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Benth., *Fl. Austral.* 4: (1868) 111.

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NOTES ON HIBBERTIA (DILLENiaceae)
4. THE IDENTITY OF *H. ENERVIA*

H.R. Toelken & J.R. Wheeler

State Herbarium of South Australia, Plant Biodiversity Centre,
P.O. Box 2732, Kent Town, South Australia 5071
e-mail: toelken.hellmut@saugov.sa.gov.au

Science Division, Dept of Conservation & Land Management,
120 Albany Highway, Albany, Western Australia 6330
e-mail: judyw@calm.wa.gov.au

Abstract

A specimen inscribed "New Holland Gov. King" (G) is identified as the type of *Pleurandra enervia* DC., which is then placed into synonymy of *Hibbertia procumbens* (Labill.) DC. New combinations, *H. hemignosta* (Steud.) J.R.Wheeler and *H. hibbertioides* (Steud.) J.R.Wheeler, are published to replace the Western Australian species previously identified as *H. enervia*.

History

Candolle (1817) described 41 species which are now included in the genus *Hibbertia* and there is a type specimen for each of them in his own herbarium except for *Pleurandra enervia*, the identity of which remained a problem. It was based on a King specimen in Lambert's herbarium, and this was assumed lost with the sale and distribution of that collection in June 1842.

In identifying the specimen *Preiss 2155* as *P. enervia* Steudel (1845) started an interpretation of the species followed by many subsequent botanists. Similar to Candolle he retained it in the genus *Pleurandra* although the stamens are in several groups and some of the filaments are basally connate, which would have suggested the genus *Candollea*, a genus maintained by that author. Bentham (1863) placed *P. enervia* tentatively into the synonymy *Candollea teretifolia* Turcz., while Druce then publishes the combination *C. enervia* as this is the oldest name for that species. Hoogland (1974) eventually validly published the new combination *Hibbertia enervia* after it had already been used as such in publications in Western Australia.

Miller (1970) established in her extensive research that a collection of Governor P.G. King is now found incorporated in the main herbarium at Geneva (G). She commented that "in 1808 Lambert twice wrote J.E. Smith that he had received New Holland plants brought back by Governor King (Linn. Soc.: Smith Corres.). Whether the specimens were actually collected by King himself is not known." George Caley in Currey (1967, p.47) is quoted to show doubt about this as he revealed that King contacted various people to collect for him.

A specimen in the herbarium at Geneva bearing "New Holland Gov. King" (unknown handwriting, not Lambert's) was identified as *H. enervia* and filed under *H. teretifolia*. The stems as well as the linear veinless leaves of this fragment are glabrous except for a few small coiled hairs adaxial to the leaf bases agree well with the original description. Crucial is "stamens 15-20, very short, uniseriate, sometimes nevertheless 1-2 inserted towards the other side of the pistil (stamina 15-20 brevissima uniseriata, interdum tamen 1-2 ad alterum pistilli latus inserta)". The short stamens, which are grouped around and the filaments adhering to or sometimes slipping between the glabrous pistils, show often only one group of one or two stamens on the anterior of the flower, so that the stamens appear to be mainly clustered at the rear of the pistils as is typical of the stamens of the genus *Pleurandra*. This would explain why Candolle retained the species in that genus in spite of

“stamina...uniserialia” instead of “unilateralia” in all the other species of *Pleurandra*. At the same time the strong grouping of the stamens can be misinterpreted as the fusion of the filaments, sometimes only basally (in *H. enervia*: Wheeler 1987), in species of *Candollea*, a genus Candolle (1817) maintained in his treatise of the family.

The interpretation of Steudel and subsequent botanists was applied to a Western Australian species, while it is highly unlikely that Governor King, being stationed in the first Australian settlement at the present Sydney, could have obtained specimens from so far away before 1808 when he brought them with him on his return to England. The specimen at G must be identified as *H. procumbens* (known from Tasmania and adjoining Victoria), and was probably collected by George Caley or his helpers on the expedition to the southern coast of mainland Australia and Tasmania in 1805. In one flower investigated of that specimen 19 stamens (*H. procumbens*: 20-25: Curtis & Morris 1975; 18-25: Toelken 1996) were counted while for the Western Australian species only 9-12 were recorded (Wheeler 1987). Judging by his description, it would seem that Steudel (1844) was not aware of these anther characters since he seem to have based his identification on Candolle's (1824) Prodrômus, which does not give this detail. Furthermore, the anthers of *H. procumbens* shrivel very much after dehiscence so that they are short and scarcely longer than broad (0.8-1.2 (to 2.2 mainly undehisced) mm long) with the margins of the empty pollen sacs irregularly shrivelling and exposing the inside, as also shown on the King specimen. The anthers of specimens of the Western Australian species investigated are narrowly oblong (1.4-1.6 mm long, un- and dehisced) and laterally split but the margins have not shrivelled to show the inside. The specimen agrees with the protologue not only well in essential characteristics, such as the stamens, but also more closely with the eastern Australian species, *H. decumbens*, than with *H. hemignosta* or *H. hibbertioides* from Western Australia. The specimen is therefore accepted as the type of *Pleurandra enervia*.

Two Hibbertia specimens out of four ascribed to Governor King found in Geneva herbarium are annotated “New Holland or Van Diemens Land”, and one of them must also be identified as *H. procumbens*. Candolle (1817) does not mention these three other specimens, but he cites eight Caley specimens from Lambert's herbarium of which there are specimens in his herbarium but no duplicates in the general herbarium. Miller (1970) could not ascertain the whereabouts of the Caley collections from Lambert's herbarium. Lambert was very generous and gave away many specimens, for instance, to de Candolle etc. (p. 505), but the significance of the Caley specimens being present in his herbarium and those of Governor King absent can not be assessed.

Taxonomy

As a type specimen of *P. enervia* has been located it is necessary to rearrange the nomenclature of three species as Bentham (1863) had included several species including *P. enervia* under *Candollea teretifolia*. However, Ostenfeld (1921) already observed: “it seems as if two species are hidden under the name of *H. teretifolia*”. A revision of the following species will be presented separately.

H. procumbens (Labill.) DC., Syst. Nat. 1: 427 (1817); Prodr. 1: 74 (1824); G. Don, Gen. Hist. 1: 75 (1831); Hook., J. Bot. (Hook.) 1: 246 (1834); Hook.f., J. Bot. (Hook.) 2: 403 (1840); Hook.f., Fl. Tasm. 1: 13 (1855), partly excl. *H. obtusifolia*; Benth., Fl. Austral. 1: 33 (1863); Spicer, Handb. Pl. Tasm. 101 (1878); Gilg, Nat. Pflanzenfam. 3, 6: 116 (1893); Ewart, Pl. Vict. 768 (1930); Garnet, Wildfl. Wilson's Prom. 65, 152, fig. 580 (1971); J.H. Willis, Handb. Pl. Vict. 2: 387 (1972); W.M.Curtis & D.I.Morris, Stud. Fl. Tasm. 1: 24 (1975); A.M.Buchanan, Cens. Vasc. Pl. Tasm. 19 (1995); Toelken in N.G.Walsh & Entwisle, Fl. Vict. 3: 303 (1996).

Type: Tasmania, "in capite Van-Diemen", *J.H.H.Labillardière s.n.* (lecto – selected here: Herb. Webb No 3963; FI; photo, AD; iso.: G-DC; G).

Dillenia procumbens Labill., Nov. Holl. Pl. 2, 16, t. 156 (1806).

Type: as above.

Hibbertia angustifolia Salisb., Parad. Lond. Pl. 73 (1807), *nom. illeg.*; Smith in Rees, Cycl. 17 (1811); F. Muell., Pl. Indig. Col. Vict. 1: 18 (1862), partly excl. *H. fasciculata*, *H. prostrata*, *H. glandulosa*, *Pleurandra camphorosma*; Syst. Cens. 1: 2 (1882); Key Syst. Vict. Pl. 1: 123 (1887), partly; Second Syst. Cens. 1: 2 (1889), partly; Rodway, Tasm. Fl. 4 (1903).

Type: same as for *H. procumbens*.

Pleurandra enervia DC., Syst. Nat. 1: 421 (1817); Prodr. 1: 72 (1824); Spreng., Syst. Veg. 16 edn, 2: 462 (1825); G. Don, Gen. Hist. 1: 74 (1831); Steud. in Lehm., Pl. Preiss. 1: 264 (1845), partly as for type; Nomencl. Bot. 2 edn, 2: 355 (1841), partly.

Candollea enervia (DC.) Druce, Rep. Bot. Exch. Club Brit. Isles 1916: 612 (1917), partly, excl. synonymy.

Hibbertia enervia (DC.) Hoogl., Kew Bull. 29: 156 (1974), partly, excl. synonymy.

Type: "New Holland Gov. King" (holo.: G).

H. procumbens (Labill.) DC. -- β . *pilosa* Hook.f., J. Bot. (Hook.) 2: 403 (1840).

Type: Tasmania, Rocky Cape, *Gunn 776* (holo.: K, n.v.).

Notes

Although variable in size, shape and hairiness of its various organs *H. procumbens* is easily identified by its decumbent to procumbent habit and 3-5 glabrous pistils. Even the length of the anthers varies considerably particularly in central- to south-western Victoria, where they often hardly shrink after dehiscence so that they are up to 2.2 mm long, while in Tasmania they are rarely more than 1 mm long on dried specimens. It seems therefore most likely that the type specimens discussed above was obtained from Tasmania.

Since Labillardiere apparently described the species on all his material, determined no holotype and distributed specimens later, a lectotype was here selected.

H. hemignosta (Steud. in Lehm.) J.R. Wheeler, *comb. nov.*

Pleurandra hemignosta Steud. in Lehm., Pl. Preiss. 1: 265 (1845), **basionym**.

Type: South Western Australia: *Preiss 2172* (holo.: LD; iso.: MEL).

Pleurandra enervia auct. non DC.: Steud. in Lehm., Pl. Preiss. 1: 264 (1845).

Candollea teretifolia auct. non Turcz.: Benth., Fl. Austral. 1: 43 (1863), partly, as for reference.

Hibbertia teretifolia (Turcz.) F. Muell., Fragm. 11: 95 (1880), partly; Diels & E. Pritz., Bot. Jahrb. 35: 386, 637 (1904), partly; Ostenf., Kgl. Dansk. Vid. Selsk. Biol. Medd. 3(2): 89, pl. Xb (1921), partly; Blackall & B.J. Grieve, W. Austral. Wildfl. 2: 382 (1956), partly; B.J. Grieve, W. Austral. Wildfl. edn 2, 2: 52 (1998), partly.

Candollea enervia auct. non DC. Druce: Druce, Rep. Bot. Exch. Club Brit. Isles 1916: 612 (1917), partly, as for references.

Hibbertia enervia auct. non DC. Hoogl.: Hoogl., Kew Bull. 29: 156 (1974), partly, as for references; C.A. Gardner ex Beard, W. Austr. Pl. 67 (1965); Beard, W. Austral. Pl. 2edn; 87 (1970); J.R. Wheeler in N.G. Marchant et al., Fl. Perth Region 1: 122 (1987).

H. hibbertioides (Steud. in Lehm.) J.R. Wheeler, *comb. nov.*

Pleurandra hibbertioides Steud. in Lehm., Pl. Preiss. 1: 265 (1845), **basionym.**

Type: Mt Bakewell (York), *Preiss 2164* (holo.: LD; iso.: MEL).

Candollea teretifolia Turcz., Bull. Soc. Natural. Moscou 22(2): 6 (1849); Benth., Fl. Austral. 1: 43 (1863).

Type: Western Australia, *J. Drummond 4, 124* (holo.: KW; iso.: PERTH, MEL).

Hibbertia teretifolia (Turcz.) F. Muell., *Fragm.* 4: 117 (1864); *Fragm.* 11: 95 (1880); *Syst. Cens.* 1: 2 (1882); *Second Syst. Cens.* 1: 2 (1889); *Gilg, Nat. Pflanzenfam.* 3, 6: 118 (1893); *Diels & E. Pritz., Bot. Jahrb.* 35: 386, 637 (1904); *Ostenf., Kgl. Dansk. Vid. Selsk. Biol. Medd.* 3(2): 89, pl. Xb (1921); *Gilg & Werderm., Nat. Pflanzenfam.* 2dn, 21: 28 (1925); *C.A. Gardner, Enum. Pl. Austral. Occ.* 83 (1931); *Blackall & B.J. Grieve, W. Austral. Wildfl.* 2: 382 (1956).

Candollea enervia auct. non (DC.) Druce: Druce, *Rep. Bot. Exch. Club Brit. Isles* 1916: 612 (1917), partly, as for references.

Hibbertia enervia auctt. non (DC.) Hoogl.: Hoogl., *Kew Bull.* 29: 156 (1974), partly, as for references; *C.A. Gardner ex Beard, W. Austral. Pl.* 67 (1965); *Beard, W. Austral. Pl.* 2edn; 87 (1970); *J.R. Wheeler in N.G. Marchant et al., Fl. Perth Region* 1: 122 (1987).

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**ACACIA SIMMONSIANA (LEGUMINOSAE:
MIMOSOIDEAE: SECT. PHYLLODINEAE), A NEW SPECIES
FROM SOUTH-EASTERN AUSTRALIA**

M.C. O'Leary^a and B.R. Maslin^b

^aState Herbarium of South Australia, Plant Biodiversity Centre,
PO Box 2732, Kent Town, South Australia 5071.

Email: OLeary.Martin@saugov.sa.gov.au (Corresponding author)

^bWestern Australian Herbarium, Department of Conservation
and Land Management, Locked Bag 104, Bentley Delivery Centre,
Western Australia 6983.

Email: brucecm@calm.wa.gov.au

Abstract

A new species of *Acacia*, *A. simmonsiana*, is described and illustrated. It has a discontinuous distribution in south-eastern Australia where it extends from Kangaroo Island in South Australia to far northwest Victoria and south-central New South Wales. Until now *A. simmonsiana* had been treated as a variant of *A. halliana*, to which it is most closely related.

Introduction

The new species described here as *A. simmonsiana* was treated as a variant of *A. halliana* by Maslin (1987) and this is how it is presented in the *Flora of Australia* treatment of *Acacia* (Maslin 2001). However, recent field studies and a re-examination of herbarium collections indicate that formal species rank is appropriate for this taxon. It was included, as *A. simmonsiana*, in the recently published electronic interactive key, *WATTLE Acacias of Australia* (Maslin 2001a).

Although both *A. simmonsiana* and *A. halliana* have in the past been confounded with *A. microcarpa* neither is especially closely related to that species (see Maslin 1987 for discussion). However, because of this confusion *A. simmonsiana* occasionally appeared in publications under the name of *A. microcarpa*, for example, the illustration on the front cover and on page 80 (fig. 106) of Jackson (1988).

Judging from a note attached to herb. AD sheet 98583264 it is apparent that E.H. Ising recognized both narrow and broad phyllode entities within what was then known as *A. microcarpa*. The narrow phyllode entity is *A. simmonsiana* (see AD 98583264) and the broad one is most likely to be *A. halliana*.

Taxonomy

Acacia simmonsiana O'Leary and Maslin, *sp. nov.* Fig. 1.

Acacia iteaphylla var. *latifolia* F. Muell., *J. Proc. Linn. Soc., Bot.* 3: 125 (1859), *pro parte*, not as to lectotype, as to Murray R., near Wellington, 1 May 1849, *Wuerth s. n.* – *vide* B.R. Maslin, *Nuytsia* 12: 353 (1999).

Ab *A. halliana* ramulis glabris, phyllodiis parvioribus incurvatis plerumque oblanceolatis (12-) 14–45 (-72) mm longis, (2-) 3–9 (-15) mm latis, capitulis parvioribus quoque (16-) 20–34 (-36) floribus, leguminibus uniformiter curvatis non (vel leviter) constrictis inter semena differt.

Typus: South Australia, Murray Region, 3.5 km by road S of Monarto South, 19 Sept. 1985, B.R. Maslin 5977; holo: PERTH; iso: AD, K, NSW.



del: dasRorSt 2000

Fig. 1. *A. simmonsiana*. (A composite from AD 99129461 & MO'L 1295; B from MO'L 1295 (left hand phyllode), AD 97046124 (second from left), AD 99129461 (third from left), AD 99129459 (second from right) and AD 99129460 (right hand phyllode); C from AD 97046124; D – K from AD 99129461; L - Q from AD 966061159.) A, habit; B, phyllodes showing range of variation; C, gland (plane view); D, stem (with most phyllodes removed) showing stipules; E, stipules; F, inflorescence; G, flower bud showing free sepals; H, flower

Bushy, spreading *shrub*, commonly domed and procumbent, to 2m high and to 4m diam. *Branchlets* reddish, prominently angular at first but soon terete, finely ribbed, glabrous. *Bark* smooth, grey. *New shoots* glabrous. *Stipules* linear – triangular, 2–4 (-5) mm long, 0.5–1mm wide at base, brittle, reddish green to grey-green, often not drying black as in *A. halliana*, usually completely deciduous or reduced (0.5–1mm long) on N.S.W. specimens. *Phyllodes* oblanceolate, sometimes interspersed with a few that are narrowly elliptic, (12-) 14–45 (-72) mm long, (2-) 3–9 (-15) mm wide, l:w = 4–10 (-16), commonly variable in size range on a single branch, ascending to erect, straight or more usually shallowly incurved, slightly fleshy when fresh, often wrinkling when dry, becoming coriaceous, glabrous, grey-green to green, *midrib* more or less central; *lateral nerves* absent to faint, though more distinct than in *A. halliana*; *marginal nerves* narrow and yellow to light brown; *apices* narrowed to a small, straight to hooked, innocuous to coarsely pungent mucro; *gland* normally single on upper margin of phyllode (2-) 5–16 (-20) mm above pulvinus, rarely 2 or absent, lamina occasionally slightly kinked at the gland. *Inflorescences* simple and commonly 2 per axil or rudimentary racemes (1- or 2-headed) with axes to 1 mm long; *peduncles* (2-) 4–10 mm long, glabrous, yellowish or black when dry; *heads* globular, 8 mm diam. (when fresh, drying 4–5 mm diam.), (16-) 20–34 (-36) flowered, light- to mid-golden. *Flowers* 5-merous; *sepals* free, 1/3–1/2 petal length, oblong-oblanceolate to spatulate, with silver-golden hairs; *petals* glabrous. Ovary glabrous to subglabrous. Legumes ± terete, not or scarcely constricted between the seeds, to 70 mm long, 2.5–4 mm wide, firmly chartaceous to thinly crustaceous, strongly curved, black, with scattered short appressed hairs. *Seeds* longitudinal in pods, oblong-elliptic, 3–4 mm long, dull, dark brown; pleurogram U-shaped; *aril* terminal, conical, creamy white.

Selected specimens examined

SOUTH AUSTRALIA: Kangaroo Island, about 1 km S of top of Macgillivray Hill, *G.Jackson 1457* (AD); Hundred Line Road, Kangaroo Island, *M.C.O'Leary 2371* (AD, PERTH); Nurragi Reserve, Nurragi, *R.Grund AD119291*; Goolwa, 14.xii.1940, *J.B.Cleland AD 97427361*, MEL 1500364 – mounted on holotype sheet of *A. × grayana*); Finniss Railway Station, 19.xii.1964, *J.B.Cleland AD 966061159*; Monarto South, about 3 km south of railway crossing on road to Chauncey's line, *H.Eichler 15106* (AD, CANB, MEL); Lower Murray River on Lake Alexandrina, ca. 15 km to Milang, *N.Gemmell 159* (AD); Monarto South, *E.H.Ising AD98583264*, 28.viii.1919; Monarto South, *E.H.Ising AD96221104*, 4.ix.1959 (K, L, B, BM, UC, P, USSR, IA); Princes Hwy, 3 km E of Monarto Sth Rd, *M.C.O'Leary 3289* (AD); Kangaroo Rd, 4 km S of Ferries McDonald Cons. Park, *M.C.O'Leary 3290* (AD); Finniss to Milang Road, *M.C.O'Leary 1295* (AD); Finniss to Milang Road, *D.E.Murfet 147* (AD); Finniss to Milang Road, *D.Hunt 2665* (AD); Pinehill North Road, 12 km N of Wolseley, *D.E.Murfet 3749* (AD); about 10 km N of Wolseley, *K.M.Alcock 115* (AD).

NEW SOUTH WALES: 4.8 km NE of West Wyalong, *R.Coveny 2376* (NSW, PERTH); West Wyalong to Temora Road, 0.5 km S of Mid-Western Highway, *M.C.O'Leary 3333* (AD); Merringreen and other stations in the Lachlan District, *T.Duff MEL 616110*, 674568; Kikoira – Weethalla road, 20.ix.1956, *C.K.Ingram NSW 121887*.

at anthesis; I, sepals showing shape range; J, anthers; K, gynoeceium; L, pods (± terete, curved and black) inserted on receptacle; M, pod showing longitudinal seeds; N, seed showing terminal, conical aril and slender funicle; O, seed in plain view showing pleurogram (left) and side view (right); P, seed (transverse section); Q, seed (longitudinal section) showing embryo beneath aril, plane view (left) and side view (right). A & D ×1; B ×1/2; C ×18; E ×8; F ×7; G & H ×27; I, J & K ×56; L ×2; M ×6; N-Q ×9.

VICTORIA: 8 m. [13 km] S of Red Bluff, *R.V. Smith MEL 672784 (B.J. Conn no. 59/220)*; Little Desert, ix.1930, *H.B. Williamson MEL 616109*.

Distribution

Discontinuous in south-eastern Australia where it extends from South Australia (recorded from Kangaroo Island – rare, Southern Lofty and lower Murray Regions – locally common on some roadsides between Monarto South and Goolwa, and in the South East Region – uncommon in the Bordertown area) eastwards to far western Victoria (the Little and Big Deserts) and south-central New South Wales (near West Wyalong). The species distribution is mapped by Maslin (1987, Fig. 1) but the Eyre Peninsula locality shown there is now considered erroneous.

Habitat

Occurs in mallee and peppermint box woodland communities, with an annual rainfall of 350–500 mm. Appears to favour seasonally wet, shallow depressions in undulating country, on red-brown loam over limestone or ironstone. Associated species include *Eucalyptus odorata*, *E. gracilis*, *E. behriana*, *E. calycogona*, *E. phenax*, *E. cneorifolia*, *Acacia sclerophylla* var. *sclerophylla*, *A. microcarpa*, *A. brachybotrya* (appressed hair variant), *A. pinguifolia*, *A. rhetinocarpa*, *A. euthycarpa*, *Callistemon rugulosus*, *Melaleuca lanceolata* and *M. wilsonii*.

Conservation status

More fieldwork is needed to properly assess the conservation status of *A. simmonsiana*. Much of its natural habitat has been cleared for farming, which has contributed to the fragmented distribution pattern and small population sizes that are observed today; many of the remaining populations appear to be confined to roadverges. Using the criteria of Briggs & Leigh (1995), a code of 3RCa is recommended for *A. simmonsiana*.

Herbarium records suggest that *A. simmonsiana* is poorly conserved in South Australia. The only population known from Kangaroo Island is considered endangered; it comprises about 25 plants which are restricted to a small area of roadside vegetation. Populations from the Goolwa to Monarto South area are restricted to remnant roadside vegetation, with the species being conserved in the Nurragi Conservation Reserve, between Sandergrrove and Milang. Populations in the Bordertown area are reported as being scattered, though not common, and have been recorded on Heritage Agreement HA 953. Collections from the Big and Little Desert Conservation Parks in western Victoria may be of significance, in being some of the few areas in which this species occurs within a large intact area of natural vegetation, however, populations in these parks require assessment. The conservation status of plants from New South Wales (near West Wyalong) also require further assessment, as only several plants were observed growing on roadsides with *Eucalyptus behriana* during a recent visit to the area.

Flowering and fruiting period

Flowering has been recorded from August to October, peaking in September. Legumes with mature seeds have been collected in December. Dehisced legumes commonly persist on plants.

Affinities

Acacia simmonsiana is closely related to *A. halliana* which differs most obviously in having branchlets hairy (rarely glabrous) with an indumentum of fine, silvery, appressed hairs, new shoots densely clothed with pale yellow, appressed hairs, phyllodes straight to shallowly recurved, rarely oblanceolate, and generally larger (3–7 cm long and 4–15 mm wide), heads larger (35–55-flowered and c. 6 mm diam. when dry) and pods clearly constricted between the seeds and usually loosely and irregularly twisted. Other, relatively minor, differences between *A. simmonsiana* and *A. halliana* are given in Maslin (1987: 38–39). Habitat differences also exist between the two species: *A. simmonsiana* has a more southerly distribution (see Fig. 1 in Maslin 1987) and occurs in woodland / mallee communities with a 350–500 mm annual rainfall; favouring low depressions which become seasonally waterlogged. *Acacia halliana* on the other hand occurs in drier mallee communities with a 200–450 mm annual rainfall, and has no preference for seasonally waterlogged sites. Although the two species are not known to be sympatric they do occur within about 20 kilometers of one another in the Monarto area, near Murray Bridge, South Australia.

Acacia simmonsiana also appears to have affinities with the Western Australian endemic, *A. mutabilis* Maslin. Taxonomically important characters shared by these two species include their 1-nerved phyllodes, rudimentary racemose inflorescences, \pm terete, black pods and seeds with terminal, conical, creamy white arils. *Acacia mutabilis* subsp. *incurva* has incurved phyllodes, similar to those found on *A. simmonsiana*, however, the subspecies is recognised by its gland being located closer to the pulvinus and its generally shorter peduncles. As implied by its epithet *A. mutabilis* is a variable taxon and despite the treatment by Maslin (1999) further work is needed to better understand the nature of this variation (after which the relationship between this species and *A. simmonsiana* could be re-assessed).

Acacia simmonsiana superficially resembles *A. \times grayana* J.H.Willis which is distinguished by its hairy new shoots and peduncles, caducous stipules, linear phyllodes, broader pods (c. 6 mm wide) that are linear and straight, and funicle that is folded along one side of the seed. As noted by Maslin (1987) when Willis (1957) described *A. \times grayana* he contrasted his new species with *A. microcarpa*. The two specimens (both ex herb. J.M.Black) thought by Willis to be *A. microcarpa* are mounted with the holotype of *A. \times grayana* at MEL, however, neither is *A. microcarpa*. The flowering specimen from Mannum is *A. euthycarpa* (J.M.Black) J.M.Black (this species has recently been segregated from *A. calamifolia* Lindl.) while the fruiting specimen from Goolwa is *A. simmonsiana*.

Biology

Recorded as being a food plant for the blue-spotted lineblue butterfly, *Nacaduba biocellata* (R.Grund, pers. comm.).

Etymology

It is with much pleasure that we have the opportunity of naming this new species in honour of Marion and John Simmons. The Simmons have contributed significantly to promoting Australian acacias and to advancing our knowledge of this genus over the past two decades, Marion through her writing and illustrations and John through his photographs (see Simmons 1981, 1987 and 1988). Marion was the Leader of the Acacia Study Group for the Society for Growing Australian Plants (now known as the Australian Plant Society), from September 1978 until July 1991. She also most generously made

available around 450 of her fine line drawings for use in the WATTLE project (see Maslin 2001a).

Acknowledgements

Gilbert Dashorst is thanked for preparing the comprehensive plate of illustration of this new species. Dr Hellmut Toelken is gratefully acknowledged for providing the Latin description. Rosemary Taplin, Denzil Murfet and Tim Croft are thanked for their knowledgeable field information, and Dr Peter Lang is thanked for information relating to Biological Survey records, and Heritage agreement sites.

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a 202915

**ACACIA SPOONERI (LEGUMINOSAE: MIMOSOIDEAE:
SECT. PHYLLODINEAE), A NEW SPECIES FROM THE
FLINDERS RANGES, SOUTH AUSTRALIA**

M.C. O'Leary

State Herbarium of South Australia, Plant Biodiversity Centre,
PO Box 2732, Kent Town, South Australia 5071.
Email: Oleary.Martin@saugov.sa.gov.au

Abstract

A new species, *Acacia spooneri*, is described and illustrated. It occurs in three isolated populations in the central and southern Flinders Ranges, South Australia. Until now *A. spooneri* has been treated as a variant of *A. watsiana*, to which it is closely related, together with *A. quornensis*.

Introduction

The new species described here as *A. spooneri* was noted as a variant of *A. watsiana* by Jessop & Toelken (1986) and Whibley & Symon (1992). It was included, as *A. watsiana* 'Nectar Brook Variant', in the recently published electronic interactive key, *WATTLE Acacias of Australia* (Maslin 2001), and was informally treated in the *Flora of Australia*, 11A (p.267) (Maslin 2001a). It was also listed as *Acacia* 'Nectar Brook', in the 'Natural History of the Flinders Ranges', Gell & Bickford (1996). However, recent field studies and a re-examination of herbarium collections indicate that formal species rank is appropriate for this taxon.

Taxonomy

Acacia spooneri O'Leary, *sp. nov.* Fig. 1.

A. watsiana *auctt. non* F. Muell. ex Benth.: Whibley in Jessop & Toelken (eds), Fl. S. Austr. 2 :567(1986); Whibley & Symon, *Acacias* S. Austr. :148 (1992).

Acacia 'Nectar Brook' Gell & Bickford in Davies et al., *Nat. Hist. Flinders Ranges* :101 (1996).

Ab *A. watsiana* et *A. quornensi* habitu arborum erectarum arancosarum, phyllodiis majoribus ellipticis ad obovatis plerumque glandibus duabus, axibus racemi longioribus 30–75 mm longis, stipitibus basalibus ad florem primum 10–35 longum, inflorescentiis 20–40 floribus, et florescentiis et frutescentiis longioribus differt.

Typus: South Australia, Winninowie Range, Nectar Brook, ridge top above tanks 14 May 1997, M.C. O'Leary 3308; holo.: AD; iso.: K, NSW, PERTH.

Erect, slender *shrub* or *tree* to 4 m tall, with a spindly, open habit. *Branchlets* reddish brown, prominently angular at first but soon terete, finely ribbed, glabrous. *Bark* smooth, grey. *Phyllodes* narrowly elliptic to oblanceolate or obovate, (22-) 25–70 (-102) mm long, 6–22 (-26) mm wide, commonly variable in size range on a single branch, ascending, straight, rarely shallowly incurved, coriaceous to thinly coriaceous, glabrous, pale-green to glaucous, *midrib* central to slightly excentric, prominent together with *marginal nerves*, pale yellow-green, *lateral nerves* clearly visible and more prominent than in *A. watsiana* and *A. quornensis*; *apices* variable, obtuse to acute, with small and innocuous to coarsely pungent mucro, straight to uncinatate, occasionally obliquely mucronulate; *glands* 1 or along upper margin of phyllode, lowermost gland 0–18 mm above the pulvinus. *Inflorescences* racemose, *raceme axes* 30–75 (-110) mm long, flattened and glabrous, length between raceme base and first flower 10–35 mm; *peduncles* 3–13 mm long, slender, glabrous; *heads* globular, 8–9 mm diam. when fresh, 5–6 mm diam. when dry, 20–40 flowered, light to mid

golden. *Flowers* 5-merous; sepals united to near their apices, $1/3$ – $2/3$ petal length, glabrous; *petals* 0.8–1 mm long, united for c. $2/3$ their length, glabrous, or with minute hairs at apex and along margins; *ovary* variably clothed with short white hairs. *Legumes* broadly linear to narrowly oblong, to 80 mm long, (4-) 5–8 (-9) mm wide, firmly chartaceous to thinly coriaceous, light brown-grey to glaucous, with scattered semi-appressed hairs that are denser along margins and at base. *Seeds* longitudinal, oblong to elliptic, 4–5 mm long, dark brown-black with a satin sheen; *funicle* encircling seed in a double fold, brittle, glossy dark red-black; *aril* clavate.



Fig. 1. *A. spooneri* (A, from M.C.O'Leary 2691; B, MO'L 2676 & 2691; C, MO'L 3308 ; D & E, MO'L 2691). A, habit, showing typical phyllode variation along branch; B, phyllodes showing range of variation; C, inflorescence and phyllode showing slender peduncle and raceme; D, pod with two windows showing scattered hairs; E, pod with longitudinal seed, showing encircling funicle. A, $\times 5$; B, $\times 1$; C, $\times 1$; D, $\times 1$; E, $\times 4$.

Selected specimens examined

SOUTH AUSTRALIA: Flinders Ranges: near The Guardians, Brachina Gorge. *E.N.S.Jackson 165* (AD); The Guardian, elev. 630 m, *B.Lay 1830* (AD); The Guardian, Brachina Gorge, *M.C. O'Leary 2676* (pop.coll.) (AD); Wilpena Pound Range, western tributary of Edeowie Creek, upstream from Kanalla Falls, *L.Haegi 2765* (BRI, CORD, RSA). **Eyre Peninsula:** ESE of the old Cudnia H.S., Nectar Brook, *T.Hall 262* (AD); Winninowie Range, *A.G.Spooner & G.L.Howie 9179* (AD); Winninowie Range, *A.G.Spooner 9181* (AD); rocky range S of Nectar Brook Reservoir, *P.Copley 412* (AD); Nectar Brook Range, *M.C.O'Leary 2691* (AD); Nectar Brook Range, above the Winninowie tanks, *M.C.O'Leary 3308* (pop.coll.) (AD, K, NSW, PERTH); Nectar Brook Range, *M.C.O'Leary 2691* (pop.coll.) (AD); hills, eastern part of Nectar Brook Range, *A.G.Spooner 11114* (AD).

Distribution

Known from two disjunct areas 150 km apart in the Flinders Ranges, South Australia. Two northern populations occur near the summit of The Guardian, at Brachina Gorge, and 18 km south, on the north-western slopes of Wilpena Pound. A southern population occurs at Nectar Brook on the Winninowie Range, SE of Port Augusta.

Habitat

Occurs on rocky ridgetops, in *Callitris* pine and mallee communities over *Triodia* grassland, with an annual rainfall of 300–400mm. Associated species in the northern populations include; *Callitris glaucophylla*, *Xanthorrhoea quadrangulata*, *Eucalyptus porosa*, *E. flindersii*, *E. aff. odorata*, *E. intertexta*, *Acacia havilandiorum*, *A. continua*, *Calytrix tetragona*, *Callistemon teretifolius*, *Spyridium phlebophyllum*, *Cassinia uncata*, *Olearia ramulosa* and *Triodia sp.*. Associated species in the southern population include; *Eucalyptus porosa*, *Xanthorrhoea quadrangulata*, *Acacia pycnantha*, *A. continua*, *A. calamifolia*, *Olearia ramulosa*, *Olearia decurrens*, *Templetonia aculeata*, *Callistemon teretifolius*, *Calytrix tetragona*, *Pommaderris paniculosa subsp. paniculosa*, *Cassinia laevi*, and *Triodia scariosa*.

Conservation status

The northern population around The Guardian comprised 20–40 mature plants in 1995 (in a 1km area), while the population 18 km south on the slopes of Wilpena Pound is of a similar size. (L.Haegi, pers.comm.). These two populations occur within the Flinders Ranges National Park. Similar habitat occurs along the Heysen Range between these two locations, and it is likely that more populations occur in this area. The southern population on the Winninowie Range numbers several hundred plants and occurs over a 5km area. The land tenure at this location is Crown Lease Perpetual. In following the criteria set down by Briggs and Leigh (1996), a code of 3RCi is recommended for this species.

Browsing by goats appears to be a significant threat to the populations of *A. spooneri*. While the Yellow Footed Rock Wallaby, (*Petrogale xanthopus*) and Euro, (*Macropus robustus*) occur in these areas, and are likely browsers of this species, damage from goats was noted at the population at The Guardian. This was evident by high broken branches in trees, and the presence of only two plants below 1m high in the area. The southern population at the Winninowie Range was in healthy condition when visited in 1997, with no obvious damage from browsers. Part of this population was burnt in the early 1990s, with a subsequent proliferation in the number of young plants. It is recommended that the

future long-term health of *A. spooneri* populations would require the monitoring and control of goat numbers. Furthermore, a study of the importance of fire for population recruitment and stability would be beneficial.

Flowering and fruiting period

Flowering and fruiting within *A. spooneri* appears to be related to seasonal climatic variations, perhaps to the timing and intensity of rainfall events. It is recorded as flowering throughout the year including the months of February, May, June, August, October and November, but peak flowering appears to occur between May and August. Legumes containing mature seed have been collected in November, December, and May; the peak fruiting period is in November and December.

Affinities

A. spooneri is a member of the 'microbotrya' group, Maslin (2001) and appears most closely related to *A. watsiana*, and *A. quornensis*. Indeed, as noted in the Introduction above, this new species has in the past commonly been referred to as a variant of *A. watsiana*, however the latter species is readily distinguished from *A. spooneri* in having a bushy, multi-branched habit, less variable oblanceolate to obovate phyllodes with less distinct venation and a central mucro, smaller flower heads 12–20 flowered, on raceme axes 10–25mm long, with 3–11 mm between the raceme base and the first flower. Habitat differences also exist between the two species, *A. spooneri* occurs on rocky ridges over *Triodia* grass with an annual rainfall of 300–400mm, while *A. watsiana* occurs on more fertile loams with woodland species and an annual rainfall of 450–600mm. *A. quornensis* is distinguished from *A. spooneri* by its bushy, multi-branched habit, less variable narrowly elliptic to oblanceolate phyllodes with less distinct venation and consistent uncinat tip, flower heads 8–15 flowered, on raceme axes 10–25 mm long, and 3–11 mm between the raceme base and the first flower. Habitat differences are less pronounced between *A. spooneri* and *A. quornensis*, though the latter species favours lower hill slopes in denser vegetation.

Based on field observations at the Winninowie Range it appears as though *A. spooneri* hybridises with *A. calamifolia*, another member of the *A. microbotrya* group. Both parents occur in the same population as the putative hybrid, which is present as scattered individuals in the population of *A. spooneri*. These hybrids have an open shrubby habit with linear-lanceolate phyllodes that superficially resemble *A. rivalis* or wide phyllode forms of *A. euthycarpa*, and intermediate legumes which are sub-moniliform (M.C.O'Leary, 2685 AD; A.G.Spooner, 8952 AD).

Biology

Seed with funicles and arils removed have been observed deposited around ant holes (together with *Triodia* husks) at the Winninowie Range population. An ant collected beside these holes was identified as a *Calomyrmex* sp. by South Australian Museum staff.

Etymology

Named in honour of the late Dr. Tony Spooner. Tony has made significant contributions to the knowledge of the South Australian flora through his innumerable collections (some 16000 lodged in the Herbarium), publications and enthusiasm. He was a life long member of the Botany Club in the Field Naturalists Society of South Australia, Kraehenbuehl

(1999). Tony had a particular interest in this species, and gave much encouragement for its publication.

Notes

Known locally in the Nectar Brook area as spear wood Graham Herde recalled being told by his father that the stems of this wattle were collected and traded as spears by the local Nukunu people. (G. Herde, pers. comm)

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a 202916

**ACACIA TOONDULYA (LEGUMINOSAE: MIMOSOIDEAE:
SECT. PHYLLODINEAE), A NEW SPECIES FROM EYRE
PENINSULA, SOUTH AUSTRALIA**

M.C. O'Leary

State Herbarium of South Australia, Plant Biodiversity Centre
PO Box 2732, Kent Town, South Australia 5071
Email: O'Leary.Martin@saugov.sa.gov.au

Abstract

A new species, *Acacia toondulya*, is described and illustrated. It has a restricted distribution in the western Gawler Ranges, Eyre Peninsula, South Australia and is most closely related to *A. notabilis*.

Introduction

The taxon described here as *A. toondulya* was first collected in 1969, and again in 1972. These specimens were identified as *A. beckleri* and *A. notabilis* due to their large phyllodes and flowers, or pods with transverse seed. A specimen collected from Toondulya Bluff in 1981 with a distinct pruinose coating on its branchlets and racemes (but in young bud) at first remained undetermined for some time and then finally identified as *A. cretacea*. At this time a study of the biology of *A. cretacea* was being conducted by the Conservation Biology Unit at the Black Hill Flora Park, and with earlier reports of populations of *A. cretacea* occurring in the Gawler Ranges a visit was made to Toondulya Bluff. The resulting collections made with inflorescences containing 80 flowers per head, pods with transverse seed, and photos showing a slender, erect habit, indicated all the previous determinations to be incorrect. This relatively inaccessible and poorly collected area was then visited by the author, where population collections and field studies have shown this taxon to be worthy of formal species ranking. *Acacia toondulya* was not included in the recently published Flora of Australia treatment of *Acacia* (Maslin 2001a) but it was included (as an informal name) in the electronic companion to the Flora, namely, *WATTLE Acacias of Australia* (Maslin 2001).

Taxonomy

***Acacia toondulya* O'Leary, sp. nov. Fig. 1.**

Ab *A. notabili* et speciebus aliis combinatione sequenti characterum differt: arbores parvae habitu erecto araneoso, ramuli juniores perpruinosi, inflorescentiae majores 55–105 floribus et 8–10 mm diametro, phyllodia magna siccantia palide virido-lutea, et legumina semenibus transversaliterdispositis.

Typus: South Australia, Eyre Peninsula Region, Kondoolka Station, 2 km W of Toondulya Bluff summit, 10 July 2000, M.C. O'Leary 3382; holo: AD; iso: K, NSW, PERTH.

Erect, slender *tree* to 4 metres. *Branchlets* angled at extremities but soon terete, glabrous, pruinose when young (aging dark red-brown). *New shoots* pruinose. *Bark* smooth, grey. *Phyllodes* narrow to broadly elliptic to narrowly oblong, (50-) 55–110 (-120) mm long, (8-) 10–25 (-39) mm wide, straight, coriaceous, green to sub-glaucous, often drying light yellow-green, *midrib* central to slightly excentric, *marginal nerves* prominent, thick, often drying yellow-green, *lateral nerves* visible but not prominent, *apices* obtuse to sub-acute or emarginate, mucro innocuous to coarsely pungent; *glands* 1 rarely 2 along upper margin of phyllode, lowermost gland 0–1 mm above pulvinus, second gland midway along phyllode. *Inflorescences* racemose, occasionally paniculate on terminal branchlets, the axes 40–60

mm long, stout, pruinose, and glabrous; *peduncles* 4–6 mm long, pruinose, and glabrous; *heads* globular, to obovoid or ellipsoid, 8–11 mm diam. when fresh, 5–7 mm diam. when dry, (50-) 55–105 (-110) flowered, deep yellow-golden. *Flowers* 5-merous; *sepals* 1/3 petal length, fused for at least 3/4 their length, slightly thickened at apex, with scattered white hairs concentrated at the apex; *petals* free to base, slightly thickened at apex, glabrous, or with minute hairs lining the apex. *Ovary* glabrous, pruinose. *Legumes* narrowly oblong, straight to slightly curved, to 80 mm long, (9-) 10–12 (-13) mm wide, raised over seeds alternately on each side, firmly chartaceous to thinly coriaceous, glabrous, dark brown, lightly pruinose. *Seeds* transverse, oblong-elliptic, 4–7 mm long, dark brown-black; funicle 1/2–3/4 encircling seed, dark red-brown; *aril* clavate.

Selected specimens examined

SOUTH AUSTRALIA: Gawler Range, 28/4/1981, *Anonymous* (AD); S of Hiltaba, 1/8/1969, *B.Copley 2735* (AD); Hiltaba Station, 10/9/1997, *M.Jusaitis* and *L.Palomka 72* (AD); Kondoolka Station, 2km W of Toondulya Bluff summit, 10/7/2000, *M.C.O'Leary 3382* (pop.coll.) (AD, K, NSW, PERTH); 1km N of Hiltaba Homestead, 28/8/1996, *A.G.Spooner 15948* (AD); 2 km N of Chinaman Well, S of Lake Acraman, 5/10/1972, *D.E.Symon 8167* (AD,B,BRI,MO,NSW).

Distribution

Extant collections show the species as occurring in a restricted area of 60 km, in the western Gawler Ranges, where it grows on Toondulya Bluff, east to the hills around Hiltaba, and south of Lake Acraman. It is also reported (S. Haigh, pers.comm.) as occurring on Waverly Hill, 14 km to the north of Toondulya Bluff. However, specimens have yet to be collected from this location.

Habitat

Occurs on low rounded hills of granite and shale in red-brown loam, in mixed open shrubland and *Triodia* grassland with an annual rainfall 200-300 mm. Associated species include *Eucalyptus gracilis*, *E. phenax*, *Acacia beckleri*, *A. continua*, *A. tarculensis*, *A. rigens* (Gawler Range variant), *A. ligulata*, *Grevillea parallelinervis*, *Stenanthemum leucophractum*, *Eremophila alternifolia*, *Senna artemisioides* subsp. *artemisioides*, *Eriostemon linearis*, *Cryptandra amara* var. *floribunda*, *Anthocercis anisantha* subsp. *collina* and *Triodia irritans*.

Conservation status

More fieldwork is needed to properly assess the conservation status of *A. toondulya*, however current indications are that it is a rare species. The known populations of this species lie within the Kondoolka, Hiltaba and Yardea Pastoral Leases. It is estimated that several thousand plants occur in the Toondulya Bluff area, and these extend over a distance of 5 km. Most are mature plants, with few juveniles seen. Using the criteria of Briggs and Leigh (1996), a code of 2R is recommended for *A. toondulya*.

Field studies were conducted by the author in the Toondulya Bluff area during the year 2000. The general health of the vegetation appeared to be good, despite recent dry conditions. Several Euro's (*Macropus robustus*) were observed and Yellow Footed Rock



Fig. 1. *A. toondulya* (A-I, from M.C.O'Leary 3382). A, habit; B & C, phyllodes showing range of variation; D, inflorescence; E, flower in bud showing fused sepals; F, flower at anthesis; G, gynoecium; H, bracteole; I, pod inserted on receptacle; J, pod showing transverse seed with $\frac{1}{2}$ encircling funicle. A, $\times 5$; B, $\times 1$; C, $\times 1$; D, $\times 2$; E, $\times 8$; F, $\times 12$; G, $\times 30$; H, $\times 10$; I, $\times 25$; J, $\times 3$.

Wallabies (*Petrogale xanthopus*) were seen in the area many years ago (T. Haigh, pers.comm.), and were known to occur near Mt. Hiltaba, 10 km east in the 1980s. (Robinson, et al, 1988). These macropods would be expected to exert some browsing pressure on the new species. Perhaps of more significance, however, was the observation that some browsing by goats had occurred in the area, and it is recommended that goat numbers be monitored in the future. The relevance of fire to seedling recruitment and long term population viability is also likely to yield information relevant to the management of this rare species.

Flowering and fruiting period

Flowering specimens to hand were collected in July and judging from these it is likely that the flowering period would probably extend from June to September. Legumes with mature seed are likely to occur from November to December. However, fresh fruiting specimens are yet to be collected.

Affinities

A. toondulya is closely related to *A. notabilis*, which differs most obviously in having fewer-flowered heads (27–36 flowers), non-pruinose branchlets, phyllodes drying more grey-glaucous, and having a smaller, densely branching bushy habit. Similarities shared by these two species include coriaceous phyllodes, robust racemose inflorescences and flowers with fused sepals and free petals, a flowering period from June to September, and oblong legumes with transverse seeds.

It appears that *A. toondulya* and *A. notabilis* hybridise 10km to the north of the population on Toondulya Bluff. Putative hybrid plants have been collected by the author in a dry drainage channel beside the road into Kondoolka Station (*M.C.O'Leary 3401*, AD). The putative hybrid plants have an open shrubby habit, non-pruinose new growth, and an intermediate flower number of 45–50 flowers per head. Neither of the putative parent plants were observed in this area.

Etymology

The specific epithet, a noun in apposition, refers to the main known occurrence of this species near Toondulya Bluff and Spring.

Acknowledgements

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A TAXONOMIC REVISION OF THE GENUS *VERBENA* L. (VERBENACEAE)* IN AUSTRALIA

Ahmad Abid Munir

State Herbarium of South Australia, Plant Biodiversity Centre
PO Box 2732, Kent Town, South Australia, 5071

Abstract

A taxonomic revision of *Verbena* in Australia is presented. The following seven species are recognized: *V. aristigera*, *V. bonariensis*, *V. hispida*, *V. litoralis*, *V. officinalis*, *V. rigida* and *V. supina*. Besides the typical varieties, the following are confirmed: *V. litoralis* var. *brasiliensis*, *V. officinalis* var. *africana*, *V. officinalis* var. *gaudichaudii*, *V. officinalis* var. *macrostachya* and *V. supina* var. *erecta*. In addition *V. officinalis* var. *eremicola* (from South Australia) and *V. officinalis* var. *monticola* (from Victoria) are described as new and *V. bonariensis* var. *conglomerata* and *V. officinalis* var. *halei* are recorded from Australia for the first time. *V. officinalis* var. *africana* was reduced from the level of a subspecies, and *V. supina* f. *erecta* is upgraded to var. *erecta*. The following are reduced to synonymy: *V. africana* synonym of *V. officinalis* var. *africana*, *V. gaudichaudii* synonym of *V. officinalis* var. *gaudichaudii*, *V. incompta* synonym of *V. bonariensis* var. *bonariensis*, *V. supina* f. *petiolulata* synonym of *V. supina* var. *supina*, *V. litoralis* var. *portoricensis* synonym of *V. litoralis* var. *litoralis*, *V. isabellei* and *V. chacensis* synonym of *V. litoralis* var. *brasiliensis*. Three species names typified here are *V. hispida*, *V. rigida* and *V. scaberrima*.

Affinities and distribution are considered for the genus and each species. A key to the species and infraspecific taxa is provided, and a detailed description of each species is supplemented by a habit sketch of a flowering branch and analytical drawings of the flower.

Taxonomic history of the genus

The genus *Verbena* was described by Linnaeus (1753) with fourteen species of which eight have since been removed to other genera and one placed in synonymy (Moldenke 1971a, 1980). The Linnaean concept was too inclusive as he "included within it species with two stamens and species with four stamens, among the latter being *V. officinalis*, the historic type of the genus" (Stearn 1961). The type (lectotype) of the genus came from Mediterranean Region and is now preserved in the Clifford Herbarium at the British Museum (Nat.Hist.). The genus was placed in the class "Diandria Monogynia" where it was retained by Reichard (1778), Murray (1784), Schreber (1791), Loureiro (1790), Gmelin (1791), Persoon (1797), Willdenow (1797), Hedwig (1806), Velloso (1829) and a few others. Jussieu (1759) placed it in "Verbenae" which was accepted by Adanson (1763) and Reichenbach (1828). The latter, however, referred *Verbena* and other related genera to the Labiatae. In 1764, Gleditsch recorded it in section "Petalostemonum" and Linnaeus in the tribe "Personatae". The latter was accepted by Scopoli (1777) and Giseke (1792). Scopoli (1772) and Walter (1788) placed it in "Didinamia Gymnospermia", Rueling (1774) in "Ringentes Verticillates", de Jussieu (1789) in "Vitices", Necker (1790) in his "Coryphytorum" and Ventenat (1799) under "Pyrenaceae". Ventenat's proposed family was later accepted for the genus by Gray (1821) and Dumortier (1822). Rauschel (1797) divided the genus *Verbena* into two sections: Diandrae and Tetrandrae, with true *Verbena* species in the section Tetrandrae. In 1803, Michaux placed it in "Didynamia Angiospermia" where it was retained by Persoon (1807), Willdenow (1809), Nuttall (1818), Link (1822), Sprengel (1825) and Dietrich (1842). In 1805, Jaume Saint-Hilaire proposed the family

* The present treatment of the genus *Verbena* is the sixteenth in the series of taxonomic revisions in the family Verbenaceae in Australia. (See Munir 1982, 1984a, 1984b, 1985, 1987a, 1987b, 1989, 1990a, 1990b, 1991, 1992, 1993a, 1993b, 1995, 1996).

Verbenaceae for *Verbena* and other related genera. The family Verbenaceae was accepted for the genus by de Jussieu (1806), Robert Brown (1810), Kunth (1818, 1823), D. Don (1825), Dumortier (1829), Bartling (1830), Endlicher (1838), Bentham (1839, 1870, 1876), Mueller (1882, 1889), Bailey (1883, 1901, 1913), Lam (1919) and by the majority of other botanists.

Dumortier (1829) divided the family Verbenaceae into two tribes, Verbeneae and Viticeae. The tribe Verbeneae was accepted by Bartling (1830), Chamisso (1832), Bentham (1839, 1870, 1876), Schauer (1847), Walpers (1852), Miguel (1858), Grisebach (1862), Harvey (1868), Clarke (1885), Gray (1886), Durand (1888), Bailey (1883, 1901, 1913), King & Gamble (1909), Lemée (1843) and others. In 1838, Endlicher divided the family Verbenaceae into three tribes Lippieae, Lantaneae and Aegiphileae, with *Verbena* in the tribe Lippieae. This was accepted by Meisner (1840), Dietrich (1843) and Walpers (1845, 1847). Schauer (1847) reclassified the Verbenaceae into three tribes: Verbeneae, Viteae and Avicennieae. He subdivided the tribe Verbeneae into seven subtribes namely Spielmannieae, Monochileae, Casselieae, Verbeneae, Lantaneae, Duranteae and Petreae. Schauer (1847) also split the genus into two sections: Verbenaca and Glandularia, based chiefly on the presence or absence of glandular appendages on anther connectives. These sections were accepted by Briquet (1895) and Perry (1933). Subsequently, these sections were given subgeneric rank by Lewis & Oliver (1961) and generic rank by Small (1933), Schnack (1944, 1964), Schnack & Covas (1944, 1946) and Umber (1979), based on morphological, anatomical and cytological evidences.

In 1895, Briquet reclassified the Verbenaceae and upgraded the tribe Verbeneae to a subfamily Verbenoideae. The latter consisted of six tribes: Verbeneae ("Euverbeneae"), Lantaneae, Priveae, Monochileae, Petraeae and Citharexyleae. This classification was adopted by Dalla Torre & Harms (1904), Lam (1919), Gardner (1931), Junell (1934), Moldenke (1959, 1971), Melchior (1964), Lopez-Palacios (1977), Verdcourt (1992) and several other botanists. Briquet further subdivided the section Verbenaca into seven subsections: Pungentes, Nobiles, Pachystachyae, Junciformes, Acerosae, Verticilliflorae and Leptostachyae. These sections and subsections were adopted by Dalla Torre & Harms (1904). The majority of botanists, however, have not divided the genus into sections and subsections, but have retained it in the Verbenaceae without reference to any subfamily or a tribe. In the present revision, Briquet's (1895) classification of the Verbenaceae is followed in retaining *Verbena* in the tribe Verbeneae. The subgeneric section proposed for the genus may be useful, but not used here because too few species have been studied.

Australian history of the genus

The first Australian record of *Verbena* was made by Robert Brown (1810) during 1802-1805 from Port Jackson in New South Wales, when he recognized one species, *V. officinalis* L. Later, the existence of *Verbena* in Australia was reported by Sprengel (1825) and Schauer (1847) without citing any collections. From 1848 onwards, records of *Verbena* in Australia gradually increased with further collecting from different parts of Australia. In 1858, Mueller described one of his own collections from Peak Down Queensland, as a new species *V. macrostachya*. Hooker (1859) and Mueller (1868) each recorded *V. bonariensis* and *V. officinalis* from mainland Australia, and Woolls (1869) reported *V. bonariensis* as an introduced plant in the neighbourhood of Sydney.

In 1870 Bentham published a complete account of the Australian Verbenaceae and listed two *Verbena* species viz. *V. bonariensis* and *V. officinalis*. In the same publication, Bentham reduced *V. macrostachya* to a variety of *V. officinalis*. Later, Mueller (1875) recorded two *Verbena* species, *V. venosa* Gillies & Hook. and *V. macrostachya*. *V. venosa* is here placed under *V. rigida* Spreng. and *V. macrostachya* is recognized as a variety of *V.*

officinalis. In 1879, Bailey and Tenison-Woods recorded three *Verbena* species from Queensland: *V. bonariensis*, *V. officinalis* and *V. venosa*. In the Census of Vascular Plants of Australia, Mueller (1882, 1889) recorded only two *Verbena* species: *V. officinalis* and *V. macrostachya*. Bailey (1883, 1890) listed four *Verbena* species from Queensland namely *V. officinalis*, *V. macrostachya*, *V. bonariensis* and *V. venosa*. Subsequently, Bailey (1901, 1913) followed Bentham (1870) in accepting *V. macrostachya* as a variety of *V. officinalis*. Dixon (1906) recorded from New South Wales respectively, *V. venosa* and *V. officinalis*. In 1904, Briquet described one of Gaudichaud's collections (no. 144) from Port Jackson as var. *gaudichaudii* under *V. officinalis*. Black (1909, 1917) for the first time recorded *V. supina* L. as a naturalised species in South Australia. A few years later, Domin (1828) listed from Queensland two *Verbena* species: *V. officinalis* and *V. venosa*. In 1929, Black reported *V. tenera* Spreng. from temperate South Australia which was later found to be a misidentification of naturalised *V. aristigera* S. Moore. Subsequently, Robertson (1957) published an account of South Australian Verbenaceae and listed four *Verbena* species: *V. bonariensis*, *V. officinalis*, *V. supina* and *V. rigida*. Moldenke (1959) enumerated for Australia four *Verbena* species and a variety viz. *V. bonariensis*, *V. litoralis* Kunth, *V. officinalis*, *V. officinalis* var. *gaudichaudii* Briq. and *V. rigida*. To the above named *Verbena* taxa in Australia, Moldenke (1971) added *V. officinalis* var. *macrostachya* (F. Muell.) Benth., *V. supina* L. and *V. tenuisecta* Briq. Later, Moldenke (1973a, 1980) updated Australian *Verbena* list by including *V. supina* f. *erecta* Moldenke. This form is now upgraded to the rank of a variety.

Beadle et al. (1962) recorded five *Verbena* species from Sydney district and Blue Mountains namely *V. rigida*, *V. bonariensis*, *V. hispida* Ruiz & Pav., *V. officinalis* and *V. erinoides* Lam. The naturalised *V. hispida* in Australia was reported here for the first time. The record of *V. erinoides* Lam., however, was a misidentification of *V. aristigera* S. Moore. The first comprehensive account of Verbenaceae for the State of Victoria was published by Willis (1973), who recorded four *Verbena* species: *V. bonariensis*, *V. officinalis*, *V. rigida* and *V. supina*. In 1981, Munir recorded three *Verbena* species for Central Australia: *V. hispida*, *V. officinalis* and *V. supina*, but *V. hispida* was later found to be *V. rigida* Spreng. Jacobs & Pickard (1981) were the first to report *V. brasiliensis* Vell. from New South Wales. This taxon was previously regarded by Briquet (1904) as a variety of *V. litoralis* Kunth. In the revised new flora of South Australia, Munir (1986) recorded five *Verbena* species: *V. bonariensis*, *V. officinalis*, *V. rigida*, *V. supina* and *V. tenuisecta*. In the flora of south-eastern Queensland, Stanley (1986) also reported five *Verbena* species viz. *V. bonariensis*, *V. litoralis*, *V. officinalis*, *V. rigida* and *V. tenuisecta*. A few years later, Carolin & Tindale (1991) recorded in "Flora of the Sydney Region" seven *Verbena* species: *V. bonariensis*, *V. brasiliensis*, *V. hispida*, *V. litoralis*, *V. officinalis*, *V. rigida* and *V. tenuisecta*. Besides these seven species Conn (1992) reported *V. supina* from New South Wales. This raised the number of *Verbena* species in the State to eight. Previously, *V. supina* had been known only from South Australia and Victoria.

Pedley (1994) recorded seven *Verbena* species and a subspecies from Queensland namely *V. bonariensis*, *V. brasiliensis*, *V. litoralis*, *V. macrostachya*, *V. officinalis*, *V. officinalis* subsp. *africana* R. Fern & Verdc. *V. rigida* and *V. tenuisecta*. Pedley seems to have been the first to record *V. officinalis* subsp. *africana* from Australia. In 1995, Michael described *V. incompta* as a new species from Victoria. A year later, Michael (1997a) elevated three infraspecific taxa of *V. officinalis* to species namely *V. africana*, *V. gaudichaudii* and *V. macrostachya*. In the "Workshop Manual" of the Weed Society of New South Wales, Michael (1997b) recorded eight *Verbena* species including *V. caracasana*, *V. quadrangularis* Vell. and *V. brasiliensis*. These taxa were resurrected from synonymy or elevated from infraspecific to species level. Most of Michael's (1996, 1997a, 1997b) new,

reinstated or resurrected taxa were later accepted by Conn (1999) as valid species. In all, Conn (1999) recorded nine species from Victoria. According to the present investigation, the known *Verbena* species in Australia are only seven with thirteen infraspecific taxa.

Chromosome numbers

Chromosome counts of at least seventy *Verbena* species have been located. Almost all counts are based on material from outside Australia. According to various investigations, the basic, i.e. haploid chromosome number in the genus *Verbena* (including *Glandularia*) is 5 or 7. Lewis & Oliver (1961) state that, "the [*Verbena*] species fall into 2 basic groups of $x=5$ and $x=7$, which, without exception, correspond to their classification in the sections *Glandularia* and *Verbenaca* as anticipated on the basis of earlier cytological studies". Schnack (1944, 1964), Schnack & Coves (1944) and Ueber (1979) separated *Glandularia* from *Verbena* using cytological, morphological and anatomical features. In their opinion, "*Glandularia* has a basic [haploid] chromosome number of $x=5$ with polyploids at $4n=20$, $6n=30$, and $8n=40$. Diploids are only present in South America, where they predominate, while North America has only polyploids. In contrast, *Verbena* has a basic, said as above, chromosome number of $x=7$ with known polyploids at $3n=21$, $4n=28$, $5n=35$, $6n=42$, $8n=56$ and aneuploids $4n+1=29$, $10n+2=72$. Diploids are primarily present in North America, whereas, South America has mostly polyploids many of which are apomictic (Schnack et al., 1959)". The chromosome number of naturalised *Verbena* species in Australia has been recorded by Junell (1934), Darlington & Wylie (1955), Fedorov (1975), Moldenke (1972c, 1983) and several others. The above records indicate that the basic chromosome number of $x=7$ is found in the majority of Australian *Verbena* species. Only in *V. aristigera* the chromosome number of $x=5$ is found. The latter is the only known naturalised representative of the section or "genus" *Glandularia* in Australia.

VERBENA L.

Verbena L., Sp. Pl. 1 (1753) 18; Willd., Sp. Pl. 1 (1797) 115; J. St.-Hil., Expos. Fam. Nat. 1 (1805) 250; Schauer in A.D.C., Prod. 11 (1847) 535; Miq., Fl. Ind. Bat. 2 (1858) 908; Benth., Fl. Aust. 5 (1870) 35; Benth. in Benth. & Hook. f., Gen. Pl. 2 (1876) 1146; F.Muell., Syst. Cens. Aust. Vasc. Pl. 1 (1882) 102; F.M.Bailey, Synop. Qld Fl. (1883) 376; F.Muell., Sec. Syst. Cens. Aust. Pl. 1 Vasc. (1889) 171; Briq. in Engl. & Prantl, Pflanzenfam. 4, 3a (1895) 146; F.M.Bailey, Qld Fl. 4 (1901) 1172; F.M.Bailey, Weeds & Suspec. Pois. Pl. Qld (1906) 141; L.M.Perry, Ann. Missouri Bot. Gard. 20, No. 2 (1933) 251; Tronc., Darwiniana 3, No. 1 (1937) 53; E.L.Robertson in J.M.Black, Fl. S. Aust. Edn 2 (1957) 720; Moldenke, Résumé Verbenac. etc. (1959) 405, 470; Moldenke, Phytologia 9, No. 4 (1963) 189; *ibid.* 10, No. 2 (1964) 89; D.N.Gibson in Standl. & L.O.Williams (eds), Fl. Guatemala, Fieldiana 24, 9, No. 1 & 2 (1970) 230; Moldenke, Fifth Summary Verbenac. etc. 1 & 2 (1971) 752, 912; J.H.Willis, Handb. Pl. Vic. 2 (1973) 580; Moldenke, Ann. Missouri Bot. Gard. 60, No. 1. Fl. Panama (1973) 43; Lopez-Pal., Fl. Venezuela, Verbenac. (1977) 558; Moldenke, Phytologia Mem. 2 Sixth Summary Verbenac. etc. (1980) 574; Munir in Jessop (ed.), Fl. Centr. Aust. (1981) 295; Moldenke in Dassan & Fosberg (eds), Fl. Ceylon 4 (1983) 198; Munir in Jessop & Toelken (eds), Fl. S. Aust. 3 (1986) 1175; Stanley in Stanley & Ross (eds), Fl. S.E. Qld 2 (1986) 367; B.J.Conn in G. Harden (ed.), Fl. N.S.W. 3 (1992) 611; Verdc. in Polhill (ed.), Fl. Trop. E. Afr. Verbenac. (1992) 6; B.J.Conn in N.G.Walsh & Entwisle (eds), Fl. Vic. 4 (1999) 413.

Type: Verbena officinalis L., Sp. Pl. 1 (1753) 20, **lectotype**, chosen by Britton & A.Brown, Ill. Fl. N.U.S. Canada etc. edn 2, 3 (1913) 94! – *fide* R.C.Farr et al., Index Nom. Gen. (Pl.) Vol. 3 Peg.-Zyz. (1979) 1842; A.D.Chapman, Aust. Pl. Name Index Q-Z (1991) 2950.

Obletia Le Monn. ex Rozier, *Introd. Obs. Phys. Hist. Nat.* 1 (1771) 367 – *fide* Moldenke (1959, 1973b, 1971a, 1983), Perry (1933), Lopez-Pal. (1977).

Type: *O. verbenalacaea* Le Monn. ex Rozier, *loc. cit.* 1 (1771) 367.

Glandularia J.F.Gmel., *Syst. Veg.* 2, 2 (1791) 886, 920 – *fide* Moldenke (1959, 1971a, 1980, 1983); Lopez-Pal. (1977).

Type: *G. caroliniensis* J.F.Gmel., *loc. cit.*, (1791) 920.

Patya Neck., *Elem. Bot.* 1 (1790) 296 – *fide* Moldenke (1959, 1971a, 1983), Lopez. Pal. (1977)

Type: *non designatus*.

Billardiera Moench, *Meth. Pl.* (1794) 369 [not *Billardiera* Sm., 1793, nor Vahl, 1796] – *fide* Moldenke (1959, 1971a, 1980, 1983), Lopez-Pal. (1977).

Type: *B. explanata* Moench., *loc. cit, nom. illeg.*

Shuttleworthia Meisn., *Pl. Vasc. Gen.* 1. Tab. Diag. (1839) 290; 2 *Commentarius* (1840) 198.

Type: *non designatus*. Pfeiffer (1874) designated *Verbena diceras* Bert. as the lectotype but this apparently has not been validly published – *fide* Farr *et al.* (eds), *Index nom. Generic. III Peg-Zyz* (1797) 1611.

Uwarowia Bunge, *Bull. Sci. Acad. Imp. Sci. St. Pétersb.* 7 (1840) 278.

Type: *U. chrysanthemifolia* Bunge, *loc. cit., nom. illeg.* – *fide* Farr *et al.* (1979) 1832.

Verbenella Spach, *Hist. Nat. Veg. Phan.* 9 (1840) 237 – *fide* Moldenke (1977a, 1983).

Type: *V. chamaedryfolia* (Juss.) Spach, *loc. cit.*, based on *Verbena chamaedryfolia* Juss., species lectotypified here.

Helleranthus Small, *Fl. Southeast. U.S.* edn 1 (1903) 1011 & 1137 – *fide* Moldenke (1959, 1971a, 1980, 1983), Lopez.Pal. (1977).

Type: *H. quadrangulatus* (Heller) Small, *loc. cit.*

Junellia Moldenke, *Lilloa* 5 (1940) 392 – *fide* J.F.Macbr., *Fl. Peru. Field Mus. Nat. Hist. Bot. Ser. Vol. 13, Part 5, No. 2* (1960) 611.

Type: *non designatus*.

Annual or perennial herbs or undershrubs. *Stem* and branches procumbent, ascending or erect, more or less quadrangular, glabrous or variously pubescent. *Leaves* simple, mostly decussate-opposite, rarely whorled, dentate or variously divided or pinnatifid-pinnatisect, rarely entire. *Inflorescence*² spicate; spikes terminal, simple or branched, usually many flowered, often flat-topped and pseudo-umbellate or fasciculate-capitate, usually arranged in panicles or corymbs. *Flowers* sessile (sometimes a few flowers with short pedicels 0.5 – 1.5 mm in *V. officinalis* var. *monticola*), bracteate, solitary in axil of a bract, zygomorphic, bisexual, hypogynous. *Calyx* tubular, 5-angled, 5-ribbed, unequally 5-toothed (4-toothed & 4-angled in *V. supina*). *Corolla* funnel-shaped, or hypocrateriform; tube cylindric, straight or slightly curved, more or less villous inside; limb 5-lobed, the lobes more or less unequal, spreading, obtuse, rounded or emarginate. *Stamens* 4, didynamous, epipetalous, included, usually inserted near the middle of the corolla-tube; anthers ovate, the thecae (lobes) with or more often without appendages, dehiscing longitudinally; filaments minute or absent. *Ovary* superior, entire or 4-lobed, bicarpellary, syncarpous, 4-locular, with one ovule in each cell, attached laterally at or near the base, erect, anatropous; style short, thickened upwards, with stigma notched or usually 2-lobed,

² Defining terms to describe the parts of the inflorescence and related structures has proved difficult. Peduncle, for the purposes of this paper, is defined as the first readily distinguishable internode of a main stem below its terminal spike.

with the anterior lobe knob-shaped, papillose, the posterior one tooth-like, smooth. *Fruit* dry, a schizocarp enclosed by the persistent calyx, separating into four 1-seeded mericarps, the mericarps subcylindrical or subtrigonal with inner (commissural) faces often scabridulous, granulate or muricate, sometimes smooth as in *V. supina*. *Seeds* without endosperm.

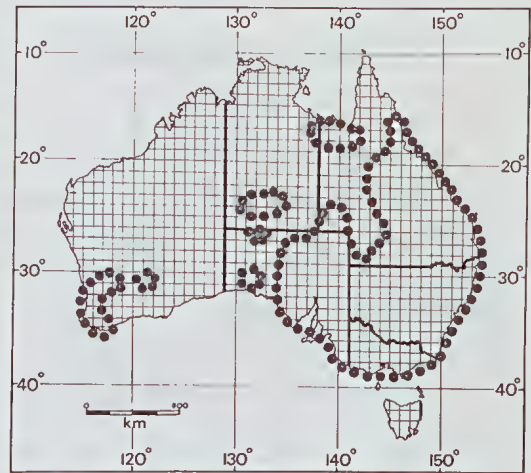
Number of species: World \pm 450 specific, infraspecific and hybrid taxa (Moldenke, 1983); Australia 7 species and 13 varieties.

Derivation of name

Derivation of the name *Verbena* is obscure. It is ancient Latin name of the common European vervain, *V. officinalis*, which appears to have been much used in religious ceremonies and also in medicine. According to L.M. Perry (1933), "the name [*Verbena*] has been handed down to us as representing certain herbs used in sacred rites by the ancients". Moldenke (1977a) reported that "Swift (1974) tells us that '*Verbena* is an ancient Latin term for ceremonial foliage rather than a name for a specific class of plants. In post-classical times the name became applied to vervain; probably in connection with medicinal uses'".

Distribution (Map 1)

The genus *Verbena* is distributed mainly in temperate, subtropical and tropical America with a few species respectively in Europe, Asia and North Africa. There are many cultivated forms and numerous natural and artificial hybrids. Of the seven *Verbena* species recognised in Australia, five were introduced from South America and two from the Mediterranean and Near East region. All of them are found on mainland Australia with the typical *V. officinalis* and its var. *africana* also in Tasmania. The following four infraspecific taxa of *V. officinalis* are endemic to mainland Australia: var. *eremicola* is restricted to the far north-eastern corner of South Australia and the far north-western corner of New South Wales, var. *gaudichaudii* is widely distributed in Queensland, New South Wales, Victoria and South Australia, var. *macrostachya* is endemic to southern Queensland and var. *monticola* occurs chiefly around Mount Buffalo in Victoria.



Map 1. Distribution of the genus *Verbena* L. in Australia

Comments

Regarding the validity of *Junellia* Moldenke and *Glandularia* J.F.Gmel. as distinct genera, Macbride (1960) states, "that *Junellia* Mold., a group name for several small alpine more or less depressed ligneous species, is correctly a part of *Verbena*, representing merely an ecological condition, see Troncoso [Darwiniana 8: 487.1949], who showed that habit varies and that anthers here may be appendaged; compare, too, *Phyla* under *Lippia*. On the other hand there may be a natural relationship within the scope of *Glandularia* as defined

by Schnack and Covas [Darwiniana 6: 469-476.1944], but since their conclusion was based on relatively few species and neither they nor apparently other students have followed up their work after more than a decade the soundness of the segregation is certainly open to question; Schauer [1847] was probably right in grouping the glandular-tipped anthered species as a section [*Glandularia*]. However, here may be recorded Schnack and Covas observations: "*Verbena* restricted to species with funnellform corollas, various tones of purple, rarely white; style at most three times longer than ovary; anther cells equal to or smaller than connective, the appendages glandular; inflorescence nearly always a terminal panicle of spikes; stem parenchyma in 4 interrupted bands; chromosomes small with basic number 7 or multiple. *Glandularia* was defined: corollas salverform, colors various; style much longer than ovary; anther cells exceeding connective, the 2 upper anthers with prominent, vestigial gland or none; inflorescence simple or branched generally once; cortical parenchyma continuous, not interrupted at the angles (below inflorescence); Chromosome large with basic number $n=5$, $yn=15$. These characters were illustrated l.c. for *V. officinalis* L. and for *G. laciniata* (L.) Schnack & Covas". In the same publication, Macbride (1960) further states that, "in other families as in the related Boraginaceae chromosome count alone may not be taxonomically conclusive. Incidentally, Schnack and Covas have merely implied transfers to *Glandularia*, as source of specific publication has not been indicated".

A few American botanists have recognised *Glandularia* as a distinct genus. It differs from *Verbena* chiefly by its stem being somewhat cylindrical; spikes flat-topped or depressed capitate at anthesis, elongating in fruit; calyx at least twice as long as mericarps and at maturity the teeth and lobes are more or less contorted; mericarps \pm prolonged at the base; anthers sometimes with a gland-like appendage on the connective; style up to 6 times longer than ovary.

In the present treatment, however, *Glandularia* is regarded as a section of the genus *Verbena* as proposed by Schauer (1847). Within Australia, therefore, sect. *Glandularia* is represented only by one naturalised species *V. aristigera* S. Moore. Moldenke (1973b) remarked that, "*Glandularia* is perhaps worthy of generic segregation", though he himself always treated it as a synonym of *Verbena*.

Stearn (1961) noted that "although Linnaeus placed his genus *Verbena* in the class *Diandria*, having two stamens, he deliberately included within it species with two stamens and species with four, among the latter being *V. officinalis*, the historic type of the genus".

According to Everist (1981), "about 5 [*Verbena*] species are naturalized in Australia. Four of them have been suspected of poisoning livestock, although positive evidence of toxicity is lacking".

The occurrence of *V. urticifolia* L. in Australia was doubtfully cited by Moldenke (1975). So far, the naturalisation of this species in Australia has not been confirmed.

Airy Shaw (1973) regarded *Burseria* Loefl. as a synonym of *Verbena* when actually it is a synonym of *Priva* Adans.

Affinities

Verbena is closely related to *Lantana*, *Lippia*, *Phyla* and *Stachytarpheta* in its flowers being arranged into a spike, solitary within each bract, without bracteoles; ovules anatropous, ascending from the base of the ovary cells. However, *Lantana*, *Lippia* and *Phyla* may easily be distinguished by their spikes being dense, usually contracted into heads; ovary 2-celled, with 1 ovule in each cell; fruit with 2 mericarps. The spikes in *Verbena* are mostly but not all elongated; ovary 4-celled, with 1 ovule in each cell; fruit composed of four 1-seeded mericarps. The elongated spike in *Stachytarpheta* has sometimes resulted in its being mistaken for *Verbena*. The former may readily be identified

by its only 2 perfect stamens, with a posterior pair of staminodes; ovary 2-locular, each locule with 1 ovule; fruit composed of 2 mericarps.

Key to species and infraspecific taxa
(Names with an asterisk * are new taxa)

- 1a. Leaves petiolate or narrowly tapering into a cuneate-attenuate subsessile base 5
- b. Leaves sessile, amplexicaul to semi-amplexicaul and somewhat cordate at the base 2
- 2a. Bracts distinctly longer than the calyx; corolla-tube at least twice as long as the calyx 4
- b. Bracts as long as or slightly longer than the calyx; corolla-tube twice as long as the calyx 1. *V. bonariensis*..3
- 3a. Spikes sub-cylindrical, aggregate but not contracted into capitate or sub- capitate clusters; peduncles not glandular; corolla-tube rarely twice as long as the calyx 1a. *V. bonariensis* var. *bonariensis*
- b. Spikes contracted into capitate or sub-capitate clusters; peduncles with minute sparse glands intermixed with hairs; corolla-tube mostly twice as long as the calyx 1b. *V. bonariensis* var. *conglomerata*
- 4a. Peduncles and bracts not glandular; leaves not cuneate-attenuate towards the base; calyx 3–3.5 mm long; corolla-tube 5–10(–12) mm long, showy; plant rhizomatous 2. *V. rigida*
- b. Peduncles and bracts glandular; leaves somewhat cuneate-attenuate towards the base; calyx 2–2.5 mm long; corolla-tube 3.5–4 mm long, not showy; plant not rhizomatous 3. *V. hispida*
- 5a. Erect or ascending perennial herbs; leaves variously incised or irregularly serrate-dentate, sometimes pinnatifid or pinnatisect in *V. officinalis* var. *gaudichaudii* 8
- b. Procumbent-decumbent annual herbs; leaves pinnatifid or pinnatisect 6
- 6a. Leaves tripartite-pinnatisect with lobes linear-subulate; spikes somewhat contracted and subglobose during anthesis; flowers large and showy; calyx 5-toothed, 6–7 mm long; corolla-tube 10–11(–14) mm long, glabrous outside; mericarp muciculate on commissural faces 4. *V. aristigera*
- b. Leaves pinnatifid-pinnatifid with lobes lanceolate to broadly oblong; spikes cylindrical during and after anthesis; flowers small, not showy; calyx 4-toothed, 2–3 mm long; corolla-tube 3–4 mm long, puberulous outside; mericarp smooth on commissural faces 5. *V. supina* 7
- 7a. Procumbent herb; stem prostrate, pubescent-canescens, not purplish; leaves hispid-canescens on both surfaces, lobes narrow, oblong; peduncles canescens-strigose, not purple 5a. *V. supina* var. *supina*
- b. Decumbent herb; stem erect or suberect, glabrous, shiny and purplish; leaves glabrous adaxially, puberulous on the veins below, lobes obtuse or rounded at the apex 5b. *V. supina* var. *erecta*
- 8a. Lower leaves deeply pinnately lobed, pinnatifid or pinnatisect; spikes 10–35(–40) cm long, not contracted 7. *V. officinalis* 11
- b. Lower leaves serrate-dentate, neither pinnatifid nor pinnatisect; spikes (1–)2–8(–10) cm long, somewhat contracted 9
- 9a. Spikes and peduncles hispid, glandular; bracts glandular, distinctly longer than the calyx; calyx

- glandular outside, 2–2.5 mm long; corolla 3.5–4 mm long, limb 1–1.5 mm diam., deeply lobed
 3. *V. hispida*
- b. Spikes and peduncles pubescent – glabrescent, not glandular; bracts not glandular, shorter than or equalling the calyx, sometimes slightly surpassing the calyx in *V. litoralis* var. *brasiliensis*; calyx not glandular, 1.5–2 mm long; corolla 2–2.5(–3) mm long, limb 1.5–2 mm diam., not deeply lobed
 6. *V. litoralis* 10
- 10a. Spikes, slender, lax; flowers distant in the lower half of the rachis; hairs on rachis, bracts and calyx minute and closely appressed; bracts ovate, often shorter than the calyx; lamina with both blunt (rounded) and sharp teeth 6a. *V. litoralis* var. *litoralis*
- b. Spikes somewhat compact; flowers close to each other along the rachis; hairs on rachis, bracts and calyx spreading; bracts narrow lanceolate, equalling the calyx, strongly keeled; lamina serrate
 6b. *V. litoralis* var. *brasiliensis*
- 11a. Inflorescence neither glandular nor viscid, pubescent to puberulous; floral bracts puberulous abaxially during anthesis, glabrous after anthesis; upper leaves narrow-linear, entire or divided into long narrow lobes or long teeth; lamina of lower and mid-stem leaves often divided almost to the central midrib or coarsely toothed or incised to lobe 16
- b. Inflorescence glandular or viscid, hirsute or pubescent; floral bracts hirsute or pubescent to puberulous abaxially; leaves variously incised, lobed, dentate or serrate; lamina of lower and mid-stem and upper leaves not divided to the midrib except var. *monticola* & var. *africana* 12
- 12a. Flowers usually crowded along the rachis; spikes densely hirsute; floral bracts as long as the calyx or longer; plants hirsute, becoming pubescent to puberulous when old 15
- b. Flowers distant at least in the lower two-thirds of the rachis; spikes pubescent; floral bracts usually half to two-thirds the length of the calyx, rarely longer; plants pubescent, becoming glabrescent when old 13
- 13a. Leaves not deeply divided, the lobes ('segments') short, obtuse, ± dentate; floral bracts usually up to half the length of the calyx, rarely equalling the calyx 7a. *V. officinalis* var. *officinalis*
- b. Leaves deeply divided into long, narrow, acute or serrate lobes ('segments'); floral bracts usually a half to two-thirds the length of the calyx 14
- 14a. Flowers sessile; rachis with glandular and non-glandular hairs; calyx-teeth distinct; corolla-tube cylindrical, constricted below the limb, puberulous in the upper half outside; floral bracts narrowly ovate - lanceolate, usually up to two-thirds the length of the calyx, rarely longer 7b. *V. officinalis* var. *africana*
- b. Flowers both sessile and with short pedicels 0.5–1.5 mm long; rachis with glandular hairs only; calyx-teeth minute or indistinct; corolla-tube somewhat broader near the top, not constricted below the limb, glabrous to glabrescent outside; floral bracts ovate, up to half the length of the calyx
 7c. *V. officinalis* var. *monticola**
- 15a. Spikes rather thick, (4–)5–8(–10) mm diam.; floral bracts (3.5–)4–5 mm long; corolla-tube exerted above the calyx, puberulous in the upper half outside; corolla-limb (3–)3.5–5 mm broad; lamina with sharp long teeth in the distal two-thirds 7d. *V. officinalis* var. *macrostachya*
- b. Spikes not very thick, 3–4 (–5) mm diam.; floral bracts 2–3 mm long, not exerted above the calyx; corolla-tube scarcely exerted, glabrous or sparingly puberulous in the upper half outside; corolla-limb

1–2.5 mm broad; lamina shortly toothed in the distal half

..... 7c. *V. officinalis* var. *eremicola**

- 16a. Lower and mid-stem leaves divided, incised, or dentate-serrate almost to the midrib; floral bracts usually as long as the calyx, occasionally two-thirds the length of the calyx 7f. *V. officinalis* var. *gaudichaudii*
- b. Lower and often mid-stem leaves coarsely toothed or incised to lobed, not deeply divided; floral bracts about half the length of the calyx 7g. *V. officinalis* var. *halei*

1. *Verbena bonariensis* L. Sp. Pl. 1 (1753) 20; Hook., Bot. Misc. 1 (1829) 166, excl. syn. *V. littoralis* Kunth; Walp., Rep. Bot. Syst. 4 (1845) 19, excl. synonyms cited; Schauer in A.D.C., Prod. 11 (1847) 541, excl. syn. *V. quadrangularis* Vell. & *V. capensis* Thunb.; F.M.Bailey, Synop. Qld Fl. (1883) 877; Kuntze, Rev. Gen. Pl. 3 (1898) 254, excl. syn. f. ("γ") *rigida* Spreng.; F.M.Bailey, Qld Fl. 4 (1901) 1178; F.M.Bailey, Weeds & Susp. Poison Pl. Qld (1906) 142, 143; H.Pearson in Dyer, Fl. Cap. 5 (1910) 209, excl. syn. *V. capensis* Thunb. & *V. quadrangularis* Vell.; L.M.Perry, Ann. Missouri Bot. Gard. 20, 2 (1933) 254; L.J.Webb, Bull. Council, Sci. Industr. Res. No. 232 (1948) 169; Everist, Common Weeds of Farm & Pastur. (1957) 108, t. 89; E.L.Robertson in J.M.Black, Fl. S. Aust. edn 2, 4 (1957) 720; Moldenke, Résumé Verbenac. etc. (1959) 109, 115, 121, 126, 149, 154, 181, 191, 202–212, 276, 359, 363, 376, 470; J.F.Macbr., Field Mus. Nat. Hist. (Bot. Ser.) 13, 4 [Fl. Peru] (1960) 616; Moldenke, Phytologia 8, 5 (1962) 246, excl. syn. *V. quadrangularis* Vell.; Fronc. in Cabrera, Fl. Prov. Buenos Aires 5 (1965) 128–131, fig. 45; Moldenke, Fifth Summary Verbenac. etc. 1 & 2 (1971) 177, 184, 192, 200, 252, 257, 278, 328, 343, 349–353, 473, 664, 667, 703, 912; Franco in Tutin et al., Fl. Europ. 3 (1972) 123; Moldenke, Phytologia 22, 6 (1972) 474; Moldenke, Phytologia Mem. 2 Sixth Summary Verbenac. etc. (1980) 67, 135, 169, 183, 190, 256, 265, 327, 332, 339, 579; Everist, Poison. Pl. Aust. (1981) 749; Moldenke in Dassan. & Fosberg (eds), Fl. Ceylon 4 (1983) 201, excl. syn. *V. quadrangularis* Vell.; N.C.W.Beadle, Student Fl. NE N.S.W. 5 (1984) 852; Munir in Jessop & Toelken (eds), Fl. S. Aust. 3 (1986) 1176, excl. syn. *V. quadrangularis* Vell.; Stanley in Stanley & E.M.Ross (eds), Fl. SE Qld 2 (1986) 368; Yeo, Kew Bull. 45, 1 (1990) 102, 103; A.D.Chapman, Aust. Pl. Name Index Q–Z (1991) 2950; B.J.Conn in G.J.Harden (ed.), Fl. N.S.W. 3 (1992) 612; Verdc. in Polhill (ed.), Fl. Trop. E. Afr. (1992) 9; Carolin & Tindale, Fl. Syd. Reg. edn 4 (1994) 596; J.-P.Lebrun & Stork, Enum. Pl. Afr. Trop. 4 (1997) 523; B.J.Conn in N.G.Walsh & Entwisle (eds) Fl. Vic. 4 (1999) 414, fig. 80d.

Type: Herb. Linn 35.11, Buenos Aires, Argentine (LINN, *lectotype!*, chosen by Yeo (1990). See typification.

V. elongata Salisb., Prod. (1796) 71 – *fide* L.M.Perry (1933), Moldenke (1959, 1971a, 1983), J.-P.Lebrun & Stork (1997).

V. trichotoma Moench, Suppl. Meth. (1802) 131, *nom. illeg.* – *fide* Moldenke (1983), J.-P.Lebrun & Stork (1997).

V. corymbosa sensu Hort.: Walp., Rep. Bot. 4 (1845) 19, *inval.* only in syn., non *V. corymbosa* Ruiz & Pav. (1798), Cham. (1832), Relh (1947). – *fide* Moldenke (1962a, 1971a, 1983).

V. bonariensis L. var. ("γ") *longibracteata sensu* Walp., Repert. Bot. 4 (1845) 20, non *V. bonariensis* var. *longibracteata* Kuntze (1898). – *fide* Moldenke (1983).

V. hasta L. *sensu* Moldenke, Alph.-List Invalid Names Suppl. 1 (1947) 24, *inval.* only in syn. – *fide* Moldenke (1971a, 1983).

V. littoralis sensu H.Betch: Moldenke, Résumé Verbenac. etc. (1959) 368, *inval.* only in syn., non *V. littoralis* Kunth (1818). – *fide* Moldenke (1983).

Cymaria idjenensis Koord.; Moldenke, Résumé Verbenac. etc. (1959) 276, inval. only in syn. – *vide* Moldenke (1962a, 1983).

V. bonariensis L. f. *umbrosa* Osten; Moldenke, Résumé Verbenac. etc. (1959) 359, inval. only in syn. – *vide* Moldenke (1983).

V. incompta P.W.Michael, Telopea 6 (1995) 181, *syn. nov.*; P.W. Michael, Weeds-Wet & Wild (1997) 9, 11 p.p. top fig.; Pedley in R.J.F.Hend. (ed.), Qld Pl. New edn (1997) 206; B.J.Conn in N.G.Walsh & Entwistle (eds), Fl. Vic. 4 (1999) 416, fig. 80e.

Type: R.V.Smith 64/64, Bright – Tawonga Road, 6 miles (9.7 km) ESE of Bright, c. 2 miles (3.2 km) E of Tawonga-Harrierville road fork, Victoria, Australia, 25.iii.1964 (MEL, holotype!; NSW, isotype!).

Typification

There is some confusion as to who actually lecto-typified *V. bonariensis*, Moldenke (1962a) or Yeo (1990). Apparently both chose LINN 35.11 as the type but Yeo (1990) clearly lectotypified it with explanation while Moldenke (1962a) merely named the type and its whereabouts. The present author follows Yeo (1990).

Description (Fig. 1)

An erect perennial or annual herb, 0.5–2 m high. *Stem* sharply 4-angled, scabrous-pubescent or hispidulous especially on the angles. *Leaves* sessile, lanceolate, ovate-lanceolate or oblong-lanceolate, cordate and sub-auriculate to adnate-semiamplexicaul (3-) 5–15 (-18) cm long, (0.5-)1–3.5 (-5) cm wide, acute, sharply and unequally serrate, entire towards the base, rugose – scabrous or harshly rough bullate-rugose adaxially, pubescent-tomentose abaxially, particularly along the prominent reticulate veins, or hirsute and scabrous on both surfaces. *Spikes* subcylindrical, compact and aggregate, or much reduced and more or less capitate or subcapitate, mostly sessile or subsessile and crowded in dense fasciculate long-pedunculate clusters, (8-) 15–50 (-60) mm long, 5–7 mm diam.; peduncle (0.5-) 1–6 (-7) cm long, pubescent, glandular and pubescent in var. *conglomerata*. *Flowers* small, sessile, bracteate; bract sessile, barely equalling or slightly surpassing the calyx, lanceolate-acuminate, pubescent or hirtellous abaxially, glabrous adaxially, ciliate along the margin, non-glandular, 2–3 (-4) mm long,) 0.5–1 mm wide near the base. *Calyx* 5-angled, 5-toothed at the top, pubescent – hispidulous on the angles outside, glabrous inside, non-glandular, persistent; tube 2–3 (-4) mm long, 0.5–1 mm wide; teeth (lobes) acute with short subulate tips, c. 0.5 mm long. *Corolla* varying from blue, bright-blue, dark-purple, lavender-pinkish, lilac or mauve; tube slender, cylindrical, as long as or up to twice the length of the calyx, pubescent outside above the calyx-tube, villous inside the throat, 3–5 (-6) mm long, c. 0.5 mm diam.; limb small and inconspicuous, nearly regular, 2–3 mm wide; lobes broad-oblong to orbicular, retuse and spreading c. 1 mm long, 0.5–1 mm wide. *Stamens* didynamous, included, inserted above the middle of corolla-tube. *Ovary* oval – globose, glabrous, faintly 4-lobed, c. 0.5 mm diam.; style short, about half the length of corolla-tube, (1-) 1.5–2.5 (-3) mm long; stigma unequally 2-lobed. *Fruit* subglobose-oblong, glabrous, 4-lobed, splitting into 4 cylindrical-oblong brown mericarps. 1–2 mm long, 1–1.5 mm diam; mericarps trigonous, slightly raised-reticulate at the apex, the dorsal side usually striate, muricate-scabrous on commissural faces, the commissural face scarcely reaching the tip of the mericarp.

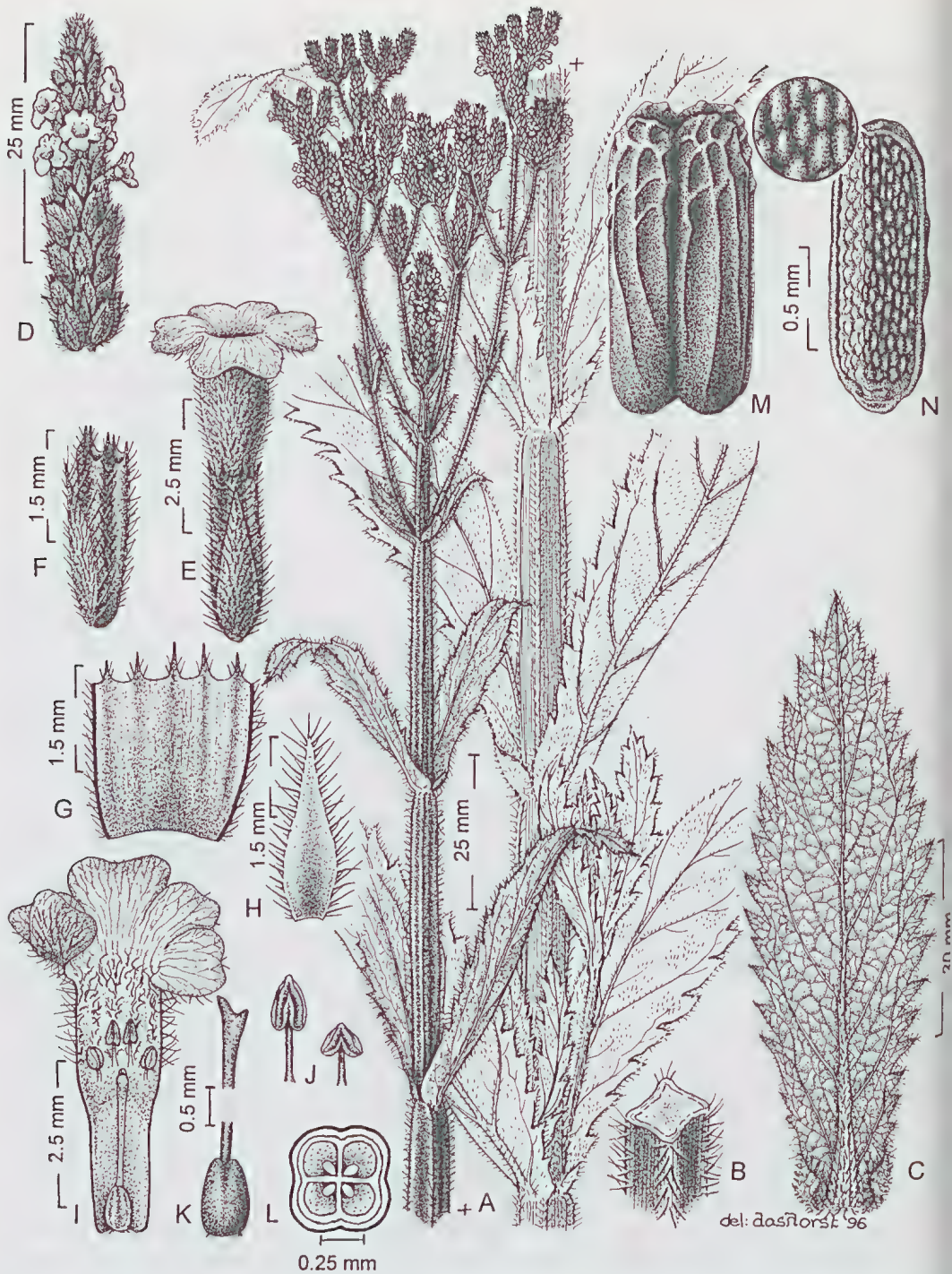


Fig. 1. *V. bonariensis* L. var. *bonariensis* (A–N, J.Cullimore 259: MEL). A, habit sketch of a flowering branch; B, transverse section of stem showing 4-angles; C, abaxial view of a leaf showing venation and hairs; D, spike; E, flower with bract; F, calyx with bract; G, calyx cut opened vertically showing glabrous inside; H, bract showing adaxial glabrous surface; I, corolla cut open showing inside hairs, androecium and gynoecium; J, stamens; K, ovary; L, transverse section of ovary; M, fruit; N, mericarp showing muriculate commissural face.

Distribution

A native to the area from Brasil and Bolivia south through Paraguay and Uruguay to Argentine and west to Chile. Introduced into and now rather widespread in other parts of South America, the United States, Bermuda, Jamaica, parts of Europe and Africa, tropical Asia, Pacific Oceanica and Australia.

1a. *Verbena bonariensis* L. var. *bonariensis*

Perennial or annual herb. *Stem* scabrous-pubescent especially on the angles. *Leaves* ovate-lanceolate, cordate to sub-auriculate, semiamplexicaul, sharply and unequally serrate towards the base. *Spikes* subsessile, sub-cylindrical, aggregate but not contracted into capitate or globose clusters or heads; peduncles not-glandular. *Bracts* barely equalling the calyx or slightly surpassing it. *Corolla* tube rarely twice as long as the calyx.

Representative specimens (collections seen: Australian 175; non-Australian 202)

WESTERN AUSTRALIA: *Bentley s.n.*, Donnybrook, 3.iii.1963, (PERTH 03658678); *Lepschi & Lally 2491*, at Junction of Sussex Street and Albany Highway, East Victoria, Perth, 4.ii.1996 (AD, CANB, MEL, NSW, PERTH).

NORTHERN TERRITORY: *Holtze s.n.* Port Darwin, -.1888 (MEL 583783).

QUEENSLAND: *Batianoff 860408*, Noosa National Park, 2.iv.1986 (BRI); *Eves s.n.*, Moreton Bay, - 1872 (MEL 583754); *Francis s.n.*, Rockhampton, 7.xi.1943 (US); *Hartman 436*, Lockyer River, - 1875 (MEL 583781); *Hood s.n.*, Toowoomba, - 1886 (MEL 583868); *F. Mueller s.n.*, Brisbane River, - 1856 (MEL 583780); *Pedley 5637*, Tanduringie, 12 km NNW of Cooyar, 21.i.1992 (AD, BRI, DNA, K, MEL, NSW); *Sayer s.n.*, Russell-River, - 1886 (MEL 583777); *Smith 3076*, Kingaroy, Burnett District, 16.iv.1947 (BRI, CANB, GH, NY); *Stanley 80280*, West Mackay near Water Treatment Works, 16.ii.1980 (BRI); *White 7222*, Wondai, South Burnett District, 10.ii.1931 (BRI).

NEW SOUTH WALES: *Carne 57*, Beecroft Head, 3.v.1914 (NSW); *Conn 4106 & Whalen s.n.*, N side of Prospect Reservoir, off Reservoir Road between Cricketers Arms Road and Manning St junction, Prospect, 30.xi.1995 (AD, MEL, NSW); *Coveny 12851*, *Bishop s.n. & Dalby s.n.*, 24.5 km NE of Blayney P.O.; 14.iv.1988 (CBG, DAO, HO, MEL, NSW, PE, PRE); *Coveny 11578 & Hind s.n.*, Coffins Crossing on Molonglo River, 3.6 km SSW of Cook P.O., 22.i.1983 (CANB, DAO, K, MO, NSW); *Gray 4854*, Uriorra Crossing, Murrumbidgee River, 19.iv.1960 (CANB); *Hamilton s.n.*, Cooks River, 25.iii.1911 (NSW 392601, NSW 122208); *S. Johnson s.n.*, hills near Bulli, - 1875 (MEL 583865 & MEL 583771); *Macpherson s.n.*, Wollongong, - 1889 (MEL 583767); *Maiden s.n.*, Lord Howe Island, -iv.1898 (NSW 245488); *Michael s.n.*, flat between Muttama Creek and Coolac, 21.iv.1995 (NSW 397615); *Miller 18 & Whaite s.n.*, Portion 147, Parish of Cogo, Cowal Creek Rd, Bellangry, 29.xii.1983 (MEL, NSW).

VICTORIA: *Aston 2014*, Gippsland, c. 18 km N of Maffra, 2.5 km NNE of Valencia Creek, 10.v.1979 (MEL); *Beaughlehole 4966*, far SW D47 Lower Glenelg River, Dartmoor, 11.i.1959 (CANB, K, MEL 2 spec.); *Cullimore 259*, c. 52.7 km SSE of Omeo, on road to Bairnsdale, 18.i.1968 (MEL, NSW); *Kaspiew 579, 841*, Bright, 3.iii.1953 (F, M, Z); *R.V. Smith 64/64*, Bright -Tawonga Road, 6 miles (9.7 km) ESE of Bright, c. 2 miles (3.2 km) E of Tawonga-Harrietville road fork, 25.iii.1964 (MEL 525700 holotype of *V. incompta*

Michael; *Willis s.n.*, Dandenong Ranges, roadside between Ferntree Gully and Upwey, -xii.1932 (MEL 583790).

SOUTH AUSTRALIA: *Black s.n.*, Woodside, -i.1904 (AD 97621093); *Black s.n.*, Belair National Park, 23.i.1908 (AD 97621093); *Kaspiew 99 & 1231*, Adelaide 9.i.? (BR, S).

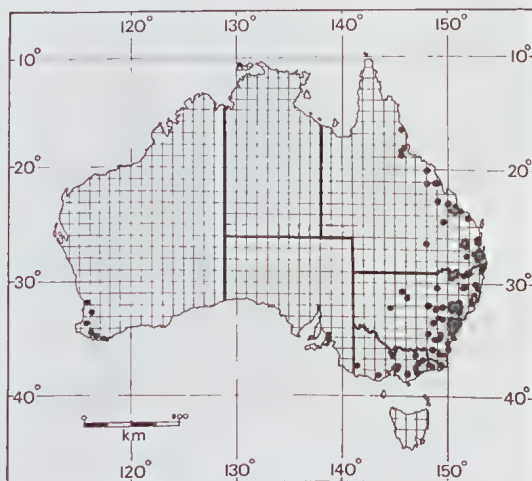
Distribution and ecology (Map 2)

V. bonariensis var. *bonariensis* has been recorded from central and southern coastal areas of Queensland, throughout central and coastal parts of New South Wales and Victoria, southern Lofty Region in South Australia and in the far south-western corner of Western Australia. In Northern Territory it is known only from an old record from Darwin.

Collections from outside Australia have been examined from almost throughout its distribution range, namely North and South America, parts of Europe and Africa, tropical Asia and Pacific Oceania.

Collectors' field notes agree with ecological notes by Bailey (1879), Bentham (1870), Conn (1992), Moldenke (1972a, 1977a, 1983) and Kleinschmidt &

Johnson (1977). They found it as an aggressive weed in cultivated and otherwise disturbed or neglected waste land and in run-down pastures. It spreads to a great extent along creeks, river banks and everywhere where the land is moist and rich.



Map 2. Distribution of *V. bonariensis* L. var. *bonariensis*.

Comments

In the protologue, Michael (1995) regarded *V. incompta* as "a species of presumed South American origin now widespread in sub-tropical and warm-temperate parts of the world". He based this taxon on a collection from Victoria though he believed it to be "most prominent in eastern New South Wales". While describing it as a new species, Michael (1995) mistook some of Yeo's (1990) remarks that certain cultivated *Verbena* plants at Cambridge Botanic Garden belonged to a new species. Before describing them as a new species Yeo (1990) discovered no difference between those plants and *V. brasiliensis* and thus included them in that species. Michael (1995), nevertheless, described these plants as a new species without providing any key to distinguish it from *V. bonariensis* or *V. brasiliensis*. In response to the present author's query, the following comments were made by Yeo about *V. incompta* [letter dated 15 January, 1996].

"What I said in my 1990 paper about this was that certain accessions cultivated at Cambridge Botanic Garden under the name *V. bonariensis* were clearly not that species and I had contemplated describing them as a new species. Later, when studying herbarium material, I could find no difference between this plant and *V. brasiliensis* apart from the form of the leaf-bases, and I said they should be included in that species. It is these plants that Michael has set up as his new species *V. incompta*. *V. incompta* is thus similar to *V. brasiliensis* rather than *V. bonariensis*.

I always felt it to be rather curious that the two variants of *V. brasiliensis* seemed not to integrate, yet there was no other character correlated with the leaf character. Peter Michael claimed that the spikes are thicker in the form with amplexicaul leaves, and he seems to be saying that the upper anthers are positioned higher in the tube than in *V. bonariensis* but less high than in *V. brasiliensis*. In addition, the plant does not attain the same height as 'subpetiolate', *V. brasiliensis*. I had not noticed the first character, while the second seems to me to be an impractically fine distinction. The third may well be valid, but since it refers to maximum height it may not often be of practical value".

According to Michael (1995, 1997a), *V. incompta* differs from *V. bonariensis* by its flowers and nutlets being "smaller", and "bracts, calyces and peduncles not generously sprinkled with stalked glands". These are not consistent characters, therefore, unreliable and of little practical use. In fact, *V. brasiliensis*, *V. incompta* and typical *V. bonariensis* lack glands, and the size of their flowers and nutlets are not uniform within these taxa. The only character that could distinguish between these species is the form of the leaf-bases. Both *V. bonariensis* and *V. incompta* have sessile amplexicaul leaf-bases and fairly identical thick spikes, whereas *V. brasiliensis* has somewhat petiolate or cuneate attenuate to subpetiolar based leaves and comparatively slender spikes. In all major characters, *V. incompta* is closer to *V. bonariensis* than to *V. brasiliensis*. In the present treatment, therefore, *V. incompta* is regarded conspecific with *V. bonariensis*.

Yeo's (1990) list of specimens cited under *V. brasiliensis* includes *R.V.Smith 64/64* (the type of *V. incompta*) from Victoria, *L.S.Smith 3076* from Queensland, *R.E.Perdue & S.P.Kibuwa 8245* from Kenya (Africa) and a few others. All these specimens are found to be identical with *V. bonariensis* because their leaves are sessile with amplexicaul bases and not tapering towards their base. Moreover, their habit, shape and size of inflorescence, and flower characters are also similar to this species. On the basis of Yeo's (1990) cultivation experience, he states that "the significant characters of *V. bonariensis* that distinguish it from *V. brasiliensis* are the darker green, more rigid leaves, the greater plant height and flatter-topped inflorescence, the curvature of the branches so that the pair forms of a wide parabola, the shorter and denser spikes, the larger corolla with the tube strongly exerted from the calyx and the position of the anthers just above the middle of the corolla tube. As a consequence of the density of the spikes and the length of the corolla tube, the corolla limbs are borne above the apices of the spikes. Because of its stately habit and the size and crowding of its flowers, *V. bonariensis* has some ornamental value, whereas *V. brasiliensis*, with its smaller, inconspicuously arranged flowers, has none". These characters being somewhat vague with no defined limit are of little practical value.

Moldenke (1962a) stated that "the original place of publication of the binomial was inaccurately given as page "28" in Lilloa 6:322 (1941), as well as by Schauer (1847, 1851) and other writers, while Moench (1794) gave the page as "117", also erroneously".

Schauer (1847, 1851), Moldenke (1962a) and a few others erroneously reduced *V. quadrangularis* Vell. to synonymy under *V. bonariensis*. In the present treatment, *V. quadrangularis* has been found synonymous with *V. litoralis* var. *brasiliensis*. Michael (1995) included in the synonymy of *V. incompta* the photograph and account of *V. bonariensis* by Auld & Medd (1987) p. 236. This clearly shows that both taxa are identical and inseparable.

Material of *V. bonariensis* has been misidentified and distributed in some herbaria as *V. rigida*. or *V. litoralis*.

In Australia, there appears to be an intermediate form between the typical var. *bonariensis* and var. *conglomerata*.

According to Webb (1948) this plant was "suspected of causing abortion in cows at Larcom in 1938". Everist (1981) states that, "*V. bonariensis* has been suspected on rather

vague field evidence of causing sickness, death and occasionally abortion in cattle in New South Wales and Queensland".

Pellett (1923) wrote that *V. bonariensis* "appears to be [the] most important in many places as a source of honey". Likewise, Chaw et al. (1986) wrote that "*V. bonariensis* is reported as a nectary-plant for honey-making and is useful in curing intermittent fevers and catarrh in Brazil. It appears to be self-compatible, setting abundant seeds in cultivation in the experiment greenhouse of the Academia Sinica".

Among the many vernacular names recorded in various parts of its range, some of the common names used for *V. bonariensis* are "purple-top *Verbena*", "South American vervain", "tall verbena", "blue vervain", "blue-top verbena", "cluster-flowered verbena", "Buenos Ayres verbena", "pretty verbena", "roadside weed", "wild verbena", "weed verbena" and "South American vervain".

Affinities

V. bonariensis var. *bonariensis* is closely related to *V. rigida*, *V. hispida* and *V. litoralis* var. *brasiliensis*. For similarities and differences see "affinities" under these taxa. Regarding affinities of *V. bonariensis*, Perry (1933) states that it "is another introduced South American species evidently related to *V. rigida*, but it is a larger and coarser plant with smaller flowers as well as less harsh and somewhat viscid pubescence" Moldenke (1983) mentioned close relationship between *V. bonariensis* and *V. brasiliensis* and distinguished *V. brasiliensis* by "its leaves being narrowed to the base and sessile but not at all cordate-auriculate or amplexicaul". In the Flora of Taiwan (Hsiao, 1978) and Illustrations of Common Plants of Taiwan (Hsu, 1975) *V. officinalis* was the only species of the genus recorded. After the naturalisation of *V. bonariensis* in Taiwan, Chaw et al. (1986) "distinguished [it] from the former species by its leaves that are cordate-auriculate to semi-amplexicaul but not at all pinnatifid, and by its inflorescence that is corymbose-spicate (rather than simple spicate) with aggregate flowers".

1b. *Verbena bonariensis* L. var. *conglomerata* Briq., Ark. Bot. Stockh. 2, 10 (1904) 2, t.3 b; Moldenke, Résumé Verbenac. etc. (1959) 109, 118, 119, 126, 223 & 471; Moldenke, Phytologia 8, 5 (1962) 265; *ibid.* 8 (1963) 463; *ibid.* 9 (1963) 375, 382; *ibid.* 10, 2 (1964) 95; *ibid.* 15 (1968) 488; Moldenke, Résumé Verbenac. etc. Suppl. 16 (1968)1, 6; Moldenke, Fifth Summary Verbenac. etc. 1 & 2 (1971) 177, 187, 189, 200, 350, 369, 912; Moldenke, Phytologia 22, 6 (1972) 479; *ibid.* 23, 2 (1972) 217; *ibid.* 23, 3 (1972) 259; *ibid.* 28, 1 (1974) 116; *ibid.* 28, 2 (1974)196; *ibid.* 28, 4 (1974) 346; *ibid.* 36, 2 (1977) 132; Moldenke, Phytologia Mem.II. Sixth Summary Verbenac. etc. (1980) 169, 179, 181, 340, 361, 579.

Type: C.A.Lindman A. 473, Porto Alegre, Rio Grande do Sul, Brazil, 12.x.1892 (S, lectotype designated here!; S, 2 iso-lectotypes!).

Typification

The var. *conglomerata* is based on C.A.M. Lindman's collection no. A.473 from Brazil, consisting of at least two duplicates, now preserved in Herb. S. Since the author of this variety did not select one of them as a type, it is necessary to designate a lectotype for this name. Both specimens are complete, well preserved and with similar herbarium labels bearing identical information. One of them, however, was annotated "*Verbena bonariensis* L. var. *conglomerata* v. nov." by Briquet and almost certainly used by him in preparing the

original description of this variety. This specimen is selected here as the lectotype for this name.

Moldenke (1962a) stated that the type of this variety "is deposited in the Delessert Herbarium at the Conservatoire et Jardin Botaniques in Geneva". In his publication, Moldenke neither cited the type in Herb. G-DEL nor mentioned seeing it in that herbarium. He cited two "isotypes" in Herb. S only, and their (type's) photographs in Herb. F, N, SI and Z. During his current investigation, the present author examined almost all *Verbena* collections in Herb. G including G-DC and G-DEL and did not find the type. In response to his latest query about the type of this taxon, the Head Curator of Herb. G, Dr Jacquemoud, also could not locate the type in that herbarium. As stated in the protologue of var. *conglomerata*, the author (J. Briquet) wrote, [Ark. Bot. Stockh. 2, 10 (1904) 2] "Toutes les plantes mentionnées dans ce memoire sont déposées dans l'Herbier Regnellien de la division botanique du Musée royal de Stockholm", i.e. [All plants mentioned in the present paper are deposited in the botanical division of the Royal Museum at Stockholm]. Therefore, as mentioned in this treatment, the types (lectotype and isolectotype) of this variety are now preserved in Herb. S.

Diagnosis

The var. *conglomerata* differs from the typical form of the species chiefly by its spikes being much crowded, reduced and more or less capitate or subcapitate in outline; corolla-tube much protruding beyond the calyx and about one and a half to twice the length of the calyx; peduncle with minute glands sparsely intermixed with hairs.

According to Moldenke (1962a), "This variety differs from the typical form of the species in its very harshly rough bullate-rugose leaves, much reduced and more or less capitate or subcapitate spikes, and elongated well-developed corollas, twice as long as the typical form, whose tube surpasses the calyx by 2-3 mm and whose limb is to 3 mm wide".

Representative specimens (collections seen: Australian 154; non-Australian 70).

QUEENSLAND: *Batianoff 940934*, Slade Point, Mackay, 29.ix.1994(BRI); *Carrick 3915*, Mt Tamborine, 5.xi.1974 (AD, CANB); *Foot s.n.*, Nangar Creek, -.1890 (MEL 583760); *Lea s.n.*, Toowoomba, -.vi.-vii.1886 (BM); *Sherrin s.n.*, Mundubbera, -.ii.1922 (BM).

NEW SOUTH WALES: *Betche 104*, Raymond Terrace, -.i.1882 (MEL); *Bryant 013*, Goolloinboin, on Glen David Road, Capertee, 11.i.1975 (B, CANB, GH, MO, NSW); *Cleland s.n.*, Hawkesbury River, Milson Island, 14.x.1911 (AD 97940066); *Coveny 8914 & Roy s.n.*, 0.8 km ENE of Green Camp, Mt Kaputar National Park, 31 km ENE of Narrabri, 21.xi.1976 (NSW); *Coveny 16707*, opposite the property "The Big Rock" at the base of the Gloucester Buckets, c. 2 km W of Gloucester, 1.i.1994 (BRI, CANB, MEL, NSW); *Darbyshire 534*, Burbong village, Molonglo River, Kowen District, 21.xii.1961 (CANB, E, G, GH, NSW); *Donner 1590*, 6 km SE of Campbelltown on banks of George River, 3.i.1966 (AD); *Everist & Webb 1385*, 56.32 km SW of Woodenbong on Stanthorpe road, 23.xi.1946 (BRI, CANB); *Hosking 341*, Oxley Park, Tamworth, 21.xii.1985 (NE, NSW); *Lally 191*, 0.5 km along Jamberoo Mountain Road from Jamberoo-Albion Park road, 30.x.1993 (CANB, MEL); *Medd 160019*, c. 5 km from Singleton on New England Highway to Maitland, undated (NSW); *Michael s.n.*, Hasting River Crossing near Kempsey, 22.xi.1993 (NSW 397599); *Michael s.n.*, 20 km from Forbes on Cowra Road, .i.1994 (NSW 390619); *Musser 33*, Hawkesbury Agric. College, -.x.1916 (NSW 398658); *Murray s.n.*, Clarence River, -.1894 (MEL 560562); *White s.n.*, Tweed River, 4.xi.1907 (AD); *Plat, Coveny & Dunn s.n.*, Sinclair Lookout, 14.4 km W of Glen Innes, 26.iii.1987

(MEL, MO 4342261, NSW 392644); *Rodway 12219*, Coolangatta Hill, 15.vi.1941 (NSW 392641); *Stewart 273A & Whigham s.n.*, Tinderry Mountains, 2 km along Sunnybrae Trail from turnoff Urila – Big Tinderry road, 13.ix.1984 (AD, CANB); *Wenholz 1671/14*, Grafton, -.iii.1914 (NSW 392399, NSW 392414).

VICTORIA: *Beaglehole 4966*, Lower Glenelg River, Dartmoor, 11.i.1959 (AD, ACB); *Beaglehole 81516*, 11 km SW of Wangaratta, 9.xi.1985 (MEL); *Morrison s.n.*, Bank of Yarra River, Kew, 21.xi.1888 (E).

SOUTH AUSTRALIA: *Cleland s.n.*, Fulham, Adelaide, 22.ii.1933 (AD); *Ising s.n.*, Balhannah, c. 22 km SE of Adelaide, 4.iii.1922 (AD 2 spec.); *Vonow 989*, Morialta Conservation Park, 21.v.1989 (AD, CANB).

Distribution and ecology (Map 3)

In Australia, var. *conglomerata* occurs in the south-eastern part of Queensland, with a few scattered localities along the eastern coast. In New South Wales, it occurs all over in the eastern-half of the State while in Victoria it is sparsely distributed in East Gippsland and around Melbourne. In South Australia, it is known from around Adelaide and its adjacent areas only. So far it has not been recorded from Northern Territory and Western Australia.

Collections from outside Australia have been examined from several countries in the Americas and Africa. Limited collections were also seen from England, Mauritius, India and New Zealand.

Collectors' ecological notes agree with Moldenke (1962a) who reported it growing in marshes, swampy places, wet field and wet fertile meadows, shrubby fields and compos, river banks, high grassy rather wet soil along railroad embankments and dry sandy pastures.

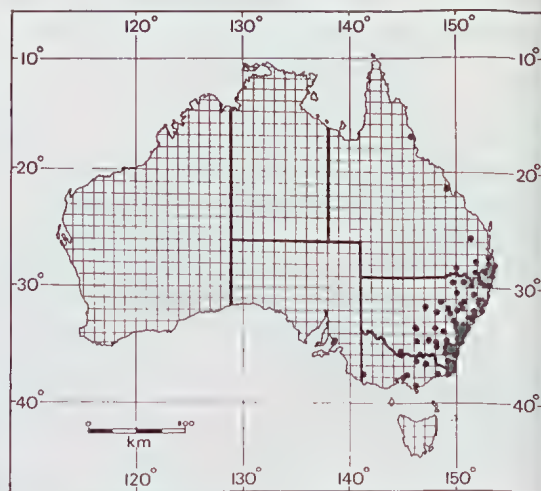
Comments

In Australia, var. *conglomerata* had been identified and distributed mostly as *V. bonariensis*. A few collections, however, were named and distributed as *V. rigida*. Some forms of overseas var. *conglomerata* have the aspect of *V. litoralis* var. *brasiliensis*. Such collections were sometimes misidentified and distributed as "*Verbena litoralis* Kunth" and "*Verbena brasiliensis* Vell."

According to Moldenke (1962a) "Specimens of the variety have been misidentified and distributed in herbaria as *V. bonariensis* L., *V. bonariensis* var. *brevibracteata* f. *brevibracteata*, *V. brevibracteata* var. *longibracteata*, *V. inamoena*, *V. montevidensis*, and var. *rigida* Spreng".

In the collections by *Hj. Eichler 13089* (AD), both four and five calyx- and corolla-lobes were in flowers of the same spike.

The occurrence of this taxon in Australia is recorded here for the first time.



Map 3. Distribution of *V. bonariensis* L. var. *conglomerata* Briq.

Affinities

The var. *conglomerata* is nearest to the typical form of the species in having similar shaped sessile and amplexicaul to semiamplexicaul leaves, and basically similar inflorescence. Nevertheless, its spikes being much crowded and more or less capitate or subcapitate in outline and corolla-tube much protruding beyond the calyx may easily distinguish var. *conglomerata*. For more detail see "Diagnosis" of this taxon. There are several characters common between var. *conglomerata*, *V. rigida* and *V. litoralis* var. *brasiliensis*. For similarities and differences see "Affinities" under *V. rigida* Spreng.

2. *Verbena rigida* Spreng., Syst. Veg. edn 16, 4 (1827) 230; L.M.Perry, Ann. Missouri Bot. Gard. 20, 2 (1933) 253; Small, Man. Fl. SE. U.S.A. (1933) 1138; E.L.Robertson in J.M.Black, Fl. S. Aust. edn 2, 4 (1957) 721, fig. 1030; Moldenke, Résumé Verbenac. etc. (1959) 120, 121, 378, 473; Moldenke, Phytologia 11, 2 (1964) 80; Backer & Bakh.f., Fl. Java 2 (1965) 596; Moldenke, Fifth Summary Verbenac. etc. (1971) 190, 349, 351, 705, 919; Franco in Tutin et al., Fl. Europ. 3 (1972) 123; Moldenke, Phytologia 24, 2 (1972) 128; J.H.Willis, Handbook Pl. Vic. 2 (1973) 581; Lopez-Pal., Revista Fac. Farm. Univ. Los Andes. Merida 15 (1974) 93; Moldenke, Phytologia 28, 4 (1974) 378; Lopez-Pal., Fl. Venezuela Verbenac. (1975) 573; Moldenke, Phytologia 36, 4 (1977) 290; Moldenke, Phytologia Mem. 2 Sixth Summary Verbenac. etc. (1980) 170, 179, 181, 184, 192, 339, 585; Everist, Poison. Pl. Aust. (1981) 749; Sastri et al., Wealth Ind. 10, repr. edn (1982) 445; Moldenke in Dassan & Fosberg (eds), Fl. Ceylon 4 (1983) 203; N.C.W.Beadle, Students Fl. NE N.S.W. 5 (1984) 852, fig. 374A labelled "*V. bonariensis*"; Munir in Jessop & Toelken (eds), Fl. S. Aust. 3 (1986) 1176, fig. 545C; Stanley in Stanley & E.M.Ross (eds), Fl. SE. Qld 2 (1986) 368; W.L.Wagner et al., Man. Fl. Pl. Hawaii 2 (1990) 1325; Carolin & Tindale, Fl. Syd. Reg. Repr. edn 4 (1991) 596; A.D.Chapman, Aust. Pl. Name Ind. (1991) 2950; Verdc. in Polhill, Fl. Trop. E. Afr. Verbenac. (1992) 8; B.J.Conn in N.G.Walsh & Entwisle (eds), Fl. Vic. 4 (1999) 414, fig. 80b.

Type: Sello ("Sellow") 428, Rio Grande, Brazil, undated (B –holotype, destroyed during the war; VT – lectotype designated here, P ? isolectotype). See typification.

V. venosa Gillies & Hook. in Hook., Bot. Misc. 1 (1829) 167; Schauer in A.D.C., Prod. 11 (1847) 541; F.Muell., Fragm. 9 (1875) 5; F.M.Bailey, Proc. Linn. Soc. New South Wales 4 (1879) 30; F.M.Bailey & Ten.-Woods, Proc. Linn. Soc. N. S. W. 4 (1879) 174; F.M.Bailey, Synop. Qld Fl. (1883) 377; Briq., Annuaire Conserv. Jard. Bot. Genève 3 (1899) 104; Small, Fl. SE. U.S.A. (1903) 1010; F.M.Bailey, Weeds & Suspect Poison. Pl. Qld (1906) 142, fig. 245; Dyer, Fl. Cape 5 (1912) 208; F.M.Bailey, Compr. Cat. Qld Pl. (1913) 382; Knuth, Repert. Spec. Nov. Regni Veg. Beih. 43 (1927) 599; Domin, Biblioth. Bot. 89 (1928) 1106; Hook., Curtis's Bot. Mag. 49, New Ser. 6 (1932) t. 3127; Webb, Bull. Council Sec. Industr. Res. Bull. 232 (1948) 169; A.D.Chapman, Aust. Pl. Name Ind. (1991) 2950.

Type: Gillies s.n., Buenos Aires, "inter Pampas prov." Argentina, undated (K, holotype! – *vide* Verdcourt 1992). See comments.

V. scaberrima Cham., Linnæa 7 (1832) 267 – *vide* Walpers (1845), Moldenke (1983).

Type: Sello ("Sellow") s.n., 'Brasilia merid', undated (P – neotype designated here; K, P 2 spec. – isoneotypes). See typification.

V. rugosa D.Don in Sweet, Brit. Fl. Gard. 7, Ser. 2, 4 (1836) t. 318 non *V. rugosa* Mill. (1786), Muhl ex Willd (1809) – *vide* Moldenke (1959, 1971a, 1983).

Type: Plate 318 in Sweet's Brit. Fl. Gard. 7, Ser., 2, 4 (1836). The plate is based on a plant raised at the Birmingham Botanic Garden from seeds received from Buenos Aires, Argentina. The specimen was communicated by Mr Cameron in July 1836. The existence and whereabouts of the specimen is not known.

V. scabra Marnock, Floric. Mag. & Misc. Gard. 5 (1840) 87, t. 54, fig. 3 (not *V. scabra* Vahl 1798, nor Muhl 1825, nor Gray 1959) – *fide* Moldenke (1971a, 1983).

Type: No type specimen was cited with the original description, therefore, Fig. 3 (erroneously labelled "fig. 2" in the text) of plate 54 in the protologue seems to be the type. It was drawn from a plant grown in the nursery.

V. doniana Steud., Nom. Bot. edn 2, 2 (1841) 750 – *fide* Moldenke (1959, 1971a, 1983).

Type: Collector unknown, Buenos Aires, Argentina (P. n.v.).

V. bonariensis sensu Walp., Repert. Bot. 4 (1845) 19, excl. syn.

Buchneria montevidensis Spreng. ex Walp., Repert. Bot. 4 (1845) 27. – *fide* Moldenke (1971, 1983).

Type: ? Sello ("Sellow") s.n., Montevideo, Uruguay ? (HBG, n.v.).

V. bonariensis L. var. *venosa* (Gillies & Hook.) Kuntze, Rev. Gen. Pl. 2 (1891) 510.

Type: As for *V. venosa*.

V. bonariensis L. f. *venosa* (Gillies & Hook.) Voss. in Vilm., Blumengart., edn 3, 1 (1895) 826.

Type: As for *V. venosa*.

V. bonariensis L. var. *rigida* (Spreng.) Kuntze, Rev. Gen. Pl. 3 (1898) 255; Briq., Ark. Bot. 2, 10 (1904) 10.

Type: As for *V. rigida*.

V. bonariensis L. var. *venosa* (Gillies & Hook.) Chodat, Bull. Herb. Boissier, Ser.2, 2 (1902) 817 f. *robustior* Chodat, loc. cit. (1902) 817 – *fide* Moldenke (1959, 1971a, 1980, 1983).

Type: Hassler 3324, "in campis humidis Caraguatay [Paraguay,], Oct." ... (G, n.v.); Hassler 4695, "in palude pr. Igatimi [Paraguay] Sept." ... (G, n.v.); Hassler 3852, "in uliginosis Tucangua [Paraguay], Febr." (G, n.v.). These syntypes were collected between 1885 – 1895 & 1895 & 1898 – 1900. Exact collecting dates are not given in the protologue of this taxon.

V. venosa Gillies & Hook. var. *parviflora* Thell. & Zimmerm.; Hegi, Illustr. Fl. Mittel-Eur. 5 (1927) 2240, *nom. nud.* – *fide* Moldenke (1971a, 1983).

V. venusta Hort.; Moldenke, Alph. List Invalid Names (1942) 51, *nom. nud.*, in syn. – *fide* Moldenke (1959, 1971a, 1983).

Type: "Based on a collection made by C.J.Meyer [s.n.?] in July 1897, at Munich, Germany and deposited in the herbarium of the University of Michigan", U.S.A. – n.v. – *fide* Moldenke (1964e).

V. nervosa Link; Moldenke, Alph. List Invalid Names Suppl. 1 (1947) 25, *nom. nud.*, in syn. – *fide* Moldenke (1959, 1971a, 1983).

Type: "Based on herb. Hort. Marit. 33, collected from cultivated material in Spain and deposited in the herbarium of the Jardin Botanico at Madrid", n.v., – *fide* Moldenke, (1964e).

V. rigida Spreng. var. *glandulifera* Moldenke, Phytologia 6 (1958) 331, *syn. nov.*

Type: Hatschbach 4212, at Laranjeiras do Sul. In the municipality of Guarapuava, Parana, Brazil, 15.xi.1957 (Herb. Moldenke, Yonkers, New York).

V. hispida: sensu Munir in Jessop, Fl. Cent. Aust. edn 1 (1981) 296. *auct. non* Ruiz & Pav., 1798.

Typification of V. rigida Spreng.

The type of *V. rigida* was collected by Friedrich Sello (sphalm. "Sellow") from Rio Grande, Brazil, and was deposited in the herbarium at Berlin (B). Schauer (1847) saw the type in Berlin Herbarium and Lopez-Palacios (1977) also recorded it as being in Herb. B. According to Verdcourt (1992), however, the holotype of *V. rigida* in Herb. B has been destroyed. Recently, A.J.Scott (1994) recorded with a question mark the existence of the 'holotype' in the herbarium at Heidelberg (HEID). He seems to have based his opinion on

Stafleu & Cowan's (1985) notes who state that "after Sprengel's death his herbarium [including Sello's collections from Brazil] went to his son Anton. After the latter's death in 1851, it was sold in parts. The Labiatae and Verbenaceae went to J.A.Schmidt in Heidelberg (HEID)." According to latest (8th) edition of 'Index Herbariorum', J.A.Schmidt's Herbarium has lately moved from Heidelberg (HEID) to Hamburg (HBG). In response to present author's inquiry, the curator of phanerogam at HBG (Dr Poppendieck) acknowledged the transfer of J.A.Schmidt's Herbarium from Heidelberg (HEID) to Hamburg (HBG) but states that they do not have the type of *V. rigida* Spreng. Recently, the present author visited Hamburg Herbarium but could not find the type of this taxon in that institution.

During the present investigation, one of Sello's collections of this species from Brazil was found in the Pringle Herbarium at Burlington (VT) and another at Paris (P). Both had been annotated as "*Verbena venosa* Gill. & Hook." which is now a synonym of *V. rigida* Spreng. The above mentioned specimen in the herbarium at Paris (P) is also labelled "lectotype". In fact, neither of these two specimens is a type of *V. venosa* because this name is based on *Gillies's s.n.* collected from Buenos Aires, Argentine.

The herbarium label of the specimen at Paris (P) reads;

"*Verbena venosa* Hook/*scaberrima* Cham./Brasil/Sellow, Brasil Prov. De Rio-Grando"

The herbarium label of the specimen at Burlington (VT) reads:

"Ex Museo botanico Berolinensi/Brasilia/S 428/leg. Sellow"

Of the above mentioned two specimens, the one in Burlington (VT) was recorded to be distributed from Berlin Herbarium (B) where Sprengel was in possession of Sello's collections from Brazil, and where he described *V. rigida* as a new species. The specimen in Herb. VT is most likely a duplicate of the type of *V. rigida* Spreng. Since the type in Herb. B was destroyed during the war this well preserved and a good representative of this taxon is being selected here as the lectotype for this species.

Typification of V. scaberrima Cham.

The type collection of *V. scaberrima* Cham. came from plants cultivated at the Botanic Gardens where they were grown in 1815 from material collected in Brazil by Sello. In the protologue of this taxon, the information about the type is "E. Brasilia extratropica et aequinoctiali misit Sellow hospitemque in hortum regium introduxit, quo an. 1825 colchatur" or "colchatur". The type in Herb. B was destroyed during the war and no type-duplicate is known to exist. Therefore, it seems most appropriate to select a neotype from Sello's Brazilian collections of this species. During present investigation, one specimen of Sello's collection of this species from Brazil has been found in the herbarium at Kew (K) and three at Paris (P). All four specimens are in type folders and identified as "*Verbena scaberrima* Cham." Besides the name, the label of Kew specimen reads: "Sellow Brasilia". The three specimens in Herb. P are in two folders, one containing one specimen and the other two, all three "ex Herb. Reg. Berolinense". Of the two specimens in one folder, one is annotated "lectotype" and the other "isotype". The third specimen in a separate folder is also annotated "lectotype". There is no indication of their coming from cultivation or distributed by Herb. B as type duplicates. Of all the above mentioned four specimens, the one alone in a type folder in Herb. P seems a better representative of this species. The specimen is particularly complete and well preserved and is selected here as the neotype for this species. The remaining two at Paris (P) and one at Kew (K) are isoneotypes.

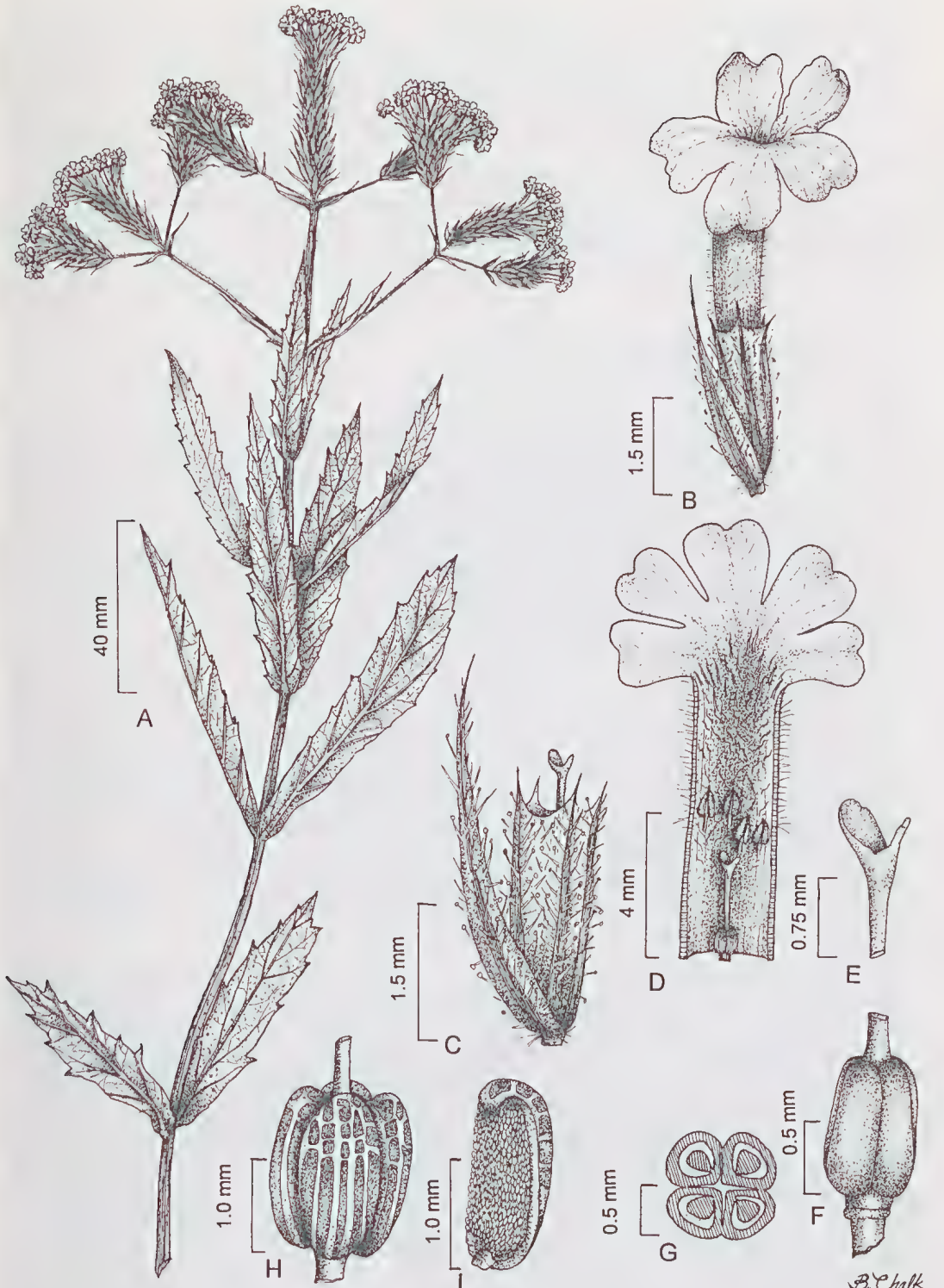
Typification of V. venosa Gillies & Hook.

In the protologue of *V. venosa*, the author did not designate any type. A specimen of *V. venosa* was collected by Dr John Gillies (*s.n.*) from Buenos Aires, Argentine, and was deposited in Herb. K. Verdcourt (1992) believed it to be the holotype. In 1991, however, it was annotated by Silvia Margarita of Botta of Herb. SI as a "lectotype". The present author has not come across any *Verbena* publication by Ms Botta explaining her typification nor were any duplicate of the type seen by the present author.

Description (Fig. 2)

A rhizomatous or stoloniferous perennial herb of erect-spreading habit, sometimes robust or suffrutescent. *Stem* simple or branched from the base, sharply 4-angled in cross-section, (15-) 20–60 (-95) cm long, scabrous-pubescent or very densely hirtellous-pubescent. *Leaves* sessile, more or less semi-amplexicaul or subcordate, oblong-lanceolate, narrowly or quite decidedly obovate or broadly-elliptic, acute or obtuse at the apex, sharply and coarsely serrate with rather distinct teeth, widest at or above the middle, somewhat narrowly cuneate to the abruptly rounded base, midrib and veins impressed above, prominently or less prominently reticulate beneath, scabrous and more or less hispidulous on both surfaces or lower leaf-surfaces much more conspicuously hirtellous-pubescent throughout, coriaceous and rigid or thinner in texture and much less firm and rigid, (2-) 3–8 (-11) cm long, (1-) 1.5–2.5 (-3.5) cm wide. *Inflorescence* spicate, pedunculate; spikes terminal, disposed in subternate groups with terminal usually sessile and the lateral pedunculate, fastigiata, usually dense-flowered and congested at first, eventually cylindric and elongating, (1-) 2–7 (-10) cm long, (5-) 10–15 (-20) mm diam.; peduncles opposite, 2–4 pairs, (1.5-) 2–8 (-10) cm long, scabrous-pubescent or densely glandular-pubescent. *Flowers* sessile, bracteate, very showy when aggregated in spikes; bracts lanceolate, acuminate-subulate, usually closely imbricate, one and a half to almost twice as long as the calyx, glandular-pubescent abaxially, glabrous adaxially, distinctly or very shortly and sparsely ciliate along the margins, purple when fresh, 4.5–6 mm long, 0.5–1 mm wide towards the base. *Calyx* reddish-purple or green, cylindric, 5-ribbed, 5-toothed or lobed at the top, shorter than the subtending bract and somewhat hidden by it, glandular-pubescent or hirsute outside, glabrous inside; tube 5-angled, 3–3.5 mm long, 1–1.5 mm wide; teeth (lobes) nearly equal, oblique, acute, with short mucronate-subulate tips, 0.5–1 mm long. *Corolla* purple, reddish-purple, violet, blue-violet, pink-mauve, lavender-blue, very pale lavender-lilac, rosy-lilac nearly sky-blue, mineral violet or sometimes almost white; tube slender, slightly curved, somewhat inflated towards the middle, mostly surpassing the calyx, downy-pubescent on the upper part outside, villous inside excepting the basal part around the ovary, (5-) 8–10 (-12) mm long, 1–1.5 mm diam.; limbs (5-) 6–8 mm wide; lobes spreading, emarginate or almost bifid, glabrous, 2–3 (-4) mm long, 1.5–2.5(-3) mm broad. *Stamens* inserted below the middle of the corolla tube; filaments short, glabrous, 0.5–1 mm long; anthers ovate-lanceolate, 0.5–0.8 mm long. *Ovary* ovoid-globose, glabrous, somewhat 4-lobed, 0.5–1 mm long; style about half as long as the corolla-tube, filiform, glabrous, 3–3.5 mm long; stigma subcapitate, bilobed, with one lobe larger and stigmatiferous within. *Fruit* enclosed by persistent calyx, globose-oblong, 4-lobed,

Fig. 2. *V. rigida* Spreng. var. *rigida* (A–I, C.Burgess s.n.: CANB/ CBG 005992). A, habit sketch of a branch with flowers and fruit; B, flower with bract; C, calyx and bract; D, corolla cut open showing androecium and gynoecium; E, stigma showing unequal lobes; F, ovary; G, transverse section of ovary; H, fruit; I, mericarp showing mucronately scabrous commissural face.



B. Chalk

glabrous, separating into 4 oblong mericarps 1.5–2 mm long, 1–1.5(-2) mm diam.; mericarps trigonous, slightly broader at the base than at the apex, raised-reticulate on the upper half, striate towards the base, bright fuscous outside, smooth and fuscous on commissural faces when young, white and muricately scabrous when mature.

Distribution

Native from central Brazil south and northern Argentina; widely cultivated and naturalised in many parts of North, Central, and South America, the West Indies, Europe, South Africa, Micronesia, India, the Pacific Islands, and Australia.

2a. Verbena rigida Spreng. var. *rigida* (Fig.2)

Type: As for *V. rigida* Spreng.

An erect spreading rhizomatous or stoloniferous perennial herb, sometimes robust or suffrutescent. *Stem* scabrous-pubescent. *Leaves* oblong-lanceolate, sharply and coarsely serrate with rather distant teeth, acute at the apex, widest about the middle, somewhat narrowly cuneate towards the base, midrib and veins impressed above, prominently reticulate beneath, scabrous and more or less hispidulous on both surfaces, coriaceous and rigid. *Peduncles* opposite, 2-4 pairs, scabrous-pubescent. *Bracts* distinctly ciliate along the margins. *Calyx* glandular-pubescent or hirsute outside. *Corolla* purple, reddish-purple, violet, blue-violet or pink-mauve.

Representative specimens (*collections seen: Australian 171; non-Australian 265*).

WESTERN AUSTRALIA: *Royce 8415*, Olive Hill, E of Brunswick, 27.iii.1968 (PERTH).

QUEENSLAND: *Allen s.n.*, east of Gatton, -.iv.1938 (CANB 00479587); *Bean 6697*, Pig Creek, 13 km N of Gympie, 5.x.1993 (BRI); *Dillewaard 196 & Olsen s.n.*, Indooroopilly, Brisbane, 5.xi.1980 (BRI); *Everist & Webb 1207*, Main Range near Toowoomba, 19.xi.1946 (CANB); *Pedley 720*, Booval near Ipswich, 21.x.1960 (BRI); *Roe 7719*, Warwick, -.iv.1937 (AD, BRI, CANB, NSW); *Smith 3068*, Kingaroy 16.iv.1947 (BRI, CANB, K, L, NY); *White 6663*, Toowoomba, 28.ii.1930 (BRI 268798); *White s.n.*, Gayndah, 13.v.1917 (BRI 268732, BRI 258299, NSW).

NEW SOUTH WALES & A.C.T. *Albrecht 2942*, Bega Valley, near the junction of Wents Road and the Snowy Mt Highway, 3.xi.1986 (AD,MEL); *Burrow 1*, Nandewar Range between Nangarah & Bundarra, 29.i.1916 (NSW); *Coveny 7618 & Hind*, Fairlight road, Mulgoa, 2.v.1976 (GH, HY, K, L, LE, MO, NSW); *Coveny 16706*, 2 km W of Gloucester, 1.i.1994 (BRI, CANB, CTES, MEL, NSW); *Donabauer 15*, *Dunn & Coveny*, in disused paddock below South Obelisk Mountain, 21.xi.1987 (AD, NSW); *Danabauer 33*, *Coveny & Tame*, Hillside overlooking the old water supply dam to Morisset Hospital, Morisset, 24.iii.1993 (AD, CHR, NSW, PERTH); *Evans 2710*, c. 1 km N of main bridge over Araluen Creek, 8.xi.1967 (AD, BISH, BO, CANB, CHR, E, K, L, LE, MEL, NSW, US); *Hadley 108*, Bingara, -.1.1910 (NSW); *Lally 190*, 0.5 km along Jamberro Mountain Road from Jamberoo – Albion Park Road, 30.x.1993 (CANB, MEL, NSW); *Lepschi 99*, *Williamsdale*, S of Canberra, 27.i.1989 (AD, BRI, CANB 2 sp;ec., K, MEL, NSW); *Lyne 1282*, c. 1 km by road from Sofale towards Mudgee, 7.iii.1994 (AD, CBG, MEL, NSW); *Muir 2424*, 1.6 km S of Bemboka, Snowy Mountains, 26.x.1961 (AD, MEL, NSW); *Rodway 11480*, Armidale, 2.iii.1940 (NSW); *Tilden 610*, Kiama, -.ix.1912 (BISH, BM, E,

F, G, GH 2 spec., K, MO, PH, S, UC, US); *White s.n.*, Tweed Heads, 14.xii.1907 (BRI 268735)

VICTORIA: *Black s.n.*, Greta, 28.xi.1935 (MEL 583911); *Callister s.n.*, Mansfield, undated (MEL 583915); *Cozens s.n.*, Oxley Shire, 3.i.1916 (MEL 583917); *Mueller s.n.*, Lake Wellington, i.iv.1878 (MEL 583913); *Smith 47/203*, Deepdene, east side of old outer Circle Railway Line, just off Whitehouse Road, near Melbourne, 6.iv.1947 (KUN, MEL); *Williamson s.n.*, Pakenham Rlway line, undated (MEL1503938).

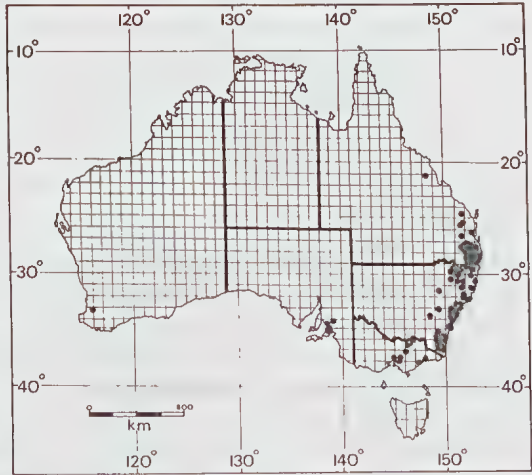
SOUTH AUSTRALIA: *Bates 5406*, 5 km S of Hahndorf, Southern Lofty, 25.iv.1985 (AD); *Griffith s.n.*, Waterfall Gully, c. 10 km ESE of Adelaide, xi.1908 (AD); *Smith 5*, near Bull Creek township, -ii.1916 (AD, CBG).

Distribution and ecology (Map 4)

In Australia, the var. *rigida* is found mainly in the eastern coastal regions of Queensland and New South Wales. Few specimens with scattered localities are known from Victoria, a few from the Southern Lofty region in South Australia and at least one from near Perth in Western Australia.

Collections from outside Australia have been examined from North, Central and South America, the West Indies, the Hawaiian Islands, New Caledonia, New Zealand, South Africa, Zimbabwe, Portugal, India, Sri Lanka and Reunion.

The ecological notes by Australian and overseas collectors agree with Moldenke (1964e) in recording it from both moist and dry soil, sandy waste ground, sandy or calcareous soil, weedy rich open soil, formerly cultivated or grazed paddocks and open dry sandy soil.



Map 4. Distribution of *V. rigida* Spreng. var. *rigida*

Comments

Schauer (1847) recognised *V. venosa* as the correct name for this taxon and recorded *V. rigida* as a synonym. However, as *V. rigida* was published in 1827, two years prior to *V. venosa* (1829), the name *V. rigida* has priority over *V. venosa*.

Kuntze (1891) was the first to relegate *V. venosa* to the status of a variety under *V. bonariensis* L. Moldenke (1983) erroneously attributed this combination to Chodat (1902) who 10 years later published *V. venosa* as a variety of *V. bonariensis*.

In the "Manual of the Southeastern Flora" of the United States of America, Small (1933) erroneously recorded this species as "*V. rigida* (L.) Spreng.", giving the impression that Sprengel based this name on one of Linnaeus's previously published taxa. Small (1933) did not cite basionym and the present author believes it to be an error as no one else has ever attributed this name to Linnaeus.

In Beadle (1984), the fig. 374A is labelled "*Verbena bonariensis*". This figure, however, matches well with *V. rigida* in every detail. These species are closely allied and can easily

be confused. In view of its close resemblance to *V. bonariensis* and in some aspects with other *Verbena* species, Moldenke (1964e) stated that "material of *V. rigida* has been misidentified and distributed in herbaria under the names *V. angustifolia* Michx., *V. aubletia* Jacq., *V. bonariensis* L., *V. bracteata* Lag. & Rodr., *V. brasiliensis* Vell., *V. hispida* Ruiz & Pav., *V. littoralis* Kunth., *V. officinalis* L...." etc.

Alston (1931) recorded from Ceylon only two *Verbena* species, namely *V. rigida* (which he called *V. venosa*) and *V. bonariensis*. In his key to the species and their text, the characters used for *V. rigida* (= *V. venosa*) are in fact that of *V. bonariensis* and vice versa.

Moldenke (1983) recorded the length of calyx and floral-bracts respectively "4-6 mm long" and "2-3 times as long as the calyx". In all Australian collections examined here, the calyx is 3-3.5 mm long and the floral-bracts one and a half to twice as long as the calyx.

In fruit, the commissural faces of young mericarps are often smooth or very sparsely muricate along the margins. The commissural faces of fully mature mericarps are always muricate or muricately scabrous.

In view of the spectacular look of *V. rigida* when in flower, Bailey (1879) stated that a "few of the garden species surpass it in beauty, and should it get a fair start few will surpass it as a weed on account of its running wiry roots, very small pieces of which if left in the ground infallibly produces a plant". In a subsequent publication, Bailey (1906) remarked that "this in some of the pastures near Brisbane forms quite a dense sword of some beauty, but useless to stock, hence a weed to be got rid of". Regarding the ornamental value of this plant, Moldenke (1964e) also admires it as showy plant, especially when forming large patches of brilliant purple".

Webb (1948) states that this species is "suspected of causing sickness in stock. The animals become constipated, feverish, swelling at throat and neck". On the same subject, Moldenke (1983) reports that "*Verbena rigida* contains an irritant principle and is said to cause a form of dermatitis in people allergic to it. In Africa some natives use a decoction of the roots in the treatment of heartburn and colic. The leaves and stems contain the enzyme, urease, and give a negative antibiotic test".

In view of its wide cultivation and introduction in various parts of the World, it is known by numerous common names. Some of the popular names are: "hardy garden verbena", "hardy garden verbain", "hardy verbena", "hardy verbena", "veined Verbena", "large veined verbena", "purple verbain", "stiffy verbena", "strong veined verbain", "veiny verbena", "wrinkled vervain" and "tuber verbena". According to Moldenke (1964a), however, the vernacular name recommended by **Standardized Plant Names** is "tuber verbena".

Affinities

V. rigida is closely related to *V. bonariensis* in its stem being sharply 4-angled, scabrous-pubescent; leaves sessile, oblong-lanceolate, semi-amplexicaul and subcordate at the base, distinctly toothed but not deeply divided; inflorescence pedunculate, spicate, spikes terminal; calyx and corolla more or less of similar shape and colours; corolla-tube surpassing the calyx, villous inside; fruit more or less similar shaped with mature mericarps muricate on commissural faces. Nevertheless, *V. rigida* can easily be distinguished by being rhizomatous and stoloniferous; leaves more rigid; spikes solitary or disposed in subternate groups, thicker at anthesis, (5-) 10-15 (-20) mm diameter, glandular; flower-bracts conspicuously one and a half to twice as long as the calyx; corolla-tube at least 2-3 times as long as the calyx. In *V. bonariensis*, the inflorescence is much-branched; spikes comparatively slender at anthesis, not glandular; flower-bracts barely equalling or slightly exceeding the calyx; corolla-tube scarcely twice as long as the calyx.

There are some characters common to *V. rigida* and *V. littoralis* var. *brasiliensis*. In both taxa the stems are 4-angled, leaves with serrate or toothed margins, inflorescence spicate

and mericarps ("nutlets") with commissural faces muricate-scabrous. Nevertheless, *V. brasiliensis* may readily be identified by its stem being practically glabrous excepting the pubescence on young parts; leaves tapering into a cuneate-attenuate sessile or petiolate base, not semi-amplexicaul or subcordate; spikes compact, mostly short and strict, usually sessile in open cymes; flower-bracts scarcely as long as the calyx; corolla-tube little longer than the calyx and limbs inconspicuous.

3. *Verbena hispida* Ruiz & Pav., Fl. Peruv. & Chil. 1 (1798) 22, t. 34, fig. A; Pers., Synop. Pl 2 (1807) 138; Spreng., Syst. Veg. 2 (1825) 749; D.Dietr., Synop. Pl. 3 (1842) 604; Kuntze, Rev. Gen. Pl. 3, 2 (1898) 256; Moldenke, Résumé Verbenac. etc. (1959) 80, 85, 110, 115, 118, 121, 127, 472; J.F.Macbr., Fl. Peru. Field Mus. Nat. Hist. (Bot.) Ser. 13, 5, 2 (1960) 622; N.C.W.Beadle et al., Handb. Vasc. Pl. Syd. Dist. edn 1 (1963) 414; Junell, Symb. Bot. Upsal. 4 (1934) 12, 164, fig. 1—6; Moldenke, Phytologia 9, 5 (1963) 292; Moldenke, Fifth Summary Verbenac. etc. 1 & 2 (1971) 137, 143, 177, 184, 187, 193, 201, 915; Phytologia 28, 2 (1974) 219; *ibid.* 28,3 (1974) 352; Tronc., Darwinia 18, 3-4 (1974) 320, 311; Phytologia Mem. II Sixth Summary Verbenac. etc. (1980) 130, 136, 169, 176, 179, 183, 191, 363, 448; Moldenke in Dassan & Fosberg, Fl. Ceylon 4 (1983) 206; Munir in Jessop (ed.), Fl. Cent. Aust. repr. edn (1985) 296; Carolin & Tindale, Fl. Syd. Reg. edn 4 (1991) 596; A.D.Chapm., Aust. Pl. Name Ind. Q-Z (1991) 2950; B.J.Conn in G.J.Harden (ed.), Fl. N.S.W. 3 (1992) 613; Lazarides et al., Handb. Aust. Weeds (1997) 191.

Type: *H. Ruiz 1/34*, "HABITAT in arenosis et cretaceis Huanuci", Peru, 1777 – 1788 (MA, lectotype designated here; BM, G, MA 2 spec., P – isolectotypes). See typification.

V. glandulosa Moris in Ann. Storia Nat. 4 (1830) 59 – *fide* Walpers (1845), Schauer (1847), Moldenke (1971a, 1980, 1983).

Type: Grown in Turin Botanic Garden from seeds sent from Chile by Mr Bertero (*s.n.*), undated (?TO, *n.v.*).

V. glandulosa Morren; Steud., Nom. Bot. edn. 2, 2 (1841) 750, *nom. nud.* – *fide* Moldenke (1959, 1964b).

V. cuneifolia Horst; Walp., Rep. Bot. Syst. 4 (1845) 22, *nom. nud.* – *fide* Moldenke (1971a, 1980, 1983).

V. clandestina Mart.; Moldenke, Alph. List Invalid Name. Suppl. 1 (1947) 23, *nom. nud.*, in syn. – *fide* Moldenke (1959, 1971a, 1983).

Type: "Herb. Mertins *s.n.*, collected from material grown in the botanical garden at Munich, Germany, in 1839, and deposited in the herbarium of the Jardin Botanique de l'Etat at Brussels" – *fide* Moldenke (1963c).

Typification

The type of *V. hispida* Ruiz & Pav. was collected in Peru by one of the two authors of this species. In the protologue, the information about the type and its locality is "HABITAT in arenosis et cretaceis Huanuci". Moldenke (1983) recorded the type as "*Ruiz 1/34* from sandy soil along torrents, Huanuco, Peru (MA)". Neither the original authors nor Moldenke (1983) mentioned the existence of any type-duplicates. According to Stafleu & Cowan (1983), the herbarium and types of Ruiz and Pavon are at MA and their duplicates were dispersed to several other herbaria including BM, G and P. During present investigation, two syntypes were discovered among general collections of this species one each in the herbaria at BM and G. Also, three 'type' specimens were found in Herb. P, each in a type-folder labelled 'isotype'. Besides, there are three syntypes in Herb. MA of which the present author has seen photographs. Since no holotype was designated in the protologue, it is necessary to choose a lectotype. Those at BM, G, MA, and one "*ex herbario Lamberti*" at P are annotated in the author's own handwriting and are accepted here as types. Of the

remaining two in Herb. P, the one with two labels dated '1827' and '1868' respectively seems to be a later addition to the type collection, therefore, may not be types. The other (3rd) specimen in Herb. P is Dombey's collection which are not included in the protologue of this species and, therefore, can not be taken as a type. As mentioned earlier, Moldenke chose 'Ruiz 1/34' in Herb. MA as the 'type'. In fact there are three syntype sheets at MA each bearing the number '1/34' and identified as '*Verbena hispida* Ruiz & Pav. Moldenke (1983) did not mention which one of these three he had chosen as the type. Of these three syntypes, the plants of two appear to be of somewhat stunted growth with not fully developed stem, leaves or inflorescence. Moreover, the information on their labels is restricted only to the name of this taxon. The third syntype has fully developed stem, leaves and inflorescence, and its label contains its name and some additional annotations. The specimen is particularly complete and well preserved. It has been chosen here as the lectotype.

Description (Fig. 3)

Erect, ascending or decumbent perennial herb, rarely suffrutescent, 25–70 (-100) cm tall. *Stem* branched; branches more or less spreading, rigid, sharply 4-angled, hispid. *Leaves* sessile, semi-amplexicaul, varying from oblong to narrow-ovate, ovate-lanceolate or lanceolate, acute or acuminate at the apex, cuneate-attenuate to the cordate-clasping base, coarsely and unevenly dentate-serrate or incised, (2.5-) 3–5 (-6) cm long, (0.8-) 1–1.5 (-2.5) cm wide, somewhat rugose above, strigose-hispidulous and glandular on both surfaces, the venations impressed adaxially, prominent abaxially. *Spikes* terminal, pedunculate, often ternate, cylindrical, densely flowered, (1.5-) 2.5–8 (-13.5) cm long, 5–10 mm diam., glandular, hispid or hirsute throughout; peduncle glandular, (2-) 3.5–6.5 (-9) cm long; bracts sessile, linear-lanceolate, becoming elliptic-lanceolate in fructescence, subulate at the apex, usually longer than the calyx, conspicuously surpassing the calyx, glandular and hispidulous abaxially, glabrous adaxially, 3–4.5 mm long, (0.5-) 1–1.5 mm wide. *Flowers* congested, sessile, bracteate, glandular-hirtellous. *Calyx* greenish when fresh, glandular and hispidulous outside, glabrous inside; tube distinctly 5-angled or 5-ribbed, translucent between the ribs, 2–2.5 mm long, 0.5–0.8 mm diam., the rim minutely toothed or subtruncate; teeth short, acute or subacute to subulate, hairy. *Corolla* varying from blue or purplish-blue to purple, lilac, lavender, violet or pinkish-mauve; tube 1.5–2 times as long as the calyx, slightly curved, puberulous outside above the calyx, villous inside in the upper half, glabrous outside and inside in the lower half, 3.5–4 mm long, 0.5–0.7 mm diam.; limb deeply 5-lobed, 1–1.5 mm diam; lobes small and inconspicuous, subequal, ovate-orbicular to elliptic-orbicular, obtuse, the middle lobe of the lower lip slightly larger than the others, all lobes glabrous inside, puberulous outside, 0.5–0.8 mm long, 0.5–0.7 mm broad. *Stamens* 4, inserted at or more often just below the middle of corolla-tube; filament very short, scarcely visible; anthers yellowish, broadly elliptic-orbicular c. 0.3 mm long. *Ovary* ovoid-obovoid or globose, glabrous, faintly 4-lobed, c.0.5 diam.; style filiform, glabrous, not extending up to the middle of corolla tube, 1–1.5 (-1.5) mm long; stigma bilobed, the upper lobe larger, obtuse and stigmastose on the inside surface. *Fruit* enclosed by persistent calyx, elliptic-globose to oblong-globose, glabrous, somewhat reticulate, separating into 4 mericarps, 1.5(-2) mm long, 1–1.3 (-1.5) mm diam.; mericarps oblong, trigonous, convex and sulcate on the outside, concave and muricate on commissural surface.



Fig. 3. *V. hispida* Ruiz & Pav. (A-L, R.G.Coveny 16708: AD). A, habit sketch of a flowering branch; B, transverse section of stem showing 4 angles; C, mature leaf; D, bract showing glandular and hairy abaxial surface; E, bract showing glabrous adaxial surface; F, calyx; G, calyx cut open; H, flower; I, corolla cut open showing androecium, gynoecium and hairy inside; J, fruit; K, mericarp, L, mericarp showing muricate commissural face.

Specimens examined (collections seen: Australian 20; non Australian 100)

QUEENSLAND: *Thompson MOR201*, Neville Laurie Reserve, Logan City, 12.ii.1993 (BRI).

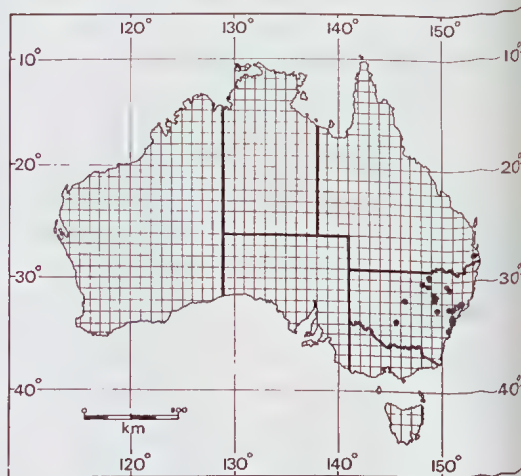
NEW SOUTH WALES: *Black 765.002*, Wollongong, 18.xii.1929 (MEL 583788); *Carne s.n.*, Singleton, -.ii.1913 (NSW 389694); *Coveny 665*, Gloucester, 22.xii.1968 (NSW); *Coveny 744*, near Gunderman, N. bank of Hawksbury River, c. 14.48 km by road SE of Wiseman's Ferry, 9.i.1969 (NSW); *Coveny 16708*, opposite the property "The Big Rock" at the base of the Gloucester Buckets, c. 2 km W of Gloucester, 1.i.1994 (AD, BRI, CANB, HO, K, MEL, MO, NSW); *Cunningham & Milthorpe s.n.*, Hartwood, Nymagee, along Station track 4 km N. of H/S, 25.iii.1976 (NSW 389686); *Evans s.n.*, Artunga, 18.iv.1955 (NSW 389689); *Green s.n.*, 22.iv.1952 (NSW 389693); *Hamilton s.n.*, Emu Plains, 26.xi.1912 (NSW 389699, SYD); *Johnson s.n.*, & *Briggs 3040*, Coonabarabran, 16.xi.1969 (NSW 389688); *Killin s.n.*, Jerrys Plains near Singleton, -.ii.1958 (NSW389691); *King s.n.*, Homebush Sale Yards, -.iii.1989 (NSW); *Kirk s.n.*, Barraba, 22.v.1976 (NSW); *McAllan s.n.*, Purlawaugh, 22.xii.1979 (NSW); *Michael s.n.*, Goolgowi township, 20.i.1994 (AD, NSW); *Michael & Gray s.n.*, Flemington Saleyard, Sydney, 6.x.1970 (CANB 289655, NSW 389696); *Morris s.n.*, Mudgee, -.vi.1949 (NSW 389687); *Salasoo 2192*, Binnaway, 3.i.1962 (NSW).

Distribution and ecology (Map 5)

In Australia, *V. hispida* occurs mainly in New South Wales with only one locality near Brisbane in Queensland. In New South Wales, it occurs in the coastal areas between Newcastle and Wollongong with several localities in the north-eastern and central parts of the State.

Collections from outside Australia have been examined from Argentina, Chile, Bolivia and Peru. Besides, Moldenke (1965) recorded it from Paraguay, Brazil and Ecuador.

Ecological notes by collectors agree with Moldenke (1963c) as it has been recorded as a weed of disturbed soil by roadsides, on railway embankments, at quarry sites, along river banks and sometimes in backyards of residential areas. Recent collectors have found this species growing in beds of dry brooks.



Map 5. Distribution of *V. hispida* Ruiz & Pav.

Comments

According to Moldenke (1983) the corolla lobes are emarginate and fruiting calyx ventricose. During present examination, the corolla-lobes are found to be rounded or broadly obtuse at the tip and the fruiting calyx not ventricose in Australian collections of this species. In two different publications, Moldenke (1971a, 1983) recorded *V. clandestina* Marti. ex Moldenke and *V. cuneifolia* Hort. ex Walp. in the synonymy of *V. hispida* Ruiz & Pav. According to present investigation, both above named synonyms have not been validly published.

Conn (1992) believed that the flower bracts of this taxon were "as long as calyx" and he extended its distribution limits to the Botanical Division "North Far Western Plains: and "South Western Plains". During present studies, the flower bracts examined in several different specimens were found to be mostly longer than calyx. It is only at fruiting stage that the bracts sometimes appear not quite surpassing the calyx. As for the occurrence of *V. hispida* in "North Far Western Plains" and "South Western Plains", it has not been confirmed by any collection on loan from Herb. NSW.

Moldenke (1972e, 1974a) stated that "the material of *V. hispida* has been misidentified and distributed in some herbaria as *V. officinalis* L.; *V. rigida* Spreng." and "*Junellia* sp."

In various parts of its range, *V. hispida* is known by several vernacular names of which some popular ones are: "hispid vervain", "hairy vervain", "hairy vervena", "rough vervena", "hispid mock vervain" and "bristly vervain".

According to collectors' field notes, it appears to flower throughout the year.

Affinities

V. hispida is closely related to *V. rigida* Spreng. in its leaves being sessile, stem-clasping, coarsely serrate-dentate; spikes disposed in ternate groups, cylindrical, dense both in flower and fruit; bract longer than calyx; peduncle, calyx and bracts glandular-hispidulous or glandular-pubescent; stamens inserted below the middle of corolla-tube. Nevertheless, *V. rigida* may easily be distinguished by its flowers being larger and much more bright and conspicuous; bracts one and a half to twice as long as the calyx; corolla limb 6-8 mm diam.; corolla-tube nearly 3 times as long as the calyx with lobes emarginate or somewhat bifid.

There are some characters in common to *V. hispida* and *V. bonariensis* L. In both species, the leaves are sessile, stem-clasping, coarsely serrate-dentate; spikes disposed in ternate groups, cylindric, dense both in flower and fruit. However, *V. bonariensis* can easily be identified by its inflorescence being not glandular; bracts not surpassing the calyx; calyx c. 4 mm long; corolla tube scarcely twice as long as the calyx, the limb 4–5.5 mm diam.; stamens inserted at or just above the middle of the corolla-tube.

4. *Verbena aristigera* S.Moore, Trans. Linn. Soc. Bot. Ser. 2, 4 (1895) 439; Moldenke, Résumé Verbenac. etc. (1959) 109, 115, 117, 119, 126, 470; Moldenke, Phytologia 8 (1962) 189; *ibid.* 9 (1963) 122, 192, 394, 397; *ibid.* 10, 2 (1964) 93; Moldenke, Fifth Summary Verbenac. etc. 1 & 2 (1971) 177, 184, 187, 189, 200, 369, 520, 912, 973; Moldenke, Phytologia 22, 6 (1972) 463; *ibid.* 30, 3 (1975) 133; *ibid.* 36, 2 (1977) 125; Malaise in Troupin, Fl. Rwanda 3 (1985) 290, fig. 94-1A & 1B; Meikle, Fl. Cyprus 2 (1985) 1252; Verdc. in Polhill (ed.), Fl. Trop. E. Afr. Verbenaceae (1992) 10; J.-P. Leburn & Stork, Enum. Pl. Afr. Trop. (1997) 523.

Type: S. Moore 1083, near Mt Pao d'Assucar, between Coimbra and River Apa, Matto Grosso, Brazil, 4.ii.1891-92 (BM, holotype!).

V. tenuisecta Briq., Annuaire Conserv. Jard. Bot. Genève 7-8 (1904) 294; Moldenke, Publ. Carnegie Inst. Wash. 522 [Bot. Maya Area] (1940) 150; Neal, Gard. Hawaii (1948) 636; Gleason, III. Fl. NE U.S. & Adj. Canada (1952) 133; Moldenke, Resume Verbenac. etc. (1959) 111, 115, 128, 154, 164, 224, 296, 362-364, 376, 474; J.F. Macbr., Field Mus. Nat. Hist. Bot. Ser. 13, 5, 2 (1960) 629; Hepper in Hutchins & Dalz., Fl. W. Trop. Afr. edn 2, 2 (1963) 434; Moldenke, Phytologia 11, 4 (1965) 280; *ibid.* 11, 5 (1965) 290; Moldenke, Fifth Summary Verbenac. etc. 1 & 2 (1971) 77, 86, 128, 144, 179, 184, 190, 203-205, 257, 279, 328, 349, 372, 522, 921; Moldenke, Phytologia 24, no. 3 (1972) 234; Lopez-Pal., Revista Fac. Farm. Univ. Los Andes. Merida, no. 15 (1974) 93; Moldenke, Phytologia 28, 4 (1974) 395; Rickett, Wild. Fl. U.S. 2, 2 (1975) 462, t. 170, top right-hand; Lopez-Pal., Fl. Venezuela Verbenaceae (1977) 576, fig. 135; Moldenke, Phytologia 36, no. 5 (1977) 454; C.C. Towns. in C.C. Towns. & Guest (eds), Fl. Iraq 4, 2 (1980) 655; Everist, Poison. Pl. Aust. (1981) 749; N.C.W. Beadle et al., Fl. Syd. Reg. edn 3 (1982) 509; Moldenke in Dassan. & Fosberg (eds), Fl. Ceylon 4 (1983) 208; Raj, Rev.

Palaeobot. Palynol. 39 (1983) 361, t. v2; N.C.W.Beadle, Stud. Fl. NE N.S.W. 5 (1984) 852; Munir in Jessop & Toelken (eds), Fl. S. Aust. 3 (1986) 1178, fig. 545E; Stanley in Stanley & E.M.Ross (eds), Fl. SE Qld 2 (1986) 268; A.D.Chapman, Aust. Pl. Name Ind. Q-Z (1991) 2950; B.J.Conn in G.J.Harden (ed.), Fl. N.S.W. 3 (1992) 613; Carolin & Tindale, Fl. Syd. Reg. edn 4 (1994) 596; B.J.Conn in N.G. Walsh & Entwisle (eds), Fl. Vic. 4 (1999) 414, fig. 80c.

Type: *B.Balansa 1025*, from La Trinidad, Paraguay, 4.x.1875 (G, holotype!).

Glandularia aristigera (S.Moore) Tronc., Darwiniana 14, no. 4 (1968) 636; *ibid.* 18, no. 3-4 (1974) 317, 318; S.Martinez et al., Darwiniana 34 (1996) 15.

Type: As for *Verbena aristigera* S.Moore.

Verbena erinoides auct. non Lam. 1791: Chodat, Bull. Herb. Boiss. Ser. 2, 2 (1902) 818; Chodat & Hassl., Bull. Herb. Boiss. Ser. 2, 4 (1904) 1059, in syn.; N.C.W.Beadle et al., Fl. Syd. Reg. (1962) 415.

V. dissecta Morong in Briq., Annuire Conserv. Jard. Bot. Genève 7-8 (1904) 294, in syn. *vide* Moldenke (1965, 1983).

V. tenera auctt. non Spreng., 1825; J. Black. Fl. S. Aust. (1929) 698; Everist, Common Weeds of Farm & Pasture (1957) 77; Yotaro, Gard. Pl. World 3 (1966) t. 64, fig. 4; Kloot, Checklist Intr. Sp. Natur. S. Aust. (1986) 93; A.D.Chapman, Aust. Pl. Name Index Q-Z (1991) 2950.

V. bipinnatifida auctt. non Schauer, 1847; Nasir & Ali, Fl. W. Pak. (1972) 608; R.J.Hnatiuk, Cens. Aust. Vasc. Pl. (1990) 629.

Glandularia tenera auct. non (Spreng.) Cabrera: S.Martinez et al., Darwiniana 34, 1-4 (1996) fig. 4A & B.

Description (Fig. 4)

Annual or perennial herb, varying from prostrate, procumbent to decumbent- ascending, (10-) 20-50 (-60) cm tall. *Stem* branched at the base, tetragonal, sparsely pubescent but soon glabrescent. *Leaves* ± triangular in outline, tripartite -pinnatisect, shortly substrigose-pubescent especially on the midrib and veins beneath, glabrescent with age, (1.5-) 2-6 (-8) cm long, (1-) 2-4 (-5.5) cm wide; primary segments pinnatisect with ultimate segments uniformly linear to subulate, 5-10 (-14) mm long, (0.5-) 1-2 (-3) mm wide, acute or obtuse at the apex, entire or minutely dentate with margins recurved. *Inflorescence* terminal, pedunculate, spicate, showy; spikes solitary or with several spikes forming a corymb, dense, ovate-capitate to subglobose during anthesis, elongating and lax during infructescence, (1.5-) 2-6 cm long during anthesis; later elongating to 9 (-10) cm, 1.5-2 (-2.5) cm diam.; peduncles (1.5-) 2.5-5 (-6) cm long, elongating to 10cm or more in fruit. *Flowers* sessile, bracteate, at first dense and ascending, later lax and spreading; bracts much shorter than the calyx, varying from elliptic-ovate, ovate-lanceolate to linear-lanceolate, 2-4 (-5) mm long, 1-2 mm wide near the base, canescent-puberulous abaxially, glabrous adaxially. *Calyx* long tubular, 5-toothed, 7-9 mm long; tube 6-7 (-7.5) mm long, 1-1.5 mm diam., densely adpressed strigose-pubescent outside, glabrous inside; teeth unequal, filiform-setose, 0.5-2 mm long. *Corolla* hypocrateriform, showy, varying from blue to bluish-purple, violet or mauve, c. one and a half times as long as the calyx; tube cylindrical, 10-12 (-14) mm long, 1-2 mm diam., glabrous outside, villous inside at throat; limb 5-lobed, asymmetrical, (5-) 6-10 (-12) mm diam., the lobes ± broadly spreading, obovate-obcordate, deeply emarginate, 3-5 mm long, (2.5-) 3-4.5 mm wide above the middle. *Stamens* included; anthers oblong, the anther connectives appendaged, the appendages glandular, partly or almost fully exerted, 1-1.5 mm long. *Ovary* obovoid-oblong, faintly 4-lobed, glabrous, 0.5-1 mm diam.; style included, filiform 10-13 mm long, surpassing the calyx, glabrous; stigma unequally 2-fid. *Fruit* about half as long as the calyx, oblong, 4-lobed, reticulately ribbed or pitted above the middle, (1.5-) 2.5-3.5 (-4) mm long, (1-) 1.5-2 mm diam.; mericarps linear-oblong, ± trigonal, white muricate on commissural faces.

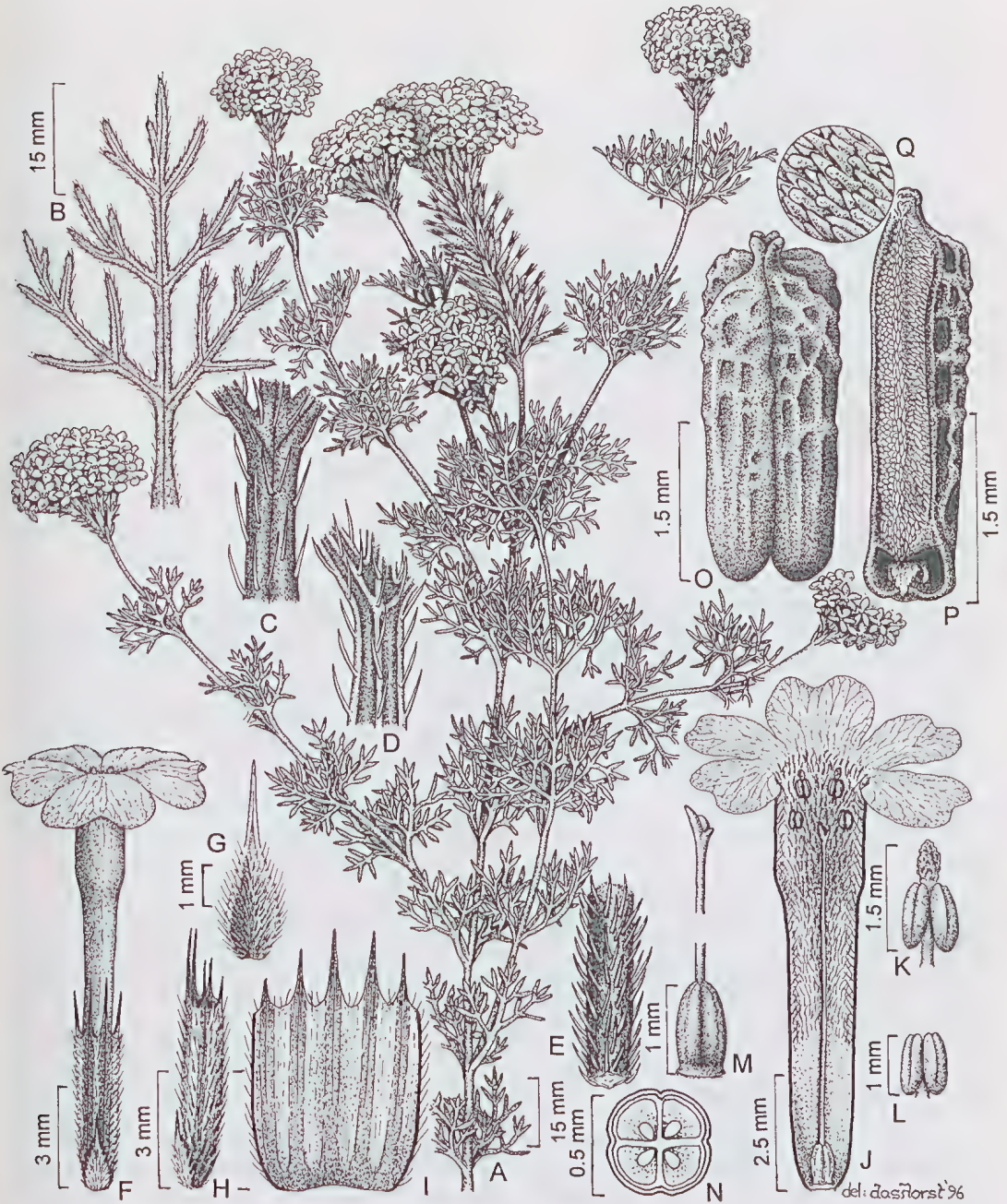


Fig. 4. *V. aristigera* S.Moore (A–N, *V.K.Moriarty* 499: CANB; O–Q, *R.Coveny* 11680 & *P Wilson*: BRI). A, habit sketch of a flowering branch; B, enlarged leaf; C & D, magnified portions of a leaf; E, magnified portion of stem; F, flower; G, flower bract; H, calyx; I, calyx cut open showing glabrous inside; J, corolla cut opened showing inside hairs, androecium and gynoecium; K, upper anther showing protruded gland-tipped connective; L, lower anther without protruded connective; M, ovary; N, transverse section of ovary; O, fruit; P, mericarp showing muricate commissural face; Q, magnified commissural portion of a mericarp.

Representative specimens (collections seen: Australian 140; non Australian 225).

WESTERN AUSTRALIA: *Andrews s.n.*, Coolgardie, -.ix.1915 (PERTH, 2 spec.); *Boyley s.n.*, Merredin, 9.xi.1971 (PERTH).

NORTHERN TERRITORY: *Latz 13019 & Gibson s.n.*, Alice Springs, Old East Side, 15.xii.1992 (AD, AREF, DNA, NT).

QUEENSLAND: *Alcock 8585*, Yelarbon, 60 km E of Goondiwindi, 15.viii.1981 (BRI); *Aston 2440*, 10 km W of St George, along Balonne Highway toward Bollen, 31.viii.1983 (BRI, CANB, MEL); *Blake 19937*, Rockhampton on level of Fitzroy River, 12.v.1956 (BRI); *Blake 7180*, Goodna, Brisbane, 29.xii.1934 (BRI, CANB); *Dillewaard 1042 & Dowling s.n.*, near Glenlyon Dam, 12.x.1984 (BRI, NSW, SP, US); *Jobson 1231*, junction of Leichhardt Highway and Fitzroy Development Road near Palm Tree Creek Crossing, 18 km N of Taroom, 10.xii.1990 (MEL); *Johnson 1471*, S of Dawson River, 2.iii.1960 (AD, BRI, CANB); *McKee 10232*, Jambin, near Biloela, 4.iv.1963 (BRI, CANB, L, NSW); *Pedley 534*, c. 48.3 km S of Meandarra, 3.xi.1959 (BRI, CANB, NY); *Phillips s.n.*, 4.8 km from Amby towards Mitchell, 21.ix.1963 (BRI, CANB, CBG 023403); *Smith & Everist 902A*, Blackall, Mitchell District, 21.x.1940 (BRI, CANB, MEL); *Stanley & Ross 78249*, Mackay, 18.xi.1978 (BRI); *White 12977*, Port Curtis District, Mount Morgan, 30.viii.1938 (BRI); *Wilson 1378*, c. 3 km SW of Cecil Plains on Dunmore S.F. road, 11.x.1975 (BRI, L, NSW).

NEW SOUTH WALES: *Burbidge 2851*, Moonbi, 5.x.1948 (CANB, MEL); *Canning 6416*, just N of Murrumbateman, 8.i.1987 (AD, CANB); *Coveny 9971 & Haegi s.n.*, 3 km S of Wallangarra on New England Highway towards Tenterfield, 6.xii.1977 (BRI, L, NSW); *Cunningham 5194 & Milthorpe s.n.*, 8 km of Weethale, 7.iii.1977 (NSW); *Gorton 4927*, Clarence Town, -.ii.1948 (NSW 4927); *Lepschi 283*, 5 km N of ACT/NSW border, 17.vi.1990 (CANB, NSW); *Parris 9118*, 40 km S of Narrabri along Newell Highway, 2.5.1986 (CANB).

VICTORIA: *Kissane 1808*, Flemington Saleyards, Melbourne, 18.iii.1991 (MEL); *Lyori s.n.*, at the foot of the You Yangs, on the eastern flank, ± east of Station Peak, 13.v.1986 (MEL 1546836).

SOUTH AUSTRALIA: *Bates 17467*, between Hawker and Wilpena, 24.i.1989 (AD); *Bates 43446*, Eden Hill, Southern Lofty Region, 19.v.1996 (AD); *Erkelenz 48*, Port Augusta West, 17.i.1990 (AD); *Jackson 3778*, 2.5 km S of Cambrae, 6.viii.1980 (AD, BR, BRI, CANB, CORD, GZU, MEL, NY, RSA); *Symon 12838*, lower slopes of Hummock Hill, Whyalla, 4.iv.1981 (AD).

Distribution and ecology (Map 6)

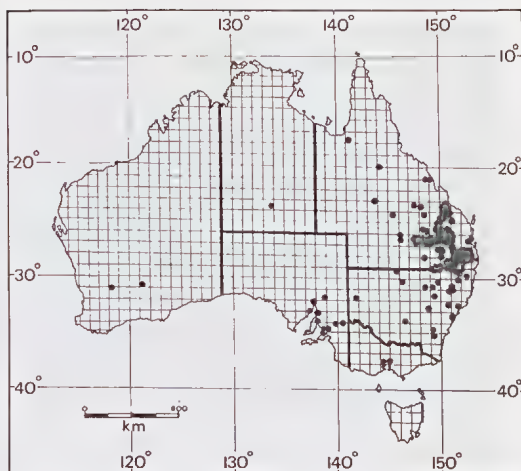
V. aristigera has been found naturalised in all Australian mainland States with major distribution in the eastern halves of Queensland and New South Wales, and southern parts of Victoria, South Australia and Western Australia. In Northern Territory It has been recorded only from near Alice Springs.

Collections from outside Australia have been examined from several countries of North and South America, East and South Africa, the Indian subcontinent and the Middle East.

According to ecological notes by collectors, this taxon occurs in Australia mainly on *Eucalyptus* dominated woodland and in a variety of soil types. Most collections have come from sandy loam, clayey or gravelly type of soils or their combination. It has been recorded as a weed along roadsides, on footpaths, vacant allotments, back yards, disturbed soil,

paddock, open woodland, open grassland and wastelands. Within the above soil types, it is reportedly common along river banks, lakes, creeks and water courses. It has been recorded as a "weed of cultivation and pastures in north-eastern and western NSW and southern Qld".

Moldenke (1983) states that, "In subtropical and warm temperate areas it tends to escape very rapidly and becomes naturalised along roadsides and in otherwise disturbed ground where it may produce a spectacularly beautiful display of colour".



Map 6. Distribution of *V. aristigera* S. Moore.

Comments

In Australia, *V. aristigera* was introduced from South America and is now naturalised in all mainland States. Perry (1933) recognised it as "*V. erinoides* Lam.", a name also widely used for it by horticulturists and gardeners. It is now widely cultivated in many countries of the world, mostly under the names "*V. tenera*", "*V. dissecta*" or "*V. erinoides*". Herbarium material of this taxon has been misidentified and distributed in some herbaria under the names "*V. ambrosifolia* Rydle.", "*V. aubletia* L.", "*V. bipinnatifida* Nutt.", "*V. canadensis* (L.) Britton", "*V. dissecta* Willd.", "*V. erinoides* Lam.", "*V. incisa* Hook. or "*V. tenera* Spreng". According to Moldenke (1974b), "the '*V. tenera*' of Williams (1949) the '*V. tenera*' and '*V. erinoides*' of Burkill (1966), the '*V. bipinnatifida*' of Drar (1970)), the '*V. bipinnatifida*' of the Park (1972), the '*V. tenera*' of Hepper (1963), and the '*V. pinnatifida*' of Nair & Rehman (1962) are all actually *V. tenuisecta*, a species far more widespread in cultivation and escaped from cultivation than the species named by these authors".

The type of *V. aristigera* was collected by S. Moore (no. 1083) in Brazil in February 1891-92, and in 1895 he described it as a new species. The type specimen is preserved in Herb. BM where it is mounted on the right side of the herbarium sheet with another conspecific collection by *A. Robert* 849 mounted on the left side. The *A. Robert* 849 should not be mistaken for the type as it was collected in 1903 from Paraguay, nearly 8 years after the publication of this taxon. A duplicate of this collection is in Herb. K. In this respect, Moldenke (1964b) also states that, "the *A. Robert* 849I distributed as 'TYPE SPECIMEN' of this species is not the type collection at all, nor does it even represent this species [i.e. *V. aristigera* S. Moore], it is *V. tenuisecta* Briq.". In his several treatments of the genus *Verbena*, Moldenke (1959, 1964b, 1965, 1971a, 1972a & d), 1980, 1983) treated *V. aristigera* S. Moore and *V. tenuisecta* Briq. as two distinct species. Nevertheless, Moldenke (1965) did acknowledge that "further studies may show that Briquet's name may have to be supplanted by one of several older names for South American plants which may possibly prove to be conspecific with this taxon, for instance, *V. aristigera* S. Moore or *V. mendocina* R.A. Phil., both of which I am at present regarding as distinct taxa". In a subsequent publication, Moldenke (1972e) states, "that these taxa are sufficiently distinct to deserve separate designation", and according to him, "details of leaf character are sufficient to distinguish them". The present author has examined the types of both *V. aristigera* S. Moore and *V. tenuisecta* Briq. and have found them conspecific. Of the two names, *V. tenuisecta* is placed in synonymy under *V. aristigera*.

Small (1933) and *Troncoso* (1968) referred this taxon to the segregate genus *Glandularia* *Gmel* which was previously regarded by *Schauer* (1847) as a section of the genus *Verbena*. The majority of botanists, however, have kept *V. aristigera* (= *V. tenuisecta*) in the genus *Verbena* without reference to any section or a subgenus.

Moldenke (1965) describes it "rooting at the nodes". During present investigation, however, this character has not been observed in any Australian collection of this species.

This plant is considered as a weed of cultivation and pastures in southern Queensland and north-eastern and western New South Wales. Besides, it has also been suspected of poisoning livestock.

In view of its wide cultivation and introduction in various parts of the world, it is known by many vernacular names. Some of the popular names are: "moss verbena", "Margarita morada", "Burkitt's blue", "Maynes pest", "Wild verbena", "small flowered verbena" or "verbena americana".

Affinities

V. aristigera is closely related to *V. bipinnatifida* Nutt., *V. dissecta* Willd., *V. laciniata* (L.) Briq. and *V. tenera* Spreng. in their overall habit of being diffuse decumbent-ascending herbs branching at the base; leaves tripartite-pinnatisect with ultimate segments (lobes) uniformly linear, oblong or subulate and spikes more or less fascicle-like during anthesis. Nevertheless, *V. bipinnatifida* may easily be distinguished by its leaves being appressed-hirsute on both surfaces and bracts mostly longer than calyx.

There are a few characters common between *V. aristigera* and *V. sulphurea* D. Don, In both taxa the leaves are tripartite-pinnatisect and spikes capitate to subglobose during anthesis. Nevertheless, *V. sulphurea* differs in having yellow instead of purple, bluish-purple, violet or mauve corollas and more particularly in the lower lobes of its leaves originating from the very base of the leaf, and not away from the base.

Rickett (1969) compared *V. tenuisecta* (now synonym under *V. aristigera*) with *V. bipinnatifida* Nutt. saying "*V. tenuisecta* has leaves similarly divided or cleft, the final parts being even narrower, almost hair-like. It is sparsely hairy, then finally becoming smooth. The corolla is large and handsome, purple, lilac or rose. The bracts are much shorter than the calyx". According to *Macbride*, Fl. Peru (1960), *V. aristigera* "differs from *V. tenera* Spreng. of Brazil in its larger leaves, pubescent calyx and evenly puberulent bract, from *V. dissecta* Willd. in its merely fastigiate inflorescence as well as by the strigose calyx; these differences are the sort, one can imagine, that may exist in varying degrees. The naturalised plant has been referred to *V. tenera* Spreng. and to *V. laciniata* (L.) Briq. (= *V. erinoides* Lam.)".

Moldenke (1965) stated that *V. tenera* Spreng. and *V. tenuisecta* Briq. closely resemble each other, but the former "differs in its bractlets being about half (instead of a quarter) as long as the calyx and densely long-ciliate on the margins and in the short but spreading often hirsutulous pubescence on the calyx (instead of the closely appressed-strigose pubescence seen in *V. tenuisecta*)".

5. *Verbena supina* L., Sp. Pl. 1 (1753) 21; Schauer in A.DC., Prod. 11 (1847) 548; Baker in Dyer, Fl. Trop. Afr. 5 (1900) 286; J.M.Black, Fl. S. Aust. Part 3 (1926) 478, fig. 199; E.L.Robertson in J.M.Black, Fl. S. Aust. edn 2, 4 (1957) 720, fig. 1028; Moldenke, Résumé Verbenac. etc. (1959) 474; Moldenke, Phytologia 11, 4 (1965) 251; Moldenke, Fifth Summary Verbenac. etc. 1 & 2 (1971) 349, 372, 594, 668, 921; Franco in Tutin et al. (eds), Fl. Europ. 3 (1972) 123; Moldenke, Phytologia 24 (1972) 228; J.H.Willis, Handb. Pl. Vic. 2 (1972) 850; Moldenke, Phytologia 36 (1977) 451; C.C.Towns. in C.C.Towns. & Guest

(eds), Fl. Iraq 4, Part 2 (1980) 652, t. 117, figs 1 – 7 p.p. exclud. *Robertson S/1031* (K!); Munir in Jessop (ed), Fl. Centr. Aust. (1981) 296, fig. 391; N.C.W.Beadle, Stud. Fl. N.E. N.S.W. 5 (1984) 852; Meikle, Fl. Cyprus 2 (1985) 1251 & 1252, p.p. exclud. *Meikle 2615*, (E!, K!); Munir in Jessop & Toelken (eds), Fl. S. Aust. 3 (1986) 1178, fig. 545D; A.D.Chapm., Aust. Pl. Name Index Q – Z (1991) 2950; B.J.Conn in G.J.Harden (ed), Fl. N.S.W. 3 (1992) 613; Lazarides, Cowley & Hohnen, Aust. Weeds (1997) 192; B.J.Conn in N.G.Walsh & Entwisle (eds), Fl. Vic. 4 (1999) 416, fig. 80f.

Type: Linnaean Herbarium Stockholm S9.1, *Loefling 16*, collected from "Hispania" (S, lectotype, designated by Moldenke (1965), microfiche!). See typification.

V. tenuifolia C.Bauhin, Pinax Theat. Bot, edn 2 (1671) 269 – *fide* Moldenke (1971a), *nom. invalid.*

V. procumbens Forssk., Fl. Aegypt Arab. (1775) 10 – *fide* Moldenke (1959, 1971a, 1980)

Type: "Ad margines agrorum Aegypti", *n.v.*

V. radicans Moench, Meth. Pl. Hort. Bot. Agric. Marbury (1794) 369 – *fide*

Moldenke (1971a), *nom. illeg.*

Typification

In the protologue of this species Linnaeus did not record any specimen but cited "Habitat in Hispania" and a Clusius Plate ("Clus. hist. 2 p. 46"). Two specimens were found in Linnaean Herbaria. One in the Linnaean Herbarium in London (No. 35.16) and another in the Linnaean Herbarium in Stockholm (No. S9.1)

According to C.Jarvis, Hon. Curator, Linnean Society Herbaria [pers. comm. 2 Oct. 1997], "*V. supina* L., 35.16 LINN appears to be a post-1753 addition to the collection; original elements for the name appears to be a sheet in the Linnaean Herbarium in Stockholm (fiche no. 9.1), and the cited Clusius plate". He did not cite a lectotypification of this species by himself or by any one else. It appears that the lectotypification of this species was done by Moldenke (1965) who stated: "There is some question about the typification of this species. The original specimen of Linnaeus, preserved as sheet G. 834, S.7, in the Linnean Herbarium at London, was collected by him in the George Clifford garden in England [Holland] and shows erect stems and thus does not agree well with his description of either 1737 or 1753. In the Stockholm herbarium, however, there is a specimen of *Loefling 16* which, in my opinion, should be regarded as the type. On the reverse side of the sheet there is written "VERBENA" in ink, and then near the bottom in pencil "cfr. Verbena 14 Supina L. sp. pl. 21", and then at the very bottom in ink in Linnaeus' own handwriting "14 supina". On the reverse side of the sheet there is written in pencil "Linné herb" and in ink "*Verbena tetrandra*, spicis filiformibus solitariis, foliis pinnatifidis Linn. Spec. Plant. 21. 14" and in ink in Linnaeus' own handwriting "Hispania 16 Loeffl". The specimen is apparently of the supine form and thus agrees with the description of Linnaeus in 1753: "14. *VERBENA tetrandra*, spicis filiformibus solitariis, foliis bipinnatifidis. *Verbena tenuifolia*. Bauh. pin. 269. Verbena supina. Clus. Hist. 2 p. 46. Habitat in Hispania". In a subsequent publication, Moldenke (1972d) stated that "According to Savage (1945), sheet number 16 under genus, 35, VERBENA, in the Linnean Herbarium [London], is inscribed "supina" in Linnaeus' own handwriting and may thus be considered the type". Nevertheless, Moldenke neither agreed with Savage's opinion nor repudiate his earlier typification of 1965.

In the light of above information, *Loefling 16* in Herb. S has been accepted as the lectotype of this species. In the Linnaean Herbarium in London, the present author has seen sheet 35.16 of *Verbenas supina* L. which matches well with the typical variety of this

species. It does not seem to show "erect" stems, and being pubescent on both stem and leaves it should not be confused with var. *erecta* (Moldenke) Munir which has erect shiny stems and is glabrous both on stem and adaxial leaf surfaces.

Description

A procumbent-decumbent erect or suberect annual herb, branched from the base upwards. *Stem* slender or robust, bluntly quadrangular with rounded angles separated by narrow grooves, (10-) 15–35 (-50) cm long, hispid-canescens, strigose or puberulous or almost glabrous, shiny and purplish. *Leaves* more or less deltoid or broadly rhomboid in outline, tapering basally to a short, flattish canalicate petiole, (1-) 1.5–3 (-4) cm long, (0.8-) 1.5–3 (-3.5) cm wide, more or less canescent-strigillose on both surfaces or glabrous adaxially, puberulous on the veins below, 1- to 2- pinnatisect or -pinnatipartite with lanceolate, broadly oblong, obovate, obtuse to subacute or bluntly toothed lobes; veins usually prominent below; petioles 5–13 mm long. *Inflorescence* a simple or sparingly branched spike, terminal on stem and branches; spikes often solitary, shortly pedunculate, cylindrical, slender, dense at first but elongating and becoming lax in fruit, (2.5-) 5–10 (-15) cm long. *Flowers* sessile, bracteate; bracts linear-lanceolate or narrowly oblong, usually about half as long as the calyx; somewhat strigillose or canescent abaxially, glabrous adaxially, 1–1.7 mm long, 0.3–0.5 mm wide. *Calyx* ± campanulate, 4-toothed with four prominent green ribs or angles, membranous between the ribs, strigillose or canescent outside, glabrous inside, non-glandular, 2–3 mm long, ± 1 mm diameter. *Corolla* lilac, mauve, pink or purple-blue, 4–5.5 mm long, usually one and a half to twice the length of calyx; limbs (2-) 2.5–3 mm diameter; tube cylindric, glabrous or thinly pubescent outside, with a dense ring of hairs in the throat, 3–4 mm long, ± 1 mm diameter; lobes obtuse or truncate, obovate-oblong, 1–1.5 mm long, nearly as wide. *Stamens* included, inserted at about the middle of corolla-tube just below the ring of hairs; anthers ± orbicular-oblong in outline, 0.3–0.5 mm long. *Ovary* obovoid-globose, glabrous, obscurely 4-lobed, 0.5–1 mm diameter; style included, filiform, glabrous, reaching to the stamens, ± 1 mm long; stigma subclavate, obscurely 2-lobed with one lobe stigmatose within. *Fruit* globose or narrowly oblong in outline, tetragonal, almost as long as the calyx or included by the fruiting calyx, composed of 4 mericarps, dull brown, obscurely veined-reticulate dorsally, 2–2.5 mm long, 1.5–2 mm diameter, the mericarps smooth (i.e. non-muricate) on the commissural faces.

Distribution

A native to the Mediterranean region, now introduced and naturalised in parts of southern and eastern Europe, northern and eastern tropical Africa, Middle East, Pakistan, Malaysia and Australia.

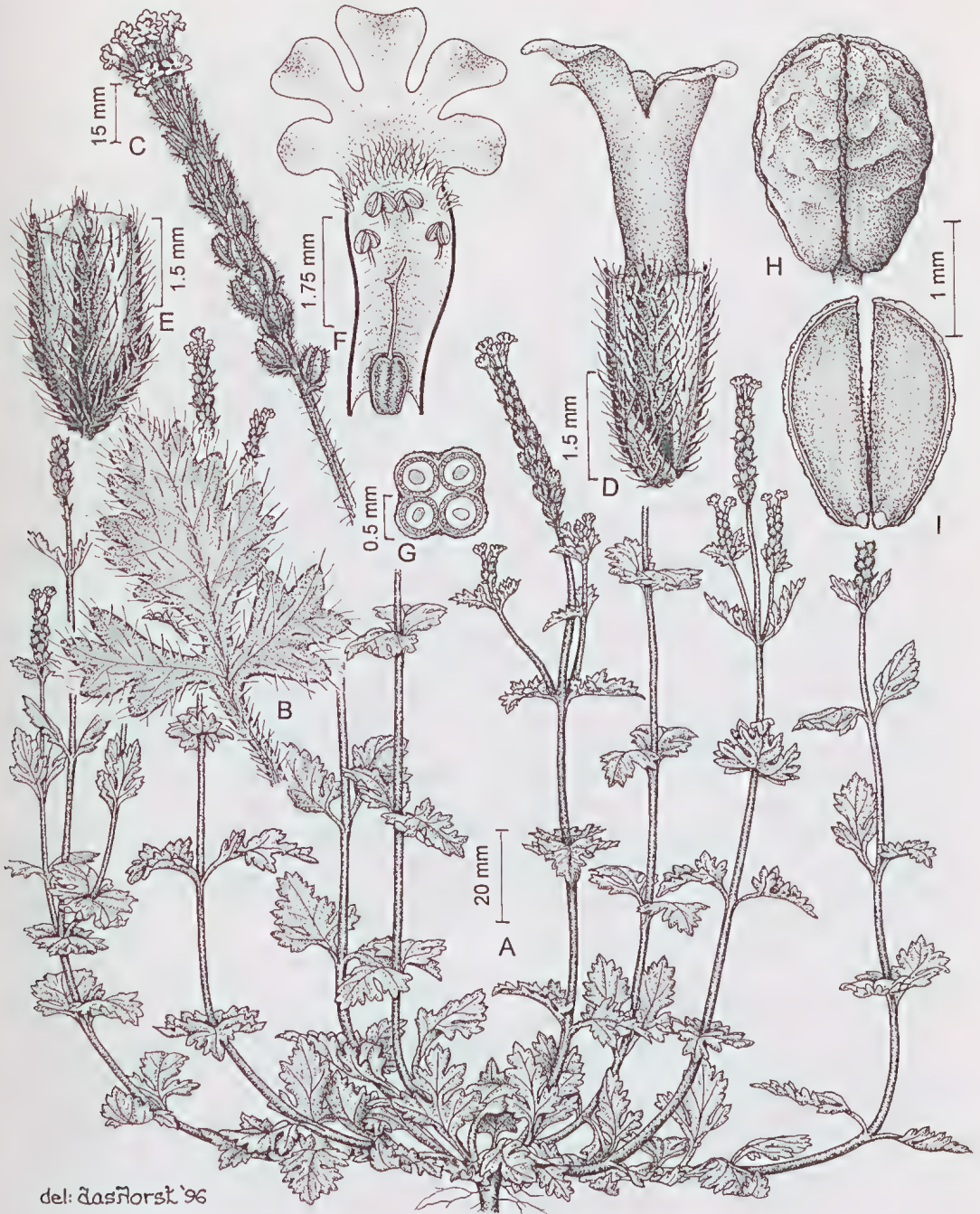
5a. *Verbena supina* L. var. *supina* (Fig. 5)

Type: As for *V. supina* L.

V. supina L. f. *petiolulata* H.Lindb., Iter Cypr. Acta Soc. Sci. Ser. B. Vol. 2, No. 7 (1946) 28, *syn. nov.*; Meikle, Fl. Cyprus 2 (1985) 1252.

Type: *Harald Lindberg s.n.*, "in arenosis juxta opp. Larnaca", Cyprus, 27.vi.1939 (H, holotype n.v., K, isotype!). See comments.

Prostrate or procumbent herb, usually densely pubescent-canescens throughout. *Stem* usually not purplish, much branched from the base, strigose-hispid or more or less canescent, the tips and branches suberect. *Leaves* usually hispid-canescens on both surfaces;



del: Gasñorak '96

Fig. 5. *V. supina* L. var. *supina* (A–I, J.Z. Weber 3414: AD). A, habit sketch; B, magnified leaf; C, inflorescence with flowers and fruit; D, flower; E, calyx showing ribs; F, corolla cut open showing androecium and gynoecium; G, transverse section of ovary; H, fruit; I, two mericarps showing smooth commissural faces.

segments usually narrow, oblong. *Calyx* and bracts strigose-canescens outside, glabrous inside. *Peduncle* always strigose.

Representative specimens (collections seen: Australian 93; non-Australian 75)

NEW SOUTH WALES: *Canning 3451*, Woorandara Station, near Booligal, 27.v.1973 (CBG, GH, L); *Constable 5199*, Byrnedale, 15.xi.1947 (MO, NSW); *Jacobs 454*, Tandou Lake, S end, 20.x.1972 (NSW); *Milthorpe 579*, Lake Mucha near Mootwingee, 1.xii.1971 (AD); *Paijmans 2767*, Billabong of Darling River, 10 km SW of Wilcannia, 16.v.1979 (CANB); *Pickard 1974*, 19 km WNW of Ivanhoe, adjacent to Menindee road, 19.iii.1973 (NSW).

VICTORIA: *Beaglehole 33436 & Henshall*, Red Cliffs, far N.W., 27.iii.1970 (MEL); *Beaglehole 55534*, 5 km SW of Chinkapook, c. 18 km S of Manangatang P.O., 17.iv.1977 (MEL); *Beaglehole 56007 & Macfarlane s.n.*, 17 km SSW of Swan Hill P.O., 1.v.1977 (MEL); *Emmerson s.n.*, Wimmera River Murtoa area, 4.iii.1983 (MEL); *Morgan s.n.*, Winlaton near Tresco, 15.iv.1939 (MEL 583920); *Muir ACB 4318*, Dimboola, -.i.1948 (MEL); *Smith 69/111*, town of Hopetoun, c. 60 km N of Warracknabeal, 18.xi.1969 (CANB., MEL).

SOUTH AUSTRALIA: *Aitken 89*, 70 km W of Central Lake Torrens, Gairdner-Torrens Basin, 15.v.1981 (AD); *Alcock 156*, Tatiara Creek c. 8 km NE of Walseley, Summer 1966 (AD); *Badman 3378*, Stuart Creek Station, Gairdner-Torrens Basin, 7.viii.1989 (AD, BR); *Badman 3941*, 10 km E of White Dam, Andamooka Station, 13.x.1989 (AD, BRI, NY); *S. Barker 114*, Quandong Vale, c. 140 km E of Peterborough, 21.iv.1967 (AD); *W.R. Barker 404*, Canegrass Dam, c. 8 km E of Frome Downs Station, 13.iv.1968 (AD); *Bates 924*, Jupiter Creek near Mt Bold Reservoir, 10.xi.1981 (AD); *Burbidge 5181*, Winnie Pinnie Dam, 6.iii.1945 (AD); *Cleland s.n.*, Swan Reach, River Murray, 19.iii.1927 (AD); *Cleland s.n.*, Frome Road, Adelaide, 11.ii.1946 (AD); *Cleland s.n.*, Mannum, 20.iii.1958 (AD); *Eichler 18896*, between Lake Torrens and Lake Gairdner, 24.x.1966 (AD, CANB); *Ising s.n.*, Watervale, N Lofty, undated (AD); *B. Lay 230*, Northern Lake Gairdner, North Swamp Well, c. 8 km N.N.W. of Coondambo Homestead on Stuart Highway, 1.vi.1971 (AD, K, W); *Lothian 1198*, Cusacks Dam, Lagoon (2 Tank Mill), c. 11 km N of Koonamore Homestead, 5.xi.1962 (AD, W); *Osborn s.n.*, Lake Margin, Finnis Swamp, Koonamore, 5.iii.1931 (AD); *Symon 14954*, Moralana Station, Flinders Ranges, 4.xi.1989 (AD, HO, NSW); *Weber 3414*, c. 6 km S of Blanchetown, 19.iii.1973 (AD); *White s.n.*, Ooldea, on transcontinental railway, -.i.1917 (AD); *Williams 10274*, 8.5 km W of H.S. on road to New Strathearn, 14.iv.1979 (AD).

Distribution and ecology (Map 7)

In Australia, *V. supina* var. *supina* is found chiefly in the eastern half of South Australia, western New South Wales and north-western Victoria. So far, it has not been recorded from any other Australian State or Territory.

Collections from outside Australia have been examined from Algeria, Argentina and several countries in Southern and Central Europe, Mediterranean region and the Middle East. In addition to this, Townsend (1980) reported it from S. Russia, Caucasus, C. Asia and N.E. tropical Africa. The above distribution range has been expanded by Jafri & El-Gadi (1980) by recording it from Iran and India (Himalayas).

Ecological notes by collectors agree with Moldenke (1965) who reported it growing in dry as well as moist places, lowlands and arid deserts, parklands and plains, and on seaport ballast, at altitude from sea level to 90 metres.

Comments

Meikle (1985) cited under *f. petiolulata* H.Lindb. only the type specimen and stated that this type is "perhaps no more than a starved and desiccated condition of *V. supina*", i.e. the typical form of this species. During present investigation, the type of *f. petiolulata* was found to be similar to young plants of the typical form. The type of *f. petiolulata* is very young without flowers or fruits. It is densely strigose with leaves divided into narrowly oblanceolate-petiolulate lobes. Such morphological characters at a very young age seem to be due to the habitat and other ecological conditions under

which this type was growing. Similar leaf-form and dense - strigose canescence have been noticed in a few young collections of this taxon. In the present treatment, therefore, *f. petiolulata* is regarded as a synonym of the typical variety.

According to Townsend (1980) the vegetative parts are "densely furnished with white strigose hairs with an admixture of stalked glands", and the inner face of mericarps "whitish-granulate". The stalked glands have not been found in any Australian collection of this species, and the inner face of mericarps is always smooth. In fact, *V. supina* seems to be the only Australian species with the inner face of the mericarps ("nutlets") smooth.

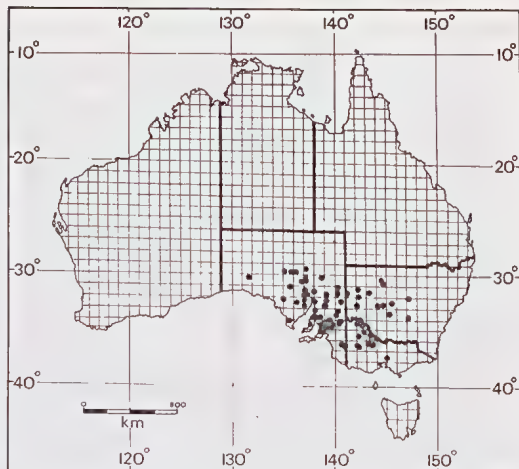
Regarding the calyx of this variety, Meikle (1985) reported it to be "with 5 minute, purplish, deltoid apical teeth". The present author has not seen the 5th tooth of the calyx, and according to Townsend (1980) the calyx is "with 4 prominent green ribs, fifth very slender and scarcely green, the fifth tooth ill-defined". In his comments on the life-form of *V. supina*, Meikle (1985) stated that *Verbena supina* is commonly said to be an annual, but specimens from Kouklia [town in Cyprus] are clearly perennial, with a horizontal, rooting rhizome. Similar plants are found throughout the range of the species, and one may conclude that the duration of the species is tied to habitat, annual plants grow in dry, sandy places, perennials in seasonally inundated pastures and meadows".

Franco (1972) states that the corolla in this variety is "about as long as calyx". However, the corolla in this taxon has been found to be at least one and a half times the length of the calyx.

According to field notes by R.Emmerson s.n. (MEL 641173) this taxon has been "suspected of poisoning sheep". A note by another collector suggests that it is "much grazed by rabbits, more than all other plants in area". Yet another collector reports that it is often "heavily grazed down" by sheep or cattle.

In the specimens examined, flowering and fruiting seem to occur almost all the year round. According to Moldenke (1965), however, flowering in this taxon takes place in the Northern Hemisphere "in March and from May to September, [and] fruiting in March, August and September".

This taxon is known by several English vernacular or common names of which the most popular ones are: "carpet vervain", "hairy vervain", "trailing vervain" and "trailing verbena".



Map 7. Distribution of *V. supina* L. var. *supina*.

Affinities

V. supina var. *supina* is closely related to *V. aristigera* in being a procumbent-decumbent annual herb; leaves deeply divided into lobes, cunneate-attenuate towards the base. Nevertheless, *V. aristigera* may easily be distinguished by its leaves being tripartite-pinnatisect with linear-subulate lobes; spikes somewhat contracted and subglobose during anthesis; flowers large and showy; calyx 5-toothed, 6–7 mm long; corolla-tube 10–11 (-14) mm long, glabrous outside; anther connectives appendaged and mericarps muricate on commissural faces. In *V. supina*, the leaf-lobes are lanceolate, broadly oblong, obovate; spikes slender, flowers small, non-showy; calyx 4-toothed, 2–3 mm long; corolla-tube 3–4 mm long, puberulous outside; anther-connectives without appendages and mericarps smooth on commissural faces. There are several characters in common to *V. supina*, *V. bracteosa* Michx. and *V. prostrata* R.Br. All three species are decumbent in habit with very similarly shaped dissected leaves covered throughout with hispidulous pubescence. *V. bracteosa*, however, differs by its bracts exceeding the calyx and mericarps being muricate on commissural faces. There are several characters in common to *V. supina*, *V. bracteosa* Michx. and *V. prostrata* R.Br. All three species are decumbent in habit with very similarly shaped dissected leaves covered throughout with hispidulous pubescence. *V. bracteosa*, however, differs by its bracts exceeding the calyx and mericarps being muricate on commissural faces. *V. prostrata* seems much closer to *V. supina* but the former differs by its finely glandular bracts, glandular-hirsute calyx and in the commissural faces of the mericarp being muricate.

5b. *Verbena supina* L. var. *erecta* (Moldenke) Munir, *stat.nov.*

V. supina L. f. *erecta* Moldenke, *Phytologia* 11 (1965) 259, *basionym*; Moldenke, *Phytologia* 16 (1968) 207; Moldenke, *Fifth Summary Verbenac.*2 (1971) 205, 206, 209, 211, 266, 699, 921; Moldenke, *Phytologia* 24 (1972) 23; Moldenke, *Phytologia* 26 (1973) 367; Moldenke, *Phytologia* 28 (1974) 393; Moldenke, *Phytologia* 34 (1976) 268; Moldenke, *Phytologia* 36 (1977) 452; Moldenke, *Phytologia Mém.* 2. *Sixth Summary Verbenac. etc.* (1980) 195-200, 202, 254, 255, 339, 365, 586; A.D.Chapm., *Aust. Pl. Name Index Q-Z* (1991) 2950.

Type: Elisée Reverchon 81, in waste places at Algeciras in south-western Spain, 24.vi.1887 (GB, holotype!; BR, S-isotypes!; NY, Z and Herb. H.N.Moldenke, Plainfield, New Jersey – Photos of type – *vide* Moldenke (1965), *n.v.*)

This form differs from the typical form of the species in having its stems usually erect or suberect from the beginning, usually robust and purplish, almost glabrous and shiny or very sparsely puberulous. *Leaves* usually glabrous adaxially, puberulous on the veins abaxially; lobes obtuse or rounded at the apex.

Representative specimens: (*collections seen: Australian 74, non-Australian 30*).

NEW SOUTH WALES: *Brooks s.n.*, Moree district, 4.xi.1950 (NSW 389673); *Canning 3583*, near Booligal, 30.ix.1973 (CANB); *Carolin 4329*, Double Tanks, S of Milparinka, 25.viii.1964 (SYD); *Constable s.n.*, Kudjee Homestead, c. 100 km S of Broken Hill, 21.vii.1955 (NSW 389586); *Cunningham & Milthorpe 2856*, 12 km NE of Bourke on Brewarrina road, 1.ix.1974 (NSW); *Fox 7910106*, bank of Ana Branch just S of Wyndham Homestead, 10.x.1979 (NSW); *Milthorpe & Cunningham 2625*, "Yelty" Ivanhoe, 18.viii.1974 (NSW); *Moore 6741*, Mt Mulyah, c. 96.5 km NW of Louth, 27.ix.1974

(CANB, 2 spec.); *Whaite 1404*, near Lake Sandy, 18.5 km E of Ivanhoe, 19.iv.1953 (NSW); *White s.n.*, New Tank area, Mootwingee Nat. Park, 18.ix.1990 (NSW).

VICTORIA: *Beaughtehole 40603*, Lindsay River, 16.09 km N of Sturt Highway, c. 80.47 km W of Mildura, 19.x.1972 (MEL); *Beaughtehole 40664*, Kulkyn Forest, far SE corner, c. 24 km E of Hattah P.O., 31.x.1972 (MEL); *Beaughtehole 79860A*, Lake Lyndger Wildlife Reserve, 2.ix.1985 (MEL); *Hanshall s.n.*, Kings Billabong, beside the Murray River, between Mildura and Red Cliffs, -.xi.1965 (MEL 583918); *Parkes & Menkhorst s.n.*, NW Lake Wallawalla, on Lindsay Point Track, 16.x.1985 (MEL 1556652).

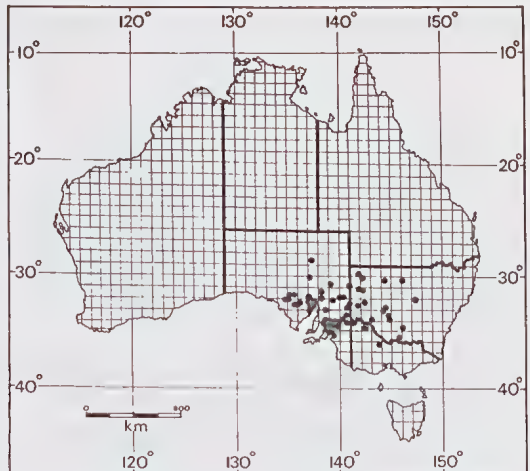
SOUTH AUSTRALIA: *Badman 3378*, Canegrass Dam, Sturt Creek Station, 7.viii.1989 (AD, AK, BA, BR, CANB, COLO n.v.); *Badman 4630*, Four Mile Dam, Carriewerloo Station, 24.ix.1990 (AD, TUR n.v.); *Bates 18630*, Manunda Station, 4.vi.1989 (AD); *Beck s.n.*, Morgan c. 140 km NE of Adelaide, -.xi.1929 (AD); *Chorney 1074*, Less Hill, c. 25 km S of Stuart Creek H.S., 7.x.1978 (AD, G, NSW); *Cleland s.n.*, Wellington, near Lake Alexandrina, 13.xi.1957 (AD); *Crisp 484*, near Southern Cross Bore, Koonamore Station, 24.vi.1973 (AD, CBG); *Eichler 19597*, c. 6.5 km W of Blanchetown, 22.x.1967 (AD); *Geytenbeek s.n.*, near Mintaro, Mortlock Experimental Station, 1.xi.1985 (AD, MEL); *Jackson 2106*, Lake Everard, near Mordinyabee Hill, 30.ix.1972 (AD, SI n.v., TI n.v.); *Spooner 10915*, NE of Koonamore Station, 11.x.1987 (AD); *Lothian 1123*, 9.65 km S of Iron Baron, Whyalla, 24.x.1966 (AD); *Symon 3702*, Bulls Head Dam, ± 45 km N of Overland Corner, 10.x.1965 (AD, DAV N.V., SPN n.v.); *Symon 8192B*, Punky Plains Dam, ± 16 km SE of Hiltaba H.S., 6.x.1972 (AD, B n.v., CANB); *Symon 14008*, Moralana Station, Whim Paddock, 9.x.1984 (AD, B, CANB, F, LG n.v., MO); *Toelken 7455*, Kolendo, Dawes Dam, 30 km W of H.S., 17.x.1983 (AD, CBG, NT, NY); *Weber 2294*, 5 km W of vermin fence near Brougham's Cootage, 6.viii.1971 (AAU n.v., AD, AK n.v., CANB, PH); *Weber 3655*, 13 km W of Blanchetown, Brookfield Zoo Wombat Reserve, 3.x.1973 (AD!, PH, W n.v.); *Williams 10043*, on wall of Kalabity Auxillary Dam, 31.viii.1978 (AD).

Distribution and ecology (Map 8)

In Australia, *V. supina* var. *erecta* has been recorded from southern and south-eastern regions of South Australia, western New South Wales and far north-western Victoria. As in the case of the typical form, var. *erecta* has not been reported from any other State or Territory in Australia.

Collections from outside Australia have been examined from Algeria, Argentina, Cyprus, Egypt, Iraq, Libya, Morocco, Spain and Tunisia. In addition to these countries, Moldenke (1965, 1971a, 1972d) recorded it from Portugal, Hungary, Italy, Azerbaijan, Cyrenaica, Sudan, Sicily, Turkey and Jordan.

According to collectors' field notes, var. *erecta* grows chiefly in sandy-loam, reddish-brown fine sand or heavy texture clayey soil. It is generally found in wet places on river



Map 8. Distribution of *V. supina* L. var. *erecta* (Moldenke)Munir

banks, near edge of ditches, lakes and swamps. Also found in open community on plains, flood plains and disturbed soil.

Comments

The var. *erecta* was first published by Moldenke (1947) as f. *erecta* without any description, and subsequently it appeared as such in his several other publications. In 1965 Moldenke validated this name by providing it with a short Latin diagnosis, its English translation and details of its type. The five names included in the synonymy of this taxon by Moldenke (1965) seem to have been never validly published.

In the protologue of this taxon, Moldenke (1965) remarked that "more study is needed to determine the actual taxonomic status of this form, which seems at times to intergrade with the typical form or perhaps to hybridize with it". In a subsequent publication, Moldenke (1972d) clearly mentioned that "I do not believe that it is hybrid in nature". The present author has found sufficient characters to distinguish var. *erecta* from the typical form. Keeping in view these characters, the possibility of mistaking this taxon with the typical form would be minimal. There may be a need of more study, however, to determine the likelihood of its hybridisation with the typical form.

The occurrence of var. *erecta* in Australia was first recorded by Moldenke (1973a) from New South Wales. So far, it has not been included in any Australian flora though its presence in New South Wales, Victoria and South Australia has been confirmed by several collections. It is known to occur in several countries of Eastern Europe, North Africa and the Middle East, but the recently published floras of some of these countries have not recorded it. For instance, the present author has seen several collections of var. *erecta* from Iraq and Cyprus, but in the "Flora of Iraq" by Townsend & Guest (1980) and "Flora of Cyprus" by Meikle (1985) there is no mention of this taxon. It seems that the author of these floras mistook var. *erecta* for the typical form. For example, a collection by V.C. Robertson S/1031 (K!) from Iraq and one by R.D. Meikle 2615 (C!, K!) from Cyprus belong to var. *erecta*, but both collections are respectively recorded in the floras of Iraq (1980) and Cyprus (1985) under the typical variety of this species.

The common names for this species are "procumbent vervain" and "trailing vervain".

Affinities

The var. *erecta* is closely related to the typical variety in having almost similar shaped leaves, inflorescence, calyx, corolla and mericarps. It may, however, be easily distinguished by its stem being always erect or suberect, glabrous, shiny and purplish; leaves glabrous adaxially, puberulous on the veins abaxially and lobes obtuse or rounded at the apex. There are a few characters in common between var. *erecta*, *V. bracteosa* Michx. *V. prostrata*. For similarities and difference, see "affinities" under var. *supina*.

6. *Verbena litoralis* Kunth. in Humb., Bonpl. & Kunth, Nov. Gen. & Sp. Pl. 2 (1818) 276 & t. 137 (1817); Spreng., Linn. Syst. Veg. 2 (1825) 748; Schauer in A.DC., Prod. 11 (1847) 542, excl. *V. brasiliensis* Vell.; A. Gray, Fl. N. Amer. edn 2 (1888) 458; Small, Fl. SE U.S.A., (1903) 1010; L.M.Perry, Ann. Missouri Bot. Gard. 20 no. 2 (1933) 257; Small, Man. S.E. Fl. (1933) 1136; Moldenke, Résumé Verbenac. etc. (1959) 203, 210, 212, 223, 359, 365, 368, 371, 472; J.F. Macbr., Fl. Peru, Field Mus. Nat. Hist. Bot. Ser. 13, 5, 2 (1960) 624; Moldenke, Phytologia 9 (1964) 501-505; Moldenke, Phytologia 10 (1964) 56-88, 114; D.N. Gibson in Standl. & L.O. Williams (eds), Fl. Guatemala Verbenac. Fieldiana Bot. 24, 9, 1 & 2 (1970) 232; Moldenke, Fifth Summary Verbenac. etc. 1 & 2 (1971) 349-351, 353, 649, 655, 672, 679-682, 686, 916; Moldenke, Fl. Panama Verbenac. Ann.

Missouri Bot. Gard. 60, 1 (1973) 45, fig. 1; Moldenke, *Phytologia*, 28, 3 & 4 (1974) 250; 354; Lopez-Pal., *Fl. Venezuela Verbenac.* (1977) 563, figs 132, 133; Moldenke, *Phytologia* 36, 3 (1977) 233; Moldenke, *Phytologia Mem.* 2, Sixth Summary Verbenac. etc. (1980) 339-341, 343, 344, 363, 447, 448, 451. 582; N.C.W.Beadle et al., *Fl. Syd. Reg.* edn 3 (1982) 509; Stanley in Stanley & E.M.Ross (eds), *Fl. SE. Qld* 2 (1986) 368, fig. 51E; W.L.Wagner et al., *Man. Fl. Pl. Hawaii* 2 (1990) 1325; A.D.Chapm., *Aust. Pl. Name Index Q-Z* (1991) 2950; B.J.Conn in G.J.Harden (ed), *Fl. N.S.W.* 3 (1992) 613; P.S.Green, *Fl. Aust. Oceanic Isl.* 1, Verbenac. 49 (1994) 315; Carolin & Tindale, *Fl. Syd. Reg.* edn 4 (1994) 597; Lazarides, Cowley & Hohnen, *Aust. Weeds* (1997) 191.

Type: F.W.H.A.Humboldt & A.J.A.Bonpland s.n., "in Salsis maritimis Oceani Pacifici prope Truxillo, Santa et Lima", Peru, undated (P lectotype!, designated by J.F. Macbride, 1960). See "typification".

V. caracasana Kunth. in Humb., Bonpl. & Kunth, *Nov. Gen. & Sp. Pl.* 2 (1818) 275; Spreng., *Linn. Syst. Veg.* 2 (1825) 748; Walp., *Repert. Bot. Syst.* 4 (1845) 19 – *fide* Schauer (1847), Perry (1933), Lopez-Palacios (1977), Yeo (1990); P.W.Michael, *Weeds-Wet & Wild* (1997)9; Pedley in R.J.F. Hend. (ed), *Qld Pl. new edn* (1997) 205.

Type: F.W.H.A.Humboldt & A.J.A.Bonpland 658, "rarissime in sylvaticis prope Caracas", Venezuela, undated (B-Willd. 11134!, P, "isotype" – photograph!).

V. lanceolata Willd. ex Spreng., *Syst. Veg.* 2 edn 16 (1825) 748, *nom. illeg.*, apparently based on the type of *V. caracasana* Kunth – *fide* Moldenke (1971b, 1973b), pro syn. *V. caracasana* Kunth.

Type: Based on Humboldt 658, Caracas, Venezuela, undated (B-Willd. 11134!).

V. bonariensis L. var. *litoralis* (Kunth)Hook., *Bot. Misc.* 1 (1829) 166; Walp., *Repert. Bot. Syst.* 4 (1845) 20 – *fide* Perry (1933), Macbride (1960), Moldenke (1973b), Lopez-Palacios (1977).

Type: As for V. litoralis Kunth.

V. litoralis Kunth var. *glabrior* Benth., *Bot. Voy. Sulphur* (1846) 153 – *fide* Lopez-Palacios (1977), Moldenke (1971b, 1973b).

Type: Sinclair s.n., Paita, Peru, 1936-1939 (Herb. Hook., K, n.v.).

V. affinis Mart. & Gal., *Bull. Acad. Brux.* 11, no. 2 (1844) 322 – *fide* Perry (1933), Gibson (1970), Moldenke (1971b, 1973b), Lopez-Palacios (1977).

Type: n.v. – fide Perry (1933), Gibson (1970), Moldenke (1971a, 1973b), Lopez-Palacios (1977).

V. bonariensis auct. non L.: Walp., *Repert. Bot. Syst.* 4 (1845) 19 p.p. quoad syn. *V. litoralis* Kunth.

V. litoralis Kunth [var.] *α pycnostachya* Schauer in A.D.C., *Prod.* 11 (1847) 542 exclud. syn. *V. brasiliensis* Vell.; Hochr., *Candollea* 5 (1934) 188 – *fide* – Perry (1933), Moldenke, (1959, 1971b), Yeo 1990.

Type: "that of V. litoralis" Kunth – *fide* Yeo (1990).

V. litoralis Kunth [var.] *β leptostachya* Schauer in A.D.C., *Prod.* 11 (1847) 542; R.Knuth, *Repert. Sp. Nov. Reg. Beih.* 43 (1927) 598 – *fide* Perry (1933), Moldenke (1959, 1971b, 1973b), Lopez-Palacios (1977), Yeo (1990).

Type: C.J.W.Schiede 1168, "ad Jalapam et Papanlam, Mexico", - vii.1828 (HAL 076812 – lectotype!, selected here); *F.Sellow s.n.*, "Brasilia meridionalis", undated (HAL 076814, K – syntype!); *F.Phillippi s.n.*, Chile, undated (SGO – syntype!).

V. nudiflora Nutt. ex Turcz., *Bull. Soc. Imp. Natur. Moscow* 36, no. 2 (1863) 195 – *fide* Moldenke (1971b, 1973b)

Type: "Funk 325, Galipan, Prov. Caracasanae", Venezuela, n.v.; "Funk 54 and Galeoti. 359, Cumana near Cumanacoa", Venezuela, - n.v.. Note: In the protologue, there is no mention of the whereabouts of the types. Turczaninow's types are mainly in Herb. KW & LE.

V. hanseni Greene, *Pittonia* 3 (1898) 308 – *fide* Perry (1933), Moldenke (1971b, 1973b).

Type: G.Hansen 2025, foothills of the Sierra Nevada, in Amador Co., California, U.S.A., 1889 (K!, ND – G, n.v.).

V. litoralis Kunth var. *caracasana* (Kunth) Briq., Ann. Conserv. Jard. Bot. Genève 7-8 (1904) 292; Moldenke, Résumé Verbenac. etc. (1959) 69, 127, 361, 369, 472; Moldenke, Phytologia 10, no. 1 (1964) 76; Moldenke, Phytologia 16 (1968) 99; Moldenke, Phytologia 23, no. 3 (1972) 294; Moldenke, Phytologia 28, no. 3 (1974) 252; Moldenke, Phytologia 28, no. 4 (1974) 355 – *vide* Perry (1933), Lopez-Palacios (1977).

Type: As for *V. caracasana* Kunth.

V. officinalis auct. non L.: Maiden, Proc. Linn. Soc. New South Wales 28 (1904) 712 – *vide* P.S. Green (1994).

V. parviflora Larrañ, Escritos D.A.Larrañ. 2 (1923) 9 – *vide* Moldenke (1959, 1971a, 1973b).

Type: n.v., not cited in the protologue.

V. litoralis Kunth var. *albiflora* Moldenke, Phytologia 1 (1940) 432; Moldenke, Phytologia 36, 3 (1977) 237; Moldenke, Phytologia 41, 3 (1979) 180 – *vide* Gibson (1970).

Type: G.B.Hinton 13965, in a llano at an altitude of 1000m, Coalcoma, district of Coalcoma, Michoacan, Mexico, 20.vii.1939 (LA, n.v.) – *vide* Moldenke (1940a).

V. litoralis Kunth f. *albiflora* (Moldenke) Moldenke, Phytologia 44, 5 (1979) 329; Moldenke, Phytologia Mem. 2 Sixth Summary Verbenac. etc. (1980) 68, 76, 112, 136, 451, 583.

Type: As for *V. litoralis* Kunth var. *albiflora* Moldenke

V. litoralis Kunth var. *portoricensis* Moldenke, Phytologia 50, 5 (1982) 310, *syn. nov.* – based on description.

Type: Alain H., Perfa Liogier & L.F.Martorell 28417, along the Panoramic Highway south of Cayey, Puerto Rico, at 640 m altitude, 14.iii.1979 (NY, n.v.).

Typification

V. litoralis Kunth is based on Humboldt and Bonpland's collections from three different localities namely Truxillo, Santa and Lima in Peru. The author did not choose a specimen as a type from these syntypes. The syntype from Truxillo in Herb. P is labelled "Isotype" but the whereabouts of any possible duplicate and the collections from Santa and Lima are not known. Macbride (1960) noted all three above-named collections by Humboldt and Bonpland and chose the Truxillo specimen as the "type". This is accepted here as the lectotype for this species. Green (1994) recorded the "holotype" as probably in Paris, but as explained above, Macbride (1960) had already correctly provided a lectotype.

Description

Erect or ascending perennial herb, (20-) 50–150 (-210) cm tall. *Stem* rather sparingly branched, 4-angled, faintly sulcate between nodes, finely pubescent strigillose when young, becoming glabrous and smooth with age, hairs minute, stiff and closely appressed, not spreading. *Leaves* subsessile or shortly petiolate, the lamina elliptic-lanceolate to oblanceolate-spathulate, gradually tapering into a short petiole of indeterminate length or semi-amplexicaul in var. *brasiliensis*, (2-) 4–10 (-15) cm long, (5-) 15–30 (-80) mm wide, apex obtuse to acute, margins coarsely or somewhat irregularly serrate-dentate, occasionally some of the larger teeth bidentate, sometimes shortly lobed, finely scabrous-strigillose with closely appressed hairs above the venations impressed above and prominent beneath, upper leaves with lamina narrowly lanceolate, entire or sparsely toothed. *Spikes* terminal, pedunculate, slender, not glandular dense at first but soon elongating and cylindrical with flowers congested near the top of the rachis and becoming lax in the lower part, (1-) 2–8 (-10) cm long, (3-) 4–5 (-6) mm diam.; rachis slender, eglandular-pubescent, the hairs closely appressed; peduncle somewhat tetragonal, sparsely puberulous when young, becoming glabrous with age, 5–10 (-12) cm long; floral-bracts ovate-lanceolate, marcescent, rigid, acuminate, ciliate, usually subequalling or somewhat shorter than the

calyx, sometimes surpassing the calyx or upper young flowers in var. *brasiliensis*, glabrous adaxially, pubescent–puberulous abaxially with minute appressed hairs, becoming glabrescent with age, 1.5–2 (2.5) mm long, 0.5–1 mm wide towards the base. *Flowers* sessile, bracteate, not showy. *Calyx* purple when fresh, later discoloured, pubescent or finely strigillose-pilose outside, glabrous inside; tube 5-angled or -ribbed, translucent between the ribs, 1.5–2 mm long, 0.5–1 mm diam., the rim subtruncate; teeth equal, minute, subulate, ciliate. *Corolla* bluish-purple, mauve, violet or occasionally white; tube cylindrical, somewhat longer than the calyx, puberulous in the upper part outside, densely villous in the throat, sparsely so inside the tube, 2–2.5 (-3) mm long, 0.5–0.8 mm diam.; limbs not very conspicuous, 1.5–2 mm diam.; lobes subequal, broadly elliptic – oblong or almost orbicular in outline, glabrous, somewhat retuse or emarginate, 0.3–7 (-1) mm long, 0.3–0.6 (-1) mm broad. *Stamens* inserted just below the corolla-throat; filaments short, scarcely visible; anthers yellowish, broadly elliptic-orbicular in outline, 0.2–0.3 mm long. *Ovary* obovoid, obovoid-glabose, glabrous, faintly 4-lobed, 0.5–0.8 mm long, 0.3–0.5 mm diam.; style filiform, glabrous, extending up to the middle of corolla tube, c. 1 mm long; stigma subcapitate, 2-lobed with one lobe larger and stigmatose on the inside surface. *Fruit* enclosed by persistent calyx, broadly elliptic-glabose to oblong-glabose, glabrous, somewhat reticulate, separating into 4 linear-oblong mericarps of which sometimes one or two abort, ± 1.5 mm long, ± 1 mm diam.; mericarps trigonous, muricate on commissural face, 2–3 times as long as broad.

Distribution

V. litoralis occurs in North and South America, South Africa, Zimbabwe, Japan (Okinawa Island), Pacific Islands, Australia, New Zealand and Hawaiian Islands.

6a. *Verbena litoralis* Kunth var. *litoralis* (Fig. 6)

Erect perennial herb. *Stem* branched, 4-angled, puberulous or almost glabrous. *Leaves* subsessile, elliptic-lanceolate or somewhat spatulate, gradually tapering towards the base, not clasping, serrate-dentate, or sometimes lobed, up to 10 cm long and 3 cm wide. *Spikes* dense at first, later elongating with flowers lax in the lower part of the rachis, usually 3–8 (-12) cm long, 2–3 mm diam. *Bracts* ovate-lanceolate, subequal or somewhat shorter than the calyx. *Flowers* not showy. *Calyx* tubular, 5-ribbed, translucent between the ribs, finely strigillose-pilose outside, glabrous inside; teeth minute, ciliate. *Corolla* bluish-purple, mauve or lilac, villous inside the tube. *Stamens* inserted just below the throat. *Ovary* obovoid, glabrous, less than 1 mm long, 0.3–0.5 mm diam. *Fruit* elliptic-glabose, glabrous, 4-lobed; mericarps ("nutlets") muricate–scabrous on commissural faces.

Representative specimens (collections seen: Australian 67; non-Australian 232)

WESTERN AUSTRALIA: *Keighery s.n.*, Lechenault Inlet, Bunbury, 20.x.1984 (PERTH 3658600).

NORTHERN TERRITORY: *Morrison s.n.*, Standley Chasm road near turn-off from Jay Creek, c. 35 km W of Alice Springs, 26.vi.1974 (MEL 583803).

QUEENSLAND: *Cribb s.n.*, Brisbane, -.x.1947 (BRI 470111); *Durrington 565*, Serpentine Creek, c. 11 km NE of Brisbane, -.x.1972 (BRI); *Johnson 3736*, 10 km NE of Yungaburra on Gordonvale Road, 16.vi.1977 (BRI); *R. Jones 378*, rubbish tip off Carmody Rd, St. Lucia, 22.x.1963 (BRI); *McDonald 3278*, Bulburin State Forest, S.F. 67 Bulburin,

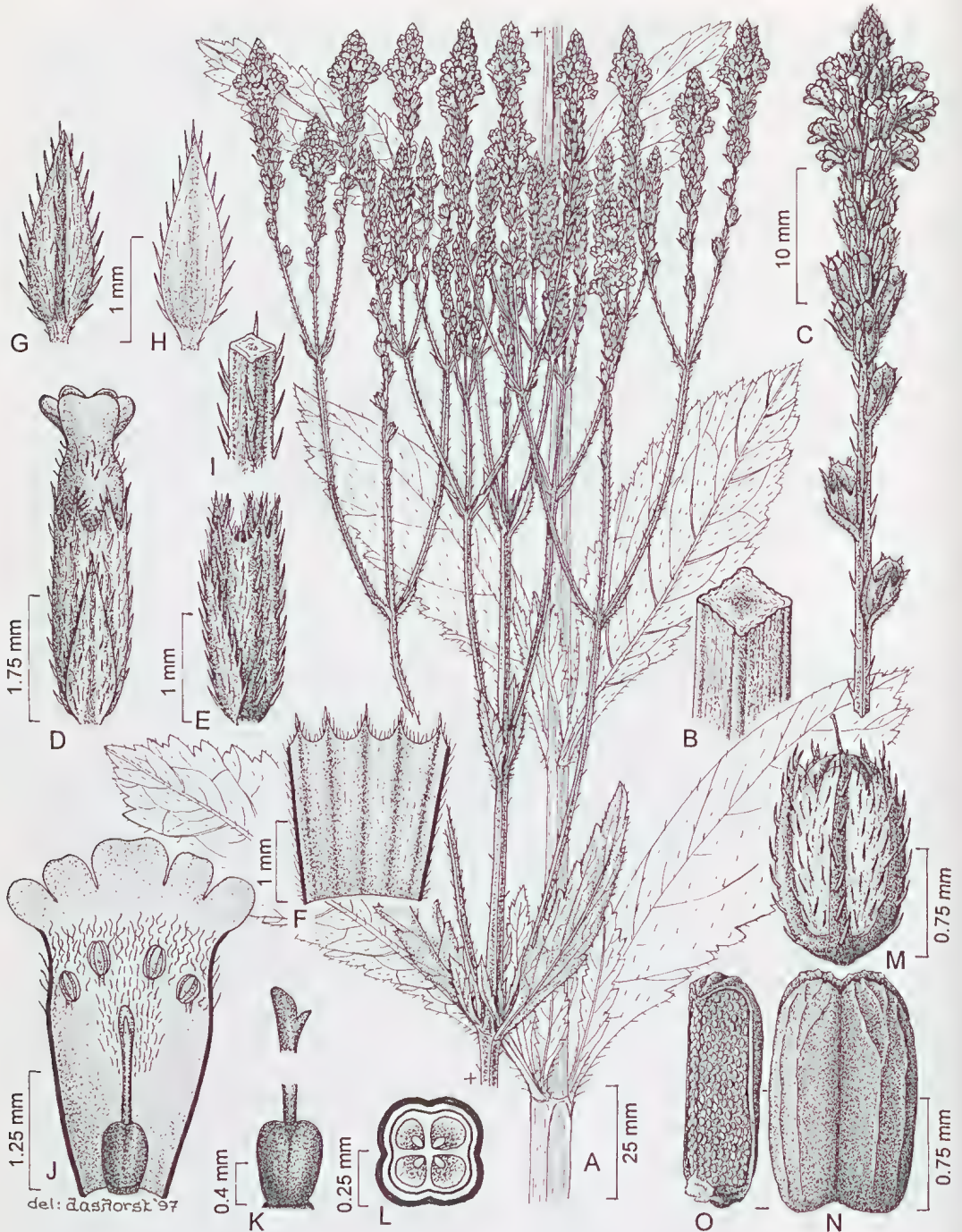


Fig. 6. *V. litoralis* Kunth var. *litoralis* (A–O, *M.Gray 5200: CANB*). A, habit sketch of a flowering branch; B, transverse section of stem showing 4-angles; C, inflorescence showing lax (non-congested) flowers in the lower part; D, flower; E, calyx with bract; F, calyx cut open showing glabrous inside; G, bract showing abaxial surface; H, bract showing adaxial glabrous surface; I, transverse section of peduncle; J, corolla cut open showing androecium, gynoecium, and hairy inside; K, ovary; L, transverse section of ovary; M, fruit enclosed by persistent calyx; N, fruit; O, mericarp showing muricate commissural face.

17.iv.1980 (BRI); *Meebold 7818*, Beerwah, -.i.1930 (BR 2 spec., M); *Pedley 4181*, St. Lucia, Brisbane, 5.iii.1975 (BRI, CANB, MO); *Sharpe 820*, Griffith University Site, Kessels Road, Mt Gravatt, 18.x.1973 (BRI); *Stanley 931*, Bundaberg, 17.iii.1980 (BRI); *White s.n.*, Brisbane River, -.iii.1915 (BRI 268458).

NEW SOUTH WALES: *Black 765.000*, Ryde, 30.xii.1927 (MEL); *Carolyn s.n.*, Big Gibber Headland, Myall Lake, -.ii.1972 (SYD); *Coveny 11420 & Dunn s.n.*, Devlin's Creek in Pennant Hills Park, Cheltenham, 6.xii.1982 (K, L, MO, NSW); *Gray 5734*, Sydney, Lane Cove National Park, 25.ix.1965 (AD, CNB, NSW); *Michael s.n.*, Bedlam Point, 10.iii.1994 (NSW 397353, NSW 397355); *Michael s.n.*, Concord Foreshore Walk, 6.v.1994 (NSW 397652, NSW 397653); *Michael s.n.*, creek near Whale Rock, 4.xi.1994 (NSW 397349, NSW 397350, NSW 397655, NSW 397656, NSW 397352, NSW 397351); *Pendered s.n.*, 2 km E of Glendon Brook, 17.v.1988 (BRI 44332, MEL, PRC); *Valentin s.n.*, Baldrack Wharf, Sydney, 13.iii.1928 (S).

SOUTH AUSTRALIA: *Smyth 83*, Cooper Creek, Innamincka, 13.v.1966 (AD); *N.P. & W.S. Survey & Research 3857*, Tirrawarra Waterhole, Site 15, Lake Eyre Region, 21.ix.1983 (AD).

Distribution and ecology (Map 9)

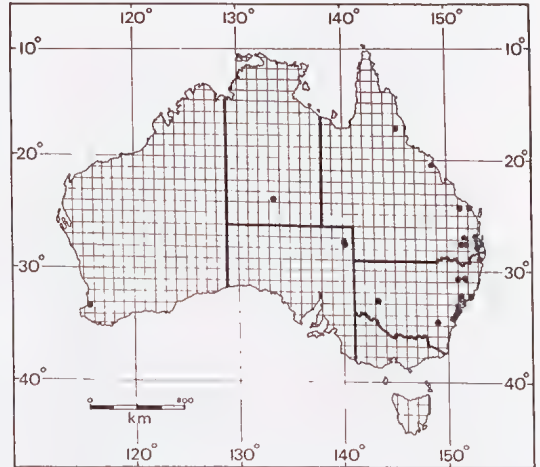
In Australia, the main distribution of var. *litoralis* is in the coastal areas of eastern Queensland and New South Wales, north-eastern corner of South Australia, near Alice Springs in Northern Territory and around Bunbury in Western Australia.

Collections from outside Australia have been examined from several States in the U.S.A., most major countries of Central and South America, South Africa, Zimbabwe, several countries of the Pacific Islands and from Okinawa Island in Japan. A more or less similar distribution pattern has been recorded by other botanists.

According to field notes by Australian collectors, this taxon occurs mainly near river banks, creeks, wet or damp shady areas, edges of mangroves and as a weed of pasture. It has been reported as a roadside weed of disturbed soil occurring chiefly in sandy as well as gravelly loam or sandy-alluvial soil, roadside waste grounds and rubbish tips. A more or less similar habitat has been recorded by Gibson (1970) and Yeo (1990).

Comments

According to the protologue of *V. litoralis* var. *portoricensis*, "this variety differs from the typical form of this highly variable species in having its leaves with their blades marginally very coarsely serrate-dentate with conspicuously antrorsely spreading broad-based teeth". The present author has examined var. *litoralis* collections from almost throughout its distribution range and believes that the above mentioned distinguishing



Map 9. Distribution of *V. litoralis* Kunth var. *litoralis*

characters of var. *portoricensis* are commonly found in the typical form of this species. The var. *portoricensis* is, therefore, relegated here to synonymy.

In the original description of *V. litoralis* var. *glabrior*, the author did not provide a type or cite any specimen. On page 182 of his publication, however, Bentham (1846) stated that, "A considerable portion of the specimens described from Western Tropical America, were gathered by Dr Sinclair, and presented by him to Sir William Hooker, in whose herbarium the originals of these species will be found, and many of them likewise in the subscriber's collection, who owes a very valuable set of them to Sir William's liberty". The type of var. *glabrior*, therefore, was collected by Dr Sinclair from Paita in Peru and is presumably preserved with other collections of this species in Herb. K.

Prior to the year 1942, Moldenke treated *V. litoralis* var. *caracasana* as a synonym of the typical form. From 1942 to 1974 he "tentatively" kept var. *caracasana* as a distinct variety. In 1974, Lopez-Palacios published the result of his extensive field and herbarium studies, including an examination of the type collection, and showed that var. *caracasana* cannot be distinguished from the typical *V. litoralis*. This was accepted by Moldenke (1977b) who from then on placed var. *caracasana* in the synonymy of the typical form. In this respect, Moldenke (1977b) clearly remarked that "all my previous notes in this series [i.e. "Material towards a monograph of the genus *Verbena*"] under this heading should therefore be transferred to typical *V. litoralis*."

It has been noticed that without careful examination the distinction between *V. litoralis* and *V. officinalis* is difficult at times. Many Australian collections of *V. litoralis* are found misidentified by others as *V. officinalis*. According to Moldenke (1964a), the "herbarium material of *V. litoralis* has been misidentified abundantly and distributed under such names as *V. angustifolia*, *V. bonariensis*, *V. brasiliensis*, *V. caracasana*, *V. hispida*, *V. officinalis*. Similarly, Yeo (1990) states that, "specimens [of *V. litoralis*] from Polynesia and Australasia are often determined as *V. officinalis* while some African material has been treated as belonging to *V. brasiliensis* by C.H.Stirton".

In the account of the genus *Verbena*, Macbride (1960) states under *V. litoralis* that "most material referred here seems doubtfully distinct from *V. carolina* L." On the contrary, Moldenke (1972c) reports that "the Mexican and Central American *V. carolina* really has very little resemblance to *V. litoralis*".

According to Moldenke (1964a, 1971b, 1973b) this species is "a widely distributed and extremely polymorphic subtropical and tropical weed". Perry (1933) says that, "this is a widely distributed species with very distinctive habit and somewhat variable inflorescence. In some specimens the spikes appear to remain compact, in others they tend to elongate. Schauer (1847) used this difference to separate the forms *pyncnostachya* and *leptostachya*, although he frankly admitted the difficulty of distinguishing the two owing to the intermediate phases". In the 'var.' α . *pyncnostachya*, Schauer (1847) included the typical *V. litoralis* as well as *V. brasiliensis*, *V. bonariensis* β *littoralis* and *V. glabrata*. Under the 'form' β *leptostachya*, he included *V. caracasana*, *V. lanceolata* and *V. affinis*. All above named taxa except *V. brasiliensis* are included here in the synonymy of the typical *V. litoralis*.

Hooker (1829), Bentham (1846) and Schauer (1847) added a "t" to the original specific epithet of this species which was subsequently retained by several botanists. In the protologue of this taxon, however, Kunth (1818) used a single "t" in the specific epithet and that has been adopted lately in the majority of recently published floras.

Wagner et al. (1990) reported that "*Verbena litoralis* has been used medicinally in Hawaii especially as a mash applied to cuts and bruises and also to sprained and fractured areas".

According to field notes by *I. Baumgärtner* (NSW 397662), this species is "sparingly grazed by stock and suspected of causing sickness, abortion and death in cattle".

This taxon is popularly known as "seashore vervain".

Affinities

The var. *litoralis* is closely related to *V. officinalis* in its leaves being cuneate-attenuate towards base; inflorescence spicate; spikes slender and lax; flowers not congested in the lower half and flower-bracts almost as long as calyx or slightly shorter in fruit. Nevertheless, *V. officinalis* may readily be distinguished by its leaves being pinnately incised, cleft or lobulate; mature spikes generally 10-5 cm long, slender; flowers lax when mature; corolla more or less twice as long as calyx, c. 3-5 mm long.

According to Yeo (1990), "*Verbena litoralis* is distinguished from *V. bonariensis* and *V. brasiliensis* by its relatively small leaves, loose, freely branched inflorescence and lax slender spikes". In Hooker's (1829) view, *V. litoralis* is a variety of *V. bonariensis* "with a shorter spike than usual".

Wagner et al. (1990) refer to Moldenke (1962b) who, according to them, believes that "*Verbena brasiliensis* is very closely related to *V. litoralis* and differs only in the inflorescence being densely flowered and the rhachis pubescent. It probably should be reduced to synonymy of *V. litoralis*". In fact, Moldenke (1962b, 1964a, 1971a, 1980) not only retained *V. brasiliensis* as a distinct species but in his publications of 1962b and 1964a he proposed a brief key to distinguish *V. brasiliensis* from its immediate relatives *V. bonariensis*, *V. rigida*, *V. litoralis* and *V. sphaerocarpa*.

6b. *Verbena litoralis* Kunth. var. *brasiliensis* (Vell.) Briq., *Annuaire Conserv. Jard. Bot., Genève* 7- 8 (1904) 292.

Type: As for *V. brasiliensis* Vell.

V. brasiliensis Vell., *Fl. Flumin.* (1829) 17; l.c. Icon. 1 (1831) t.40; Small, *Man. S.E. Fl.* (1933) 1137; L.M.Perry, *Ann. Missouri Bot. Gard.* 20, no. 2 (1933) 255; Moldenke, *Résumé Verbenac. etc.* (1959) 69, 84, 109, 115, 121, 126, 154, 157-160, 362, 368, 369, 471; J.F. Macbr., *Fl. Peru. Field Mus. Nat. Hist. Bot. Ser.* 13, 5, 2 (1960) 617; Moldenke, *Phytologia* 8 (1961) 124, 148; l.c. 8, no. 6 (1962) 309; l.c. 8 (1963) 463; Moldenke, *Fifth Summary Verbenac. etc.* 1 & 2 (1971) 137, 143, 177, 184, 200, 257, 262, 351, 652, 654, 657, 664, 680, 681, 687, 913; Moldenke, *Phytologia* 22, 6 (1972) 488; l.c. 23, 2 (1972) 217; l.c. 23, 3 (1972) 259; l.c. 24, 1 (1972) 21; l.c. 24, 3 (1972) 217; l.c. 28, 1 (1974) 119; l.c. 28, 2 (1974) 196; l.c. 28, 4 (1974) 346; *T.c.* 36, 2 (1977) 136; S.W.L.Jacobs & J.Pickard, *Pl. New South Wales* (1981) 209; Yeo, *Kew Bull.* 45 (1990) 111, fig. 3 excl. Constable 19183 from Kenebri, N.S.W. Aust.; A.D.Chapman, *Aust. Pl. Name Index Q-Z* (1991) 2950; A.C.Sm., *Fl. Viti. Nova* 5 (1991) 167; B.J.Conn in G.J.Harden (ed), *Fl. N S W* 3 (1992) 613; Carolin & Tindale, *Fl. Syd. Reg. edn* 4 (1994) 597; P.S.Green, *Fl. Aust.* 49 (1994) 314; Pedley in R.J.F. Hend. (ed), *Qld Vasc. Pl.* (1994) 337.

Lectotype: In view of the non-existence of a type specimen of this taxon, [plate 40 in] Vellozo's *Flora Fluminensis* Ic. 1 (1831) t. 40 has been chosen by Verdcourt (1992) as the lectotype. See typification.

V. quadrangularis Vell., *Fl. Flumin.* (1829) 16; l.c. Icon 1 (1831) t. 39; P.W. Michael Weeds – Wet & Wild (1997) 10, 17; P.W.Michael, *Telopea* 7 (3) (1997) 299, 300; Pedley in R.J.F. Hend. (ed), *Qld Pl. New edn* (1997) 206; B.J.Conn in N.G.Walsh & Entwisle (eds), *Fl. Vic.* 4 (1999) 413, 415 – *vide* Yeo (1990).

Lectotype: The whereabouts of the type is unknown, therefore, plate 39 in Vellozo's *Flora Fluminensis* Ic 1 (1831) t. 39 has been selected by Verdcourt (1992) as the lectotype. For further information, see typification.

V. isabellei Briq., *Annuaire Conserv. Jard. Bot., Genève* (1900) 234, *syn.nov.*

Type: *M.Isabelle s.n.*, province de Rio-Grande do Sul, Brasil Meridional, 1835 (G, 2 syntypes!).

V. litoralis Kunth f. *angustifolia* Chodat, *Bull. Herb. Boiss. Sér.* 2, 2 (1902) 818, "hyponym" – *vide* Moldenke (1962b).

Type: Emil Hassler 3853, in a swamp near Tucangua, Paraguay, in February 1897 (BM!, G – Deless., n.v.) – *vide* Moldenke (1962b).

V. approximata Briq., *Annuaire Conserv. Jard. Bot. Genève* 7–8 (1904) 293 – *vide* Moldenke (1964a).

Type: Benedict Balansa 1027C, "Grand-Chaco en face de l'Assomption", Paraguay, 5.i.1875 (P, holotype!; G, P – isotypes!).

V. cordobensis Briq., *Annuaire Conserv. Jard. Bot. Genève* 10 (1907) 100–102 – *vide* Moldenke (1962b).

Type: Lortentz 131, at Entrancia Germania, Córdoba, Argentina, between June and December, 1874 (G, holotype!).

V. boliviana Briq.: Moldenke, *Suppl. List Invalid Names* (1941) 8, involv. in syn. – *vide* Moldenke (1962b).

V. chacensis Moldenke, *Phytologia* 5, no. 6 (1955) 228, *syn. nov.*; Moldenke, *Fifth Summary Verbenac. etc.* 1 (1971) 187; *Phytologia Mem.* 2 *Sixth Summary Verbenac. etc.* (1980) 179.

Type: Rojas [Hassler 2459], at Lomal Clavel, latitude S. 23° 20', in the Gran Chaco, Paraguay, -.xi.1903 (UC, holotype, n.v.; P, isotype!).

V. litoralis Kunth [var.] *α pycnostachya auct. non Schauer* (1847), *p.p. quoad syn. V. brasiliensis* Vell.

V. bonariensis auctt. non L.: Maiden, *Proc. Linn. Soc. New South Wales, Ser. 2*, 23 (1898) 150 – *vide* P.S. Green (1994); W.R.B.Oliv., *Trans. & Proc. New Zealand Inst.* 49 (1917) 157 – *vide* P.S.Green (1994); L.M.Perry, *Ann. Missouri Bot. Gard.* 20, no. 2 (1933) 254, *p.p. quoad syn. V. quadrangularis* Vell.; E.W.Greenw., *Proc. Linn. Soc., London* 154 (1943) 94 – *vide* A.C.Smith & S.P.Darwin (1991); Parham, *Pl. Fiji Isl. edn 2* (1972) 302 – *vide* A.C.Smith & S.P.Darwin (1991); A.N.Rodd & J.Pickard, *Cunninghamia* 1 (1983) 278 – *vide* P.S. Green (1994); Stanley in Stanley & E.M.Ross (eds), *Fl. S.-E. Qld 2* (1986) 268, *p.p.* – *vide* A.C.Smith & S.P.Darwin (1991).

V. officinalis auctt. non L.: W.G.Wright, *Wild Fls S. Afr.* (1963) 156, 157 – *vide* Moldenke (1972d); Munir in Jessop and Toelken (eds), *Fl. S. Aust. edn 4*, 3 (1986) 1177, fig. 545A – *vide* P.S.Green (1994); Auld & R.W. Medd, *Weeds* (1987) 236, *p.p. quoad* *Illust.* – *vide* P.S.Green (1994).

Typifications

V. quadrangularis and *V. brasiliensis* were simultaneously described by Vellozo (1829) without citing any type specimen in their protologues. In the original descriptions of these taxa, however, Vellozo did mention "Tab. 39. T.1" under *V. quadrangularis* and "Tab. 40 T.1" under *V. brasiliensis*. It appears that both these plates (drawings) were possibly prepared, seen and used by the author in preparing the protologues of these taxa, though these plates (Vellozo 1831) were published separate from the texts (Vellozo 1829). Since no specimen could be located in Herb. R, LISU and P (Moldenke 1962b, Yeo 1990, Green 1994) Verdcourt (1992) choose these plates as lectotypes.

Diagnosis

Var. *brasiliensis* differs from the typical variety by its stem being more sharply angled; leaves serrate-dentate, cuneate towards the base, somewhat half clasping or semiamplexicaul, not narrowing into a petiole; spikes dense, contracted, (1-) 2–6 (-8) cm long, 3–5 mm diam., rarely up to 15 cm long, almost uniformly cylindrical; flowers mostly closely congested along the rhachis, not lax or open in the lower (proximal) part of spike when in fruit; floral bracts narrow-lanceolate, equalling the calyx or surpassing in the upper young flowers of the spike; peduncle pubescent; pubescence on rhachis, bracts and calyx spreading; stamens inserted just below the corolla-throat.

Representative specimens (collections seen: Australian 50; non-Australian 165)

QUEENSLAND: *Dillewaard 192 & Olsen s.n.*, Indooroopilly, Brisbane, 5.xi.1980 (BRI, NSW); *Fensham 1398*, 2 km N of Knobby, 28.iv.1994 (BRI); *Forster 9213*, Walkers Creek, Burgess Avenue, Maleny area, 15.xii.1991 (AD, BRI, K, MEL); *Halford Q2480*, 4 km N of Nobby Clifton Greenmount road, Toowoomba verge, 13.ii.1995 (BRI); *Hubbard 2110*, between Calvert & Lanefield, 12.iv.1930 (BRI, K); *Pedley 4047*, 15 km NE of Oakey, 17.i.1973 (BRI, L, MEL); *Pedley s.n.*, Grantham, -.xi.1974 (BRI 33359, CANB 36928, K, MO 404338815, NSW 274505, US 3233281, US 3113900); *Pedley 4564*, Long Pocket, Brisbane, 10.iv.1979 (BRI, K, MO, NSW); *Pedley 5660*, 6 km W of Yarraman, Yarraman State Forest, 1.iv.1992 (AD, BRI); *Scheffe CMW 675*, "Autumnvale", Bungil Shire, 23.ii.1991 (BRI, L); *Stanley 590*, Mt Archer, near Rockhampton, 18.ii.1980 (BRI).

NEW SOUTH WALES: *Albrecht 4684*, Burra Creek, c. 300 m downstream of the junction of Oulla Creek, W of Moruya, 4.i.1991 (MEL); *Carolin 10911*, Casino, Richmond River, 9.xi.1978 (SYD); *Conn 4097*, c. 100 m E of eastern end of McClean Street, Bass Hill, near Crest Park, Sydney, 14.xi.1995 (AD, K, MEL, NSW); *Coveny 16391 & Whalen*, Dumaresq Creek near swimming pool, Armidale, 21.i.1993 (BRI, NE, NSW); *Coveny 16718*, Gloucester River, Gloucester, 2.i.1994 (AD, BRI, CANB, HO, MEL, NSW); *Crawford & Graham 1387*, Singleton Army Area & Minibah Creek, 0.7 km at 32° degrees from centre of landing ground, 27.xi.1991 (CANB); *Gray 5200*, Lane Cove National Park, 3.iii.1962 (CANB 2 spec.); *Gray 5991 & Michael*, Tahlmoor, 28.xi.1966 (BRI, CANB, MEL, NSW); *Gray 6906*, Stirling Park, Canberra, 28.xi.1980 (CANB, NSW); *Gray 6905*, Yarralumla, near corner of Moonah Place and Perth Avenue, 6.iii.1980 (CANB, NSW); *Lepschi 535*, 10 km E of Gundaroo on W. shore of Lake George, Federal Highway, 23.iii.1991 (CANB); *Lepschi 673*, Norton Road, 900 m E of its junction with the Sutton Road, Wamboin, 13.xii.1991 (AD, CANB, NSW); *Lepschi 520*, Mt Stromlo settlement, Mt Stromlo, 3.ii.1991 (CANB, NSW); *Lepschi 810*, c. 500 m S of Casuarina Sands turnoff in Cotter Road, 19.iv.1992 (CANB); *Lepschi 763*, 7.5 km W of Gunning, 9.iii.1992 (CANB); *Lyne 1809*, 80 km along the Barrier Highway from Wilcania towards Broken Hill, 9.xii.1995 (AD, BRI, CANB, MEL, NSW); *Michael s.n.*, 20 km from Forbes on Cowra Road, between roadside and Lachlan River, -.i.1994 (NSW 397393); *Michael s.n.*, Devlins Creek, under footbridge at N end of Kent Street, Epping, 26.iii.1994 (AD, NSW 397327, NSW 397328, NSW 397329, UB); *Michael s.n.*, Arcadia Downs, Maraylya, 7.v.1995 (NSW 397582, NSW 397583); *Coveny & Dunn s.n.*, Macintyre River, Inverell, 26.iii.1987 (NSW 204626).

VICTORIA: *Cheers 192*, Hamilton Crossing (Loddon River) on the Baringhup West-Eastville Road, 1.xii.1990 (MEL).

Distribution and ecology (Map 10)

In Australia, there is considerable overlap in the distribution of var. *litoralis* and var. *brasiliensis*. Like var. *litoralis*, var. *brasiliensis* is restricted chiefly to the areas along the east-coast of Queensland and New South Wales. In Queensland, the main distribution is from Rockhampton southwards to the New South Wales border and in New South Wales, it occurs in the coastal areas from the Queensland border southwards to Moruya township. Further inland, it occurs between Forbes and Cowra. In Victoria, this taxon is known to grow only near Maryborough along the Loddon River.

Collections from outside Australia have been examined from the U.S.A., several major countries of South America, South Africa, New Zealand and the Hawaiian Islands.

Ecological notes by Smith & Darwin (1991) and Moldenke (1962b) agree with collectors' field notes who recorded it as a weed on roadsides, near railway tracks, in grassland, on river banks and near creeks. Moreover, it has been collected from disturbed areas of clayey, clay-loam, silt- sandy-loam and with a mixture of somewhat gravelly type of soils, fringes of forest, open woodland and cultivated fallow land.

Comments

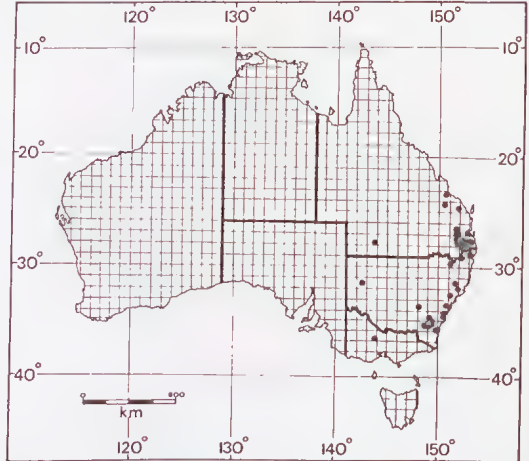
After careful examination of the types of *V. isabellei* (Herb. G!) and *V. chacensis* (Herb. P!), both taxa were found to be conspecific with *V. litoralis* var. *brasiliensis*. They are included here in the synonymy of this taxon because their stems are sharply angled; leaves sharply serrate-dentate, semiamplexicaul and not narrowing into a petiole; spikes dense and contracted; flowers congested along the pubescent rhachis; the pubescence on rhachis, bracts and calyx somewhat spreading.

Perry (1933) maintained *V. brasiliensis* Vell. and *V. litoralis* Kunth as two distinct species. However, under *V. brasiliensis*

she stated that it is "a species very similar in habit to *V. litoralis* but readily distinguished by the difference in inflorescence. The spikes of *V. brasiliensis* are short, compact, sessile, and regularly arranged in open cymes; whereas those of *V. litoralis* are longer, compact or somewhat elongate, peduncled, and arranged in more or less paniculate cymes". Regarding *V. litoralis* she further states that "this is a widely distributed species with very distinctive habit and somewhat variable inflorescence. In some specimens the spikes appear to remain compact, in others they tend to elongate. Schauer used this difference to separate the forms [varieties] *pycnostachya* and *leptostachya*, although he frankly admits the difficulty of distinguishing the two owing to the "intermediate phases". It is important to note here that Schauer (1847) recorded the typical form of *V. litoralis* and *V. brasiliensis* under the form [variety] *pycnostachya*.

Subsequently, Hooker & Jackson (1895) also reduced *V. brasiliensis* to synonymy under *V. litoralis* and later Sampaio & Peckolt (1943) did the same. In 1904, Briquet relegated *V. brasiliensis* to the rank of a variety under *V. litoralis*. Recently Wagner et al. (1990) stated that, "According to Moldenke (1962b) *Verbena brasiliensis* is very closely related to *V. litoralis* and differs only in the inflorescence being densely flowered and the rachis pubescent. It probably should be reduced to synonym of *V. litoralis*". Considering the close relationship between *V. brasiliensis* and *V. litoralis*, Yeo (1990) states that, "*V. brasiliensis* occupies a middle position between *V. bonariensis* and *V. litoralis* Kunth". In his opinion, both *V. bonariensis* and *V. brasiliensis* are rather variable and overlap in several characters of leaf, corolla, and mericarp. He further states: "I do not feel it would be justified to unite *V. litoralis* with *V. brasiliensis*, unless they were retained as distinct at infraspecific rank". At the end of his comments under *V. brasiliensis*, Yeo (1990) clearly mentions that "a case might be made for combining *V. brasiliensis* and *V. litoralis* at infraspecific rank".

In spite of the above mentioned statements by Perry (1933), Moldenke (1962b) and Yeo (1990), each one of them retained *V. brasiliensis* and *V. litoralis* as two distinct species, and each one of them provided a key to these and other related species. Their key characters,



Map 10. Distribution of *V. litoralis* Kunth var. *brasiliensis* (Vell.)Briq.

however, not only differ from each other but in places contradict one another. The characters suggested in these keys could not be applied throughout the range of these extremely polymorphic taxa. None of these keys has been found to work satisfactorily.

Recently, Michael (1997a, 1997b) on the basis of limited overseas material recognised *V. brasiliensis*, *V. caracasana*, *V. litoralis* and *V. quadrangularis* as four distinct species. He did not comment on the doubts expressed by Yeo (1990) and Verdcourt (1992) about the status of these taxa. Michael's only key (1997b) does not provide distinct, reliable and contrasting characters for distinguishing these species.

The present author has found no character(s) to maintain *V. litoralis* and *V. brasiliensis* as distinct species. Both are extremely variable in the shape and size of their leaves, length and diameter of spikes, congestion and laxity of flowers particularly in the lower part of their spikes. For each character there seems to be intermediates between the two taxa although there are some extreme cases where these taxa look different from each other in the size and shape of their leaves and spikes. Due to the presence of these intermediates, it has been difficult to draw a line between the two. Nevertheless, there are some characters in the leaves and inflorescence that seem sufficient to follow Briquet (1904) in retaining *V. brasiliensis* as a variety of *V. litoralis*.

Schauer (1847), Perry (1933) and Moldenke (1959, 1962a, 1971a) have erroneously included *V. quadrangularis* in the synonymy of *V. bonariensis*. While doing so, Perry and Moldenke placed a question mark against the name *V. quadrangularis*, expressing their doubts about its synonymous status under *V. bonariensis*. On the other hand, Schauer placed an exclamation mark against the name *V. quadrangularis*, suggesting that he had seen the type. In fact, as mentioned here under the typification of *V. quadrangularis* and *V. brasiliensis*, the whereabouts of their type specimens is unknown (Stafleu & Cowan 1986). As a result, the confusion about their identity and relationship with other taxa has persisted. The present author has seen the protologues and original drawings (plates 39 & 40) of these taxa published respectively in 1829 and 1831. There is about 2 years gap between the publication of their text and drawings (plates), but the mention of these plates in the protologues shows that these plates were ready during the preparation of original descriptions. Therefore, these plates are regarded as part of the protologues. If these taxa are judged by the drawings, they undoubtedly seem very similar to each other though a few characters in both illustrations suggest an affinity with *V. bonariensis*. Yeo (1990) recognised *V. quadrangularis* and *V. brasiliensis* as one and the same species and for the first time correctly placed the former in the synonymy of the latter.

Michael's (*s.n.*) collections of this taxon from Sydney, with spikes somewhat larger than usual, have been annotated by him as "putative hybrids between *V. quadrangularis* Vell. and *V. litoralis* H.B.K."

Some of the common names recorded for this taxon include "Brazilian vervain", "Camaradinha", "kudii penkel" and "verbena morada".

Affinities

Among the infraspecific taxa of *V. litoralis*, var. *brasiliensis* is nearest to the typical form in its leaves being tapering, narrow or cuneate towards the base, coarsely toothed or serrate along the margins; inflorescence of several spikes arranged in subpanicles or corymbose cymes; peduncle usually naked for some distance below the spike; corolla-tube less than one-third exerted above the calyx and stamens attached just below the corolla-throat. Nevertheless, var. *brasiliensis* may readily be identified by its stem being very sharply angled; leaves serrate-dentate, often semi-amplexicaul, not narrowing into a petiole; spikes thick, uniformly cylindrical, 3–5 mm diam.; flowers congested, not lax in the lower part of the spike when in fruit and bracts equalling the calyx or surpassing in the upper young

flowers. There are some characters in common to var. *brasiliensis* and *V. bonariensis* L. In both taxa, the spikes are thick and uniformly cylindrical and flowers not lax in the lower part of the spike during fruiting stage. *V. bonariensis*, however, may easily be distinguished by its hairs on stem and leaves being stiff and scabrous; leaves always amplexicaul, not tapering or cuneate towards the base; spikes shorter, 5–15 mm long, 5–7 mm diam.; flowers very congested; corolla-tube up to 2 times longer than calyx and stamens inserted just above the middle of corolla tube.

7. *Verbena officinalis* L., Sp. Pl. 1 (1753) 20; Willd., Sp. Pl. 1 (1797) 120; R.Br., Prod. Fl. Nov. Holl. (1810) 514; Kunth in Humb., Bonpl. & Kunth (eds), Nov. Gen. & Sp. Pl. 2 (1818) 274; Spreng., Syst. Veg. edn 16, 2 (1825) 750; Schauer in A.D.C., Prod. 11 (1847) 547, excl. syn. *V. setosa* Mart. & Gal.; Miq., Fl. Ned. Ind. 2 (1858) 908, excl. syn. *V. setosa* Mart. & Gal.; Hook. f., Fl. Tasman. (1859) xlvi; F.Muell., Fragm. 6 (1868) 153; Benth., Fl. Aust. 5 (1870) 36; F.M.Bailey & Ten.-Woods, Proc. Linn. Soc. N.S.W. 4 (1880) 174; F.Muell., Syst. Cens. Aust. Pl. (1882) 102; F.M.Bailey, Synop. Qld Fl. (1883) 876; C.B.Clarke in Hook. f. (ed.), Fl. Brit. Ind. 4 (1885) 565; A.Gray, Synop. Fl. N. Amer. 2, 1 (1886) 335; F.Muell., Sec. Syst. Cens. Aust. Pl. 1, Vasc. (1889) 171; Baker in Dyer, Fl., Trop. Afr. 5 (1900) 286; F.M.Bailey, Qld Fl. 4 (1901) 1178; Small, Fl. South U.S. (1903) 1008; Payne in F.M.Bailey, Weeds & Susp. Poison. Pl. Qld (1906) 141, fig. 243; F.M.Bailey, Weeds & Poison. Pl. Qld (1906) 137; Ewart & O.B.Davies, Fl. N. Terr. (1917) 236; H.J.Lam, Verbenac. Malay. Archip. (1919) 10, excl. syn. *V. menthaefolia* Benth.; Domin, Biblioth. Bot. 89 (1928) 552; L.M. Perry, Ann. Miss. Bot. Gard. 20, 2 (1933) 262; Small, Man. S.E. Fl. (1933) 1137; L.J.Webb, Guide Medic. & Pois. Pl. Qld Bull. Council Sci. Industr. Res. Bull. 232 (1948) 169; Everist, Common Weeds Farms & Past. (1957) 107, fig. 88; E.L.Robertson in J.M.Black, Fl. S. Aust. 4 (1957) 720; Moldenke, Résumé Verbenac. etc. (1959) 185, 202, 210, 224, 371, 473; J.F.Macbr., Fl. Peru. Field Mus. Nat. Hist. Bot. Ser. 13, 5, 2 (1960) 627; N.C.W.Beadle, Handb. Vasc. Pl. Syd. Dist., edn 1 (1963) 415; Moldenke, Phytologia 10, 3 (1964) 194 & ib. 4 (1964) 271; W.M.Curtis, Stud. Fl. Tasm. 3 (1967) 541; Moldenke, Fifth Summary Verbenac. etc. 1 & 2 (1971) 318, 328, 337, 349, 350, 371, 376; Moldenke, Phytologia 24, 1 (1972) 22 & ib. No. 3 (1972) 219; Franco in Tutin et al. (eds), Fl. Europ. 3 (1972) 123; Moldenke, Phytologia 23, 2 (1972) 377–389, 414, 419, 421–423, 435–437, 460–473, 511; J.H.Willis, Handb. Pl. Vic. 2 (1972) 580; Moldenke, Phytologia 30, 3 (1975) 156; Moldenke, Phytologia 36, 3 (1977) 247; Moldenke, Phytologia 36, 4 (1977) 274; Moldenke, Phytologia Mem. 2, Sixth Summary Verbenac. etc. (1980) 193–204, 318, 327, 339, 340, 383; Munir in Jessop (ed), Fl. Centr. Aust. (1981) 296; Everist, Poison. Pl. Aust. rev. edn (1981) 749; N.C.W.Beadle et al., Fl. Syd. Reg. edn 3 (1982) 509; Meikle, Fl. Cyprus 2 (1985) 1251; Munir in Jessop & Toelken (eds), Fl. S.Aust. Part 3 (1986) 1176, fig. 545B; Stanley in Stanley & E.M. Ross (eds), Fl. SE Qld 2 (1989) 368; A.D. Chapman, Aust. Pl. Name Index Q-Z (1991) 2950; B.J. Conn in G.J. Harden (ed), Fl. N.S.W. 3 (1992) 613; Carolin & Tindale, Fl. Syd. Reg. edn 4 (1994) 597; J.-P. Leburn & Stork, Enum. Pl. Fleurs Afr. Trop. (1997) 523; W.Zeng & Raven, Fl. China Illust. 17 (1998) fig. 5; B.J.Conn in N.G.Walsh & Entwistle (eds), Fl. Vic. 4 (1989) 416, fig. 80g.

Type: Mediterranean specimens collected from Clifford's Gardens in the Netherlands and preserved in the Clifford Herbarium at the British Museum (N.H.) London (HC. 11, *Verbena* No. 6, fol. 6: BM, lectotype! designated by Verdcourt (1993); *Verbena* No. 6, fol. 5: BM "lectoparatype"!; *Verbena* No. 6, fol. A: BM, "lectoparatype"!).

V. spuria L., Sp. Pl. 1 (1753) 20; Willd., Sp. Pl. 1 (1797) 119; Pers., Synop. Pl. 2 (1807) 133; Spreng., Syst. Veg. 2 (1825) 750 – *vide* Hooker (1836), Schauer (1847), Miquel (1858), H.J. Lam (1919), L.M.Perry (1933), Moldenke (1964c).

Type: "Habitat canada, Virginia", n.v. The types of this taxon have not been found in the Linnaean Herbarium in London (LINN) or Stockholm (S-Linn.).

V. spicata Gilib., Fl. Lithuan 1 (1782) 92 – *fide* Moldenke (1964c).

Type: (KW, n.v.).

V. officinalis L. var. *spuria* (L.) Hook., Comp. Bot. Mag. 1 (1836) 176 – *fide* Moldenke (1964c)

Type: As for *V. spuria* L.

V. sororia D.Don, Prod. Fl. Nepal. (1825) 104 – *fide* Schauer (1847), Miquel (1858), Moldenke (1959, 1964c, 1971a, 1980).

Type: Hamilton s.n., "ad Bassaria Nepaliac" (BM!).

V. rumelica Velen., Fl. Bulg. (1891) 441 – *fide* Moldenke (1964c).

Type: ? PRM, n.v.

V. domingensis Urb., Symb. Ant. 5 (1908) 484; Moldenke, Résumé Verbenac. etc. (1959) 53, 57, 371; Moldenke, Phytologia 11 (1965) 455; Moldenke, Fifth Summary Verbenac. etc. 1 & 2 (1971) 98, 370, 666, 686, 914; Moldenke, Phytologia 23, 2 (1972) 224, 260; ib. 30, 3 (1975) 140; ib. 34 (1976) 19, 20, 254; ib. 36, 2 (1977) 151; ib. 41, 3 (1979) 165; Phytologia Mem. 2 Sixth Summary Verbenac. etc. (1980) 91, 96, 362; Alain, Fl. Espan 6 (1994) 249 – *fide* L.M. Perry (1933).

Type: Eggers 1828 & Bertero 735, in Santo Domingo near Angostura in limestone rocks on the bank of the Yaqui River, Mexico (?B n.v., possibly destroyed during the war).

Description

Annual or perennial herb, 30–100 (–150) cm high. *Stem* erect, branched, 4-angled, longitudinally striate-sulcate, with or without glands, scabrous or pubescent when young, glabrescent to glabrous and smooth when old. *Leaves* sessile to subsessile, narrowed towards the base or cuneate into a short winged petiole, (1.5-) 2–8 (–12) cm long excluding petiole, (0.5-) 1–4(–5) cm wide, the lower and mid-stem ones more or less ovate, ovate-oblong, oblong, or oblong-lanceolate to lanceolate, oblanceolate or rhomboid-ovate in general outline, variously incised, lobed, dentate or serrate, 1- or 2- pinnatifid or pinnatisect, the upper ones narrow-linear, smaller and less divided, the upper-most entire or shortly toothed to serrate, the various lobes, teeth or segments acute or obtuse, often again incised or crenate-serrate, hispid, strigose-scabrous or roughly pubescent to sparsely strigillose, with or without glands, the primary and secondary veins impressed adaxially, prominent abaxially; petiole winged, (0.5-) 1–2 (–3) cm long. *Spikes* terminal, pedunculate, bracteate, solitary or ternate and in a lax panicle, slender or somewhat thick in var. *macrostachya*, with or without glands, pubescent to puberulous or pubescent-hirsute, open and remotely flowered or compact during anthesis, greatly elongating after anthesis, (5-) 10–35 (–40) cm long in fruiting, 3–8 (–10) mm diam.; peduncle puberulous to glabrescent, striate; rhachis pubescent, hirsute or puberous, with or without glands. *Flowers* bracteate, sessile, sometimes with minute pedicels 0.5–1.5 mm in var. *monticola*, usually distant in the lower part of the rhachis, crowded above, almost uniformly crowded in var. *macrostachya* and var. *eremicola*; bracts ovate to lanceolate, acute or acuminate at the apex, hirtellous, pubescent to puberulous or hirsute abaxially, glabrous adaxially, ciliate along the margins, with or without glands, shorter than or as long as the calyx, (1-) 2–3.5 (–5) mm long, 1–2 mm broad near the base, somewhat keeled. *Calyx* cylindric, 5-toothed, or subtruncate, 5-ribbed, 2–3.5 (–4) mm long, 1–1.5 mm diam. glabrous inside, pubescent-hirsute on the ribs outside, sometimes puberulous to glabrescent in fruit, with or without glands. *Corolla* light blue, purple, bluish-purple, mauve, pale pink to lilac, violet or lavender, hypocrateriform; tube cylindric, a little longer than the calyx, 3–4 (–5) mm long,

0.8–1.5 mm diam., puberulous to glabrescent outside, villous inside in the upper third; limb subequally 5-lobed, 1–4 mm broad; lobes more or less rounded. *Stamens* inserted just above the middle of the corolla-tube; filaments very short; anthers ovate, \pm 0.4–0.5 mm long. *Ovary* globose to ovoid, glabrous, faintly 4-lobed, 0.8–1 mm long, \pm 0.5 mm diam.; style short, glabrous; 0.4–0.5 mm long; *stigma* minute, subcapitate, shortly bilobed, with one lobe larger and stigmatose on the inner face. *Fruit* globose to broadly oblong, glabrous, brownish, 1.5–3.5 mm long, 1–1.5 (-2) mm diam., the 4 mericarps easily separating at maturity; mericarps trigonous narrowly, oblong, strongly striate and areolate-reticulate on the back, muricate on commissural faces.

Distribution

Verbena officinalis is one of the most widely distributed species in the genus. It is native to Mediterranean region but has naturalised in several countries of Europe, central and southern America, Africa, Asia, Australia and Polynesia. Some varieties are considered to be native in Australia.

7a. *Verbena officinalis* var. *officinalis* (Fig. 7)

Annual or perennial erect herb. *Stem* and branches scabrous-pubescent, glandular. *Leaves* not deeply divided, the lobes short, obtuse, scabrous and glandular. *Inflorescence* glandular or viscid, scabrous or hirsute. *Flowers* distant in lower part of the rachis, sessile; floral bracts ovate-lanceolate, hirsute and glandular abaxially, glabrous adaxially, usually up to half the length of calyx, sometimes almost equally the calyx. *Calyx* cylindrical, 5-toothed, pubescent-hirsute and glandular on the ribs outside, glabrous inside. *Corolla* tube exerted, puberulous outside above the calyx, cylindrical, villous in the throat. *Stamens* inserted almost in the corolla throat. *Ovary* glabrous, faintly 4-lobed. *Fruit* areolate-reticulate, dark brown, the mericarps muricate on the inner face.

Representative specimens (Collections seen: Australian 17; non-Australian \pm 300).

NORTHERN TERRITORY: *Tate s.n.*, Horn Exped., Central Aust. loc. incert., 1894 (NSW 387502); *Willis s.n.*, Finke River below Mt Sonder, 20.viii.1966 (MEL 236982).

QUEENSLAND: *Noble 55*, Rock Tank, Lake Machattie, 5.x.1977 (CANB); *Spencer s.n.*, Elmina Springs, S. Queensland, 1885 (MEL 583926).

NEW SOUTH WALES: *Carolin 11040*, Fort Grey, Sturt National Park Rest Area, 14.xi.1978 (SYD); *Costin s.n.*, Cooma, 12.i.1949 (NSW 387514); *Jackson 2834*, Yarriarraburra Swamp, 8.v.1977 (AD, PE); *Jacobs 3085*, Lake Stewart, Old Woolshed, 8.v.1977 (AD, NSW); *Mackay 20*, Clover Creek, Bourke 1890 (MEL); *Moore 6078*, Bidura, c. 64.37 km N of Balranald, 14.x.1971 (CANB).

SOUTH AUSTRALIA: *Badman 987*, 6 km SSW of Narrawalpinna Waterhole, Coopers Creek, Lake Eyre Basin, 23.iv.1984 (AD); *Badman 1019*, Waukatana Waterhole, Coopers Creek, Lake Eyre Basin, 23.iv.1984 (AD); *Badman 5168*, Waukatana Waterhole, Mungernie Station, Coopers Creek, Lake Eyre Basin, 24.iv.1992 (AD, PTBG); *Barratt & Fleming s.n.*, Mulligan paddock, 1.6 km NW of the old Alton Downs Homestead and Well, site 4473, Lake Eyre Basin, 23.x.1995 (AD); *Donner 5264*, near the north-west branch of Coopers Creek, S of Coongie Lake, far NE, Lake Eyre Basin, 21.xii.1975 (AD); *Hosking 1521*, Roseworthy Campus, University of Adelaide, 3.xi.1997 (AD, CANB, MEL, NSW, NE); *Spooner 1795*, Pitman Farm, Windsor Gardens, Adelaide, 20.ii.1972 (AD).

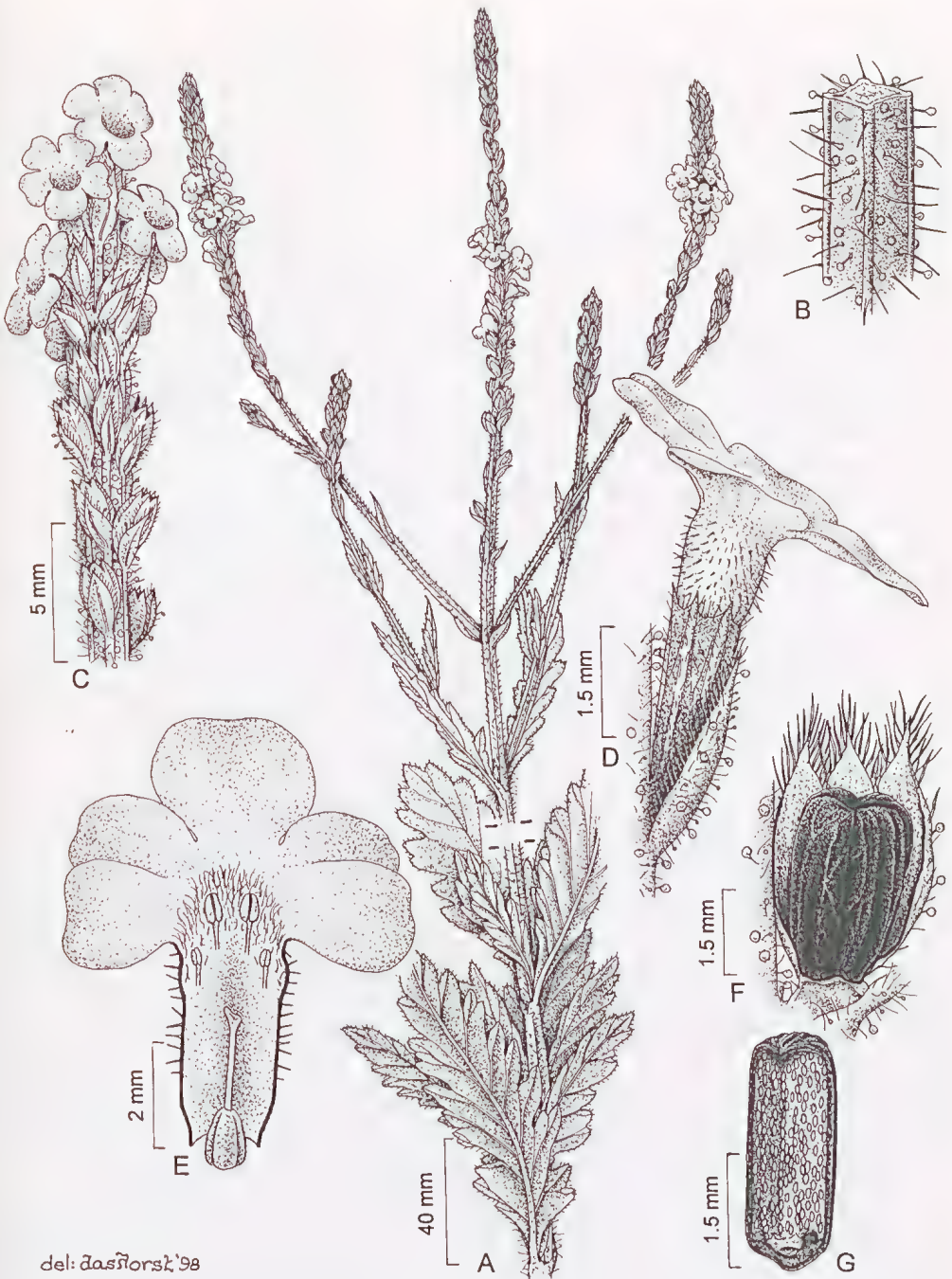


Fig. 7. *V. officinalis* L. var. *officinalis* (A-G, N.N.Donner 5264: AD). A, habit sketch of a flowering branch; B, magnified portion of stem showing glandular hairs; C, part of inflorescence magnified; D, flower; E, corolla cut open showing androecium, gynoecium and hairy inside; F, fruit with persistent calyx; G, mericarp showing muricate commissural face.

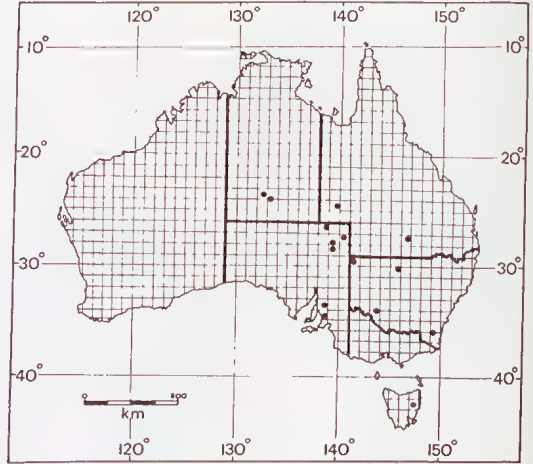
Distribution and ecology (Map 11)

In Australia, the *var. officinalis* occurs sparsely in the interior dry parts of Northern Territory, Queensland, New South Wales and South Australia. The only specimen (*Rodway 604a*: HO) from outside mainland Australia was collected from near Hobart in Tasmania.

Collection from outside Australia have been examined from throughout its distribution range.

Ecological notes by collectors' agree with Small (1933) and Moldenke (1964c) who reported its occurrence along roadsides and ditches, in fields, wheatfields, pastures, roadside meadows, waste places, grassy ground, damp or moist places, vacant lots, railroad grounds, and very dry pastures, on dry

gentle slopes, grassy hillsides, village commons, and mountainsides, along village streets, rocky paths, sandy roadsides, and canal-banks, at the border of rice fields and the edges of barnyards, in moist or sandy soil, in damp, grassy, or cultivated ground, on old ballast in shipyards, in dry land under trees, lowlands, cleared areas, and the lawns of old houses.



Map 11. Distribution of *V. officinalis* L. var. *officinalis*.

Comments

Michael (1997a) stated that, "*V. officinalis* L. *sensu stricto*, which occurs widely throughout Europe and Asia, appears to be quite uncommon in Australia where it is certainly introduced". In the same publication, he regarded previously recognised infraspecific taxa of *V. officinalis* namely subsp. *africana*, *var. gaudichaudii* and *var. macrostachya* as "native to eastern Australia". He also stated that "comments by Kloot (1984) on the introduced status of *V. officinalis* in Australia are misleading because he did not consider it as a variable complex". After examination of a range of material of this species held in Australian and major European and American herbaria, the present author agrees with Michael's view on the 'variable complexity' of *V. officinalis*. However, the above infraspecific taxa are accepted here only as variants of *V. officinalis*. Michael (1997a) raised these infraspecific taxa to species level without giving any sound reason or providing a key for their identification. The present author believes that the above-named infraspecific taxa do not merit the status of species because they differ from the typical form chiefly by the size of their spikes and flower parts and dentation of leaf blades. These characters are very variable and there are intermediates between these taxa. Apparently, Michael's judgement seems to have been based chiefly on his interpretation of other people's publications and examination of limited collections in Australian herbaria only. One such example is a labelled drawing of *V. officinalis* in "Flora of Central Australia" which Michael interprets as "*V. macrostachya* F. Muell." The three figures accompanying Michael's publication (1997a) seem a fair representation of leaf forms of these taxa.

Michael (1997a) also stated that, "*V. officinalis* L. s. str. has been collected occasionally in central and eastern Victoria and rarely in New South Wales". The occurrence of the typical variety in Victoria has not been confirmed. Its distribution in dry interior parts of Australia has been confirmed by six collections from New South Wales, six from South Australia, two from Northern Territory, two from Queensland and one poor and somewhat doubtful from Tasmania.

The *V. officinalis* complex in Australia comprises seven infraspecific taxa. After detailed examination of many collections of this species, a key to these taxa has been provided. The characters distinguishing these taxa are such that each unit has been recognised here as a variety.

Verdcourt (1992) regarded Linnaean Herbarium 35.15 as a syntype of *V. officinalis* L. It is now known that this specimen is not original material because it appears to be a post 1753 addition to the collection at LINN. (Personal commun. & discussion in 1997 with C.Jarvis, Hon. Curator, Linn. Soc. Herb.). The specimen LINN 35.15, however, matches well with the actual types in Clifford's herbarium at the BM.

Schauer (1847) included *V. setosa* Mart & Gal. in the synonymy of *V. officinalis*, but after examining the type of *V. setosa* it appears to belong to *V. menthaefolia* Benth.

H.J. Lam (1919) placed *V. macrostachya* F.Muell. and *V. menthaefolia* Benth. in the synonymy of *V. officinalis*. Small (1903, 1913, 1933) also discussed *V. menthaefolia* under the name *V. officinalis*, while Walpers (1845) listed it among doubtful species. In the present treatment, *V. macrostachya* is regarded as a variety of *V. officinalis* and *V. menthaefolia* as a distinct species.

While dealing with North American *Verbena* species, Perry (1933) reduced *V. domingensis* Urb. to synonymy under *V. officinalis*. To justify this reduction, she stated that, "On the whole, the specimens from Santo Domingo and Cuba differ from the typical *V. officinalis* in their slender and more elongate habit; the inflorescence is scarcely as glandular, the flowers are smaller, and the nutlets often do not exceed 1.5 mm in length. Nevertheless, the Cuban specimens vary greatly in size, and Curtis 677 is hardly separable from typical *V. officinalis*. Since many of the specimens are rather poor, it appears probably that they may very well represent an impoverished condition. Urban himself was somewhat uncertain of the status of his species as he appended the following note in a later publication: "An re vera a formis *V. officinalis* L. separanda?". Apparently, the above arguments by Perry and Urban's remark were not accepted by Moldenke (1959, 1971a, 1980) who retained *V. domingensis* as a distinct species.

Hamilton (1888) erroneously included *V. officinalis* in his list of "Indigenous plants of the Mudgee District in New South Wales". In fact, the typical variety is a native of Mediterranean region and now naturalised in many countries of the world including Australia.

Herbarium material of *V. officinalis* has been misidentified and distributed under the names *V. litoralis*, *V. riparia*, *V. xutha*, *V. supina*, *Bouchea* sp., and *Stachytarpheta* sp.

Curtis (1967) described the inner faces of mericarps as "hoary with papillose hairs". Actually, the inner or commissural faces of mericarps of this species are muricate or somewhat papillose, not hoary. In general, the mericarps of all naturalised *Verbena* species in Australia are non-hoary on their inner faces.

In Beadle's (1984) Flora of North Eastern New South Wales, the leaves in figure 374B1 of *V. officinalis* seem to be that of var. *gaudichaudii* Briq.

Regarding *V. officinalis*, Sastri et al. (1982) stated that, "the plant is used in many parts of Europe in the early stages of fevers and colds and in nervous disorders. In Africa, it is employed for the treatment of chronic eczema and bronchitis and menstrual disorders". Everist (1982) reports that, "This species and *V. bonariensis* have been suspected on rather

vague field evidence of causing sickness, death and occasionally abortion in cattle in New South Wales and Queensland". Similarly, Webb (1948) 'suspected it' of causing death of cattle in N.S. Wales". Moldenke recorded medicinal use of this plant in several issues of his "Phytologia" journal. In some countries, the plant has been reportedly used in sacred ceremonies.

Throughout its distribution range, this species is known by numerous common or vernacular names. Some of the popular names are: "official vervain", "European vervain", "sister vervain", "spurious vervain", "spike verbain", "horse whip", "devil's hate", "herba sacra", "holy plant", "holy herb", "Wild verbena", "pamukh", "Colombaria" and "pigeon's grass".

Affinities

V. officinalis var. *officinalis* is closely related to *V. litoralis* var. *litoralis* Kunth in its leaves being subsessile or attenuate towards the base, neither sessile nor amplexicaule; spikes elongating in the fruiting stage; bracts ovate-lanceolate, usually shorter than or as long as the calyx. Nevertheless, *V. litoralis* var. *litoralis* can easily be distinguished by its stem and inflorescence being not glandular; leaves coarsely toothed, neither pinnatifid nor pinnately incised or lobed; calyx up to 2 mm long and corolla-limbs 1.5–2 mm diam., not very conspicuous. According to Perry (1933), some species within the section *Verbenaca* appear to be more closely related than others. In her opinion, "*V. officinalis*, *V. menthaefolia*, *V. halei* and *V. riparia* form a natural group possessing the same general habit, type of pubescence and of nutlets. These are species of more or less adjacent regions except *V. officinalis*, which has been introduced from Europe".

Within the infraspecific taxa of this species, the typical var. *officinalis* seems nearest to var. *africana* and var. *monticola* in its spikes being of somewhat similar aspect, glandular or viscid, pubescent-hirsute; flowers distant in the lower two-thirds of the rachis; floral bracts usually half to two-thirds the length of the calyx. Despite that, var. *officinalis* may readily be identified by its leaves being not deeply divided, the lobes short, obtuse, more or less dentate and floral bracts usually half the length of the calyx, rarely longer.

7b. *Verbena officinalis* L. var. *africana* (R.Fernandes & Verdc.) Munir, *stat. nov. et*

var. nov.

Type: As for *V. officinalis* L. subsp. *africana* R.Fernandes & Verdc.

V. officinalis L. subsp. *africana* R.Fernandes & Verdc. in Bol. Soc. Brot. Ser. 2, 62 (1989) 305, Tab. 1, **basionym**; Verdc. in Polhill (ed.), Fl. Trop. E. Afr. Verbenaceae (1992) 8, fig. 1; Pedley in R.J.F.Hend. (ed.), Qld Vasc. Pl. (1994) 337; J.-P. Leburn & Stork, Enum. Pl. Fleurs Afr. Trop. (1997) 523; P.W. Michael in Telopea 7, No. 3 (1997) 296, fig. 3.

Type: R.B. Drummond 4858, between Avondale West and Mabelreign, Salisbury [Harare], Southern Rhodesia [Zimbabwe], 21.viii.1955 (K holotype!, B, BR!, LISC, S, SRGH – isotypes).

V. officinalis L. var. *natalensis* Hochst. ex C. Krauss, Flora 28 (1845) 68, *nom. nud.*; Moldenke, Phytologia 36, No. 4 (1977) 279 – *vide* Moldenke (1964c, 1971a, 1980), Fernandes & Verdcourt (1989), Verdcourt (1992),

Type: In the protologue, the only information about the type is "ad fluv. Umlaas, Natal, Dec." In this respect, Moldenke (1977c) states that, "Although unaccompanied by a formal description, this variety is clearly based on Krauss 151 from 'ad fluv. Umlaas, Natal, Dec.' The unnumbered Krauss collection in the Munich herbarium is probably a part of the type collection".

V. africana (R. Fernandes & Verdc.) P.W. Michael in *Telopea* 7, No. 3 (1997) 296, fig. 3; B.J. Conn in N.G. Walsh & Entwisle (eds), *Fl. Vic.* 4 (1999) 417, fig. 80i.

Type: As for *V. officinalis* L. subsp. *africana* R. Fernandes & Verdc.

V. officinalis L. *sensu* M.D.Hend. & J.G. Anderson, *Mem. Bot. Surv. S. Africa* No. 37, *Common Weeds S. Africa* (1966) 258, fig. 128, *quoad* descrip. & fig.

Diagnosis (Fig. 8)

The var. *africana* differs from the typical variety of this species by its leaves being deeply divided into long, narrow, acute or serrate lobes; floral bracts usually half to two-thirds the length of the calyx, rarely equalling the calyx; corolla-tube somewhat constricted below the limb. From var. *monticola*, it differs by its flowers being always sessile; rhachis with both glandular and non-glandular hairs; calyx distinctly toothed; corolla-tube somewhat constricted below the limb; floral bracts narrowly ovate-lanceolate and in habitat non-mountainous. It may be distinguished from glandular var. *eremicola* and var. *macrostachya* by its flowers being distant at least in the lower two-thirds of the rhachis; spikes pubescent, not hirsute; floral bracts shorter than the calyx and becoming glabrescent when old. From eglandular var. *gaudichaudii* and var. *halei*, var. *africana* differs by its stem and inflorescence being glandular, and floral bracts not glabrous abaxially after anthesis.

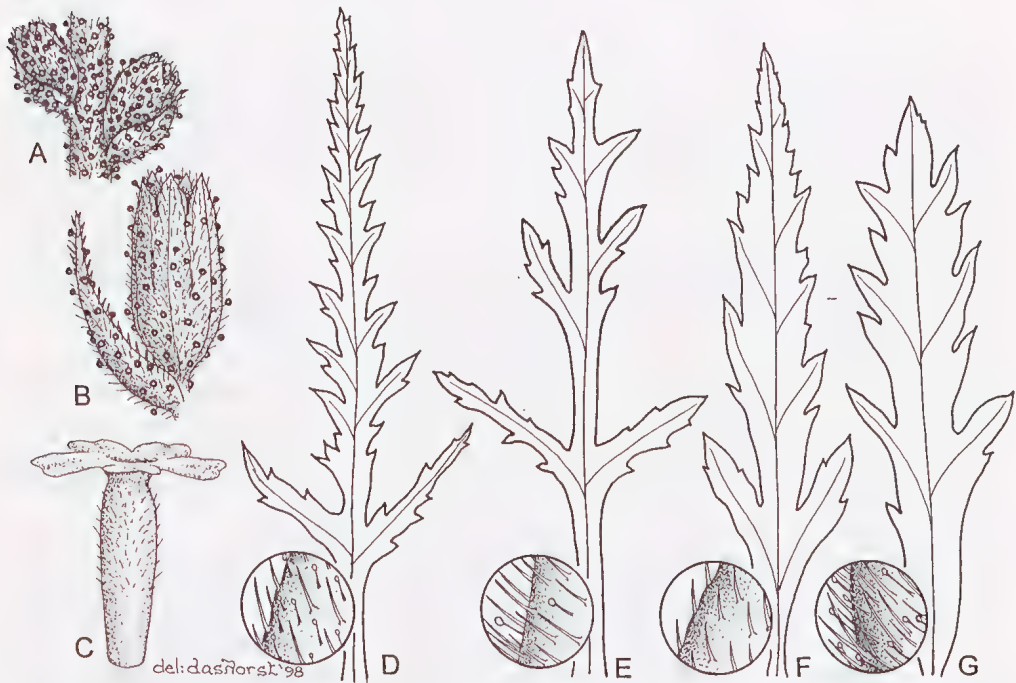


Fig. 8. *V. officinalis* L. var. *africana* (R.Fernandes & Verdc.) Munir (A-D, C.W.E.Moore 6656: CANB; E, J.Z.Weber 743: AD; F, R.J.Chinnock 3437: AD; G, P.K.Latz 4366: AD). A, portion of spike showing glands; B, calyx with floral bract \pm two-third the length of the calyx; C, corolla-tube constricted below the limb; D-G, range of variation in leaf form each with acute lobes.

Representative specimens (collections seen: Australian 77; non-Australian 65)

NORTHERN TERRITORY: *Latz 4366*, Little Palm Valley, 21.ix.1973 (AD, CANB, DNA, NT); *Tate s.n.*, Upper Fink by Mt Sonder, c. 130 km W of Alice Springs, 2.viii.1894 (AD 95836015).

QUEENSLAND: *Allen 340*, Noondoo Dirranbandi, 19.iv.1947 (CANB 2 spec.); *Everist 4335*, Orion Downs, 20.vi.1951 (BRI, CANB); *Everist 6101*, Buckinbah, c. 22 km SE of St. George, 12.ix.1959 (BRI, L, NY); *O'Shanasey 125*, Rockhampton, 16.iv.1867 (MEL 583883). *Speck 1888*, 1.6 km E of Chauvel Homestead, N of Theodore, Leichhardt District, 18.x.1963 (BRI, CANB, L, NSW); *Stanley & Ross 78469*, along road between Springsure and Rolleston, c. 30 km from Springsure, 22.xi.1978 (BRI).

NEW SOUTH WALES: *H. Beckler s.n.*, River Darling, Victoria Exped., 31.x.1860 (MEL583891); *Boorman s.n.*, Euabalong, -.v.1908 (G, NSW); *Boorman s.n.*, Arrara – Lake Eliza, -.x.1912 (NSW); *R. Brown s.n.*, Port Jackson, 1800-1805 (BM); *Chinnock 3437*, western side of Yantara Lake, 5.v.1977 (AD, HO). *Constable 11633*, Bundy-Coola, Cobar, 17.x.1947 (L, NSW, US); *Coveny 8757 & Roy s.n.*, Green Camp, Mt Kaputer National Park, c. 29 km ENE of Narrabri, 18.xi.1976 (NSW); *Eichler 22763*, Lake Cargelligo, Boomerioi Creek, below the bridge of road from Mount Hope to Lake Cargelligo, 12.xi.1979 (AD 2 spec., CANB); *Jacobs 3847*, Fort Grey, 6.vi.1980 (AD, NSW); *Moore 8937*, "Yathonga", at Coaker's Tank, 52 km SW of Louth, 16.x.1988 (AD, CANB 2 spec., G); *Richley 1203*, Wilcannia, c. 200 km ENE of Broken Hill, 19.ix.1973 (AD); *Waterhouse s.n.*, "Birrabirramah", Pokataroo, -.i.1948 (SYD).

VICTORIA: *Beaglehole 39291*, far NW of Hattah Lakes National Park, E side of Lake Hattah, 11.ix.1960 (MEL); *Beaglehole 56152*, Lake Powell, c. 16 km SE of Robinvale P.O., Wildlife Reserve, 4.v.1977 (MEL); *Clarke 2438*, c. 10 km SE of Myrtleford beside Ovens River just NW of Fernydale Lane, 21.i.1994 (MEL); *Mackay 85*, Clover Creek, -.x.1890 (MEL); *Sullivan 27*, Yarra, iii.1872 (MEL583863).

SOUTH AUSTRALIA: *Cleland s.n.*, Cordillo Downs, -.v.1924 (AD 97621089); *Donner 5246*, NW branch of Coopers Creek, S of Coongie Lake, 21.viii.1975 (AD); *Hunt 1745*, S of Naracoorte, c. 95 km N of Mt Gambier, 24.xii.1965 (AD); *Symon 15062*, Manunda Creek, c. 15 km NE of Faraway Hill, 23.vii.1991 (AD); *Weber 743*, Mernmerna, c. 150 km NE of Port Augusta on road to Maree, 24.x.1968 (AD 2 spec., NSW).

TASMANIA: *Somerville 19*, Royal Park, Launceston, across road from Harrops wool store, 11.iii.1961 (HO).

Distribution and ecology (Map 12)

In Australia, var. *africana* has been recorded from all States with major distribution on mainland. The mainland localities are chiefly in the south-eastern part of Queensland, the western half of New South Wales, along northern border of Victoria and in the eastern half of South Australia. Two localities are in the southern part of Northern Territory and one in the far south-western corner of Western Australia. Besides, one collection has come from near Launceston in Tasmania.

Collections from outside Australia have been seen from New Zealand, Philippines, China, Taiwan, Japan, Kenya, Rwanda, Uganda, Tanzania, Congo and Zimbabwe.

According to Australian collectors' field notes, var. *africana* occurs chiefly in grassland, on flood-plains, along river and creek banks, sides of lakes, near drainage areas and margins of water holes. The general habitat is deep red or black cracking-clay soil, pale brown loam or deep yellow brown sandy soil. In several cases, it has been found growing in association with different *Eucalyptus* species and amongst *Muehlenbeckia florulenta*.

Comments

The var. *africana* was originally described by Fernandes & Verdcourt (1989) as a subspecies of *V. officinalis* L.

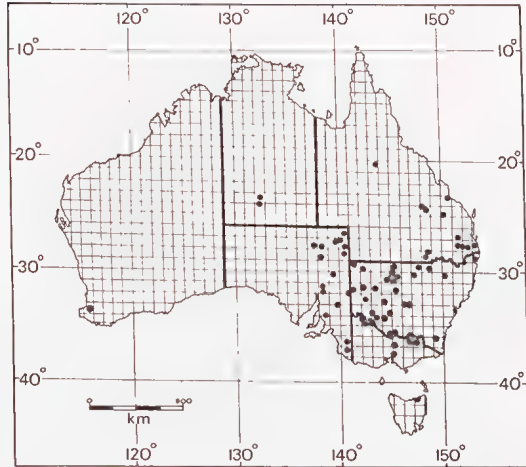
In 1997a, Michael raised its status to a

species and remarked, "that it is sufficiently distinct from *V. officinalis* L. *sensu stricto* and other native Australian *Verbena* species to give it specific status also". He did not give any distinguishing character other than those mentioned by Fernandes & Verdcourt (1989), nor provided any key to identify it from its nearest allies. Regarding var. *africanca*, Michael (1997a) also stated that, "it also occurs in the Indian sub-continent and, I think, is native in Australia". The present author has seen a range of material of this taxon in major European herbaria and has also examined borrowed specimens from several other European and American herbaria. So far, the occurrence of var. *africana* in the Indian sub-continent has not been confirmed by any collection. Only the typical var. *officinalis* occurs in the Indian sub-continent. All taxa of *Verbena* were introduced from the Americas, Europe and the Mediterranean regions, except those varieties of *V. officinalis* which have been described for Australia.

Previously, some collections of var. *africana* from South Africa were determined as *V. officinalis* var. *natalensis* Krauss, a name not published validly. Moldenke (1964c, 1971a) regarded it as a synonym of *V. officinalis* but in 1977c, he published it as a valid variety. Subsequently, Moldenke (1980) again relegated it to the synonymy of *V. officinalis*.

Affinities

Amongst the infraspecific taxa of *V. officinalis*, var. *africana* seems most closely related to var. *monticola* in its leaves being deeply divided into long, narrow, acute or serrate lobes, inflorescence glandular and floral bracts usually half to two-thirds the length of the calyx. Nevertheless, var. *africana* may easily be distinguished by its flowers being always sessile; rhachis with both glandular and non-glandular hairs; calyx-teeth distinct; corolla-tube cylindrical, constricted below the limb, pubescent in the upper half outside; floral bracts narrowly ovate-lanceolate, usually up to two-thirds the length of the calyx. There are characters common between var. *africana* and the typical var. *officinalis*. Both taxa have inflorescence glandular, pubescent; flowers sessile; calyx-teeth distinct and floral bracts pubescent abaxially. The typical variety, however, can readily be distinguished by its leaves being not deeply divided, the lobes short, obtuse, somewhat dentate, corolla tube not constricted below the limb and floral bracts usually up to half the length of the calyx.



Map 12. Distribution of *V. officinalis* L. var. *africana* (R. Fernandes & Verdc.)Munir.

According to Fernandes & Verdcourt (1989), this taxon "Affinis etiam *V. riparia* Rafin. ex Small & Heller, *V. ehrenbergianae* Schau. et *V. hallei* Small. An species propria?".

7c. *V. officinalis* L. var. *monticola* Munir, var. nov.

Herba ca. 60 cm alta. Caulis puberules vel ubi vetus fere glaber. *Folia* profunde lobata, sparsim pubescentia et adaxialiter glabrescentia. *Inflorescentia* dense glandulosa rachis pilis solum glandulosis. *Flores* sessiles et pedicellis brevibus, pedicelli 0.5–1.5 mm longi, glandulosi; bractae ovatae, longae usque ad dimidium calycis, glandulosae et extra puberulae, secus margines ciliatae. *Corolla* roseo-malyina, extra glabrescens-glabra; tubus super calycem exsertus, prope apicem parum latior. *Fructus*: pyrenae in superficies commisurales muricatae.

Type: D.E. Albrecht 2474, Mount Buffalo, in the vicinity of the Chalet, Victoria, Australia, 19.ii.1986 (MEL 1560636-holotype, MEL 1560637-isotype).

Herb c 60 cm high. *Stem* puberulous or almost glabrous when old, somewhat purplish. *Leaves* deeply lobed, sparsely pubescent and becoming glabrescent adaxially. *Inflorescence* with glandular hairs only. *Flowers* both sessile and with short pedicels; pedicels 0.5–1.5 mm long, glandular; bracts ovate, up to half the length of the calyx, glandular and puberulous abaxially, glabrous adaxially, ciliate along the margins. *Calyx* green, campanulate, truncate or minutely toothed, glandular and pubescent outside, glabrous inside. *Corolla* pink-mauve, glabrous to glabrescent outside; tube exserted above the calyx, somewhat broader near the top. *Fruit* mericarps muricate on commissural faces.

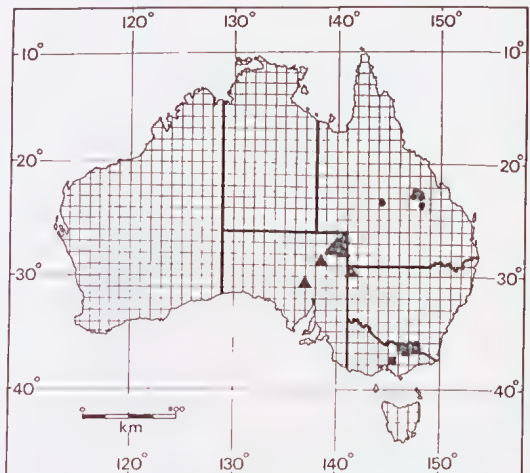
Specimens examined

VICTORIA: *Albrecht 2474*, Mt Buffalo, in the vicinity of the Chalet, 19.ii.1986 (MEL1560636, holotype; MEL1560637, isotype); *R.A. Black 765*, Milawa, 29.xi.1935 (MEL); *Canning 1411*, 22.5 km from Corryong, towards Omeo, 4.i.1969 (CBG, L); *Smith 59/3*, near Mt Evelyn Recreation Reserve, near York Road, c. 35 km E of Melbourne, 21.i.1959 (MEL); *Miss Handley s.n.*, ex Herb. H.B. Williamson, Gippsland, loc. incert, undated (MEL583871, p.p. exclud. middle spec. of the three).

Distribution and ecology (Map 13)

Var. *monticola* seems to be endemic in Victoria where it is restricted between latitude 36° and 38°S, and between longitude 145° and 148°E. The main distribution is at and around Mt Buffalo with only one locality near Mt Evelyn Recreation Reserve, about 35 km east of Melbourne.

According to collector's field notes, it grows in mountain forest on granitic slope in association mainly with *Eucalyptus*, *Kunzea* and *Juncus* species.



Map 13. Distribution of *V. officinalis* L. *eremicola* Munir ▲; - var. *macrostachya* (F.Muell.) Benth. ●; - var. *monticola* Munir ■.

Comments

The leaves in *R.A.Black* 765 (MEL) are not deeply divided. Its inflorescence, however, is glandular and other flower characters are similar to that of var. *monticola*.

Affinities

For similarities and differences, see "affinities" under var. *africana*.

7d. *V. officinalis* L. var. *macrostachya* (F.Muell.) Benth., Fl. Aust. 5 (1870) 36, excl. *Bowman* s.n. from Rockhampton; F.M.Bailey, Qld. Part 4 (1901) 1178; Moldenke, Phytologia 2 (1947) 339; Moldenke, Résumé Verbenac. etc. (1959) 132, 224, 369, 473; Moldenke, Phytologia 10, No. 4 (1964) 280; Moldenke, Phytologia 11 (1965) 475; Moldenke, Fifth Summary Verbenac. etc. 1 & 2 (1971) 208, 349, 371, 682, 687, 918; Moldenke, Phytologia 24, No. 1 (1972) 27; Moldenke, Phytologia 36, No. 4 (1977) 278; Moldenke, Phytologia Mem. 2 Sixth Summary Verbenac. etc. (1980) 199, 339, 364; A.D.Chapm., Aust. Pl. Name Index Q-Z (1991) 2950.

Type: As for *V. macrostachya* F.Muell., Fragm. 1 (1858) 60.

V. macrostachya F.Muell., Fragm. 1 (1858) 60; F.Muell., Fragm. 9 (1875) 5; F.Muell., Syst. Cens. Aust. Pl. (1882) 102; F.Muell., Sec. Syst. Cens. Aust. Pl. 1 (1889) 171; F.M.Bailey, Cat. Indig. & Natur. Pl. Qld (1890) 35; A.D.Chapm., Aust. Pl. Name Index Q-Z (1991) 2950; Pedley in R.J.F.Hend. (ed.), Qld Pl. new edn (1997) 206; Pedley in R.J.F.Hend., Qld Vasc. Pl. (1994) 337; P.W. Michael in Telopea 7, 3 (1997) 293, 294.

Lectotype: *F. Mueller* s.n., Peak Downs, Queensland, Australia, undated (MEL 583551, lectotype chosen by P.W.Michael (1997a); GH, K, M – isolectotypes!).

Diagnosis

Amongst *V. officinalis* complex in Australia, var. *macrostachya* may be distinguished by its comparatively robust habit, stout stems and dense covering of glands and hirsute indumentum. *Leaves* large, dentate-serrate in the distal two-thirds; lobes neither obtuse nor divided to the midrib. *Inflorescence* (spikes) rather thick, glandular and hirsute, up to 4.5–5 cm long, (4-) 5–8 (-10) mm diam. *Flowers* sessile, rather large, usually crowded along the rhachis; floral bracts ovate-lanceolate, as long as the calyx or slightly longer, glandular and hirsute abaxially, glabrous adaxially, (3.5-) 4–5 mm long. *Calyx tube* ribbed, almost truncate or minutely toothed, glandular and hirsute outside, glabrous inside. *Corolla tube* pale lilac, exerted above the calyx, ± cylindrical, pubescent in the upper-half outside, villous inside the tube, limb (3-) 3.5–5 mm broad.

Specimens examined

QUEENSLAND: *Bisset* s.n., c. 48-28 km N of Clermont, 7.xi.1964 (BRI 057285); *Everist* 4384, Peak Downs, 22.vi.1951 (BRI, MO); *Francis* s.n., State Farm Gindi, near Emerald, - .iii.1920 (AD, NSW 387503); *Jarvis* s.n., Longreach, -.x.1913 (BRI 1057131); *F. Mueller* s.n., Peak Downs, undated (GH, K, M - isolectotypes, MEL 583551 lectotype); *Saclier* s.n., Kilcummin airstrip, Clermont, undated (BRI 061237, K, L); *Spencely* s.n., Kilcummin, Clermont, 9.xi.1934 (BRI 1057130).

Distribution and ecology (Map 13)

The var. *macrostachya* is endemic to Australia where it has been found only in the pastoral district Mitchell in Queensland. The main distribution seems restricted between latitude 22° and 24° S, and longitude 147° and 149° E. Within this limit, the main distribution is near the townships Clermont and Emerald, and the homesteads Kilcummin and Peak Downs. The only outside locality is near the township Longreach.

Comments

In the protologue of *V. macrostachya*, the author mentioned two collectors, Leichhardt and Mueller. The collection by Leichhardt has not been cited by any subsequent botanist nor seen by the present author.

Bentham (1870) cited also a *Bowman s.n.* collection from Rockhampton, Queensland. This collection has not been seen but it is regarded as unlikely to belong to var. *macrostachya* because so far this taxon has been recorded only from central Queensland and its occurrence in the coastal areas has not been confirmed.

Lam (1919) included *V. macrostachya* in the synonymy of *V. officinalis s. lat.*

Affinities

The var. *macrostachya* is nearest to the typical form in its lamina not being divided to the central midrib; inflorescence densely glandular and corolla-tube exerted above the calyx. Nevertheless, var. *macrostachya* differs from the typical form of the species in its comparatively robust habit with stout stem, the lamina-lobes with sharp teeth; indumentum hirsute; spikes rather thick, (4-) 5–8 (-10) mm diam.; flowers large, usually crowded along the rhachis; floral bracts as long as the calyx or longer, (3.5-) 4–5 mm long.

This taxon is also close to var. *africana* in having the lamina sharply toothed and inflorescence densely glandular. However, var. *africana* may easily be distinguished by its lamina-lobes being deeply divided; spikes somewhat slender, up to 5 mm diam. and floral bracts usually up to two-thirds the length of the calyx.

There are several characters in common between var. *macrostachya* and var. *eremicola*. In both varieties the inflorescence are glandular; spikes densely hirsute; flowers usually crowded along the rhachis; floral bracts equalling the calyx or slightly longer. Nevertheless, var. *eremicola* can be identified by its spikes being not very thick, 3–4 (-5) mm diam.; floral bracts 2–3 mm long; corolla-tube scarcely exerted, glabrous or sparingly puberulous in the upper half outside and corolla-limb 1–2.5 mm broad

7e. *V. officinalis* L. var. *eremicola* Munir, var. *nov.*

Herba erecta, (30-) 50–70 (-100) cm alta. *Caulis* ramosus, glanduloso-pubescens. *Folia* oblongo-oblancoolata, in dimidio distali breviter dentata, glanduloso-pubescentia. Inflorescentia pilis glandulosis et eglandulatis; spicae 3–4 (-5) mm diametro. *Flores* sessiles; bractae florales ovata-lanceolatae, fere calycem aequantes, abaxialiter glandulosae et pubescentes, adaxialiter glabrae secus margines ciliatae. *Calyx*: tubo ± campanulato, minute denticulato, extra glanduloso-pubescenti, intra glabri. *Corolla*: tubo vix exserto, subcylindrico, extra glabri vel parce puberulo; limbo 1–2.5 mm lato. *Fructus*: mericarpia ("nuculae") extra brunnea vel atrobunnea, in superficiebus commissuralibus muricata.

Type: J.Z. Weber 4543, c. 120 km west-north-west of Innamincka near waterhole, c. 5 km east-north-east of Karawinni Waterhole, far North-East of South Australia, 17.viii.1975 (AD holotype; BR, HBG - isotypes).

Erect herb (30-) 50–70 (-100) cm high. *Stem* branched, glandular-pubescent. *Leaves* oblong-ob lanceolate, shortly toothed in the distal half, glandular-pubescent. *Inflorescence* with glandular and eglandular hairs; spikes 3–4 (-5) mm diam. *Flowers* sessile; floral bracts ovate-lanceolate, almost as long as the calyx, glandular and pubescent abaxially, glabrous adaxially, ciliate along the margins. *Calyx*: tube \pm campanulate, minutely toothed, glandular-pubescent outside, glabrous inside. *Corolla*: tube scarcely exerted, almost cylindrical, glabrous or sparingly puberulous outside; limb 1–2.5 mm broad. *Fuit*: mericarps ("nutlets") brown to dark-brown outside, muricate on commissural faces.

Specimens examined

NEW SOUTH WALES: *Jacobs 3085*, Lake Stewart, 8.v.1977 (NSW).

SOUTH AUSTRALIA: *Andrewartha 8283*, Purple Downs Station, -v.1938 (AD); *Cleland s.n.*, S of Cordillo Downs, c. 40 km west and 80 km S of Queensland border, 29.v.1924 (AD); *Conrick 188*, Coongie Lake, 14.x.1986 (AD, MEL); *Gillen 27*, on shore of Coongie Lake, 9.xi.1986 (AD); *Gillen 557*, W of Lake Apachirie, Coongie, 16.iii.1987 (AD); *Mueller s.n.*, Lake Eyre, loc. incert., undated (AD 97113009); *Osborn s.n.*, flood plain of Cooper's Creek near Killalpaninna Lake, 28.v.1920 (AD 97744363); *S.A. Pastoral Board*, Innamincka, 7.vi.1957 (AD 3 spec.); *Weber 4543*, 5 km ENE of Karawinnie Waterhole, ca. 120 km WNW of Innamincka, 17.viii.1975 (AD holotype; BR, HBG – isotypes).

Distribution and ecology (Map 13)

The var. *eremicola* has been recorded chiefly from the far north-eastern part of South Australia and adjacent border area of New South Wales

The above distribution is in a low rainfall area. According to collector's field notes, this taxon has been collected from near waterholes, swamp margins, along creeks and near Lake Shores.

Comments

Material of var. *eremicola* has generally been identified in herbaria as typical *V. officinalis* L. At least two collections, namely *Andrewartha 8283* and *Weber 4543* have been misidentified and distributed as *V. bonariensis* L.

Affinities

Amongst the infraspecific taxa of *V. officinalis*, var. *eremicola* seems nearest to var. *macrostachya*. For similarities and differences see "Affinities" under var. *macrostachya*. There are some characters in common between var. *eremicola*, var. *officinalis*, var. *africana* and var. *monticola*. In all these taxa, inflorescences are glandular, hirsute or pubescent; floral bracts always hairy abaxially; leaves variously incised, serrate or dentate. Nevertheless, var. *eremicola* may readily be distinguished by its flowers being usually crowded along the rhachis; spikes densely hirsute; floral bracts as long as the calyx.

7f. *V. officinalis* L. var. *gaudichaudii* Briq., *Annuaire Conserv. Jard. Bot. Genève* 10 (1907) 105; *Moldenke, Known Geog. Distrib. Verbenac. edn 1* (1942) 70, 101; *Moldenke in Chitt., Roy. Hort. Soc. Dict. Gard.* 4 (1951) 2209, 2211; *Moldenke, Résumé Verbenac. etc.* (1959) 210, 224; *Moldenke, Phytologia* 10, 4 (1964) 279; *Moldenke, Phytologia* 11 (1965) 475; *Moldenke, Fifth Summary Verbenac. etc. 1 & 2* (1971) 349, 371, 687, 917;

Moldenke, *Phytologia* 24, 1 (1972) 26; Moldenke, *Phytologia* 28, 4 (1974) 364, 443; Moldenke, *Phytologia* 36, 4 (1977) 278; Moldenke, *Phytologia Mem.* 2. Sixth Summary Verbenac. etc. (1980) 339, 364; A.D.Chapman, *Aust. Pl. Name Index Q-Z* (1991) 2950; P.W.Michael, *Telopea* 7, 3 (1997) 295.

Type: Charles Gaudichaud Beaupré 144, Port Jackson, Sydney, New South Wales, Australia, undated (G holotype!).

V. gaudichaudii (Briq.) P.W.Michael, *Telopea* 7, No. 3 (1997) 295; B.J.Conn in N.G.Walsh & Entwisle (eds), *Fl. Vic.* 4 (1999) 417, fig. 80h.

Type: As for *V. officinalis* L. var. *gaudichaudii* Briq.

Description (Fig. 9)

Erect herb to 1 m tall. *Stems* branched, several from a somewhat woody rootstock, eglandular, pubescent-puberulous. *Leaves* dull-green adaxially, slightly paler abaxially, the upper leaves narrow-linear or narrow-lanceolate, almost entire or sparsely and superficially dentate, the lower and mid-stem leaves oblong-lanceolate in outline, 5–7 (-12) cm long, (3-) 4–8 (-15) mm wide, the lamina deeply incised-dentate almost to the central midrib, the segments (lobes) 2–5 (-10) mm long. *Inflorescence* (spikes) neither glandular nor viscid, pubescent-puberulous. *Flowers* (corolla) deep-blue, bluish or lilac; floral bracts ovate-lanceolate usually as long as the calyx, occasionally two-thirds the length of the calyx, puberulous abaxially during anthesis, glabrous after anthesis.

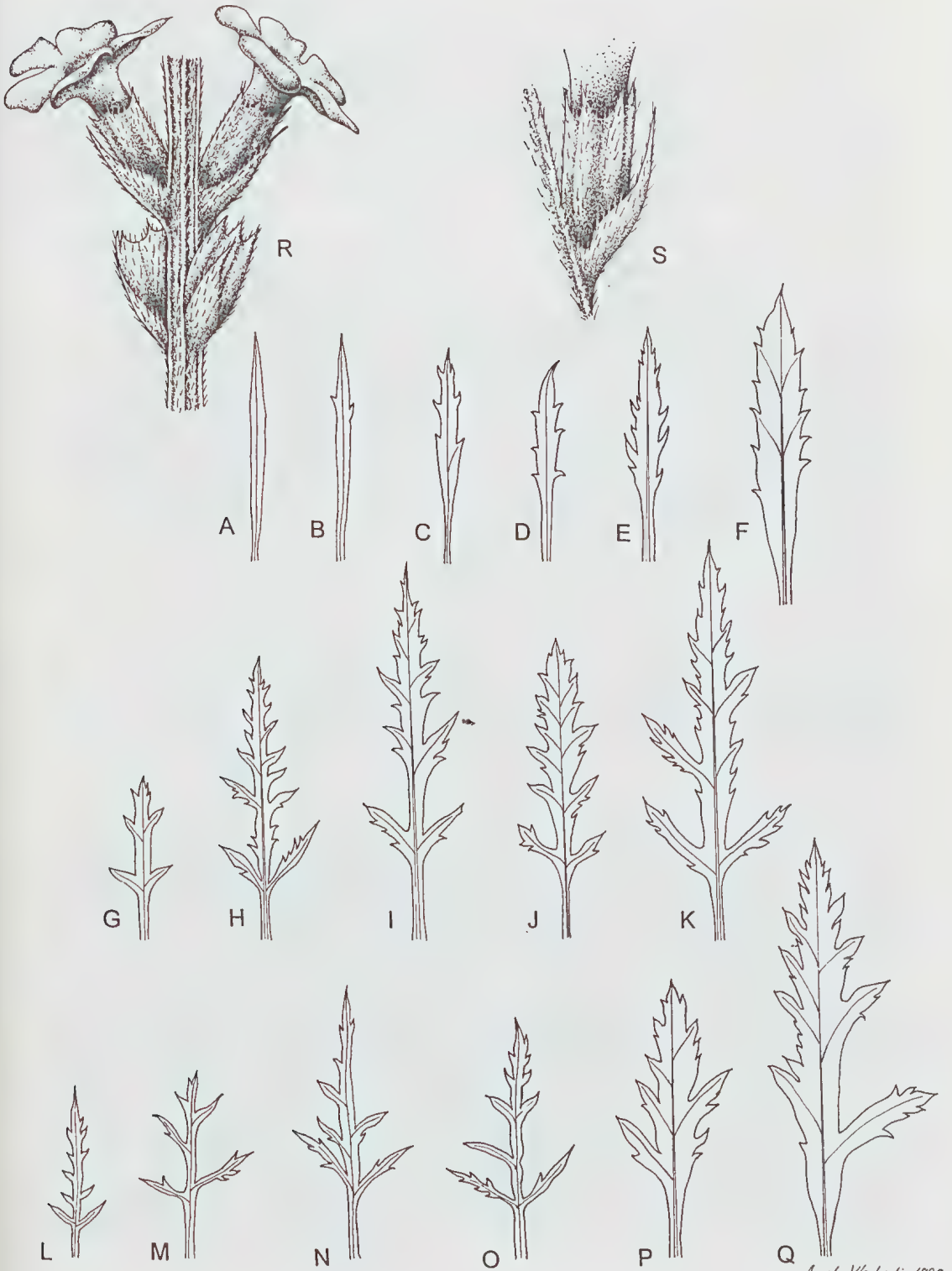
Representative specimens (collections seen: Australian 168, non-Australian 1).

NORTHERN TERRITORY: *Latz 4366*, Little Palm Valley, 21.ix.1973 (AD, CANB, DNA, NT).

QUEENSLAND: *Anderson 3832*, 7 km SW of Aramac, 11.ix.1984 (BRI); *Chinnock 6173*, Ravensbourne Creek, 29 km S of Blackall-Emmet road junction on road to Adavale, 21.ix.1984 (AD, BRI); *Dallachy s.n.*, Herbert River, 24.vi.1866 (MEL 583875); *Jobson 587*, base of Mt Fox, 70 km SW of Ingham, 12.vi.1989 (BRI, CANB, MEL); *Leichhardt 402*, Jimbour Plain of Condamine, 1842-1848 (AD, MEL 583839, NSW 387511); *Pedley 377*, Hannaford, 15.i.1959 (BRI, CANB); *Pedley 5387*, Southbrook, 30.xi.1987 (BISH, BRI, LAE, MO, NSW); *Webb 5300*, between Oakey and Dalby, 15.ii.1951 (BRI, CANB).

NEW SOUTH WALES: *Beckler 1574*, New England – 1884 (M); *Boorman s.n.*, Euabalong, -.v.1906 (AD 97940062, BRI 268737, E, NSW, SYD, Z); *R. Brown 2336*, Port Jackson & Parramatta, -.vi.1802 (BM, BR); *Constable s.n.*, Mount Harris Station, 64.37 km NNW of Warren, 30.iv.1952 (BRI, NSW 20496); *Dunn 33*, *Plat & Coveny s.n.*, Sinclairs Lookout, 14.4 km W of Glen Innes, 26.iii.1987 (AD, NSW); *Jacobs s.n. & Lapinpuro 44*, 13 km S of Graman on Delungra road, 27.xi.1982 (AD, NSW); *Jobson 264*, 29 km N of Narrabri, E of Newell Hwy 16.iv.1988 (MEL, NSW); *MacGillivray s.n.*, Morton Boolka, -.1912 (AD, ADW 14600); *Mueller s.n.*, junction of Darling and Murray Rivers, -.iii.1888

Fig. 9. *V. officinalis* L. var. *gaudichaudii* Briq. (A & B, L.Richley 1069: AD; C, A.C.Beaglehole 37377: MEL; D, A.C.Beaglehole 79518: CANB; E, C.R.Alcock 10082: AD; F, A.Dietrich 1500: AD; G, A.C.Beaglehole 37633: MEL; H, A.Morrison s.n.: B; I, E.Chesterfield 2537: MEL; J, A.Morrison 1257: E; K, R.Bates 20136: AD; L, W.Greuter 21215: B; M, S.Jacobs s.n. & L.Lapinpuro 44: AD; N, R.Cheffins 231: BRI; O, J.L.Boorman s.n.: E; P, A.B.Oldfield s.n.: US; Q, D.E.Symon 5731: AD; R, S, D.E.Symon 5731: AD). A–Q, showing range of leaf form; R–S, magnified flowers showing relative length of bracts.



Angelo Vlachoulis 1998

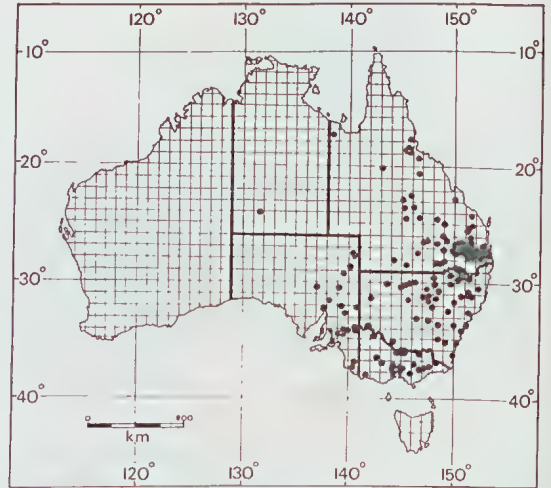
583845); *Lindley s.n.*, Upper Murray, -.1883 (MEL 560559); *Wallace 159*, Daylesford, -.1878 (MEL 583860).

SOUTH AUSTRALIA: *Badman 1540*, Mundibarcoola Waterhole, Strzelecki Creek, 13.ix.1984 (AD, LSU, OSA); *Carrick 1981*, Innamincka crossing, Coopers Creek, 17.viii.1968 (AD, AK, CANB, H); *Eardley 2546*, Koonamore Head Station, -.vi.1937 (AD); *Symon 5731*, drying flats about the Coopers Creek at Innamincka, 18.viii.1968 (AD, CANB, K, SPN); *Tepper 501*, St Vincent Gulf, 8.vi.1882 (MEL 583807); *Weber 743*, Mernmerna, c. 150 km NE of Port Augusta on road to Marree, 24.x.1968 (AD, HBG).

Distribution and ecology (Map 14)

The var. *gaudichaudii* seems to be native of Australia where it has been recorded chiefly from the eastern halves of Queensland and South Australia, and throughout New South Wales and Victoria. Besides the above mentioned distribution range, this taxon has been collected only once from the Northern Territory at Little Palm Valley. So far, it has not been found in Western Australia and Tasmania.

According to collectors' field notes, this taxon occurs chiefly in heavy clay, alluvial clay loam and sandy loam types of soils. Generally, it grows in *Eucalyptus* woodland, *Acacia* – *Casuarina* woodland, grassland, open forested bank of rivers, creeks, margin of swamps, flood-plains, roadside disturbed soil and as a weed of cultivated and fallow land.



Map 14. Distribution of *V. officinalis* L. var. *gaudichaudii* Briq.

Comments

Michael (1997a) recorded the original Latin description of var. *gaudichaudii* and remarked, "that plants like this described by Briquet occur throughout a large part of eastern Australia; that they are definitely native and that they are sufficiently distinct to raise to the specific level". He illustrated a limited range of variation in leaf form but did not mention any other character that could justify its elevation to specific level. Due to lack of any other distinguishing character, this taxon is retained here as a variety of *V. officinalis*.

Collection of *L.J.Boorman s.n.* from Euabalong, New South Wales, seems to consist of two different specimens. Both specimens are not glandular but with a somewhat similar type of leaves and spikes. In the left-hand specimen, however, the lower flowers have short pedicels 0.5-1 mm long. Similarly, the collection by *Everist 3458* from St George, Queensland, has a few flowers with short pedicels and a few with puberulous ovary and style. These abnormal flower characters may have developed due to spraying of some herbicide because these specimens were found growing on edge of cultivation.

According to Moldenke (1964d), "the *E.F.Constable 11633*, *Pedley 377* and *Smith 3045* are actually var. *gaudichaudii*". *E.F.Constable 11633* is here identified as *V. officinalis* L. var. *africana*, *Pedley 377* as *V. officinalis* L. var. *gaudichaudii* and *Smith 3045* as *V. litoralis* Kunth var. *brasiliensis*.

Herbarium specimens of var. *gaudichaudii* have been misidentified and distributed under the name *V. litoralis* Kunth which is also pubescent and non-glandular.

Walker's collection no. ANU439 (CANB) from Western Highlands, New Guinea, is *V. officinalis*. It is pubescent but without glands and its lower and mid-stem leaves are dissected almost to the central midrib. In every respect it matches well with var. *gaudichaudii*, and so far it is the only collection of this variety known from outside Australia.

Affinities

Within the *V. officinalis* L. complex in Australia, var. *gaudichaudii* is closely related to var. *halei* (Small) Munir in its inflorescence being pubescent to puberulous, not glandular or viscid; floral bracts puberulous abaxially, glabrous after anthesis; upper leaves narrow-linear, entire or divided into long narrow lobes or teeth. Nevertheless, var. *halei* may easily be distinguished by its lower and often mid-stem leaves coarsely toothed, not deeply divided, and floral bracts about half the length of the calyx. In var. *gaudichaudii*, the floral bracts are usually as long as the calyx or occasionally two-thirds the length of the calyx.

There are some characters in common between var. *gaudichaudii* and *V. litoralis* Kunth. Both taxa are pubescent, non-glandular, non-viscid; floral bracts usually subequalling the calyx or somewhat shorter; uppermost leaves linear-lanceolate with margins almost entire. *V. litoralis*, however, can readily be identified by its leaves being sessile or shortly petiolate, cuneate towards the base, semiamplexicaul in *V. litoralis* var. *brasiliensis*, elliptic-lanceolate or oblanceolate-spathulate; flowers congested near the top of the spikes; floral bracts marcescent, rigid.

7g. *V. officinalis* L. var. *halei* (Small) Munir, var. *et stat. nov.*

Type: Dr Josiah Hale 245, loc. incert, Louisiana, U.S.A., undated (NY, lectotype!, chosen by Moldenke (1963); GH, isoelectotype, *n.v.* – *fide* Barber, 1982); *M.B. Croft 119*, San Diego, Texas, U.S.A., 1885-1886 (NY, syntype!); *A. Arthur Heller 1419*, Corpus Christi, 5-12.iii.1894 (K, NY, syntypes!); *Dr Edward Palmer 242*, in the Indian Territory, chiefly on the Washita, between Fort Cobb and Fort Arbuckle, Oklahoma, U.S.A., 1868 (NY, syntype!).

V. halei Small, Bull. Torrey Bot. Club 25 (1898) 617, **basionym**; Small, Fl. SE U.S. edn 1 (1903) 1009; L.M.Perry, Ann. Missouri Bot. Gard. 20, No. 2 (1933) 265; Small, Man. S.E. Fl. (1933) 1137; Lewis & Oliv., Ann. J. Bot. 48 (1961) 641, fig. 16; Moldenke, Phytologia 8 (1961) 120, 121, 124 & 145; Moldenke, Phytologia 8 (1962) 212, 231, 435; Moldenke, Phytologia 8 (1963) 472, 477, 478, 487 & 488; Rickett, Wildfls U.S. 3, 2 (1963) 364; Moldenke, Phytologia 9 (1963) 38, 39, 78, 147, 160-175, 199, 205 & fig. 9; Moldenke, Phytologia 10, 2 (1964) 108; Moldenke, Phytologia 23, 2 (1972) 240; Moldenke, Phytologia 28 (1974) 251, 362, 432; Moldenke, Phytologia 30, 3 (1975) 142; Moldenke, Phytologia 31 (1975) 375, 377, 378; Moldenke, Phytologia 36, 3 (1977) 216; Moldenke, Phytologia 41, 3 (1979) 171; Moldenke, Phytologia Mem. 2, Sixth Summary Verbenac. etc. (1980) 17, 18, 20, 24, 26, 27, 38, 40, 42, 46, 56, 68, 581.

Type: As for V. officinalis L. var. *halei* (Small) Munir.

V. leucanthemifolia Greene, Pittonia 5 (1903) 135 – *fide* L.M.Perry (1933), Moldenke (1959, 1971a).

Type: Samuel Mills Tracy 7996, Abilene, Taylor County, Texas, U.S.A., 19.v.1902 (F, G, MBG, NY – *n.v.*) – *fide* L.M.Perry (1933).

V. officinalis L. subsp. *halei* (Small) S.C.Barber, Syst. Bot. 7, No. 4 (1982) 454.

Type: As for *V. officinalis* L. var. *halei* (Small) Munir.

Typification

In the protologue of *V. halei* Small, the author cited the following four specimens: *Hale* 245 from Louisiana, *Croft* 119 and *Heller* 1419 from Texas and *Palmer* 242 from Oklahoma. The author did not choose any of them as a type, and they are, therefore, syntypes. Moldenke (1963a) recorded Hale's collection from Louisiana as the type without mention of its collection no. "245". He also stated that, "although the original description cites, in addition, *Croft* 119, *Heller* 1419, and *Palmer* 242, with no specific type designation, the species is named in honour of the original collector". It seems that perhaps Moldenke did not accept *Croft* 119, *Heller* 1419 and *Palmer* 242 as syntypes nor did he give a clear indication that he was choosing *Hale* 245 as a lectotype. Barber (1982) recorded "*Hale s.n.*" from Louisiana as the lectotype by quoting "(Moldenke 1963, p. 162)", the presumed place of typification. Following Moldenke (1963a), Barber also did not cite Hale's collection no. 245. According to the list of institutions from where Barber examined specimens, she did not see any from NY where all above named four syntypes are now preserved. She also stated that she had seen an "isolectotype" in Herb. GH. In response to the present author's request, the collection Manager of Herb. GH replied that unfortunately they "have not been able to locate the GH isolectotype of *Verbena halei*" (Pers. Correspond. 22 Feb. 1996). If the isolectotype is in Herb. GH it may not be in the type collections of the type folder, or perhaps it is without Hale's collection "245" written on the herbarium sheet.

The present author has examined all four syntypes preserved at Herb. NY and has accepted *Hale* 245 as a lectotype apparently chosen by Moldenke (1963a). The other collections remain syntypes. A duplicate of "*A Arthur Heller s.n.*, from Corpus Christi, Texas", is in a type folder at Herb. K. It has been annotated as "*Verbena officinalis* L. subsp. *halei* (Small) Barber". This specimen matches well with the above mentioned *Heller* 1419 and may be a syntype of this taxon though the collector's no. "1419" is not recorded on the type sheet.

Description

Annual or perennial herb, 20–80 (-120) cm tall. *Stems* usually several arising from a woody base, glabrous or strigillose in the upper part. *Leaves* 3–10 cm long, strigillose on both surfaces, diverse in outline, the basal and mid-stem leaves elliptic-oblong to ovate in outline, tapering into a petiole approximately as long as the lamina, the lower leaves variously and irregularly dentate, the middle stem-leaves 1–2-pinnatifid or incised to lobed or dissected but not deeply divided, the upper stem-leaves linear or linear-oblancoelate, entire or sparingly dentate. *Spikes* slender and elongate, usually 2–5-per branch, paniculately disposed. *Bracts* about half as long as the calyx, appressed, ciliate. *Calyx* 3–3.5 mm long in fruiting, subtruncate, hirsute-strigillose outside, glabrous inside. *Corolla* varying from blue, purplish-pink to deep lavender; tube scarcely longer than the calyx; limb 6–7 mm broad; lobes retuse at the apex. *Fruit* about twice as long as broad; mericarps trigonous, 2–3 mm long, usually striate and raised-reticulate at the apex, muricate ("saginoïd") on commissural faces.

Representative specimens (collections seen: Australian 45; non Australian 20)

QUEENSLAND: *Fensham 1926*, Greenmount West, 10.ii.1995 (BRI); *Kersten s.n.*, near Trinity Bay, 1881 (MEL 560561); *Olsen 752 & Boyland*, Eyre Creek, 10 km SW of Dickerrrie Waterhole, Simpson Desert, 26.v.1978 (BRI); *Pedley 4537*, near Goombungee, 2.xi.1978 (BISH, BRI, LAE, MO, NSW); *Watson s.n.*, Gatton, 22.x.1930 (BRI 012934).

NEW SOUTH WALES: *Beaglehole 82127*, Tocumwal Regional Park, 17.xi.1985 (MEL); *Beckler s.n.*, Clarence River, undated (MEL 583878); *Bauer s.n.*, Port Jackson, undated (W); *Dallachy s.n.*, Goodwin & Darling Rivers, undated (MEL 583897); *Hind s.n.*, Volcanic neck, NW Mt Annan ridge, Mt Annan Botanic Garden, 4 km W of Campbelltown, 9.xii.1985 (A, PRC, MEL, NSW 206715).

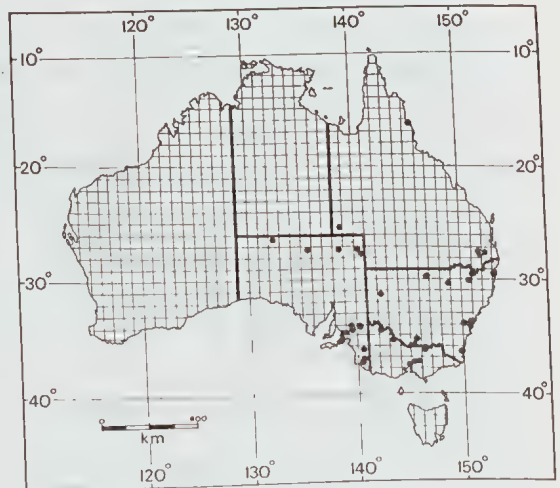
VICTORIA: *Beaglehole 81928*, Murray Valley Highway, roadside reserve, 15.xi.1998 (MEL); *Clarke 2421*, Eastern Highlands, Mt Donna Buang Road 100 m from Cement Creek towards Healesville, 11.i.1994 (MEL 2 spec.); *Conrick 134*, Lake Lalbert, 22.iii.1974 (MEL1563386); *Munchin s.n.*, Yarra Glen, -.ii.1894 (MEL 527841); *Mueller s.n.*, Wangaratta, undated (MEL 583877); *Reader s.n.*, banks of Yarra, Studley Park, 25.iii.1883 (MEL 663959).

SOUTH AUSTRALIA: *Alcock s.n.*, roadside from Penola to Mt Gambier, -.ii.1941 (AD); *Alcock s.n.*, Tantanoola, -.ii.1918 (AD); *Badman 1297*, Deparanie Waterhole, Coopers Creek, 19.vi.1984 (AD, CBG, MEL); *Bates 36871*, Hindmarsh Valley, 3.iv.1994 (AD); *Bates 43478*, Tamara Springs, 18.v.1996 (AD); *Cleland s.n.*, Ross's Waterhole, c. 45 km NNE of Oodnadatta, 5.i.1927 (AD); *Cleland s.n.*, c. 10 km N of Victor Harbor, 30.i.1937 (AD); *Cleland s.n.*, Waterfall, upper Hindmarsh, c. 10 km N of Victor Harbor, 15.i.1946 (AD); *Gillen 617*, Coongie Survey, Lake Eyre Basin, 19.iv.1987 (AD); *Griffith s.n.*, Murray River, -.iii.1916 (AD); *Mueller s.n.*, Third Creek, 10.i.1848 (MEL 583873); *Symon 3787*, Section 73, Hundred of Parcoola River flat opposite Overland Corner Hotel, 11.x.1965 (AD, SPN); *Tate s.n.*, Belair, S Mt Lofty, 24.xi.1883 (AD); *Weber 3453*, c. 6 km S of Blanchetown, 19.iii.1973 (AD, CANB, CHR, NSW); *White s.n.*, Wantnapilla Swamp, Musgrave Ranges, 9.vii.1914 (AD).

Distribution and ecology (Map 15)

The var. *halei* is sparsely distributed in the south-eastern regions of mainland Australia.

In Queensland, it occurs chiefly in the far south-eastern corner with only one northern locality near Mossman. Distribution in New South Wales is along the Clarence and Darling rivers in the north, around Sydney and Campbelltown along the east-coast and along Victorian border in the south. In South Australia, the distribution is in the far north and in the south-eastern part of the State. So far it has not been recorded from Northern Territory and Western Australia.



Map 15. Distribution of *V. officinalis* L. var. *halei* (Small)Munir.

Collections from overseas have been examined from the USA and Mexico only.

Ecological comments by Small (1933) and Moldenke (1963a, 1972b, 1977b, 1979) agree with collectors' field notes who found it growing as a weed of pasture, on waste places, in open grassland and riverine woodland on clay-loam soil, in cleared weedy roadside gravel dump, within wet sclerophyll forest and along creek banks.

Comments

The var. *halei* is based on *Verbena halei* Small which, according to Small (1898) "has the general habit of *Verbena officinalis* but differs from that species in both the leaves and inflorescence. The lower leaf-blades are usually less deeply lobed, often merely coarsely toothed,

while the upper leaves or leaf-segments are conspicuously elongated and nearly entire or remotely toothed. The corollas are twice the size of those of *Verbena officinalis* and the narrow fruit often fully twice the length of that of the eastern relative", i.e. *V. officinalis*. According to Perry (1933), *V. halei* is "closely related to *V. menthaefolia* and *V. officinalis*, but readily distinguished by the diverse outline of the leaves and somewhat more slender achenes".

After making numerical analysis of *V. halei*, *V. officinalis* and other related taxa, Barber (1982) concluded that "*V. halei* and *V. officinalis* cannot be separated "because of the congruence" of these taxa. She regarded both the taxa as "one species with each taxon representing a subspecies; plants with papillate commissural faces are subspecies *officinalis* and plants with saginoid commissural faces are subspecies *halei*. In her opinion, "Small's nutlet length character (1898) does not serve to separate the subspecies because the lengths overlap between the subspecies. The resultant species exhibits an interesting distributional pattern with subsp. *halei* of New World origin and subsp. *officinalis* from the Old World. According to Moldenke (1963a) subsp. *officinalis* is found virtually throughout the world. It is found on islands in all oceans and also on all continents with the exception of Antarctica. Perry (1933) stated that, "*V. officinalis* is of European origin. However, it seems more likely that subsp. *officinalis* is derived from the North American subsp. *halei* and reached the Old World via long distance dispersal, because *Verbena* is considered to be of North American origin (Lewis and Oliver 1961)".

During present investigation, *V. halei* and *V. officinalis* are found to be conspecific. They not only agree with each in major characters but are found to be sympatric in Australia. The sympatric condition was noticed by Small (1898) in various states of the U.S.A. The main differences between these taxa seem to be glandular and non-glandular inflorescence and the leaf-characters mentioned by Small (1898) in the protologue of *V. halei*. The characters of corollas and fruit show insignificant differences between the two taxa. In the present treatment, therefore, *V. halei* is regarded only as a variety of *V. officinalis*.

According to Moldenke (1963a), "common names reported for *V. halei* are "blue vervain", "candelabra verbena", "European vervain", "Hale's verbena", "herb-of-the-cross", "slender vervain", "standing verbena", "tall vervain", and "wild verbena". For more common or vernacular names, see Moldenke (1977b), p. 250.

The presence of var. *halei* in Australia is recorded here for the first time.

Affinities

Within the *V. officinalis* complex in Australia, var. *halei* is closely allied to var. *gaudichaudii*. For details, see "affinities" under the latter taxon. As mentioned here under "comments", its relationship with *V. officinalis* has been expressed by Small (1898), Perry (1933) and Barber (1982). There are several characters common between var. *halei* and *V.*

menthaefolia Benth. Both taxa are non-glandular with lamina of lower and mid-stem leaves coarsely toothed or incised, not very deeply divided; spikes slender and floral bracts half the length of the calyx. Nevertheless, *V. menthaefolia* differs by its lamina being more sharply toothed or sharply incised and the lower and mid-stem leaves more or less oblong in outline.

Perry (1933) also recorded the relationship of *V. halei* with *V. menthaefolia* from which, she states, *V. halei* differs "by the diverse outline of the leaves and the somewhat more slender achenes", i.e. mericarps.

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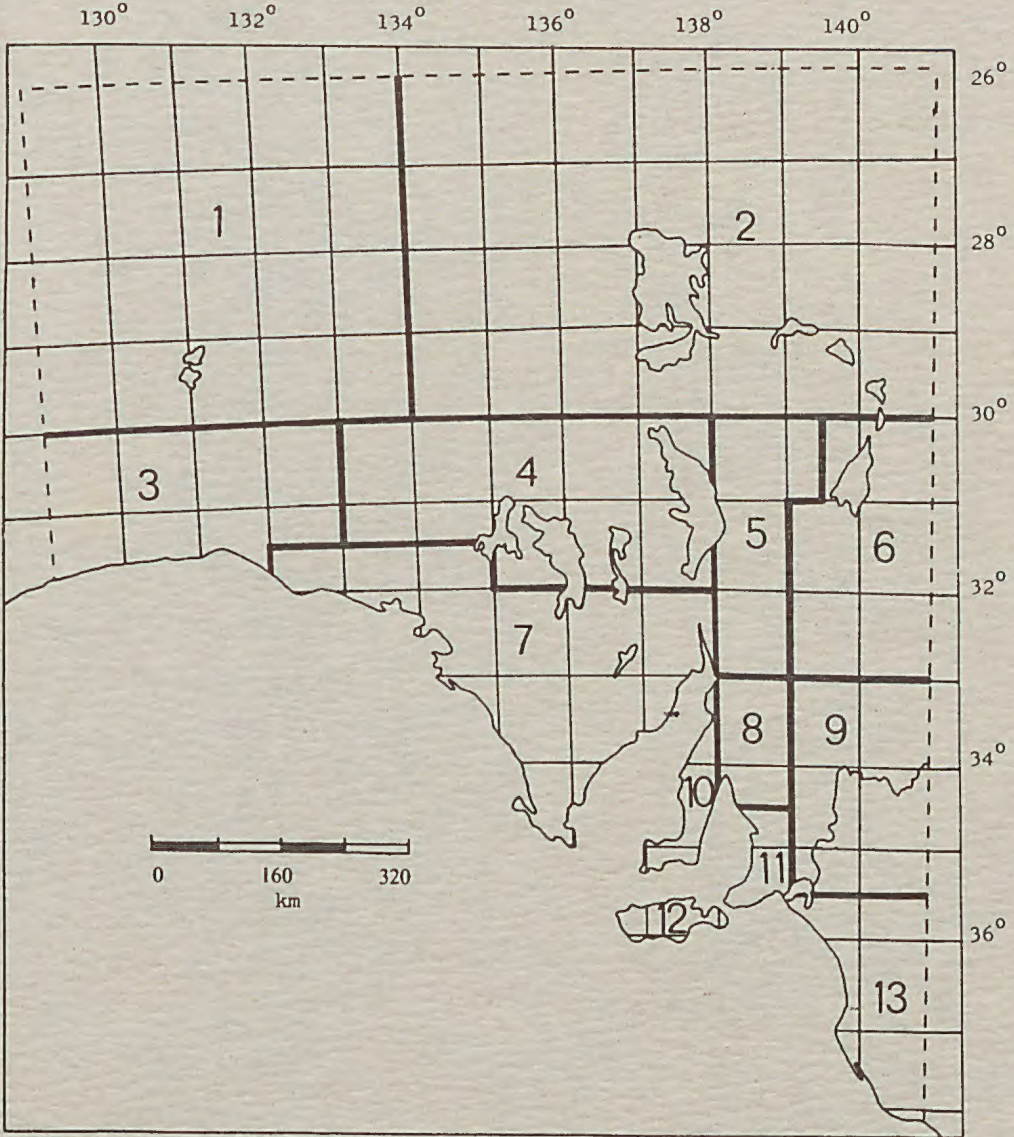
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- | | |
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| 1. North-western | 8. Northern Lofty |
| 2. Lake Eyre | 9. Murray |
| 3. Nullarbor | 10. York Peninsula |
| 4. Gairdner-Torrens | 11. Southern Lofty |
| 5. Flinders Ranges | 12. Kangaroo Island |
| 6. Eastern | 13. South-eastern |
| 7. Eyre Peninsula | |



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