica*) as a synonym of *D. xerophila*. This variety is referable to *D. lanceolata* and what Parmentier labelled (in herbarium) as typical *D. aromatica* is referable to *D. xerophila* (Willis 1957). In spite of this confusion (and the fact that in the sense of Parmentier *D. aromatica* is synonymous with *D. xerophila*), *D. xerophila* does not 'definitely include the holotype' (see ICBN, Art. 63.1 & 63.2) of *D. aromatica* and is therefore legitimate.

2a. Tasmania xerophila subsp. **xerophila**

HETEROTYPIC (INFORMAL) SYNONYM: *Drimys piperita* Hook. f. 'entity 39. *xerophila*' Vickery, *Blumea* 18: 349 (1970).

MISAPPLIED NAME: *Drimys aromatica sensu* P.Parm. *Bull. Sci. France Belgique* 27: 298 (1896), *non* (R.Br. *ex* DC.) F.Muell. SPECIMEN EXAMINED: Australian Alps, Victoria/New South Wales, *C.Walter s.n.* (P) (see Willis 1957, p. 189).

Small shrub to 2.5 m high. *Leaves* (2–)3–9 cm long, 7–17 mm wide. *Flowers* 1–16 per inflorescence. *Female flowers* with carpels 2–6 (rarely to 11) and ovules 2–9 per carpel. (Fig. 12b)

SPECIMENS COLLECTED DURING STUDY

Victoria — Mt Buffalo NP, alt. 1400 m, *R.E.Raleigh 1–10, 78–80, 86*; Delegate R., Gunmark Rd, *R.E.Raleigh 12, 14–16, 96*; Frosty Hollow, Errinundra NP, alt. 970–1000 m, *R.E.Raleigh 29–38, 98–102*; Falls Creek, alt 1700 m, *N.G.Walsh 3288, 3289*; Chinamans Flat beside Hutchinsons Creek, alt. 880 m), *K.E.Wilson 320.*

New South Wales — Mt Selwyn, alt. 1300 m, *R.E.Raleigh 72–77*; 1 km SW Tumut Pond, alt. 1300 m), *R.E.Raleigh 81–84*; Beside road, 10 km from Cabramurra, *R.E.Raleigh 85*; Thredbo R. near Thredbo village, Mt Kosciusko, alt. 1250 m), *P.Y.Ladiges 1422–1425*; Dead Horse Gap, Mt Kosciusko, alt. 1500 m), *P.Y.Ladiges 1426–1428*; Alpine Way, 2 km WSW Dead Horse Gap, Mt Kosciusko, alt. 1500 m), *P.Y.Ladiges 1429–1431.*

2b. Tasmannia xerophila subsp. **robusta** Raleigh *subsp. nov.*

A varietate typica habitu altiore (2.5–4 m), foliis longioribus (7–14 cm) et latioribus (20–30 mm) differt.

TYPUS: Goonmirk Rocks, East Gippsland, Victoria, 8 Jan. 1992, *R.Raleigh 103.* HOLOTYPUS: MEL 2014065 (female plant); ISOTYPUS: MELU (female plant).

Shrub to small tree, 2.5–4 m tall. Leaves 7–14 cm long, 20–30 mm wide, with petioles 3.5–6 mm long. *Flowers* 5–8 per inflorescence. *Female flowers* with carpels 1–8, ovules 3–7 per carpel. (Fig. 12c)

SPECIMENS COLLECTED DURING STUDY

Victoria — Goonmirk Rocks, Errinundra NP, alt. 1100–1200 m), *R.E.Raleigh 18–20, 25, 26, 26a, 27, 27a, 103–107*; Mt Ellery, Errinundra NP, alt. 1291 m, *R.E.Raleigh 39–44.*

3. Tasmannia vickeriana (A.C.Smith) A.C.Smith, *Taxon* 18: 287 (1969).

BASIONYM: *Drimys vickeriana* A.C.Smith, *J. Arnold Arb.* 24: 130 (1943). TYPE: Mt Mueller, Victoria, *Luehmann & French s.n.* (A).

HETEROTYPIC SYNONYMS: *Drimys xerophila* ['*aromatica*'] var. *alpina* F.Muell. *ex* P.Parm., *Bull. Sci. France Belgique* 27: 226, 300 (1896). TYPE: Baw Baw Ranges, Victoria, *F. Mueller s.n.* (P).

Drimys lanceolata var. *parvifolia* Vickery, *Proc. Linn. Soc. New South Wales* 62: 83 (1937). TYPE: Upper Yarra, Victoria, *Staer s.n.* (NSW).

Plants as for *T. xerophila*, but 0.5–1.2 m in height. *Leaves* compact, 0.8–2(–2.5) cm long, 2–6 mm broad, apex obtuse, veins obscured, petiole 1.5–3.5 mm long. *Flowers* 1–15 per inflorescence, pedicels 3–10 mm long. *Male flowers* with stamens 8–26, sterile carpels 1 (rarely 2). *Female flowers* with stamens absent, carpels 1–6, with 3–6 ovules. *Fruit* 1–3 (rarely 4) per pedicel, globose to short ovoid, 6–12 mm long, 6–10 mm broad, burgundy at maturity, flesh near skin pale burgundy, white towards centre; pedicels 4–11 mm long; seeds 2–5 per berry, 2–3 mm long, 1.5–2 mm broad, black; aborted ovules white. (Fig. 12d)

SPECIMENS COLLECTED DURING STUDY

Victoria — Mt Baw Baw: Edge of car park near Mt Baw Baw ski village, alt. 1563 m, *R.E.Raleigh 90*; 1 km below Mt Baw Baw ski village, alt. 1500 m, *R.E.Raleigh 91–95*; Mt Baw Baw ski village, alt. 1563 m, *R.E.Raleigh 112*; Mt Baw Baw ski village, alt. 1563 m, *P.Y.Ladiges 1403–1412.*

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BOOK REVIEW

Acacias of Southeast Australia. Terry Tame. Published by Kangaroo Press (Kenthurst, N.S.W.). 1992. 206 pages. ISBN 0 86417 475 6. Price $AU45.00.

This excellent publication is a source-book of information for 230 species of *Acacia* which occur in southeastern Australia. Almost one quarter of the Australian *Acacia* flora is covered, including all species occurring in New South Wales and Victoria as well as many that extend to the adjoining states of Tasmania, Queensland and South Australia. The book provides keys, descriptions, illustrations, photographs and other useful information and as such it is a welcome contribution to the growing literature on this very large and important genus.

The individual species descriptions are informative, botanically accurate and demonstrate that the author has a sound appreciation of the critical characters. This level of taxonomic understanding is accentuated by the self-executed line drawings that accompany each description. Besides showing general habit, pod and seed features these illustrations commonly show enlargements of phyllode nervature and flowers; these two (cryptic) features are fundamentally important to discriminate taxa with confidence. Species distributions and habitat preferences within southeastern Australia are described; further information is given by a map which depicts the Australia-wide range of each species. Other information provided for each species includes its place of publication, the derivation of the species name, its common name, details regarding who collected the type specimen and from where, and the flowering period. The general notes included at the end of each species account are particularly informative. These contain discussions on affinities, distinctive features of the plant, remarks on cultivation and aspects of biology of the plant. Colour photographs are included in a section at the beginning of the book, with seven or eight individual images per page.

There are three short introductory chapters. Chapter 1 is devoted principally to a description of the individual parts of the *Acacia* plant and the terms used to describe these. This narrative, and its accompanying two figures, introduce the reader to most of the terminology that is used elsewhere in the book. Included in the chapter on cultivation (Chapter 2) is an useful categorization of the species according to their stature (e.g. shrub vs tree) and climatic zones in which they occur (e.g. cool-dry, warm-humid, cool-humid, etc.). Chapter 3 is a scholarly, synoptic account of the evolutionary history and classification of the genus.

Two keys are provided, one to individual species and the other, a pictorial key, to major groups of species; both keys seem to work reasonably well, however, they were not tested extensively. My major criticism of this book is the lay-out of the key to species: because the leads are not indented it is very difficult to find the second couplet. This can be particularly troublesome when keying species that are placed towards the end of the key. Another (slight) inconvenience is that the index to names refers the reader to species numbers rather than to page numbers.

The strength of this work lies in its thoroughness, pleasing presentation and comprehensive coverage. It is a truly professional treatment of a particularly complex group of species. At a recommended retail price of $AU45.00 it represents good value and is a must for all lovers of this, Australia's largest genus of flowering plants.

BRUCE MASLIN

BOOK REVIEW

Identifying the weeds around you — revised second edition. E.M. Felfoldi. Published by Inkata Press, North Ryde. 1993. 303 pp. including 161 line illustrations (92 full-page) and 14 composite full page half-tones. ISBN 0 409307 49 1 (Soft cover). Price $AU39.95.

Although the level of interest in agricultural weeds has not increased as dramatically in recent years as it has for weeds of natural or semi-natural vegetation, there continues to be a steady stream of publications concerning agricultural weeds. Very few of those publications readily available in Australia, however, contain detailed descriptions and/or illustrations of seeds or fruits. This has been recognised by the author, a former officer at the Victorian Seed Testing Station, Burnley, with 27 years experience in seed identification, who has endeavoured in this book to provide a reference work on the identification of weed seeds. A quick perusal of the book shows that the subject matter is not confined to seed identification, and that the title of the book is not completely consistent with its stated aim.

The book begins with a brief introductory section on seed identification, followed by notes on the 'seed' morphology of Compositae, Cruciferae, Gramineae, Leguminosae and Polygonaceae (the term 'seed' being used throughout the book in the functional sense). This is followed by 13 full-page black and white composite plates of the seeds and/or fruits of 65 species. The subject of each photograph is portrayed in a magnified form, the actual size being conveyed by a life-sized silhouette set in the corner of the plate. Much of the remainder of the book is taken up with more specific information about the 65 species photographed in the previous section, under the sectional heading 'seed descriptions'. The species are arranged alphabetically within each family, the families (20 in all) being arranged alphabetically irrespective of whether monocotyledon or dicotyledon. The best represented families are Compositae (25 spp.), Gramineae and Cruciferae (6 spp. each), Boraginaceae (5 spp.) and Polygonaceae (4 spp.). Information given under each species entry includes synonyms, common names, a description of the fruit, seed and whole plant, flowering period, significance, whether known to be poisonous, occurrence in various crops and mechanical control methods for agricultural situations. Line illustrations of the seeds and/or fruit, habit and sometimes other diagnostic features are presented for each species.

Following the section dealing with the species there are two short lists, one giving the approximate number of seeds produced per plant for 19 species and the other giving longevity of seeds for 24 species. The book has a large glossary consisting of 28 pages of text and 23 pages of illustrations, and a comparatively small (2 page) list of references. Both common names and botanical names are given in the index and cross referenced to the seed photographs and the species descriptions.

Undoubtedly the main features of the book are the fruit and seed descriptions, and photos and illustrations of these structures. The fruit and seed descriptions are generally very good, though in some cases the terminology is not always current, e.g. for Boraginaceae the terms nutlets or fruitlets are used but the generally accepted term is mericarps. Where dispersal structures vary within a species the book describes and illustrates the various forms, such as the disc and ray cypselas in Compositae. The inclusion of a separate section of 'seed' photos is also very useful for quick reference.

The book is written principally for laypeople and uses botanical terminology in an educative way. If botanical terms are used they are followed by an explanation in brackets and *vica versa*. This format may be useful for laypeople but is unnecessarily cumbersome for anyone with knowledge of botanical terminology, especially considering that many of the botanic terms given in the text are also explained in the over-generous glossary.

One of the major omissions of the book is that the preface fails to be explicit enough about various aspects of the book. No statement is made about the regional coverage of the book. I assumed the book's coverage to be strictly Victorian because of the involvement of the Victorian Department of Agriculture but this is apparently not the case as it includes two species that do not occur in Victoria, *viz. Ambrosia artemisiifolia* and *Sonchus arvensis*. Knowledge of the regional coverage of a book is critical for making a decision about its potential usefulness in identifying an unknown specimen. The species selection criteria are also unclear. About two-thirds of species included appear to be noxious weeds somewhere in Australia, but the book also includes species such as *Buglossoides arvensis*, which are not generally considered as economically significant, and even *Sonchus arvensis*, which is exceptionally rare and perhaps now extinct in Australia. Similarly, there is no statement given to explain why the seeds of Compositae, Cruciferae, Gramineae, Leguminosae and Polygonaceae are described in detail rather than other families. The author also neglects to spell out the limitations of the book, a major oversight considering the very small coverage of species.

The introductory section on seed identification is too brief and has insufficient detail on the range of morphological characters that are useful for seed and fruit identification. Mention of the various terms sometimes used for a sexual propagule and a discussion of the importance of anatomical characters in seed identification would also have been useful.

The section entitled 'seed descriptions' contains far more information than descriptions of seed, but surprisingly omits or inconsistently provides information on fruiting period, time of germination, distribution and country of origin. Generally, unless more than one species of a genus is included in the book comparisons are not made with similar species. In some instances the distinction between the fruit and seed in a particular species could have been more clearly described by introducing the term dispersal unit. The dispersal unit is sometimes mentioned for a species (though not by that name) but it is hidden away under an unexpected heading. Seedlings of slightly over half of the species in the book are illustrated but not described, which is unexpected considering the comment in preface concerning the importance of identifying weeds at an early stage in their development to maximise the effectiveness of chemical control. The species illustrations are generally satisfactory, but some, such as the one of *Verbascum thapsis*, have insufficient detail to be of much assistance with identification. The glossary illustrations are generally just satisfactory, but the labelling is occasionally misleading or incorrect.

With the exception of some family names and a small number of very recent changes to species, the nomenclature used in the book is current. The decision to continue using outdated family names from the first edition (with current family names in parentheses below) had the obvious advantage of overcoming the need to rearrange text for the second edition, but the decision is likely to disappoint purists. For *Oxalis corniculata* mention should have been made of its segregation into several introduced and indigenous species. The inclusion of nomenclatural synonyms is useful, but citing six for *Silene vulgaris* is a bit excessive for the style of book.

There is room for improvement in the layout of the book as there are a considerable number of blank half-pages, and the definition between adjacent sections could be clearer. The latter could have been rectified by enlarging the main sectional headings so that they are more readily distinguished from subheadings. A table of species listed in families could have been included near the beginning of the book to assist readers with the subsequent layout of species. The readability of the text could have been improved by placing botanical names in italics, and synonyms in non-bold type.

The first edition of the book apparently sold out over a short period. The second edition, which is virtually identical to the first except for minor nomen-

clatural changes, has more competition to contend with than its earlier 1985 edition. With the exception of information on seeds and fruits, most species included in Felfoldi's book are treated in a more comprehensive or useful manner in other recent publications. Such books include those published by Inkata, *viz. Crop Weeds*, *Noxious weeds of Australia* and *Weeds. An illustrated botanic guide to the weeds of Australia.*

Considering the author's knowledge and experience in the field of seed identification it is unfortunate that she hasn't channelled her talents into producing a book focusing solely on propagule identication of a larger range of taxa. Undoubtedly she has a wealth of useful tips on a wide range of families and genera, but not enough is passed on to the reader. The book's simple terminology and copious illustrations may be appealing to students, graziers, farmers and people involved in the seed industry, but due to the limited species coverage and somewhat cumbersome descriptions I suspect the book is unlikely to be used to any great extent by botanists.

D.E. ALBRECHT

CONTENTS

Brown Prior Anderson Pty Ltd, Burwood, Victoria