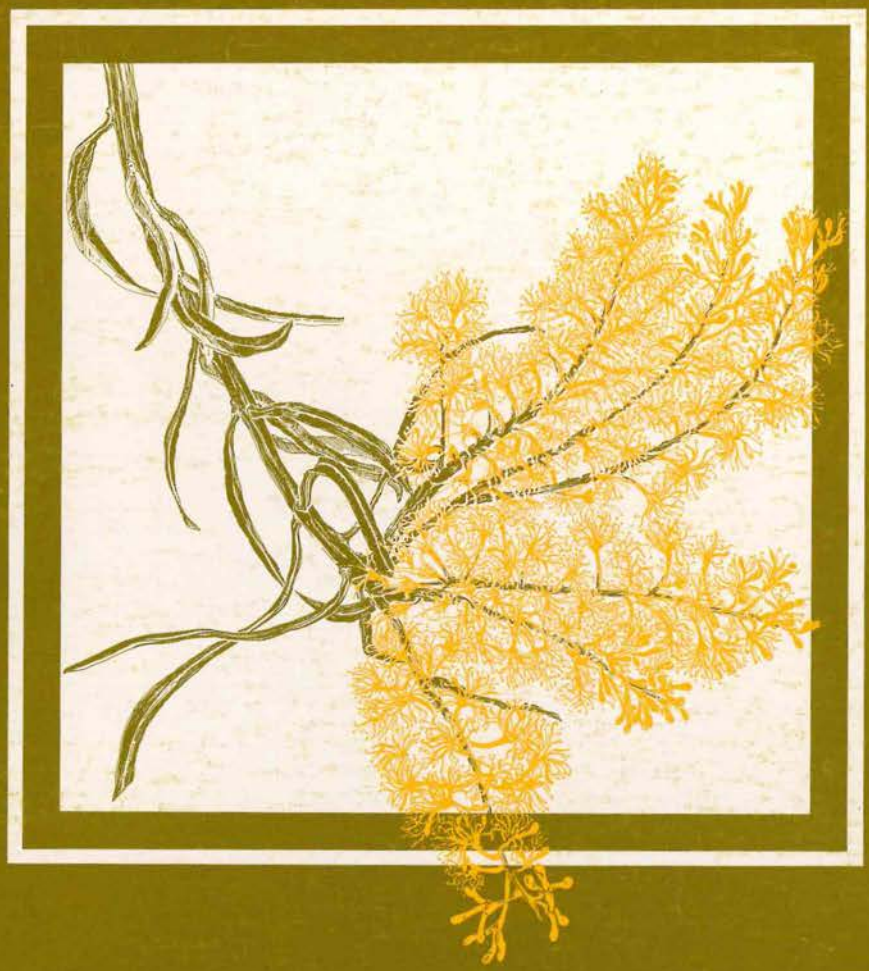


NUYTSIA

Volume 7 ◆ Number 1
1989

WESTERN AUSTRALIAN HERBARIUM
DEPARTMENT OF CONSERVATION
AND LAND MANAGEMENT

♦ CONTENTS ♦

ISSN 0085-4417

NUYTSIA

VOLUME 7 NUMBER 1
1989

WESTERN AUSTRALIAN HERBARIUM,
DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT,
COMO, WESTERN AUSTRALIA

CONTENTS

Western Australian Herbarium,
Department of Conservation and Land Management,
P.O. Box 104, Como, Western Australia 6152

Hakea tamminensis (Proteaceae): a case of mistaken identity

W.R. Barker

State Herbarium of South Australia, Botanic Gardens of Adelaide,
North Terrace, Adelaide, South Australia 5000

Abstract

Barker, W.R. *Hakea tamminensis* (Proteaceae): a case of mistaken identity. Nuytsia 7(1): 1-3 (1989). *Hakea tamminensis*, described by C.A. Gardner from Tammin, Western Australia, is synonymous with *H. gibbosa* (Sm.) Cav., a species from the Sydney region of New South Wales. Possible reasons for Gardner's error are discussed.

My participation in an ongoing revision of *Hakea* with Mrs R.M. Barker and Dr L. Haegi has provided the opportunity of examining the original specimen upon which Gardner (1964) based his new species *H. tamminensis* which he reported had been collected by him from gravelly sand-heath near Tammin in the Avon district of Western Australia.

The holotype of *H. tamminensis*, on loan from the Western Australian Herbarium (PERTH), is undoubtedly a specimen of *H. gibbosa* (Sm.) Cav., a species confined to the near coastal region in and surrounding the city of Sydney, New South Wales.

The type matches *H. gibbosa* in all features, some of which are unusual in *Hakea*. One such feature is the persistent long-villous tomentum on the branchlets and leaves. Another is the fruit, which in *H. gibbosa* is unique amongst species of *Hakea* with ovoid to broad-ovoid fruits of this size (c. 3 cm long) by the transverse orientation of the seed within the fruit body. The flowers on Gardner's specimen are identical to those of *H. gibbosa* in the size, shape and orientation of the tepals, anthers and pistil.

But for a reference to flower colour as purple or red ('purpureis vel rubra'), the type description also matches well the characteristics of *H. gibbosa* and, in particular, the holotype of *H. tamminensis*, including reference to a villous tomentum on the branchlets and a clearly oblique fruit. *H. gibbosa* differs from the description in its cream-yellow flowers, but they do turn dark-brown on drying, clearly causing Gardner to confuse its colour.

No material from Western Australia has been seen which remotely matches the original specimen of *H. tamminensis*. The two specimens seen which have been determined as this species are from the herbarium of the Australian National Botanic Gardens, Canberra (CBG) (*R.W. Purdie* 5305, 24 Sept. 1983, 17 km S of Tammin (Charles Gardner Flora Reserve)) and from the Western Australian Herbarium (PERTH) (*P. Roberts* 390, 20 Sept. 1984, Charles Gardner Flora Reserve, South Tammin). Both are *H. strumosa* Meissner (Mrs R.M. Barker, pers. comm. June 1988).

It has come to my attention from various sources that the Tammin region has been intermittently visited in order to rediscover *H. tamminensis*. In the absence of authentic material of the species from Western Australia despite these searches, it seems extremely unlikely that the species represents a distant outlier of *H. gibbosa*. Indeed, the Sydney region is very different bioclimatically compared with the general region of Tammin (cf. Nix 1982). Accordingly, it seems certain that the species was described as a result of an unfortunate mislabelling by Gardner of a specimen of *H. gibbosa* from the Sydney region or possibly from plants cultivated in wetter parts of south-west Western Australia. Confusion in the information on labels of C.A. Gardner is known in at least one other instance; Haegi (1983) cites the case of Gardner's erroneous numbering of the type of *Anthocercis aromatica* C. Gardner [= *Symonanthus aromaticus* (C. Gardner) Haegi].

It is fortunate that the creation of the Charles Gardner Flora Reserve provided for "the protection of indigenous flora" and not specifically for *H. tamminensis* (Dr S.D. Hopper, pers. comm. June 1988). It was founded on 1 March 1929, well before the *H. tamminensis* issue arose.

How did Gardner commit his error of describing this discordant specimen as new? Neither Gardner's notes nor his manuscript "Flora of Western Australia" treatment for *Hakea* answer this (Dr N.G. Marchant, pers. comm. October 1988). Did he take the flower colour solely from his impression of his dried type or did he confuse it with red-flowered *H. strumosa* which he had collected in flower in sand heaths at Tammin in September 1936 (*Gardner* s.n., PERTH) and on 7 September 1945 (*Gardner* 7651, PERTH)? In both specimens of *H. strumosa* fruits were absent and he incorrectly identified the material as or possibly as *H. commutata* F. Muell. A fruiting specimen of *H. strumosa* from Mt Madden (*Gardner* 12873, PERTH) was correctly determined. It is possible that Gardner long had these problem plants from Tammin in mind and, when he came across fruiting material which he believed to have come from the same provenance, he realised it was a species he had not seen elsewhere. Unfortunately, since his herbarium was very much a regional herbarium, he had no facility to compare his specimen with representative material of *Hakea* species from the eastern States. The type of *H. tamminensis* to this day represents the only specimen of *H. gibbosa* in the Western Australian Herbarium.

Acknowledgements

The Western Australian Herbarium (PERTH) is thanked for the loan of the type of *H. tamminensis*, as are the many other herbaria whose loans have made this assessment possible. I am grateful to Mr J.D. Briggs for drawing my attention to problems concerning the conservation status of the species and the consequent need for this note, and to Dr N.G. Marchant and Dr S.D. Hopper for providing the information requested. Mrs R.M. Barker, Dr L. Haegi and Mr N.S. Lander provided helpful criticism and comments. Miss Tina Eadsforth typed the manuscript.

References

Gardner, C.A. (1964). Contributiones Florae Australiae Occidentalis XIII. J. & Proc. Roy. Soc. Western Australia 47: 54-64.

Haegi, L. (1983). "Systematic and Evolutionary Studies in the Australian Solanaceae." (Ph.D. dissertation: The Flinders University of South Australia, Adelaide.)

Nix, H.A. (1982). Environmental determinants of biogeography and evolution in Terra Australis. *In* W.R. Barker & P.J.M. Greenslade (eds). "Evolution of the Flora and Fauna of Arid Australia", pp. 47-66. (Peacock Publications: Frewville, now Norwood.)

A new series, *Rigentes*, of *Eucalyptus* (Myrtaceae) comprising three new species endemic to Western Australia

M.I.H. Brooker[1] and S.D. Hopper[2]

[1]CSIRO Division of Plant Industry, G.P.O. Box 1600, Canberra, Australian Capital Territory 2601
[2]Department of Conservation and Land Management, W.A. Wildlife Research Centre, P.O. Box 51, Wanneroo, Western Australia 6065

Abstract

Brooker, M.I.H. and Hopper, S.D. A new series, *Rigentes*, of *Eucalyptus* (Myrtaceae) comprising three new species endemic to Western Australia. Nuytsia 7(1) : 5-13 (1989). A new taxonomic series, *Rigentes*, endemic to Western Australia is described. It comprises *Eucalyptus rigens* from north-west, north and north-east of Esperance, *E. litorea* from near Israelite Bay, both occurring around salt lakes, and *E. famelica* from east of Hopetoun, a species of subcoastal swamps. The series belongs in the informal *Eucalyptus* sect. *Dumaria* of Pryor & Johnson and is characterised by brown, somewhat flat to pyramidal seed, with the ventral side ribbed and dorsal side shallowly pitted.

Introduction

Many new species of *Eucalyptus* have been discovered in Western Australia in the last 30 years. This has been due to the intensive study of the remaining vegetation in the newly developed agricultural lands and to the botanical exploration of uncleared country. Access to much of the latter has been made possible by the extension of roads into virgin marginal scrub for development of potential farmland.

The first of the currently treated new species to be discovered was *E. litorea*, which was found by R.D. Royce in 1960 and is only known from the shores and near vicinity of a few coastal salt lakes in the remote south-east of the State near Israelite Bay. The second species, *E. rigens*, was discovered in 1970 east of Scadden, but has since been found to be widespread around the numerous salt lakes in the area. The most recently discovered of these species is *E. famelica*, which is known from only two sites in subcoastal swamps east of Hopetoun. Because of its rarity and occurrence in potentially usable agricultural land, *E. famelica* may be threatened.

Taxonomy in the informal *Eucalyptus* sect. *Dumaria* Pryor & Johnson

The new *Eucalyptus* ser. *Rigentes*, characterized by reniform cotyledons, inflexed stamens and versatile anthers, belongs in the very large informal "*E.* sect. *Dumaria*" (Pryor & Johnson 1971). *E.* sect. *Dumaria* is based on the *E.* ser. *Dumosae* Blakely which was broken up by Blakely (1934), with a limited amount of material at his disposal and even more limited field experience, into four subseries based on habit and bud and fruit morphology. The deficiencies in this classification were pointed out by Carr & Carr (1969) and Brooker (1971) who both recognised four groups of species based on seed characters. These groups were not in agreement with Blakely's and were given informal recognition by Pryor & Johnson (1971) (see Key below).

Brooker (1979) later informally described a fifth series also based on seed characters This fifth series, *E.* ser. *Merrickianae*, comprised *E. leptocalyx* Blakely, *E. platycorys* Maiden & Blakely, and *E. scyphocalyx* (F. Muell. ex Benth.) Maiden & Blakely (with which *E. merrickiae* Maiden & Blakely was then believed to be conspecific). Following the rediscovery in the field of typical *E. merrickiae* and a study of its seed, it is now realised that both it and a later described species, *E. deflexa* Brooker, have similar seed (see Key following) which is clearly different from the seed of the other series. These two species themselves differ in stature, bark type, inflorescence deflection and flower bud numbers. They are here recognised as two monotypic series, namely E. ser. *Merrickianae* and *E.* ser. *Deflexae* (see Key below). The species eliminated from the now monotypic *E.* series *Merrickianae*, namely *E. leptocalyx*, *E. platycorys* and *E. scyphocalyx*, make up the new informal *E.* ser. *Leptocalyces* (see Key below).

A sixth series, described here as *E.* ser. *Rigentes*, is made up of three undescribed species. They have seed different from the other series in the informal *E.* sect. *Dumaria*. Of these series, the *Incrassatae* are closest in bud, fruit and seed morphology to the *Rigentes* but can always be distinguished by the black rather than brown seed. The various groups in *E.* sect. *Dumaria* may be distinguished as follows.

Key to Series in the Informal *Eucalyptus* sect. *Dumaria*

1. Seed lustrous, ruby red ..... *Dumosae*[1]
1. Seed otherwise
    2. Seed prominently ribbed on underside
        3. Seed black ..... *Incrassatae*[1]
        3. Seed brown ..... *Rigentes*
    2. Seed not prominently ribbed on underside
        4. Seed pitted on dorsal side, toothed around edge
            5. Pits with entire grey-brown walls ..... *Torquatae*[1]
            5. Pits with collapsed hyaline or white walls
                6. Flower buds pendulous, in 7s ..... *Deflexae*[2]
                6. Flower buds erect, in 3s ..... *Merrickianae*

4. Seed not pitted on dorsal side, not toothed around edge

7. Seed brown, compressed-ovoid, distinctly reticulate ..... *Ovulares*[3]

7. Seed grey-black, flattened, scurfy, shallowly reticulate ..... *Leptocalyces*[2]

[1]The informal groups of Pryor & Johnson (1971). [2]Informal series of L.A.S. Johnson (unpublished). [3]*E.* ser. *Ovulares* Brooker, based on *E.* subser. *Ovularinae* Pryor & Johnson (informal).

The following taxonomic treatment is based on extensive field surveys, examination of herbarium specimens, bud dissections, seed morphology, and glasshouse-grown seedlings.

Series *Rigentes*

Eucalyptus series **Rigentes** Brooker & Hopper, ser. nov.

Frutices "mallees" ad 6 m alti cortice laevi vel aspero; lignotuberum formantes. Medulla ramulorum glandibus pallentibus. Cotyledones reniformes. Folia plantularum petiolata decussata, remanentia opposita ad nodis paucis, tum apparenter alternantia, ovata, 5-13 x 3-5 cm. Folia adulta hebetia vel nitentia, reticulo denso, glandulis paucis. Inflorescentiae axillares, 3,7 vel 11-floribus. Alabastra bi-operculata. Filamenta staminum inflexa; antherae versatiles, dorsifixae, dehiscentes rimis longitudinalibus. Ovula verticaliter 4-seriata. Semina brunnea aliquantum plana vel pyramidalia, hilo ventrali et testa foveata non-profunda.

Typus: *Eucalyptus rigens* Brooker & Hopper

Low or medium-sized *mallees* to 6 m tall with smooth or rough bark; lignotuberous. *Pith* of branchlets with pale glands. *Cotyledons* reniform. *Leaves of seedlings* petiolate, decussate, remaining opposite for few nodes, then apparently alternating, ovate, 5-13 x 3-5 cm. *Adult leaves* dull or glossy; reticulum dense; oil glands few. *Inflorescences* axillary, with 3, 7 or 11 flowers. *Flower buds* bi-operculate. *Staminal filaments* inflexed; anthers versatile, dorsifixed, opening by longitudinal slits. *Ovules* in 4 vertical rows, hemitropous. *Seed* brown, somewhat flat to pyramidal, with ventral side ribbed and dorsal side shallowly pitted.

Etymology. The name is derived from the most abundantly occurring of the three species.

Notes. The three species occur on sites associated with water, one species being near littoral salt lakes, another near inland salt lakes and the third from subcoastal swamps. The three species have potential in reclamation of salt-affected land and are likely to be suitable for windbreaks in coastal areas.

Key to the Species of the *Eucalyptus* ser. *Rigentes*

1. Inflorescences 3-flowered ..... 1. *E. rigens*

1. Inflorescences 7-flowered

2. Bark rough over whole of stems; plants growing around salt lakes ..... 2. *E. litorea*

2. Bark smooth or in tall specimens, rough, thin, to 0.5 m only; plants growing in subcoastal swamps ..... 3. *E. famelica*

1. **Eucalyptus rigens** Brooker & Hopper, sp. nov. (Figure 1)

Frutex "mallee" erectus vel fere prostratus, cortice laevi. Folia adulta rigida hebetia saepe erecta. Inflorescentiae 3-florae pedunculis parvissimis. Fructus sessiles, obconici vel cupulati.

Typus: Truslove Nature Reserve, 9 April 1983, *M.I.H. Brooker* 8070 & *S.D. Hopper* (holo: PERTH; iso: CANB, NSW).

A stout effuse *mallee* to 4 m tall or almost prostrate shrub. *Bark* smooth, grey over white. *Juvenile leaves* to 13 x 5 cm. *Adult leaves* alternating, petiolate, lanceolate, to 11 x 2.5 cm, concolorous, dull or glossy, grey-green to light green, very firm and stiff, often erect. *Inflorescences* axillary, unbranched, 3-flowered; peduncles strongly flattened, to 0.5 cm long, widening at the top. *Flower buds* sessile or very shortly pedicellate, ovoid, longitudinally ribbed, to 1.4 x 0.9 cm; inner operculum conical to slightly beaked. *Flowers* not seen. *Ovary* 3 or 4-locular. *Fruit* sessile, obconical to cupular, ribbed, to 1.3 x 1.3 cm; rim thick; disc descending obliquely; valves to rim level or slightly exserted.

Other specimens examined. WESTERN AUSTRALIA: c. 20 miles E of Scadden, 8 August 1970, *M.I.H. Brooker* 2757 (CANB, PERTH); 24 km from Mt Burdett towards Mt Ney, 33° 26' S, 122° 13' E, 11 Nov. 1981, *M.I.H. Brooker* 7088 (CANB, NSW, PERTH); 1.3 km S of Browning's road, N of Gibson Soak, 33° 38' S, 121° 49' E, 7 Nov. 1986, *M.I.H. Brooker* 9519 (CANB, MEL, NSW, PERTH); "near salt lake", 33° 28' S, 122° 21' E, 9 Aug. 1980, *A.S. George* 15938 (PERTH); 17 km S of Mt Ridley on Dempster Road, 22 Jan. 1981, *G.J. Keighery* 3695 (PERTH); 9 km E of Scadden on Norwoods Road, 26 May 1982, *P. van der Moezel* 15 (PERTH); 21 km NE of Scadden on Lignite Road, 18 Aug. 1982, *P. van der Moezel* 130 (PERTH).

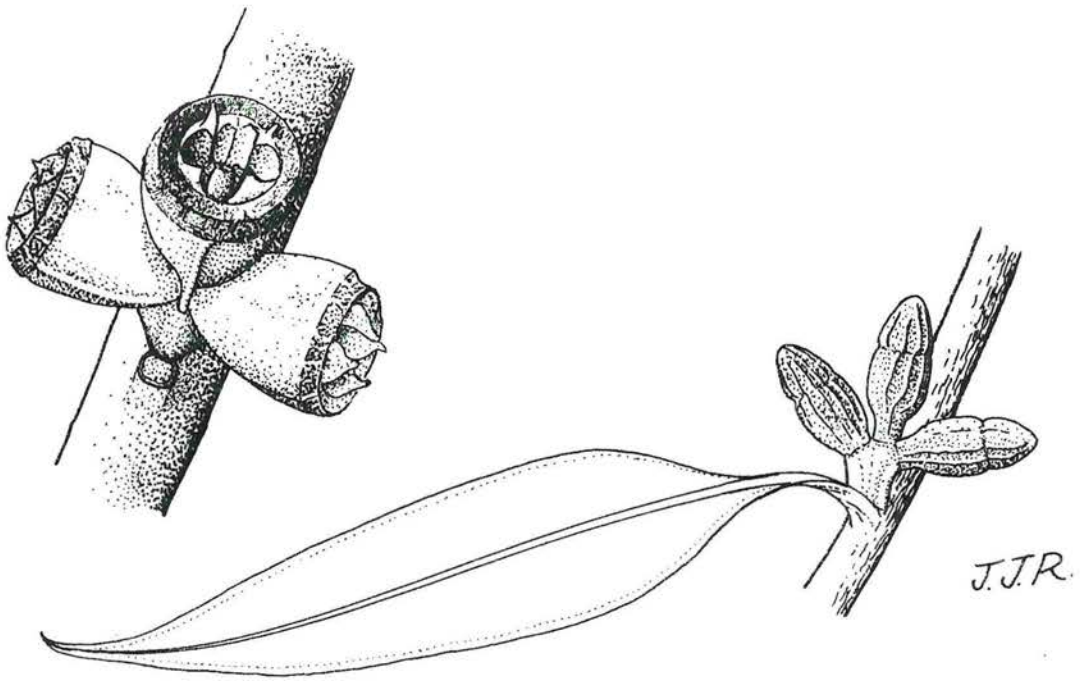


Figure 1. Leaf, flower buds and fruits of *E. rigens* (*A.S. George* 15938).

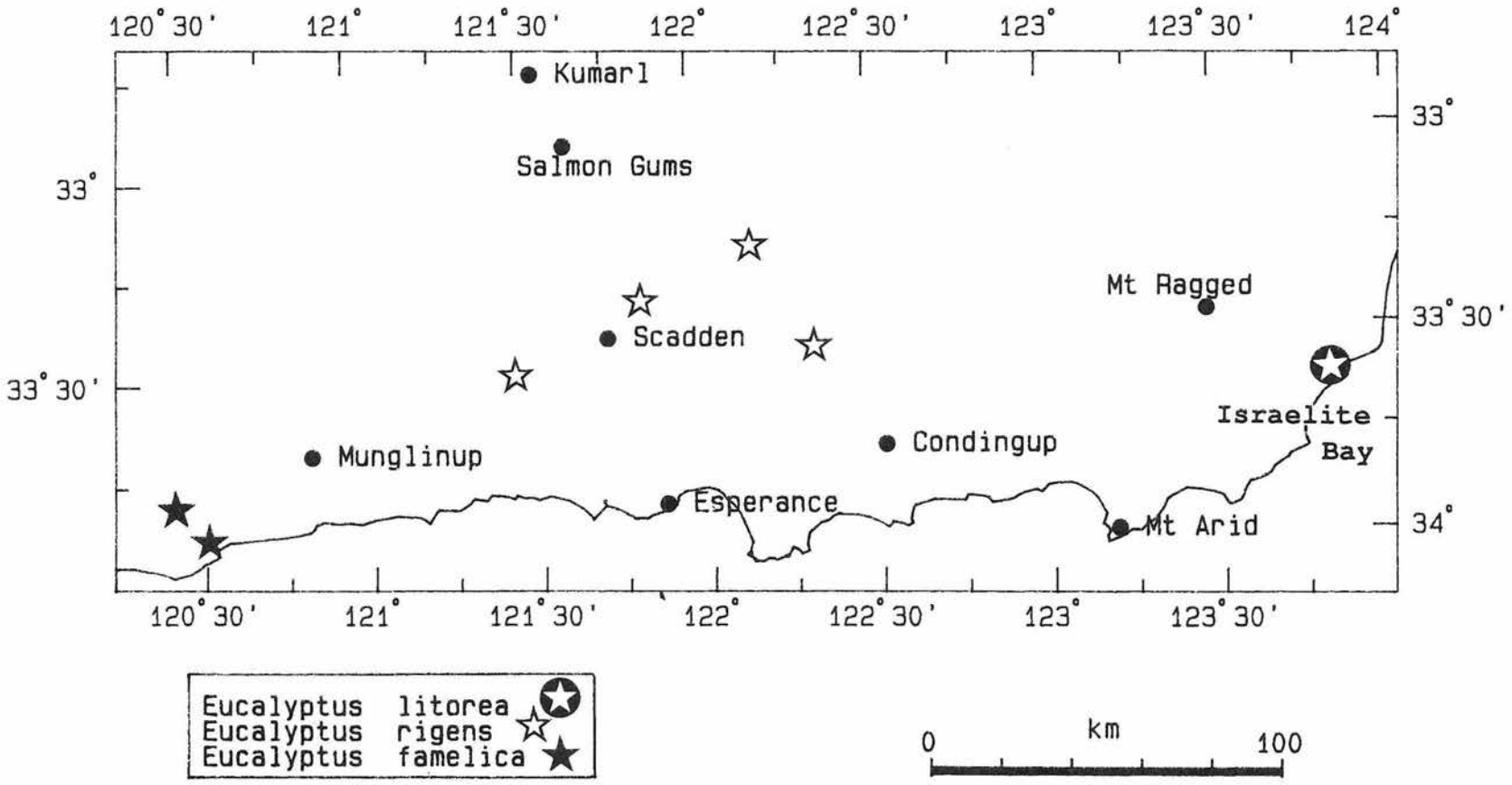


Figure 2. Distributions of *E. litorea*, *E. rigens* and *E. famelica* in the Esperance region of south-western Australia.

Distribution and habitat. Confined to the margins of salt lakes north-west, north and north-east of Esperance, Western Australia, usually on sand in mallee shrublands. Sometimes associated with *E. halophila* Carr & Carr. Figure 2.

Flowering period. ? August.

Etymology. Named from the Latin *rigens* (stiff, rigid), alluding to the rigid erect leaves.

Notes. Easily recognised in the Scadden area by its proximity to many of the salt lakes where it occurs as a dense-canopied, effuse shrub with stiff erect leaves. *E. rigens* differs from *E. litorea* and *E. famelica* in its predominantly effuse habit, three-flowered inflorescences and the larger buds and fruits.

2. **Eucalyptus litorea** Brooker & Hopper, sp. nov. (Figure 3)

Frutex "mallee" *Eucalypto rigenti* affinis a qua habitu diffusiore erecto altiore, cortice aspero, foliis plantularum parvioribus, foliis adultis tenuioribus, inflorescentiis 7-floribus, alabastris fructibusque parvioribus differt.

Typus: N side of salt lake SW of settlement, Israelite Bay, 6 Sept. 1984, *M.I.H. Brooker* 8667 (holo: PERTH; iso: CANB, NSW).

An erect *mallee* to 6 m tall with rough bark over the whole stems. *Crown* terminal. *Juvenile leaves* to 9 x 4.5 cm. *Adult leaves* alternating, petiolate, lanceolate or some falcate, to 9 x 1.5 cm, light green. *Inflorescences* axillary, unbranched, 7-flowered; peduncles stout, flattened, 0.8-1.5 cm long, widening at the top. *Flower buds* subsessile to distinctly pedicellate, fusiform, to 1 x 0.6 cm; inner operculum beaked, very slightly ribbed. *Flowers* not seen. *Ovary* 3(4)-locular. *Fruit* subsessile to distinctly pedicellate, cupular to cylindrical, sometimes slightly contracted at the rim, with one to few ribs extending onto the pedicel, to 0.9 x 0.8 cm; rim moderately thick; disc descending obliquely or steeply; valves to rim level or included.

Other specimens examined. WESTERN AUSTRALIA: Israelite Bay, 33° 37' S, 123° 52' E, 6 Sept. 1984, *M.I.H. Brooker* 8666 (CANB, MEL, NSW, PERTH); 18.5 km E of Sheoaks Hill, 2.5 km S of Israelite Hill, 33° 37' S, 123° 51' E, 9 Sept. 1982, *S.D. Hopper* 2538 (PERTH); Israelite Bay, 16 Feb. 1960, *R.D. Royce* 6312 (PERTH).

Distribution and habitat. Locally common as a narrow band of mallees on sand dunes on the margins of salt lakes near the Israelite Bay settlement, Western Australia. Figure 2.

Flowering period. Unknown.

Etymology. Named from the Latin *litoreus* (of the seashore), alluding to the proximity of the only known populations to the sea near Israelite Bay.

Notes. E. litorea is the tallest and most robust species in the series, maturing to 6 m. While clearly distinct from *E. rigens* by its taller, erect form, rough bark, smaller juvenile and thinner adult leaves, 7-flowered inflorescences and smaller buds and fruit, it is more closely allied to *E. famelica,* differing in the rough bark, terminal crown and pedicellate, smaller, less ribbed buds and fruit. It is known only from sand dunes around salt lakes unlike the swampy depressions favoured by *E. famelica.*

Further survey of the remote habitat of *E. litorea* is needed to adequately assess the conservation status of the species.

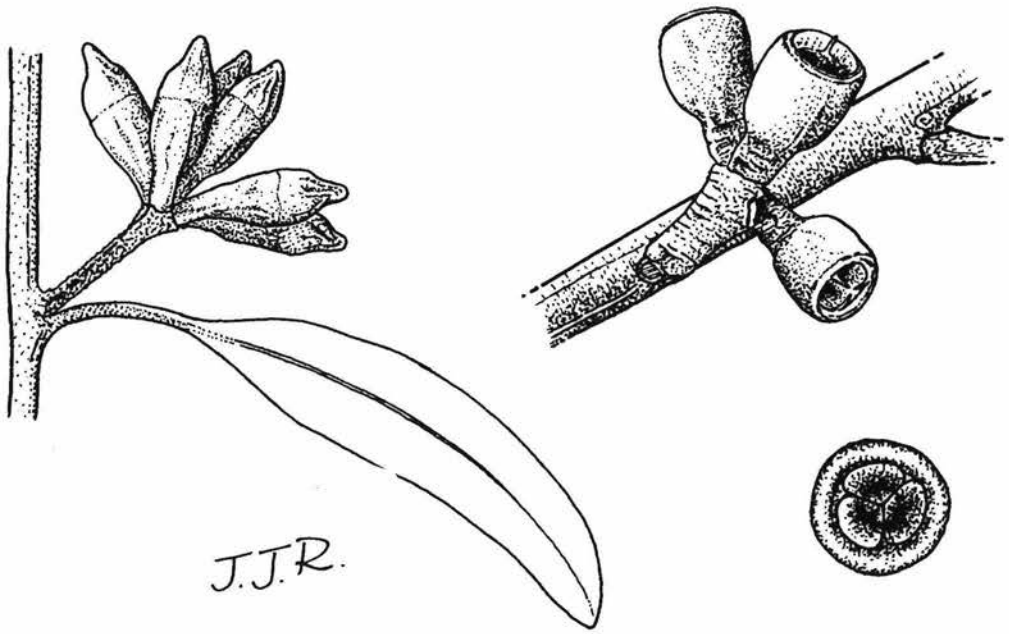


Figure 3. Leaf, flower buds and fruits of *E. litorea* (*R.D. Royce* 6312).

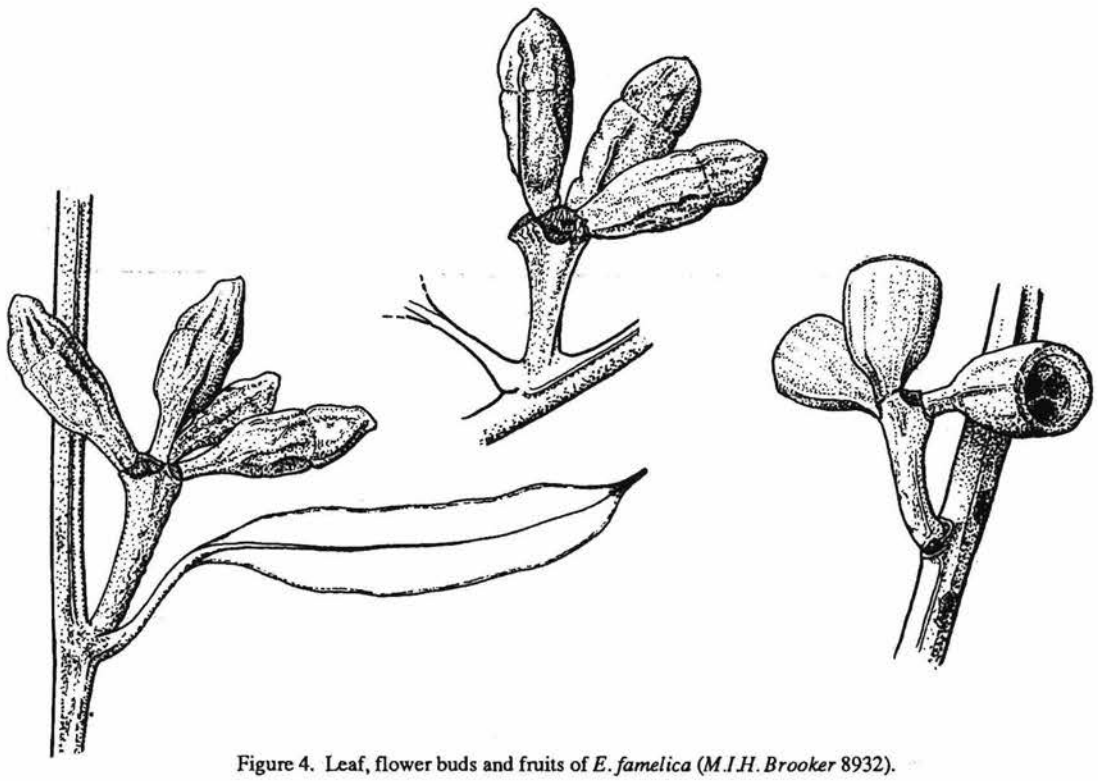


Figure 4. Leaf, flower buds and fruits of *E. famelica* (*M.I.H. Brooker* 8932).

3. **Eucalyptus famelica** Brooker & Hopper, sp. nov. (Figure 4)

Frutex "mallee" *Eucalypto rigenti* affinis a qua arbore summa ad terram, foliis plantularum parvioribus, inflorescentiis 7-floribus, et alabastris fructibusque parvioribus differt.

Typus: 3.6 km S of Springvale road on Starvation Harbour road, 11 April 1985, *M.I.H. Brooker* 8932 (holo: PERTH; iso: CANB, NSW).

An erect *mallee* to 4 m tall or smaller, effuse mallee to 1.5 m tall, both forms with crown dense, to ground level. *Bark* smooth, pale pink or grey on smaller specimens, larger specimens with thin, grey, rough bark to 0.5 m, grey, pinkish or brown smooth above. *Juvenile leaves* to 9 x 4.5 cm. *Adult leaves* alternating, petiolate, lanceolate, to 10 x 2 cm, stiff, glossy, green. *Inflorescences* axillary, unbranched, 7-flowered; peduncles stout, flattened, 0.4-1.3 cm long, widening at the top. *Flower buds* shortly to distinctly pedicellate, fusiform, ribbed or sometimes winged, to 1.4 x 0.6 cm; inner operculum beaked to cylindrical and finally obtuse. *Flowers* creamy white. *Ovary* 3 or 4-locular. *Fruit* shortly pedicellate, cupular to cylindrical, ribbed, to 1.1 x 0.8 cm; rim moderately thick; disc descending; valves included.

Other specimens examined. WESTERN AUSTRALIA: c. 3.6 km S of Springvale road on Starvation Boat Harbour road, 33° 55' S, 120° 32' E, 11 April 1985, *M.I.H. Brooker* 8931, 8935 (CANB, MEL, NSW, PERTH); 3.9 km E of Mason Bay Road on Middle Road, 33° 47' S, 120° 25' E, 26 Nov. 1985, *M.I.H. Brooker* 9116 (CANB, MEL, NSW, PERTH); same locality, 16 July 1987, *M.I.H. Brooker* 9720 (CANB, MEL, NSW, PERTH).

Distribution and habitat. Known from only two sites on road verges and/or adjacent farmland near Starvation Boat Harbour. Favours winter-wet depressions in undulating sandplain. Before clearing, 25-30 years ago, the area enjoyed fresh-water runoff while the groundwater was probably saline (A. Popplewell pers. comm.). Nowadays the water table is higher and the surface water mostly saline. The Middle Road population is large (200+), and the plants themselves are taller (to 4 m) than the other population. Associated species at Middle Road include *Melaleuca cuticularis* Labill. (dwarf form), *E. incrassata* Labill. and an undescribed species related to *E. decipiens* Endl. Figure 2.

Flowering period. April to August.

Etymology. Named from the Latin *famelicus* (hungry), an oblique allusion to Starvation Boat Harbour, near to which the species grows.

Notes. E. famelica is distinguished from *E. rigens* by the taller form, dense crown, thinner leaves, 7-flowered inflorescences and swampy habitat (not associated with salt lakes). It differs from *E. litorea* in its smooth bark on all except the butt of large mature specimens, the dense crown to ground level, its swampy, not dune, habitat, and usually larger and more prominently ribbed flower buds. These degrees of distinction are comparable to those of other pairs of species in *Dumaria*, viz., *E. incrassata* Labill., and *E. angulosa* Schau., *E. leptocalyx* and *E. scyphocalyx*, *E. rugosa* R. Br. ex Blakely and *E. brachycalyx* Blakely, *E. obtusiflora* DC. (syn. *E. dongarraensis* Maiden & Blakely) and *E. sheathiana* Maiden.

Of the three species in the series, *E. famelica* in particular, might be confused with *E. incrassata*, but the two species grow together and flowered concurrently in July 1987 on Middle Road without apparent hybrids. At this site, *E. incrassata* was morphologically distinguishable by the strongly rostrate opercula, the downturned longer peduncles and the more upright habit with the canopy well above ground level.

This apparently rare new species is in need of further survey to adequately assess its conservation status.

Acknowledgements

We are grateful to J.J. Rainbird for the line drawings, to Paul G. Wilson for drawing our attention to *E. litorea*, to P. Grayling and A. Popplewell for drawing our attention to *E. famelica*, to B. Rockel for growing seedlings, and to A. Napier and P. Gioia for computer mapping assistance.

References

Blakely, W.F. (1934). "A Key to the Eucalypts." (The Worker Trustees: Sydney.)

Carr, Stella, G.M. & Carr, D.J. (1969). Oil glands and ducts in *Eucalyptus* L'Hérit. I. The phloem and the pith. Austral. J. Bot. 17: 471-513.

Brooker, M.I.H. (1971). Studies in the genus *Eucalyptus*, Series *Dumosae*. Nuytsia 1: 210-216.

Brooker, M.I.H. (1979). A new series based on seed characters in the informal section *Dumaria* Pryor and Johnson of the genus *Eucalyptus*. Austral. For. Res. 9: 185-188.

Pryor , L.D. & Johnson, L.A.S. (1971). "A Classification of the Eucalypts." (Australian National University Press: Canberra.)

New subspecies of *Banksia seminuda* and *B. occidentalis* (Proteaceae) from the south coast of Western Australia

S. D. Hopper

Department of Conservation and Land Management,
Western Australian Wildlife Research Centre,
P.O. Box 51, Wanneroo, Western Australia 6065

Abstract

Hopper, S.D. New subspecies of *Banksia seminuda* and *B. occidentalis* (Proteaceae) from the south coast of Western Australia. Nuytsia (7): 15-24(1989). *Banksia seminuda* subsp. *remanens* and *B. occidentalis* subsp. *formosa* are described and illustrated. Both have smaller leaves, are more floriferous and are smaller shrubs than their respective nominate subspecies. Both have outstanding horticultural merit. Their conservation in the wild will necessitate careful management, as both new subspecies may be killed by fire, and both have restricted geographical distributions. *B. seminuda* subsp. *remanens* and *B. occidentalis* subsp. *formosa* each have a distribution and morphological features suggesting that they are relictual taxa of Western Australian lineages that show the closest relationships to eastern Australian members of *Banksia* section *Oncostylis*.

Introduction

The genus *Banksia* L. f. has been the subject of intensive scrutiny in recent years. George's (1981) taxonomic revision constituted a significant advance in understanding variation in the genus. The revision, together with publication of colour books on banksias (Holliday & Watton 1975; George 1984), led to the selection of the genus as the subject of a three year national mapping project, The Banksia Atlas (Taylor & Hopper 1988). This resulted in the collection, collation and computer mapping of 25 000 sight records made by hundreds of volunteer contributors throughout Australia.

Banksia Atlas contributors, and a number of botanical collectors before them, drew attention to the occurrence of anomalous populations of a *Banksia* growing near granite outcrops in the Walpole-Nornalup National Park on Western Australia's south coast. A specimen of this taxon (*G. Liddelow* 778) was included by George (1981) in his list of selected collections of *B. littoralis* R. Br. var. *seminuda* A.S. George (now *B. seminuda* (A.S. George) B.L. Rye). George did not comment on this specimen as being a noteworthy variant of *B. seminuda*. In the case of

B. occidentalis, however, he did discuss a poorly collected coastal variant that was short in stature and had short broad leaves in comparison to typical populations (George 1981, p. 405). Muir (1981), in a little known publication, also mentioned this variant, extolling its horticultural merit and noting its precarious conservation status. Several members of the Albany Branch of the Western Australian Wildflower Society were also aware of a population of this variant, and had successfully grown it in gardens. Their conviction that it warranted a name as a distinct taxon was communicated to Banksia Atlas coordinating staff in 1985.

Examination of both these variants in the field and in the herbarium has convinced me that each constitutes a distinct subspecies.

Key to subspecies of *B. seminuda*

Longest leaves 4-6 cm long, 5-8 mm wide; margins recurved, entire except for 2-6 apical serrations; canopy densely floriferous; usually a shrub to 2-3 m tall ..... *B. seminuda* subsp. *remanens*

Longest leaves 7-12 cm long, 8-15 mm wide; margins not recurved, with 5-40 serrations along whole length; canopy sparsely floriferous; a tree to 20 m tall..... *B. seminuda* subsp. *seminuda*

Banksia seminuda (A.S. George) B.L. Rye subsp. **remanens** Hopper, subsp. nov. (Figures 1a-d, 2h-k, 3c).

B. seminuda (A.S. George) B.L. Rye subsp. *seminuda* foliis brevioribus dentibus non profundis apicem versus, habitu fruticoso et floridioribus differt.

Typus: Walpole-Nornalup National Park, 1 km due W of Conspicuous Beach carpark, 35° 03' 30" S, 116° 50' E, 31 July 1987, *S.D. Hopper* 5920 (holo: PERTH; iso: CANB, K, MEL, NSW, PERTH).

A *shrub* to 2 or 3 m or rarely a *tree* to 15 m, fire sensitive; trunk usually irregular and branching close to the ground, rarely straight; bark with longitudinal fissures, hard; canopy densely floriferous. *Longest leaves* linear, 4-6 cm long and 5-8 mm wide; margins recurved, often prominently, entire except for 2-6 apical serrations. *Bracts* on fruit with a dark narrowly elliptical or compressed rhomboidal glabrous patch on outer surface, to 4.5 x 1.2 mm on common bracts and 2.0 x 1.0 mm on floral bracts, with narrow interbract depressions densely hairy with a fine tomentum.

Other specimens examined. Long Point, Walpole-Nornalup National Park, 1 Aug. 1987, *B. Bond* s.n. (PERTH); Mt Hopkins area, Walpole-Nornalup National Park, May 1986, *A. Danks* s.n. (PERTH); 1 km E of Mt Hopkins, 26 May 1987, *A. Danks* s.n. (PERTH); Poison Hill, 2 km E of Long Point, Walpole-Nornalup National Park, 30 July 1987, *S.D. Hopper* 5915 (AD, CANB, NSW, PERTH); Walpole-Nornalup National Park, Forest of Arms, c. 1 km due E of the summit of Mt Hopkins, 1 Aug. 1987, *S.D. Hopper* 5931, 5932 (MEL, NSW, PERTH); Crystal Springs, Long Point, 200 m from sea, 20 Aug. 1973, *G. Liddelow* 778 (PERTH); Walpole, June 1974, *G. Rogerson* s.n. (PERTH); Cliffy Head, Nornalup National Park, 24 April 1968, *R.D. Royce* 8418 (PERTH); Mt Hopkins, Walpole-Nornalup National Park, 35° 02' S, 116° 40' E, May 1978, *T. & A. Wilson* s.n. (CANB, PERTH).

Distribution. Confined to a 30 km stretch of the south coast of South West Western Australia, from Cliffy Head to Conspicuous Cliff, mainly in the Walpole-Nornalup National Park. (Figure 2).

Habitat. All known sites are within one kilometre of the coast, near or rarely on the edge of exposed sheet granite outcrops. This subspecies favours deep well-drained sand surrounding outcrops,

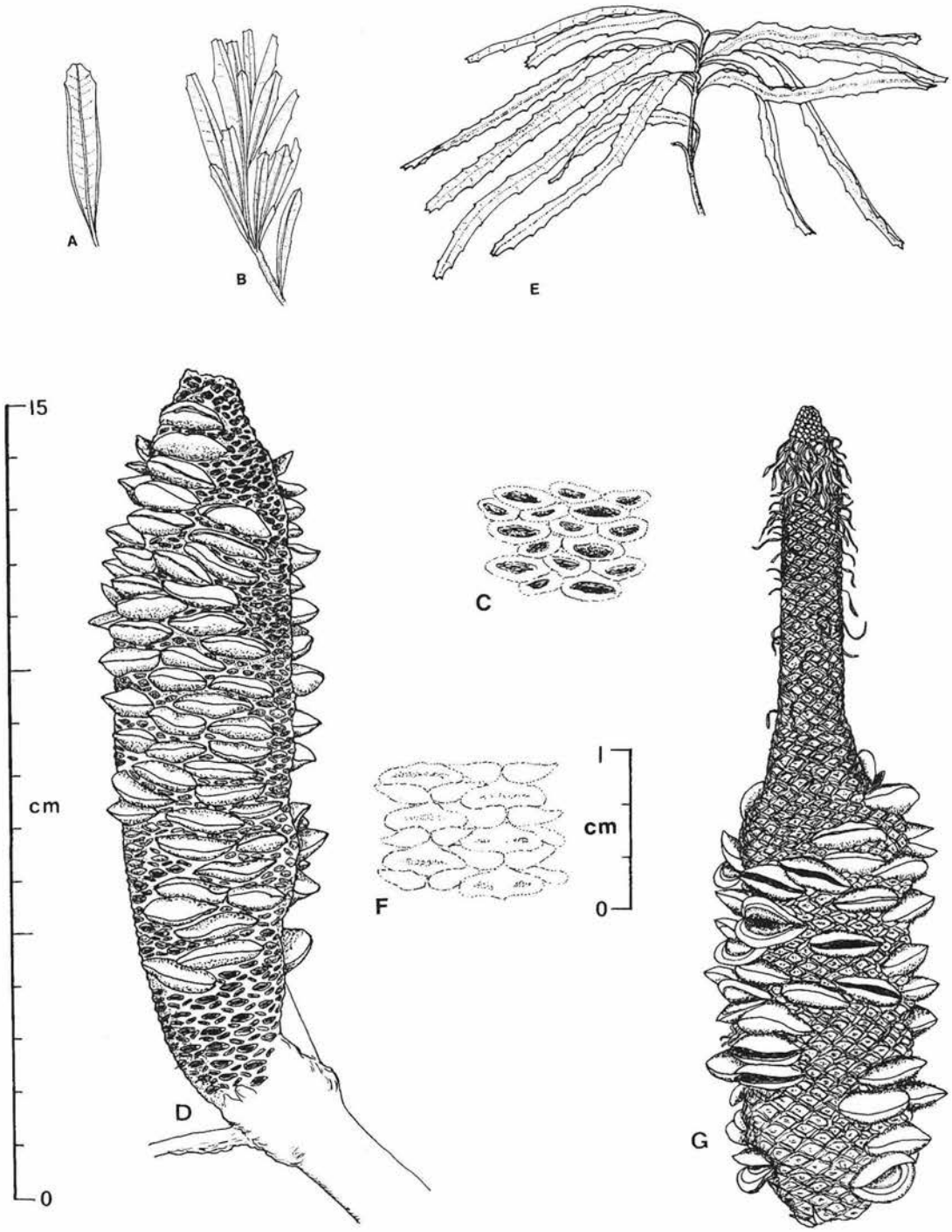


Figure 1. (A-D) *Banksia seminuda* subsp. *remanens:* (A) abaxial view of a leaf showing recurved margins; (B) sprig of leaves; (C) enlargement of bracts on infructescence; (D) infructescence. (E-G) *Banksia seminuda* subsp. *seminuda*: (E) leaves; (F) enlargement of bracts on infructescence: (G) infructescence. A-D: *A. Danks* s.n. May 1986 (PERTH). E: *A. Danks* s.n. 26 May 1987 (PERTH). F-G: *A.S. George* 11654 (PERTH) A, B, D, E, G, same scale; C, F same scale. Drawn by Susan Patrick.

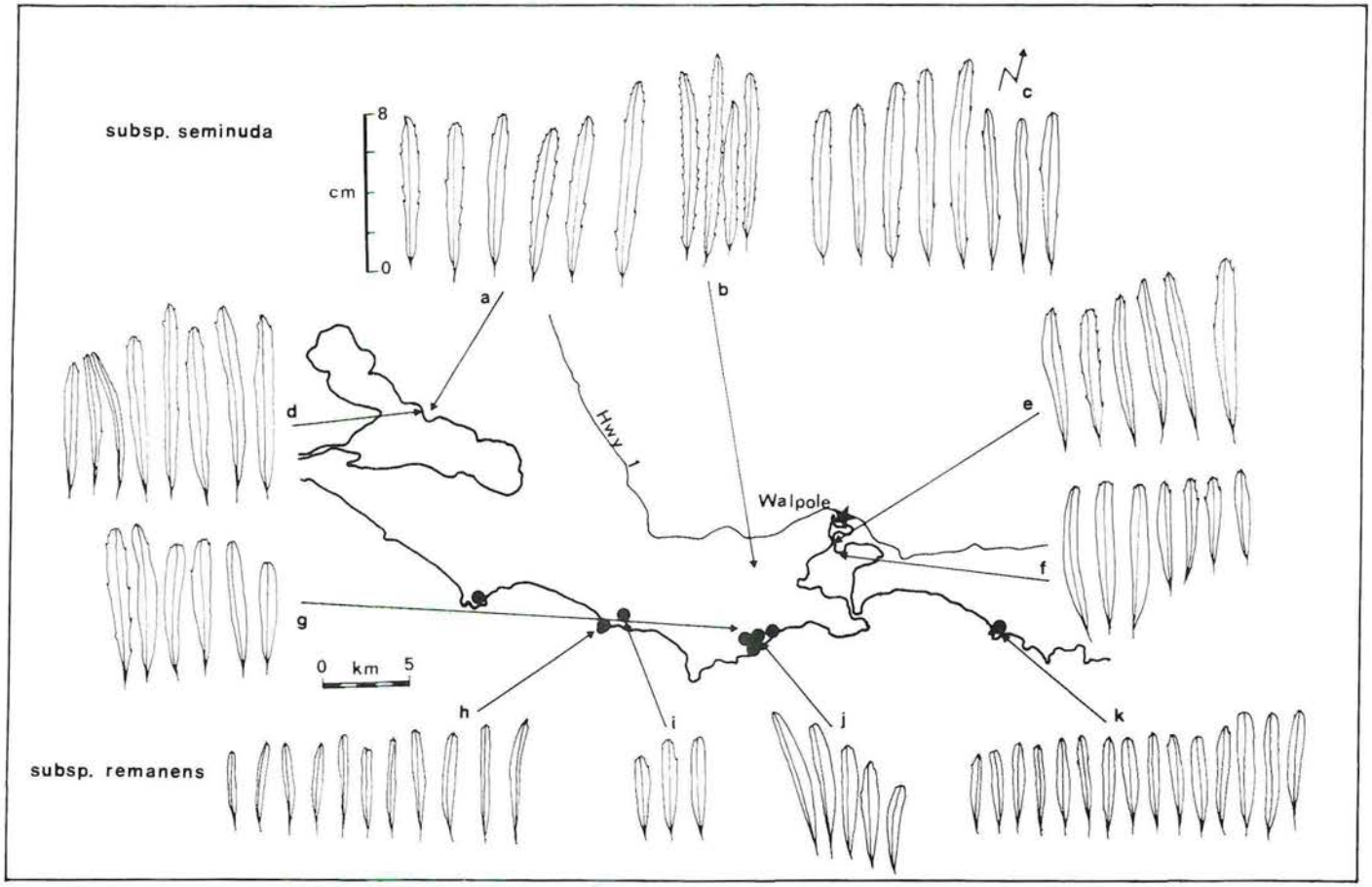


Figure 2. Known distribution of *Banksia seminuda* subsp. *remanens* (black circles) in the Walpole area of the south coast of W.A. Also illustrated is the largest mature leaf from each of a sample of plants in the following populations: *B. seminuda* subsp. *seminuda* (a) 300 m E of Broke Inlet on Broke Inlet Road; (b) tributary of the Deep River near Tinglewood Lodge; (c) Tone River bridge on Muir Highway E of Manjimup; *B. seminuda* ?subsp. *seminuda* (estuarine populations) (d) Broke Inlet settlement, (e) 400 m S of Rest Point Caravan Park, (f) Coalmine Beach Nornalup Inlet; *B. seminuda* intergrades of subsp. *remanens* and subsp. *seminuda* (g) Boggy Lake; *B. seminuda* subsp. *remanens* (h) Long Point, (i) Poison Hill, (j) Forest of Arms 1 km E of Mt Hopkins, (k) type locality 1 km W of Conspicuous Beach Road carpark. Drawn by the author.

attaining its maximum size in the steep well-watered gully of the Forest of Arms on the east side of Mt Hopkins. There it grows in a dense forest to 15 m tall with the paperbark, *Melaleuca* aff. *preissiana* Schau.; tingle *Eucalyptus jacksonii* Maiden; jarrah *E. marginata* Donn ex Smith; and an understorey of *Chorilaena quercifolia* Endl., *Chamaexeros* sp. and *Lepidosperma* spp. (including *L. effusum* Benth.).

On Mt Hopkins itself, *B. seminuda* subsp. *remanens* is a rare component of dense thickets on soil pockets adjacent to bare rock, with common associates including: *Banksia verticillata* R. Br., the Walpole Wax, *Chamelaucium* sp., *Agonis marginata* (Labill.) Schau., *A.* aff. *linearifolia* (DC.) Schau., *Gastrolobium bilobum* R. Br., *Acacia myrtifolia* (Smith) Willd., *Anthocercis viscosa* R. Br. and *Melaleuca* aff. *preissiana.* On the slopes of Poison Hill near Long Point, the subspecies is smaller in stature (to 3 m), but emerges from low heath with associates such as mallee jarrah *Eucalyptus marginata, Banksia grandis* Willd. and *B. quercifolia* R. Br. Common components of the low heath include *Dasypogon bromeliifolius* R. Br. and *Conostylis aculeata* R. Br. subsp. *aculeata.*

At the type locality west of Conspicuous Beach, the subspecies grows to 2 m in scrub on the edge of outcropping granite, but attains a height of 8 m in well-watered depressions on consolidated dunes downslope from the granite. In such sites it is conspicuously emergent from the surrounding coastal heath of *Spyridium globulosum* (Labill.) Benth., *Olearia axillaris* (DC.) F. Muell. ex Benth., *Hakea prostrata* R. Br. and *Banksia grandis.* It is sympatric with *B. littoralis* R. Br. at one site where a sloping interdunal swale runs down to a seasonally waterlogged flat.

Flowering period. Probably March to July (the last flowers of the season were observed in three populations in late July to early August 1987).

Discussion. B. seminuda subsp. *remanens* is readily distinguished from subsp. *seminuda* by its usually smaller stature, its densely floriferous canopy, its smaller leaves with recurved margins which are entire except for a few apical serrations, and in the narrowly elliptic glabrous patches on the outer surface of the bracts on the fruit.

Typical subsp. *seminuda* is an erect tree with a moderately floriferous canopy, with longer broader leaves usually serrate along the entire margin, and with smaller circular glabrous patches on the fruiting bracts. It also occurs on rich loams along watercourses, unlike the coastal consolidated dunes near granite outcrops favoured by subsp. *remanens.*

While typical populations of both subspecies differ in the above characters, some intergradation does occur. George (1981) noted the presence of estuarine populations of subsp. *seminuda* such as at Broke Inlet and Nornalup Inlet where "the habit is lower and of irregular form, similar to that of var. *littoralis.*". My field observations suggest that such populations are of irregular habit only at the water's edge, becoming upright within a few metres inland as the ground rises on rich loamy slopes. Even some plants at the water's edge may be tall and upright (e.g. near the Walpole Yacht Club at Coalmine Beach, Nornalup Inlet). However, the estuarine populations differ from typical subsp. *seminuda* in having shorter less serrate more coriaceous leaves, with some plants approaching the size of leaves of subsp. *remanens* (Figure 2d-f). There appears to be a transition in leaf form at both Broke Inlet and Coalmine Beach towards more typically serrate thin leaves inland within 5-100 m from the water's edge. Possibly, the shorter-leaved variants in these estuarine localities warrant formal treatment as a third subspecies, but further studies of population variation are needed. They are here retained in subsp. *seminuda.*

A rare population of apparent intergrades between *B. seminuda* subsp. *seminuda* and subsp. *remanens* occurs as an isolated stand on the edge of the creek running into Boggy Lake, about 600 m NW of the summit of Mt Hopkins (vouchers *S.D. Hopper* 5934, PERTH). About 20 trees

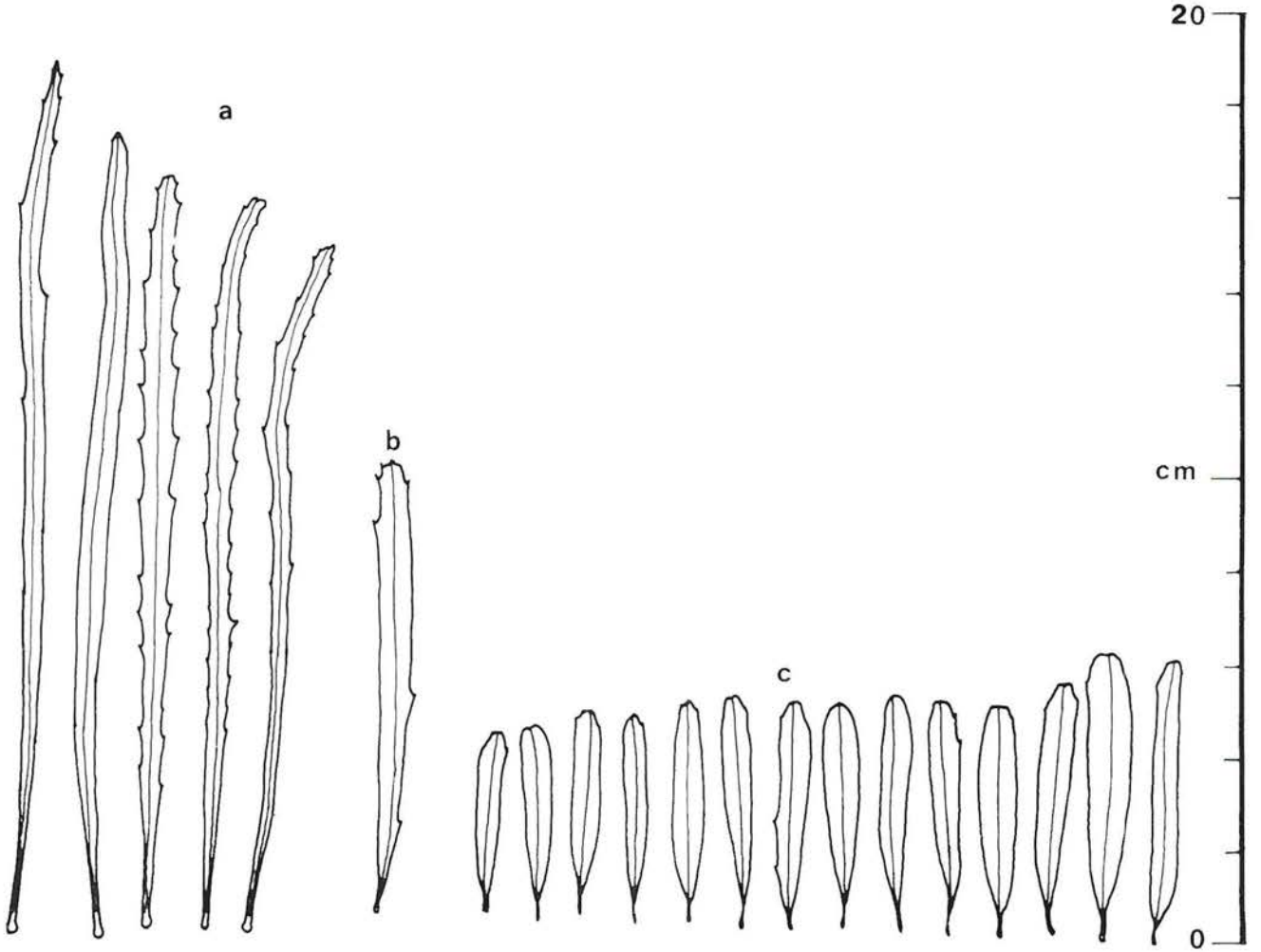


Figure 3. The largest mature leaf from each of a sample of (a) *Banksia littoralis*, (b) putative hybrid, and (c) *B. seminuda* subsp. *remanens* (type population) from the granite headland 1 km W of Conspicuous Beach Road carpark. Drawn by the author.

were observed in this population in 1987, some attaining a height of 17 m and a d.b.h. of 50 cm. Leaves were 6-9 cm long and 9-12 mm wide, and their margins varied from entire except for a few apical serrations through to sparsely serrate along their entire length (Figure 2g). Thus, leaves on different trees ranged from those typical for subsp. *remanens* through to those typical of subsp. *seminuda*. The population was also geographically and ecologically intermediate between the coastal slopes below granite occupied by subsp. *remanens* and the riverine forests further inland (e.g. along the Deep River) occupied by subsp. *seminuda*.

In view of the localized intergradation seen at Boggy Lake, and the similarity in leaf morphology of some of the estuarine plants of subsp. *seminuda* at Broke and Nornalup Inlets to that of some plants of subsp. *remanens*, subspecific rather than specific status is considered appropriate for the latter taxon. Throughout most of its range, subsp. *remanens* is morphologically uniform and ecologically differentiated from subsp. *seminuda*.

A single presumed hybrid of *B. seminuda* subsp. *remanens* and *B. littoralis* was located on a small granite outcrop 1 km W of Conspicuous Beach Road carpark (*S.D. Hopper* 5918, PERTH). The plant was a straggly shrub 1.5 m tall growing in an otherwise pure stand of subsp. *remanens* some 500 m from the nearest *B. littoralis*. The presumed hybrid had leaves intermediate between the parental taxa (Figure 3), and hirsute perianth limbs, a feature of *B. littoralis*.

In leaf morphology and its densely floriferous canopy, *B. seminuda* subsp. *remanens* resembles taxa in the eastern Australian *B. spinulosa* complex. The subspecies may be a relictual taxon with affinities linking western and eastern members of the hook-styled *Banksia* section *Oncostylis* Benth.

Conservation status. Geographically restricted and possibly vulnerable, but secure in Walpole-Nornalup National Park, and western populations to be included in the proposed Shannon-D'Entrecasteaux National Park. Several thousand plants occur at the type locality and near Mt Hopkins, while thousands of seedlings were observed on the slopes of Poison Hill in 1987.

Etymology. From the Latin *remanens* (remaining behind, persisting), alluding to the evolutionary history of the subspecies, which appears to be a relic of a more mesic climate persisting in the highest and most equable rainfall area of the southwest. An additional meaning intended is that the subspecies is one of the last to be identified and named as a distinct banksia after a very active phase of taxonomic research.

Key to subspecies of *B. occidentalis*

Longest leaves 4-8 cm long, 2-8 mm wide; canopy densely floriferous;
shrub to 2 m tall ..... *B. occidentalis* subsp. *formosa*

Longest leaves 9-17 cm long, 2-3 mm wide; canopy moderately floriferous;
shrub or small tree to 7 m tall ..... *B. occidentalis* subsp. *occidentalis*

Banksia occidentalis R. Br. subsp. **formosa** Hopper, subsp. nov. (Figure 4a).

B. occidentalis R. Br. subsp. *occidentalis* foliis brevioribus latioribusque (ad 8 cm x 8 mm), floridioribus et habitu fruticosa differt.

Typus: Black Point, proposed Shannon-D'Entrecasteaux National Park, 2 Aug. 1987, *S.D. Hopper* 5937 (holo: PERTH; iso: AD, CANB, K, MEL, NSW, PERTH).

A *shrub* to 2 m, fire sensitive; trunk irregular or straight, usually with widespreading branches. *Longest leaves* linear, up to 48 cm long and 38 mm wide. *Canopy* densely floriferous.

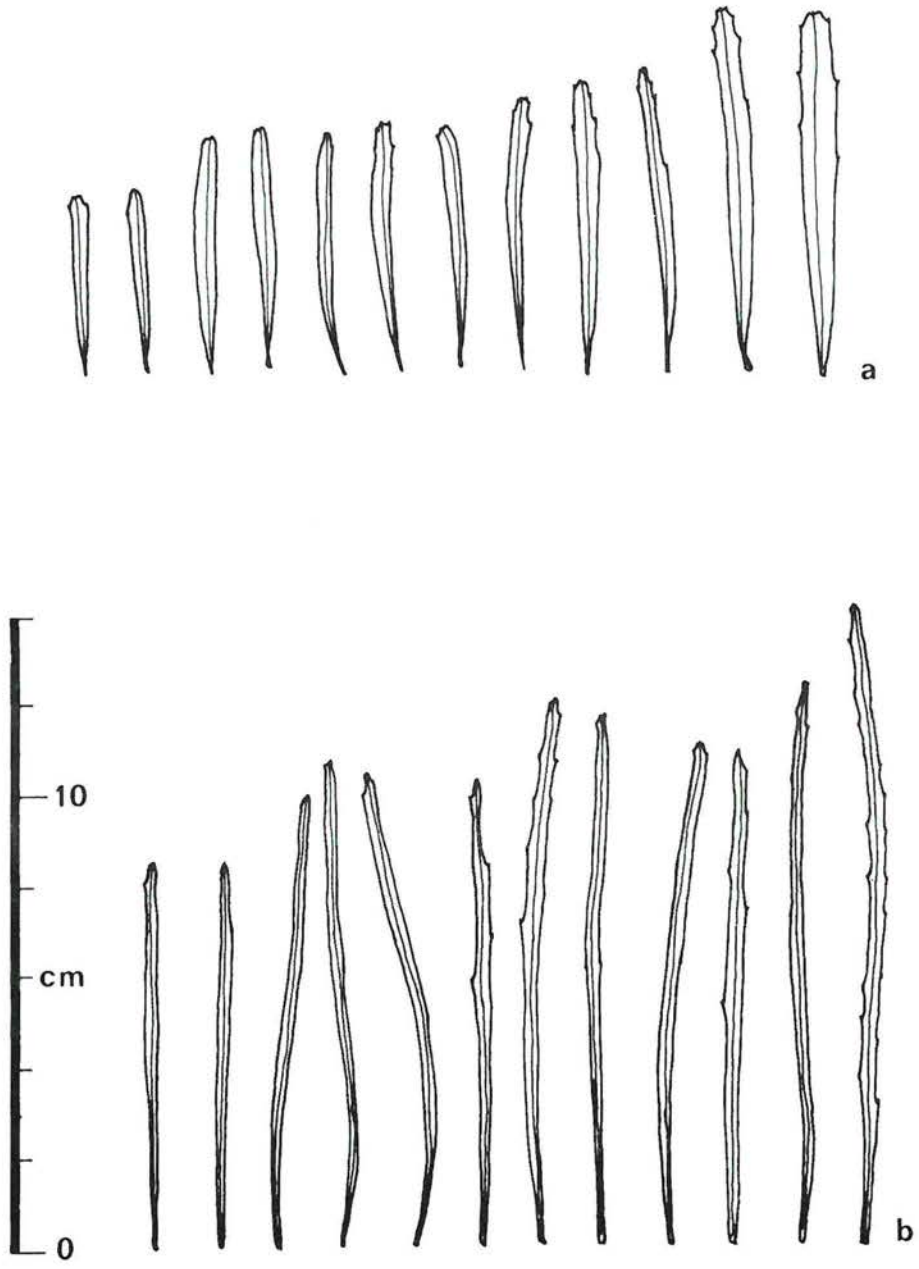


Figure 4. The largest leaf from each of a sample of (a) *Banksia occidentalis* subsp. *formosa* (type population), and (b) *B. occidentalis* subsp. *occidentalis* (Wilson's Inlet near Hay River, *S.D. Hopper* 5952, PERTH). Drawn by the author.

Other specimens examined. Black Point, near Cape Beaufort, Feb. 1978, *P. Luff* s.n. (CANB, PERTH); c. 15 km W of Albany, SE of coastal carpark on Muttonbird Road, 9 Oct. 1987, *S.D. Hopper* 6224 (PERTH).

Distribution. Known from the south coast of South West Western Australia on the Black Point peninsula, c. 40 km ESE of Augusta, and near Shelter Island, c. 15 km W of Albany.

Habitat. This subspecies occurs in coastal ephemeral swamps and seepages overlying massive outcrops of basalt or granite. Associates in the dense low heath at the type locality included *Banksia littoralis*, *Melaleuca cuticularis* Labill., *Spyridium globulosum*, *Olearia axillaris*, *Adenanthos meisneri* Lehm, *Boronia alata* Smith, *Hakea varia* R. Br., *Lepidosperma gladiatum* Labill., *Dianella revoluta* R. Br. var. *brevicaulis* Ostenf., *Jacksonia* sp., *Melaleuca* sp. (*S.D.Hopper* 5938, PERTH), and *Conostylis aculeata* R. Br. subsp. *aculeata*. Near Shelter Island, *B. occidentalis* subsp. *formosa* is a dominant emergent from dense low heath of *Lysinema ciliatum* R. Br., *Pimelea rosea* R. Br., *Dryandra sessilis* (Knight) Domin, *Banksia grandis* Willd, *Jacksonia* sp., *Acacia myrtifolia* (Smith) Willd., *Agonis flexuosa* (Sprengel) Schauer and *Adenanthos sericeus* Labill.

Flowering period. In full flower near Shelter Island in March 1985 (B. Swainson, pers. comm.). Luff's specimen collected in February has flowers, and the last flowers of the 1987 season were opening when the type was collected in early August.

Discussion. B. occidentalis subsp. *formosa* may be distinguished from subsp. *occidentalis* by its compact densely floriferous habit and its shorter broader leaves.

The new subspecies has outstanding horticultural merit as it retains its habit in cultivation (A. Taylor pers. comm.).

Like *B. seminuda* subsp. *remanens*, *B. occidentalis* subsp. *formosa* has a shrubby habit and short leaves similar to members of the eastern *B. spinulosa* complex of *Banksia* section *Oncostylis*. Subsp. *formosa* too may well be a persisting relic of the ancestral lineage that ranged across Southern Australia before the Miocene seas laid down the Nullarbor limestones and split the extant *Banksia* section *Oncostylis* into allopatric western and eastern groups.

Some intergradation with *B. occidentalis* subsp. *occidentalis* occurs at the Shelter Island site. A dense tall thicket of *Oxylobium lanceolatum* (Vent.) Druce on a small seepage near the foot of the coastal slopes contains about 50 trees 2.5-3 m tall of subsp. *occidentalis* (*S.D. Hopper* 6225, PERTH). Upslope in a narrow band 5 m wide are plants intermediate in leaf morphology and stature between the two subspecies. Beyond this narrow band, several hundred plants of subsp. *formosa* 1 m tall extend over the drier coastal slope.

Thus subsp. *formosa* is an ecologically differentiated race with distinctive morphological features, which intergrades with subsp. *occidentalis* rarely where habitats of the two subspecies abut. Subspecific status is considered appropriate in these circumstances.

Conservation status. Geographically restricted in two disjunct sites 200 km apart, but the subspecies has not been thoroughly surveyed and mapped. Known populations number several thousand plants, and one is secure within the proposed Shannon-D'Entrecasteaux National Park. *B. occidentalis* subsp. *occidentalis* was found by McCredie *et al.* (1985) to have high susceptibility to dieback disease, with about 60% of plants dead after 96 days following innoculation, and 95% dead after 396 days. The susceptibility of subsp. *formosa* may well be as high.

Etymology. From the Latin *formosus* (finely formed, beautiful), alluding to the beauty and horticultural potential of the subspecies.

Acknowledgements

I am grateful to Anne Taylor, Susan Patrick and Alex George for useful discussions and comments on the manuscript, to Alan Danks for collecting specimens in remote areas, to Susan Patrick for artwork, and to Banksia Atlas contributors who stimulated my interest in this project. Able assistance in the field was provided by Andrew Brown, Bruce Bond, Alan Danks, Hardey Derschow, George Gardner, Rick Francis, Bill Jackson, Stephen van Leeuwen, Mary Hart and Harry Winfield. Ian Brooker kindly provided the Latin diagnoses.

References

George, A.S. (1981). The genus *Banksia* L. f. (Proteaceae). Nuytsia 3: 239-474.

George, A.S. (1984). "The Banksia Book." (Kangaroo Press: Sydney.)

Holliday, I., and Watton, G. (1975). "A Field Guide to Banksias." (Rigby: Adelaide.)

McCredie T.A., Dixon, K.W., and Sivasithamparam, K. (1985). Variability in the resistance of *Banksia* L. f. species to *Phytophthora cinnamomi* Rands. Austral. J. Bot. 33: 629-637.

Muir, B.G. (1981). "D'Entrecasteaux National Park Resource Study." (National Parks Authority: Perth).

Taylor, A. & Hopper, S.D. (1988). The Banksia Atlas. Austral. Flora Fauna Ser. No. 8. (Australian Government Publishing Service: Canberra.)

Taxonomy of *Olearia stuartii* (Asteraceae: Astereae) and allied species

N.S. Lander

Western Australian Herbarium, Department of Conservation and Land Management,
P.O. Box 104, Como, Western Australia 6152

Abstract

Lander, N.S. Taxonomy of *Olearia stuartii* (Asteraceae: Astereae) and allied species. Nuytsia 7 (1): 25-35 (1989). Western Australian specimens hitherto considered as *Olearia stuartii* (F. Muell.) F. Muell. ex Benth. are segregated into three distinct species. One of these is described as new, namely *O. humilis* Lander. Another represents *O. xerophila* (F. Muell.) F. Muell. ex Benth., previously known only from Queensland. *O. stuartii* is recognised as being a species widespread in inland Australia. A related species, *O. gordonii* Lander, is described from southern Queensland. These taxa all fall within *Olearia* sect. *Merismotriche* Benth. within which they form a natural group.

Introduction

The name *O. stuartii* (F. Muell.) F. Muell. ex Benth. has long been a source of confusion in herbaria, especially in Western Australia where it has been applied to specimens exhibiting a wide range of variation in leaf and flowering-head morphology. Since commencing revisionary studies on the genus *Olearia* in 1984 the present author has recognised three distinct entities present in Western Australia. One of these is identical to a species otherwise known only from Queensland, namely *O. xerophila* (F. Muell.) F. Muell. ex Benth. Another represents a distinct new species, *O. humilis* Lander. The third entity is *O. stuartii* sens. strict., a species widespread in inland Australia.

Stanley & Ross (1986) note, as *Olearia* "sp. 1", an unnamed taxon from southern Queensland. This species, formally described here as *O. gordonii*, is clearly related to *O. xerophila*.

The taxonomy in this paper is based on a study of the gross morphology of all available herbarium specimens examined at, or loaned by, the major Australian and British herbaria and relevant European herbaria, and on field observation of species present in Western Australia. The methods and procedures adopted were those indicated in Lander (1985).

The descriptions of the various trichomes follow the terminology of Ramayya (1962).

Key to *Olearia stuartii* and its allies

1. Leaf-venation obscure, apart from midvein; vestiture subglabrous or densely glandular-pubescent with minute, biseriate glandular hairs (scattered conic, biseriate glandular and long, filiform, eglandular hairs may also be present)

   2. Stems and leaves subglabrous. Leaves often fasciculate; margin entire to irregularly serrulate; apex actue, sometimes obtuse, inconspicuously mucronate. Ligulate florets 10-20; ligules 9.6-14.2 mm long. Tubular florets 6.0-8.7 mm long ..... *O. humilis*

   2. Stems and leaves densely glandular. Leaves never fasciculate; margin irregularly and coarsely dentate; apex truncate and dentate. Ray florets 21-64; ligules 5.1-8.8 mm long. Disc florets 3.0-6.0 mm long..... *O. stuartii*

1. Leaf venation distinctly reticulate, with prominent midvein; vestiture weakly to densely hirsute with long, filiform, eglandular hairs and conic, biseriate, glandular hairs (minute biseriate, glandular hairs also present)

   3. Leaves distinctly petiolate (petiole winged, discrete); lamina elliptic to broadly elliptic, rarely narrowly elliptic, 7-22 mm wide. Ligulate florets > 4/5 the number of disc florets. Achene 2.0-2.2 mm long ..... *O. xerophila*

   3. Leaves indistinctly petiolate (petiole winged, merging into lamina); lamina linear to very narrowly elliptic, 2-8 mm wide. Ligulate florets c. 1/2 the number of disc florets. Achene 2.7-4.0 mm long ..... *O. gordonii*

Olearia humilis Lander, sp. nov. (Figure 1)

Olearia stuartio arte affinis a qua vestimento subglabro, marginibus folii integris vel irregulariter serrulatis, flosculis ligulatis paucioribus (ad 20) et ligulis longioribus (ad 14.2 mm), et flosculis tubularibus longioribus (ad 8.7 mm) differt.

Typus: 3 km S of 'Atley' turnoff on Sandstone - Paynes Find road, 28°14' S, 119° 06' E, 25 Aug. 1986, *P.S. Short* 2563 (holo: PERTH; iso: MEL; K).

Erect shrub to 1 m high, spindly, slightly glutinous. *Vestiture* of stems, leaves and outer involucral bracts subglabrous with minute, biseriate, capitate, glandular hairs and occasional, conic, biseriate, capitate, glandular hairs and long, filiform, eglandular hairs. *Leaves* alternate, sessile, often fasciculate; lamina narrowly obovate or linear, often somewhat falcate, 20-30 x 1-3 mm, concolorous, green; venation obscure apart from midvein; base very narrowly cuneate; margin recurved, entire to irregularly serrulate; apex acute, sometimes obtuse, inconspicuously mucronate. *Heads* solitary, terminal, pendunculate, radiate, 15-30 mm diameter; disc 8-15 mm diameter. *Peduncle* to 40 mm long with several leaf-like bracts merging into those of the involucre. *Involucre* broadly campanulate; bracts 4-seriate, 2.5-7.0 x 0.4-2.0 mm; *outer bracts* very narrowly triangular, slightly carinate; stereome green; margin narrowly membranous, fimbriate; apex acute or acuminate; *inner bracts* narrowly ovate, flat; stereome green, glabrous; margin broadly membranous, fimbriate; apex acute or acuminate. *Receptacle* flat. *Ray florets* 10-20, uniseriate, female, 13.6-18.3 mm long; tube with scattered, long, biseriate, eglandular hairs; ligule narrowly ovate, 9.6-14.2 x 1.6-3.2 mm, purple, glabrous, acute or obtuse and minutely 3-lobed or more or less deeply 2-cleft; staminodes sometimes present; stylar arms more or less filiform, 1.1-1.8 mm

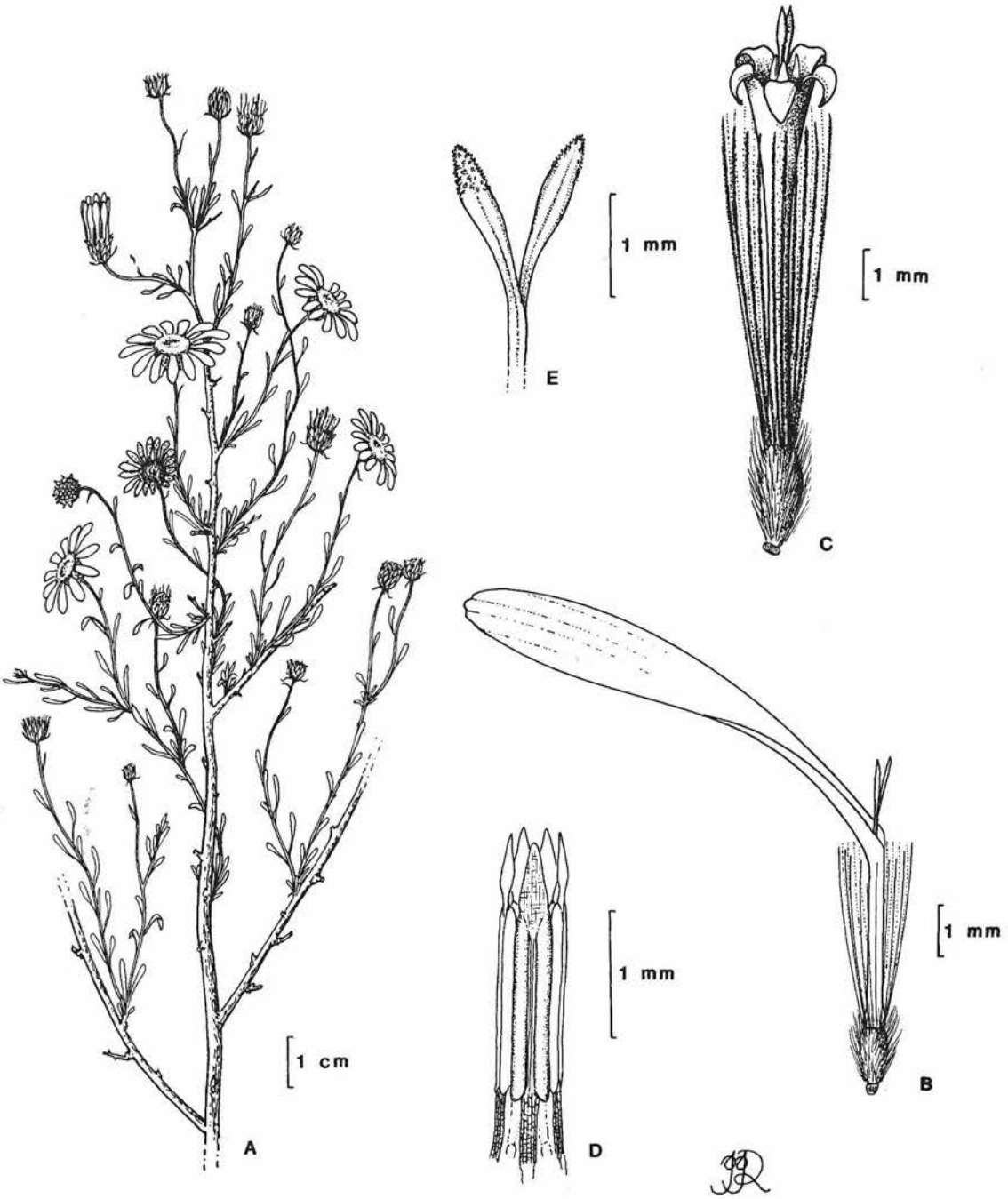


Figure 1. *Olearia humilis*. A - Habit. B - Ray floret. C - Disc floret. D - Anthers. E - Stylar arms. Drawn from *P.S. Short* 2563 (holo: PERTH).

long. *Disc florets* 21-30, bisexual, yellow, buccinate, 6.0-8.7 mm long, with scattered, long, biseriate, eglandular hairs; lobes 0.9-1.2 mm long; anthers 1.6-2.2 mm long, shortly acute or obtuse and shorter than the filament collar basally, with narrowly triangular, acute, terminal appendage; filament collar 0.4-0.6 mm long; stylar arms 1.0-1.7 x 0.3-0.4 mm, with narrowly triangular or spathulate apical appendages bearing long, botuliform papillae above the stigmatic lines. *Achene* narrowly obovoid, flattened, 1.8-2.2 x 0.7 mm, light brown, sericeous with appressed duplex hairs; base acute, with oblique carpopodium; margin ± thickened; apex truncate. *Pappus* of 21-33 free, uniseriate, minutely barbellate bristles more or less equal to the length of the tubular florets. *Chromosome number*, n = 9 (Turner 1970; Short, pers. comm.).

Other specimens examined. WESTERN AUSTRALIAN: 25 miles (40 km) E from Paynes Find on Sandstone road, *R. Aitken* HA9 (PERTH); 40 miles (64 km) N of Wubin, *K.M. Allan* 73 (PERTH); 54 miles (86 km) NW of Cue towards 'Mileura', *T.E.H. Aplin* 2526 (PERTH); c. 128 km N of Mullewa on Carnarvon road, *A.M. Ashby* 2529 (AD, PERTH); c. 4-5 miles (6.4-8.0 km) S of Sandstone on Wiluna road, 27° 59' S, 118° 18' E, *A.M. Ashby* 4819 (AD, PERTH); 210 Mile Peg, Wubin - Paynes Find, *J.S. Beard* 2610 (KP, PERTH); Laverton, *W.E. Blackall* 419 (K); Laverton, 28° 22' S, 122° 24' E, *W.E. Blackall* 3856 (PERTH); teutonic [Bore], 28° 22' S, 121° 10' E, *R. Cumming* 1229 (PERTH); Mt Magnet road, *H. Demarz* 2396 (KP, PERTH); 247 Mile Peg, Paynes Find road, *H. Demarz* 4355 (KP, PERTH); s.loc., s.dat., *J. Drummond* s.n. (MEL1543767); c. 45 km N of Mullewa on Mt Tallering road, *J. Galbraith* 420 (MEL); 2 miles (3.2 km) S of Laverton, *C.A. Gardner* 2466 (BM, K, PERTH); Mt Gibson, 29° 36' S, 117° 11' E, Nov. 1952, *C.A. Gardner* s.n. (PERTH); 'Anketell', 28° 02' S, 118° 51' E, *J.W. Green* 1631 (PERTH); 109 km S of Mt Magnet, *R.M. King* 9594 (NSW, PERTH, US); Mt Magnet, 28° 04' S, 11° 51' E, *J.R. Knox* 660926 (PERTH); 18.4 km SW of 'Lake Barlee' turnoff on Paynes Find - Sandstone road, 28° 58' S, 118° 40' E, *N.S. Lander* 1398 (MEL, PERTH); 31.6 km NE of Paynes Find on Sandstone road, 29° 16' S, 118° 00' E, *N.S. Lander* 1403 (K, MEL, PERTH); 'Thundelarra', 28° 54' S, 117° 08' E, SE of Mullewa, s. dat., *E. McCrumm* s.n. (PERTH); 5 miles (8 km) N of Latham, *K.R. Newbey* 2083 (PERTH); 23 miles (36.8 km) NE of Southern Cross, *K.R. Newbey* 2533 (PERTH); 20.9 km S of Menzies towards Kalgoorlie, *M.E. Phillips* 608 (PERTH); 0.7 km E of Sandstone - Paynes Find road, on 'Youinmery' road, 28° 34' S, 118° 54' E, *P.S. Short* 2565 (MEL, PERTH); 39 km from Paynes Find along road to Cleary, 29° 30' S, 117° 46' E, *P.S. Short* 2586 (MEL, PERTH); 7 km N of Pindar on road to 'Yuin', 28° 26' S, 115° 49' E, *P.S. Short* 2885 (AD, MEL, PERTH); c. 9 km N of Paynes Find along Great Northern Highway, 29° 11' S, 117° 42' E, *P.S. Short* 2927 (AD, CANB, MEL, PERTH); Mt Gibson, 29° 36' S, 117° 11' E, *B.H. Smith* 719 (CANB, MEL, PERTH); 10 miles (16 km) NW of 'Albion Downs', *N.H. Speck* 1460 (CANB, PERTH); Paynes Find - Fields Find - Warne River - Sandstone - Mt Gibson, *K. Stewart* 13 (PERTH), 14 (PERTH); 35 miles (56 km) N of Mullewa, *B.L. Turner* 5360J (MEL, PERTH); Wilgiemia, 26° 56' S, 117° 42' E, *F. Uther-Baker* 4074/63 (PERTH); Koolyanobbing Range, 30° 50' S, 119° 33' E, *P.G. Wilson* 6152 (PERTH); 24 km W of Paynes Find, *P.G. Wilson* 8646 (AD, K, MEL, PERTH); Mt Jackson, 30° 15' S, 11° 16' E, *P.G. Wilson* 8790 (K, PERTH); 2 km N of Evanston Mine, c. 140 km N of Bullfinch, *P.G. Wilson* 8803 (AD, K, PERTH); s. loc., *E. Wittwer* 1025 (KP, PERTH); 15 miles (24 km) W of Agnew, *E. Wittwer* 1339 (KP, PERTH); 8 km S of Mt Jackson, *C.E. & D. Woolcock* 2424 (PERTH); 14.5 km SE of Paynes Find, *C.E. & D. Woolcock* 2428 (PERTH).

Distribution. Found in the Avon District of the South-West Botanical Province and the Austin District of the Eremaean Botanical Province of Western Australia (Figure 3).

Habitat. Shrubland and open woodland on red sand, loam or clay, often on lateritic breakaways, sometimes on granite outcrops.

Flowering period. July to November.

Conservation status. This species is widespread and well collected, occurring in a variety of habitats in areas unlikely to experience changes in land use. It is not considered rare or threatened.

Etymology. The specific epithet draws attention to the small stature of plants of this taxon.

Notes. This is the *Olearia* "sp. nov." of Turner (1970).

Olearia stuartii (F. Muell.) F. Muell. ex Benth., Fl. Austral. 3: 481 (1867); A.J. Ewart & O.B. Davies, Fl. Northern Territory 274-5 (1917); C.A. Gardner, Enum. Pl. Austral. Occ. 131 (1931); J.M. Black, Fl. South Australia, edn 2, 4: 872 (1965); J.S. Beard, Western Austral. Pl., edn 2, 135 (1970); G.M. Chippendale, Proc. Linn. Soc. New South Wales 96: 264 (1971); B.J. Grieve & W.E. Blackall, How to know Western Austral. Wildfl. 4: 788 (1975); J.P. Jessup, Vasc. Pl. South Australia, edn 2, 67 (1984); J.W. Green, Census Vasc. Pl. Western Australia, edn 2, 168 & 264 (1985); J.P. Jessop, Fl. Central Australia 377 (1981); D.A. Cooke in J.P. Jessup & H.R. Toelken, Fl. South Australia 3: 1484 (1986); C.R. Dunlop, Checklist Vasc. Pl. Northern Territory 12 (1987); S.J. Forbes & J.H. Ross, Census Vasc. Pl. Victoria, edn 2, 39 (1988). — *Aster stuartii* (F. Muell.) F. Muell., Fragm. 5: 76-77 (1865); R. Tate, Fl. Extratrop. South Australia 114 & 237 (1890); F. Mueller, Second Syst. Census Austral. Pl. 1: 132 (1889). — *Eurybia stuartii* F. Muell., Fragm. 1: 202 (1859). *Type citation*: "In regionibus interioribus boreali-occidentalibus coloniae South Australia. J. Macd. Stuart." *Types*: NW interior, South Australia, anno 1859, *J. McDouall Stuart* s.n. (holo: MEL; iso K).

Olearia megalodonta F. Muell. ex C. Gardner, Enum. Pl. Austral. Occid. 131 (1931), nom. inval., pro syn. — *Aster megalodontus* F. Muell., Fragm. 8: 244 (1874). *Type citation*: "In monte Olgae; E. Giles." *Type*: Mt Olga, Northern Territory, anno 1873/4, s. dat. *[W.E.P.] Giles* s.n. (holo: MEL).

Erect shrub to 0.3 (1.0) m high, spreading, glutinous, unpleasantly aromatic. *Vestiture* of stems, leaves and outer involucral bracts densely glandular-pubescent with minute, biseriate, capitate, glandular hairs, conic, biseriate, capitate, glandular hairs and scattered filiform, eglandular hairs. Stems yellowish green or green when young, brown when older. *Leaves* alternate, sessile; lamina narrowly to broadly obovate, 10-28 x 2-8 mm, concolorous, green; venation obscurely reticulate with prominent midvein; base narrowly cuneate; margin flat, irregularly and coarsely dentate; apex truncate and dentate. *Heads* solitary or several in loose, terminal corymbs, pedunculate, radiate, 11-30 mm diameter; disc 5-20 mm diameter. *Peduncle* to 50 mm long, with several narrow, leaf-like bracts merging into those of the involucre. *Involucre* hemispheric; bracts 3-5-seriate, 1.5-7.0 x 0.6-0.8 mm. *Outer involucral bracts* linear or narrowly obovate, slightly carinate; stereome green, apically glandular-hairy, bearing biseriate, capitate glandular hairs and multiseriate, sessile glandular hairs; margin narrowly membranous, fimbriate; apex acute. *Inner involucral bracts* narrowly elliptic, flat; stereome yellowish, apically subglabrous; margin membranous, more or less entire;apex acuminate, sometimes pinkish. *Receptacle* convex. *Ray florets* 21-64, uniseriate, female, 7.0-11.5 mm long; tube with scattered biseriate, eglandular hairs; ligule narrowly elliptic, 5.1-8.8 x 1.0-1.9 mm, blue, mauve or lilac, glabrous, obtuse and minutely 3-lobed apically; stylar arms filiform, 0.9-1.2 mm long. *Disc florets* 20-72, bisexual, yellow, buccinate, 3.0-6.0 mm long, with scattered biseriate, eglandular hairs; lobes 5, triangular, 0.6-1.0 mm long; anthers 1.6-3.3 mm long, shortly acute or obtuse and shorter than the filament collar basally, with narrowly ovate, acute terminal appendage; filament collar 0.3-0.7 mm long; stylar arms 1.0-1.5 x 0.2-0.3 mm, with triangular apical appendages bearing long, botuliform papillae above the stigmatic lines. *Achene* narrowly obovoid, flattened, 2.0-2.3 x 0.5-1.0 mm, light brown, sericeous with duplex hairs; base acute, with oblique carpopodium; margins thickened; apex truncate. *Pappus* of 20-26 uniseriate, minutely barbellate bristles subequal to the disc florets, and several much shorter ones. *Chromosome number*, n = 9 (Short, pers. comm.).

Selected specimens examined. NORTHERN TERRITORY: Livingstone Pass, 24° 53' S, 129° 06' E, March 1967, *W.H. Butler* s.n. (PERTH); Brookes Soak, 22° 06' S, 132° 19' E, Aug. 1931, *J.B. Cleland* s.n. (AD); Curtain Springs, 25° 31' S, 131° 53' E, *T.S. Henshall* 112 (DNA); 2 km N of Jervois Dam Mine, 'Jervois', 22° 37' S, 136° 15' E, *B.W. Strong* 756 (DNA).

SOUTH AUSTRALIA: Mt Mounden, 26° 40' S, 129° 12' E, *W.R. Barker* 3140 (AD); Mt Finke, 30° 55' S, 134° 01' *E, R. Bates* 274 (AD); Mt Morris, 26° 09' S, 131° 05' E, *H. Eichler* 17461

(AD); 'Evelyn Downs', 28° 12' S, 134° 29' E, *E.H. Ising* 3550 (AD).

QUEENSLAND: Honeymah, 40 miles (64 km) SE of Bollon, 28° 01' S, 148° 00' E, *S.L. Everist* 3462 (BRI); Site S169, Warlus VI, 22° 02' S, 142° 02' E, *R.W. Purdie* 1557 (BRI); Ambathala Range, 50 km E of Adavale, 26° --' S, 145° --' E, Sept. 1980, *C. Sandercoe* s.n. (BRI).

WESTERN AUSTRALIA: Mt Nameless, 22° 43' S, 117° 45' E, *K.J. Atkins* HI-770 (PERTH); Gill Pinnacle, Schwerin Mural Crescent, Rawlinson Range, 24° 53' S, 128° 37' E, *A.A. Burbidge* 51/77 (PERTH); Binthabooka Creek, 'Mooka', 24° 58' S, 114° 49' E, *H. Demarz* 235 (KP, PERTH); 16 km E of Cocklebiddy, 32° 00' S, 126° 17' E, *G.J. Keighery* 7550 (PERTH).

Distribution. The Ashburton, Austin, Carnarvon, Carnegie, Coolgardie, Fortescue, Giles and Helms Districts of the Eremaean Botanical Province of Western Australia, the North-western, Lake Eyre Basin and Gairdner-Torrens Basin Regions of South Australia, the Central North and Central South Botanical Provinces of the Northern Territory and the Bourke, Warrego and Maranoa Pastoral Districts of Queensland (Figure 3).

Habitat.. Open shrubland or woodland in sandy or silty lithosols on a variety of substrates (including chert, granite, grainstone, gypsum, haematite and sandstone) in crevices on rocky hilltops, scree slopes, gorges or creek beds.

Flowering period. Principally June to September, but sporadically throughout the year.

Typification. The J. McDouall Stuart specimen at K is from "Mr McDougal [sic] Stuart's journey of 1859" and is annotated by Mueller with an unpublished manuscript name, not *Aster stuartii*; it is therefore considered to be an isotype rather than a syntype of *Aster stuartii.* Mueller (1865 loc. cit.) notes that Stuart collected this species NW of Lake Gairdner, but this locality is not noted on either specimen.

Giles (1889) records visiting Mt Olga and collecting plant specimens in that vicinity in September 1873, during the second of his expeditions. Doubtless, these specimens included the type of *Aster megalodontus.*

Etymology. The specific epithet honours the collector of the type of this taxon, the explorer John McDouall Stuart (1815-1866) who made five epic journeys into Central Australia (Stuart 1864).

Olearia xerophila (F. Muell.) F. Muell. ex Benth., Fl. Austral. 3: 486-7 (1867); F.M. Bailey, Syn. Queensl. Fl. 243 (1883); F.M. Bailey, Catal. Indig. & Nat. Pl. Queensl. 23 (1890); F.M. Bailey, Queensl. Fl. 3: 808 (1900); F.M. Baile.y, Compreh. Catal. Queensl. Pl. 262 (1913). — *Aster xerophilus* (F. Muell.) F. Muell., Fragm. 5: 76 (1865); F. Mueller., Syst. Census Austral. Pl. 1: 78 (1882); F. Mueller, Second Syst. Census Austral Pl. 1: 132 (1889). — *Eurybia xerophila* F. Muell., Fragm. 1: 51 (1858). *Type citation*: "In collibus sterilioribus ad fluvium Burdekin." *Types*: Barren ridges, Upper Burdekin [River], Queensland, *F. Mueller* s.n. (syn: K, MEL1547173).

Aster heynei F. Muell., Fragm. 5: 86 (1865). *Type citation*: "Ad flumen Cape's River. Bowman." *Types*: Cape River, 20° 20' E, 145° 00' S, Queensland, s. dat., [*E.M. Bowman*] 221 & 246 (syn: MEL1547108); Cape River, 20° 20' E, 145° 00' S, Queensland, s. dat., *[E.M.] Bowman* s.n. (syn: K).

Erect subshrub to 1 m high. *Stems* yellowish brown, sometimes reddish when young, with a grey reticulum when older. *Vestiture* of stems, leaves and outer involucral bracts densely hirsute with long, filiform, eglandular hairs, conic, biseriate, capitate, glandular hairs and minute, biseriate, capitate glandular hairs. *Leaves* alternate, spreading, distinctly petiolate; petiole 5-18 mm long, winged; lamina elliptic to broadly elliptic, rarely narrowly elliptic, 25-65 x 7-22 mm, concolorous, grey-green; venation distinct, reticulate with prominent mid-rib; base very narrowly cuneate; margin irregularly serrate or double-serrate; apex acute to obtuse. *Heads* in loose, terminal corymbs,

pedunculate, radiate, 20-30 mm in diameter; disc 10-12 mm in diameter. *Peduncle* to 70 mm long, with several filiform, leaf-like bracts merging into those of the involucre. *Involucre* broadly turbinate or hemispheric; bracts 5-seriate, 0.3-1.2 x 3.0-6.2 mm. *Outer involcural bracts* narrowly triangular, slightly carinate; stereome green; margin entire or slightly fimbriate; apex acuminate. *Inner involucral bracts* narrowly linear, flat; stereome pale green, bearing scattered eglandular and glandular hairs apically; margin fimbriate; apex acuminate. *Receptacle* very slightly convex. *Ray florets* 20-50, violet, blue or mauve, female, uniseriate, 10.3-16.0 mm long; tube with scattered, biseriate, eglandular hairs; ligule narrowly elliptic or linear, 7.5-12.0 x 1.5-2.0 mm, glabrous, acute and minutely 3-lobed; stylar arms filiform, 1.3-1.9 mm long. *Disc florets* 25-52, bisexual, narrowly infundibular, 4.5-6.8 mm long, 5-lobed, bearing a few scattered biseriate, eglandular hairs; lobes triangular, 0.6-0.8 mm long; anthers 2.3-3.1 mm long, shortly acute and shorter than the filament collar basally, with narrowly triangular, acute terminal appendages; filament collar 0.4-0.6 mm long; stylar arms 1.3-1.8 x 0.3-0.4 mm, with narrowly elliptic apical appendages bearing long, botuliform papillae above the stigmatic lines. *Achene* obovoid, flattened, 2.0-2.2 x 0.8-0.9 mm; light to dark brown, sericeous with duplex hairs; base acute with prominent central or oblique carpopodium; apex truncate *Pappus* of 20-30 uniseriate, minutely barbellate bristles 2/3 to more or less equalling the length to the disc florets and several much shorter ones.

Other specimens examined. QUEENSLAND: Carnarvon Creek, 25° 00' S, 148° 01' E, *G.W. Althofer* 95 (BRI); 35 km W of Alpha, 23° 38' S, 146° 19' E, *E.R. Anderson* 3844 (BRI); Quittand Hill [obscure locality], *Anonymous* 102 (MEL1547184 pro pte); Gilbert River, s. dat., *Bayles*, 495 (MEL); Woolgar, 19° 04' S, 143° 01' E, Aug. 1914, *E.W. Bick* s.n. (BRI); Jericho, 23° 03' S, 146° 01' E, *S.T. Blake* 6842 (BRI); Poison Creek source, 19° 56' S, 144° 17' E, *S.T. Blake* 8550A (BRI, PERTH); SE of Surat, *S.T. Blake* 21288 (BRI n.v., K); Poison Creek, 80 miles (128 km) N of Hughenden, 19° 50' S, 144° 01' E, *L.J. Brass* 47 (BRI); Baal Gammon Mine, 17° 23' S, 145° 21' E, *J. De Campo* 1293 (BRI, MAREEBA n.v., MEL); 20 km E of Jerricho, 23° 38' S, 146° 18' E, *A.D. Chapman* 1262 (BRI, CANB); Lake Elphinstone, 21° 32' S, 148° 15' E, *A. Dietrich* 1653 (L, MEL); Carnarvon National Park, 24° --' S, 148° --' E, *C.H. Gittins* 342 (BRI); Carnarvon Gorge, 25° --' S, 148° --' E, *D.M. Gordon* 78 (BRI); Devils Sign Post, Carnarvon Ranges, 25° 01' S, 148° 04' E, June 1962, *F.D. Hockings* s.n. (BRI); E of Tambo (24° 53' S, 146° 15' E), *W.T. Jones* 3717 (CANB); Birra, SW of Springsure (24° 07' S, 148° 05' E), Feb. 1961, *A. McLaughlin* s.n. (BRI); range between the [illegible] R[iver] and Burdekin River, s. dat., *F. Mueller* s.n. (MEL1547184 pro pte); Poison Creek, 14 miles (23 km) N of 'Mt Sturgeon', 19° 05' S, 144° 01' E, *R.A. Perry* 3656 (BRI, CANB, DNA, K, L, MEL); Clermont, 22° 04' S, 147° 03' E, *A.J. Peterson* A2 (BRI); 55 km ESE of Aramac, 23° 00' S, 145° 40' E, *R.G. Silcock* 502 (BRI); S of Clarke road, Charters Towers - Lynd Junction, *T. & J. Whaite* 3607 (BRI, NSW n.v.); Enniskillen, 24° 30' S, 146° 00' E, *C.T. White* 12361 (BRI).

WESTERN AUSTRALIA: East Prong, Mt Tom Price, 22° 45' S, 117° 46' E, July 1980, *K.J. Atkins* s.n. (PERTH); Mt Bruce, 22° 36' S, 118° 09' E, *J.S. Beard* 2918 (PERTH); Wittenoom Gorge, 22° 17' S, 118° 19' E, *J.V. Blockley* 176 (CANB, KP, PERTH); Mt Farquhar, 22° 18' S, 116° 46' E, 17 miles (22.2 km) from Duck Creek Junction, *J.V. Blockley* 25 (KP, PERTH); Dales Gorge, 22° 30' S, 118° 37' E, *M.I.H. Brooker* 2196 (DNA, PERTH); Willy Willy [Creek] crossing, 18° 46' S, 127° 01' E, *W.H. Butler* 1170 (PERTH); Dales Gorge, 22° 30' S, 118° 37' E, *G.W. Dale* 4883 (BRI, NSW, NT, PERTH); 53 miles (85 km) E of Meekatharra on Wiluna road, 26° 27' S, 119° 17' E, *A.R. Fairall* 1865 (KP, PERTH); 50 miles (80 km) W of Wiluna on Meekathara road, 26° 28' S, 119° 27' E, *A.R. Fairall* 2160 (KP, PERTH); Mt Bruce, 22° 36' S, 118° 09' E, *C.A. Gardner* 3144 (PERTH); s. loc., *C.A. Gardner* 4044 (PERTH); Dales Gorge, 22° 30' S, 118° 20' E, *McGuire* 49 (PERTH); Hamersley Range, s. dat., *J.W. Ripton*, s.n. (MEL); Henry River, Barlee Range, 23° 44' S, 116° 19' E, *R.D. Royce* 6610 (AD, K, NSW); Wittenoom Gorge, 22° 17' S, 118° 19' E, *K. Stewart* 5 (PERTH); Mt Bruce, 22° 30' S, 118° 00' E, *A.S. Weston* 8363 (K, PERTH).

Distribution. The Fitzgerald District of the Northern Botanical Province and the Ashburton, Austin and Fortescue Districts of the Eremaean Botanical Province of Western Australia and in the Burke, Cook, Leichhardt, Mitchell, North Kennedy and South Kennedy Pastoral Districts of Queensland (Figure 3).

The Queensland locality Quittand Hill (*Anonymous* 102) is obscure.

Habitat. Open shrubland or woodland in colluvial wash or sandy lithosols on rocky ridges or cliff faces.

Flowering period. Principally July to September, but sporadically throughout the year.

Typification. Since *F. Mueller* s.n. (MEL1547173) and its duplicate at K are annotated by Mueller as *Eurybia xerophila* both specimens are considered to be syntypes. A further specimen, *F. Mueller* s.n (MEL1547184), from the Burdekin area is annotated merely "*Aster* (*Olearia*)" and thus is not considered to be a syntype.

The specimen MEL1547108 lacks any indication of the collector but bears collecting numbers and locality. A sheet at K bears Bowman's name and the type locality but no numbers. Both specimens are annotated by Mueller as Aster heynei of which they thus appear to be syntypes.

Notes. The curious disjunct distribution of this species in Western Australia and Queensland is worthy of note. The enormous distance barrier involved and the presence of an isolated population in the Kimberley Region suggest that this species once had a continuous distribution across northern Australia but has survived subsequent periods of aridity only in comparatively wetter refugial habitats, such as those in the Hamersley Range. It may yet be found in suitable habitats in the intervening region of the Northern Territory.

Etymology. The specific epithet draws attention to the dry habitats favoured by this species.

Olearia gordonii Lander, sp. nov. (Figure 2)

Olearíae xerophilae arte affinis a qua vestimento leniter hirsuto, foliis 2-8 mm raro ad 22 mm latis linearibus vel peranguste ellipticis, flosculis ligulatis paucioribus, et acheniis longioribus differt.

Typus: On the very dry slopes of the "Bendee" ridges between Glenmorgan and Surat; and on the Thomby Range, Queensland, s. dat., *D.M. Gordon* 80 (holo: BRI; iso: PERTH).

Erect shrub to 0.6 m high, spreading. *Stems* green when young, brown when older. *Vestiture* of stems, leaves and outer involucral bracts weakly hirsute with long, filiform, eglandular hairs, conic, biseriate, capitate glandular hairs and minute, biseriate, capitate, glandular hairs. *Leaves* alternate, ascending, apparently sessile; petiole winged, merging insensibly into lamina; lamina linear to very narrowly elliptic, 10-75 x 2-8 mm, concolorous, pale green; venation reticulate with prominent midrib; base narrowly cuneate; margin serrate; apex acute. *Heads* in loose, terminal corymbs, pedunculate, radiate, 21-30 mm diameter; disc 7-10 mm diameter. *Peduncle* to 80 mm long, with several filiform, leaf-like bracts merging into those of the involucre. *Involucre* broadly turbinate or hemispheric; bracts 5-seriate, 2.5-6.5 x 0.4-0.8 mm. *Outer involucral bracts* narrowly triangular, slightly carinate; stereome green; margin broadly membranous, entire; apex acuminate. *Inner involcural bracts* narrowly linear, flat; stereome pale green, bearing scattered eglandular and glandular hairs apically; margin fimbriate; apex acuminate. *Receptacle* flat. *Ray florets* 13-33, blue, female, uniseriate, 9.8-11.5 mm long; tube with scattered, biseriate, eglandular hairs; ligule narrowly elliptic, 7.0-10.0 x 0.8-1.2 mm, glabrous, acute and minutely 3-toothed; stylar arms filiform, 1.0-1.5 mm long. *Disc florets* 22-69, bisexual, narrowly infundibular, 3.8-5.5 mm long, bearing a few scattered, biseriate, eglandular hairs; lobes 5, triangular, 0.5-0.8 mm long; anthers 1.6-1.7 mm long, shortly acute or obtuse and shorter than the filament collar basally, with narrowly ovate, acute sterile terminal appendage; filament collar 0.3-0.4 mm long; stylar arms ligulate, 1.0-1.4 x 0.2-0.3 mm long, with triangular apical appendages bearing long, botuliform papillae

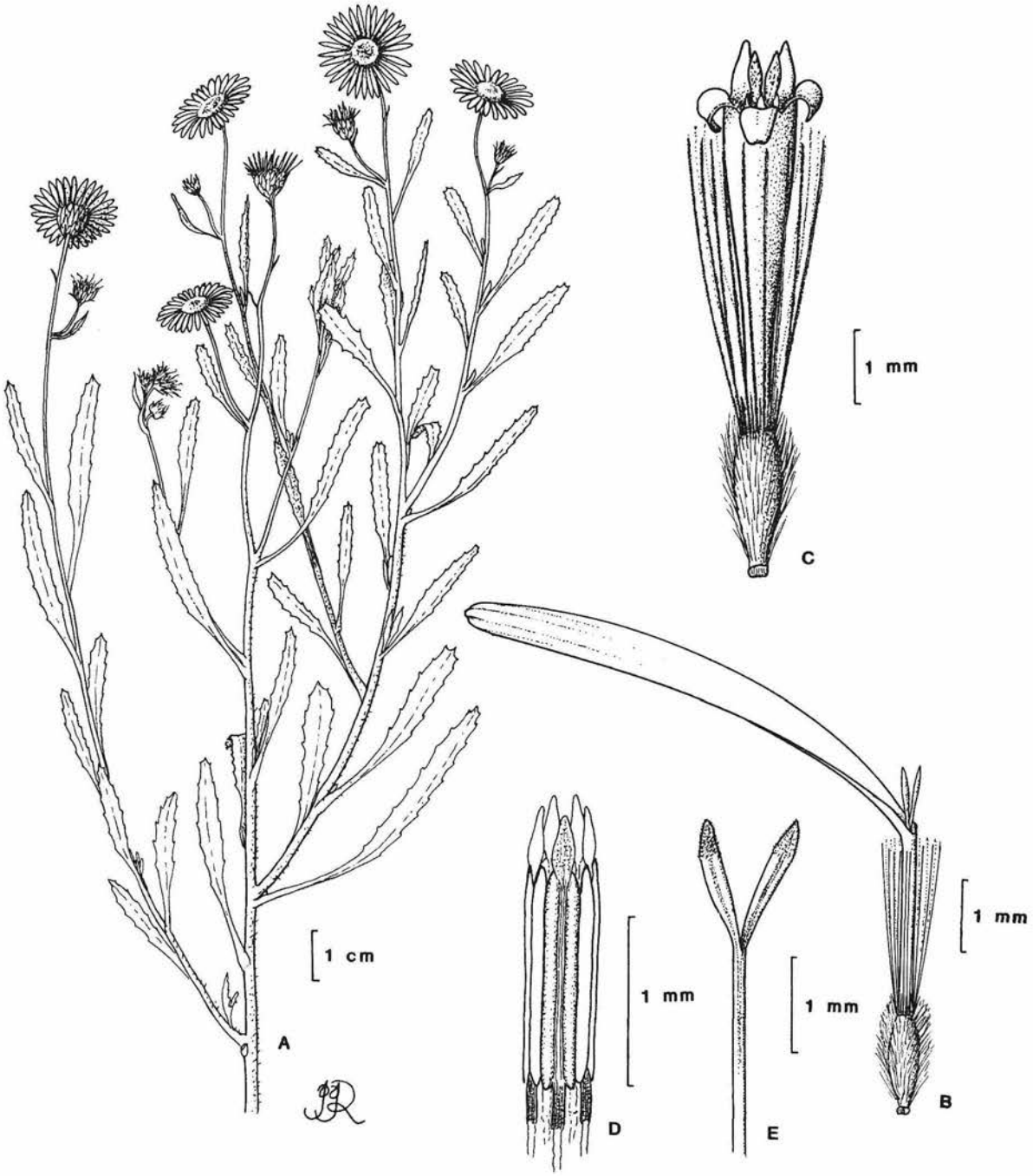


Figure 2. *Olearia gordonii*. A - Habit. B - Ray floret. C - Disc floret. D - Anthers. E - Stylar arms. Drawn from *D.M. Gordon* 80 (iso: PERTH).

above the stigmatic lines. *Achene* obovoid, flattened, 2.7-4.0 x 0.8-1.4 mm, light brown, densely sericeous with duplex hairs; carpopodium prominent, central; margins thickened; apex truncate. *Pappus* of 20-25, free, uniseriate, minutely barbellate bristles more or less equal to the disc florets, and several much shorter ones.

Other specimens examined. QUEENSLAND: SE of Surat, Thomby Range, *S.T. Blake* 21288 (BRI, CANB); 20 km W of Glenmorgan near 'Murilla' on Surat road, 27° 01' S, 149° 02' E, *T.J. McDonald* 57 (BRI); Camp 29, *T.L. Mitchell* 504 (CGE); 12 miles (19.3 km) W of Glenmorgan, 27° 01' S, 149° 03' E, *L. Pedley* 1203 (BRI, K); 8 km SE of 'Yo Yo Park' on Morven - Augathella road, 26° 04' S, 146° 49' E, *R.W. Purdie* 762D (AD, BRI).

Distribution. Endemic to southern Queensland, occurring in the Maranoa and Warrego Pastoral Districts, south of 26° S latitude, between Augathella and Glenmorgan (Figure 3).

Habitat. Open forest dominated by "Bendee" (*Acacia catenulata* C.T. White) in shallow lithosols on lateritic ridges or hillsides.

Flowering period. January to July.

Conservation status. Although little collected, this species occurs in a habitat of extensive distribution; it is not considered endangered or vulnerable.

Etymology. The specific epithet honours David Morrice Gordon (1899-), the collector of the type of this taxon.

Notes. This taxon is the *Olearia* "sp. 1" of Stanley & Ross (1986).

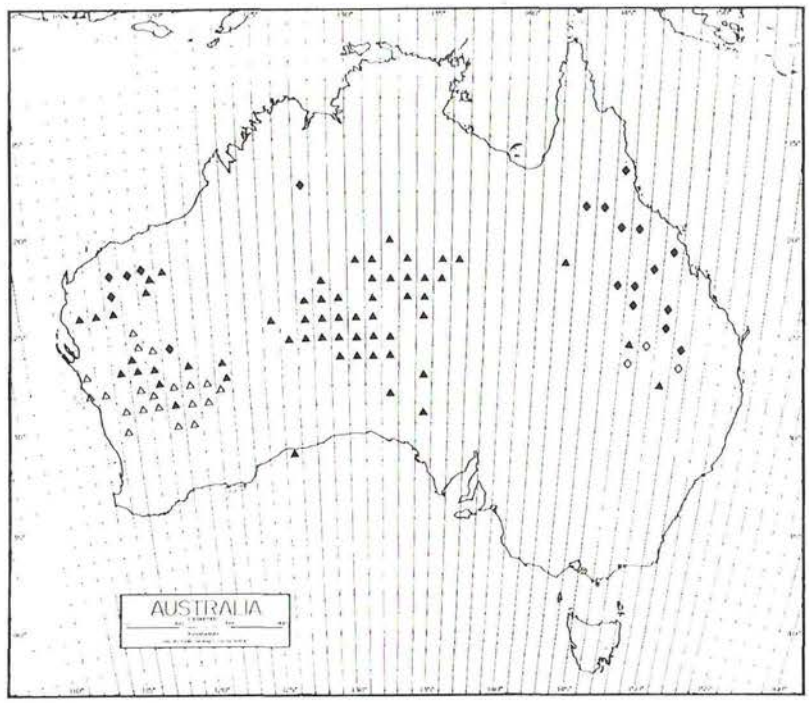


Figure 3. Distribution of *Olearia humilis* (△), *O. stuartii* (▲), *O. xerophila* (◆), *O. gordonii* (◇) indicating occurrence in 1° x 1° squares.

Discussion

With the exception of the multiseriate glandular hairs found on the involucral bracts of *O. stuartii*, the species treated here share the same complement of trichome types. The vestiture of each species comprises a characteristic admixture and frequency of these various trichome types and thus provides an invaluable diagnostic feature to the extent that the species can generally be distinguished on this basis alone.

The combination of these particular trichome types is typical of *Olearia* sect. *Merismotriche* Archer ex Benth. where the species described in this paper would seem best placed, pending the completion of my own studeis in the genus. This necessitates the removal of *O. stuartii* from sect. *Adenotriche* Archer ex Benth. anticipated by Bentham (1867) and first adopted by Gardner (1931). The four species appaer to form a natural group with no other close relatives within the sect. *Merismotriche*.

Acknowledgements

It gives me great pleasure to thank Mr Paul G. Wilson for his constructive criticism of a draft of this paper, Mr M.I.H. Brooker for providing the Latin diagnoses and Mr J.J. Rainbird for providing the illustrations.

I am also grateful to the heads of the following herbaria for the loan of material examined in the course of this study: AD, BRI, CANB, CGE, DNA, MEL, NSW.

Much vital background work towards my ongoing revision of Australian *Olearia* was carried out during my assignment as Australian Botanical Liaison Officer at Kew in 1984/5 and during visits to MEL in 1986 and 1987. This work has been further supported by an Australian Biological Resources Study Grant in 1988 and 1989.

References

Bentham, G. (1867 [as 1866]). "Flora Australiensis." Vol. 3. (Lovell Reeve & Co.: London.)

Gardner, C.A. (1931 [as 1930]). "Enumeratio Plantarum Australiae Occidentalis. A Systematic Census of the Plants occurring in Western Australia." (Government Printer: Perth).

Giles, W.E.P. (1889). "Australia Twice Traversed." Vol. 1. (Sampson Low, Marston, Searle & Rivington: London.)

Lander, N.S. (1985 [as 1984]. Revision of the Australian genus *Lawrencia* Hook. (Malvaceae: Malveae). Nuytsia 5: 201-271.

Ramayya, N. (1962). Studies on the trichomes of some Compositae I. General structure. Bull. Bot. Surv. India 4: 177-188.

Stanley, T.D. & Ross, E.M. (1986). "Flora of South-eastern Queensland." Vol. 2, pp. 519-520. (Queensland Department of Primary Industries: Brisbane).

Stuart, J.McD. (1864). "Exploration in Australia - 1856-1862." (Saunders, Otley & Co.: London.)

Turner, B.L. (1970). Chromosome numbers in the Compositae. XII. Australian species. Amer. J. Bot. 57: 382-389.

Taplinia, a new genus of Asteraceae (Inuleae) from Western Australia

N.S. Lander

Western Australian Herbarium, Department of Conservation and Land Management,
P.O. Box 104, Como, Western Australia, 6152

Abstract

Lander, N.S. *Taplinia*, a new genus of Asteraceae (Inuleae) from Australia. Nuytsia 7 (1): 37-42 (1989). *Taplinia* Lander, a new genus, is described with a single species, *T. saxatilis* Lander, from Western Australia. It appears to belong to the tribe Inuleae subtribe Gnaphaliineae, although its affinities there are obscure.

Introduction

Taplinia saxatilis Lander, the composite described here, was first collected at localities near Wiluna and Agnew by Mr T.E.H. Aplin of the Western Australian Herbarium in August 1963. Subsequently, further specimens were gathered by Mr Paul G. Wilson and Dr R.J. Chinnock. Due to a superficial resemblance to *Helipterum battii* F. Muell. these specimens had been tentatively assigned to the genus *Helipterum.*

In the course of his ongoing revisionary studies of Australian species hitherto placed in *Helipterum*, Paul G. Wilson (pers. comm.) has excluded *Taplinia* from that group on the basis of its anther morphology. It certainly represents a distinct new genus, one readily circumscribed and not impinging on investigations in Australian Inuleae being carried out elsewhere.

Descriptions

Taplinia Lander, gen. nov.

Herbae lignosae foliis alternis sessilibus. Capitula discoidea homogama in paniculam terminalem disposita. Receptacula plana laevia glabra. Involucra anguste turbinata in alabastro, obconica sub anthesi; bracteae multiseriales chartaceae. Flosculi numerosi tubuliformes hermaphroditi; bases antherarum breviter sagitattae absque caudiculis et collo fila menti breviores;

brachia styli ligulata stigmatibus ventralibusque dilatatis apices versus semiverticillum formantia papillarum extendentium et appendicem subulatem ferentia. Achenia ellipsoidea sericea pilis adpressis duplicibus; carpopodia conspicua, angusta, centralia. Pappi constati ex setis multis plus minusve aeqalibus discretis minute barbellatis, subaequantibus flosculos. Pollen spheroideum tricolporatum spinosum.

Typus: Taplinia saxatilis Lander

Woody herbs. Vestiture of vegetative parts comprising eglandular and glandular hairs. Leaves alternate, sessile; laminae membranous; venation pinnate. Heads discoid, homogamous, in terminal, leafy panicles, subsessile, subtended by leaf-like bracts. Receptacles flat, smooth, glabrous. Involucres narrowly turbinate in bud, obconic at anthesis; bracts multiseriate, chartaceous, with central, pale green stereome and broad, translucent margins. Florets many, tubular, bisexual; anthers with bases shortly sagittate, without tails and shorter than their filament collars, with narrowly ovate, sterile, terminal appendage; stylar arms ligulate, ventro-marginally stigmatic, dilated apically into a half-whorl of spreading papillae and bearing a subulate appendage. Achenes ellipsoid, sericeous with appressed duplex hairs; carpopodia conspicuous, narrow, central. Pappi of many, more or less equal, free, minutely barbellate bristles subequal to the florets. Pollen spheroid, tricolporate, spinous.

Etymology. The name honours Theodore Ernest Holmes Aplin (1927), for many years botanist at the Western Australian Herbarium, who made the first collection of this new genus.

Taplinia saxatilis Lander, sp. nov. (Figures 1 & 2)

Herba ad 30 cm alta foliis ellipticis ovatis, obovatis velspathulatis, 2-16 x 8-50 mm, membranaceis, peranguste cuneatis vel basi amplectentibus. Involucrum 3-6 x 4-7 mm bracteis ovatis vel anguste ovatis 3.8-6.0 x 1.5-2.5 mm. Flosculi 13-14 tubo 4.2-4.5 mm longo infra flavido, supra aliquantum purpureo; antherae 1.06-1.27 mm longae collo filamenti 0.37-0.40 mm longo et appendice terminali 0.40 mm longa; brachia styli 1.2-1.3 mm longa. Achenium c. 0.3-1.0 mm. Pappus constatus ex 18-20 setis, 2.5-3.8 mm longis.

Typus: near James Pool, 'Windidda' [26° 23' S, 122° 13' E], Western Australia, 6 September 1973, *R.J. Chinnock* 836 (holo: PERTH; iso: AD).

Woody herb, erect, to 30 cm high, monopodial but branching basally, viscid. *Vestiture* of stems, leaves and subtending involucral bracts comprising scattered patent, simple, conic hairs, spreading, flagellate, filiform hairs and short, patent, biseriate, capitate, glandular hairs. *Stems* light brown when young, dark purple when older. *Leaves* alternate, sessile; lamina elliptic, ovate, obovate or spathulate, 8-50 x 2-16 mm, membranous, dark green or purplish; venation pinnate with prominent midvein; base very narrowly cuneate or clasping; margin entire, undulate; apex acute to acuminate. *Heads* discoid, homogamous, bisexual, in terminal, leafy panicles, subsessile, subtended by several small, narrowly ovate, reddish, leaf-like bracts. *Receptacle* flat, c. 1 mm in diameter, smooth, glabrous. *Involucre* narrowly turbinate in bud, obconic at anthesis, 4-7 x 3-6 mm; bracts elliptic to narrowly ovate, 3.8-6.0 x 1.5-2.5 mm, chartaceous, with central pale green stereome (much reduced in inner bracts), broad, translucent, entire margin and obtuse or acute apex. *Florets* 13-14, tubular, bisexual; tube narrowly infundibular, 4.2-4.5 mm, yellow below, purplish above, with scattered, spreading, simple, biseriate hairs; lobes 5, narrowly triangular, c. 1 mm long; anthers shortly sagittate basally, 1.06-1.27 mm long, with filament collar 0.37-0.40 mm long and narrowly ovate, sterile, terminal appendage 0.40 mm long; stylar arms ligulate, 1.2-1.3 mm long, dilated apically into a half-whorl of papillae, with a subulate appendage of fused epidermal cells. *Achene* ellipsoid,

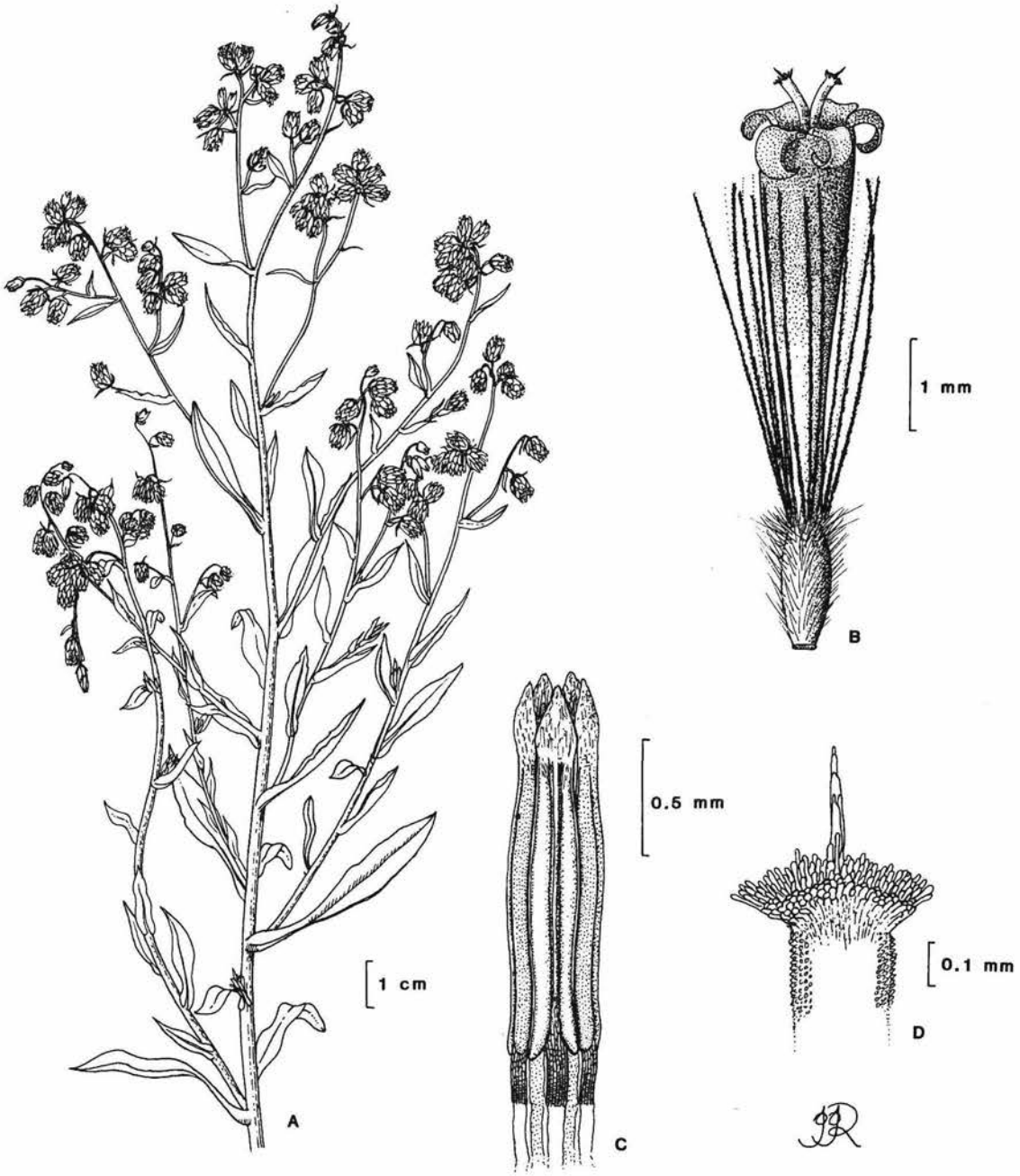


Figure 1. *Taplinia saxatilis*. A - Habit. B - Floret. C - Anthers. D - Apex of stylar arm. Drawn from the holotype.

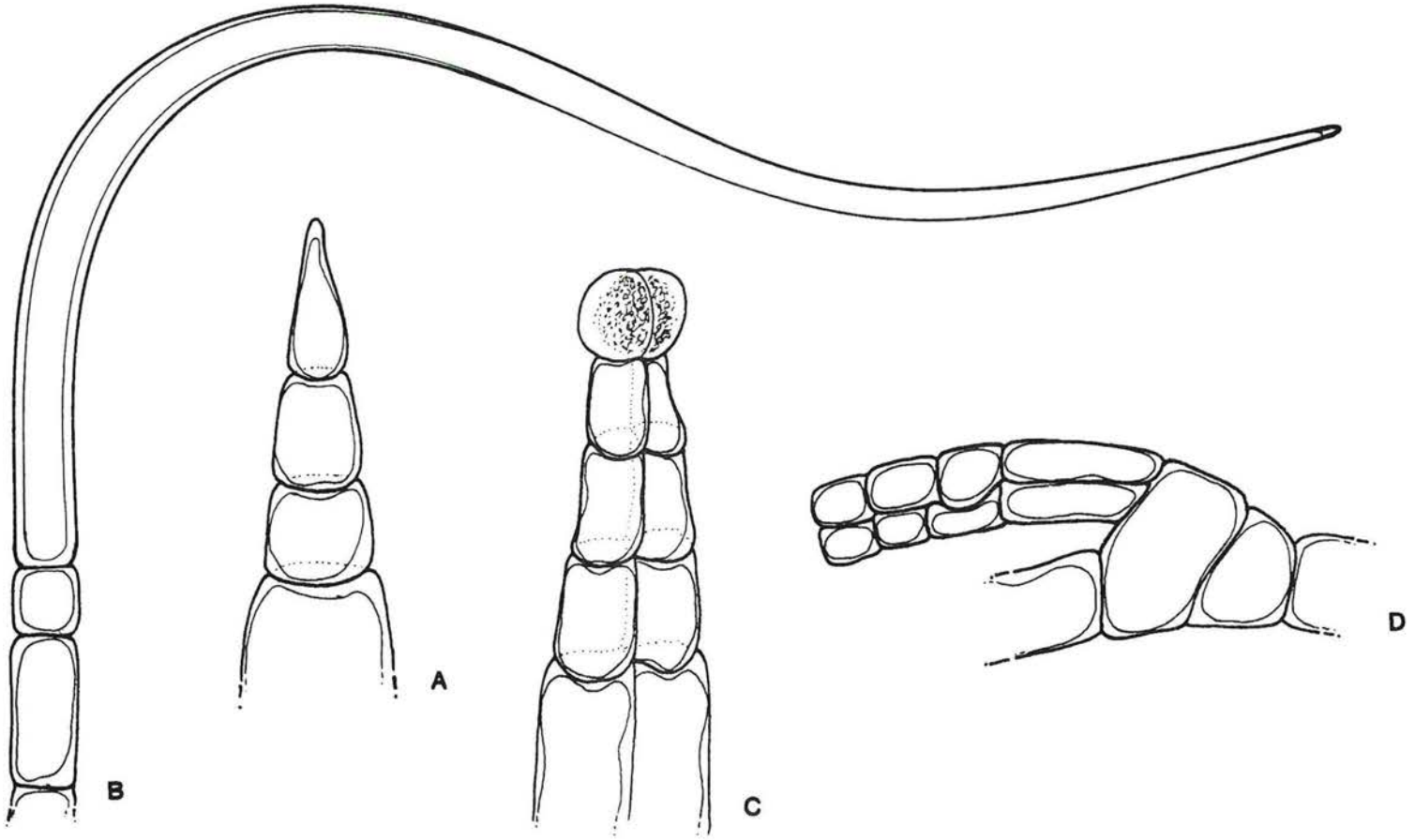


Figure 2. *Taplinia saxatilis*, Trichomes. A - Simple conical hair (from leaf). B - Flagellate filiform hair (from leaf). C - Biseriate capitate glandular hair (from leaf). D - Simple biseriate hair (from floral tube). Drawn from the holotype.

c. 1.0 x 0.3 mm, densely sericeous with appressed duplex hairs; carpopodium narrow, central. *Pappus* of 18-20 more or less equal, free, minutely barbellate bristles, 2.5-3.8 mm long.

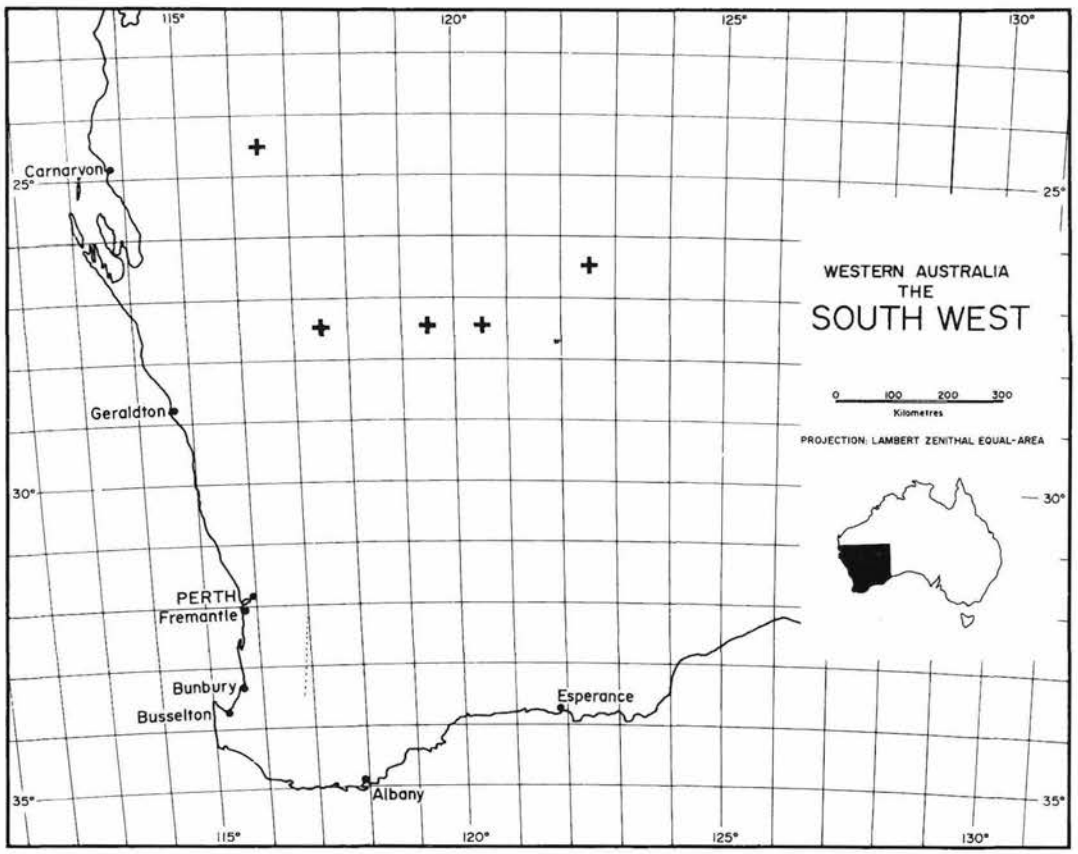
Other specimens examined. WESTERN AUSTRALIA: 51 miles [82 km] N of Agnew, [27° 18' S, 120° 31' E], *T.E.H. Aplin* 2393 (PERTH); 27 miles [43 km] W of Wiluna, [26° 34' S, 119° 59' E], *T.E.H. Aplin* 2441 (PERTH); 60 km NW of Cue on road to 'Kalli', [27° 18' S, 117° 39' E], *P.G. Wilson* 9902 (MEL, NSW, NT, PERTH).

Distribution. Found in the Ashburton and Austin Districts of the Eremaean Botanical Province of Western Australia (Map 1).

Habitat. Amongst open shrubland in red sandy soil in crevices of lateritic breakaways.

Flowering period. August to September.

Conservation status. Although infrequently collected this species is widespread, occurring in areas unlikely to experience change in land use. It is probably neither rare nor endangered, but it would be useful to have a more detailed knowledge of its distribution and the sizes of its populations.



Map 1. Distribution of *Taplinia saxatilis* indicating occurrence in 1° x 1° squares.

Etymology. The specific epithet draws attention to the rocky sites inhabited by this plant.

Note. In the above species account the descriptions of the various trichomes follow the terminology of Ramayya (1962).

Discussion

The alternate, entire leaves; the discoid heads lacking a calyculus; the multiseriate, subequal, imbricate, chartaceous involucral bracts; the naked receptacles; the anthers with basally sagittate microsporangia and with a terminal, sterile appendage; the appendiculate, "*Senecio*-type" styles; and the capillary pappus place this genus in the tribe Inuleae subtribe Gnaphaliinae sensu amplo of Merxmüller et al. (1977).

The absence of anther tails is not unknown elsewhere in the Inuleae (Dunlop 1981, Merxmüller et al. 1977, Randeria 1960).

In *Taplinia* the stylar arms are ventro-marginally stigmatic all the way to the apex, the stigmatic lines remaining discrete. The apex of each arm is dilated into a half-whorl of spreading papillae. From the centre of this whorl arises a slender shaft of fused epidermal cells. (See Figure 1D.)

Each stylar arm is ascended by a single line of spiral tracheary elements in continuation of one of the two xylem strands in the style proper. This vascular strand terminates abruptly in the region of the whorl of divergent papillae and does not ascend the shaft of fused epidermal cells.

Stylar arms very similar in morphology to those of *Taplinia*, with the same apical half-whorl of spreading papillae from which arises a shaft of fused epidermal cells, can be observed in *Helipterum heteranthum* Turcz. and other members of the the tribe Inuleae (see Wilson 1989). They are not unlike those reported for certain genera in the tribe Senecioneae (Nordenstam 1977, p. 812).

Acknowledgements

I wish to thank Mr M.I.H. Brooker for providing the Latin diagnoses and Mr J.J. Rainbird for preparing the illustrations. I am indebted to Mr Paul G. Wilson for helpful discussion.

References

Dunlop, C.R. (1981). *Allopterigeron*, a new genus in Asteraceae (Inuleae). J. Adelaide Bot. Gard. 3(2): 183-186.

Merxmüller, H., Leins, P. & Roessler, H. (1977). Inuleae - systematic review. *In* Heywood, V.H. et al. "The Biology and Chemistry of the Compositae." Vol. 1, pp. 577-602. (Academic Press: London.)

Nordenstam, B. (1977). Senecioneae and Liabeae - systematic review. *In* Heywood, V.H. **et al.** "The Biology and Chemistry of the Compositae." Vol. 2, pp. 799-830.

Randeria, A.J. (1960). The composite genus *Blumea*, a taxonomic revision. Blumea 10: 176-317.

Ramayya, N. (1962). Studies on the trichomes of some Compositae I. General structure. Bull. Bot. Surv. India 4: 177-188.

Wilson, Paul G. (1989). A Revision of the genus *Hyalosperma* (Asteraceae: Inuleae: Gnaphaliinae). Nuytsia 7: 75-101.

Acacia veronica Maslin (Leguminosae: Mimosoideae), a new species of *Acacia* endemic in the Stirling Range, Western Australia

B.R. Maslin

Western Australian Herbarium, Department of Conservation and Land Management,
P.O. Box 104, Como, Western Australia 6152

Abstract

Maslin, B.R. *Acacia veronica* Maslin (Leguminosae: Mimosoideae), a new species endemic in the Stirling Range, Western Australia. Nuytsia 7(1): 43-47 (1989). A new species of *Acacia* section *Plurinerves*, *A. veronica* Maslin, is described and illustrated. Although its precise taxonomic affinities are unclear it seems in some ways related to *A. cyclops* A. Cunn. ex Don. *Acacia veronica* is the only species of *Acacia* known to be endemic in the Stirling Range.

Acacia veronica Maslin, sp. nov. (Figure 1).

Typus: 300 m N of Toolbrunup car park, Stirling Range National Park, Western Australia, 10 April 1974, A.*S. Weston* 9170 (holo: PERTH; iso: CANB, K, MEL, NY, PERTH).

[*Acacia dentifera* auct., non Benth.: G. Bentham, Fl. Austral. 2: 361(1864), *pro parte*, as to *J. Drummond* coll. 5, no. 7 (FI, G, P, PERTH).]

Frutex vel arbor plerumque 3-10 m alta. Ramuli glabri. Surculi novi resinosi. Phyllodia linearia ad linearia-elliptica, (6-8)9-15(20) cm longa, 3-8 mm lata, glabra, plerumque 3-nervia, nervo centrali maxime conspicuo. Racemi (1)2-6(8) mm longi, plerumque binati. Pedunculi 8-15 mm longi, glabri, resinosi. Capitula globulosa, 24-27-floribus. Flores 4-meri. Calyx gamosepalus. Legumina linearia, ad 11 cm longa, 5-5.5 mm lata. Semina in legumine longitudinalia, 5.5-6 mm longa, arillo albo.

Shrub or *tree* 3-10 m tall, sometimes smaller, main trunks c. 10 cm or more d.b.h., canopy often dense. *Bark* grey or greenish grey, finely fissured at base of trunks, otherwise smooth. *Branchlets* glabrous, terete, angled towards apices, finely ribbed, ribs yellow to light brown. *New shoots* resinous, aromatic (fragrance of friar's balsam). *Stipules* inconspicuous, 0.5 mm long, triangular, caducous. *Phyllodes* linear to linear-elliptic, narrowed at both ends, (6-8)9-15(20) cm long, 3-8 mm wide, l:w = 15-30(60), thinly coriaceous, spreading to erect, usually shallowly incurved, sometimes

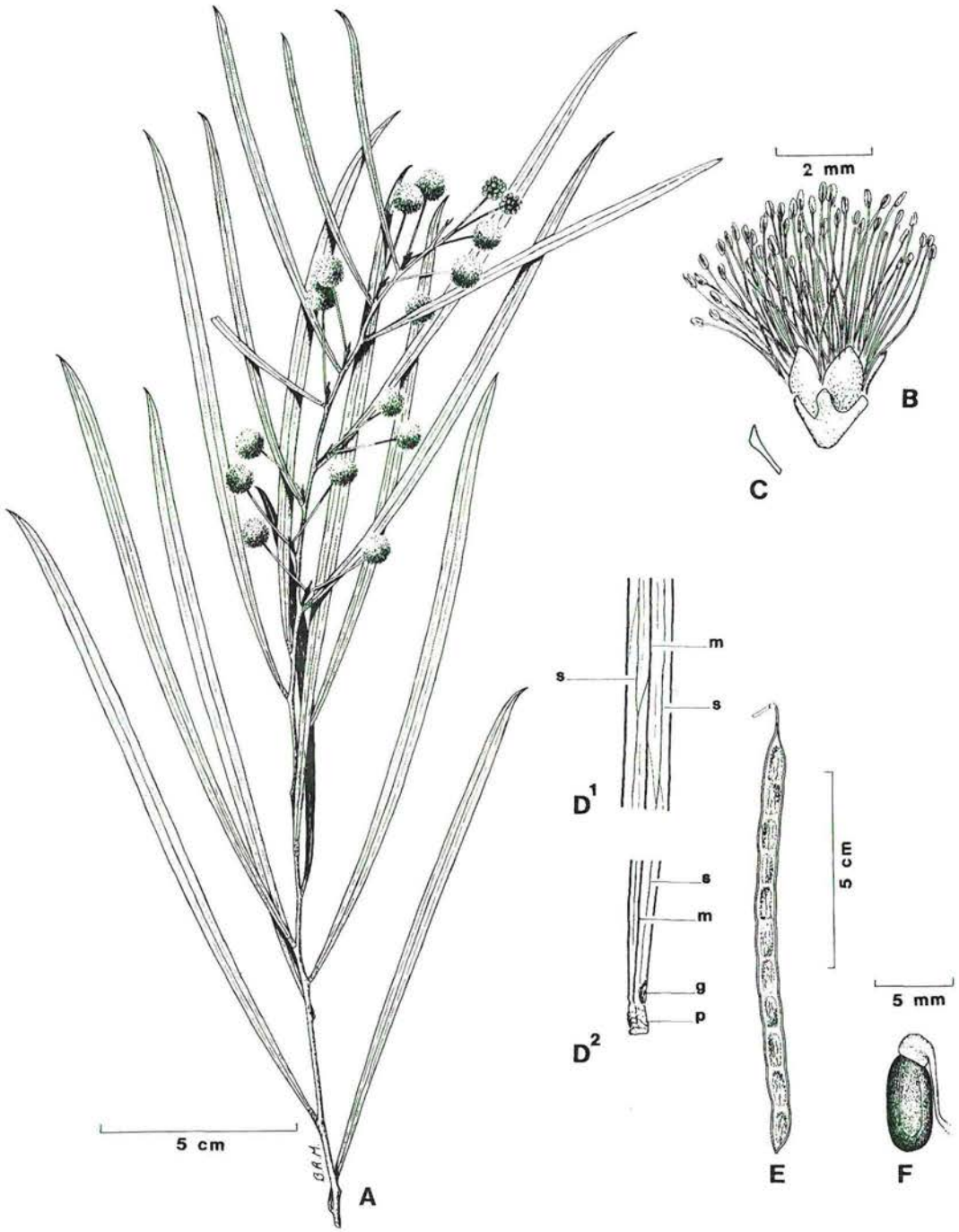


Figure 1. Acacia veronica. A - Portion of branch. B - Flower. C - Bracteole. D - Phyllode showing nervature, D^1 central segment of phyllode, D^2 lower segment of phyllode (p - pulvinus, g - gland, m - midrib, s - secondary longitudinal nerves). E - Legume. F - Seed. A drawn from *A.S Weston* 9170; B-D from *G.J. Keighery* 4978; E-F from *B.R. Maslin* 4013.

straight, glabrous, dark green, slightly shiny when fresh; commonly 3 longitudinal *nerves* arising from near base of phyllode, the central nerve (midrib) the most pronounced, secondary nerves trending longitudinally and sparingly anastomosing; *apices* acute, straight or sub-uncinate, apical point callose and brown; *pulvinus* 1.5-2 mm long, transversely wrinkled when dry, ± channelled adaxially (at least when dry). *Gland* inconspicuous, situated on upper margin of phyllode at distal end of pulvinus or to c. 1 mm above it. *Racemes* (1)2-6(8) mm long with commonly two peduncles inserted towards the end of the raceme axis; *raceme axis* resinous, glabrous, base ebracteate, apex usually terminated by a dormant bud enveloped by resin, occasionally the bud growing out as a vegetative shoot or sometimes replaced by a peduncle. *Peduncles* 8-15 mm long, glabrous, resinous, papillose or verruculose, ± smooth in fruit; basal peduncular bract ± caducous, solitary, triangular, shallowly concave at base, 1-1.5 mm long, light brown. Flower-heads globular, 24-27 -flowered, to 12 mm diam. at anthesis (when dry), white to cream. *Bracteoles* spathulate, equalling calyx in length, glabrous, apices thickened and abaxially verruculose or papillose. *Flowers* 4-merous, resinous, glabrous. *Calyx* 2/5-3/5 length of corolla, gamosepalous, divided for c. 1/4 its length into triangular-oblong lobes which are slightly keeled abaxially. *Petals* 2-2.5 mm long, superficially nerveless. *Legumes* linear, to 11 cm long, 5-5.5 mm wide, up to 11 seeded, thinly coriaceous-crustaceous, ± straight, not or scarcely constricted between the seeds and moderately raised over them, glabrous, brown to grey-brown, marginal nerve narrow. *Seeds* longitudinal in the legume, oblongoid, 5.5-6 mm long, 2.7 mm wide, dark brown, moderately shiny; *pleurogram* obscure, open at hilar end, 3.5-4 mm long, 1-1.3 mm wide; *funicle* straight, c. 3 mm long, expanded into a thickened, terminal, white (light brown when dry) aril.

Other specimens examined. WESTERN AUSTRALIA: At back of Mt Hassell, Stirling Range, *A.M. Ashby* 4479 (PERTH); [Mt] Toolbrunup, on the climbing track from SE, *J.S. Beard* 7441 (PERTH); N of [Mt] Toolbrunup, Stirling Range National Park, *J.S. Beard* 7660 (PERTH); cultivated at Muchamulla, Moore River, 24 June 1982, *M.I. Blackwell* s.n. (AD, NY, PERTH); 10 km from Chester Pass Road on Stirling Range Scenic Drive, *R.J. Cumming* 947 (PERTH); 21 km along Stirling Range Scenic Drive from Red Gum Pass Road, *R.J. Cumming* 1000 (MEL, PERTH); 4.4 km from Chester Pass Road on Stirling Range Scenic Drive, *R.J. Cumming* 1013 (PERTH); Mt Toolbrunup, Stirling Range, *A.R. Fairall* 2515 (PERTH); cultivated in Ashby's garden from Stirling Range seed, *F.M. Hilton* 900 (PERTH); Mt Trio car park, Stirling Range, *G.J. Keighery* 3382 (PERTH) and 3510 (PERTH); Summit ridgeline of Wedge Hill, *G.J. Keighery* 4872 (PERTH); Gullies below Mt Hassell, Stirling Range, *G.J. Keighery* 4978 (CANB, K, PERTH); Near Mt Hassell, Stirling Range, *B.R. Maslin* 3744 (PERTH) and 4013 (PERTH); cultivated in Ken Newbey's Arboretum, Ongerup, *K.R. Newbey* 3689 (PERTH); Mt Talyuberlup, Stirling Range, anno 1973, *K.R. Newbey* s.n. (PERTH); Mt Toolbrunup, Stirling Range National Park, *F.A. Spratt* 10 (PERTH) and *A.S. Weston* 8247 (PERTH); Top of Mt Barnett, Stirling Range, *A.S. Weston* 9147 (PERTH).

Distribution. South-west Western Australia at the western extremity of the Eyre Botanical District (1: 250,000 map, I50-11). Endemic in the Stirling Range National Park, c. 80 km N of Albany. *Acacia veronica* is the only species of *Acacia* known to be restricted to the Stirling Range.

Habitat. Gullies along watercourses in Jarrah-Marri or Wandoo forest or woodland. Also in sheltered sites near summits of some high peaks.

Flowering period. March-September.

Fruiting period. Legumes with mature seeds have been collected in December. The species is a heavy seeder.

Variation. Specimens from near summits of some high peaks may reach only 1.5 m tall and have shorter than normal phyllodes (6-8 cm long).

Affinities. On account of its globular flower-heads and its multi-nerved phyllodes *A. veronica* is referred to *Acacia* section *Plurinerves* (Benth.) Maiden & Betche. However, because the phyllode midrib is more pronounced than the other 1 or 2 longitudinal nerves, *A. veronica* can easily be mistaken for a species of *Acacia* section *Phyllodineae* DC. Indeed, this is what Bentham (1864, 361) did by including under *A. dentifera* Benth. the specimen, J. Drummond coll. 5, no. 7. *Acacia dentifera* is distinguished from *A. veronica* by many characters including the following: it is a non-resinous, non-aromatic shrub with golden heads, 5-merous flowers, ± terete legumes and prominently 1-nerved phyllodes (with no secondary longitudinal nerves).

The precise taxonomic affinities of the new species are not clear. Based on inflorescence structure and phyllode nervature *A. veronica* appears to have some affinities with *A. cyclops* A. Cunn. ex Don. This species is widespread in coastal and near-coastal habitats in Western Australia and South Australia (Maslin & Pedley 1982) and is readily distinguished from *A. veronica* in the following ways: branchlets, peduncles and flower-heads not resinous; phyllodes 3-5-nerved (nerves ± equally prominent), 4-9.5 cm long, 6-15 mm wide; flowers 5-merous; flower-heads light golden; legumes 8-12 mm wide; funicle thick and prominent, red or yellowish orange, encircling the seed. Gum chemistry studies by Anderson et al. (1984) lend support to a relationship between *A. veronica** and *A. cyclops*. However, somewhat surprisingly, Anderson's results suggest that the following species are biochemically more closely related to *A. veronica* than the new species is to *A. cyclops*: *A. implexa* Benth. (*Acacia* section *Plurinerves*), *A. saligna* (Labill.) H. Wendl. (*Acacia* section *Phyllodineae*), *A. longifolia* (Andr.) Willd. and *A. maidenii* F. Muell. (both *Acacia* section *Juliflorae* (Benth.) Maiden & Betche). Using existing classifications of *Acacia* this is an unlikely alliance of taxa. However, a re-assessment of the classification of *Acacia* is long overdue, and it is not possible to predict how species will be grouped in a more natural classification of the genus.

Acacia veronica is possibly distantly related to some species occurring in eastern Australia. For example, *A. subporosa* F. Muell. (New South Wales, Victoria) is similar in phyllode shape, size and nervature, flower-head shape, and in carpological features. This species differs markedly from *A. veronica* in its puncticulate phyllodes, 5-merous flowers, and non-racemose inflorescences. *Acacia baeuerlenii* Maiden & R.T. Baker (New South Wales, Queensland) resembles *A. veronica* in its large, globular, white flower-heads arranged in short racemes (raceme axis with a dormant apical bud, peduncles with a single basal bract) but differs in many other ways, e.g. hairy branchlets, racemes and legumes, 5-merous flowers, broader phyllodes with more numerous nerves (see Pedley 1978, 208).

Conservation status. 2RC using the criteria of Leigh et al. (1981).

Cultivation. In cultivation at Moore River (c. 80 km N of Perth) the species reached 1.5 m high and flowered in its first year. Also successfully cultivated in Perth and Adelaide.

Etymology. Named in honour of my wife, Veronica. The epithet "*veronica*" is used here deliberately as a noun in apposition, thus requiring no change by the addition of a case ending.

Acknowledgements

Diana Corbyn kindly provided the Latin description for *A. veronica*.

* In this work *A. veronica* was called *Acacia* 'P31' and, upon my advice, referred to *Acacia* sec Phyllodineae.

References

Anderson, D.M.W., Gill, M.C.L., McNab, C.G.A. & de Pinto, G. (1984). Some *Acacia* gum exudates of the section *Phyllodineae*. Phytochemistry 23: 1923-1926.

Bentham, G. (1864). "Flora Australiensis." Vol. 2. (Reeve: London.)

Leigh, J., Briggs, J.D. & Hartley, W. (1981). "Rare or Threatened Australian Plants." (Australian National Parks and Wildlife Service: Canberra.)

Maslin, B.R., & Pedley, L. (1982). The distribution of *Acacia* (Leguminosae: Mimosoideae) in Australia. Part 1. Species distribution maps. Western Austral. Herb. Res. Notes 6: 1-127.

Pedley, L. (1978). A revision of *Acacia* Mill. in Queensland. Part 1. Austrobaileya 1: 75-234.

The genus *Anthotium* (Goodeniaceae)

D. A. Morrison

Department of Applied Biology, University of Technology, Sydney,
P.O. Box 123, Broadway, N.S.W. 2007

Abstract

Morrison, D.A. The genus *Anthotium* (Goodeniaceae). Nuytsia 7(1): 49-58 (1989). Three species are recognised in the genus, which is endemic to the southwest of Western Australia. *A. humile* R. Br. var. *junciforme* (Vriese) E. Pritzel is raised to specific status as *A. junciforme* (Vriese) D.A. Morrison. A total of five names are lectotypified, the species are described, and a key, illustrations and distribution maps are provided.

Introduction

The first satisfactory complete treatment of *Anthotium* was that of Bentham (1868), and the only full generic treatment since then is that of Krause (1912). More recently, there have been considerable advances in the understanding of the morphology and anatomy not only of this genus, but also of related genera (e.g. Carolin 1959, 1960, 1966, 1967a, 1970). At the same time, there has been much collecting of material of the species referred to *Anthotium*, and also redefinition of species limits in the other genera in the family Goodeniaceae (e.g. Carolin 1967b, 1967c, 1974, 1979, Morrison 1986). As a consequence, it is now desirable to revise *Anthotium* in order to bring the formal taxonomy of the genus up to date.

Generic Relationships

Anthotium is a very coherent group within the Goodeniaceae. The most distinctive feature of the genus is that the fruit is a true dehiscent capsule, rather than the more complex pseudocapsule of *Lechenaultia* (Morrison 1988) or the indehiscent fruits of the rest of the closely related genera of the family (Carolin 1966).

The genus is most closely related to *Lechenaultia* R. Br., with which it shares a number of synapomorphies (Carolin 1977). In particular, the ovary is inferior and extremely elongated with numerous ovules, as it is in *Lechenaultia*, and the upper part of the ovary remains unilocular.

However, in contrast to *Lechenaultia*, the ovules are in four vertical rows rather than in two, the leaves are radical rather than cauline, the indusium is cup-shaped rather than two-lipped, the inside of the corolla lacks an indumentum, and the pollen grains are free rather than united in tetrads.

In general, the facies of the genus are most similar to those of *Lechenaultia filiformis* R. Br. and *L. ovata* D. Morrison, which are in many ways the most distinctive members of that genus (Morrison 1986, 1988). Indeed, Sprengel (1824) considered that *Lechenaultia* and *Anthotium* should be combined, although he gave no reasons for this decision. No-one has followed this lead.

Carolin (1977) unites *Anthotium*, *Lechenaultia* and *Dampiera* as one of the two distinct groups within the Goodeniaceae, characterised by anthers that are connate around the style, the lack of stellate hairs, and a base chromosome number of nine. This seems to be the most satisfactory arrangement.

Methods and Terminology

This revision is intended to deal with most of the collections made to date, and material from the following herbaria was examined and annotated (abbreviations follow Holmgren et al. 1981): MEL, PERTH, NSW, and SYD. The specimens at BRI were also examined, and types were obtained from LD. All of the specimens cited have been personally examined unless otherwise noted.

Terminology, in general, follows Carolin (1959, 1960, 1966, 1967a), but some comments on the inflorescence and corolla seem warranted.

Carolin (1967) applied the descriptive terminology of Troll to the Goodeniaceae, and this interpretation has been followed here. All inflorescences in *Anthotium* terminate in a flower and are thus cymose, each being a monochasium of about three flowers. Each flower is subtended by a bracteole, and each monochasium by a bract. The monochasia are grouped into a higher-order inflorescence which itself terminates in a flower, each higher-order group (referred to as a head) having about five monochasia. Several of these heads appear on each flowering shoot, which is axillary.

Recent taxonomic works on the Goodeniaceae (Carolin 1967b, 1967c, 1974, 1979, Morrison 1986, 1988) have adopted the terminology of Krause (1912) for the corolla, and I have followed suit. In particular, the abaxial and adaxial sides of the flower are referred to as inferior and superior respectively. Carolin (1967b) illustrates the series of measurements relating to the parts of the corolla. In *Anthotium*, all five of the petals are fused near the base into a short tube, with the three inferior lobes further fused beyond this tube. All five of the petals are free along their winged part.

Systematic Treatment

Anthotium R. Br., Prodr. 1: 582 (1810); Roemer & Schultes, Linn. Syst. Veg. edn 16, 5: 35 (1820); Don, Gen. Hist. 3: 727 (1834); Endl., Gen. Pl. 508 (1838); DC., Prodr. 7: 520 (1839); Benth., Fl. Austral. 4: 44 (1868); Benth. & J.D. Hook., Gen. Pl. 2: 537 (1876); Baillon, Hist. Pl. 8: 370 (1885); F. Muell., Syst. Census Austral. Pl. edn 2, 147 (1889); Schonl., Nat. Pflanzenfam. IV. 5: 76 (1889); K. Krause, Pflanzenr. IV. 54: 109 (1912); C. Gardner, Enum. Pl. Austral. Occ. 125 (1930); N. Burb., Dict. Austral. Pl. Gen. 20 (1963); Beard, Descr. Cat. Western Austral. Pl. edn 2, 101 (1970); Grieve & Blackall, How to Know Western Austral. Wildfl. edn 2, 4: 679 (1975); J. Green, Census Vasc. Pl. Western Australia edn 2, 156 & 183 (1985); J. Wheeler, Fl. Perth Region 627 (1987). *Type: A. humile* R. Br.

Perennial herbs, entirely glabrous except for the indusium of one species. Stems ascending to erect, one to many from a common woody rootstock, sparsely branched, terete, up to 2 mm diam., often striate. *Leaves* radical, simple, somewhat fleshy, linear-terete to lanceolate or spathulate, entire to serrulate, usually rugose. *Inflorescences* axillary, compound, 1-5 heads (and a terminal flower) on each leafless terete flowering shoot, each head formed from 1-5 monochasial cymes of 1-3 flowers (and a terminal flower), each cyme in the axil of a bract and each flower in the axil of a bracteole; bracts and bracteoles paired but pairs displaced. *Flowers* bisexual, zygomorphic, sessile. *Sepals* 5, adnate to the ovary for most of their length but apparently not connate, lobes linear to linear-lanceolate, usually all equal. *Petals* 5 with 2 superior (adaxial) and 3 inferior (abaxial), either purple to light blue or cream or else various shades of bright red; all petals connate into a short tube at the base, the superior two otherwise free, the inferior three connate beyond the tube; the inferior lobes lanceolate, acute, with rounded wings on the free parts; the superior lobes falcate, acute, with the wings on the adjacent margins hemispherical auriculate thickened and infolded to enclose the indusium, the wings on the opposite margins rounded. *Stamens* 5, epigynous, exposed; filaments narrow linear, thin, free; anthers linear or oblong, 2-celled, connate around the style, dehiscing in bud through 2 longitudinal slits; pollen grains free. *Ovary* inferior, narrowly cylindrical, erect, 2-locular, ribbed; ovules axile, basifixed, up to 15 pairs per locule; style 1, usually straight, moderately robust; indusium cupular, glabrous or bearded outside, the stigmatic surface inside the cup. *Fruit* a true capsule, very similar in appearance to the ovary, surmounted by persistent sepal lobes and often also the style, dehiscing through 4 longitudinal valves. *Seeds* small, epidermis thickened and hardened; embryo terete, the same size as the albumen.

Anthotium is endemic to Western Australia, with all three species restricted to the South-West Botanical Province.

The generic name comes from the Greek *anthos* for flower and *otos* for ear, referring to the auriculate inner wings of the superior corolla lobes.

Key to the Species

1. Leaves lanceolate or spathulate, > 2 mm wide; flowers red ..... 2. *A. rubriflorum*

1. Leaves linear or terete, <1 mm wide; flowers pale blue to pink or cream

2. Flowering stems 2-7 cm long ..... 1. *A. humile*

2. Flowering stems 12-40 cm long ..... 3. *A. junciforme*

1. **Anthotium humile** R. Br., Prodr. 1: 582 (1810); Roemer & Schultes, Linn. Syst. Veg. edn 16, 5: 35 (1820); Don, Gen. Hist. 3: 727 (1834); DC., Prodr. 7: 520 (1839); Vriese, Natuurk. Verh. Holl. Maatsh. Wetensch. Haarlem ser. 2, 10: 188 (1854); Benth., Fl. Austral. 4: 44 (1868); F. Muell., Syst. Census Austral. Pl. edn 2, 147 (1889); E. Pritzel, Bot. Jahrb. Syst. 35: 554 (1905); K. Krause, Pflanzenr. IV. 54: 110 & t. 21A (1912); C. Gardner, Enum. Pl. Austral. Occ. 125 (1930); Beard, Descr. Cat. Western Austral. Pl. edn 2, 101 (1970); Grieve & Blackall, How to Know Western Austral. Wildfl. edn 2, 4: 679 (1975); J. Green, Census Vasc. Pl. Western Australia edn 2, 156 & 183 (1985). — *Anthotium glabrum* Poiret, Dict. Sci. Nat. 2: Suppl. 80 (1816). — *Lechenaultia humilis* (R. Br.) Sprengel, Linn. Syst. Veg. edn 17, 1: 720 (1824). *Lectotype* (here designated): Bay I ora occidentis Nova Holl vel oric a Portu GRIII^{tii}, *R. Brown* (Britten sheet No. 2542) (lecto: BM n.v., photo SYD; isolecto: BM n.v., photo SYD).

Goodenia pygmaea Vriese in Lehm., Pl. Preiss. 1: 413 (1845). *Lectotype* (here designated): In depressis arenosis prope urbiculam 'Perth', *L. Preiss* 1492, s. dat. (lecto: LD; isolecto: G n.v., photo SYD).

Tufted herb, almost clonal with up to 5 separate tufts connected underground to a central rootstock, to 10(-20) cm high and 10 cm diam. *Leaves* somewhat fleshy, usually linear to terete or rarely narrow lanceolate to narrow spathulate, if narrow lanceolate or narrow spathulate then 30-65 mm long and 1.5-3 mm wide, or if linear to terete then 45-110 mm long and 0.5-1 mm wide, entire, acute or with a callous tip, thickened, rugose. *Flowering stalks* rugose, (1.5-)2.5-7 cm long, usually shorter than the leaves; heads compact, each of up to 3 crowded cymes; bracts linear to terete but often flattened near the base, (5-)7-10(-13) mm long, 0.6-1.3 mm wide, obtuse to acute; bracteoles linear to triangular, 3-5 mm long, 0.71-(-1.2) mm wide, acute. *Calyx lobes* 2.7-3.2 mm long, 0.6-0.8 mm wide, acute to acuminate. *Corolla* from light blue through mauve or pink to cream; tube 1.5 mm long, inferior petals fused for a further 1.3-2.5 mm; inferior lobes 2.1-3.3 mm long and 0.8-1.2 mm wide, wings 1.9-3 mm long and 0.5-0.7 mm wide; superior lobes 3.5-4.3 mm long and 0.7-1 mm wide, wings 1.2-1.5 mm long and 0.9-1.2 mm wide on adjacent margins and 0.2-0.3 mm wide on opposite margins. *Staminal filaments* 1-1.5 mm long; anthers 1.1-1.2 mm long. *Ovary* 2.5-3.8 mm long, ribbed, with 6-8 pairs of ovules per locule; style straight or sometimes bent, 2.5-5 mm long; indusium glabrous. *Fruit* not seen. Figure 1a.

Specimens examined. WESTERN AUSTRALIA: between West Mt Barren and Cape Anne, *T.E.H. Aplin* 5696 (PERTH); near Torbay, Dec. 1927, *W.E. Blackall* s.n. (PERTH); Lake Wagin, 1890, *M. Cronin* s.n. (MEL); Chester Pass Rd, c. 2 miles [3 km] from Porongorup turnoff, *E.J. Croxford* 163 (PERTH); s. loc., *J. Drummond* 181 (MEL, NSW82004); Young River, Jan. 1935, *E. & C.A. Gardner* s.n. (PERTH); 13 miles [21 km] S of Elverdton Mine, *A.S. George* 1989 (PERTH); 51.5 miles [83 km] E of Ravensthorpe, *A.S. George* 2251 (PERTH); Tuttanning Reserve, *A.S. George* 10517 (PERTH); 11 km S of Dumbeming Siding, *G.J. Keighery* 7861 (PERTH); Broke Inlet, *K.F. Kenneally* 6570 (PERTH); K.G.S., s. dat., *G. Maxwell* s.n. (MEL); Plantagenet and Stirling Range, s. dat., [*G. Maxwell*] s.n. (MEL); s. loc., s. dat., *F. von Mueller* s.n. (NSW82009); Lake Muir, s. dat., *Muir* s.n. (MEL); 7 miles [11 km] E of Gnowangerup, *K.R. Newbey* 1206 (PERTH); 1 mile [2 km] E of Pabelup Lake, *K.R. Newbey* 1218 (PERTH); 13 miles [21 km] N of Albany, *K.R. Newbey* 1226 (PERTH); District South West Plantagenet, *E. Pritzel* 255 (NSW82005); Thistle Cove, *H.M. Wilson* 61 (PERTH); 60 miles [97 km] E of Lake King, *E. Wittwer* 1498 (PERTH); 8 km E of Lake Muir, *E. Wittwer* 2288 (PERTH).

Distribution. South Western Australia: Avon, Eyre, Darling and Roe Districts. Scattered throughout the inland and coastal areas from Pemberton and Narrogin to Cape le Grande (Map 1).

Habitat. Recorded from sand, sandy loam, sandy clay, and silt. It usually occurs in heath or eucalypt woodland, but it also occurs around the edges of winter-wet depressions and swamps.

Flowering period. Usually from early December to late January, but flowers have also been collected in March.

Typification. In his protologue, Robert Brown noted that he had seen two "varieties" of *A. humile*, one of which was twice as large in all of its parts as the other. The herbarium sheets of his material at BM are labelled as being collected from King George Sound on 27 December 1801 and at Lucky Bay (Bay I) in January 1802; and this dual collecting presumably reflects the two varieties referred to. The Britten sheet has 3 specimens of the larger variety and 5 specimens of the smaller variety, while the public collection sheet has 2 of the former and 1 of the latter. I have chosen the third specimen from the left on the Britten sheet at BM (a specimen of the large variety) as the lectotype. It should be noted here that the two "varieties" of Brown's material are both *L. humile* s. str., and cannot be confused with *L. junciforme*.

The sheet of *Preiss* 1492 at LD (the preferred reference collection for Preiss material (Crisp 1983)) has only two small scraps of a flowering specimen. The flower measurements are those of *A. humile* rather than *A. junciforme*, but this seems to contradict the reported collecting locality, as there are no other known collections of *A. humile* from this area.

Figure 1. *Anthotium humile*. A — habit (from *George* 1989, PERTH). *Anthotium junciforme*. B — habit (from *Keighery* 3844, PERTH). *Anthotium rubriflorum*. C habit (from *Morrison* 199, SYD). Scale bar: 2 cm.

Notes. Poiret attributes the name *A. glabrum* to Robert Brown, noting that it is the only species in the genus. Brown's provisional name for the species (as noted on the type specimens) was "*fasciculatum*", so it is unclear where Poiret obtained this epithet.

Conservation status. Widespread and common.

2. **Anthotium rubriflorum** F. Muell. ex Benth., Fl. Austral. 4: 45 (1868); F. Muell., Syst. Census Austral. Pl. edn 2, 147 (1889); E. Pritzel, Bot. Jahrb. Syst. 35: 554 (1905); K. Krause, Pflanzenr. IV. 54: 110 & t. 21CH (1912); C. Gardner, Enum. Pl. Austral. Occ. 125 (1930); Beard, Descr. Cat. Western Austral. Pl. edn 2, 101 (1970); Grieve & Blackall, How to Know Western Austral. Wildfl. edn 2, 4: 680 (1975); J. Green, Census Vasc. Pl. Western Australia edn 2, 156 & 183 (1985). [*Anthotium humile* auct. non R. Br. (1810): Vriese, Natuurk. Verh. Holl. Maatsh. Wetensch. Haarlem ser. 2, 10: 188 (1854), p.p. (as to *Drummond* 180 only)]. *Type citation*: "Drummond, n. 180, Maxwell." *Lectotype* (here designated): S.W. Australia, *Maxwell*, s. dat. (lecto: K n.v., photo SYD; isolecto: MEL). *Lectoparatype*: S.W. Australia, *Drummond* 180, 1848 [5th Coll.] (K n.v., photo SYD, MEL).

Tufted herb, almost clonal with up to 5 separate tufts connected underground to a central rootstock, to 15(-20) cm high and 10(-20) cm diam. *Leaves* fleshy, lanceolate to spathulate, (35-)45-80(-95) mm long, (2-)3-6(-7.5) mm wide, entire to serrulate, acute, often thickened or recurved, rugulose. *Flowering stalks* rugulose, (7-)9-16 cm long, usually twice as long as the leaves; heads compact, each of up to 2 crowded cymes; bracts linear to terete, (8-)10-17(-21) mm long, 0.6-1.5(-2) mm wide, obtuse; bracteoles lanceolate but usually flattened near the base, 5-8 mm long, 1.5-2(-3) mm wide, acute. *Calyx lobes* 3.5-4.2 mm long, 0.7-1 mm wide, acuminate. *Corolla* usually bright scarlet, but sometimes a deeper or paler red; tube 1 mm long, inferior petals fused for a further 1.8-3 mm; inferior lobes 3.5-4(-4.5) mm long and 0.8-1.2 mm wide, wings 3-3.5(-4.5) mm long and 0.4-0.7 mm wide; superior lobes 3.5-4.5 mm long and 1.1-1.3(-1.5) mm wide, wings 1.5-1.8 mm long and 1.1-1.3(-1.7) mm wide on the adjacent margins and 0.2-0.4 mm wide on the opposite margins. *Staminal filaments* 1-1.4 mm long; anthers 1-1.2 mm long. *Ovary* 4-5(-7) mm long, strongly ribbed, with 7-9(-12) pairs of ovules per locule; style straight, 2.8-3.5 mm long; indusium bearded on the upper side. *Fruit* 7-9 mm long. *Seeds* cylindrical or ovoid, 0.8 mm long, black, pitted. Figure 1c.

Specimens examined. WESTERN AUSTRALIA: s. loc., s. dat., *C. Andrews* s.n. (PERTH); W of Ravensthorpe, *J.C. Anway* 584 (MEL, NSW100867, PERTH); 40 miles [64 km] E of Hyden, *J.S. Beard* 3918 (PERTH); near Bruce Rock, Sept. 1929, *W.E. Blackall* s.n. (PERTH); 11 km ENE of Conjinup Hill, *M.A. Burgman* 2882 (PERTH); 2 km NW of boundary of Fitzgerald River National Park on Hammersley Drive, *M.G. Corrick* 8817 (MEL105738); Coolgardie, 1893, *E. Cronin* s.n. (MEL); Coolgardie, 1894, *Cronin* s.n. (MEL); 11 miles [18 km] E of Newdegate, *H. Demarz* 3610 (PERTH); Swan River, s. dat., *J. Drummond* s.n. (NSW81993); E sources of Swan River, 1890, *A. Eaton* s.n. (MEL); Youndegin, 1890, *A. Eaton* s.n. (MEL); Uberin Hill, Jan. 1918, *C.A. Fontleroy* s.n. (BRI377089); c. 65 km N of South Coast Highway on Old Ravensthorpe Road, *D.B. Foreman* 1191 (MEL1546036); Bungulla, *C.A. Gardner* 461 (PERTH); Bendering, *C.A. Gardner* 1331 (PERTH); 10 km E of Bendering, *C.A. Gardner* 13619 (PERTH); near Rabbit-proof fence E of Hyden, *C.A. Gardner* 14994 (PERTH); c. 60 km E of Hyden, *C.A. Gardner* 15947 (PERTH); eastward from Newdegate, Nov. 1935, *C.A. Gardner* s.n. (PERTH); Fitzgerald townsite, *G.J. Keighery* 335 (PERTH); N of Bendering, *F. Lullfitz* 1754 (PERTH); 7 miles [11 km] E of Hyden, *F. Lullfitz* 3823 (PERTH); Ag. Dept. Plot, E of R.P. Fence, Forrestania, *F. Lullfitz* 4028 (PERTH); 5 miles [8 km] NW of Calingiri, Nov. 1955, *A.R. Main* s.n. (PERTH); 6 km N of Mt Madden towards Lake King, *B.R. Maslin* 4064 (PERTH); 33 km W of Lake King towards Newdegate, *D. Morrison* 199 (SYD); 22 miles [35 km] E of Hyden, *K. Newbey* 1106 (PERTH); 27 km W of Lake Cronin, *K. Newbey* 6285 (PERTH); Cookernup, Sept. 1946, *W.H. Nicholls* s.n. (MEL644160); Tammin, *C.H. Ostenfeld* 960 (PERTH); District Avon, *E. Pritzel* 891 (NSW81995); Calingiri, *R.D. Royce* 5649 (PERTH); Minnivale, *R.D. Royce* 7998 (PERTH); 15 miles [24 km] S of Tammin, *R.D. Royce* 9435 (PERTH); Frank Hann National Park, *R.D. Royce* 10250 (PERTH); E sources of Swan River, 1890,

G. Sewell s.n. (MEL); 16-19 km from Lake King along road to Lake Grace, *A. Strid* 21082 (PERTH); 10 km E of Rabbit Proof Fence on Hyden-Norseman road, *P. Weston* 332 (SYD).

Distribution. South Western Australia: Avon, Eyre and Roe Districts. Found in the inland areas from New Norcia to Ravensthorpe (Map 1).

Habitat. Recorded from sand, or occasionally sandy clay, sandy loam or gravel. It is usually found in heath or scrub, but it also occurs in woodland and mallee.

Flowering period. Usually from early November to mid December, but flowers have also been collected in October.

Typification. Bentham lists two specimens in the protologue, and so a lectotype must be chosen. The Maxwell and Drummond collections are mounted on the same sheet at K, the Maxwell specimen (in the upper left-hand corner) being chosen because it appears to be more complete.

Conservation status. Widespread and common.

3. **Anthotium junciforme** (Vriese) D.A. Morrison, comb. nov. — *Goodenia junciformis* Vriese in Lehm., Pl. Preiss. 1: 413 (1845). — *Anthotium humile* R. Br. var. *junciforme* (Vriese) E. Pritzel, Bot. Jahrb. Syst. 35: 554 (1905); K. Krause, Pflanzenr. IV. 54: 110 & t. 21B (1912); Grieve & Blackall, How to Know Western Austral. Wildfl. edn 2, 4: 679 (1975); J. Wheeler, Fl. Perth Region 627 (1987). [*Anthotium humile* auct. non R. Br.: Vriese, Natuurk. Verh. Holl. Maatsh. Wetensch. Haarlem ser. 2, 10: 188 & t. 37, p.p.; Benth., Fl. Austral. 4: 44 (1868), p.p. (both as to *Preiss* 1522 only)]. *Lectotype* (here designated): In planitie arenosa; hieme aqua salsa inundata ad fl. Cygn. prope urbiculam 'Perth', *L. Preiss* 1522, 12.ii.1840 (lecto: LD n.v., photo SYD; isolecto: G n.v., photo SYD, K n.v., photo SYD, L903.311-189 n.v., 903.311-183 n.v., & 909.62-74 n.v., photo SYD, MEL 2 sheets, P n.v., W n.v.).

Goodenia geniculata Vriese in Lehm., Pl. Preiss. 1: 413 (1845) nom. illeg. non R. Br. (1810). — *Goodenia genuflexa* Vriese in Lehm., Pl. Preiss. 2: 244 (1848). [*Anthotium humile* auct. non R. Br.: Vriese, Natuurk. Verh. Holl. Maatsh. Wetensch. Haarlem ser. 2, 10: 188 (1854), p.p.; Benth., Fl. Austral. 4: 44 (1868), p.p. (both as to *Preiss* 1456 only)]. *Lectotype* (here designated): In planitie sublimosa hieme inundata prope 'Toby's-Inlet' (Sussex), *L. Preiss* 1456, 27.xii.1839 (lecto: LD n.v., photo SYD; isolecto: G n.v., photo SYD, L903.311-185 n.v. & 903.311-186 n.v., photo SYD, MEL 2 sheets, W n.v.).

Junciform herb, with solitary clumps from a single rootstock, to 40-(50) cm high and 20 cm diam. *Leaves* somewhat fleshy, linear to terete, 90-145 mm long, 0.6-0.9 mm wide, entire, acute or often with a callous tip, thickened, rugose. *Flowering stalks* rugulose, (12-)18-40 cm long, usually twice as long as the leaves; heads loose, each of up to 5 scattered cymes; bracts linear to terete and sometimes flattened near the base, (5-)9-19 mm long, 0.4-0.9 mm wide, acute or with a callous tip; bracteoles triangular, 2-4(-6) mm long, 0.5-0.8 mm wide, acute. *Calyx lobes* 3.2-4.5 mm long, with the superior lobe 0.5-1 mm longer than the others, 0.4-0.5 mm wide, acute to acuminate. *Corolla* purple to light blue; tube 2 mm long, inferior petals fused for a further 1-1.5 mm; inferior lobes 3-4.5 mm long and 0.9-1.1 mm wide, wings 2.5-4.5 mm long and 0.7-0.8 mm wide; superior lobes 4.5-6 mm long and 1-1.2 mm wide, wings 1.2-1.6 mm long and 1-1.5 mm wide on the adjacent margins and 0.2-0.3 mm wide on the opposite margins. *Staminal filaments* 1.3-1.5 mm long; anthers 1-1.5 mm long. *Ovary* 3.5-6.5(-9) mm long, ribbed, with 11-15 pairs of ovules per locule; style straight, 4-5 mm long; indusium glabrous. *Fruit* 8-12 mm long. *Seeds* cylindrical or laterally compressed and ovoid, 0.7 mm long, pale brown, tuberculate. Figure 1b.

Specimens examined. WESTERN AUSTRALIA: Yallingup, Dec. 1930, *W.E. Blackall* s.n. (PERTH); S.W. Australia, s. dat., *Clarke* s.n. (MEL); Keysbrook-Mandurah road, *H. Demarz* 6634

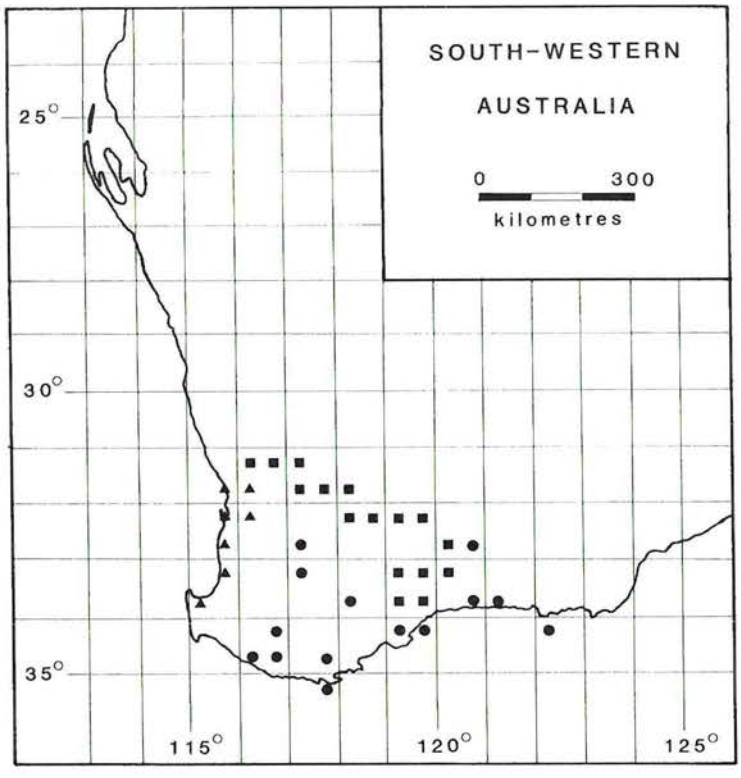
(PERTH); s. loc., [*J. Drummond*] 416 (MEL); Midland Junction, Dec. 1899, *W.V. Fitzgerald* s.n. (NSW82007, PERTH); Wattle Grove, *A.S. George* 627 (PERTH); lower Canning River, Jan. 1898, *R. Helms* s.n. (PERTH); Waterloo, *G.J. Keighery* 3844 (PERTH); 1 km N of Serpentine, *G.J. Keighery* 7183 (PERTH); Bayswater, *A. Morrison* 9314 (NSW81996); Midland Junction, *A. Morrison* 9334 (NSW81999); Cannington, *A. Morrison* 10263 (NSW81998); Kelmscott, *A. Morrison* 10264 (NSW82001); Kelmscott, *A. Morrison* 10266 (NSW82000); Cannington, *A. Morrison* 12260 (NSW82003); Kelmscott, *A. Morrison* 12262 (NSW82002); Bayswater, *A. Morrison* 18031 (BRI079201, NSW81997); Kelmscott, Dec. 1900, *A. Morrison* s.n. (BRI079200); Harvey's River, Dec. 1877, *F. von Mueller* s.n. (MEL); Maida Vale, *J. Peacock* 60827.1 (SYD); Busselton, s. dat., *A. & E. Pries* s.n. (MEL); District Murray, *E. Pritzel* 134 (NSW82006); Busselton, s. dat., *T.C. Rosselloty* s.n. (MEL); upper Swan River, 1885, *J. Sewell* s.n. (MEL).

Distribution. South Western Australia: Darling District. Found along the coast from Perth to Yallingup (Map 1).

Habitat. Occurs in eucalypt woodland, especially in winter-wet depressions.

Flowering period. Usually from early December to late February, but flowers have also been collected in late March.

Typification. De Vriese published the names *G. junciformis* and *G. geniculata* simultaneously in "Plantae Preissianae" in 1845. However, *G. geniculata* Vriese is a later homonym of *G. geniculata* R. Br. (Prodr. 1: 577 (1810)), and so in the corrigenda to the "Plantae Preissianae" de Vriese provided *G. genuflexa* as a replacement name for *G. geniculata* Vriese. *G. junciformis* Vriese thus has priority in combination with *Anthotium.*



Map 1. Distribution of *Anthotium humile* (●), *Anthotium rubriflorum* (■), and *Anthotium* junciforme (▲).

Relationships. This taxon has traditionally been treated at the varietal level, although Wheeler (1987) has noted that with more study it might be elevated to specific status. In many ways this taxon is less similar to *A. humile* than is *A. rubriflorum.* In particular, the non-clonal growth habit, the extremely elongated flowering stems, the larger leaves, the unequal calyx lobes, the larger corolla, and the larger ovary with more numerous ovules make this taxon distinctive within the genus. In contrast, the only similarities with *A. humile* are the narrow leaves, the pale blue corolla, and the glabrous indusium. So, this taxon must be given equal status with the other two. It is completely allopatric with respect to *A. humile.*

Conservation status. 3R. This species has been collected only very rarely since the turn of the century (about 6 times), and the known distribution extends through some of the most closely-settled parts of the state. It is not known from conservation reserves.

Acknowledgements

Most of those type specimens cited in this paper that have not been seen by me have been checked by Roger Carolin, who kindly made his notes available to me; Gordon Guymer was very helpful as Australian Botanical Liaison Officer at Kew; the Curator of PERTH and the Keeper of LD lent me specimens under their care; the Directors of BRI, MEL and NSW and the Curator of SYD allowed me to examine specimens at their herbaria; and the Director of NSW kindly allowed me to use facilities there. The referee's comments greatly improved the presentation of the manuscript.

References

Bentham, G. (1868). "Flora Australiensis." Vol. 4. (Reeve: London.)

Carolin, R.C. (1959). Floral structure and anatomy in the family Goodeniaceae Dumort. Proc. Linn. Soc. New South Wales 84: 243-255.

Carolin, R.C. (1960). The structures involved in the presentation of pollen to visiting insects in the order Campanulales. Proc. Linn. Soc. New South Wales 85: 197-207.

Carolin, R.C. (1966). Seeds and fruits of the Goodeniaceae. Proc. Linn. Soc. New South Wales 91: 58-83.

Carolin, R.C. (1967a). The concept of the inflorescence in the order Campanulales. Proc. Linn. Soc. New South Wales 92: 726.

Carolin, R.C. (1967b). The genus *Velleia* Sm. Proc. Linn. Soc. New South Wales 92: 27-57.

Carolin, R.C. (1967c). *Coopernookia:* a new genus of Goodeniaceae. Proc. Linn. Soc. New South Wales 92: 209-216.

Carolin, R.C. (1970). The trichomes of the Goodeniaceae. Proc. Linn. Soc. New South Wales 96: 8-22.

Carolin, R.C. (1974). *Nigromnia*, a new genus of Goodeniaceae. Nuytsia 1: 292-293.

Carolin, R.C. (1977). The systematic relationships of *Brunonia.* Brunonia 1: 9-29.

Carolin, R.C. (1979). The genus *Calogyne* R. Br. in Australia. Brunonia 2: 1-17.

Crisp, M.D. (1983). Plantae Preissianae types at Lund. Austral. Syst. Bot. Soc. Newsletter 36: 4-6.

Holmgren, P.K., Keuken, W. and Schofield, E.K. (1981). "Index Herbariorum." Part 1, 7th edn. (Junk: The Hague.)

Krause, K. (1912). Goodeniaceae und Brunoniaceae. "Das Pflanzenreich." Vol. IV, Part 54, pp. 97-109. (Engelmann: Berlin.)

Morrison, D.A. (1986). Taxonomic and nomenclatural notes on *Lechenaultia* R. Br. (Goodeniaceae). Brunonia 9: 1-28.

Morrison, D.A. (1988). Notes on the fruits of *Lechenaultia* R. Br. (Goodeniaceae), with a new species from northern Australia. Telopea 3: 159-166.

Sprengel, K. (1824). "Linnaeus' Systema Vegetabilium." Vol. 1, 17th edn. (Dietrich: Gottingen.)

Wheeler, J.R. (1987). Goodeniaceae. In Marchant, N.G., Wheeler, J.R., Rye, B.L., Bennett, E.M., Lander, N.S. and Macfarlane, T.D. "Flora of the Perth Region." (Western Australian Herbarium: Perth.)

A new species of *Pimelea* (Thymelaeaceae) from south-western Australia

B.L. Rye

Western Australian Herbarium, Department of Conservation and Land Management,
P.O. Box 104, Como, Western Australia 6152

Abstract

Rye, B.L. A new species of *Pimelea* (Thymelaeaceae) from south-western Australia. Nuytsia 7(1): 59-62 (1989). The new species *Pimelea pelinos* is named, described and illustrated. It is known only from a cluster of salt lakes near Scaddan in the south-west of Western Australia. A few printing errors that occurred in an earlier paper on the Thymelaeaceae are noted.

Introduction

A recent revision of the Thymelaeaceae of Western Australia (Rye 1988) describes 45 species of *Pimelea* occurring in the state. Another *Pimelea* species has now been discovered near Scaddan in south-western Australia. The first known collection of the species was made from a male plant in 1984 and came to my attention when the revision paper was in press. More complete material, collected in 1988, has made it possible to describe both male and female flowers of the species although the fruits are still unknown. As well as providing a description and name for the species, this paper amends the key to Western Australian *Pimelea* species of Rye (1988, 143) so as to accommodate the new species.

Pimelea pelinos Rye, sp. nov. (Figure 1)

Frutex dioecius. Caules foliaque glabra. Flores extus pubescentes. Floris tubus internus glaber. Sepala interna pubescentia. Antherae sessiles.

Typus: East of Scaddan, Western Australia, 10 June 1988, *A.J.G. Wilson* 114 (holo: PERTH; iso: CANB, K, MEL). The type collection is from an individual female plant.

Dioecious shrub. Stems and leaves glabrous. Flowers hairy outside. Floral tube glabrous inside. Sepals hairy inside. Anthers sessile.

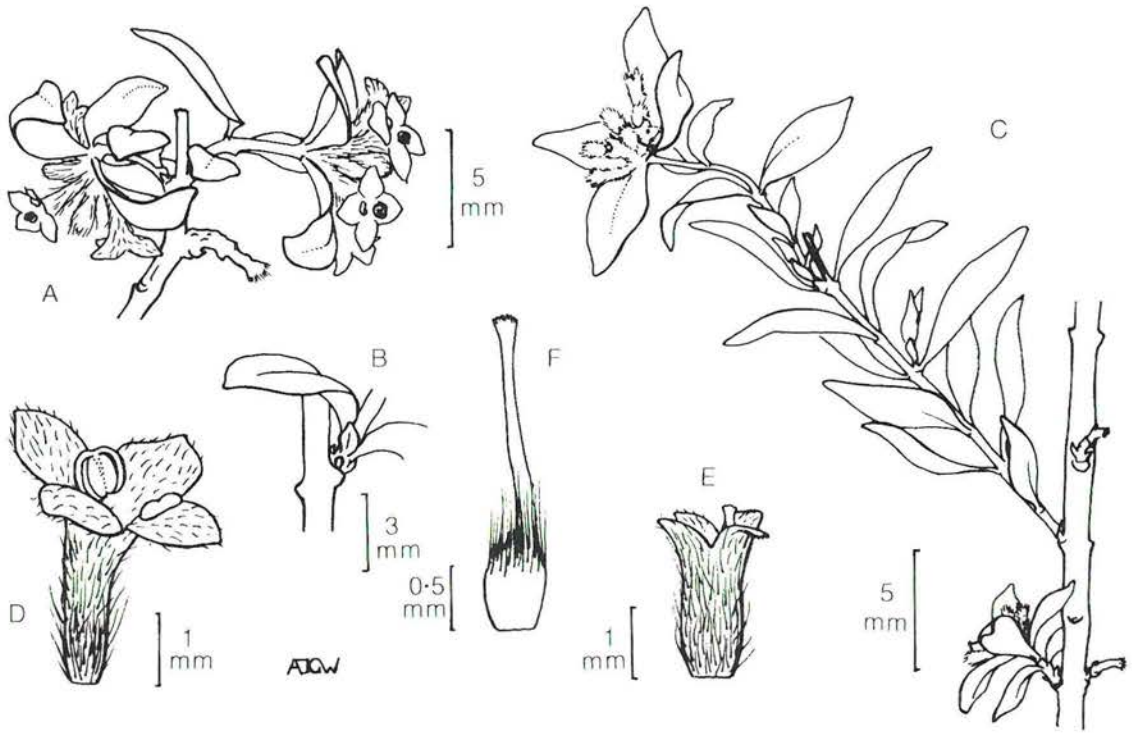


Figure 1. *Pimelea pelinos*. A - Male flowering branch. B - Base of flowering branchlet. C - Female flowering branch. D - Male flower. E - Female flower. F - Ovary and style. Drawn from *A.J.G. Wilson* 112 (A, B, D), 113 (E, F) and 114 (C).

Shrub, 0.3-0.6 m high, single-stemmed at ground level, erect or straggling above, dioecious. *Stems* glabrous, yellowish or red-tinged at first, becoming dark grey-brown then medium to dark grey further from apex. *Leaves* opposite, antrorse to patent, glabrous; petiole 0.2-0.5 mm long; blade concolorous, green, narrowly obovate or rarely obovate, 2.5-11.5 x 0.8-2.5 mm, acute. *Flowering branchlets* axillary, 0.7-9 mm long not including flowers, with minute sessile reddish bracts at base; peduncle 0.5-3.5 mm long, sometimes hairy. *Involucral bracts* 2 or 4, sessile, leaf-like in colour and texture, ovate to obovate or rarely narrowly so, 3.3-6 x 1.7-3 mm, obtuse, glabrous or inner pair of bracts with hairs along middle of adaxial surface. Inflorescence terminal, compact, 5-21-flowered. *Pedicels* c. 0.5 mm long, densely hairy; hairs antrorse, up to 0.7 mm long. *Flowers* cream, densely hairy outside, the hairs antrorse; tube glabrous inside. *Male flowers*: tube 2-3.2 mm long, 0.4-0.6 mm diameter at middle, expanded to 0.7-1 mm at summit, with hairs 0.5-0.7 mm long towards base and smaller hairs 0.3-0.4 mm long above; sepals ovate, 1-1.5 mm long, hairy inside, the hairs on both surfaces similar to those on distal part of floral tube; stamens virtually sessile, the filament c. 0.05 mm long, the anther 0.5-0.7 x 0.4-0.6 mm, the slits semi-lateral after dehiscence; pistillode 0.2-0.3 mm long. *Female flowers:* tube c. 1.5 x 1 mm, scarcely continued above ovary-portion, c. 0.8 mm diameter at summit, uniformly hairy, the hairs up to 0.8 mm long; sepals ovate, c. 0.8 mm long, hairy inside in distal half, the hairs of both surfaces up to 0.4 mm long; staminodes c. 0.3 mm long; ovary c. 1 mm long, with an apical tuft of hairs up to 0.7 mm long; stigma somewhat brush-like. *Fruit* not seen.

Other specimens examined. WESTERN AUSTRALIA: E of Scaddan, *P. van der Moezel* 367 (PERTH); E of Scaddan, *A.J.G. Wilson* 112, 113 (PERTH).

Distribution. (Figure 2.) Known only from the vicinity of the type location east of Scaddan.

Habitat. Occurs around salt lakes. Together with a variety of other shrub species, *Pimelea pelinos* grows in clay or somewhat sandy clay on the higher ground slightly above the area occupied by samphires.

Flowering period. June-July.

Derivation of name. From the Greek word *pelinos* meaning 'of clay or mud', referring to the habitat of the species.

Affinities. Pimelea pelinos belongs to *Pimelea* sect. *Pimelea* but does not appear to have any very close relatives. It can be confused with *P. microcephala* R. Br. but differs in having flower clusters on short modified branchlets, in being hairy on the adaxial surface of the sepals and in its subsessile anthers.

Conservation status. There appears to be a large number of plants of *Pimelea pelinos* in its only known area of occurrence, which extends for at least two kilometers along a series of salt lakes. A.J.G. Wilson (pers. comm.) observed about 100 plants during a quick survey of five lakes in the vicinity. She also examined many more lakes extending north of this area to near Salmon Gums, as well as a few lakes to the east. Most of these lakes had a gypsum rather than clay substrate and none had populations of *P. pelinos*. A detailed survey of the lakes at Scaddan and other areas nearby is needed to assess the conservation status of this species more exactly but it does appear to be geographically restricted. It is not known from any conservation reserves.

Notes. Although the head-like flower clusters sometimes appear almost sessile at first glance, they are on well defined branchlets, which are modified by the presence of minute sessile bracts at the base. The branchlets have one to several pairs of leaves below the involucral bracts of the flower clusters.

The stigma was slightly exserted from the throat of the female flowers examined, but most flowers were still in bud and those measured had only just opened. In older flowers the style may become more prominently exserted.

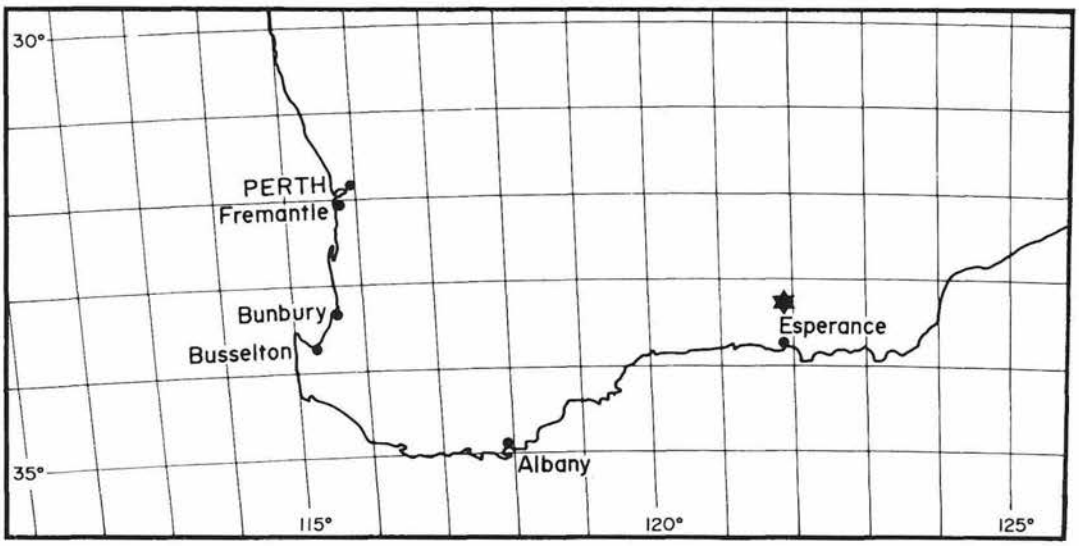


Figure 2. Distribution of *Pimelea pelinos* (●).

Dioecious species of *Pimelea* usually appear to have about equal numbers of male and female plants. However, A.J.G. Wilson (pers. comm.) estimated that there were about ten times as many male as female plants in the populations of *P. pelinos*.

Amendment to *Pimelea* Key

The fourth couplet of the key given in Rye (1988: 143) needs to be renumbered as the fifth and the new fourth couplet given below inserted before it. All subsequent couplets should be renumbered to become one number greater than they are at present.

4. Sepals hairy inside. Anthers subsessile ..... *P. pelinos*

4. Sepals glabrous inside. Anthers with a filament 0.4-1.4 mm long.

Errata to Thymelaeaceae Revision

Two of the figures given in Rye (1980), numbered 31 and 32, were printed at only half the magnification of all other figures in the paper; consequently the magnifications given in the captions are double the actual size for these figures.

In the key to sections of *Pimelea* on page 143, greater than and less than symbols were omitted in the fourth couplet. The couplet should read as follows.

4. Floral tube prominently constricted at cirumscission point, glabrous inside. Sepals narrowly ovate to elliptic. Stamens > 12 mm long ..... 5. *Macrostegia*

4. Floral tube not prominently constricted or, if so, then hairy inside above circumscission point. Sepals narrowly ovate to elliptic. Stamens < 10 mm long.

Acknowledgements

I am grateful to Annette J.G. Wilson for collecting material of this species to use as a type and for drawing the illustration. I also thank Paul G. Wilson for providing the Latin diagnosis.

References

Rye, B.L. (1988). A revision of Western Australian Thymelaeaceae. Nuytsia 6: 129-278.

Wahlenbergia caryophylloides (Campanulaceae), a new species from northern Australia

P.J. Smith

44 Hawkins Parade, Blaxland, New South Wales 2774

Abstract

Smith, P.J. *Wahlenbergia caryophylloides* (Campanulaceae), a new species from northern Australia. Nuytsia 7(1): 63-67 (1989). *Wahlenbergia caryophylloides* P.J. Smith is described. The species occurs in the wetter tropical regions of Queensland, Northern Territory and Western Australia.

A number of undescribed species of *Wahlenbergia* have become evident during my revision of the Australian members of the genus. The revision will be published in the near future. However, one species is described here for inclusion in the forthcoming "Flora of the Kimberley Region."

Herba annua, 13-85 cm alta, caule typice singulo, partibus superis glabrae et infernis ± hirsutae. Folia opposita tum alterna secus caulem, elliptica tum anguste elliptica tum linearia secus caulem, 5-45 mm longa, 1-10 mm lata. Flores in cymis terminalibus, bracteis linearibus. Tubus floris hemisphaericus vel cylindricus, 1-2 mm longus.

Wahlenbergia caryophylloides P.J. Smith, sp. nov. (Figure 1)

Lobi calycis 5, anguste triangulares, 1.0-3.5 mm longi. Corolla campanulata, caerulea ad purpurea, interdum alba vel rosea, omnino glabra; tubo 2-8 mm longo; lobis 5, ellipticis, 1.0-6.5 mm longis, tubum aequantibus vel eo brevioribus. Stamina 5; filis trullatis ad obtrullatis, cum vel sine humeris protrudibus, 1.0-2.5 mm longis; antheris 1-4 mm longis. Ovarium 2- vel 3-loculatum; stylo 2.5-9.0 mm longo, incontracto, 2- vel 3-fido. Capsula hemisphaerica vel cylindrica, 2.0-6.5 mm longa.

Typus: Kennedy Road, 15 miles [25 km] N of Musgrave, Queensland, Aug. 1965, *C.H. Gittins* 994 (holo: NSW; iso: BRI).

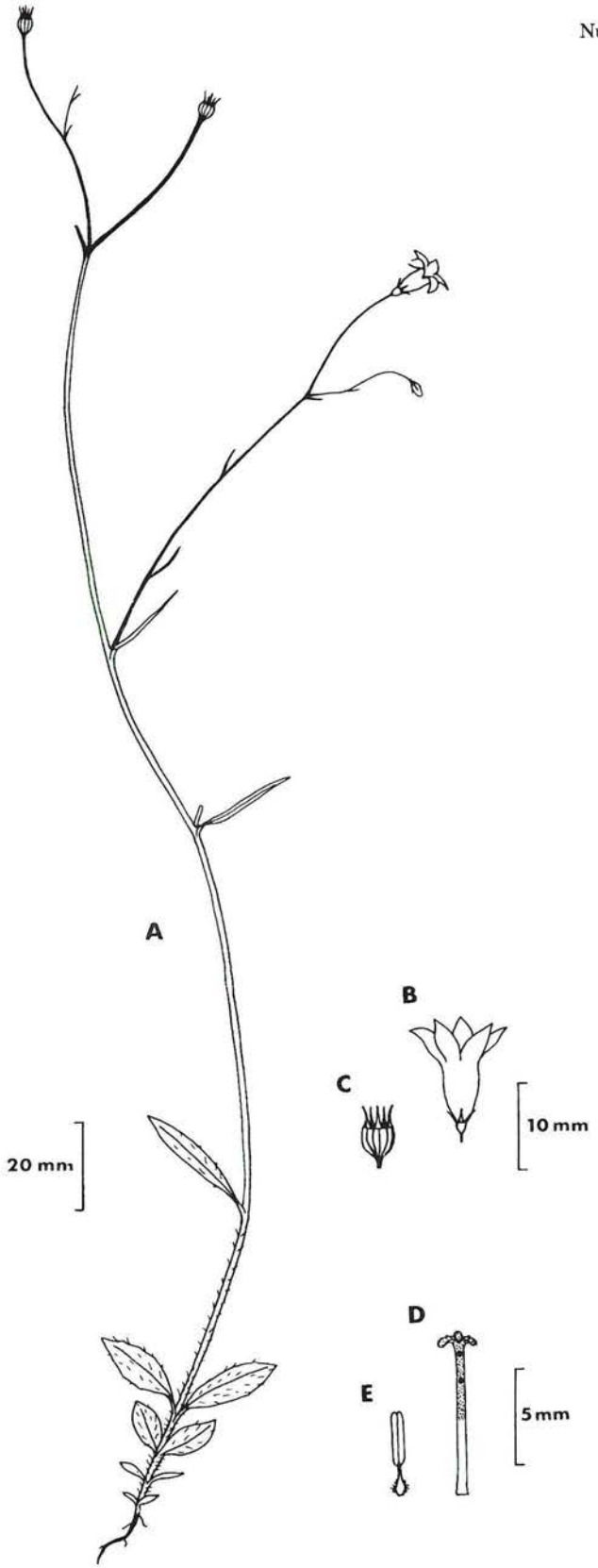


Figure 1. *Wahlenbergia caryophylloides*. A - Habit. B - Flower. C - Fruit. D - Style. E - Stamen. From *C.H. Gittins* 994.

Annual herb, erect or ascending, 13-85 cm tall, with one or rarely a few stems arising from a thin taproot. Upper parts glabrous, lower parts ± hirsute; hairs simple, white, 0.1-1.5 mm long. *Stems* unbranched below the inflorescence or sometimes with a few lower branches, terete, lightly ridged with decurrent leaf margins. *Leaves* sessile, opposite, becoming alternate up the stem, elliptic (or sometimes the lowermost obovate), becoming narrowly elliptic then linear up the stem, 5-45 x 1-10 mm, lower leaves obtuse or acute, upper leaves acute or acuminate; margins usually flat and cartilaginous with small, distant callus-teeth. *Inflorescence* a terminal cyme with linear bracts 1-15 mm long. *Floral tube* hemispheric or cylindric, 1-2 mm long, glabrous. *Calyx lobes* 5, ± erect, narrowly triangular, 1.0-3.5 mm long, acuminate, glabrous. *Corolla* campanulate, blue to purple, sometimes white or pink, entirely glabrous; tube 2.8 x 1.0-3.5 mm; lobes 5, elliptic, shorter than or equal to the tube, 1.0-6.5 x 0.6-3.0 mm, acute. *Stamens* 5; filaments 1.0-2.5 mm long, upper section linear, 0.5-1.0 mm long, lower section trullate to obtrullate, 0.5-1.5 x 0.3-0.8 mm, ciliate on the upper margins, with or without protruding shoulders; anthers with 2 cylindric cells, 1-4 mm long. *Ovary* inferior, 2- or 3-celled. *Style* 2.5-9.0 mm long, not constricted, the upper half covered with pollen-presenting hairs, with 1 or 2 glands below each stigmatic cleft; stigmatic lobes 2 or 3, 0.5-1.5 mm long. *Capsule* hemispheric or cylindric, 2.0-6.5 x 1-3 mm, glabrous. *Seeds* numerous, compressed-ellipsoid, c. 0.4 mm long, dark brown at maturity, shiny.

Other specimens examined (selection from a total of 97 from AD, ADW, BRI, CANB, CBG, DNA, MEL, NSW, NT, PERTH and SYD). QUEENSLAND: Cook District: Badu Island, Torres Strait, *S.T. Garnett* 129 (BRI); Davies Creek Forestry Road, c. 15 miles [25 km] E of Mareeba, Atherton Tableland, *R. Schodde* 3315 (CANB, BRI, AD); North Kennedy District: Louisa Lake, c. 8 km S of Lyndhurst, *M. Lazarides* 8180 (CANB, BRI); near Pentland, *S.T. Blake* 19310 (BRI); Burke District: Circle Lagoon, 18° 02' S, 141° 48' E, *L.A. Craven* 4817 (CANB).

NORTHERN TERRITORY: Darwin & Gulf District: near Mt Saunders, Gove, *N. Byrnes* 2365 (NT, DNA, CANB); 8 miles [13.3 km] N of Mudginberri, *N. Byrnes* 819 (NT); Barkly Tableland: 17° 46' S, 137° 43' E, Barkly Tableland, *A. Kanis* 1717 (CANB, NT); Attack Creek, Barkly Tableland, *A.C. Beauglehole* 46306 (MEL).

WESTERN AUSTRALIA: Gardner District: 15 km W of Lake Argyle turnoff, Kimberleys, *A.C Beauglehole* 3044 (MEL); Rocky Cove, Vansittart Bay, *C.A Gardner* 1519 (PERTH); Blyxa Creek, 15° 48' S, 125° 20' E, *A.S George* 12569 (PERTH); Fitzgerald District: Adcock Gorge, Kimberleys, *A.C. Beauglehole* 4196 (MEL); Dampier District: Camballin, *Y. Power* 845 (PERTH).

Distribution and habitat. (Figure 2.) Widespread in the wetter tropical regions of Queensland (Cook, North Kennedy and Burke Districts), Northern Territory (Darwin & Gulf District and Barkly Tableland) and Western Australia (Gardner, Fitzgerald and Dampier Districts). Often grows on the edges of swamps, lagoons and streams, but also found in eucalypt woodland in drier sites. A preference for sandy soils is indicated.

Flowering period. May to October, with one record in February.

Etymology. The specific epithet refers to the rather Caryophyllaceae-like appearance of this taxon.

Notes. W. caryophylloides was first recognised by Roger Carolin in the 1960s. It is characterised by a combination of annual habit, opposite, elliptic lower leaves, linear bracts, narrowly triangular calyx lobes, and corolla tube equal to or longer than the lobes. The annual habit and opposite, elliptic lower leaves suggest a relationship with the annual species of the *W. gracilenta* Lothian / *W. preissii* Vriese group of southern Australia. However, W. *caryophylloides* lacks the other characteristic (though not constant) features of that group, namely narrowly oblong calyx lobes and narrowly ovate bracts.

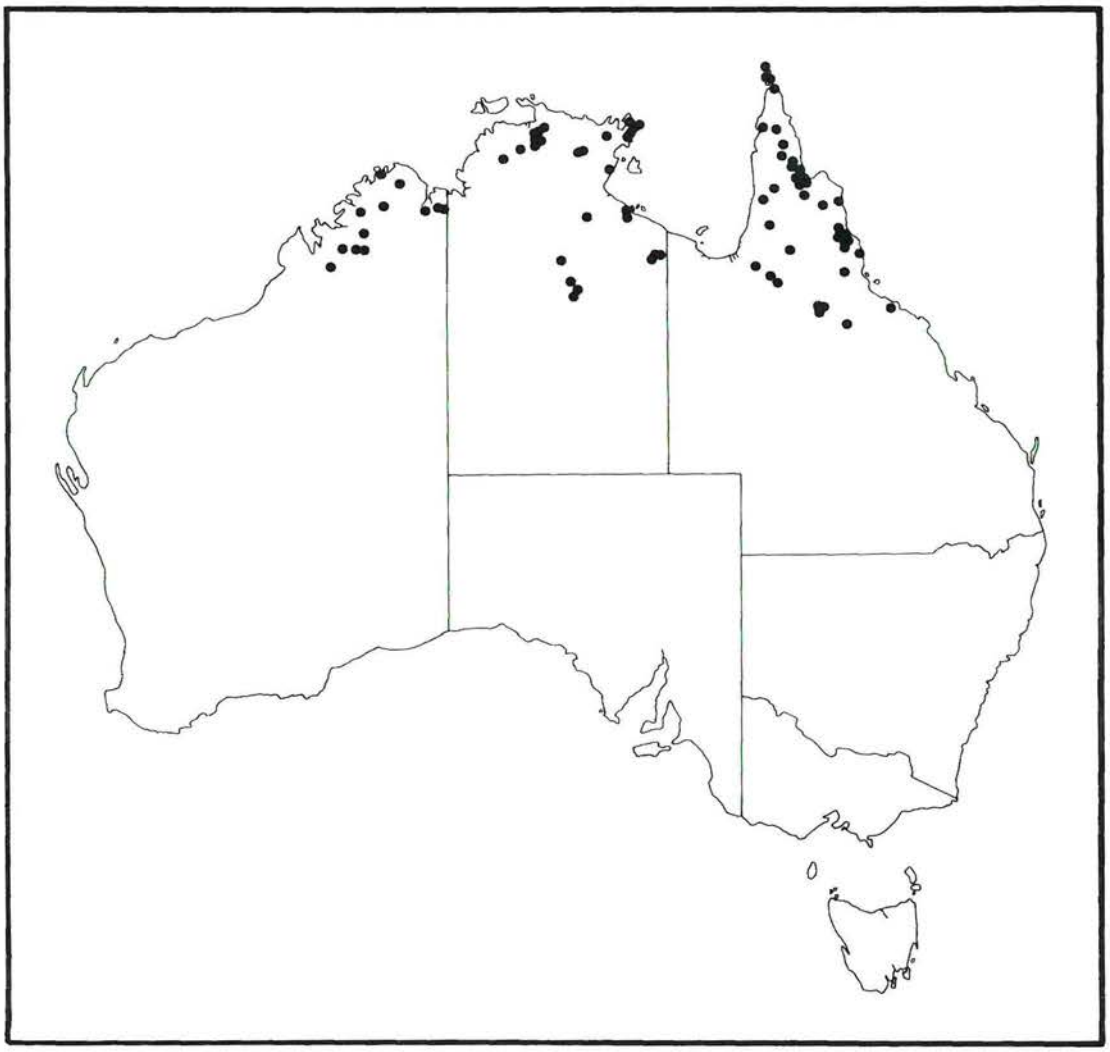


Figure 2. Distribution of *Wahlenbergia caryophylloides*.

It is generally possible to divide *W. caryophylloides* specimens into those with large flowers (corolla tube c. 7 mm long, lobes c. 6 mm long; e.g. *Gittins* 994, *Byrnes* 2365 and *Beauglehole* 4196) and those with small flowers (corolla tube c. 3 mm long, lobes c. 2 mm long; e.g. *Craven* 4817, *Kanis* 1717 and *Beauglehole* 3044). Both forms occur throughout the species' range and without obvious ecological separation.

Acknowledgements

I thank Associate Professor Roger Carolin for his assistance during my study of the genus and for first drawing my attention to this species. I am also grateful for the facilities provided at the Botany Department, University of Sydney, and the National Herbarium of NSW, and for the loan of specimens from AD, ADW, BRI, CANB, CBG, DNA, MEL, NT and PERTH. I thank Lola Smith for the illustrations.

Hibbertia hooglandii (Dilleniaceae), a new species from the Kimberley Region, Western Australia

J.R. Wheeler

Western Australian Herbarium, Department of Conservation and Land Management,
P.O. Box 104, Como, Western Australia 6152

Abstract

Wheeler, J.R. *Hibbertia hooglandii* (Dilleniaceae), a new species from the the Kimberley Region, Western Australia. Nuytsia 7(1): 69-73 (1989). A new species, *Hibbertia hooglandii* J.R. Wheeler, is described and illustrated. This species is endemic to the Kimberley Region. Its closest relative appears to be *H. muelleri* Benth. The tentative placement of the new species in *H.* section *Hemistemma* (Thouars) Benth. is discussed.

Introduction

This paper describes a new species, *Hibbertia hooglandii*, to provide a name for use in the forthcoming "Flora of the Kimberley Region". This species, endemic to the Nothern Botanical Region as defined by J.S. Beard (1980), was first collected in 1976.

Description

Hibbertia hooglandii J.R. Wheeler, sp. nov. (Figure 1)

Fruticulus caulibus rufis glabrescentibus. Folia subsessilia lineares supra glabra, margine revoluta. Flores solitarii axillares pedunculati. Bractea linearis vel subulata. Sepala elliptica extra pilis implicatis crispatis obtectis. Staminodia omnia extra stamina in uno latere floris posita. Stamina in seriebus duobus vel tribus omnia in uno latere floris posita. Carpella 2, dense villosa; ovula in quoque carpello 2.

Typus: Mitchell Plateau, N of camp, Western Australia, 27 Feb. 1979, *J.S. Beard* 8467 (holo: PERTH; iso: CANB).

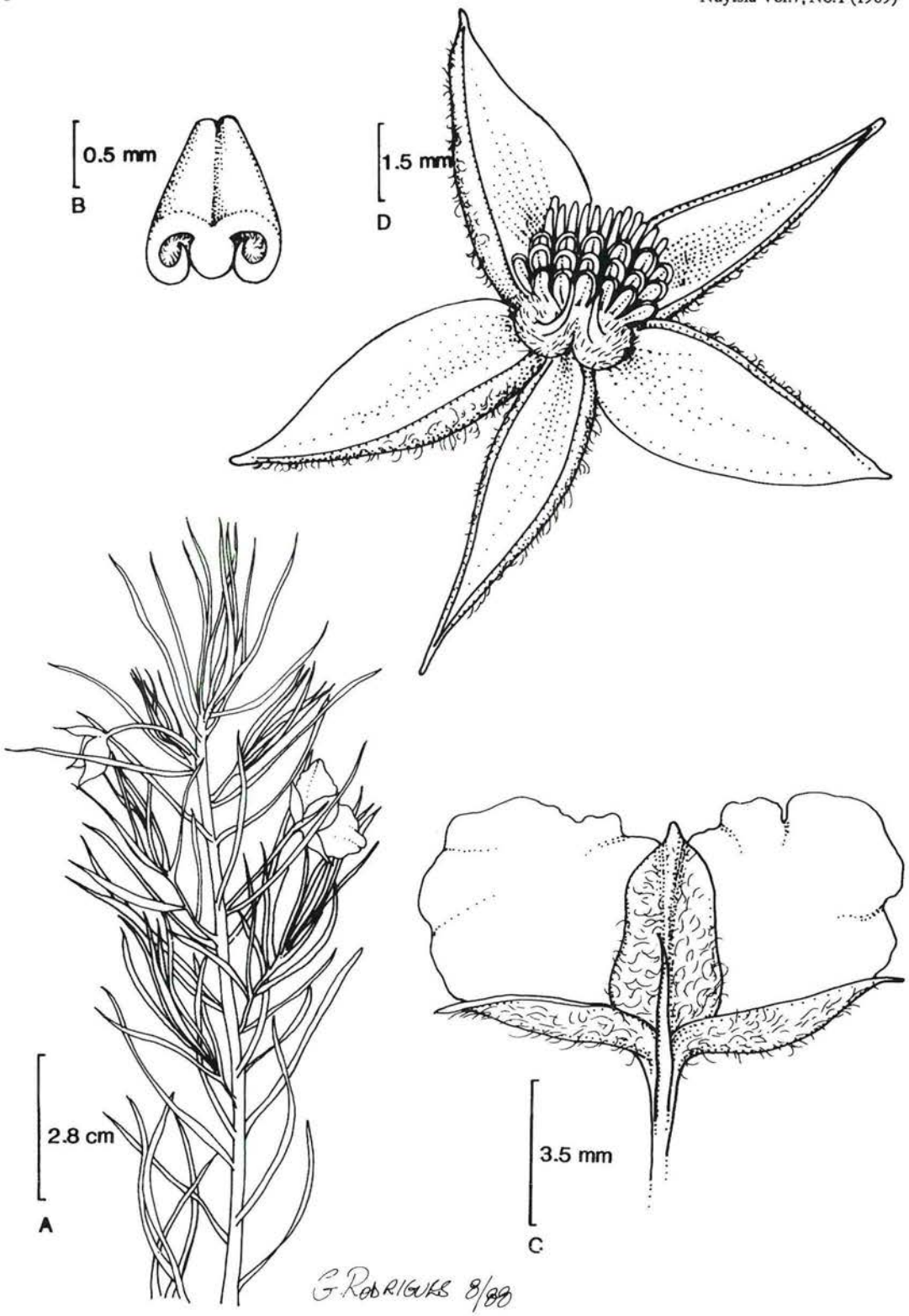


Figure 1. *Hibbertia hooglandii*. A - Flowering branch. B - Part of leaf to show revolute margins. C - Flower showing bract, sepals and petals. D - Flower with petals fallen showing staminodes, stamens and carpels. Drawn from *K.F. Kenneally* 7048 (PERTH).

Small *shrub*, erect or spreading, to 0.4 m high, often multistemmed. *Stems* reddish brown, glabrescent, somewhat angular at least when young. Young shoots with a few simple, curly, tangled hairs. *Leaves* scattered sometimes a few of them clustered together, subsessile with a few hairs in the axil, linear, 13-55 x 0.3-0.5 mm, apparently terete with revolute margins, acute to mucronulate; upper surface glabrous and grooved longitudinally down the centre; lower surface apparently glabrous, but with minute curly hairs hidden by the margin which is revolute to the prominent and glabrous midrib. *Flowers* solitary, axillary. *Peduncle* (6)15-35 mm long, slender, glabrous. *Bract* beneath the flower linear to subulate, 2.5-7 mm long, glabrous or with curly, tangled hairs, acute. *Sepals* elliptic, midrib thickened, outer surface with curly, tangled hairs which are usually white but also occasionally ferruginous, inner surface glabrous, apex acute to mucronulate; outer 2 sepals 5-8 x 2-3 mm, sometimes to 3.5 mm wide in fruit, narrower than the inner sepals; inner sepals 5.5-8 x 2.5-4 mm, sometimes to 5.5 mm wide in fruit, margin thinner and often glabrous or almost so. *Petals* golden yellow, obovate and obcordate, 5.5-11 x 5-10 mm. *Staminodes* 6-13, all on one side of the flower in a row outside the stamens, linear, 1.5-3 mm long, not differentiated into filament and anther. *Stamens* 17-25, all on one side of the flower in 2 or 3 rows inside the staminodes, free except at the very base; filament (0.5)1-1.5 mm long; anther narrowly oblong, 2-2.3 mm long, dehiscing by longitudinal slits, obtuse. *Carpels* 2, globular, c. 1 mm across, densely villous with white, curly hairs; ovules 2 per carpel; style more or less erect, c. 2.5 mm long, glabrous. Fruiting carpels globular to obovoid, 5-6.5 x 4.5-5 mm, with white, curly, tangled hairs, often only one carpel maturing. *Seeds* light brown, more or less globular, c. 5 x 4-5 mm, the lower two thirds covered by a waxy aril, often only one seed developing.

Specimens examined. WESTERN AUSTRALIA: King Edward River, Mitchell Plateau road, 14° 55' S, 126° 13' E, *A.C. Beauglehole* 51927 (PERTH); McDonald Creek, 31 km NE Mitchell River turnoff on Gibb River-Kalumburu Mission road, 14° 47' S, 126° 30' E, *A.C. Beauglehole* 52188 (PERTH); King Edward River, c. 50 km NE 'Mitchell River' Homestead, 15° 08' S, 126° 11' E, *A.C. Beauglehole* 58931 & *E.G. Erroy* 2631 (PERTH); Mitchell Plateau, N of mining camp, 14° 49' S, 125° 50' E, *A.C. Beauglehole* 59059 & *E.G. Erroy* 2759 (PERTH); Mitchell Plateau, 15 km W of airstrip on Mitchell Falls road, 14° 48' S, 125° 45' E, *T.P. Farrell* 954 (PERTH); Pim Hill, 17 km NNW of Kalumburu Mission, Napier Broome Bay, 14° 11' S, 126° 32' E, *S.J. Forbes* 2185S (PERTH); Mitchell Plateau, 50 km ESE of mining camp on road to Theda, 14° 54' S, 126° 11'E, *P.A. Fryxell & L.A. Craven* 4059 (CANB); Mitchell Plateau, 14° 50' S, 125° 50' E, *R.J. Hnatiuk* MP47 (PERTH); Mitchell Plateau, 14° 50' S, 125° 50' E, *K.F. Kenneally* 4942 (PERTH); Mitchell Plateau, Amax Basecamp, 14° 49' S, 125° 51' E, *K.F. Kenneally* 6807 (PERTH); Mitchell Plateau, track to Surveyors Falls, 14° 41' S, 125° 43' E, *K.F. Kenneally* 7048 (PERTH); Mitchell Plateau, 1 km NW of mining campsite, 14° 49' S, 125° 50' E, *K.F. Kenneally* 7723 (PERTH); King Edward River, 0.7 km SSW of ford crossing on old 'Mitchell River' Station road, 15° 07' S, 126° 07' E, *B.L. Koch* 597 (PERTH).

Distribution. Endemic to the Kimberley Region. Recorded from between Mitchell Plateau and the Gibb River - Kalumburu road, also a sterile collection from Pim Hill, 17 km NNW of Kalumburu (Figure 2).

Habitat. Occurs in palm-eucalypt woodland or *Eucalyptus miniata-Eucalyptus tetrodonta* woodland, mainly on lateritic soil but also recorded on clay over basalt or on sandstone.

Flowering and fruiting period. Flowers and fruits recorded for October, January, February, May and June.

Affinities. The closest relative of *Hibbertia hooglandii* appears to be *H. muelleri* Benth., in *H.* section *Hemistemma* (Thouars) Benth. The latter species appears to be restricted to the Daly River area of Northern Territory and differs from *H. hooglandii* principally in the inflorescence. The flowers of *H. hooglandii* are always solitary and pedunculate, whereas in *H. muelleri* they are always arranged in pedunculate, one-sided, several-flowered spikes. *H. muelleri* has a denser

indumentum than *H. hooglandii* and has an ovate rather than linear to subulate bract below each flower.

Discussion. The species in *Hibbertia* section *Hemistemma* characteristically have sessile flowers arranged in a one-sided, several-flowered, pedunculate spike, broad bracts, an indumentum of simple hairs, numerous stamens and staminodes both of which occur on one side of the flower with the staminodes outside the stamens, two densely hairy carpels each with 2-4 ovules.

Hibbertia section *Hemistemma*, as recognised by Bentham (1863) and Gilg & Werdermann (1925), also includes the south-western species *H. verrucosa* (Turcz.) Benth. The latter species I believe to be misplaced in *H.* section *Hemistemma*. Not only does it have one-flowered peduncles and stellate hairs, but the staminodes, although outside the stamens, also extend each side of the stamens. If *H. verrucosa* is removed from this section then the remaining species form a more cohesive group, all tropical in distribution.

Hibbertia hooglandii exhibits stamens, staminodes and indumentum characteristic of *H.* section *Hemistemma* but lacks the typical several-flowered spikes with sessile flowers subtended by broad bracts. Instead it has solitary, pedunculate flowers, each subtended by a narrow bract. Despite this anomally, *H. hooglandii* would seem best placed in *H.* section *Hemistemma*, pending a reasssessment of sectional boundaries within the genus.

Etymology. This species is named after Dr R.D. Hoogland, in recognition of his contribution to the taxonomy of the genus *Hibbertia*.

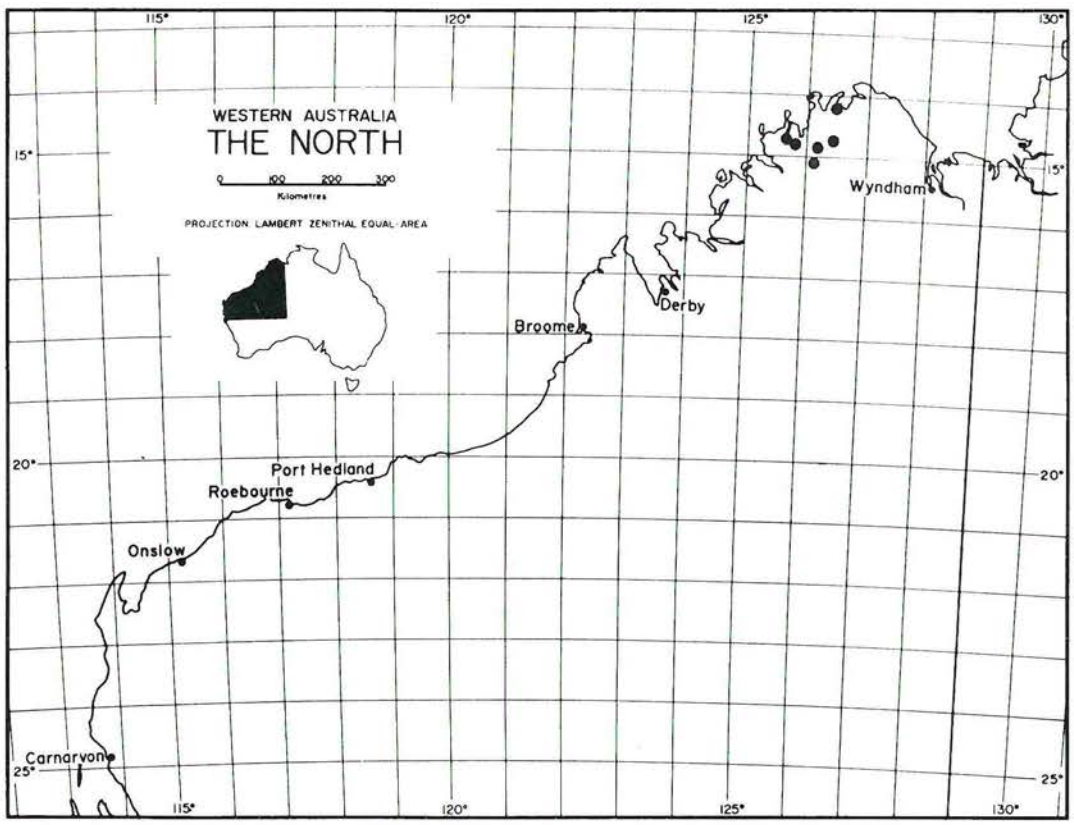


Figure 2. Distribution of *Hibbertia hooglandii*.

Acknowledgements

I am very grateful to Mr Paul G. Wilson for nomenclatural advice and for providing the Latin diagnosis, Mr G. Rodrigues for the illustration and Dr N.G. Marchant for his encouragement and critical comments. I also thank the curators and staff of CANB, MEL, DNA and NT for the loan of specimens.

References

Beard, J.S. (1980). A new phytogeographic map of Western Australia. Western Australian Herbarium Research Notes No. 3: 37-58.

Bentham, G. (1863). "Flora Australiensis." Vol 1, pp. 16-48. (Lovell Reeve & Co.: London.)

Gilg, E. & Werdermann, E. (1925/1960). Dilleniaceae. In, A. Engler "Die Naturlichen Pflanzenfamilien" edn 2. Vol. 21, pp. 7-36. (W. Engelmann: Leipzig; Duncker & Humblot: Berlin.)

A Revision of the genus *Hyalosperma* (Asteraceae: Inuleae:Gnaphaliinae)

Paul G. Wilson

Western Australian Herbarium, Department of Conservation and Land Management, P.O. Box 104, Como, Western Australia 6152.

Abstract

Wilson, Paul G. A revision of the genus *Hyalosperma* (Asteraceae: Inuleae: Gnaphaliinae). Nuytsia 7(1): 75-101 (1989). Characters used in discriminating genera within the Gnaphaliinae are noted. The application of the name *Helipterum* is discussed. The recognition of *Hyalosperma* Steetz as an Australian endemic genus distinct from *Helipterum* is proposed. Nine species are recognised; eight new species combinations are made. Three species previously reduced to synonymy under *Helipterum cotula* (Benth.) DC. are reinstated.

Introduction

During an investigation into the morphology of those Australian species that are included in *Helipterum, Helichrysum*, and related taxa it became very evident that the genera as currently constituted are not natural ones. Species that are closely related have been placed in different genera while within *Helipterum* Lindley, *Helichrysum* Miller, *Waitzia* Wendl., *Myriocephalus* Benth., *Podotheca* Cass., and *Ixiolaena* Benth. are distinct groups of species that have no close relationship to other groups in the same genus. Study of European and African species of *Helipterum* and *Helichrysum*, including the type species, indicate that neither name can be applied in the strict sense to Australian taxa and that the African and Eurasian species should not be considered congeneric with any in Australia.

A paper outlining a proposed classification of the Australian taxa in the *Helipterum-Helichrysum* group is in preparation. Some of the genera involved are being studied by taxonomists in other institutions and require a unified approach. In the meantime it appears desirable to publish revisional papers on a few of the segregate genera that are readily circumscribed and that do not impinge on the investigations being carried out elsewhere. The genus *Hyalosperma* is such an example; to follow will be papers on other similarly discrete groups.

The name *Helipterum*

The name *Helipterum* has always been attributed to Augustin de Candolle (1838), however, it was first published by John Lindley in "A Natural System of Botany" edn 2, 260 (1836). In this work Lindley listed several genera that were obtained from a manuscript copy of de Candolle's "Prodromus", to these he adds 'DC. Pr.' indicating the origin of the names. Among the accepted names was '*Helipterum* DC. Pr.'. In synonymy under it were *Argyrocome* Gaertn., *Damironia* Cass., *Syncarpha* DC., *Roccardia Neck.*, *Edmondia* Cass., and *Aphelexis* Don. The earliest of these names is *Argyrocome* Gaertn. (1791) with the type *A. retorta* (L.) Gaertn. This South African species is currently (Hilliard 1983) considered to belong to the genus *Helichrysum* P. Miller (1754). The name *Helipterum* DC. ex Lindley (1836) is therefore an illegitimate, superfluous name based on *Argyrocome retorta.*

In the year after the publication of Lindley's "Natural System of Botany" edn 2 and the year prior to the appearance of vol. 6 of de Candolle's "Prodromus", there appeared a work by Endlicher et al. (1837) in which George Bentham wrote up the Asteraceae collected by Karl Hügel in Western Australia and described, as new, *Helichrysum cotula.* Bentham included under this species a short discussion on its sectional or generic distinctiveness and on its possible future inclusion in de Candolle's seemingly unpublished genus *Helipterum* of which he had seen mention in Lindley's Natural System. edn 2 (to which work he refers) and evidently also in a manuscript copy of vol. 6 of de Candolle's "Prodromus".

In 1838, vol. 6 of de Candolle's "Prodromus" finally appeared; it included a description of the genus *Helipterum* but no reference under that name to the publication of Lindley (1836). De Candolle included in the text the types of a number of validly published genera of which the earliest is *Syncarpha* DC. (1810) which is based on the South African *S. gnaphalioides* (L.) DC., a species currently referred to *Helipterum* (Hilliard 1983). The type of the genus *Argyrocome* Gaertn. was specifically excluded by de Candolle and placed in *Helichrysum.*

Therefore *Helipterum* DC. ex Lindley (1836) is an illegitimate name and a synonym of *Helichrysum* while *Helipterum* DC. (1838) is an illegitimate name, a later homonym of *Helipterum* DC. ex Lindley (1836) and a synonym of *Syncarpha* DC. (1810). If it were to be argued that Bentham (1837) had published the name *Helichrysum* sect. *Helipterum* it would either have to be considered to be based on *Helipterum* DC. ex Lindley or it could be lectotypified on *Helichrysum cotula* Benth., a species which in this paper is placed in *Hyalosperma* Steetz.

Generic History

George Bentham (1837) described the first species, as *Helichrysum cotula*, that is now included in the genus *Hyalosperma*; he indicated it should possibly be placed in the genus *Helipterum*, a name which would be appearing in vol. 6 of Augustin de Candolle's "Prodromus" of which Bentham had evidently seen a manuscript copy. In the following year de Candolle (1838) transferred *Helichrysum cotula* to *Helipterum* and placed it in his section *Leucochrysum* along with three other Australian species which are now recognised as being conspecific under the name *Helipterum albicans* (A. Cunn.) DC.

The genus *Hyalosperma* was described by Steetz in 1845. He placed in it two new species, *H. strictum* and *H. glutinosum.* Steetz distinguished *Hyalosperma* from *Helipterum* on the basis of the former having plano-compressed achenes and a paleaceous pappus, characters that do not serve to distinguish the genus as it is here circumscribed. The genus was accepted without comment by Walpers (1846) and Lindley (1847). Asa Gray (1852) suggested that it was merely a section of *Helipterum* but he did not publish any new combinations.

Hyalosperma was next accepted as a genus by Sonder (1853) who described *Hyalosperma variabile* and included under one of its two varieties the two *Hyalosperma* species of Steetz.

At the time that Steetz (1845) described *Hyalosperma* he also published the name *Helipterum* sect. *Pachypterum*, placing in it *Helipterum cotula*, *Helipterum citrinum* (both of which = *Hyalosperma cotula*), *Helipterum simplex* (= *Hyalosperma simplex*), and *Helipterum niveum*; this last species belongs to a group of taxa quite unrelated to *Hyalosperma*. In 1851 Turczaninow referred *Helipterum pusillum* Turcz. (= *Hyalosperma pusillum*), a new species from Western Australia, to sect. *Pachypterum*, evidently recognising its affinity to *H. cotula*.

A further species, *Pteropogon demissus* Gray, was described in 1852 and placed by Gray in *Pteropogon* sect. *Pteropogonopsis* (a monotypic section) but with no mention of possible affinity to other species here included in *Hyalosperma*.

Neither the generic name *Hyalosperma* Steetz nor the sectional names of Steetz and of Gray have been taken up subsequent to Sonder (1853). All later authors who described or treated the species here included in *Hyalosperma* have placed them in the genus *Helipterum*, either under one or other of the various sectional names established by de Candolle (1838) or without indication of section.

Methods

Specimens of Australian species of *Helipterum* have been borrowed from all Australian State and Federal herbaria. Type specimens relevant to this study have been seen at the Royal Botanic Gardens, Kew (K), the British Museum (BM), and the Naturhistorisches Museum, Vienna (W). In addition material of some Australian *Helichrysum* species has been borrowed from the State Herbarium, Adelaide (AD) and the Tasmanian Herbarium (HO).

Achenes and dissections of florets of all Australian species of *Helipterum*, and of representative species of genera of other Australian Inuleae, have been mounted in Hoyer's solution (King & Robinson 1970) and examined under the microscope. Achenes have also been embedded in Spurr low-viscosity embedding media (Anonymous 1973) and sections stained in Toluidine Blue.

Morphological Characters

In addition to characters that have been classically used when describing members of the Asteraceae I have included some that have not been previously utilised, or have only recently come into prominence. A number of the characters require an explanation and are listed below along with a few of the more traditional ones. Further notes on some characters may be found in Hilliard & Burtt (1981).

Involucral bracts. The bracts usually consist of a claw and a lamina. The claw varies in shape from cylindrical to broad flat and hyaline; it usually contains a thickened median strip or stereome and a central vascular trace, or several traces, simple or branched. The central trace may terminate at the apex of the claw or may continue into the lamina.

In species of the *Helipterum-Helichrysum* group the leaves diminish in size beneath the capitulum and there is an abrupt or gradual transition from leaves to involucral bracts. In most species the transition takes the form of the terminal portion of the leaf becoming scarious and the lower, foliaceous portion, becoming smaller. However, in one group of five species, referred in an accompanying paper to the new genus *Erymophyllum* (Wilson 1989), the terminal portion remains

foliaceous and the base becomes scarious. This would appear to represent a substantial difference in the nature of the transition from one organ to another.

Receptacular bracts. These bracts are absent from most species of the *Helipterum* group; however they appear as hyaline scales in *H. maryonii* S. Moore and *H. tietkensii* F. Muell. Receptacular bracts are also found in *H. verecundum* S. Moore but this species is very distinct and better referred to the monotypic genus *Gilberta* as *G. tenuifolia* Turcz.

Corolla. Shape and arrangement of the cells of the adaxial epidermis: The side walls of the cells that make up the adaxial epidermis of the throat may be straight or slightly to strongly undulate. The shape of the cells on the adaxial surface of the lobes may vary from square to linear and their ends from truncate to acute. The surface of the adaxial epidermal cells of the throat or lobes may be flat, rounded, or papillate; the cells may be arranged either randomly or in transverse rows.

Vascular strands. There are typically 5 commissural vascular strands in the corolla tube. They may be fine and of a single row of tracheids or may be stout and several tracheids thick. The vascular strands may terminate in the tube, at the base of the lobes, along the margins of the lobes, or a pair of strands may unite at the apex of a lobe. Tracheids independent of vascular strands are sometimes present at the apex of corolla lobes.

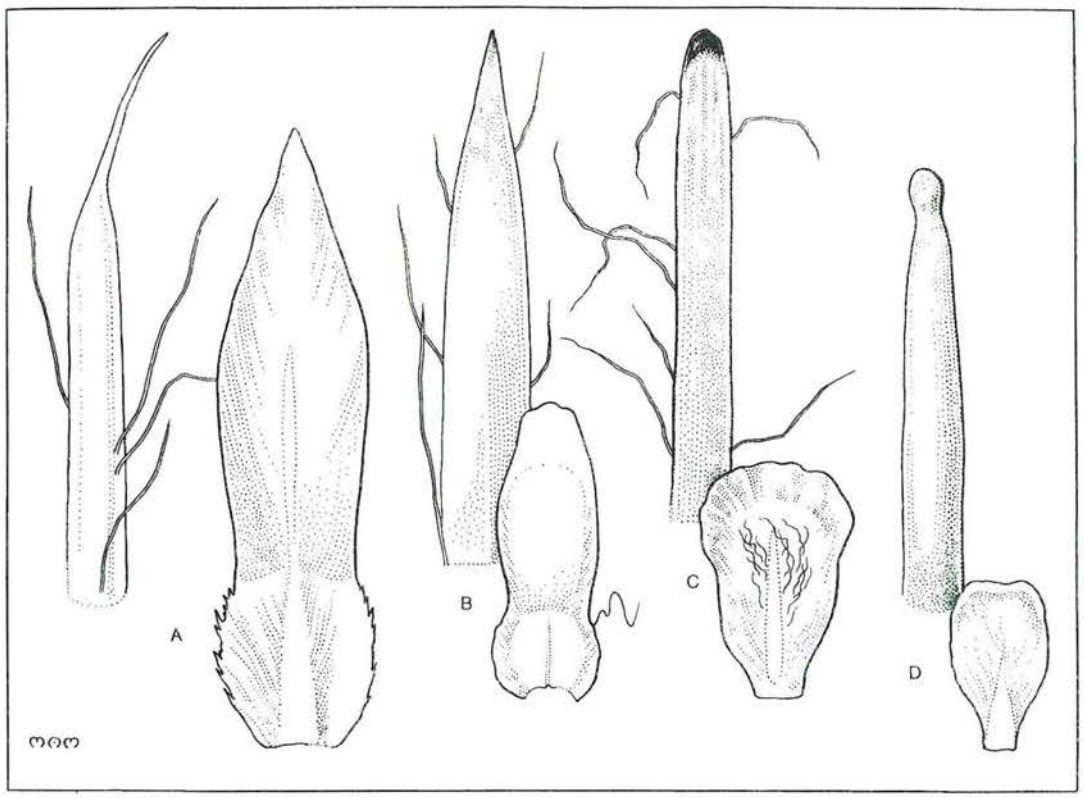


Figure 1. Innermost involucral bracts and apices of lower leaves. A - *Hyalosperma simplex*. B - *H. praecox*. C - *H. cotula*. D - *H. pusillum*. All x 17.

Stamens.

Anther collar (Robinson & King 1977). This is the differentiated distal adaxially concave portion of the staminal filament and consists of cells with lignified walls. It varies in shape and length between different species or genera.

Anther tails. These are considered to be characteristic of members of the Inuleae (but occasionally are absent); they vary considerably in length and texture. This structure is useful for assessing relationships particularly at the sectional or generic level.

Endothecial thickening (see Dormer 1962). This character is not of generic significance in the *Helipterum* complex since the arrangement of the ribs in the endothecial tissue of the anther appears to be consistently of the 'radial' type.

Anther appendage. Detailed examination of the appendage in the *Helipterum-Helichrysum* assemblage has shown that it may vary in overall thickness (2 to several cells thick), in the presence or absence of a thickened central area, in the arrangement and shape of the constituent cells, and in the structure of the cells themselves. These characters are fairly constant within species clusters that may constitute genera or sections.

Style.

Style appendage. This varies in shape and in the arrangement and length of the hairs that surround it.

Vascular trace. Considerable variation is found in overall thickness between species groups; in addition, the trace may terminate in the style branch, in the appendage, or at the extreme tip; it may be uniform in thickness or become spatulate at the apex.

Achene.

Anatomy. A study of cleared whole mounts of achenes and of transverse sections has exhibited a variety of structures. In particular the nature of the pericarp and testa often differs markedly between members of different species groups. The position occupied by the vascular traces in the pericarp in relation to the cotyledons was considered by Short (1987) to be possibly of generic significance; this I have not been able to confirm in the groups that make up the *Helipterum* alliance.

Achenial hairs. In most species of the *Helipterum* alliance the hairs are of the duplex type (see Hilliard & Burtt 1981), that is with a basal cell and a pair of slender united cells that may separate slightly at the apex. In some cases (as in *Hyalosperma*) the twinned cells are lacking and the basal cells form a rounded papilla or collicule on the surface of the achene and are part of the epidermis of the pericarp. The duplex cells are often myxogenic, that is, when moistened they may burst at the tip and exude mucilage.

In some species duplex hairs and papillae are absent. The achene may then be glabrous or it may bear the type of compound hair commonly found on the corolla; this type of uniseriate or biseriate hair is sometimes found on the achenes of *Helichrysum davenportii* F. Muell. and some of its relatives.

Carpopodium. The term used for the structure that forms the abscission zone at the base of the achene (Haque & Godward 1984). In some species of *Helipterum* it is absent (e.g. in *H. uniflorum* J. Black) but in most is represented by a fairly well-defined multilayered series of thick-walled cells. The morphology of the carpopodium varies but is generally constant within a species group.

Nectary. The nectary takes the form of a lobed or entire cup that surrounds the base of the style. It may persist on the fruit or it may be deciduous with the corolla. In some species it is minute or apparently absent.

Mycorrhizal Associations. It has been shown by Warcup & McGee (1983) that the Australian species of *Helipterum* and *Helichrysum*, as these genera are currently circumscribed, may be divided almost equally into two groups: (1) those that form both ectomycorrhizas and vesicular-arbuscular mycorrhizas and (2) those that form only ectomycorrhizas. Further taxa were subsequently examined by Warcup (pers. comm. 1986) and these included four species (with one additional subspecies) that are here recognised as being members of *Hyalosperma*; each of the four species form both ecto- and vesicular-arbuscular mycorrhizas.

Evolution and Breeding Systems

As part of an investigation into the classification of the subtribe Gnaphaliinae some interesting comments were made by Short (1981) on breeding systems and on the recognition of derived versus ancestral characters. These observations are relevant to *Hyalosperma.*

Three of the nine species of *Hyalosperma* are small rounded ephemerals to 5 cm high, these are *H. zacchaeus, H. demissum*, and *H. stoveae.* Their involucres are dull coloured without radiant bracts; the flowers are small with colourless corollas that are very shortly 3-4-lobed, and the anthers included and relatively short (0.15-0.3 mm). These characters are all ones that suggest an autogamous breeding system. Short (1981) has indicated that *H. demissum* has a pollen-ovule ratio of 84.6 which corresponds to the ratio established for other inbreeding species in the subtribe. *Hyalosperma demissum* and *H. stoveae* are morphologically very similar and are presumably closely related while *H. zacchaeus* while of the same habit is quite distinct and evidently evolved its autogamous breeding system independently of the other two.

It is reasonable to postulate that the ancestral form of these species was a plant with pentamerous flowers and showy involucres such as is found in the other members of *Hyalosperma.*

The six species of *Hyalosperma* with showy radiant involucres have anther loculi ranging in length from 0.5 mm (*H. pusillum*) to 1.0 mm (*H. semisterile*), and 5-merous corollas lobed 1/5 - 2/5 of their length; they are presumably at least predominantly outbreeding. Within *H. glutinosum* can be observed a transition from a typical outbreeder to a semiautogamous plant. The putative ancestral outbreeder form is to be found in *H. glutinosum* subsp. *venustum* which has very showy involucral bracts (the yellow laminae to 15 cm long), deeply lobed corollas (lobes 1/3 - 1/2 length of corolla), and exserted anthers with relatively long loculi (average from five collections 0.9 mm). On the other hand in *H. glutinosum* subsp. *glutinosum* the laminae of the involucral bracts are relatively short (to 5 mm), the corolla is shortly lobed (c. 1/5 length of corolla), while the anthers remain in corolla tube and have shorter loculi (average from ten collections across Australia 0.7 mm). The subsp. *venustum* is restricted in its distribution to west-central Western Australia; however, subsp. *glutinosum* is found from the west coast of Western Australia to central New South Wales and Victoria.

A similar distribution pattern was noted by Short in closely related species pairs of which one (the putative ancestral form) was an outbreeder and the other an inbreeder.

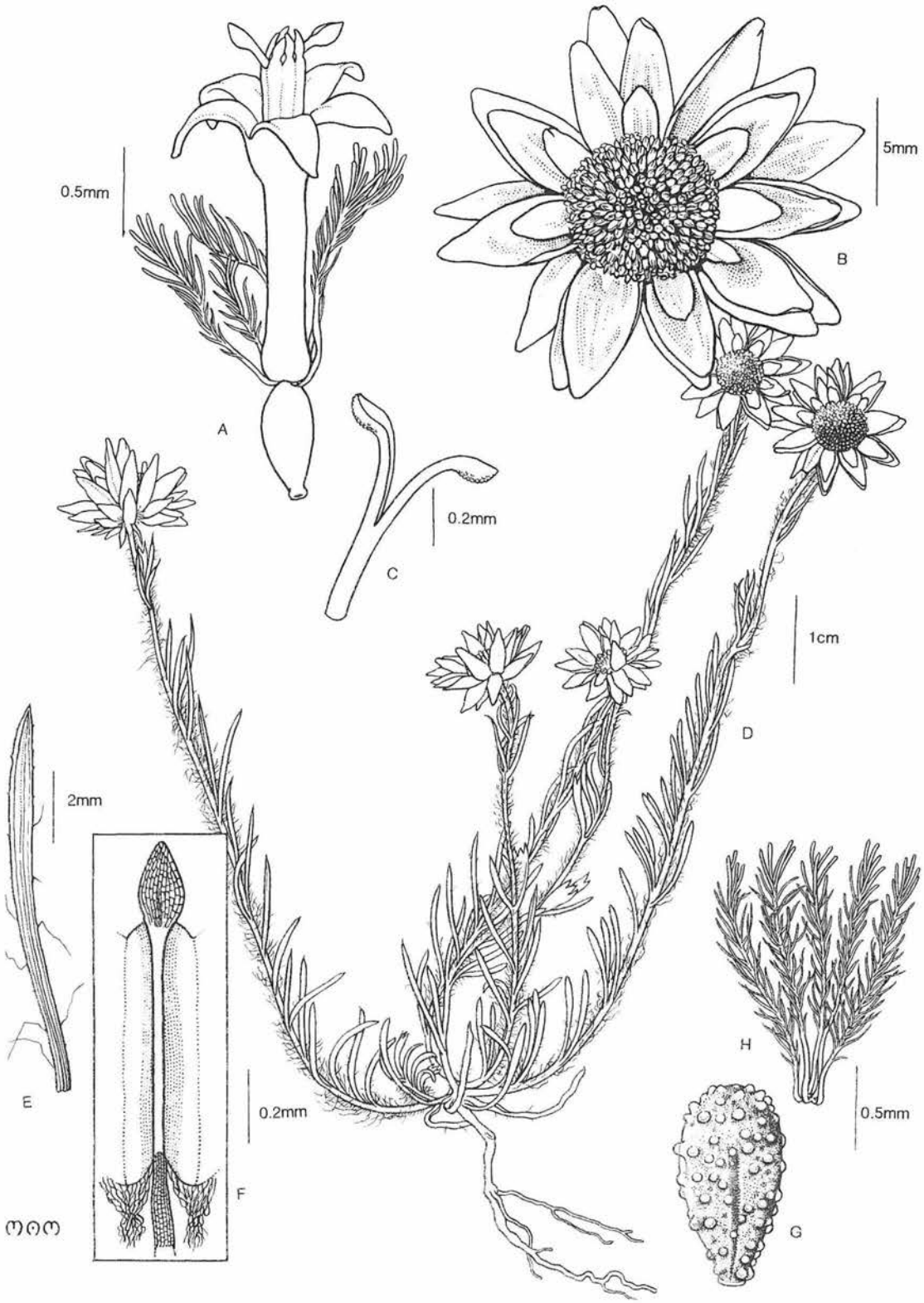


Figure 2. *Hyalosperma praecox*. A - Floret. B - Flower-head from above. C - Style branches. D - Habit of plant. E - Leaf. F - Anther. G - Achene. H - Pappus. All from *T.B. Muir* 6834 (PERTH).

Generic Affinities

The species here included within *Hyalosperma* form a homologous assemblage whose closest affinities in the *Helipterum* complex appear to be with members of the 'Achyroclinoides' alliance, an informal name based on *Pteropogon* sect. *Achyroclinoides* A. Gray (1852). In this alliance I place *Helipterum laeve* (A. Gray) Benth., *H. corymbosum* (A. Gray) Benth., *Helipterum polycephalum* (A. Gray) Benth., and *H. forrestii* F.Muell. *Hyalosperma* differs from *'Achyroclinoides'* in having terete (not flat) leaves, glabrous (not hirsute) achenes, uniseriate (not biseriate) hairs on the corolla, and smooth and straight (not papillose and undulate) walled cells in the inner epidermis of the corolla.

Outside the *Helipterum* complex affinities are possibly with *Blennospora* A. Gray which shares with *Hyalosperma* terete leaves, glabrous and sometimes myxogenic achenes, deciduous pappus, and similar style appendices and stamens. *Blennospora* differs from *Hyalosperma* in inflorescence characters, in the inner epidermal cells of the corolla being variably papillose and with undulate walls, and in hairs on the corolla being biseriate. Short (1987) has suggested that the crustaceous layer of the achene in *Blennospora* is formed from the pericarp but my observations on *B. drummondii* A. Gray indicate that it is formed from the integument and is therefore the testa as it is in *Hyalosperma*. Numerous homomorphic narrow-oblong crystals occur in the testa of the achene of *Blennospora*. They are absent in the mature seed of *Hyalosperma* (but present in the young seed); I am uncertain of the value of this character for ascertaining generic limits.

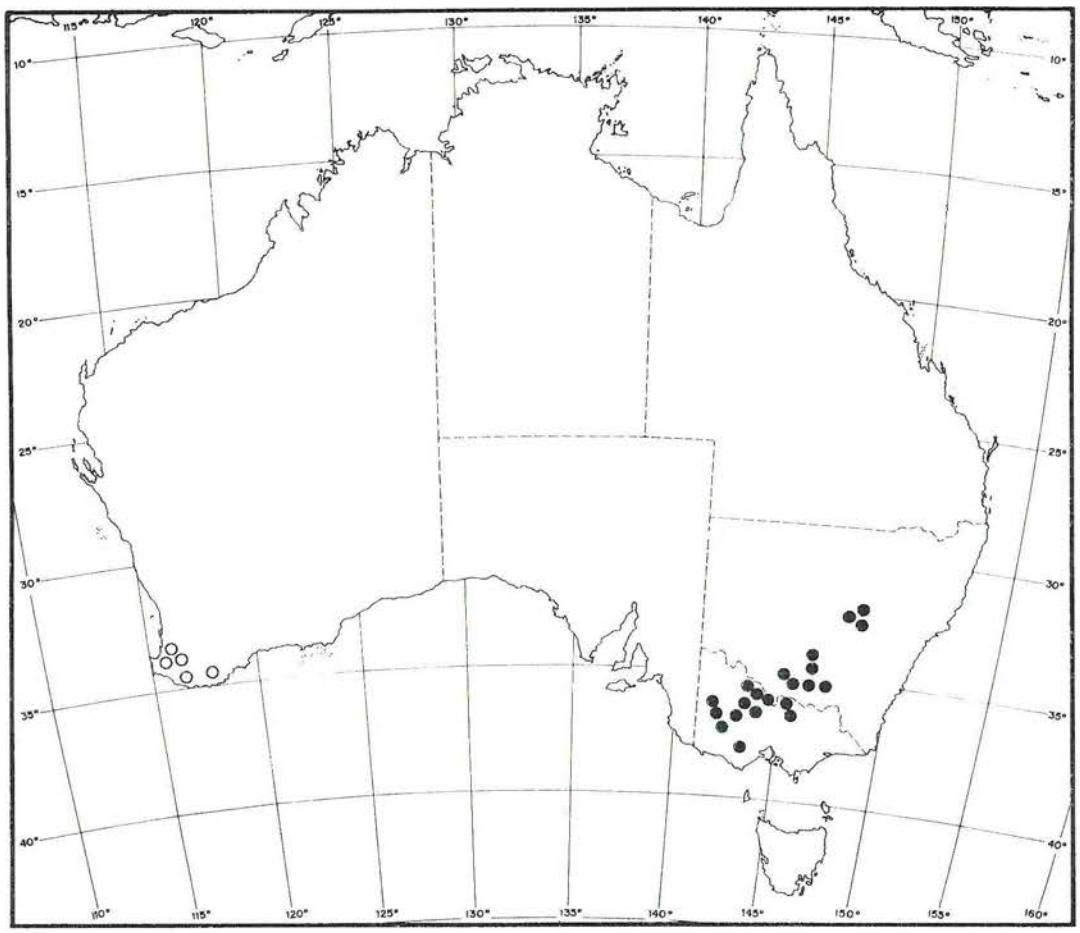


Figure 3. Distribution of *Hyalosperma pusillum* (○), and *H. praecox* (●).

Taxonomy

Hyalosperma Steetz in Lehm., Pl. Preiss. 1: 476 (1845); Walpers, Repert. Bot. Syst. 6: 242 (1846); Sonder, Linnaea 25: 519 (1853). *Lectotype: Hyalosperma glutinosum* Steetz, lecto nov. (see Nomenclatural Notes).

Helipterum sect. *Pachypterum* Steetz in Lehm., Pl. Preiss. 1: 473 (1845) p. pte. maj. and as to lectotype. *Lectotype*: *Helipterum cotula* (Benth.) DC., lecto nov. (see Nomenclatural Notes).

Pteropogon sect. *Pteropogonopsis* A. Gray, Hooker's J. Bot. Kew Gard. Misc. 4: 269 (1852). *Type: Pteropogon demissus* A. Gray.

Annual herbs, cottony to subglabrous. *Stem* slender, simple or branching at or above base. *Leaves* alternate or the lower ones opposite, slender, semiterete. *Flower heads* solitary, multiflowered, homogamous, discoid. *Involucral bracts* 3- to multi-seriate, glossy, glabrous or sparsely woolly; *claw* broad, hyaline on margin; *stereome* linear to narrow-oblong, hard, or thin and inconspicuous; *vascular strand* simple (unbranched), ending below apex of claw; *inner bracts* with a petaline lamina or this represented by a small opaque tip or absent. *Receptacle* convex to conical, glabrous, ebracteate, pitted. *Flowers* actinomorphic, bisexual or the innermost functionally male. *Pappus* caducous as a whole; *bristles* linear-acuminate or broad in lower half, united in a ring at base and in some species in lower half to form a short cylinder, plumose throughout (or only in upper half) with fine cilia, the terminal cilia sometimes clavate or inflated. *Corolla* cylindrical, usually pale yellow, broader in upper half, 3-5 lobed, glabrous or with a few minute uniseriate non-glandular hairs, not papillose within; *vascular strands* of corolla not continuing into lobes; cells of *inner epidermis* of lobes oblong to narrow-oblong, not in rows; cells of inner epidermis of throat with straight walls. *Anthers*: *apical appendages* acute, smooth, thin, 2-cells thick (except for *H. pusillum* in which the distal portion is thickened); *tails* fine and diaphanous. *Nectary cup* minute, persistent on achene. *Style branches: vascular trace* fine, terminating below apex. *Style apex* rounded or broad- to narrow-deltoid, minutely to prominently papillose. *Achene* ellipsoid to obovoid, or flattened and obovate, 1-2 mm long; *vascular strands* 2; *pericarp* soft and translucent, the epidermis smooth, or colliculate to verrucose due to depressed-globular duplex papillae, these usually myxogenic; *testa* thin, crustaceous or sclerenchymatous; *carpopodium* a minute narrow ring (annular). *Chromosome numbers* 8, ll, and 12 (see text).

This genus contains nine species which are endemic to temperate Australia.

Nomenclatural Notes

The genus *Hyalosperma* Steetz (1845) included two species, *H. strictum* Steetz and *H glutinosum* Steetz. In considering them to be conspecific I have retained the name *H. glutinosum* (see under this name).

Steetz (1845) placed four species in *Helipterum* sect. *Pachypterum*, these were *H. cotula* (Benth.) DC., *H. citrinum* Steetz, *H. simplex* Steetz, and *H. niveum* Steetz. I consider that, except for *H. niveum*, they belong to the genus *Hyalosperma* and have designated as lectotype *H. cotula*, the one listed first by Steetz.

Key to species

1. Inner involucral bracts without a radiating lamina or the lamina less than 1 mm long; plants 2-4 cm high, much branched; corolla 3-4-lobed.

   2. Involucre c. 5 mm long; inner involucral bracts with a small ovate pale brown lamina 0.5-1 mm long (W.A.) ..... 1. *H. zacchaeus*

   2. Involucre to 3 mm long; inner involucral bracts entirely hyaline or with a very short erect opaque apex.

      3. Leaves slender terete; plant very sparsely pilose ..... 2. *H. demissum*

      3. Leaves fleshy, elliptic to obovate; plant moderately pilose ..... 3. *H. stoveae*

1. Inner involucral bracts with a prominent white or yellow radiating lamina over 2 mm long; plants mostly 10-20 cm high; stem simple or branched; corolla 5-lobed.

   4. Involucre turbinate to cup-shaped, glossy, glabrous; radiating bracts with yellow lamina; achene warty.

      5. Involucre (excluding ray) turbinate to broadly cup-shaped, reddish brown; lower leaves with rounded apex; pappus bristles broad towards base and variably united into a sheath; achene broad-oblong, flattened, hyaline on margin (W.A. & Eastern States) ..... 4. *H. glutinosum*

      5. Involucre (excluding ray) broadly cup-shaped, silvery to pale brown; lower leaves obtuse to acute or acuminate; pappus bristles narrow in lower half and united only at base; achene narrow-obovoid, not hyaline on margin (Eastern States) ..... 5. *H. semisterile*

   4. Involucre spreading from base, somewhat woolly to subglabrous; radiating bracts with white or yellow lamina; achene warty or smooth.

      6. Leaves (middle and lower) blunt; innermost involucal bracts with very short rounded or truncate lamina 0.25-1.5 mm long.

         7. Receptable conical; innermost involucral bracts with extremely short (c. 0.25 mm) truncate white limb; pappus tips white, clavate (W.A., Bunbury southwards) ..... 9. *H. pusillum*

         7. Receptacle rounded; innermost involucral bracts with short (0.5-1.5 mm) white or yellow rounded lamina; pappus tips yellow, clavate (W.A., Geraldton southwards) ..... 6. *H. cotula*

      6. Leaves (middle and lower) acuminate; innermost involucral bracts with prominent (c. 5 mm) radiating lamina.

         8. Stem usually branched at and above base; receptacle rounded (W.A., Perth southwards) ..... 7. *H. simplex*

         8. Stem branching at base; receptacle conical (south-eastern Australia). ..... 8. *H. praecox*

1. **Hyalosperma zacchaeus** (S.Moore) Paul G. Wilson, comb. nov. — *Helipterum zacchaeus* S.Moore, J. Bot. 35: 166 (1897); B. Grieve & W. Blackall, How to know Western Austral. Wildfl., Pt. 4: 834 (1975). *Type:* Near Coolgardie, Aug. 1895, *S. Moore* (holo: BM; iso: K, MEL).

Helipterum guilfoylei Ewart, Proc. Roy. Soc. Victoria n.s. 20: 82, t. 12 (1907). *Lectotype:* Cowcowing, Aug. 1904, *M. Koch* 1097 (lecto: MEL 1539022; isolecto: NSW 179898, PERTH), lecto nov. *Lectoparatypes*: Cowcowing, Aug. 1904, *M. Koch* 1097 (MEL 1539023, NSW 179898, PERTH); Cowcowing Sept. 1904, *M. Koch* 1097 (MEL 1539023, BM, PERTH).

Decumbent to erect rounded *annual* branching at and above base, c. 5 cm high, sparsely villous to very sparsely woolly. *Branches* slender. *Leaves* slender, semiterete 3-6 mm long, acute; *terminal leaves* clustered around capitulae and bearing short scarious appendages. *Heads* solitary, terminal to branches. *Involucre* broad cylindrical to urceolate, c. 5 mm high, 2.5 mm diameter. *Involucral bracts* c. 4-seriate, glossy, straw-coloured, glabrous; *outer bracts* broad-elliptic, c. 2.5 mm long, hyaline except for flat linear stereome, woolly ciliate on margin; *intermediate* and *inner bracts* similar to outer but c. 4 mm ong, eciliate and with a very small pale brown somewhat spreading lamina to 0.7 mm long; innermost bracts ovate, c. 3 mm long, eciliate and without a lamina. *Receptacle* slightly convex, c. 0.7 mm diameter, smooth. *Flowers* 5-10, all fertile or the inner with sterile ovaries. *Pappus: bristles* c. 10, c. 2 mm long; shaft narrow-linear acuminate, united in a ring at base, plumose throughout, colourless or the terminal cilia very pale yellow, basal cilia curled around those of other florets. *Corolla* narrow-tubular, c. 2 mm long, glabrous, very shortly 4-lobed. *Anthers* included; loculi c. 0.3 mm long. *Style tip* truncate, minutely papillose. *Achene* oblong to obovate, c. 2 mm long, colliculate due to the sessile depressed globular duplex papillae, myxogenic; *pericarp* reddish brown or colourless, translucent but filled with the reddish brown seed (testa); attachment minute, 0.1 mm diameter. *Chromosome number* n = 8 fide B.L. Turner (1970).

Specimens seen (selection only). WESTERN AUSTRALIA: Boorabbin, *K.R. Newbey* 8692 (PERTH); 30 miles S of Coolgardie, *B.L. Turner* 5291 (MEL, PERTH); Mongers Lake, *P.G. Wilson* 12302 (PERTH).

Distribution. Inland south-western Western Australia from Cowcowing in the west to Coolgardie and Fraser Range in the east. Figure 4.

Habitat. Sandy loam or gravel in open forest or exposed areas.

Lectotypification of Helipterum guilfoylei. No locality or collection was cited by Ewart; I have therefore designated as lectotype a specimen that was annotated by Ewart and was probably the basis for the illustration of the plant on plate 12 that accompanied the description.

2. **Hyalosperma demissum** *(A. Gray) Paul G. Wilson, comb. nov.* — *Pteropogon demissus* A. Gray, Hooker's J. Bot. Kew Gard. Misc. 4: 269 (1852). — *Helipterum demissum* (A. Gray) Druce, Bot. Exch. Club Soc. Brit. Isles 4: 627 (1917); Ewart, Fl. Vict. 1128 (1931); J. Willis, Handb. Pl. Victoria 2: 709 (1973); J. Black, Fl. South Australia edn 2, 906 (1957). *Type:* Swan River, *J. Drummond* 66 (holo: K).

Helipterum exiguum F. Muell., Trans. & Proc. Vict. Inst. Advancem. Sci. 1854-1855: 39 (1855); Benth., Fl. Austral. 3: 649 (1867). *Type citation:* 'In sandy stony declivities of the Grampians, the Serra and Victoria Ranges, near Gawlertown, and in the Bugle Ranges'. *Lectotype*: Mount Sturgeon, Victoria, November 1858, *F. Mueller* (lecto: MEL 1539027; isolecto: K, MEL 1539062), lecto. nov.

Much-branched rounded *annual* 5-20 mm high, sparsely villous to glabrous. *Branches* obscurely ribbed from the decurrent leaf bases. *Leaves* opposite and alternate, linear-triquetrous, acuminate, c. 5 mm long. *Heads* terminal to branches and subtended by foliage leaves. *Involucre*

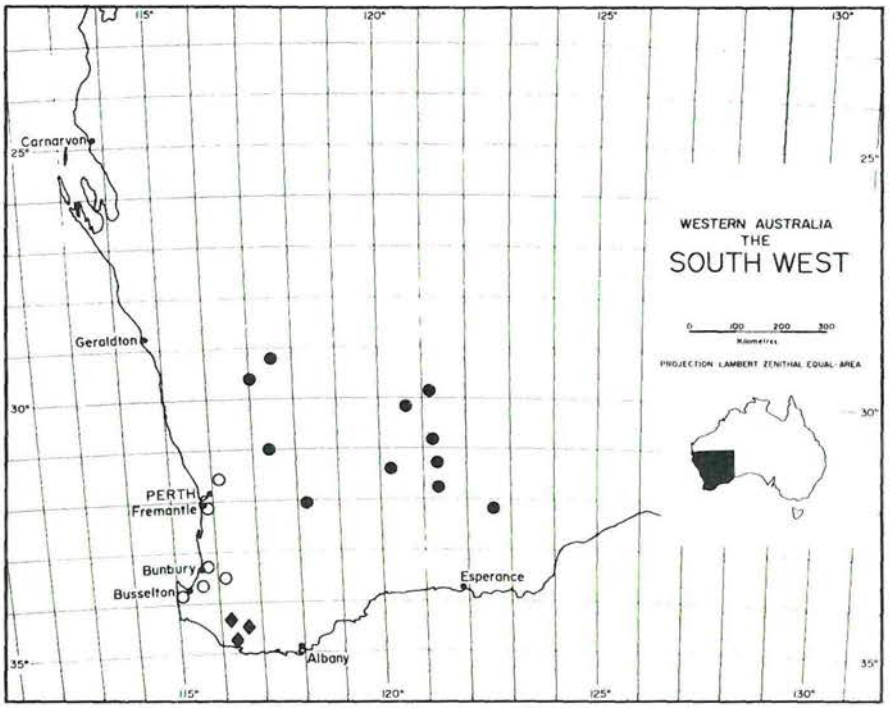


Figure 4. Distribution of *Hyalosperma zacchaeus* (●), *H. simplex* subsp. *simplex* (○), and *H. simplex* subsp. *graniticola* (◆).

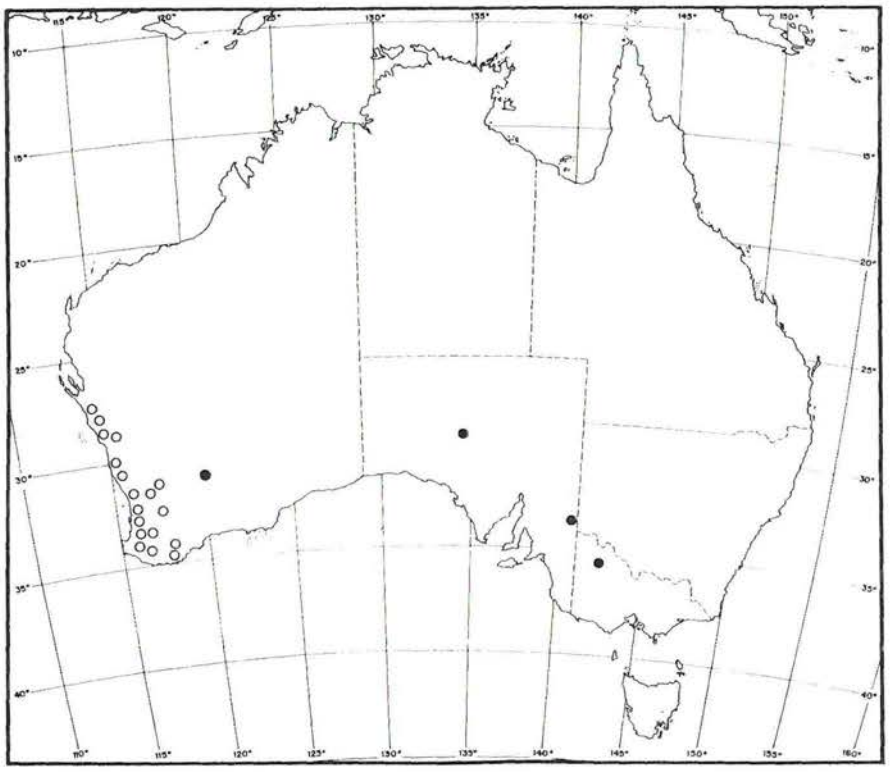


Figure 5. Distribution of *Hyalosperma cotula* (○), and *H. stoveae* (●).

urceolate to cup-shaped c. 3 mm long, 1.5 mm diameter, glabrous. *Involucral bracts* 3-4 seriate, pale green to straw-coloured or silvery glossy, ovate to broad oblong, 2-2.5 mm long, hyaline with flat linear stereome extending 1/2-2/3 the length; *inner bracts* with an erect short (c. 0.2 mm) rounded pale brown to off-white (rarely pale yellow) apex. *Receptacle* rounded to conical, c. 0.7 mm diameter. *Flowers* 15-25, fertile. *Pappus:* bristles c. 10, c. 1.5 mm long; shaft narrow-linear acuminate shortly united at base in a ring, plumose throughout with slender cilia, colourless. *Corolla* narrow-cylindrical, white or pale yellow, equal to pappus, glabrous, very shortly 3 or 4 lobed. *Anthers* included; *loculi* c. 0.3 mm long. *Style apex* minute, rounded, prominently papillose. *Achene* obovoid or somewhat compressed, c. 0.7 mm long, colliculate with sessile depressed globose duplex papillae, margaritaceous, myxogenic; *carpophore* minute, c. 0.06 mm diameter. Pappus and corolla attached to centre of apex of achene.

Specimens seen (selection only). WESTERN AUSTRALIA: Nippering, *T.B. Muir* 4457 (MEL); Boyagin Rock, *R. Ornduff* 9299 (PERTH); 65 km SW of Sandstone, *P.G. Wilson* 8894 (PERTH).
SOUTH AUSTRALIA: Hundred of Ramsay, *B.J. Blaylock* 1714 (AD); Fairview Conservation Park, P.E. Conrick 1219 (AD); 25 km ENE of Murray Bridge, *D.N. Kraehenbuehl* 4231 (AD).
VICTORIA: Mt Arapiles, *H.I. Aston* 1072 (MEL); Narrandera Range, *T.B. Muir* 6082 (MEL); You Yangs, Oct. 1976, *J.H. Willis* (MEL).
NEW SOUTH WALES: Jindera Gap, *E.J. McBarron* 36846 (NSW); Temora, Oct. 1915, *J.W. Dwyer* 690 (NSW); Narrandera Range, *T.B. Muir* 6082 (CBG, MEL).
TASMANIA: Hobart, *W.M. Curtis* (HO 52397); Lindisfarne, *L. Rodway* (NSW).

Distribution. Found in south-west Western Australia, southern South Australia, Victoria, southern New South Wales as far east as 147° longitude, and Tasmania. Figure 8.

Habitat. Grows in shallow soils in a variety of habitats, often in exposed situations.

Note. For the characters that serve to separate *H. demissum* from *H. stoveae* see under the latter species.

3. **Hyalosperma stoveae** (D.A. Cooke) Paul G. Wilson, comb. nov. — *Helipterum stoveae* D.A. Cooke in Jessop & Toelken, Fl. South Australia edn 4, 1546, 1548 f. 700C (1986). *Type:* c. 2.5 km S of 'Ingomar' Homestead, c. 1 km SSW of southern end of Birthday Swamp, South Australia, 15 Sept. 1978, *K. Stove* 655 (holo : AD).

Much-branched semi-prostrate *annual* to 50 mm diameter, sparsely villous. *Branches* slender. *Leaves* subopposite, fleshy; lower leaves narrow-oblong, c. 5 mm long; upper leaves elliptic to narrow-obovoid, c. 3 mm long; uppermost leaves c. 4, ovate to broad-ovate, c. 2.5 mm long and surrounding the solitary sessile capitulum. *Involucre* broadly cup-shaped, c. 1.7 mm high, 2 mm diameter. *Involucral bracts* not radiating, 2-seriate, obovate with rounded apex, c. 2 mm long, hyaline with the apex sometimes semiopaque, glabrous; *stereome* linear, flat, hard, c. 1/2 length of bract. *Receptacle* convex to broad-conical, c. 0.7 mm diameter. *Florets* numerous, fertile. *Pappus bristles* 6-8, c. 1.2 mm long; *shaft* narrow-linear acuminate, plumose from near base with slender cilia, united in a short ring at base, colourless. *Corolla* narrow-cylindrical, glabrous outside and inside, very shortly 3-lobed, equal to pappus. *Anthers* 3, included; loculi c. 0.15 mm long; base acute; tails short and diaphanous; apiculum triangular; collar linear, equal in length to anther. *Style apex* acuminate the lobes very short and scarcely separable, papillose. *Achene* very broadly obovoid, c. 0.5 mm long, rounded at apex, smooth, not myxogenic, colourless to pale brown; *carpophore* a minute ring c. 0.08 mm diam. Pappus and corolla excentrically attached to achene.

Specimens seen. WESTERN AUSTRALIA: Perrinvale Station, *R.J. Cranfield* 7187 (PERTH).
SOUTH AUSTRALIA: Canopus, 33° 30' S, 140° 42' E, *K.M. Alcock* 36 (AD).
VICTORIA: Wyperfeld N.P., 0.5 km SW of Eastern Lookout, 35° 36' S, 142° 06' E, *T.B. Muir* 5891 (MEL).

Distribution. Found in south-central region of Western Australia, the Lake Eyre and Murray Regions of South Australia and in western Victoria. Figure 5.

Habitat. Acacia aneura woodland (Lake Eyre region, South Australia) and mallee woodland (western Victoria).

Notes. Hyalosperma stoveae is very similar in appearance to *H. demissum*; it differs from the latter species in having somewhat more villous branches, broader leaves, and a smooth achene on which the corolla is excentrically attached. Although *H. stoveae* is small and certainly easily overlooked, it must be more rare than *H. demissum* since, although evidently widely distributed, only four collections have been seen in Australian herbaria, all collected between 1978 and 1988.

4. **Hyalosperma glutinosum** Steetz in Lehm., Pl. Preiss. l: 477 (1845); — *Helipterum glutinosum* (Steetz) Druce, Bot. Exch. Club Brit. Isles 1916: 627 (1917); Domin, Vestn. Kral. Ceske Spolecn. Nauk. Tr. Mat.-Prir. 2: 118 (1923) nom. illeg. non Hook. (1848). *Type citation*: 'In solo sublimoso prope oppidulum York, d. 4. Sept. 1839. Herb. *Preiss.* No. 19.' *Type:* K, MEL 1538987, 1538988, 1538989 (see Notes).

Hyalosperma strictum Steetz in Lehm., Pl. Preiss l: 47745). *Type citation*: 'In calculosis apricis lateris orientalis montis Brown et montis Lehmann, d. 4 Sept. 1839. Herb. *Preiss.* No. 20.' *Type:* (MEL 1538985, MEL 1538986).

Hyalosperma variabile Sond., Linnaea 25: 519 (1853), nom. illeg. (both *H. strictum* Steetz and *H. glutinosum* Steetz were cited in synonymy of an included variety) — *Helipterum variabile* Ostenf., Biol. Meddel. Kongel. Danske Vidensk. Selsk. 3(2): 141 (1921), comb. illeg. (an earlier epithet available).

Hyalosperma variabile Sonder var. *preissii* Sonder, Linnaea 25: 519 (1853), based on types of *H. strictum* Steetz and *H. glutinosum* Steetz.

Helipterum hyalospermum F. Muell. ex Benth., Fl. Austral. 3: 644 (1867), based on types of *Hyalospermum strictum* Steetz and *H. glutinosum* Steetz, non *Helipterum strictum* (Lindley) Benth. (1867) nec *Helipterum glutinosum* Hook. (1848).

Helipterum venustum S. Moore, J. Linn. Soc. Bot. 45: 180 (1920). Type citation: 'Mt Magnet district, Youanne; *Maryon.*' *Type*: (holo: BM).

[*Hyalosperma variabile* Sonder. var. *muelleri* Sonder., Linnaea 25: 519 (1853) p.pte. as to 'Burra Burra' not as to lectotype.] See Notes.

Erect *annual herb* 10-20 cm high, simple or branching at and above base. *Branches* slender weakly sinuous, glabrous or very sparsely woolly, inconspicuously ribbed by the narrow green leaf decurrencies. *Leaves* alternate, filiform, 5-40 mm long, glabrous to sparsely woolly with obtuse to rounded apex, abruptly diminishing and bract-like in upper portion of branches and there with short scarious appendages. *Heads* solitary, terminal to branches. *Involucre* turbinate becoming hemispherical at maturity with radiating laminae, 5-10 mm high and wide (excluding rays). *Involucral bracts* multiseriate; *outer bracts* glossy, pale to dark brown, almost glabrous, broad-elliptic with flat lanceolate stereome, grading downwards into upper cauline bracts; *inner bracts:* claw broad-elliptic to suborbicular, c. 3-4 mm long, hyaline, membranous, woolly ciliate, with narrow-oblong thin flat stereome extending throughout length; lamina oblong-elliptic, acute, 3-15 mm long, yellow; innermost series of bracts similar to inner or with very reduced lamina. *Receptacle* convex, 2-5 mm diameter, prominently pitted. *Flowers* numerous, fertile except for some in centre. *Pappus* colourless or towards apex yellow; bristles c. 12; shaft linear-acuminate, broader in lower half, 2.5 mm long, variably united towards base into a sheath, plumose in upper

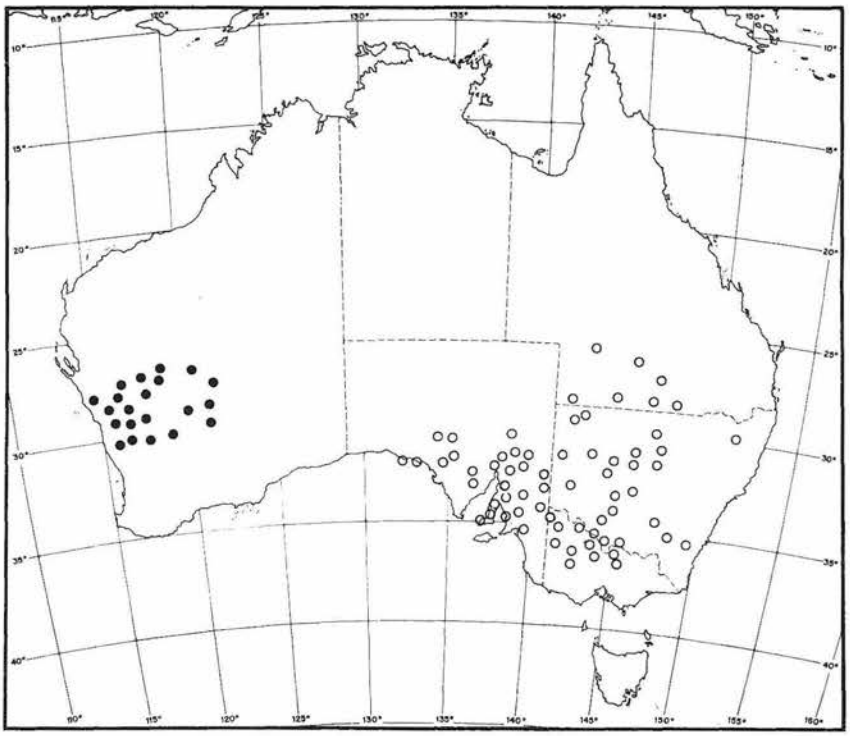


Figure 6. Distribtuion of *Hyalosperma glutinosum* subsp. *venustum* (●), and *H. semisterile* (○).

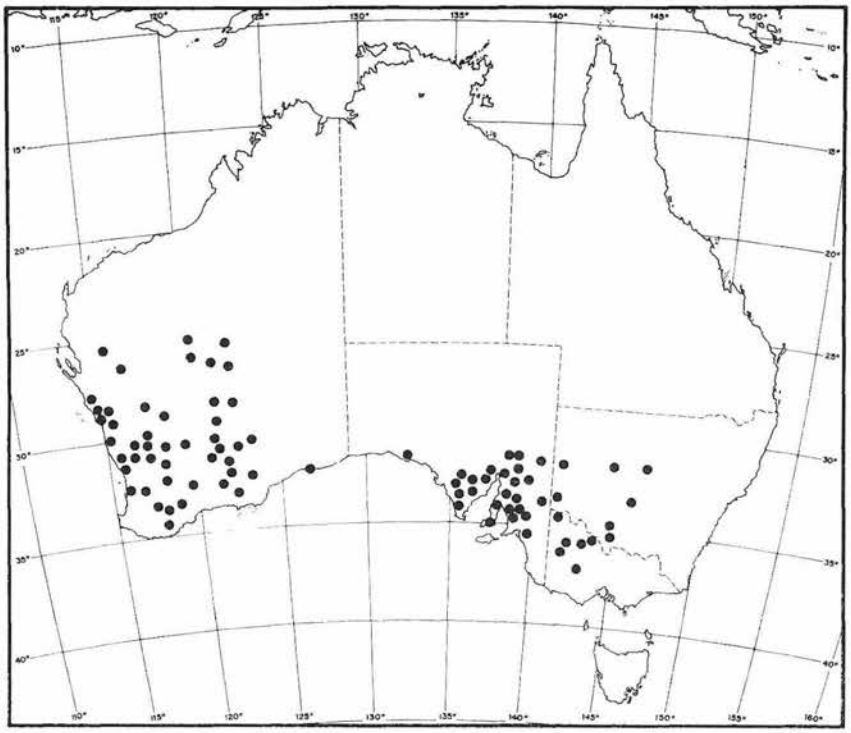


Figure 7. Distribution of *Hyalosperma glutinosum* subsp. *glutinosum*.

half, the terminal cilia filamentous or in those of the central florets clavate to obovoid. *Corolla* tubular, narrow in lower half, somewhat broader in upper, 2.5 mm long, glabrous, yellow, 5-lobed to between 1/5 and 1/2 of its length. *Anther loculi* 0.7-0.9 mm long. *Style apex* very broadly deltoid, papillose. *Achene* broad-oblong, 1.5-2.5 mm long, base rounded, apex truncate and slightly concave in centre; pericarp translucent, soft, brown or colourless, densely colliculate with small low rounded duplex papillae that are myxogenic; *seed* occupying central portion of achene, testa brown; margins of achene hollow, translucent; *carpophore* inconspicuous, c. 0.2 mm diameter.

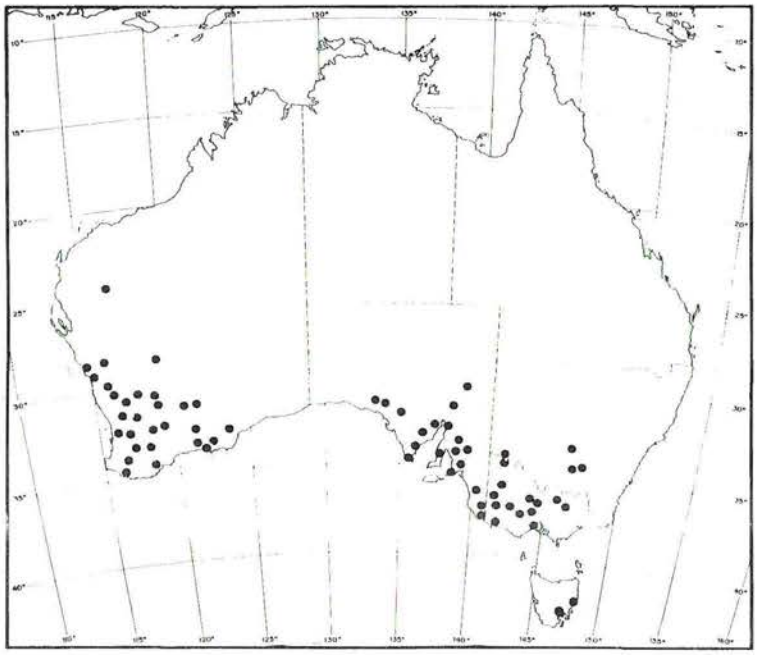


Figure 8. Distribtuion of *Hyalosperma demissum*.

Key to subspecies

1. Inner involucral bracts with lamina to 5 mm long; corolla lobed to c. 1/5 of length ..... a. subsp. *glutinosum*

1. Inner involucral bracts with lamina 5-15 mm long; corolla lobed 1/3 to 1/2 of length ..... b. subsp. *venustum*

4a. **Hyalosperma glutinosum** Steetz subsp. **glutinosum**; synonymy as for the species, except for the name *Helipterum venustum*.

Leaves 5-15 mm long. *Inner involucral bracts* with lamina -5 mm long. *Inner florets* with terminal pappus hairs filamentous or slightly clavate. Corolla c. 2.5 mm long, lobed to c. 1/5 of its length. *Anther loculi* c. 0.7 mm long. *chromosome number* n = 11 fide B.L. Turner in sched. (*Turner* 5339).

Specimens seen (selection only). WESTERN AUSTRALIA: 4.1 km N of Piawanning, *H. Demarz* 7410 (PERTH); 33 km SW of Rawlinna, *A.S. George* 11890 (PERTH); Woodline, *G.J. Keighery*

2952 (PERTH); 3 miles S of Mindalla, *B.L. Turner* 5339 (MEL).

SOUTH AUSTRALIA: Mambray Creek, *G. Coombe* 210 (AD); Yardea Homestead to Scrubby Peak, *N.N. Donner* 3368 (AD); Wilpena Chalet, D.E. Symon 557; SE of Carrappee Hill, *D.E. Symon* 9040 (AD).

VICTORIA: Wyperfeld N.P., *A.C. Beauglehole* 28940 (MEL); N.W. Yarrara State Forest, *T. Henshall* 891 (MEL); Timberoo Forest, *T.B. Muir* 1145 (MEL).

NEW SOUTH WALES: Mt Waabalong, *P.L. Milthorpe* and *G.M. Cunningham* 1289 (NSW); 'Myalla', NW of Hillston, *W. Semple* 1786 (NSW).

Distribution. South-western Western Australia south of 25° latitude, and west of 124° longitude, southern South Australia, central and western New South Wales, north-western Victoria. Figure 7.

Habitat. Exposed situations in a wide variety of soils.

Notes. Type specimens of *Hyalosperma glutinosum,* of which I have seen several, are covered by a resinous secretion. The plants are otherwise very similar to type specimens of *H. strictum.* I have not observed this secretion on any other collection of the species and it may have been caused by insect predation.

Hyalosperma glutinosum subsp. *glutinosum* sometimes grows in the same area as *H. semisterile;* the two species are sufficiently similar to be sometimes confused in the field, collected together, and mounted on the same herbarium sheet.

The material that Sonder included under the name *Hyalosperma variabile* b. *muelleri* consisted of plants of both *H. glutinosum* and *H. semisterile* (F. Muell.) Paul G. Wilson. A 'Burra Burra' collection that was cited by Sonder (MEL 1539189) bears an invalid name *Jessenia heterocarpa* in Mueller's handwriting and, above it, the name *'Hyalosperma variable* b. Mulleri Sond.' in Sonder's. This specimen is of *H. glutinosum* Steetz. The name *'Jessenia heterocarpa* F. Muell.' was cited by Sonder l.c. as a nomen pro syn. under *Hyalosperma variabile.* A further collection of Mueller's from Burra Burra, (MEL 1538904) has been correctly determined by Mueller as *'Helipterum jesseni'* (= *Hyalosperma semisterile).*

Hyalosperma strictum Steetz (1845) and *Hyalosperma glutinosum* Steetz (1845) were first stated to be conspecific by Sonder (1853) who provided an illegitimate nomen novum *'Hyalosperma variabile'* for the combined names. Bentham (1867) on transferring the combined species to *Helipterum* provided the nomen novum *'Helipterum hyalospermum'* which was legitimate since the earlier epithets *'strictum'* and *'glutinosum'* were not available under *Helipterum.* Druce in 1917 made the illegitimate combination *Helipterum glutinosum* (Steetz) Druce (a later homonym of *H. glutinosum* Hook. 1848) indicating that it replaced *H. hyalospermum* Benth. but he did not cite either of the two *Hyalosperma* names of Steetz in synonymy. Domin (1923) published the same illegitimate combination *'Helipterum glutinosum* (Steetz) Domin' but cited in synonymy both *Hyalosperma glutinosum* and *Hyalosperma strictum;* he was therefore the first to choose one of the two names as having priority when they are combined (Intern. Code Bot. Nom. Art. 57.2, 1983). The name *Hyalosperma glutinosum* must therefore be used if the two are treated as being conspecific. This is unfortunate since its type specimens are aberrant and possibly diseased.

4b. **Hyalosperma glutinosum** subsp. **venustum** (S. Moore) Paul G. Wilson, comb. et stat. nov. *Helipterum venustum* S. Moore, J. Linn. Soc. Bot. 45: 180 (1920).

Leaves filiform, 10-40 mm long. *Inner involucral bracts* with lamina 5-15 mm long. *Inner florets* with some of the terminal pappus hairs clavate to obovoid. *Corolla* 3.5-4 mm long, lobed 1/3 to 1/2 of length. *Anther loculi* c. 0.9 mm long.

Specimens seen (selection only). WESTERN AUSTRALIA: 10 km N of Mt Magnet, *P. Copley* 1237 (AD); Watheroo Rabbit Fence, *M. Koch* 1333 (AD); 1 km S of Murchison R. bridge, *P.S. Short* 1595 (AD, MEL); 26 km W of 'Warriedar' Homestead, *P.G. Wilson* 12271 (PERTH); 2 km S of Wongan Hills township, *P.G. Wilson* 12355 (PERTH).

Distribution. From near the west coast of Western Australia lat. 27° (near Ajana) to 30° (near Badgingarra) east to long. 122° (near Leonora). Figure 6.

Habitat. Often found in *Acacia* scrub in sand or loam.

Notes. This subspecies occurs within the distribution of subspecies *glutinosum* with which it has close affinity and possibly intergrades. The two may be distinguished by the characters indicated above.

5. **Hyalosperma semisterile** (F. Muell.) Paul G. Wilson, comb. nov. — *Helipterum semisterile* F. Muell., Fragm. 2: 157 (1861). *Type*: Darling Desert [near Lake Pamamaroo fide J.H. Willis, 1962], 31 Oct. 1860, *H. Beckler* (holo: MEL 108292).

Hyalosperma variabile var. *muelleri* Sonder, Linnaea 25: 519 (1853). *Type citation*: 'Gawler-town, Sept. Burra Burra et in regionibus interioribus frequens et gregatim crescens.'. *Lectotype:* Gawler-town, Sept. 1848, *F. Mueller* (lecto: MEL 1538937; isolecto: MEL 603653), lecto nov. (see Notes.)

Helipterum jessenii F. Muell., Victorian Naturalist 7: 48 (1890); Maiden & E. Betche, Census New South Wales Pl. 203 (1916); Ewart, Fl. Vict. 1129 (1931); J. Black, Fl. South Australia edn 2, 903 (1957); J. Willis, Handb. Pl. Vict. 2: 708 (1973). *Lectotype*: Port Augusta, 1885, *Mrs Ann Richards* (MEL 1538889), lecto nov. (see Notes.)

[*Helipterum hyalospermum* auct. non Benth.; Benth., Fl. Austral. 3: 644 (1867) p.pte.]

Erect *annual herb* to 15 cm high, branching at and above base. *Branches* slender, sparsely cottony or glabrous. *Leaves* alternate slender semiterete 5-15 mm long, obtuse to acute, sparsely pilose or glabrous, terminal leaves much reduced and bract-like with hyaline appendages. *Heads* solitary, terminal. *Involucre* broadly hemispherical, c. 4 mm high, 8 mm wide (excluding ray). *Involucral bracts* multiseriate, glabrous; outer and intermediate bracts glossy, silvery to stramineous with pale brown apices, *claw* suborbicular hyaline, membranous, c. 2.5 mm long and wide, with a short flat, triangular stereome; *inner bracts:* claw suborbicular, hyaline, membranous, c. 3 mm long and wide with a flat narrow-oblong stereome extending length; *lamina* ovate, obtuse, 2-5 mm long, bright yellow. *Receptacle* convex c. 2 mm diameter, somewhat pitted. *Flowers* numerous, fertile except for those in centre. *Pappus:* bristles c. 12; shaft narrow-linear acuminate, c. 2.5 mm long, evenly plumose (terminal cilia not clavate), united in ring at base, clear or pale yellow towards apex. *Corolla* narrow cylindrical, broader in upper half, c. 2.5 mm long, 5-lobed to 1/3-2/5 length, glabrous. *Anther loculi* c. 0.9 mm long. *Style apex* broad deltoid, papillose. *Achene* compressed obovoid, c. 1.5 mm long; pericarp clear, totally filled by seed, verrucose due to the sessile depressed globular duplex papillae, myxogenic. *Chromosome number* n = 7 or 8 fide B.L. Turner (1970).

Specimens seen (selection only). SOUTH AUSTRALIA: Between Hartley and Langhorn's Creek, *D. Hunt* 2704 (AD); Mannum, *D.E. Symon* 6758 (AD); Druid Range, *G.F. Telfer* 42 (AD).
VICTORIA: 30.6 km SE of Walpeup, *M.G. Corrick* 6687 (MEL); Berribee Tank, 29 Aug. 1948, *J.H. Willis* (MEL); Lake Hindmarsh, 1889, *H. Worsley* (MEL).

NEW SOUTH WALES: 23 km ENE of Goolgowie, *L. Haegi* 1339 (NSW); Pimpara Ck., *S. Jacobs* 1056 (NSW); Near Hebel, *P.L. Milthorpe* and *G.M. Cunningham* 3839 (NSW).
QUEENSLAND: 100.8 km SSW of Noccundra, *D.E. Boyland* 3072 (BRI); Elmina Stn, *S.L. Everist* 3111 (BRI); 50 km E of Adavale, *C. Sandercoe* 582 (BRI).

Habitat. Found on a variety of soils, e.g. heavy clay, silty loam, saltmarsh, sand, and on granite outcrops, in woodland or exposed situations.

Distribution. Southern central and eastern Australia, south of 26° latitude and east of 131° longitude, absent from south-eastern South Australia, south and east Victoria, eastern New South Wales (except for isolated localities), and Tasmania. Figure 6.

Notes. The name *Hyalosperma variabile* var. *muelleri* Sonder is lectotypified on a collection from Gawler town that is conspecific with *H. semisterile.* The syntype from Burra Burra is *H. glutinosum* Steetz, q.v. It is probably due to this confusion that Sonder did not follow Mueller's suggestion (in sched.) and recognise the two taxa as distinct species. This confusion may also account for the new specific epithet *'variabile'* that was given by Sonder to his broadly based species.

When describing *Helipterum jessenii* twenty five collections were cited by Mueller of which I have seen twenty two, all except one of these are of *H. semisterile.* The exception is the collection 'Port Gregory, *Oldfield*' (MEL 1538982) which is *Hyalosperma cotula.*

Hyalosperma semisterile is similar to, and often found growing with, *Hyalosperma glutinosum* subsp. *glutinosum*, as was noted by F. Mueller in the protologue of *Helipterum jessenii.*

Hyalosperma semisterile (as *Helipterum jessenii*) has been recorded as being present in Western Australia (Gardner 1930, Beard 1970, Grieve & Blackall 1975, Green 1985) but these records have been principally based on a misidentification of specimens of *Gilberta tenuifolia* Turcz. [syn. *Helipterum verecundum* S. Moore and *Myriocephalus gracilis* (A. Gray) Benth.]. This latter species is superficially similar to *Hyalosperma semisterile* but differs considerably in the structure of the capitulum, the achene, and the anthers; it would appear to be best recognised as the only member of this distinct genus.

6. **Hyalosperma cotula** (Benth.) Paul G. Wilson, comb. nov. — *Helichrysum cotula* Benth. in Endl. et al., Enum. Pl. Hueg. 65 (1837); - *Helipterum cotula* (Benth.) DC., Prodr. 6: 215 (1838); Benth., Fl. Austral. 3: 644 (1867) p.pte min. *Type*: Fremantle, *C. Huegel* (holo: W).

Helipterum cotula var. *ramosissimum* Steetz in Lehm., Pl. Preiss. 1: 474 (1845), nom. illeg. (includes type of *H. cotula*).

Helipterum cotula var. *simplex* Steetz, loc. cit. *Type citation*: 'In solo sublimoso glareoso interioris sinus regis Georgii III. d. 7 Nov. 1840. Herb. *Preiss.* No. 17. *Types*: (MEL 108296, 108301).

Helipterum citrinum Steetz, loc. cit. Type citation: 'In arenosis planitiei ad fluvium Canning. d. 2 Nov. 1839. Herb. *Preiss.* No. 21' *Types*: (MEL 604824, 108373, W).

[*Helipterum jessenii* F. Muell., Vict. Naturalist 7: 45 (Aug. 1890) p.pte min. as to syntype 'Port Gregory, *Oldfield*' (MEL 1538982) not as to lectotype.]

Erect *annual herb* to 25 cm high, simple or branching at and above the base. Branches slender, sparsely cottony below, woolly towards apex. *Leaves* alternate or the lower opposite, slender terete, 5-15 mm long, moderately to sparsely cottony, narrowed to a blunt reddish-brown resinous apex or

the upper ones acute; uppermost leaves much reduced and with a hyaline appendage. *Heads* solitary, terminal to branches. *Involucre* at first almost hemispherical (the bracts spreading from base), to 2 cm diameter eventually becoming constricted in a ring that forms at a level halfway up the inner involucral bracts. *Involucral bracts* multiseriate; outer bracts elliptic, scarious, very pale brown, uniform in texture apart from the hard narrow-triangular stereome in lower third, sparsely woolly at base; *intermediate bracts:* claw broad-oblong, c. 2 mm long, scarious, pale brown, slightly woolly with hard linear stereome throughout its length: lamina narrow-elliptic, papery, 5-10 mm long, white or yellow; *innermost bracts*: similar to intermediate but with very short white or yellow lamina rounded at apex, 0.5-1.5 mm long. *Receptacle* rounded, slightly pitted, 3-4 mm diameter. *Flowers* numerous, fertile except for a few in the centre. *Pappus*: bristles c. 10, c. 2 mm long; shaft linear-acuminate, contiguous below, united in a ring at base, plumose, the terminal cilia shorter, clavate and yellow, lower cilia fine acute, and colourless. *Corolla* equal to pappus, narrow-tubular in lower half narrow-turbinate in upper, shortly (1/4-1/5) 5-lobed, glabrous, pale yellow. *Anther loculi* c. 0.6 mm long. *Style tips* deltoid to ovate, shortly papillose. *Achene* obloid to obovoid, c. 1 mm long, colliculate, glabrous, pale brown, glossy; attachment minute; duplex cells sessile, depressed globular, myxogenic. *chromosome number* n = 12 fide B.L. Turner (1970). Figure 1.

Specimens seen (selection only). WESTERN AUSTRALIA: Howatharra, *A.M. Ashby* 2510 (PERTH); Calingiri road, *R.J. Cranfield* 4362 (PERTH); 12 mi W of Northam, *J.W. Green* 536 (PERTH); 17.5 km NE of Eneabba, *N. Hoyle* 173 (PERTH).

Distribution. South-western Western Australia from Northampton in the North to Albany in the south. Figure 5.

Habitat. In periodically damp situations on a variety of substrates, jarrah or wandoo woodland, heath, or in pockets of soil on granite outcrops.

Notes. This species has been confused with *H. pusillum* and *H. simplex* from Western Australia, and with *H. praecox* from eastern Australia; it is most similar to *H. simplex* and shares with that species the possibility of having either yellow or white involucral bracts. The very short innermost involucral bracts may be either white or yellow irrespective of the colour of the inner bracts. *Hyalosperma cotula* may be distinguished from *H. simplex* by having the lower and middle leaves obtuse to rounded at the apex (not acute to acuminate), the innermost involucral bracts with a very short rounded lamina (not similar to the inner bracts), and the terminal cilia of the pappus short and clavate or obovoid (not of normal length and slender).

Bentham (1867) and subsequent Australian authors, included in *Helipterum cotula* several species here recognised as distinct, i.e. *H. praecox* F. Muell., *H. semisterile* F. Muell., and *H. pusillum* Turcz.; Bentham also included in synonymy *Helichrysum oldfieldii* F. Muell. the type of which is referable to *Waitzia citrina* (Benth.) Steetz.

7. **Hyalosperma simplex** (Steetz) Paul G. Wilson, comb. nov. — *Helipterum simplex* Steetz in Lehm., Pl. Preiss. 1: 475 (1845). Type citation: 'In uliginosis arenosisque sylvae haud procul ab oppidulo Guildford. d. 31 Aug. 1839. Herb. *Preiss.* No. 18' *Types*: MEL, W.

[*Helipterum cotula* auct. non (Benth.) DC.; Benth., Fl. Austral. 3: 644 (1867) p.pte.; B.J. Grieve & W.E. Blackall, How to know Western Austral. Wildfl. 829 (1975) p.pte.]

Erect *annual herb* 10-15 cm high; *stem* simple or sparsely branched at lower nodes, slender, very sparsely cottony. *Leaves* opposite below otherwise alternate, slender, semiterete, c. 10 mm long, acute to acuminate, very sparsely cottony to glabrous; upper leaves shorter and more widely spaced with slender scarious apex and grading abruptly into involucral bracts. *Heads* solitary,

terminal. *Involucre* almost hemispherical (the bracts spreading from base), 2-3 cm diameter. *Involucral bracts* multiseriate, either yellow with outer ones pale yellowish brown, or white with outer ones pale brown or pale mauve; outer bracts broad-ovate, sessile, c. 3 mm long, scarious, glossy, slightly woolly at base; *intermediate bracts*: claw broad oblong-elliptic c. 3 mm long with broad scarious sparsely woolly margin and narrow-oblong thin stereome extending length of claw, *lamina* elliptic 5-8 mm long papery; innermost bracts similar to (but slightly shorter than) intermediate series. *Receptacle* rounded, c. 3 mm diameter, slightly pitted. *Flowers* numerous, fertile except for a few in centre. *Pappus*: bristles c. 10, 2-3 mm long; shaft linear-acuminate, united in a ring at base, plumose throughout, the terminal cilia shorter and slightly clavate, very pale yellow, lower cilia fine and colourless. *Corolla* equal to pappus, narrow tubular in lower half, narrow-turbinate in upper, shortly 5-lobed, glabrous, pale yellow. *Anther loculi* c. 0.6 mm long. *Style apex* broad-elliptic, obtuse, shortly papillose. *Achene* obloid to obovoid, 1-2 mm long, colliculate or smooth, dark reddish brown, attachment minute, c. 0.15 mm diameter; duplex papillae sessile, depressed globular, myxogenic, or absent. Figure 1.

Notes. This species differs from *Hyalosperma cotula*, with which it has been united, in having acute to acuminate leaves and in the innermost involucral bracts being similar to, and only slightly smaller than, the intermediate bracts.

Recent collections suggest that the most northerly distribution of this species is near Wooroloo in the Darling Range east of Perth, however, one pre-1867 collection by *A. Oldfield* (MEL 108198) is stated to have come from the Murchison River which is over 500 km north of Perth.

Key to subspecies

1. Achene verrucose c. 1 mm long ..... a. subsp. *simplex*

1. Achene smooth 1-2 mm long ..... b. subsp. *graniticola*

7a. **Hyalosperma simplex** (Steetz) Paul G. Wilson subsp. **simplex**

Intermediate and inner *involucral bracts* white or yellow. *Achene* c. 1 mm long, verrucose with sessile rounded duplex papillae.

Specimens examined (selection only). WESTERN AUSTRALIA: 16 km S of Williams, *M. Davis* 760 (AD); 9 km N of Capel, *G.J. Keighery* 5676 (PERTH); Benger, *R.D. Royce* 4376 (PERTH); W of Manjimup, *E. Wittwer* 1162 (PERTH).

Distribution. South-western Australia from the coastal plain and Darling Range east of Perth south to Augusta district. Figure 4.

Habitat. Moist or marshy situations in loam over granite, in woodland or meadows.

7b. **Hyalosperma simplex** subsp. **graniticola** Paul G. Wilson, subsp. nov.

Achenium 1-2 mm longum, laeve, papillis duplicibus carentibus.

Typus: 2 km NW of Shannon township, Western Australia; in moss sward over granite, 12 Nov. 1986, *P.G. Wilson* 12374 (holo: PERTH; iso: CANB, K, MEL).

Intermediate and inner *involucral bracts* white. *Achene* 1-2 mm long, smooth, without duplex papillae. *Chromosome number* n = 11 fide B.L. Turner in sched. (*Turner* 5499).

Specimens seen (selection only). WESTERN AUSTRALIA: Cape Naturaliste road, *L.A.R. Haegi* 2509 (MEL); Tone River, Oldfield 59 (MEL); 44 mi NW of Walpole, *S. Paust* 326 (PERTH); 1 mi (1.6 km) NW of Shannon River Mill, *B.L. Turner* 5499 (MEL); 24 km SE of Pemberton, *P.G. Wilson* 6294 (PERTH).

Distribution. South-western Western Australia from near Busselton south-east to Albany. Figure 4.

Habitat. Loamy soil, frequently on granite rocks.

Notes. The distributions of the two subspecies overlap in the region south of Busselton. However, it would appear that in that area they are allopatric.

A number of collections examined have achenes that are not in a condition suitable for allocating the plant to a subspecies; the distribution data is therefore incomplete.

The character of smooth versus verrucose for the achenes would appear to suggest a specific difference. In this case the colliculae are formed from round sessile duplex papillae; the difference between the achenes is therefore the presence or absence of these duplex papillae. In different collections of subsp. *simplex* the density of the colliculae varies and it is possible that with further collections a clinal variation between the two subspecies will become apparent.

The subspecific epithet *graniticola* refers to the habitat on which this plant frequently occurs.

8. **Hyalosperma praecox** *(F. Muell.) Paul G. Wilson, comb. nov.* — *Helipterum praecox* F. Muell., Trans. & Proc. Vict. Inst. Advancem. Sci. 1854-1855: 38 (1855); G.M. Cunningham et al., Pl. Western New South Wales 697 (1981); S. Jacobs & J. Pickard, Pl. New South Wales 80 (1981). Type citation: 'Abundant on the less fertile plains and low ridges along the Avoca, Avon, Wimmera, and Richardson River'. *Lectotype*: In planitiebus humidis et siccis ad fl. Avoca, 3 Dec. 1853, *F. Mueller* (lecto: MEL 653826, isolecto: MEL 653827, W), lecto nov.

[*Helipterum cotula* auct. non (Benth.) DC.; Benth., Fl. Austral. 3: 644 (1867) as to Victorian specimen cited; F. Muell., Key Syst. Vict. Pl. 1: 319 (1888); J.H. Willis, Handb. Pl. Victoria 2: 707 (1973).]

Erect *annual herb* 10-20 cm high simple or branching at base. Stem slender, sparsely cottony. *Leaves* alternate, slender, semiterete, acuminate, 10-15 mm long, glabrous or very sparsely cottony, the uppermost shorter and piliferous or with a narrow scarious appendage. *Heads* solitary, terminal. *Involucre* almost hemispherical (the bracts radiating from base), 15-25 mm diameter. *Involucral bracts* either all white or all yellow (usually the former), multiseriate; outer bracts: claw very short and broad, woolly ciliate, lamina narrow-elliptic, acute, c. 5 mm long; inner bracts: claw very broadly oblong-elliptic, c. 2 mm long, scarious, woolly ciliate, with a faint narrow-linear stereome throughout its length; lamina narrow-elliptic, acute, 7-10 mm long; *innermost bracts* similar to inner bracts but with a shorter lamina. *Receptacle* conical, pitted. *Flowers* numerous, fertile except for a few in centre. *Pappus:* bristles 4-6, well-separated, c. 1.5 mm long (shorter than corolla), shaft narrow-linear acuminate, united in a ring at base, plumose, uniformly very pale yellow or clear, the terminal cilia somewhat thicker than the rest but similar in length. *Corolla* c. 2 mm long, narrow-tubular in lower half, turbinate above, 5-lobed to c. 1/4 length of corolla, yellow, attached slightly excentrically to achene. *Anther loculi* c. 0.7 mm long. *Style apex* rhombic, papillose. Achene obovoid, c. 1 mm long, smooth to verrucose, glabrous, pale brown; carpopodium minute, c. 0.15 mm diameter; duplex papillae, when present, depressed globular. Figures 1,2.

Specimens seen (selection only). VICTORIA: Minyip, *J.P. Eckert* 131 (MEL); Ulupna Island, *T.B. Muir* 6834 (MEL); Nathalia, Oct. 1932, *J.H. Willis* (MEL 108339).

NEW SOUTH WALES: 9 mi N of Moama, *R.B. Filson* 5406 (NSW); Womboota, *C.W.E. Moore* (CANB 54211); Near Conargo, *W.E. Mulham* 824 (NSW).

Distribution. Central and south Western Slopes and South Western Plains of New South Wales, the Grampians east to central Victoria. Listed by D.A. Cooke in Jessop & Toelken (1986) (as *Helipterum cotula*) as possibly occurring in South Australia but I am unable to confirm this suggestion. One collection (*Dwyer*, Sept. 1931, CBG) purports to have come from Broken Hill but since the original label with this specimen has been altered this record may be incorrect. That locality is well outside its range as otherwise known. Figure 3.

Habitat. Fairly open situations in sand or heavy loam.

Notes. Hyalosperma praecox is similar to *H. simplex*, it differs most noticeably in the conical receptacle and in the shorter pappus with only about half the number of bristles.

The duplex papillae that form the rounded tubercles in *H. praecox* have the same form as those found in *H. simplex* subsp. *simplex* and in *H. cotula.* In the last two taxa these papillae are myxogenic whereas this character has not been observed by me in seeds from a number of collections of *H. praecox.* It appears probable that in this species the duplex cells only tardily exude mucilage or possibly only after being subjected to certain physical conditions.

9. **Hyalosperma pusillum** *(Turcz.) Paul G. Wilson, comb. nov.* — *Helipterum pusillum* Turcz., Bull. Soc. Imp. Naturalistes Moscou 24: 80 (1851). *Type*: [Western Australia], anno 1849, *J. Drummond* 5th coll. n. 384 (holo: KW, photo seen; iso: MEL, PERTH, W).

[*Helipterum cotula* auct. non (Benth.) DC.; Benth., Fl. Austral. 3: 644 (1867) p.pte at least as to '*Drummond* 5th coll. n. 384' and 'King George's Sound.....to Swan River, *Oldfield*'.]

Erect *annual herb* to 20 cm high; stem simple or branching above the base, sparsely cottony. *Leaves* opposite below otherwise alternate, sometimes present up to capitulum, slender, semiterete, c. 10 mm long, blunt, the uppermost leaves with a scarious appendage, glabrous or very sparsely cottony. Heads solitary, terminal. *Involucre* almost hemispherical or the lower portion broadly turbinate, 1-2 cm diameter. *Involucral bracts* multiseriate; outer bracts: claw very broad, c. 1.5 mm long and wide, scarious except for an indefinite linear stereome, woolly ciliate, lamina narrow-elliptic, c. 2-3 mm long, white; intermediate bracts similar to outer but with lamina 5-10 mm long, spreading; *innermost bracts* with broad claw c. 2 mm long bordered by a white very short broadly rounded to truncate erect lamina c. 0.2 mm long. *Receptacle* conical, pitted. *Flowers* numerous, fertile. *Pappus bristles* c. 10, c. 1.8 mm long; shaft linear-acuminate, shortly plumose, the terminal cilia congested, clavate, and white. *Corolla* colourless (or purple, at least on drying), equal to pappus, tubular (slightly broader in upper half), very sparsely puberulous with a few scattered short simple hairs, shortly 5-lobed. *Anther-tails* very short and somewhat twisted; loculi c. 0.6 mm long. *Style tips* narrow-deltoid, obtuse, shortly papillose. *Achene* narrow-obovoid or obloid, c. 1 mm long, compressed, rounded at base and apex, not verrucose, minutely tesselate, not myxogenic, reddish brown; carpophore minute, c. 0.15 mm diam. Figure 1.

Specimens seen (selection only). WESTERN AUSTRALIA: S of Northcliffe, *A.M. Ashby* 2703 (PERTH); Porongurup Range, *T.B. Muir* 3947 (MEL); Balingup, s. dat. *R.H. Pulleine* (NSW 179918); Waterloo, *P.G. Wilson* 12133 (PERTH).

Distribution. South-west Western Australia from near Bunbury to Albany. Figure 3.

Habitat. Usually in seasonally waterlogged situations in sand over clay or in heavy loam.

Notes. Although this species has been synonymized under *Helipterum cotula* since Bentham's (1867) treatment it is very distinct. The white pappus tips and the very short and broad innermost row of involucral bracts enable it to be clearly distinguished.

Acknowledgements

I am grateful to Philip Short for the opportunity of discussing ideas from which the classification of the *Helipterum* group has evolved. I should also like to thank Hansjorg Eichler (CANB), D.H. Nicholson (US), R.K. Brummitt (K), C. Jeffery (K), and my colleague Gillian Perry for discussing with me some of the nomenclatural complexities surrounding the name *Helipterum.* To J.H. Warcup I am grateful for sharing with me some unpublished results regarding mycorrhizal relationships. Margaret Menadue carefully prepared the illustrations. Cheryl Parker and Ray Cranfield painstakingly prepared numerous slides of sections through composite achenes. Finally to the curators and staff of the many herbaria that have sent specimens on loan I wish to express my particular gratitude.

References

Anonymous (1973). Spurr low-viscosity embedding media. Polysciences Inc., Data Sheet no. 127.

Beard, J.S. (1970). "West Australian Plants." Edn 2. (Society for Growing Australian Plants: Picnic Point.)

Bentham, G. (1837). Compositae. In S.L. Endlicher et al., "Enumeratio Plantarum." (Beck University Biblio.: Vienna.)

Bentham, G. (1867). "Flora Australiensis." Vol. 3. (Lovell Reeve & Co.: London.)

Candolle, A.P. de (1838). "Prodromus systematis naturalis regni vegetabilis." Vol. 6. (Treuttel & Wurtz: Paris.)

Dormer, K.J. (1962). The fibrous layer in the anthers of the Compositae. New Phytol. 61: 150-163.

Gardner, C.A. (1930-1931). "Enumeratio Plantarum Australiae Occidentalis." (Government Printer: Perth.)

Gray, A. (1852). Characters of some south-west Australian Compositae, principally of the Subtribe Gnaphalieae. Hooker's J. Bot. Kew Gard. Misc. 4: 225-232.

Green, J.W. (1985). "Census of the Vascular Plants of Western Australia." Edn 2. (Western Australian Herbarium: Perth.)

Grieve, B.J. & Blackall, W.E. (1975). "How to know Western Australian Wildflowers." Part IV. (University of Western Australia Press: Perth.)

Haque, M.Z. & Godward, M.B.E. (1984). New records of the Carpopodium in Compositae and its taxonomic use. J. Linn. Soc. Bot. 89: 321-340.

Hilliard, O.M. (1983). " Flora of Southern Africa. Vol. 33 Asteraceae. Part 7, Inuleae fascicle 2, Gnaphaliinae (first part)." 1-325. (Department of Agriculture: Pretoria.)

Hilliard, O.M. & Burtt, B.L. (1981). Some generic concepts in Compositae-Gnaphaliinae. J. Linn. Soc., Bot. 82: 181-232.

Jessop, J.P. and Toelken, H.R. (1986). "Flora of South Australia." (South Australian Government: Adelaide.)

King, R.M. and Robinson, H. (1970). The new synantherology. Taxon 19: 6-11.

Lindley, J. (1836). "A Natural System of Botany." Edn 2. (Longman: London.)

Lindley, J. (1847). " The Vegetable Kingdom." Edn 2. (Bradbury & Evans: London.)

Nordenstam, B. (1978). Taxonomic studies in the tribe Senecioneae (Compositae). Opera Bot. 44: 1-84.

Robinson, H. & King, R.M. (1977). Eupatorieae - systematic review. In V.H. Heywood & B.L. Turner (eds). "The Biology and Chemistry of the Compositae." (Academic Press: London.)

Short, P.S. (1981). Pollen-ovule ratios, breeding systems and distribution patterns of some Australian Gnaphaliinae (Compositae: Inuleae). Muelleria 4: 395-417.

Short, P.S. (1987). A revision of *Blennospora* A. Gray (Compositae: Inuleae: Gnaphaliinae). Muelleria 6: 349-358.

Sonder, O.W. (1853). Plantae Muellerianae. Linnaea 25: 449-530.

Steetz, J. (1845). Compositae. In J.G.C. Lehmann, "Plantae Preissianae." Vol. 1. (Meissner: Hamburg.)

Turczaninow, N. (1851). Synanthereae quaedam hucusque indescriptae. Bull. Soc. Imp. Naturalistes Moscou 24(2): 59-95.

Turner, B.L. (1970). Chromosome numbers in the Compositae. XII Australian species. Amer. J. Bot. 57: 382-389.

Walpers, W.G. (1846). "Repertorium Botanices Systematicae." Vol. 6. (Fr Hofmeister: Leipzig.)

Warcup, J.H. & McGee, P.A. (1983). The mycorrhizal associations of some Australian Asteraceae. New Phytol. 95:667-672.

Willis, J.H. (1962). The botany of the Victoria Exploring Expedition (September 1860-June 1861) and of relief contingents from Victoria (July 1861-November 1862). Proc. Roy. Soc. Victoria 75: 247-268.

Wilson, Paul G. (1989). *Erymophyllum* (Asteraceae: Inuleae: Gnaphaliinae), a new Australian genus in the *Helipterum* complex. Nuytsia 7: 101-116.

Index to scientific names

New names are given in bold type. Other accepted names in Roman. Synonyms are in italics.

Erymophyllum (Asteraceae: Inuleae: Gnaphaliinae), A new Australian genus in the *Helipterum* complex

Paul G. Wilson

Western Australian Herbarium, Department of Conservation and Land Management,
PO Box 104, Como, Western Australia 6152

Abstract

Wilson, Paul G. *Erymophyllum* (Asteraceae: Inuleae: Gnaphaliinae), a new Australian genus in the *Helipterum* complex. Nuytsia 7(1) 103-116(1989). The genus *Erymophyllum* is described; it contains five species, three of which are new; all except one are endemic to Western Australia. The two species previously recognised were included by Bentham (1867) in *Helipterum* sect. *Pteropogon* (DC.) Benth.

Introduction

In an earlier paper (Wilson 1989) I discussed the application of the names *Helipterum* DC. ex Lindley (1836) and *Helipterum* DC. (1838). I explained how the genus *Helipterum*, as currently conceived, is an unnatural one in which the constituent species can be clustered into groups that should either be recognised as distinct genera or be placed with related genera of the Gnaphaliinae. The five species here described, of which the two previously recognised were placed in *Helipterum*, form a discrete cluster that I consider constitutes a distinct genus.

The methods used for examining the material, and the microcharacters investigated, are detailed in the earlier paper. The significance of the nature of the cells that form the inner epidermis of the lobes of the corolla is further discussed below.

Historical Survey

The first species described, that is now to be placed in the genus *Erymophyllum*, was *Helipterum tenellum* Turcz. (1851). It was based on material collected by John Gilbert in Western Australia. Turczaninow placed it in sect. *Sericophorum* DC. (1838) which contained several Australian species with silky achenes. In 1852 Asa Gray described *Pteropogon* sect. *Helipteroides* and included in it *Pteropogon ramosus* A. Gray (= *Erymophyllum ramosum*) and *P. gracilis* A. Gray

(= *E. tenellum*); he distinguished this section from other sections of *Pteropogon* by the presence of leafy bracts around the involucre. *Helichrysum involucratum* F. Muell. (= *E. ramosum* subsp. *involucratum*) was described in 1863 and placed by Mueller in sect. *Blepharolepis* DC. which included species not closely related to the new taxon. However, Mueller indicated correctly that the circumscription of that section needed revising and that both *Pteropogon ramosus* and *Helipterum tenellum* were closely related to his new species. Bentham (1867) recognised three species, *Helipterum tenellum*, *H. gracile*, and *H. involucratum* and noted that each had a similar arrangement of linear foliaceous bracts; he included the three in *Helipterum* sect. *Pteropogon* (DC.) Benth. This placement was also accepted by Spencer Moore who, in 1920, described *Helipterum intermedium*, a species conspecific with *Erymophyllum tenellum*.

Generic Affinities

The closest affinities of the species within *Erymophyllum* appear to be with members of the *Helipterum* complex that have silky achenes and non-glandular leaves, e.g. *Helipterum humboldtianum* (Gaudich.) DC., *H. microglossum* (Benth.) Tate, and *H. pygmaeum* (DC.) Benth. All belong, in the strict sense, to *Pteropogon* DC. This genus differs noticeably from *Erymophyllum* in (1) the nature of its involucral bracts, (2) the shape and arrangement of the inner epidermal cells of the corolla lobes, (3) the woolly indumentum on leaves and branches (not glandular puberulous), and (4) the flattened (not terete) leaves.

The nature of the transition in *Erymophyllum* of the uppermost leaves into involucral bracts is unique in the *Helipterum* complex and one that I have not observed in other members of the Gnaphaliinae. The outer bracts have a short scarious base and a terete leaf-like apex; grading inwards, the scarious base enlarges while the foliaceous apex decreases until, with the inner bracts, only the scarious portion remains (Figure 2). In other genera of the *Helipterum* complex there is an abrupt or gradual transition from leaf to involucral bract with the apical portion of the leaf becoming scarious and the foliaceous base diminishing in size.

The particular combination of shape and arrangement of the inner epidermal cells of the corolla lobes is possibly also unique in the Gnaphaliinae; these cells are very narrowly oblong to linear and are grouped in transverse rows (Figure 1). In related genera such cells of the corolla lobes are equilateral to oblong and are randomly arranged.

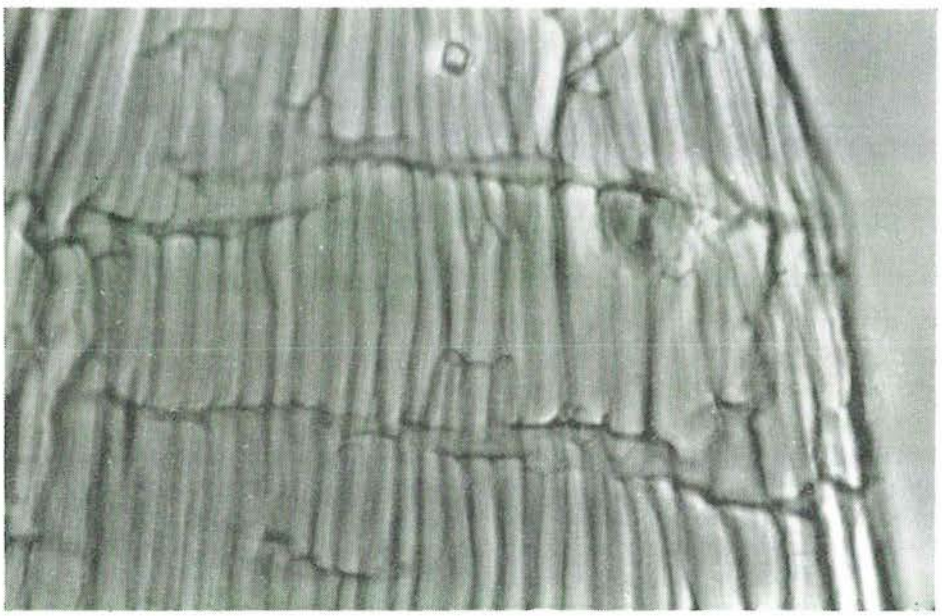


Figure 1. *Erymophyllum ramosum*. Inner epidermis of a corolla lobe, x 600. From CBG 022866

Distribution

The species of *Erymophyllum* are found in the western or south-western portion of Western Australia. All, with the exception of *E.ramosum* which extends into south-western South Australia, are endemic to that State.

Taxonomy

Erymophyllum Paul G. Wilson, gen. nov.

Pteropogon sect. *Helipteroides* A. Gray, Hooker's J. Bot. Kew Gard. Misc. 4: 269 (1852). *Lectotype*: *Pteropogon ramosus* A. Gray, lecto. nov. (see note).

Herba annua glabra vel glanduloso puberula, Rami graciles teretes. Folia basilaria opposita, sequentia alterna, gracilia, teretia, obtusa. Capitula dense vel laxe corymbosa vel solitaria, folius terminalibus subtentibus. Involucrum cylindricum vel late turbinatum 3-7 mm longum; bracteae exteriores basi glumaceae hyalinae late ovatae, apice foliaceae; bracteae interiores late ellipticae glumaceae hyalinae nec appendiculatae; bracteae intimae lamina flava vel raro alba vel absenti. Flores 10-20, bisexuales vel intimi achenio sterili. Corolla anguste cylindrica versus apice anguste turbinata, 5-lobata, actinomorpha vel leviter zygomorpha, glabra vel sparse puberula vel lobis sparse glanduloso pilosulis, flava; lobi anguste triangulares vel oblongi, cellulis epidermidis interioris anguste oblongis vel linearibus in seriebus transversalibus dispositis. Styli apex truncatus vel deltoideus, papillosus. Achenium anguste turbinatum sericeo-villosum.

Typus: Erymophyllum ramosum (A. Gray) Paul G. Wilson

Annual *herbs*, erect, glabrous or puberulous with short gland-tipped hairs. *Branches* slender, terete. *Leaves* opposite below, alternate above, slender-terete, rounded at apex. *Inflorescence* an open or congested corymb, or heads solitary. *Capitulum* subtended by foliage leaves or foliaceous bracts. *Involucre* cylindrical to hemispherical, 3-7 mm long; outermost bracts foliaceous with short, broad glumaceous base grading to inner bracts that are entirely glumaceous or with margins membranous and hyaline, glabrous or arachnoid-ciliate; *innermost bracts* with a narrow hyaline claw and a yellow or white lamina, or the lamina absent; stereome hard, flat, and linear. Receptacle cushion-shaped, c. 1 mm diameter, shallowly alveolate, glabrous. *Flowers* 10-20, bisexual, the innermost usually with a sterile and almost glabrous achene. *Corolla* narrow-tubular or with upper half narrow-turbinate, 5-lobed, actinomorphic or slightly zygomorphic, glabrous or with a few minute simple hairs on tube and a few minute biseriate gland-tipped hairs on back of lobes, glabrous within, yellow; *cells* of inner epidermis of lobes and throat narrow-oblong to linear with straight lateral walls, the cells of the lobe mostly grouped in transverse rows; *vascular traces* terminating in throat or at base of sinuses between lobes or in lower part of lobes. *Nectary* cup-shaped, persistent on achene. *Anther*: apiculum not thickened, narrowly triangular to ovate, marginal cells not differentiated; *anther tails* of fine weak hairs exceeding collar; *collar* narrow, equal in width to filament. *Style apex* truncate to deltoid, papillose or, on margins, pilosulose; *vascular trace* extending to base of style apex. *Achene* narrow-turbinate, compressed, silky or villous with long duplex hairs; *carpophore* a short glabrous ring c. 0.1 mm diameter; *pericarp* thin, translucent; testa brown, somewhat leathery, eventually fused to pericarp, with numerous minute crystals randomly arranged in cells. *Pappus* persistent; shaft of bristles filiform to linear or linear - lanceolate, denticulate to narrowly plumose, shorter than or shortly exceeding corolla.

Notes: Two species were included by Asa Gray in his section *Helipteroides*, these were *Pteropogon gracilis* and *P. ramosus*; both are members of *Erymophyllum*. I have selected the second species as lectotype of the section and also as the type of *Erymophyllum*.

The name *Erymophyllum* is derived from the Greek words *'eryma'* a fence and *'phyllon'* a leaf, with reference to the leafy bracts that surround the capitula.

Key to species

1. Capitula with white or yellow lamina to inner involucral bracts
   2. Upper leaves and branches somewhat glandular puberulous
      3. Pappus bristles firm, shaft linear-lanceolate, outwardly curved and elastic in fruit; corolla somewhat zygomorphic, the abaxial side more deeply lobed; achenial hairs rounded at apex ..... 1. *E. glossanthus*
      3. Pappus bristles very slender, neither curved nor elastic in fruit; corolla actinomorphic; achenial hairs bidentate at apex ..... 2. *E. ramosum*
   2. Upper leaves and branches glabrous
      4. Lamina of inner involucral bracts obovate, c. 5 mm long..... 4. *E. hemisphaericum*
      4. Lamina of inner involucral bracts linear to narrow oblong, c. 2 mm long .... 5. *E. tenellum*
1. Capitula without lamina to involucral bracts..... 3. *E. compactum*

1. **Erymophyllum glossanthus** Paul G. Wilson, sp. nov. (Figure 2)

Typus: Western Australia, 46 km W of Warriedar Homestead, 29° 12' S, 116° 45' E, red heavy soil, 26 Sept. 1986, *P.G. Wilson* 12278 (holo: PERTH; iso: CANB, K).

Herba erecta ad 20 cm alta, minute et sparse glanduloso puberula. Folia graciliter teretia obtusa 5-12 mm longa supra sulcata. Capitula modice dense corymbosa. Involucrum ovoideum c. 5 mm longum; bracteae exteriores foliaceae glanduloso puberulae; bracteae intermediae basi late ellipticae hyalinae apice foliaceae sparse ciliato-arachnoideae; bracteae interiores late ellipticae, c. 4 mm longae, hyalinae; bracteae intimae unguice elliptico hyalino, lamina late ovata flava 2-3 mm longa. Corollae tubus anguste cylindricus versus apicem leviter turbinatus, c. 3 mm longus, sparsissime puberulus; lobi inaequales: lobo abaxiali longissimo, c. 1 mm longo, lobis ceteris c. 0.5 mm longis. Styli apex truncatus papillosus. Achenium anguste obovoideum, dorsi-ventraliter compressum, c. 1.5 mm longum, dense villosum pilis relative firmis obtusis (nunquam bidentatis). Pappi setae scapo lineari-lanceolato 2.5-3 mm longo, in statu maturo extrinsecus curvato brevissime plumoso versus basi denticulato.

Erect *herb* 10-20 cm high branching at base, minutely and sparsely glandular puberulous. *Branches* slender. *Leaves* slender-terete, 5-14 mm long, sulcate above. Heads in fairly dense corymbs. *Involucre* ovoid, c. 5 mm long; outer bracts leaf-like, slightly scarious at base, c. 2.5 mm long, glandular puberulous; *intermediate bracts* broadly elliptic, hyaline, with a foliaceous sparsely ciliate-archnoid apex; *inner bracts* broadly elliptic, acute, c. 4 mm long, straw-coloured to pale brown, totally hyaline except for the firm linear stereome; innermost bracts similar to inner but with a spreading broadly ovate yellow lamina 2-3 mm long. *Florets* c. 10, the 4 innermost functionally male with narrowly cylindrical ± glabrous sterile achenes. *Corolla* narrowly cylindrical, slightly turbinate in upper half; *tube* c. 3 mm long, very sparsely puberulous in middle with simple hairs otherwise glabrous; *lobes* unequal, spreading; abaxial lobe more deeply divided than others, c. 1 mm long; other lobes c. 0.5 mm long. *Anther* (including apiculum) c. 1.5 mm long; *apiculum* ovate, c. 0.3 mm long. *Style apex* truncate, prominently papillose. Achene narrow obovoid, dorsiventrally compressed, c. 1.5 mm long, densely villous with relatively firm blunt hairs, not myxogenic.

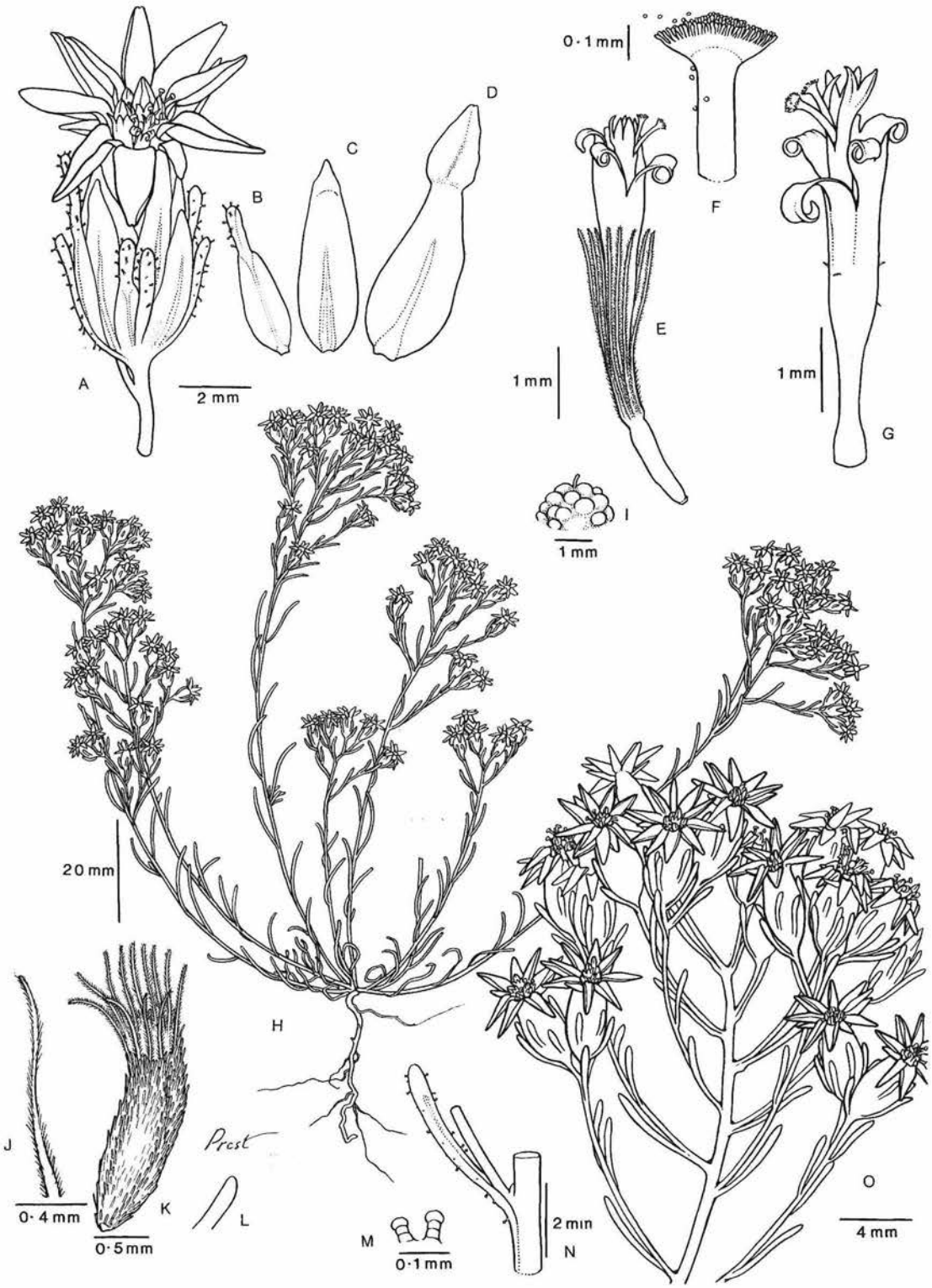


Figure 2. *Erymophyllum glossanthus*. A - Capitulum. B - Outer involucral bract. C - Intermediate involucral bract. D - Innermost involucral bract. E - Floret. F - Style apex. G - Floret with achene removed. H - Habit of plant. I - Receptacle. J - Pappus bristle. K - Achene and pappus. L - Apex of duplex hair. M - Glandular hairs of leaf. N - Leaf. O - Inflorescence. All from *H. Demarz* 8259 (PERTH).

Pappus bristles with shaft linear-lanceolate, 2.5-3 mm long (of sterile achenes slightly longer), outwardly curved, very shortly plumose and denticulate towards base.

Specimens examined. WESTERN AUSTRALIA: near Paynes Find, *W.E. Blackall* 3900 (PERTH); 4 miles (c. 6 km) south of Three Springs, *H. Demarz* 2655 (PERTH); Youanme, *H. Demarz* 8259 (PERTH); 67 km N of Wubin, *H. Demarz* 8315 (PERTH); Mt Magnet, Sept. 1903, *W.V. Fitzgerald* (NSW 181884); 70 km E of Mullewa, *G.J. Keighery* 3303 (PERTH); 10 km E of Paynes Find, Nov. 1984, *C. Luscombe* (PERTH); Western edge of Lake De Courcy, *P.S. Short* 601 (AD); 32 km SE of Fields Find, *P.S. Short* 2169 (MEL); 32 km N of Cleary, *P.S. Short* 2379 (MEL).

Distribution and habitat. Inland Western Australia between Mullewa, Three Springs and east of Paynes Find. Found in a variety of habitats including *Acacia* scrub and granite outcrops, generally in heavy soil. Figure 4.

Discussion. This species exhibits very little variation throughout its geographical range. It is similar in appearance to some variants of *Erymophyllum ramosum* from which it may be distinguished in having (1) a zygomorphic corolla with a large abaxial lobe, (2) relatively coarse and blunt (not bidentate) duplex hairs on the achene, and (3) linear-acuminate elastic pappus bristles. The pappus bristles are similar to those found in species of *Actinobole* and presumably serve, as in that genus, to help disperse the fruits.

The epithet *'glossanthus'* is derived from the Greek word *'glossa'* (a tongue) and *'anthos'* (a flower) and alludes to the relatively long abaxial lobe of the corolla.

2. **Erymophyllum ramosum** (A. Gray) Paul G. Wilson, comb. nov.

Pteropogon ramosus A. Gray, Hooker's J. Bot. Kew Gard. Misc. 4:270 (1852). *Lectoptype*: 'Swan River', s. dat. *J. Drummond* (lecto: K; isolecto: K) lecto nov.

Helichrysum involucratum F. Muell., Fragm. 3:135 (1863). — *Helipterum involucratum* (F. Muell.) Benth., Fl. Austral. 3: 646 (1867); Grieve and Blackall, How to know Western Austral. Wildfl. 831 (1975). *Type citation:* 'In collibus calcareis ad sinum Champion Bay et Flumen Murchison. Walcott et Oldfield'. *Lectotype:* Limestone N. of Murchison, *A. Oldfield* (lecto: MEL 10977; isolecto: K, PERTH), lecto nov. (see note).

[*Helipterum tenellum* auct. non Turcz.: Benth., Fl.Austral. 3:646(1867); B.J.Grieve & W.E.Blackall, How to Know Western Australian Wildflowers, 831(1975).]

Erect *herb* branching at and above base, 10-30 cm high, minutely glandular puberulous on leaves and branches, sometimes aromatic. *Branches* slender, terete. *Leaves* slender, terete, 5-30 mm long, sulcate above, rounded at apex. *Heads* in dense to open corymbs or panicles or solitary on slender branchlets. *Involucre* narrow-campanulate and c. 5 mm long to narrow-cylindrical and 7 mm long; *outer bracts* leaf-like, shorter than the involucre, glandular puberulous; *intermediate bracts* with a broad obovate hyaline base and a foliaceous appendage, sometimes sparsely to densely ciliate-arachnoid; *inner bracts* narrow-ovate, hyaline, terminated by a short (c. 0.5 mm) erect yellow (rarely white) lamina or this absent; *innermost bracts* linear to narrow-elliptic, hyaline, c. 5 mm long, with a spreading yellow (rarely white) ovate lamina 3-6 mm long. *Florets* 8-20, a few of the innermost with sterile sparsely pubescent achenes. *Corolla* narrow-cylindrical, in all 5-6 mm long, slightly turbinate in upper half, very sparsely puberulous in middle with simple hairs otherwise glabrous; lobes all narrowly oblong-triangular 0.7-1.5 mm long, equal in length, glabrous or with a few minute gland-tipped hairs towards apex. *Anther* (including apiculum) c. 2 mm long;

with minutely bidentate hairs, not myxogenic. *Pappus bristles* with shaft linear-filiform, c. 5 mm long, denticulate to shortly plumose, the terminal cilia shorter and sometimes opaque.

Key to subspecies

1. Involucre narrow-campanulate c. 5mm long; outer bracts sparsely ciliate or eciliate ..... a. subsp. *ramosum*

1. Involucre narrow cylindrical c. 7mm long; outer bracts long arachnoid-ciliate ..... b. subsp. *involucratum*

2a. **Erymophyllum ramosum** (A. Gray) Paul G. Wilson subsp. **ramosum**

Involucre narrow-campanulate c. 5mm long; outer (foliaceous) bracts glandular puberulous; innermost bracts with an ovate lamina 3-5 mm long. *Corolla* c. 5mm long. *Anther apiculum* ovate c. 0.5 mm long. *Style apex* truncate to broadly deltoid. *Pappus bristles* shortly plumose.

Specimens examined (selection only). WESTERN AUSTRALIA: Bullabulling, *A.M. Ashby* 1350 (AD); Eucla, 1890, *Batt* (MEL); Widgiemooltha, *W.E. Blackall* 966 (PERTH); Cundeelee, *P. Boswell* B25 (PERTH); 14.5 km SE of Windidda HS, *R.J. Chinnock* 819 (AD); s. loc. *J. Drummond* 156 (MEL); Mt Jackson, *G.J. Keighery* 4376 (PERTH); 30 km S of Haig, *A.A. Mitchell* 79 (PERTH); Frank Hann National Park, *K. Newbey* 6503 (PERTH).
SOUTH AUSTRALIA: Between Colona and Ooldea, Oct. 1954, *J.B. Cleland* (AD); Hughes, *E.H. Ising* 1568 (AD,MEL,NSW); between Eucla and Fowlers Bay, 1875, *Richards* (MEL).

Distribution. Found in Western Australia south-west of a line from Roebourne to Eucla (but excluding the extreme south-west and south coast) and in the Nullarbor region of South Australia. Figure 6.

Discussion. Erymophyllum ramosum subsp. *ramosum* exhibits considerable variability in habit and in the minutiae of floral structure. This variability is most noticeable in the length of the cilia that make up the plumose pappus bristles, the shape of the style apex (truncate to deltoid), and in the presence of cilia on the outer involucral bracts. However, I have been unable to find a correlation of characters to support further infraspecific division within this taxon. To the northern extent of its range some collections have narrower and longer involucres, outer bracts somewhat ciliate, and style tips more obviously deltoid; these characters suggest an introgression with subsp. *involucratum.*

2b. **Erymophyllum ramosum** subsp. **involucratum** (F. Muell.) Paul G. Wilson, comb. et stat. nov. — *Helichrysum involucratum F. Muell., Fragm. 3: 135 (1863).* — *Helipterum involucratum* (F. Muell.) Benth., Fl. Austral. 3:646 (1867).

Involucre narrow-cylindrical c. 7 mm long; outer (foliaceous) bracts long arachnoid-ciliate; innermost bracts with a narrowly oblong-elliptic laminae c. 6 mm long. *Corolla* c. 6mm long. *Anther apiculum* narrow-ovate c. 0.7 mm long. *Style apex* deltoid to narrow-deltoid. *Pappus bristles* denticulate to very shortly pilose.

Specimens examined (selection only). WESTERN AUSTRALIA: 'Wanna' Station, *J.S. Beard* 6073 (PERTH); 39 km NNW of Overlander Roadhouse, *W.R. Barker* 2174 (AD); 56 km S of Dongarra, *A.E. Orchard* 4221 (PERTH); 11 km S of Wannoo, *M.E. Phillips* (CBG 062774); 66 km S of Billabong Roadhouse, *P.S. Short* 2108 (MEL).

Distribution and habitat. Near the west coast of Western Australia from Shark Bay region to south of Dongarra; usually found in calcareous soil. Figure 4.

Discussion. The narrowly cylindrical involucre and the arachnoid-ciliate outer bracts serve to distinguish this sub-species, however, as noted earlier, some collections are somewhat intermediate between the two subspecies in these features.

Nomenclatural notes. Mueller's description of *Helichrysum involucratum* was based on mixed material. The Murchison River collection, here selected as lectotype, corresponds to the plant that is commonly referred to this species. Only material of this collection was cited by Bentham (1867). An isolectotype at herb. K has an original label with the information 'Limestone Hills, Yatthoo, Murchison, Oldf[ield], W. Aust.'. The Champion Bay collection cited by Mueller (MEL 109800) is, in this paper, described as a new species, *Erymophyllum hemisphaericum.* Although Walcott was given as a co-collector only Oldfield's name is present on the type specimens I have seen.

For a comment on the misapplication of the name *Helipterum tenellum* see under *Erymophyllum tenellum.*

3. **Erymophyllum compactum** Paul G. Wilson, sp. nov. (Figure 3)

Herba erecta ad 20 cm alta, glanduloso puberula. Folia graciliter teretia supra sulcata 5-20 mm longa obtusa. Capitula in corymbis terminalibus compactis foliaceis disposita. Involucrum breviter cylindraceum, c. 3-5 mm longum, bracteis foliaceis linearis glanduloso puberulis araneoso-ciliatis subtentum. Bracteae involucri hyalinae, glabrae, eciliatae; lamina absens. Flosculi 10-26, omni fertiles. Corolla omnino glabra involucrum excedens; tubus anguste cylindricus c. 3 mm longus; lobi anguste oblongi c. 1.5 mm longi. Styli apex truncatus papillosus. Achenium anguste turbinatum leviter dorsi-ventraliter compressum c. 1.5 mm longum dense sericeo villosum pilis minute bidentatis. Pappi setae scapo anguste lineari, arcte dentato, corollam aliquantum breviore.

Typus: 35 km west of Wiluna, in clay, 20 Sept. 1980, *H. Demarz* 8236 (holo: PERTH).

Erect *herb* to 20 cm high branching at base, sparsely to moderately puberulous with short gland-tipped hairs, viscid, somewhat aromatic. *Branches* slender, straight. *Leaves* slender, terete, sulcate above, 5-20 mm long, rounded at apex. *Heads* clustered in a compact terminal corymb; peduncles c. 3 mm long, leafy. *Involucre* shortly cylindrical, c. 3-5 mm long, 2.5 mm diameter, subtended by c. 6 linear-spathulate leafy bracts densely glandular puberulous and sparsely arachnoid ciliate, ± equal to the involucre. *Involucral bracts* hyaline, glabrous, eciliate; outer bracts ovate obtuse, c. 1.5 mm long; intermediate and inner bracts elliptic to broad-oblong, 3-3.5 mm long, obtuse to rounded with prominent hard linear stereome; lamina absent. *Florets* 10-26, all fertile. *Corolla* completely glabrous, orange-yellow, exceeding involucre; tube narrow-cylindrical, c. 3 mm long; lobes narrow-oblong, acute, c. 1.5 mm long; vascular strands extending to base of lobes. *Anthers* exerted c. 1.5 mm long including the narrow-ovate apiculum c. 0.3 mm long. *Style arms* truncate prominently papillose. *Achene* narrow-turbinate, slightly dorsiventrally compressed, c. 1.5 mm long, densely silky villous, the hairs minutely bidentate, not myxogenic. *Pappus bristles:* shaft narrow-linear, closely dentate, 2-3.5 mm long, shorter than the corolla.

Specimens examined. WESTERN AUSTRALIA: 49.3 miles E of NW Coastal Hwy and Gascoyne Junction turnoff, *A.M. Ashby* 4572 (AD); 'Wanna' Station, *J.S. Beard* 6080 (PERTH); 52 km S of Ashburton Downs turnoff, *H. Demarz* 4447 (PERTH); 7 km N of Meekatharra, *H. Demarz* 4700 (PERTH); 'Three Rivers Station', *H. Demarz* 6963 (PERTH); 35 km W of Wiluna, *H. Demarz* 8236 (PERTH); 92 km N of Meekatharra, *H. Demarz* 8356 (PERTH); Mullewa to Annean, *S. Dixon* s.n. (AD); Jimba Jimba, *C.A. Gardner* 6095 (PERTH); 2 km N of 'Polelle' Homestead, *A.A. Mitchell* 1268 (PERTH); 18 km W of 'Lyons River' Homestead, *K.R. Newbey* 11561 (PERTH); Wooramel River, 1889, *G.D. Robinson* (MEL); 'Mulgul' Station, *T.L. Setter* 321 (AD); near Colurabi Hills, *P.G. Wilson* 7404 (PERTH); 8 km N of Gascoyne Junction, *P.S. Short* 463 (MEL); 20 km N of Gascoyne Junction, *P.S. Short* 469 (AD); 18 km S of Wiluna, *P.G. Wilson* 8941 (PERTH).

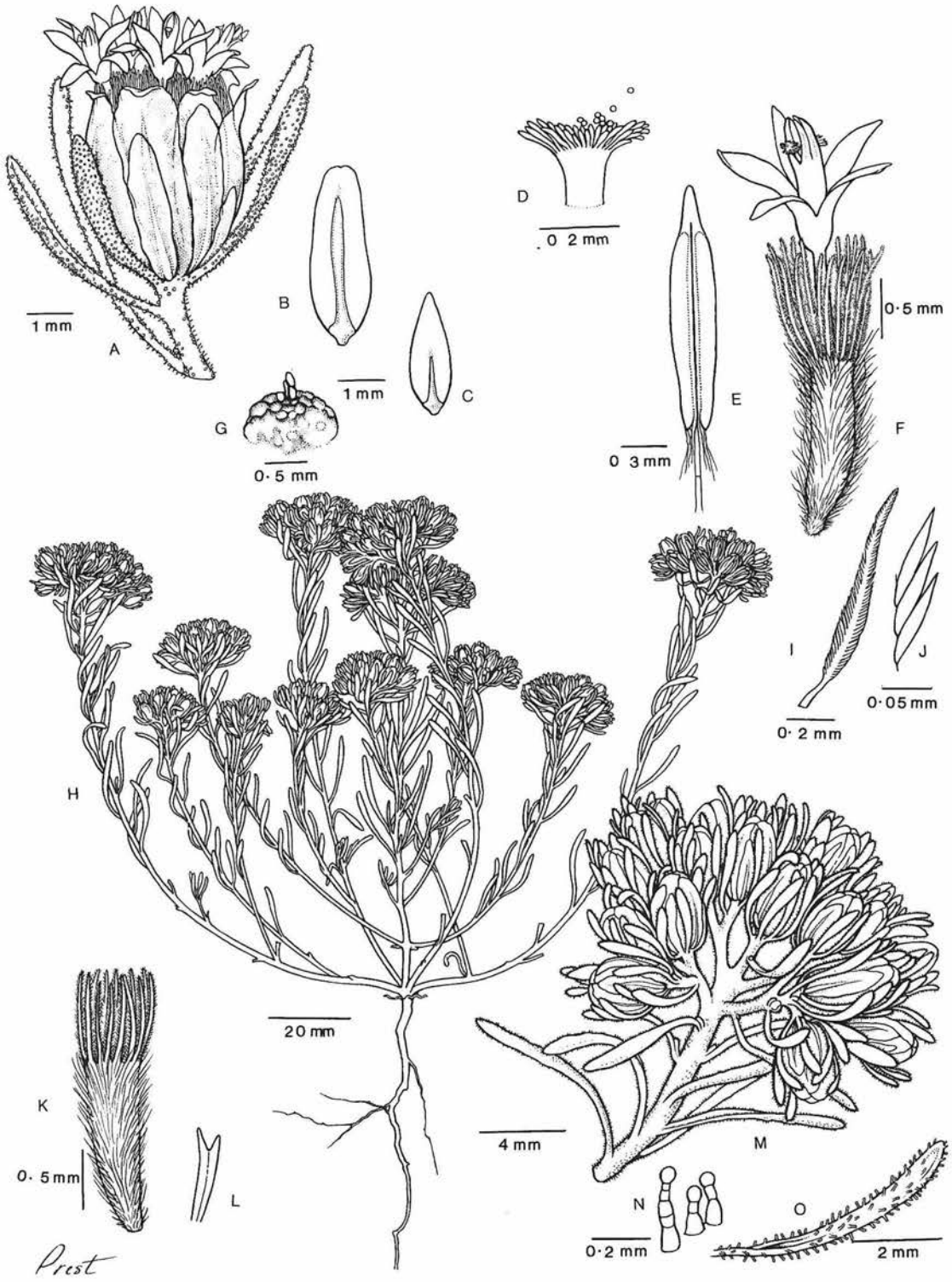


Figure 3. *Erymophyllum compactum*. A - Capitulum. B - Inner involucral bract. C - Outer involucral bract. D - Style apex. E - Anther. F - Floret. G - Receptacle. H - Habit of plant. I - Pappus bristle. J - Portion of duplex hair. M - Inflorescence. N - Glandular hairs of leaf. O - Leaf. Figure K from *H. Demarz* 8356 (PERTH), otherwise from *P.G. Wilson* 8941 (PERTH).

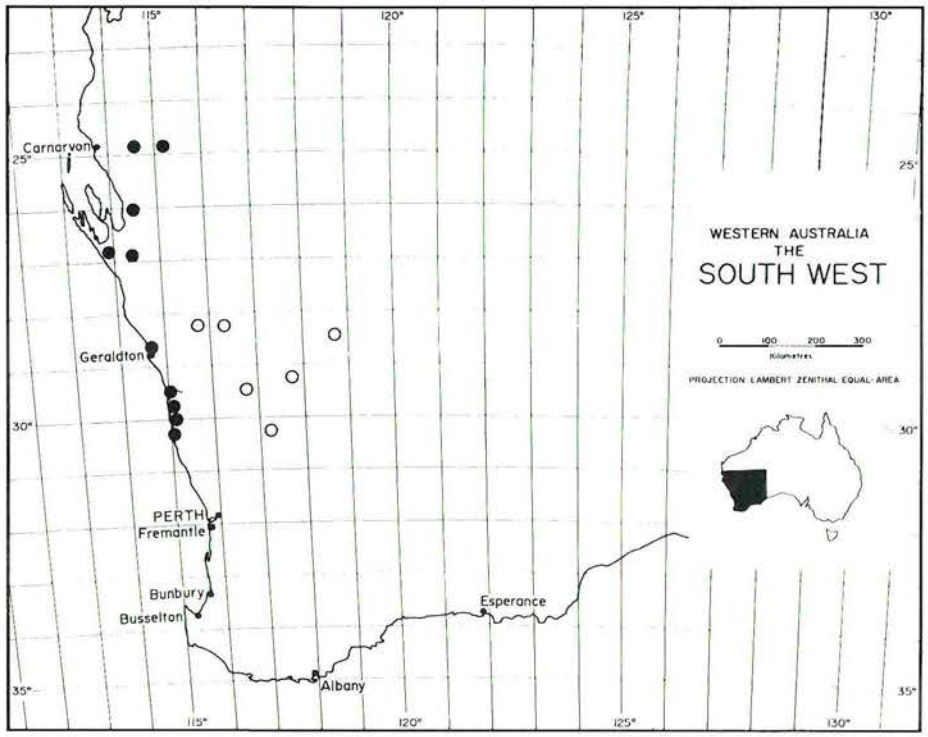


Figure 4. Distribution of *Erymophyllum ramosum* subsp. *involucratum* (●), and *E. glossanthus* (○).

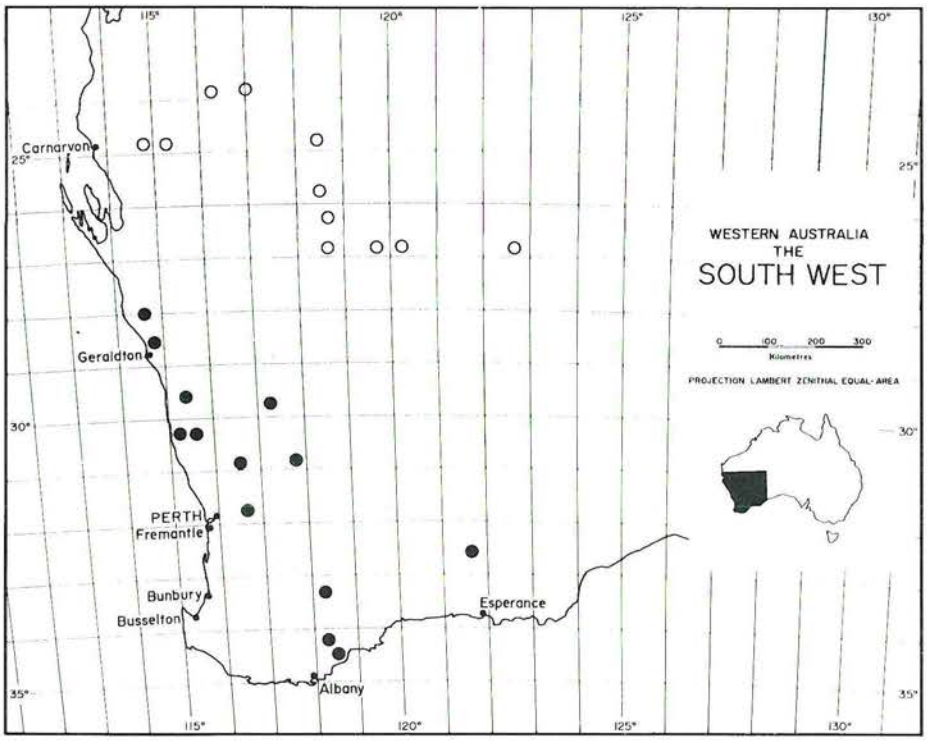


Figure 5. Distribution of *Erymophyllum compactum* (○), *and E. tenellum* (●).

Distribution and habitat. Found in Western Australia in the area between Laverton and Gascoyne Junction. Principally in gravelly soil in open country. Figure 5.

Flowering time. Material has been collected in bud in late August, and in flower from mid-August to mid-October. Some of the specimens collected in October also apparently bear mature fruit.

Discussion. This species differs from other members of the genus *Erymophyllum* in having compact inflorescences and inner involucral bracts that lack a lamina. It is also distinctive in the form taken by the foliaceous bracts for these pass abruptly into hyaline bracts whereas in the other species they merge, with the basal portion becoming hyaline.

The specific epithet refers to the manner in which the flower heads are congested together.

4. **Erymophyllum hemisphaericum** Paul G. Wilson, sp. nov.

[*Helichrysum involucratum* F. Muell., Fragm. 3: 135 (1863) p. pte. as to Champion Bay collection, not as to lectotype.].

Herba erecta ad 25 cm alta glabra. Folia filiformia 10-30 mm longa, supra sulcata, obtusa. Capitula pauca graciliter pedunculata. Involucrum hemisphaericum c. 6 mm altum, nitidum praeter unguices bractearum interiorum lanato ciliatos glabrum; bracteae exteriores foliaceae; bracteae intermediae basi late ovatae hyalinae, apice foliaceae; bracteae intimae unguice anguste oblongo hyalino, lamina obovata obtusa c. 5 mm longa flava. Corolla c. 3.5 mm longa; tubus anguste cylindricus, fere glaber; lobi anguste triangulares c. 1 mm longi, sparse glanduloso pilosi. Styli apex truncatus papillosus. Achenium anguste obovatum dense sericeo villosum pilis minute bidentatis. Pappi setae scapo lineari-filiformi manifeste dentato, dentibus versus apicem congestis opacis.

Typus: Champion Bay, Western Australia, s. dat., *A. Oldfield* (holo: MEL 109800).

Herb to 25 cm high, simple or branching at base, glabrous. *Stems* and *branches* slender, sometimes slightly flexuose. *Leaves* filiform, c. 30 mm long near base of plant diminishing in size towards apex, sulcate above, obtuse. *Inflorescence* an open cyme of 2-6 heads on slender peduncles. *Involucre* hemispherical, c. 6 mm high, glossy, glabrous except for sparsely ciliate claw of inner bracts; *outer bracts* foliaceous with short glumaceous base, shorter than the involucre; *intermediate bracts* with a broad ovate hyaline pale brown base and a short foliaceous apex; *inner bracts* broad ovate, obtuse to acute, c. 5 mm long, hyaline, pale brown, with a minute appendage or this lacking; *innermost bracts* with a narrow-oblong delicate hyaline claw and a thick linear stereome with a prominent obovate obtuse yellow lamina c. 5 mm long and 3 mm wide. *Florets* c. 20. *Corolla* narrow-cylindrical (upper half narrow-turbinate), c. 3.5 mm long; tube almost glabrous; lobes narrow-triangular c. 1 mm long with a few short biseriate gland-tipped hairs on abaxial side; vascular strands terminating at base of lobes. *Anthers* (including apiculum) c. 1.5 mm long; apiculum narrow-ovate, c. 0.4 mm long. *Style apex* truncate, papillose. *Achene* narrow-obovate, not seen in mature state, densely silky villous, the hairs bidentate, not myxogenic. *Pappus bristles* with shaft linear-filiform c. 4 mm long, very prominently dentate, the teeth congested and opaque towards the apex.

Distribution. Only known from the type locality. Figure 6.

Discussion This species is known only from the type collection which is also a syntype (lectoparatype) of *Erymophyllum ramosum* subsp.*involucratum.* The two taxa may be distinguished by the difference in indumenta (glandular puberulous in subsp. *involucratum*), shape of the involucres, shape of the laminae of the innermost involucral bracts, and the morphology of the

pappus bristles. *Erymophyllum hemisphaericum* is most similar to *E. tenellum* and, as in that species, is glabrous.

The specific epithet refers to the shape of the involucre.

5. **Erymophyllum tenellum** (Turcz.) Paul G. Wilson, comb. nov.

Helipterum tenellum Turcz., Bull. Soc. Nat. Moscou 24 (1):198 (1851). *Type*: 'Nova Hollandia occidentalis', *Gilbert* 272(lect: KW). See note.

Pteropogon gracilis A. Gray, Hooker's J. Bot. Kew Gard. Misc. 4: 269 (1852), - *Helipterum gracile* (A. Gray) Benth., Fl. Austral. 3: 646 (1867); Grieve and Blackall, How to know Western Austral. Wildfl. 831 (1975). *Type citation*: 'Swan River, *Drummond*' (holo: K).

Helipterum intermedium S. Moore, J. Linn. Soc. 45: 181 (1920); Grieve and Blackall, op. cit. 830 (1975). *Type citation*: 'Kauring; *Stoward*, 593' (holo: BM; iso MEL).

Slender *herb* to 20 cm high usually branching at base, glabrous. *Stem* and *branches* slender to almost filiform, often slightly flexuose. *Leaves* filiform, well-spaced, 8-40 mm long, sulcate above, obtuse. *Inflorescence* an open cyme of 2-10 heads on slender peduncles, or the heads sometimes clustered. *Involucre* ovoid, c. 6 mm long; outer bracts foliaceous, 3-4 mm long with very short glumaceous base, glabrous, grading into intermediate bracts with broad-elliptic brown glumaceous base and foliaceous apex; *inner bracts* broad-elliptic, acuminate, c. 6 mm long, hyaline, pale brown to straw-coloured; innermost with a linear to narrow-oblong hyaline claw c. 6 mm long, a flat green linear stereome that is cottony within, and an erect narrow-oblong yellow lamina c. 2 mm long. *Florets* c. 20, all fertile or the innermost functionally male. *Corolla* narrow-cylindrical with the upper half slightly turbinate, c. 3 mm long; tube glabrous; lobes erect, narrowly triangular, c. 0.5

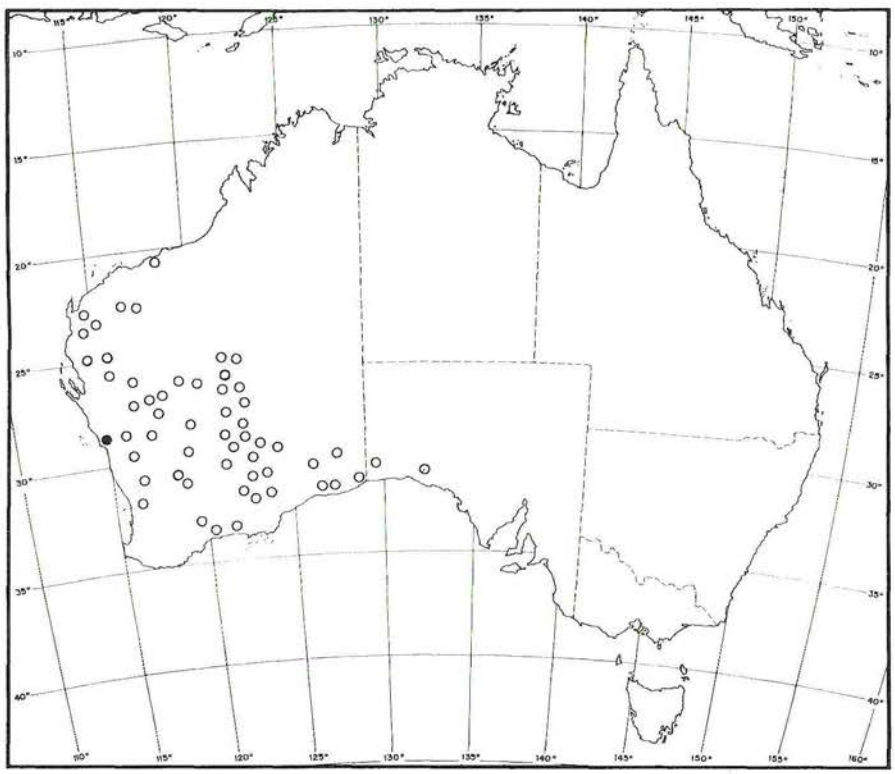


Figure 6. Distribution of *Erymophyllum ramosum* subsp. *ramosum* (○), *and E. hemisphaericum* (●).

mm long, with a few short gland-tipped biseriate hairs on abaxial side; vascular strands terminating low in tube. *Anthers* (including apiculum) c. 1 mm long; apiculum narrow-ovate obtuse c. 0.3 mm long. *Style apex* truncate. *Achene* narrow-obovate, dorsiventrally compressed, 1.5-2.5 mm long, pale brown, densely silky villous, the hairs bidentate, not myxogenic. *Pappus bristles* with shaft narrowly linear-lanceolate, slightly exceeding corolla, shortly plumose with the cilia reduced towards apex.

Specimens examined (selection only). WESTERN AUSTRALIA: 1 km NE of Mt Lesueur, *E.A. Griffin* 2620 (PERTH); Throssel Nature Reserve, *G.J. Keighery* 1224 (PERTH); Kukerin, Oct. 1913, *M. Koch* 2212 (MEL); Wongan Hills, Oct. 1903, *A. Morrison* (CANB); 15.5 km from Borden, *P.S. Short* 2286 (MEL); 15 km N of Badgingarra, *P.G. Wilson* 3830 (PERTH).

Distribution. South-west Western Australia from Geraldton to near Albany and Salmon Gums; growing in heathland and woodland on a variety of soils. Figure 5.

Discussion. This species is fairly uniform in appearance over its range although varying slightly in microscopic characters. It differs noticeably from other species in the genus in being glabrous, in having a very open inflorescence, and in the yellow laminae of the involucral bracts being short and erect. As in *E. hemisphaericum*, the capitulum is not surrounded by true leaves since even the outermost involucral bracts have a scarious base.

Typification. The type sheet of *Helipterum tenellum* (KW) consists of five specimens. Two of these specimens (those on the left-hand side of the sheet), including the largest and most complete, are of glabrous plants with slender appendages to the outer bracts and short, yellow laminae to the inner bracts. The other three specimens are minutely glandular-puberulous with shorter outer-bracts appendages and with white laminae to the inner bracts. Turczaninow in his original description referred to the plant as *glaberrimum* (i.e. perfectly glabrous) and as having slender appendages to the outer bracts and golden yellow appendages to the inner bracts. This description obviously applies only to the two specimens on the left-hand side of the sheet. I have therefore lectotypified the name on the larger of those two specimens. The name *Helipterum tenellum* therefore corresponds to the plant previously referred to as *Helipterum gracile*. The three remaining specimens on the sheet belong to *Erymophyllum ramosum*.

Acknowledgements

I thank the Directors of the state herbaria in Australia for the loan of specimens, the Director of the Royal Botanic Gardens, Kew for facilities when working in that institution, for the loan of types and for the donation of colour photographs of other specimens, and my colleague Neville Marchant for information on the condition of the type collection of *Helipterum tenellum*. To Margaret Menadue I express my thanks for preparing the illustrations.

References

Candolle, A.P. de (1838). "Prodromus systematis naturalis regni vegetabilis." Vol. 6. (Treuttel et Wurtz: Paris.)

Gray, A. (1852). Characters of some south-west Australian Compositae, principally of the subtribe Gnaphalieae. Hooker's J. Bot. Kew Gard. Misc. 4: 225-232.

Lindley, J. (1836). "A Natural System of Botany" 2nd edn. (Longman : London.)

Wilson, Paul G. (1989). A revision of the genus *Hyalosperma* (Asteraceae: Inuleae: Gnaphaliinae). Nuytsia 7: 75-101.

Index To Scientific Names

Numerals in bold type represent main entry of accepted names. New names are given in bold type. Other accepted names are in Roman. Synonyms are in italics.

Publication date of Nuytsia Volume 6 Number 3: 23 December 1988

0724-0889-750