The *Westringia dampieri-W. eremicola-W. rigida* complex (Labiatae)

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Abstract

Conn, Barry J. The *Westringia dampieri-W. eremicola-W. rigida* complex (Labiatae). Nuytsia 6(3): 335-349 (1988). The relationship between *Westringia dampieri, W. eremicola* and *W. rigida* is discussed. *W. grevillina, W. rigida* var. *dolichophylla* and *W. senifolia* var. *canescens* are reduced to synonymy of *W. dampieri. W. rigida* var. *brachyphylla* and var. *brevifolia* are regarded as indistinct from typical *W. rigida. W. eremicola* var. *quaterna* is not formally recognized as distinct from typical *W. eremicola.* The relationship between *W. eremicola, W. cremnophila* and *W. longifolia* is discussed. Notes on the type of *W. longifolia* are provided.

Introduction

While preparing an account of *Westringia* for the recent "Flora of South Australia" (Conn 1986) it became apparent that there are considerable taxonomic problems in this genus. In an attempt to understand the South Australian species of *Westringia*, it was necessary to consider many of the species of this genus occurring outside this region.

The most recent complete account of the genus is by Boivin (1949). Although this treatment is a commendable effort considering the circumstances under which it was done (see Boivin 1949, p. 99), much of the present-day confusion (e.g. Eichler 1965, Costermans 1981) has, in part, resulted from Boivin's treatment. In Boivin's defence, it must be pointed out that the amount of herbarium material available for study has increased significantly since 1944. The problems he faced were further compounded because much of the type material was not available for examination during the second World War and he had insufficient time for field work.

The increased amount of herbarium material has emphasized the complexities of the genus far beyond that suspected by Boivin (1949) and many of the more recent flora accounts. It is now obvious from this study that detailed population studies are essential, so that within-population and between-population morphological variation can be evaluated.

This paper presents my investigations into the relationship between *W. dampieri, W. eremicola* and *W. rigida.* The conclusions presented here are tentative since they represent initial hypotheses which have been derived from relatively inadequate data. Although I have begun population studies of this complex, it will be several years before sufficient data are available to allow a detailed re-evaluation. The purpose of this paper is twofold: (1) to bring the taxonomic problems of this complex to the attention of the taxonomic community so that some misconceptions regarding these taxa can (at least in part) be corrected; (2) to stimulate other plant collectors to collect these taxa on a population basis, with adequate field observations, so that the planned population studies will be as representative of the group as possible.

These investigations have been based on material from the following herbaria (abbreviations as designated in Holmgren et al. 1981): AD, BM, C, K, MEL, PERTH.

A59733-6

Methods and presentation

The measurements of the morphological characters and the subsequent descriptions were taken from 650 herbarium specimens. In the descriptions, those character states which occur in fewer than 10% of the individuals (of the relevant taxon) are enclosed by parentheses. Parentheses are also used to enclose rarely occurring character states which may be present in an otherwise typical individual specimen.

General terminology follows Lawrence (1955), Porter et al. (1973), and Stearn (1973). Terminology for plane shapes follows Ball et al. (1962). Author and literature abbreviations follow Stafleu & Cowan (1976, 1979, 1981, 1983, 1985).

The distribution summary and the selected citation of specimens examined are grouped according to various regional subdivisions. The subdivisions used for the States are: for Queensland I have followed the pastoral divisions as in Contr. Queensl. Herb. 19 (1975) back end paper, for New South Wales those of Jacobs & Pickard (1981) (which is modified from Anderson 1961), for Victoria those of Cochrane et al. (1968), for South Australia those of Laut et al. (1977a-f), and for Western Australia those of Beard (1980).

Morphological characters

Bentham noted that 'the species [of *Westringia*] are so closely allied, and run so much into each other as to render it exceedingly difficult to assign to them any tangible characters' (Bentham 1870, p. 127). This has proved to be particularly true for the three taxa discussed in this paper.

The type of field observations required for *Westringia* are the same as those needed for all Labiatae. As similar observations are required for both *Westringia* and *Prostanthera*, Conn (1980) should be referred to for a discussion of the type of observations required. The lack of useful field observations on most of the herbarium collections of *Westringia* has made it difficult to evaluate many characters. Only about 30% of the collections examined have information other than the locality of the collection. Even less have information which can be used to evaluate the taxonomic value of certain characters which are not readily represented by herbarium specimens.

Boivin (1949) discussed the usefulness of various morphological characters and his paper should be consulted for further details.

Taxonomic characters currently used

The characters which have been most frequently used to distinguish between the taxa of this complex are: the number of leaves per whorl, the size and shape of the leaves, and the size of the calyx lobes.

The number of leaves per whorl. Although the number of leaves per whorl is a useful character for delimiting certain *Westringia* species (see Boivin 1949), it appears to be of limited taxonomic value in this complex. For example, some specimens of *W. eremicola* have 3 and 4 leaves per whorl (namely *Chipstone* 25, *Copley* 4504, *Hunt* 233). *W. eremicola* and *W. rigida* usually have 3 leaves per whorl. The Western Australian populations of *W. dampieri* usually have either 3 or 4 (rarely 5) leaves per whorl, whereas the South Australian populations (*'W. grevillina'*) appear consistently to have 3 leaves per whorl. So, because of the overlap and the variation even within plants, it is concluded that the number of leaves per whorl is useful as a secondary feature which may confirm an initial determination within this complex.

The size and shape of leaves. With respect to this complex, there is a general tendency for *W. rigida* to have smaller leaves than *W. eremicola* and *W. dampieri.* However, many collections are difficult to classify into any particular taxon on the basis of leaf size. For practical reasons it was found that size (such as length) was a difficult character to use because it appears to be readily modified by environmental factors. Furthermore, it is difficult to ascertain if mature leaves are present in herbarium specimens.

It was found that within a single collection the lamina length to width ratio does not vary as much as either the length or the width. Therefore, the lamina length to width ratio proved to be a useful and reliable way of quantifying leaf shape. However, a consideration of this ratio does not produce recognizably disjunct species (refer abcissa of Figure 1). The leaf length of *W. rigida* is usually less than 9 times the width; in *W. dampieri* the leaf length is usually between 8 and up to about 20 times the width; whereas *W. eremicola* has a leaf length which is usually greater than 6 and up to 30 times the width. The extent of the overlap is such that this character can only be used as a supplementary taxonomic character. This character is further discussed below, with reference to Figure 1.

The size of the calyx lobes. The size of the calyx lobes, usually relative to the size of the calyx tube, has been regarded as taxonomically useful by several authors (see Bentham, in Candolle 1848; Bentham 1870; Boivin 1949; Robertson, in Black 1957; Curtis 1967; Willis 1973). The calyx lobes of *W. rigida* are usually regarded as about one third the length of the calyx tube (Curtis 1967; Robertson, in Black 1957; and Willis 1973). Blackall & Grieve (1965) regarded the calyx lobes of *W. dampieri* as about one fifth the length of the calyx tube. The calyx lobe to tube ratio of *W. eremicola* is regarded as greater than 0.5 (Boivin 1949) and often 1 (Willis 1973). It can be seen from Figures 1A & B (ordinate axis) that the various calyx lobe to tube ratios mentioned above do not adequately distinguish between *W. eremicola, W. dampieri* and *W. rigida.*

I have plotted the calyx lobe to calyx tube ratio against lamina length to width ratio (Figure 1). Figure 1A summarizes the spatial limits, with respect to these two features, for the three species of this complex. Although most collections can be classified using these two characters, about 36% of the collections examined occur in the overlap zones. The complexity of the overlap zones is shown in Figure 1B.

Other useful taxonomic characters

This study has revealed additional characters which offer further insights into the taxonomy of this complex. They are: corolla size, colour and markings; habit; presence or absence of indumentum on staminodal filaments, plus the size of the staminodal lobes; and petiole length. These additional characters which appear to assist in the delimitation of the three taxa, are discussed below.

Corolla. Both *W. eremicola* and *W. rigida* usually have smaller corollas than *W. dampieri* (6-8.5 mm long cf. 8-12 mm long). In particular, the adaxial median lobe-pair of *W. eremicola* is smaller than both *W. rigida* and *W. dampieri* (namely *W. eremicola* 2.6-3.8 mm long, 2.6-3.9 mm wide; *W. rigida* 3.2-4.4 mm long, 4.2-5 mm wide; *W. dampieri* 7.2-8 mm long, 6.4-8 mm wide).

W. rigida have white corollas (often with mauve tinge) with orange to orange-brown markings. However, *Gardner* 2100 and *Hunt* 2692 record lilac and mauve corollas which lack markings. *W. eremicola* have lilac, mauve or purple, rarely white (*Sharrad* 1392) corollas with or without markings. *Conn* 1041 noted mauve and white flowers in a population of *W. eremicola* at Monarto South, South Australia. In *W. dampieri* the corolla may not be very useful since it is either white with purple, red, yellow and/or yellow-brown markings, or pale purple, pale mauve to lilac without markings. The corolla colour and markings may be of some use for distinguishing *W. rigida* from *W. eremicola,* but for the complex as a whole, it would appear to be, at best, of secondary importance.

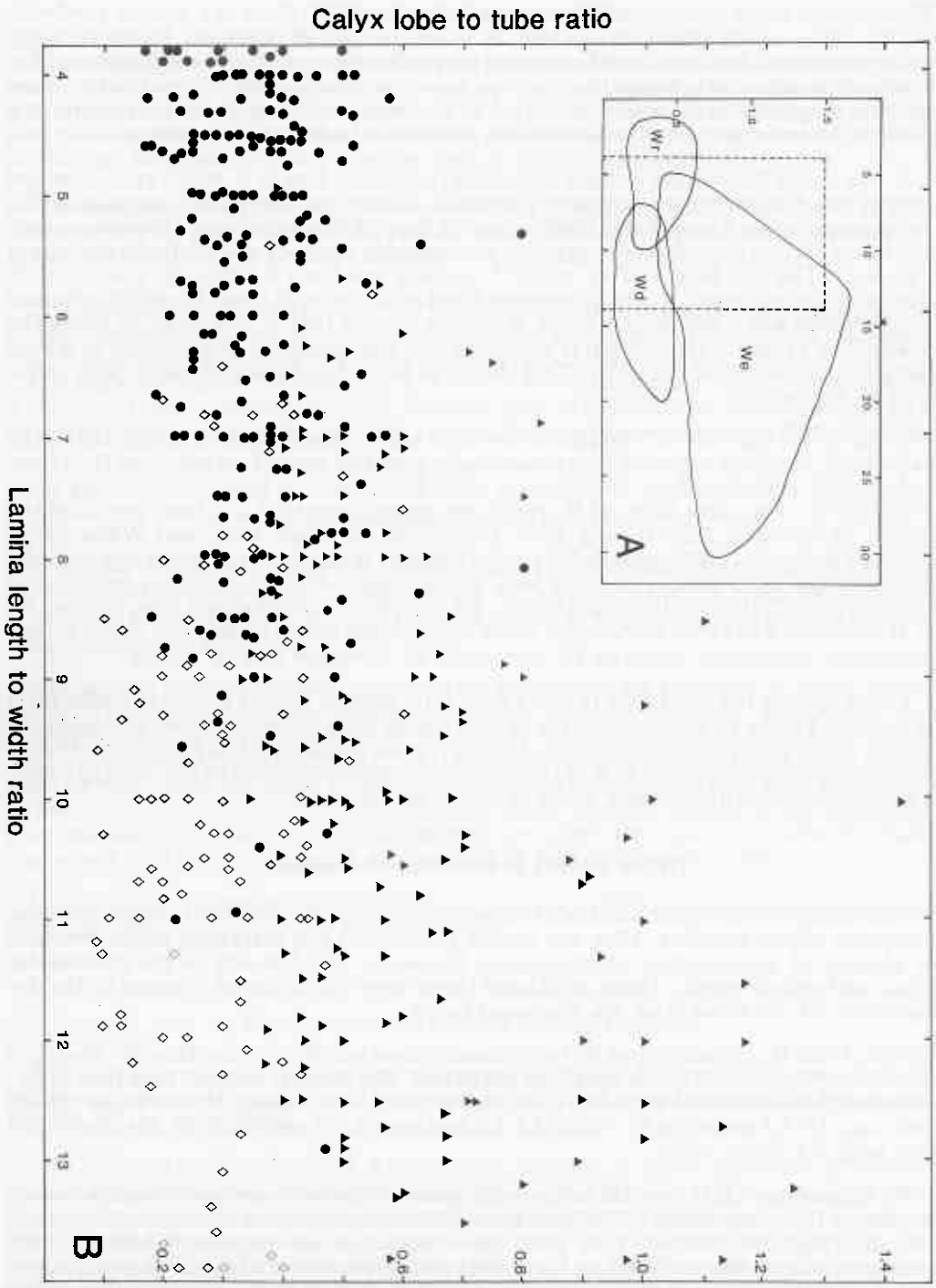

Figure 1. Calyx lobe to tube ratio compared with lamina length to width ratio for *Westringia dampieri-W. eremicola-W. rigida* complex. A. Summary of total scattergram for *W. dampieri* (Wd), *W. eremicola* (We), and *W. rigida* (Wr) (area enclosed by dashed line is shown in detail in Figure 1B). B. Scattergram of 'overlap zone'; solid dot = *W. rigida*, solid triangle = *W. eremicola*, open diamond = *W. dampieri*.

Habit. The habit seems likely to provide the most useful additional information to aid in the classification of these species. Although habit is a difficult character(s) to quantify, the following qualitative differences have been observed. *W. eremicola* is a slender, or sometimes bushy shrub which has an overall 'soft' appearance. The leaves and branches are ascending, usually at an angle less than 45° to the next higher order axis. For photographs of this species refer G. & P. Althofer (1980, p. 349) and Costermans (1981, p. 269 [figure labelled as '*Westringia grevillina* (? *eremicola*)']). *W.dampieri* is usually a very dense shrub. The shrub appears compact, partly because of the relatively short internodes. This species also tends to be slightly 'fleshy', which is possibly correlated to its more or less coastal environment. *W. rigida* is usually a multistemmed divaricate or intricate shrub, reasonably compact and often hemispherical in shape. The branches are rigid and often somewhat tangled. The rigid leaves are often patent. For photographs of this species refer Cunningham et al. (1982, p. 581) and G. & P. Althofer (1980, p. 348).

Staminodes. The staminodal filaments of *W. rigida* are glabrous or hairy, whereas those of *W. eremicola* and *W. dampieri* are hairy, at least at the base. The staminodal lobes show small differences in size between the three taxa (namely *W. rigida* 0.4-0.5 mm long, *W. eremicola* 0.6-0.8 mm long and *W. dampieri* 0.9-1 mm long). These characters appear to be taxonomically useful, even though further evaluation is necessary.

Petiole length. W. rigida has sessile leaves whereas *W. dampieri* and *W. eremicola* are petiolate (petiole 0.3-0.5 mm long and 0.5-0.7 mm long, respectively). Although this character appears to be taxonomically useful, in practice it is sometimes difficult to distinguish between leaves which are sessile and those which are very shortly petiolate (i.e. about 0.3 mm long).

Conclusion

At present, the morphological evidence suggests that many (apparently) minor character differences combine to maintain *W. dampieri, W. eremicola* and *W. rigida* as distinct from each other. I have been unable to identify one or two major differences which will consistently differentiate between these taxa. Extensive population studies are required so that these characters can be more thoroughly evaluated.

Key to species

1a. Leaves sessile, usually subpatent (sometimes spreading to recurved), ovate to narrowly ovate, 1.9-5.2(-9.8) mm long, subpungent (mucro c. 0.8 mm); corolla white with dots on inner surface; calyx lobe to tube ratio (0.2-)0.4-0.5; shrub intricate or divaricate .....2. *W. rigida*

1b. Leaves with petiole 0.3-0.7 mm long, spreading to recurved, ovate, narrowly ovate, narrowly oblong, to linear, (4-)6-26(-40) mm long, usually mucronate (mucro 0.3-0.5 mm long); corolla white or purple, lilac or mauve, dots present or absent; calyx lobe to tube ratio (0.1-) 0.2-0.6(-0.9); shrub with suberect to spreading branches

2a. Leaf lamina (8-)13-26(-40) mm long, (1-)1.5-3 mm wide; petiole 0.3-0.5 mm long; calyx lobes (0.5-)0.8-1.9 mm long; corolla 8-12 mm long; corolla adaxial median lobe-pair 7.2-8 mm long, 6.4-8 mm wide; staminodal lobes 0.9-1 mm long; calyx lobe to tube ratio (0.1-)0.2-0.5 (-0.6) .....1.*W. dampieri*

2b. Leaf lamina (4-)6-12(-15) mm long, (0.6-)0.8-1.3 20 mm wide; petiole 0.5-0.7 mm long; calyx lobes (1-)1.3-3(-5.3) mm long; corolla 6.5-8.5 mm long; corolla adaxial median lobe-pair 2.6-3.8 mm long, 2.6-3.9 mm wide; staminodal lobes 6-0.8 mm long; calyx lobe to tube ratio (0.3-)0.4-0.6(-0.9) .....3.*W. eremicola*

1. **Westringia dampieri** R. Br., Prodr. 501 (1810); J.D. Hook., Bot. Mag. t. 3308 (1834); Benth., Labiat. Gen. Spec. 458 (1834); Bartl. in Lehmann, Pl. Preiss. 1: 361 (1845); Benth. in DC., Prodr. 12: 570 (1848); Fl. Austral. 5: 129 (1870); F. Muell., Fragm. 9: 163 (1875); Boivin, Proc. Roy. Soc. Queensland 60: 107 (1949 [as 1950]); Robertson in J.M. Black, Fl. S. Austral. 2nd. edn, 4: 742, fig. 1064 (1957); Blackall & Grieve, Western Austral. Wildfl. 3: 577 (1965); J.S. Beard, Descr. Cat. Western Austral. Pl. 94 (s. dat. [Oct. 1965]); G. & P. Althofer, Austral. Pl. 10: 361 (1980) [as '*Westringia dampierii*']; Grieve (ed.), Blackall & Grieve, Western Austral. Wildfl. 3B: 430 (1981). *Lectotype* (here chosen): *R. Brown* s.n. [*J.J. Bennett* 2381], anno 1802-5 [8 Dec. 1801-1 Jan. 1802 (Stearn 1960)], King Georges Sound, Western Australia (lecto: BM, upper left specimen; isolecto: BM, upper centre & right specimens).

W. cinerea R. Br., Prodr. 501 (1810); J.D. Hook., Bot. Mag. t. 3307 (1834); Benth. in DC., Prodr. 12: 570 (1834). *Lectotype* (here chosen): *R. Brown* s.n. [*J.J. Bennett* 2383], anno 1802-5 [29 Jan. 1802-13 Feb. 1802], Bay 3 - 4 - 5 - 7 [Fowler's Bay, Petrel Bay, Franklin Bay, Waldgrave Island (Stearn 1960)], South Australia (lecto: BM, third specimen from left; isolecto: BM - other specimens on sheet [excluding type]).

W. grevillina F. Muell., Defn. Austral. Pl. 16 ([July (Seberg 1986)] 1855); Trans. Phil. Soc. Victoria 1: 49 ([September (Aston 1984)] 1855); J. Bot. Kew. Gard. Misc. 8: 169 (1856); Boivin, Proc. Roy. Soc. Queensland 60: 106 (1949 [as 1950]); G. & P. Althofer, Austral. Pl. 10: 363 (1980). *Lectotype* (here chosen): *Wilhelmi* s.n., s. dat., Cape Donnington and Tungetta, Port Lincoln, South Australia (lecto: MEL 614327; isolecto: MEL 614328 & MEL 614329).

W. rigida R. Br. var. *dolichophylla* Ostenf., Biol. Meddel. Kongel. Danske Vidensk. Selsk. 3: 112 (1921); Blackall & Grieve, Western Austral. Wildfl. 3: 577 (1965); G. & P. Althofer, Austral. Pl. 10: 364 (1980); Grieve (ed.), Blackall & Grieve, Western Austral. Wildfl. 3B: 429 (1981). *Lectotype* (here chosen): *Ostenfeld* 977, 29.x.1914, Geraldton (lecto: C - lower specimen; isolecto: C - upper specimens, PERTH).

W. senifolia F. Muell. var. *canescens* Benth., Fl. Austral. 5: 130 (1870). *Lectotype* (here chosen): *Maxwell* 262, s. dat., Phillips Ranges, Western Australia (lecto: MEL 614549, left specimen; isolecto: MEL 614549, right specimen).

[*W. senifolia* auct. non F. Muell. (1855); Blackall & Grieve, Western Austral. Wildfl. 3: 578 (1965).]

Small shrubs 0.3-1(-1.3) m high. *Branches* triangular to quadrangular, or subterete, ± smooth or internodes with raised ridges from axil of leaf to next more distal node, densely hairy (c. 100-230 hairs/mm^2), hairs appressed, antrorse, simple, c. 0.2 mm long. *Leaves* in whorls of 3 or 4(or 5), spreading to recurved, abaxial surface and petiole densely hairy (150-200 hairs/mm^2), adaxial surface densely hairy basally, sparsely hairy to glabrescent distally; *petiole* 0.3-0.5 mm long; *lamina* narrowly ovate or narrowly oblong to linear, (8-)13-26(-40) mm long, (1-)1.5-3 mm wide (lamina length to width ratio (4-)7.5-15(-19.7), length of maximum width from base to total lamina length ratio up to c. 0.1), base cuneate, margin entire and recurved such that only midrib of abaxial surface visible, apex mucronate (mucro 0.3-0.5 mm long); venation not visible, midrib slightly raised on abaxial surface. *Inflorescence* a frondose racemiform conflorescence, uniflorescence monadic. *Pedicel* 0.2-0.8 mm long, densely hairy; *prophylls* inserted at base of calyx, narrowly ovate to narrowly oblong, 1.4-1.5 mm long, 0.2-0.3 mm wide (length to width ratio 5-7), densely hairy, base narrowly cuneate or prophylls not restricted at base, margin incurved, apex obtuse. *Calyx* green, mid-vein of each sepal thickened to form a ridge from base to apex of each calyx lobe, outer surface densely hairy, hairs appressed, antrorse, c. 0.2 mm long; *tube* (2.5-)3.3-4.4(-5.5) mm long, inner surface glabrous; *lobes* depressed to very broadly triangular, (0.5-)0.8-1.9 mm long, 1.1-2.3 mm wide (length to width ratio 0.5-0.8), inner surface moderately to densely hairy, apex obtuse to subacute; (calyx lobes to tube ratio (0.1-)0.2-0.5(-0.6)). *Corolla* 8-12 mm long, white with purple, red, yellow and/or brown dots medially on abaxial surface of tube and mouth, or pale purple, pale mauve to lilac with dots absent; outer surface

glabrous basally, sparsely hairy on distal part of tube, densely hairy on lobes, hairs c. 0.2 mm long, ± appressed; inner surface sparsely to moderately hairy, hairs 0.3-0.7 mm long, ± erect and spreading; *tube* 4-5.5 mm long, tubular, dilated basally around ovary and in throat such that tube appears slightly funnelform distally, diameter at mouth c. 1.8-2 mm; *abaxial median lobe* broadly oblong to ± oblong or subelliptic to ± ovate, 3-3.5 mm long, 1.8-2.5 mm wide (length to width ratio 1.4-1.7), apex rounded and ± irregular; *lateral lobes* subtriangular to ± ovate, 5-5.5 mm long, 2.5-3 mm wide (length to width ratio 1.7-2), apex rounded to obtuse, irregular; *adaxial median lobe-pair* 7.2-8 mm long, 6.4-8 mm wide distally, bilobed (sinus 2-2.6 mm long), each half of lobe-pair very broadly ovate to broadly obovate (lobe length to width ratio 0.7-1) and each with a ± rounded and irregular apex. *Androecium* inserted in mouth. *Staminal filaments* 1.7-2 mm long, hairy; anthers 1-1.2 mm long, lobe with a minute basal acumen up to 0.1 mm long, or acumen absent. *Staminodal filaments* 1-1.5 mm long, hairy; staminodal lobes white, 0.9-1 mm long. *Disc* cylindrical, c. 0.2 mm high. *Pistil* 6.5-8 mm long; ovary c. 0.6-1 mm long; style 6-7 mm long; stigma lobes up to c. 0.3 mm long. *Mericarps* 2-2.5 mm long, distally 0.7-0.8 mm extended beyond base of style; seeds ± flattened, narrowly obovate in outline, 1-1.3 mm long, glabrous.

Selected specimens examined (150 examined). SOUTH AUSTRALIA: Mt Lofty Block: Kangaroo Island (Amberley): *Andrew* s.n., 8.v.1914, Kingscote (AD). - Eyre and Yorke Peninsulas: Southern Highlands and Plains (Peake Bay): *Robjohns* s.n., 24.x.1967, Point Bolingbroke (AD); (Lincoln): *Wilson* 327, 8.x.1958, Stamford Hill (AD): West Coast (Polda): *Willis* s.n., 26.viii.1947, Elliston Beach (MEL); (Streaky Bay): *Cooper* s.n., 7.v.1955, Cape Bauer (AD): Central Mallee Plains and Dunes (Ceduna): *Wilson* 1521,10.ix.1960, Thevenard (AD, MEL).

WESTERN AUSTRALIA: Eremaean (Coolgardie): *Wilson* 7709, 4.ix.1968, near Pt Dover (PERTH); (Carnarvon): *Kinnear* (WAWRC)D, 24.iv.1979, Dorre Island (PERTH). - South-West (Roe): *Andrews* s.n., -.x.1979, Salmon Gums (PERTH); (Eyre): *Weston* (& *Trudgen*) 86811, 15.xi.1973, NE part of Middle Island, Recherche Archipelago (PERTH); (Darling): *Alexander* B.1501, -.xii.1919, Garden Island (PERTH); (Irwin): *Ashby* 3261, 10.vii.1970, East Wallabi Island, Houtman Abrolhos (PERTH).

Distribution. South Australia and Western Australia.

Ecology. This species occurs in coastal situations on beach sands, sand dunes or limestone cliffs, and on small islands. It grows in sandy soils which are usually calcareous-derived or sometimes granitic-derived. It rarely occurs in clayey soils.

Typification. The labels and specimens of Wilhelmi's collection of *Westringia grevillina* have been mounted on three separate herbarium sheets (namely MEL 614327 - 614329). Only MEL 614329 has a label in Mueller's hand.

Notes. The interpretation of *W. grevillina* has resulted in considerable confusion. Mueller (1875) reduced this taxon to the synonomy of *W. dampieri.* Boivin (1949) reinstated *W. grevillina* and excluded *W. eremicola* from South Australia without comment. Robertson (in Black, 1957) followed Mueller's interpretation without discussing Boivin's opinion. Subsequently, Eichler (1965) assumed from Boivin's work that the taxon known as '*W. eremicola*' in South Australia was *W. grevillina.* I have concluded that *W. grevillina* is a synonym of *W. dampieri* and that *W. eremicola* does occur in South Australia (for further discussion of the latter species refer 'Notes' under *W. eremicola).* Robertson (in Black, 1957) describes *W. dampieri* (of South Australia [as '*W. grevillina*']) as sometimes having 4 leaves per whorl. In all the material that I examined the South Australian populations appeared consistently to have 3 leaves per whorl. *W. dampieri* (as occurring in Western Australia) has mostly 4 leaves per whorl. However, some specimens of the latter populations have both 3 and 4 leaves per whorl, and two collections (namely *George* 139 and *Newbey* 815) have 5 leaves per whorl. The number of leaves per whorl is thought to be of little taxonomic significance in this species.

Mueller (1875), and more recently G. & P. Althofer (1980) regarded *W. senifolia* var. *canescens* from Western Australia as a distinct taxon from typical *W. senifolia* from Victoria. Boivin (1949) regarded *W. senifolia* var. *canescens* as an indistinct form of typical *W. senifolia*. This interpretation is regarded as incorrect since the two taxa are readily distinguishable. *W. senifolia* has leaves which are moderately to densely hairy on all surfaces (although the abaxial surface is more densely hairy than the adaxial surface), with spreading hairs about 0.5-1 mm long. The branches have the same type of indumentum. *W. senifolia* var. *canescens* has densely hairy to glabrescent leaves. The indumentum of the leaves of the latter taxon is sometimes restricted to the abaxial surface. The hairs of the leaves and branches are appressed and 0.2-0.3 mm long. This latter taxon appears to be a small-leafed form of *W. dampieri*.

Conservation status. Considered not at risk.

2. **Westringia rigida** R. Br., Prodr. 501 (1810); Benth. in DC., Prodr. 12: 570 (1848); Fl. Austral. 5: 129 (1870); Rodway, Tasman. Fl. 150 (1903); J.M. Black, Fl. S. Austral. 3: 494, fig. 200E & F (1926); Ewart, Fl. Victoria 980 (1931 [as 1930]); Boivin, Proc. Roy. Soc. Queensland, 60: 107 (1949 [as 1950]); Robertson in J. M. Black, Fl. S. Austral. 4:742, figs 1038E & F, 1063C (1957); Blackall & Grieve, Western Austral. Wildfl. 3: 577 (1965); Beard, Desc. Cat. Western Austral. Pl. 94 (s. dat. [Oct. 1965]); Curtis, Student's Fl. Tasmania, 3: 555 (1967); Willis, Handb. Pl. Victoria, 2: 585 (1973 [as 1972]); G. & P. Althofer, Austral. Pl. 10: 364, & tt. (1980); Grieve (ed.) in Blackall & Grieve, Western Austral. Wildfl. 3B: 429 (1981); Haegi in J. Jessop (ed.), Fl. Central. Austral. 311, fig. 413 (1981); Costermans, Native Trees & Shrubs SE Austral. 268 & t. (1981); Cunningham et al., Pl. W. New S. Wales 581 & t. (1982 [as 1981]). *Lectotype* (here chosen): *R. Brown* s.n. [*J.J. Bennett* 2382], anno 1802-5 [January 1802 (Stearn 1960)], Bay 3 South Coast [Goose Island Bay, Western Australia (Stearn 1960)] (lecto: K - lower left specimen; isolecto: K - other specimens on sheet excluding type).

W. rigida var. *brevifolia* Benth. in DC., Prodr. 12: 570 (1848). *Lectotype* (here chosen): *Drummond* 194, s. dat., Swan River (lecto: K - central left specimen; isolecto: K - upper left and right specimens).

W. rigida var. *brachyphylla* Ostenf., Biol. Meddel. Kongel. Danske Vidensk. Selsk. 3: 112 (1921); Blackall & Grieve, Western Austral. Wildfl. 3: 577 (1965); G. & P. Althofer, Austral. Pl. 10: 364 (1980); Grieve (ed.) in Blackall & Grieve, Western Austral. Wildfl. 3B: 429 (1981). *Lectotype* (here chosen): *Ostenfeld* 982, 7.x.1914, Kalgoorlie (lecto: C - left specimen; isolecto: AD, C - centre and right specimens, MEL, PERTH).

Small shrubs, 0.3-0.6(-1) m high. *Branches* subterete with two slightly raised lateral ridges, sparsely to densely hairy distally, glabrous basally; hairs appressed, simple, antrorse, c. 0.3 mm long. *Leaves* in whorls of 3(or 4), spreading to recurved, sessile; *lamina* ovate to narrowly ovate, 1.9-5.2(-9.8) mm long, 1-1.7(-2.2) mm wide (lamina length to width ratio (1.5-)2-7(-8.2), length of maximum width from base to total lamina length ratio 0.1-0.6), rigid, sparsely to moderately hairy, hairs usually persistent on abaxial surface, but adaxial surface becoming sparsely hairy or rarely glabrous, base rounded to broadly obtuse, margin entire and recurved such that abaxial surface almost concealed, apex submucronate to subpungent (rigid point c. 0.8 mm long); venation not visible, midrib slightly raised on abaxial surface. *Inflorescence* a frondose racemiform conflorescence, uniflorescence monadic. *Pedicel* 0.2-0.7(-1) mm long, densely hairy; *prophylls* inserted near base of calyx, narrow, ovate to suboblong, 1-1.5 mm long, 0.3-0.5 mm wide (length to width ratio 2.7-5.6), moderately to densely hairy, base narrowly-cuneate, margin often slightly incurved, apex obtuse. *Calyx* green, mid-vein of each sepal thickened to form a ridge from base to apex of each calyx lobe, outer surface densely hairy, hairs appressed, antrorse, less than 0.2 mm long; tube 2.6-3.6 mm long, inner surface glabrous; lobes depressed triangular to very broadly triangular, (0.6-)0.9-1.6 mm long, 1-1.7 mm wide at base (length to width ratio 0.7-1), inner surface moderately to densely hairy, apex subacute; (calyx lobes to tube ratio (0.2-)0.3-0.5). *Corolla* 6-7 mm

long, white, often with a mauve tinge, with orange to orange-brown dots medially on abaxial surface of tube and mouth, dots also on lateral and abaxial lobes; outer surface moderately hairy, hairs ± appressed, 0.1-0.3 mm long; inner surface sparsely to moderately hairy, hairs (0.2-)0.3-0.4 mm long, ± erect and spreading; *tube* 3.3-5.2 mm long, tubular, dilated basally around ovary and in throat such that tube appears funnelform distally, diameter at mouth c. 2 mm; *abaxial median lobe* ± oblong, 3.2-3.5 mm long, 2-2.2 mm wide (length to width ratio 1.4-1.6), apex rounded and ± irregular; *lateral lobes* ± oblong, often slightly constricted 1-1.5 mm above base, 1.5-3.3 mm long, 1.4-2 mm wide (length to width ratio 1-1.6), apex rounded and ± irregular; *adaxial median lobe-pair* 3.2-4.4 mm long, 4.2-5 mm wide distally, bilobed (sinus 1-1.2 mm long), each half of lobe-pair ovate to broadly ovate (lobe length to width ratio 0.8-0.9) and each with a rounded apex. *Androecium* inserted in corolla mouth. *Staminal filaments* 1.3-1.5 mm long, glabrous; *anthers* 0.7-0.8 mm long, lobe with a minute basal acumen 0.1-0.2 mm long. *Staminodal filaments* 0.4-0.9 mm long, usually glabrous; *staminodal lobes* white, 0.4-0.5 mm long. *Disc* cylindrical, 0.4 mm high. *Pistil* c. 6 mm long; ovary 0.7-1 mm long; style c. 5 mm long; stigma lobes 0.2-0.3 mm long. *Mericarps* 1.5-1.8 mm long, distally 0.7 mm extended beyond base of style; seeds ± flattened, narrowly obovate in outline, c. 1.1 mm long.

Selected specimens examined (380 examined). QUEENSLAND: Warrego: *Barker* 4856, 25.ix.1984, 4-5 km SSE of road between Yowah and Black Gate Opal Field Store (AD, MEL).

NEW SOUTH WALES: North Western Plains: *Day* s.n., anno 1878, upper Darling River (MEL 614660, MEL 61674); South Western Plains: *Beckler* s.n., 15.ix.1860, at Lake Yanga, near Balranald (MEL 614612); South Far Western Plains: *Phillips* CBG 17331, 31.viii,1962, 19 miles from Euston (AD).

VICTORIA: Mallee: *Corrick* 7375, 1.viii.1981, Stewart Flora & Fauna Reserve, Red Cliffs area (MEL); *Morton* 321, 30.viii.1979, Walpeup (MEL); (Big Desert): *Beauglehole* 28762A, 1.x.1968, Duttack Track, Wyperfeld National Park (MEL); Northern Plains: *Muir* 911, 20.x.1959, c. 6 miles N of Bagshot (AD, MEL).

SOUTH AUSTRALIA: Murray Mallee: Murray Lakes (Lake Alexandrina): *Donner* 6759, 20.x.1978, turnoff to Cookes Plaines (AD - mixed collection); Northern Calcarenite Ridges and Plains (Cantana): *Sharrad* 1230, 12.x.1961, 1 mile E of Coomandook (AD); (Coonalpyn): *Williams* s.n., 26.x.1952, Coonalpyn (AD); South-east Mallee Heathlands (Karoonda): *Southcott* & *Fischer* s.n., 25.x.1971, c. 8 km E of Lameroo (AD); (Moorlands): *Sharrad* 1158, 4.ix.1961, Naturi (AD); (Wood Hill): *Ising* s.n., 4.ix.1958, Murray Bridge (AD); (Lower Murray): *Sharrad* 1302, 24.vii.1962, 10 miles N of Tailem Bend (AD); Upper Murray Lands (Punthari): *Donner* 1104, 4.viii.1964, c. 10 km ENE of Mannum (AD); (Blanchetown): *Whibley* 7176, 16.x.1975, c. 19 km NNE of Morgan (AD); (Holder): *Wheeler* 462, 18.ix.1967, c. 16 km WSW of Waikerie (AD); (Renmark): *Sharrad* 1172, 5.ix.1961, near Glossop, on Morgan-Berri Rd (AD); (Parcoola): *Whibley* 3653, 26.ix.1971, c. 12 km N of Overland Corner (AD); (Mt Mary): *Orchard* 190, 29.iii.1968, c. 3 km SW of Bower (AD); (Sutherlands): *Boehm* 369, 14.viii.1962, c. 3km WSW of Sutherlands (AD). Mt Lofty Block: Peninsula Uplands (Sandergrove): *Fagg* 511, 4.iii.1968, Ferris MacDonald (AD); (Hahndorf): *Cooper* s.n., -.vii.1941, c. 3 km S of Tungkilla (AD); (Barossa): *Behr in herb. Sonder* s.n., 29.xi.1848, Salt Creek (c. 13 km NE of Gawler) (MEL 614601). Eyre and Yorke Peninsulas: West Coast (Kappawanta): *Specht* 2068, 8.xii.1959, c. 120 km N of Pt Lincoln (AD); Central Mallee Plains and Dunes (Hincks): *Alcock* 1594, 29.x.1967, c. 3 km W of Mt Verran (AD); (Cleve): *Eichler* 19168, 27.viii.1952, c. 12 km NE of Arno Bay (AD); (Pinkawillinie): (Midgee): *Whibley* 246, 1.x.1958, between Whyalla and Cowell (AD); *Baker* s.n., 29.viii.1952, 4 miles W. of Bookaloo (AD); (Kyancutta): *Hilton* s.n., 19.viii.1955, 6 miles W of Wudinna (AD); (Wirrula): *Symon* s.n., 30.ix.1959, 13 miles N of Koonibba Siding (AD); Northern Myall Plains (Buckleboo): *Wilson* 191, 3.x.1958, c. 74 km W of Whyalla (AD); (Whyalla): *Cleland* s.n., 1.ix.1944, Whyalla Knob (AD); Southern Yorke Peninsula (Urania): *Cleland* s.n., 9.viii.1953, Port Victoria (AD); Gulf Plains (Weetulta): *Blaylock* 802, 23.ix.1967, c. 6 km SSE of Moonta (AD); (Boor Plains); *Copley* 1302, 11.v.1967, Point Riley (AD); (Mallala): *Cooper* s.n., 8.ix.1964, Goyder

Siding to Bowans (AD); (Barung): *Cooper* s.n., 23.viii.1966, Hummock Mt (AD); (Glendella): *Chinnock* 1433, 25.vii.1974, Mt Grainger (AD). Flinders Ranges: Northern Complex (Yudnamutana): *Chinnock* 321, 20.v.1973, 2 km N of Mudlamutana Well (AD). Western Pastoral: Gawler Uplands (Gawler): *Bates* s.n., 10.x.1976, Scrubby Peak (AD); (Koolcutta): *Donner* 3184, 23.ix.1969, Cariewerloo Homestead (MEL); Central Salt Lakes and Plateaux (Acraman): *Hilton* s.n., 13.vii.1954, top of Uro Bluff (AD); Great Victoria Desert (Yellabina): *Mowling* 36, 27.ix.1976, 15 km W of Barton (AD). Northern Arid: Western Sandplains (Mt Sir Thomas): *Helms* s.n., 23.vi.1891, 96 km E of Mt Lindsay (AD).

WESTERN AUSTRALIA: Eremaean (Helms): *George* 3754, 19.viii.1962, 12 miles E of Cosmo Newberry (PERTH); (Eucla): *Aplin* 1690, 1.ix.1962, 6 miles N of Eucla (PERTH); (Austin): *Smith* 66/513, 15.ix.1966, 7 miles S of Broad Arrow on Menzies-Kalgoorlie Road (MEL). - South-West(Roe): *Foreman* 789, 19.ix.1984, 4 km E of Lake King (MEL); (Avon): *Smith* 261, 10.ix.1983, Amery (MEL); (?Darling): *Cronin* s.n., anno 1889, sources of Blackwood River (MEL 614625).

Distribution. Queensland, New South Wales, Victoria, Tasmania, South Australia, Western Australia.

Ecology. It usually occurs in *Eucalyptus* mallee or open *Eucalyptus* woodland communities, associated with *Eucalyptus erythronema, E. clelandii, E, griffithsii, E. oleosa, E. transcontinentalis, Melaleuca uncinata, Acacia* spp., *Eremophila* spp., *Triodia* spp., *Beyeria leschenaultii, Dodonaea bursariifolia* and *Hakea multilineata.* The soils are usually sandy, shallow or deep, frequently overlying limestone or sandstone, often in association with lateritic gravel, rarely clayey.

Notes. W. rigida is an extremely variable species which is often difficult to distinguish from *W. dampierii* and *W. eremicola.* The distinguishing characters are summarized in the 'Key to species'

White & Francis (1922) believed that the Queensland material referred to *W. rigida* by Bailey (1901) actually belonged to *W. cheelii.* A detailed reappraisal of these two taxa is required. A recent collection (*Barker* 4856) from the Warrego district of Queensland appears to be a typical specimen of *W. rigida.*

The calyx of *S.A. Pastoral Board* s.n. (AD 97628557) is very similar to *W. eremicola.* It has calyx lobes of about 2.8 mm long and a calyx lobe to calyx tube ratio of about 0.8. However, the vegetative characters are typical of *W. rigida.*

Conservation status. Although this species is often locally rare, it is not considered to be at risk.

Vernacular names. Stiff Westringia (Willis 1973, Cunningham et al. 1982); Stiff Western Rosemary (Cunningham et al. 1982).

3. **Westringia eremicola** A. Cunn. ex Benth., Labiat. Gen Spec. 459 (1834); J.D. Hook., Bot. Mag. t. 3438 (1835); Benth. in DC., Prodr. 12: 571 (1848); Fl. Austral. 5: 130 (1870); F. Muell., Fragm. 9: 163 (1875) [as '*W. longifolia*' p.p.]; Ewart, Fl. Victoria 980 (1931 [as 1930]); Boivin, Proc. Roy. Soc. Queensland 60: 107 (1949 [as 1950]); Robertson in J.M. Black, Fl. S. Austral. 2nd. edn, 4: 742, fig. 1063A & B (1957); Beadle, Evans & Carolin, Fl. Sydney Region 519 (1963); Burbidge & M. Gray, Fl. Austral. Cap. Terr. 316, fig. 318 (1970); Willis, Handb. Pl. Victoria 2: 585 (1973 [as 1972]); G. Cunningham et al., Pl. W. New S. Wales 581 (1982 [as 1981]). *Lectotype* (here chosen): *A. Cunningham* s.n., anno 1817, 'Arid wastes on the Lachlan R. [River]' New South Wales (lecto: K - left specimen).

[*W. angustifolia* auct. non R. Br. (1810): J.M. Black, Fl. S. Austral. 494 (1926).]

[*W. dampierii* auct. non R. Br. (1810): G. & P. Althofer, Austral. Pl. 10: 361 (1980).]

[*W. grevillina* auct. non F. Muell. (1855): H. Eichler, Suppl. J.M. Black's Fl. S. Austral. 270 (1965); Costermans, Native Trees & Shrubs SE Austral. 268 (1981) (p.p.)].

W. eremicola var. *quaterna* Benth., Fl. Austral. 5: 130 (1870); Boivin, Proc. Roy. Soc. Queensland 60: 108 (1949 [as 1950]). *Lectotype* (here chosen): *C. Moore* 38, -.iii.1865, Shoalhaven Gullies near Glenroch, New South Wales (lecto: MEL 614401 - right specimen; isolecto: MEL 614401 - left & central specimens).

Small shrubs, (0.3-)0.5-1.5(-2) m high. *Branches* triangular or quadrangular to subterete, moderately to densely hairy (70-125 hairs/mm^2); hairs ± appressed, simple, antrorse, 0.2-0.3(-0.4) mm long. *Leaves* in whorls of 3(or 4), spreading and usually slightly recurved; *petioles* 0.5-0.7 mm long, densely hairy; *lamina* narrowly elliptic to linear, (4-)8-20(-27) mm long, (0.5-)0.8-1.3(-1.6) mm wide (length to width ratio (4-)6-20 (-36), length of maximum width from base to total lamina length ratio up to c. 0.6), moderately to densely hairy, often only with hair bases persistent on mature leaves (hence, appearing glabrous), abaxial surface densely hairy along midrib, base obtuse or lamina not restricted at base, margin entire and recurved, often such that abaxial surface almost concealed, apex submucronate with mucro up to c. 0.3 mm long; venation not visible, midrib slightly raised on abaxial surface. *Inflorescence* a frondose racemiform conflorescence, uniflorescence monadic. *Pedicel* 0.6-1.2(1.7) mm long (up to 2 mm long in fruit), densely hairy; *prophylls* inserted near base of calyx, narrowly ovate to linear, 1-2.6 mm long, 0.2-0.5 mm wide (length to width ratio 3.3-13), moderately to densely hairy, base narrowly cuneate or prophylls not restricted at base, margin often slightly incurved, apex obtuse to subacute. *Calyx* green, mid-vein and marginal veins of sepals slightly thickened to form ridges on calyx tube, outer surface densely hairy, hairs appressed, antrorse, 0.3-0.4 mm long; tube 2.5-4(-4.5) mm long, inner surface glabrous at base, moderately to densely glandular (glands pedicellate) on part surrounding ovary, glabrous in mouth, or glabrous throughout; lobes triangular (usually appearing narrowly triangular because margin strongly recurved), (1-)1.3-3(-5.3) mm long, 1-2 mm wide (length to width ratio 1.2-2.6), inner surface densely hairy, apex subacute; (calyx lobe to tube ratio (0.3-)0.4-1.3(-1.7)). *Corolla* 6.5-8.5 mm long, lilac, mauve or purple, rarely white, with orange to brown dots medially on abaxial surface of tube and mouth, dots also on lateral and abaxial lobes, or dots apparently absent; outer surface glabrous basally, sparsely to moderately hairy on distal part of tube, densely hairy on lobes, hairs erect to subappressed and antrorse, 0.1-0.4 mm long; inner surface densely hairy in throat, sparsely hairy on basal part of lobes, lobes often glabrous distally, hairs ± erect and spreading, (0.2-)0.3-0.4 mm long; *tube* 5-6.5 mm long, tubular, dilated basally around ovary, constricted immediately above ovary, dilated in throat such that tube appears funnelform distally, diameter at mouth c. 2 mm; *abaxial median lobe* ± oblong to obovate, 2.9-3.9 mm long, 2.9-3.3 mm wide (length to width ratio 1-1.2), apex rounded, irregular and bilobed (sinus 0.5-0.7 mm long); *lateral lobes* oblong to slightly obovate, 2.9-3.3 mm long, 1.6-2 mm wide (length to width ratio 1.6-2.1), apex rounded and ± irregular; *adaxial median lobe-pair* 2.6-3.8 mm long, 2.6-3.9 mm wide (length to width ratio 0.9-1.2), bilobed (sinus 1.3-1.5 mm long), each half of lobe-pair broadly ovate (length to width ratio c. 1.2) and each with a rounded apex. *Androecium* inserted in corolla mouth. *Staminal filaments* 1.3-2 mm long, glabrous; *anthers* 0.7-1.3 mm long, lobe without basal acumen. *Staminodal filaments* 0.5-1.3 mm long, sparsely hairy (particularly at base); *staminodal lobes* white, 0.6-0.8 mm long. *Disc* cylindrical, c. 0.5 mm high. *Pistil* 7-8 mm long; ovary 0.7-1 mm long; style 6.5-7 mm long; stigma lobes c. 0.4 mm long. *Mericarps* 1.3-1.5 mm long, distally 0.7-0.8 mm extended beyond base of style; *seeds* ± flattened, narrowly obovate in outline, c. 1.5-1.8 mm long.

Selected specimens examined (118 examined). NEW SOUTH WALES: North Western Slopes: *McKee* 273, 30.ix.1952, below Bluff Pyramid, Warrumbungle Mts (MEL); Central Western Slopes: *Baker* s.n., 17.x.1917, Kamarah (MEL 575448); Southern Tableland: *Moore* 3047, 3.xii.1954, 5 miles from Cotter on Tidbinbilla Road [Australian Capital Territory](AD); North Western Plains: *Streimann* 756, 12.xii.1973, Pilliga Scrub, 55 km SW of Narrabri (AD); South Western Plains: *Carrick* 3193, 19.x.1972, 10 km S of Marong(AD, MEL).

VICTORIA: Eastern Highlands: Victorian Alps: *Walter* s.n., -.xi.1891, Pine Mountain (MEL 1515914); East Gippsland: *Willis* s.n., 12.xi.1968, Little River Gorge (MEL 614355); East Gippsland Plains: *Beauglehole* (& *Finck*) 32354, 13.xii.1969, between The Narrows and Totem Point, Mallacoota Inlet National Park (MEL). - Northern Plains: *Phillips* CBG 24052, 8.xi.1965, Whipstick Scrub, N of Bendigo (AD). - Mallee: Big Desert: *Beauglehole* (& *Finck*) 29023, 7.x.1968, Rudd's Rocks, W side of Wyperfeld National Park (AD, MEL); Wimmera: *Beauglehole* 19005, 3.ix.1962, 8 miles N of Mt Arapiles (MEL); Little Desert: *Beauglehole* 42930, -.x.1948, Woraigworm (MEL).

SOUTH AUSTRALIA: Murray Mallee: Murray Lakes (Lake Alexandrina): *Hergstrom* s.n., -.ix.1961, Cooke Plains (AD); Northern Calcarenite Ridges and Plains (Cantana): *Wilson* 1472, 3.viii.1960, c. 8 km from Coonalpyn (AD); (Coonalpyn): *Symon* 12776, 9.ix.1980, between Kiki & Coonalpyn (AD). South-East Mallee Heathlands (Bordertown): *Herb. Ising* s.n., 16.x.1925, Bordertown (AD); (Cannawigara): *Boomsma* 281, 26.ix.1977, 20 km NE of Bordertown (AD); (The Big Desert): *Symon* 8622, 21.x.1973, Scorpion Springs Conservation Park (AD); (Karoonda): *Phillips* CBG 23844, 20.ix.1965, 7 miles S of Lock (AD); (Moorlands): *Donner* 6757, 20.x.1978, turnoff to Cooke Plains (AD). Mt Lofty Block: Kangaroo Island (Amberley): *Cooper in herb. Southcott* B176, 8-14.viii.1961, near Muston (AD); (MacGillivray): *Tepper* 1251, 13.iii.1884, near Lashmar's Lagoon (MEL 614650); Peninsula Uplands (Sandergrove): *Smith* 371, 22.ix.1967, c. 3 km S of Monarto South (AD); (Claredon): *Gill* 251, s. dat., Milang scrub (MEL); (Mt Terrible): *Clipstone* 25, 6.xi.1980, near Athelstone (AD); (Hahndorf): *?Fischer* s.n., s. dat., near Mt Barker (MEL 614651). Eyre and Yorke Peninsulas: Southern Highlands and Plains (Lincoln): *Alcock* 763, 3.x.1965, Cape Donnington (AD); West Coast (Kappawanta): *Jackson* 1131, 4.x.1967, c. 9 km S of Bascombe Well Homestead (AD); (Polda): *Ising* s.n., 16.ix.1938, Venus Bay (AD); Central Mallee Plains and Dunes (Hincks): *Wheeler* 1040, 11.x.1968, Hincks National Park (AD); (Lock): *Phillips* CBG 23844, 20.ix.1965, 7 miles S of Lock (AD); (Hambidge): *Alcock* 1027, 28.viii.1966, SW corner of Hambidge Flora and Fauna Reserve (AD); Southern Yorke Peninsula (Innes): *Copley* 4504, 30.viii.1974, Warrenben National Park (AD).

Distribution. ?Queensland, New South Wales (incl. Australian Capital Territory), Victoria and South Australia.

Ecology. This species usually occurs in sandy soils (rarely in clays), overlying or derived from sandstones, shales or granitic rocks. Often associated with buckshot gravel. In the drier areas it is usually associated with mallee-eucalypt communities with an understorey typically of *Leptospermum laevigatum* (*L. coriaceum*), *Acacia brachybotrya, Calytrix tetragona, Daviesia spp., Leucopogon* spp. and *Triodia* sp. In central Victoria it is associated with Box-Ironbark *Eucalyptus* forests, whereas in eastern Victoria it is associated with coastal to foothills riparian cliff communities of *E. botryoides, Banksia integrifolia*, and *Acacia kybeanensis, Eucalyptus glaucescens, Leptospermum scoparium* (respectively), plus *Oxylobium arborescens, Pomaderris andromedifolia* and *P.aurea.* In the Australian Capital Territory it has been recorded as occurring in *Eucalyptus cordieri-E. dives-E. viminalis* dominated forests.

Notes. Black (1926) included *W. angustifolia* R. Br. in the flora of South Australia. Boivin (1949) correctly restricted this taxon to Tasmania, but he appears not to have included '*W. angustifolia*' sensu Black in his treatment of the genus. Robertson (in Black 1957) realized that the taxon referred to *W. angustifolia* (by Black 1926) was *W. eremicola.* Eichler (1965) assumed that Boivin regarded '*W. angustifolia*' sensu Black as synonymous with *W. grevillina.* It appears likely that Boivin did not examine South Australian material of *W. eremicola.*

I have applied a relatively broad species concept to this species. The typical form of this species occurs in central New South Wales and central Victoria. This species is often extremely difficult to distinguish from other closely related taxa. Although populations from the drier parts of New South Wales and Victoria are usually readily identifiable, the South Australian populations are very similar to some populations of *W. rigida.*

For example, there is a reduction in the calyx lobe to tube ratio, such that the eastern populations (of New South Wales and Victoria) have larger values than the South Australian population. Therefore, in the South Australian populations, this feature is not as clearly diagnostic as it is for the Victorian and New South Wales populations of *W. eremicola*.

The most useful characters for distinguishing this species from *W. rigida* are summarized in the 'Key to species'. Unfortunately, the character-states are not mutually exclusive.

The eastern Victorian populations have much longer leaves than the other Victorian populations. The former populations show strong similarities with *W. longifolia* (? Queensland, New South Wales). The two are maintained as distinct. In *W. longifolia* the outer surface of the calyx is usually (if not always) glabrous and the leaves are 1.5-2.5 mm wide, with the abaxial surface largely exposed. In *W. eremicola* the outer surface of the calyx is moderately to densely hairy and the leaves are 1-1.5 mm wide, with the abaxial surface largely concealed. Furthermore, *W. longifolia* usually has white corollas, whereas *W. eremicola* usually has purple to lilac corollas. Much of the material from the wetter regions of Queensland, which is referred to *W. eremicola* is possibly *W. longifolia*.

W. cremnophila is very closely related to the eastern Victorian populations of *W. eremicola*. The most obvious difference between the two taxa is that the former is more densely hairy on the distal (hence, young) parts of the branches, and also on the outer surface of the calyx, than the latter taxon. The taxonomic significance of these characters requires detailed investigation.

Conservation status. Considered not at risk.

Vernacular names. Slender Westringia (Willis 1973, Cunningham et al. 1982); Slender Western Rosemary (Cunningham et al. 1982).

Notes on *Westringia longifolia* R. Br.

Stearn (1960) suggested that the lectotype of a Brownian species should be chosen from the most complete individual specimen in the British Museum which has been annotated by Brown. Therefore, I have delayed the choosing of a lectotype until I have examined Brown's material in the British Museum.

Boivin (1949) incorrectly referred *R. Brown* s.n. (MEL 614361), which is part of the type material of this species, to *W. eremicola*

See 'Notes' under *W. eremicola* for additional discussion of this species.

Bentham (1870) incorrectly cited *Sieber* 188 [previously cited by Bentham (in Candolle 1848)] as *Sieber* 180. This is presumed to be a typographical error (refer MEL 614456 and Dietrich 1881, p. 300). This is not type material because Sieber collected in Australia from June until December 1823 (Dietrich 1881), whereas the protologue of *W. longifolia* was published in 1810.

For completeness, a full literature citation and distribution summary are provided below.

Westringia longifolia R. Br., Prodr. 501 (1810); Benth., Labiat. Gen. Spec. 460 (1834); in DC., Prodr. 571 (1848); Fl. Austral. 5: 131 (1870); F. Muell., Fragm. 9: 163 (1875); C. Moore & E. Betche, Handb. Fl. New S. Wales 353 (1893); Boivin, Proc. Roy. Soc. Queensland 60: 109 (1949 [as 1950]); G. & P. Althofer, Austral. Pl. 10: 362 (1980). *Type*: *R. Brown* s.n., s. dat. [probably August - December 1803], Grose [River], New South Wales (BM n.v., MEL 614361).

Prostanthera linearis Sieber ex Benth. Labiat. Gen. Spec. 455 (1834)[non R. Br. Prodr. 501 (1810)]. Type: *Sieber* 189 (Dietrich 1881), n.v.

[*W. eremicola* auct. non A. Cunn. ex Benth.: F.M. Bailey, Queensl. Fl. 5: 1206 (1902) p.p.].

Distribution. ?Queensland and New South Wales.

Acknowledgements

I wish to sincerely thank Drs D.B. Foreman, P.S. Short (Both MEL) and J.G. West (CANB) for their constructive comments on the manuscript.

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