

A taxonomic review of the naturalized species of *Babiana* (Iridaceae) occurring in Western Australia

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Abstract

Lepschi, B.J. & Manning, J.C. A taxonomic review of the naturalized species of *Babiana* (Iridaceae) occurring in Western Australia. *Nuytsia* 13 (2): 283–292 (2000). The taxonomy of the naturalized species of *Babiana* in Western Australia is reviewed and three taxa are recognized: *B. angustifolia* Sweet, *B. nana* (Andr.) Spreng. and *B. tubulosa* (Burm.f.) Ker Gawl. var. *tubiflora* (L.f.) G.J. Lewis. A key and distribution maps for these taxa are provided. The widespread misapplication of the names *B. disticha* Ker Gawl. and *B. stricta* (Ait.) Ker Gawl. to naturalized *Babiana* species in Western Australia is also discussed.

Introduction

Babiana is one of a number of genera of southern African Iridaceae to have become naturalized in Australia. As in many other plant groups introduced to Australia, the correct nomenclature for many naturalized Iridaceae has not been fully established. Recent Australian floras and censuses have generally recognized one species of *Babiana*, *B. stricta*, as occurring in Australia (e.g. Cooke 1986a, b, James & Brown 1993, Conn 1994), although Green (1985) and Perry (1987) recorded the presence of a second species, *B. disticha* Ker Gawl., in Western Australia. Field observations by the first author and Greg Keighery, however, indicated that three species of *Babiana* occurred in Western Australia, two of these representing taxa not accounted for by Green (1985) or Perry (1987). Further investigations also revealed confusion regarding the nomenclature of these taxa. As *Babiana* species are, or have the potential to become, serious environmental weeds in Western Australia, a critical review of the species occurring in the state is required.

Babiana is also naturalized in New South Wales, South Australia and Victoria (Cooke 1986a), but these plants are not considered here. See notes under *B. angustifolia* below.

Materials and methods

This study is based on examination of herbarium collections from PERTH, as well as selected material from CANB, along with observations made on live plants of all species except *B. tubulosa*. As only a single Australian collection of *B. tubulosa* was available, the description of this taxon is partly based on South African material housed at NBG (see Holmgren *et al.* 1990). All measurements were made from herbarium material (reconstituted where necessary). Terminology for indumentum follows Hewson (1988).

Taxonomic treatment

Synonymy data presented in this paper is restricted to names that have been applied to *Babiana* in Australia, or names used by Lewis (1959) in her monograph of the genus. For additional nomenclatural information and further synonymy refer to Phillips (1951) and Lewis (1959).

***Babiana* Ker Gawl., *Curtis's Bot. Mag.*, 15: sub t. 539 (1802).**

Perennial herbs. Corms usually deep-seated, tunics papery, decaying into fine or coarse fibres. *Stem* subterranean or aerial, erect to declinate or decumbent, simple or sometimes branched, terete to angular. *Leaves* basal, distichous, usually plicate, sometimes tortuous, curled or undulate, lamina flat or rarely terete, hairy or rarely glabrous. *Inflorescence* a spike, flowers distichous, spiral or secund. *Bracts* and *bracteoles* sheathing, free or partially united, herbaceous, apical portion usually scarious, hairy or glabrous. *Flowers* usually zygomorphic and bilabiate, sometimes actinomorphic and funnel-shaped, mostly shades of blue but rarely red, yellow or cream, often fragrant. *Perianth tube* straight or curved, cylindrical or funnel-shaped. *Tepals* equal or unequal. *Stamens* inserted in the mouth of the perianth tube, usually unilateral and arcuate, rarely symmetrically arranged and erect, anthers basifixed. *Ovary* glabrous or hairy. *Style* exerted or rarely included; style branches 3, slender or apically expanded. *Fruit* a cartilaginous capsule, glabrous or hairy. *Seeds* several per locule, funicle prominent and swollen, rugose, shiny. *Chromosome number* $x=7$.

A genus of c. 65 species in southern Africa with one in Socotra.

Etymology. Derived from the Dutch for baboon 'baviaan' or its Cape corruption 'babianer', the common name applied to *Babiana* species in the Cape region of South Africa, as a result of their status as a favoured food of these animals (Lewis 1959).

Key to naturalized taxa of *Babiana* occurring in Western Australia

- 1 Perianth tube more than twice as long as the tepals, 45–85 mm long; flowers cream **1. *B. tubulosa* var. *tubiflora***
1. Perianth tube shorter than to as long as the tepals, 7–18 mm long; flowers predominantly blue to magenta
 2. Bracteoles united c. two-thirds to four-fifths of their length, herbaceous to the margins; flowers with the marked tepals lowermost; ovary glabrous or pubescent on the ribs only **2. *B. nana***
 2. Bracteoles free to the base, mostly herbaceous, with a scarious, reddish-brown margin to 0.4 mm wide; flowers twisted such that the marked tepals are uppermost and facing the stem apex; ovary densely sericeous **3. *B. angustifolia***

1. *Babiana tubulosa* (Burm.f.) Ker Gawl. var. *tubiflora* (L.f.) G.J. Lewis, *J. S. African Bot. Suppl.* 3: 120 (1959).

Illustrations. Jeppe, *Spring and Winter Flowering Bulbs of the Cape* 104–105 (1989); Manning & Goldblatt, *West Coast: S. African Wild Flower Guide* 7: 70–71 (1996).

Perennial herb 12–45 cm high. *Corm* subglobose, 20–35 mm diameter, tunics papery, decaying into fine fibres. *Stem* 50–250 mm long. *Leaves* distichous, spreading to erect, plicate, pubescent; sheathing base 40–100 mm long; lamina linear to linear-elliptic, 60–250 mm long, 2–6 mm wide, base attenuate-oblique, apex narrowly acute to acuminate. *Inflorescence* shorter than leaves, 2–8-flowered, flowers not twisted to face the stem apex; scape simple, usually straight, pubescent. *Bracts* sheathing, herbaceous, reddish-brown, narrowly to very narrowly ovate-triangular in lateral view (margins often \pm straight), 20–65 mm long, densely pubescent, grading to sericeous-pubescent distally; scarious apical portion glabrous; apex very narrowly acute. *Bracteoles* united for c. half of their length, sheathing, herbaceous, narrowly to very narrowly ovate-triangular in lateral view (margins often \pm straight), c. 14–17 mm long, pubescent at base, grading to sericeous-pubescent distally, scarious apical portion glabrous; apex of individual bracteoles very narrowly acute. *Perianth* white to cream (the tube often flushed mauve abaxially), lower three tepals with a red saggitate or triangular-shaped mark centrally on the adaxial surface, glabrous; perianth tube cylindrical proximally, flared towards the apex, 45–85 mm long; tepals subequal, narrowly obovate to obovate, 15–23 mm long, 2–5 mm wide; base attenuate; apex acute to apiculate, the outer tepals sometimes cuspidate. *Stamens* arching, filaments 10–14 mm long; anthers narrowly oblong, mauve, 2–4 mm long. *Ovary* ovoid, c. 3 mm long, glabrous; style 50–80 mm long, dividing near the base of the anthers, style branches 3–4 mm long. *Capsule* broadly obovoid, distended due to pressure from seeds, 8–10.5 mm long, glabrous; seeds few, ovoid, ellipsoid or \pm globose (frequently misshapen due to the attached funicle), c. 4–5.5 mm long, seed coat wrinkled or folded, grey-brown to brown (appearing dark reddish-brown where the seed coat adheres to the endosperm).

Specimen examined. WESTERN AUSTRALIA: Bold Park, 8 km W of Perth, 23 Aug. 1988, G.J. Keighery s.n. (PERTH 04180607).

Distribution. Native to the Western Cape Province, South Africa. In Western Australia known from one nature reserve in metropolitan Perth. (Figure 1A)

Habitat. Keighery s.n. is recorded as occurring in grey calcareous sand on a gentle slope in *Eucalyptus gomphocephala* woodland. Occurs on coastal sands in restioid fynbos (heathland) in South Africa.

Phenology. Keighery s.n. collected in late August, is in fruit. Flowering probably occurs in July and August in Western Australia.

Breeding system. Within its natural range, *Babiana tubulosa* var. *tubulosa* is adapted to pollination by the nectar-feeding fly *Moegistorhynchus longirostris* Wiedemann (Diptera: Nemestrinidae) which is a highly specialized flower visitor with a proboscis 40–70(90) mm long (Manning & Goldblatt 1997). Var. *tubiflora*, however, appears to be facultatively autogamous. No floral visitors have been observed in Western Australia.

Notes. *Babiana tubulosa* is a distinctive taxon and is unlikely to be confused with other *Babiana* species naturalized in Western Australia. The only known population in Western Australia is still extant (as at July 1999) and is expanding, albeit slowly (G.J. Keighery pers. comm.). Of the three species

of *Babiana* naturalized in Western Australia, *B. tubulosa* is probably the least significant in terms of weediness, at least on the basis of present observations (G.J. Keighery pers. comm.).

2. *Babiana nana* (Andr.) Spreng., Syst. Veg. 1: 156 (1825).

Illustrations. Jeppe, Spring and Winter Flowering Bulbs of the Cape 96–97 (1989); Manning & Goldblatt, West Coast: S. African Wild Flower Guide 7: 70–71 (1996); Hussey *et al.*, Western Weeds 29 (1997) [as *B. disticha*].

Perennial herb 10–30 cm high. *Corm* subglobose to broadly ovoid, 10–20 mm in diameter, tunics papery, decaying into fine fibres. *Stem* 45–100 mm long, cormlets occasionally present in leaf axils of the subterranean portion. *Leaves* distichous, spreading (fanwise) to erect, scarcely plicate, pubescent; sheathing base 20–80 mm long; lamina narrowly obovate-elliptic to narrowly elliptic, 45–160 mm long, 7–25 mm wide, base attenuate-oblique, apex acuminate to acute. *Inflorescence* shorter than to (usually) longer than leaves, 1- or 2-branched, 2–10-flowered, flowers not twisted to face the stem apex, straight to occasionally flexuose, pubescent. *Bracts* sheathing, herbaceous, reddish-brown, \pm narrowly ovate in lateral view (margins often \pm straight), 12–20 mm long, pubescent to sericeous-pubescent, scarious apical portion glabrous; apex acute to obtuse, rarely apiculate. *Bracteoles* united for c. two-thirds to four-fifths of their length, sheathing, herbaceous, reddish-brown, \pm narrowly ovate in lateral view (margins often \pm straight), 12–20 mm long, pubescent to sericeous-pubescent, scarious apical portion glabrous; apex of individual bracteoles acute to narrowly acute. *Perianth* mauve to purple or bluish-purple, the lower three tepals each with a whitish or cream area near the middle and a reddish mark near the base, apiculum of outer tepals purplish-black, glabrous; perianth tube straight, cylindrical proximally, flared towards the apex, 12–17 mm long; tepals subequal, narrowly obovate to obovate, 25–40 mm long, 6–10 mm wide; base attenuate; apex obtuse to acute or the outer tepals apiculate. *Stamens* arching, filaments 10–14 mm long, anthers narrowly oblong, cream to mauve, 5–5.5 mm long. *Ovary* ellipsoid to rarely ovoid, 3–5 mm long, glabrous or pubescent on the (longitudinal) ribs; style 24–28 mm long, style dividing between the middle and the apex of the anthers, style branches 3.5–5 mm long. *Capsule* and seeds not seen.

Specimens examined. WESTERN AUSTRALIA: Vasse Highway, Busselton, 1 Sep. 1987, G.J. Keighery 9150 (PERTH); old cemetery, Middleton Road, Albany, 14 Sep. 1990, E. Croxford 6748 (PERTH); Moodong Nature Reserve, 14 Sep. 1992, G.J. Keighery 13519 (PERTH); adjacent East Perth Cemetery, Bronte St, Perth, 16 Sep. 1995, B.J. Lepschi & T.R. Lally 1971 (PERTH).

Distribution. Native to the Western Cape Province, South Africa. In Western Australia, *B. nana* is known from a few sites in the Perth metropolitan area, as well as the settlements of Busselton and Albany. This species is probably more widespread in Western Australia than current collections would indicate. The first author has observed a naturalized population of this species at Kings Park, West Perth, but this is not supported by a voucher specimen. It is likely that other naturalized populations exist elsewhere in the state, especially near settlements in coastal and near-coastal areas in the south-west. (Figure 1B)

Habitat. In Western Australia *B. nana* has been recorded growing in sand in *Agonis flexuosa* woodland, *Eucalyptus marginata*/*Banksia* spp. woodland, and amongst various weeds in disturbed sites. Occurs on coastal sands in restioid fynbos (heathland) in South Africa.

Phenology. Flowering recorded during August and September in Western Australia.

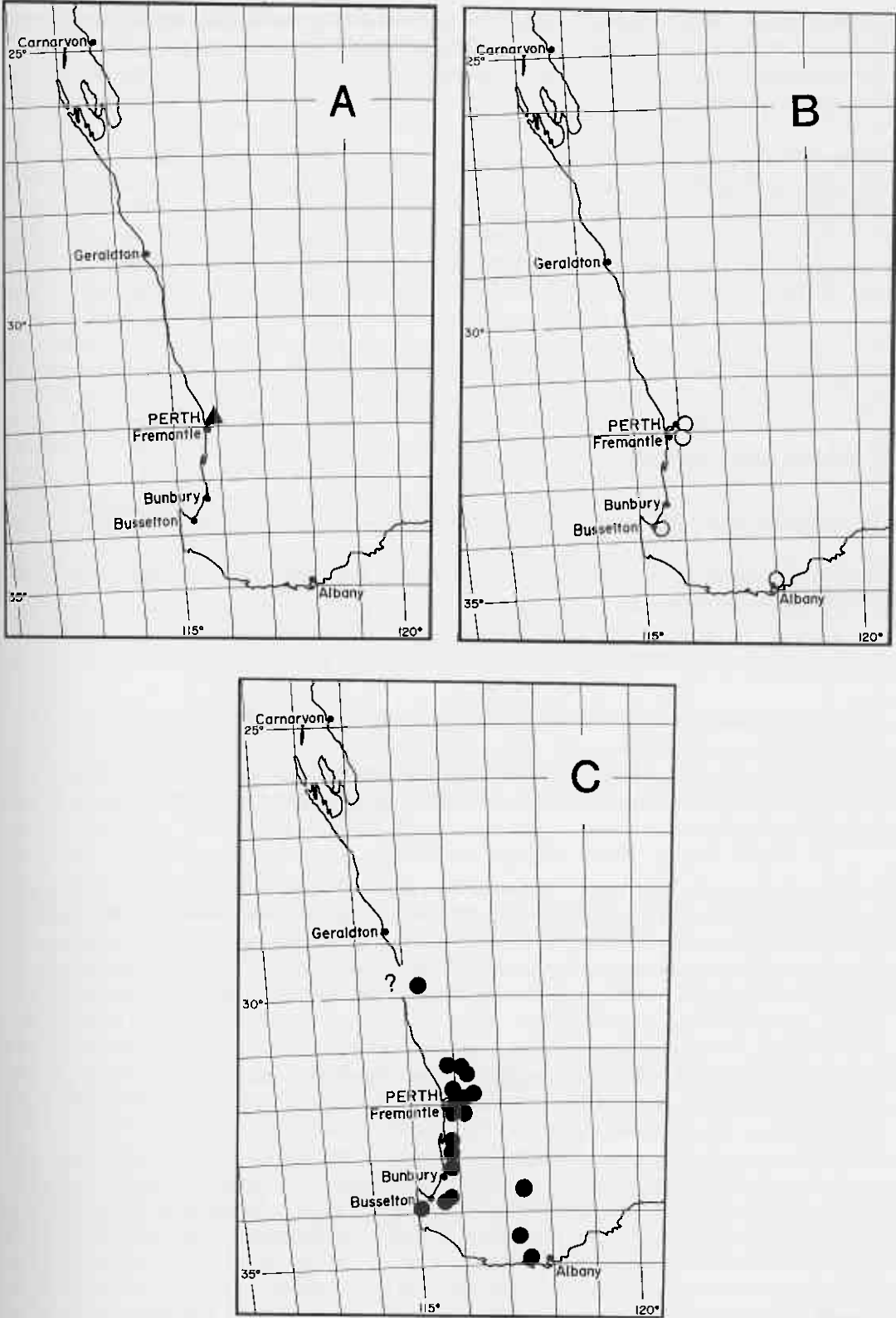


Figure 1. Distribution of *Babiana* species. A - *B. tubulosa* var. *tubiflora*, B - *B. nana*, C - *B. angustifolia*.

Breeding system. Within its natural range, *B. nana* is pollinated by the large solitary bee *Anthophora diversipes* Friese (Hymenoptera: Apidae) (Manning, unpubl.). Honeybees *Apis mellifera* L. (Hymenoptera: Apidae) have been observed gathering pollen from this species in Western Australia (G.J. Keighery unpubl. obs.).

Notes. *Babiana nana* is superficially similar to *B. angustifolia*, and it is possible that it has been overlooked in Western Australia as a result of confusion with the latter species. *Babiana nana* has been referred to *B. disticha* in Western Australia *in herb.* (at PERTH) and in Hussey *et al.* (1997), but is not closely related to that species. The earliest herbarium specimen of *B. nana* dates from 1987, but it is likely that this species was naturalized in Western Australia some years prior to this date. Although only sparingly naturalized in Western Australia at present, *B. nana* has the potential to become a serious weed on sandy soils in the higher rainfall areas of the south-west of the state (G.J. Keighery pers. comm.). The presence of a very large population spreading through *Banksia* woodland in a nature reserve on the outskirts of Perth (see Keighery 13519) demonstrates the threat this species poses to remnant vegetation.

3. *Babiana angustifolia* Sweet, Hort. Brit. ed. 1: 396 (1827).

Babiana pulchra G.J. Lewis, *J. S. African Bot. Suppl.* 3: 49 (1959) [as *B. pulchra* (Salisb.) G.J. Lewis].

?*Babiana plicata* auct. non (Thunb.) Ker Gawl., *Curtis's Bot. Mag.*, 16: t. 576 (1802). See Cooke (1986a) and notes below.

Babiana disticha auct. non Ker Gawl., *Curtis's Bot. Mag.*, 16: t. 626 (1803).

Babiana stricta auct. non (Ait.) Ker Gawl., *Curtis's Bot. Mag.*, 16: t. 621 (1803).

Illustrations. Jeppe, *Spring and Winter Flowering Bulbs of the Cape* 104–105 (1989); Manning & Goldblatt, *West Coast: S. African Wild Flower Guide* 7: 68–69 (1996); Hussey *et al.*, *Western Weeds* 29 (1997) [as *B. stricta*].

Perennial herb 15–60 cm high. **Corm** subglobose to broadly ovoid, 10–30 mm in diameter, tunics papery, decaying into coarse or fine fibres and extending up the base of the stem for 20–80 mm. **Stem** 5–20 mm long. **Leaves** distichous, spreading (fanwise) to erect, plicate, pubescent; sheathing base 40–200 mm long; lamina narrowly to very narrowly elliptic, linear-elliptic, or rarely very narrowly ovate, narrowly oblong-elliptic or narrowly oblong, 35–200 mm long, 4–22 mm wide, base attenuate-oblique, apex narrowly acute to acuminate. **Inflorescence** longer than the leaves (often markedly so), 2–35-flowered, flowers twisted to face the stem apex (so that the lower (patterned) tepals are uppermost); scape simple, 1- or 2-branched, rarely much-branched, straight to occasionally flexuose, pubescent. **Bracts** sheathing, herbaceous, reddish-brown, \pm narrowly ovate to very narrowly ovate or narrowly to very narrowly ovate-triangular (margins often \pm straight), or rarely narrowly oblong in lateral view, 15–30 mm long, pubescent to sericeous-pubescent, scarious apical portion glabrous; apex acuminate to long-acuminate (frequently also lacerate), rarely narrowly acute or aristate. **Bracteoles** free, loosely sheathing, herbaceous, brown to reddish-brown, \pm narrowly ovate in lateral view (margins often \pm straight), 12–30 mm long pubescent, scarious apical portion and margins glabrous; apex of individual bracteoles narrowly acute to acuminate. **Perianth** colour variable, usually purple to deep purple, bluish-purple or violet, less often white (with pale blue flush abaxially), pinkish-purple or purplish-crimson, the lower three tepals each with a dark red or blackish mark at the base (frequently with an

area of yellowish-cream to whitish coloration extending into the throat), sometimes the lower lateral tepals with the central portion yellowish-cream to whitish, apiculum of outer tepals purplish-black, glabrous except for an occasional line of hairs towards the apices of the outer tepals; perianth tube straight to very slightly curved, cylindrical proximally, flared towards the apex, 7–18 mm long; tepals subequal, narrowly obovate to obovate, 15–25 mm long, 5–11 mm wide, base attenuate, apex obtuse to acute or the outer tepals apiculate. *Stamens* scarcely arching, filaments 8–12 mm long; anthers narrowly oblong, mauve to bluish-purple, 4–6 mm long. *Ovary* ellipsoid to rarely ovoid, 3–3.5 mm long, densely sericeous; style 17.5–25 mm long, dividing at or beyond the apex of the anthers, style branches 1.5–5 mm long. *Capsule* ± globose, 9–10 mm long, walls smooth, pubescent; seeds few, ellipsoid, ± globose or ovoid (frequently misshapen due to the attached funicle), seed coat wrinkled or folded, grey-brown to brown (appearing dark reddish-brown where the seed coat adheres to the endosperm), c. 3.5–5 mm long.

Selected specimens examined. WESTERN AUSTRALIA: 9 miles [c. 14.4 km] NE of Katanning, 24 Sep. 1974, *T.E.H. Aplin* 6024 (CANB, PERTH); 1.5 km SE of Gosnells on Albany Highway, 15 Oct. 1982, *R.J. Cranfield s.n.* (PERTH 02023024); Forrest Hill, 20 km W of Mount Barker towards Manjimup, 4 Nov. 1986, *G.J. Keighery* 8439 (PERTH); Maddington Rd, Maddington, Perth, 18 Sep. 1983, *K.F. Kenneally* 8837 (PERTH); vacant land at junction of Albany Highway and Dalziell St, Maddington, Perth, 15 Oct. 1995, *B.J. Lepschi & T.R. Lally* 2116 (CANB, MEL, PERTH); 1.1 km S of Atkins Rd turnoff on Mundaring Weir Rd, c. 2 km NE of Mundaring Weir wall, E of Perth, 8 Oct. 1997, *B.J. Lepschi* 3570 (AD, CANB, MEL, NSW, PERTH); 12 km N of Toodyay on road to Bolgart, 21 Oct. 1997, *B.J. Lepschi & T.R. Lally* 3624 (CANB, PERTH); Bindoon, 5 Oct. 1982, *G. Perry* 1503 (PERTH); Midland, 7 Oct. 1984, *G. Perry* 1429 (PERTH); Guildford, 18 Sep. 1944, *R.D. Royce s.n.* (PERTH 02022958); 1 mile [c. 1.6 km] N of Kirup, 29 Sep. 1948, *R.D. Royce* 2753 (PERTH); Waterloo, N of Busselton, 16 Sep. 1953, *R.D. Royce* 4342 (PERTH).

Distribution. Native to the Western Cape Province, South Africa. In Western Australia, *B. angustifolia* is naturalised over a small part of the south-west of the state. The main occurrence of this species is from the Gingin–Bindoon area in the north, along the Swan Coastal Plain and adjacent parts of the Darling Range south to Margaret River. More or less isolated populations also occur in the Denmark–Albany area, near Katanning and Mount Barker township. A rather poor collection from “near Eneabba” (*Ollerenshaw & Carriage* 132 (CANB)), is probably also this species. (Figure 1C)

Habitat. Habitat data for Western Australia are sparse, but generally recorded growing in heavier soils (e.g. loams and clays), although *Lepschi & Lally* 2116 was collected growing in white sand. Occurs in disturbed sites amongst weeds, also invading disturbed eucalypt woodland, especially after fire. Occurs on damp clay or silt lowlands in renosterveld (*Elytropappus rhinocerotis* shrubland) in South Africa.

Phenology. Flowering recorded during July, and September to November. Fruiting recorded during October and November.

Breeding system. In South Africa, this species is pollinated by the large solitary bee *Anthophora diversipes* Friese (Hymenoptera: Apidae) (Manning, unpubl.). Honeybees have been observed gathering pollen from this species in Western Australia (*G.J. Keighery* unpubl. obs.). D.L. Jones (pers. comm.) also reports honeybees visiting flowers of cultivated babianas (possibly *B. angustifolia* or a related taxon) in eastern Australia.

Notes. The taxon treated here as *B. angustifolia* has previously been referred to *B. plicata* [= *B. disticha*] (early collections in herb. at PERTH), *B. disticha* or *B. stricta* (Green 1985, Cooke 1986a, Perry 1987). All three taxa are similar in overall morphology, but may be distinguished by various floral characters. In *B. disticha* the perianth tube is longer (18–25 mm as opposed to 7–18 mm in *B. angustifolia*), and the stamens are more obviously arched. The flowers are also not twisted to face the stem apex (as in *B. angustifolia*), so the lower (marked) tepals face away rather than towards the stem apex, and the flowers are often markedly zygomorphic. These features can be difficult to distinguish on dried material, and are best observed in live plants. *Babiana stricta* may be distinguished from *B. angustifolia* by the same character of flower-orientation as described above, as well as its somewhat broader, ± sagittate anthers (anthers in *B. angustifolia* are narrowly oblong).

Nordenstam (1970) pointed out that the earliest name for this taxon, *Acaste pulchra* Salisb., was not validly published and that the next available name is *Babiana angustifolia* Sweet. The species treated as *Babiana pulchra* by Lewis (1959), the most recent monographer of the genus, is thus correctly identified as *B. angustifolia*.

It should be noted, however, that material here referred to *B. angustifolia* may not represent the 'true' wild variant of that species. Many species of *Babiana* are of horticultural interest (Bailey 1914, Harrison 1963, Bryan & Griffiths 1995), and the genus has been in cultivation in Australia since approximately the mid 19th Century (D.L. Jones pers. comm.). Naturalized babianas in Australia (including Western Australia) are presumably derived from these horticultural introductions. In the case of *B. angustifolia*, naturalized plants show considerably greater variation in perianth colour than do wild populations of this species in South Africa, in which perianth colour ranges from pale to deep bluish-purple or purple. The variability exhibited by naturalized plants is probably the result of horticultural selection, possibly through hybridization with species such as *B. disticha* or *B. purpurea* (Jacq.) Ker Gawl., although this has not been confirmed.

The name *B. stricta* has been widely applied to cultivated babianas for many years, both in Australia (e.g. Pescott 1968, Hitchmough 1989) and overseas (e.g. Bailey 1914, Syngé 1961, Harrison 1963, Bryan 1989). The concept of *B. angustifolia* has varied considerably between authors of horticultural texts, being variously cited as a synonym of *B. pulchra* (e.g. Bryan 1989; cf. Lewis 1959) regarded as a variety (var. *angustifolia* (Sweet) Baker) of *B. stricta* (e.g. Bailey 1914, Syngé 1961) or treated at specific rank (e.g. Bryan & Griffiths 1995). This suggests a degree of confusion with regard to the taxonomy of cultivated babianas, and clarification of the identity of at least the more commonly grown taxa would be advantageous, particularly as this is the source from which the naturalised members of the genus originate.

Babiana angustifolia is the most common and widespread species of *Babiana* in Western Australia, and is also the most aggressively weedy. It is a major weed of heavy soils on the Swan Coastal Plain and the adjacent Darling Range area, often forming extensive monocultures to the detriment of indigenous herbaceous and bulbous plants. While presently only naturalized over a relatively small portion of the state, *B. angustifolia* has the potential to extend further into the more mesic coastal regions between Geraldton and Esperance; rainfall (along with soil type) appears to be the main limiting factor affecting the distribution of this species in Western Australia (G.J. Keighery pers. comm.).

The earliest collection of this species from Western Australia seen by the present authors was made at Gingin in 1925 (*Road Board Secretary s.n.* PERTH 02022893). However, Ostenfeld (1921) records collecting "*Babiana plicata*" on a roadside at Armadale in 1914 (Ostenfeld 166). This is almost

certainly referable to *B. angustifolia* (cf. Cooke 1986a) although in the absence of a specimen at PERTH (the bulk of Ostenfeld's Western Australian collections are held at herb. C) the authors are unable to confirm this at present. Despite these early records, no species of *Babiana* were included by Gardner (1931) in his census of the Western Australian flora.

The taxon referred to *B. stricta* in eastern Australia by various authors (e.g. Cooke 1986a, b, James & Brown 1993, Conn 1994) is probably also referable to *B. angustifolia*. However, this is based on the examination of only a few herbarium specimens at CANB by the first author, and requires confirmation through field studies.

Acknowledgements

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