

A revision of the southern African
genus *Babiana*, Iridaceae:
Crocoideae

Peter Goldblatt
and
John C. Manning

*S*TRELITZIA 18

A revision of the southern African genus
Babiana, Iridaceae: Crocoideae

by
Peter Goldblatt

B.A. Krukoff Curator of African Botany, Missouri Botanical Garden, P.O. Box 299, St.
Louis, Missouri 63166, USA. peter.goldblatt@mobot.org

and
John C. Manning

Compton Herbarium, South African National Biodiversity Institute, Private Bag X7,
Claremont, 7735 Cape Town. manning@sanbi.org

Illustrated by John C. Manning

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T R E L I T Z I A

This series has replaced *Memoirs of the Botanical Survey of South Africa* and *Annals of Kirstenbosch Botanic Gardens* which were inherited from predecessor organisations.

The plant genus *Strelitzia* occurs naturally in the eastern parts of southern Africa. It comprises three arborescent species, known as wild bananas, and two acaulescent species, known as crane flowers or bird-of-paradise flowers. The logo of the South African National Biodiversity Institute is based on the striking inflorescence of *Strelitzia reginae*, a native of the Eastern Cape and KwaZulu-Natal that has become a garden favourite worldwide. It symbolises the commitment of the Institute to promote the sustainable use, conservation, appreciation and enjoyment of the exceptionally rich biodiversity of South Africa, for the benefit of all people.

Referee: O.A. Leistner.

Front cover: *Babiana praemorsa*

Back cover: *Babiana minuta*, *B. carminea*, *B. patula*, *B. engysiphon*.

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New combinations, names, species and statuses in *Strelitzia* 18 (2007)

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Abstract

A member of Iridaceae subfamily Crocoideae, *Babiana* Ker Gawl. is a genus of some 88 species of southern and central Africa. Although considered relatively well known as a result of G.J. Lewis's (1959) monograph, in which 61 species were recognized, subsequent exploration has resulted in the discovery of many more species. Three new species have been described since 1959, and in 1990 two more were transferred from *Antholyza* L., a genus differing from *Babiana* only in floral adaptations for sunbird pollination. Our taxonomic philosophy, strongly oriented toward the biology of the plants, has led us to adopt a narrower species concept than Lewis entertained and this has led to the recognition of more species. The taxonomy of *Babiana* now requires thorough re-evaluation. *Babiana* is divided into three sections: the more generalized section *Teretifolieae* G.J.Lewis; the derived section *Babiana* with inner bracts divided to the base; and section *Antholyzoides* Benth. & Hook.f., with bilabiate flowers with clawed tepals and a short perianth tube. Two of the five sections of Lewis's (1959) classification, *Acaste* and *Scariosae*, are included in section *Babiana*, and those species of her section *Babiana* with inner bracts forked apically, or to the middle, are transferred to section *Teretifolieae*. The Socotran *B. socotrana* Hook.f., which differs from all other members of the genus in its trisulcate pollen grains, basic chromosome number of $x = 10$, and unspecialized seed morphology, has been referred to a new genus, *Cyanixia* Goldblatt & J.C.Manning. While section *Teretifolieae* occurs across the entire geographic range of *Babiana*, section *Antholyzoides* is restricted to Namaqualand and the adjacent northern edge of the Cape Floristic Region (CFR), and section *Babiana* extends from southern Namaqualand across the CFR to the Eastern Cape Province of South Africa. *Babiana* shows a pattern of speciation and adaptive radiation in the southern African winter rainfall zone with two centres of diversity, one in section *Babiana* in the extreme southwest where rainfall is highest, and the other in sections *Antholyzoides* and *Teretifolieae* in Namaqualand and southwestern Namibia, to the north, which have a semi-arid to arid climate.

Keywords: *Babiana* Ker Gawl., biogeography, Iridaceae, southern Africa, systematics

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A



B



C



D



E



F



G



H

Plate 1.—*Babiana*: A, *pygmaea* (No. 2); B, *minuta* (No. 11); C, *tanquana* (No. 12); D, *torta* (No. 14); E, *flabellifolia* (No. 20); F, *cuneata* (No. 21); G, *confusa* (No. 9); H, *pauciflora* (No. 5).



A



B



C



D



E



F



G



H

Plate 2.—*Babiana*: A, *pubescens* (No. 23); B, *attenuata* (No. 24); C, *curviscapa* (No. 25); D, *sambucina* (No. 28); E, *rigidifolia* (No. 31); F, *dregei* (No. 32); G, *cinnamomea* (No. 17); H, *framesii* (No. 33).



A



B



C



D



E



F



G



H

Plate 3.—*Babiana*: A, *carminea* (No. 34); B, *tubulosa* (No. 35); C, *brachystachys* (No. 37); D, *bainesii* (No. 40); E, *fimbriata* (No. 44); F, *sinuata* (No. 45); G, *salteri* (No. 64); H, *toximontana* (No. 63).



A



B



C



D



E



F



G

Plate 4.—*Babiana*: A, *planifolia* (No. 47); B, *lobata* (No. 48); C, *thunbergii* (No. 50); D, *patula* (No. 53); E, *mucronata* (No. 58); F, *arenicola* (No. 65); G, *engysiphon* (No. 60).



A



B



C



D



E



F



G



H



I

Plate 5.—*Babiana*: A, *ringens* (No. 51); B, *scabrifolia* (No. 66); C, *ecklonii* (No. 68); D, *odorata* (No. 69); E, *noctiflora* (No. 70); F, *spathacea* (No. 72); G, *fragrans* (No. 74); H, *inclinata* (No. 77); I, *rubrocyanea* (No. 78).



A



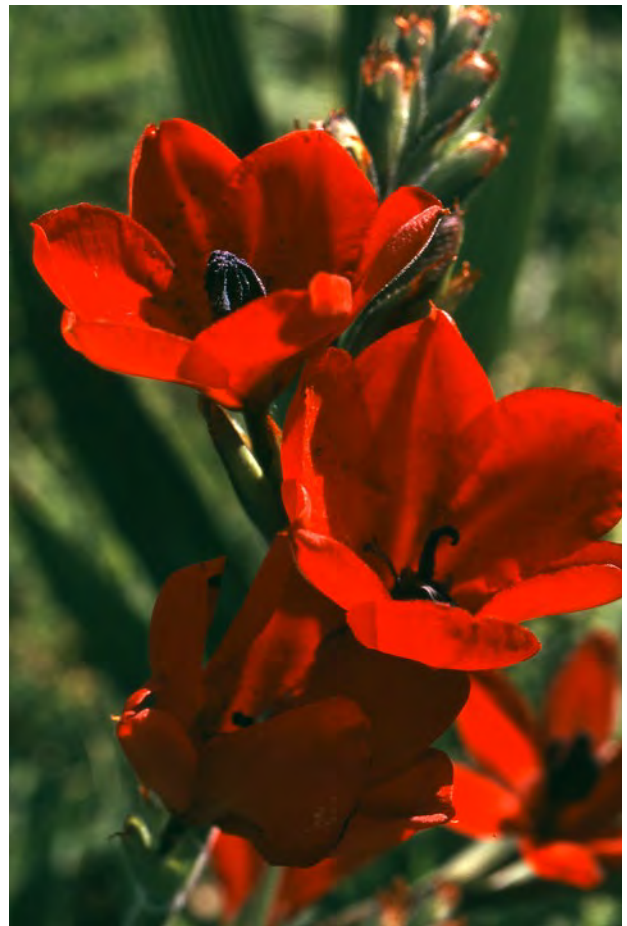
B



C



D



E

Plate 6.—*Babiana*: A, *leipoldtii* (No. 79); B, *regia* (No. 80); C, *stricta* (No. 84); D, *melanops* (No. 87); E, *villosa* (No. 88).

Introduction

A thorough review of the central and southern African genus *Babiana* Ker Gawl., conducted over the years 1996–2004, shows that this member of the Iridaceae subfamily Crocoideae comprises some 88 species. Like most African genera of the family, *Babiana* has radiated extensively in the southern African winter rainfall zone, which lies along the southwestern edge of the subcontinent. Eighty-six species flower in winter or spring in southwestern South Africa and adjacent southwestern Namibia. Of the remaining two species, *B. bainesii* Baker extends across the summer rainfall region of southern and central Africa, including Botswana, the northern half of Namibia, southern Zambia, and Zimbabwe, and blooms in late summer and autumn, and *B. hypogaea* Burch. occurs in the predominantly summer rainfall region of southeastern Namibia and Bushmanland and the Upper Karoo of South Africa, and flowers mostly in winter and early spring, which is unusual for this arid part of southern Africa. The plant called *B. socotrana* Hook.f., which is restricted to the Indian Ocean island of Socotra, is now excluded from the genus on the basis of chromosome cytology, seed and pollen morphology, vegetative form, and DNA sequence analysis, and has been referred to a new genus *Cyanixia* Goldblatt & J.C.Manning (Goldblatt *et al.* 2004a).

When last revised in 1959 by the South African botanist, G.J. Lewis, *Babiana* was considered to comprise 61 species. Since the publication of her monograph, three further species, *B. lewisiana* B.Nord. (Nordenstam 1970), *B. virginea* Goldblatt (Goldblatt 1979) and *B. cuneata* J.C.Manning & Goldblatt (Goldblatt & Manning 2004) have been described, and *Antholyza plicata* L.f. and *A. ringens* L. have been restored to *Babiana* (Goldblatt 1990a) as *B. ringens* (L.) Ker Gawl. and *B. thunbergii* Ker Gawl. These two species were included in *Babiana* by most 18th and early 19th century botanists, notably J. Ker Gawler (1804), J.G. Baker (1892, 1896), and H.M.L. Bolus (1927). Lewis, however, followed Brown (1932a) in maintaining *Antholyza* L. for *B. ringens* and a second genus *Anaclanthe* N.E.Br. for *B. thunbergii* and its synonym, *A. namaquensis*. Field research, especially since 1995, often conducted in conjunction with our studies of the pollination biology of African Iridaceae, has yielded several new species, while others have been discovered by colleagues or were found misidentified in herbaria. Our research has also shown a need for substantial revision of Lewis's taxonomy, both the circumscriptions of some species and the infrageneric classification. In addition to diagnostic descriptions for all species and extended descriptions of the new species, we provide a key to the species, as well as biological and nomenclatural notes, and range extensions for several more.

Three sections are recognized here in *Babiana*: sections *Babiana*, *Antholyzoides*, and *Teretifolieae*. The circumscription of section *Antholyzoides* is largely concordant with Lewis's section *Exohebeoides* but with the addition of *B. ringens* and *B. thunbergii* (see discussion below). Section *Babiana* is, however, restricted to species with the inner floral bracts divided to the base (or almost so), and often with a hairy ovary (Figure 1B) (smooth in series *Patulae*, *Secundae* and *Scariosae*). Section *Teretifolieae* includes species of Lewis's section *Babiana* that have large green bracts, the inner forked at the tip to $\pm$ the middle (Figure 1A), usually a smooth ovary, and a stem reaching shortly above the ground or entirely subterranean.

In section *Babiana*, the type of the genus is now called *B. fragrans* (Jacq.) Steudel (1840) and not *B. fragrans* (Jacq.) Goldblatt & J.C. Manning (2004); the name used by Lewis, *B. plicata* Ker Gawl., is illegitimate, and the one in more recent use, *B. disticha* Ker Gawl., is also superfluous. Changes to the section involving the *B. angustifolia*–*B. stricta*–*B. villosa* complex have been made by Goldblatt & Manning (2004). They include a revised circumscription for *B. stricta* (Aiton) Ker Gawl. to include only *B. stricta* var. *stricta* and var. *erectifolia* (G.J.Lewis) G.J.Lewis, and the recognition of the species *B. longiflora* Goldblatt & J.C.Manning and *B. regia* (G.J.Lewis) Goldblatt & J.C.Manning for *B. stricta* var. *grandiflora* G.J.Lewis and var. *regia* G.J.Lewis respectively. *B. stricta* var. *sulphurea* is excluded because we cannot identify the type illustration; the modern collections referred to the taxon by Lewis (1959) are a pale yellow-flowered form of *B. fragrans*.

The name *Babiana villosa* (Aiton) Ker Gawl. is reserved for plants with actinomorphic flowers on an inclined spike and a red to purple perianth with a filiform tube that is completely blocked internally by the style. This species also has enlarged, blackish to purple anthers with an expanded connective. The anther lobes are therefore $\pm$ latrorse. Plants related to *B. villosa* with a suberect stem, blue or purple flowers with a dark centre, and tepals much narrowed below, represent a second species which we call *B. melanops* Goldblatt & J.C.Manning. Some collections of this plant were included by Lewis (1959) in *B. stricta* while others were thought to represent hybrids between *B. villosa* and *B. stricta*. As circumscribed here, this last species has short floral bracts and a weakly zygomorphic flower with subequal, spreading tepals but unilateral stamens, and a short style lying behind the anthers and usually dividing opposite the anther bases. The anthers are blackish and either linear with parallel, extrorse thecae or arrow-shaped with an expanded connective.

Babiana angustifolia Sweet, as circumscribed by Lewis (1959), includes two species: *B. angustifolia* and a second species, here called *B. inclinata* Goldblatt & J.C.Manning, from the coastal plain of Western Cape Province. The two species share the characteristic inverted flower but differ in several features including height, tepal orientation and lower tepal development. Also in section *Babiana*, the new *B. noctiflora* J.C.Manning & Goldblatt, restricted to the Paardeberg north of Cape Town, has distinctive long-tubed, yellow flowers that are strongly scented at night. Other new species of the section are *B. papyracea* Goldblatt & J.C.Manning (series *Scariosae*) from tillites of the Bokkeveld Plateau in Northern Cape; *B. arenicola* Goldblatt & J.C.Manning (series *Mucronatae*) from the Breede River Valley; and *B. petiolata* Goldblatt & J.C.Manning (series *Patulae*) from the West Coast of Western Cape.

We here add *Babiana ringens* and *B. thunbergii* to Lewis's section *Exohebeoides*, which thus becomes section *Antholyzoides*, an earlier name at this rank. New collections of members of the section have shown that its taxonomy requires significant revision (Goldblatt & Manning 2005). *Babiana spiralis* Baker (Baker 1892), included by Lewis (1959) in *B. fimbriata* (Klatt) Baker (Klatt 1867–1868, as *Antholyza*), is similar in general form but differs in the vestiture of the leaves and stem, and flower shape and colour. The Richtersveld *B. lobata* G.J.Lewis, known to Lewis from a single specimen thought to have come from Garies, to the south, has likewise often been confused with *B. fimbriata*, and we provide expanded descriptions of both *B. lobata* and *B. spiralis* here. Lastly, *B. striata* var. *planifolia* has been

recognized as a separate species, *B. planifolia* (Goldblatt & Manning 2005). It is distinguished from *B. striata* (Jacq.) G.J.Lewis by its finely fibrous corm tunics, $\pm$ plane leaves and erect stem. Examination of living plants of *B. unguiculata* G.J.Lewis shows that it does not belong in section *Antholyzoides*: the inner bracts are divided nearly to the base and the dorsal tepal is erect but not recurved, and the species is now referred to section *Babiana* with which its hairy ovary is consistent.

In section *Teretifolieae*, examination of the type specimen of *Babiana flabellifolia* (Goldblatt & Manning 2004) has revealed that the plant has flowers with a short perianth tube and is thus the earliest name for plants called *B. truncata* by Lewis (1959). Long-tubed plants from the western Karoo called *B. flabellifolia* by Lewis have accordingly been described as *B. praemorsa* (Goldblatt & Manning 2004). Examination of plants included by Lewis in *B. truncata* has shown that the spring-blooming southern populations that typically grow on sandstone-derived soils have a longer perianth tube and subequal tepals and represent a second species, *B. cuneata* (Goldblatt & Manning 2004). Other new species of section *Teretifolieae* are *B. carminea*, a red-flowered species of the Knersvlakte of southern Namaqualand; *B. grandiflora*, *B. lanata*, and *B. rubella*, all from coastal Namaqualand; *B. gariepensis* from the Richtersveld; *B. lapeirousioides* from an as yet unknown locality in Namaqualand; *B. cinnamomea* from the southern edge of Namaqualand; *B. tanquana* from the Tanqua Basin; and *B. radiata* from the Little Karoo which has actinomorphic flowers.

Materials and methods

In the account of species that follows the key, the treatment of species is sometimes deliberately inconsistent. When no new information for species is available, we provide only a brief description and discussion, following the primary nomenclature and a reference to the most recent account of the genus, usually Lewis's (1959) monograph. The latter includes full synonymy, which is not repeated unless the synonymy is relevant to the discussion that follows. When known, capsules and seeds, which hardly differ across the genus, are described only for the new species.

New biological, geographical, or taxonomical information is presented in narrative form after the formal description. We cite all specimens known for new species, but for others, we list only significant new collections, most of which are range extensions made since Lewis's (1959) revision was published, at the end of the species entry, as *Additional specimens examined*. Readers should consult Lewis's account of the genus for

a more complete listing of specimens. The distribution maps, however, are based on all known specimens. For the several species added to the genus since Lewis's account, we list only *Representative specimens*. Full descriptions are provided for species described here for the first time and for the few that were incompletely known in the past, or are resurrected from synonymy. Species are arranged in taxonomic order within sections and informal series in a sequence that reflects as far as possible our understanding of relationships.

All types and specimens cited have been seen unless stated to the contrary.

Exsiccatae are cited following the quarter-degree square system in use in southern Africa as outlined by Edwards & Leistner (1971). Each degree square is identified by its numerical degree co-ordinates and is assigned a geographic name based on an important town or geographic feature therein. The distribution maps are

based on specimens cited by Lewis and new collections seen in B, BOL, K, MO, NBG, P, PRE, and S.

For leaf characters, only well-developed leaves should be examined; the lower leaves are often smaller than normal and upper leaves may grade into bracts. It is useful to examine more than one plant in a collection or population, as leaf characters are, to some extent, variable. Measure leaf width at $\pm$ the middle of a leaf. Measure bracts in the middle of the spike; the lower and upper flowers often have larger or smaller bracts than would be considered normal for a species.

Perianth tube length must be measured from the top of the ovary to the point at which the dorsal tepal separates from the upper lateral tepals. Therefore, not only the narrow lower portion of the tube is included in this measure, but also the wider, funnel-shaped portion. It is essential for identification of *Babiana* species to examine the inner floral bract(s) carefully to determine the point at which the apex is forked or if the inner bract is divided to the base, resulting in two separate structures.

A hand lens is useful for examining leaf and stem vestiture and the surface of the ovary.

Morphology and diagnostic characters

Species of *Babiana* are small to medium-sized, deciduous geophytes with a globose corm rooting from below and basal in origin, features typical of most genera of the largely African Iridaceae subfamily Crocoideae. Corm tunics are characteristic of the genus in their pale brown colour and tough, closely fibrous texture. They are usually deep-seated, in many species buried over 10 cm below ground level, and the tunics are usually extended upward, persisting as a collar around the underground part of the stem. The tunics are so distinctive that the genus can usually be recognized from the corms alone. In a few species the corm tunics are fairly coarsely fibrous and *B. striata* and *B. montana* G.J.Lewis may be distinguished from their allies by this feature. Some species, including *B. ambigua* (Roem. & Schult.) G.J.Lewis and *B. petiolata* Goldblatt & J.C.Manning (section *Babiana*), and *B. grandiflora* Goldblatt & J.C.Manning and *B. nana* (Andrews) Spreng. (section *Teretifolieae*), consistently have a poorly developed collar of fibres.

Leaves of most *Babiana* species are pleated, unusual in the subfamily, and usually hairy, with hairs varying from long and soft to short and velvety or scabrid. There is also a sharp distinction between the leaf sheath and blade, which is set at an oblique angle. Several species of section *Antholyzoides* stand out in having $\pm$ hairless mature leaves although the margins or sheaths may be hairy or ciliate. Seedling leaves are invariably softly hairy, even in species that have glabrous leaves at maturity. Leaf blade morphology is moderately variable. In a few species the blade surface is nearly plane, or the entire blade may be twisted or slightly coiled (*B. fimbriata*, *B. spiralis*, *B. torta* G.J.Lewis), or the margins undulate and crisped (*B. sinuata* G.J.Lewis, *B. striata*). The four species of the *B. cuneata*–*B. flabellifolia* group and *B. lanata* Goldblatt & J.C.Manning have the blade abruptly truncate with the apex irregularly dentate, as if chewed by a grazing animal. The leaf blades of *B. brachystachys* (Baker) Ker Gawl. are oval in section with several prominent longitudinal grooves. The oblique nature of the leaf blades is especially pronounced in some species, including *B. lewisiana*, *B. salteri*, and *B. tritonoides*, so

that the blade is held almost at right angles to the sheaths and thus almost horizontal.

The leaf blades of *Babiana* characteristically lack a central vein (pseudomidrib), a secondary loss that is associated with pleated leaves in other genera in the family, such as *Crocasmia*. Internally, the pleats are characterized by unequal development of one of the two vascular traces in each fold. The larger traces are located at the angles of the pleats, with a much smaller one opposed to them in the sinus of each fold. In genera of Crocoideae with plane leaves, the two vascular traces of each pair are $\pm$ equal in size. The hairs, most often concentrated above the veins or on the margins, are always uniseriate. The leaves have a prominent marginal vascular trace with a sclerenchyma cap below the epidermis. The marginal epidermal cells differ little from those of the rest of the blade. This contrasts with several genera of Crocoideae which lack a marginal vein, have no sclerenchyma strand below the epidermis, and have the columnar, marginal epidermal cells with thickened radial walls (Rudall & Goldblatt 1991; Rudall 1995).

Stems are round in section and, like the leaves, are usually short-hairy or velvety with uniseriate hairs. Most species of section *Antholyzoides* have a hairless or virtually hairless stem. The closely velvety stem of *Babiana spiralis* is a notable exception here. The stem is often branched, sometimes repeatedly. Stems are subterranean or largely so in most species of section *Teretifolieae*, and several of section *Babiana* (*B. ambigua*, *B. obliqua*, *B. scabrifolia*), but the spike is usually borne close to or a short distance above ground level. *Babiana ringens* is remarkable in having the main axis sterile and the flowers borne on one or more short, lateral branches.

The spike is fundamentally two-ranked but as the flower buds open, twisting of the axis may leave the flowers arranged $\pm$ spirally or subsecund. The number of flowers per spike is highly variable but some species typically have fewer flowers than others. Partly a function



FIGURE 1.—Floral features of *Babiana*. A, section *Teretifolieae*, flower l/s and floral bracts of *B. cinnamomea*, showing larger inner bract forked at apex, and smooth ovary; B, section *Babiana*, flower l/s and floral bracts of *B. engysiphon*, showing smaller inner bract divided to base with membranous margins, and hairy ovary; C, D, section *Antholyzoides*: C, single flower of *B. spiralis* showing dorsal tepal held well apart from other tepals, lower tepals narrowed into claws at base, and pronounced arching of stamens; D, single flower of *B. sinuata*, showing dorsal tepal held well apart from other tepals, pronounced arching of stamens, and connate anthers; E, F, *B. inclinata*, showing inverted flowers with horizontal dorsal tepal and erect lower tepals; G, *B. radiata*, actinomorphic flower. Scale bar: 10 mm. Artist: John Manning.

of overall plant size, flower number is consistently low in *Babiana minuta* and *B. pauciflora*. The flowers are subtended by two floral bracts (Figure 1A, B), a larger outer one and an inner one, usually smaller, which is partly clasped by the outer. Both are typically green and leafy in texture with the apices usually dry, sometimes prominently rust-coloured. The bracts are completely dry and rusty in *B. secunda* and dry-membranous and translucent in series *Scariosae* of section *Babiana*. The outer surface of the bracts is usually hairy, either velvety, pilose, or with long, sometimes silky hairs but is often hairless in section *Antholyzoides*. An apparently fundamental division in the genus is whether the inner bracts are green and forked at the tips (Figure 1A)—sometimes up to $\pm$ the middle—or are divided to the base or almost so (Figure 1B), sometimes with the two halves held together near the base by a transparent dry membrane. Outgroup comparison indicates that divided inner bracts are derived and we regard species with such inner bracts as constituting a clade, section *Babiana* (Lewis's sections *Acaste* and *Babiana* in part). Relatively short bracts characterize section *Antholyzoides*, in which the firm, usually smooth inner bracts are divided $\pm$ to the middle, and have two fairly prominent ribs separated by $\pm$ membranous tissue.

Flowers are ancestrally zygomorphic and bilabiate with unilateral, arcuate stamens that lie opposite the dorsal (posterior or adaxial) tepal and face the lower three tepals (Figure 1A–D). Both stamens and the dorsal tepal face the spike base in conventionally zygomorphic flowers in an erect or suberect spike, but when the spike axis is strongly inclined or horizontal, as in *Babiana auriculata* and *B. pilosa*, the stamens and dorsal tepal face the spike axis. *Babiana secunda* (series *Secundae*) and three species of series *Babiana*, *B. angustifolia*, *B. inclinata* and *B. rubrocyanea* have inverted flowers in which the dorsal tepal faces the spike apex and thus the unilateral stamens and style appear to be declinate (Figure 1E, F). In *B. rubrocyanea* the perianth is radially symmetric but the stamens are unilateral.

Several more species have actinomorphic flowers, or an actinomorphic perianth with unilateral stamens. Most of these species, referred to series *Babiana*, *Scariosae*, and *Strictae*, have the inner floral bract divided to the base, thus conforming to section *Babiana*. Two unrelated species of section *Teretifoliae* also have actinomorphic flowers, *B. pygmaea* and *B. radiata* (Figure 1G). This indicates an independent origin of the actinomorphic flower in two sections, and most likely at least four times in section *Babiana* and twice in section *Teretifoliae*.

Tepals are subequal in length in most species but the dorsal tepal is broader in species with a zygomorphic perianth and lies arched over the stamens, forming the upper lip, whereas the lower three tepals constitute a landing stage, the lower lip. Often the lower tepals are joined to the upper laterals for a short distance, thus forming a more pronounced lower lip. In *Babiana ringens* and *B. thunbergii* the dorsal tepal much exceeds the other tepals and the edges are curved inward to loosely enclose the filaments. In section *Antholyzoides* the dorsal tepal is initially arched but becomes erect to recurved as the

flower ages. The dorsal and usually the other tepals are also $\pm$ distinctly clawed in the section.

The perianth is tubular below, and the tube may be funnel-shaped with a slender, cylindric, lower portion of varying length, or the tube may be $\pm$ uniformly cylindric (*Babiana brachystachys*, *B. tubulosa*), or it may be divided into a narrow base but $\pm$ abruptly expanded above into a widely cylindric throat (*B. ringens*, *B. thunbergii*). Perianth tube length is variable, ranging from < 10 mm to > 80 mm. Length and shape are closely correlated with the pollination system. The tube length can, however, often be misleading in functional terms because the tube is not always hollow for the entire length. Instead, the tube may be effectively closed for some distance toward the base by a thickening of the tube wall or narrowing of the diameter so that it tightly encloses the style. Nectar, when present in these species, is forced into the upper, hollow part of the tube. This feature is most common in species with a largely subterranean stem and we assume that the closed portion of the tube serves as a pseudopedicel raising the flower above the basal cluster of leaves. Species with an actinomorphic flower, which are often pollinated by hopliine scarab beetles, typically have the narrow part of the tube completely closed, even though it may be relatively long, even up to 35 mm in forms of *B. villosa*. In these species nectar production is usually completely suppressed.

We speculate that the ancestral flower colour is blue or violet (by far the most common colours in the genus), with the lower three tepals or only the lower laterals bearing lozenge- or spear-shaped white (or cream-coloured) markings outlined in darker blue, purple or red. A few species have pale yellow, cream-coloured, or white flowers, including *Babiana noctiflora*, *B. odorata*, *B. pygmaea*, *B. spathacea*, *B. tubulosa*, *B. unguiculata*, and *B. virginea*. Several more have pink flowers, notably *B. blanda*, *B. purpurea*, and *B. rubella*, whereas *B. brachystachys* has white flowers, pink on the outside. Red flowers characterize *B. carminea*, *B. ringens*, *B. thunbergii*, and the type form of *B. villosa*. *Babiana regia* and *B. rubrocyanea* have a dark blue perianth with an intense red centre edged with a thin white band. Flowers of *B. stricta* may be blue to mauve, pink, or cream-coloured to white, but most populations have a uniform flower colour except for the weakly expressed contrasting markings on the lower tepals.

The stamens arise at the junction of the narrow and wider parts of the tube (Figure 1A, B) and the slender filaments are normally exerted but included in the narrow upper half of the tube in the actinomorphic-flowered *Babiana leipoldtii* and *B. villosa*. The filaments are well exerted in *B. ringens* and *B. thunbergii*, and reach beyond the apex of the loosely sheathing dorsal tepal. The anthers are usually linear to oblong and conventionally shaped with parallel anther thecae, and in most species, yellow to cream-coloured, or pale mauve. In the *B. stricta* group, series *Strictae*, however, the connective is widened between the lobes and broadest at the anther base, rendering the anthers lanceolate to arrow-shaped. The widened connective results in the anther thecae lying at the edges of the anther in a $\pm$ lateral position.

Anthers of this species group and a few others, including *B. patersoniae*, are blackish, dark blue, or turquoise and the pollen is pale to dark blue or black. Anthers of most flowers with unilateral stamens are parallel and lie below the dorsal tepal but in *B. geniculata* (section *Teretifoliae*) the anthers diverge, although the filaments are $\pm$ parallel for most of their length. The anthers of *B. sinuata* (section *Antholyzoides*) are joined together, a feature unique in the Iridaceae. The ellipsoid pollen grains are typical of Crocoideae, and have a perforate exine and a single elliptical aperture with a double-banded operculum (Goldblatt *et al.* 1991).

The ovary is hairless in section *Antholyzoides* and usually so in section *Teretifoliae* (except for *Babiana cedarbergensis*, *B. geniculata*, *B. pygmaea*, and sometimes *B. vanzijliae*). In these species the ovary is hairy on the ribs or on the upper half. In section *Babiana* the ovary is hairy throughout or above the base, except in series *Patulae*, *Secundae* and *Scariosae*. In series *Patulae* the ovary is exceptionally minutely hairy on the ribs in *B. ambigua*. A short-stalked (or stipitate) ovary was described for *B. hypogaea* and *B. bainesii* (as *B. hypogaea*) by Lewis, a feature that she considered taxonomically significant. We have, however, noted a stalked ovary in several other species with the inflorescence borne at or below ground level, including *B. cuneata* and *B. sambucina*. The bracts subtending each flower are inserted, as in all members of subfamily Crocoideae, at the base of the ovary, thus above the so-called ovary stalk. Inflorescences with a stalked ovary or with so-called branches bearing single flowers are rare in the Crocoideae but occur in species with subterranean inflorescences, for example in *Duthiastrum* (De Vos 1974, as *Duthiella*) and *Romulea Maratti* (De Vos 1972; Manning & Goldblatt 2001).

The style divides into three slender branches at the level between the bases and the tips of the anthers, the point of division varying depending on the species. The style reaches the anthers' apices or beyond in *Babiana* section *Antholyzoides* and a few species of other sections, including *B. ambigua*, *B. purpurea*, *B. ringens*, and *B. thunbergii*. The style branches are broadened and often bilobed at the tips when fully expanded but when flowers first open, the distal portion is folded along the midline so that the two surfaces are conduplicate. In a few species, notably *B. purpurea* and *B. rubrocyanea*, the style branches are conspicuously expanded apically. Short styles that divide below or opposite the anther bases are characteristic of some members of the *B. stricta*–*B. villosa* group, *B. fragrans* and *B. longiflora*, and several more. The feature is usually associated with pollination by hopliine beetles or a mixed pollination system involving these insects in combination with apid bees.

In *Babiana ecklonii*, style length varies within populations, dividing in different individuals below, opposite the middle, or near the anther apices. The significance of this pattern in *B. ecklonii*, a species pollinated by long-proboscid flies (Goldblatt & Manning in press), is uncertain.

Capsules are $\pm$ globose to ovoid but somewhat three-lobed, and the firm, cartilaginous walls often show the

outline of the seeds. *Babiana* seeds are atypical for the Iridaceae, being dark brown to blackish and glossy, with an uneven surface, in part with an irregularly wrinkled (rugulose) primary sculpture (Goldblatt *et al.* 2004a). They are also unique in being $\pm$ pear-shaped. The narrow part of the seed at the micropylar end consists only of slightly folded seed coat tissue and within the seed coat the seed body itself is spherical. Seeds of *Babiana* species are comparatively large for subfamily Crocoideae, with a long axis of mostly 3–4 mm. Seeds of *B. bainesii* are the largest so far recorded, measuring $\pm$ 5 mm at the longest axis (Goldblatt & Porter 11954A, MO, NBG). In *B. ecklonii* the narrow, micropylar end of the seed is particularly well developed and $\pm$ 2 mm long, nearly as long as the transverse diameter of $\pm$ 2.5 mm. So uniform are the capsules and seeds, except for their size, that we describe these features, when known, only for the new species.

The ancestral basic chromosome number is uniform in *Babiana*: $x = 7$, for the 24 species counted, including the original counts reported here (Table 1) (Goldblatt 1971; Goldblatt & Takei 1997). The distinctive karyotype comprises two long and five short chromosome pairs. All species counted to date are diploid, $2n = 14$, and the only departure from this pattern is the presence of small B chromosomes in a few species. The chromosome number and karyotype are apomorphic for the genus. In subfamily Crocoideae the diploid number of $2n = 14$ is shared only with *Zygotritonia* Mildbr., a tropical African genus that has never been seriously thought to be allied to *Babiana*, but which also has plicate leaves. The shared chromosome number is presumably convergent as the karyotype of *Zygotritonia* consists of one long and six much shorter chromosome pairs, unlike that of *Babiana* (Goldblatt 1989). *Zygotritonia*, unique in Crocoideae in having an undivided style, appears taxonomically isolated. *Babiana socotrana*, now considered a separate genus *Cyanixia*, only distantly related to *Babiana*, has a base number of $x = 10$, and different seed morphology and corm development (Goldblatt *et al.* 2004a).

We take this opportunity to correct the record of chromosome counts for *Babiana* and to report original chromosome numbers for two species, *B. longicollis* and *B. sambucina* (Table 1), the former until now uncounted. Re-examination of the voucher for the plant reported as *B. sambucina* (Goldblatt 19, J), shows it to be *B. attenuata*, a species not otherwise counted (Goldblatt 1971). Because of nomenclatural changes in this review, counts published for *B. flabellifolia* are for *B. praemorsa* and those for *B. hypogaea* are for *B. bainesii*. True *B. hypogaea* is thus uncounted.

TABLE 1.—New chromosome counts in *Babiana*. Vouchers are housed at the Missouri Botanical Garden Herbarium (MO)

Species	Diploid chromosome number, $2n$	Voucher data
<i>attenuata</i>	14	(Goldblatt 1971, as <i>B. sambucina</i>)
<i>longicollis</i>	14	Namibia, Farm Zebrafontein, Lavranos & Pehlemann 19906
<i>sambucina</i>	14	South Africa, Eastern Cape, north of Hankey, Goldblatt 4938

Infrageneric classification

We adopt a revised infrageneric classification here (Table 2), dividing the genus into three infrageneric clusters: section *Teretifoliae* (40 spp.); section *Antholyzoides* (11 spp.) with the inner bracts forked apically to $\pm$ the middle and a smooth ovary (Figure 1A); and section *Babiana* (37 spp.) with inner bracts divided to the base (or almost so) and either a hairy or smooth ovary (section *Babiana*) (Figure 1B).

Section *Teretifoliae* consists of two large species clusters, those with $\pm$ conventional, gullet flowers and those with long-tubed flowers, both with well-developed and often hairy bracts, but submembranous and $\pm$ hairless in some acaulescent species. Most members of section *Teretifoliae* also have a largely subterranean stem and a decumbent spike borne close to ground level.

Section *Antholyzoides* comprises 11 species, most with short-tubed flowers with clawed tepals, stamens arched in a semi-circle, the dorsal tepal recurving with age to become $\pm$ erect, and relatively short floral bracts (Figure 1C, D). Two bird-pollinated species, *Babiana ringens* and *B. thunbergii*, which have long-tubed flowers, are included in the section. They have long floral bracts but are otherwise of the same type as other members of the section, with the inner bracts having prominent paired ribs and a submembranous midline.

In section *Babiana* two species clusters stand out, the *B. villosa* and *B. villosula* groups (section *Acaste* in part of Lewis) which often have radially symmetric flowers, and the *B. villosa* group with dark blue to blackish anthers with an expanded connective. The remaining species of the section, series *Babiana*, have conventional anthers and zygomorphic flowers, although the tepals may be subequal. Two species of series *Babiana* have inverted flowers borne on strongly inclined spikes; the perianth tube is recurved so that the nearly horizontal dorsal tepal faces the spike apex with the unilateral stamens and style arching above the dorsal tepal, the reverse of the expected orientation (Figure 1E, F).

This classification contrasts with those of both Baker (1892, 1896) and Lewis (1959). Baker recognized three subgenera, *Babiana* (21 spp., one of them, *B. mononeura* Baker, is evidently a *Gladiolus* [see Lewis 1959]), *Acaste* (3 spp.), and *Antholyzoides* (2 spp.). Lewis (1959) excluded *B. ringens* and *B. thunbergii* (Baker's subgenus *Antholyzoides*) from the genus, and subdivided *Babiana* into five sections, *Acaste* (10 spp.), *Babiana* (41 spp., including *Cyanixia socotrana*, as *B. socotrana*), *Exohebeoides* (7 spp.), *Scariosae* (2 spp.), and *Teretifoliae* (1 sp.). Baker's subgenus *Babiana*, and Lewis's section *Babiana*, included both species with

inner bracts forked apically to $\pm$ half way or entirely divided, while section (or subgenus) *Acaste* here falls in section *Babiana*. We expand section *Teretifoliae*, in which Lewis included only *B. brachystachys*, to include the species of her section *Babiana* that have the inner bracts forked apically to $\pm$ halfway. The taxonomic position within *Babiana* of *Antholyza ringens* and *A. plicata*, included by Bentham & Hooker (1883) in *Babiana* section *Antholyzoides* and by Baker in his *Babiana* subgenus *Antholyza*, is equivocal. Section *Exohebeoides* is here united with section *Antholyzoides* in which the branching pattern of the aerial stem of *B. thunbergii* is consistent. The second species, *B. ringens*, has the spike borne at ground level, but a sterile aerial stem raised well above ground level. Because of their highly derived flowers the taxonomic affinities of these two species within *Babiana* remain uncertain.

In this new classification, *Babiana* section *Exohebeoides* becomes section *Antholyzoides*, and has a much-expanded circumscription, with two species added to the total and *B. unguiculata* transferred to section *Babiana*. The latter species always seemed isolated in section *Antholyzoides* because of its hairy ovary. Living plants that we have examined show additionally that the outer floral bracts are divided to the base or almost so and the dorsal tepal is suberect rather than curving backward with age. Both the hairy ovary and divided bracts are synapomorphies for section *Babiana*.

The species are here arranged in the sequence that best reflects what we can infer about their phylogenetic relationships. As a result, the sequence of species departs radically from that followed by Lewis, who began her account with what we now consider to be the most derived species, those with radially symmetric flowers, fully divided bracts, and a densely hairy ovary. Radially symmetric flowers of the kind found in several southern African genera of Iridaceae–Crocoideae, including *Ixia* L., *Sparaxis* Ker Gawl., *Tritonia* Ker Gawl. and *Babiana*, are partly or exclusively adapted for pollination by hopliine beetles. The flowers are usually associated with limited or no nectar production and the narrowing of the perianth tube, which appears to function as a pseudopedicel, much as it does in some species of *Ixia* or *Duthiastrum* (Goldblatt & Manning 2000a). Species of *Babiana* with radially symmetric flowers are considered to be derived from ancestors with conventional, open perianth tubes, that produce nectar, and have a zygomorphic flower. The pattern of evolution and adaptive radiation that we propose for *Babiana* is therefore very far removed from the one suggested by Lewis (1959).

TABLE 2.—Classification of *Babiana*, with species distributions

Section 1. Teretifoliae		Section 2. Antholyzoides	
Series 1.1 Brevitubae		Series 2.1 Exohebeoides	
1. <i>B. nana</i>	Western Cape coast, Hopefield to Milnerton (subsp. <i>nana</i>), Cape Peninsula to Stilbaai (subsp. <i>maculata</i>)	41. <i>B. spiralis</i>	Northern and Western Cape, Garies to Klawer
2. <i>B. pygmaea</i>	Western Cape, Hopefield to Mamre	42. <i>B. stenomera</i>	Western Cape, near Nuwerus
3. <i>B. rubella</i>	Northern Cape, sandveld near Kotzesrus	43. <i>B. lewisiana</i>	Northern and Western Cape, near Kotzesrus to Vredendal
4. <i>B. pilosa</i>	Western Cape, Nuwerus to Koekenaap	44. <i>B. fimbriata</i>	Northern and Western Cape, Garies to Nuwerus
5. <i>B. pauciflora</i>	Northern Cape, Bokkeveld Mtns	45. <i>B. sinuata</i>	Western Cape, Nuwerus to Olifant's River Valley
6. <i>B. lanata</i>	Northern Cape, Kleinsee to Oograbies hills	46. <i>B. striata</i>	Northern and Western Cape, Namaqualand
7. <i>B. grandiflora</i>	Northern Cape, Groen River mouth to Brand-se-Baai	47. <i>B. planifolia</i>	Northern and Western Cape, Richtersveld to Knersvlakte
8. <i>B. cedarbergensis</i>	Western Cape, Cederberg	48. <i>B. lobata</i>	Northern Cape, Richtersveld
9. <i>B. confusa</i>	Western Cape	49. <i>B. tritonioides</i>	Northern Cape, N Namaqualand and Richtersveld
10. <i>B. crispa</i>	Northern and Western Cape, Loeriesfontein to Bidouw Valley		
11. <i>B. minuta</i>	Western Cape, mainly Calvinia District	Series 2.2 Antholyzoides	
12. <i>B. tanquana</i>	Western Cape, Tanqua basin	50. <i>B. thunbergii</i>	Northern and Western Cape, Orange River mouth to St Helena Bay
13. <i>B. karooica</i>	Western Cape, Little Karoo	51. <i>B. ringens</i>	Northern and Western Cape, Bokkeveld Mtns to Stilbaai
14. <i>B. torta</i>	Northern and Western Cape, Springbok hills to Bitterfontein		
15. <i>B. namaquensis</i>	Northern Cape and SW Namibia to Port Nolloth	Section 3. Babiana	
16. <i>B. longicollis</i>	SW Namibia	Series 3.1 Patulae	
17. <i>B. cinnamomea</i>	Western Cape, Loeriesfontein to foot of Koebe Pass	52. <i>B. fourcadei</i>	Western Cape, Swellendam to George
18. <i>B. horizontalis</i>	Northern Cape, southern Richtersveld	53. <i>B. patula</i>	Western Cape, Wolseley to Montagu and Stilbaai
19. <i>B. gariensis</i>	Northern Cape, Richtersveld	54. <i>B. montana</i>	Western Cape, southern Cape
		55. <i>B. ambigua</i>	Western Cape, Gifberg to Stilbaai
		56. <i>B. petiolata</i>	Western Cape, W coast, Lambert's Bay to Velddrif
Series 1.2 Cuneifoliae		Series 3.2 Secundae	
20. <i>B. flabellifolia</i>	Northern Cape, Steinkopf to Calvinia	57. <i>B. secunda</i>	Western Cape, Porterville to Paarl
21. <i>B. cuneata</i>	Northern and Western Cape, Bokkeveld Mtns and Roggeveld to Laingsburg		
22. <i>B. praemorsa</i>	Northern Cape, Bokkeveld plateau and Hantamsberg	Series 3.3 Mucronatae	
23. <i>B. pubescens</i>	Northern Cape, central Namaqualand	58. <i>B. mucronata</i>	Northern and Western Cape, Bokkeveld Mtns to Tulbagh
		59. <i>B. lineolata</i>	Western Cape, Cold Bokkeveld
Series 1.3 Longitubae		60. <i>B. engysiphon</i>	Northern Cape, S Bokkeveld Mtns
24. <i>B. attenuata</i>	Northern Cape, central Namaqualand	61. <i>B. auriculata</i>	Western Cape, Pakhuis Mtns
25. <i>B. curviscapa</i>	Northern Cape, Namaqualand, Springbok to Bitterfontein	62. <i>B. unguiculata</i>	Northern and Western Cape, S Bokkeveld Mtns to Nardouwsberg
26. <i>B. geniculata</i>	Western Cape, Pakhuis and Bidouw Mtns	63. <i>B. toximontana</i>	Western Cape, Matsikamma and Gifberg
27. <i>B. vanzijliae</i>	Northern Cape, Bokkeveld Escarpment	64. <i>B. salteri</i>	Western Cape, S Knersvlakte
28. <i>B. sambucina</i>	Northern, Western and Eastern Cape, Nieuwoudtville to Uitenhage	65. <i>B. arenicola</i>	Western Cape, Breede River Valley near Brandvlei
29. <i>B. radiata</i>	Western Cape, Little Karoo near De Rust	66. <i>B. scabrifolia</i>	Western Cape, Olifants River Valley and surrounding valleys
30. <i>B. virginea</i>	Northern Cape, Roggeveld Escarpment	67. <i>B. latifolia</i>	Western Cape, Piketberg foothills
31. <i>B. rigidifolia</i>	Northern Cape, Bokkeveld and Stinkfontein Mtns	68. <i>B. ecklonii</i>	Western Cape, Gifberg to Olifants River Valley
32. <i>B. dregei</i>	Northern Cape, central Namaqualand	69. <i>B. odorata</i>	Western Cape, Hopefield to Malmesbury
33. <i>B. framesii</i>	Northern Cape, Bokkeveld Plateau	70. <i>B. noctiflora</i>	Western Cape, Paardeberg
34. <i>B. carminea</i>	Western Cape, Knersvlakte		
35. <i>B. tubulosa</i>	Western Cape, Mamre to Saldanha		
36. <i>B. tubiflora</i>	Western Cape, Lambert's Bay to Stilbaai		
37. <i>B. brachystachys</i>	Northern and Western Cape coast, Wallekraal to Brand-se-Baai		
38. <i>B. lapeirousioides</i>	Northern Cape, probably Richtersveld		
39. <i>B. hypogaea</i>	Namibia, Botswana, Zimbabwe, S Zambia, and N South Africa		
40. <i>B. bainesii</i>	SW Namibia and Northern Cape to Kimberley		

TABLE 2.—Classification of *Babiana*, with species distributions (cont.)

Series 3.4 Scariosae		79. <i>B. leipoldtii</i>	Western Cape, Malmesbury to Hopefield
71. <i>B. scariosa</i>		80. <i>B. regia</i>	Western Cape, western Cape forelands
Northern and Western Cape, Bokkeveld Mtns to Montagu		81. <i>B. villosula</i>	Western Cape, Darling and Wellington to Peninsula
72. <i>B. spathacea</i>		82. <i>B. blanda</i>	Western Cape, Mamre to Melkbosstrand
Northern Cape, Loeriesfontein and Hantamsberg to Papkuilsfontein		83. <i>B. foliosa</i>	Western Cape, Riviersonderend
73. <i>B. papyracea</i>		Series 3.6 Strictae	
Northern Cape, Bokkeveld Mtns			
Series 3.5 Babiana		84. <i>B. stricta</i>	Western Cape, Cape Peninsula to Swellendam
74. <i>B. fragrans</i>		85. <i>B. purpurea</i>	Western Cape, Bot River to Swellendam
75. <i>B. longiflora</i>		86. <i>B. patersoniae</i>	Western and Eastern Cape, Caledon to Alexandria
Western Cape, lower slopes, Piketberg and Porterville Mtns			
76. <i>B. angustifolia</i>		87. <i>B. melanops</i>	Western Cape, Tulbagh to Mamre
77. <i>B. inclinata</i>		88. <i>B. villosa</i>	Western Cape, Tulbagh to Malmesbury
Western Cape, Porterville to Darling			
78. <i>B. rubrocyanea</i>			
Western Cape, Darling to Malmesbury			

Relationships of *Babiana*

The immediate relationships of *Babiana* have always been puzzling. It undoubtedly belongs in subfamily Crocoideae, a taxon long treated as Ixiodeae (Lewis 1954b; Goldblatt 1990b). *Babiana* has the spicate inflorescence of sessile flowers, tepals united in a well-developed perianth tube, a corm rooting from the base, pollen grains with a perforate exine and an aperture with a two-banded operculum, and embryological features including a campylotropous ovary, that represent synapomorphies for the subfamily (Goldblatt *et al.* 2006). The distinctive features of *Babiana* include tough, fibrous corm tunics, pleated leaves, pubescence on the leaves, stem and bracts (lacking or poorly expressed in some species), gynoeceum with simple style branches expanded at the tips, and pear-shaped seeds with a glossy, loose seed coat enclosing a rounded seed body. The basic chromosome number is $x = 7$ and the karyotype consists of two long and five short chromosome pairs. All these features appear to represent autapomorphies. Pleated leaves also occur in some species of *Crocasmia* Planch. (4 of 8 spp.), *Cyanixia* (1 sp., once included in *Babiana* as *B. socotrana*), *Savannosiphon* Goldblatt & Marcus (1 sp.) and *Zygotritonia* (4 spp.) (Goldblatt *et al.* 2004a). *Crocasmia* has a derived anatomy of the leaf margin, rounded seeds with peripheral ovular vasculature (Goldblatt & Manning 1995; Goldblatt *et al.* 2004b), and a chromosome base number of $x = 11$ (Goldblatt & Takei 1997). The remaining *Cyanixia*, *Savannosiphon*, and *Zygotritonia* have axillary corm development (apparently plesiomorphic for Crocoideae, Goldblatt *et al.* 2006), style branches slender throughout (in *Zygotritonia* the style is uniquely undivided), and plesiomorphic rounded seeds with prominent cell outlines (Goldblatt *et al.* 2004a). Basic

chromosome numbers in *Cyanixia* and *Savannosiphon* are $x = 10$ and 8, respectively, whereas *Zygotritonia* has $x = 7$. Despite sharing a basic chromosome number of $x = 7$, the possibility that *Babiana* and *Zygotritonia* are immediately allied does not seem likely. The two differ in too many features, including axillary corm development and trisulcate pollen in *Zygotritonia*, both the latter derived features, and the shared chromosome base number is thus due to convergence. The similar appearance of the style in *Gladiolus* L. and *Babiana*, in which the branches are expanded apically and conduplicate, led to a suggestion by Goldblatt (1996) that the two genera may be closely allied. No other serious suggestions about the relationships of *Babiana* have been made. Lewis (1954b), in her study of southern African Iridaceae, emphasizing the apparent isolation of the genus, grouped *Babiana* in a subtribe Babianinae together with *Antholyza* and *Anaclanthe*, both now included in *Babiana*.

Molecular data, based on base sequences from four plastid DNA regions, including *matK*, provide a novel association of *Babiana*, with its closest relative *Chasmanthe* N.E.Br. These two genera are sister to a clade within tribe Croceae (Goldblatt *et al.* 2006) that includes *Dierama* K.Koch., *Duthiastrum* M.P.de Vos, *Ixia*, *Sparaxis*, and *Tritonia*. The latter alliance plus *Chasmanthe* have three important morphological synapomorphies, excluded ovular vasculature in the seed, a smooth, shiny seed coat, and leaf margins that lack a marginal sclerenchyma strand (except *Dierama* and *Ixia*) and instead, have specialized marginal epidermal cells with thickened radial walls. *Babiana* species have a smooth shiny seed coat, but have neither

the excluded ovular vascular trace nor a derived leaf marginal anatomy, and its association with this clade of tribe Ixieae and *Chasmanthe*, in particular, is thus only supported by one morphological or anatomical feature. Nevertheless, strong statistical support for the molecular result (bootstrap value 100%), leaves us no

choice but to accept *Babiana* as a divergent member of Croceae in which leaf marginal anatomy has reverted to the plesiomorphic type and the ovular trace in the seed which is not excluded, the former perhaps associated with the pleated leaf and the latter with the unusual seed shape and loose seed coat.

Floral biology and pollination

The range of flower types in *Babiana* closely reflects their pollination biology. As in other larger African genera of the Iridaceae, *Babiana* exhibits a diversity of pollination systems and different species are adapted to most of the pollination systems found in southern Africa, with the notable exception of large butterflies, bee flies (Bombyliidae), and short-tongued flies attracted to foul-smelling, dull-coloured flowers (Goldblatt & Manning in press). As in *Gladiolus* (Goldblatt *et al.* 1998b, 2001), pollination by large, long-tongued anthophorine bees and *Apis mellifera* may be the ancestral condition. Selected species of all sections of the genus with blue, mauve, pink or yellow flowers with contrasting pale nectar guides on the lower tepals, a sweet scent, and a perianth tube shorter to about as long as the dorsal tepal and usually 15–20 mm long, are visited by *Anthophora* species and/or honey bees that accomplish pollen transfer passively while foraging for nectar. Nectar is secreted from septal nectaries in the walls of the ovary (Rudall *et al.* 2003) directly into the base of the perianth tube through pores close to the base of the style. Nectar is retained in the lower part of the tube, or is forced into the upper part of the tube when the internal diameter of the lower portion of the tube is narrowed and accommodates only the style.

Even some species of *Babiana* with an elongate perianth tube may have this pollination system. An example is the common form of *B. sambucina*, which has a perianth tube 35–50 mm long. The tube is narrowed internally in the lower two thirds, forcing the nectar into the upper 15 mm of the tube where it is readily reached by bees such as *Anthophora diversipes* and *A. krugeri*, which have tongues 6.5–8.0 mm long (Goldblatt *et al.* 1998b). Predicting the pollination system of longer-tubed species of *Babiana* thus requires knowledge of the perianth tube structure. Based on our current knowledge of the genus, we infer that some 53 of the 88 species in the genus share the passive pollination system using anthophorine bees and/or worker honeybees.

An active pollen-collecting system is inferred for the few species with fragrant, actinomorphic flowers and white, pink, or yellow anthers with pale-coloured pollen. For example, *Babiana villosula*, which flowers early in the season, mainly in June and July, is visited by worker

honey bees that actively gather pollen and often carry pure loads of pollen of the species in their pollen baskets. We predict a similar pollination system for *B. blanda*, *B. foliosa*, *B. leipoldtii* (all section *Babiana*) and for *B. radiata* (section *Teretifolieae*).

The second most common pollination system broadly resembles the anthophorine bee system, and involves species with an elongate perianth tube with the hollow part of the tube usually at least 25 mm long. These species are pollinated by long-proboscid flies of the families Nemestrinidae and Tabanidae. In Namaqualand and the western part of Western Cape, species with dark blue or violet flowers and scented or unscented flowers are pollinated by the nemestrinids *Prosoeca peringueyi* or *Prosoeca* sp. nov. 1, which have mouthparts 35–55 mm long (Manning & Goldblatt 1996a; Goldblatt & Manning 2000). Species in which this pollination system has been confirmed include *Babiana curviscapa*, *B. dregei*, *B. ecklonii*, *B. engysiphon*, *B. geniculata*, *B. pubescens*, and *B. rigidifolia* (pollinated by *Prosoeca peringueyi*), and *B. framesii*, *B. praemorsa*, and *B. sambucina* subsp. *longibracteata* (pollinated by *Prosoeca* sp. nov. 1). In addition, the long-tubed variant of *B. vanzijliae*, which has yellow, strongly fragrant flowers, is also pollinated by *Prosoeca* sp. nov. 1 (the shorter-tubed form is pollinated by a combination of bees and *Prosoeca* sp. nov. 2 with a proboscis 12–14 mm long).

Babiana species with long-tubed, white to cream-coloured flowers usually with contrasting pink or red markings are, we infer, adapted for pollination by a second nemestrinid, *Moegistorhynchus longirostris*. To date only *B. tubiflora* has been confirmed to be pollinated by this fly (Manning & Goldblatt 1997a) but at least *B. brachystachys*, *B. lapeirousioides* and *B. tubulosa* have flowers that conform to the type predicted for this pollination system. *Babiana spathacea*, with a perianth tube 35–45 mm long and cream-coloured flowers with red nectar guides is also assumed to be pollinated by long-proboscid flies, but no fly has yet been recorded over much of its range in the western Karoo. We predict that a total of 18 taxa (17 species and one subspecies) have flowers adapted for pollination by long-proboscid flies.

Next in numerical importance is pollination by hopliine beetles (Scarabaeidae: Rutelinae: Hopliini), which are most likely the primary or sole pollinators of *Babiana* species with actinomorphic flowers and dark-coloured pollen. This system is best developed in section *Babiana*, in species including *B. melanops*, *B. papyracea*, *B. regia*, and *B. villosa*. These species have flowers with a $\pm$ flat or shallow bowl-like perianth, and either a darkly pigmented centre or blackish stamens or both, the anthers sometimes with an enlarged connective. Hopliine scarabs also pollinate similar actinomorphic flowers in *B. pygmaea* (section *Teretifolieae*). *Babiana angustifolia*, *B. fragrans*, *B. rubrocyanea*, and *B. stricta* are also pollinated by hopliine beetles, but either in combination with the nectarivorous horsefly *Philoliche atricornis* or various bees, including *Apis mellifera* and *Anthophora* species. Pollination systems using hopliine beetles and insects of other orders is not uncommon in

the southern African flora (Goldblatt *et al.* 1998a, 2000, 2004c).

Three red-flowered species have flowers adapted for pollination by sunbirds (Goldblatt *et al.* 1999). This mode of pollination, involving unscented flowers with red pigmentation, a long perianth tube wide in the upper half, and the production of generous amounts of nectar, has been confirmed for *Babiana ringens* and *B. thunbergii*, but remains to be documented for *B. carminea*. Pollination by night-flying moths is likely for *B. noctiflora*, on which the noctuid *Syngrapha circumflexa* has been captured, whereas moth pollination is inferred for *B. patersoniae* and *B. virginea*. These species have intensely fragrant flowers and a pale-coloured perianth that remains open at night. The scents are reminiscent of clove oil, and are most strongly evident at night.

Systematics

Babiana Ker Gawl. ex Sims in Curtis's Botanical Magazine 15: t. 576 (1802a). Type: *B. plicata* Ker Gawl. [= *B. fragrans* (Jacq.) Steudel].

Antholyza L., Species plantarum: 37 (1753), in part, excluding the lectotype, *A. cunonia* L. (= *Gladiolus cunonius* (L.) Gaertn.), designated by Hitchcock & Green (1929); see also Goldblatt (1990a) and Goldblatt & Manning (1998).

Acaste Salisb., Transactions of the Horticultural Society of London 1: 332 (1812), nomen nudum. Type: *A. venusta* Salisb. (= *Babiana rubrocyanea* (Jacq.) Ker Gawl.).

Anaclanthe N.E.Br., Transactions of the Royal Society of South Africa 20: 269 (1932). Type: *A. plicata* (L.f.) N.E.Br. (= *Babiana thunbergii* Ker Gawl.).

Last revisionary account: Lewis, Journal of South African Botany, Suppl. 3 (1959).

Deciduous, cormous perennials; corm rooting from below, basal in origin; tunics of tough, closely fibrous layers, or sometimes netted. Stem aerial or subterranean, $\pm$ terete, simple or branched, erect to arching outward, usually hairy to scabrid, or smooth, usually sheathed below by a collar of tough fibrous layers. Leaves several, lower 2 or 3 cataphylls; foliage leaves unifacial, blades pleated, with prominent veins at angles, without definite midrib, set obliquely to sheaths, sometimes nearly at right angles and thus held horizontally, sheath rarely extended upward as a pseudopetiole, ovate to linear, sometimes

abruptly truncate, and then cuneate, sometimes undulate, sinuate, or terete, usually pubescent or puberulous, or smooth, sometimes with long hairs on upper margin. Inflorescence a spike, with flowers few to many, often secund, or spiral or in two ranks. Bracts two, abaxial (outer) usually larger, short or long, green with dry brown apices, variously hairy or smooth, entirely dry in a few species, papery and translucent in 3 species, adaxial (inner) forked apically or to middle, or divided to base. Flowers usually zygomorphic and bilabiate or salver-shaped, or actinomorphic and with tepals spreading or cupped, usually shades of blue to violet, sometimes yellow, red, pink, purple, or white, when bilabiate usually with pale markings on lower lateral tepals, when actinomorphic centre often darker or lighter, often sweetly fragrant, usually with nectar from septal nectaries; perianth tube short to long, cylindric and straight to curved or funnel-shaped; tepals equal, subequal or unequal and dissimilar, then dorsal one enlarged, hooded, reflexed or erect with margins involute and enclosing filaments, lower tepals sometimes clawed. Stamens unilateral and arcuate or symmetrically disposed and erect; filaments within tube at junction between lower, narrower portion and upper, wider portion; anthers linear and extrorse, or occasionally latrorse with connective very broad, exerted; pollen monosulcate, operculate, exine perforate. Ovary smooth, hairy on ribs or densely hairy; style exerted or included, dividing opposite or beyond anther tips, or sometimes below level of anthers, style branches filiform or slightly to prominently expanded above. Capsules globose to ovoid, cartilaginous, hairy or smooth. Seeds pear-shaped, smaller at micropylar end, slightly wrinkled, surface smooth and usually shiny. Basic chromosome number: $x = 7$.

KEY TO SECTIONS

- 1a Inner bract divided to base or rarely close to base, but then joined only by thin transparent membranous tissue; bracts green with dry brown or rust-brown tips, or dry and brown, or completely papery and translucent; ovary often densely hairy (smooth or minutely hairy on ribs in a few species)..... Section 3. *Babiana* (p. 61)
- 1b Inner bract forked at tips or divided in upper third to half; bracts green with dry and pale brown tips, or sometimes rust-brown; ovary smooth, rarely hairy:
- 2a Tepals narrowed below into claws, lower three abruptly so with claw linear and limb often with prominent auriculate lobes at base; dorsal tepal initially arched, often curving upward and erect to recurving when fully open (margins curving forward and enclosing filaments in two species); bracts 5–15 mm long, rarely up to 22 mm; plants never acaulescent with spike borne at or below ground level..... Section 2. *Antholyzoides* (p. 53)
- 2b Tepals not as above and limb without prominent auriculate lobes at base; dorsal tepal arched, erect, or fully patent, never initially arched and later curving back; bracts (13–15–)16–50 mm long; plants often acaulescent or nearly so with spike borne close to ground level or sometimes below ground Section 1. *Teretifoliae* (p. 15)

KEYS TO SPECIES

Section 1. *Teretifoliae*

- 1a Flowers actinomorphic, tepals $\pm$ equal and spreading horizontally or almost so; stamens erect, symmetrically arranged around central style:
- 2a Flowers cream-coloured to pale yellow with brown to dull purple centre; leaves lanceolate to ovate; stamens 10–15 mm long; ovary hairy 2. *B. pygmaea*
- 2b Flowers violet with red centre and throat; leaves linear; stamens 18–20 mm long; ovary smooth 29. *B. radiata*
- 1b Flowers zygomorphic, tepals differentiated, with lower ones bearing contrasting markings and dorsal usually somewhat to much larger, often held apart, sometimes erect or recurving above; stamens arched or erect, unilateral with anthers parallel, rarely diverging, and facing lower tepals:
- 3a Leaves $\pm$ truncate with apex ragged and toothed:
- 4a Perianth tube funnel-shaped or cylindrical, widening towards throat, (18–)32–36 mm long:
- 5a Leaves and bracts softly long-hairy; leaf blades widest below apex; perianth tube $\pm$ 24 mm long; filaments straight; dorsal tepal erect to recurved 6. *B. lanata*
- 5b Leaves and bracts smooth, scabrid or rarely roughly hairy; leaf blades widest at apex; perianth tube 18–36 mm long; filaments arching beneath ascending dorsal tepal 20. *B. flabellifolia*
- 4b Perianth tube cylindrical for most of its length, 40–60 mm long:
- 6a Perianth tube sharply curved in upper 10 mm; plants of central Namaqualand 23. *B. pubescens*
- 6b Perianth tube straight or nearly so; plants of Bokkeveld Mountains, Cold Bokkeveld and western Karoo:
- 7a Tepals spreading horizontally, 18–22 $\times$ 3.5–5.0 mm; filaments 8–9 mm long 22. *B. praemorsa*
- 7b Tepals laxly ascending or spreading, straight or distally recurving, 26–32(–40) $\times$ 6–12 mm; filaments 15–18 mm long .. 21. *B. cuneata*
- 3b Leaves acute to attenuate, sometimes pungent, or $\pm$ obtuse:
- 8a Stem and spike axis not reaching ground level, flowers arising below ground; bracts $\pm$ dry, membranous:
- 9a Flowers shades of blue to violet with white markings on lower tepals; perianth tube 35–55(–70) mm long; dorsal tepal 30–50 mm long; filaments mostly 10–12 mm long; flowering mainly February to May 40. *B. bainesii*
- 9b Flowers shades of yellowish to buff (dry tepals often with broad purple median streak); perianth tube 30–40 mm long; dorsal tepal 24–40 mm long; filaments 15–18 mm long; flowering mainly July to September 39. *B. hypogaea*
- 8b Spike always above ground; stem reaching shortly to well above ground level; flowers always arising above ground; bracts usually green, sometimes with dry tips, sometimes $\pm$ dry:
- 10a Perianth tube 22–105 mm long, as long or up to three times as long as dorsal tepal:
- 11a Flowers pale pink, white or yellow, suffused with mauve or pink; lower tepals sometimes with purple, pink or red marks in lower half:
- 12a Leaves smooth or at most with few scattered long hairs, deeply pleated or terete and grooved:
- 13a Leaves $\pm$ terete and with narrow longitudinal grooves; perianth tube 70–75 mm long; tepals 16–24 mm long .. 37. *B. brachystachys*
- 13b Leaves lanceolate, deeply pleated, stiff and pungent; perianth tube $\pm$ 22 mm long; tepals $\pm$ 10 mm long 38. *B. lapeirousioides*
- 12b Leaves variously hairy, lanceolate to linear, plane or slightly pleated:
- 14a Leaves lanceolate; perianth tube 40–65 mm long, less than twice as long as dorsal tepal; tube flaring gradually from base:
- 15a Flowers white, sometimes suffused with mauve; anthers 9–11 mm long 30. *B. virginea*
- 15b Flowers yellow, sometimes suffused with mauve; anthers 7–8 mm long 27. *B. vanzijliae*
- 14b Leaves linear to lanceolate; perianth tube 60–90 mm long, two to three times as long as dorsal tepal, narrow and cylindrical in lower half, flared and narrowly funnel-shaped in upper third:
- 16a Perianth tube (45–)60–100 mm long, nearly straight and cylindrical, expanded in upper 5–7 mm; dorsal tepal 18–23 mm long, lower tepals 15–20 $\times$ 3–4 mm; filaments 13–16 mm long; anthers 4–5 mm long; style branches 3–4 mm long 36. *B. tubiflora*
- 16b Perianth tube 65–105 mm long, widening abruptly in upper 10–11 mm into a wide gullet; dorsal tepal 30–34 mm long, lower three tepals 18–23 $\times$ 8 mm; filaments 20–22 mm long; anthers 5–7 mm long; style branches $\pm$ 6 mm long 35. *B. tubulosa*
- 11b Flowers shades of red, blue to violet; lower lateral tepals with white or yellow markings often edged in darker blue, violet or red:
- 17a Flowers red with yellow markings on lower tepals and throat; filaments $\pm$ 40 mm long 34. *B. carminea*
- 17b Flowers shades of blue to violet with white to pale yellow splashes or streaks on lower lateral tepals; filaments 10–20 mm long:
- 18a Ovary hairy above base; filaments diverging above and anthers held widely apart; style dividing below anthers, branches 11–13 mm long 26. *B. geniculata*
- 18b Ovary smooth; filaments and anthers parallel and contiguous; style dividing opposite anthers or above them, branches 3–6 mm long:
- 19a Leaves minutely hairy or almost hairless, with sparse, scattered silky hairs on margins; blade loosely coiled in upper half and tips often recurved; plants of southern Namibia 16. *B. longicollis*
- 19b Leaves velvety, usually without scattered silky hairs on margins; blade $\pm$ plane, straight or rotated for entire length; plants of South Africa:
- 20a Leaves with prominent fibrous veins and margins (turning yellow on drying), hairless; leaf tips hard and pungent 32. *B. dregei*

- 20b Leaves lacking prominent fibrous veins and margins, scabrid to velvety or long-hairy; leaf tips not or only rarely pungent:
- 21a Perianth tube 25–45 mm long; dorsal tepal $\pm$ as long as tube:
- 22a Leaves oblong-lanceolate, upright, subacute, soft-textured and weakly pleated; flowering June to July 5. *B. pauciflora*
- 22b Leaves sword-shaped, rarely linear, often inclined toward ground, firm-textured and distinctly pleated; flowering (late July–)August 24. *B. attenuata*
- 21b Perianth tube (30–)40–70 mm long; dorsal tepal $\pm$ as long to 3 times as long as tube:
- 23a Perianth tube slightly to sharply curved below throat; bract of lowermost flower never with blade-like, leafy tip; tepals unequal, dorsal one 23–33 mm long:
- 24a Leaves usually arching toward ground, conspicuously hairy; perianth tube 36–43 mm long; dorsal tepal 20–23 mm long. 25. *B. curviscapa*
- 24b Leaves erect, sparsely short-hairy; perianth tube 60–70 mm long; dorsal tepal 23–33 mm long 33. *B. framesii*
- 23b Perianth tube straight or nearly so, not curved below throat; bract of lowermost flower with a blade-like, leafy tip; tepals nearly equal, dorsal (25–)30–45 mm long:
- 25a Flower bilabiate; lower tepals joined to upper laterals for 3–5 mm and to one another for $\pm$ 2 mm; dorsal tepal 35–43 mm long 31. *B. rigidifolia*
- 25b Flower not noticeably bilabiate; lower tepals not joined to upper laterals for any distance; dorsal tepal 25–35 mm long 28. *B. sambucina*
- 10b Perianth tube 12–30 mm long; dorsal tepal slightly longer to twice as long as tube:
- 26a Flowers magenta-pink, pale yellow on lower tepals (but see *B. nana*):
- 27a Leaf blades narrowly sword-shaped, borne on slender pseudopetioles; stem slightly retrorse-hairy; ovary rarely minutely hairy on ribs, or smooth 4. *B. pilosa*
- 27b Leaf blades ovate to oblong, borne directly on sheaths and at nearly right angles to them, conspicuously long-hairy; stem densely long-hairy; ovary always smooth 3. *B. rubella*
- 26b Flowers variously coloured, but not predominantly magenta-pink and yellow (but see *B. nana*):
- 28a Leaf margins undulate or crisped, and/or blade loosely coiled above middle:
- 29a Leaf blades broadly ovate, 30–40 $\times$ 20–25 mm, held at right angles to sheaths 17. *B. cinnamomea*
- 29b Leaf blades linear to sword-shaped, 3–12 mm wide, erect or falcate:
- 30a Flowers pale yellow sometimes flushed mauve; lower tepals yellow with paler edges; perianth tube (18–)25–50 mm long 27. *B. vanzijliae*
- 30b Flowers blue to violet or pink to magenta; lower tepals marked white to yellow:
- 31a Leaf blades 3–6 mm wide, with prominent central vein, margins undulate and crisped; bracts mostly 28–30 mm long 10. *B. crispa*
- 31b Leaf blades $>$ 6 mm wide with two or more main veins, margins plane or undulate, rarely somewhat crisped; bracts mostly 17–27 mm long:
- 32a Leaf blades slightly undulate, occasionally crisped in lower part, often twisted above; flowers blue to mauve; bracts sparsely hairy, mostly 17–20 mm long 14. *B. torta*
- 32b Leaf blades with margins plane, loosely coiled in upper half; flowers pale mauve to whitish; bracts smooth, 17–27 mm long 15. *B. namaquensis*
- 28b Leaf margins plane, blades $\pm$ flat, sometimes twisted from base:
- 33a Corm tunics not forming collar or rarely with short and sparse collar enclosing only below-ground portion of stem; lower leaf axils bearing cormlets below ground:
- 34a Flowers large; dorsal tepal 45–50 mm long; filaments $\pm$ 10 mm long 7. *B. grandiflora*
- 34b Flower medium to large but dorsal tepal 25–40 mm long; filaments mostly 12–17 mm long:
- 35a Perianth tube 12–17 mm long; tepals 25–30 mm long 1. *B. nana*
- 35b Perianth tube 22–30 mm long; tepals 33–40 mm long 9. *B. confusa*
- 33b Corm tunics forming well-developed collar enclosing stem below ground; underground cormlets not visible:
- 36a Anthers 7–9 mm long; ovary densely hairy above base 8. *B. cedarbergensis*
- 36b Anthers 5–9 mm long; ovary smooth:
- 37a Perianth tube $\pm$ 14 mm long 12. *B. tanquana*
- 37b Perianth tube 20–35 mm long:
- 38a Leaf blades lanceolate to linear, mostly 3–12 mm wide, erect or suberect:
- 39a Leaves short-hairy or puberulous, more than twice as long as spike; filaments 10–11 mm long; flowers blue to violet 13. *B. karoocia*
- 39b Leaves softly long-hairy, about as long as spike and mostly 3–6 mm wide, pleated at base; filament 15–17 mm long; flowers yellowish to reddish mauve 11. *B. minuta*
- 38b Leaf blades broadly lanceolate to more or less ovate, at least 13 mm wide, extended nearly horizontally, shallowly pleated along entire length:
- 40a Flowers lilac; inner tepals pale yellow, edged lilac or entirely yellow; leaf blades 30–40 $\times$ 13 mm, smooth or upper margin sparsely long-hairy; perianth tube $\pm$ 25 mm long 18. *B. horizontalis*
- 40b Flower greenish to grey-blue; leaf blades (40–)70–100 $\times$ 18–25 mm, scabrid on veins and margins; perianth tube 20–22 mm long 19. *B. gariensis*

Section 2. Antholyzoides

- 1a Flowers red; dorsal tepal erect, twice to three times as long as lower tepals, with margins curving inward; filaments 35–60 mm long, enclosed by dorsal tepal:
- 2a Dorsal tepal 25–50 mm long, tubular below; main axis of spike sterile, flowers borne on lateral branch near ground; leaves smooth 51. *B. ringens*
- 2b Dorsal tepal 15–20 mm long, not tubular below; main axis fertile with several side branches borne well above ground; leaves finely velvety 50. *B. thunbergii*
- 1b Flowers variously coloured, but never red; dorsal tepal as long to 1.5 times as long as lower tepals and $\pm$ plane; filaments mostly 6–20 mm long:
- 3a Stem and/or bracts hairy, hispid or velvety, at least above:
- 4a Leaf blades oblong, held nearly at right angles to sheath and stem, at least 12 mm wide and with 3 or 4 prominent veins; bracts sparsely hairy 43. *B. lewisiana*
- 4b Leaf blades narrowly lanceolate or linear, blade not markedly oblique to sheaths and stem, mostly 8 mm wide; bracts minutely scabrid or smooth:

- 5a Bracts 8–10 mm long; anthers $\pm$ 4 mm long; leaves twisted to loosely coiled in upper half 41. *B. spiralis*
 5b Bracts mostly 14–20 mm long; anthers $\pm$ 6 mm long; leaves sword-shaped, not coiled above 42. *B. stenomera*
 3b Stem and bracts smooth or largely so:
 6a Leaf margins strongly undulate and crisped; cataphylls and leaf sheaths cobwebby or woolly:
 7a Anthers cohering; leaf margins and sheaths bearing scattered long hairs; lower lateral tepal limbs without auriculate lobes 45. *B. sinuata*
 7b Anthers free; leaves without hairs; lower lateral tepal limbs with prominent auriculate lobes at base 46. *B. striata*
 6b Leaf margins not strongly undulate and never crisped; cataphylls and leaf sheaths sometimes cobwebby to woolly:
 8a Bracts 12–20 mm long, hairless or sparsely hairy; flowers borne in erect or inclined spikes; sheaths and cataphylls cobwebby to woolly:
 9a Leaf blades ascending, narrowly lanceolate or linear, blade not markedly oblique to sheaths and stem, mostly < 5 mm wide, loosely twisted in upper half 44. *B. fimbriata*
 9b Leaf blades borne obliquely to sheaths and stem, mostly > 5 mm wide, hardly twisted in upper half, margins plane or slightly undulate 47. *B. planifolia*
 8b Bracts 4–7 mm long, hairless; flowers borne in horizontal spikes; sheaths and cataphylls smooth, not cobwebby to woolly:
 10a Leaf blades ascending, not held markedly oblique to sheaths, narrowly lanceolate to linear, loosely twisted for entire length 48. *B. lobata*
 10b Leaf blades held nearly at right angles to sheaths, oblong to lanceolate, twisted distally and becoming erect 49. *B. tritonioides*

Section 3. *Babiana*

- 1a Bracts entirely dry at flowering; outer bract always smooth (series *Scariosae*):
 2a Outer bract firm and solid in texture, tricuspidate with long central cusp 57. *B. secunda*
 2b Outer bract dry-membranous and translucent, clear or brownish, long-attenuate:
 3a Flowers actinomorphic with stamens erect and symmetrically arranged around style; plants acaulescent or stem reaching just above ground 73. *B. papyracea*
 3b Flowers zygomorphic with stamens unilateral and arcuate, and perianth bilabiate; plants with well-developed aerial stem:
 4a Perianth tube shorter than tepals, 12–20 mm long; flowers blue to mauve with white or cream-coloured to pale yellow markings on lower tepals 71. *B. scariosa*
 4b Perianth tube longer than tepals, 35–45 mm long; flowers cream-coloured or lilac with red to purple markings on lower tepals 72. *B. spathacea*
 1b Bracts green in lower half or almost entirely, tips often dry and rust-brown, occasionally somewhat attenuate; outer bract usually scabrid to hairy:
 5a Tepals equal or subequal, symmetrically arranged and spreading with dorsal tepal not differentiated from others in size or coloration; all tepals similarly marked; stamens symmetrically or asymmetrically arranged:
 6a Tepals bicoloured deep blue with dark red base; anthers reddish brown, linear, < 1 mm wide:
 7a Stamens unilateral, facing base of spike; style dividing opposite middle of anthers, branches widening into broad, glossy, flattened stigmas; tepals narrowed below 78. *B. rubrocyanea*
 7b Stamens symmetrically arranged in centre of flower, enclosing style; style dividing below anthers, branches filiform with apices not or barely expanded; tepals not narrowed below 80. *B. regia*
 6b Tepals either uniformly pink, red, purple, pale to dark blue, violet or mauve, or darker blue at bases and sometimes white in throat; anthers white, cream-coloured or blue to blackish, linear or arrow-shaped:
 8a Anthers dark blue to blackish, either linear and < 1.5 mm wide, or arrow-shaped with broad connective tapering to apex and 2–4 mm wide:
 9a Flowers shades of pale to mid-blue or mauve, usually darker in centre; perianth salver-shaped with tepals narrowed into claws below; stem erect or nearly so 87. *B. melanops*
 9b Flowers shades of scarlet, purple or mauve-pink; perianth shallowly bowl-shaped; stem usually strongly arching outward 88. *B. villosa*
 8b Anthers white to cream-coloured, pale blue or turquoise, linear and < 1 mm wide:
 10a Bracts entirely green; leaf blades borne obliquely from stem; filaments $\pm$ 10 mm long 83. *B. foliosa*
 10b Bracts brown and scarious at apices; leaf blades not notably oblique:
 11a Filaments 7–9 mm long, and anthers well exerted from perianth tube; anthers and pollen white to pale yellow; flowers with darker centre 79. *B. leipoldtii*
 11b Filaments 3.5–8.0 mm long, and anthers partly included within perianth tube; pollen mauve, blue or cream-coloured; flowers uniformly coloured or with white throat sometimes edged with dark pigment:
 12a Flowers mauve to white; tepals oblong to obovate, 8–13 mm wide; style dividing between base and lower half of anthers 81. *B. villosula*
 12b Flowers pink; tepals obovate to suborbicular, 14–20 mm wide; style dividing below anthers 82. *B. blanda*
 5b Tepals subequal or unequal, but flower zygomorphic with unilateral stamens and dorsal tepal usually differentiated, often erect or arching over lower three; tepals opposite, dorsal one with contrasting markings:
 13a Ovary smooth or thinly hairy, sometimes only on ribs:
 14a Underground part of stem without collar of fibres (or collar poorly developed); corm tunics of reticulate or netted fibres; stem reaching shortly or not at all above ground:
 15a Leaf blades inclined toward ground, minutely hairy or evidently smooth; blades hardly pleated, usually borne on slender, terete pseudopetioles up to 40 mm long 56. *B. petiolata*
 15b Leaf blades suberect, usually obviously hairy; blades prominently pleated, borne directly on sheaths 55. *B. ambigua*
 14b Underground part of stem with well-developed collar of dry fibres; corm tunics of $\pm$ matted fibres not obviously netted; stem aerial or mostly underground:
 16a Stem usually well developed, mostly 150 to 250 mm high and usually branched several times; perianth tube $\pm$ as long as or longer than tepals, 25–30 mm long 52. *B. fourcadei*
 16b Stem often $\pm$ subterranean or extending above ground; perianth tube as long as or shorter than tepals, 10–20 mm long:
 17a Bracts not noticeably rust-brown at tips; inner bract with broad membranous margins; ovary thinly hairy above or only on ribs 66. *B. scabrifolia*
 17b Bracts with conspicuous rust-brown tips; ovary minutely hairy on ribs or smooth:
 18a Perianth tube 10–14 mm long; stamens equal; filaments 12–14 mm long; inner tepals widest at or near apices 53. *B. patula*
 18b Perianth tube 17–20 mm long; stamens unequal in length; filaments 7–10 mm long; inner tepals widest near middle 54. *B. montana*

- 13b Ovary hairy, often densely so:
- 19a Perianth tube 30–50 mm long, mostly 1.5 to 2 times as long as dorsal tepal but at least 10 mm longer:
- 20a Perianth uniformly pale yellow; perianth tube narrow below, wide and tubular above, 35–50 mm long; tepals 27–32 mm long; flowers strongly scented 70. *B. noctiflora*
- 20b Perianth in shades of violet to mauve with either white or dark red or purple markings on lower tepals; perianth tube slender, widening slightly in upper half; flowers unscented:
- 21a Aerial stem produced shortly above ground; spike horizontal 60. *B. engysiphon*
- 21b Aerial stem produced well above ground; spike erect or slightly inclined:
- 22a Spike $\pm$ erect; perianth tube 35–47 mm long; tepals acute; outer bracts attenuate, 14–40 mm long; style branches slender 68. *B. ecklonii*
- 22b Stem arching outward above and spike inclined; perianth tube 30–40 mm long; tepals obtuse (or obtuse-apiculate); outer bracts $\pm$ truncate, 10–30 mm long; style branches orbicular at tips and noticeably ciliate 67. *B. latifolia*
- 19b Perianth tube shorter to $\pm$ as long as dorsal tepal, or if longer then < 32 mm long and < 8 mm longer than dorsal:
- 23a Flowers inverted, in shades of blue or violet, inclined on spike; perianth tube recurved, dorsal tepal abaxial and $\pm$ horizontal, lower tepals suberect:
- 24a Tepals overlapping, forming a cup, subequal, dorsal one not held apart, 20–22 mm long; filaments 8–10 mm long . . . 76. *B. angustifolia*
- 24b Tepals not forming a cup, dorsal one held apart from others, 22–24 mm long; filaments 12–15 mm long 77. *B. inclinata*
- 23b Flowers not inverted, in various colours, blue to violet, purple, red, cream-coloured, white or yellow; perianth tube straight or arching forward and dorsal tepal erect or arching toward spike apex:
- 25a Anthers ovate or arrow-shaped, connective expanded below:
- 26a Perianth tube 10–18 mm long and shorter than, to as long as, dorsal tepal; style dividing below or opposite anther bases 84. *B. stricta*
- 26b Perianth tube 18–30 mm long and $\pm$ as long as, to slightly longer than, dorsal tepal; style dividing opposite upper half of anthers:
- 27a Flowers pink to reddish purple; perianth tube as long as or slightly longer than tepals, straight; anthers 6–8 mm long 85. *B. purpurea*
- 27b Flowers in shades of cream, mauve or pale blue; perianth tube ± 1.5 times longer than tepals, curved near apex; anthers 4–5 mm long 86. *B. patersoniae*
- 25b Anthers $\pm$ linear, connective not expanded below:
- 28a Perianth tube at least 18 mm long and $\pm$ as long as, or longer than, dorsal tepal:
- 29a Leaves strongly pleated, $\pm$ smooth or minutely hairy; dorsal tepal ± 32 mm long; style dividing below base of anthers 65. *B. arenicola*
- 29b Leaves slightly pleated, hairy throughout; dorsal tepal 18–30 mm long; style dividing between base and apex of anthers:
- 30a Dorsal tepal 22–26 mm long; perianth tube 25–30 mm long 75. *B. longiflora*
- 30b Dorsal tepal 18–22 mm long; perianth tube 18–20 mm long 74. *B. fragrans*
- 28b Perianth tube 10–15(–25) mm long and half to nearly as long as dorsal tepal:
- 31a Flowers pale yellow, rarely pale mauve; lower tepals deep yellow, highly fragrant; perianth tube 10–14(–15) mm long:
- 32a Plants with well-developed, ascending to suberect aerial stem; bracts 6–8 mm long 62. *B. unguiculata*
- 32b Plants with stem extending shortly above ground and strongly inclined to horizontal; bracts 15–25 mm long . . . 69. *B. odorata*
- 31b Flowers blue to mauve with yellow markings on lower tepals, weakly scented or unscented; perianth tube 9–25 mm long:
- 33a Plants flowering May to June rarely after mid-July; aerial stem short, seldom reaching > 50 mm above ground; leaf blades lanceolate to ovate, spreading horizontally or at 45° :
- 34a Leaves lanceolate, held at 45° , usually slightly coiled at tips; perianth tube 12–14 mm long and dorsal tepal 28–30 mm long 63. *B. toximontana*
- 34b Leaves ovate, held $\pm$ at right angles to sheaths, never coiled; perianth tube ± 9 mm long and dorsal tepal ± 23 mm long 64. *B. salteri*
- 33b Plants flowering (late July–)August to October; aerial stem short or well developed; leaf blades linear to lanceolate, ascending to erect:
- 35a Leaves narrow, deeply pleated, often rigid and almost pungent, mostly 2–8 mm wide; bracts 7–12 mm long; perianth tube 8–15 mm long 59. *B. lineolata*
- 35b Leaves lanceolate, relatively firm but not rigid or pungent, shallowly to deeply pleated, mostly 8–20 mm wide; bracts 15–25 mm long; perianth tube (12–)15–18(–25) mm long:
- 36a Lower lateral tepals clawed and with prominent auriculate lobes at base of limb; inner bract forked in upper half to two thirds and membranous in lower midline 61. *B. auriculata*
- 36b Lower lateral tepals not noticeably clawed and without auriculate lobes at base of limb; inner bract divided to base 58. *B. mucronata*

1. SECTION TERETIFOLIEAE

1. Section **Teretifolieae** *G.J.Lewis* in Journal of South African Botany, Suppl. 3: 125 (1959), emend. Goldblatt & J.C.Manning. Type: *B. brachystachys* (Baker) Ker Gawl.

Stem often mostly or entirely underground; spike suberect to decumbent and borne shortly above, or sometimes shortly below ground level; bracts usually green, fairly large, slightly hairy, dry and pale brown at tips, inner forked apically or to $\pm$ middle. *Flowers* usually zygomorphic, rarely actinomorphic, usually in shades of blue to mauve, occasionally white to pink, or yellow; perianth tube short or elongate; tepals not or scarcely clawed and dorsal not widely separated from others;

anthers oblong-linear, without expanded connective. *Ovary* usually smooth, rarely sparsely hairy throughout or on ribs.

Species no. 1–40, occurring over the entire range of the genus, from the southwestern Cape, South Africa, to northern Namibia, Zimbabwe and Zambia.

As defined by Lewis (1959), section *Teretifolieae* included only the specialized *Babiana brachystachys*, which not only has $\pm$ terete leaves but whitish to pink flowers with an elongate perianth tube. The sectional name is, however, the only one available at this rank for the large group of species with inner bracts divided apically or to $\pm$ the middle, and a stem produced shortly above the ground or entirely subterranean, a suberect to

decumbent spike, and, with few exceptions, a smooth ovary. The name is unfortunately inappropriate for the section in the expanded sense, for only *B. brachystachys*, the type, has $\pm$ terete leaves. We divide the 40 species of the section into three series: series *Brevitubae* for species with leaf apices acute and flowers with a perianth tube shorter than, to as long as, the dorsal tepal; series *Cuneifoliae* for species with leaves abruptly truncate; and series *Longitubae* for species with leaf apices acute and the perianth tube as long as, to twice as long as, the tepals.

Series 1.1 *Brevitubae*

Flowers zygomorphic or actinomorphic (*B. pygmaea*, *B. radiata*); perianth tube $\frac{1}{3}$ to $\frac{2}{3}$ as long as dorsal tepal, obliquely funnel-shaped or straight, slender, only slightly expanded at apex when flower radially symmetric.

1. *Babiana nana* (Andrews) Spreng., Systema vegetabilium 1: 156 (1825); G.J.Lewis: 77 (1959).

Gladiolus nanus Andrews: t. 137 (1801). Type: South Africa, without precise locality or collector, illustration in Andrews in The botanist's repository 3: t. 137 (1801).

Plants 60–150(–250) mm high; stem mostly underground, often 1- or 2-branched. *Leaves* ovate to narrowly lanceolate to almost linear, 15–35 mm wide (subsp. *nana*) or 5–15 mm wide (subsp. *maculata*), densely soft-hairy, moderately to slightly pleated, suberect or held almost at right angles to sheaths. *Bracts* green, densely hairy, 16–30 mm long, inner slightly shorter than outer and forked apically. *Flowers* zygomorphic, 2–6 in a suberect to weakly inclined spike, blue or violet, rarely pale pink, with white markings on lower lateral tepals, usually with a strong rose-violet scent; perianth tube obliquely funnel-shaped, 12–17 mm long; tepals subequal or upper three slightly larger, the dorsal 25–30 mm long, lower three tepals united for a short distance, 22–25 mm long. *Stamens* unilateral; filaments 10–14 mm long, arched, sometimes short-hairy at base; anthers 5.0–6.5 mm long. *Ovary* smooth (rarely short-hairy on ribs *fide* Lewis 1959); style usually dividing opposite or close to anther tips, branches 3(–5) mm long. *Flowering time*: mainly September, also in late August.

Distribution and ecology: Western Cape: extending from the Piketberg and Hopefield in the north to Mossel Bay in the southeast; sandy flats and dunes along the coast, rarely a short distance inland (Map 1).

The moderate-sized blue, violet, or sometimes purple to pink flowers marked with white or pale yellow on the lower tepals of *Babiana nana* are a striking sight in spring along the coast of Western Cape, and are rendered even more attractive at close range by their intense, rose-violet perfume. *Babiana nana* comes close to our concept of the ancestor of section *Teretifoliae*. It has the characteristics that we consider plesiomorphic for the section, based on outgroup comparison: green floral bracts becoming dry at the tips, inner bracts forked only near the tips, and a zygomorphic, bilabiate flower. In addition, it is one of relatively few members of the section that has an aerial (though short) stem that is often

branched. We also assume that it has the plesiomorphic flower for the genus, with a relatively short, funnel-shaped perianth tube, and blue perianth. A few other species of the section also have an aerial stem but appear specialized in their leaf morphology [*B. rubella* (No. 3), *B. pilosa* (No. 4)].

The nomenclatural confusion surrounding this common Western Cape *Babiana* was resolved by Lewis (1959) who included as synonyms, *B. pygmaea* sensu Baker and *B. sprengelii* Baker, the names used for this plant in *Flora capensis* (Baker 1896). Lewis recognized three varieties of *B. nana*: typical var. *nana* is the broad-leaved form common in deep sands along the coast north of Cape Town, whereas var. *angustifolia* included the narrow-leaved southern populations that extend from the Cape Peninsula east to Mossel Bay. We follow Lewis's treatment for these two taxa except that we treat them as subspecies. She recognized a third variety, var. *confusa*, for plants from the northwest of the range between the Berg River and the sandy flats between Lambert's Bay and the Heerenlogement Cave. These plants have larger flowers with a longer perianth tube (23–30 mm long) and anthers 8–9 mm long (versus a tube 12–17 mm long and anthers 5.0–6.5 mm long in *B. nana*). We regard this variety as a separate species with an underground, unbranched stem, and undulate to slightly twisted leaves, here called *B. confusa* (No. 9).

Babiana nana flowers relatively late in the season, mainly in September, whereas the superficially similar, but often fully acaulescent *B. ambigua* (No. 55), which is often confused with *B. nana*, blooms in the same habitat in late July and August. The two should not be confused, for *B. ambigua*, a typical member of section *Babiana*, has the inner floral bracts divided to the base, and also has narrowly sword-shaped or linear leaf blades like the southern *B. nana* subsp. *maculata*, and is quite different from the relatively broad, oblong or lanceolate, soft-textured leaf blades of *B. nana* subsp. *nana*. The flower of *B. nana* has a suberect dorsal tepal, whereas that of *B. ambigua* is arched over the stamens.

Lewis (1959) made a point of describing a series of hybrids between *Babiana nana* and *B. ambigua*, noting that these plants tended to obscure the distinction between these two otherwise quite separate species. The hybrids are intermediate between the parental species. We have not encountered hybrids ourselves and suspect that their importance was overemphasized by Lewis.

Key to subspecies

Plants with broad, ovate to broadly lanceolate leaves, 15–35 mm wide 1a. subsp. *nana*
Plants with narrow, sword-shaped to linear leaves, 6–12(–15) mm wide 1b. subsp. *maculata*

1a. subsp. *nana*

See Lewis (1959) for complete synonymy.

Plants with ovate to broadly lanceolate leaves, (15–)20–35 mm wide, held obliquely or sometimes $\pm$ at right angles

to sheaths, slightly pleated. *Flowers* in shades of blue to violet; perianth tube mostly 14–17 mm long; dorsal tepal mostly 25–30 mm long. *Flowering time*: late August and September.

Distribution and ecology: Western Cape: Saldanha to Milnerton; sandy coastal flats and dunes (Map 1).

As outlined above, subsp. *nana* is recognized by the broad leaves held obliquely to the sheaths and often $\pm$ horizontally. Flowering mainly in September, plants are often seen at the Hopefield and Darling wild flower shows where their form and wonderfully rich, violet-like scent can be admired comfortably. It is readily distinguished from the narrow-leaved subsp. *maculata* of the southern Cape coast.

1b. subsp. ***maculata*** (Klatt) Goldblatt & J.C. Manning, comb. et stat. nov.

B. maculata Klatt: 349 (Ergänzungen 15) (1882). *B. nana* var. *maculata* (Klatt) B. Nord.: 442 (1970). *B. angustifolia* Eckl.: 31 (1827), nom. nud. et hom. illeg., non *B. angustifolia* Sweet (1827). *B. nana* var. *angustifolia* (Eckl.) G.J. Lewis: 80 (1959), nom. illeg. bas. illeg. Type: South Africa, [Western Cape], Cape Flats, Doornhoogte, without date, C.F. Ecklon & C.L. Zeyher, *Irid.* 124 (B, K, S, syn.).

B. angusta N.E.Br.: 467 (1932a). Type: South Africa, [Western Cape], Riversdale Division, August 1932, J. Muir 4851 (K, holo.).

Plants with lanceolate to sword-shaped leaves, 8–15 mm wide; blades ascending to suberect, slightly pleated, usually overtopping flowers. *Flowers* in shades of blue to violet; perianth tube 12–15 mm long, $\pm$ straight; dorsal tepal mostly 20–25 mm long. *Flowering time*: late August and September.

Distribution and ecology: Western Cape: Cape Peninsula to Mossel Bay; sandy coastal flats and dunes (Map 1).

The narrow-leaved populations of *Babiana nana* deserve recognition for the consistent difference in leaf

width and orientation, slightly smaller flowers, and for their largely separate range, but we prefer subspecies to varietal rank for this series of populations. The name of the taxon, called var. *angustifolia* by Lewis, becomes *B. nana* subsp. *maculata*. *Babiana nana* var. *angustifolia*, based on *B. angustifolia* Eckl. (1827), is both a *nomen nudum* and a homonym. As the basionym is illegitimate, combinations based on the name are also illegitimate. We choose the name *B. nana* subsp. *maculata* for the taxon at subspecific rank, a combination based on Klatt's *B. maculata*, the type of which is the same as that for Ecklon's invalid *B. angustifolia* (Nordenstam 1970).

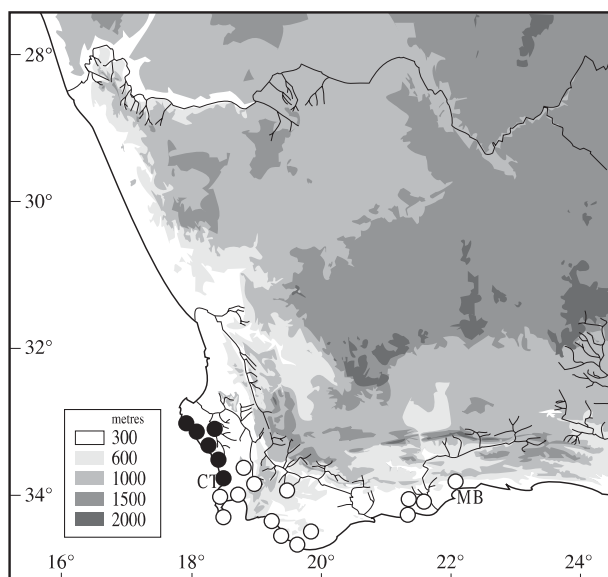
2. ***Babiana pygmaea*** (Burm.f.) Baker in *Journal of the Linnean Society, Botany* 16: 165 (1877), name misapplied to *B. nana*. Lewis: 32 (1959), as *B. pygmaea* (Burm.f.) N.E.Br. *Ixia pygmaea* Burm.f.: 1 (1768) (as *I. pigmaea*), syn. nov. Type: South Africa, without precise locality or collector (G–Herb. Burman, holo., not seen).

B. macrantha MacOwan: 394 (1890). Type: South Africa, [Western Cape], near Darling, October 1877, P. MacOwan sub *Herb. Norm. Austr. Afr.* 811 (SAM, holo.; B, K, P, iso.).

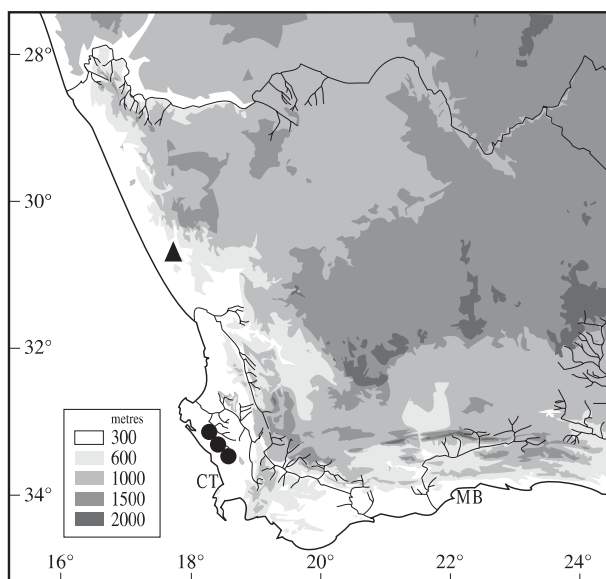
Plants up to $\pm$ 100 mm high; stem erect, rarely branched, velvety hairy. *Leaves* lanceolate, 6–20 mm wide, pleated, softly hairy, spreading almost at right angles to sheaths. *Bracts* 30–36 mm long, velvety hairy, inner bract shortly forked or divided to $\pm$ halfway, slightly shorter than the outer. *Flowers* actinomorphic, 2–5 in an erect spike, yellow with a dark brown to dull purplish centre, unscented, tepals spreading when fully open; perianth tube cylindric, slightly expanded at throat, 15–25 mm long; tepals subequal, spreading when fully open, obovate, 23–33 $\times$ 14–20 mm. *Stamens* symmetrically arranged; filaments partly included, 3–6 mm long, erect, enclosing style; anthers 8–10 mm long. *Ovary* hairy above or on ribs; style dividing opposite middle of anthers, branches rarely reaching anther tips. *Flowering time*: August to early September. Plate 1A.

Distribution and ecology: Western Cape: coastal forelands between Hopefield and Darling; sandy and gravelly flats and lower slopes (Map 2).

Included in section *Acaste* of *Babiana* by G.J. Lewis because of its actinomorphic flower and short, erect stamens, *B. pygmaea* seems to us misplaced in that section, other members of which have the inner bracts divided to the base. *B. pygmaea*, in contrast, has the inner bract forked apically or to $\pm$ the middle which, according to our classification, places it in section *Teretifoliae* rather than section *Babiana* where the other species of Lewis's section *Acaste* are now placed as series *Babiana*. Lewis followed Brown (1929) in treating *B. pygmaea* as a valid combination based on the 1768 name *Ixia pygmaea* Burm.f., dating from 1929. In fact, the combination in *Babiana* was made by J.G. Baker in 1877, although Baker misapplied the name to *B. nana*, and may not have even seen the type. Baker also changed Burman's original spelling *pigmaea* to *pygmaea*, a form followed by later authors. The 1890 name *B. macrantha* MacOwan used by Baker (1892, 1896) in his accounts of



MAP 1.—Distribution of *Babiana nana* subsp. *nana*, ●; *B. nana* subsp. *maculata*, ○.



MAP 2.—Distribution of *Babiana pygmaea*, ●; *B. rubella*, ▲.

southern African Iridaceae for what is now *B. pygmaea*, thus falls into synonymy. Neither Baker nor MacOwan seem to have been aware of the true identity of Burman fil.'s *Ixia pygmaea*.

The general aspect of *Babiana pygmaea* suggests an affinity with the *B. nana* group of species of section *Teretifoliae*, which have a similar vegetative morphology but conventional zygomorphic, $\pm$ bilabiate blue to violet or purple flowers with the lower lateral tepals bearing nectar guides. One aspect of *B. pygmaea* that does not entirely accord with section *Teretifoliae* is the short, erect aerial stem and erect, rather than inflexed or decumbent spike. We suspect that this latter feature is associated with the actinomorphic flower, which is best displayed on an upright stalk. The apparently related *B. nana* also has a short, suberect aerial stem and only slightly deflexed spike.

The bowl-shaped flowers of *Babiana pygmaea* are adapted for pollination by hopliine beetles (Goldblatt & Manning in press). The pale yellow flowers with a dark centre and absence of scent are typical of this pollination strategy (Goldblatt *et al.* 1998a, 2000; Steiner 1998).

Once relatively common, *Babiana pygmaea* has become increasingly rare in the last 20 years as its lowland habitat has become invaded by introduced *Acacia* species or reduced by expanding agriculture on the well-watered western coastal plain of Western Cape. Only a few small populations are now known in the Hopefield District west of Malmesbury.

3. *Babiana rubella* Goldblatt & J.C.Manning, sp. nov.

Plantae 100–120 mm altae; foliis laminis lanceolatis vel ovatis dense pubescentibus oblique ferentibus; bracteis dense pubescentibus 15–24 mm longis, bractee interiore furcata ad apicem vel in parte superiore; floribus bilabiatis odoratis pallide vel atrofroseis (caeruleis ubi siccis), tubo perianthii infundibuliformi 12–15 mm

longo, tepalis inaequalibus, tepalo dorsale 28–30 $\times$ 8–9 mm, tepalis inferioribus 23–25 mm longis, cremeis; filamentis $\pm$ 14 mm longis, antheris $\pm$ 4.5 mm longis pallide caeruleis; ovario glabro.

TYPE.—Northern Cape, 3017 (Hondeklipbaai): Namaqualand, $\pm$ 8 km north of Kotzesrus, road to Hardevlei, (–DD), 3 September 2001, P. Goldblatt & L.J. Porter 11825 (NBG, holo.; K, MO, PRE, US, iso.).

Plants 100–120 mm high; corm up to 30 mm diam., deep-seated, stem base with well-developed collar of fibres, extending above ground level and inclined, spike suberect to inclined, simple or with one branch, covered by leaf sheaths, densely long-hairy where exposed. Leaves broadly lanceolate to ovate, blade held obliquely or almost at right angles to short, broad imbricate leaf sheaths, slightly plicate, veins and margins densely long-hairy, hairs up to 4 mm long, sheaths hairy or almost hairless. Bracts 15–24 mm long, green, densely hairy, apices dry and rust-brown, inner $\pm$ as long as outer, forked apically or to $\pm$ middle, or transparent in upper mid-line. Flowers (2)3–6 per spike, bilabiate, pale to deep pinkish purple, lower lateral tepals yellow with pink tips, lightly rose-scented; perianth tube 12–15 mm long, $\pm$ half as long as tepals; dorsal tepal 28–30 $\times$ 8–9 mm, lower tepals joined to upper laterals for $\pm$ 5 mm and to one another for $\pm$ 3 mm, upper laterals $\pm$ 24 mm long, lower tepals 23–25 mm long, crisped along lower margins. Stamens unilateral; filaments arched, $\pm$ 14 mm long; anthers $\pm$ 4.5 mm long, pale bluish; pollen white. Ovary smooth, $\pm$ 3 mm long; style arching over stamens. Capsules and seeds unknown. Flowering time: August to early September. Figure 2.

Distribution and ecology: Northern Cape: southern coastal plain of Namaqualand north of Kotzesrus; local on sandy flats (Map 2).

Currently known only from a collection made by John Acocks in 1963 and the type gathering made at or close to the same site in 2001, *Babiana rubella* appears to be a narrow endemic of the coastal sandveld north of Kotzesrus in southern Namaqualand. It is distinctive in the densely long-hairy stem and leaves, the blades of which are short, oblong-ovate and held nearly horizontally to the sheaths, and the pink to pale purple perianth with pale yellow, lower lateral tepals. The flowers are of moderate size with a perianth tube 12–15 mm long, a dorsal tepal 28–30 mm long, and have a pleasant, sweet, rose-like scent.

Superficially *Babiana rubella* resembles a second Namaqualand endemic, *B. horizontalis* (No. 18), but this species has almost hairless leaves and bracts, leaf blades with prominently thickened veins and is virtually acaulescent, the stem rarely reaching above ground. While it is highly speculative to comment on the relationships of the apparently unspecialized *B. rubella*, we suggest that *B. nana* (No. 1), a species of coastal sandveld in Western Cape to the south, may be its closest ally. Both *B. nana* and *B. rubella* may have a branched aerial stem, suberect to weakly inclined spikes, and relatively short, broad leaves, often held nearly at right angles to the sheaths.



FIGURE 2.—*Babiana rubella*, Goldblatt & Porter 11825 (NBG). A, whole plant; B, front view of flower; C, flower l/s. Scale bar: 10 mm. Artist: John Manning.

Additional specimen examined

NORTHERN CAPE.—3017 (Hondeklipbaai): 4.8 miles NNW of Kotzesrus, (–DD), 19 August 1963, Acocks 23314 (NBG, PRE).

4. ***Babiana pilosa*** G.J.Lewis in Journal of South African Botany, Suppl. 3: 87 (1959). Type: South Africa, [Western Cape], 15 miles west of Nuwerus, 5 August 1956, H. Hall s.n. (Nat.Bot.Gard.414/56 in NBG, holo.).

Plants 100–150 mm high; stem erect, reaching some distance above ground level, usually unbranched, with retrorse hairs above, enclosed at base with thick collar of fibres. Leaves narrowly lanceolate, on long pseudopetioles, scarcely plicate, sparsely retrorse-hairy. Bracts green with dry rust-coloured tips, with short retrorse hairs, 20–30 mm long, inner slightly shorter than outer, forked apically and acuminate. Flowers zygomorphic, 2–5 in a second, decumbent spike, magenta-pink, lower

lateral tepals with pale yellow markings; perianth tube 15–18 mm long; tepals unequal, the dorsal 30–34 mm long, lower three tepals joined to upper laterals for $\pm$ 4 mm and forming a prominent lip, 20–28 mm long. *Stamens* unilateral; filaments $\pm$ 15 mm long; anthers $\pm$ 6 mm long. *Ovary* smooth, rarely sparsely hairy on ribs; style dividing opposite middle of anthers, branches $\pm$ 5 mm long. *Flowering time*: late July and August.

Distribution and ecology: Western Cape: southern Namaqualand, south and west of Nuwerus; stony hills, often on quartzite patches (Map 3).

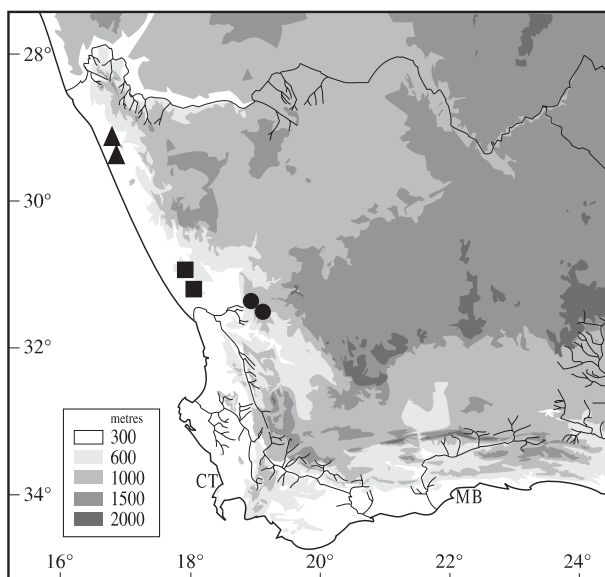
Since it was described by Lewis in 1959 from cultivated plants from a single gathering, *Babiana pilosa* has been collected several times in the area south and west of Nuwerus. These new collections closely resemble the type and confirm the distinctive feature of the species, namely the narrow leaves with a long pseudopetiole and the pale magenta-pink perianth. Both the stem and leaves bear slightly retrorse hairs, a feature rare in the genus. The flower colour is also unusual in *B. pilosa*, but is known in a few other species.

Collections made since *Babiana pilosa* was described, all from the same area near Komkans between Nuwerus and Lutzville in southern Namaqualand, are listed below.

Additional specimens examined

WESTERN CAPE.—3118 (Vanrhynsdorp): 2 miles S of Komkans, quartzite area, (–AA), 11 August 1962, *Nordenstam* 940 (M, NBG); Komkans, (–AA), 10 August 1962, *Hall* 2557 (NBG); road to Koekenaap, 14 miles SW of Nuwerus, (–AC), 28 July 1962, *Nordenstam* 827 (M, NBG).

5. *Babiana pauciflora* G.J.Lewis in *Journal of South African Botany*, Suppl. 3: 99 (1959). Type: South Africa, [Northern Cape], Farm Menzieskraal, between Nieuwoudtville and Botterkloof, June 1953, G.J. Lewis 2750 (SAM, holo.).



MAP 3.—Distribution of *Babiana pilosa*, ■; *B. pauciflora*, ●; *B. lanata*, ▲.

Plants up to 100 mm high; stem short, unbranched, inclined above ground level, enclosed basally by collar of fibres. *Leaves* oblong-lanceolate, slightly pleated at base, hairy on veins. *Bracts* 35–55 mm long, sparsely hairy above, green, inner $\pm$ as long as outer, forked apically, strongly 2-keeled. *Flowers* zygomorphic, 2–4 in a compact, suberect spike, violet, lower lateral tepals with bright yellow blotches outlined in lilac, sweetly rose-scented; perianth tube cylindrical below, funnel-shaped above, 35–45 mm long; tepals unequal, the dorsal 30–50 mm long, lower tepals joined basally for a short distance, 25–40 mm long. *Stamens* unilateral; filaments arched, 15 mm long; anthers 8 mm long. *Ovary* smooth; style dividing opposite anther apices, branches $\pm$ 4 mm long, tips expanded. *Flowering time*: June. Plate 1H.

Distribution and ecology: Northern Cape: on the Bokkeveld Escarpment; damp, stony, clay flats (Map 3).

Flowering in midwinter, in June, *Babiana pauciflora* is a poorly understood species of the Bokkeveld Plateau. Despite the few collections known, it is quite common on the stony clay flats south of Nieuwoudtville along the road to Botterkloof. The large green bracts, 35–55 mm long, the inner forked apically, place the species in our section *Teretifoliae* but the species lacks any obvious specializations that would help determine its possible relationships. The perianth tube is $\pm$ as long or slightly longer than the dorsal tepal, suggesting a possible relationship with the yellow-flowered *B. vanzijliae* (No. 27), also from the Bokkeveld Plateau, but which flowers later, in August and September, whereas *B. pauciflora* flowers in June, soon after the first winter rains have fallen. Its early flowering habit is probably the reason it has so rarely been collected.

Additional specimens examined

NORTHERN CAPE.—3119 (Calvinia): Papkuilsfontein, 100 m north of turnoff to farm on Nieuwoudtville–Botterkloof road, damp clay flats, (–AC), 6 June 2005, *Manning* 2947 (MO, NBG).

6. *Babiana lanata* Goldblatt & J.C.Manning, sp. nov.

Plantae 50–90 mm altae; foliis laminis lanceolatis vel ovatis dense pubescentibus per oblique dispositis; bracteis dense pilosis 12–16 mm longis, bractea interiore ad apicem furcata; floribus tepalis superioribus flavis vel marroninis marginibus cremeis, tepalis inferioribus purpureis in medio striatis, tubo perianthii anguste infundibuliformi $\pm$ 24 mm longo, tepalis subaequalibus, lanceolatis, tepalo dorsale $\pm$ 17 $\times$ 5 mm, tepalis inferioribus 15–25 mm longis; filamentis $\pm$ 14 mm longis, antheris $\pm$ 5 mm longis, flavis; ovario glabro.

TYPE.—Northern Cape, 2917 (Springbok): Namaqualand coast near Kleinsee, (–CA), 2 August 2001, G.D. Duncan 447 (NBG, holo.).

Plants 50–90 mm high; corm up to 20 mm diam., deep-seated; stem erect, simple or 1-branched, reaching shortly above ground level, enclosed at base by well-developed collar of fibres; spike suberect, long-hairy. *Leaves* 3–6, broadly lanceolate to ovate, 2–3 mm long, blade held very obliquely to overlapping leaf sheaths,

slightly plicate, apex truncate, veins drawn into short teeth, with long silky hairs up to 3 mm long on veins and margins. *Bracts* 12–16 mm long, green, silky-hairy, inner $\pm$ as long as outer, forked apically, membranous in midline. *Flowers* 3–5 per spike, upper three tepals yellow or maroon with yellow margins, lower three tepals pale yellow with pale median maroon streak, presence of scent unknown; perianth tube narrowly funnel-shaped, $\pm$ 24 mm long; tepals spreading, lanceolate, the dorsal $\pm$ 17 $\times$ 5 mm, lower tepals 15–25 mm long, channelled below. *Stamens* unilateral; filaments $\pm$ 14 mm long; anthers $\pm$ 5 mm, yellow; pollen yellow. *Ovary* smooth; style dividing opposite middle of anthers, branches $\pm$ 3 mm long. *Capsules* globose, $\pm$ 6 mm long. *Seeds* unknown. *Flowering time*: July and August.

Distribution and ecology: Northern Cape: on the northern Namaqualand coastal plain from Kleinsee to the southern Richtersveld; stony red sand (Map 3).

First collected in 2001 by Cape Town horticulturist, Graham Duncan, curator of the bulb collection at Kirstenbosch National Botanical Garden, *Babiana lanata* remains known from limited material. Nevertheless, the leaf morphology is distinctive and this, associated with the long silky vestiture of the leaves, spike axis and bracts, leave no doubt that the plant represents an undescribed species. The leaves, truncate and serrate and widest at $\pm$ the middle, recall those of *B. flabellifolia* (No. 20) and its immediate allies. We doubt, however, that *B. lanata* is related to this group of species, which always has fairly large, blue to mauve or purple flowers, less conspicuous vestiture, and leaves more obviously truncate, usually widest at the apex, rather than widest well below the apex.

The flowers of *Babiana lanata* are relatively small despite the $\pm$ 24 mm long tube. The dorsal tepal is $\pm$ 17 mm long and the lower tepals are only slightly smaller. The upper three tepals are pale yellow or maroon with yellow edges, an unusual colour for the genus, whereas the lower tepals are pale cream-yellow with a pale maroon central streak. We suspect that the flowers are scented but this is not known. The long silky pubescence and leaf blades set obliquely to the sheaths recall *B. rubella* (No. 3), also from coastal Namaqualand, but that species is readily distinguished by its magenta-pink perianth, hooded dorsal tepal and acute leaf tips.

Additional specimens examined

NORTHERN CAPE.—2917 (Springbok): Richtersveld, hills NE of Port Nolloth, (–AA), August 2003, *Le Roux s.n.* (NBG, photo. only); Kleinsee Diamond Mine, 4 km NW of Kleinsee town, $\pm$ 1 km from sea in succulent karroid bush, among rocks and sand, (–CA), 2 September 2004, *Van Jaarsveld & Kruger 19207* (NBG).

7. *Babiana grandiflora* Goldblatt & J.C.Manning, sp. nov.

Plantae 80–140 mm altae, acaulescentes; foliis lanceolato-ensiformibus leviter tortuosis, pubescentibus; bracteis 24–35 mm longis, bractea interiore ad apicem furcata; floribus in spicam decumbentem 2- ad 5-floram dispositis, zygomorphis, pallide vel atro-caerulescentibus; tepalis inferioribus lateralibus notis albo-cremeis valde odoratis, tubo perianthii infundibuliformi 18–20

mm longo, tepalis inaequalibus, tepalo dorsale 45–55 $\times$ $\pm$ 13 mm, tepalis inferioribus labriformibus superioribus lateralibus $\pm$ 35 mm longis; filamentis arcuatis $\pm$ 10 mm longis, antheris 8–9 mm longis pallide caeruleis; ovario glabro.

TYPE.—South Africa, Northern Cape, 3017 (Hondeklipbaai): 3.5 km east of Kotzesrus on the road to Garies, (–DD), 3 September 2001, *P. Goldblatt & L.J. Porter 11823* (NBG, holo.; K, MO, PRE, iso.).

Plants 80–140 mm high including leaves, acaulescent, or stem reaching shortly above ground level, densely hairy, occasionally with 1 or 2 branches. *Leaves* lanceolate to sword-shaped, 6–11(–15) mm wide, slightly twisted, short-velvety. *Bracts* 24–35 mm long, green with dry brown tips, velvety, inner often slightly longer than outer, forked apically. *Flowers* zygomorphic, 2–5 in a decumbent spike, pale to deep blue with markings, strongly spicy, acrid-scented with undertones of violet; perianth tube funnel-shaped, 18–20 mm long, lower part $\pm$ 12 mm long, thick-walled and blocked in lower half; tepals lanceolate, dorsal one 45–55 $\times$ 13 mm, margins undulate, upper laterals joined to lower three tepals for $\pm$ 8 mm, lower tepals joined for $\pm$ 4 mm, $\pm$ 35 mm long. *Stamens* unilateral; filaments arched, $\pm$ 10 mm long, hairy at base, shortly exerted from upper part of tube; anthers 8–9 mm long, pale bluish; pollen off-white. *Ovary* smooth; style arching over stamens. *Capsules* and *seeds* unknown. *Flowering time*: late July to early September. Figure 3.

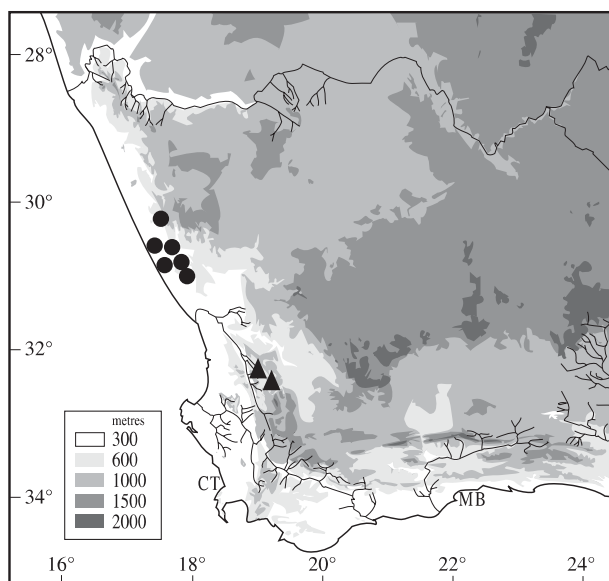
Distribution and ecology: Northern and Western Cape: on the Namaqualand coastal plain between Soutfontein south of Wallekraal and Koekenaap; sandy flats (Map 4).

As far as we know, *Babiana grandiflora* was first collected in 1962 by the Swedish botanist, Bertil Nordenstam. The species belongs to section *Teretifoliae*, which comprises species with apically forked inner bracts, a $\pm$ underground flowering stem, and a hairless ovary. It may be most closely allied to the Western Cape coastal *B. nana* (No. 1), but is easily distinguished from that species by the narrow, erect leaves with short, velvety pubescence and the mostly unbranched spikes borne at ground level and bearing 2–5 flowers. It has in the past been confused with the widespread *B. ambigua* (No. 55) of deep sands in coastal and inland sites in Western Cape, but although *B. grandiflora* resembles that species superficially, *B. ambigua* has the inner bracts divided to the base and smaller flowers with the dorsal tepal 28–40 mm long (versus 45–55 mm in *B. grandiflora*).

Babiana grandiflora can be distinguished mainly by its large flower, the perianth tube, 18–20 mm long, and the dorsal tepal 45–55 mm long. The flowers have a strong odour of violets mixed with a spicy, acrid scent, which is common in the genus. Despite the large flowers, the stamens are disproportionately short, with the filaments only $\pm$ 10 mm long, so that the anthers are held within the floral cup and largely hidden from view inside the funnel-shaped perianth. *Babiana ambigua*, with smaller flowers, has filaments 13–16 mm long. We suspect that the two are not closely related and we regard them as belonging to different sections of the genus.



FIGURE 3.—*Babiana grandiflora*, Goldblatt & Porter 11823 (NBG). A, whole plant; B, flower l/s. Scale bar: 10 mm. Artist: John Manning.



MAP 4.—Distribution of *Babiana grandiflora*, ●; *B. cedarbergensis*, ▲.

Additional specimens examined

NORTHERN CAPE.—3017 (Hondekliptaai): Farm Soutfontein on Soutfontein-Sabies road, (–BB), 9 September 1981, *Van Berkel* 435 (NBG); Farm Waterval, west of Kotzesrus, (–DC), 28 August 2001, *Goldblatt & Porter* 11773 (MO); 8 km N of Kotzesrus, (–DD), 3 September 2001, *Goldblatt & Porter* 11826 (K, MO, NBG, PRE).

WESTERN CAPE.—3118 (Vanrhynsdorp): 17 miles SW of Nuwerus, road to Koekenaap, sandy soil, (–AD), 28 July 1962, *Nordenstam* 826 (NBG, S).

8. *Babiana cedarbergensis* G.J.Lewis in *Journal of South African Botany*, Suppl. 3: 82 (1959). Type: South Africa, [Western Cape], 3220 (Wuppertal): Cederberg, flats near Bushman's Cave, (–AC), 23 September 1930, *J.A. Lamb s.n.* (*Nat.Bot.Gard.*1613/30 in BOL, holo.; K, iso.).

Plants 40–60 mm high; stem with collar of thick fibres around base, mostly underground. *Leaves* sword-shaped, 40–60 mm long, rigid, almost pungent, pleated, velvety hairy. *Bracts* 18–25 mm long, green, sometimes with a minute brown mucro, inner slightly shorter than outer, forked in upper third, with membranous margins. *Flowers* zygomorphic, 2–5 in a decumbent spike, pale to deep violet with white markings outlined in dark blue on lower lateral tepals, slightly musk-scented; perianth tube obliquely funnel-shaped, 16–18 mm long; tepals unequal, the dorsal largest, 28–35 mm long, lower tepals joined to upper laterals for $\pm$ 3 mm forming prominent lip, lower three 21–27 mm long. *Stamens* unilateral; filaments arched, $\pm$ 13 mm long; anthers 7–9 mm long. *Ovary* hairy above base; style dividing at or beyond anther tips, style branches $\pm$ 4 mm long. *Flowering time*: September.

Distribution and ecology: Western Cape: Cederberg; rocky sandstone flats above 1 000 m (Map 4).

Superficially resembling the widespread and well-known *Babiana ambigua* (No. 55) in the narrow leaves

and acaulescent habit, *B. cedarbergensis* has inner bracts divided only in the upper third, suggesting a placement in section *Teretifoliae*. In contrast, *B. ambigua* has the inner bracts divided to the base and is included in section *Babiana*. Other differences between these two species are the thick, fibrous neck around the base of the stem, stiff, straight leaves, and densely hairy ovary of *B. cedarbergensis*, whereas *B. ambigua* has a poorly developed neck of fibres around the base, firm but not rigid leaves, and a hairless ovary. The resemblance to *B. ambigua* is presumably convergent. *Babiana cedarbergensis* is restricted to higher elevations in the Cederberg, and is endemic to the Northwest Centre of the Cape Floristic Region. The hairy ovary of *B. cedarbergensis* is unusual in section *Teretifoliae*, which leads us to speculate that it might be an aberrant member of section *Babiana* in which a hairy ovary is common but the inner bracts are divided to the base.

The perianth tube of *Babiana cedarbergensis* is of intermediate length, 16–18 mm long, but it is hollow to the base and ample nectar is retained in the lower half of the tube. This is accessible to bees with tongues at least 6–8 mm long, and even these bees cannot reach nectar in the lower 5 mm of the tube, which can only be accessed by long-proboscid flies. We have seen the fly, *Prosoeca peringueyi* systematically foraging on nectar of this species, and we infer that *B. cedarbergensis* is using both this fly and large, long-tongued anthophorine bees for pollen transfer.

9. *Babiana confusa* (G.J.Lewis) Goldblatt & J.C.Manning, comb. et stat. nov.

B. nana var. *confusa* G.J.Lewis in *Journal of South African Botany*, Suppl. 3: 81 (1959). Type: South Africa, [Western Cape], 3318 (Cape Town): near Berg River Station, (–AA), July 1946, *G.J. Lewis* 4798 (SAM, holo.).

Plants 40–80 mm high; stem mostly underground but reaching up to 10 mm above ground level, unbranched, without well-developed collar of fibres around stem base; corm tunics of fairly fine fibres, bearing cormlets in underground axils. *Leaves* ovate to broadly lanceolate, 6–14 mm wide, sparsely hairy to smooth except on margins, slightly pleated to almost plane, margins usually slightly raised. *Bracts* 20–35 mm long, green or becoming dry in upper half, sparsely hairy, inner slightly longer than outer, forked apically. *Flowers* zygomorphic, 2–6 in a suberect to slightly inclined spike, pale blue or greenish to white with pale markings edged in blue on lower lateral tepals, sweetly scented; perianth tube obliquely funnel-shaped, 22–30 mm long; tepals subequal or upper three slightly larger, the dorsal 33–40 mm long, lower tepals 22–28 mm long, joined to upper laterals for 4–5 mm and to one another for $\pm$ 2.5 mm, forming prominent lip. *Stamens* unilateral; filaments arched, 12–15 mm long, sometimes short-hairy at base; anthers 6–9 mm long. *Ovary* smooth; style usually dividing opposite or close to anther tips, branches $\pm$ 3 mm long. *Flowering time*: mid-June and July. Plate 1G.

Distribution and ecology: Western Cape: from Lambert's Bay and Heerenlogement Mountain to near Hopefield; sandy flats and mountain plateaus (Map 5).

This plant was not well known to Lewis when she described it and was based on the type, which she collected near Berg River Station in the Hopefield District, and a second collection, *Drège* 2625, from Klipfontein between Lambert's Bay and Heerenlogement Mountain. We have now seen additional collections and endorse Lewis's comment that more material may show this to be a separate species. It can be distinguished from *B. nana* (No. 1) by the larger flower with a longer perianth tube, 23–30 mm long, subequal tepals, and longer anthers, 8–9 mm long.

Additional material examined

NORTHERN CAPE.—3017 (Hondekliptaai): 39 km along Garies-Groenrivier road, Farm Rondawel, in deep red sand, (–DD), 28 July 2006, *Manning* 3034 (NBG).

WESTERN CAPE.—3118 (Vanhynsdorp): Knersvlakte, Farm Klipdrift Extension, (–AD), 17 June 1995, *Le Roux* 4544 (NBG); Nardouw Mtns, Farm Brakfontein, (–DD), 20 June 1993, *Manning* 1097 (NBG). 3218 (Clanwilliam): Klipfontein, between Lambert's Bay and Heerenlogement Mountain, (–BA), August 1830, *Drège* 2625 (K, MO, P).

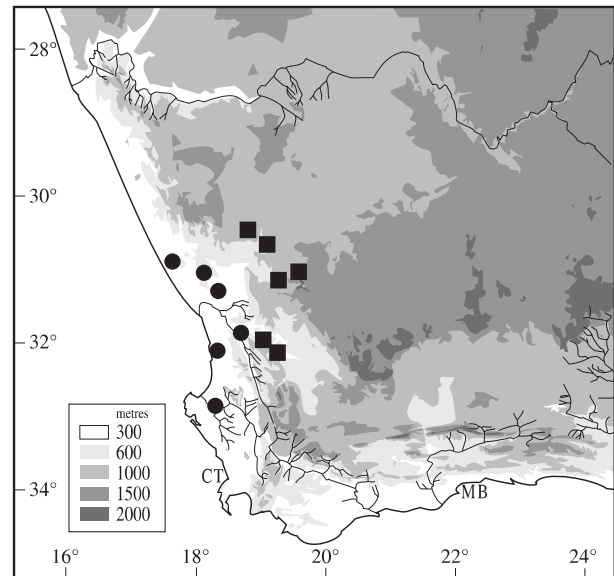
10. *Babiana crispa* G.J.Lewis in *Journal of South African Botany*, Suppl. 3: 84 (1959). Type: South Africa, [Western Cape], Clanwilliam to Doornbosch, Farm Langekraal, July 1933, *P. Ross Frames s.n.* (BOL20837, holo.).

Plants 60–130 mm high including leaves; stem underground, sheathed within thick fibrous neck, unbranched. *Leaves* sword-shaped to linear, up to 13 × 3–6 mm, scarcely pleated, hairy, margins crisped and undulate, entire, blade often slightly twisted. *Bracts* 28–30 mm long, green with brown attenuate tips, hairy in upper half, inner forked apically. *Flowers* zygomorphic, 2–4 in a short spike, pale blue, lower lateral tepals with white markings, acrid-smelling; perianth tube funnel-shaped, 14–20 mm long; tepals unequal, dorsal 25–30 mm long, lower tepals 16–18 mm long, margins crisped. *Stamens* unilateral; filaments arched, 15 mm long; anthers 6–7 mm long. *Ovary* smooth; style dividing opposite anther apices, branches ± 4 mm long. *Flowering time*: May to July.

Distribution and ecology: Northern Cape: extending from the Langberg at Loeriesfontein to Biedouw Valley; hard clay and shale ground (Map 5).

A member of section *Teretifoliae*, *Babiana crispa* has the relatively large flower and large bracts, with the inner forked only at the tips, that characterize the section. It is allied to a group of early flowering species with short-tubed, scented flowers that occur across the dry northern interior of Western and Northern Cape, the western Karoo and Namaqualand. Among these species, all of which have few-flowered spikes borne at ground level, *B. crispa* can be recognized by the narrow leaves, 3–6 mm wide on mature flowering individuals, the blades undulate or slightly crisped, hardly or not at all pleated, and slightly twisted in the upper half.

When described in 1959, *Babiana crispa* was known only from Botterkloof and the hills east of Pakhuis



MAP 5.—Distribution of *Babiana confusa*, ●; *B. crispa*, ■.

Pass, including the Biedouw Valley in Western Cape and the adjacent Calvinia District in Northern Cape. Additional collections have subsequently extended its range northward to the Hantamsberg at Calvinia, and the Langberg NW of Loeriesfontein, at the southern edge of Namaqualand. Flowering in early winter, mainly in May and June but sometimes as late as July. *B. crispa* grows on stony shale and hard clay ground.

Additional specimens examined

NORTHERN CAPE.—3018 (Kamiesberg): northern foothills of the Langberg, NW of Loeriesfontein, banks of seasonal stream, (–DB), 18 May 1993, *Snijman* 1301 (NBG). 3019 (Loeriesfontein): slopes of Kubiskou Mtn, (–CC), 6 September 2006 (sterile), *Goldbalt & Porter* 12778 (MO, NBG). 3119 (Calvinia): between the farms Danielskop and Sandfontein, clay flats, (–BB), 16 May 1989, *Snijman* 1211 (NBG).

11. *Babiana minuta* G.J.Lewis in *Journal of South African Botany*, Suppl. 3: 74 (1959). Type: South Africa, [Western Cape], 3118 (Vanhynsdorp): near Vanhynsdorp, (–DB), July 1932, *T.M. Salter* 2508 (BOL, holo.; K, iso.).

Plants mostly 40–60 mm high, growing in clumps; stem barely reaching above ground level, decumbent above ground. *Leaves* often inclined toward ground, narrowly lanceolate to linear, mostly 3–6 mm wide, pleated at base, hairy, slightly twisted above; juvenile plants with linear, falcate leaves 1–2 mm wide. *Bracts* 20–32 mm long, green with dry brown attenuate tips, inner slightly shorter than outer, forked at apex. *Flowers* zygomorphic, 1–3 in a short, horizontal spike, yellow or mauve with reddish mauve to violet in centre of tepals, with yellow marks on lower lateral tepals, ?unscented; perianth tube funnel-shaped, 20–22 mm long; tepals subequal, dorsal tepal 25–40 mm long, lower tepals joined for 2–4 mm, 20–25 mm long. *Stamens* unilateral; filaments arched, 15–17 mm long; anthers 5–6 mm long. *Ovary* smooth; style dividing opposite anther tips, branches ± 4 mm long, abruptly expanded apically. *Flowering time*: mainly June and July, rarely later. Plate 1B.

Distribution and ecology: Northern and Western Cape: extending from southern Namaqualand and the western Karoo to Karooport; rock outcrops, either in shale, sandstone, or marble (Map 6).

The winter-flowering *Babiana minuta* was only formally recognized by Lewis in 1959 but the earliest collection recorded is the type, made by Salter in 1932. It remains poorly known and inadequately documented because little collecting is done in midwinter in the arid country where it grows. Recent collections are beginning to show that *B. minuta* is more widespread than the record indicates and plants may be locally quite common. They have been recorded growing on marble, granite, or even shale, but wherever found, the plants grow in thin soil or rock crevices that remain wet for a short time during the winter and then dry out as the warm weather sets in. The reddish mauve to violet flowers are typical of the short-tubed species of section *Teretifoliae* and surprisingly large for the small leaves: a single open flower may be larger than the rest of the above ground parts of an individual. Plants grow in small tufts with adult flowering individuals surrounded by the narrow juvenile leaves of young plants derived from cormlets produced from the base of mature corms.

Additional specimens examined

NORTHERN CAPE.—3119 (Calvinia): 6 miles E of Nieuwoudtville on road to Calvinia, (–AC), 27 July 1962, *Nordenstam 771* (M, NBG).

WESTERN CAPE.—3118 (Vanrhynsdorp): Holrivier (–CB), 6 July 1963, *Booyesen 26* (NBG); 10 km NE of Vanrhynsdorp, (–DB), 14 July 1988, *Vlok 1945* (NBG, MO); Damlaagte, (–DB), June 1967, *Fouche 20* (NBG); Klawer, flowers unscented (–DC), 13 July 1994, *Manning 2119* (NBG). 3219 (Wuppertal): Tanqua Karoo, 18 km N of Katbakkies intersection (–DA), 5 June 2002, *Manning 2737* (NBG).

12. *Babiana tanquana* J.C.Manning & Goldblatt, sp. nov.

Plantae 60–120 mm altae; caule subterraneo 1- vel 2-ramoso glabro; foliis lanceolatis breve pilosis marginibus longe pilosis obscure plicatis; bracteis 22–25 mm longis supra pilosis, bractea interiore ad apicem furcata; spica 3- ad 6-flora decumbenti, floribus zygomorpha violaceis tepalis inferioribus flavis, tubo perianthii ± 14 mm longo oblique infundibuliformi, tepalis inaequalibus, tepalo dorsali ± 25–30 mm longo, tepalis inferioribus 18–20 mm longis; filamentis arcuatis ± 12 mm longis, antheris ± 6 mm longis; ovario glabro.

TYPE.—Western Cape, 3220 (Sutherland): Tanqua Karoo, Farm De Syfer, among dolerite boulders, (–AA), 3 July 2002, *J.C. Manning 2748* (NBG, holo.; K, MO, iso.).

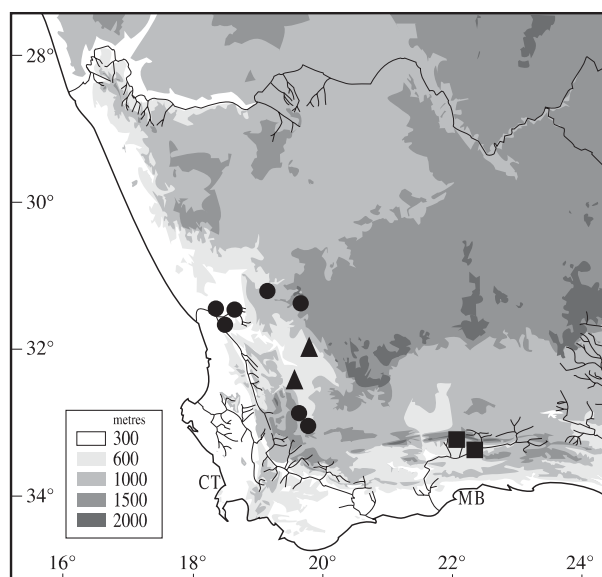
Plants 60–120 mm high including leaves; stem subterranean or reaching up to 100 mm above ground level, simple or with 1 or 2 branches produced close to ground level, smooth. *Leaves* ascending, blades slightly oblique to sheaths and stem, lanceolate to narrowly ovate, 7–13 mm wide, short-hairy on lamina, long-hairy on margins, rough to touch, hardly pleated but with 3 or 4 main veins. *Bracts* slightly striate, green, outer 22–

25 mm long, with slender brown apices, sparsely hairy above, inner 2–5 mm longer than outer, forked apically. *Flowers* zygomorphic, 3–6 in a decumbent or suberect spike, upper tepals dark violet with pale lilac edges, lower laterals pale yellow in upper half, with acrid, spicy odour; perianth tube ± 14 mm long, slender below, curving outward and wider in upper 6 mm; tepals unequal, the dorsal 25–30 mm long, arching over stamens, upper laterals joined to lower three for ± 4 mm, lower tepals 18–20 mm long. *Stamens* unilateral; filaments arched, ± 12 mm long; anthers ± 6 mm long. *Ovary* smooth; style arching over stamens, dividing opposite upper half of anthers, branches slender, ± 4 mm long. *Flowering time*: June and July. Figure 4, Plate 1C.

Distribution and ecology: Western Cape: local in the Tanqua Karoo; dolerite outcrops (Map 6).

As far as we know, *Babiana tanquana* was first collected by the South African botanist, Deirdré Snijman in 1979, and again only in the winter of 2000. The species is distinguished by the almost plane leaves with slight pubescence on the blade surface and long-hairy on the margins, spike borne at or shortly above ground level, and the dark purple upper tepals with pale lilac on the edges and the pale yellow lower lateral tepals. The inner floral bracts, forked only near the apices, underground stem, and decumbent spike, place the species in section *Teretifoliae*. *Babiana tanquana* resembles the western Karoo species *B. salteri* in general aspect, particularly the broad leaves held almost obliquely to the sheaths and short spike, but that species has inner bracts divided to the base, and is thus referred to section *Babiana*. The resemblance is presumably due to convergence, perhaps the result of adaptation to the similar arid habitat and early flowering.

The attractive flowers, with dark purple upper tepals outlined in pale lilac, and clear yellow lower lateral tepals, have a distinctive acrid-musky scent characteristic of several other species of the genus. *Babiana tanquana*



MAP 6.—Distribution of *Babiana minuta*, ●; *B. tanquana*, ▲; *B. karoocica*, ■.

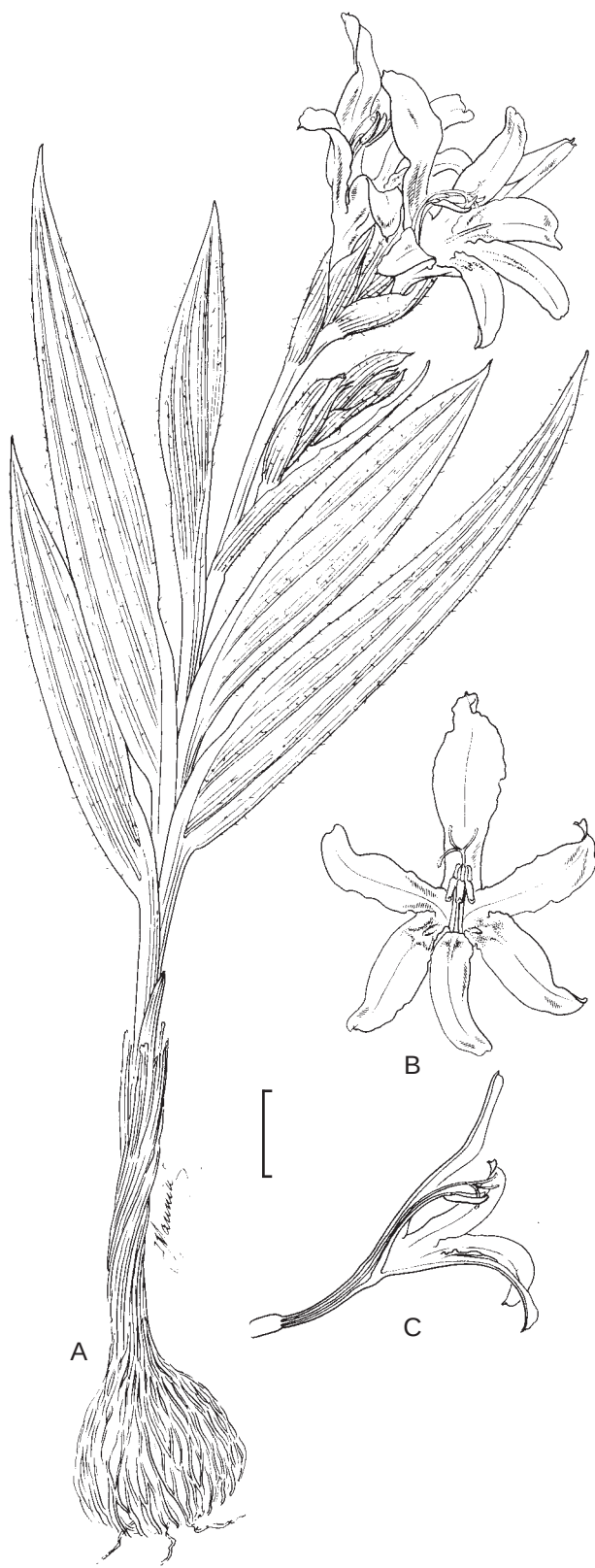


FIGURE 4.—*Babiana tanquana*, Manning 2748 (NBG). A, whole plant; B, front view of flower; C, flower l/s. Scale bar: 10 mm. Artist: John Manning.

keys closest to *B. minuta* (No. 11), the tepals of which also have pale margins, but this species has narrow leaves and the inner bracts shorter than the outer, whereas in *B. tanquana* the inner bracts exceed the outer by 2–5 mm.

Additional specimen examined

NORTHERN CAPE.—3219 (Wuppertal): Ceres-Calvinia road, 60.8 km north of Tulpfontein, (–BA), 24 July 1979, *Snijman* 126 (NBG).

13. *Babiana karooica* Goldblatt & J.C.Manning, sp. nov.

Plantae 120–200 mm altae foliis inclusis, caule glabri brevissimo raro 1-ramoso, foliis lanceolatis vel anguste ensiformibus, 70–150 × 4–12 mm, leviter plicatis, bracteis (20–)25–30(–35) mm longis pallide viridibus apicibus ferrugineis marginibus bractea villosis interiore apice furcata, floribus 2–6 in spica compacta decumbenti zygomorphis caeruleis ad violaceis intense fragrantibus, tubo perianthii 20–35 mm longo curvato ad apicem puberulo parte supera, tepalis subaequalibus, tepalo dorsali 24–28 × ± 7 mm suberecto, filamentis 10–11 mm longis ad basem puberulis, antheris 6–7 mm longis, lilacinis.

TYPE.—Western Cape, 3322 (Oudtshoorn): about 10 km west of De Rust, next to R62, locally abundant on Enon conglomerate, (–CB), 21 June 2006, *J.H.J. Vlok* 2867 (NBG, holo.; K, MO, iso.).

Plants 120–200 mm high including leaves; stem reaching shortly above ground level, unbranched or rarely with a single branch, smooth. Leaves lanceolate to narrowly sword-shaped, 70–150 × 4–12 mm, shallowly pleated, short-hairy but long-hairy at base and upper part of sheath; seedling leaves long-hairy. Bracts (20–)25–30(–35) mm long, green with rust-brown tips, long-hairy near margins, otherwise sparsely short-hairy or smooth, inner slightly shorter than outer, forked at apex. Flowers zygomorphic, 2–6 in a short, compact, decumbent spike, blue to violet, lower lateral tepals each with a white median mark edged below in dark blue, intensely fragrant; perianth tube 20–35 mm long, slightly flaring and curved at apex, tightly enclosing style below, puberulous in upper part, hairs extending onto base of filaments; tepals subequal, the dorsal 24–28 × ± 7 mm, suberect, lower three tepals 20–22 mm long, basally united for up to 4 mm, extended horizontally. Stamens unilateral; filaments ± straight, 10–11 mm long, puberulous at base; anthers 6–7 mm long, lilac. Ovary smooth, those of the lowermost flowers sometimes shortly stipitate; style dividing at apex of anthers or beyond, branches spreading, 3–6 mm long. Capsules subglobose, ± 8 mm long; seeds not known in ripe state. Flowering time: late May to early July.

Distribution and ecology: Western Cape: in the central Little Karoo on rocky slopes of Enon Conglomerate (Map 6).

The earliest collection of *Babiana karooica* we have seen was made in 1961 by the amateur naturalist and bulb enthusiast, J.W. Loubser. That and the few later collections remained puzzling to botanists. No early flowering species of the genus is known from the Little Karoo where the most common species is *B. sambucina*. This larger-flowered, acaulescent species blooms mainly in August and September, occasionally in July, and has

flowers with a straight perianth tube 35–65 mm long, at least half again as long as the dorsal tepal in length, and the tepals are broader, mostly 30–35 × 5–12 mm. In addition, the perianth tube is smooth inside, the anthers are cream-coloured to pale yellow, and the style typically divides opposite the base to the middle of the anthers. All these features contrast with the puberulous mouth of the perianth tube, violet anthers, and style dividing beyond the anther tips in *B. karooica*, which also lacks the distinctive leafy outer bract of the lowermost flower of the spike characteristic of *B. sambucina*.

We at first confused *Babiana karooica* with *B. bainesii*, which always has the spike underground, the flowers thus arising below ground level. *Babiana bainesii*, a widespread species of the southern African summer rainfall zone, typically flowers in late summer, mainly February to April, but later, in July and August in colder parts of the high mountains of the Great Karoo. *Babiana karooica* can be distinguished from *B. bainesii* by the broader and shorter leaves, usually sparsely hairy on the veins and margins, the slightly smaller flower and green floral bracts tipped rust-brown.

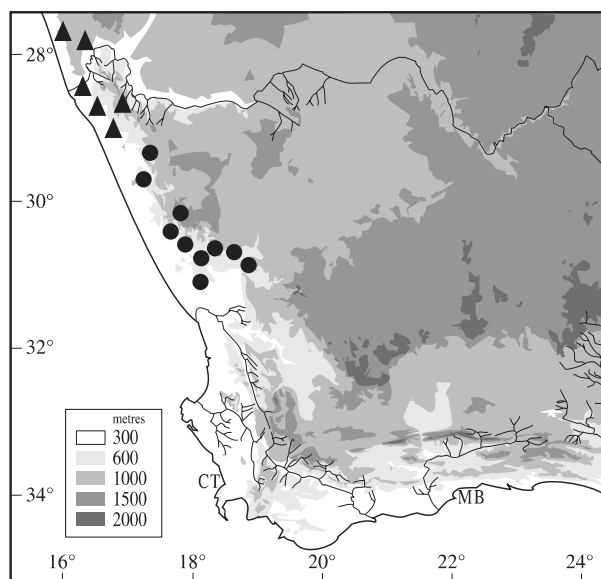
Additional specimens examined

WESTERN CAPE.—3322 (Oudtshoorn): Little Karoo west of De Rust, near Farm Mons Ruber, slopes of Enon Conglomerate ridge, (–CB), 16 August 2002 (fr.), Goldblatt & Porter 12051 (K, MO, NBG, PRE); Farm Doornbosch, hills NW of reservoir, ± 400 m, (–DA), 28 May 1971, Dahlstrand 2026 (MO); Oudtshoorn, (–DA), 9 July 1961, Loubser 996 (NBG).

14. *Babiana torta* G.J.Lewis in Journal of South African Botany, Suppl. 3: 86 (1959). Type: South Africa, [Northern Cape], 3018 (Kamiesberg): ± 10 miles E of Kliprand to Brakfontein, (–DD), 1 May 1958, H. Hall s.n. (Nat.Bot.Gard.385/54 in NBG, holo.).

Plants 40–80(–120) mm high; stem largely underground or extending up to 10 mm above ground, unbranched. Leaves lanceolate, 7–12(–18) mm wide, soft-textured, undulate, sometimes slightly crisped, twisted above middle, margins and usually only one major vein prominently thickened, lying close to upper margin, softly hairy to nearly hairless, juvenile leaves ± linear and loosely coiled, prominently hairy. Bracts 17–20 mm long, green with tips drying pale brown, slightly hairy, inner ± as long as or slightly longer than outer, forked in upper third. Flowers zygomorphic, 1–3(–5) in a compact spike borne close to ground level, pale slate-blue to mauve, or white, lower lateral tepals with pale yellow to white median blotch usually edged in dark blue, sweetly scented; perianth tube 20–22 mm long; tepals unequal, the dorsal 30–34 mm long, lower three 22–25 mm long. Stamens unilateral; filaments arched, ± 15 mm long; anthers ± 6 mm long. Ovary smooth; style dividing opposite anther apices. Flowering time: mainly May to mid-June. Plate 1D.

Distribution and ecology: Northern Cape: from Springbok to Nuwerus and Kliprand; mainly in crevices in granite outcrops or granitic gravel, occasionally in deep sands (Map 7).



MAP 7.—Distribution of *Babiana torta*, ●; *B. namaquensis*, ▲.

When described by Lewis in 1959, *Babiana torta* was known only from the type collection from near Kliprand in eastern Namaqualand and it has long seemed somewhat mysterious. Collecting for this study and our associated work on the pollination biology of *Babiana* has, however, shown that *B. torta* is not rare, but that it flowers early in the season, mainly in late autumn, when little collecting is normally done. Its range is now known to extend from Springbok in the north through the Kamiesberg to the granite hills south of Kliprand and westward to Bitterfontein, Nuwerus, and Koekenaap. Plants are most often seen growing in cracks in granite outcrops with the narrow, coiled juvenile leaves mixed with the broader, less hairy leaves of mature individuals. Plants flower in May or June and produce ripe capsules in August. While plants usually have softly hairy leaves and bracts, the leaves may occasionally be almost hairless and the bracts sparsely pilose (e.g. Snijman 1304; Goldblatt & Porter 12145). Flowers are usually pale to mid-blue with white to pale yellow on the lower tepals, but may occasionally be white or even greenish mauve.

Babiana torta appears to be related to a group of early winter-flowering, dwarf species of section *Teretifoliaeae* of Namaqualand and the adjacent western Karoo that includes *B. crispa* (No. 10), *B. minuta* (No. 11), *B. tanquana* (No. 12), and *B. namaquensis* (No. 15). These all have few-flowered spikes borne at ground level and variously undulate, twisted or crisped leaves. Among this group, *B. torta* may be most closely related to *B. minuta*, also a species of rock outcrops and shallow soils, that occurs in the western Karoo and adjacent southern Namaqualand. *Babiana torta* may also be confused with *B. namaquensis*, and their differences are discussed in detail under the latter species.

Additional specimens examined

NORTHERN CAPE.—2917 (Springbok): coastal plain below Wildepaardehoek Pass, deep sand at intersection Koinaas-Kommagas road, (–CD), 21 August 2002 (fr.), Goldblatt & Porter 12093 (MO, NBG, PRE); granite dome west of Springbok, in rock

crevices, (–DB), August 2000 (fr.), *Goldblatt & Manning 11334* (MO, NBG), 21 June 2001, *Manning 2354* (NBG). 3018 (Kamiesberg): Farm Karas, ± 5 km north of farm buildings, (–AC), 1 September 2002 (fr.), *Goldblatt & Porter 12140* (MO); ± 30 km north of Bitterfontein, rocky slopes above the Swart Doring River, (–CC), 2 August 1994 (fr.), *Goldblatt & Manning 9893* (NBG).

WESTERN CAPE.—3018 (Kamiesberg): Farm Kamaboes, 27 km from Kliprand to Bitterfontein, cracks in granite domes, (–DA), 19 May 1993, *Snijman 1310* (NBG); 38 km from Kliprand on Bitterfontein road, wedged in cracks in granite, (–DA), 29 May 1999, *Manning 2232A* (NBG); Kliprand road near Bitterfontein, flowers greenish mauve with yellow markings, (–CD), 19 May 1993, *Snijman 1304* (NBG). 3118 (Vanrhynsdorp): 55 km N of Koekenaap, rocky slope above Sout River, (–AA), 16 September 2002 (fr.), *Goldblatt & Porter 11890A* (MO, NBG).

15. *Babiana namaquensis* Baker, Handbook of the Irideae 181 (1892); G.J.Lewis: 76 (1959). Type: South Africa, [Northern Cape], 2917 (Port Nolloth): sandy plains near Port Nolloth, August 1883, *H. Bolus 6579* (K, holo.; BOL, iso.).

B. buchbergensis Dinter: 254 (1931). Type: Namibia, Buchberg, on micaceous schist in a water ravine, 2 August 1929, *M.K. Dinter 6569* (B, holo.).

Plants up to 80 mm high; stem reaching ground level, usually with well-developed collar of fibres around base. Leaves narrowly lanceolate to linear, 1.5–3.5(–8) mm wide, twisted to loosely coiled above, not pleated, smooth or with short or long hairs, margins and central vein prominently thickened. Bracts 17–27 mm long, smooth, green with dry brown tips, inner forked apically. Flowers zygomorphic, 1–3 in a short spike borne at ground level, pale mauve to whitish, flushed purple outside, lower lateral tepals white to yellow with mauve tips, sweetly scented; perianth tube funnel-shaped, 25–28 mm long; tepals unequal, the dorsal 30–40 mm long, lower three shorter, 25–35 mm long, joined basally for a short distance. Stamens unilateral; filaments arched, ± 12 mm long; anthers 5–6 mm long. Ovary smooth; style dividing opposite anther apices. Flowering time: mainly June, sometimes early July.

Distribution and ecology: Namibia and South Africa: from Buchberg in southwestern Namibia to the Richtersveld in Northern Cape; stony coastal and near interior flats and low hills, usually on weathered dolomite, but also on micaceous schist (Map 7).

Surprisingly common in northern Namaqualand, *Babiana namaquensis* is nevertheless seldom seen for it flowers early in the season, mostly in June or July, before much plant collecting is undertaken. As Lewis (1959) noted, it grows in rocky dolomite outcrops or sometimes in schist, the corms often wedged in rock cracks. Although only recorded three times in southwestern Namibia, it is almost certainly as common there as it is on stony slopes on the south bank of the Orange River in South Africa. Collections that have accumulated since Lewis's account of the species, cited below, significantly expand the range of the species, known to Lewis from a handful of collections made between Port Nolloth and Steinkopf in northern Namaqualand, in addition to the Buchberg site in southwestern Namibia, the type locality of the synonym *B. buchbergensis* Dinter.

Leaf morphology of *Babiana namaquensis* is unusually variable. Younger plants produce narrow leaves, twisted or coiled above, whereas mature plants have narrowly lanceolate leaves loosely twisted distally. The leaf morphology recalls that of *B. torta*, a similarly acaulescent species of central and southern Namaqualand that also has coiled to twisted leaves. In *B. torta* (No. 14) the leaves are usually densely hairy, while the slate-blue or rarely white flowers have a perianth tube 20–22 mm long, and the bracts are prominently veined and silky hairy or rarely sparsely velvety. In contrast, *B. namaquensis* has sparsely hairy to smooth leaves, consistently smooth bracts, and a pale mauve to white perianth with a tube 25–28 mm long. *Babiana torta* appears to be confined to granitic substrates, mostly growing in cracks in granite outcrops, and it flowers mainly in May or early June, whereas *B. namaquensis* favours limestone substrates and flowers later, in later June or early July (not in August as Lewis indicated).

Additional specimens examined

NAMIBIA.—2716 (Witpütz): dolomite hills just north of Obib dunes, (–DC), 4 June 1990, *Bean & Oliver 2336* (BOL). 2816 (Orangemund): Skilpad Diamond Area, (–BC), June 1977, *Williamson 2558* (BOL).

NORTHERN CAPE.—2816 (Oranjemund): hills along south bank of the Orange River at Beauvallon, (–CA), 22 August 2001 (fr.), *Goldblatt & Porter 11743* (MO, NBG); Grootderm, 6 km E of Alexander Bay, common on low dolomite outcrops with drifting sands, (–CA), 28 June 2002, *Helme s.n.* (NBG); Beauvallon, (–CA), 19 July 2002 (fr.), *Manning 2748A* (NBG). 2817 (Vioolsdrif): 5 W of Eksteenfontein, deep red sand, (–CD), 10 July 1988, *Williamson 3904* (NBG).

16. *Babiana longicollis* Dinter in Feddes Repertorium 29: 253 (1931); G.J.Lewis: 103 (1959). Type: Namibia, Klinghardt Mountains, 26 September 1922, *M.K. Dinter 4007* (B, holo.).

Plants 100–150 mm high including the leaves; stem reaching shortly above ground level, sometimes branched, smooth. Leaves sword-shaped to lanceolate, linear in juvenile plants, 60–100 $\times$ 4–10 mm, firm, slightly to strongly pleated, minutely hairy or almost hairless, with few, scattered, silky hairs on margins, loosely twisted in upper half and sometimes tip recurved. Bracts 18–25 mm long, green with tips punctate and drying reddish brown, fairly prominently veined, smooth, inner slightly longer than outer, forked apically, with dry attenuate tips. Flowers zygomorphic, 3–5 in a compact decumbent spike, purple to grey-mauve or greenish, lower tepals marked with white to pale yellow, with sweet-pea scent; perianth tube (?32–)40–45 mm long; tepals unequal, dorsal 20–30 $\times$ (10–)15–20 mm, lower three tepals shortly united, 14–16 mm long. Stamens unilateral; filaments arched, ± 10 mm long; anthers 5–6 mm long. Ovary smooth; style dividing opposite anther bases. Flowering time: mainly late June and July, but sometimes in August.

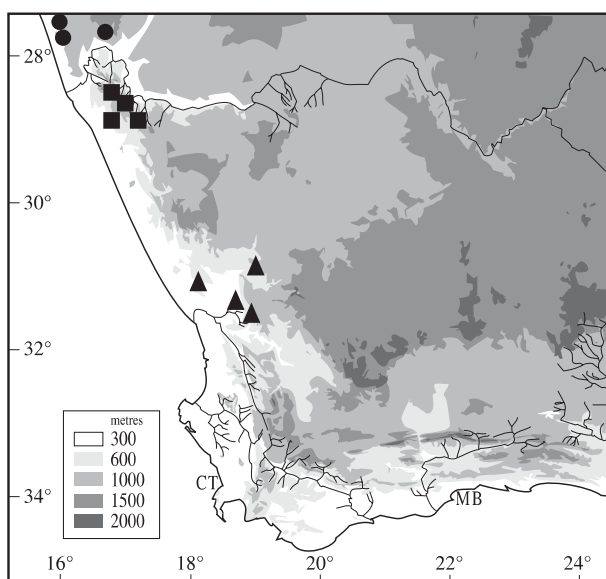
Distribution and ecology: Namibia: from the Klinghardt Mountains to Rosh Pinah in the southwest; in crevices in granite outcrops (Map 8).

When described by Dinter in 1931, *Babiana longicollis* was known only from his own collection from the Klinghardt Mountains of southwestern Namibia and no more material had accumulated when Lewis's (1959) monograph of *Babiana* was published. Since then a handful of collections have been made, all in southern Namibia, making it possible to better understand the species. Plants from Zebrafontein, near Rosh Pinah, e.g. Lavranos 19901 and Lavranos & Pehlemann 19906, have larger flowers than were previously recorded. The perianth tube is 35–45 mm long, gradually widening in the upper half and the dorsal tepal is up to 30 mm long. Lewis actually reported the tube as 24 mm (in the type) but this is incorrect, for the tube in the shrunken, poorly pressed flowers is up to 32 mm long and was probably longer when alive. Leaves in well-grown plants such as in the Lavranos & Pehlemann 19906 collection are also broader than recorded by Lewis: 8–14 mm wide.

Babiana longicollis appears to be related to *B. namaquensis* (No. 15), and we have seriously wondered whether *B. longicollis* is not merely a longer-tubed regional variant of that species, which has identical leaves, ± 1.5 –8 mm wide, loosely twisted in the upper half and weakly or not at all pleated. Its pale mauve to whitish flowers, however, have a substantially shorter perianth tube, mostly 25–28 mm long, compared to a tube (32–)35–45 mm in *B. longicollis*. The tepals of *B. longicollis* are smaller than, to about the same size as, those of *B. namaquensis*, the dorsal (15–)20–30 $\times$ (10–)15–20 mm. Available specimens confirm the original observation that the style divides close to the bases of the anthers in *B. longicollis*, whereas it divides opposite the anther tips in *B. namaquensis*. Both species have smooth, hairless bracts. Plants grown at the Missouri Botanical Garden produced flowers with a lovely sweet-pea-like scent.

Additional specimens examined

NAMIBIA.—2715 (Bogenfels): 1.3 km WSW of Höchster Mtn, (–BD), 21 July 1986, Van Berkel 561 (NBG); 98 km N of Chameis mine



MAP 8.—Distribution of *Babiana longicollis*, ●; *B. cinnamomea*, ▲; *B. horizontalis*, ■.

entry, (–DC), 28 June 1993, Williamson 4921 (NBG). 2716 (Witpütz): Farm Zebrafontein, north of Rosh Pinah, (–DD), 7 July 1982, Lavranos 19901 (MO, NBG), 15 August 1981, Lavranos & Pehlemann 19906 (MO); Spitskop, N-facing slope of Scorpion Hill, 15 July 1986, Van Berkel 556 (NBG).

17. *Babiana cinnamomea* J.C.Manning & Goldblatt, sp. nov.

Plantae 40–60 mm altae; caule subterraneo eramoso glabro; foliis late ovatis 30–40 $\times$ 20–25 mm, glabris marginibus incrassatis minute papillosis crispis; bracteis glabris infra viridibus apicem versus siccis brunneisque, bractea exterior 17–19 mm longa, interior 20–25 mm longa ad apicem furcata; spica 2–6 flora decumbenti, floribus pallide caeruleo-malvinis; tepalis inferioribus lateralibus maculis cremeis ad albis; tubo perianthii 22–25 mm longo; tepalis inaequalibus, tepalo dorsali $\pm 30 \times 7$ –8 mm; filamentis ± 15 mm longis; antheris 7–8 mm longis; ovario glabro.

TYPE.—Western Cape, 3118 (Vanrhynsdorp): stony shale slope between Vanrhynsdorp and Grootdrif, foot of Vuurberg, rock crevices, (–BD), 15 June 2002, J.C. Manning 2744 (NBG, holo.).

Plants 40–60 mm high; stem subterranean, unbranched, smooth. Leaves broadly ovate, 30–40 $\times$ 20–25 mm, held $\pm$ at right angles to sheaths, smooth, margins thickened, minutely papillate, and crisped. Bracts green below, dry and translucent pale brown toward tips, hairless, outer 17–19 mm long, inner 20–25 mm long, bifid at tip. Flowers zygomorphic, 2–6 in a short, decumbent spike, pale yellow-green flushed with mauve, lower lateral tepals with white to cream-coloured median blotches, with sweet, spicy scent; perianth tube funnel-shaped, 22–25 mm long, narrow part hollow to base; tepals unequal, the dorsal $\pm 30 \times 7$ –8 mm, upper lateral tepals joined to lower for ± 6 mm, forming a lip, lower tepals ± 20 mm long. Stamens unilateral; filaments ± 15 mm long; anthers 7–8 mm long. Ovary smooth; style dividing opposite anther tips, branches ± 3.5 mm long. Flowering time: May and June. Figure 5, Plate 2G.

Distribution and ecology: Western Cape: Vanrhynsdorp District; stony lower slopes often among quartzite pebbles (Map 8).

The dwarf but strikingly unusual *Babiana cinnamomea* appears to have been first recorded in 1999 when the type colony was discovered northeast of Vanrhynsdorp in northern Western Cape. Plants were then mostly past flowering and in no condition to be illustrated or pressed for a type collection. It was clear, however, from the distinctive, broadly ovate leaves with undulate and crisped margins, that this was an undescribed species. In the winter of 2002, several plants were found in flower and were then described, drawn, and the type collection made. Even in full bloom, *B. cinnamomea* is inconspicuous, for the pale bluish to yellowish green flowers flushed with mauve, are borne close to the ground and are easily overlooked. The flowers have a particularly strong, sweet, spicy scent, reminiscent of cinnamon and clove, produced during the day and at



FIGURE 5.—*Babiana cinnamomea*, Manning 2744 (NBG). A, whole plant; B, front view of flower; C, flower l/s; D, outer (left) and inner (right) floral bracts. Scale bar: 10 mm. Artist: John Manning.

night, a feature more noticeable than the drab flower colour. The scent, reminiscent of other moth-pollinated Iridaceae, in particular *Gladiolus liliaceus* Houtt. (Goldblatt & Manning 1998), suggests moth pollination for *B. cinnamomea*, a hypothesis supported by the fact that the flower remains open and scented at night.

Like many other species of *Babiana* with highly modified leaves, the juvenile foliage is very different.

Seedlings and plants with immature corms have slender, linear leaves that bear a few long, soft hairs. Not only are the leaves of *B. cinnamomea* distinctive, but the floral bracts are unusual in being largely dry, thinly papery in texture, and pale straw-coloured with minute pale brown flecks over the surface. With its inner bracts forked only at the apex, *B. cinnamomea* clearly belongs in section *Teretifoliae*, but its immediate relationships are puzzling.

Currently known from just three sites, not far distant from one another, *Babiana cinnamomea* appears restricted to the slopes along the base of the mountains that stretch from east of Vanrhynsdorp to the Langberg west of Loeriesfontein. We suspect that additional populations will be found in suitable habitats in this dry country.

Additional specimens examined

WESTERN CAPE.—3019 (Loeriesfontein): 1 km along Langberg road north of Loeriesfontein, cracks in rock sheet, (–CD), 28 March 2001 (sterile), *Manning s.n.* (NBG). 3118 (Vanrhynsdorp): ± 35 km SW of Nuwerus on road to Lutzville, on lower slopes of Sandkop, (–AD), wedged in fissures in granite, 11 July 2004, *A. Harrower 2058* (NBG); flats at the foot of Kobee Pass, in quartzite areas, (–DB), 31 August 2001 (sterile), *Goldblatt & Porter 11791* (NBG); stony slope between Vanrhynsdorp and Grootdrif, foot of Vuurberg, rock crevices, (–BD), 16 June 1999 (sterile), *Manning 2228* (NBG).

18. *Babiana horizontalis* G.J.Lewis in *Journal of South African Botany*, Suppl. 3: 90 (1959). Type: South Africa, [Northern Cape], Anenous Pass, June 1900, *E.G. Alston in Herb. Marloth 4568* (PRE, holo.).

Plants up to 50 mm high; stem reaching no more than 20–30 mm above ground level, unbranched, smooth, enclosed below by thick, fibrous collar. *Leaves* lanceolate, 30–40 × 13 mm, blade held at right angles to short pseudopetioles 20–30 mm long, almost horizontal, scarcely plicate, smooth or sparsely long-hairy on upper margin, prominently 3- or 4-ribbed. *Bracts* ± 25 mm long, green, smooth, closely striate, inner ± as long as outer, forked apically, tips pale and dry. *Flowers* zygomorphic, (1)2–5 per spike, outer tepals lilac, occasionally yellow, inner tepals pale yellow; perianth tube ± 25 mm long, funnel-shaped; tepals unequal, the dorsal ± 27 mm long, lower three 20–23 mm long. *Stamens* unilateral; filaments 16–17 mm long; anthers ± 6 mm long, said to be declinate. *Ovary* smooth; style dividing just beyond anther tips. *Flowering time*: June and July.

Distribution and ecology: Northern Cape: in the southern Richtersveld; granite outcrops (Map 8).

The dwarf *Babiana horizontalis* is easily recognized by the unusual leaves, borne on pseudopetioles sometimes up to 30 mm long, with the lanceolate to oblong blades prominently 3- or 4-ribbed, scarcely pleated, and held horizontally at right angles to the sheaths. We have not seen live plants but according to Lewis the flowers have lilac outer and yellow inner tepals. Some new collections indicate that the flowers are entirely yellow. The single collection known to Lewis had a spike bearing one flower, but new collections show that plants typically have spikes with 2–5 flowers.

The immediate relationships of *Babiana horizontalis* are uncertain but it seems to belong with the several dwarf, acaulescent species of section *Teretifoliae* of Namaqualand. Known only from the type when it was described by Lewis in 1959, *B. horizontalis* has since been re-collected on several occasions and it is no longer the mystery it once was. Plants have now been collected from the Stinkfontein Mountains near Eksteenfontein and on the low, stony hills east of Port Nolloth.

Additional specimens examined

NORTHERN CAPE.—2817 (Vioolsdrif): mountain summit 10 km W of Eksteenfontein, (–CC), 20 July 1986, *Williamson 3544* (BOL, NBG). 2917 (Springbok): 20 miles E of Port Nolloth, rocky hillock, (–AC), 18 July 1962, *Nordenstam 656* (NBG).

19. *Babiana gariepensis* Goldblatt & J.C.Manning, sp. nov.

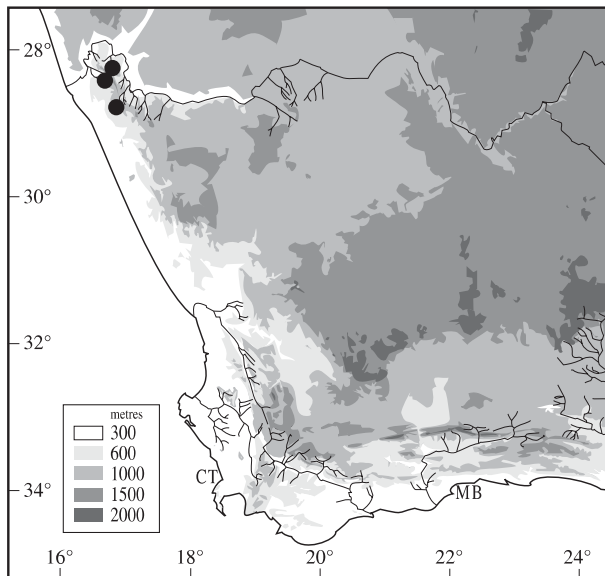
Plantae 120–200 mm altae; caule pro parte maiore subterraneo 1- vel 2-ramoso glabro; foliis lanceolatis nervis marginibusque scabridis obscure plicatis; bracteis 23–35 mm longis, scabridis, bractea interiore ad apicem furcata; spica 3- ad 5-flora decumbenti, floribus zygomorphis pallide cinereo-viridibus; tepalis inferioribus notis cremeo-albis; tubo perianthii 20–24 mm longo, oblique infundibuliformi; tepalis inaequalibus, dorsalibus 28–32 mm longis, inferioribus 18–24 mm longis; filamentis arcuatis, ± 16 mm longis; antheris ± 5 mm longis; ovario glabro.

TYPE.—South Africa, Northern Cape, Richtersveld National Park, Koeskop, steep, south-facing rocky slope, September 1995, *G. Williamson & F. Williamson 5776* (NBG, holo.).

Plants 120–200 mm high; stem mainly subterranean, with 1 or 2 branches produced close to ground level, smooth. *Leaves* ascending-horizontal, borne obliquely to sheath and stem, broadly lanceolate, (40–)70–100 × 18–25 mm, exceeding spike, scabrid to papillate on veins and margins, rough to touch, obscurely plicate but with 3–5 main veins. *Bracts* 23–35 mm long, sparsely striate, green with brown apices, short-hairy on veins, inner slightly shorter to ± as long as outer, forked apically. *Flowers* zygomorphic, 3–5 in a congested, decumbent spike held close to ground level, bilabiate, pale grey-green, upper tepals each with slate-blue median streak, red-lined in throat, lower three tepals with white, spear-shaped markings outlined in dull reddish maroon, sweetly violet-scented; perianth tube 20–24 mm long, slender below, curving outward and wider in upper 7 mm; tepals unequal, the dorsal 28–32 × ± 5 mm, arching over stamens, upper laterals ± 28 × 4 mm, joined to lower for ± 5 mm, lower tepals 18–24 mm long. *Stamens* unilateral; filaments arched, ± 16 mm long; anthers ± 5 mm long, lilac; pollen off-white. *Ovary* smooth; style dividing opposite lower third of anthers, branches ± 2 mm long. *Flowering time*: June and July.

Distribution and ecology: Northern Cape: from Koeskop to Grasvlakte in the Richtersveld; rocky open slopes and south-facing cliffs (Map 9).

Known from the type consisting of two plants past flowering, and two more collections, one from the wild, and the other which flowered in cultivation, *Babiana gariepensis* is somewhat puzzling. Even from the limited material available, there seems no doubt that it is a new species, but its affinities are obscure. The large bracts, 23–35 mm long, with the inner forked near the apex, place *B. gariepensis* in section *Teretifoliae*. The broad, sparsely hairy, slightly plicate leaf and moderately

MAP 9.—Distribution of *Babiana gariensis*.

long perianth tube, 20–22 mm long, with a sharp curve below the throat, suggest a possible relationship with the central Namaqualand *B. attenuata* (No. 24), but we know too little about *B. gariensis* to make an informed assessment of its relationships within the section. The flowers seem to be distinct also in the relatively long, narrow tepals of which the dorsal one is 28–32 × 5 mm. Additional material in flower is needed to better understand this apparently rare Richtersveld endemic known from three sites: Koeskop in the Richtersveld National Park in the north, Cornelsberg, and the Farm Grasvlakte in the southern Richtersveld.

Additional specimens examined

NORTHERN CAPE.—2817 (Vioolsdrif): Richtersveld, Cornelsberg summit in rock cracks, (–CA), 21 August 1982, Williamson 3110 (BOL). 2917 (Springbok): summit of rocky hills near Farm Grasvlakte, (–AB), flowered in Portland, USA in May 2002, Goldblatt & Porter 11746A (MO).

Series 1.2 *Cuneifoliae*

20. *Babiana flabellifolia* Harv. ex Klatt in Linnaea 35: 380 (1867–1868); Goldblatt & J.C. Manning: 88 (2004). Type: South Africa, [Northern Cape], Namaqualand, without precise locality or date, probably near Modderfontein, west of Springbok, H. Whitehead s.n. (K, holo.).

B. cuneifolia Baker: 335 (1876). Type: South Africa, [Western Cape], Mierenkasteel, karroid slopes, August 1830, J.F. Drège 2627 (K, holo.; MO, P (two sheets), S, iso.).

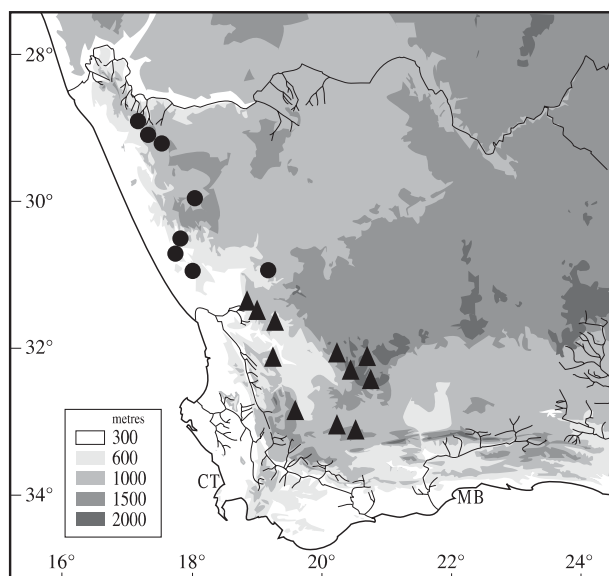
B. truncata G.J.Lewis: 100 (1959), syn. nov. Type: South Africa, [Western Cape], 2 miles E of Springbok, 26 July 1950, G.J. Lewis 2203 (SAM, holo.; SAM, iso.).

Plants up to 80 mm high; stem short or entirely underground. Leaves crowded basally, abruptly truncate and wedge-shaped, pleated, smooth or finely hairy with short-velvety margins, or rarely coarsely hairy with white hairs up to 2.5 mm long; juvenile leaves filiform and long-

hairy. Bracts 15–30 mm long, ± membranous or green, smooth or papillate to finely hairy, inner bracts forked above, tapering into slender awns. Flowers zygomorphic, 2–several in a compact spike borne at ground level, pale mauve to violet, tube white to pale yellow and lower lateral tepals with pale yellow to white median markings, sweetly scented of rose or carnation; perianth tube 12–36 mm long, cylindrical, straight, dorsal tepal suberect or arching forward, 27–35 mm long, lower tepals slightly shorter, 25–27 mm long. Stamens unilateral; filaments arched, 15–18 mm long; anthers 6–8 mm long. Ovary smooth; style dividing near anther apices, branches 4–5 mm long, expanded apically. Flowering time: mainly June and July, sometimes in early August. Plate 1E).

Distribution and ecology: Northern and Western Cape: extending from the Anenous Mountains of northern Namaqualand to Koekenaap in the south, and local on the Bokkeveld Plateau near Nieuwoudtville; in clay and granitic soils, in renosterveld and succulent karroid scrub [plants cited by Lewis (1959) from the Bokkeveld Plateau south of Nieuwoudtville are *B. cuneata*] (Map 10).

The vegetatively distinct *Babiana flabellifolia*, which is widespread across Namaqualand and extends south to the Bokkeveld Plateau, was treated by Lewis (1959) in her monograph of *Babiana* as *B. truncata*. Examination of the type specimen at the Kew Herbarium has shown that the species has two later synonyms. These are *B. truncata*, described by Lewis in 1959, and *B. cuneifolia* (Baker 1876), based on Drège 2627 from southern Namaqualand. Lewis, however, considered *B. cuneifolia* to be a synonym of the long-tubed *B. pubescens* (tube ± 50 mm long) and used the name *B. flabellifolia* for a second long-tubed species from the Calvinia area of the western Karoo (tube 40–60 mm long), described here as *B. praemorsa* (No. 22). The types of both *B. cuneifolia* and *B. flabellifolia* have flowers with a fairly short perianth tube, 25–35 mm in the former (despite Lewis's contention that it has a tube ± 50 mm long), and ± 18 mm in the latter. We do note, however, that some sheets of Drège 2627 (as those at B and P) are the long-tubed *B.*

MAP 10.—Distribution of *Babiana flabellifolia*, ●, *B. cuneata*, ▲.

pubescens, as Lewis (1959) noted, but the sheet marked by Lewis as the holotype at K is the shorter-tubed species that grows at the type locality, Mierenkasteel. We suspect that Drège collected *B. pubescens* further north and either confused the later collection with the vegetatively similar *B. cuneifolia*, or that mislabelling occurred later. Baker (1876) described *B. cuneifolia* as having a perianth tube 12–15 lines long, i.e. 25–28 mm. This seems to exclude the possibility that *B. cuneifolia* and *B. pubescens* are the same species. It is also relevant here to note that an isotype of *B. cuneifolia* at the Stockholm Herbarium is annotated *B. flabellifolia* by Klatt, so we are not alone in our conclusion about the identity of the types of these two species. Lewis's *Babiana truncata* thus falls into synonymy and this plant must be called *B. flabellifolia*, an unfortunate situation that is likely to cause confusion for some time.

The species is easily distinguished among the four species with abruptly truncate leaves broadest at the tips, by its sweetly scented flowers with subequal tepals, and a perianth tube of moderate length, 18–35 mm, largely included in soft-textured bracts, 28–40 mm long. The flowers remain open at night and then are strongly carnation-scented. The relatively short perianth tube has comparatively thick walls in the lower half when the tube exceeds 20 mm, so that nectar is forced into the upper part of the tube where it is accessible to long-tongued solitary bees and even moths, the presumed pollinators.

The species extends from northern Namaqualand at Anenous Pass, northwest of Springbok, through southern Namaqualand near Nuwerus and Koekenaap and also occurs on the Bokkeveld Escarpment near Nieuwoudtville, from where we have seen two collections, cited below. Plants are often hairless, or sparsely hairy on the leaf margins or bracts, but the feature is variable, and some collections from near Springbok have sparsely hairy leaves.

The exact origin of the type is unknown but Reverend Whitehead, who collected it, was stationed at the Anglican Mission at Modderfontein, close to Springbok. We assume that the type of *B. flabellifolia* is from close to Modderfontein or nearby at Ezelsfontein, where he also collected (Gunn & Codd 1981). The type collection of *B. flabellifolia* is somewhat puzzling because the leaves and bracts are conspicuously long-hairy. They are not matched in any other specimen with truncate leaves and it is possible that they represent a taxon separate from the hairless or sparsely hairy plants that occur widely in southern Namaqualand, as well as north of Springbok. More information on the variation in the type population and those growing nearby would be helpful in dealing more critically with the question about the status of the type of *B. flabellifolia* relative to other collections assigned to the species.

Among the specimens cited by Lewis as *Babiana truncata*, were two collections from the Bokkeveld Mountains south of Nieuwoudtville, one from Papelfontein (i.e. Papkuilsfontein) (*Schlechter 10892*) and the other from Lokenburg (*Compton 11504*, NBG). These plants have a perianth tube longer than expected for *B. flabellifolia*, ± 45 mm long and have been referred to the

new species, *B. cuneata* (No. 21) (Goldblatt & Manning 2004).

We agree that the central and northern Namaqualand *Babiana pubescens* is correctly separated from *B. flabellifolia*: although the two are vegetatively virtually identical, *B. pubescens* has a slender perianth tube ± 50 mm long, strongly curved below the throat, unequal and narrower tepals, and unscented flowers. The bracts are normally densely hairy in contrast to the nearly smooth bracts of most populations of *B. flabellifolia*, with the notable exception of the type.

Babiana flabellifolia in Lewis's sense, now called *B. praemorsa* (No. 22), is readily distinguished by its elongate perianth tube, 40–60 mm long and straight throughout, flower with subequal, outspread tepals, unusually short filaments, 8–9 mm long, and usually narrow, minutely hairy leaves that form a loose, poorly differentiated fan quite unlike the type of *B. flabellifolia*, which has leaves forming a tight fan.

Additional specimens examined

NORTHERN CAPE.—3119 (Calvinia): near Nieuwoudtville, road to Kareebooms, flowers buff/yellowish grey suffused with mauve, (–AC), August 1961 (fr.), flowered at Kirstenbosch National Botanical Garden, June 1962, *Lewis 5973* (NBG); 17.7 km along Rondekop road off R27 between Nieuwoudtville and Calvinia, shale and silt washes, (–AC), 6 June 2005, *Manning 2947* (MO, NBG).

21. *Babiana cuneata* J.C.Manning & Goldblatt in *Bothalia* 34: 89 (2004). Type: South Africa, Western Cape, 3219 (Wuppertal): Cold Bokkeveld, Katbakkies Pass, (–DC), 5 September 2000, *P. Goldblatt & J.C. Manning 11457* (NBG, holo; K, MO, PRE, iso.).

Plants 80–150 mm high including leaves; stem short, hairless. Leaves crowded basally, up to 6, oblong, (20–) 30–100 $\times$ (6–)8–15(–30) mm, leathery, plicate, abruptly truncate, hairless or finely velvety hairy. Bracts 25–50 mm long, green with brown attenuate tips, smooth or sparsely hairy, inner $\pm$ as long as outer, forked apically, basal margins sometimes fused around ovary for ± 2 mm. Flowers zygomorphic, 2–5(–7) in a compact spike borne at ground level, pale blue to violet, lower lateral tepals with white median marks outlined dark violet to purple below, odourless or sweetly scented; perianth tube 40–60 mm long, cylindrical, straight, widening slightly in upper 8 mm; tepals laxly ascending, subequal or upper three slightly larger, 26–32(–40) $\times$ 6–12 mm, upper laterals fused to lower for ± 2 mm. Stamens unilateral; filaments 15–18 mm long, exerted 9–10 mm; anthers ± 6 (–11) mm long, pale yellow to cream-coloured. Ovary smooth, in lower flowers shortly stipitate; style dividing opposite anther bases or opposite anther apices, style branches ± 6 mm long, arching outward between or over anthers. Flowering time: August to mid-September. Figure 6, Plate 1F.

Distribution and ecology: Northern and Western Cape: from the Bokkeveld Mountains to the interior Cold Bokkeveld as far south as Karooport, the Klein Roggeveld and foot of the Witteberg between Matjesfontein and Laingsburg; dry rocky sandstone or dolerite slopes and flats in arid fynbos, renosterveld, or karroid bush (Map 10).



FIGURE 6.—*Babiana cuneata*, Goldblatt & Porter 11825. A, whole plant; B, front view of flower; C, flower l/s. Scale bar: 10 mm. Artist: John Manning.

Babiana cuneata is distinguished from other species with truncate leaves by its elongate perianth tube, 40–60 mm long, $\pm$ equal, laxly ascending tepals 26–30(–40) mm long, and fragrant or apparently odourless flowers. The stamens are openly displayed, with filaments 15–18 mm long and exserted 9–10 mm. The point of division of the style varies. In the type population, the branches separate opposite the base of the anthers but in plants to the south, below the Roggeveld Escarpment, the style reaches the anther apices. Flowering occurs from early August to late September. The flowers of *Babiana cuneata* closely resemble those of *B. sambucina* (No. 28), which is widespread across the dry interior of the Cape Floral Region, but absent from the Roggeveld.

We suspect that flowers of some populations of *Babiana cuneata* are adapted for pollination by long-

proboscis flies, but the presence of scent in many populations is unusual for this pollination system. It is more likely that the strongly scented flowers are pollinated by long-tongued bees. The perianth tube is hollow to the base in some populations but blocked below by the style, which forces the nectar higher up the tube, where it is within reach of bees. Plants produce ample amounts of nectar retained within the lower third or half of the tube or higher up when the lower part is blocked. Similar pale to deep blue flowers of *Babiana* species, including *B. curviscapa* (No. 25), *B. dregei* (No. 32), *B. framesii* (No. 33), *B. praemorsa* (No. 22), and *B. pubescens* (No. 23) are pollinated by *Prosoeca* species with proboscises 25–45 mm long.

Babiana cuneata was seemingly first collected by Rudolf Schlechter in August 1897 from 'Papelfontein',

i.e. Papkuilsfontein, some 15 km south of Nieuwoudtville at the northern end of its range. In 1941, Robert Compton collected the species at Lokenburg, a short distance to the south. The range of *B. cuneata* falls partly within the arid interior of the Cape Floral Region, but there are also several recent records (see below) from the Roggeveld Escarpment and Klein Roggeveld to the east. Most collections are from rocky habitats, with the parent rock either sandstone or dolerite. Plants at the southern end of the range, in the Klein Roggeveld south of Komsberg Pass, have unusually large flowers with the dorsal tepal ± 40 mm long, the anthers 9–11 mm long, and the style is also unusual in dividing opposite the anther apices rather than opposite their bases. Plants also seem unusual in the blue-grey colour of the leaves, often 20–30 mm wide, likewise exceptional for the species. We see no reason at present, however, to recognize these plants as a separate taxon. Representative specimens of *B. cuneata* are cited below; a complete listing of specimens is provided by Goldblatt & Manning (2004).

Representative specimens

NORTHERN CAPE.—3119 (Calvinia): ‘Papelfontein’, (–AC), 17 August 1897, *Schlechter 10892* (MO); near Soutpan, (–CD), 24 July 1961, *Lewis 5820* (NBG).

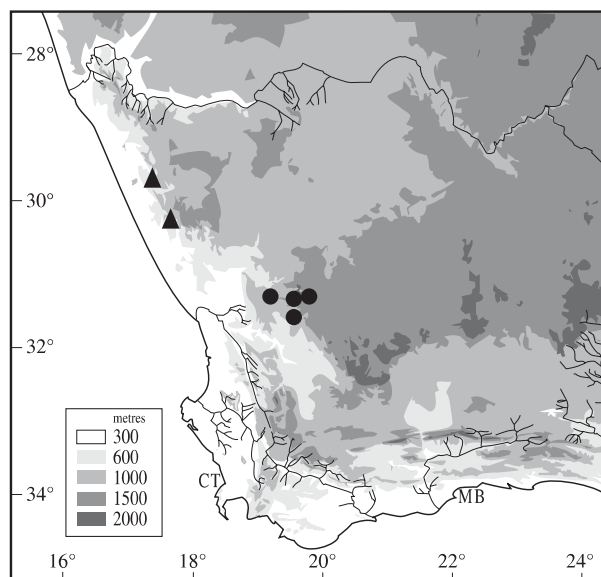
WESTERN CAPE.—3220 (Sutherland): Sutherland-Matjesfontein road at Komsberg turnoff, (–DC), 21 September 2003, *Goldblatt, Manning & Porter 12312* (K, MO, NBG, PRE). 3319 (Worcester): Karooport, 3 km north of Sutherland turnoff on Calvinia road, (–BA), 6 August 2002, *Manning 2761* (NBG). 3320 (Montagu): Karoo Garden, Whitehill, Laingsburg, (–BA), 17 August 1942, *Compton 13389* (NBG).

22. *Babiana praemorsa* Goldblatt & J.C.Manning in *Bothalia* 34: 90 (2004). Type: South Africa, [Northern Cape], Calvinia District, north of Bloukrans Pass, shale flats, 25 August 1976, *P. Goldblatt 3935* (NBG, holo.; K, MO, iso.).

B. flabellifolia sensu G.J.Lewis: 98 (1959) not of Harv. ex Klatt: 380 (1867–1868), misapplied name.

Plants 50–150 mm high; stem short, suberect or decumbent, rarely reaching 20 mm above ground level. *Leaves* oblong-cuneate, pleated, minutely hairy, in a spreading fan; juvenile leaves linear, ± 1 mm wide, silky hairy. *Bracts* 25–50 mm long, green, minutely hairy, inner slightly shorter than outer, forked apically, with acuminate tips. *Flowers* weakly zygomorphic, 5 or 6 in a congested spike, dark violet with white to cream-coloured, spear-shaped marks often edged with red or dark blue on lower lateral tepals, unscented or rarely faintly sweet-scented; perianth tube 40–60 mm long, cylindric, straight; tepals subequal, spreading horizontally, mostly $18\text{--}22 \times 3.5\text{--}5.0$ mm. *Stamens* unilateral; filaments suberect, 8–9 mm long, exserted 4–5 mm; anthers 5–6 mm long, violet or yellow. *Ovary* smooth; style dividing opposite upper half of anthers or shortly beyond them, branches 2–3 mm long. *Flowering time*: mainly August, sometimes until mid-September.

Distribution and ecology: Northern Cape: Calvinia District, from the Hantamsberg and Bloukrans Pass westward to near Nieuwoudtville; dolerite outcrops, often in rock crevices (Map 11).



MAP 11.—Distribution of *Babiana praemorsa*, ●; *B. pubescens*, ▲.

One of four species of *Babiana* with abruptly truncate, wedge-shaped leaves, *B. praemorsa* is recognized by its flowers with a straight, cylindric perianth tube 40–60 mm long, and firm, narrow, spreading tepals, 18–22 mm long. The perianth is deep violet rather than blue as in the related long-tubed species of the alliance and they are perhaps most like those of the central Namaqualand *B. pubescens* (No. 23), with which it is easily confused. *Babiana praemorsa* can be distinguished from this and another long-tubed species, *B. cuneata* (No. 21) from the dry interior of northern Western Cape, by its short filaments, 8–9 mm long, exserted 4–5 mm from the perianth tube, tepals spreading at right angles from the nearly straight tube of uniform diameter, and short style branches ± 3 mm long.

In her account of the genus, Lewis (1959) called *Babiana praemorsa*, *B. flabellifolia*, a species described by Klatt in 1867–1868, and based on a specimen, from ‘Namaqualand Minor’. This is not the same as the plants from the Calvinia District with which she associated the name. As explained in detail by Goldblatt & Manning (2004), the type specimen, a single plant at the Kew Herbarium, has flowers with a short, obliquely funnel-shaped perianth tube, ± 18 mm long, with the narrow part ± 10 mm long, and broadly cuneate leaves that are densely long-hairy on the major veins and margins. Except for the prominently hairy leaves and slightly shorter tube, this corresponds exactly to the Namaqualand plant called by Lewis *B. truncata*, which has accordingly been reduced to synonymy in *B. flabellifolia* (Goldblatt & Manning 2004).

Babiana praemorsa is a narrow endemic of dolerite outcrops in the Calvinia District, sometimes growing in crevices in dolerite pavement where the corms are secure from predation. Specimens cited by Lewis from ‘Upington, Namaqualand’ (*Orpen s.n.*, NBG), are certainly incorrectly located. The collection from Whitehill (*Compton 13389*, NBG) south of Laingsburg is *B. cuneata*, from the southern limit of its range. Since it was treated by Lewis (1959), *B. praemorsa* has been

collected at several localities not known to her, extending the known range of the species. These are listed below.

Additional specimens examined

NORTHERN CAPE.—3119 (Calvinia): 36 km from Loeriesfontein to Calvinia, S-trending slope, (–AB), 5 September 2006 (fr.), Goldblatt & Porter 12773 (MO, NBG); ± 12 km east of Nieuwoudtville, rocky dolerite flats, (–AC), 12 September 2004, Goldblatt & Porter 12419 (MO); Hantamsberg summit plateau, in cracks in dolerite outcrops, (–BD), 3 September 1994, Goldblatt & Manning 9961 (MO); Kareebomfontein, Calvinia, (–DA), 30 August 1974, Hanekom 2368 (K, M, MO, P, PRE).

23. *Babiana pubescens* (Lam.) G.J.Lewis in *Annals of the South African Museum* 40: 131 (1954a); G.J.Lewis: 110 (1959), excl. syn. *B. cuneifolia* Baker. *Gladiolus pubescens* Lam.: 119 (1791). Type: South Africa, [Northern Cape], without precise locality or date, *F. le Vaillant* s.n. (P–Herb. Lamarck, holo.).

Plants 60–100 mm high; stem short, decumbent, rarely reaching above ground level, simple or 1- or 2-branched. *Leaves* crowded basally, abruptly truncate and wedge-shaped, slightly plicate, usually finely hairy. *Bracts* 20–38 mm long, smooth to velvety, inner slightly shorter than outer, forked apically. *Flowers* zygomorphic, 6–10 in a dense spike, blue to violet with white median marks sometimes edged in red on lower lateral tepals; perianth tube elongate, ± 50 mm long, sharply bent below apex; tepals unequal, the dorsal largest and held somewhat apart, ± 20 mm long, lower tepals joined to upper laterals for a short distance and to one another for ± 2 mm forming a lip, lower tepals 15–17 mm long. *Stamens* unilateral; filaments ± 15 mm long, well exerted from tube; anthers 6–7 mm long. *Ovary* smooth; style dividing opposite lower half of anthers, branches ± 4 mm long. *Flowering time*: from late July to early September. Plate 2A.

Distribution and ecology: Northern Cape: Namaqualand, extending from Komaggas to Garies; in stony slopes in coarse granitic soils (Map 11).

Babiana pubescens is readily distinguished from other species with truncate leaves by the slender perianth tube, ± 50 mm long, sharply bent below the apex, and the relatively narrow tepals 15–20 mm long and 5–7 mm wide. *Babiana cuneifolia* Baker, cited by Lewis as a later synonym of *B. pubescens*, is not this species but rather the short-tubed plant treated by Lewis as *B. truncata* and which is now called *B. flabellifolia* (No. 20).

Said by Lewis (1959) to occur from Garies southward to Mierenkasteel (near Nuwerus) (*Drège* 2627) in southern Namaqualand, *Babiana pubescens* has only been reliably reported from Komaggas, west of Springbok, and in the vicinity of Garies, from where there are several collections. It seems almost certainly a fairly narrow endemic of central Namaqualand and that the plants said to be from Mierenkasteel that match *B. pubescens* are mislabeled. Most collections of *Drège* 2627 are short-tubed and must be referred to a second species, *B. flabellifolia*.

Although increasingly threatened by overgrazing and especially the heavy stocking of goats, *Babiana pube-*

scens remains relatively common locally. The attractive, blue to violet, long-tubed flowers are pollinated by the long proboscis fly, *Prosoeca peringueyi*, an important insect pollinator of long-tubed flowers in Namaqualand (Manning & Goldblatt 1996a; Goldblatt & Manning 2000a).

Additional specimens examined

NORTHERN CAPE.—2917 (Springbok): near Komaggas, granitic soil, (–DC), 23 August 1981, Van Berkel 367 (NBG); 7 km north of Komaggas, (–DC), 21 August 2002, Goldblatt & Porter 12094 (K, MO, NBG). 3017 (Hondeklipbaai): hills above Garies, (–DB), 4 August 1994, Goldblatt & Manning 9907 (MO, NBG).

Series 1.3 *Longitubae*

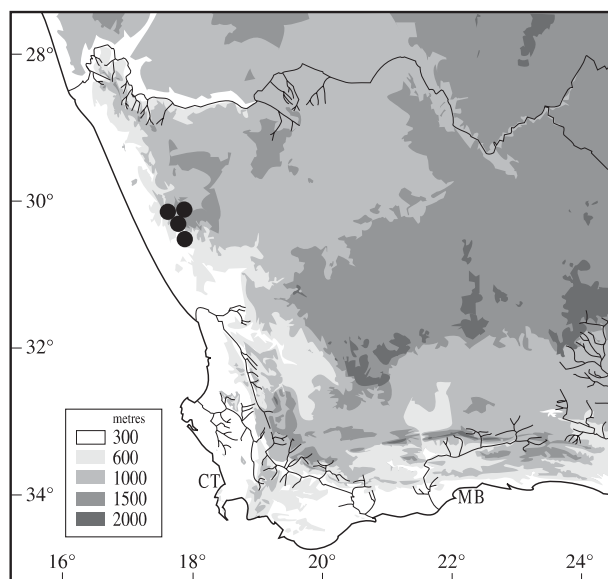
24. *Babiana attenuata* G.J.Lewis in *Journal of South African Botany*, Suppl. 3: 102 (1959). Type: South Africa, [Northern Cape], foot of the Kamiesberg near Kamieskroon, 29 July 1957, G.J. Lewis 4414 (SAM, holo.; NBG, iso.).

Plants up to 80 mm high; stem mostly or entirely underground, softly hairy. *Leaves* sword-shaped to lanceolate, rarely linear, plicate, softly hairy, often arching toward ground. *Bracts* 20–30 mm long, velvety, inner ± as long as outer, forked apically, attenuate. *Flowers* zygomorphic and bilabiate, 4–9 in a decumbent spike, blue to violet with white to yellow marks on lower lateral tepals, with a strong scent of violets; perianth tube narrowly funnel-shaped, 25–35 mm long, bent near apex; tepals unequal, dorsal (20–)26–35 mm long, lower tepals slightly shorter. *Stamens* unilateral; filaments arching under dorsal tepal, ± 15 mm long; anthers 5–7 mm long. *Ovary* smooth; style arching over stamens, dividing opposite anther tips, style branches ± 2.5 mm long. *Flowering time*: late July to early September. Plate 2B).

Distribution and ecology: Northern Cape: central Namaqualand, in the Kamiesberg and the highlands between Kamieskroon and Garies; rocky and gravel slopes (Map 12).

The locally common *Babiana attenuata*, described by Lewis in 1959, extends across central Namaqualand at middle to upper elevations, from Garagams (Kharkams) in the north to Garies in the south. It blooms relatively early in the spring season, often coming into flower in late July. It is most easily recognized by the perianth tube ± as long as or slightly longer than the bracts and tepals, a strong sweet violet fragrance, and the blue-violet flowers borne on crowded horizontal spikes close to ground level.

It is easily confused with the vegetatively virtually identical *B. curviscapa* (No. 25), which extends from Steinkopf in the north to Bitterfontein in the south, thus including the entire range of *B. attenuata*. Lewis (1959), in her monograph of *Babiana*, did not associate the two species, but we find them difficult to distinguish. They are separated primarily by the perianth tube, substantially longer in *B. curviscapa* and usually 36–43 mm, versus 25–35 mm in *B. attenuata*. Flowers of *B. attenuata* are

MAP 12.—Distribution of *Babiana attenuata*.

always strongly fragrant and have tepals usually 26–35 mm long, whereas the flowers of *B. curviscapa* have a faint scent or lack a floral odour completely and the tepals are 20–23 mm long. In the north of its range *B. curviscapa* can also be distinguished by the magenta to cherry-red flowers, but further south they are blue to violet, just like those of *B. attenuata*. Despite its relatively long perianth tube, *B. attenuata* is pollinated by anthophorine bees with mouthparts ± 10 mm long. Bees are able to reach the nectar in the perianth tube because the narrow part of the tube has thick walls that closely envelop the style. Nectar is therefore forced into the wider upper portion of the tube and is then within reach of long-tongued bees. The strong scent of *B. attenuata* makes the plant a desirable garden subject, especially suitable for pot culture. Well-grown plants will flower for several weeks in early spring when few other plants bloom.

We include here plants from the southern Kamiesberg that have erect, linear leaves up to 150 mm long (Goldblatt & Porter 12137). The leaf blades are conspicuously long-hairy and impart a rather different appearance to these plants, which nevertheless seem best regarded as a local variant of *Babiana attenuata*.

Additional specimens examined

NORTHERN CAPE.—3018 (Kamiesberg): Kamiesberg, near Witwater, (–AC), 3 September 2002, Goldblatt & Porter 12154 (MO, NBG); southern Kamiesberg, between Karas and Nartjiesdam, (–CA), 1 September 2002, Goldblatt & Porter 12137 (MO, NBG).

25. *Babiana curviscapa* G.J.Lewis in Journal of South African Botany, Suppl. 3: 107 (1959). Type: South Africa, [Northern Cape], Nababeep, 5 September 1951, W.F. Barker 7431 (NBG, holo.; K, iso.).

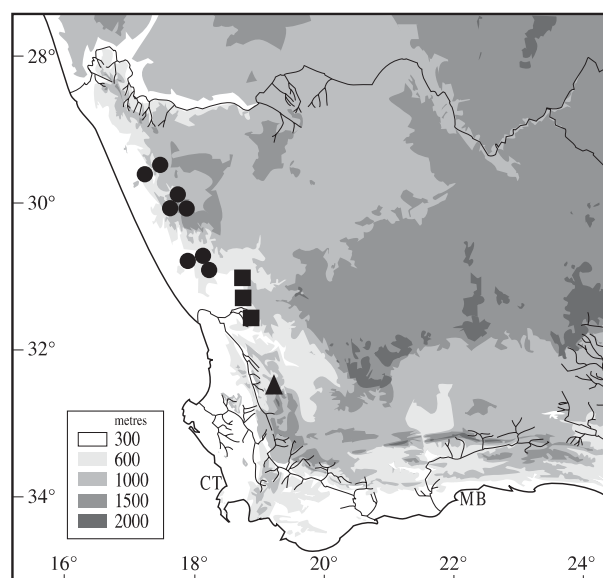
B. framesii var. *kamiesbergensis* G.J.Lewis: 98 (1959), syn. nov. Type: South Africa, [Northern Cape], Kamiesberg, cultivated at Kirstenbosch National Botanical Garden, 30 September 1943, C.L. Leipoldt s.n. (Nat.Bot.Gard.981/39 in NBG, holo.).

Plants mostly acaulescent, 80–150 mm high, including leaves, often growing in tufts; stem short,

mostly underground, smooth or hispid to long-hairy, with up to three branches. Leaves lanceolate, mostly 5–8 mm wide, rarely up to 15 mm, plicate, velvety hairy, rarely silky long-hairy, blades held apart, not forming a fan. Bracts green with dry brown tips, velvety, 25–35 mm long, inner $\pm$ as long as outer, forked at tip. Flowers zygomorphic, 5–12 in a horizontal spike, deep red-purple or violet to deep blue, with white markings on lower lateral tepals, odourless or faintly violet-scented; perianth tube elongate-cylindrical, 36–43 mm long, bent near apex; tepals unequal, dorsal 20–23 mm long, lower tepals 17–19 mm long. Stamens unilateral; filaments 12–14 mm long; anthers 4–6 mm long, white. Ovary smooth; style dividing opposite upper third of anthers, branches ± 4 mm long. Flowering time: late August to September. Plate 2C.

Distribution and ecology: Northern Cape: extending from the southern edge of the Richtersveld to the Kamiesberg and Bitterfontein; granitic, stony flats and granite outcrops (Map 13).

The most common long-tubed species of *Babiana* in Namaqualand, *B. curviscapa* extends from near Steinkopf in the north to the hills west of Bitterfontein in the south. Plants flower from late August to the end of September, depending on elevation, those on the Kamiesberg flowering the latest. In Namaqualand robust specimens of *B. curviscapa* were treated by Lewis (1959) as *B. framesii* var. *kamiesbergensis*, but these plants differ from *B. framesii* (No. 33) in having a perianth tube curved near the apex and leaves somewhat loosely arranged and often conspicuously hairy, unlike the nearly straight perianth tube and the tight fan of subglabrous or thinly hairy leaves that characterize *B. framesii*. *Babiana curviscapa* was known to Lewis mainly from the Springbok–Kamieskroon portion of its range where the flowers are magenta or cherry-red. Populations from south of Kamieskroon and north of Springbok, however, have violet or deep bluish flowers. The occurrence of *B. curviscapa* in the Kamiesberg and to the south near

MAP 13.—Distribution of *Babiana curviscapa*, ●; *B. geniculata*, ▲; *B. vanzijliae*, ■.

Bitterfontein was not recorded by Lewis and specimens from these localities, some of them included by her in *B. framesii* var. *kamiesbergensis*, are cited below.

Babiana curviscapa appears to be most closely allied to *B. attenuata* (No. 24), which is vegetatively virtually indistinguishable but has strongly scented violet flowers with a perianth tube 25–35 mm long. *Babiana attenuata* is pollinated by long-tongued anthophorine bees, mainly *Anthophora* species and *Pachymelus peringueyi*, whereas the longer-tubed flowers of *B. curviscapa* are pollinated by the long-proboscid fly, *Prosoeca peringueyi* (Goldblatt *et al.* 1995; Manning & Goldblatt 1996a; Goldblatt & Manning 2007). Although the two species flower at a slightly different time, *B. curviscapa* mainly in September and *B. attenuata* from late July to late August, we suspect that flowering times overlap at some sites, creating the possibility for hybridization. It seems likely that some interspecific crossing between the two species is the reason they are often so difficult to distinguish.

Additional specimens examined

NORTHERN CAPE.—3017 (Hondeklipbaai): top of Kamiesberg Pass, Farm Bovlei, (–AA), 17 September 2001, Goldblatt & Porter 11903 (MO, NBG, PRE). 3018 (Kamiesberg): Kamiesberg, near FM tower at Leliefontein, (–AC), 20 September 1994, Goldblatt & Manning 10007 (MO, NBG).

WESTERN CAPE.—3018 (Kamiesberg): $\pm$ 10 km north of Bitterfontein, rocky slopes, (–CC), 20 August 2001, Goldblatt & Porter 11712 (MO, NBG). 3017 (Hondeklipbaai): mountains west of Rietpoort, 1374 feet [418.4 m], (–DD), 20 August 2002, Goldblatt & Porter 12075 (K, MO, NBG, PRE, WAG).

26. ***Babiana geniculata*** G.J.Lewis in Journal of South African Botany, Suppl. 3: 109 (1959). Type: South Africa, [Western Cape], 3219 (Wuppertal): Boontjiesrivier, (–AA), 25 August 1896, R. Schlechter 8666 (BOL, holo.; B, MO, S, iso.).

B. velutina var. *nana* Schltr.: 101 (1899). Type: South Africa, [Western Cape], Boontjiesrivier, 25 August 1896, R. Schlechter 8666 (B, BOL, MO, S, syn.).

Plants 20–60 mm high; stem barely reaching above ground level, usually unbranched, velvety hairy, enclosed below in thick, fibrous neck. Leaves lanceolate, pleated, usually inclined toward ground, velvety hairy. Bracts 25–35 mm long, green with dry acuminate apices, densely hairy, inner half to two thirds as long as outer, forked in upper third. Flowers zygomorphic, 4–9 in compact, decumbent spike, violet, lower lateral tepals with white median markings, unscented; perianth tube 35–45 mm long, cylindrical, sharply bent at top; tepals unequal, dorsal 23–29 mm long, lower tepals 15–22 mm long, joined to upper laterals for $\pm$ 3 mm and to one another for 2–3 mm forming a prominent lip. Stamens unilateral; filaments arched, diverging above, 13–15 mm long; anthers $\pm$ 7 mm long, held widely apart. Ovary hairy above base; style dividing opposite middle of filaments, branches slender, 11–13 mm long. Flowering time: August.

Distribution and ecology: Western Cape: in the Pakhuis and Biedouw Mountains and northern Cederberg; rocky sandstone slopes in dry fynbos (Map 13).

A narrow endemic of the Pakhuis and Biedouw Mountains north of the main Cederberg Range, *Babiana geniculata* can be distinguished by flowers with a long, slender perianth tube 35–45 mm long, characteristically bent at a sharp angle just below the apex, the divergent rather than parallel anthers, and the style dividing below the bases of the anthers. The style branches, the longest in the genus, 11–13 mm long, are slender and barely expanded at the tips. The long-tubed flowers of *B. geniculata* are pollinated by the long-proboscid fly, *Prosoeca peringueyi* (Manning & Goldblatt 1996a).

First collected by Rudolf Schlechter in the spring of 1896 near Boontjiesrivier, east of Pakhuis Pass, *Babiana geniculata* was named *B. velutina* var. *nana* by Schlechter in 1899. *B. velutina* is a synonym of *B. ecklonii* (No. 68). Only in 1959 did Lewis recognize the plant as a separate species, *B. geniculata*, based on Schlechter's original collection. Several unusual features of *B. geniculata* leave no doubt that her treatment was correct. The inner bracts, forked in the upper third, indicate that *B. geniculata* belongs in section *Teretifoliae*, whereas the taller *B. ecklonii* has the inner bracts divided to the base, and is therefore referred here to section *Babiana*. We assume that *B. geniculata* is most closely related to the long-tubed Namaqualand species *B. curviscapa* (No. 25), which it resembles in the short leaves, decumbent spike, and elongate perianth tube also sharply bent below the apex. *Babiana curviscapa* has conventional arcuate and parallel filaments and anthers, and the style divides close to the anther apices into short branches, $\pm$ 4 mm long.

27. ***Babiana vanzijliae*** L.Bolus in Annals of the Bolus Herbarium 4: 27 (1925); G.J.Lewis: 85 (1959), as *B. vanzylliae*. Type: South Africa, [Northern Cape], Nieuwoudtville District, without precise locality, flowered in Cape Town, September 1924, Van Zijl s.n. (BOL17698, holo.).

Plants 40–120 mm high; stem reaching shortly above ground level, velvety, rarely with 1 or 2 branches borne at ground level, stem base enclosed by thick collar of fibres. Leaves sword-shaped to lanceolate, pleated, velvety hairy. Bracts 25–40 mm long, green, becoming dry at tips, inner slightly shorter than outer, forked at apex. Flowers zygomorphic, 3–5 in a compact, decumbent spike, yellow to pale blue-mauve, lower lateral tepals with whitish median blotches, intensely scented; perianth tube narrowly funnel-shaped, (18–)25–50 mm long; tepals unequal, dorsal arching forward, 30–38 mm long, lower tepals 25–30 mm long, joined to upper laterals for short distance forming oblique lip. Stamens unilateral; filaments arched, 15–17 mm long; anthers 7–8 mm long. Ovary smooth or shortly hispid on ribs; style arching over stamens, dividing opposite anther tips, branches $\pm$ 4 mm long. Flowering time: early August to mid-September.

Distribution and ecology: Northern Cape: on the Bokkeveld Escarpment; rocky sandstone- and tillite-derived soils in fynbos and renosterveld (Map 13).

One of just a handful of yellow-flowered species of *Babiana*, *B. vanzijliae* is a narrow endemic of the Bokkeveld Escarpment. It occurs from the escarpment edge

north of Vanrhyn's Pass southward to Papkuilsfontein Farm and inland for ± 15 km. They are most common on sandstone-derived soils and in seasonally wet sites but also occur on the tillite band that lies parallel to the escarpment edge adjacent to the Cape sandstone belt. The range of flower size and colour in *Babiana vanzijliae* is unusual for the genus, especially for a species of such a narrow distribution. In the south, at Papkuilsfontein and Lokenburg, the perianth may be a dull creamy yellow or flushed pale bluish mauve and the perianth tube is 18–25 mm long (e.g. Goldblatt 10942). Between these sites and Nieuwoudtville the perianth is usually bright yellow and the tube 30–38 mm long. North and east of Nieuwoudtville the flowers have the same bright yellow colouring but the tube is 35–50 mm long (e.g. Barker 10762, Goldblatt & Nänni 11401); yet further north, flowers have purple-flushed upper tepals and a tube 25–30 mm long (e.g. Goldblatt 12683). The shorter-tubed plants with mauve flowers may be the result of introgression due to occasional crossing with short-tubed, violet-flowered *B. mucronata* because both may be pollinated by bees and *Prosoeca* flies with mouthparts of up to 12–14 mm long. In the north, the longer tube may be the result of pollinator selection by a second species of *Prosoeca* which has a proboscis 31–44 mm long. A common visitor to the species here, it successfully pollinates only the plants with the longest tubes: the style branches and anthers of plants with shorter tubes are not long enough to brush against the fly's body as it forages for nectar.

Babiana vanzijliae was seemingly first collected by Rudolf Schlechter in August 1897 at 'Papelfontein' (i.e. Papkuilsfontein), south of Nieuwoudtville (Schlechter 10910). Some specimens of that collection, for example, at the Paris Herbarium, bear the manuscript name *B. sulphurea*, which if published, would have been a homonym for *B. sulphurea* (Jacq.) Ker Gawl. In Lewis's (1959) account of *B. vanzijliae*, which she spelled *vanzyliae* in accordance with contemporary transliteration into Afrikaans from the original Dutch, thus departing from the original spelling, the species is recorded as extending from Grasberg, northwest of Nieuwoudtville to Papkuilsfontein, some 16 km to the south of the town. Our collection from Lokenburg, cited below, extends the range some 15 km further south, a minor and not unexpected extension.

Additional specimens examined

NORTHERN CAPE.—3119 (Calvinia): Bokkeveld Escarpment, Farm Lokenburg, (–CA), 1 August 1998, Goldblatt & Manning 10942 (MO); Bokkeveld Escarpment, Grasberg road northwest of Grasberg, (–AC), 1 Sept. 2005, Goldblatt 12683 (MO, NBG).

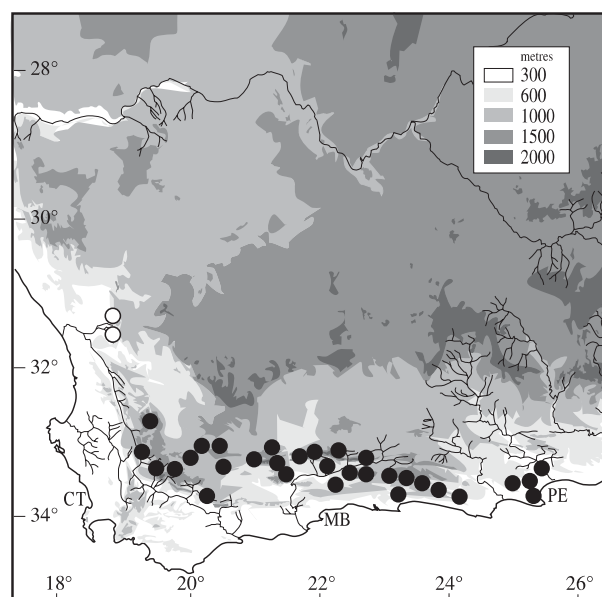
28. *Babiana sambucina* (Jacq.) Ker Gawl. in König & Sims, Annals of Botany 1: 234 (1804); G.J.Lewis: 92 (1959). *Gladiolus sambucinus* Jacq.: 15 (1797). Type. South Africa, without precise locality, collector or date; illustration in Jacquin, Plantarum rariorum horti caesarei Schoenbrunnensis: t. 15 (1797).

Plants 80–300 mm high including leaves; stem mostly underground, smooth. Leaves lanceolate to linear, rarely subterete, strongly pleated to nearly flat, short-hairy or

hispid, occasionally glabrescent, occasionally long-hairy and silky at base and upper part of sheath or throughout. Bracts mostly 25–40 mm long, green with rusty tips, variously scabrid to sparsely long-hairy, inner slightly shorter than outer, forked at apex, sometimes united basally around ovary; lowermost outer bract extended and leaf-like above, up to 60 mm long. Flowers zygomorphic, in a several-flowered, compact spike, violet to blue, lower lateral tepals each with a white median mark edged below in dark blue to red, or sometimes with solid red centre, intensely fragrant or rarely odourless; perianth tube 35–55(–65) mm long, straight, slightly flaring above, hollow throughout or with thick walls below tightly enclosing style; tepals subequal, (20–)30–35 $\times$ 5–12 mm, often overlapping even when fully open, lower three tepals sometimes basally united for up to 2 mm. Stamens unilateral; filaments $\pm$ straight, 10–20 mm long; anthers 7–10 mm long, white to cream-coloured. Ovary smooth, lowermost sometimes shortly stipitate; style usually dividing between base and upper third of anthers. Flowering time: mainly mid-August and September. Plate 2D.

Distribution and ecology: Northern, Western and Eastern Cape: throughout the interior Cape Floristic Region from the Bokkeveld Mountains in the north through the Cold Bokkeveld, Witteberg, and Swartberg to Uitenhage and Addo; usually stony slopes and flats or rock outcrops, in dry fynbos and renosterveld, most often on sandstone-derived soils (Map 14).

Babiana sambucina is recognized by the smooth spike borne at ground level, a distinctive lowermost outer floral bract that is extended upward into a short blade (called a foliaceous awn by Lewis), and the flowers with a long, straight perianth tube and nearly equal tepals. Flowers of most populations are strongly and sweetly scented of violets, a particularly characteristic feature of the species.



MAP 14.—Distribution of *Babiana sambucina* subsp. *sambucina*, ●; *B. sambucina* subsp. *longibracteata*, ○.

The record from the Great Karoo near Beaufort West (Lewis 1959) is actually from near Klaarstroom in the Swartberg (*Drège* 8395, P) and the collection from the Addo Bush, north of Uitenhage (*Story* 2726, NBG) in Eastern Cape, is from the dry interior foothills of the sandstone Great Winterhoek Mountains. Collections from the Worcester–Villiersdorp area assigned to the species in herbaria are, however, the new *B. arenicola* (No. 65), which is readily distinguished from *B. sambucina* by having the inner bracts divided to the base, flowers with a slightly shorter perianth tube, ± 30 mm long, and the style dividing below the level of the anthers.

Typical *Babiana sambucina* has flowers with a perianth tube 35–50 mm long and subequal tepals $25\text{--}35 \times 5\text{--}12$ mm. Despite the length of the tube, flowers are pollinated by long-tongued bees, mostly large *Anthophora* species, with tongues no more than 10 mm long. Bees readily reach the nectar because it is held in the upper 10 mm of the tube, the lower portion being thick-walled and tightly enclosing the style. The elongate tube thus functions largely as a pseudopedicel, raising the flowers above the ground.

Three unusual sets of populations were accorded formal recognition as varieties of *Babiana sambucina* by Lewis (1959). The first of these, var. *undulato-venosa*, from the southeastern part of the range of the species, has short lanceolate leaves sometimes not overtopping the flowers, a perianth tube 55–60 mm long, and a lower bract with a weakly developed blade. Lewis commented that this plant cannot be regarded as more than a longer-tubed variant of *B. sambucina*. We concur, and prefer not to give it a formal rank.

The remaining two varieties are more distinctive. *Babiana sambucina* var. *longibracteata* has long, narrow leaves 2–6 mm wide, densely covered in long, white, silky hairs. First described by Lewis in 1932 as *B. longibracteata*, this plant also has particularly large flowers with an elongate, hollow perianth tube 40–55 mm long and tepals $30\text{--}40 \times 7\text{--}12$ mm. Unlike typical *B. sambucina*, the flowers are sometimes unscented. Var. *longibracteata* is restricted to the northern end of the range of *B. sambucina* along the Bokkeveld Escarpment west of Nieuwoudtville, and is pollinated by the long-proboscid fly *Prosoeca* sp. (Goldblatt & Manning 2000a). We treat this variant as a separate subspecies here.

The third variety, *Babiana sambucina* var. *unguiculata* occurs along a narrow stretch of country from Botterkloof Pass to Oorlogskloof south of Nieuwoudtville. Its range, therefore, abuts on that of var. *longibracteata*, but the two remain quite distinct. Like var. *longibracteata*, it has flowers with an elongate, hollow perianth tube 38–55 mm long and tepals $30\text{--}38 \times 7\text{--}12$ mm, but it differs in having narrow tepals, the lower united in a prominent lip, and narrowed below, thus somewhat clawed. The leaves are broader than in var. *longibracteata*, $12\text{--}30 \times 7\text{--}13$ mm, minutely hairy or virtually hairless, and are rigid and sharply pointed at the tip. On drying, the veins and margins appear prominent and hyaline, a feature reminiscent of the Namaqualand species *B. dregei*, which has even more rigid leaves with prominently thickened margins and a prickly apex. In well-grown plants of this taxon, the stem is produced well above the ground,

therefore appearing very different from *B. sambucina*. Its combined differences have led us to treat this as a separate species, *B. rigidifolia*. The flowers are visited and pollinated by the long-proboscid fly, *Prosoeca peringueyi* (Goldblatt & Manning 2000a).

The relationships of *Babiana sambucina* are uncertain. Lewis regarded the species as closely related to the widespread *B. bainesii* (which she called *B. hypogaea*) of summer rainfall southern Africa. The latter differs most significantly in the spike being borne just below the ground so that the flowers arise at $\pm$ ground level, whereas in *B. sambucina* the spike is carried slightly above the ground. The leaves of *B. hypogaea* are longer and normally narrower than in *B. sambucina*, usually 3–10 mm wide, and long-hairy, but the degree and type of leaf pubescence is variable in both species. The perianth tube of *B. sambucina*, normally 35–55 mm long, is similar to that of *B. bainesii* but the tepals, 20–60 mm long and 6–12 mm wide, are proportionally narrower than in *B. sambucina* and they do not overlap one another in the lower half as in *B. sambucina*. More significantly, the perianth tube of *B. hypogaea* has a wide throat and the lower tepals are joined to the upper laterals forming a prominent lip. In contrast, the tube of *B. sambucina* is cylindrical or gradually expanded from the base and the tepals arise at $\pm$ the same level.

Among the species of the southern African winter rainfall zone, *Babiana sambucina* may be most closely allied to *B. framesii* of the Bokkeveld Plateau and we find it difficult to separate the two when dry. *Babiana framesii* has, like *B. sambucina*, a long straight perianth tube, although somewhat curved below the throat, but the somewhat smaller tepals are proportionally narrower and spread almost at right angles to the tube, and the flowers are at best only faintly scented.

Key to subspecies

Leaves linear, 2–6 mm wide, with long, white-silky hairs; perianth tube 40–55 mm long, hollow to base; flowers faintly scented or unscented; usually growing singly in sandy ground subsp. *longibracteata*

Leaves linear to sword-shaped, mostly 6–12 mm wide, occasionally subterete and ± 2.5 mm wide, variously velvety, pubescent, scabrid, or smooth; perianth tube 30–65 mm long, usually hollow only near apex; flowers usually strongly scented; usually growing in tufts in rocky ground subsp. *sambucina*

28a. subsp. *sambucina*

B. undulato-venoso Klatt: 350 (1882). *B. sambucina* var. *undulato-venoso* (Klatt) G.J.Lewis: 96 (1959), syn. nov. Type: South Africa, [Eastern Cape], Humansdorp, Company's Drift, September 1922, H.G. Fourcade 2311 (SAM, neo., designated by Lewis: 96; BOL, iso.).

See Lewis (1959) for complete synonymy.

Leaves lanceolate to linear or subterete, short or long-hairy or hispid, sometimes glabrescent. Bracts mostly 25–40 mm long, green with rust-brown tips, variously scabrid to long-hairy. Flowers violet or blue, lower lateral tepals with white blotches, occasionally with red

in throat, intensely to faintly fragrant, rarely odourless; perianth tube 30–50(–60) mm long, gradually flaring, straight; tepals subequal, (20–)30–35 × 6–12 mm, or the dorsal slightly longer. *Filaments* 10–20 mm long. *Flowering time*: August and September.

Distribution and ecology: Western and Eastern Cape: extending from the Cold Bokkeveld to Uitenhage and Addo; rocky, usually sandstone-derived ground (Map 14).

Always acaulescent, with spikes produced at ground level, *Babiana sambucina* subsp. *sambucina* varies considerably in leaf form and perianth tube length across its wide range. Particularly noteworthy is a narrow-leaved variant from the Anysberg and nearby ranges in the western Little Karoo. While the flowers are exactly like those of typical *B. sambucina* from the nearby Klein Swartberg and Groot Swartberg, the leaves have heavily thickened veins and nearly terete blades, and seem at first to be significantly different from typical *B. sambucina*. We found, however, in the spring of 2002 at Anysberg, that these plants grow together with plants with broader leaves that have identical flowers and we have concluded that they do not merit taxonomic recognition.

A second variant are plants from shale and limestone slopes in the Cango Valley of the Little Karoo. These resemble *Babiana sambucina* in vegetative form, but have unscented or at best weakly scented flowers (e.g. Goldblatt & Porter 11838, MO, NBG, PRE). The bases of all the tepals and the throat are dark red, and the perianth tube has a uniformly wide diameter, is hollow throughout, and contains nectar in the base. The floral adaptations of this plant seem to us exactly those for long-proboscid fly pollination although we have not seen insects visiting them. In addition, the pubescence of the leaves is very short, which contrasts with the dense, fairly long vestiture of most Little Karoo and Swartberg populations of *B. sambucina*. The degree of hairiness in *B. sambucina* does, however, vary across its range, and differences therefore seem not particularly significant. Future study will show whether these populations merit taxonomic recognition, but for the present we regard them as a divergent race of *B. sambucina*.

28b. subsp. **longibracteata** (G.J.Lewis) Goldblatt & J.C.Manning, comb. et stat. nov.

B. longibracteata G.J.Lewis in South African Gardening 22: 243 (1932). *B. sambucina* var. *longibracteata* (G.J.Lewis) G.J.Lewis: 95 (1959). Type: South Africa, [Northern Cape], Grasberg road, 10 miles N of Nieuwoudtville, Sept. 1930, L. Bolus s.n. (BOL19803, holo.; K, iso.).

Plants similar to *Babiana sambucina* subsp. *sambucina* but leaves mostly nearly flat, linear, 11–30 × 2–6 mm, with spreading or appressed long, silky hairs. *Bracts* except for lower one, 35–40 mm long, silky long-hairy. *Flowers* with perianth tube 40–55 mm long, hollow throughout, with nectar at base, scented or unscented. *Filaments* 15–20 mm long. *Flowering time*: August and September.

Distribution and ecology: Northern Cape: Bokkeveld Mountains; sandy ground among rocks (Map 14).

Babiana sambucina subsp. *longibracteata* was apparently first collected in 1897 by Rudolf Schlechter, who gave it the manuscript name *B. montigena*. A second early collection, jointly made in 1900 by Diels & Pritzel (though seemingly two collections with separate labels) bears the manuscript name *B. inodora* (apparently based on an unscented population of the taxon). When the plant was encountered again in the 1930s during the systematic botanical exploration of the Bokkeveld Mountains by Louisa Bolus and her students, the existence of the earlier collections at the Berlin Herbarium were unknown. It fell to Lewis to describe the plant, which in 1932 she named *B. longibracteata*. Later she reduced the species to varietal rank in *B. sambucina*. As outlined above, we prefer subspecies rank for the taxon, recognizing both its morphological differences and its geographic isolation. The nearest populations of subsp. *sambucina* are well to the south, in the Cold Bokkeveld.

We remain doubtful about the value of subspecies treatment for this taxon, and subsp. *longibracteata* could equally be regarded as a separate species. The infraspecific rank recognizes its close affinity with *B. sambucina*, of which we assume it represents a series of populations in the process of evolving into a separate species. Its differentiation is obviously pollinator driven, for the flowers are pollinated by long-proboscid flies, whereas subsp. *sambucina* is pollinated by long-tongued bees, as far as is known, over its entire range (Goldblatt & Manning 2007).

29. **Babiana radiata** Goldblatt & J.C.Manning, sp. nov.

Plantae cum foliis 100–150 mm altae, caule subterraneo eramoso; foliis anguste lanceolatis usque ad 180 mm longis 2–4(–7) mm latis; bracteis 25–35 mm longis, bractea interiore ad apicem furcata; spica 4- ad 6-flora, floribus hypocrateriformibus actinomorpha violaceis centro rubro marginibus proximalibus tepalorum albis, fragrantibus, tubo perianthii 30–37 mm longo, tepalis aequalibus patentibus lanceolatis ± 30 × 10 mm; filamentis ± 9 mm longis, antheris ± 10 mm longis; ovario glabro.

TYPE.—Western Cape: Little Karoo, near De Rust, Farm Mons Ruber, sandy flats at foot of Enon Conglomerate ridge, 18 September 2002, P. Goldblatt & L.J. Porter 12187 (NBG, holo.; K, MO, PRE, WAG, iso.).

Plants 100–150 mm high, including leaves; stem subterranean, mostly unbranched, enclosed by neck of coarse, brittle brown fibres. *Leaves* in basal tuft, narrowly lanceolate to ± linear, up to 180 mm long and exceeding spike, 2–4(–7) mm wide, nearly flat, finely hairy. *Bracts* 25–35 mm long, pale green, dry and pale brown at tips, shortly attenuate, finely hairy, inner ± as long as outer, forked at apex. *Flowers* actinomorphic, 4–6 in an inclined spike, salver-shaped, tepals forming shallow bowl, violet with red centre and throat, sometimes with median white

streak or diamond in red zone, sweetly scented during day; perianth tube 30–37 mm long, cylindrical, straight or slightly curved, flared outward in upper 6 mm, with thick walls tightly enclosing style, upper quarter containing nectar; tepals lanceolate to spatulate, ascending below, spreading distally, subequal, 28–37 × 10–12 mm. *Stamens* symmetrically arranged, erect; filaments ± 9 mm long, purple; anthers 8–10 mm long, diverging, violet; pollen whitish. *Ovary* smooth; style erect, purple, dividing opposite lower third of anthers, branches 4–5 mm long. *Capsules* and seeds not known. *Flowering time*: mid-August to mid-September. Figure 7.

Distribution and ecology: Western Cape: restricted to the Little Karoo near Mons Ruber; sandy flats in succulent karoo vegetation (Map 15).

Currently known from a relatively small roadside population near Mons Ruber Farm, close to De Rust in the Oudtshoorn District of Western Cape, *Babiana radiata* was discovered by the South African biologist, Jan Vlok in the 1990s. It is readily distinguished by the actinomorphic flower, the tepals forming a shallow bowl, short style with the branches extending between the anthers, and linear leaves 2–4(–7) mm wide and usually bearing fine long hairs. The large soft, pale green floral bracts, the inner of which is forked apically, place the species in our section *Teretifoliae*, and we assume, because of the elongate perianth tube blocked in the lower two thirds, and the lower floral bract often having a leafy tip, that *B. radiata* is most closely related to the widespread *B. sambucina*. That species, however, typically has broader, noticeably pleated, usually short-hairy to scabrid leaves and zygomorphic flowers, usually blue to violet with the lower lateral tepals boldly marked in the centre with white blotches outlined in darker blue or rarely red-purple.

The actinomorphic flower of *Babiana radiata* seems anomalous in section *Teretifoliae* but *B. pygmaea* of the section also has actinomorphic flowers, evidently a parallel development in this species of the Western Cape west coast, where it is associated with pollination by hopliine scarab beetles. Pollination of *B. radiata* is currently unknown, but it seems unlikely that it has a hopliine beetle system, because the flower produces nectar and has a faint, sweet and diurnal floral odour, attributes associated with bee rather than hopliine pollination. Flowers similar in form to those of *B. radiata* and also producing nectar and a sweet floral odour occur in *B. leipoldtii* and *B. villosula* (section *Babiana*) and the latter is known to be pollinated by bees foraging for pollen as well as nectar (Goldblatt & Manning 2007).

Additional specimens examined

WESTERN CAPE.—3319 (Oudtshoorn): De Rust District, flats E of Rooikoppe near Sementdrif, in sandy gravel derived from Enon Conglomerate, (–CB), 11 August 1995, *Snijman & Vlok* 1509 (MO, NBG).

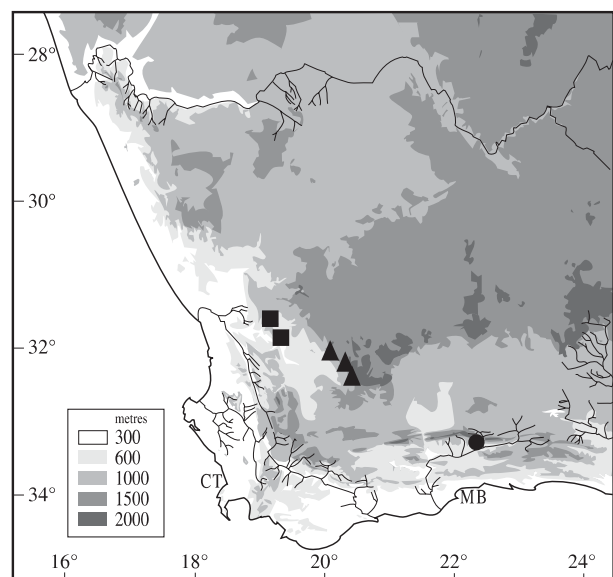
30. *Babiana virginea* Goldblatt in *Journal of South African Botany* 45: 82 (1979). Type: South

Africa, [Northern Cape], Roggeveld Escarpment west of Middelpoos, Farm Rooiwal, September 1974, *M. Thomas* sub *P. Goldblatt* s.n. (MO, holo.; K, NBG, PRE, S, iso.).

Plants 100–180 mm high; stem short or subterranean, usually unbranched. *Leaves* lanceolate, pleated, finely hairy, exceeding the flowers. *Bracts* 25–45 mm long, but lowermost up to 80 mm, densely hairy, green with attenuate brown tips, inner forked at apex. *Flowers* zygomorphic, 2–4 per spike, white or pale mauve with pale yellow or cream-coloured blotches on lower lateral tepals, intensely fragrant; perianth tube 45–65 mm long, gradually flaring from base, straight; tepals unequal, dorsal 35–40 mm long, lower projecting forward, 30–35 mm long. *Stamens* unilateral; filaments arched, 15 mm long; anthers 9–11 mm long, pale yellow. *Ovary* smooth; style dividing opposite anther tips, branches spreading, ± 5 mm long, expanded at apices. *Flowering time*: September.

Distribution and ecology: Northern Cape: Roggeveld Escarpment between Middelpoos and Verlate Kloof in dolerite rock outcrops with the corms wedged in cracks (Map 15).

When described in 1979, *Babiana virginea* was known from a single population on the edge of the Roggeveld Escarpment west of Middelpoos on the Farm Rooiwal. Since then it has been re-collected near the type locality and some distance to the south, between Middelpoos and Sutherland in 1985, close to the top of Ganagga Pass in 1997 and on the Farm Quaggaskop in 2003. The species is evidently more common than the record suggests. Additional collecting along the Roggeveld Escarpment late in the spring season will undoubtedly yield additional populations. The flowers remain open at night and are strongly scented both during the day and at night and this, plus the penetrating clove component



MAP 15.—Distribution of *Babiana radiata*, ●; *B. virginea*, ▲; *B. rigidifolia*, ■.



FIGURE 7.—*Babiana radiata*,
Goldblatt & Porter 12187.
A, whole plant; B, flower.
Scale bar: 10 mm. Artist: John
Manning.

of the fragrance, suggests moth pollination, as does the long-tubed perianth and white or pale mauve perianth.

Babiana virginea is probably most closely allied to *B. sambucina* (No. 28), which has blue to violet flowers of similar morphology, but typically glabrous or minutely hairy leaves, rather different from the conspicuously hairy leaves of *B. virginea*. The lowermost outer floral bract in *B. sambucina* is produced upward as a small leaf, a feature sometimes weakly developed in *B. virginea*.

Additional specimens examined

NORTHERN CAPE.—3220 (Sutherland): near the top of Ganagga Pass, Farm Agterkop, in dolerite rocks, (–AA), 16 September 1997, Goldblatt & Manning 10746 (MO, NBG); Roggeveld Escarpment, Farm Quaggaskop, (–AB), 20 September 2003, Goldblatt & Manning 12323 (MO, NBG); between Middelpos and Sutherland, (–AB), 6 September 1985, Snijman 916 (NBG).

31. *Babiana rigidifolia* Goldblatt & J.C.Manning, nom. et stat. nov. pro *B. sambucina* var. *unguiculata* G.J.Lewis in Journal South African Botany, Suppl. 3: 95 (1959), non *B. unguiculata* G.J.Lewis. Type. South Africa [Western Cape], top of Botterkloof Pass, 20 September 1952, G.J. Lewis 2650 (SAM, holo.).

Plants 150–200 mm high including leaves; stem reaching up to 100 mm above ground level, ± erect, simple or 1- or 2-branched, smooth, enclosed by a dense, coarsely fibrous collar below ground. Leaves sword-shaped to lanceolate, mostly 9–16 mm wide, attenuate, usually exceeding spike, pleated, softly hairy to glabrescent, apices firm and sometimes slightly pungent, on drying, veins and margins becoming prominent and hyaline. Bracts green, becoming brown at tips, minutely velvety, attenuate, outer 25–45 mm long (except for the lowermost), slightly keeled, inner forked apically, 2-keeled, slightly shorter than outer. Flowers zygomorphic, several in a compact spike, violet, lower lateral tepals with narrow median white streak or blotch, unscented; perianth tube elongate, 45–55 mm long, slightly curved upward; tepals unequal, markedly narrowed in lower half, dorsal tepal slightly longer than lower three, 35–43 × 8–12 mm long, lower tepals 27–40 × 6–10 mm long, joined to upper laterals for 3–5 mm and to one another for ± 2 mm, forming a prominent lip. Stamens unilateral; filaments 18–20 mm long; anthers ± 8 mm long. Ovary smooth; style usually dividing opposite anther tips, branches ± 4 mm long. Flowering time: late August and September. Plate 2E.

Distribution and ecology: Northern and Western Cape: Bokkeveld–Stinkfontein Mountain complex between Nieuwoudtville and Botterkloof; crevices in sandstone outcrops and rocky pavement (Map 15).

Striking in its deep violet flowers, *Babiana rigidifolia* is recognized by the elongate perianth tube, 45–50 mm long, lower tepals joined to the upper laterals and forming a prominent lip 5–7 mm long, and rigid, velvety to glabrescent leaves with pungent tips. The leaves are fairly broad, strongly pleated and are held in a tight, erect fan. With their firm, pungent tips they most closely resemble the Namaqualand *B. dregei* (No. 32). That species has

smooth to glabrescent leaves with cartilaginous hyaline veins and margins and a horny, pungent tip. The flowers are similar, but somewhat smaller with the dorsal tepal 18–28 × 8–10 mm, and the lower lateral tepals have prominent white median blotches. On drying, the major veins and margins of the leaves of *B. rigidifolia* appear prominent and hyaline, the plants then even more closely resembling those of *B. dregei*.

Restricted to the semi-arid sandstone ridges west of Botterkloof Pass in the Bokkeveld–Stinkfontein Mountain complex of Northern Cape, *Babiana rigidifolia* was first collected in 1930 by Winsome Barker and was treated as *B. sambucina* var. *unguiculata* by Lewis in 1959. The epithet *unguiculata* is preoccupied in the genus at species rank, hence the use of a substitute name, *B. rigidifolia* at this rank. The relationships of *B. rigidifolia* are difficult to assess but it seems to us likely that it is more closely related to *B. dregei* than to *B. sambucina* (No. 28), from which it differs in the unscented flower, tepals narrowed below and the lower three joined to the upper laterals in a pronounced lip, 5–7 mm long, and longer filaments, 18–20 mm long. The bilabiate perianth, large, rigid, prominently veined leaves and stem extended for some distance above the ground in *B. dregei*, are all consistent with *B. rigidifolia*.

Additional specimens examined

NORTHERN CAPE.—3119 (Calvinia): Moedverloor road, 28 km from Doornbos, (–CA), 4 September 2004, Goldblatt & Manning 12384 (MO, NBG); Moedverloor road, escarpment edge ± 45 km south of Nieuwoudtville, (–CA), 13 September 2004, Goldblatt & Porter 12437 (MO, NBG, PRE).

WESTERN CAPE.—3119 (Calvinia): top of Botterkloof Pass, (–CD), 7 September 1979, Plowes s.n. (NBG).

32. *Babiana dregei* Baker in Journal of Botany 1876: 336 (1876); G.J. Lewis: 106 (1959). Type: South Africa, [Northern Cape], Namaqualand, Uitkomst, October 1830, J.F. Drège 2628 [K, holo.; B, MO, P (3 sheets), iso.].

Plants up to 350 mm high including leaves; stem reaching shortly above ground level, arching outward below spike, usually branched, sometimes repeatedly, angular, smooth (or minutely hairy on spike axis). Leaves sword-shaped to lanceolate, pleated, smooth, with prominently thickened veins and margins (turning pale yellow on drying), apices hard and pungent. Bracts green or with dry tips, minutely puberulous, or velvety, outer 35–60 mm long, keeled, inner forked apically, 5–10 mm shorter than outer. Flowers zygomorphic, several in a compact spike, dark blue to violet or magenta purple with white splashes edged in darker colour on lower lateral tepals, unscented; perianth tube elongate, (45–)50–65(–70) mm long, straight or slightly curved near throat; tepals unequal, dorsal 18–28 mm long, lower three slightly shorter, joined to upper laterals for 2 mm in a lip. Stamens unilateral; filaments 11–15 mm long; anthers ± 8 mm long. Ovary smooth; style usually dividing between middle and shortly beyond anther tips, branches 3–4 mm long. Flowering time: mainly late August and September. Plate 2F.

Distribution and ecology: Northern Cape: central Namaqualand, centred in the Kamiesberg and the highlands between Garies and Kamieskroon in granite outcrops (Map 16).

A particularly distinctive species of *Babiana*, *B. dregei* has striking, hard-textured, lanceolate leaves with a prominent, spiny apex. It almost always grows on granite outcrops, yet in this apparently harsh environment, plants are up to 350 mm tall and produce numerous flowers on a branched stem. The leaves are usually smooth, but may be finely hairy, and have prominent, pale fibrous veins at the angles of the folds or pleats. The long-tubed flowers are pollinated by the long-proboscid fly, *Prosoeca peringueyi* while foraging for nectar. The tube, 50–65 mm long, is much longer than the fly's proboscis, but has unusually thick walls in the lower part, which force nectar into the middle of the tube where it can be reached by flies as they push their bodies into the flower.

Babiana dregei is characteristic of higher elevations in central Namaqualand and is most common in the Kamiesberg where plants grow in rock crevices on granite domes in little or no soil.

33. *Babiana framesii* L.Bolus in South African Gardening 22: 276 (1932b); G.J.Lewis: 97 (1959). Type: South Africa, [Northern Cape], near Nieuwoudtville (as Klawer), cultivated at Kirstenbosch National Botanical Garden, September 1927, *P. Ross Frames s.n.* (*Nat.Bot. Gard.*1244/26 in BOL, holo.).

Plants up to 100 mm high; stem reaching 10–20 mm above ground level, often with 1 or 2 short branches, sheathed below by thick fibrous neck. *Leaves* crowded basally, lanceolate, pleated, short-hairy. *Bracts* 40–50 mm long, green with dry tips turning brown with age, with short and long silky hairs, inner $\pm$ as long as outer, forked apically. *Flowers* zygomorphic, 4–8 in a compact, suberect spike, dark blue-purple, lower lateral tepals with arrow-shaped white markings in midline, faintly sweet-

scented; perianth tube 60–70 mm long, cylindrical, slightly curved below throat; tepals subequal or the dorsal up to 3 mm longer, 23–33 $\times$ 5–9 mm, spreading nearly horizontally. *Stamens* unilateral; filaments suberect, 10–12 mm long; anthers 7–9 mm long. *Ovary* smooth; style dividing opposite upper third of anthers. *Flowering time*: August to mid-September. Plate 2H.

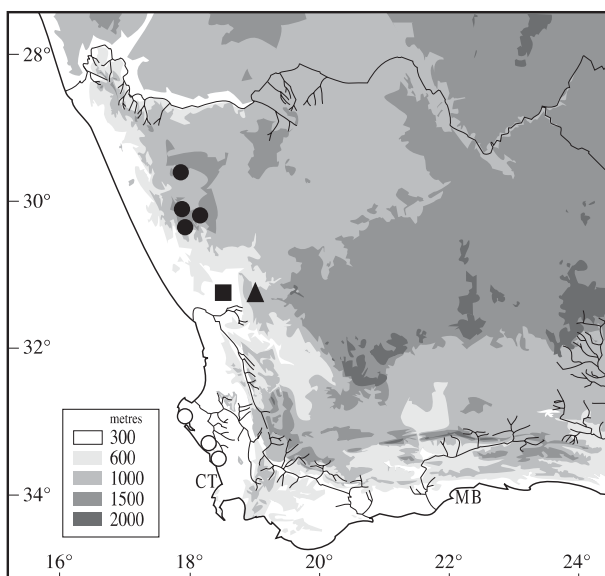
Distribution and ecology: Northern Cape: restricted to the Bokkeveld Plateau in the vicinity of Nieuwoudtville in the western Karoo; dolerite rock outcrops in karroid scrub (Map 16).

A narrow endemic of the Bokkeveld plateau, *Babiana framesii* is most easily identified by its underground stem, $\pm$ erect spike, tight fan of basal leaves, and the $\pm$ silky hairy bracts, 40–50 mm long. The flowers are deep violet-blue and have an elongate perianth tube 60–70 mm long, slightly curved at the throat. The lower tepals have bold white markings in the midline outlined in darker blue or red and the tepals are relatively narrow, 5–9 mm wide, and spread almost at right angles to the tube when the flowers are fully open. *Babiana framesii* is well known from the immediate vicinity of Nieuwoudtville, where it is often difficult to distinguish from the long-tubed *B. sambucina* subsp. *longibracteata* (No. 28b), to which it is probably most closely related. The latter plant has a straight perianth tube, broader tepals, mostly 8–12(–16) mm wide, and even when the flowers are fully open, the tepals may overlap one another and remain slightly ascending, thus contrasting with the outspread, widely separate tepals of *B. framesii*. Whereas the perianth tube of *B. framesii* is 60–70 mm long, populations of *B. sambucina* subsp. *longibracteata* have a tube 30–55 mm long.

The flowers of *Babiana framesii* closely resemble those of *B. praemorsa* (No. 22), which has a straight perianth tube 40–60 mm long and slightly smaller flowers with subequal, spreading tepals mostly 18–22 mm long, and filaments 8–9 mm long. That species can however, be immediately recognized by the truncate leaves. The ranges of the two species are complimentary and meet east of Nieuwoudtville where they occur in similar habitat, and plants of intermediate morphology indicate some hybridization.

Namaqualand plants treated by Lewis (1959) as *Babiana framesii* var. *kamiesbergensis* are here referred to *B. curviscapa* (No. 25), a species which has the stem produced shortly above the ground, and, unless growing under shrubs, with the spike strongly arched toward the ground. Also, the 36–43 mm long perianth tube is shorter than that of *B. framesii*, and is sharply curved below the apex. The spike of *B. framesii* is suberect, the tube is nearly straight, and the tepals spread nearly horizontally, unlike the somewhat cupped tepals of *B. curviscapa*, and a dorsal tepal slightly arching over the stamens.

Pollination of *Babiana framesii* by the long-proboscid fly, *Prosoeca* sp., has been studied extensively and it is a model for this pollination system (Manning & Goldblatt 1996a; Goldblatt & Manning 2000a). *Babiana framesii* forms a pollination guild locally with species with



MAP 16.—Distribution of *Babiana dregei*, ●; *B. framesii*, ▲; *B. carminea*, ■; *B. tubulosa*, ○.

similarly coloured, long-tubed flowers, including *B. sambucina* subsp. *longibracteata*, *Lapeirousia jacquinii* N.E.Br. and *L. oreogena* Goldblatt.

34. *Babiana carminea* J.C.Manning & Goldblatt, sp. nov.

Plantae cum foliis 50–100 mm altae, acaulescentes; foliis, lanceolatis, plicatis, velutinis; bracteis 40–50 mm longis, subtiliter pilosis, bractea interiore ad apicem furcata; floribus in spicam paucifloram decumbentem dispositis; floribus zygomorphis, atrorubris maculis flavis; tubo perianthii elongato, 56–60 mm longo, curvato et supra expanso; tepalo dorsali arcuato 40–48 mm longo, tepalis inferioribus 35–40 mm longis; ovario glabro.

TYPE.—South Africa, Western Cape, 3018 (Vanrhynsdorp): Knersvlakte, Farm Quaggaskop, limestone ridge, (–BC), 13 August 1997, P. Goldblatt & J.C. Manning 10662 (NBG, holo.; K, MO, PRE, iso.).

Plants acaulescent, 50–100 mm high including leaves; stem reaching shortly above ground level, unbranched, sheathed in a coarse, fibrous collar. Leaves erect, narrowly lanceolate, up to 100 mm long, exceeding

flowers, shallowly plicate, finely hairy. Bracts 40–50 mm long, pale green with dry, pale brown tips, finely hairy, inner slightly longer than outer, forked apically. Flowers zygomorphic, 2–5 in a decumbent spike, carmine red, lower lateral tepals with broad, spear-shaped creamy yellow blotches, unscented; perianth tube slightly curved, 56–60 mm long, $\pm$ cylindrical below and 36–40 mm long, widening abruptly and curving outward, the upper 17–20 mm $\pm$ horizontal, cylindrical, $\pm$ 6 mm diam.; tepals unequal, the dorsal 40–48 $\times$ 9–13 mm, lower tepals united basally for 2–4 mm, 35–40 $\times$ 10 mm. Stamens unilateral; filaments somewhat enlarged below, $\pm$ 40 mm long, exerted $\pm$ 20 mm from tube, dark pink; anthers $\pm$ 9 mm long. Ovary smooth; style usually dividing between base and middle of anthers, branches $\pm$ 6 mm long. Capsules ovoid, 10–14 mm long; mature seeds unknown. Flowering time: early August, probably also late July. Figure 8, Plate 3A.

Distribution and ecology: Western Cape: in the Knersvlakte of southern Namaqualand; confined to limestone outcrops (Map 16).

Seemingly most closely related to the long-tubed *Babiana* species of section *Teretifoliae*, *B. dregei* (No. 32), *B. framesii* (No. 33) and *B. sambucina* (No. 28)



FIGURE 8.—*Babiana carminea*, Goldblatt & Manning 10662. A, whole plant; B, flower l/s. Scale bar: 10 mm. Artist: John Manning.

and their allies. *B. carminea* is distinguished by fine- and short-hairy leaves, floral bracts 40–50 mm long, and cherry-red flowers with an elongate perianth tube, 56–60 mm long. Although the leaves of *B. dregei* differ significantly from those of *B. carminea* in being rigid, pungent, and coarsely fibrous, the primary distinction between the long-tubed species of this alliance is in the flowers which closely reflect their pollination ecology. *Babiana dregei* and *B. framesii* have dark blue to violet flowers with white markings, and a slender, straight or curved perianth tube of narrow diameter, and both are pollinated by long-proboscid flies of the genus *Prosoeca* (Goldblatt *et al.* 1995; Manning & Goldblatt 1996a). In contrast, the flowers of *B. carminea* are red and have a perianth tube that is slender below and wide and cylindrical above, features typically associated with pollination by sunbirds of the genus *Nectarinia*. Almost certainly the *B. carminea* flower is adapted for pollination by sunbirds, an unusual strategy in the genus, shared only with the apparently distantly related *B. ringens* and *B. thunbergii*. The presence of pale markings on the tepals such as found in *B. carminea* is unusual in bird-pollinated flowers, and may reflect a relatively recent shift from long-proboscid fly to avian pollination and the persistence of a feature no longer of adaptive value.

The habitat of *Babiana carminea* is unusual. Plants grow in crevices in limestone outcrops, the corms tightly wedged in bedrock. It is one of few species of *Babiana* restricted to this substrate, which is relatively rare in southern Africa, especially on the Cape west coast. *Babiana carminea* thus joins a group of some 15 species of Iridaceae known to be restricted to unusual substrates, including limestone, dolomite, and serpentine (Goldblatt & Manning 1996). It is one of two limestone endemic *Babiana* species, the other being *B. namaquensis* (No. 15) of northern Namaqualand, which usually grows in dolomite outcrops, but also in micaceous schist. The habitat in which *B. carminea* grows is extremely arid. The low, rolling plains of the Knersvlakte in southern Namaqualand receive less than 100 mm of rainfall per year. The crevices in the limestone outcrops probably accumulate considerably more moisture from runoff from the light rainfall and from coastal fog condensing on the rocks. Limestone outcrops in the Knersvlakte are known to be home to at least two other endemic geophytes, *Ixia acaulis* Goldblatt & J.C.Manning (Iridaceae) and *Eriospermum arachnoideum* P.L.Perry (Eriospermaceae) as well as other plants such as *Antimima dualis* N.E.Br. (Aizoaceae), *Bulbine margarethae* L.Hall and *B. wiesei* L.Hall (Asphodelaceae) (if these are indeed distinct from *B. haworthioides* B.Nord.) (Goldblatt & Manning 1993; Perry 1994). Another limestone endemic, *Moraea deserticola* Goldblatt (Iridaceae), grows in deeper loamy clay soils surrounding the limestone rocks on which *B. carminea* occurs. A thorough survey of the southern Namaqualand limestone outcrops may well yield additional and possibly new edaphic endemics.

Additional specimens examined

WESTERN CAPE.—3118 (Vanhynsdorp): Knersvlakte, Farm Kwaggaskop, limestone ridge, (–BC), 15 August 1982, Van Jaarsveld 6820 (NBG), 31 August 2002 (fr.), Goldblatt & Porter 12131 (MO).

35. ***Babiana tubulosa*** (Burm.f.) Ker Gawl., Iridaceae genera: 154 (1827); G.J.Lewis: 118 (1959), excl. var. *tubiflora*. *Ixia tubulosa* Burm.f.: 1 (1768). Type: South Africa, without precise locality or date, N.L. Burman s.n. (G–Herb. Burman, holo., not seen).

See Lewis (1959) for complete synonymy.

Plants 70–150 mm high; stem extending shortly up to 100 mm above ground level, then sparsely hairy to velvety, with a poorly developed fibrous collar around base. Leaves narrowly sword-shaped, 8–12 mm wide, pleated, hairy. Bracts 20–40 mm long, green with dry, brownish tips, velvety, inner $\pm$ half as long as outer, forked apically. Flowers zygomorphic, mostly 6–10(–15) in a decumbent spike, cream-coloured inside, flushed pink outside, with prominent triangular to spear-shaped red markings on lower lateral tepals, odourless; perianth tube 65–105 mm long, cylindrical below, widening in upper 15–21 mm into a distinct gullet, tepals unequal, narrowed below and almost clawed, the dorsal largest, $\pm$ 30–34 mm long, lower three narrower, 18–23 $\times$ 8 mm. Stamens unilateral; filaments arched, 20–22 mm long; anthers 5–7 mm. Ovary smooth; style dividing opposite or shortly above anther tips, branches $\pm$ 6 mm long. Flowering time: mid-September to mid-October. Plate 3B.

Distribution and ecology: Western Cape: in the hills between Mamre and Saldanha; well-drained slopes in gritty, granite-derived soil, occasionally on limestone (Map 16).

A relatively narrow endemic of the granitic hills in the Darling and Saldanha Districts of Western Cape, *Babiana tubulosa* was described in 1768, as *Ixia tubulosa* by N.L. Burman, based on a specimen of unknown origin. It is recognized by the cream-coloured flowers flushed deep pink on the outside, and the elongate perianth tube 65–105 mm long expanded in the upper 10–21 mm in a wide gullet. The species is often confused with white- or cream-flowered *B. tubiflora* (No. 36), a widespread plant of coastal fynbos or strandveld that favours coarse sandy soil or rock outcrops, and usually has narrow, pilose leaves. Although the latter also has an elongate perianth tube, mostly 60–80 mm long, the tube is slender, only slightly expanded in the upper 5–7 mm. In addition, it has shorter filaments, 13–16 mm long, and style branches, 3–4 mm long. The larger flowers of *B. tubulosa* have filaments 20–22 mm long and style branches $\pm$ 6 mm long. Lewis (1959) treated *B. tubiflora* as a variety of *B. tubulosa* but we consider the different habitat and consistent morphological differences sufficient grounds for maintaining the two as separate species. The occasional difficulty experienced in distinguishing poorly prepared herbarium specimens of the two species is not a valid argument for treating the two as varieties or subspecies of a single species.

The pollination biology of *Babiana tubulosa* is unknown, but the species has flowers closely resembling those of *Lapeirousia fabricii* (D.Delaroche) Ker Gawl. in form and colouring, and that species is pollinated by the long-proboscid flies, *Moegistorhynchus longirostris*

and *Philoliche gulosa* (Goldblatt *et al.* 1995). *Babiana tubulosa* is presumably pollinated by the same insects.

36. *Babiana tubiflora* (L.f.) Ker Gawl. in J.König & Sims, *Annals of Botany* 1: 233 (1804). *Gladiolus tubiflorus* L.f.: 96 (1782). *B. tubulosa* var. *tubiflora* (L.f.) G.J.Lewis: 120 (1959). Type: South Africa, [Western Cape], without precise locality (as Swartland) or date, *C.P. Thunberg s.n.* (UPS—Herb. Thunberg 1085, holo.).

See Lewis (1959) for full synonymy.

Plants 70–150 mm high; stem reaching ground level, densely white-velvety, without collar of fibres around stem base, often producing slender stolons. *Leaves* linear to lanceolate, 3–6 mm wide; pleated, smooth to sparsely hairy. *Bracts* 35–60 mm long, green with dry brown tips, velvety, inner $\pm$ one fourth to half as long as outer, forked apically. *Flowers* zygomorphic, mostly 6–12 in an inclined to decumbent spike, white, with or without small pink or red median markings on lower lateral or all three lower tepals, odourless; perianth tube (45–)60–80(–100) mm long, nearly straight and cylindrical, slightly wider in upper 5–7 mm; tepals subequal, narrowed below and almost clawed, dorsal one only slightly larger, 18–23 mm long, lower three tepals 3–4 mm wide. *Stamens* unilateral; filaments arched, 13–16 mm long; anthers 4–5 mm. *Ovary* smooth; style dividing between middle and shortly above anther tips, branches 3–4 mm long. *Flowering time*: mostly August to mid-September, occasionally in early October.

Distribution and ecology: Western Cape: common from Lambert's Bay in the north to Stilbaai in the southeast; sandy, mainly coastal flats and dunes (Map 17).

One of the most common species of the genus, *Babiana tubiflora* is frequent in coastal or occasionally inland flats or dunes where it favours deep sandy soil. Described as early as 1781 by Linnaeus the younger, as *Gladiolus tubiflorus*, the species was transferred

to *Babiana* by John Ker Gawler in 1804. It was then consistently recognized as a separate species until 1959 when it was reduced by Lewis to varietal rank in *B. tubulosa*, a local endemic of the Darling area of Western Cape. Despite the shared 65–100 mm long perianth tube and pale-coloured flower, this treatment seems to us inappropriate for a plant that occurs in a different habitat and differs in floral details. *Babiana tubiflora* can always be distinguished from *B. tubulosa* (No. 35) by its less robust habit, flowers usually uniformly white or cream-coloured except for small, sometimes obscure, red markings on the lower tepals, and a slender perianth tube widening only near the apex. Reflecting its smaller flower, the filaments of *B. tubiflora* are 13–16 mm long and the style branches 3–4 mm long. This contrasts with *B. tubulosa*, which has cream-coloured flowers pink on the outside, a perianth tube with a distinct gullet 10–21 mm long, filaments 20–22 mm long, and style branches $\pm$ 6 mm long.

Despite these apparently sharp differences, *Babiana tubiflora* is often confused with *B. tubulosa*: even the collections made by Carl Thunberg under that name are mixed. The Thunberg specimen at the Stockholm Herbarium is *B. tubulosa*, whereas the specimen at UPS in the Thunberg Herbarium, now the lectotype, is *B. tubiflora*.

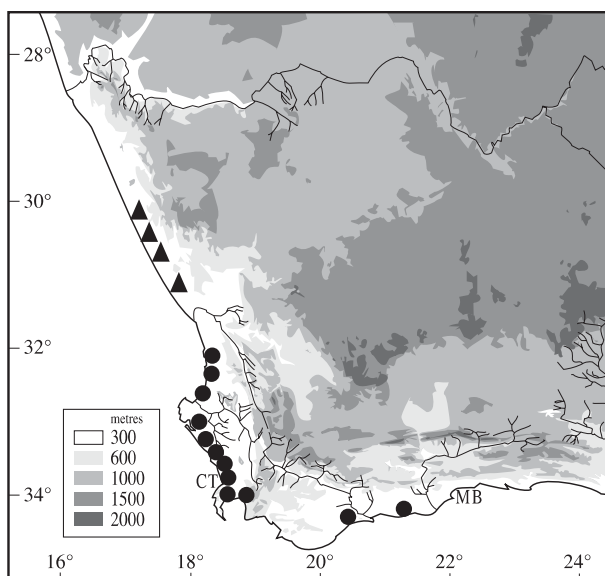
Although cited by Lewis (1959) as extending as far north as Elands Bay, we have collected plants further north at Lambert's Bay, a small range extension of some 25 km. In cultivation, plants from that site proved to be autogamous. All capsules on the spikes produced a full complement of seeds. The only other species of *Babiana* known to be autogamous is the sunbird-pollinated *B. ringens*.

Additional specimen examined

NORTHERN CAPE.—3218 (Clanwilliam): outskirts of Lambert's Bay, in strandveld, (–AA), 17 September 2003, Goldblatt & Porter 12393 (MO, NBG).

37. *Babiana brachystachys* (Baker) G.J.Lewis in *Journal of South African Botany*, Suppl. 3: 125 (1959). *Acidanthera brachystachys* Baker: 338 (1876). Type: South Africa, [Northern Cape], without precise locality or date, *P.A. Mader sub P. MacOwan* 2183 (K, holo.).

Plants 200–300 mm high; cataphylls long-hairy to somewhat cobwebby above; stem mostly underground or very short, often branched. *Leaves* leathery, linear to terete with longitudinal grooves, hairless, sheaths ciliate on margins, cobwebby below. *Bracts* 22–35 mm long, green, drying brown at tips, smooth, inner $\pm$ as long as outer, forked in upper third. *Flowers* weakly zygomorphic, 5–10 in a horizontal spike, pale pink, lower tepals with red triangular marks on lower midline, pink outside, odourless; perianth tube cylindrical, 70–75 mm long, slightly curved toward apex; tepals subequal, spreading at right angles to tube, 16–24 mm long. *Stamens* unilateral; filaments 4–5 mm long; anthers $\pm$ 5 mm long. *Ovary* smooth; style dividing opposite anther apices, branches $\pm$ 2.5 mm long. *Flowering time*: September and October. Plate 3C.



MAP 17.—Distribution of *Babiana tubiflora*, ●; *B. brachystachys*, ▲.

Distribution and ecology: Northern and Western Cape: in Namaqualand between Wallekraal and Vredendal; sandy hills and dunes inland of the coast (Map 17).

Unmistakable in the nearly terete leaves with narrow longitudinal grooves and the horizontal spikes bearing pale pink flowers with an elongate, slender perianth tube 70–75 mm long, *Babiana brachystachys* is a remarkable plant. The pale pink flower with red nectar guides and subterete leaves at first suggest that this plant belongs to some other genus, and indeed, the species was first referred to *Acidanthera*, a nomenclatural synonym of *Gladiolus*. Other features, however, notably the tough corm tunics, somewhat cobwebby cataphylls, largely underground stem, and decumbent spike are consistent with *Babiana* section *Babiana*. The unusual flowers suggest pollination by the long-proboscid fly, *Moegistorhynchus longirostris*, which pollinates flowers of several species with this shape and colour (Manning & Goldblatt 1997a). Until now no pollinators have been seen or captured visiting *B. brachystachys*.

The affinities of *Babiana brachystachys* are uncertain and Lewis placed it alone in section *Teretifoliae* when she transferred the species from *Acidanthera* to *Babiana* in 1959. We suggest that it may be allied to the large group of *Babiana* species with a similar largely underground stem, decumbent spike and inner bracts divided in the upper third. Section *Teretifoliae* is the only name available at this rank for such a group and we include both long- and short-tubed species with the inner bracts forked apically or to the middle in this section, much expanding Lewis's concept of the section. The cobwebby to woolly cataphylls of *B. brachystachys* are remarkable for the section, and recall the predominantly Namaqualand section *Antholyzoides* of *Babiana*.

Babiana brachystachys was known to Lewis from one site, the sandveld east of Hondeklipbaai near Wallekraal where we have also collected it. It has since been recorded at several sites to the south, near the Groen River mouth, Brand-se-Baai, and west of Vredendal. We suspect it has a wider range on the sandy coastal plain that stretches along the Namaqualand coast from the Olifants River mouth in the south to Koiingnaas and perhaps further north.

Additional specimens examined

NORTHERN CAPE.—3017 (Hondeklipbaai): slopes above the Groen River, in deep sand, 823 m, (–DC), 7 September 1982, *Van Berkel* 447 (MO, NBG).

WESTERN CAPE.—3117 (Rietfontein): Brand-se-Baai NW of Vredendal, strandveld on sand, (–BD), 29 September 1992, *Van Rooyen* 2124 (PRE). 3118 (Vanrhynsdorp): 15 km east of Vredendal, red sand in sandveld, (–CB), 5 September 1974, *Nordenstam & Lundgren* 1648 (MO, S).

38. *Babiana lapeirousioides* Goldblatt & J.C.Manning, sp. nov.

Plantae cum foliis 50–70 mm altae; caule ut videtur eramoso breviter ex terra emergenti; foliis ensiformibus suberectis rigidis plicatis glabris; bracteis 20–22 mm

longis, bractea interiore ad apicem furcata; spica compacta 2- vel 3-flora, floribus zygomorphis albis notis rubris, tubo perianthii recto cylindrico $\pm$ 22 mm longo, tepalis subaequalibus patentibus $\pm$ 10 mm longis; filamentis erectis $\pm$ 7 mm longis, antheris $\pm$ 4.5 mm longis; ovario glabro.

TYPE.—South Africa, [Northern Cape], without precise locality, as 'Gariep', 30 September 1943, *C.L. Leipoldt* s.n. NBG170/40 (NBG, holo.).

Plants 50–70 mm high including the leaves; stem reaching shortly above ground level, unbranched. Leaves sword-shaped, rigid, plicate, pungent, smooth. Bracts 20–22 mm long, smooth or minutely scabrid above, inner slightly shorter than outer, forked apically. Flowers zygomorphic, in a compact, 2- or 3-flowered spike, white with red markings near base of lower tepals, presence of scent unknown; perianth tube $\pm$ 22 mm long, cylindrical and straight, flaring slightly toward mouth; tepals subequal, spreading, $\pm$ 10 mm long. Stamens unilateral; filaments erect, $\pm$ 7 mm long; anthers $\pm$ 4.5 mm. Ovary smooth; style dividing shortly beyond anther tips. Flowering time: late September as far as known. Figure 9.

Distribution and ecology: Northern Cape: precise locality and habitat unknown, but almost certainly the Richtersveld (Map 18).

The fragmentary material available is not at all satisfactory as a type specimen or as the basis for a description. Nevertheless, this plant is so distinctive that we feel it is more useful to name it in this account than to leave it among the herbarium incertae where it has lain since 1943. The white flowers with red V-

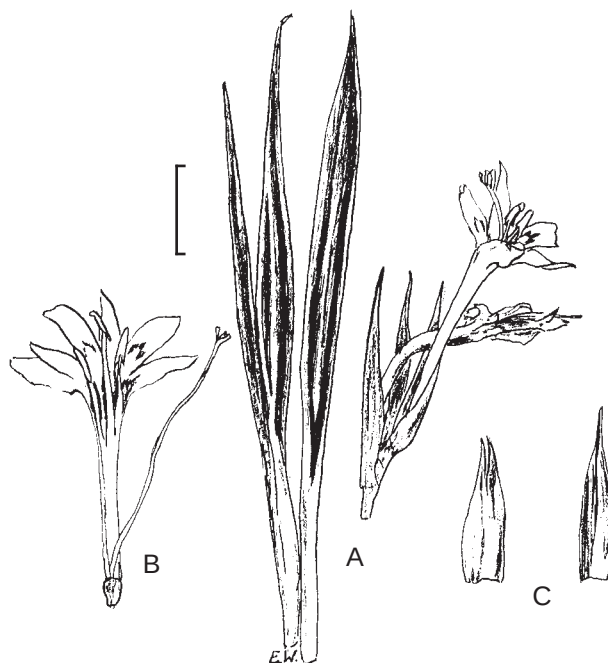
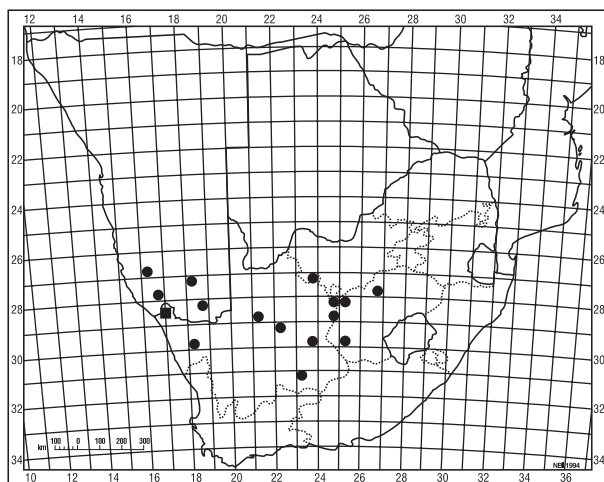


FIGURE 9.—*Babiana lapeirousioides*, Leipoldt s.n. NBG170/40 (NBG). A, leaves and flowering spike; B, laid-out flower; C, inner (left) and outer (right) floral bracts. Scale bar: 10 mm. Artist: Estelle (Wasserfall) van Hoepen.



MAP 18.—Distribution of *Babiana lapeirousioides*, ■; *B. hypogaea*, ●.

shaped markings on the lower tepals and straight, nearly cylindric perianth tube $\pm$ 22 mm long, mark them as adapted for pollination by long-proboscid flies (Manning & Goldblatt 1997a). The species most likely belongs to a guild of plant species with similarly coloured long-tubed flowers, including *Lapeirousia anceps* (L.f.) Ker Gawl., *L. fabricii* (D.Delaroche) Ker Gawl. (Iridaceae), *Pelargonium praemorsum* (L.) L'Hér. and *P. pulchellum* (Cav.) Willd. (Geraniaceae) that in Namaqualand are pollinated by the long-proboscid flies *Philoliche* (Tabanidae) and *Moegistorhynchus* (Nemestrinidae) (Goldblatt *et al.* 1995). In *Babiana*, similar flowers are known in *B. tubulosa* (No. 35) and *B. brachystachys* (No. 37). The short, rigid, pleated leaves with almost pungent tips readily separate *B. lapeirousioides* from these species, neither of which occurs in northern Namaqualand.

Babiana lapeirousioides was discovered by Louis Leipoldt in 1940. It was grown at the Kirstenbosch National Botanical Garden and flowered there in 1943 when a pressed specimen was made. The illustration shown here is a copy of a watercolour made in 1943 by Estelle van Hoepen (née Wasserfall). The type locality, Gariep, is one we have not been able to locate with confidence. While it may simply denote the northern reaches of Namaqualand toward the Orange River, known as the Gariep to the Khoisan, it probably refers more specifically to the area northeast of Port Nolloth in the Richtersveld, so marked on some maps and known under that name to the early 19th century plant collector, Johann Franz Drège.

39. ***Babiana hypogaea* Burch.**, *Travels in the interior of southern Africa* 2: 415 (1824). *Antholyza hypogaea* (Burch.) Klatt: 345 (Ergänzungen 11) (1882). Type: South Africa, [Northern Cape], Pellat Plains near Takun (or Litakun), 24 August 1812, W.J. Burchell 2241 (K, lecto., designated by Goldblatt & Manning: 92 (2004); B, P, iso.).

B. flavida G.J.Lewis: 117 (1959). Type: South Africa, Northwest, Warrenton, December 1922, C.G. Adams 819 (BOL, holo.).

B. falcata G.J.Lewis: 115 (1959). Type: South Africa, [Northern Cape], 20 miles east of Springbok, red sand flats, 8 September 1950, W.F. Barker 6671 (NBG, holo.).

Plants acaulescent, 50–80 mm high, often growing in tufts with leaves up to 150 mm; stem subterranean, simple or with short or vestigial lateral branches. *Leaves* linear to falcate or sword-shaped, 25–150 $\times$ 1.5–3.0 mm, often bent near base, sometimes inclined toward ground or prostrate, slightly pleated, sparsely hairy to finely long-hairy, with firm tips. *Bracts* 30–35 mm long, smooth, $\pm$ membranous below, green above ground level in upper third, 25–50 mm long, inner as long or slightly exceeding outer, forked apically, tips attenuate. *Flowers* zygomorphic, 1 or 2 per branch, seemingly in a 2–6-flowered spike, arising below ground level, greenish yellow to buff, flushed with pale brown or mauve outside, tepals darker in midline especially when dry, lower tepals with pale nectar guides edged with reddish arrow-shaped marks near base and with dark reddish streaks in throat, strongly scented; perianth tube emerging from below ground level, cylindrical, 30–40 mm long widening at throat; tepals unequal, dorsal one 35–42 mm long, lower tepals joined to upper laterals for up to 6 mm, forming a prominent lip, lower tepals 30–35 mm long. *Stamens* unilateral; filaments 15–18 mm long; anthers 8–11 mm long. *Ovary* smooth, in lower flowers of spike shortly stipitate; style dividing close to anther apices. *Flowering time*: mainly June to September, occasionally December to May.

Distribution and ecology: Namibia and South Africa: Northern Cape, in Bushmanland and the Upper Karoo, and adjacent southeastern Namibia; red sand plains (Map 18).

Described by the 19th century English explorer-naturalist, William Burchell in 1824, *Babiana hypogaea* was based on his own collection made in August 1812 on the Pellat Plains near Litakun (also called Takun), close to modern Kuruman, now in Northern Cape. Baker (1896) recognized the species as separate from *B. bainesii*, which has larger, blue or mauve flowers with white markings and occurs widely across eastern southern Africa and into Botswana, Namibia and Zimbabwe. Misunderstanding the identity of the type collection, Lewis (1959) united *B. bainesii* with *B. hypogaea* and described *B. falcata* and *B. flavida* for greenish yellow- to buff-flowered plants from Bushmanland, that mostly flower in the winter and early spring. These two species closely match Burchell's type collection in their smaller flower size, perianth colour and other details, as well as in their habitat and winter–spring flowering. Morphologically, *B. hypogaea* and *B. bainesii* are similar, both being acaulescent with the long-tubed flowers arising below the ground, but *B. hypogaea* has pale yellow to buff (rarely white) flowers with a tube 30–40 mm long, and shorter, often sparsely hairy to almost smooth leaves, sometimes with inclined to prostrate blades. The blades are often visibly constricted and apparently flexible at the base, which suggests an inclined to prostrate orientation even when they appear upright in pressed specimens. In contrast, *B. bainesii* has larger, blue-mauve to violet flowers with prominent white markings on the lower lateral tepals edged in

darker blue, as well as nearly erect, usually densely hairy leaves, mostly 15–25 mm long, and plants often grow in tufts. The flowers also have a tube (40–)50–60(–70) mm long, contrasting with the shorter tube of *B. hypogaea*.

Despite being a species of the edge of the southern African summer rainfall zone, *Babiana hypogaea* flowers mainly in the dry, late winter and spring, June to August, but occasionally (as in the type of *B. flavida*) as early as December (if this is correct) or as late as September. We assume plants respond to some extent to rainfall timing, flowering in summer when occasional good early summer rains fall across Bushmanland and the Upper Karoo, and failing to follow the expected but unusual pattern of flowering in winter–early spring. The corms are edible, like those of most species of *Babiana*, and Burchell (1824) wrote in some detail of their preparation and use. They have a sweet nutty flavour, and lack the bitterness that corms of Iridaceae often have.

The shortly stipitate ovary of *Babiana hypogaea* and *B. bainesii* (No. 40) was considered by Lewis (1959) to be unique to these two species. As we have explained elsewhere (Goldblatt & Manning 2004), species of several genera of Iridaceae with an inflorescence borne at or below ground level often have the lower flowers of the spike with a short stipe and we suggested that this is simply a developmental aberration of the inflorescence due to its position. This feature is associated with the underground inflorescence in other genera of the Iridaceae, including *Crocus* L., *Duthiastrum*, and *Romulea*, and does not in itself mark the two species as sharing a synapomorphy other than the underground spike. We have seen stipitate flowers in other species of *Babiana*, notably *B. sambucina* (No. 28).

Babiana hypogaea and the plant described by Lewis (1959) as *B. flavida* are essentially identical, and another species from Bushmanland, *B. falcata*, also described by Lewis, has the same flowers. It was distinguished by its short leaves, 25–70 mm long and 1.5–3.0 mm wide, which are falcate, firm, strongly plicate, and somewhat pungent. Lewis contrasted the species with *B. flavida* (i.e. *B. hypogaea*), which she described in her key to the species as having leaves erect or decumbent but not firm or falcate. The range of specimens now available make the distinction untenable. Leaf shape ranges without any clear division from the short, falcate and firm type in the west, to the suberect, more prominently hairy type in the east. We therefore include *B. falcata* in *B. hypogaea*. Some collections even show a range of leaf shapes from linear and erect, to sword-shaped, to falcate.

Additional collections, made since the publication of Lewis's monograph, are listed by Goldblatt & Manning (2004) and only representative specimens are cited below.

Representative specimens

NAMIBIA.—2615 (Lüderitz): between Tsiurub and Graspoort, (–CA), *Dinter* 1040 (B). 2616 (Aus): Farm Kubub, (–CB), 9 September 1973, *Giess* 12858 (K, M, NBG). 2716 (Witpütz): Farm Witpütz Sud, (–DA), 1983, *Lavranos* 21225 (NBG). 2818 (Warmbad): Farm Sperlingspütz, Warmbad, sandy plains, (–BC), 16 May 1963, *Giess, Volk & Bleissner* 7009 (K, M, MO).

NORTHERN CAPE.—2824 (Kimberley): 7 miles NE of Kimberley, (–DB), 20 August 1961, *Leistner* 2635 (K, M, PRE).

40. *Babiana bainesii* Baker in *Journal of Botany* 1876: 335 (1876); Goldblatt & J.C.Manning: 92 (2004). Type: South Africa, [Gauteng], 'Gold Fields', Witwatersrand, near Johannesburg, in 1870, *J.T. Baines s.n.* (K, lecto., designated by Goldblatt & Manning 92: 2004).

B. schlechteri Baker: 712 (1904), syn. nov. Type: South Africa, [Mpumalanga], Witbank, 22 December 1893, *R. Schlechter* 4055 (Z, holo., not seen).

B. hypogaea var. *longituba* G.J.Lewis: 115 (1959), syn. nov. Type: South Africa, [Limpopo], Mount Myorul, 29 March 1894, *R. Schlechter* 4729 (BOL, holo.; K, iso.).

B. hypogaea (as *hypogaea*) sensu G.J.Lewis: 112 (1959) not of Baker, misapplied name.

B. hypogaea var. *ensifolia* G.J.Lewis: 114 (1959), syn. nov. Type: South Africa, [Eastern Cape], near Murraysburg, August 1879, *W. Tyson* 312 (SAM, holo.; K, SAM, iso.).

See Lewis (1959) and Goldblatt (1993) for complete synonymy (under the name *B. hypogaea*).

Plants mostly 150–250 mm high (leaves only), sometimes growing in tufts; stem underground, often branched. *Leaves* linear to sword-shaped, 15–25 × 3–10 mm, pleated, much exceeding flowers, densely hairy, scabrid, or virtually smooth. *Bracts* mostly 35–60 mm long, membranous to papery, with dry, rust-brown tips or dry and rust-brown throughout, sparsely hairy, inner slightly shorter than outer, forked at apices. *Flowers* zygomorphic, 2–8 in a compact spike borne below ground level, lateral flowers usually with short stalks, shades of blue to violet or mauve, tepals paler (rarely white) toward edges, lower lateral tepals with white markings often edged in dark blue, usually sweetly scented; perianth tube mostly 40–60(–70) mm long, cylindrical with an expanded throat; tepals unequal, the dorsal 40–50 mm long, upper laterals joined to lower tepals for ± 6 mm to form a lip, lower tepals 25–40 mm long. *Stamens* unilateral; filaments 10–15 mm long; anthers 8–10(–12) mm long, white to palest yellow. *Ovary* smooth, in lower flowers shortly stipitate; style usually dividing close to anther apices, branches ± 6 mm long. *Flowering time*: mainly in summer, February to April, occasionally in December or January; southern Karoo populations flower in August or September. Plate 3D.

Distribution and ecology: Botswana, Namibia, South Africa, Zimbabwe, and Zambia; across the summer rainfall region in southern Africa from Murraysburg and Carnarvon in the Great Karoo to southern Zambia in the northeast and northern Namibia in the northwest; stony or sandy slopes and flats in dry grassland and bush (Map 19).

Babiana bainesii is recognized by the subterranean stem and inflorescence, the flowers which therefore arise shortly below ground level, and by its narrow, erect leaves, associated with blue-mauve to violet flowers with white markings on the lower lateral tepals edged in darker blue. The flowers have a perianth tube 40–55(–70) mm long and subequal tepals, the dorsal one usually ± as long

as the tube, or slightly shorter when the tube exceeds 50 mm. The narrow leaves are linear to sword-shaped, erect and 15–25 mm long, thus much exceeding the flowers. Plants are often difficult to see among the grass where they grow, but when in bloom can often be located by their particularly strong, sweet scent.

A peculiar feature of this species and the allied *Babiana hypogaea* is the underground inflorescence, a spike or pseudospike with the lower flowers borne on short stalks. Sometimes these resemble lateral branchlets, each bearing one or two flowers. Lewis regarded the feature as being particularly significant, and distinguished *B. bainesii*, which she called *B. hypogaea* (sic), and *B. hypogaea* (as *B. flavida* and *B. falcata*) partly by the stipitate ovary. This, together with the largely membranous or papery bracts of these species, were regarded by Lewis (1959) as important in distinguishing *B. bainesii* from the southern and western Cape species, *B. sambucina* (No. 28). We have, however, occasionally noted the stalked ovary in other species in which the inflorescence is borne at or shortly below ground level, including *B. cuneata* (No. 21) and *B. sambucina*. Curiously, the bracts subtending each flower are inserted, as in subfamily Crocoideae, at the base of the ovary, thus above the so-called ovary stalk. Inflorescences with the branches bearing single flowers are rare in Crocoideae but do occur in some other species with subterranean inflorescences, e.g. *Duthiastrum* (De Vos 1974, as *Duthiella*) and *Romulea* (De Vos 1972; Manning & Goldblatt 2001). The subterranean inflorescence with flowers arising below the ground (and the associated peculiarities of the branching pattern), are most likely the result of the disruption of developmental patterns that produce a true spike simply by their underground position.

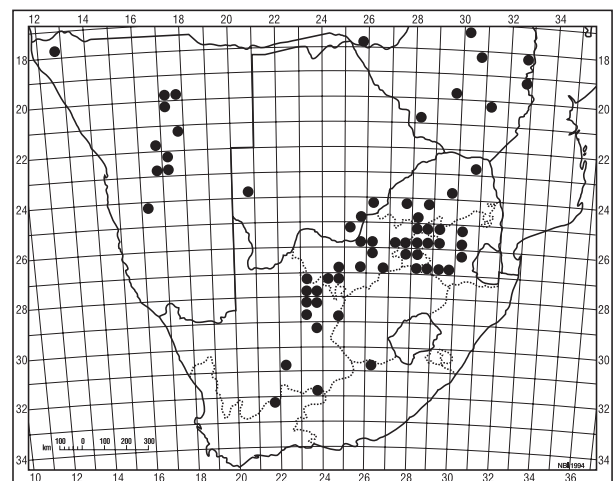
Lewis (1959) treated *Babiana bainesii* as a synonym of the earlier *B. hypogaea*, misinterpreting the type of the latter, which flowered in winter and had pale yellowish to buff flowers. That Burchell described the flower colour as blue (*caeruleus*) was perhaps the result of basing the description on his pressed specimens in which the tepals have a dull mauve cast, as do all dry specimens of the species. This is the result of the mauve pigmentation on the outside of the tepals masking the dull yellow colouring of the inside of the tepals when dry. Following Lewis, the accounts of the Iridaceae for Namibia (Sölch 1969) and *Flora zambesiaca* (Goldblatt 1993) also treated the species as *B. hypogaea*. The type of *B. schlechteri*, described by Baker in 1904, based on a collection from Witbank, northeast of Johannesburg, does not differ in any significant way from other collections referred to *B. bainesii* from Gauteng and elsewhere across its range.

Lewis recognized two varieties of what we now call *Babiana bainesii*: var. *longituba* from the mountains of Limpopo Province, South Africa; and var. *ensifolia* from the Great Karoo. The former, distinguished largely by an elongate perianth tube up to 70 mm long, was included by us in *B. bainesii* (Goldblatt & Manning 2004). We considered the long tube in these plants to represent the extreme of a range that includes many plants with

a tube 55–65 mm long (the type of *B. bainesii* from the Witwatersrand has a tube nearly 60 mm long). Near Haenertsburg in Limpopo Province, close to the type locality of var. *longituba*, plants have a perianth tube 35–59 mm long ($n = 15$) (P.J.D. Winter pers. comm.).

In contrast, *Babiana hypogaea* var. *ensifolia* has comparatively short, broad leaves 50–140 × 10–14 mm, unlike the narrow, sparsely to densely hairy, narrowly sword-shaped to linear leaves, mostly 15–25 × 3–10 mm, of typical var. *bainesii*. It approaches in general appearance the largely southern Cape species *B. sambucina* but it has the entirely subterranean inflorescence, short lateral branchlets, and rust-brown bracts typical of *B. bainesii*. These plants flower in early spring: August and September. Var. *ensifolia* is poorly documented and requires additional study before its status can be established. It may be recognized or not, at the discretion of the reader, but we hesitate to make the new combination in *B. bainesii* until more is learned about these plants from the central Great Karoo.

The most widespread species of the genus, *Babiana bainesii* extends from the central Great Karoo to northern Namibia, Botswana, Zimbabwe, and southern Zambia (Lewis 1959; Goldblatt 1993). It grows in grassland on soils ranging from deep Kalahari sands to stony slopes and flats, and typically flowers from late summer until late autumn, the exact timing probably depending on rainfall in areas of low annual rainfall. *Babiana hypogaea*, which has pale dull yellow to buff flowers, but sometimes nearly identical vegetative morphology to *B. bainesii*, has a complementary range, occurring west and south of the range of *B. bainesii*, in the northwestern Great Karoo, Bushmanland, and adjacent southeastern Namibia. It flowers mostly in winter and early spring: June to September, in contrast to February to April or May for *B. bainesii*. Both their flowering time and ranges overlap to some extent in the Kimberley–Vryburg area of Northern Cape and North-West Provinces but there is no indication that they converge in floral morphology along the area of overlap.



MAP 19.—Distribution of *Babiana bainesii*.

2. SECTION ANTHOLYZOIDES

2. Section **Antholyzoides** Benth. & Hook.f., *Genera plantarum* 3: 707 (1883). Type: *B. ringens* (L.) Ker Gawl. (lecto., here designated).

Section *Exohebeoides* G.J.Lewis: 126 (1959). Type: *B. striata* (Jacq.) G.J.Lewis.

Subgenus *Antholyzoides* Baker: 166 (1877); Baker: 107 (1896). Type: *B. ringens* (L.) Ker Gawl. (lectotype, here designated).

Stem well developed, smooth or velvety hairy (*B. spiralis*, *B. stenomera*), the main axis erect, with short, horizontal lateral branches, sterile in *B. ringens*. *Bracts* relatively short, usually hairless, dry in upper third and apiculate-attenuate, inner forked to $\pm$ middle, 2-keeled. *Leaves* usually smooth, sometimes scabrid or long-hairy on the margins. *Flowers* zygomorphic, dorsal tepal widely separated from others, curving back and erect when fully unfolded, and distinctly clawed, lower tepals usually united for some distance in a lip, clawed, lower lateral tepals with limb abruptly expanded and usually bearing a lobe or auricle on either side of base. *Stamens* unilateral; filaments arcuate; anthers oblong-linear, fused together in *B. sinuata*. *Ovary* smooth.

Species no. 41–51, mainly Namaqualand, with *B. sinuata* and *B. thunbergii* extending south into the northern portion of Western Cape (and the Cape Floral region proper) and *B. ringens* widespread in Western Cape.

Section *Antholyzoides*, agrees largely with section *Exohebeoides* as defined by Lewis (1959), but we recognize five more species than in her account: *Babiana spiralis*, resurrected from synonymy in *B. fimbriata*; the early winter-flowering *B. planifolia*, raised from varietal rank in *B. striata*; *B. lewisiana*, described by Nordenstam in 1974; and the two species once included in *Antholyza*, the bird-pollinated *B. ringens* and *B. thunbergii*. *Babiana stenomera* is still known only from the type collection made in 1896 in the Kareeberg near Nuwerus; further collections will help to determine its status. We have arranged the species in two series: ser. *Exohebeoides* for the short-tubed species; and ser. *Antholyza* for *B. ringens* and *B. thunbergii*, which have red, long-tubed flowers.

Series 2.1. *Exohebeoides*

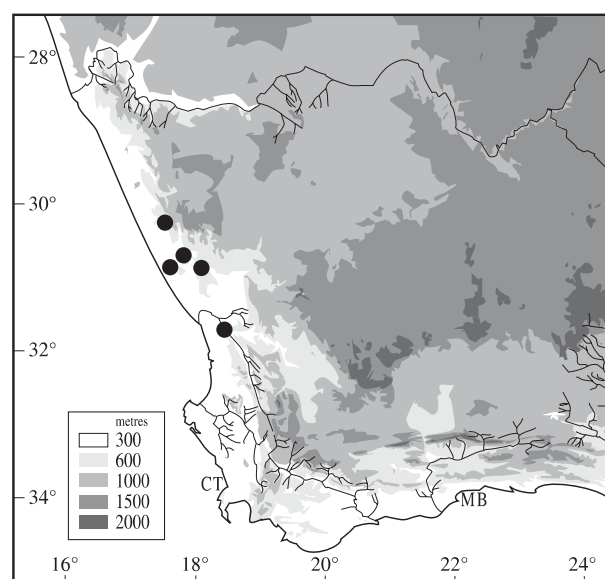
41. ***Babiana spiralis*** Baker, *Handbook of the Irideae* 111 (1892); Goldblatt & J.C.Manning: 9 (2005). Type: South Africa, [Northern Cape], Namaqualand, without precise locality or date, *Herb. Forsyth s.n.* [collector possibly J. Niven] (K, syn.: 2 sheets).

Plants (150–)250–550 mm high; stem erect, usually 2–6-branched, short-velvety. *Leaves* narrowly lanceolate to linear, 1.5–2.5 mm wide, plicate, loosely to fairly tightly twisted above, often with pronounced pseudopetiole sometimes up to 40 mm long, sparsely scabrid on veins, sheath margins and upper edge of blade usually long-hairy, not cobwebby on sheaths. *Bracts* green below,

dry in upper third, somewhat attenuate, obscurely hairy to hispid on lower midline, outer 8–10 mm long, inner slightly shorter, forked to $\pm$ middle. *Flowers* zygomorphic, 5–8 per spike, blue-mauve to pink, lower tepals yellow with blue-mauve or pink tips, with strong freesia-like scent; perianth tube funnel-shaped, 8–10 mm long; tepals unequal, clawed, the dorsal initially arched, later erect, 18–21 mm long, the upper laterals joined to the lower for $\pm$ 4 mm, lower three united for short distance, lower laterals abruptly expanded at top of claw, limb bases with prominent auriculate lobes. *Stamens* unilateral; filaments arched, $\pm$ 15 mm long; anthers 4 mm long. *Ovary* hairless; style dividing opposite middle of anthers, branches $\pm$ 3 mm long, spreading. *Flowering time*: August and September.

Distribution and ecology: Northern and Western Cape: from Garies and Hondeklipbaai in Namaqualand to Trawal and the Nardouw foothills in the Olifants River Valley; stony granite hills and deep red sands (Map 20).

Babiana spiralis is perhaps most closely related to *B. fimbriata* (No. 44) of central Namaqualand and it has often been confused with that species (e.g. by Lewis 1959). The brightly coloured, attractive flowers, velvety hairy stem, and leaves twisted or coiled above and hairless except for a few long hairs on the margins, distinguish it from *B. fimbriata*, which has dull-coloured flowers, somewhat rigid, only slightly twisted leaves, a sparsely hairy or smooth stem, and upper lateral tepal limbs curving inward, very different from the $\pm$ patent ones of *B. spiralis*. The lower lateral tepals also lack the conspicuous auriculate lobes at the base of the limbs characteristic of several species of section *Antholyzoides*, including *B. fimbriata*. They are obscurely lobed at best, as Lewis's painting of the species (under the name *B. fimbriata*) shows (see also Figure 1C). Unlike most species of section *Antholyzoides*, the leaf sheaths and cataphylls of *B. spiralis* are not woolly or cobwebby. Unusual for section *Antholyzoides*, the leaf blades may have fairly well-developed, terete pseudopetioles, a feature particularly pronounced in *Nordenstam* &



MAP 20.—Distribution of *Babiana spiralis*.

Lundgren 1170 (MO, S), in which they may be up to 40 mm long with the broad part of the blade abruptly expanded. An attractive plant, *B. spiralis* has numerous, long-lasting pink to violet flowers with a strong freesia-like scent, and it would be a valuable subject for the garden, especially in dry areas. Plants thrive in the wild with less than 250 mm annual rainfall.

The ranges of *Babiana spiralis* and *B. fimbriata* overlap in central Namaqualand, but *B. spiralis* has the wider distribution, extending westward to the sandy west coast south of Hondeklipbaai and south to the Nardouw Mountains south of Klawer. We have found it to be relatively common both between Hondeklipbaai and Kotzesrus and at higher elevations in the hills above Garies.

The origin of the type collection is uncertain, for the name Forsyth on the two type sheets at the Kew Herbarium is now believed to refer not to the original collector of the plants, but to William Forsyth, whose herbarium collection was bought in 1835, after his death, by George Bentham of the Royal Botanic Gardens, Kew. Goldblatt & Manning (2005) suggest that the specimens were collected by James Niven who botanized in Namaqualand in 1799, gathering seeds, and perhaps bulbs, for wealthy British and French patrons. Selected specimens of *B. spiralis* are cited below; a complete listing of specimens is provided by Goldblatt & Manning (2005).

Representative specimens

NORTHERN CAPE.—3017 (Hondeklipbaai): hills above Garies, (–DB), 2 September 2000, Goldblatt & Nänni 11453 (K, MO, NBG, PRE); 18 km from the junction of the Garies–Groenrivier road toward Nuwefontein, (–DC), 3 September 1976, Boucher 3159 (K, NBG, PRE); Farm Waterval west of Kotzesrus, (–DC), 28 August 2001, Goldblatt & Porter 11773 (NBG, MO).

WESTERN CAPE.—3118 (Vanrhynsdorp): hills at Bitterfontein, (–AA), 2 September 1897, Schlechter 11041 (K, MO, S).

42. ***Babiana stenomera*** Schltr. in *Botanische Jahrbücher* 27: 100 (1899); G.J.Lewis: 127 (1959). Type. South Africa, [Western Cape], Kareeberg, near Nuwerus, 1200 ft ($\pm$ 380 m), $\pm$ 17 July 1896, R. Schlechter 8185 (B, BOL, K, MO, P, PRE, S, syn.).

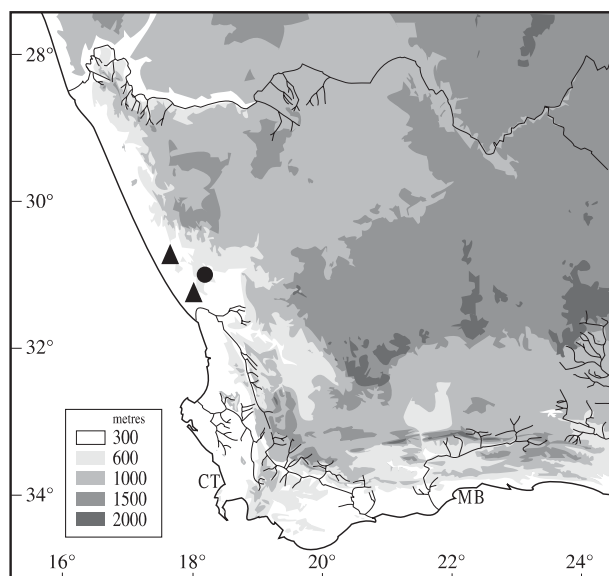
Plants 80–120 mm high; cataphylls and bases of leaf sheaths seemingly smooth (old, rather poor specimen); stem short, erect, densely hairy above, simple or with 1 or 2 short lateral branches, sheathed below by thick neck of fibres. Leaves sword-shaped, mostly 4.0–5.5 mm wide, reaching to $\pm$ top of spike, scarcely plicate, hairless or sparsely hairy on veins and sheath margins. Bracts mostly 15–20 mm long, seemingly green with brown tips, short-hairy near base and on keels of inner bracts, the inner divided near apex, sometimes for almost one third its length. Flowers bilabiate, 5–8 in an erect spike, bluish with yellow markings on lower lateral tepals; perianth tube 12–14 mm long; tepals unequal, short-clawed, dorsal tepal 22–24 mm long, lower tepals

$\pm$ 15 mm long, joined to upper laterals for $\pm$ 4 mm and to one another for $\pm$ 2 mm. Stamens unilateral; filaments $\pm$ 15 mm long; anthers $\pm$ 6 mm long. Ovary smooth; style seemingly dividing opposite middle of anthers, branches $\pm$ 4 mm long. Flowering time: July.

Distribution and ecology: Western Cape: in the Kareeberg near Nuwerus in southern Namaqualand; granite hills, $\pm$ 1200 ft ($\pm$ 380 m) (Map 21).

Discovered in 1896 by Rudolf Schlechter and described by him in 1899, *Babiana stenomera* remains a puzzling and poorly known species. Lewis (1959), in her monograph of the genus, included the collection Drège 2624 from Hol River in *B. stenomera*. Specimens at P and S bearing this number are not *B. stenomera*: the leaves are too broad, 7–14 mm wide, are held almost at right angles to the sheaths, the bracts are up to 20 mm long, and the inner bracts have prominent dry, rust-brown, acuminate tips. Typical *B. stenomera* has bracts 15–18 mm long, the inner of which do not have rust-brown, acuminate tips, and the ascending leaves are 4.0–5.5 mm wide. Drège 2624 most closely resembles *B. lewisiana* (No. 43), the type of which is also from Hol River. *Babiana stenomera* thus remains known only from the type collection.

Babiana stenomera is evidently most closely related to a second Namaqualand species, *B. fimbriata* (No. 44), but that species has narrower leaf blades, up to 3.5 mm wide, tapering and lightly twisted in the upper half, a smooth or at best sparsely hairy stem, and prominent long hairs on the edges of the leaf sheaths. The bracts of *B. stenomera* in particular, seem at odds with its placement in section *Antholyzoides* for they are mostly 15–20 mm long, which is beyond the expected range for *B. fimbriata* or the related *B. spiralis* (No. 41) which has a velvety hairy stem and narrow, coiled leaves. Within section *Antholyzoides* the relatively long bracts recall those of *B. planifolia* (No. 47), also an early flowering species, but this has a smooth stem and spike. Additional collections



MAP 21.—Distribution of *Babiana stenomera*, ●; *B. lewisiana*, ▲.

are needed to determine the status of *B. stenomera* but for the present we continue to recognize the species and provisionally include it in section *Antholyzoides*.

43. ***Babiana lewisiana*** *B. Nord.* in Botaniska Notiser 123: 436 (1970). Type: South Africa, [Western Cape], Vredendal, Hol River, on quartzite slope, 28 July 1962, *B. Nordenstam* 787 (S, holo.; K, M, MO, NBG, iso.).

Plants 70–150 mm high; cataphylls smooth; stem simple or with one branch, softly hairy above. *Leaves* with short pseudopetioles, blades oblong, 10–15 mm wide, held almost at right angles to sheaths, strongly ribbed but scarcely plicate, hairless or minutely hairy on margins, sheaths smooth. *Bracts* 15–20 mm long, sparsely hairy, green with attenuate, dry brown tips, often torn at apex, inner slightly shorter than outer, forked to $\pm$ middle. *Flowers* zygomorphic, 3–8 per spike, magenta, lower lateral tepals with narrow claw, greenish yellow with purple tips; perianth tube funnel-shaped, $\pm$ 10 mm long; tepals unequal, the dorsal oblong, $\pm$ 25 mm long, lower tepals $\pm$ 20 mm long, joined to upper laterals for short distance, markedly clawed. *Stamens* unilateral; filaments arcuate, $\pm$ 15 mm long; anthers 5–6 mm long. *Ovary* smooth; style dividing opposite anther apices, branches $\pm$ 2.5 mm long. *Flowering time*: July to August.

Distribution and ecology: Northern and Western Cape: on stony granite slopes S of Kotzesrus and quartzite flats and slopes near Hol River near Vredendal (Map 21).

Known only from the type gathering when described, just a few additional collections of *Babiana lewisiana* are now known, one made by Lewis in 1959 from the Knersvlakte; all but one of the remaining are from the type locality (*Booyesen* 33, NBG; *Hall s.n.*, NBG). The last, *Goldblatt & Porter* 11898, is from south of Kotzesrus. These collections confirm the observations made by Nordenstam that this species has virtually hairless leaves, a smooth ovary, and lacks the cobwebby hairs on the cataphylls characteristic of many species of section *Antholyzoides*. Although Nordenstam speculated that *B. lewisiana* might be closely allied to *B. salteri* (No. 64), we think it unlikely because that species has hairy, soft-textured leaves, the inner bracts are divided to the base, and the ovary is densely hairy. The similarity of the short leaf blades held nearly at right angles to the sheaths must be seen as due to convergence, possibly because of the similar arid habitat. Indeed, similar leaves are known in several other species of the genus, e.g. *B. cinnamomea* (No. 17), not always related to each other. We suggest that *B. lewisiana* is most closely allied to the group of species in section *Antholyzoides* that have a pubescent stem and lack the cobwebby hairs on the cataphylls and lower leaf sheaths. These include *B. spiralis* (No. 41) and *B. stenomera* (No. 42). *Babiana lewisiana* is unlikely to be confused with either of these species because of the plane leaves with broad, oblong blades extending almost horizontally, quite unlike the narrow upright leaves of the last two species.

Specimens collected by Johann Franz Drège at Hol River (*Drège* 2624) were assigned by Lewis (1959) to

the rare local endemic *Babiana stenomera* but they do not belong to this species, and most likely represent the earliest collection of *B. lewisiana* (see discussion under *B. stenomera*). Some specimens of this Drège collection bear the undated annotation '*B. subglabra* Lewis' in Lewis's own hand. Evidently she changed her mind about the identity of these plants, leaving the species to be described later by Nordenstam (1970).

Additional specimens examined

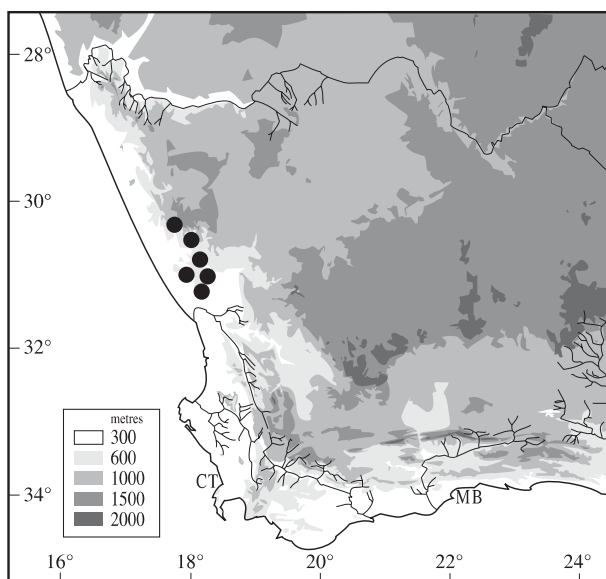
NORTHERN CAPE.—3017 (Hondeklipbaai): 19 km S of Kotzesrus on road to Landplaas, granite escarpment, (–DD), 16 September 2001 (fr.), *Goldblatt & Porter* 11898 (MO, NBG).

44. ***Babiana fimbriata*** (*Klatt*) *Baker* in Journal of the Linnean Society, Botany 16: 166 (1877); G.J. Lewis: 132 (1959), in part. *Antholyza fimbriata* Klatt: 299 (1867–1868). Type: South Africa, [Northern Cape], southern Namaqualand, between the Swartdoorn and Groen River, August 1830, *J.F. Drège* 2619 (B, holo.; K, MO, P (3 sheets), S (2 sheets); a second sheet of *Drège* 2619 at K may be *B. planifolia*).

Plants 120–200 mm high; cataphylls cobwebby to woolly; stem erect, simple or with short lateral branches, smooth or sparsely hairy in lines below bracts. *Leaves* linear, 3–4 mm wide, pleated, as long as or shortly exceeding spike, loosely twisted above, sparsely short- or long-hairy on slightly undulate margins. *Bracts* smooth, green, dry and brown toward apices, the outer 12–14 mm long, inner forked in upper third, membranous in lower midline. *Flowers* zygomorphic, 5–7 in short, erect spike, dull reddish purple to brownish, greenish outside, lower lateral tepals dull yellow with purple tips, sweetly smelling of freesia and vanilla; perianth tube funnel-shaped, 10–12 mm long; tepals unequal, clawed, the dorsal initially arched, becoming erect, (18–)21–25 mm long, upper lateral tepals directed forward and slightly inward, lower tepals 10–12 mm long, joined to upper laterals for $\pm$ 5 mm and to one another for $\pm$ 2.5 mm, lower laterals with conspicuous auriculate lobes at base of limb. *Stamens* unilateral; filaments arched, 13–15 mm long; anthers 5–6 mm long, usually lilac; pollen cream-coloured. *Ovary* smooth; style dividing between middle or upper third of anthers, branches $\pm$ 2.5 mm long. *Flowering time*: late July to mid-September. Plate 3E.

Distribution and ecology: Northern and Western Cape: in Namaqualand, extending from Garies to Nuwerus and the Knersvlakte north of Vanrhynsdorp; stony granite or quartz slopes (Map 22).

First collected by Johann Franz Drège in 1830 between the Swartdoorn and Groen Rivers, not far south of present-day Garies, *Babiana fimbriata* was first assigned to the genus *Antholyza* by Klatt in 1867–1868, then transferred to *Babiana* by Baker in 1877. When treated by Lewis (1959), *B. fimbriata* included *B. spiralis* (No. 41) in synonymy, and thus its range was described as extending from Bitterfontein southward to Klawer. In fact, *B. fimbriata* is a fairly narrow endemic of central Namaqualand, with a range limited to the area between Garies and the hills south of Nuwerus. The more

MAP 22.—Distribution of *Babiana fimbriata*.

widespread *B. spiralis*, favours sandy soils, and extends from Garies to Klawer in the south and west to the coast between Groen River mouth and Kotzesrus.

The only collection of *Babiana fimbriata* correctly assigned to the species by Lewis (1959) is the type gathering but since the publication of her monograph, several additional collections have been made of plants corresponding to the original Drège collection. They show beyond question that *B. fimbriata* is separate from *B. spiralis*. It is distinguished by the hairless or nearly hairless stem, the cataphylls and bases of the leaf sheaths woolly or cobwebby, leaves to 3–4 mm wide, and the dull-coloured flowers have prominent auriculate lobes on the lower lateral tepals. In contrast, *B. spiralis* has smooth cataphylls and leaf sheaths, a velvety stem, while the bright pink or blue flowers also have auriculate lobes on the lower tepal limbs. Tepal orientation also differs: the upper lateral tepals of *B. fimbriata* are directed forward or are slightly curved inward in the proximal half, whereas those of *B. spiralis* curve outward shortly above the base in conventional subpatent orientation. Available herbarium specimens are cited by Goldblatt & Manning (2004) and only a representative selection of specimens is listed below.

Representative specimens

NORTHERN CAPE.—3018 (Kamiesberg): between Bitterfontein and Garies at Swartdoorn River, at border of Western Cape, (–CC), 2 September 2000, Goldblatt & Nänni 11452 (MO, NBG, PRE).

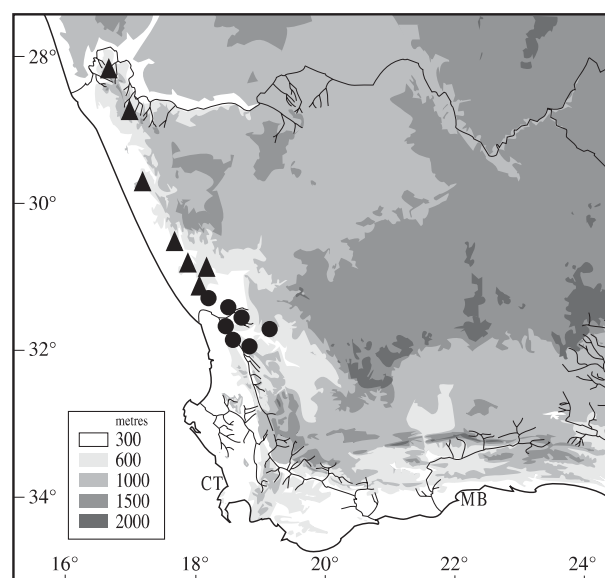
WESTERN CAPE.—3018 (Kamiesberg): 10 km north of Bitterfontein, (–CC), 20 August 2001, Goldblatt & Porter 11711 (MO, NBG). 3118 (Vanrhynsdorp): 3 miles NW of Nuwerus, (–AA), 11 September 1971, Hall 4141 (NBG); rocky bank between Bitterfontein and Nuwerus, (–AB), 13 August 1997, Goldblatt & Manning 10666 (MO).

45. *Babiana sinuata* G.J.Lewis in Journal of South African Botany, Suppl. 3: 128 (1959). Type: South Africa, [Western Cape], 10 miles south of Klawer, 10 September 1950, W.F. Barker 6710 (NBG, holo.; BOL, K, SAM. iso.).

Plants 100–250 mm high; cataphylls and lower leaf sheaths woolly or cobwebby; stem smooth, erect, mostly 2–6-branched. Leaves lanceolate, nearly plane with few prominent veins, reaching to $\pm$ base of spike, loosely twisted, undulate and crisped, margins of sheath and upper margin of blade long-hairy, margins thickened, darker green. Bracts 8–10 mm long, smooth, green below, dry and brown in upper half, inner one as long as outer, forked to $\pm$ middle. Flowers zygomorphic, several in a lax, inclined spike, pale blue, lower tepals yellow with pale blue tips, lower laterals also with dark violet median mark, sweetly scented; perianth tube funnel-shaped, 8–9 mm long; tepals unequal, clawed, dorsal tepal arched, later erect, $\pm$ 28 mm long, lower three shortly united. Stamens unilateral; filaments arched, 20 mm long; anthers connate, $\pm$ 7 mm long. Ovary smooth; style mostly dividing opposite upper half of anthers, sometimes beyond anther tips, branches $\pm$ 1.5 mm long. Flowering time: late August to mid-September. Plate 3F.

Distribution and ecology: Northern and Western Cape: from southern Namaqualand to Bulshoek north of Clanwilliam and in the Doorn River Valley east of the Nardouw Mountains; stony shale slopes (Map 23).

One of the most distinctive species of section *Antholyzoides*, *Babiana sinuata* is also the most distinctive member of series *Exohebeoides*, both vegetatively and in the flower. The leaf sheaths are cobwebby, and the long, relatively narrow leaf blades are undulate and crisped, bearing fine long hairs on the upper margin, and are loosely twisted in the upper half. The pale blue-mauve flowers (Figure 1D) are relatively large and the lower median tepal has a prominent violet central mark on a pale yellowish background. Most remarkable, however, are the long, arched stamens with united anthers, albeit fairly weakly, a feature unique in the genus. Extending from Clanwilliam and the Botterkloof Valley at Doornbos in the south to Nuwerus in the north, *B. sinuata* is especially common on dry slopes of the lower Olifants River Valley where it forms dense stands in years of good rainfall.

MAP 23.—Distribution of *Babiana sinuata*, ●; *B. striata*, ▲.

The woolly cataphylls and crisped, undulate, and twisted leaves suggest a close relationship with a second Namaqualand species, *Babiana striata* (No. 46), with which it was long confused. This early flowering species is easy to distinguish because the inflorescence is more compact, the flowers smaller, the anthers are parallel but not joined together, and the corm tunics consist of particularly coarse fibres. Although only described by Lewis in 1959, *B. sinuata* was first distinguished from *B. striata* by Rudolf Schlechter in the later 1890s. His collection, *Schlechter 10979*, from Vuurfontein (?Zuurfontein) has the annotation '*B. namaquana* Schltr. n. sp.' in the Kew and Berlin Herbaria but that name was never published.

Additional specimens examined

NORTHERN CAPE.—3119 (Calvinia): Moedverloor road, ± 10 km from Doornbos, (–CA), 4 September 2004, *Goldblatt & Manning 12384* (NBG).

WESTERN CAPE.—3118 (Vanhynsdorp): between Nuwerus and Lutzville, (–AA), cultivated at Kirstenbosch National Botanical Garden, 25 August 1964, *Lewis 6204* (NBG); 5 km SW of Nuwerus, (–AB), 11 September 1971, *Hall 4141* (NBG); between Vanhynsdorp and the Waterfall, (–DB), August 1993, *Branch s.n.* (NBG).

46. *Babiana striata* (Jacq.) G.J.Lewis in *Journal of South African Botany*, Suppl. 3: 129 (1959), excl. var. *planifolia*. *Gladiolus striatus* Jacq.: t. 260 (1794). Type: South Africa, without precise locality or date, illustration in Jacq., *Icones plantarum rariorum* 2: t. 260 (1794).

See Lewis (1959) for complete synonymy.

Plants 80–150 mm high; corm with coarsely fibrous tunics; cataphylls cobwebby to woolly; stem smooth, inclined toward ground, enclosed below ground by a thick collar of fibres. *Leaves* sword-shaped to lanceolate, margins broadly undulate and slightly crisped, twisted above, with prominent midrib, hairless or ciliate on margins, sometimes only near tips. *Bracts* 8–15 mm long, smooth, inner forked in upper third. *Flowers* zygomorphic, 3–5 in two ranks on an inclined to horizontal spike, pale mauve or dull yellow, lower lateral tepals darker yellow-green in midline, lower median with spear-shaped, median purple outline, unscented; perianth tube ± 7 mm long; tepals unequal, abruptly narrowed into claws near base, the dorsal largest, widely arched, later curving back, 20–25 mm long, lower three joined to upper laterals for 3–4 mm and to one another for 3–6 mm, with prominent auriculate lobes just above base of limbs, 12–14 mm long. *Stamens* unilateral; filaments ± 15 mm long; anthers 4.5–6.0 mm long. *Ovary* smooth; style dividing opposite anther bases, branches ± 2 mm long. *Flowering time*: June to late July.

Distribution and ecology: Northern and Western Cape: Namaqualand extending from the southern Richtersveld to Nuwerus; stony and gravel slopes at lower elevations (Map 23).

The winter-flowering *Babiana striata* is recognized primarily by the unusual inclined leaves with undulate and slightly crisped margins and the entire blade loosely

twisted, and smooth or at most ciliate on the margins. The fairly small flowers are borne on an inclined to horizontal spike, facing the spike axis, and the tepals are pale yellow, flushed pale purple outside. Like most species of section *Antholyzoides*, the cataphylls and leaf bases are cobwebby. The species is most often confused with blue-flowered *B. sinuata* (No. 45), specimens of which were included in *B. striata* until 1959 when Lewis resolved this confusion. The two share similarly undulate and twisted leaves, but are otherwise very different. The leaves of *B. sinuata* differ in having long hairs on the margins of the sheath and upper margin of the blade, the flowers are larger, with the dorsal tepal ± 28 mm long (versus 20–25 mm in *B. striata*), and are pale blue with pale yellow lower tepals with pale blue tips, and the lower laterals have a conspicuous dark violet median mark. Even more distinctive are the stamens of *B. sinuata*, which have filaments ± 20 mm long and connate anthers, a feature that persists even in pressed specimens. The stamens of *B. striata* are conventional, with filaments ± 15 mm long, and the anthers free from one another. Surprisingly, given their dull coloration, the flowers of *B. striata* are unscented, at least in the live plants we have examined from near Kotzesrus.

As circumscribed by Lewis (1959), *Babiana striata* comprised two varieties, the typical and var. *planifolia* which included plants with plane leaves and more finely fibrous corm tunics. The latter was raised to species rank as *B. planifolia* by Goldblatt & Manning (2005) and we discuss its characteristics below. Typical *B. striata* occurs in southern Namaqualand, where plants closely match the type, but Lewis included in her var. *striata*, a collection from Kubus in the Richtersveld (*Verdoorn 1832*, PRE) that seemed to be geographically isolated when her monograph was published, although it conformed broadly to the southern plants. A collection from east of Grootmis (*Goldblatt & Manning 9894*, MO, NBG) accords with the Richtersveld plants and links the two sets of populations. Although the leaves of the Grootmis population match the species closely, the flowers are somewhat larger than described by Lewis and the circumscription is accordingly adjusted here.

Additional specimens examined

NORTHERN CAPE.—2917 (Springbok): 62 km west of Springbok on road to Grootmis, gravel slope, (–CB), 2 August 1994, *Goldblatt & Manning 9894* (MO, NBG).

47. *Babiana planifolia* (G.J.Lewis) Goldblatt & J.C.Manning in *Bothalia* 35: 10 (2005). *B. striata* var. *planifolia* G.J.Lewis: 130 (1959). Type: South Africa, [Northern Cape], 9 miles (5.6 km) W of Steinkopf, 30 June 1935, *T.M. Salter 5554* (BOL, holo.).

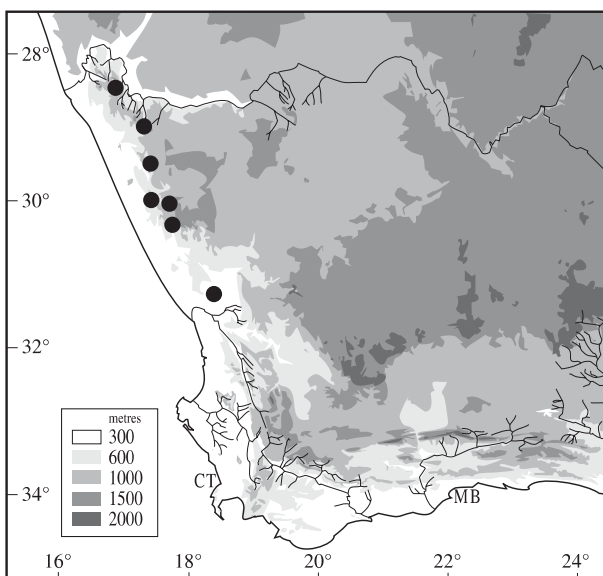
Plants 120–350 mm high; cataphylls and base of leaf sheaths cowebby to woolly; corm tunics finely fibrous; stem erect, usually hairless, simple or with one or more short lateral branches, enclosed below ground by thick fibrous collar. *Leaves* lanceolate to sword-shaped, plane or slightly undulate in proximal half, loosely twisted distally, blades (40–)80–160 × 5–16(–20) mm, sparsely short-hairy, often long-hairy on adaxial margins. *Bracts*

12–24 mm long, smooth or sparsely short-hairy, inner forked to middle, tips attenuate. *Flowers* zygomorphic, 3–8, spirally arranged on erect, sometimes sparsely hairy spike, mauve, lower lateral tepals yellow-green with mauve to purple tips; perianth tube 8–16 mm long, slender below, expanded toward apex; tepals unequal, clawed, the dorsal arched, later curving back, 23–28 mm long, lower lateral tepals 15–20 mm long, joined to upper laterals for 4–5 mm and to one another for ± 2 mm. *Stamens* unilateral; filaments arched, ± 15 mm long; anthers ± 6 mm long. *Ovary* smooth; style dividing opposite middle to upper third of anthers, ± 3 mm long. *Flowering time*: May and June, occasionally July. Plate 4A.

Distribution and ecology: Northern and Western Cape: extending from the southern Richtersveld to Garies and Soebatsfontein and local in the Knersvlakte; stony slopes, mainly on fine-grained soils (Map 24).

When Lewis described *Babiana striata* var. *planifolia* in 1959, she based it on the type and one other collection. Several additional gatherings have now accumulated, making it clear that these specimens represent a separate species. Whereas typical *B. striata* has relatively short, conspicuously undulate and crisped leaves, corm tunics of coarse fibres, and a strongly inclined spike, *B. planifolia* can be recognized by its nearly plane leaves, occasionally slightly undulate toward the base, and corm tunics of relatively fine texture (Goldblatt & Manning 2005). Plants have cobwebby to woolly cataphylls and lower leaf sheaths, and the leaf blades are sparsely long-hairy on the veins or are virtually hairless. As in *B. striata*, the stem and bracts are usually hairless but the lower lateral tepals appear to lack the prominent auriculate lobes typical of most other species of section *Antholyzoides*, including *B. striata*.

Plants from the Eksteenfontein area of the southern Richtersveld are included in *Babiana planifolia* but they have short, broad, slightly undulate leaves 35–50 $\times$ 15–20 mm, twisted in the upper half. These plants seem to differ consistently in their short stature, and in addition



MAP 24.—Distribution of *Babiana planifolia*.

have long, soft, almost silky hairs on the leaf margins and upper sheaths, especially conspicuous in *Goldblatt & Manning 9898*. Corms, cataphylls, and the lower leaf sheaths of the Richtersveld plants are not known and we provisionally include them in *B. planifolia* (Goldblatt & Manning 2005), noting that when more specimens become available they may be found to constitute a separate taxon.

Representative specimens

NORTHERN CAPE.—2817 (Vioolsdrif): 3 km N of Eksteenfontein, (–CD), 3 August 1994, *Goldblatt & Manning 9898* (MO, NBG). 2917 (Springbok): near Paddagat, 22 miles NW of Springbok, 25 May 1961, *Leistner 2552* (NBG, PRE); 14 km S of Springbok, (–DD), 7 August 2000 (fr.), *Goldblatt & Manning 11327* (MO, NBG). 3017 (Hondeklipbaai): 14 miles NW of Kamieskroon, (–BB), 19 July 1957, *Acocks 19323* (PRE).

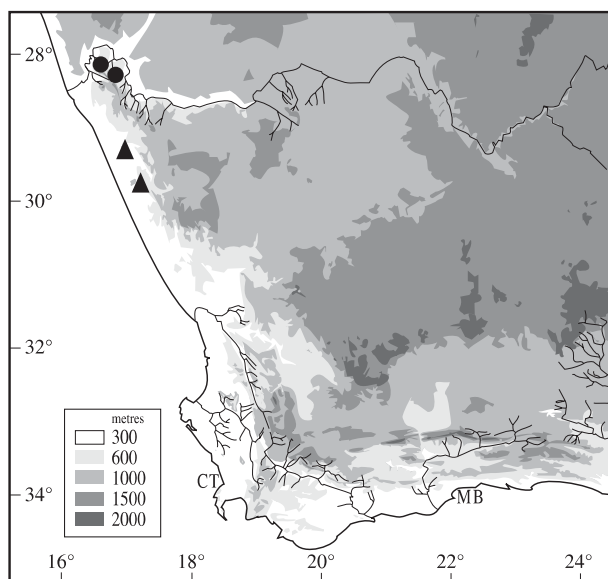
WESTERN CAPE.—3118 (Vanrhynsdorp): Knersvlakte at Grootgraafwater turn-off, stony east-facing slope, (–BC), 20 August 2001 (fr.), *Goldblatt & Manning 11710A* (MO).

48. *Babiana lobata* G.J.Lewis in *Journal of South African Botany*, Suppl. 3: 135 (1959); Goldblatt (1983). Type: South Africa, [Northern Cape], ‘near Garies’, but almost certainly from the Richtersveld, 29 July 1937, *I.C. Verdoorn 1892* (PRE, holo.).

Plants 120–250 mm high, hairless throughout; stem simple or dichotomously branched with branches widely diverging, old dry leaves coiled around stem base. *Leaves* narrowly linear-sword-shaped, 2.5–4.0 mm wide, reaching to base of spike, scarcely plicate, smooth, slightly twisted, veins prominently thickened. *Bracts* 5–8 mm long, subequal, smooth, green below, dry and rust-brown in upper third, inner $\pm$ as long or slightly longer than outer, forked apically or in upper third. *Flowers* (4–)7–12, second in a nearly horizontal spike, pale blue-mauve, lower lateral tepals pale yellow or with mauve tips, with faint acrid-metallic scent; perianth tube 7–8 mm long, narrowly funnel-shaped; tepals unequal, the dorsal 18–23 $\times$ 4–5 mm, erect, later curving back in distal third, lower lateral tepals joined to upper laterals for ± 5 mm and to one another for ± 3 mm, abruptly clawed at base, claws ± 2 mm long, limbs with conspicuous auriculate lobes just above base, margins slightly crisped. *Stamens* unilateral; filaments ± 15 mm long; anthers ± 4 mm long, purple; pollen cream-coloured. *Ovary* smooth; style dividing between base and middle of anthers, branches tangled in anthers. *Capsules* depressed-globose, $\pm 6 \times 7$ –8 mm when fully formed; mature seeds unknown. *Flowering time*: July and August. Plate 4B.

Distribution and ecology: Northern Cape: in the Richtersveld, extending from Armanshoek to the Stinkfontein Mountains; rocky lower slopes and flats (Map 25).

The first collection of *Babiana lobata*, made by Inez Verdoorn in 1937, consisted of a single specimen at the end of flowering. Supposedly from near Garies in central Namaqualand, this was the only collection known to Lewis in 1959 when she described the species. Despite its poor condition, the specimen was sufficient for adequate identification. The characteristic short bracts, 5–8 mm long, nearly linear leaves, cataphylls without woolly



MAP 25.—Distribution of *Babiana lobata*, ●; *B. tritonioides*, ▲.

pubescence, and unusual, widely divergent branching pattern are clearly evident. A second collection, made in the Richtersveld of northern Namaqualand near the Rosyntjieberg in 1977 (Oliver, Tölken & Venter 372, PRE) seemed an important range extension, and plants of that collection, subsequently grown in Pretoria National Botanical Garden, were illustrated in *The Flowering Plants of Africa* (Goldblatt 1983).

Because of the type locality, said to be near Garies, the name *Babiana lobata* became associated in herbaria with two related species, *B. spiralis* (No. 41) and *B. fimbriata* (No. 44), from central Namaqualand, both also with auriculate lobes on the lower lateral tepal limbs. The latter has sparsely hairy bracts, leaves twisted distally, woolly-cobwebby cataphylls, and bracts 12–14 mm long, much exceeding those of *B. lobata*, which are 5–8 mm long. The related *B. spiralis* has velvety hairy stems and bracts 8–10 mm long, but like *B. lobata* has smooth cataphylls and leaf sheaths. The type locality, near Garies, must be an error, and we note that Verdoorn was in the Kubus Valley in the western Richtersveld on July 24 and may not have been near Garies on July 29, only five days later, given the difficulties of travel in Namaqualand in 1937.

Additional collections of *Babiana lobata* have come to hand in the past 20 years and it now appears to be relatively common in the Richtersveld. The hairless habit, short floral bracts, and more or less divaricate branching suggest that the closest ally of *B. lobata* is *B. tritonioides* (No. 49), centred in the Komaggas area of northwestern Namaqualand. That species has short, relatively broad leaves, the blades borne at right angles to the sheaths and twisted or folded back on themselves in concertina fashion and is typically shorter: 100–150 mm high.

Additional specimens examined

NORTHERN CAPE.—2816 (Oranjemund): Richtersveld, east of Helskloof, (–BD), August 1995, G. Williamson & F. Williamson 5684 (NBG). 2817 (Vioolsdrif): Richtersveld National Park, Armanshoek, (–AC), July 1995, G. Williamson & F. Williamson 5648 (NBG);

Richtersveld National Park, near Die Koeie, 1500 ft, (–AC); 23 August 2002 (fr.), Goldblatt & Porter 12111 (MO, NBG); stony slopes east of the Stinkfontein Mountains below Cornelsberg, (–CA), 3 August 1994, Goldblatt & Manning 9901 (K, MO, NBG, PRE), 23 August 2001, Goldblatt & Porter 11756 (K, MO, NBG, PRE, WAG).

49. ***Babiana tritonioides*** G.J.Lewis in *Journal of South African Botany*, Suppl. 3: 134 (1959). Type. South Africa, Northern Cape, between Brakwater and Komaggas, 31 July 1953, W.F. Barker 6699 (NBG, holo.).

Plants 100–150(–350 under bushes) mm; cataphylls smooth; stem sharply inclined, simple or with 1 or 2 diverging branches. *Leaves* oblong to lanceolate, blade held nearly at right angles to sheath, scarcely plicate, twisted above and erect, hairless, with slightly thickened veins. *Bracts* 4.0–6.5 mm long, smooth, the inner forked to $\pm$ middle. *Flowers* zygomorphic, 7–10, secund in a horizontal, flexuose spike, blue-mauve, lower lateral tepals yellow, sweetly scented; perianth tube narrowly funnel-shaped, 6–8 mm long; tepals unequal, clawed, the dorsal 23–27 mm long, lower tepals 12–14 mm long, joined to upper laterals for 3–5 mm and to one another for $\pm$ 2 mm, lower laterals with conspicuous auriculate lobes just above limb base. *Stamens* unilateral; filaments 15–17 mm long; anthers $\pm$ 5 mm long. *Ovary* smooth; style dividing opposite middle to upper third of anthers, branches 3–4 mm long. *Flowering time*: late July to early September.

Distribution and ecology: Northern Cape: northern Namaqualand, from the southern Richtersveld to Komaggas; stony granitic slopes (Map 25).

The short bracts, 6–8 mm long, and inclined spike with secund flowers, mark *Babiana tritonioides* as most closely allied to the Richtersveld species, *B. lobata* (No. 48), and the two seem somewhat isolated taxonomically within section *Antholyzoides*. There is, however, no doubt that they belong here, and represent a northern species pair of the section. Since the publication of her monograph of the genus (Lewis 1959), *B. tritonioides* has been collected several times within its recorded range, and it is evidently common in the Komaggas area southwest of Springbok. An apparently outlying population, collected by Rudolf Marloth to the north in the Oograbies (or Ugrabies) Hills of the Richtersveld, northeast of Port Nolloth (Marloth 12668, PRE), remains to be confirmed. The short leaves of *B. tritonioides* with relatively broad blades, 40–60 $\times$ 6–10 mm, held nearly at right angles to the sheaths and twisted or folded back on themselves in concertina fashion, and short stature, usually 100–150 mm high, make the species easy to distinguish from the taller *B. lobata*, which has stems 120–250 mm high, and erect, linear to narrowly sword-shaped leaves, 2.5–4.0 mm wide and only slightly twisted in the upper half.

Additional specimens examined

NORTHERN CAPE.—2917 (Springbok): $\pm$ 7 km north of Komaggas, (–DC), 21 August 2002, Goldblatt & Porter 12095 (K, MO, NBG, PRE); near Komaggas, (–DC), flowers dark blue and greenish yellow, sweet smell, 23 August 1981, Van Berkel 376 (NBG).

Series 2.2. *Antholyzoides*

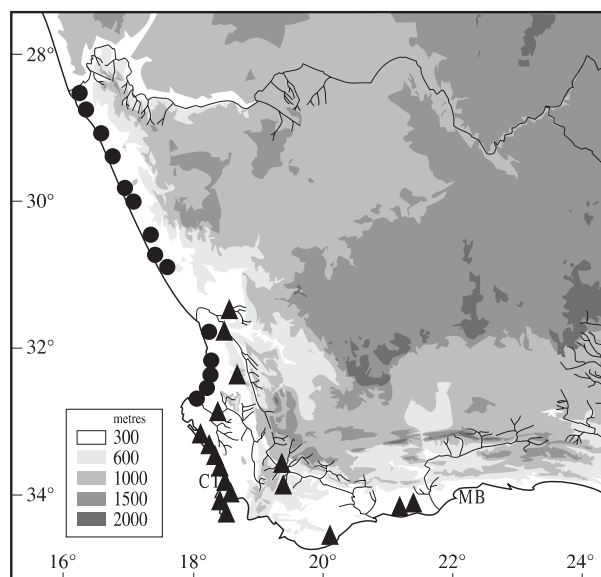
50. *Babiana thunbergii* Ker Gawl. in König & Sims, Annals of Botany 1: 233 (1804), as a new name for *Antholyza plicata* L.f., non *B. plicata* Ker Gawl. (1802a); Goldblatt: 80 (1990a). *Antholyza plicata* L.f.: 96 (1781). *Anaclanthe plicata* (L.f.) N.E.Br.: 269 (1932b). Type: South Africa, [Western Cape], dunes near the coast below Verlorenvlei, October 1774, C.P. Thunberg s.n. (UPS–Herb. Thunberg 1104, holo.).

Anaclanthe namaquensis N.E.Br.: 269 (1932b). *Antholyza namaquensis* (N.E.Br.) Goldblatt: 444 (1971). Type: South Africa, [Northern Cape], dunes near Port Nolloth, September 1883, H. Bolus sub Herb. Norm. Austr. Afr. 669 (BOL, K, syn.).

Plants 400–700 mm high; stem erect, densely hairy, with short, horizontal branches. Leaves lanceolate, stiff, pleated, minutely hairy or scabrid. Bracts smooth or minutely hairy, green with dry brown tips, outer 18–30 mm long, inner shorter than outer, divided to $\pm$ middle, transparent in midline, prominently 2-veined. Flowers zygomorphic, numerous in a crowded, horizontal spike, facing spike apex, bright red, lower tepals yellow marked with green to black at base, unscented; perianth tube narrowly funnel-shaped, 30–40 mm long, expanded in upper half, upcurved away from spike apex; tepals unequal, $\pm$ clawed, dorsal 16–20 mm long, erect, margins curving inward, lower tepals united with upper laterals for $\pm$ 6 mm in a prominent lip, lower and upper laterals $\pm$ 8 mm long. Stamens unilateral; filaments straight, 37–40 mm long, erect, unilateral, enclosed by upper tepal; anthers 5–7 mm long. Ovary smooth; style dividing between base and middle of anthers, branches $\pm$ 4 mm long. Flowering time: mainly July to October. Plate 4C.

Distribution and ecology: Northern and Western Cape: from the mouth of the Orange River southward to Britannia Bay near Saldanha; sandy flats and dunes along the coast or a short distance inland (Map 26).

The attractive, red-flowered *Babiana thunbergii* is a common plant of dunes and raised beaches along the southern African west coast. It is known locally as the *sandlelie* (sand lily). Plants are usually 0.35–0.5 m high but may reach 1 m when growing through low bush. The bright red flowers have the large dorsal tepal $\pm$ erect and channelled, the margins curving together and enclosing the filaments and style. The anthers and style extend beyond the tepal apex, and the upper lateral and lower three tepals are partly united in an extended lower lip. The lower tepal lobes are short and inconspicuous. The flowers resemble those of *Babiana ringens* (No. 51) but are smaller (see Goldblatt 1971). The wide perianth tube contains ample nectar; as much as 30 μ l has been measured in wild populations (Goldblatt *et al.* 1999). The flowers are clearly adapted for sunbird pollination, and both dusky and malachite sunbirds (*Nectarinia fusca* and *N. violacea*) have been recorded visiting them. The unusual flowers, combined with the branched flowering stem, and perianth with the tube bent backward, that is, curved away from the spike apex, prompted Brown (1932b) to recognize this species as belonging to his new genus *Anaclanthe* in which he included *A. plicata* and a second species, *A. namaquensis*, now considered a synonym of *A. plicata* (Goldblatt 1990a). The close



MAP 26.—Distribution of *Babiana thunbergii*, ●; *B. ringens*, ▲.

similarity of the flowers of these two species to those of *Antholyza ringens*, which he also recognized as that genus, seems not to have impressed Brown, although their resemblance was obvious to Baker (1896) who placed them next to one another at the end of his account of *Babiana*. The vegetative similarity of *Anaclanthe* to *Babiana* is striking and, moreover, it matches *Babiana* in its chromosome number and karyotype (Goldblatt 1971).

Records indicate that *Babiana thunbergii* was first collected by Carl Thunberg in 1774, on the Cape west coast near Verlorenvlei (between Elands Bay and Lambert's Bay) (Thunberg 1803) and was described soon after its discovery by Linnaeus the younger in 1781 as *Antholyza plicata*. Its close relationship to *Babiana* was clear to Ker Gawler (1804) who transferred it to *Babiana* soon after he erected the genus. Ker Gawler gave it the replacement name *B. thunbergii*, an action necessary because of the existence of *B. plicata* (now *B. fragrans*), dating from 1803. Sometimes it is so common locally that it makes a good display in late spring. *Babiana thunbergii* extends from the mouth of the Orange River to Britannia Bay in the south. We suspect it will eventually be found further to the north in southwestern Namibia, an area that is closed to plant exploration because of diamond mining. No complete account of *B. thunbergii* exists since *Flora capensis* (Baker 1896) and we therefore list a range of important collections below.

Representative specimens

NORTHERN CAPE.—2816 (Oranjemund): Alexander Bay, Gifkop, (–AC), 25 August 1978, *Le Roux & Ramsey* 202h (NBG). 2916 (Port Nolloth): dunes 10 km east of Port Nolloth, (–BC), 22 August 2001, *Goldblatt & Porter* 11737 (MO). 2917 (Springbok): Kleinzee, (–CA), 1 October 1959, *Fry* s.n. (NBG). 3017 (Hondeklipbaai): sand dunes between Wallekraal and Hondeklipbaai, (–AD), 18 September 1976, *Goldblatt* 4225 (MO); Groenriviermond, dunes north of river mouth, (–DC), 13 September 1978, *Le Roux & Ramsey* 290 (NBG).

WESTERN CAPE.—3217 (Vredenburg): Stompneus Point, (–BB), 4 September 1955, *Taylor* 1516 (NBG). 3218 (Clanwilliam): Lambert's Bay, (–AB), 13 October 1976, *Hugo* 666 (MO, NBG); near Elands

Bay, (–AD), 30 September 1943, *F.M. Leighton 111* (NBG); Velddrif, Rocher Pan Nature Reserve, (–CA), 13 October 1980, *Le Roux & Ramsey 363* (NBG).

51. *Babiana ringens* (L.) Ker Gawl. in J.König & Sims, *Annals of Botany* 1: 233 (1804); Baker: 114 (1896); Goldblatt: 580 (1990a). *Antholyza ringens* L.: 37 (1753); N.E.Brown: 265 (1932b). Type: South Africa, without precise locality or date, illustration in J.Commelin, *Horti medici Amstelodamensis rariorum tam orientalis* 81, plate 41 (1697–1701).

Plants 150–400 mm high; stem branched at ground level, main axis sterile, velvety. *Leaves* linear-lanceolate to almost terete, stiff, pungent, deeply pleated, usually smooth or minutely hairy. *Bracts* 20–50 mm long, green with dry rust-brown tips, smooth or minutely hairy below, inner forked in upper third. *Flowers* zygomorphic, (3–) 6–10 in a decumbent, lateral spike borne close to ground level, red with yellow throat, unscented; perianth tube narrowly funnel-shaped, 30–45 mm long, expanded in upper third, curving upward away from spike apex; tepals unequal, the dorsal longest, 30–50 mm long, channelled below with margins overlapping and enclosing filaments and style, lower tepals $\pm$ 20 mm long, shortly united with upper laterals. *Stamens* unilateral; filaments straight, 35–60 mm long, erect, unilateral; anthers 5–6 mm long. *Ovary* smooth; style dividing opposite upper half of anthers or shortly beyond them, branches $\pm$ 3.5 mm long. *Flowering time*: August to October. Plate 5A.

Distribution and ecology: Northern and Western Cape: from the Bokkeveld Mountains in the north to Albertinia in the southeast; sandy flats and slopes in strandveld and fynbos, 30–500 m, mainly along the coast but also inland at elevations up to 600 m (Map 26).

Originally described as *Antholyza ringens* by Linnaeus (1753), and first referred to *Babiana* by Ker Gawler (1804), the generic placement of this remarkable plant has long been unsettled. It was included in *Babiana* in Baker's *Flora capensis* (1896) account of the genus, but Brown (1932b) transferred it back to *Antholyza*, as the sole member of that genus, where it remained until Goldblatt (1990a) restored it to *Babiana*. The genus *Antholyza* was established by Linnaeus in 1753, who recognized two species, *A. ringens* and *A. cunonia*. The latter, now *Gladiolus cunonius* (L.) Gaertn., was designated the type of *Antholyza* by Hitchcock & Green (1929). Brown disagreed with Hitchcock & Green's action, and maintained *Antholyza*, regarding *A. ringens* as the type and only species. Nevertheless, Hitchcock & Green's lectotypification stands (Goldblatt 1990a, 1996) so that *Antholyza* is effectively a generic synonym of *Gladiolus*.

The placement of *Antholyza ringens* in *Babiana*, is supported not only by the vegetative morphology which is entirely consistent with *Babiana*, but by the chromosome number, $2n = 14$, and the karyotype matching exactly that of *Babiana* (Goldblatt 1971). This taxonomy is confirmed independently by a molecular study using the plastid exon matK. This shows that *Antholyza ringens* is nested in the *Babiana* clade, which receives 100% bootstrap support (Goldblatt *et al.* 2004a). The unusual

flower of *B. ringens*, the source of the generic confusion, is adapted for sunbird pollination. Its specializations, including the red colour, stiff, well-exserted stamens and style, and elongate perianth tube with a wide throat, are recurrent adaptations found in other genera of African Iridaceae that are pollinated by sunbirds (Goldblatt *et al.* 1999). The pollination biology of this plant was known to Brown (1932b) who summarized what was known about this pollination system in some detail, based largely on the original observations of Marloth (1917).

While the generic placement of this species has been controversial, the circumscription of *Babiana ringens* has never been in doubt. The sterile main axis, assumed to act as a perch for visiting sunbirds (Brown 1932b; Goldblatt *et al.* 1999) is perhaps its most remarkable specialization. The flowers closely resemble those of *B. thunbergii* in form and colouring. Although the flowers of *B. thunbergii* are considerably smaller, they also have the large channelled dorsal tepal enclosing the filaments and style, and a lower lip with short lower tepals.

Babiana ringens occurs on deep sandy soils, and although most common along the western coastal belt of Western Cape, it extends along the southern Cape coast as far east as Albertinia, and inland a considerable distance, occurring in the Breede River Valley south of Worcester and on the Bokkeveld Escarpment at Botterkloof Pass, the latter a sight record (Manning & Goldblatt 1997b: 91).

Representative specimens

WESTERN CAPE.—3218 (Clanwilliam) Clanwilliam District, Farm Fisantevlug, (–DC), 11 August 1988, *Steiner 1766* (NBG). 3318 (Cape Town): Darling District, Burgerspost Farm, (–DA), 4 July 1979, *Boucher & Shephard 4411* (NBG). 3319 (Worcester): Worcester Dist., Farm Reiers Rus, (–CB), 30 August 1983, *Snijman 741* (NBG). 3421 (Riversdale): Riversdale–Albertinia road 2 km west of Dekriet, in sand, 170 m, (–AB), 26 July 1979, *Bohnen 6101* (NBG); Victoriasdale south of Riversdale, slopes east of Brandkop, sandy ground in fynbos, 600 ft, (–AC), 6 September 1975, *Oliver 5996* (NBG).

3. SECTION BABIANA

3. Section *Babiana*

Section *Acaste* Salisb. ex Benth. & Hook.f.: 707 (1883). Subgenus *Acaste* (Salisb.) Baker: 166 (1877); Baker: 107 (1896). Type: *Babiana angustifolia* Sweet (lecto., here designated).

Plants with the aerial stem well developed, or acaulescent, usually velvety hairy, sometimes smooth, main axis erect or decumbent, branched or not. *Leaves* usually velvety. *Bracts* often relatively short, usually hairy, green with dry rust-brown tips or entirely dry, inner divided to base (or almost so), each half with prominent central vein unless completely dry. *Flowers* zygomorphic or actinomorphic, dorsal tepal seldom widely separated from other tepals when flower zygomorphic, lower tepals usually united for some distance in a lower lip. *Stamens* symmetrically arranged or unilateral, sometimes dark blue to blackish; anthers oblong-linear or with connective expanded and then anthers arrow-shaped. *Ovary* densely hairy or sometimes smooth.

Species no. 52–88, South African, mainly Western Cape; *Babiana patersoniae* extends into Eastern Cape, *B. mucronata* and *B. unguiculata* north to the Bokkeveld Mountains of Northern Cape, and *B. salteri* into southern Namaqualand.

Babiana section *Babiana*, as circumscribed here, includes Lewis's (1959) section *Acaste* and $\pm$ half the species that she included in section *Babiana*. The remainder, those with inner floral bracts divided apically, are assigned here to section *Teretifoliae*. Typification of section *Acaste* is unsettled; Lewis cited the illegitimate *Acaste venusta* Salisb. (illegitimate because the genus was invalidly published, being without a description) as the type of the genus *Acaste*. *Acaste venusta* is *Babiana rubrocyanea* (Jacq.) Ker Gawl., of which the basionym, *Ixia rubrocyanea*, is based on the same illustration [as *A. venusta*], plate 235 of Jacquin's *Icones plantarum rariorum*. *Acaste* was only legitimately described as a section by Bentham & Hooker (1883), who refer to Salisbury's *Acaste*, noting that it lacked a description, but Bentham & Hooker did not specify the type. Instead they cited several illustrations from Jacquin's *Icones plantarum rariorum* and Curtis's *Botanical Magazine* and one from Redouté's *Les Liliacées*. None of those cited is the Jacquin plate in question, plate 235. However, a second species of *Acaste* was also listed by Salisbury, namely *A. pulchra*, also illegitimate. That name is based on plate 637 of Curtis's *Botanical Magazine*, which is the type of *Babiana angustifolia*. This plate is the only common element linking *Acaste* Salisb. and *Babiana* section *Acaste* Salisb. ex Benth. & Hook.f. It seems appropriate to designate this species as the lectotype of *Babiana* section *Acaste*. Currently *B. angustifolia* is included in section *Babiana*, hence section *Acaste* falls into synonymy under that section.

The present taxonomy of section *Babiana* differs radically from that of Lewis (1959). Species with radially symmetric flowers are regarded as derived, and are placed toward the end of the section. In addition, three of the five varieties of *B. stricta* have been recognized as separate species (Goldblatt & Manning 2004); and the section includes three new species.

We have arranged the 37 species of section *Babiana* in five series: series *Patulae* includes species with a smooth (or mostly smooth) ovary; series *Secundae* and *Scariosae* have a smooth ovary and dry floral bracts; series *Mucronatae* comprises species with conventionally zygomorphic flowers with pale anthers and pollen; and series *Babiana* contains species with dark anthers, sometimes arrow-shaped with a broad connective and flowers which are sometimes actinomorphic or inverted.

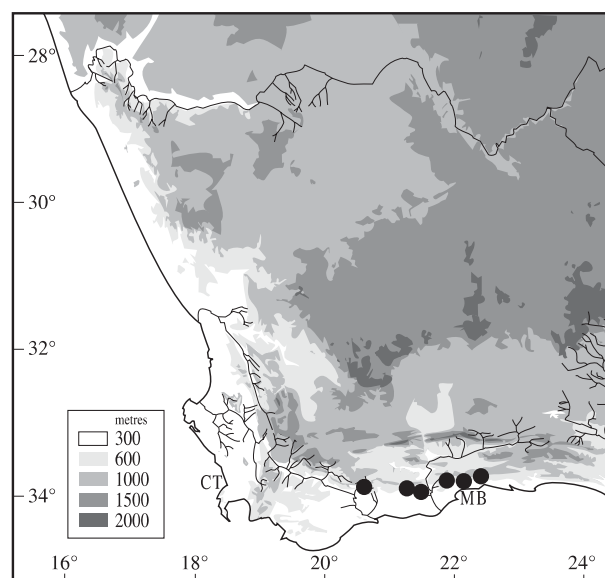
Series 3.1. *Patulae*

52. ***Babiana fourcadei*** G.J.Lewis in *Journal of South African Botany*, Suppl. 3: 92 (1959). Type: South Africa, [Western Cape], hills east of Great Brak River, September 1932, H.G. Fourcade 4765 (BOL, holo.; BOL, iso.).

Plants (70–)150–250 mm high; stem erect, usually with 3–5(–7) short lateral branches, occasionally simple, long-hairy, enclosed below by a hard collar of fibres (occasionally in overgrazed or poor conditions subcaulescent). *Leaves* usually $\pm$ falcate or lanceolate, (5–)9–20(–30) mm wide, slightly pleated, short-hairy, usually crowded basally, reaching to base or middle of spike. *Bracts* 12–20 mm long, green with dry rusty tips, softly hairy, the inner shorter than the outer, divided to base. *Flowers* zygomorphic, (4–)6–10 in a lax or compact spike, pale to deep blue to violet, lower lateral tepals white to pale yellow, edged toward base with small violet marks, intensely sweet-spicy scented; perianth tube narrowly funnel-shaped, 20–30 mm long, abruptly curved outward in upper 6 mm; tepals unequal, the dorsal 25–30 $\times$ $\pm$ 10 mm, flaring gradually from base, lower three tepals joined to upper laterals for 3–5 mm and to one another for $\pm$ 2 mm, lower tepals 18–24 mm long. *Stamens* unilateral; filaments arched, 15–18 mm long; anthers 5–8 mm long, pale mauve. *Ovary* smooth; style usually dividing opposite upper third of anthers, rarely slightly beyond tips, branches 4–5 mm long, abruptly expanded apically. *Flowering time*: September to mid-October.

Distribution and ecology: Western Cape: between Swellendam and George in the southern Cape; lower mountain slopes and coastal hills (Map 27).

Although this species was first collected by the British explorer-naturalist William Burchell in the early 19th century, the taxonomy of *Babiana* remained so poorly understood that *B. fourcadei* was not recognized until 1959, when it was described by Lewis. The species is relatively common on lower mountain slopes in the southern Cape, and Lewis reported its range as extending from Garcia's Pass in the west to the Outeniqua Mountains near George. A record from the Oudtshoorn District, Taylor s.n. (BOL), is most likely from the interior Outeniqua Mountains closer to George than to Oudtshoorn. A recent collection, Goldblatt & Porter 12204, from the Langeberg foothills between Suurbraak



MAP 27.—Distribution of *Babiana fourcadei*.

and Buffeljagsrivier, a short distance from Swellendam, represents a range extension of some 80 km for the species. Plants at that site were growing on heavy clayey loam, a soil type on which the species has previously not been recorded. The population consisted of plants with perianth tubes among the longest recorded in the species: 28–30 mm.

Babiana fourcadei belongs in the *B. patula*-*B. montana* group (i.e. series *Patulae*) of section *Babiana*, which is distinguished by a well-developed aerial stem (sometimes subacaulescent), smooth ovary, and distinctive outer bracts which are dark rust-brown at the tips and rather irregularly lobed or torn. Among the species of series *Patulae*, *B. fourcadei* is readily recognized by the well-developed and repeatedly branched stem, and fairly large pale blue to violet flowers with a perianth tube 20–25(–30) mm long, dorsal tepal 25–30 mm long, and the completely smooth ovary. *Babiana patula* (No. 53), is often confused with *B. fourcadei* but always has a shorter, $\pm$ decumbent stem, and is therefore seldom higher than 100 mm, and the ovary in most populations is minutely hairy on the ribs (we have not seen any plants with a completely hairless ovary although this is reported in the literature). The perianth of *B. patula* ranges from either pale blue to mauve, purple, or pale yellow to white, typically with large yellow or cream-coloured markings on the lower lateral tepals. The flowers are slightly smaller, the tube 10–14 mm long, the dorsal tepal mostly 20–25 mm long, and the bracts acute and often only pale rust-brown.

Additional specimens

WESTERN CAPE.—3419 (Bredasdorp): $\pm$ 10 km from Suurbraak on road to Swellendam, (–BA), 11 September 2002, Goldblatt & Porter 12204 (MO, NBG, PRE).

53. *Babiana patula* N.E.Br. in The Gardener's Chronicle 92: 466 (1932a); G.J.Lewis: 62 (1959). Type: South Africa, [Western Cape], near Riversdale, 30 August 1932, J. Muir 4852 (K, holo.).

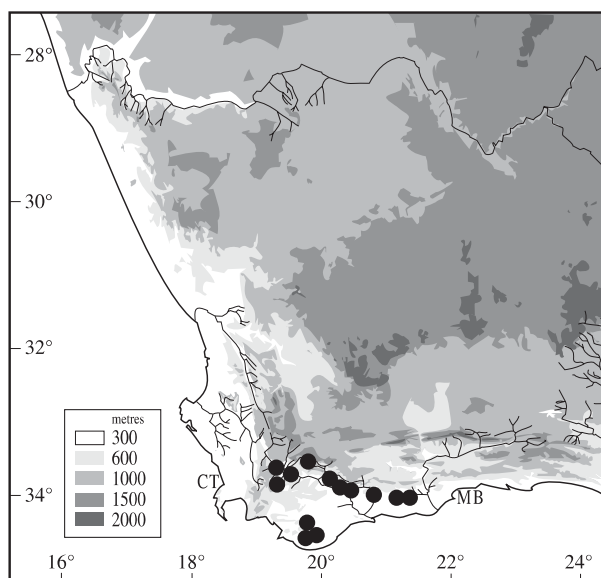
Plants mostly 60–100 mm high; stem usually reaching shortly above ground level, occasionally up to 150 mm high and reaching well above ground level, flexed outward above, velvety hairy, simple with up to 4 short, ascending branches. Leaves lanceolate, pleated, usually widely divergent, velvety to pilose. Bracts 10–15(–20) mm long, green with dry, rust-brown apices, hairy, outer truncate to trifid, inner slightly shorter than outer, divided to base. Flowers zygomorphic, 3–9 in a decumbent spike, mauve to blue, occasionally purple, yellow or white, lower laterals and sometimes lower median tepal yellow, tipped with mauve or entirely yellow, intensely fragrant, smelling often of rose or violet; perianth tube narrowly funnel-shaped, 10–14 mm long; tepals unequal, the dorsal mostly 20–25 mm long, lower tepals joined to upper laterals for $\pm$ 2.5 mm and to one another for $\pm$ 2 mm forming a lip, lower tepals 15–25 mm long. Stamens unilateral; filaments arched, 12–14 mm long; anthers $\pm$ 6 mm long. Ovary minutely hairy on ribs (or smooth to the naked eye); style dividing between middle and apex of anthers, branches 3–4 mm long. Flowering time: August and September. Plate 4D.

Distribution and ecology: Western Cape: extending from near Worcester to Albertinia; on clay or stony flats and lower slopes (Map 28).

A species of stony flats or clay slopes, *Babiana patula* is distinguished by the relatively small, strongly fragrant flowers, typically low-growing habit, and often unusually coloured perianth. The flowers may be white to creamy yellow, but are more often violet or pale mauve to purple, with the lower lateral tepals deep yellow and tipped with purple or mauve. The affinities of *B. patula* seem to lie with the southern Cape *B. fourcadei* (No. 52), a taller plant with blue to violet flowers marked with white, a longer perianth tube, 20–30 mm long, often a quite different, spicy, acrid fragrance, and a completely smooth ovary. The ovary of *B. patula*, unusual in section *Babiana* but typical of other members of series *Patulae*, is usually sparsely hairy on the ribs. This character readily separates it from the superficially similar *B. odorata* (No. 69), which also has strongly scented, cream- and yellow-coloured flowers, sometimes flushed with mauve, and is easily confused with *B. patula* until the densely hairy ovary of that species is noted.

Typically a short plant, seldom exceeding 100 mm, *Babiana patula* extends from Kluitjieskraal in the upper Breede River Valley near Wolseley, eastward to Riversdale and Stilbaai, and locally into the Little Karoo near Montagu. Where we have seen it, the species grew on clay soils, sandy loam at the interface of sandstone and clay substrates, or on stony flats. With its intense sweet fragrance and often deeply pigmented perianth, *B. patula* would make an interesting rock garden or container plant.

Babiana patula is easily confused with *Babiana ambigua* (No. 55), a typically acaulescent or short plant of sandy habitats. Flowers of *B. ambigua* are dark blue, rarely mauve, and have white nectar guides. The ovary of *B. ambigua* is, like that of *B. patula*, smooth or sparsely hairy on the ribs, but the outstanding difference is that *B. ambigua* lacks a well-developed neck around the stem



MAP 28.—Distribution of *Babiana patula*.

base, whereas *B. patula* has a thick neck of fibres such as found in most *Babiana* species.

54. ***Babiana montana*** G.J.Lewis in Journal of South African Botany, Suppl. 3: 63 (1959). Type: South Africa, [Western Cape], Kleinrivier Mountains, August, C.L. Zeyher 4003 (BOL, holo.; K, P, SAM, S (2 sheets), Z, not seen, iso.).

Plants 60–100 mm high including leaves, with corm tunics of coarse, matted fibres; stem short, suberect, sometimes with a short lateral branch, hairy, sheathed below by a tough fibrous collar. *Leaves* lanceolate, pleated, hairy. *Bracts* 25–30(–38) mm long, green with dry rust-brown acute tips, densely hairy, the inner $\pm$ 5 mm shorter than outer, divided to base. *Flowers* zygomorphic, 2–5 in a deflexed spike, mauve, lower lateral tepals with yellow median blotch edged below in dark purple; perianth tube narrowly funnel-shaped, 17–20 mm long; tepals unequal, the dorsal 25–35 mm long, lower tepals 22–30 mm long. *Stamens* unilateral; filaments unequal, median longer, 7–10 mm long; anthers 7 mm long. *Ovary* smooth; style dividing opposite upper half of anthers, branches $\pm$ 3 mm long, tips flattened and orbicular. *Flowering time*: June to August.

Distribution and ecology: Western Cape: from Caledon to Bredasdorp; sandstone and limestone slopes (Map 29).

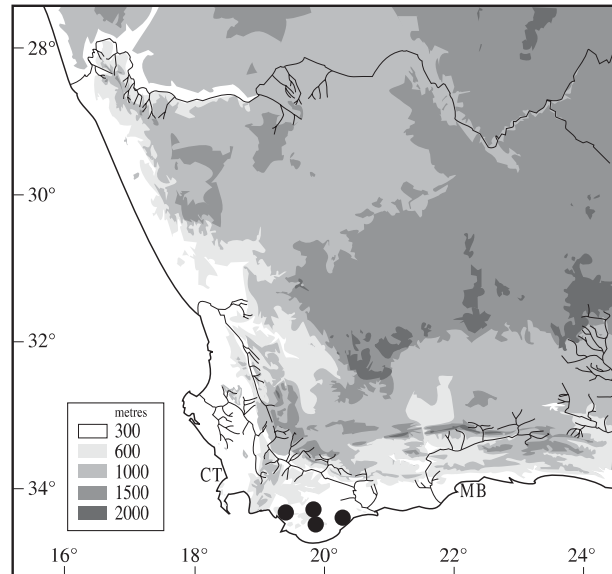
Although only described by Lewis in 1959, the earliest collection of *Babiana montana*, and the type of the species, was made by Carl Zeyher in the early 19th century. The collection remained confused with other species until it came to Lewis's attention. Available collections show that *B. montana* is a montane species of sandstone-derived soils in southern Western Cape.

As Lewis pointed out in the protologue, *Babiana montana* is readily recognized by the coarsely fibrous corm tunics that form a distinctive hard, cylindrical collar around the stem base, flowers with unequal filaments, the median one longer than the other two, and style branches with large orbicular tips. The smooth ovary also stands out in section *Babiana* but this feature is shared with a few other species, including *B. ambigua* (No. 55) and *B. patula* (No. 53). The latter is perhaps most closely allied to *B. montana* although it is readily distinguished by shorter floral bracts, mostly 15–20 mm long, stamens of equal length, and style branches only slightly expanded at the tips. *Babiana montana* can also be distinguished from *B. ambigua* by the thick neck of fibres surrounding the underground part of the stem, a feature lacking in the latter.

Plants from limestone habitats west of Bredasdorp (Albertyn 706, Burgers 2067) have smaller bracts, 12–14 mm long, and smaller flowers, $\pm$ 40 mm long, but the unequal stamens suggest that they are depauperate, perhaps limestone forms of the species.

Additional specimens examined

WESTERN CAPE.—3419 (Caledon): Fairfield, (–BC), 24 June 1960, Lewis 5288 (NBG), 18 August 1998, Goldblatt & Nänni 10254A



MAP 29.—Distribution of *Babiana montana*.

(MO); limestone flats west of Heuningrug, Bredasdorp, (–DB), 3 July 1995, Paterson-Jones 412 (NBG). 3420 (Bredasdorp): De Hoop Nature Reserve, Dronkvlei, white sand over limestone, (–AD), Burgers 2067 (NBG); Kliprug, SE of homestead, sand on limestone downs, (–CA), 8 September 1983, Albertyn 706 (NBG).

55. ***Babiana ambigua*** (Roem. & Schult.) G.J.Lewis in Journal of South African Botany, Suppl. 3: 64 (1959). *Gladiolus ambiguus* Roem. & Schult.: 446 (1817). Type: South Africa, [Western Cape], without precise locality or date, collector unknown (P–Herb. Lamarck, holo.).

Babiana obliqua E. Phillips in The Flowering Plants of South Africa 9: t. 357 (1929); G.J.Lewis: 67 (1959), syn. nov. Type: South Africa, [Western Cape], Lambert's Bay, $\pm$ 20 yards from high water mark, flowered at National Herbarium, Pretoria, July 1929, J.J. van Nouhuys s.n. (PRE8180, holo.; K, iso.).

Plants 50–80(–160) mm high including leaves; stem underground or reaching shortly above ground level and without neck of fibres, suberect or inclined, sparsely hairy; corm tunics netted, often with cormlets in underground axils, sometimes producing underground runners. *Leaves* linear to lanceolate, 3–10(–15) mm wide, longer than stem, usually fairly narrow, pleated, softly hairy. *Bracts* 15–30(–40) mm long, usually entirely green or with brown tips, finely to velvety hairy, the inner $\pm$ as long as or slightly shorter than outer, divided to base. *Flowers* zygomorphic, 2–4 in a crowded spike borne close to ground level, blue to mauve, occasionally lilac, with white to cream-coloured lower lateral tepals edged in darker blue to purple, sweetly or spicy fragrant; perianth tube obliquely funnel-shaped, 10–19 mm long; tepals unequal, the dorsal 28–45 $\times$ 10–12 mm, lower tepals 20–30 mm long, joined to upper laterals for 2–4 mm and to one another for 2–4 mm. *Stamens* unilateral; filaments arched, 13–16 mm long; anthers linear, 6–8 mm long. *Ovary* smooth or sparsely hairy on ribs distally; style dividing opposite anther tips, branches 4–6 mm long, expanded in upper third. *Flowering time*: late July to September, later with increasing altitude.

Distribution and ecology: Western Cape: extending from the Gifberg in the north to Riversdale in the south; deep coastal sands and stony or sandy mountain slopes and plateaus (Map 30).

One of the most widespread of the *Babiana* species of the winter rainfall zone, *B. ambigua* extends from the Gifberg in the north through the mountains and coastal belt of the Western Cape to the southern part of the province near Riversdale. Plants grow in deep coastal sands or on stony sandstone flats and are particularly characteristic of the coastal belt in sandveld and low fynbos. In the Malmesbury District and on Lion's Head in Cape Town, *B. ambigua* grows in coarse, granite-derived sands in renosterveld.

Babiana ambigua is often confused with a second coastal species, *B. nana* (No. 1), and the two sometimes co-occur, *B. nana* flowering later in the season than *B. ambigua*. A series of hybrids between the two species has been described by Lewis (1959) from the Cape Peninsula and on the Atlantic coast to the north. *Babiana nana* has a similar general appearance, but not only are the larger flowers more intensely fragrant and the perianth often a deeper colour, but the inner bracts are undivided, and it is therefore placed in section *Teretifoliae*. Lewis also reported hybrids between *B. ambigua* and the related and similar *B. scabrifolia* from the Olifants River Valley. Another species from coastal Namaqualand that also grows on sandy coastal flats, *B. grandiflora* (No. 7), which has the inner floral bracts notched apically, has often been confused with *B. ambigua*. Not only do the inner bracts differ, however, but the flower is considerably larger, with the dorsal tepal 45–55 mm long, compared with 28–40 mm in *B. ambigua*.

We include the puzzling *Babiana obliqua* in *B. ambigua*. The species was based on a single specimen when it was described by Phillips in 1929, and was hardly better known to Lewis in 1959. *Babiana obliqua* was distinguished largely by the linear-lanceolate leaf

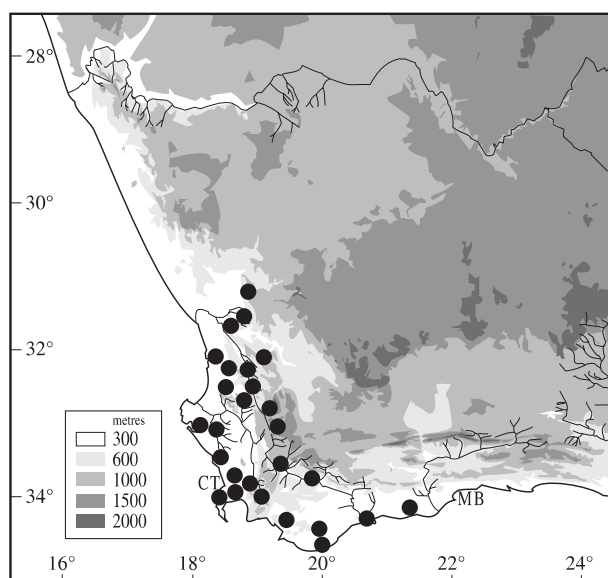
blades, 2–4 mm wide, borne on long, well-differentiated pseudopetioles mostly 20–30 mm long (reported as up to 100 mm by Lewis), the stem bearing retrorse hairs and lacking a neck of fibres surrounding the base. Lewis suggested that this species may be most closely allied to *B. scabrifolia* (No. 66) which is also acaulescent, but has a stem with a fibrous neck, broader, fairly soft-textured leaves, and a sparsely hairy ovary. She also contrasted *B. obliqua* with *B. ambigua*, which like *B. obliqua*, is $\pm$ acaulescent, lacks a neck of fibres around the stem base, and has a smooth ovary. On examination of the type it became clear that the so-called pseudopetioles are actually the upper portions of the leaf sheaths that are no longer clasping because they have become distorted during pressing. In addition, the so-called retrorse hairs of the stem are merely fairly long, lax hairs, no different from the hairs on the stem of *B. ambigua*. The early flowering of the type may be explained by the fact that it was a plant cultivated in Pretoria. This may also explain the rather long leaf sheaths. *Babiana* species in cultivation are typically more robust, and have longer, somewhat etiolated leaves.

56. *Babiana petiolata* Goldblatt & J.C.Manning, sp. nov.

Plantae acaulescentes 80–140 mm, caule superficiem soli attingenti, laevi, simplici vel 1- vel 2-ramoso; foliis lanceolatis ad ensiformibus laeviter plicatis, saepe pseudopetiole tereti 5–40 mm longo; bracteis 15–20 mm longis, laevibus, bractea exteriori supra carinata, obtusa, marginibus dilute brunneis, bractea interiori ad basin divisa; floribus zygomorphis, 4–6 in spicam inclinatam dispositis, violaceis, tepalis inferioribus notis dilute luteis proximaliter rubellis dilute iridiodoris, tubo perianthii oblique infundibuliformi, $\pm$ 11 mm longo; tepalis inaequalibus, tepalo dorsali $\pm$ 30 $\times$ 8 mm, lateralibus superioribus minoribus, tepalis 3 inferioribus partim ad tepalos laterales superiores junctis; filamentis $\pm$ 12 mm longis; antheris $\pm$ 6 mm longis.

TYPE.—Western Cape, south of Lambert's Bay, strandveld above the beach, flowered in Portland, Oregon, USA, May 2004, Goldblatt & Porter 12301a (NBG, holo.).

Plants acaulescent, 80–140 mm high including leaves; stem reaching to ground level, smooth, simple or 1- or 2-branched, lacking collar of fibres around base, with small cormlets at first node above corm. Leaves lanceolate to sword-shaped, shallowly pleated, slightly papillate-scabrid to virtually smooth, often with terete pseudopetiole 5–40 mm long, arching forward and concave with margins facing toward ground and sometimes thickened. Bracts 15–20 mm long, smooth, outer keeled above and sparsely hairy on keel and margins, obtuse, margins pale brown, inner bract slightly shorter than outer, divided to base, keeled, with broad membranous margins, sparsely hairy on keels. Flowers zygomorphic, 4–6 in an inclined spike, violet, lower tepals with pale yellow markings reddish proximally, with faint iris-like scent; perianth tube obliquely funnel-shaped, $\pm$ 11 mm long, lower cylindrical part $\pm$ 7 mm long; tepals



MAP 30.—Distribution of *Babiana ambigua*.

unequal, the dorsal held slightly apart, $\pm 30 \times 8$ mm, upper laterals smaller, lower three tepals joined to upper laterals for ± 5 mm and to one another for ± 3 mm, lower median narrowed below into a channelled claw. *Stamens* unilateral; filaments arcuate, ± 12 mm long; anthers ± 6 mm long, pale violet; pollen cream-coloured. *Ovary* ovoid, smooth, ± 4 mm long; style arching over stamens, dividing opposite anther tips, ± 5 mm long, expanded at apices. *Capsules* and *seeds* unknown. *Flowering time*: mainly July.

Distribution and ecology: Western Cape: between Lambert's Bay and Veldrif; flat sandy ground in strandveld along the coast (Map 31).

A late winter-flowering species, *Babiana petiolata* has until recently been overlooked, probably because little collecting was undertaken along the west coast of Western Cape early in the season. When in fruit, plants are inconspicuous, but we have established that the species is relatively common along the narrow band of strandveld that extends from Veldrif northward to Lambert's Bay.

Babiana petiolata, is so named because the leaf blades are narrowed into a terete, petiole-like base above the sheaths, whereas the remainder of the blades is oblong to lanceolate. The leaves are also distinctive in being inclined toward the ground and the blades are concave, especially when young or on immature plants, which have only one or two leaves versus three or four in mature individuals. The species is most closely related to the widespread *B. ambigua* (No. 55) and is readily confused with this species. Both have the inner floral bracts divided to the base, and smooth ovary, and the underground part of the stem lacks a collar of fibres. *Babiana petiolata* is distinguished from *B. ambigua* by the consistently pseudopetiolate leaves with smooth or sparsely papillate to scabrid blades, smaller flowers with a perianth tube ± 11 mm long, an iris-like scent, and its early flowering time, mainly late June and July. Leaves of *B. ambigua* often appear petiolate, but the narrow base

of the blade is actually the leaf sheath extending upward, and is normally clasping the leaf above; the blades are typically prominently hairy; the larger flowers have a tube 12–19 mm long and they have a spicy scent with undertones of violet. The range of *B. ambigua* extends from Strandfontein north of Lambert's Bay to Riversdale in the southern Western Cape, and although largely coastal, plants extend inland into the Cape mountains. Near Lambert's Bay *B. ambigua* and *B. petiolata* co-occur and then their differences become evident. The spring-flowering *B. ambigua* flowers from August along the coast to September inland. *Babiana obliqua*, now a synonym of *B. ambigua*, described from the same area as *B. petiolata*, is a different plant, although in the protologue the single type specimen was described as having leaves with long petioles. The petioles in this case are merely leaf sheaths with their position distorted during pressing. The large flowers of the type accord well with *B. ambigua* which also grows in this area.

Additional specimens examined

WESTERN CAPE.—3218 (Clanwilliam): south of Lambert's Bay, strandveld above the beach, (–AB), 17 September 2003 (juvenile), Goldblatt & Porter 12301 (MO, NBG); near Elandsbaai along private Spoornet road, (–AD), 11 September 2004 (fr.), Goldblatt & Porter 12403 (MO); between Elandsbaai and Noordkuil, sandy flats near coast, (–AD), 11 September 2004 (fr.), Goldblatt & Porter 12402 (MO).

Series 3.2. *Secundae*

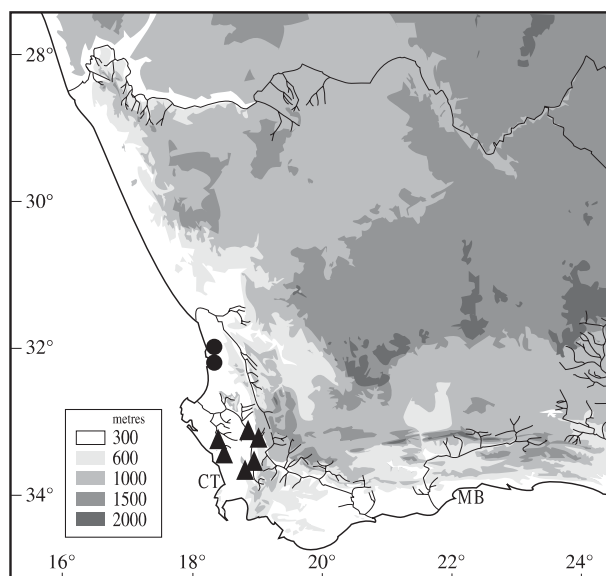
57. *Babiana secunda* (Thunb.) Ker Gawl., *Genera iridearum*: 154 (1827); G.J.Lewis: 57 (1959). *Gladiolus secundus* Thunb.: 186 (1800). Type: South Africa, [Western Cape], without precise locality or date, C.P. Thunberg s.n. (UPS–Herb. Thunberg, holo.; K, drawing).

See Lewis (1959) for complete synonymy.

Plants 150–350 mm high; stem flexed nearly horizontally, often with widely diverging branches, sparsely velvety, at least below. *Leaves* lanceolate, pleated, velvety. *Bracts* 10–13 mm long, initially green but usually completely dry at flowering, smooth, outer tricuspidate with long central awn, inner shorter than outer, divided to base. *Flowers* zygomorphic, numerous, secund in an inclined spike, inverted, with perianth tube recurved, dorsal tepal horizontal, unilateral stamens curved back to lie above dorsal tepal and lower tepals suberect, blue with yellow or white markings on lower lateral tepals; perianth tube narrowly funnel-shaped, 6–8 mm long; tepals unequal, dorsal one largest, 18–20 mm long, lower 14–17 mm long, shortly joined below. *Stamens* unilateral; filaments arching over dorsal tepal, 12–14 mm long; anthers yellow, facing spike apex, ± 6 mm long. *Ovary* smooth; style dividing opposite anther tips. *Flowering time*: mainly October to mid-November.

Distribution and ecology: Western Cape: extending from Porterville to Darling and Paarl; clay flats and lower slopes in renosterveld (Map 31).

Babiana secunda is one of a handful of species of *Babiana* with so-called inverted flowers, that is, with the



MAP 31.—Distribution of *Babiana petiolata*, ●; *B. secunda*, ▲.

spike inclined and the flowers facing upward, and the dorsal tepal and the unilateral stamens facing the spike apex. It can be distinguished by the smooth, dry, often torn bracts, the outer one tricuspidate with a long central awn, smooth and hairless, the latter unusual for section *Babiana*. *Babiana secunda* flowers unusually late in the season, usually in October or November, another feature separating the species from others of the section. In the other species with inverted flowers, *B. angustifolia* (No. 76), *B. inclinata* (No. 77), and *B. rubrocyanea* (No. 78), the ovary is densely hairy, the bracts remain partly green at flowering, are usually velvety, and lack a pronounced awn, although they do tend to be tricuspidate. The anthers and pollen are white or pale to deep blue or violet in *B. angustifolia* and *B. inclinata*, whereas the anthers and pollen of *B. secunda* are yellow.

Lewis (1959) did not associate *Babiana secunda* with *B. angustifolia* (which she called *B. pulchra*) despite their shared unusual orientation of the flowers in relation to the spike axis. Influenced by the dark stamens and subequal, cupped tepals of that species, she considered *B. angustifolia* most closely related to *B. stricta* (No. 84) and hence included it in her section *Acaste*, whereas she referred *B. secunda* to section *Babiana*, without commenting on its possible relationships. We are likewise uncertain of its position within section *Babiana* and provisionally place it alone in series *Secundae*.

Series 3.3. *Mucronatae*

58. ***Babiana mucronata*** (Jacq.) Ker Gawl. in König & Sims, *Annals of Botany* 1: 234 (1804); G.J.Lewis: 58 (1959). *Gladiolus mucronatus* Jacq.: t. 253 (1794). Type: South Africa, without precise locality or collector, illustration in Jacq., *Icones plantarum rariorum* 2: t. 253 (1794).

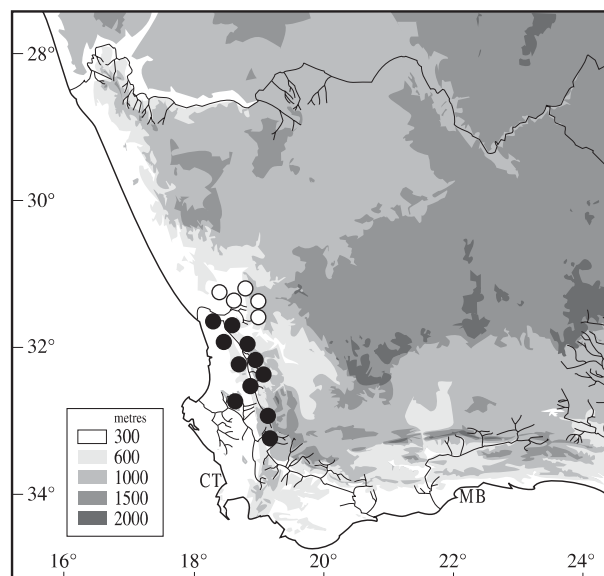
See additional synonymy under the subspecies.

Plants 50–180 mm high; stem suberect or flexed outward, simple or with 2 or 3 branches, velvety hairy, enclosed below by thick fibrous collar. Leaves sword-shaped to broadly lanceolate, 7–15(–20) mm wide, usually reaching to $\pm$ middle or top of spike, exceeding stem in dwarf plants, pleated, short-hairy with margins velvety and sometimes prominent. Bracts (11–)15–25 mm long, green with dry and rust-brown tips, the outer obtuse to truncate or tridentate, inner $\pm$ half as long as to only slightly shorter than outer, divided to base. Flowers zygomorphic, (3–)6–12 in a compact, suberect spike, pale to dark blue-violet, lower lateral tepals with white to cream-coloured or pale yellow with violet edges, usually acrid-scented, occasionally evidently odourless; perianth tube narrowly funnel-shaped, (10–)12–18(–25) mm long; tepals unequal, the dorsal 25–35 mm long, the lower joined to upper laterals for 3–5 mm and to one another for $\pm$ 2.5 mm, forming a prominent lip, lower tepals 15–18 mm long. Stamens unilateral; filaments arched, 13–16 mm long; anthers 5–7 mm long, violet or pale turquoise. Ovary densely hairy; style dividing between middle and apex of anthers, branches 3–4 mm long. Flowering time: late July to September. Plate 4E.

Distribution and ecology: Northern and Western Cape: extending from the Bokkeveld Mountains in the north to Tulbagh in the south; rocky sandstone or stony clay slopes and flats, and rock outcrops (Map 32).

One of the more common species of the interior valleys and lower mountain slopes of the western half of Western Cape, *Babiana mucronata* is recognized among those species of section *Babiana* with a densely hairy ovary, by the pale to deep violet flowers with white to pale yellow blotches on the lower lateral tepals. The anthers are pale yellow to lilac and the flowers usually have an acrid to metallic odour, though sometimes plants are apparently odourless. Most other blue-flowered species of section *Babiana* from this area are $\pm$ acaulescent, have leaves taller than the stem, and a smooth or sparsely hairy ovary, except for the relatively tall *B. lineolata* (No. 59), which favours wet, sandy ground and is easily separated by the rigid, narrow, deeply pleated leaves and short floral bracts, mostly 7–10 mm long.

Babiana mucronata is typically a fairly tall plant with a branched, aerial stem, and lightly pleated, softly hairy leaves. In the north of its range, however, on the Gifberg plateau and Bokkeveld Escarpment, plants are consistently dwarfed with a stem extending only a short distance above the ground. The latter variant, known to Lewis from only one collection from the Gifberg, she named *B. mucronata* var. *minor*. It is also distinctive in having flowers with a perianth tube $\pm$ 12 mm long, whereas the taller southern populations have a tube 15–25 mm long. Additional collections from the Gifberg, and from the Bokkeveld and Stinkfontein Mountains to the east, all conform to this phenotype. We recognize this taxon here as subsp. *minor*, for it is both geographically and morphologically distinct from subsp. *mucronata*. Plants from Elandskloof described as var. *longituba* seem to us no more than a slightly longer-tubed form of typical *B. mucronata*, less distinctive than var. *minor*, and we here include var. *longituba* in subsp. *mucronata*. Longer-tubed populations of subsp. *mucronata* occur in a



MAP 32.—Distribution of *Babiana mucronata* subsp. *mucronata*, ●; *B. mucronata* subsp. *minor*, ○.

seemingly random pattern across the range of the taxon, e.g. *Goldblatt 12679* (MO), from the central Olifants River Valley.

Key to subspecies

Plants tall, usually 150–350 mm high; spike usually exceeding leaves; perianth tube 15–18(–25) mm long subsp. *mucronata*
Plants dwarf, mostly 50–80 mm high; spike usually overtopped by leaves; perianth tube 10–14 mm long subsp. *minor*

58a. subsp. *mucronata*

B. mucronata var. *longituba* G.J.Lewis in Journal of South African Botany, Suppl. 3: 60 (1959). Type: South Africa, [Western Cape], Elandsbloof, 29 September 1944, W.F. Barker 3090 (NBG, holo.).

Plants with well-developed aerial stem, mostly 150–350 mm high, suberect, usually branched. *Leaves* lanceolate, 7–15(–20) mm wide, usually reaching to $\pm$ middle or top of spike, margins not thickened. *Bracts* 15–25 mm long. *Flowers* violet, lower lateral tepals with white or pale yellow markings edged violet; perianth tube mostly 15–18(–25) mm long; dorsal tepal 25–35 mm long, lower tepals 15–18 mm long, joined to upper laterals for 3–5 mm and to one another for $\pm$ 2.5 mm forming a lip. *Filaments* 13–16 mm long; anthers 5–7 mm long. *Flowering time*: August and September.

Distribution: Western Cape, extending from the Olifants River Mountains and Pakhuis Pass to Tulbagh and Piketberg; rocky sandstone slopes, or on gravelly shale (Map 32).

Unless dwarfed by poor seasonal rains, *Babiana mucronata* subsp. *mucronata* is an erect plant, with an aerial stem at least 100 mm long. It grows in a variety of habitats, and may be found on sandstone outcrops, stony clay slopes, and sometimes on the shale band of the Table Mountain series of the Cape System. We do not recognize Lewis's var. *longituba*, which has an unusually long perianth tube 20–25 mm long. This falls in the upper range for perianth tube length for subsp. *mucronata*.

58b. subsp. *minor* (G.J.Lewis) Goldblatt & J.C. Manning, stat. nov.

B. mucronata var. *minor* G.J.Lewis in Journal of South African Botany, Suppl. 3: 60 (1959). Type: South Africa, [Western Cape], Gifberg Plateau, 21 September 1948, J.H.P. Acocks 14905 (PRE, holo.; K, iso.).

B. klaverensis G.J.Lewis in Journal of South African Botany, Suppl. 3: 72 (1959), syn. nov. Type: South Africa, [Western Cape], Klawer, higher plateau in front of mountains, not rare, flowers mostly eaten or faded, corms often dug out by baboons, alt. 250 m, 1 August 1920, H.K.C. Andreae 505 (PRE, holo.).

Plants 50–100 mm high including leaves; stem reaching up to 40 mm above ground level, suberect or decumbent, simple or 1- or 2-branched, velvety. *Leaves* sword-shaped, firm, slightly to strongly pleated, minutely hairy, margins occasionally slightly raised and prominent. *Bracts* 11–15 mm long. *Flowers* 3–6 in a

compact spike, violet or mauve; perianth tube 10–14 mm long; dorsal tepal 25–30 mm long, lower tepals joined to upper laterals for short distance and to one another for $\pm$ 1.5 mm, lower 20–25 mm long. *Filaments* $\pm$ 13 mm long; anthers $\pm$ 6 mm long. *Flowering time*: mid-July to mid-September.

Distribution and ecology: Northern and Western Cape: Bokkeveld and Gifberg-Matsikamma Mountains; rocky slopes and sandstone pavement (Map 32).

The plant that Lewis (1959) called *Babiana mucronata* var. *minor* was known to her from a single collection from the Gifberg. This fairly distinctive taxon, however, has a somewhat wider range. It has now been recorded repeatedly on the Gifberg slopes and plateau as well as the Bokkeveld and Stinkfontein Mountains to the north and east. Plants are consistently short in stature and have slightly smaller flowers. The modest morphological differences combined with a separate geographic range suggest to us that subspecies rank is more appropriate for these northern populations than Lewis's varietal rank. Apart from their low stature, plants have flowers with a slightly shorter perianth tube $\pm$ 12 mm long, dorsal tepal $\pm$ 25 mm long, and the lower and upper lateral tepals are joined for up to 2.5 mm into a lip. In contrast, subsp. *mucronata* has a perianth tube 15–25 mm long, dorsal tepal 25–35 mm long, and lower tepals joined for 5–7 mm. Associated with the short perianth tube, subsp. *minor* has floral bracts 11–15 mm long.

We include *Babiana klaverensis* here in subsp. *minor*. This plant was distinguished by Lewis (1959) by a nearly acaulescent habit and narrow leaves with slightly thickened margins, but it otherwise matches *B. mucronata* subsp. *minor*, which typically has a perianth tube 11–12 mm long, versus $\pm$ 11 mm long (not 10 mm as reported by Lewis) in *B. klaverensis*. A few specimens apparently belonging to subsp. *minor* also have margins slightly thickened, e.g. *Goldblatt & Porter 11798*, MO, from Koebe Valley, and *Saunders s.n.*, NBG, from the Bokkeveld Escarpment south of Nieuwoudtville. Although *B. klaverensis* was reported to grow on sandy mountain slopes and to flower early in the season, June and July (Lewis 1959), the type and only collection reliably referred to the species was actually collected on 1 August in late flower. We conclude that this plant is no more than a particularly dwarfed plant (or population) of *B. mucronata* var. *minor*.

Additional specimens examined

NORTHERN CAPE.—3119 (Calvinia): Nieuwoudtville Escarpment, Farm Papkuilsfontein, in sandstone outcrops, (–CA), 5 September 1995, *Goldblatt & Manning 10285* (MO, NBG); Moedverloor road, $\pm$ 20 km from Doornbos, (–DC), 4 September 2004, *Goldblatt & Manning 12385* (MO, NBG, PRE); Moedverloor road, (–DC), Sept. 1999, *Saunders s.n.* (NBG).

WESTERN CAPE.—3118 (Vanrhynsdorp): Gifberg Pass, below Koorlandshoek, 12 July 1974, (–DB), *Thompson 2042* (NBG); top of Gifberg Pass, (–DB), 3 September 1985, *Snijman 890* (NBG). 3119 (Calvinia): Koebe Valley, renosterveld on clay flats, (–DA), 1 September 2001, *Goldblatt & Porter 11798* (MO).

59. ***Babiana lineolata* Klatt** in *Abhandlungen der Naturforschenden Gesellschaft zu Halle* 15: 347 (Ergänzungen 13) (1882); G.J. Lewis: 51 (1959). Type: South Africa, [Western Cape], Olifants River Valley near Brakfontein, without date, C.F. Ecklon & C.L. Zeyher 76.9 (Irid. 132) (B, holo.; P (2 sheets), Z, not seen, iso.).

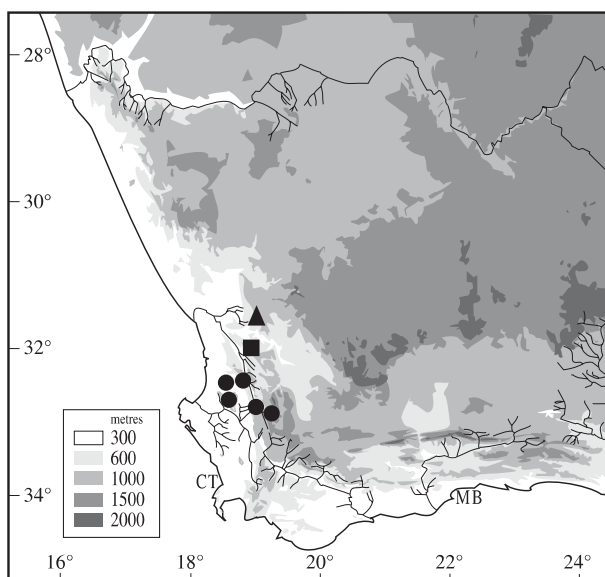
B. parviflora Brehm ex Klatt: 350 (1882). Type: South Africa, [Western Cape], without precise locality or date, J.F. Drège 1825 (B 'Herb. Lubeck', holo., not seen and apparently destroyed; P, S, iso.).

See Lewis (1959) for additional synonymy.

Plants 130–250 mm high; stem erect, often with several short lateral branches, velvety hairy. *Leaves* sword-shaped, 2–6(–10) mm wide, rigid, deeply plicate, finely hairy. *Bracts* 7–14 mm long, green with rust-brown attenuate tips, softly hairy, the inner $\pm$ two-thirds to nearly as long as outer, divided to base. *Flowers* zygomorphic, 4–12, secund in a compact, erect spike, pale blue, lower lateral tepals white to pale yellow tipped with blue, odourless; perianth tube narrowly funnel-shaped, 10–16 mm long; tepals unequal, tapering below, the dorsal 18–24 mm long, lower tepals joined to upper laterals for 3–4 mm and to one another for $\pm$ 2 mm, lower tepals 14–20 mm long. *Stamens* unilateral; filaments arched, 12–17 mm long; anthers 4.5–6.0 mm long. *Ovary* densely hairy; style dividing opposite middle of anthers, branches 3–4 mm long. *Flowering time*: September and early October.

Distribution and ecology: Western Cape: from the Cold Bokkeveld and southern Olifants River Valley to the Piketberg; mainly seasonally wet, sandy flats (Map 33).

The distinctive *Babiana lineolata* can be recognized by the rigid, narrow, suberect, deeply plicate leaves, short bracts and zygomorphic, markedly bilabiate flower with the dorsal tepal erect and the lower tepals united below to form a prominent lip. Plants typically grow in dense colonies in damp, sandy sites where the pale blue-mauve flowers make a display unusual for the genus.



MAP 33.—Distribution of *Babiana lineolata*, ●; *B. engysiphon*, ▲, *B. auriculata*, ■.

Lewis's (1959: opposite p. 55) illustration in her account of *Babiana*, faithfully shows the stiff, narrow leaves, much-branched stem, and particularly short floral bracts. The fairly short-tubed flowers are adapted for pollination by anthophorine bees and *Apis mellifera* workers, which visit the flowers for their nectar.

Babiana lineolata is probably most closely related to *B. mucronata* (No. 58) and it is easily confused with this species. The paler coloured flowers with a perianth tube 8–15 mm long (8–10 according to Lewis) and bracts 7–12 mm long, easily separate it from the tall subspecies of *B. mucronata* which has a tube 15–25 mm long, bracts 15–25 mm long, and broader, more softly textured leaves 7–15(–20) mm wide. The shorter *B. mucronata* subsp. *minor* is not likely to be confused with *B. lineolata*.

Nordenstam (1970) suggested that *B. parviflora*, published at the same time and place as *B. lineolata*, be regarded as a synonym of that species. We concur and formally include it in the synonymy above.

60. ***Babiana engysiphon* J.C.Manning & Goldblatt**, sp. nov.

Plantae cum foliis 60–100 mm altae, caule brevi inclinato simplici vel 1(2)-ramoso velutino; foliis sublinearibus ad anguste ensiformibus; bracteis viridibus apicibus brunneis, bractea exterior 15–25 mm longa interiore usque ad basem divisa; floribus in spica compacta horizontali (2–)4–8 floribus zygomorphis atroviolaceis inodoratis, tepalis lateralibus inferioribus maculo albo ad flavo; tubo perianthii elongato (30–)35–40 mm longo cylindrico; tepalis inaequalibus dorsalibus grandioribus 22–27 $\times$ 7–8 mm; filamentis 10–12 mm longis, antheris 5–6 mm longis; ovario villosa.

TYPE.—Northern Cape, 3119 (Calvinia): Moedverloor road, $\pm$ 28 km from Doornbos, (–CA), 4 September 2004, P. Goldblatt & J.C. Manning 12388 (NBG, holo.; K, MO, PRE, iso.).

Plants up to 60–100 mm high including leaves; stem reaching shortly above ground level, inflexed at ground level and inclined, simple or 1(2)-branched, velvety. *Leaves* mostly 5–7, sublinear to narrowly sword-shaped, 3–4 mm wide, widest in upper third, shallowly plicate to almost flat, minutely velvety. *Bracts* green, with pale brown attenuate tips, velvety to sparsely hairy, outer 15–25 mm long, slightly keeled, inner $\pm$ two-thirds to almost as long as outer; margins membranous, divided to base or almost so, or joined in lower third by transparent membranous tissue. *Flowers* zygomorphic, (2–)4–8 in a compact, horizontal spike, dark violet, lower lateral tepals with broad white to pale yellow blotch near base, odourless; perianth tube elongate, (30–)35–40 mm long, gently upcurving, cylindrical, slightly expanded at apex; tepals unequal, the dorsal largest, 22–27 $\times$ 7–8 mm, recurved in upper half, lower three tepals joined to upper laterals for 4–5 mm and to one another for $\pm$ 2 mm in a prominent lip, 15–16 $\times$ 6 mm. *Stamens* unilateral; filaments 10–12 mm long, well exerted; anthers 5–6 mm long. *Ovary* softly hairy; style dividing opposite anther tips, branches $\pm$ 3 mm long, filiform throughout. *Flowering time*: late August and September. Figure 10, Plate 4G.



FIGURE 10.—*Babiana engysiphon*, Goldblatt & Manning 11172 (NBG). A, whole plant; B, front view of flower; C, flower lvs; D, outer (left) and inner (right) floral bracts. Scale bar: 10 mm. Artist: John Manning.

Distribution and ecology: Northern Cape: Stinkfontein and southern Bokkeveld Mountains near Moedverloor; sandy and stony sandstone ground (Map 33).

A dwarf plant, seldom reaching more than 100 mm above the ground, *Babiana engysiphon* is recognized by its elongate perianth tube, mostly 35–40 mm long, violet perianth with large white markings on the lower lateral tepals and the horizontal spike. The several leaves, narrow and almost linear to narrowly sword-shaped and

usually slightly pleated or nearly plane and velvety, arch toward the ground and are often close to horizontal.

Babiana engysiphon is a narrow endemic of the sandstone ridges that lie between Botterkloof and the Gifberg-Matsikamma range to the west. Plants favour deeper sandy soils in this rocky country and grow among fynbos shrubs and Restionaceae. They co-occur in some places with *B. mucronata* subsp. *minor* (No. 58b), which has short-tubed, scented flowers adapted for pollination

by anthophorine bees, whereas the scentless flowers of *B. engysiphon* are pollinated by the long-proboscid fly, *Prosoeca peringueyi*. Despite the difference in pollination system, some hybridization between the two is evident. These plants have a tube of intermediate length and pale yellow, rather than white, markings on the lower tepals. *Babiana engysiphon* also co-occurs with *B. rigidifolia* (No. 31), but this more robust, broad-leaved plant grows in a different habitat, with the corms wedged in crevices in sandstone pavement. Although their flowering times overlap, we have seen no hybrids between the two, although both are pollinated by the same long-proboscid fly species.

Additional specimens examined

NORTHERN CAPE.—3119 (Calvinia): Moedverloor road S of Nieuwoudtville, 39 km mark, (–CA), 15 September 2000 (CA), *Indigenous Bulb Society of South Africa* 3 (NBG); ± 45 km south of Nieuwoudtville on road to Moedverloor, escarpment edge in sand, (–CA), 13 September 2004, *Goldblatt & Porter* 12433 (MO, NBG, PRE).

61. *Babiana auriculata* G.J.Lewis in *Journal of South African Botany*, Suppl. 3: 88 (1959). Type: South Africa, [Western Cape], Pakhuis Pass, September 1947, (–BB), G.J. Lewis 1878 (SAM, holo.).

Plants 40–100 mm high; stem often with 1 or 2 short branches, deflexed, long-hairy. *Leaves* lanceolate, 50–80 × 3–5(–10) mm, pleated, with short and long silky hairs, apex shortly cuspidate. *Bracts* 13–25 mm long, green, dry and rusty in upper third, softly hairy, inner slightly shorter than outer, forked for ± two thirds and membranous in lower midline, margins hyaline. *Flowers* zygomorphic, 3–8, secund, in an inclined spike, dorsal tepal and stamens facing spike apex, blue-mauve, lower lateral tepals with pale yellow markings outlined in dark violet; perianth tube funnel-shaped, 15–20 mm long; tepals unequal, the dorsal 20–28 mm long, lower tepals narrowed into claws ± 5 mm long, joined to upper laterals for short distance forming a lip, limbs 10–15 mm long, lower laterals with auriculate lobes at base. *Stamens* unilateral; filaments arched, 15–18 mm long; anthers 4–6 mm long. *Ovary* hairy on ribs; style dividing opposite middle third of anthers, ± 3 mm long. *Flowering time*: September.

Distribution and ecology: Western Cape: Pakhuis Mountains; in shady crevices in sandstone outcrops (Map 33).

When described by Lewis in 1959, *Babiana auriculata* was known from six collections from Pakhuis Pass east of Clanwilliam. Since then a few more gatherings have been made, all from the same general area of the Pakhuis Mountains, where plants grow in damp, shady situations on sandstone outcrops. Although this species appears at first to be a smaller form of *B. mucronata* (No. 58) of section *Babiana*, common in this area of Western Cape, the deflexed stem, lower tepals ± clawed and the limbs with prominent, incurved, auriculate lobes near the base, set the species apart. The inner floral bracts are forked for ± two thirds their length, whereas in *B. mucronata* they are forked to the base. The incompletely separated

inner bracts suggest a possible relationship with section *Teretifolieae*, but the partly hairy ovary is inconsistent with that section, as are the membranous inner bract margins and midline. Apart from their incomplete separation, the inner bracts are otherwise typical of section *Babiana* in their membranous margins and rust-brown tips. The narrow claws of the lower tepals suggest that *B. auriculata* is most closely allied to *B. unguiculata* of section *Babiana* which also has narrowly clawed lower tepals.

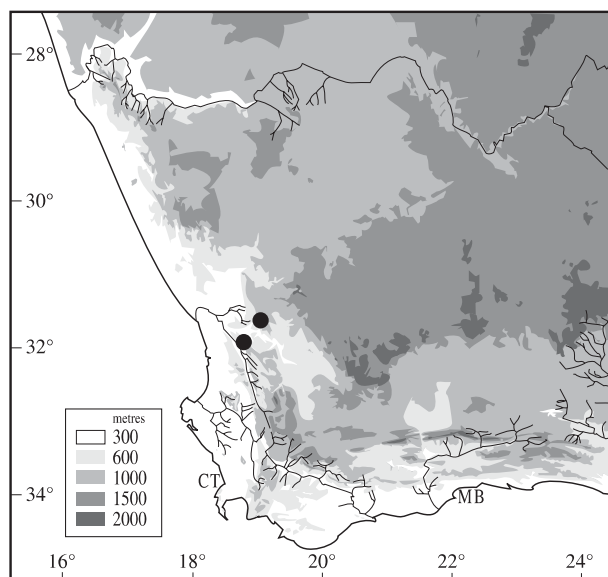
The nearly horizontal spike axis with the flowers facing the stem apex, as in *Freesia* (Goldblatt 1982), is another striking feature of *Babiana auriculata*, and one shared with a few other species of section *Babiana*. The distinctive auriculate lobes at the base of the lower lateral tepal limbs also recall species of the predominantly Namaqualand section *Antholyzoides*, but other features of *B. auriculata*, including the larger, rust-tipped bracts, partly hairy ovary, and long-hairy leaves are unlike any member of that section.

62. *Babiana unguiculata* G.J.Lewis *Journal of South African Botany*, Suppl. 3: 131 (1959). Type: South Africa, [Western Cape], Nardouw Pass, September 1941, T.P. Stokoe 8482 (SAM, holo.; BOL, iso.).

Plants 100–200 mm high; stem erect, sometimes with 1 or 2 short branches in upper third, velvety, enclosed below by a thick collar of fibres. *Leaves* sublinear to sword-shaped, 4–7 mm wide, reaching to ± middle of spike, sometimes slightly twisted, strongly pleated, usually short-hairy (in cultivation hairless except for a line of long hairs along adaxial margin). *Bracts* 7–15 mm long, green, dark brown at tips, softly hairy, inner slightly shorter or longer than outer, forked mostly to base (exceptionally only for half their length but membranous in midline; cf. Lewis 1959). *Flowers* zygomorphic, 4–12 in a crowded suberect spike, pale creamy yellow, lower lateral tepals deep yellow; perianth tube 10–12 mm long; tepals unequal, dorsal ± 25 mm long, arching over stamens, later erect, lower tepals joined to upper laterals for ± 5 mm and to one another for 3–4 mm in a prominent lip, lower laterals with narrow claws ± 2 mm long, abruptly widening into broad limbs ± 15 × 7 mm. *Stamens* unilateral; filaments arched, 12–15 mm long; anthers 5–6 mm long. *Ovary* sparsely hairy, mostly on ribs; style dividing between middle and apex of anthers, branches 3–4 mm long. *Flowering time*: August to mid-September.

Distribution and ecology: Northern and Western Cape: on the Nardouwberg east of Trawal, and on the Bokkeveld-Stinkfontein Mountain complex south of Nieuwoudtville; seeps and locally wet sandstone flats (Map 34).

Placed in *Babiana* section *Antholyzoides* by Lewis (1959), largely because of the supposed recurving of the dorsal tepal in the later stages of anthesis, *B. unguiculata* stood out in the section in having an ovary hairy above or on the ribs, whereas all members of section *Antholyzoides* have a smooth ovary. We have now examined living plants of the species from its two known



MAP 34.—Distribution of *Babiana unguiculata*.

populations and two features stand out, both inconsistent with section *Antholyzoides*. These are the dorsal tepal, which is not recurved but suberect in late anthesis, while the inner bract is forked almost to the base (and basally linked by transparent membranous tissue) and not, as noted by Lewis, forked only in the upper third or half. The re-assignment of *B. unguiculata* renders series *Antholyzoides* largely restricted to Namaqualand proper (i.e. north of Vanrhynsdorp).

The fairly small flowers and the hairy ovary are consistent with section *Babiana*, as is the inner bract divided to the base. In the type collection the narrow leaf blades are tightly pleated, appearing to be ribbed, but plants we examined have softer-textured leaves, only moderately pleated, that are densely short-hairy or have long hairs along the adaxial margins. The general appearance of the flowers and the short floral bracts recall *B. lineolata* (No. 59) and *B. mucronata* (No. 58) and we regard the three species as closely allied. *Babiana lineolata*, which occurs widely in seasonally wet sites in the Cold Bokkeveld, has blue flowers borne on an erect spike, and narrow, fairly rigid, strongly pleated leaves. *Babiana mucronata* is similar, but usually has broader leaves, somewhat longer floral bracts and blue-violet flowers with a perianth tube mostly 12–18 mm long.

Babiana unguiculata remains poorly collected. It is now known from the type locality on the Nardouw Mountains north of Clanwilliam, where its occurrence has been confirmed at or close to the type locality by the indigenous bulb enthusiast, Alan Horstmann (*Horstmann s.n.*, NBG) and ourselves, and from one new collection. This is from the mountains to the north, on the Moedverloor road on the Farm Blomfontein, south of Nieuwoudtville in Northern Cape.

Additional specimens examined

NORTHERN CAPE.—3119 (Calvinia): Farm Blomfontein, Moedverloor road south of Nieuwoudtville, (–CC), 13 September 2004, Goldblatt & Porter 12431 (K, MO, NBG, PRE).

WESTERN CAPE.—3118 (Vanrhynsdorp): farm at the top of Nardouw Pass, (–DC), cultivated in Durbanville, Sept. 2003, Horstmann *s.n.* (NBG).

63. *Babiana toximontana* J.C.Manning & Goldblatt, sp. nov.

Plantae 80–150 mm altae, caule 20–40 mm supra terram breviter extenso horizontaliter inflexo velutino, foliis 6 lanceolatis supra leviter tortuosis 50–100 × 7–18 mm velutinis leviter plicatis, floribus in spicam 5–10(–15)-floram dispositis, zygomorphis pallide vel intense caeruleis tepalis inferioribus latis albis notatis, tubo perianthii infundibuliforme 12–14 mm longo, tepalis inaequalibus dorsale 28–32 × 6–8 mm inferioribus ± 20 mm longis, filamentis ± 15 mm longis, antheris 7 mm longis lilacinis, ovario dense villosa, stylo ad apicem antherarum divergente, ramis ± 4 mm longis ad apicem minute expansis, bracteis exterioribus viridibus apicibus brunneis 14–20(–30) mm longis interioribus ad basem divisis.

TYPE.—Western Cape, 3118 (Vanrhynsdorp): flats below Matsikamma along road near foot of Gifberg Pass, (–DB), 18 July 2005, J.C. Manning, E. Parker, M. Berowsky & R. Smuts 2979 (NBG, holo.; K, MO, iso.).

Plants 80–150 mm high, stem reaching shortly above ground, strongly inflexed and horizontal, branched, velvety. Leaves 6, lanceolate, lightly coiled distally, held at ± 45° to sheaths, 50–100 × 7–18 mm, velvety, lightly pleated. Bracts green with brown tips, velvety, outer obtuse, 14–20(–30) mm long, inner 11–15(–20) mm long, divided to the base. Flowers 5–10(–15), secund in horizontally arching spikes, zygomorphic, pale to deep blue, lower lateral tepals with white median blotches and wine-red streaks, with sweet spicy scent; perianth tube funnel-shaped, narrow part hollow to base, 12–14 mm long; tepals unequal, the dorsal 28–32 × 6–8 mm, upper lateral tepals joined to lower for ± 5 mm, forming a lip, lower tepals ± 20 mm long. Stamens unilateral; filaments ± 15 mm long; anthers 7 mm long, lilac. Ovary densely hairy; style dividing opposite anther tips, style branches ± 4 mm long. Flowering time: late June to mid-July. Figure 11, Plate 3H.

Distribution and ecology: Western Cape: southern foothills of the Matsikamma and Gifberg between Vanrhynsdorp and Klawer, on sandy flats and stony lower slopes in arid fynbos (Map 35).

Babiana toximontana is distinctive in the spreading, velvety leaves, lightly coiled at the tips, typically short, branched stems with horizontally arching, secund spikes, and fairly obtuse bracts, the inner divided to the base. The flowers are moderately sized and pale to deep blue marked with white blotches and red streaks on the lower tepals. It is most closely allied to *B. salteri* (No. 64), which also has oblique, rather spreading leaves and dense, horizontal spikes and also flowers early in the season, in late June and July. *Babiana salteri* (No. 64) has broader, more widely spreading leaves that are firm-textured and never twisted or coiled at the tips, and smaller flowers (tube ± 9 vs 12–14 mm long and dorsal tepal 23 vs 28–30 mm long) with the lower lateral tepals

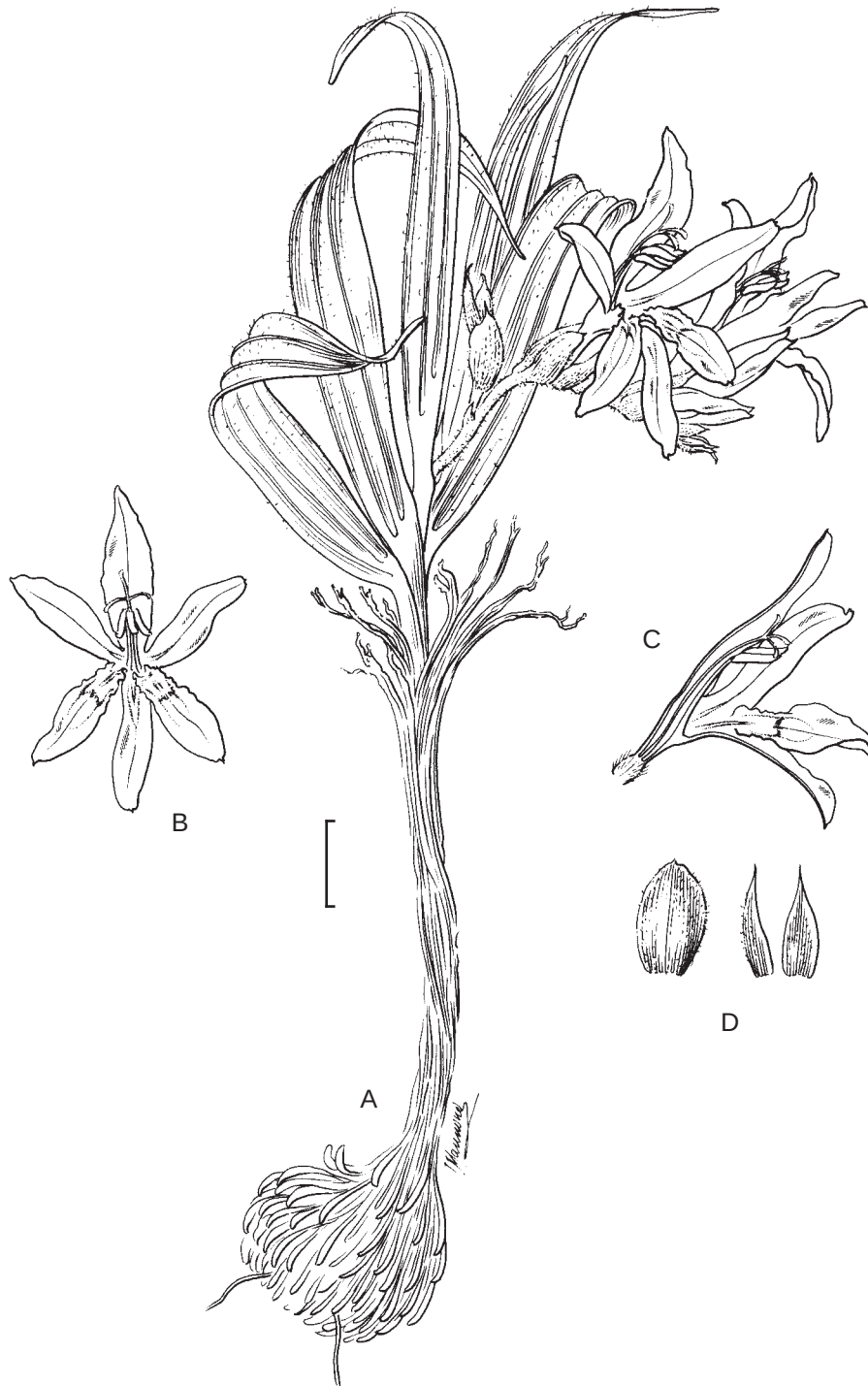


FIGURE 11.—*Babiana toximontana*, Manning 2950 (NBG). A, whole plant; B, front view of flower; C, l/s flower; D, outer (left) and inner (right) floral bracts. Scale bar: 10 mm. Artist: John Manning.

mostly or entirely yellow and the upper lateral tepals narrower and recurved. The two species favour different habitats: *B. salteri* is restricted to quartz patches on clay soils in succulent karoo scrub, and *B. toximontana* favours sandstone-derived soils in arid fynbos. *Babiana salteri* is known for certainty only NE of Vanrhynsdorp, whereas *B. toximontana* occurs in several populations in the foothills and lower slopes of the Gifberg and Matsikamma. First collected by M.F. Thompson in July 1974, *B. toximontana* has until now been confused with *B. salteri*.

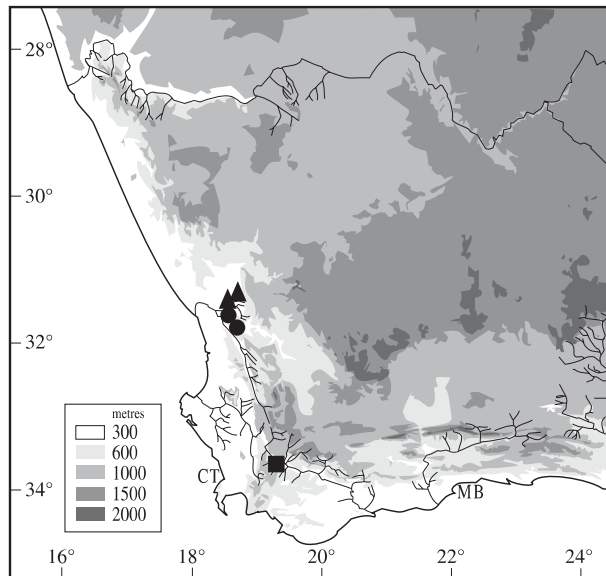
Additional specimens examined

WESTERN CAPE.—3118 (Vanrhynsdorp): Klawer, Farm

Welkom, lower slopes of ridge behind farm, stony sandstone in arid fynbos, (–DC), 14 August 2004 (fruit), F. Forest & J. Manning 540 (NBG); Klawer, Farm Windhoek, sandstone ridge behind farm, (–DA), 25 June 2005, Manning 2950 (NBG); road to Mauwerskop south of Vanrhynsdorp, a third of way to Raskraal, (–DB), sandy clay, 15 July 1974, M.F. Thompson 2106 (NBG); flats west of Matsikammaberg, (–DB), sandy damp ground, 11 July 1974, M.F. Thompson 2106 (NBG).

64. *Babiana salteri* G.J. Lewis in Journal of South African Botany, Suppl. 3: 73 (1959). Type: South Africa, [Western Cape], 16 miles [$\pm$ 24 km] NE of Vanrhynsdorp on the road to Calvinia, 14 June 1938, T.M. Salter 7318 (SAM, holo.).

Plants 70–100 mm high; stem reaching shortly above ground level, usually with 1–3 short branches, short-



MAP 35.—Distribution of *Babiana toximontana*, ●; *B. salteri*, ▲; *B. arenicola*, ■.

hairy above, stem base enclosed with a thick fibrous collar. *Leaves* lanceolate-oblong, held nearly at right angles to sheath and stem, pleated, minutely hairy. *Bracts* 10–13 mm long, green with dry tips, sparsely hairy, inner almost as long as outer, divided to base. *Flowers* zygomorphic, 5–10 in a dense, 2-ranked spike, pale mauve with white to yellow blotches on lower lateral tepals; perianth tube funnel-shaped, ± 9 mm long; tepals unequal, tapering toward base, the dorsal ± 23 mm long, lower three tepals 13–15 mm long, joined to upper laterals for short distance and to one another for ± 2 mm. *Stamens* unilateral; filaments ± 1.3 mm long; anthers ± 7 mm long. *Ovary* densely hairy; style dividing opposite middle of anthers, branches ± 3 mm long. *Flowering time*: June to late July. Plate 3G.

Distribution and ecology: Northern Cape: southern Knersvlakte and lower slopes of the Bokkeveld and Koebe Mountains; dry stony flats and lower mountain slopes (Map 35).

The dwarf *Babiana salteri* was described by Lewis only in 1959 although it was evidently first collected in 1938 by T.M. Salter. Lewis knew it from just a single collection, but since then, *B. salteri* has been collected across a small portion of the southern Knersvlakte and adjacent lower slopes of the Bokkeveld and Koebe Mountains, marking it as a fairly narrow endemic of this area. The species can be recognized by the dwarf habit and leaves with lanceolate to ovate blades held almost at right angles to the erect sheaths. The relatively small, pale mauve flowers with the tepals tapering toward the base, although not distinctly clawed, recall the specialized flowers of the predominantly Namaqualand *Babiana* section *Antholyzoides*, but the green bracts, the inner of which is divided to the base, do not accord with the section, instead placing *B. salteri* in section *Babiana*. The short, horizontally oriented leaves recall those of the Richtersveld endemics, *B. gariensis* (No. 19) and *B. horizontalis* (No. 18), as well as those of the southern Namaqualand *B. lewisiana* (No. 43) but none of these

species has bracts divided to the base, and we assume that this specialized leaf type is convergent. *Babiana salteri* is probably a dwarf relative of the western southern African *B. mucronata*–*B. scabrifolia* complex adapted to particularly arid habitats.

65. ***Babiana arenicola*** Goldblatt & J.C.Manning, sp. nov.

Plantae 60–140 mm altae; caule 20–40 mm supra terram attingenti, leviter pubescenti; foliis anguste ensiformibus usque linearibus, perplicatis, caulem parce excedentibus, 3–6 mm latis, sparsim pubescentibus; bracteis viridibus apicibus brunneis, bractea exteriori 22–30(–45) mm longa, interiori usque ad basem divisa; floribus in spicam 2- ad 6-floram dispositis, zygomorphis, caeruleis, tepalis inferioribus latis, notis albis; tubo perianthii recto, ± 30 mm longo, infra cylindrico; tepalis subaequalibus, superioribus ± 32 mm longis, inferioribus 28–30 $\times$ ± 10 mm; filamentis ± 15 mm longis; antheris 6–7 mm longis, albescentibus; ovario sparsim vel manifeste pubescenti, stylo infra basem antherarum divergenti, ramis 5–6 mm longis ad apicem minute expansis.

TYPE.—South Africa, [Western Cape], 3319 (Worcester): Brandvlei, south of Worcester, half a mile before the hot spring, (–CD), 18 September 1974, A.A. Mauve & I. Oliver 757 (PRE, holo.; MO, NBG, iso.).

Plants 60–140 mm high including leaves; stem reaching 20–40 mm above ground level, sparsely hairy, enclosed below by neck of dark brown fibres; corm globose, 15–20 mm diam. *Leaves* narrowly sword-shaped to linear, mostly 3–6 mm wide, shortly exceeding stem, firm to rigid, deeply pleated and veins thickened, sparsely short-hairy, mainly on veins. *Bracts* green with dry rust-brown tips, almost smooth above, short-hairy to silky hairy below, the outer 22–30(–45) mm long, the inner $\pm$ two-thirds as long, shortly attenuate, divided to base. *Flowers* zygomorphic, in a 2–6-flowered suberect spike, blue with white markings on the lower lateral tepals edged toward throat in dark blue or red, sweetly fragrant; perianth tube straight, cylindrical below, widening gradually in upper third, ± 30 mm long; tepals subequal, upper three ± 32 mm long, the dorsal ± 12 mm wide, upper laterals ± 10 mm wide, lower tepals 28–30 $\times$ 10 mm. *Stamens* unilateral; filaments suberect, ± 15 mm long, exerted ± 8 mm from mouth of tube; anthers linear, 6–7 mm long, white. *Ovary* sparsely to densely short-hairy; style dividing ± 2 mm below base of anthers, branches 5–6 mm long, slender, hardly expanded at tips. *Flowering time*: mid-August to late September. Plate 4F.

Distribution and ecology: Western Cape: local in the vicinity of Brandvlei, between Worcester and Villiersdorp; sand among sandstone rocks (Map 35).

This puzzling species of section *Babiana*, identified as *B. disticha* when first collected in 1962 and 1974, appears to be a local endemic of the sandy lower slopes of the hills surrounding Brandvlei Dam between Worcester and Villiersdorp. At first, the nearly acaulescent habit, with the blue flowers borne close to ground level, combined with a lowland, sandy habitat suggests *B. ambigua*

(No. 55), which is common in such places. *Babiana arenicola* differs markedly, however, from that species in the minutely to prominently hairy ovary, narrow, deeply plicate, stiff leaves 30–60 mm long, the $\pm$ 30 mm long straight perianth tube, the style that divides below or shortly above the base of the anthers into slender branches 5–6 mm long, and even in the appearance of the long, silky bracts. By contrast, *B. ambigua* has firm, but less rigid leaves, 3–10 mm wide, a curved perianth tube, 10–19 mm long, wider in the throat, arched filaments, and the style dividing opposite the anther tips. Like *B. arenicola*, *B. ambigua* has long style branches, 5–6 mm long, expanded at the tips.

We include *Babiana arenicola* in series *Mucronatae* because of the short-hairy, almost bristly ovary, and unspecialized yellow anthers and pollen.

Additional specimens examined

WESTERN CAPE.—3319 (Worcester): Brandvlei, lake edge, (–CB), 1 September 1962, Bayliss 644 (NBG); Draaivlei, Doornrivier, sandy soil, (–CD), 14 August 1982, Walters 2592 (NBG), 1 September 1976, Walters 1505 (NBG); Farm De Grip, swampy ground, (–CD), 2 September 1962, Walters 691 (NBG); lower slopes of the Brandvlei Hills on the road from Worcester to Villiersdorp, (–CD), 6 September 2002, Goldblatt & Porter 12172 (MO).

66. *Babiana scabrifolia* Brehm ex Klatt in *Abhandlungen der Naturforschenden Gesellschaft zu Halle* 15: 349 (Ergänzungen 15) (1882); G.J.Lewis: 68 (1959). Type: South Africa, [Western Cape], Clanwilliam District, Langevallei, July 1830, J.F. Drège 2623 [K, lecto., designated by Lewis, 1959: 68; P, iso. (two sheets)].

B. scabrifolia var. *acuminata* G.J.Lewis: 70 (1959). Type: South Africa, [Western Cape], Olifants River Valley at Bulshoek Barrage, 2 August 1950, G.J. Lewis 2207 (SAM, holo.; SAM, iso.).

B. scabrifolia var. *declinata* G.J.Lewis: 71 (1959). Type: South Africa, [Western Cape], between Brandewyn River and Doorn River, in sand, 25 August 1950, G.J. Lewis 2192 (SAM, holo.).

See Lewis (1959) for complete synonymy.

Plants 50–150 mm high including leaves, with a thick collar of fibres around stem base, $\pm$ acaulescent, often forming tufts, simple or branched at ground level, hairy above ground level. *Leaves* lanceolate to oblong, exceeding stem, 60–100 $\times$ 6–20 mm, usually inclined toward ground, soft-textured and lightly pleated, short-hairy or nearly smooth, narrow and twisted in young plants. *Bracts* 20–32 mm long, green, sparsely hairy, the inner slightly shorter than the outer, divided to base (rarely shortly above base), with wide transparent margins. *Flowers* zygomorphic, 4–8 in a dense, inclined to horizontal spike, mostly pale blue to pale lilac, lower lateral tepals with broad white to cream-coloured splashes in upper half outlined in dark blue to violet, sweetly scented, often of narcissus; perianth tube narrowly funnel-shaped, 12–18 mm long; tepals unequal, dorsal 30–45 $\times$ 7–10 mm, lower tepals 20–30 mm long, joined to upper laterals for up to 4 mm and to one another for $\pm$ 4 mm forming a prominent lip, margins of lower laterals undulate, slightly crisped in lower half. *Stamens*

unilateral; filaments arched, 13–18 mm long; anthers 6–8 mm long; pollen white. *Ovary* thinly hairy above or on ribs, rarely smooth; style dividing between middle and apex of anthers, branches 4–5 mm long, expanded at tips. *Flowering time*: June to August. Plate 5B.

Distribution and ecology: Western Cape: in the Olifants River Valley and lower slopes of the surrounding mountains; stony soils in dry fynbos or karroid scrub (Map 36).

Hardly differing in its flowers from several other species of section *Babiana*, *B. scabrifolia* is most easily recognized by the underground stem, often branched at ground level, and usually forming small tufts. It reproduces amply by cormlets and it is common to see mature flowering plants with their broad, soft-textured leaves surrounded by the linear, twisted to coiled leaves produced by immature corms. The flowers are relatively large, and although overtopped by the leaves, make an attractive sight in the Olifants River Valley and surrounding hills in early spring. The flowers have a pleasing sweet scent and contrast both in the scent and large size from those of *B. mucronata*, which is also common in the Olifants River Valley. That species typically has an erect, usually well-developed aerial stem, whereas the flowers have a densely hairy ovary and produce a rather harsh acrid-spicy odour (sometimes described as flea powder), and does not have young plants with narrow, twisted to coiled immature leaves surrounding the parent plant.

Lewis drew attention to the variability of *Babiana scabrifolia* in leaf shape, size and pubescence. Apparently variant ecological forms were described in the past as the separate species, *B. subglabra* G.J.Lewis and *B. adpressa* G.J.Lewis (Lewis 1959). The variants are often simply individuals growing in more shaded, or wetter, or more exposed sites. We suspect that hybrids between *B. scabrifolia* and *B. mucronata* (No. 58) occur locally, for they are sometimes sympatric and have overlapping flowering times and are both pollinated by anthophorine bees and the native honey bee, *Apis mellifera*.

Despite the variability due to differences in soil, water and shade conditions, Lewis (1959) did recognize two varieties. She distinguished var. *acuminata* based on its lanceolate, acuminate leaves, and var. *declinata* by its second spike, thus with all the flowers in a single row, rather than alternate in two rows. These differences seem trivial to us and we do not recognize either variety.

Babiana scabrifolia is broadly similar in habit to *B. ambigua* (No. 55) and the two occasionally grow fairly close to one another. The latter is most easily distinguished by the absence of a collar of fibres around the underground part of the stem and by the tepals with $\pm$ straight margins that contrast with the undulate to crisped tepal margins of *B. scabrifolia*. Whereas *B. scabrifolia* has a sparsely hairy ovary, sometimes only on the ribs, *B. ambigua* typically has a smooth ovary, occasionally sparsely hairy on the ribs.

67. ***Babiana latifolia*** L.Bolus in South African Gardening 17: 377 (1927). *B. ecklonii* var. *latifolia* (L.Bolus) G.J.Lewis: 105 (1959). Type: South Africa, [Western Cape], foot of the Piketberg, flowered at Kirstenbosch National Botanical Garden, 16 September 1927, *D. van Zijl* s.n. (*Nat.Bot.Gard.*625/1927 in BOL, holo.).

Plants 100–250 mm high; stem inclined, usually with 2–4 branches, densely hairy. *Leaves* lanceolate, up to 20 mm wide, soft and slightly pleated, softly hairy. *Bracts* 15–25 mm long, green with brown tips, densely long-hairy, outer obtuse-acuminate, inner slightly shorter than outer, divided to base. *Flowers* zygomorphic, violet with whitish or pale violet median streaks on lower lateral tepals; perianth tube cylindrical, curved near apex, 30–40 mm long; tepals unequal, the dorsal suberect, 22–26 mm long, lower tepals obtuse to obtuse-apiculate, 17–21 mm long, joined to upper laterals for ± 4 mm, forming a fairly prominent lower lip. *Stamens* unilateral; filaments arcuate, ± 12 mm long; anthers ± 6 mm long, dark blue-black. *Ovary* densely hairy; style dividing opposite upper thirds of anthers, branches ± 4 mm long, tips unusually large and undulate, overtopping anthers. *Flowering time*: August to early September.

Distribution and ecology: Western Cape: along the eastern base and lower slopes of the Piketberg; loamy sandstone-derived soils (Map 36).

Babiana latifolia was described by Louisa Bolus in 1927 from plants cultivated at Kirstenbosch, sent there by Mrs D. van Zijl of Piketberg. At the time she was unaware of the existence of the plant described as *B. ecklonii* (No. 68) in 1882 by Klatt, later mistakenly treated as a synonym of the western Karoo species, *B. spathacea* (No. 72), by Baker. In fact, *B. ecklonii* seems the appropriate species with which to compare *B. latifolia*. It has a similar elongate perianth tube, divided inner bracts and an ovary hairy in the upper half. Lewis (1959) considered the two conspecific, but treated *B. latifolia* as *B. ecklonii* var. *latifolia*, distinguished by

its somewhat smaller flowers and broader and slightly crenate stigma lobes.

After re-collecting this plant a short distance north of Piketberg, we see little justification in regarding these two plants as belonging to the same species, albeit separated at infraspecific rank. *Babiana latifolia* differs from *B. ecklonii*, not only in the nature of the stigma and flower size, but also in the perianth colour, purple with narrow, white, nectar guides on the lower lateral tepals, blue-black anthers, and obtuse-apiculate tepal tips. The perianth of *B. ecklonii* is violet with broad white to pale yellow nectar guides, the anthers are pale violet, and the tepals are narrow and acute. Flowers of *B. latifolia* also have a shorter lower lip, broader, almost obtuse leaves, and obtuse outer floral bracts. In addition, the style divides opposite the anther apices in *B. latifolia* and the style branches are ± 4 mm long with the tips unusually broad and undulate. In *B. ecklonii*, the point of division of the style and length of style branches is variable, in different individuals, dividing variously below the anthers and ± 2 mm long, or opposite the middle or close to the anther apices and up to 4 mm long, but in both cases the style branches are slender, widening gradually toward the tips. The two also differ vegetatively: in *B. latifolia* the leaf and stem pubescence is velvety but in *B. ecklonii* the pubescence is longer and sparser and the erect stem is largely sheathed by the leaf bases, whereas the stem of *B. latifolia* arches outward and is free of the leaf bases for at least half its length.

As predicted from its morphology, flowers of *Babiana latifolia* are pollinated by the long-proboscid fly, *Prosoeca peringueyi*, which we have seen and captured north of the town of Piketberg.

Additional specimens examined

WESTERN CAPE.—3218 (Clanwilliam); ± 10 miles north of Piketberg, (–CC), 1 September 1963, *Loubser 2037* (NBG); ± 13 km north of Piketberg, (–CC), 31 August 2002, *Goldblatt & Porter 12127* (MO, NBG, PRE).

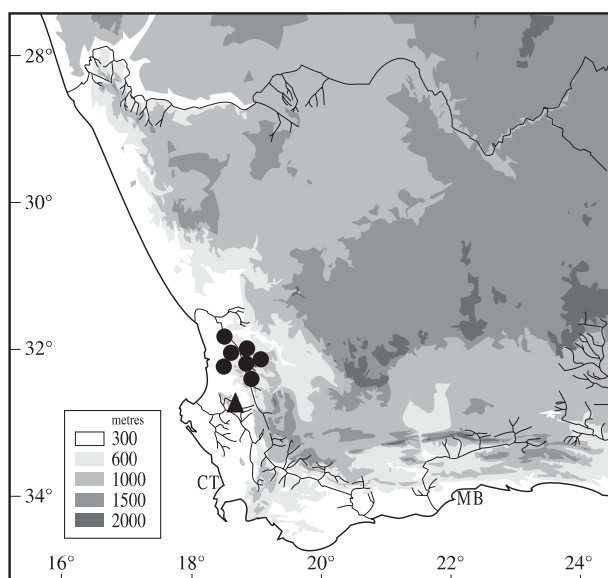
68. ***Babiana ecklonii*** Klatt in *Abhandlungen der Naturforschenden Gesellschaft zu Halle* 15: 348 (*Ergänzungen* 14) (1882); G.J.Lewis: 104 (1959). Type: South Africa, [Western Cape], without precise locality or date, *Ecklon & Zeyher* 133 (G, lecto., designated by Lewis: 105, 1959, not seen).

B. velutina Schltr.: 100 (1899). Type: South Africa, [Western Cape], Gifberg, near Windhoek, 1 August 1897, *R. Schlechter 8364* (BM, K!, MO!, P!, PRE!, Z, syn.).

B. fastigiata L.Bolus: 377 (1927). Type: South Africa, [Western Cape], thought to have come from George, cultivated at Piketberg, August, *D. van Zijl* s.n. (*BOL*17823, holo.).

See Lewis (1959) for complete synonymy.

Plants 100–300 mm high; stem suberect to weakly flexed below spike, well developed and usually 2–4-branched, softly hairy, mostly sheathed by leaves. *Leaves* lanceolate to sword-shaped, usually relatively soft-textured and slightly pleated, somewhat silky hairy. *Bracts* 14–25 mm long, green with attenuate brown tips,



MAP 36.—Distribution of *Babiana scabrifolia*, ●; *B. latifolia*, ▲.

densely hairy, the inner $\pm$ two thirds as long as outer, divided to base. *Flowers* zygomorphic, violet with large cream-coloured to pale yellow mark on lower lateral tepals, unscented; perianth tube cylindrical, 35–47 mm long, usually sharply curved below top, widening and arching outward in upper 6–8 mm; tepals unequal, dorsal suberect, 23–27 mm long, lower three tepals joined to upper laterals for 5–7 mm and often to one another for a short distance, forming a pronounced lower lip, lower three tepals 12–17 mm long, extending horizontally below, arching outward and downward above. *Stamens* unilateral; filaments arcuate, 14–16 mm long, diverging after anther dehiscence; anthers 5–7 mm long, pale blue or violet. *Ovary* hairy above or throughout, rarely hairy only on ribs; style usually dividing opposite middle of anthers, occasionally below anther bases or opposite anther tips, branches $\pm$ 4 mm long (or when style short $\pm$ 2 mm long), stigmatic lobes barely expanded. *Flowering time*: August to September. Plate 5C.

Distribution and ecology: Western Cape: from the Gifberg and Heerenlogementberg in the north to Elands-kloof and Piekenierskloof in the south; mountain slopes and flats in sandstone-derived soils, sometimes in rock crevices, 200–500 m (Map 37).

Described by Klatt in 1882 and based on an early collection of Ecklon & Zeyher, without locality, *Babiana ecklonii* has remained poorly understood. It was regarded as a synonym of *B. spathacea* (No. 72) by Baker (1896), presumably because of the shared elongate perianth tube and long bracts. When a second collection, erroneously thought to have come from George in the southern Cape, but cultivated at Piketberg, came into the hands of Bolus in 1927, she thought it represented a novelty which she named *B. fastigiata*. Lewis (1959) realised that *B. ecklonii* was a distinct species but included what we treat as *B. latifolia* (No. 67) as *B. ecklonii* var. *latifolia*, noting its somewhat smaller flowers, paler colour, broader, slightly crenate stigma lobes, bracts with obtuse tips, and somewhat broader, and more villous leaves. Having re-collected and carefully examined *B. latifolia* at, or close

to the type locality north of Piketberg, we agree with Bolus (1927), who considered it separate from *B. ecklonii* (as *B. fastigiata*) (she described both *B. fastigiata* and *B. latifolia* in the same paper), possibly, but not certainly, closely allied to *B. ecklonii*. We discuss the differences between the two species under *B. latifolia*.

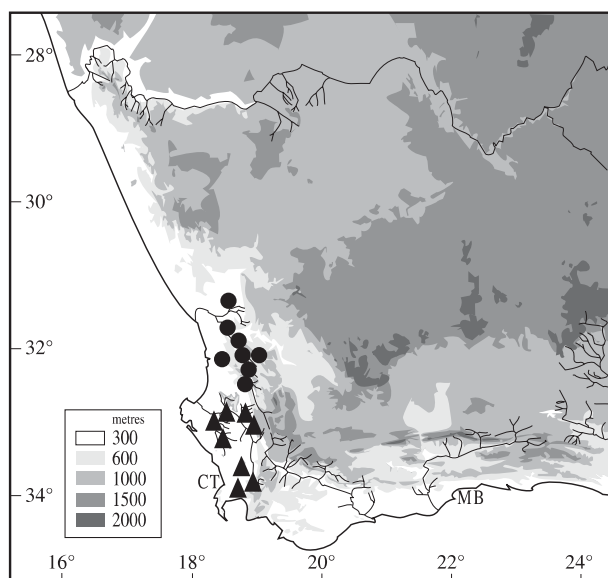
Although typical of section *Babiana* in its branched, aerial stem and inner bracts divided to the base, *B. ecklonii* is remarkable for its tall stature when well grown, stem largely sheathed by the bases of the erect leaves, and particularly for its elongate perianth tube. Another feature unusual in the species is the diverging filaments, which are initially parallel but diverge in the upper half after the anthers dehisce, leaving the anthers widely separated from one another. *B. ecklonii* is one of the few species of section *Babiana* that has flowers with an elongate perianth tube and thus adapted for pollination by *Prosoeca peringueyi* (Manning & Goldblatt 1996a).

Variation across the range of *Babiana ecklonii* is puzzling. It is relatively uniform in the Olifants River Mountains, where it has deep violet flowers with very discrete and prominent white to pale yellow nectar guides on the lower lateral tepals, an erect stem, fairly attenuate floral bracts, and style branches terminating in small stigmatic lobes. At the northern edge of its range, at Klawer and on the Gifberg, plants have narrower, more densely pilose leaves and also flexed and inclined stems (e.g. *Schlechter* 8364, NBG; *Goldblatt & Manning* 10967, MO, NBG). This plant was described as *B. velutina* by Rudolf Schlechter in 1899. Whereas the type form of *B. ecklonii* has the ovary densely hairy above the base, plants from sites west of the Olifants River Mountains may have the ovary hairy only on the ribs (*Leipoldt* 3535, BOL).

A feature of *Babiana ecklonii*, evidently unique in the genus, is variation in style and style branch length within populations. At sites we have examined in the field in the Olifants River Valley and near Algeria in the Cederberg, the style in some plants is short, dividing below the anther bases and with style branches $\pm$ 2 mm long, but in others (as recorded by Lewis for the species) the style divides opposite the middle or upper third of the anthers and the branches are $\pm$ 4 mm long.

69. ***Babiana odorata*** L.Bolus in South African Gardening 22: 243 (1932a); G.J.Lewis: 60 (1959). Type: South Africa, [Western Cape], near Porterville, 4 August 1897, *R. Schlechter* 10725 (BOL, lecto., designated by Lewis, 1959: 61; K, S, iso.).

Plants 50–150 mm high; stem inclined, usually with short lateral branches, velvety. *Leaves* lanceolate, pleated, softly hairy. *Bracts* 15–25 mm long, green with dry rust-brown tips, softly hairy, inner slightly shorter than outer, divided to base. *Flowers* zygomorphic, 3–8 in an inclined spike, usually creamy yellow with broad yellow blotches on lower tepals, sometimes upper tepals flushed pale mauve, highly spicy violet-scented; perianth tube narrowly funnel-shaped, 10–14 mm long; tepals unequal, dorsal largest, 26–34 mm long, lower joined to upper laterals for $\pm$ 3 mm and to each other for 2–3 mm, forming a prominent lip, lower tepals 20–22 mm long.



MAP 37.—Distribution of *Babiana ecklonii*, ●; *B. odorata*, ▲.

Stamens unilateral; filaments arched under dorsal tepal, 14–17 mm long; anthers 5–6 mm long, blue or turquoise. *Ovary* densely hairy; style usually dividing opposite anther apices, style branches 4–5 mm long, expanded apically. *Flowering time*: late July to early September. Plate 5D

Distribution and ecology: Western Cape: extending from Porterville and Piketberg to Tygerberg; mainly gravelly granitic soils, occasionally sandstone, at low elevations in renosterveld (Map 37).

The attractive *Babiana odorata* is a common species of the loamy clay or granitic soils of the Swartland north of Cape Town and is a pleasant sight in fairly disturbed renosterveld in early spring around Malmesbury and Moorreesburg. The flowers may be fairly pale cream-coloured with bright yellow lower tepals, somewhat dull, or rarely flushed pale mauve, but are always intensely fragrant, with a spicy to pleasant violet odour, the scent varying with ambient temperature and age of the flowers, which each last three days. *B. odorata* is most easily confused with the vegetatively similar *B. patula* (No. 53), which occurs in similar habitats to the east, in the Breede River Valley and across the low hills of the southern Cape. Most readily distinguished by the ovary which is smooth or sparsely hairy on the ribs, *B. patula* has dull yellowish or white or more often pale mauve to blue or purple flowers with yellow markings and a particularly powerful fragrance, sometimes very much like that of violet or freesia.

70. *Babiana noctiflora* J.C.Manning & Goldblatt, sp. nov.

Plantae 180–300 mm altae, usitate 2- ad 4-ramosae; foliis lanceolatis; bracteis 12–15 mm longis bractea interiore usque ad basem divisa; spica 4- ad 8-flora; floribus flavo-cremeis violodoris tepalis infernis flavis, tubo perianthii 35–50 mm longo filiformi infra cylindrico, tepalis inaequalibus tepalo dorsale 27–32 mm longo, inferioribus 22–25 mm longis; filamentis 28–30 mm longis; antheris 6–7 mm longis; ovario dense villosa.

TYPE.—Western Cape, 3318 (Cape Town): Slent Farm, SE end of Paardeberg, granite outcrops, (–DB), 28 September 1999, P. Goldblatt 11172 (NBG, holo.; K, MO, NBG, PRE, iso.).

Plants 180–300 mm high; stem usually with 2–4 branches, flexed outward above, velvety to silky hairy. *Leaves* lanceolate, pleated, softly hairy, reaching to $\pm$ middle of spike. *Bracts* 12–15 mm long, green with dry rust-brown tips, silky hairy, inner slightly shorter than outer, divided to base. *Flowers* zygomorphic, 4–8 per spike, creamy yellow, lower lateral tepals deep yellow, violet-scented; perianth tube 35–50 mm long, slender and cylindrical below, with long wide throat, 15–25 mm long; tepals unequal, the dorsal 27–32 mm long, inclined toward ground, lower tepals joined to upper laterals for $\pm$ 5 mm, lower three 22–25 mm long. *Stamens* unilateral; filaments arched, 28–30 mm long; anthers 6–7 mm long. *Ovary* densely hairy; style dividing below or opposite base of anthers, branches $\pm$ 4.5 mm long, expanded at apex. *Flowering time*: late September to mid-October. Figure 12, Plate 5E.

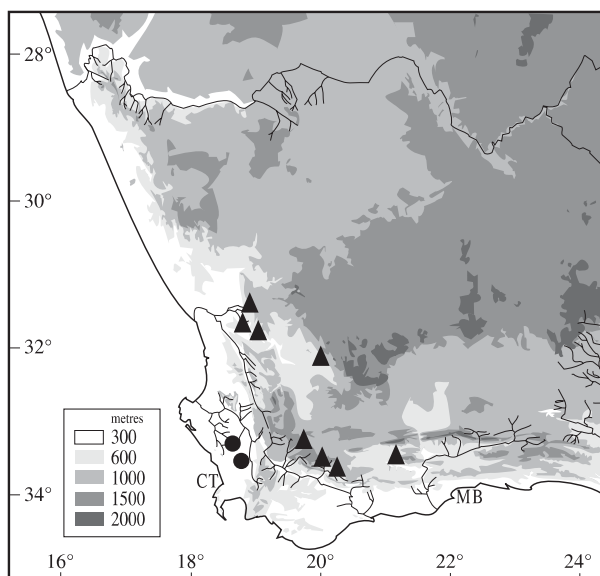
Distribution and ecology: Western Cape: local on the Paardeberg between Malmesbury and Agterpaarl; granite outcrops in fynbos (Map 38).

Specimens of a long-tubed species of *Babiana* from the Paardeberg, north of Cape Town, closely resembling *B. odorata* vegetatively, were first collected in 1932. Unknown to Lewis because the specimen was then housed at the herbarium at the University of Stellenbosch (incorporated with NBG in 1996), this species was rediscovered by ecologists making a plant survey of Slent Farm at the southeastern end of the Paardeberg in 1999. Subsequent visits to the farm confirmed that the species was indeed distinct from *B. odorata* (No. 69), from which it differs largely in the length and shape of the perianth tube, 33–50 mm long, compared with 10–14 mm in *B. odorata*. The late flowering, from mid-September until mid-October, contrasts with the early spring flowering of *B. odorata* which blooms from July to late August. The discovery of an undescribed species of *Babiana* so close to Cape Town, only $\pm$ 40 km away, emphasizes the need for careful botanical surveys before the rich flora of the area is further degraded and destroyed by human activity.

Described here as *Babiana noctiflora*, the species has flowers adapted for pollination by night-flying moths; the flowers are unusual in remaining open and scented all night. The noctuid moth, *Syngrapha circumflexa*, which was the only moth captured while visiting the species (Goldblatt & Manning 2007), is probably not the sole visitor but is likely to be an effective pollinator as it has a proboscis 16–17 mm long.

Additional specimens examined

WESTERN CAPE.—3318 (Cape Town): Malmesbury, sandy ground, (–DB), September 1932, Lötter s.n. (NBG); Malmesbury, Farm Wyngaard, NW end of Paardeberg, (–DB), 15 September 1979, Boucher 4719 (NBG); Slent Farm, SE end of Paardeberg, (–DB), 3 September 1999, Spriggs sub Low 4823 (NBG).



MAP 38.—Distribution of *Babiana noctiflora*, ●; *B. scariosa*, ▲.



FIGURE 12.—*Babiana noctiflora*, Goldblatt 11172 (NBG). A, whole plant, with spike and corm separated from leafy stem; B, front view of flower; C, flower l/s. Scale bar: 10 mm. Artist: John Manning.

Series 3.4. *Scariosae*

Section *Scariosae* G.J.Lewis in Journal of South African Botany, Suppl. 3: 122 (1959). Type: *B. spathacea* (L.f.) Ker Gawl.

71. ***Babiana scariosa*** G.J.Lewis in Journal of South African Botany, Suppl. 3: 122 (1959). Type: South Africa, [Northern Cape], between Oorlogskloof and Papkuilsfontein, September 1939, C.L. Leipoldt 3043 (BOL, K, syn.).

Plants mostly 300–600(–800) mm high; stem erect, smooth, branched, branches short, held close to axis. *Leaves* linear-lanceolate, pleated, short-velvety. *Bracts* 20–24 mm long, papery, smooth, pale brown or colourless with brown flecks, attenuate, inner bract divided for $\pm$ two-thirds. *Flowers* zygomorphic, blue to mauve with whitish to pale yellow markings on lower tepals; perianth tube narrowly funnel-shaped, 11–20 mm long; tepals unequal, dorsal largest, 23–27 $\times$ 6–11 mm, lower tepals 17–20 $\times$ 6–8 mm, joined to upper laterals for $\pm$ 5 mm, short-clawed, the claws $\pm$ 4 mm long. *Stamens* unilateral; filaments arched, 12–14 mm long; anthers 5–7 mm long, yellow. *Ovary* smooth; style dividing opposite middle of anthers, branches 3–4 mm long. *Flowering time*: August to September.

Distribution and ecology: Northern and Western Cape: extending from the Bokkeveld Mountains and Roggeveld Escarpment to the Hex River Mountains, and western Little Karoo near Montagu; dry sandstone or clay slopes, in arid fynbos or karroid scrub (Map 38).

The distinctive *Babiana scariosa* was known from only two stations when described by Lewis (1959), the type locality on the Bokkeveld Plateau south of Nieuwoudtville, and the Touwsberg in the Little Karoo, more than 300 km to the southeast. Since then it has been recorded from several localities between these two sites, which mark the northwestern and southeastern ends of its range. The species seems fairly uniform for so wide a range, and it now appears to be a species of the interior edge of the southern African winter rainfall zone, occurring in dry, mountain renosterveld.

The perianth tube in the type specimen is 20 mm long, which is the upper limit for this character. Plants elsewhere have a tube 12–15 mm long. *Babiana scariosa* is closely allied to *B. spathacea* (No. 72) of the western Karoo, and the two species have similar dry, translucent floral bracts, the inner divided almost to the base. Although *B. spathacea* has cream-coloured flowers with red markings on the lower tepals, and appears to be adapted for pollination by long-proboscid flies, hybrids between this species and *B. scariosa* may be found where the two co-occur on the Bokkeveld Plateau south of Nieuwoudtville. We suspect that the long-tongued anthophorine bees that visit *B. scariosa* avidly for nectar (Goldblatt & Manning 2007) may occasionally also visit flowers of *B. spathacea* although the 30–45 mm long tube is too long for them to reach the nectar. Long-proboscid flies appear to be absent from the range of *B. spathacea* today and fruit production is the result

of pollination by occasional visits to flowers by other insects, including bees and settling moths. The hybrids between *B. spathacea* and *B. scariosa* are discussed in more detail below.

Additional specimens examined

NORTHERN CAPE.—3119 (Calvinia): Bokkeveld Plateau, 2 km south of Farm Matjiesfontein, (–AC), 4 October 2000, Goldblatt 11609 (MO, NBG). 3220 (Sutherland): Roggeveld, Ganagga Pass, (–AA), 20 September 1968, Stayner s.n. (NBG).

WESTERN CAPE.—3118 (Vanrhynsdorp): Koebe Pass, renosterveld, (–DB), 14 October 1973, Hall 4520 (MO, M, NBG). 3119 (Calvinia): Koebe Valley, stony clay slope, (–CA), 5 October 2000, Goldblatt 11614 (K, MO, NBG). 3319 (Worcester): top of Hex River Pass, steep south-facing shale slope, (–BD), 17 September 1974, Mauve & Oliver 222 (NBG, PRE), 8 September 1992, Goldblatt & Manning 9427 (MO, NBG). 3320 (Montagu): Waboomsberg, near the top of Ouberg Pass, (–CA), 27 September 1997, Goldblatt & Manning 10773 (MO, NBG); Montagu–Barrydale road at Rietvlei turnoff, (–CC), 12 September 1994, Goldblatt & Manning 9822 (K, MO, NBG).

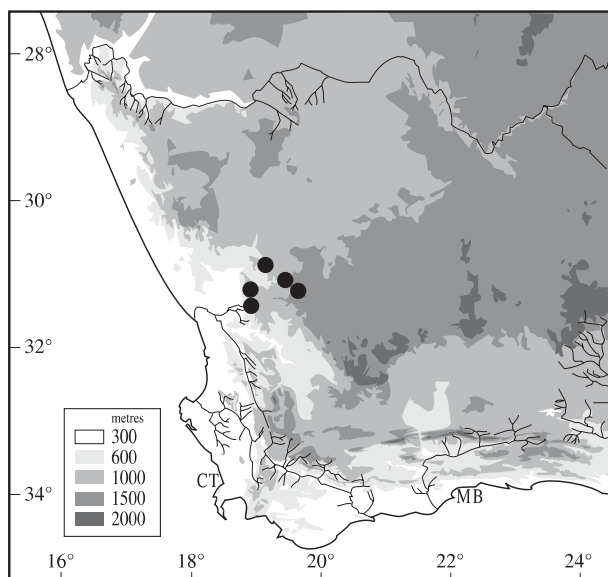
72. ***Babiana spathacea*** (L.f.) Ker Gawl. in Curtis's Botanical Magazine 17: t. 638 (1803c), name misapplied to *B. sambucina*; G.J.Lewis 3: 124 (1959). *Gladiolus spathaceus* L.f.: 96 (1781). Type: South Africa, [Northern Cape], without precise locality, as Bokkeveld 'Bockland' and Hantam, November 1774, C.P. Thunberg s.n. (UPS–Herb. Thunberg 1070, hol.).

See Lewis (1959) for complete synonymy.

Plants mostly 150–400 mm high; stem erect, usually branched, smooth. *Leaves* linear-lanceolate, pleated, short-hairy. *Bracts* 25–50 mm long, papery, pale brown or colourless with brown flecks, attenuate, inner bract slightly shorter than outer, divided for two thirds, rarely completely, but often torn in open flower and appearing divided to base. *Flowers* zygomorphic, crowded in a dense, erect spike, cream-coloured to white, sometimes pale lilac outside, or bluish white to lilac, lower tepals and lower half of throat with small red or purple markings, odourless; perianth tube cylindrical, sharply curved above, (30–)35–45 mm long; tepals unequal, the dorsal 20–23 $\times$ 6 mm, ovate to spatulate, upper laterals curved backward, lower three joined together for a short distance, directed forward, $\pm$ 15 mm long. *Stamens* unilateral; filaments weakly arched, $\pm$ 10 mm long; anthers 4–6(–7) mm long, usually violet or purple. *Ovary* smooth; style dividing opposite anther tips, branches usually short, 1.8–2.5(–4) mm long. *Flowering time*: mostly from mid-September to early November. Plate 5F.

Distribution and ecology: Northern Cape: western Karoo between Calvinia and Loeriesfontein in the north and Papkuilsfontein near Nieuwoudtville in the south and in the Tanqua Karoo; stony clay soils, often in dolerite outcrops, in karroid scrub and renosterveld (Map 39).

First collected in 1774 by Carl Thunberg on his expedition from the Cape to the Roggeveld via the Bokkeveld Mountains, *Babiana spathacea* has had a rather confused taxonomic history, outlined by Lewis (1959) and which need not be repeated. It is, however, important to mention that the name was associated with *B. sambucina* by Ker Gawler in Curtis's *Botanical*

MAP 39.—Distribution of *Babiana spathacea*.

Magazine plate 638 in 1803. This resulted in confusion in the older literature between the very different *B. sambucina* and *B. spathacea*. Typical *B. spathacea* has long-tubed, cream-coloured flowers with dark red markings near the bases of the lower three tepals. The tube is 35–45 mm long and the dorsal tepal $\pm$ 25 mm long. The dry, membranous, long-cuspidate floral bracts, which prompted the name *spathacea*, are distinctive only in combination with the perianth characters. Two other species also have similar floral bracts, *B. scariosa* (No. 71) (Lewis 1959) which has bilabiate, blue flowers with a relatively short perianth tube, 12–20 mm long, and *B. papyracea* (No. 73), described here, which is acaulescent and has large, actinomorphic flowers. A species of the Roggeveld and western Karoo, the range of *B. spathacea* extends from near Loeriesfontein in the north to Klipdrif near Sutherland in the south. A collection made in 1869 by Heinrich Meyer on the Hantamsberg bears the manuscript name *B. densiflora* Klatt.

In the Nieuwoudtville area of the Bokkeveld Plateau, plants that we include in *Babiana spathacea* are unusually variable. To the south, on tillite-derived stony ground on the Farms Matjesfontein and Oorlogskloof, flowers are pale lilac with purple markings and the perianth is somewhat smaller with the tube 30–36 mm long and the dorsal tepal 13–23 mm long (e.g. Goldblatt 11610, MO, NBG). These plants also sometimes have longer style branches, up to 3 mm long, unusual for cream-flowered *B. spathacea*, in which the style branches are typically 1.8–2.0 mm long. A good photograph of this plant, under the name *B. spathacea*, is included in the wild flower guide for the Bokkeveld Plateau (Manning & Goldblatt 1997b).

It seems likely that some hybridization with *Babiana scariosa*, which also grows there, and in the same habitat, is the source of the bluish colouring, shorter perianth tube, and longer style branches. Closer to Nieuwoudtville, on the Farm Glenlyon, plants have white flowers with red markings, flushed lilac on the tube and underside of

the tepals, and the anthers and pollen are dark purple. Flowers are smaller and have a tube $\pm$ 30 mm long and a dorsal tepal $\pm$ 15 mm long but the style branches in these plants are 2.0–2.5 mm long, which is typical of *B. spathacea*. The shift in flower colouring and perianth size is difficult to explain. The differences are so striking that this distinctive race of *B. spathacea* probably deserves taxonomic recognition. The pattern of variation needs additional study before an informed decision can be reached. Examples of the lilac-flowered race are listed below and marked with an asterisk.

Additional specimens examined

NORTHERN CAPE.—3019 (Loeriesfontein): slopes of Kubiskou Mtn, (–CC), 6 September 2006, Goldblatt & Porter 12776 (MO, NBG). 3119 (Calvinia): Farm Glenlyon, paddock 2, near Oorlogskloof road, (–AC), 4 October 2000, Goldblatt 11611A (MO)*; Farm Oorlogskloof, south of Nieuwoudtville, tillite slopes, (–AC), 4 October 2000, Goldblatt 11610 (MO, NBG)*; Klipkoppies, Nieuwoudtville, (–AC), 5 November 1962, Lewis 6121 (NBG); 1.6 km toward Toring from Calvinia–Loeriesfontein road, dolerite boulders, (–BC), 1 September 1982, Snijman 636 (NBG).

73. *Babiana papyracea* Goldblatt & J.C.Manning, sp. nov.

Plantae cum foliis usque ad 150 mm altae, caespitosae, caule subterraneo vel supra terram breviter extenso 2–4-ramoso; spica compacta 3–8-flora, bracteis scariosis 30–35 mm longis attenuatis, bractea interiore usitate $\pm$ longitudinis $\frac{2}{3}$ furcata; floribus actinomorphis pallide vel atro-caeruleo-purpureis in fauce albis, tubo perianthii recto filiformi 35–45 mm longo, tepalis subaequalibus subpatentibus anguste lanceolatis 26–32 $\times$ 5–6 mm longis; filamentis erectis $\pm$ 7 mm longis, antheris $\pm$ 8 mm longis.

TYPE.—Northern Cape, 3119 (Calvinia): Glenlyon Farm, S of Nieuwoudtville, tillite flats, (–AC), 4 October 2000, P.Goldblatt 11611 (NBG, holo.; K, MO, PRE, iso.).

Plants up to 150 mm high; stem short or subterranean, closely 2–4-branched, usually forming small tufts. Leaves several in basal tuft, linear, pleated, short-velvety, 2–4 mm wide. Bracts 30–35 mm long, dry, membranous, pale with brown flecks, tapering to attenuate, awn-like tips, with brown central vein, the inner $\pm$ as long as the outer, usually divided for $\pm$ two-thirds its length. Flowers actinomorphic, 3–8 in a congested spike, pale or deep blue-purple (rarely white), tepals often darker toward base and with white markings, throat usually white, unscented; perianth tube filiform, straight, 35–45 mm long, thick-walled and tightly enclosing style; tepals subequal, narrowly lanceolate, 26–32 $\times$ 5–6 mm, spreading at $\pm$ 70° from vertical when fully open. Stamens symmetrically arranged; filaments $\pm$ 7 mm long, erect, surrounding style; anthers $\pm$ 8 mm long, slightly diverging, straight, later arching inward, pale mauve, pollen cream-coloured. Ovary smooth; style dividing opposite lower half of anthers, branches slender, $\pm$ 2.5 mm long. Flowering time: late September and October. Figure 13.



FIGURE 13.—*Babiana papyracea*, Goldblatt 11611 (NBG). A, whole plant with corm separated from flowering stem; B, front view of flower; C, outer (left) and inner (right) floral bracts. Scale bar: 10 mm. Artist: John Manning.

Distribution and ecology: Northern Cape: on the Bokkeveld Plateau near Nieuwoudtville and a short distance to the south; renosterveld on stony clay soil derived from Dwyka tillite (Map 40).

Known only from two populations, one to the north and one to the south of Nieuwoudtville on the Bokkeveld Plateau west of Calvinia, *Babiana papyracea* is one of the surprising new discoveries from an area rich in geophytic plants and one that has been botanized fairly intensively for over 70 years. Its rarity and late blooming, when most of the spring flowering is over, may explain why it has been overlooked until now. The species was discovered as a result of a conservation biology project to assess the impact of farming practices on species diversity in the region. Coincidentally, *B. papyracea* was also seen in 1999 by seed merchants Rachel and Rod Saunders, who quite independently drew our attention to the plant. *B. papyracea* is the third local endemic species of the Iridaceae from the well-collected Nieuwoudtville area of the Bokkeveld Plateau to be discovered in the past ten years. The rare dolerite endemic, *Moraea vespertina* Goldblatt & J.C.Manning, which also flowers late in the season, was first collected in 1996 (Goldblatt & Manning 2000b), and *Romulea discifera* was first recorded in 1998, again by the Saunders's (Manning & Goldblatt 2001).

The dry, $\pm$ membranous floral bracts with attenuate awn-like tips place *Babiana papyracea* in section *Scariosae*, where it joins the long-tubed *B. spathacea* (No. 72) and short-tubed, bilabiate-flowered *B. scariosa* (No. 71). Although both the latter species are more widespread, they also occur in the immediate vicinity of Nieuwoudtville. The radially symmetric flower of *B. papyracea* is a striking contrast to the zygomorphic flowers of its two relatives in the series and represents one more example of the evolution of radial floral symmetry in the genus, where radial symmetry has evolved repeatedly. Such flowers are present in sections *Babiana*

and *Teretifoliae*, where they are adapted to alternative pollination systems, using either pollen collecting bees or hopliine beetles, the latter being the primary pollinators of *B. papyracea* (Goldblatt & Manning 2007).

Additional specimens examined

NORTHERN CAPE.—3119 (Calvinia): treckpad northwest of Nieuwoudtville to Farm Willemsrivier, (–AC), October 1999, *Mokena & Volchansky s.n.* (K, MO, NBG, PRE), 5 October 2000, *Goldblatt 11617* (K, MO, NBG, PRE, S).

Series 3.5. *Babiana*

74. *Babiana fragrans* (Jacq.) Steudel, Nomenclator botanicus edn 2: 176 (1840). *Gladiolus fragrans* Jacq.: t. 14 (1797). Type: South Africa, without precise locality or collector, cultivated in Vienna, illustration in Plantarum rariorum horti caesarei Schoenbrunnensis t. 14 (1797).

B. plicata Ker Gawl.: t. 576 (1802a); G.J.Lewis: 53 (1959), nom. illeg. superfl. pro *Gladiolus fragrans* Jacq. (1797). Type: South Africa, without locality, illustration in Curtis's Botanical Magazine 16: t. 576 (1802a).

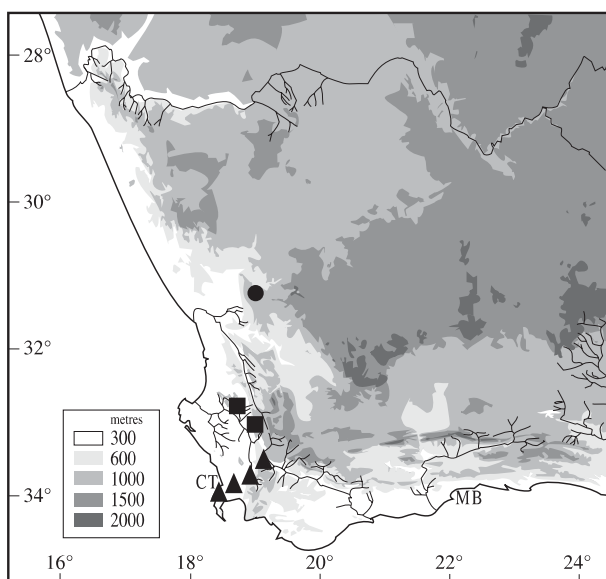
B. disticha Ker Gawl.: t. 626 (1803b). Type: South Africa, without locality, illustration in Curtis's Botanical Magazine 17: t. 626 (1803b).

See Lewis (1959) for complete synonymy.

Plants 70–200 mm high; stem erect, often branched, velvety. *Leaves* lanceolate to oblong, up to 20 mm wide, ascending, slightly pleated, short-hairy. *Bracts* 12–18 mm long, green with dry rust-brown tips, usually densely hairy, inner usually slightly shorter than outer, divided to base. *Flowers* zygomorphic, 4–10 in an erect spike, pale deep violet, occasionally creamy yellow, lower lateral tepals usually with narrow median streak or blotch, and with dark blue or purple markings near base, faintly to strongly fragrant; perianth tube narrowly funnel-shaped, 18–20 mm long; tepals subequal, the dorsal ascending, 18–22 mm long, lower tepals joined to upper laterals for 2–3 mm, lower $\pm$ 18 mm long. *Stamens* unilateral; filaments arched, 12–16 mm long; anthers 6–7 mm long, dark blue. *Ovary* densely hairy; style dividing between base and middle of anthers. *Flowering time*: mainly late August and September. Plate 5G.

Distribution and ecology: Western Cape: extending from Ceres and Malmesbury to the Cape Peninsula; sandstone, granite and occasionally clay slopes (Map 40).

A relatively unspecialized species of section *Babiana*, *B. fragrans* is also the type species of the genus. It is recognized by the subequal, spreading tepals, the dorsal one only slightly longer than the lower, and small pale markings edged in darker blue or purple on the lower tepals. The perianth tube is $\pm$ as long or slightly longer than the dorsal tepal and the erect, usually branched stem bears spikes of up to 10 flowers. The suberect stamens are unilateral and the anthers parallel and contiguous, and usually dark blue. The soft-textured, hairy leaves are slightly pleated and often oblong rather than the usual sword shape in section *Babiana*. Both Ker Gawler, when



MAP 40.—Distribution of *Babiana papyracea*, ●; *B. fragrans*, ▲; *B. longiflora*, ■.

describing the synonym *B. plicata*, and Lewis (1959) remarked on the strong, pleasing fragrance, likened by Lewis to that of a carnation. Somewhat variable across its range, *B. fragrans* from the interior of the southwestern Cape has a more strongly bilabiate flower with the dorsal tepal up to 5 mm longer than the lower, and the upper lateral tepals are united for a short distance with the lower, therefore forming a more pronounced lip than is evident in plants from the Cape Peninsula and nearby.

Called by Lewis in her account of the genus, *Babiana plicata* Ker Gawl., and subsequently known as *B. disticha* because the name *B. plicata* is illegitimate and superfluous, this species has a confused history. *B. plicata* was a new species based on a plant illustrated in *Curtis's Botanical Magazine* that Ker Gawler believed was the same as plants called *Gladiolus plicatus* by Burman fil. (1768) and by Thunberg (1784). Thunberg in turn thought his *G. plicatus* was the same plant described by Linnaeus as *Ixia plicata* in 1759, and which was transferred by him to *Gladiolus* in 1762. Linnaeus's *G. plicatus*, however, is the plant we now call *B. villosula* (which Ker Gawler in 1804 called *B. obtusifolia*). Ker Gawler's new species is unfortunately illegitimate (Bullock 1961) because when Ker Gawler introduced the name, he cited as a synonym *Gladiolus fragrans* Jacq., which was available for transfer to *Babiana*. The plant in question then became known by the later and legitimate synonym *B. disticha*, also described by Ker-Gawler, but based on a different type (and which Ker Gawler thought represented a different species). *Gladiolus fragrans* was considered by Lewis and others to be unavailable for transfer to *Babiana* because of the existence of *B. fragrans* Eckl. (1827), regarded by Lewis (1959) as a synonym of *B. nana*. This name is, however, either a combination without indication of the basionym or a *nomen nudum* (Ecklon provided no description or diagnosis of the plant). Goldblatt & Manning (2004) made the combination *B. fragrans* for the species, not then aware of the earlier combination by Steudel (1840).

Babiana fragrans has flowers that appear to be primarily adapted for pollination by long-tongued bees: the moderately long tube is hollow to the base and contains ample nectar, the perianth is pale to deep blue, occasionally cream-coloured to pale yellow, with contrastingly coloured nectar guides on the lower tepals, and the flowers are strongly fragrant. Nevertheless, at its presumed type locality, Signal Hill in Cape Town, flowers are often seen being visited by hopliine scarab beetles that use the flowers as sites for assembly, mate selection, and copulation. Possibly the flowers of *B. fragrans* have evolved a dual pollination strategy that uses both bees and beetles.

75. *Babiana longiflora* Goldblatt & J.C.Manning in *Bothalia* 34: 94 (2004). Type: Western Cape, 3218 (Clanwilliam): $\pm$ 28 km north of Piketberg, 31 August 2002, P. Goldblatt & L.J. Porter 12129 (NBG, holo.; MO, iso.).

B. stricta var. *grandiflora* G.J.Lewis: 46 (1959). Type: South Africa, [Western Cape], 18 miles north of Piketberg, 28 July 1950, G.J. Lewis 2197 (SAM, holo.; SAM, iso.).

Plants mostly 150–200 mm high; stem erect, often branched, velvety hairy. *Leaves* lanceolate to oblong, mostly 9–12 mm wide, slightly pleated, fairly soft-textured, sparsely hairy. *Bracts* mostly 16–20 mm long, green, outer with $\pm$ obtuse to bilobed, dry rust-brown tips, densely hairy, inner slightly shorter than outer, divided to base. *Flowers* zygomorphic, 6–10 in a suberect spike, lilac to deep mauve or violet, lower tepals each with spear-shaped, reddish basal mark, white in centre, or with a narrow median white stripe, faintly rose-scented; perianth tube slender, straight, widening in upper third, 25–30 mm long; tepals subequal, ascending, 20–24 mm long, the dorsal mostly 1–3 mm longer than lower three, upper laterals joined to lower tepals for $\pm$ 2 mm. *Stamens* unilateral; filaments weakly arched, $\pm$ 15 mm long, mauve; anthers $\pm$ 6 mm long, dark purple, with narrow connective visible. *Ovary* densely hairy; style dividing between middle and apex of anthers, branches 3–4 mm long, expanded and densely ciliate at tips, exceeding anther tips. *Flowering time*: mainly mid-August to mid-September.

Distribution and ecology: Western Cape: known only from flats at the foot of the Piketberg and Porterville Mountains; stony sandstone ground in transitional fynbos–renosterveld (Map 40).

First described by Lewis in 1959 as *Babiana stricta* var. *grandiflora*, this plant has been collected four times at the same locality or close by, and we think its affinities are misunderstood. It seems to us not closely allied to *B. stricta* or any of its four varieties recognized by Lewis. In particular, it has fairly broad leaves arranged in a spreading fan, unlike the fairly rigid, narrow, deeply pleated, $\pm$ erect, short-hairy leaves of *B. stricta*. Plants have a long-tubed, pale purple flower, subequal, ascending tepals, soft-textured, hairy leaves, and long, rather blunt outer bracts. We suspect that it may be most closely related to *B. fragrans*, which has comparable, soft-textured, long-hairy, fairly broad leaves, and large floral bracts rust-brown only at the tips. *Babiana longiflora* can be recognized in section *Babiana* by the fairly long perianth tube 25–30 mm long, relatively long for the section, and the dark violet stamens reaching to $\pm$ the middle of the dorsal tepal. Other long-tubed species of section *Babiana*, *B. ecklonii* (No. 68) and *B. latifolia* (No. 67) are unlike *B. longiflora* in their dark violet perianth, the 30–47 mm long tube, curved at the apex, and the lower tepals joined to one another for at least 4 mm (5–7 mm in *B. ecklonii*), thus forming a strongly bilabiate perianth with horizontally extended lower tepals and the dorsal erect. *Babiana fragrans* has strongly scented flowers with a perianth tube 18–20 mm long, broader, usually pale blue (rarely pale yellow) tepals, and the style dividing opposite the lower third of the anthers.

We include here plants from the foot of the Porterville Mountains at Twenty Four Rivers, some 40 km east of the type locality (see below). These plants have dark blue flowers, but otherwise closely resemble other specimens of *Babiana longiflora*, notably in their straight, $\pm$ 30 mm long perianth tube, hollow to the base and containing nectar. The anthophorine bee, *Anthophora diversipes* has been captured foraging for nectar on the flowers of this population.

Additional specimen examined

WESTERN CAPE.—3218 (Clanwilliam): 3318 (Cape Town): Twenty Four Rivers, gravelly sand alluvium, (–BB), 1 September 1992, Goldblatt & Manning 9363 (MO, NBG).

76. *Babiana angustifolia* Sweet, Hortus Britannicus 396 (1827), as a new name for *B. stricta* var. *α*, Curtis's Botanical Magazine 17: t. 637 (1803d). *B. stricta* var. *angustifolia* (Sweet) Baker: 166 (1877). Type: South Africa, without precise locality or date, illustration in Curtis's Botanical Magazine 17: t. 637 (1803d).

Acaste pulchra Salisb.: 332 (1812), nom. illeg., gen. nom. nud. *B. pulchra* (Salisb.) G.J.Lewis: 48 (1959), nom. illeg., basionym illeg.

B. intermedia L.Bolus: 276 (1932b). Type: South Africa, between Darling and Yzerfontein, September 1932, H.M.L. Bolus s.n. (BOL20167, holo.).

See Lewis 1959 for complete synonymy.

Plants mostly 100–150 mm high; stem velvety, usually unbranched, strongly deflexed. *Leaves* lanceolate,

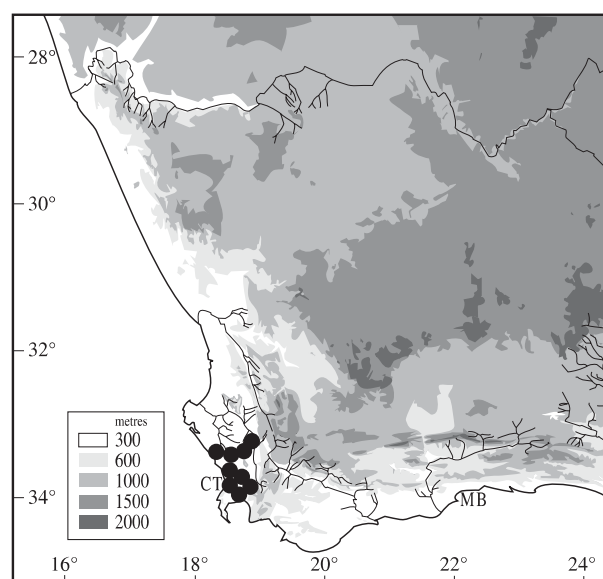
strongly pleated, stiffly erect, minutely velvety, inclined. *Bracts* 12–14 mm long, green, rust-brown at tips, velvety, outer almost tricuspidate or trilobed apically, inner often slightly shorter than outer, divided to base. *Flowers* zygomorphic, 2–8, second in an inclined spike, inverted with perianth tube recurved, dorsal tepal horizontal, unilateral stamens curved back to lie above dorsal tepal and lower tepals suberect (Figure 14A, B), dark blue to violet or purple, lower three tepals with black or red spear-shaped markings; perianth tube curved, narrowly funnel-shaped, 11–17 mm long; tepals subequal, cupped, 20–22 mm long, dorsal hardly different from others, up to 12 mm wide. *Stamens* unilateral; filaments arching over dorsal tepal, 8–10 mm long; anthers linear, facing spike apex, 4.5–6.0 mm long, blackish. *Ovary* densely hairy; style arching beneath stamens, dividing opposite anther apices. *Flowering time*: August and September.

Distribution and ecology: Western Cape: extending from Porterville in the north to Somerset West in the south; damp sandy or loamy flats and lower slopes (Map 41).

A plant of seasonally wet lowland habitats in the Western Cape coastal plain, *Babiana angustifolia* is recognized by the dark blue perianth with relatively broad, subequal tepals held in a shallow cup enclosing the stamens and style (Figure 14A, B). The perianth is inverted so that the dorsal tepal and arched stamens face the spike apex, an unusual feature in *Babiana*, shared with only three other species, two assigned to series *Babiana* here, and *B. auriculata* of series *Mucronatae*. The lower tepals of the darkly pigmented perianth have blackish or occasionally dark red, spear-shaped marks in the lower midline and this together with the blackish anthers gives the flowers a darkly pigmented, distinctive appearance. The flowers are often visited by hopliine scarab beetles, sometimes seen resting for long periods in the base of the floral cup. These beetles may be the primary pollinators of *B. angustifolia* but we have also seen the small horsefly, *Philoliche atricornis* visiting the flowers, presumably in



FIGURE 14.—A–D, *Babiana angustifolia* and *B. inclinata* showing inverted orientation of flowers with recurved perianth tube, horizontal dorsal tepal, erect lower tepals, and stamens arching above dorsal tepal. A, B, *B. angustifolia*, Helme 2549 (NBG): A, open flower; B, flower l/s. C, D, *B. inclinata*, Goldblatt 11611 (NBG): C, flowering spike; D, flower l/s. Scale bar: 10 mm. Artist: John Manning.



MAP 41.—Distribution of *Babiana angustifolia*.

search of the small amounts of nectar held at the top of the perianth tube. These flies, like the beetle visitors, become densely covered with the blackish pollen and are effective in transferring pollen from the flowers of one individual to another.

The species was treated as *Babiana pulchra* by Lewis (1959), a combination based on *Acaste pulchra* Salisb. which, as pointed out by Nordenstam (1970), is a *nomen nudum*, and thus not valid. Lewis's combination is equally invalid. This plant thus takes the name *B. angustifolia* given to it by Robert Sweet in 1827. The type illustration in Curtis's *Botanical Magazine* entitled *B. stricta* var. *α*, closely matches plants found in low-lying, seasonally waterlogged habitats from Gordon's Bay in the south to Darling and Gouda in the north. The plants on which the type illustration was based were reported by Ker Gawler to have been introduced by the Kew Gardens collector, Francis Masson, although the plants illustrated were grown by the Colville Nursery in Chelsea, London.

Lewis held a broader concept of *Babiana angustifolia* than the one we have, and included plants from the Piketberg and Porterville Districts under this name. The flowers of these plants have narrower tepals not overlapping to form a floral cup, pale mauve to white anthers, and the lower lateral tepals and sometimes the dorsal tepal are pale in colour. These plants are treated here as a separate species, *B. inclinata* (No. 77), which also has inverted flowers and is no doubt closely related to *B. angustifolia*.

77. *Babiana inclinata* Goldblatt & J.C.Manning, sp. nov.

Plantae 150–300 mm altae; caule inclinato velutino; foliis lanceolatis plicatis velutinis; bractea exterior 9–12 mm longa, interiore ad basem divisa; spica multiflora secunda inclinata; floribus zygomorphis invertis atrocaeruleis usque violaceis, tepalis inferioribus lateralibus usitate cremeis, tubo perianthii curvato anguste infundibuliformi ± 10 mm longo, tepalis inaequalibus tepalo dorsali 22–24 mm longo, inferioribus ± 18 mm longis; filamentis 12–15 mm longis, antheris linearibus 5–6 mm longis; ovario dense piloso, ramis styli ± 3.5 mm longis.

TYPE.—Western Cape, 3218 (Clanwilliam): flats at foot of Piketberg, north of town, (–DC), 27 September 2001, P. Goldblatt & J.C. Manning 11931 (NBG, holo.; MO, PRE, iso.).

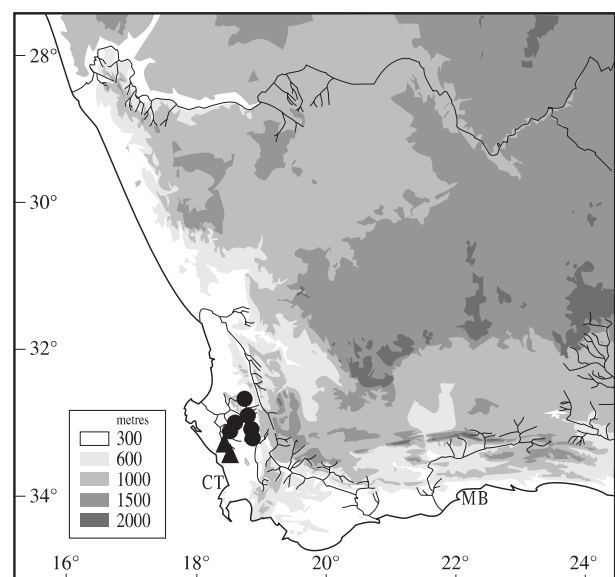
Plants mostly 150–300 mm high; stem strongly inclined, velvety. Leaves lanceolate, closely pleated, velvety, in loose basal fan. Bracts green with rust-brown tips, the outer 9–12 mm long, obtuse or bilobed at tip, the inner slightly shorter to $\pm$ as long as outer, divided to base. Flowers zygomorphic, several, secund in an inclined spike, inverted, with perianth tube recurved, dorsal tepal horizontal, unilateral stamens curved back to lie above dorsal tepal and lower tepals suberect, blue to violet, lower tepals often and dorsal sometimes cream-coloured, lower with black or reddish markings in lower third, unscented; perianth tube curved, narrowly

funnel-shaped, ± 10 mm long; tepals unequal, oblong-oblancheolate, dorsal held somewhat apart from others, 22–24 mm long, lower tepals joined to upper laterals for ± 2 mm, lower tepals 18–20 mm long. Stamens unilateral; filaments arched over dorsal tepal, 12–15 mm long; anthers linear, facing spike apex, 5–6 mm long, often with narrow portion of connective visible between thecae; anthers and pollen purple, lilac or white. Ovary densely hairy; style dividing opposite middle of anthers, branches ± 3.5 mm long, expanded apically. Flowering time: late August to late September. Figure 14C, D, Plate 5H.

Distribution and ecology: Western Cape: extending from Porterville and Gouda to Piketberg and Hopefield; damp clay flats and lower slopes (Map 42).

Babiana inclinata has in the past been confused with the vegetatively similar *B. angustifolia* (No.76), which also has inverted flowers, but that species has a more narrowly cupped flower (Figure 14A, B), subequal tepals 20–22 mm long that overlap one another, filaments 12–15 mm long, and blackish anthers 5–6 mm long. In contrast, *B. inclinata* has unequal tepals that do not form a cup, the dorsal tepal is 22–24 mm long and held well apart from the others, and the anthers are purple to lilac or white. The lower tepals are shortly united with the upper laterals for ± 2 mm to form a distinct lower lip, and the free parts are 12–15 mm long. Whereas the anthers of *B. inclinata* are the same size as in *B. angustifolia*, 5–6 mm long, the filaments are longer, 12–15 mm, versus 8–10 mm in *B. angustifolia*.

The taxonomy of series *Babiana*, to which *B. angustifolia* and *B. inclinata* belong, is difficult and cannot be satisfactorily resolved using herbarium specimens, unless plants are very carefully pressed with flowers laid out and the specimens accompanied by notes about tepal orientation and colour. Care must therefore be taken in identifying any member of the group using herbarium material.



MAP 42.—Distribution of *Babiana inclinata*, ●; *B. rubrocyanea*, ▲.

Additional specimens examined

WESTERN CAPE.—3218 (Clanwilliam): $\pm$ 12 miles [$\pm$ 19 km] N of Piketberg, (–DB), 1 September 1992, Goldblatt & Manning 9341 (K); near Piketberg, (–DC), 28 September 1952, Maguire 2031 (NBG); lower slopes of Versveld Pass, (–DC), 22 September 1992, Goldblatt & Manning 9470 (MO); Berg River bridge, (–DC), 1 October 1943, Barker 2826 (NBG); 2 miles [$\pm$ 3 km] S of the Berg River bridge, (–DC), 15 September 1933, Salter 3677 (K). 3318 (Cape Town): 8 miles [$\pm$ 13 km] SE of Hopefield, (–AA), 8 September 1932, Salter 2699A (K); between Darling and Hopefield, wet sandy flats, (–AD), Goldblatt 2697 (MO). 3319 (Worcester): 3 km south of Porterville, (–AA), 1 October 2003, Goldblatt & Porter 12381 (MO, NBG); near Gouda, (–AC), 1 October 2003, Goldblatt & Porter 12382 (MO, NBG).

78. *Babiana rubrocyanea* (Jacq.) Ker Gawl. in J.König & Sims, *Annals of Botany* 1: 234 (1804). G.J.Lewis: 36 (1959). *Ixia rubrocyanea* Jacq.: t. 285 (1791).

Acaste venusta Salisb.: 332 (1812), nom. nud. et illeg. superfl. pro *Babiana rubrocyanea* (Jacq.) Ker Gawl. Type: South Africa, without precise locality, illustration in Jacquin, *Icones plantarum rariorum* 2: t. 285 (1791).

See Lewis (1959) for complete synonymy.

Plants 50–150 mm high; stem strongly flexed outward, usually branched. *Leaves* lanceolate, pleated, hairy. *Bracts* 18–30 mm long, green with brown tips, velvety, inner slightly shorter than outer, divided to base. *Flowers* subzygomorphic, 5–10 in an inclined spike, deep blue with red centre outlined in white, unscented; perianth tube narrowly funnel-shaped, 15–20 mm long; tepals subequal, symmetrically disposed, widely cupped, 20–24 mm long. *Stamens* unilateral (possibly sometimes symmetrically arranged); filaments arching over lower tepals, 10–13 mm long; anthers 6–7 mm long, facing spike apex, reddish brown. *Ovary* hairy above base; style dividing opposite middle of anthers, branches short, with broad, flattened tips. *Flowering time*: August to mid-September. Plate 5I.

Distribution and ecology: Western Cape: local between Darling and Mamre; stony and sandy granitic slopes in renosterveld (Map 42).

The strikingly coloured flowers of *Babiana rubrocyanea*, with the deep blue outer portion of the tepals contrasting with a dark red centre, make this one of the best known species of the genus, although we note that the rare *B. regia* (No. 80) has identically coloured flowers. Its relationships are, however, puzzling. Lewis included it in her section *Acaste*, because of the symmetrically arranged tepals and [sometimes] symmetrical stamens, but she noted the unusually short style branches with very broad tips and somewhat clawed tepals, both unique for section *Acaste* as she interpreted it, in which narrow style branches are the norm. We propose an alternative hypothesis, that *B. rubrocyanea* is allied to the *B. angustifolia* group of species and most closely to *B. angustifolia* (No. 76). That species has similarly cupped, subequal tepals, flowers borne on a strongly inclined stem, and outer floral bract bidentate with a central mucro. These bracts recall the trilobed to obscurely tricuspidate bracts of *B. rubrocyanea*. More significantly, the stamens of *B. rubrocyanea* are unilateral and the anthers face toward the spike apex, exactly the

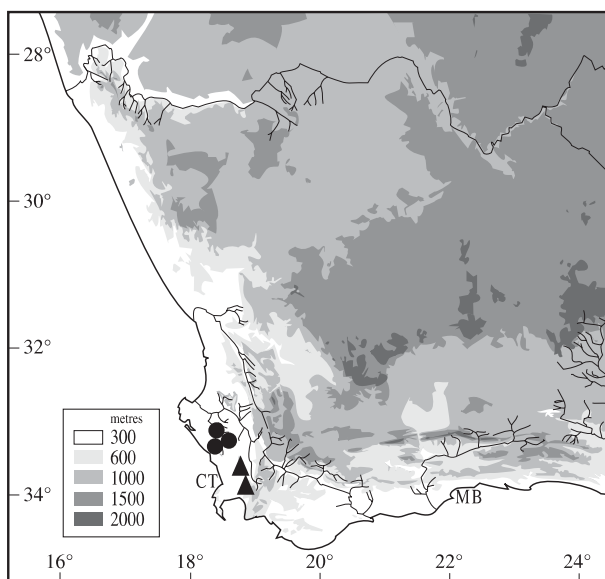
orientation in *B. angustifolia*. The unusual perianth colouring in *B. rubrocyanea* is recalled by the form of *B. angustifolia* from near Darling, named *B. intermedia* L.Bolus, which has dark blue flowers marked with dark red on the lower tepals.

The tepal colouring of *Babiana rubrocyanea* is also strikingly similar to that in four species of *Geissorhiza* (Iridaceae), *G. eurystigma* L.Bolus, *G. mathewsii* L. Bolus, *G. monanthos* Eckl., and *G. radians* (Thunb.) Goldblatt, the so-called wine cups (Goldblatt 1985). These species all occur in the same area as *B. rubrocyanea*, the Western Cape coast immediately north and south of Darling, and we suspect they form a pollination guild. The similar flower coloration extends to the anthers, for all these species have unconventional, reddish brown pollen. Pollination in this group of species has not been studied, but at least hopliine beetles (Scarabaeidae) and the horsefly, *Philolichia atricornis* (Tabanidae) have been recorded visiting *B. rubrocyanea*. Elsewhere we have postulated that unusually coloured pollen is in effect camouflaged so that pollen-collecting bees do not remove it. The dark (or at least contrasting) central pigmentation of the perianth may be a form of beetle mark, attracting hopliine beetles to these flowers where they assemble, engage in agonistic behaviour and often copulate (Goldblatt *et al.* 1998a). They often accumulate heavy loads of pollen, which they transfer to receptive stigmas as they fly from one flower to another, presumably in search of mates. The small, short-proboscid *P. atricornis* presumably visits the flowers of the *Geissorhiza* species to forage on the small amounts of nectar held at the top of the perianth tube. In addition, bees are occasionally found visiting the flowers of *B. rubrocyanea* and the *Geissorhiza* species (unpubl. obs.). Enlarged stigmatic surfaces and unusually coloured pollen are often associated with hopliine pollination and long-proboscid fly pollination (Goldblatt *et al.* 1998a; Goldblatt & Manning 1999).

79. *Babiana leipoldtii* G.J.Lewis in *Journal of South African Botany*, Suppl. 3: 33 (1959). Type: South Africa, [Western Cape], between Mamre and Darling, 4 August 1940, C.L. Leipoldt s.n. (SAM55686, holo.).

Plants 100–180 mm high; stem erect, often branched, velvety hairy. *Leaves* lanceolate, pleated, hairy, usually reaching to $\pm$ base of spike. *Bracts* 20–35 mm long, green, dry and rust-brown at tips, velvety, inner slightly shorter than outer, divided to base. *Flowers* actinomorphic, 4–8 in an erect spike, blue-violet, somewhat darker in centre, lower tepals sometimes with small red markings in lower third, usually faintly violet-scented; perianth tube slender below, 15–20 mm long, flared in upper half, walls thick and tightly enclosing style below; tepals subequal, 25–30 mm long, oblong-ovate. *Stamens* symmetrically arranged; filaments 7–9 mm long, erect, surrounding style; anthers linear, 6–8 mm long, white or yellow. *Ovary* densely hairy above; style dividing between base and middle of anthers. *Flowering time*: late July to early September. Plate 6A.

Distribution and ecology: Western Cape: from Hopefield to Darling and Klipheuwel; damp, sandy flats (Map 43).



MAP 43.—Distribution of *Babiana leipoldtii*, ●; *B. regia*, ▲.

Babiana leipoldtii was until recently relatively common on the Western Cape forelands between Mamre Road and Klipheuwel in the south and Hopefield in the north, thus almost confined to the greater Malmesbury District. The wet, poorly drained sandy flats where it grows, are rapidly disappearing under the plough or are being invaded by alien *Acacia* species so that little of its former range remains. *B. leipoldtii* is distinctive in its actinomorphic flowers with erect, symmetrically disposed filaments enclosing the style and bearing linear white or yellow anthers. Belonging to the *B. fragrans* group of section *Babiana*, *B. leipoldtii* may be most closely allied to *B. villosula* (No. 81) and the two are easily confused, as they were in the past, under the name *B. stricta*, or were distinguished from that species as *B. obtusifolia* or *B. orthosantha*. *Babiana villosula* has pale blue to mauve flowers with a small white centre, and usually bluish to mauve anthers, whereas *B. leipoldtii* has violet flowers darker in the centre, and white or yellow anthers that strongly contrast with the perianth pigmentation. Both these species have short filaments included in the upper part of the perianth tube, and the anthers held at the mouth of the tube where they are bound to contact the bodies of insects foraging for nectar present in the lower, narrow part of the tube. Apart from the flowers, *B. leipoldtii* is distinguished from most other species with an actinomorphic flower by the relatively tall, aerial stem and somewhat lax spike. Related species have the stem extended only a short distance above the ground.

80. *Babiana regia* (G.J.Lewis) Goldblatt & J.C.Manning in *Bothalia* 34: 94 (2004). *B. stricta* var. *regia* G.J.Lewis: 45 (1959). Type: South Africa, [Western Cape], Bottelary road near Stellenbosch, September 1950, G.J. Lewis & D.K. Davis 2216 (SAM, holo., iso.).

Plants 50–120 mm high; stem strongly flexed outward, simple or branched. Leaves narrowly lanceolate, deeply pleated, fairly stiff, rough short-hairy. Bracts 12–22 mm long, green, rust-brown at tips, velvety hairy, inner $\pm$ as long as outer, divided to base. Flowers actinomorphic,

(4–)6–10 in an ascending spike, deep blue with red centre sometimes edged with diffuse white zone, unscented; perianth tube narrowly funnel-shaped, 10–12 mm long, filiform near base, wider above; tepals subequal, obovate, 18–20 $\times$ 8–10 mm. Stamens symmetrically arranged; filaments $\pm$ 8 mm long, erect; anthers linear, 4–5 mm long, erect, reddish brown. Ovary densely hairy; style dividing $\pm$ 2 mm below anther bases, branches slender, $\pm$ 2 mm long, extending between filaments. Flowering time: mainly September and early October. Plate 6B.

Distribution and ecology: Western Cape: local between Malmesbury and Stellenbosch; seasonally damp, well-drained sandy and gravelly slopes and flats (Map 43).

Although treated by Lewis (1959) as var. *regia* of *Babiana stricta*, we believe this plant merits a higher status and have raised it to species rank (Goldblatt & Manning 2004). *B. regia* has an actinomorphic flower with broad, ovate, overlapping dark blue tepals that form a shallow cup with a deep red centre. The stamens are arranged symmetrically around the short style that divides below the level of the linear anthers. In contrast, *B. stricta* (No. 84) has a zygomorphic flower with blue to mauve, white or cream-coloured, spreading tepals, the lower distinguished from the upper by different markings, unilateral stamens, sagittate anthers with an expanded connective, and a style dividing at the base of the anthers. Vegetatively the two species seem almost identical, having narrow, fairly stiff, erect leaf blades, but the stem of *B. regia* is strongly flexed outward. Flowers of *B. regia* produce no detectable nectar and are pollinated by hairy hopline scarab beetles, of which the common Western Cape *Anisonyx ursus* seems to be the most frequent visitor at the one population we studied, although we have also seen small halictid bees visiting the flowers and collecting pollen. *Babiana regia* has pollen of an unusual colour, reddish brown, and we suspect that this is an adaptation for camouflage, limiting the pollen collecting activities of bees [Compare to *B. rubrocyanea* (No. 78)].

Babiana regia is restricted to the southwestern Cape where its lowland habitat in sandy loam is largely given over to agriculture. We suspect that it is now limited to only a few, small sites that no longer represent viable habitats.

81. *Babiana villosula* (J.F.Gmel.) Ker Gawl. ex Steud., *Nomenclator Botanicae*: 371 (1821); G.J.Lewis: 28 (1959). *Ixia villosula* J.F.Gmel.: 110 (1796). Type: South Africa, without precise locality, date or collector, illustration in *Icones plantarum rariorum* 2: t. 284 (1791).

B. obtusifolia Ker Gawl.: 234 (1804), nom. superfl. pro *I. villosula* J.F.Gmel. (based on the same type).

B. hiemalis L.Bolus: 243 (1932). Type: South Africa, [Western Cape], Wynberg Hill, August 1932, H.M.L. Bolus s.n. (BOL20151, holo.).

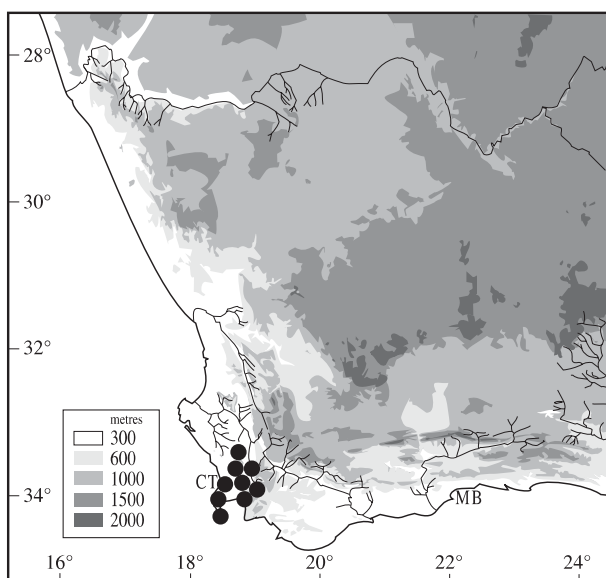
See Lewis (1959) for more complete synonymy.

Plants 50–150 mm high; stem short, often mostly subterranean, simple or occasionally with 1 or 2 branches,

velvety hairy. *Leaves* lanceolate, pleated, softly hairy. *Bracts* 18–40 mm long, green with dry rust-brown tips, inner shorter than outer, divided to base, with narrow hyaline margins. *Flowers* actinomorphic, in a congested 2–8-flowered erect spike, pale blue to mauve or rarely yellow or red, white at base of tepals and throat, edged in darker blue, occasionally uniformly white, faintly acid- or violet-scented; perianth tube 18–25(–30) mm long, erect, widening at throat; tepals subequal, 20–30 × 8–13 mm. *Stamens* symmetrically arranged; filaments 3.5–6.0 mm long, erect, surrounding style; anthers 4–6 mm long, divergent, pale blue, mauve, or whitish, linear or connective wider toward base. *Ovary* densely hairy; style dividing opposite base or lower third of anthers, branches filiform, ± 4 mm long, tips hardly expanded. *Flowering time*: May to July, rarely in August.

Distribution and ecology: Western Cape: from Darling and Malmesbury to Gordon's Bay and the Cape Peninsula; stony sandstone flats and lower slopes in fynbos (Map 44).

Until Lewis (1959) resolved the complicated synonymy of *Babiana villosula*, this common, early flowering southwestern Cape species was known variously as *B. obtusifolia* Ker Gawl., *B. orthosantha* Baker, and most recently, *B. hiemalis* L.Bolus. In fact, it was one of the earliest species of the genus to be named, its taxonomic history beginning in 1759 when Linnaeus described it as *Ixia plicata*, subsequently transferring it to *Gladiolus* in 1762. The existence of *B. plicata* Ker Gawl. (1802a) bars the transfer of this early name to *Babiana*. A species of sandstone- or granite-derived stony soils, *B. villosula* is recognized in section *Babiana* by the pale blue perianth with a white throat, or rarely uniformly white perianth, with short stamens, and bluish anthers held in the mouth of the tube that contrast with the white throat (Manning & Goldblatt 1996b). The anthers are usually linear with parallel lobes but occasional populations have the connective slightly expanded below and the lobes slightly diverging (e.g. Goldblatt 11428, MO, from the Farm Joostenberg Vlakte).



MAP 44.—Distribution of *Babiana villosula*.

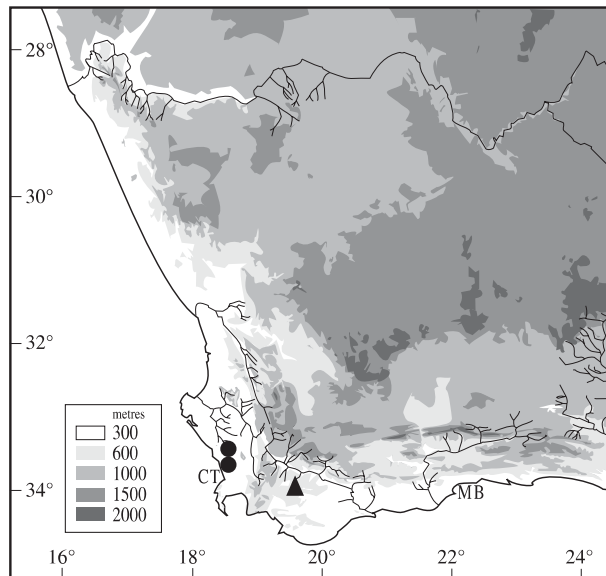
The flowers are faintly scented with a perfume suggesting violets, usually combined with a light, acid, somewhat unpleasant chemical component. Flowering early in the season, when few other geophytes are in bloom, *Babiana villosula* is pollinated by native honey bees foraging for the traces of nectar in the perianth tube. The bees also carry loads of the distinctive whitish pollen in their pollen baskets, indicating that pollen must also be an important reward to visiting bees.

82. *Babiana blanda* (L.Bolus) G.J.Lewis in Journal of South African Botany, Suppl. 3: 30 (1959). *B. macrantha* var. *blanda* L.Bolus: 276 (1932b). Type: South Africa, [Western Cape], near Melkbosstrand, cultivated at Kirstenbosch National Botanical Garden, September 1932, O.A. Eaton s.n. (Nat.Bot.Gard.1110/26 in BOL, holo.).

Plants 80–150 mm high; stem erect, velvety hairy, rarely with one branch. *Leaves* oblong-lanceolate, pleated, hairy, blades held almost at right angles to sheaths. *Bracts* 24–35(–45) mm long, green with dry rust-brown tips, inner shorter than outer, divided to base. *Flowers* actinomorphic, 3–6 in an erect spike, rosy pink, sometimes white in centre, unscented; perianth tube 20–27 mm long, slender below, expanded above; tepals subequal, obovate or suborbicular, 23–33 × 14–20 mm, forming shallow bowl. *Stamens* symmetrically arranged; filaments 5–8 mm long, erect, surrounding style; anthers linear, 7–9 mm long, lilac, divergent. *Ovary* silky hairy above; style dividing below anther bases, branches 3–4 mm long, expanded apically. *Flowering time*: late August to September.

Distribution and ecology: Western Cape: extending from Darling to Milnerton and near Agterpaarl; seasonally wet, sandy or loamy flats (Map 45).

The large-flowered *Babiana blanda* with its bright, rosy pink perianth is a delightful plant, now unfortunately on the brink of extinction in the wild. Never common, its specialized, seasonally wet habitat has now all but disappeared and the remaining known wild plants are seriously threatened by encroachment of alien *Acacia* species and pasturage. It is difficult to see how the species can survive for much longer. It is in cultivation at Kirstenbosch National Botanical Garden and does well as a potplant, flowering abundantly in late August. This Western Cape coastal species appears to be most closely related to *B. villosula* (No. 81), which has similar, though generally smaller, actinomorphic flowers and which blooms earlier in the season. The two may be distinguished by flower size and colour, the tepals of *B. villosula* being 20–30 × 8–13 mm and pure white or blue with a small white centre, whereas those of *B. blanda* are 23–33 × 14–20 mm, rosy pink and unscented, unlike *B. villosula*. Lewis (1959) also noted that whereas the style branches of *B. villosula* are filiform with small expanded tips, those of *B. blanda* have prominent, broad apices. The leaf blades of *B. blanda* also tend to be oriented more obliquely to the sheaths than in related species, but this character is variable and cannot be relied upon alone. Lewis described several hybrids between the two species, which often have the inner bracts partially



MAP 45.—Distribution of *Babiana blanda*. ●; *B. foliosa*, ▲.

united. *Babiana villosula* is typically an early flowering species, which is usually in seed by August when *B. blanda* blooms. The presence of hybrids between the two is thus somewhat surprising.

We do not believe that *Babiana pygmaea* (No. 2) which has large, yellow actinomorphic flowers, is at all closely related to *B. blanda*, as Lewis (1959) suggested. Although *B. pygmaea* has radially symmetric flowers, it also has large floral bracts, the inner divided only in the upper half to one third, and on this account is placed in section *Teretifoliae*.

83. *Babiana foliosa* G.J.Lewis in Journal of South African Botany, Suppl. 3: 35 (1959). Type. South Africa, [Western Cape], Riviersonderend, 4 August 1951, W.F. Barker 7343 (NBG, holo.).

Plants up to 100 mm high; stem reaching shortly above ground level, simple or with 1 or 2 branches. *Leaves* lanceolate, pleated, hairy. *Bracts* 20–30 mm long, velvety hairy, entirely green, inner slightly shorter than outer, divided to base, margins hyaline. *Flowers* actinomorphic, 2–5 in a congested spike, mauve with cream-coloured markings; perianth tube straight, $\pm$ 20 mm long, widening toward throat; tepals subequal, 20–24 $\times$ 8–12 mm. *Stamens* symmetrically arranged; filaments $\pm$ 10 mm long, surrounding style; anthers 5–6 mm long, apparently cream-coloured or pale bluish. *Ovary* densely hairy; style dividing opposite anther bases, branches with broad expanded tips. *Flowering time*: August.

Distribution and ecology: Western Cape: vicinity of Riviersonderend; presumed to grow on clay-loam flats (Map 45).

Collected only once, *Babiana foliosa* is a puzzling plant. The flowers closely resemble those of the winter-flowering *B. villosula* (No. 81) and it might be seen as an eastern form of that species. However, we concur with Lewis in recognizing *B. foliosa* until we learn more of its morphological variability. As Lewis noted in the

protologue, its $\pm$ 10 mm long filaments are substantially longer than the 4–6 mm long ones of *B. villosula*, and it has a stouter perianth tube. The more numerous leaves, for which the species was named, and green bracts without dry, rust-brown tips, also make it easy to distinguish *B. foliosa* from other species of section *Babiana* with actinomorphic flowers. We assume that it is most closely related to *B. villosula* and note that the two species have separate geographical ranges, and very likely different soil preferences. Whereas *B. villosula* is a species of sandy and stony flats and mountain slopes, *B. foliosa*, for which we have no ecological data, may be a plant of clay or loam, the predominant soils on the flats around Riviersonderend, the type locality.

Series 3.6. *Strictae*

84. *Babiana stricta* (Aiton) Ker Gawl. in Curtis's Botanical Magazine 17: t. 621 (1803a). *B. stricta* var. *stricta* G.J.Lewis: 40 (1959). *Gladiolus strictus* [Solander in] Aiton: 63 (1789). Type: South Africa, without precise locality or collector, illustration in Curtis's Botanical Magazine 17: t. 621 (1803) (neo., designated by Goldblatt & Manning 2004: 94).

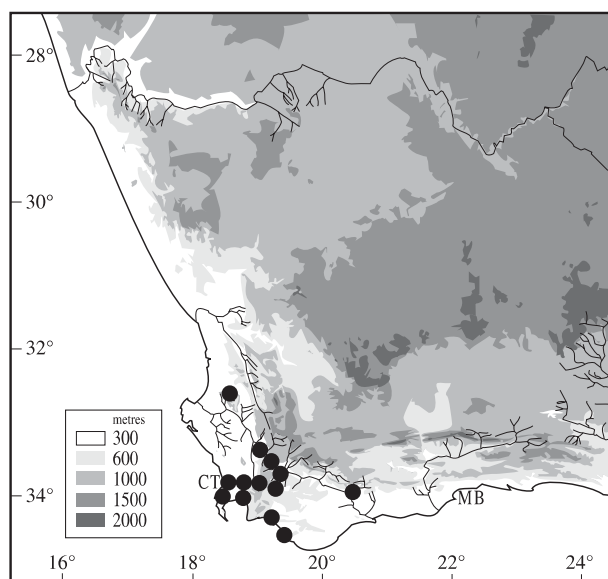
B. erectifolia G.J.Lewis: 3 (1938). *B. stricta* var. *erectifolia* (G.J.Lewis) G.J.Lewis: 43 (1959). Type: South Africa, [Western Cape], Brand Vlei, near Worcester, September 1932, G.J. Lewis s.n. (*Nat.Bot. Gard.* 2686/32 in BOL, holo.).

See Lewis (1959) for complete synonymy, but note that *Babiana sulphurea* and *B. stricta* var. *sulphurea* are listed here under excluded species.

Plants 100–200 mm high, slender; stem suberect to flexed outward, velvety, simple or branched. *Leaves* sword-shaped to almost linear, 4–7(–11) mm wide, fairly rigid and deeply pleated, short-hairy. *Bracts* mostly 8–12(–15) mm long, with dry and brown apices, inner divided to base. *Flowers* weakly zygomorphic, 4–9 in an erect spike, mauve to violet-blue, white or pale yellow, often with contrasting marks at base of lower tepals, apparently unscented or faintly violet-scented; perianth tube narrowly funnel-shaped, 8–18 mm long, widening in upper 3–4 mm; tepals subequal, 15–25 mm long. *Stamens* unilateral; filaments weakly arched or erect, 8–13 mm long; anthers arrow-shaped with broad connective wider at base, 4–7 mm long, usually dark blue-black. *Ovary* hairy; style usually dividing below anther bases, branches $\pm$ 4 mm long, expanded toward tips. *Flowering time*: mainly August to late September, but sometimes in July and in wet years as late as October. Plate 6C.

Distribution and ecology: Western Cape: from the Picketbert and Cape Peninsula eastward to Worcester and Swellendam; damp to waterlogged clay or gravelly soils in renosterveld or fynbos (Map 46).

As circumscribed here, *Babiana stricta* includes plants with narrow, deeply pleated, suberect leaves, a blue-mauve, purple-pink, or cream-coloured to pale yellow perianth, a narrow, but partly hollow perianth tube that usually contains nectar, unilateral, erect stamens with sagittate anthers that have the connective expanded in the lower half, and a short style that divides opposite the



MAP 46.—Distribution of *Babiana stricta*.

base of the anthers. Although the tepals are subequal, the lower (abaxial three) have different markings and the lower laterals, and, sometimes also the dorsal may be cream-coloured, in contrast to the other tepals which may be bluish. Lewis described the species (as var. *stricta*) as having flowers actinomorphic or nearly so with symmetrically disposed stamens, but we have not seen populations conforming to this character and we assume this is not the normal condition for *B. stricta*. The recorded range for *B. stricta* extends from the Cape Peninsula in the west, through the Worcester–Tulbagh Valleys (Lewis 1959), but we have collected plants well to the east, near Swellendam, which appears to be its eastern limit. A collection from Weltevreden at the NW base of the Piketberg (*Helme s.n.*) extends the range of the species northward a considerable distance. Plants consistently favour seasonally waterlogged, lowland habitats, either on clay or loamy sand.

Typification of *Babiana stricta* presents a problem. It was described in 1789 in *Hortus kewensis* by Daniel Solander but under William Aiton's name. The species was based on plants grown at Kew Gardens from stock introduced by Francis Masson a few years earlier. There is unfortunately no known type specimen, and Lewis (1959) designated plate 621 in *Curtis's Botanical Magazine* as the lectotype. That is unacceptable as the painting was made long after the protologue was published and cannot be considered part of the protologue, hence it is unavailable as a lectotype. As far as we can tell, however, the plant figured in *Curtis's Botanical Magazine* differs little from the original Masson introduction (and may even be the same genotype). As there seems no conflict in the interpretation of the protologue and this painting, we designate this element the neotype, thus maintaining continuity with past treatments of the species.

Babiana stricta has been much confused in the past and subjected to considerably different interpretations. Lewis (1959), who had a fair field knowledge of Western Cape *Babiana* species, recognized five taxonomic varieties. One of these, var. *regia*, is now regarded as a

separate species, *B. regia* (Goldblatt & Manning 2004). It is readily distinguished by the strongly flexed stem, actinomorphic, unscented flowers, cupped perianth, short style dividing below the level of the linear, brown anthers, unusually slender style branches, and dark blue pigmentation almost always with a dark red central eye. Var. *erectifolia* seems to us little more than a cream or yellowish colour form of typical blue-flowered subsp. *stricta*, and it is not recognized here. Plants assigned to a third variety, var. *sulphurea*, seem to us merely cream- to pale yellow-flowered variants of the broad-leaved *B. fragrans* but the type of *Gladiolus sulphureus*, the basionym, is excluded from our account because we cannot associate it with any particular species of section *Babiana*.

Lastly, the long-tubed *Babiana stricta* var. *grandiflora*, which has pale to deep mauve, unscented flowers, broad, soft-textured leaves, and long, blunt outer floral bracts, is probably closely related to *B. fragrans* (No. 74) rather than *B. stricta*. It has unscented violet to dark purple flowers marked with red at the base of the lower tepals, a perianth tube 25–30 mm long that exceeds the tepals, and unilateral stamens with linear anthers. We now treat this variety as *B. longiflora* (Goldblatt & Manning 2004).

Additional specimens examined

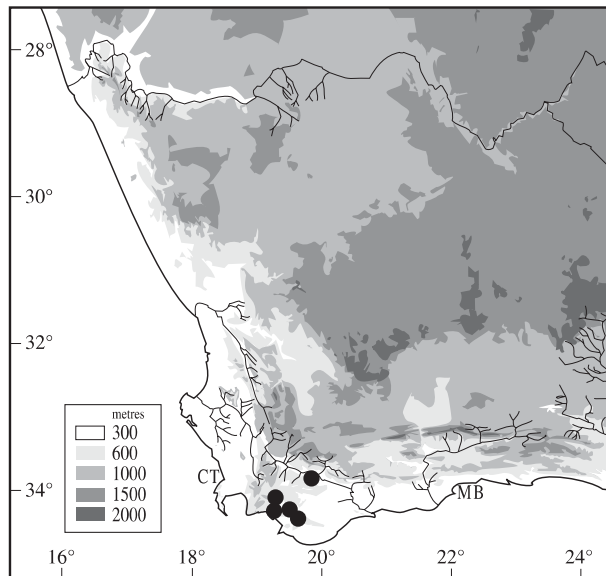
WESTERN CAPE.—3218 (Clanwilliam): Weltevreden, NW base of Piketberg, burnt shale slopes, (–DA), 15 August 2006, *Helme s.n.* (NBG). 3420 (Bredasdorp): south of Swellendam, road to Bontebok Park, light stony clay, (–AB), 26 August 2000, *Goldblatt 11434* (MO, NBG).

85. *Babiana purpurea* (Jacq.) Ker Gawl. in *Curtis's Botanical Magazine* 26: sub t. 1019 (1807a); G.J.Lewis: 47 (1959). *Ixia purpurea* Jacq.: t. 286 (1793). *Gladiolus purpureus* (Jacq.) Willd.: 198 (1797). *B. stricta* var. *purpurea* (Jacq.) Ker Gawl.: t. 1052 (1807b). Type: South Africa, without precise locality, collector or date, illustration in *Icones plantarum rariorum* 2: t. 286 (1793).

Plants 100–200 mm high; stem velvety, simple or 1–3-branched, often flexed outward, with prominent collar of fibres below ground. *Leaves* narrowly lanceolate, firm, pleated, hairy. *Bracts* 15–25 mm long, green with rust-brown tips, inner divided to base. *Flowers* weakly zygomorphic, pink to reddish purple, lower tepals with darker markings near base, faintly fragrant; perianth tube straight, cylindrical below, slightly expanded above, 18–28 mm long; tepals subequal, spreading, 18–25 mm long. *Stamens* unilateral; filaments nearly straight, 10–14 mm long; anthers arrow-shaped, parallel, connective not or hardly exposed, facing lower tepals, 6–8 mm long. *Ovary* hairy; style arching behind filaments, exceeding anthers, branches slender, with broad, bilobed tips. *Flowering time*: August–September.

Distribution and ecology: Western Cape: from Botrivier to Robertson and Bredasdorp; clay flats and slopes in renosterveld (Map 47).

Relatively common in the Caledon and Bredasdorp Districts of Western Cape, *Babiana purpurea* is found in heavy clay or clay-loam soils in renosterveld. The pink or

MAP 47.—Distribution of *Babiana purpurea*.

purple flowers at first glance appear to be actinomorphic but the stamens are unilateral and erect and the anthers are parallel, facing the lower tepals, which usually have contrasting markings near the base representing nectar guides. The dark blue to blackish anthers are arrow-shaped, suggesting a relationship with the *B. stricta* and *B. villosa* complexes of series *Strictae*. Unlike several of these species, however, the anther connectives are not visibly expanded. The flowers are evidently adapted for pollination by large anthophorine bees (*Anthophora*, Apidae) that visit the flowers in search of nectar, quantities of which are secreted from septal nectaries into the base of the perianth tube. Because of the prominent, blue-black, arrow-shaped anthers *B. purpurea* has even been treated as a variety of *B. stricta* (Ker Gawler 1807b) but we concur with Lewis in regarding *B. purpurea* as a separate species. It can be distinguished from *B. stricta* by the pink to red-purple perianth colour, perianth tube 18–28 mm long, and unusual style branches, broadly lobed at the tips, that are held beyond the anther apices. *Babiana stricta* as circumscribed here, has white to creamy yellow or blue to mauve flowers with cream-coloured markings on the lower lateral tepals, a perianth tube 10–18 mm long, and fairly short style branches up to 3 mm long, less prominently expanded at the tips. Although Lewis described the flowers of *B. purpurea* as sometimes having symmetrically disposed stamens, we have not seen any plants with such flowers, a condition which may be atypical of the species.

Babiana purpurea may also be confused with a second species of clay soils, *B. patersoniae* (No. 86), which extends from Napier and Riviersonderend to Port Elizabeth and Alexandria in Eastern Cape. That species has flowers with a longer perianth tube, 20–30 mm long, slightly flared from the base and curved near the apex, a bluish to nearly white perianth, and a strong, sweet fragrance with a strong clove component. Flowers of *B. patersoniae* may be adapted for pollination by moths, for unlike most species of the genus, the flowers remain open at night when the intense fragrance seems most powerful.

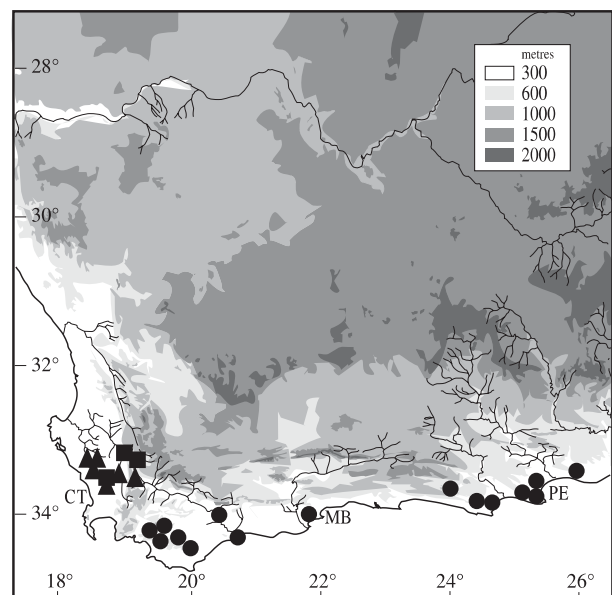
The apices of the style branches of *B. patersoniae* are also expanded but the style itself normally divides below the anther apices in contrast to that of *B. purpurea* which divides at or beyond the anther tips.

86. *Babiana patersoniae* L.Bolus in South African Gardening 21: 282 (1931); G.J.Lewis: 55 (1959). Type: South Africa, Eastern Cape, Swartkops near Port Elizabeth, cultivated in Cape Town, September 1931, F.M. Paterson 39 (BOL, holo.; K, iso.).

Plants 150–250 mm high; stem suberect, usually with 1 or 2 short branches, velvety. *Leaves* sword-shaped, firm, pleated, closely hairy. *Bracts* 12–30 mm long, green with dry brown apices, sparsely hairy, inner slightly shorter to $\pm$ half as long as outer, divided to base. *Flowers* zygomorphic, 1–5 in an erect spike, white to pale blue to mauve, lower lateral tepals partly cream-coloured to yellow, with darker red to purple markings near base, usually strongly scented of cloves, especially at night; perianth tube nearly cylindrical, slightly flared in upper half, 20–30 mm long; tepals subequal, the dorsal 16–25 $\times$ 8–11 mm, lower tepals 15–22 mm long, joined to upper laterals for 1–2 mm. *Stamens* unilateral; filaments arched, 8–12 mm long; anthers 4–5 mm long, blue to blackish, linear to $\pm$ arrow-shaped with connective expanded below; pollen cream-coloured. *Ovary* hairy in upper half; style dividing between base and middle of anthers, branches $\pm$ 4 mm long, with prominent, spatulate tips. *Flowering time*: August to October.

Distribution and ecology: Western and Eastern Cape: extending from Caledon to Alexandria; clay and loamy slopes in grassland or renosterveld (Map 48).

Extending from Caledon in Western Cape eastward along the southern Cape coastal hills to Alexandria in Eastern Cape, *Babiana patersoniae* is one of only two species of the genus that ranges across the southern coast of South Africa into Eastern Cape. Plants from the Eastern

MAP 48.—Distribution of *Babiana patersoniae*, ●; *B. melanops*, ▲; *B. villosa*, ■.

Cape tend to have longer floral bracts, up to 30 mm long, versus 12–18 mm in plants from the west of its range. In the east of its range it is readily distinguished from long-tubed and acaulescent *B. sambucina* (No. 28) (section *Teretifoliae*) by the dark blue to blackish anthers, inner bracts divided to the base, smaller tepals 15–25 mm long, and perianth tube 20–30 mm long. *Babiana sambucina* has whitish to pale mauve anthers, larger bracts, the inner forked at the tips, tepals (20–)30–35 × 6–12 mm, and a perianth tube 30–50(–60) mm long. In the west, *B. patersoniae* may be confused with *B. purpurea* (No. 85), which also has dark-coloured anthers, but a pink to purple perianth, and longer tepals relative to the tube, which is narrow below and only wider in the upper third, whereas the tube of *B. patersoniae* has a wider diameter and is gradually flared in the upper half.

Confusion is also possible with *Babiana fourcadei* (No. 52), which like *B. patersoniae*, has bracts divided to the base, but a smooth ovary, and is a more robust plant, usually bearing 3–5 short lateral branches. The intensely fragrant flowers of *B. fourcadei* have white lower lateral tepals edged distally in pale blue, long slender style branches not so obviously expanded at the tips, and a generally larger flower with the dorsal tepal 25–30 mm long.

We assume the flowers of *Babiana patersoniae* are adapted for pollination by settling moths as they remain open at night when the pale colour is easily seen and the sweet clove fragrance seems particularly intense. The perianth tube is hollow to the base and contains up to 3 µl of nectar of relatively high sugar concentration (average is 31.7% sucrose equivalents). These features are consistent with settling moth pollination in the Iridaceae (Goldblatt *et al.* 2004c). The closely related *B. purpurea* has flowers adapted for pollination by large anthophorine bees.

87. *Babiana melanops* Goldblatt & J.C.Manning, sp. nov.

Plantae 100–200 mm altae; caule velutino usitate ramoso suberecto; foliis lanceolatis plicatis dense pilosis; bracteis 16–26 mm longis, bractea interiore usque ad basem divisa; spica 6- ad 10-flora erecta, floribus actinomorpha vel staminibus unilateralibus, caeruleis vel pallide malvinis ad centrum atrantibus; tubo perianthii 16–27 mm longo, tepalis subaequalibus patentibus unguiculatis 20–27 mm longis; filamentis erectis 8–9 mm longis, antheris sagittatis vel sublinearibus 7–8 mm longis; ovario dense piloso.

TYPE.—Western Cape, 3318 (Cape Town): east-facing hill slope north of Mamre, on Darling road, (–AD), 22 August 1999, P. Goldblatt & I. Nänni 11095 (NBG, holo.; K, MO, PRE, iso.).

Plants 100–200 mm high; stem velvety hairy, usually branched, suberect, but often strongly deflexed in fruit, with thick collar of fibres below ground. *Leaves* lanceolate, pleated, densely hairy, fairly softly textured. *Bracts* 16–26 mm long, green with dry rust-brown tips, inner slightly shorter than outer, divided to base. *Flowers* actinomorphic, mostly 6–10 in an erect spike,

blue or pale mauve, tepals narrowed into claws toward base and darker in lower midline or throughout lower third, unscented or lemon-scented; perianth tube slender, 16–27 mm long, filiform below, slightly flared in upper third; tepals subequal, spreading, narrowed and claw-like below, 20–27 mm long. *Stamens* symmetrically arranged; filaments erect, 8–9 mm long, blue; anthers arrow-shaped to linear, 7–8 mm long, with connective expanded and widest at base, blackish to dark purple, sometimes turquoise on back. *Ovary* densely hairy; style dividing just below anther bases. *Flowering time*: August to early September. Figure 15, Plate 6D.

Distribution and ecology: Western Cape: extending from Tulbagh to Darling and Mamre; granitic gravel flats and slopes in renosterveld or rocky sandstone flats in fynbos (Map 48).

A puzzling species, *Babiana melanops* has long confused botanists. It most closely resembles *B. villosa* (No. 88), which also has actinomorphic flowers and prominent, blackish stamens with arrow-shaped anthers but it can be distinguished by its suberect stem, tepals spreading horizontally when fully open, and narrowed at the base ± into claws so that the perianth has small windows between the bases of adjacent tepals. The perianth is either bluish or mauve with the tepal bases darker than the tips. There are two series of populations,

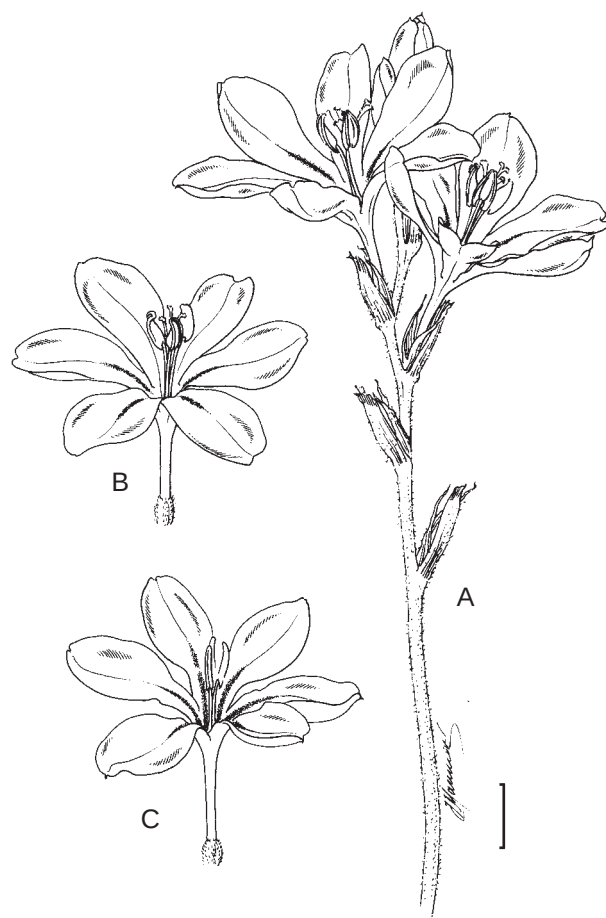


FIGURE 15.—*Babiana melanops*. A, B, flowering spike and flower of plants from Tulbagh, Goldblatt 11090 (NBG); C, flower of plant from Mamre, Goldblatt & I. Nänni 11095 (NBG), showing narrower anthers. Scale bar: 10 mm. Artist: John Manning.

one in the granitic Darling-Mamre hills interior to the west coast, and the other inland near Wellington and in the Tulbagh Valley, growing on a sandy loam, sometimes in alluvial fans of sandstone rocks.

The populations in the hills near Mamre represent an important variant, for the flowers are sweetly scented and the perianth tube contains significant amounts of nectar. Other populations that we have seen have odourless flowers and only traces of nectar at the top of a slender perianth tube that is blocked internally by the style. The flowers of the Mamre plants are pollinated by a combination of apid bees, especially *Apis mellifera* foraging for nectar, and by hopliine beetles that assemble on the flowers, mate there, and sometimes sleep in the flowers, the tepals of which close at night. As far as we have been able to determine, the unscented flowers of other populations are pollinated exclusively by hopliine beetles.

Perianth tube length is unusually variable. In the Mamre populations the tube is 16–17 mm long but in the Darling population it is 20–27 mm long. The narrow lower part of the tube is so constricted that the walls tightly enclose the style, and any nectar is forced into the wider, upper part of the tube. Tube length is thus unlikely to be selected, as plants are not visited by long-proboscid insects foraging for nectar, and length may therefore vary independently of pollinator selection. Hybrids between *B. melanops* and *B. villosa* in the Tulbagh Valley are described below.

Additional specimens examined

WESTERN CAPE.—3318 (Cape Town): hill slope north of Mamre on Darling road, (–AD), 23 August 2000, Goldblatt & Manning 11412 (NBG, MO, PRE); 22 September 1999 (fr.), Goldblatt & Nänni 11167 (K, MO, NBG, PRE); Nature Reserve, Darling, (–AD), 25 August 1999, Goldblatt & Nänni 11095A (MO, NBG). 3319 (Worcester): rocky flats between Tulbagh and Wolseley, (–AC), 18 August 1999, Goldblatt 11090 (MO, NBG, PRE).

88. *Babiana villosa* (Aiton) Ker Gawl. in Curtis's Botanical Magazine 16: t. 583 (1802b). G.J.Lewis: 37 (1959). *Ixia villosa* [Solander in] Aiton: 58 (1789). Type: South Africa, without precise locality or collector, illustration in Curtis's Botanical Magazine 16: t. 583 (1803) (neotype, here designated).

B. villosa var. *grandis* G.J.Lewis: 39 (1959), syn. nov. Type: South Africa, [Western Cape], commonage at Malmesbury, 30 August 1957, G.J. Lewis 5230 (NBG, holo.; K, iso.).

See Lewis (1959) for complete synonymy.

Plants 100–200 mm high; stem usually strongly deflexed, velvety hairy. *Leaves* lanceolate, pleated, hairy. *Bracts* 13–24(–28) mm long, green with dry brown tips, inner half to two thirds as long as outer, divided to base. *Flowers* actinomorphic, 3–8 in an ascending spike, scarlet, purple or mauve-pink, unscented; perianth tube slender, 16–28(–36) mm long; tepals subequal, ovate, 28–33 × 12–15 mm, remaining partly cupped even when fully open. *Stamens* symmetrically arranged; filaments 8–15 mm long, erect, surrounding style; anthers arrow-shaped, 7–9 mm long, up to 3 mm at widest, with

prominent connective wider in lower third, dark purple to blackish, ± latrorse. *Ovary* hairy; style dividing shortly below or opposite anther bases, branches 2–3 mm long. *Flowering time*: August to September. Plate 6E.

Distribution and ecology: Western Cape: in the Tulbagh and Malmesbury Districts; on clay or granitic gravel flats and slopes in renosterveld (Map 48).

Babiana villosa is easily recognized by the large, black, arrow-shaped anthers with a broad connective, widest in the lower third, the radially symmetrical flowers with a fairly long, filiform perianth tube, and the short style, dividing opposite the anther bases. Perhaps more striking is the perianth colour in the best known form, from the Tulbagh Valley, a brilliant scarlet not matched in any other species of the genus. The softly hairy leaves, alluded to in the specific epithet *villosa*, are, in contrast, not at all distinctive although they do serve to separate *B. villosa* from the similar *B. stricta* (No. 84), which has narrow, tightly pleated, scabrid leaves. When first described in 1786 by Daniel Solander in Aiton's *Hortus kewensis*, the species was referred to *Ixia*, in which genus the radially symmetrical flower would not have been at all unusual, but the villous leaves would have been distinctive. *Babiana villosa* was in cultivation in western Europe in the late 18th century, and plants grown in France were named *Ixia punicea* by Jacquin in 1794, *Gladiolus latifolius* by Lamarck in 1791, and *G. mucronatus* by De Candolle in 1807 (Lewis 1959). The type of *B. villosa* is an illustration in Curtis's *Botanical Magazine* in an article by Ker Gawler (1802b) in which he transferred *Ixia villosa* to *Babiana*. The plant illustrated there was evidently a descendant of the same stock cultivated at the Royal Botanic Gardens, Kew, when the plant was described by Solander. Because she could not locate a preserved specimen associated with the protologue, Lewis designated the illustration in Curtis's *Botanical Magazine* as the lectotype of *I. villosa*. That action is inadmissible, for the illustration is not an element associated with the protologue. We designate the same illustration a neotype.

Lewis (1959) treated *Babiana villosa* as comprising two varieties, var. *villosa* from the Tulbagh Valley, and var. *grandis* from the northern Paardeberg in the Malmesbury District. The latter has pink to mauve flowers and a perianth tube 30–36 mm long, whereas var. *villosa* has either brilliant scarlet or purple flowers and a tube 16–25 mm long. Although the two races are obviously different, we see no reason to recognize the longer-tubed var. *grandis* as a separate taxon. Both have blackish, arrow-shaped anthers with a broad connective, short style, and a perianth tube so narrow that the style fills the internal space and contains no nectar. They are pollinated primarily by the hopliine scarab beetles, *Anisonyx ursus* and *A. ditus* in the Malmesbury District, and *Lepithrix ornatella* and *Peritrichia rufotibialis* in the Tulbagh Valley.

Lewis included populations of what we consider a second species from west of Malmesbury, at Groenekloof, now Mamre, in *Babiana villosa* var. *villosa*. She did not realise that these plants represent an important variant,

and even suggested that the locality might be erroneous. In fact the Mamre populations, and others like them from Darling, Wellington and in the Tulbagh Valley are distinct enough to be treated as a separate species, here named *B. melanops* (No. 87). Adapted for pollination by hopliine beetles and bees, *B. melanops* has a suberect stem, flowers with the tepals narrowed into claws toward the base, and darker at the base or lower midline. The Mamre plants have scented flowers and produce nectar, but other populations of *B. melanops* do not. Lewis believed that the Tulbagh Valley plants, which she saw were different from true *B. villosa*, might be hybrids with *B. stricta*. In fact, hybrids between *B. villosa* and *B. melanops* do occur where populations of *B. villosa*, found on heavy clay, and *B. melanops*, which prefers wetter habitats, grow close together. The hybrid plants have a perianth colour intermediate between the parents and weakly deflexed stems, but they are confusing and often difficult to distinguish.

Excluded species

Babiana sulphurea (Jacq.) Ker Gawl. in J.König & Sims, *Annals of Botany* 1: 234 (1804). *Gladiolus sulphureus* Jacq. 2: t. 239 (1793). *B. stricta* var. *sulphurea*

(Jacq.) Baker: 166 (1877); G.J.Lewis: 44 (1959). Type: South Africa, without precise locality, collector or date; illustration Jacq., *Icones plantarum rariorum* 2: t. 239 (1793).

Lewis (1959) treated *Babiana sulphurea* as *B. stricta* var. *sulphurea*, one of four varieties of *B. stricta* that she recognized, distinguishing it by the yellow flowers. She associated the species with wild plants with cream-coloured to yellow flowers in the Malmesbury, Bellville and Stellenbosch Districts of Western Cape. Those plants have a nearly radially symmetrical perianth with spreading tepals, a relatively long, narrow perianth tube, and broad, softly hairy leaves, and are better referred to *B. fragrans* (called *B. plicata* by Lewis). The type specimen of *B. sulphurea*, a painting in Jacquin's *Icones plantarum rariorum*, however, is not the same as these plants. It has flowers with cupped tepals, a cream-coloured perianth and a particularly short perianth tube. Critical details of the stamens and style are not illustrated. The painting may represent one of several species, but not *B. stricta*, which has horizontally spreading or slightly cupped tepals, prominently exerted stamens, and narrow, tightly pleated leaves. Because we cannot with confidence associate the Jacquin painting with any one species we prefer to exclude it.

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In this systematic revision of the southern African genus *Babiana* (a member of the Iridaceae subfamily Crocoideae), the authors Peter Goldblatt and John Manning, recognize 88 species, a substantial increase over the 61 included in *Babiana* by G.J. Lewis in her 1959 monograph. The increase reflects the transfer of the genera *Anaclanthe* and *Antholyza*, each with a single species, to *Babiana*, the discovery of some 20 new species, and the application of a taxonomic philosophy strongly oriented toward the biology of the plants, which led to the adoption of a narrower species concept than Lewis entertained. The revision here also reflects the removal of *B. socotrana* from the genus: it is now regarded as belonging to a separate and unrelated genus, *Cyanixia*. This revision also presents a new infrageneric classification of *Babiana*, which is divided into three sections: the more generalized section *Teretifolieae* (40 species), which has inner bracts forked apically or to about the middle; the derived section *Babiana* (37 species), which has inner bracts divided to the base; and section *Antholyzoides* (11 species), which has bilabiate flowers with clawed tepals and a short perianth tube, and inner bracts divided to about the middle. Species of Lewis's section *Acaste*, which have radially symmetric flowers, are dispersed among sections *Babiana* and *Teretifolieae*, whereas her section *Scariosae* is included in section *Babiana* as an informal series. *Babiana*, as now constituted, is largely a genus of the winter rainfall zone of western South Africa and southwestern Namibia. Just two species occur in the southern African summer rainfall zone, *B. hypogaea* and *B. bainesii*, the latter widespread and extending from the Upper Karoo through Botswana and Namibia to Zimbabwe and southern Zambia.



B. minuta



B. carminea



B. patula



B. engysiphon