

Flowering Plants of Africa

Volume 61

June 2009



Flowering Plants of Africa

Since its inception in 1921, this serial, modelled on the former *Curtis's Botanical Magazine*, has published well over 2 000 colour plates of African plants prepared by some 80 artists.

The object of the serial is to convey to the reader the beauty and variety of form of the African flora, to stimulate an interest in the study, conservation and cultivation of African plants and to advance the science of botany as well as botanical art.

The illustrations are mostly prepared by artists on the staff of the South African National Biodiversity Institute, but we welcome other contributions of suitable artistic and scientific merit. Please see *Guide for authors and artists* on page 145.

A list of available back issues is given in the current *Publications Catalogue* of the Institute and on the website www.sanbi.org. Copies of this serial and of the *Catalogue* are obtainable from the Bookshop, South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

History of this series

(note Afrikaans translation and changes in title)

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Flowering Plants of Africa

Flowering Plants of Africa

A magazine containing colour plates with descriptions of
flowering plants of Africa and neighbouring islands

Edited by

G. Germishuizen

with assistance of

E. du Plessis and G.S. Condy

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Pretoria
2009

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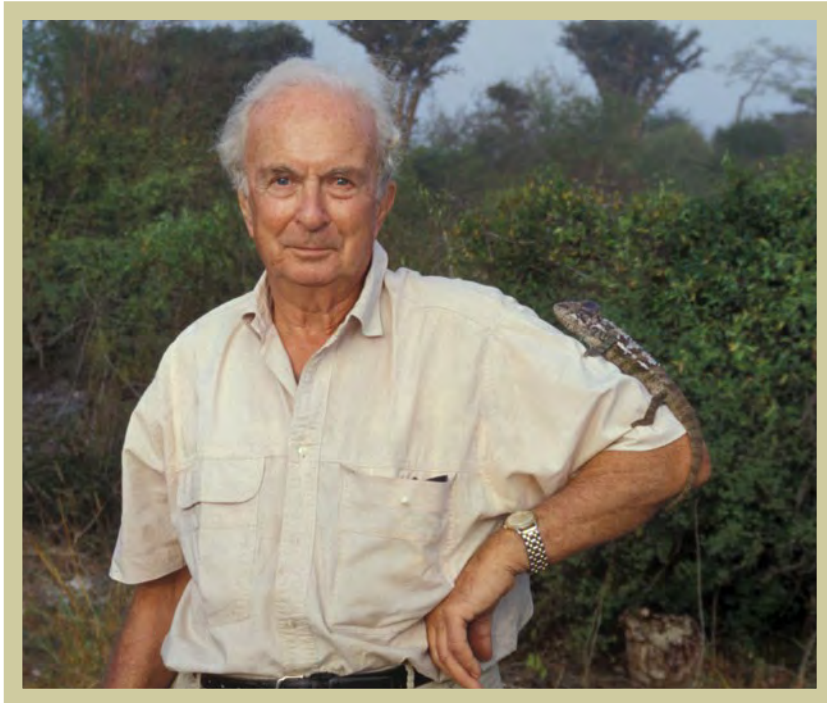
New taxon published in this volume

Thorncroftia greenii K.Changwe & K.Balkwill, sp. nov., p. 112

This volume is dedicated to

JOHN LAVRANOS

Citizen of the succulent world.



John Lavranos with a chameleon, *Furcifer verrucosus*, in southern Madagascar in May 2003. Photographer: Tom McCoy.

Over a period of more than 50 years John has contributed extensively to our knowledge of particularly the succulents of Africa, Saudi Arabia, Madagascar and beyond. Through his exploration of previously remote and inaccessible areas, dozens of new species have been discovered and described. Even as an octogenarian his intrepid global explorations, now extending to several continents, are continuing unabated.

John collaborates freely and easily and has assisted scores of emerging and established plant diversity scientists in their quest to improve our understanding of the natural world, particularly species relationships. His exploration feats have inspired generations of natural historians and he remains a popular lecturer at international conventions.



PLATE 2241 *Aloe pronkii*

Aloe pronkii

Asphodelaceae

Madagascar

Aloe pronkii Lavranos, Rakouth & T.A.McCoy in Cactus & Succulent Journal (U.S.) 78: 198–200 (2006).

In August of 1960, The Secretaries of the Linnean Society of London made special mention of Dr Gilbert Reynolds for his having ‘travelled more miles in Africa in search of (*Aloe*) plants than any other plant collector living or dead’ (Reynolds 1966). The astonishing distance travelled by this prolific contributor to *Aloe* taxonomy exceeded 64 000 km, which included his 1955 sojourn on the *Ile Rouge*, the Red Island. This was arranged by the Institut Scientifique de Madagascar, Tsimbazaza, in Antananarivo. During his period in Madagascar he sought out aloes at their type localities and wherever else he could find them, managing to traverse the island, working the northwest, the central highlands and the more arid south, in which region he appears to have focussed his collecting activities (Reynolds 1958).

Following the description by Reynolds of several Malagasy novelties shortly thereafter, and still more by Prof. Werner Rauh, a total of 46 species (plus 15 varieties) were enumerated for this Indian Ocean island by the time of Reynolds’s landmark work, published in 1966. Reynolds at that point remarked, ‘I believe there are still a few species of *Aloe* in Madagascar awaiting discovery and description’. This was a substantial underestimation, for within 40 years the number has approximately doubled. In fairness to Reynolds, a single fieldtrip to the fourth largest island in the world (at 587 000 km²)—and an inaccessible one at that—could hardly do it justice!

The diversity of xeric and mesic habitats in Madagascar is remarkable: ‘tsingy’ limestone massifs of knife-edge pinnacles, quartzitic highlands, the desolate sandstones of the Isalo Mountains and much else besides (Preston-Mafham 1991). These various sites sustain a tremendous diversity of aloes, many highly localised in their distribution, and only recently brought to light (see for example Lavranos *et al.* 2007). The tremendous improvement in our understanding of the diversity of Malagasy aloes in the last few decades can be attributed largely to John J. Lavranos, botanist extraordinaire, adventurer and consummate contributor of numerous scientific publications and the herbarium vouchers that underpin them. To date, over 32 000 collections have been made by Lavranos. Seldom is it that a monograph or floristic treatment of African succulents is produced that does not necessarily cite his interesting specimens—especially in the Asphodelaceae, Euphorbiaceae and Apocynaceae (Stapeliaceae, the succulent stapeliads) (e.g. Dyer 1983).

Given the rate of discovery of aloes in Madagascar in recent decades, this island may yet prove to be the hottest of *Aloe* hotspots. Currently, this exclusively Old World

PLATE 2241.—1, habit, × 1; 2, ripe fruit, × 1.5; 3, open capsule and seeds, × 1.5. Voucher specimen: Smith & Figueiredo 1 in National Herbarium, Pretoria. Artist: Gillian Condy.

genus is known to be most speciose in South Africa, with about 150 indigenous representatives (Van Wyk & Smith 2004); the other significant present-day regions of diversity—eastern Africa and Saudi Arabia—lag behind somewhat in the richness stakes (Smith & Van Wyk 2008).

Probably the best way to describe the vegetative appearance of *Aloe pronkii* is to imagine it as a hypothetical hybrid of two other alooids, both South African in this instance: *Aloe bowiea* and *Chortolirion angolense*. The latter has earlier featured (as *C. stenophyllum*) in *The Flowering Plants of South Africa* (Plate 932), while the miniature *A. bowiea* has also been figured (Plate 2096). The slender, but distinctly succulent leaves of Pronk's aloe are grass-like and carried in a lax, open tuft as shown on the accompanying plate. The flowers are reminiscent of those of the exclusively karroid genus *Astroloba* (Aloioideae), except that they are red with white apical portions.

In the protologue of *Aloe pronkii*, Lavranos *et al.* (2006) reflected on the ease with which this species can be cultivated. That it is one of the easiest of the miniature Malagasy *Aloe* species to grow, has been confirmed by the present authors. When planted in a well-drained, friable potting mixture, plants soon establish themselves, developing new leaves within a matter of weeks. Since plants remain solitary, propagation is necessarily from seed; fortunately, plants appear to be weakly self-fertile—an obliging feature given the scarcity of *A. pronkii* specimens in cultivation. This is a truly delightful little aloe to grow. It is exceedingly tolerant of varying rainfall regimes and different soil types. Temperature-wise it has shown no damage whatsoever from exposure to temperatures of as low as -4°C and as high as 38°C. Plants have flowered in Pretoria after 18 months in pot culture—the inflorescence matured slowly and the plant remained in bloom for over two months from mid- to late summer.

Unlike most African and several Malagasy aloes, *Aloe pronkii* does not flower in winter, behaving phenologically much like the graminoid aloes with which South Africa is so well endowed. Such grass aloes are an artificial construct comprising sections *Graminialoe* and *Leptoaloe*, to which *A. pronkii* does not belong. Nor for that matter are there any representatives of either of these sections in Madagascar (Reynolds 1966). The true taxonomic affinities of Pronk's aloe remain uncertain, although Lavranos *et al.* (2006) have suggested that it could be related to *Aloe parvula* (= *Lemeea parvula*; but see Smith *et al.* 1995). Notably, Reynolds (1966) had earlier related the vegetative form of *A. parvula* to the South African *A. humilis*, but acknowledged that the flowers were different in all ways.

The species was named for Mr Olaf Pronk of Antananarivo, the capital of Madagascar. Olaf operates a nursery here, and through his interest in the island's natural history and flora has brought numerous alooid novelties to the attention of John Lavranos and his co-workers.

Mr John J. Lavranos, primary author of the name *Aloe pronkii*, has contributed extensively to our knowledge of succulents in general and aloes in particular. This paper and indeed the entire 61st volume of *Flowering Plants of Africa* is respectfully

dedicated to him in his 84th year. John spent four decades in South Africa while working in commerce, but expressed throughout this period a healthy appetite for exploring little-known and remote succulent-rich areas, particularly in Africa and Madagascar. It is fitting that in honour of his scholarly contribution on the aloes of Arabia (Lavranos 1965), Reynolds in 1964 named *A. lavranosii* for him. This Yemenese species hails from the Amiri Highlands near Dhala to the north of Aden, from where Lavranos collected the type.

Aloe pronkii is endemic to the mountainous central highlands of Madagascar (Figure 1), in the province of Antananarivo, where it occurs together with other succulents. The type was collected in the quartzitic mountains west of Antsirabe, east of the small town of Vatogana, at an altitude of approximately 1 500 m. Plants are here exposed to a temperate climate, with light frosts in winter and high precipitation in the form of summer rain and mist. The thin soils in which it grows are acidic in character, derived as they are from quartzitic bedrock (Lavranos *et al.* 2006).

Description.—Miniature, slow-growing, succulent, perennial herb, solitary, not forming clusters, consisting of a miniature to small, laxly foliate, open rosette, 60–80 mm diam., 80–100 mm tall. *Roots* thickened, spindle-shaped, tapering to both ends. *Stems* absent or very short, then subterranean. *Leaves* numerous, rosulate, succulent but thin, grass-like, attenuate, gradually tapering to nonpungent apex, 80–100 mm long, 4–5 mm broad at base, basally sheathing, erect to outwardly slightly spreading, especially when young, apex dry, not reflexed, fresh leaves not bleeding when damaged, cut surface drying opaquely greenish brown, dry leaves easily abscising; upper surface flat to convex, not canaliculate, uniformly dull midgreen to brownish green, spots absent, very finely tuberculate, rough to the touch; lower surface convex, uniformly dull midgreen; margins lacking a whitish or brownish, translucent edge, armed with very fine, saw-tooth-like, nonpungent teeth; teeth white, straight, 0.5 mm long, closely spaced, 0.2–0.5 mm distant, \pm evenly spaced. *Inflorescence* a simple, unbranched, solitary raceme, 150–200 mm tall. *Peduncle* basally rounded, 2.0–2.5 mm broad at base, matt dull green lower down, reddish pink along flowering portion, sterile bracteate, sterile bracts up to 6 mm long, 1.5–2.0 mm broad at base, perched on a swollen red base, thin, scarious, few-veined, whitish green lower down on peduncle, light brown to straw-coloured higher up. *Racemes* distinctly cylindrical, laxly flowered, flowering portion up to 130 mm long; buds suberect, hori-

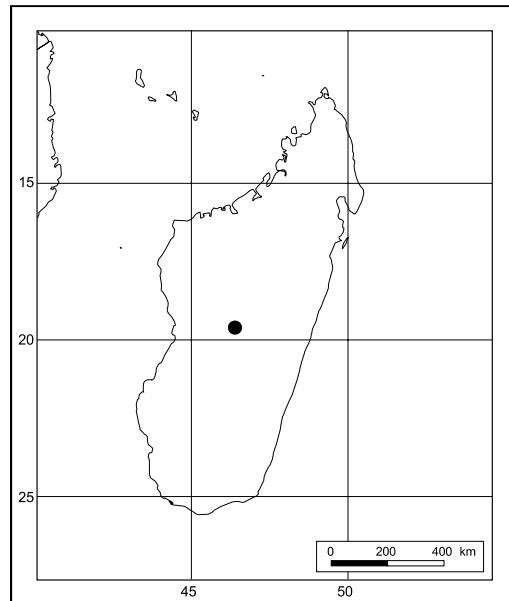


FIGURE 1.—Known distribution of *Aloe pronkii*.

zontal or subpendulous, not congested at apex, lowest open flowers pendulous to subpendulous. *Bracts* amplexicaul, small, thin, 2–5 mm long, scarious, dirty brownish white, margins the same colour. *Pedicels* 5–7 mm long, pinkish red. *Flowers* cylindrical-trigonous, 10–15 mm long, bicoloured, buds with greenish white tips, open flowers deep reddish pink to scarlet, with white, flared tips; mature flowers cigar-shaped, 3–5 mm diam. in middle, tapering towards throat, but with wide open mouth; outer segments free for half their length, free portion with 1 distinct, central, red section, with broad white border and rounded, recurved apex; inner segments broader than outer ones, with broad white border and similarly rounded, obtuse, spreading apex, dorsally adnate to outer ones for their greater length. *Anthers* 6, hypogynous, included. *Ovary* 3 mm long, 2 mm diam., pinkish; style and stigma small, included. *Fruit* a cylindrical-oblong capsule, 12–15 × 7–8 mm, erect, matt light green, turning purplish when maturing, apically truncate, trilobular, dehiscing loculicidally, chartaceous to woody when dry, for some time wrapped in remains of dry perigone. *Seeds* few per capsule, short, 3.5 × 1.5–2.0 mm, whitish grey wings present. *Chromosome number*: unknown. Plate 2241.

REFERENCES

- DYER, R.A. 1983. *Ceropegia, Brachystelma and Riocreuxia in southern Africa*. Balkema, Rotterdam.
- LAVRANOS, J.J. 1965. Notes on aloes of Arabia with descriptions of six new species. *Journal of South African Botany* 31: 55–81.
- LAVRANOS, J.J., RAKOUTH, B. & McCOY, T.A. 2006. *Aloe pronkii*. A most remarkable dwarf species from the Malagasy highlands. *Cactus & Succulent Journal (U.S.)* 78: 198–200.
- LAVRANOS, J.J., RAKOUTH, B. & McCOY, T.A. 2007. *Aloe argyrostachys*, a beautiful new species from the mountains of central Madagascar. *Bradleya* 25: 17–20.
- PRESTON-MAFHAM, K. 1991. *Madagascar. A natural history*. Struik, Cape Town.
- REYNOLDS, G.W. 1958. Les aloes de Madagascar. *Le Naturaliste Malgache* Tome 10, volume hors-serie.
- REYNOLDS, G.W. 1964. A new *Aloe* from S-W. Arabia. *Journal of South African Botany* 30: 225–227.
- REYNOLDS, G.W. 1966. *The aloes of tropical Africa and Madagascar*. Trustees of the Aloes Book Fund, Mbabane.
- SMITH, G.F., MÖSSMER, M., VAN WYK, B.-E. & VILJOEN, A. 1995. The taxonomy of *Aloinella*, *Guillauminia* and *Lemea* (Aloaceae). *Taxon* 44: 513–517.
- SMITH, G.F. & VAN WYK, B. [A.E.] 2008. *Aloes in southern Africa*. Struik, Cape Town.
- VAN WYK, B.-E. & SMITH, G. [G.F.] 2004. *Guide to the aloes of South Africa*, expanded edn 2. Briza, Pretoria.

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PLATE 2242 *Aloe vossii*

Aloe vossii

Asphodelaceae: Alooideae

South Africa

Aloe vossii Reynolds in Journal of South African Botany 2: 65–68 (1936); Reynolds: 136, 137 (1950, and same pages of the 1969, 1974 and 1982 editions); Jacobsen: 212 (1960); Jeppe: 123, 124 (1969, and same pages of the 1974 edition and 1977 impression); Bornman & Hardy: 28, 29 (1971); Jacobsen: 102 (1974); Willis & Willis: 34–37 (1995); Van Wyk & Smith: 296, 297 (1996, and same pages of the 2003 edition); Glen & Hardy: 17, 18 (2000); Craib: 119–122 (2005).

Within a large genus of some 550 taxa worldwide, *Aloe* displays a remarkably diverse array of life forms—from tall, dichotomously branched trees that dominate the landscape to acaulescent grass-like dwarfs that hide beneath short grassy swards. The subject of this account is one of the smaller taxa, *A. vossii*, a member of a group of species widely known as the grass or graminoid aloes, named rather for their robust grass-like appearance than for their preferred grassland habitat.

Aloe is an Old World genus with its centre of highest diversity in southern Africa, particularly South Africa, which boasts 150-odd species. Even though other species-rich centres occur in Madagascar, East Africa, the East-Afro Arc of tropical southern Africa and the Arabian Peninsula (Van Wyk & Smith 1996), it is primarily in the south of its range that we encounter the leptoaloes, section *Leptoaloe* (here excluding section *Graminialoe*). *Aloe vossii* is a leptoaloe.

Leptoaloes and some other grass aloes collectively exhibit the following key characters: inflorescences that are usually unbranched and produced in the summer rather than winter months, roots that are spindle-shaped (being swollen in the centre and tapering towards both the origin and extremity), and fleshy, semisucculent leaves that are long and narrow, sometimes with white spots that predominate on the underside. Grass aloe leaves do not exude the yellow, purgative, aloin-containing juice so typical of other aloes. Instead of anthraquinone glycosides, *Aloe vossii* and its relatives have flavonoids as main phenolic compounds in the leaves, with a flavone called isovitexin as the main compound (Viljoen *et al.* 1998).

They occur typically at higher altitudes in cool, moister climatic regimes in the eastern summer-rainfall region; none are known from the arid western regions of South Africa, or for that matter from neighbouring Namibia (Jankowitz 1975). About 30 leptoaloes and other grass aloes are recognised from South Africa alone (Van Wyk & Smith 1996; Smith 2003; Craib 2005; Van Jaarsveld & Van Wyk 2006), with Reynolds (1966) documenting a meagre 12 species from tropical Africa, and none at all from the Red Isle, Madagascar. Nine of the 12 are found close to South Africa, in the eastern highlands of Zimbabwe / western highlands of Mozambique (West 1974). In the light of the five grass aloes found in the Chimanimanis, Reynolds (1966) some-

PLATE 2242.—1, habit, × 0.5; 2, raceme, × 0.5; 3, sterile peduncle bract, × 1. Voucher specimen: Crafford, Smith & Klopffer 1 in National Herbarium, Pretoria. Artist: Sibonelo Chiliza.

what effusively described this mountain range as ‘a botanical treasure-house’ (Van Wyk & Smith 2001). Travel still further north and one finds only a couple more graminoid aloes endemic to south-central Africa, and just three occurring as far up as East Africa—the extremely widespread graminialoe *Aloe myriacantha* and the lept aloes *A. nuttii* and *A. buchananii* (Reynolds 1966). Generally speaking, the lept aloes and grass aloes require rather specialised environmental conditions and this may account for the fact that none have yet been recorded naturalised. This is not the case for several nongraminoid aloes such as *A. vera* (section *Purpurascentes*), *A. arborescens* (section *Arborescentes*) and others (Walters 1984) which have, through the agency of man, invaded sites in South America, the Caribbean Islands, the Mediterranean, Australia, India and China.

Aloe vossii was first brought to the notice of Gilbert Reynolds following its collection by Mr Harold Voss in 1927, at an altitude of 1 230 m some 8 km north of the town of Louis Trichardt. Reynolds (1936) accordingly named it for Voss, taking him to have been the first to collect it. However, herbarium records (*PRE 112443*) show that this species was actually first gathered from the Soutpansberg by Dr Herman Breijer in 1919, towards the end of his tenure as director of the Transvaal Museum (Gunn & Codd 1981). Subsequent gatherings have confirmed a narrowly restricted distribution range for this species (Figure 1), which grows only on the upper slopes of this mountain range, within the Soutpansberg Centre of Plant Endemism (Van Wyk & Smith 2001), in Soutpansberg Summit Sourveld (Mucina *et al.* 2006) and to a lesser extent in the adjacent Soutpansberg Mountain Bushveld (Rutherford *et al.* 2006). Most rainfall in the Soutpansberg is received in January (midsummer), just prior to the peak flowering of Voss’s aloe, with 1 250 mm recorded as an annual mean at the type locality. In summer, plants are also routinely exposed to precipitation in the form of dense mist. While plants may occasionally be subjected to subzero temperatures (to -4°C), the average temperature is a comparatively mild 3°C in the coldest and 28°C in the hottest month (Bornman & Hardy 1971).

Plants of Voss’s aloe grow singly or in small clumps on sandy, acidic soils (Willis & Willis 1995), historically at altitudes of between 930–1 680 m. This species prefers grassy southern and western slopes, being found only rarely on the drier northern slopes of the Soutpansberg range (Craib 2005). Plants associated with *Aloe vossii* in habitat include *Aloe swynnertonii*, *Englerophytum magalismsontanum*, *Hemizygia obermeyerae*, *Leucosidea sericea*, *Maesa lanceolata*, *Morella pilulifera*, *Protea caffra*, *Pteridium aquilinum*, *Rothmannia capensis* and *Searsia chirindensis* (Willis & Willis 1995; Hahn 2000). It is with *Aloe vogtsii*, a striking

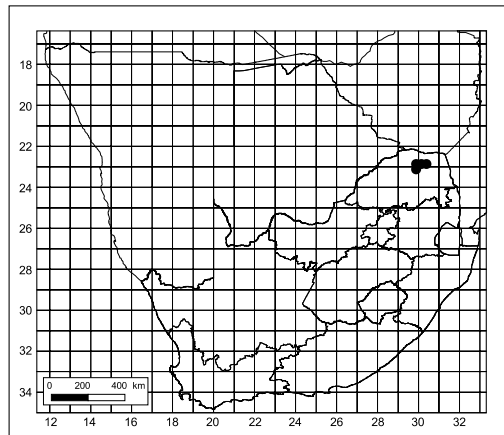


FIGURE 1.—Known distribution of *Aloe vossii*.

member of section *Pictae* and another Soutpansberg Centre endemic, that a natural hybrid with *A. vossii* has been recorded (Reynolds 1950).

Field observations by Craib (2005) have revealed that rocky open grassland is the preferred habitat of our species, although subpopulations have for the most part been destroyed by the plantation forestry industry, primarily through planting up with *Eucalyptus*. Subpopulation remnants of Voss's aloe today survive in the ecotone between the plantations and indigenous forest, generally very rocky terrain—evidently suboptimal habitat given that plants here never clump profusely, as they do in open rocky grassland. On shallower rock sheets and pronouncedly rocky outcrops, the plants grow with their roots wedged tightly into the soil-filled fissures. Only where the soil is deeper do plants grow to full size (Craib 2005). Here amongst the rocks they receive some measure of protection from excessive fires (Willis & Willis 1995). Occasional fire is, however, deemed beneficial for *Aloe vossii*, but given the density and proximity of commercial plantations on the Soutpansberg, such fires are actively prevented (Craib 2005). Should these plantations, which have already wholly transformed most suitable *A. vossii* habitat (Craib 2005), be removed at some stage, it is highly unlikely that this aloe would ever recolonise and recover fully (Smith *et al.* 2000).

When not in bloom, plants are difficult to notice, for with their narrow grass-like leaves they are well camouflaged amongst pooid species, especially as they are semi-deciduous. When in flower, they are most certainly obvious, at least to those who are not red-green colour blind! The head-shaped racemes are presented on erect flowering stalks some 0.5 m tall, just slightly shorter than the longest leaves. Often a second inflorescence will follow the first, with flowering peaking during the months of February and March, although some heads may appear as early as November. Within the slightly conical head of flowers, the uppermost buds are found tightly packed and upright while the lowermost mature ones hang pendulously from their pedicels, each tubular bloom about 30 mm long, orange to flame-scarlet, and narrowing slightly towards the green tips. Pollinators have not yet been observed, although sunbirds probably fulfil this role (Willis & Willis 1995).

As seed capsules can take months to mature (Craib 2005), they are often encountered green rather than their eventual dark grey-brown, accounting for their being originally described as green by Reynolds (1936). At 0.5 m, the leaves are relatively long for a grass aloe, narrowing gradually from a 30 mm wide base and becoming channelled and marginally incurved along their length. Both upper and lower leaf surfaces are a deep yellowish green, both covered in elongated white spots, particularly at the base on the underside. The thin white margins are armed with rather innocuous white deltoid teeth, becoming much smaller towards the leaf apex. Plants are stemless or produce a short stem up to 150 mm tall.

Although several other aloe species are confined to the Soutpansberg Centre and general range of *Aloe vossii*, only one of them is classified as a true grass aloe—*A. soutpansbergensis*. However, it is the spectacular *A. angelica*, a single-stemmed species at times towering above the surrounding vegetation, for which the Soutpansberg

is best known to *Aloe* enthusiasts. Of the grass aloes with which Voss's aloe may be confused, *A. soutpansbergensis* is readily distinguishable on account of its smaller stature, shorter leaves and peduncles, and less floriferous racemes (only 8–20 flowers) bearing apricot-orange flowers. The inflorescences of *A. soutpansbergensis* are subcapitate rather than capitate, and tend to be angled rather than erect, and its stems attain a length of only 60 mm.

However, the closest ally of *Aloe vossii* would appear to be *A. verecunda* (Reynolds 1936) which has never been found growing sympatrically, its closest known locality being in the Wolkberg \pm 95 km to the south. Although it is claimed that *A. verecunda* reaches the Soutpansberg (see distribution map in Glen & Hardy 2000), the specimen on which this interpretation is based (*T. Bauling s.n.* in the National Herbarium, Pretoria) is dubiously an aberrant form of *A. vossii*. This ally requires a cooler climate than *A. vossii* and accordingly its distribution is centred on the Gauteng highveld (Glen & Hardy 2000). Reynolds (1936) separated *A. vossii* from *A. verecunda* on account of the arrangement and characters of leaves, and their spots: the leaves of *A. vossii* are rosulate rather than distichous or (rarely) subrosulate; these organs of the Soutpansberg endemic are longer, broader and a deeper yellowish green, and their spots are larger and more copious on both surfaces. The spots are particularly diagnostic in *A. vossii* for they are subtuberculate with a terminal, short white spine, particularly evident on the abaxial leaf surface. This feature is shared with *A. micracantha* from the Eastern Cape, but absent in both *A. verecunda* and *A. soutpansbergensis*. Another singular *A. vossii* feature is its sterile peduncle bracts, the lowermost of which can sometimes attain a length of 120 mm. These fleshy bracts have dentate margins towards the apex and are green with hard, raised spinulescent spots—equivalent bracts are quite dissimilar in the aforementioned grass aloes. It was the experience of Craib (2005) that sometimes only leaf characters were useful in distinguishing *A. vossii* from *A. verecunda*, leading him to suggest that *A. vossii* may yet prove a mere ecotype of *A. verecunda*, a view not shared by the present authors. Craib (1996) had earlier reported that *A. verecunda* plants from 'The Downs' in Limpopo and from near Piet Retief in Mpumalanga possess virtually indistinguishable habits, leaves and flowers. Craib (2005) also drew attention to the floral similarities between *A. vossii* and *A. fouriei*, further questioning the validity of current species boundaries.

Some 30 years after its discovery by Breijer, Reynolds (1950) reported that *Aloe vossii* was still known only from a small area to the east and west of a then well-known landmark—the Mountain Inn—situated alongside the main road (N1) that bisects the central Soutpansberg. Willis & Willis (1995) directly related its distribution to the mist belt at that altitude. Subsequently, Craib (2005) noted further populations at both western and eastern ends of the Soutpansberg, and on its highest peak, Lejuma. Field observations have revealed that regeneration from seed is poor, attributed to both insect parasitism of seeds *in situ* (Willis & Willis 1995) and the out-competing of seedlings by alien weeds (Craib 2005). By 1971, Bornman & Hardy reported that though once common, the numbers of Voss's aloe had decreased significantly owing to habitat degradation, which they related to silvicultural and agricultural activities. Willis & Willis (1995), in considering subpopulations on plantation

forestry properties, additionally recorded bush encroachment, inappropriate burning practices and trampling by cattle as factors threatening this graminoid aloe. For plants growing in a marginal habitat, Craib (2005) also cited too frequent fires as a cause of vegetation transformation, evidenced by the overwhelming invasion by bracken (*Pteridium aquilinum*).

In view of these various new threats, Smith *et al.* (2000) upgraded the Red Data List status of *Aloe vossii* from Rare (Hilton-Taylor & Smith 1994) to Endangered (B1+2bcde), applying criteria of the World Conservation Union (IUCN 1994). A subsequent unpublished but thorough report on *A. vossii* by Hahn (2000) upgraded this status to Vulnerable (D2 + E). This more recent status was based on extensive fieldwork during which a total of 3 324 plants were found, in 16 subpopulations with a total area of occupancy of less than 11 ha. Its injudicious and illegal collection from the wild for the local and international trade in succulent plant species necessitated its inclusion in Appendix I of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) in 1975, one of only five southern Africa succulents so listed (CITES 1998; Hilton-Taylor 1998; Smith *et al.* 2000; Hahn 2002). In 2002 the species was reported still traded as wild-collected plants (CITES 2002), despite Newton & Chan (1998) not mentioning this species in their extensive TRAFFIC (Trade Records Analysis of Flora and Fauna in Commerce) report on regional succulents. On a more positive note, Craib (2005) has reported an increase in the number of Soutpansberg farms converting to game reserves, in which case *A. vossii* could be afforded a degree of protection beyond mere paper regulations. However, Hahn (2000) documented only one relatively secluded subpopulation that occurs in undisturbed habitat on private land.

After growing the type material in Johannesburg for a period, Reynolds (1936) was able to report that *Aloe vossii* was well worth cultivating. However, this species has not been introduced widely into horticulture and accordingly remains quite poorly known to succulent enthusiasts (Van Wyk & Smith 1996). Bornman & Hardy (1971) described it as reasonably easy to cultivate, preferring to grow it as a pot plant. They observed its requirement for frequent watering in summer and protection from frost in winter, while Craib (2005) reported that under colder growing conditions Voss's aloe is prone to express its semi-deciduous character. Craib (2005) described it as one of the easiest grass aloes to cultivate, noting that it thrived in cultivation if placed in undisturbed sunny or semishaded beds in the garden, especially in sloping, well-drained and well-ventilated situations, or in large containers. He found the species to grow easily from seed sown in summer or early autumn, taking as few as three years to flower for the first time and only five years to start clumping. Aside from seed propagation, Craib (2005) further documented the ease with which stem cuttings can be struck in coarse gravelly sand. These cuttings should be taken in spring from semihardwood stem sections cut at an angle, with all leaves longer than 60 mm removed. Planting in the rooting medium should be undertaken only after drying off to seal the wound (Craib 1996); thereafter new root systems take a month or two to develop. On cultivation challenges, Craib (2005) registered mealy bugs on roots of potted plants, and damping off of seedlings

under hot, humid conditions, in both of which instances pesticide interventions are required.

The plant figured here was given to one of us (GFS) by Mr Jan Crafford. He has contributed extensively to general information on the natural history of the Soutpansberg.

Description.—Herbaceous succulent perennial, stemless or very shortly caulescent (up to 150 mm), solitary or suckering to form small clumps of up to 6 stems. *Roots* spindle-shaped. *Leaves* 14–20, multifarious, lorate, gradually attenuate, 250–500 mm long, 7–30 mm broad at base, suberect to flaccid, fleshy; upper surface concave towards base, acroscopically more caniculate, deep green with several scattered elongate, narrow, white spots, spots occasionally subtuberculate and spinulose; lower surface convex, copiously spotted near base, spots gradually more distant upwards, basal spots rounder, those above more elongate, spots with a hard tubercular excrescence and frequently with a short firm white spine; margins with extremely narrow thin white cartilaginous edge, armed; teeth white, deltoid, up to 2 mm long, 2–4 mm distant towards base, gradually smaller upwards, minute at apex, sometimes bifid. *Leaf sap* clear. *Inflorescence* simple, up to 500 mm tall, usually a little shorter than the longest leaves, a second one appearing after the first. *Peduncle* 275–500 × 8–10 mm, flattened low down, terete above, copiously sterile bracteate from about the middle; lowest bract up to 120 × 14 mm, fleshy, leaf-like, ± 7-veined, margins dentate near apex, sometimes with a few subtuberculate, subspinescent white spots; sterile bracts gradually smaller upwards, sometimes subimbricate, those above ovate-acute, up to 20 × 10 mm, amplexicaul, rather fleshy, green, veins not visible, margins with distinct white border. *Racemes* capitate, up to 45-flowered, ± 80 × 70 mm, very slightly conical, buds densely congested and slightly shorter than their bracts, open flowers lax, cernuous, becoming erect after pollination. *Bracts* ovate-acute, 16 × 11 mm, clasping pedicels, rather fleshy, green with white margin. *Pedicels* green, 17–30 mm long, 40 mm long in fruit. *Flowers* orange to scarlet, green-tipped, cylindric-trigonous, 20–30 × 8–9 mm at base, narrowing slightly to throat, base rotund and shortly stipitate; outer segments free to base, obscurely veined, apices greenish, subobtuse, slightly spreading; inner segments free, narrower at base and broader near apex than the outer, with a slight keel pale orange over its greater length, margins thin, white, apices greenish and more obtuse and slightly more spreading than the outer. *Stamens* 6, hypogynous; filaments flattened, inner 3 narrower and lengthening before outer 3; anthers not or very shortly (1 mm) exerted. *Ovary* 6–7 × 2.5 mm, finely 6-grooved, green; stigma exerted 1 mm. *Fruit* a capsule, 28 × 12 mm, finely 6-grooved, dark grey-brown, dehiscing loculicidally. *Seed* laterally compressed. *Chromosome number*: $2n = 14$ (Brandham 1971). Plate 2242.

REFERENCES

- BORNMAN, H. & HARDY, D.S. 1971. *Aloes of the South African veld*. Voortrekkerpers, Johannesburg.
BRANDHAM, P.E. 1971. The chromosomes of the Liliaceae: II. Polyploidy and karyotype variation in the Aloineae. *Kew Bulletin* 25,2: 381–399.

- CITES. 1998. *Checklist of CITES species*. World Conservation Monitoring Centre, Cambridge, UK.
- CITES. 2002. *Report of the Chairman of the Plants Committee* (SC46 Doc. 22). Forty-sixth meeting of the Standing Committee, Geneva (Switzerland), 12–15 March 2002. <http://www.cites.org/eng/com/SC/46/46-22.pdf> (accessed April 2008).
- CRAIB, C. 1996. Grass aloe populations in eastern South Africa. *Haseltonia* 4: 1–12.
- CRAIB, C. 2005. *Grass aloes in the South African veld*. Umdaus Press, Hatfield, Pretoria.
- GLEN, H.F. & HARDY, D.S. 2000. Aloaceae (First part): *Aloe*. *Flora of southern Africa* 5,1: 1–167.
- GUNN, M. & CODD, L.E. 1981. *Botanical exploration of southern Africa*. Balkema, Cape Town.
- HAHN, N. 2000. *Field assessment of Aloe vossii*. Unpublished report. National Botanical Institute and British Cactus and Succulent Society.
- HAHN, N. 2002. *Endemic flora of the Soutpansberg*. M.Sc. thesis, University of Natal, Pietermaritzburg.
- HILTON-TAYLOR, C. 1998. Southern Africa. In S. Oldfield, *Cactus and succulent plants—status survey and conservation action plan*: 67–84. IUCN/SSC Cactus and Succulent Specialist Group. IUCN, Gland, Switzerland, and Cambridge, UK.
- HILTON-TAYLOR, C. & SMITH, G.F. 1994. The conservation status of Aloaceae in southern Africa. In B.J. Huntley, *Botanical diversity in southern Africa*. *Strelitzia* 1: 287–303.
- IUCN. 1994. *IUCN Red List Categories*. IUCN, Gland, Switzerland.
- JACOBSEN, H. 1960. *A handbook of succulent plants*. Vol. 1, *Abromeitiella* to *Euphorbia*. Blandford Press, London.
- JACOBSEN, H. 1974. *Lexicon of succulent plants*. Blandford Press, London.
- JANCOWITZ, W.J. 1975. *Aloes of South West Africa*. Division of Nature Conservation and Tourism, Windhoek.
- JEPPE, B. 1969 (also 1974 edition and 1977 impression). *South African aloes*. Purnell, Cape Town.
- MUCINA, L., HOARE, D.B., LÖTTER, M.C., DU PREEZ, P.J., RUTHERFORD, M.C., SCOTT-SHAW, C.R., BREDEKAMP, G.J., POWRIE, L.W., SCOTT, L., CAMP, K.G.T., CILLIERS, S.S., BEZUIDENHOUT, H., MOSTERT, T.H., SIEBERT, S.J., WINTER, P.J.D., BURROWS, J.E., DOBSON, L., WARD, R.A., STALMANS, M., OLIVER, E.G.H., SIEBERT, F., SCHMIDT, E., KOBISI, K. & KOSE, L. 2006. Grassland Biome. In L. Mucina & M.C. Rutherford, *The vegetation of South Africa, Lesotho and Swaziland*. *Strelitzia* 19: 348–437.
- NEWTON, D.J. & CHAN, J. 1998. *South Africa's trade in southern African succulent plants*. TRAFFIC East/Southern Africa, Johannesburg.
- REYNOLDS, G.W. 1936. Notes on two new aloes and one new variety. *Journal of South African Botany* 2: 65–73.
- REYNOLDS, G.W. 1950 (also 1969, 1974 and 1982 editions). *Aloes of South Africa*. Trustees of the Aloes of South Africa Book Fund, Johannesburg.
- REYNOLDS, G.W. 1966. *The aloes of tropical Africa and Madagascar*. Trustees of the Aloes Book Fund, Mbabane, Swaziland.
- RUTHERFORD, M.C., MUCINA, L., LÖTTER, M.C., BREDEKAMP, G.J., SMIT, J.H.L., SCOTT-SHAW, C.R., HOARE, D.B., GOODMAN, P.S., BEZUIDENHOUT, H., SCOTT, L., ELLIS, F., POWRIE, L.W., SIEBERT, F., MOSTERT, T.H., HENNING, B.J., VENTER, C.E., CAMP, K.G.T., SIEBERT, S.J., MATTHEWS, W.S., BURROWS, J.E., DOBSON, L., VAN ROOYEN, N., SCHMIDT, E., WINTER, P.J.D., DU PREEZ, P.J., WARD, R.A., WILLIAMSON, S. & HURTER, P.J.H. 2006. Savanna Biome. In L. Mucina & M.C. Rutherford, *The vegetation of South Africa, Lesotho and Swaziland*. *Strelitzia* 19: 438–538.
- SMITH, G.F. 2003. *Aloe craibii* Gideon F.Sm. (Asphodelaceae: Alooideae): a new species of grass aloe from the Barberton Centre of endemism, Mpumalanga, South Africa. *Bradleya* 21: 25–28.
- SMITH, G.F., STEYN, E.M.A., VICTOR, J.E., CROUCH, N.R., GOLDING, J. & HILTON-TAYLOR, C. 2000. The conservation status of *Aloe* in South Africa: an updated synopsis. *Bothalia* 30: 206–211.
- VAN JAARSVELD, E.J. & VAN WYK, A.E. 2006. *Aloe challsii*, a new cliff-dwelling aloe from Mpumalanga, and a checklist of the obligate cliff-dwelling aloes in South Africa and Namibia. *Aloe* 43,2 & 3: 36–41.
- VAN WYK, A.E. & SMITH, G.F. 2001. *Regions of floristic endemism in southern Africa. A review with emphasis on succulents*. Umdaus Press, Hatfield, Pretoria.
- VAN WYK, B-E. & SMITH, G.F. 1996 (also 2004 edition). *Guide to the aloes of South Africa*. Briza Publications, Arcadia, Pretoria.
- VILJOEN, A.M., VAN WYK, B-E. & VAN HEERDEN, F.R. 1998. Distribution and chemotaxonomic significance of flavonoids in *Aloe* (Asphodelaceae). *Plant Systematics and Evolution* 211: 31–42.

- WALTERS, S.M. 1984. *The European garden flora. Vol. 1: Pteridophyta, Gymnospermae, Angiospermae—Alismataceae–Iridaceae*. Cambridge University Press, Cambridge.
- WEST, O. 1974. *A field guide to the aloes of Rhodesia*. Longman Rhodesia, Salisbury.
- WILLIS, C.K. & WILLIS, C.B. 1995. Notes on the current conservation status of *Aloe vossii* Reynolds, a threatened endemic of the Northern Province. *Aloe* 32: 34–37.

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PLATE 2243 *Eucomis zambesiaca*

Eucomis zambesiaca

Hyacinthaceae

Malawi, Zimbabwe and South Africa

Eucomis zambesiaca Baker in The Gardeners' Chronicle, ser. 2, 26: 9 (1886); Baker: 528 (1898); Engler: 301 (1908); Chittenden: 797 (1951); Brenan: 92 (1954); Kativu: 174 (2006).

This species was first collected by John Kirk in 1859 at Mambane, near Blantyre, Malawi, during the Livingstone expedition (Kativu 2006). The area is part of what was then known as the 'Zambesi Highlands', hence the specific epithet applied to this plant. The generic name is derived from 'eu', meaning true or good, and 'coma', meaning tuft, in allusion to the prominent tuft of sterile bracts that terminate the racemes in this genus. The earliest reported flowering of *Eucomis zambesiaca* in cultivation was in 1880 in the UK (Baker 1898).

Eucomis zambesiaca is one of many species of which the taxonomy has been affected by the fact that it straddles two Flora regions, namely the *Flora of southern Africa* region south of the Limpopo River, and the *Flora zambesiaca* region to its north. Since its original description by Baker in 1886 until late in the 20th century (Letty *et al.* 1962; Reyneke 1972), any *Eucomis* species in the *Flora zambesiaca* region was called *E. zambesiaca*, and the closely related *E. autumnalis* (= *E. undulata*) was considered to be restricted to the *Flora of southern Africa* region (Grey 1938; Martineau 1953; Reyneke 1972). In addition, some accounts of the South African members of the genus omitted *E. zambesiaca*, presumably on the assumption that it was restricted to the *Flora zambesiaca* region (e.g. Gibbs Russell *et al.* 1985; Du Plessis & Duncan 1989; Govender *et al.* 2000). Brenan (1954) asserted that there was no satisfactory delimitation at species level among Malawian populations. Perhaps this was more an artefact of Baker's earlier inaccuracies—for example leaves purported to be firmer in texture than in *E. comosa* and *E. autumnalis*—than a reflection on true species limits and occurrence. These opinions no doubt influenced Zimbabwean authors (Plowes & Drummond 1976; Mapaura *et al.* 2004) to consider *E. autumnalis* as the only one to occur in Zimbabwe.

Binns (1968) was the first to reinstate *Eucomis zambesiaca*, in a checklist of the herbaceous flora of Malawi. Reyneke (1980) followed, and even then only by implication when one compares his publication to his earlier unpublished thesis (Reyneke 1972). Reyneke's thesis tentatively included all the collections of *Eucomis autumnalis* from the *Flora zambesiaca* region under *E. zambesiaca*, following the ideas of previous workers. Fortunately he anticipated that these two elements might have to be separated later, and in his list of specimens, he marked all those he considered to represent typical *E. zambesiaca* with an asterisk. His later paper on *E. autumnalis* (Reyneke

PLATE 2243.—1, flowering plant, × 1; 2, almost mature infructescence, × 1. Voucher specimens: 1, Baragwanath *s.n.* sub Winter 7268 in National Herbarium, Pretoria; 2, Winter 6884 in National Herbarium, Pretoria. Artist: Gillian Condy.

1980) clearly omits these marked collections while citing most of the unmarked ones, thus suggesting that he considered *E. zambesiaca* to be a separate entity. It was, however, only decades later that Goldblatt & Manning (2003) formally listed the species for the South African flora.

The initial aim of the present paper was to address the paucity of published information on the South African occurrence of a poorly known species, and provide a simple circumscription for it after studying a Blouberg (Limpopo Province) population, from where plants were obtained for the accompanying plate. As happens in science, things are not always as simple as they appeared at the start, and after having committed thoughts to paper there are now more questions than answers.

Kativu's (2006) lectotype (Kirk's 1859 Mambane specimen) of the name *Eucomis zambesiaca* does appear to be rather different from the Blouberg plants (and perhaps more like *E. autumnalis*). From a comment gratefully received from an anonymous reviewer, it seems that the two names might refer to a single species. The question still remains whether the plant illustrated here represents an extreme form of the variation that Reyneke (1980) referred to as the form of *E. autumnalis* subsp. *autumnalis* with a northern distribution, from Malawi to near Loskop Dam in the Mpumalanga Province of South Africa, or whether it represents a separate species as yet unnamed. In other words, is it realistic to stretch the broadening concept of *E. autumnalis* subsp. *autumnalis* to the extent that it might apply to our plant as well? While it is plausible that the type population of *E. zambesiaca* and several others could be accommodated under *E. autumnalis* subsp. *autumnalis*, it may be premature to treat some Chimanimani populations or the Blouberg population in the same way.

The historic uncertainty regarding Baker's (1886) concept of *Eucomis zambesiaca* and its typification, adds to this conundrum. It appears as though Baker's concept of the species might even have been a mixed one. Was there a plant among those he saw that matched our illustrated Blouberg plant? While it is not impossible that either or both of the other two specimens seen by Baker indeed represent a different taxon from the lectotype, it is difficult to prove with the available evidence. We at least have to bear in mind that his description, and therefore also the one presented here, may not be representative of a single species.

I (P.J.D.W.) therefore had to change my aim of providing a simple circumscription to that of stating a taxonomic problem and providing postulates for future classification of these entities. I have of necessity retained a broad concept of the species in this paper, which may have to be constrained in future studies to include only south African populations, or perhaps also some Zimbabwean populations.

Though widespread as it is here delimited, spanning the countries Malawi, Zimbabwe and South Africa, our species does not appear to be common and is relatively restricted within these countries. Most collections to date have been from southern Malawi, with further occurrences in the Chimanimani area in the eastern highlands of Zimbabwe, and on the Blouberg in the Limpopo Province of South Africa (Figure 1).

In its small stature and linear leaves, *Eucomis zambesiaca* approaches *E. vandermerwei*, but the purple colouring of the latter is absent, and instead, the flowers are white. The only other taxon that occurs in the same area is *E. autumnalis* subsp. *autumnalis*, of which the northern form is usually more robust and with greener or yellower flowers than *E. zambesiaca*, despite its neotype from the Eastern Cape Province being smaller. Small (relative to the total variation of *E. autumnalis*), pale-flowered forms of *E. autumnalis* can be distinguished by a thicker peduncle, more densely flowered raceme, or a coma that is conspicuously wider than the raceme. At least on the Blouberg, *E. zambesiaca* forms dense clumps, while *E. autumnalis* subsp. *autumnalis* occurs in small groups or more usually as solitary plants (Reyneke 1980).

Compton (1990) draws attention to the structure formed by the fusion of the perianth and filament whorls. He states that the readily recognisable cup-like structure in *E. autumnalis* clearly sets it apart from *E. zambesiaca*, but unfortunately fails to elaborate on the contrasting state in *E. zambesiaca*. From my observations, the perianth and associated staminal cup in *E. autumnalis* always envelops the capsule, often extending beyond its apex. In the observed population currently still treated as *E. zambesiaca*, the perianth is shorter than the mature capsule, and often not at all clasping it after anthesis, with the staminal cup withering soon after anthesis. Further work would no doubt be needed to assess the variability and thus the true value of these characters across the geographical range, and at least where populations have been thought to be intermediate in character. The developmental stage and the exact organs involved are critical when describing colour variation among populations. In particular, we have to know when and for how long the staminal cup retains its shape and how that corresponds to colour variation both in it and in the perianth. A good starting point will be a description based on Blouberg plants only, another based only on white-flowered Chimanimani populations, followed by critical comparison with populations purported to be intermediate.

The population from the Blouberg is restricted to clay soils on a dolerite dyke, and plants are absent from the sandy soils of the surrounding quartzitic sandstone terrain. They occur in dense clumps in light shade of open woodland, on moderate to steep slopes with a western aspect. On that part of the mountain, it is likely that rainfall is significantly supplemented by frequent fog (mist) as well as dew. Flowering occurs from December to February and capsules ripen from February to April.

Eucomis zambesiaca has been described as one of the prettiest *Eucomis* species due to its elegant, narrow peduncle of loosely arranged, sweetly scented flowers

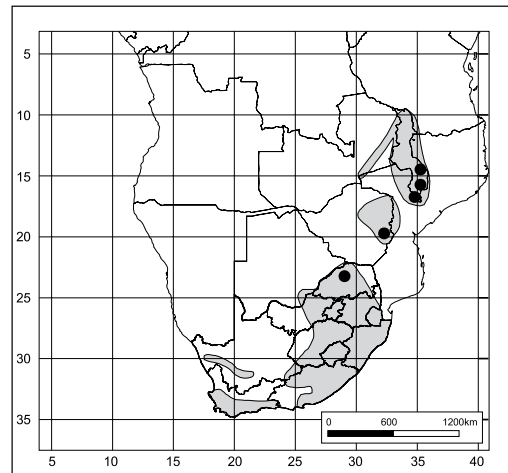


FIGURE 1.—Known distribution of *Eucomis zambesiaca* (●), relative to the distribution range of the rest of the genus (shaded areas).

(Compton 1990). It is readily grown outdoors in a variety of moist subtropical to temperate and cold climates (does well in the UK), and has the advantage that it is more tolerant of hotter and drier conditions than most of the other *Eucomis* species. Compton (1990) recommends a sunny, well-drained and sheltered position, between rocks. Alternatively, it should be planted in gravelly soil or raised beds. The plants should be watered well during the growing period. In South Africa the plants should be grown in light shade to prevent wilting in full sun (Duncan 2007). In colder climates, it can be grown as a glasshouse pot plant.

Description.—Acaulescent, summer-growing, geophytic, terrestrial herb up to 0.3(–0.5) m high, in dense clumps up to 3 m across. *Bulb* ovoid, widest near base, 50 mm long, 30 mm diam., attached to swollen basal plate. *Leaves* 3–6 per bulb, lorate to slightly narrowly obovate, canaliculate, 300–600 × 38–50(–95) mm, immaculate, apex subobtusate, margins undulate, only slightly crispate. *Peduncle* cylindrical, immaculate, 150–230(–270) mm long, 5–9 mm diam. *Raceme* lax to moderately dense, oblong, (70–)100–120(–205) mm long, 15–50 mm diam.; pedicels all erecto-patent, 6.4–8.5 mm long; lower bracts ovate, central narrowly ovate. *Coma* of (10–)12–15 (–20) sterile bracts; bracts oblong to elliptic or narrowly ovate, 25–38 mm long, membranous, apex acute, margin crisped. *Perianth* greenish white to white, 10–13 mm long; segments narrowly obovate-oblong, obtuse. *Stamens* 8 mm long; filaments narrowly ovate to very narrowly triangular, their broad bases fused for 3.5 mm, white. *Ovary* globose to ovoid, 4.3 mm long; style 3.7 mm long. *Capsule* globose, obtusely trigonous, 8.5 mm long and broad, thin-walled, loculicidally 3-valved. *Seeds* (immature) 3.0–3.4 × 2.5 mm, dark brown, 2 or 3 (from 7 ovules) per locule, shiny. Plate 2243.

REFERENCES

- BAKER, J.G. 1886. New garden plants: *Eucomis zambesiaca*, Baker, n. sp. *The Gardeners' Chronicle*, ser. 2, 25: 8, 9.
- BAKER, J.G. 1898. Liliaceae. In W.T. Thiselton-Dyer, *Flora of tropical Africa* 7: 527, 528. Reeve, London.
- BINNS, B. 1968. *A first checklist of the herbaceous flora of Malawi*: 64. The Government Printer, Zomba.
- BRENAN, J.P.M. 1954. Plants collected by the Vernay Nyasaland Expedition of 1946. *Memoirs of the New York Botanical Garden* No. 1, 9: 92.
- CHITTENDEN, F.J. 1951. *The Royal Horticultural Society Dictionary of Gardening* 2: 797. Clarendon Press, Oxford.
- COMPTON, J. 1990. *Eucomis* L'Heritier. *The Plantsman* 12: 128–139.
- DUNCAN, G. 2007. Lesser-known *Eucomis*. *The Plantsman* (new series) 6: 98–103.
- DU PLESSIS, N. & DUNCAN, G. 1989. *Bulbous plants of southern Africa: a guide to their cultivation and propagation*: 75. Tafelberg, Cape Town.
- ENGLER, A. 1908. Die Pflanzenwelt Afrikas 2: 301. In A. Engler & O. Drude, *Die Vegetation der Erde* 9. Engelmann, Leipzig.
- GIBBS RUSSELL, G.E., REID, C., VAN ROOY, J. & SMOOK, L. 1985. List of species of southern African plants, edn 2, Part 1, Cryptogams, Gymnosperms, Monocotyledons. *Memoirs of the Botanical Survey of South Africa* No. 51: 103. Botanical Research Institute, Pretoria.
- GOLDBLATT, P. & MANNING, J.C. 2003. Hyacinthaceae. In G. Germishuizen & N.L. Meyer, *Plants of southern Africa: an annotated checklist*. *Strelitzia* 14: 1059, 1060. National Botanical Institute, Pretoria.
- GOVENDER, D., BAIJNATH, H. & SINGH, Y. 2000. *Eucomis*—an elite éclat of excellence. *Herbertia* 55: 52–57, 84, 85.

- GREY, C.H. 1938. *Hardy bulbs 3, Liliaceae*: 231–237. Williams & Norgate, London.
- KATIVU, S. 2006. Lectotypification of *Eucomis zambesiaca* Baker (Hyacinthaceae). *Kirkia* 18: 174.
- LETTY, C.L., DYER, R.A., VERDOORN, I.C. & CODD, L.E. 1962. *Wild flowers of the Transvaal*: 25, Plate 16. Wild Flowers of the Transvaal Book Fund, Pretoria.
- MAPAURA, A., TIMBERLAKE, J. & MANYANGA, P. 2004. Hyacinthaceae. In A. Mapaura & J. Timberlake, *A checklist of Zimbabwean vascular plants*. Southern African Botanical Diversity Network Report No. 33: 91. SABONET, Pretoria and Harare.
- MARTINEAU, R.A.S. 1953. *Rhodesian wild flowers*: 15, Plate 1. Longmans, Green, Cape Town, London, New York.
- PLOWES, D.C.H. & DRUMMOND, R.B. 1976. *Wild flowers of Rhodesia*: Plate 16. Longman, Salisbury [Harare].
- REYNEKE, W.F. 1972. 'n *Monografiese studie van die genus Eucomis L'Hérit. in Suid-Afrika*. M.Sc. thesis, University of Pretoria, Pretoria.
- REYNEKE, W.F. 1980. Three subspecies of *Eucomis autumnalis*. *Bothalia* 13: 140–142.

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Veltheimia bracteata

Hyacinthaceae

South Africa

Veltheimia bracteata Harv. ex Baker in Journal of the Linnean Society (Botany) 11: 411 (1870); Baker: 471 (1897); Marais: 483 (1972); Duncan: 72 (1982); Batten: 386 (1986); Du Plessis & Duncan: 78 (1989); Duncan: 97 (2004). *Aletris capensis* in the sense of Murray: 227, t. 5 (1770); W.T.Aiton: t. 501 (1799) and many authors, not *L. V. undulata* Moench: 631 (1794), illegitimate name. *V. viridifolia* of authors, not Jacq.: t. 78 (1797a); De Candolle in Redouté: t. 193 (1807); Baker: 471 (1897), illegitimate name. *V. capensis* in the sense of Turrill: t. 215 (1953), not (L.) DC.

Established by the German botanist J.G. Gleditsch in 1771, *Veltheimia* is a small lilioid genus endemic to the western, southern and southeastern parts of South Africa and the southwestern corner of Namibia (Duncan 2004). *Veltheimia* honours the German amateur botanist and patron of botany, Count August Ferdinand von Veltheim (1741–1801), of Brunswick. There are two species, *Veltheimia capensis*, the type species (originally described by Linnaeus (1759) as *Aletris capensis*), and *V. bracteata*.

Considerable nomenclatural uncertainty prevailed from the late 18th century up until 1972 as a result of the confused application of names by several authors. It would appear that J.A. Murray (1770) became the first person to incorrectly apply the epithet ‘*capensis*’ to the plant from the Eastern Cape, a mistake perpetuated by a number of authors. *Veltheimia capensis* and *V. bracteata* were illustrated in several important publications in the late 18th, early 19th and early 20th centuries. The two species were included as *V. glauca* (now *V. capensis*) and *V. viridifolia* (now *V. bracteata*) respectively in Jacquin (1797a, b), which depicted exotic plants cultivated at the imperial palace gardens at Schönbrunn near Vienna.

In 1799, W.T. Aiton published a plate of *Veltheimia bracteata* in *Curtis’s Botanical Magazine*, mistakenly under the name *Aletris capensis*, and seven years later *V. bracteata* was figured again (erroneously as *V. capensis*) on t. 193 of Pierre-Joseph Redouté’s *Les Liliacées* (1807). Plate 1356 of *The Flowering Plants of Africa* depicts a watercolour of *V. capensis* by M.E. Connell, with text by Obermeyer (1961). In that article, *V. glauca* and two additional *Veltheimia* taxa described respectively in the 1920s and 1930s (*V. roodeae* and *V. deasii*) were relegated to synonymy under *V. capensis*.

The confused application of names dating from the late 18th century was almost fully elucidated, mainly through considerable botanical detective work undertaken by John Lewis of the British Museum of Natural History in London, in 1960. However, both Lewis and Obermeyer evidently did not realise that in accordance with the International Code of Botanical Nomenclature, Jacquin’s name *V. viridifolia* had to give way to Harvey & Baker’s later name, *V. bracteata*, on account of Jacquin having mis-

PLATE 2244.—1, inflorescence and scape, × 0.8; 2, foliage and upper portion of bulb, × 0.8; 3, single flower, × 0.8; 4, longitudinal section of flower, × 0.8; 5, ripe infructescence, × 0.8. Voucher specimen: *Tennant s.n.* in Compton Herbarium, Kirstenbosch; Kirstenbosch National Botanical Garden Reference No.: 31/87. Artist: Marieta Visagie.



PLATE 2244 *Veltheimia bracteata*

takenly included a reference to *Aletris capensis* (*V. capensis*) when he described *V. viridifolia*. The taxonomic turmoil was finally resolved by Marais (1972) at Kew, with the recognition of *V. capensis* (including *V. deasii*, *V. glauca* and *V. roodeae*) and *V. bracteata* (including *V. undulata* and *V. viridifolia*).

Within the Hyacinthaceae, *Veltheimia* forms part of the tribe Massonieae, to which its near relative *Lachenalia* also belongs. It is distinguished from *Lachenalia* primarily by a relatively large, globose or ovoid bulb with perennial fleshy roots, a basal rosette of large, broadly lanceolate, oblanceolate or ovate leaves, by the presence of bracteoles and almost completely fused tepals, and in having broadly winged, inflated papery capsules that are unique within the family (Duncan 2004).

The specimen illustrated here was painted in the spring of 2006 by Marieta Visagie from material cultivated in the bulb nursery at Kirstenbosch that had been collected in October 1986 by Sandra Tennant at Sardinia Bay near Port Elizabeth.

Veltheimia bracteata and *V. capensis* are both extremely variable and often confused, as they are not easily distinguishable with regard to floral characters. Vegetatively, however, they are easily set apart by a combination of bulb and leaf characters, flowering phenology, distribution and habitat. Bulbs of *V. bracteata* are globose and more or less subterranean with distinctive fleshy scales that do not form layers of papery outer tunics as in *V. capensis* (Du Plessis & Duncan 1989). In contrast, *V. capensis* has ovoid bulbs that are more or less exposed.

The leaves of *Veltheimia bracteata* vary from light green to bright shiny green and are evergreen or almost evergreen, whereas those of *V. capensis* are glaucous and distinctly deciduous, and the plant has a pronounced summer dormant period. The leaves of *V. capensis* are often partially hysteranthous, the new rosette produced together with the developing inflorescence in autumn, whereas those of *V. bracteata* are fully developed at flowering time in spring.

The specific epithet *bracteata* is descriptive of the conspicuous lanceolate bract of up to 32 mm long that subtends each flower. Within *Veltheimia bracteata*, variation occurs in inflorescence shape as well as flower and scape coloration. In the greenish yellow forms, pigmentation is highly unstable and dependent on illumination, flower colour becoming increasingly washed out with a decrease in light intensity. Pigmentation in many light pink forms of this species with elongate racemes and scapes blotched with light purple, is similarly unstable, losing much of the pink coloration with a decrease in light intensity. Pigmentation in forms with relatively short, deep rose-pink or reddish pink flowers produced in short, compact racemes is much more stable and not greatly influenced by light intensity, and their scapes are heavily blotched with deep purple. Several greenish yellow forms of this species have been cultivated in South Africa for many years but the precise origin of most of them is unknown. In the late 1970s, an outstanding robust, greenish yellow form that breeds true to type was donated to Kirstenbosch by Mr J. den Houting of Port Alfred in the Eastern Cape. It was named *V. bracteata* 'Lemon Flame' (Duncan 1982). The plant had previously been received from a resident of Bushman's River Mouth, Eastern Cape.

As far as we are aware, only two wild collections of greenish yellow forms of *V. bracteata* exist, one from Bushman's River Mouth and another from near Port Elizabeth.

A number of cultivars of *Veltheimia bracteata* have been developed and in 1962 one of the best known ones, *V. bracteata* 'Rosalba' raised by Messrs Van Tubergen, received an Award of Merit from the Royal Horticultural Society. It is still in cultivation today and is a cross between greenish yellow- and pink-flowered forms of *V. bracteata* that yielded plants with bicoloured flowers that are light pink in the upper third and cream-coloured in the lower two thirds (Duncan 2004).

Key to the species of *Veltheimia*:

- Bulb \pm subterranean, globose, with fleshy scales; leaves light green to dark shiny green, evergreen or almost evergreen, synanthous; flowering early to late spring; bracts 8–32 mm long; Baviaanskloof to Mazeppa Bay *V. bracteata*
- Bulb \pm exposed, ovoid, with papery outer tunics; leaves glaucous, partially hysteranthous, completely deciduous; flowering autumn to early winter; bracts 8–15 mm long; Namuskluft (Namibia) to Ladismith *V. capensis*

Veltheimia bracteata is confined to the Eastern Cape and is distributed from the Baviaanskloof Mountains in the extreme western part of the province to Mazeppa Bay on the Wild Coast (Figure 1). The most southerly population occurs on the St Francis Airfield, between St Francis Bay and Cape St Francis (Caryl Logie, pers. comm.). This species is not under threat in its natural habitat, nor is *V. capensis*.

It is frequently encountered on coastal dunes, singly or in scattered clumps as part of larger colonies on south-facing, often rocky slopes, bearing the full brunt of incessant wind, sometimes growing within a few metres of the high-water mark. It is known colloquially in Afrikaans as *sandui* (sand onion) and is also known as forest lily in shadier habitats. In coastal areas it grows in sandy soil containing decomposing leaf litter, in association with low scrub vegetation including *Metalasia muricata* and the succulent *Gasteria acinacifolia* (Sandra Muller, pers. obs.), or in shade of shrubs such as *Mimusops caffra* and *Sideroxylon inerme*, the leaves shaded by surrounding vegetation but the inflorescences pushing their way through the bush into full sun. Supported by surrounding bush, the old scapes of the previous flowering season often remain attached to the bulb for a year or more and are often present at time of flowering. Inland populations are encountered in full sun on cliff faces in stony, sandstone-derived soil or in thicket along rocky riverbanks.

Forms with greenish yellow flowers occasionally occur as scattered individuals or in small groups within

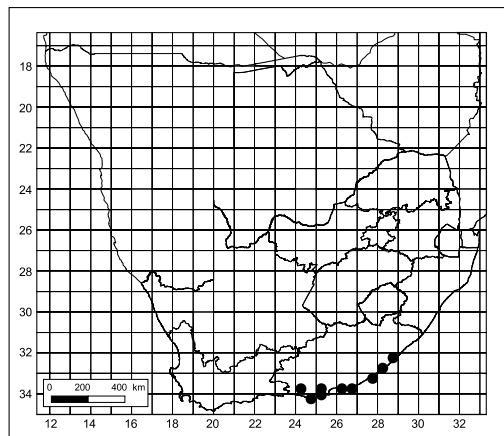


FIGURE 1.—Known distribution of *Veltheimia bracteata*.

predominantly pink-flowered colonies, and not as isolated populations. The ripening fruits of pink forms of this species are tinged with reddish purple, whereas those with greenish yellow flowers are uniformly green.

Veltheimia capensis has a much wider distribution than *V. bracteata* and occurs in the drier western parts, extending from Namuskluft in southwestern Namibia, southwards throughout the Richtersveld and Namaqualand, along the west coast to Ysterfontein, and in the De Hoop Nature Reserve east of Bredasdorp. It also occurs in the western Karoo and Little Karoo from the Hantamsberg at Calvinia to the Gamkapoort Dam near Ladismith. On the west coast of the Northern and Western Cape, it is usually encountered on granite outcrops, growing in acid leaf litter among bushes in partial shade of boulders, but also occurs on exposed sandy flats. In the De Hoop Nature Reserve, it is confined to limestone outcrops and in the Karoo it is associated with stony flats and dolerite rocky outcrops.

The flowers of *Veltheimia* exude plentiful viscid nectar, which is especially copious in *V. bracteata*. It is frequently seen dripping down the scape and onto the leaves and is eagerly consumed by sunbird pollinators. As is done when visiting the tubular flowers of several long-tubed *Lachenalia* species, the sunbird clings to the scape while probing the base of the flowers with its long curved beak, lifting the flower into a more or less horizontal position. In so doing, pollen is deposited onto its forehead, ensuring effective pollination of the flowers visited subsequently. The large papery, ripe capsules of veltheimias have evolved perfectly for wind dispersal; they detach from the infructescence during gusts of wind and are carried several metres away, falling to the ground among bushes. The papery capsule opens apically and disintegrates over the summer months, during which time the seed becomes covered with decomposing leaf litter, rapidly germinating after autumn rains. The trilobular capsules usually contain two seeds per locule but one, three or four seeds are also sometimes produced.

Veltheimia bracteata is a very useful, long-lived evergreen or almost evergreen geophyte for frost-free gardens or containers on a shady patio, and can also be grown as an indoor plant. *V. capensis* is best suited to sharply drained, sunny rock garden pockets in areas with dry summers that are not subject to heavy winter rainfall; it can also be successful as a container plant grown under cover. The most admirable horticultural attributes of *V. bracteata* are its glossy dark green leaves with undulate margins that remain attractive for almost twelve months of the year, its dense cluster of showy, long-lasting mottled pink or greenish yellow tubular flowers and its ornamental papery seed capsules. The pink-flowered forms tolerate relatively low light levels and thrive in dappled shade, whereas greenish yellow forms and *V. capensis* require much higher light intensity to flower well and allow the flower colour to manifest fully. When grown under excessively shaded conditions, flower colour of the greenish yellow forms tends to be washed out, *V. capensis* fails to flower and its leaves lose their intense glaucous coloration and attractively crisped margins. *V. capensis* is best grown where it will receive morning sun and afternoon shade. *V. bracteata* can also be grown in sunny conditions provided its leaves receive some protection from excessive direct sun by inter-planting with low-growing perennials. The

fleshy leaves of *V. bracteata* are easily blemished by even the mildest of hailstorms, leaving characteristic yellow-brown blotches.

Veltheimia bracteata is a winter-growing plant, of which pink-flowered forms produce new rosettes of leaves in late summer or early autumn, before those of the previous season have died down, whereas the leaves of the greenish yellow forms and those of *V. capensis* are completely deciduous and die down in early summer. *V. bracteata* makes a handsome display if planted in large drifts beneath deciduous or high canopy evergreen trees, or placed towards the centre of herbaceous borders, and is also recommended for large containers and shaded window boxes (Duncan 2000). The bulbs of this species should be planted with the top at or just below soil level but at least one third or up to two thirds of the bulb of *V. capensis* should be exposed. Once established, bulbs of both species like to remain undisturbed for at least five years, whether grown in pots or in the garden. *V. bracteata* grows best in well-composted, slightly acid soil but is so adaptable that it will succeed in even the poorest of soils. It likes frequent watering throughout the winter growing period and is not adversely affected by moisture received in summer. *V. capensis* performs well in a mixture of three parts coarse river sand or grit and one part well-decomposed, finely sifted acid compost. During the winter-growing period the growing medium for this species should be allowed to dry out substantially before the next watering is given, and the medium must be allowed to dry out completely over the summer months.

Both *Veltheimia* species can be successfully propagated by seed, offsets, leaf cuttings, bulb chipping and by *in vitro* propagation. For the home gardener, seed propagation is an easy method of increasing plants but it should be borne in mind that this method often results in heterogeneous progeny; true-to-type material is best obtained vegetatively by offsets, leaf cuttings and bulb chipping. The black, pear-shaped seeds of veltheimias are harvested from the dry capsules from late winter to midsummer. To prevent capsules from being blown away, they can be removed from the infructescence while still slightly green and allowed to complete the maturation process in a protected environment. The seeds are best sown in early autumn in deep pots or seed trays, in the same medium as for mature bulbs, and kept fairly moist by watering with a fine rose every two to three days. Germination of fresh seeds is rapid, occurring within three weeks. Seed trays of *V. bracteata* should be placed in a semishaded position, whereas those of *V. capensis* prefer bright light, or morning sun and afternoon shade. Once germination has taken place, seedlings of *V. capensis* should be watered much less frequently than those of *V. bracteata* as they are particularly susceptible to attack by damping-off fungi. Seedlings of both species can be grown in the same container for two seasons, then lifted in early autumn and planted into permanent positions in the garden or into permanent containers. Under ideal conditions, seedlings of *V. bracteata* may flower for the first time in the spring of their third season (Du Plessis & Duncan 1989), while *V. capensis* usually takes a further season before producing its first inflorescence.

Separation of offsets is most successfully undertaken in late summer, just before the new rosette of leaves appears. Offsets should be carefully prized apart, ensuring that the basal plate is not damaged excessively. Injured surfaces should be treated

with a fungicide, then be allowed to dry for a few days before replanting into dry growing medium. *Veltheimia bracteata* is easily propagated by leaf cuttings in much the same way as *Eucomis* and *Lachenalia*. Cuttings are taken from strong, mature leaves during active growth from early to midwinter by cutting away the upper half and inserting the lower half of the lower portion into coarse, slightly damp, sterilised river sand, in deep seed trays placed in a warm, lightly shaded position. Bulblets will develop along the cut parts of the leaf and can be removed in early summer and potted up separately. This method of propagation is more successful with *V. bracteata* than with *V. capensis* as cuttings of the latter rot easily.

Propagation by chipping involves cutting mature bulbs into about ten slices or 'chips' in autumn, ensuring that each chip has a portion of basal plate attached, treating the cut surfaces with a fungicide and planting directly into a propagation medium such as equal parts of river sand and vermiculite. Leaves emerge after several months and flowers can be expected in the second season after chipping in *Veltheimia bracteata* (Van Leeuwen & Van der Wijden 1996), but will probably take an additional year for *V. capensis*.

In vitro propagation by adventitious bud formation is not feasible for the home gardener, but is a useful method for commercial producers of *Veltheimia bracteata*. It involves the use of leaf and bulb explants that provide a relatively rapid and prolific means of increasing stocks, with rooted plantlets available to grow on after only seven or eight months (Taylor & Van Staden 1997).

An unusual method of propagation (also known to occur in *Lachenalia*) was noted by Batten (1986), who reported that after an inflorescence of *V. bracteata* happened to touch the ground, roots and a bulb formed at the base of one of the floral bracts that then developed into the first leaf of a new plant.

Veltheimia bracteata and *V. capensis* are not overly prone to pest or disease attack, but the latter species is certainly more susceptible to fungal rotting of the bulbs. The most important pests affecting plants of both species are caterpillars that feed on the unopened buds of developing inflorescences, European garden snails that feed on the flower buds and foliage, and snout beetles that chew the leaf margins of *V. bracteata* in summer. Mealy bugs can be problematic when plants are grown in containers in enclosed, warm environments, rapidly infesting the leaf bases and bulb tunics, and together with snails, they are transmitters of viral disease, to which both species are highly susceptible. Fungal rotting of the bulbs and roots rarely occurs in the pink-flowered forms but is common in yellow-flowered variants and more frequently still in *V. capensis*. Over-watering, an insufficiently drained medium and bulbs that have been planted too deep are usually the cause, as well as failure to dry out the growing medium sufficiently over the summer dormant period in *V. capensis*.

Description.—Evergreen or almost evergreen, winter-growing geophyte 0.25–0.9 m high. *Bulb* globose, offset-forming, 50–90 mm diam., with fleshy, greenish purple or uniformly green scales, with perennial fleshy roots. *Leaves* 4–7, broadly lanceolate to oblanceolate, 200–350 × 60–100 mm, produced in a rosette, spread-

ing to suberect, weakly canaliculate with a distinct midrib, variable in colour from light green to shiny dark green, margins undulate and often crisped. *Scape* erect or suberect, rigid, slightly compressed laterally, 200–650 × 6–17 mm, pale to dark green, lightly to heavily marked with purple speckles and blotches, covered with a grey waxy bloom. *Inflorescence* an erect, dense, terminal, cone-shaped raceme, 60–170 × 50–70 mm; bracts lanceolate, longest at base of inflorescence, 8–32 × 0.8–6 mm, white, soft and membranous, suberect to spreading or slightly deflexed during flowering stage, becoming strongly deflexed in fruiting stage; bracteoles narrowly lanceolate, 6–8 × 0.5–1 mm, white, soft and membranous, spreading or slightly deflexed; pedicels 2–5 mm long, decurved in lower half of inflorescence, becoming spreading above, white, pale green or brownish purple. *Flowers* unscented, tubular, cream-coloured or dull white, lightly to heavily mottled with light to deep rose-pink or reddish pink, rarely uniformly greenish yellow, pendulous to nodding or spreading; tepals flaring slightly to markedly at top, 30–35 × 6–8 mm; perianth tube cylindrical, 20–25 × 4–6 mm, slightly curved, narrow in lower half, broadening slightly towards top; outer and inner tepals fused for three quarters of their length, free portion of outer tepals ovate, 5–7 × 4–6 mm; free portion of inner tepals ovate, very slightly shorter and narrower, 4–5 × 3–4 mm. *Stamens* included within perianth or shortly exserted, slightly curved, arising from perianth tube in two whorls, the lower whorl longer and arising slightly higher; lower half of filaments decurrent along perianth tube, white, upper half free, white or purplish magenta with white tips, free portion 11–17 mm long; anthers oblong, bright yellow, included or shortly exserted. *Ovary* ellipsoid, 6-sided, 10–12 × 2–4 mm, sessile, pale green, 1–4 ovules per locule; style 19–28 mm long, white, slightly curved, shortly exserted. *Fruit* a large, nodding or pendulous, papery, 6-sided capsule, 35–50 × 20–30 mm, with 3 prominent wings, opening apically. *Seeds* 1–4 per locule, pear-shaped, 5–6 × 4–5 mm; testa matte black, heavily wrinkled (Figure 2), strophiole prominent, 1.2–1.6 mm long. *Chromosome number*: $2n = 10$ (Coleman 1940). Plate 2244.

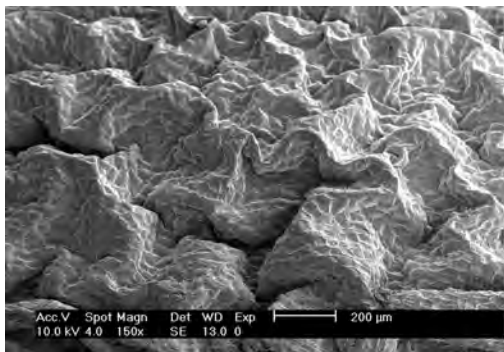


FIGURE 2.—Scanning electron micrograph showing heavily wrinkled testa of *Veltheimia bracteata* seed.

REFERENCES

- AITON, W.T. 1799. *Aletris capensis*. *Curtis's Botanical Magazine* 14: t. 501.
- BAKER, J.G. 1870. A revision of the genera and species of the herbaceous capsular gamophyllous Liliaceae. *The Journal of the Linnean Society (Botany)* 11: 349–436.
- BAKER, J.G. 1897. *Veltheimia* Gleditsch. In W.T. Thiselton-Dyer, *Flora capensis* 6: 470, 471. Reeve, London.
- BATTEN, A.U. 1986. *Veltheimia bracteata*. *Flowers of southern Africa*: 386–389. Frandsen, Johannesburg.
- COLEMAN, L.C. 1940. The cytology of *Veltheimia viridifolia* Jacq. *American Journal of Botany* 27: 887–895.
- DE CANDOLLE, A.P. 1807. *Veltheimia capensis*. In P.J. Redouté, *Les Liliacées* 4: t. 193. Didot, Paris.

- DUNCAN, G.D. 1982. *Veltheimia bracteata* 'Lemon Flame'—introducing the yellow form. *Veld & Flora* 68,3: 72, 73.
- DUNCAN, G.D. 2000. Grow bulbs: 42, 43, 45. *Kirstenbosch Gardening Series*. National Botanical Institute, Cape Town.
- DUNCAN, G.D. 2004. The genus *Veltheimia*. *The Plantsman*, new series 3,2: 97–103.
- DU PLESSIS, N.M. & DUNCAN, G.D. 1989. *Veltheimia*. *Bulbous plants of southern Africa*: 78. Tafelberg, Cape Town.
- GLDITSCH, J.G. 1771. *Veltheimia*. *Histoire de l'Academie Royale des Sciences et Belles Lettres de Berlin* 25: 66.
- JACQUIN, N.J. 1797a. *Veltheimia viridifolia* Jacq. *Plantarum rariorum Horti Caesarei Schönbrunnensis descriptions et icones* 1: t. 78. Vienna.
- JACQUIN, N.J. 1797b. *Veltheimia glauca* (Ait.) Jacq. *Plantarum rariorum Horti Caesarei Schönbrunnensis descriptions et icones* 1: t. 77. Vienna.
- LINNAEUS, C. 1759. *Aletris capensis*. *Species plantarum*, edn 2: 456. Salvius, Stockholm.
- MARAIS, W. 1972. The correct names for veltheimias, the winter red hot pokers. *Journal of the Royal Horticultural Society* 47: 483, 484.
- MOENCH, C. 1794. *Veltheimia undulata*. *Methodus plantarum horti botanici et agri Marburgensis*: 631. Cotta, Marburg.
- MURRAY, J.A. 1770. *Aletris capensis*. *Kongliga Vetenskaps Academiens Handlingar* 31: 227, t. 5.
- OBERMEYER, A.A. 1961. *Veltheimia capensis*. *The Flowering Plants of Africa* 34: t. 1356.
- TAYLOR, J.L.S. & VAN STADEN, J. 1997. *In vitro* propagation of *Veltheimia bracteata* and *V. bracteata* 'Lemon Flame'. *South African Journal of Botany* 63,3: 159–161.
- TURRILL, W.B. 1953. *Veltheimia capensis*. *Curtis's Botanical Magazine* 169: t. 215.
- VAN LEEUWEN, P.J. & VAN DER WIJDEN, J.A. 1996. Effects of storage temperature and duration on dormancy and flowering of *Veltheimia bracteata*. *Acta Horticulturae* 430,2: 419–425.

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Nerine pancratioides

Amaryllidaceae

South Africa

Nerine pancratioides Baker in The Gardener's Chronicle 10, ser. 3: 576 (1891); Baker: 213 (1896); O'Brien: 122 (1905); Traub: 29 (1967); Norris: 22 (1974); Pooley: 106 (1998); Duncan: 42 (2002); Pooley: 58 (2003); Craib: 105 (2004); Craib: 131 (2005). *Nerine schlechteri* Baker: 665 (1903).

The horticulturally important genus *Nerine* is a mainly autumn-flowering group endemic to five southern African countries—Botswana, Lesotho, Namibia, South Africa and Swaziland (Duncan 2005). Concentrated in the summer-rainfall zone in the eastern parts of South Africa, it is represented in all nine provinces of South Africa and comprises some 23 species (Zonneveld & Duncan 2006). The Eastern Cape supports the largest number of nerines, including several of which the numbers have declined to dangerously low levels in the wild, such as *N. filamentosa*, *N. gibsonii* and *N. masoniorum*. The most important commercially produced species is the very hardy *N. bowdenii* from the high Drakensberg in western KwaZulu-Natal and the midlands of the Eastern Cape, now extensively marketed around the world for its bulbs and cut flowers (Duncan 2002).

Nerine pancratioides is a beautiful, distinctive species, not easily confused with any other member of the genus. Described by the Kew botanist J.G. Baker in 1891, it has pure white, funnel-shaped, suberect flowers borne on densely pubescent, suberect pedicels. The tepals overlap for about half their length and all have a light pinkish maroon median stripe on the upper surface in the lower portion. The tepal margins are smooth or very slightly undulate and the tepal apices are straight or slightly recurved. The filaments are bent forward and much shorter than or up to half as long as the tepals, and have laterally flattened filament bases with apical appendages. The inflorescence is borne on a very long, erect, glabrous scape and the ovary is a distinctive deep pinkish maroon. The plant has a solitary, ovoid bulb and two or three erect, bright green, linear, weakly spirally twisted leaves with obtuse apices. Norris (1974: 23) stated that *N. schlechteri*, described from a collection at Mount West in the centre of the *N. pancratioides* range in southwestern KwaZulu-Natal, is synonymous with the latter species. This view has been followed by Snijman (Snijman & Archer 2003) and we concur; the type material of *N. schlechteri* clearly matches that of *N. pancratioides*.

Within the developing field of genome size measurement, it has been shown that when species in a genus have the same chromosome number, as in *Nerine* ($2n = 2x = 22$), differences in nuclear DNA content can be used as an additional character to delimit species and infrageneric divisions. This has been done in a number of genera such as *Agapanthus* (Zonneveld & Duncan 2003) and *Gasteria* (Zonneveld &

PLATE 2245.—1, inflorescence with scape and open flowers, × 1; 2, flower buds enclosed by spathe bracts, × 1; 3, bulb, leaves and basal scape region, × 1; 4, infructescence with ripe seeds; 5, flower opened out showing tepals and stamens, × 2. Voucher specimen: *Condy 161* in National Herbarium, Pretoria. Artist: Gillian Condy.



PLATE 2245 *Nerine pancratioides*

Van Jaarsveld 2005). In a recent study of genome size for the species of *Nerine*, correlation was demonstrated with their nuclear DNA content, growth cycle, leaf width and other morphological characters (Zonneveld & Duncan 2006). When arranged according to increasing nuclear DNA content, the species could be placed into three distinct groups if growth cycle (observed under temperate, greenhouse conditions) and leaf width were also considered: a narrow-leaved, mainly evergreen group has a DNA content of 18.0–24.6 picograms (pg) and contains 13 species, a broad-leaved, winter-growing group of four species has a DNA content of 25.3–26.2 pg, and a broad-leaved, summer-growing group containing six species has a DNA content of 26.8–35.3 pg. A collection of *N. pancratioides* from the Mt Currie area in southern KwaZulu-Natal was shown to have a nuclear DNA content of 21.9 pg, which correlated well with the narrow-leaved, evergreen group. Although DNA content does not give direct clues about evolution, its correlation with the growth cycles in *Nerine* is striking, suggesting that plants with similar nuclear DNA contents are related (Zonneveld & Duncan 2006).

Nerine pancratioides shares several morphological features with *N. platypetala* (Archer *et al.* 1997), a native of perennial marshes in southern Mpumalanga, both species occurring in wet, acid soil. Both have short, forward-bending filaments and relatively broad tepals, the tepal apices flat or very slightly recurved and the tepal margins flat or very slightly undulate. *N. platypetala* has larger, fewer flowers, borne on spreading pedicels atop a sturdier scape. In *N. platypetala*, each filament arises from a widened filament base and the tepals are pink and widely flaring; the shape and arrangement of the tepals is unique within the genus, the bases being folded and very narrow, then flaring abruptly (Norris 1974).

The specific epithet *pancratioides* refers to the white-flowered inflorescence that superficially resembles that of members of the mainly Mediterranean amaryllid genus *Pancratium*. *Pancratium* has a prominent staminal cup that is not comparable with the staminal appendages in *N. pancratioides*.

Nerine pancratioides is endemic to KwaZulu-Natal and recorded from the southern, southwestern, central and northwestern parts of the province, its distribution extending from Kokstad in the south to Kamberg in the southwest, eastwards to Greytown in the central part, to just northwest of Dundee in the northwestern part (Figure 1). It occurs at altitudes from 1 220–1 828 m (Traub 1967) and may be subject to heavy frost and snow during its winter-dormant period. It used to occur in various parts of the KwaZulu-Natal Midlands near rocky streams and in moist rocky places but has declined considerably in numbers throughout the area, mainly as a result of the degradation of its habitat due to the invasion of damp grasslands by alien vegetation, notably *Pennisetum clandestinum* (kikuyu grass) as well as annual and perennial weeds (Craib 2005). *N. pancratioides* also used to occur on damp hill-sides within seepage areas, and many of these places have now been afforested with alien timber or have become degraded by invasive Australian vegetation, particularly *Acacia mearnsii* (black wattle). The nerines are currently encountered mainly in the marshes and damp grasslands in the extreme southwestern corner of the KwaZulu-Natal Midlands, immediately east of the southern Drakensberg (Craib 2005).

A survey was carried out by one of us (C.L.C.) in the area to the southeast of Giant's Castle in the 2004 flowering season. The nerines flower mostly in the second half of February and first half of March, occasionally extending to early April, and various populations were surveyed during this period. They were found to occupy several distinct habitats. Damp grasslands and marshes beside streams were particularly favoured and comprised the most commonly utilised habitat. Additional places frequented were seepage areas on moist, east- and southeast-facing hillsides and pockets of damp soil amongst boulders bordering rushing streams. All these habitats were degraded to some extent and some were in the process of transformation by *Rubus cuneifolius* (American bramble) (Craib 2005).

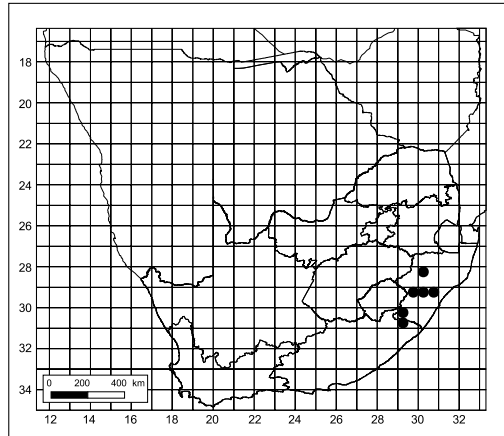


FIGURE 1.—Known distribution of *Nerine pancratioides*.

During the dry season, fires sweep through the habitat of *Nerine pancratioides*, removing moribund grasses and herbs and promoting the vigorous growth of the species. As the bulbs flower six or more months after winter fires, it is probably the clearing of the habitat rather than the stimulus of a grass fire that causes improved flowering. In addition, flowering may be stimulated by the nutrients from fire, which may act in combination with another cue, such as seasonal drop in temperature. Fires are now very erratic in the *N. pancratioides* habitats, bordering, as most of them do, on extensive timber plantations, which lie in a fire exclusion area. Prior to the advent of timber production, vast areas of the veld would have been burnt, synchronising the flowering of *N. pancratioides* over a wide area. During the survey it was found that some populations of these nerines flowered very well after a fire the previous dry season while in other areas nearby, where there had been no fires, only the large bulbs with tall scapes managed to produce flowers.

A perennial problem in areas where *Nerine* species grow in damp grassland surrounded by alien timber, is periodic heavy grazing by livestock. The animals do not have the range of grazing afforded to them by open tracts of veld and consequently grazing in the valley grasslands around marshes and streams is commonplace. *N. pancratioides* is known to be eaten by livestock (Pooley 1998). The flowers and leaves are eaten, and in most seasons the plants are trampled by livestock, since nearly all the significant colonies are located in timber-producing areas where grazing is also regularly practised.

Nerine pancratioides has a growing and flowering habit typical of *Nerine* species in the summer-rainfall area associated with moist grasslands and marshes. Most plants come into flower when the habitat is at its wettest, when there is the greatest chance of fluctuation in water levels of the streams. Temporarily flooded grasslands

beside these streams aid the distribution of seeds that fall from the parent plants. *N. pancratioides* differs from other marshland *Nerine* species in that the first flowers to open on the inflorescence produce ripe seeds at a time when other flowers, towards the centre, may have just opened. This habit allows for the maximum number of seeds to be shed over the longest period, improving the overall possibilities for the germination of seeds (Craib 2004).

Nerine species frequenting damp grasslands have probably become commensal with grazing livestock to some extent. In the case of *N. pancratioides*, the animals keep the grassland short and free from moribund grasses during the interfire years. For several nerines, this function becomes more significant in areas heavily planted with timber such as many parts of Mpumalanga, KwaZulu-Natal, and the northeastern part of the Eastern Cape. There is, however, a delicate balance between the number of animals put out to graze in the veld and the health of the habitat. In the former Transkei region of the Eastern Cape, *Nerine gibsonii* has been severely reduced in numbers owing to overgrazing which has led to the erosion and degradation of its marshy grassland habitat (Dold & McMaster 2004). In due course it will probably become necessary for the *N. pancratioides* habitats in timber-producing areas to be actively managed to prevent the plants from slipping into extinction. This can be achieved via controlled burning programmes and ensuring that some of the largest *Nerine* habitats are not grazed during optimal flowering seasons (Craib 2005). The conservation status of *N. pancratioides* is currently listed as 'vulnerable' B1ab(ii,iii,iv,v) (Snijman & Raimondo, in press).

Nerine pancratioides is possibly the most difficult of all the *Nerine* species to cultivate. It is extremely difficult to flower in cultivation and there are sometimes heavy losses of seedlings in the second and third years after germination. The young bulbs also take surprisingly long to develop when grown from seed, remaining thin and elongated for at least the first three to four seasons. This species would consequently not be a good candidate for *ex situ* conservation, should this practice be considered in the future. Although strictly summer-growing and winter-dormant in the wild, the plants remain evergreen in cultivation in temperate climates, as has been experienced in the bulb nursery at Kirstenbosch National Botanical Garden (Duncan 2002).

The specimens illustrated here were collected in March 2004 by Gillian Condy in a wetland site along Broadmoor Road in the Kamberg, Drakensberg, in southwestern KwaZulu-Natal.

Description.—Deciduous, summer-growing geophyte 0.3–1.2 m high. *Bulb* solitary, ovoid, up to 25 mm diam., white, surrounded by thin membranous brown outer tunics, extended into a slender neck 20–30 mm long. *Leaves* 2 or 3, linear, 180–300 × 2–3 mm, synanthous, erect or suberect, bright green, basal portion subterete and suffused with light maroon, slightly channelled in central portion, becoming flat above, smooth, weakly spirally twisted, with obtuse apex. *Scape* erect, terete, 500–950 mm long, glabrous, bright green. *Inflorescence* 5–20-flow-

ered, 60–75 mm across; spathe valves 2, lanceolate, 18–35 × 3–6 mm, pink with light brown margins during bud stage, uniformly light brown at flowering; bracteoles filiform, white, up to 5 mm long; pedicels suberect, 15–30 mm long at flowering, lengthening up to 40 mm at fruiting, densely pubescent, becoming glabrescent as they lengthen, bright green or olive-green, maturing to brown. *Flowers* funnel-shaped, slightly zygomorphic, suberect, pure white; tepals 6, free to base, overlapping for ± half their length, pure white with prominent midrib and short, light pinkish maroon median stripe on adaxial surface in lower portion, margins flat or undulate; outer tepals lanceolate, 12–25 × 4–6 mm, apices acute or rarely apiculate, straight or slightly recurved, margins smooth or slightly undulate towards apex; inner tepals oblanceolate, broader than outer tepals, 12–26 × 5–7 mm, apices acute or somewhat obtuse, straight or slightly recurved. *Stamens* 6, declinate, much shorter than or up to half as long as tepals; filaments filiform, 8–10 mm long, white, filament bases widened, with apical appendages, not fused to appendages of adjacent filaments; anthers oblong, 2 × 1 mm, dorsifixed, deep purple prior to anthesis; pollen ivory-coloured at anthesis. *Ovary* globose, trilocular, pubescent, 1.5 × 1.5 mm, deep pinkish maroon, 3–6 ovules per locule; style declinate, 6–7 mm long, white, included within perianth. *Capsule* subglobose, 3–4 × 5–6 mm, papery, pubescent, dehiscing loculicidally, rupturing rapidly as seeds enlarge. *Seeds* ellipsoid, 4–6 × 3–4 mm, fleshy, green or purple. Plate 2245.

REFERENCES

- ARCHER, R.H., CRAIB, C.L. & CONDY, G. 1997. *Nerine platypetala*. *Flowering Plants of Africa* 55: 36–39.
- BAKER, J.G. 1891. *Nerine pancratioides*. *The Gardener's Chronicle* 10, ser. 3: 576.
- BAKER, J.G. 1896. *Nerine pancratioides*. In W.T. Thiselton-Dyer, *Flora capensis* 6,2: 213, 214. Reeve, London.
- BAKER, J.G. 1903. *Nerine schlechteri*. *Bulletin de l'Herbier Boissier*, ser. 2, 3: 665.
- CRAIB, C.L. 2004. *Nerine pancratioides*. *Veld & Flora* 90,3: 105–107.
- CRAIB, C.L. 2005. *Nerine pancratioides* in the grasslands of South Africa's KwaZulu-Natal Province. *Herbertia* 58: 131–136.
- DOLD, T. & McMASTER, C. 2004. *Nerine gibsonii*. *Veld & Flora* 90,3: 102–104.
- DUNCAN, G.D. 2002. *Nerine pancratioides*. *Grow nerines*: 42, 43. *Kirstenbosch Gardening Series*. National Botanical Institute, Cape Town.
- DUNCAN, G.D. 2005. *Nerine pusilla*. *Curtis's Botanical Magazine* 22,3: 169–175.
- NORRIS, C.A. 1974. *Nerine pancratioides*. The genus *Nerine*. *Bulletin of The Nerine Society* 6: 22, 23.
- O'BRIEN, J. 1905. *Nerine pancratioides*. *Flora & Sylva* 3: 122.
- POOLEY, E. 1998. *Nerine pancratioides*. *A field guide to wild flowers of KwaZulu-Natal and the eastern region*: 106. Natal Flora Publications Trust, Durban.
- POOLEY, E. 2003. *Nerine pancratioides*. *Mountain flowers, a field guide to the flora of the Drakensberg and Lesotho*: 58. The Flora Publications Trust, Durban.
- SNIJMAN, D. & ARCHER, R.H. 2003. *Nerine*. In G. Germishuizen & N.L. Meyer, *Plants of southern Africa: an annotated checklist*. *Strelitzia* 14: 965. National Botanical Institute, Pretoria.
- SNIJMAN, D. & RAIMONDO, D. In press. *Nerine pancratioides*. *Strelitzia*. South African National Biodiversity Institute, Pretoria.
- TRAUB, H.P. 1967. Review of the genus *Nerine* Herb. *PlantLife* 23: 29.
- ZONNEVELD, B.J.M. & DUNCAN, G.D. 2003. Taxonomic implications of genome size and pollen colour and vitality for species of *Agapanthus* L'Héritier (Agapanthaceae). *Plant Systematics and Evolution* 241: 115–123.
- ZONNEVELD, B.J.M. & DUNCAN, G.D. 2006. Genome size for the species of *Nerine* Herb. (Amaryllidaceae) and its evident correlation with growth cycle, leaf width and other morphological characters. *Plant Systematics and Evolution* 257: 251–260.

ZONNEVELD, B.J.M & VAN JAARVELD, E.J. 2005. Taxonomic implications of genome size for all species of the genus *Gasteria* Duval (Aloaceae). *Plant Systematics and Evolution* 251: 217–227.

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Xerophyta longicaulis

Velloziaceae

South Africa

Xerophyta longicaulis Hilliard in Notes from the Royal Botanic Garden, Edinburgh 43: 405 (1986); as *Vellozia viscosa* Baker, Trauseld: 33, fig. opp. (1969).

The Velloziaceae is a monocotyledonous family of both the New and Old World. It comprises up to eight genera incorporating over 250 perennial species, with the divergence time for the split between African and South American taxa calculated at between 40 and 70 million years (Behnke *et al.* 2000).

Whereas the taxonomy at supraspecific level has long been contentious (Smith & Ayensu 1974; Mello-Silva 1991) and remains unresolved (Mello-Silva 2005), both molecular and ultrastructural analyses substantiate Velloziaceae as monophyletic, sister to the Acanthochlamydeaceae (Behnke *et al.* 2000; Salatino *et al.* 2001). Members of the essentially tropical Velloziaceae are either herbs or erect shrubs, with fibrous stems bearing terminal rosettes of grass-like leaves. In that some members (e.g. *Xerophyta splendens* from Mt Mulanje) are arborescent, the Velloziaceae is colloquially referred to as the ‘tree lily’ family, for they also all bear showy, brightly coloured, lily-like flowers. Besides such giants as *X. splendens*, many of the smaller species resemble miniature trees with stout trunks, which would justify this collective family name. The anomalous stem woodiness seen in these monocots may be attributed to an unusual growth characteristic: adventitious roots emerge from the short apical living portion of the slender stem and pierce the persistent dead leaf bases below, growing downwards mantle-like through them to anchor the plant in the substrate—usually shallow soil overlying a rock pavement. A dense mat of roots often develops at the plant base, allowing for optimal gathering of moisture, including that available as fog. The water-absorbing and -holding capacity of these xerophytes is strongly enhanced by the persistent leaf sheaths which act like blotting paper (Ayensu 1973) and which further protect the plant from fire (Kubitzski 1998).

All three sections of *Xerophyta* are generally considered to comprise only taxa adapted to extreme xeric conditions, with the 30-odd species confined to tropical Africa, Madagascar and southernmost Arabia (Kubitzski 1998). Of the 10 *Xerophyta* species gracing southern Africa, only one has previously been figured in this series—the widespread *X. retinervis* (Plate 856). The most elusive of the 10 is figured here, a species recognised as distinct only 20-odd years ago, and which has been collected on only a few occasions within its very limited distribution range (Figure 1). *X. longicaulis* was described from a voucher collected in the upper Thugela Gorge of the Royal Natal National Park by W.R. (Bill) Trauseld, following its being photographed as a subject for his book *Wild flowers of the Natal Drakensberg*. At the type locality, plants



PLATE 2246 *Xerophyta longicaulis*

grow abundantly in mats, many thousands adorning moist drip lines on the near-vertical sandstone rock faces.

Olive Hilliard, who originally determined the Trauseld collection to be of the highly variable *Xerophyta viscosa* (as *Vellozia viscosa*) (small black stick lily), later decided the specimen represented a novelty and so described it, according it the specific epithet *longicaulis* in view of its characteristically long stems. Besides substantial differences in stem length (*X. viscosa* stems never exceed 50 mm) and branching patterns, *X. longicaulis* stems (which can branch up to four times) are clothed with residual truncate leaf bases that remain intact and closely appressed to the long stems rather than shredding into fibres and recurving, as in *X. viscosa*. Additionally, the stigma of *X. longicaulis* is only 10 mm long, somewhat shorter than that of *X. viscosa* which is between 16 and 20 mm long. An obvious distinguishing field character for *X. longicaulis* is the lack of leaf stickiness, glutinosity being a defining feature of *X. viscosa* leaves and one aptly captured by its own specific epithet.

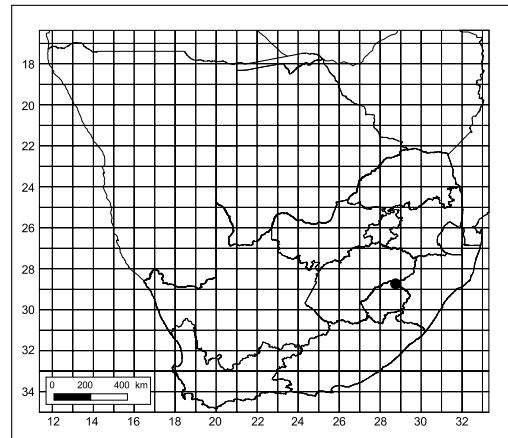


FIGURE 1.—Known distribution of *Xerophyta longicaulis*.

The ecological niches of these two taxa are distinct too: *Xerophyta longicaulis* typically occurs as a cremnohyte on drip lines alongside waterfalls and open perennial watercourses, even within forest (Figure 2), whereas the chasmophytic *X. viscosa* is a plant of exposed grasslands and cliff edges. Here it is found occupying shallow lithosols on sheetrock expanses where it is necessarily adapted to rapid fluctuations in soil moisture. In preferring a moist habitat, *X. longicaulis* is unique among members of the genus, being more akin in this respect to the related *Talbotia elegans*, though not quite as tolerant of shade. Indeed, plants of these two species are sometimes found within metres of each other in their forest abode. *Talbotia*, a monotypic South African endemic, has earlier been shown to differ from at least one *Xerophyta* species in its physiological response to desiccation: it retains its chloroplasts on drying, whereas *X. villosa* has been shown to lose these organelles under similar conditions (Hallam & Gaff 1978). In that *X. longicaulis* evidently favours a moister habitat than other xerophytas, it appears that the leaf blades are mesophytic in function. Ecophysiological investigations could yet reveal remarkable functional insights, for this species may be only marginally poikilohydric (having no mechanism to prevent desiccation) and so intolerant of true xeric environments. If the contention is correct that *Talbotia* arose prior to *Xerophyta* evolving into its xeric niche (Menezes *et al.* 1994; Kubitzski 1998), then particularly intriguing are the modifications that have allowed for reversal of *Xerophyta* to the mesic state—evidenced in *X. longicaulis*. If its leaves are actually mesophytic, then has this species lost the leaf rib sclerenchyma present in all other shrubby xerophytas from southern Africa (Coetzee 1974)? On the

basis of *rbcL* cladistic analyses, Behnke *et al.* (2000) proposed merging *Talbotia* with *Xerophyta*, reinstating *X. elegans* as proposed originally by Baker (1875). If this molecular argument is accepted over counter morphological findings (Mello-Silva 2005), then two xerophytas would be known to favour moist environs. Perhaps on account of its unexpected habitat preference *X. longicaulis* has largely eluded field botanists, several of whom have searched without success for it within its narrow range.

Although Hilliard (1986) provided flower colour as a character to further separate *Xerophyta longicaulis* from *X. viscosa*, it would appear that the type is actually an aberrant white form, the normal perianth colour being purple-mauve. In January 1964, the same year that he gathered the October-flowering white sport that was designated the holotype (*Trauseld 279*, in the herbarium of the University of KwaZulu-Natal, Pietermaritzburg), Trauseld had collected material of *X. longicaulis* from moist sandstone cliffs in the same general area, but of plants bearing mauve flowers (*Trauseld 109*, in the National Herbarium, Pretoria). Apart from the type, the few herbarium specimens made of *X. longicaulis* all appear to be of purple-flowering plants, dating back to the first collection made by G.E. Oliver in 1927. Such white flowers among mauve-flowered populations are quite a common feature of other genera in the Velloziaceae (Mello-Silva 2000).

Plants flower between October and January, generally earlier than *X. viscosa* which typically starts blooming in late November. One or two individual perfect flow-



FIGURE 2.—*Xerophyta longicaulis* mats growing between tumbling cascades on the Gudu River, Royal Natal National Park.

ers are produced from within each leaf rosette, their pedicels curving upwards to present the attractive flowers with their prominent yellow anthers. Each broad funnel-shaped bloom possesses a very short perianth formed by the six united tepals, which are arranged in two whorls; the tepal apices are free and recurved. On the underside of the three outer tepal bases, as well as the entire ovary and the thin pedicel, are prominent sticky, purple-green glands. These are presumed to play a role in attracting pollinators, which we anticipate are bees, based on observations by Ayensu (1973) of New World tree-lilies. While hummingbirds also pollinate South American Velloziaceae (Sazima 1977; Sazima & Sazima 1990), we have been unable to find references to sunbird pollination of African representatives.

The habit of *Xerophyta longicaulis* is most unusual for a member of the genus, for in adapting to its precipitous abode this cremnophyte has evolved slender but rigid pendulous stems, rather than stout erect ones. In hanging downwards, the stems direct the water dripping from above along their sheath-covered lengths to capture moisture optimally. The value of such thin hanging stems comes to the fore during floods when the riparian clumps are inundated with streaming water—in limiting its mass and lowering its centre of gravity, the likelihood of a *X. longicaulis* plant losing purchase on its moist vertical substrate is much reduced. However, gravity does still take its toll: in the Thugela Gorge brown-stemmed mats are sometimes found senescing amongst the riverside boulders following their fall from the cliffs above. The dichasial stems bear terminal rosettes of leathery, keeled leaves. Each long, narrow leaf is recurved, with serrate margins, and often turns brown towards its drawn-out apex before eventually abscising towards the base, the residual portions overlapping each other like scales and remaining appressed to the narrow brown stem.

Fruit characters have not yet been documented for *Xerophyta longicaulis* but in accord with other members of the genus they are probably capsules opening with three pores at the base, releasing the small seeds (Coetzee *et al.* 1973).

The known altitude range for *Xerophyta longicaulis* is between 1 800 and 2 740 m and it is narrowly restricted to the upper Thugela, the Mahai and Gudu River systems within the Royal Natal National Park and to the adjacent Witsieshoek region of the Drakensberg. A high degree of endemism seems a global feature of the Velloziaceae (Mello-Silva 1991; Kubitzki 1998) and is exemplified by another regional relative, *X. seineri*: this recently described species is known only from two inselbergs within Zimbabwe's Rhodes Matopos National Park (Behnke *et al.* 2002).

The specimen figured here was collected from a mat on the vertical face of a sandstone boulder, within the spray of the upper Gudu River as it tumbles through the forest of the same name in the Royal Natal National Park. Associated plants at this site include *Huperzia verticillata*, *Streptocarpus pusillus*, *Phygelius aequalis*, *Aloe aristata*, *Drimia elata*, *Selaginella mittenii* and the elongate forest form of *Elaphoglossum acrostichoides*: strange bedfellows indeed for a *Xerophyta*. Near The Tunnel of the upper Thugela, *Huperzia saururus* replaces *H. verticillata* while *Selaginella nubigena* is somewhat unexpectedly found alongside *S. mittenii*. Clumps along the Gudu River face

south, whereas in the upper Thugela region, they grow on both eastern and western aspects, though here receiving reduced insolation on account of the narrowness of the gorge at this point.

In keeping with the largely unsuccessful experience of horticulturists with other Velloziaceae (Ayensu 1973), *Xerophyta longicaulis* has proven difficult as a transplant in cultivation. Although most stems of a plant moved to Lydenburg died back, one developed, producing a single flower the next year. Fruit was not set, and no seed was available to attempt germination. In the unlikely event that the horticultural requirements of seed-grown plants are elucidated, *X. longicaulis* when mature would make a useful and very attractive subject for a hanging basket.

The genus name is derived from the Greek words *xeros* (dry) and *phytos* (plant), somewhat of a misnomer for this particular taxon. No common names have been applied previously to *Xerophyta longicaulis*, for which we suggest 'hanging black stick lily'.

Description.—Plants perennial, evergreen, subshrubby to shrubby, clumped to form pendulous mats. *Stems* up to 400 mm long, 9–12 mm diam., towards apex often dichotomously branched, occasionally branched up to 4 times, entirely covered with imbricate appressed, dirty-brown leaf bases; apices of leaf bases grey and truncate. *Leaves* tristichous, apple-green, glabrous, 6–11 mm from stem apex, each about 250 mm long, base 5–11 mm broad, distally narrowing into a long attenuate, often brown apex, margins thickened, finely serrate, midrib channelled above, prominently ribbed below with small teeth along upper two thirds, abaxially curved outwards, transverse abscission band evident towards base. *Flower* perfect, solitary, arising from centre of leaf rosette. *Pedicel* 150 mm long, ± 1 mm diam., triangular in transverse section, glandular, sticky, glands purple, capitate. *Perianth* segments 6, spreading, free at base, mauve (rarely white) with pale purple veins; 3 outer tepals lanceolate, $\pm 14 \times 6$ –7 mm, acute, glandular hispid on outside, dark glands sessile to subsessile, arranged regularly along veins; 3 inner tepals oblong-elliptic, $\pm 35 \times 10$ mm, obtuse, apiculate, glabrous. *Stamens* 6; filaments green, ± 0.25 mm long; anthers 13×1.5 mm, dorsifixed, opening by longitudinal slits. *Ovary* inferior, turbinate, 3-locular, 6×6 mm, covered with enlarged, purple-tipped, green-stemmed, capitate to subsessile glands extending onto median base of outer tepals; style 4 mm long; stigma 10 mm long (or 8 mm when dry), 1.5 mm diam., triquetrous. *Fruit* a capsule. Plate 2246.

REFERENCES

- AYENSU, E.S. 1973. Biological and morphological aspects of the Velloziaceae. *Biotropica* 5: 135–149.
- BAKER, J.G. 1875. Synopsis of the African species of *Xerophyta*. *Journal of Botany* 13: 231–236.
- BEHNKE, H.-D., KRAMER, K. & HUMMEL, E. 2002. *Xerophyta seineri* (Velloziaceae), a distinctive new species from Zimbabwe. *Taxon* 51: 55–67.
- BEHNKE, H.-D., TREUTLEIN, J., WINK, M., KRAMER, K., SCHNEIDER, C. & KAO, P.C. 2000. Systematics and evolution of Velloziaceae, with special reference to sieve-element plastids and *rbcl* sequence data. *Botanical Journal of the Linnean Society* 134: 93–129.

- COETZEE, H. 1974. Anatomy of the leaves of Velloziaceae in South Africa and South West Africa and a key based on leaf anatomy. *Dinteria* 10: 19–31.
- COETZEE, H., VAN DER SCHIJFF, H.P. & STEYN, E. 1973. External morphology of the species of the South African Velloziaceae including a key based on external morphological characteristics. *Dinteria* 9: 3–17.
- HALLAM, N.D. & GAFF, D.F. 1978. Regeneration of chloroplast structure in *Talbotia elegans*: a desiccation-tolerant plant. *New Phytologist* 81: 657–662.
- HILLIARD, O.M. 1986. Velloziaceae. Notes on some plants of southern Africa: XII. *Notes from the Royal Botanic Garden, Edinburgh* 43: 405.
- KUBITZKI, K. 1998. Velloziaceae. *The families and genera of vascular plants. III. Flowering plants. Monocotyledons. Lilianae (except Orchidaceae)*: 459–466. Springer-Verlag, Berlin.
- MELLO-SILVA, R. DE 1991. The infra-familial taxonomic circumscription of the Velloziaceae: a historical and critical analysis. *Taxon* 40: 45–51.
- MELLO-SILVA, R. DE 2000. Partial cladistic analysis of *Vellozia* and characters for the phylogeny of Velloziaceae. In K.L. Wilson & D.A. Morrison, *Monocots: systematics and evolution*: 505–522. CSIRO, Melbourne.
- MELLO-SILVA, R. DE 2005. Morphological analysis, phylogenies and classification in Velloziaceae. *Botanical Journal of the Linnean Society* 148: 157–173.
- MENEZES, N.L. DE, MELLO-SILVA, R. DE & MAYO, S.J. 1994. A cladistic analysis of the Velloziaceae. *Kew Bulletin* 49: 71–92.
- SALATINO, A., SALATINO, M.L.F., MELLO-SILVA, R. DE, VAN SLUYS, M.-A., GIANNASI, D.E. & PRICE, R.A. 2001. Phylogenetic inference in Velloziaceae using chloroplast *TrnL-F* sequences. *Systematic Botany* 26: 92–103.
- SAZIMA, M. 1977. Hummingbird pollination of *Barbacenia flava* (Velloziaceae) in the Serra do Cipó, Minas Gerais, Brazil. *Flora* 166: 239–247.
- SAZIMA, M. & SAZIMA, I. 1990. Hummingbird pollination in two species of *Vellozia* (Liliiflorae: Velloziaceae) in southeastern Brazil. *Botanica Acta* 103: 83–86.
- SMITH, L.B. & AYENSU, E.S. 1974. Classification of Old World Velloziaceae. *Kew Bulletin* 29: 181–205.
- TRAUSELD, W.R. 1969. *Wild flowers of the Natal Drakensberg*. Purnell, Cape Town.

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Habenaria schimperiana

Orchidaceae

Southern Africa and tropical East Africa

Habenaria schimperiana Hochst. ex A.Rich., Tentamen florae Abyssinicae 2: 295 (1851); Williamson 51, fig. 21.32 (1977); Stewart et al.: 92, t. 9.22 (1982); La Croix & Cribb: 105, t. 4 (1995). *H. involuta* Bolus: 165, fig. 3 (1889).

In February 2005 a specimen of *Habenaria schimperiana* was collected in a wetland in Gauteng, a new record more than 200 km west of the nearest known record in Mpumalanga (Figure 1). This species had previously been recorded in three provinces of South Africa, namely Limpopo, Mpumalanga and KwaZulu-Natal. It is also known from Swaziland and is widespread in the eastern half of tropical Africa—Sudan, Ethiopia, Kenya, Democratic Republic of Congo, Tanzania, Malawi, Zambia, Zimbabwe and in Yemen. Because of the wide distribution range of this orchid, it is not listed on the South African Red List, but because of its rarity in this country, it should be of conservation importance (J. Victor, pers. comm.).

Habenaria is one of the major genera of the Orchidaceae, with about 800 species distributed throughout the tropics of the world (Summerhayes 1968). In southern Africa it is represented by some 35 species, and it is therefore not surprising that members of this genus are among the most frequently seen terrestrial orchids in the summer-rainfall region. They are typically grassland species, often found in marshy areas (Schelpe 1966). Most *Habenaria* species have leafy stems producing spikes of small green or green-and-white flowers in summer. Many species have petals that are deeply divided into two lobes and

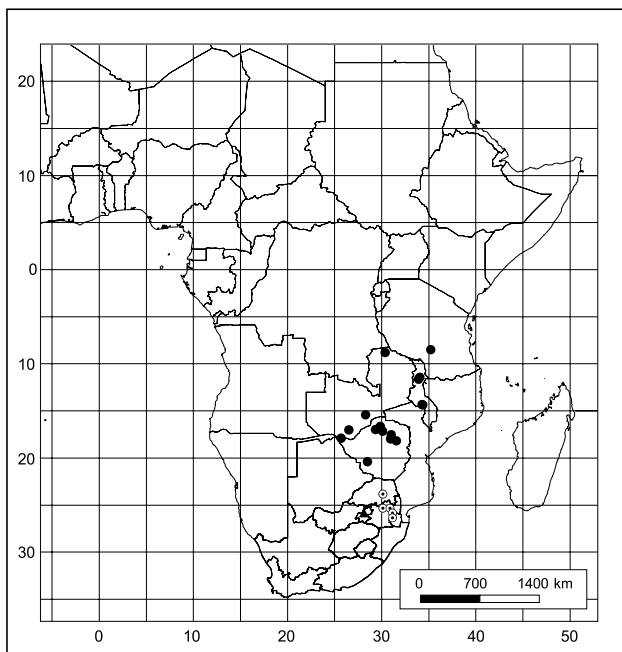


FIGURE 1.—Known distribution of *Habenaria schimperiana*: ●, distribution in tropical Africa; ⊙, distribution in *Flora of southern Africa* region; ▲, new record.

PLATE 2247.—1, tuber, roots and basal leaves, $\times 1.2$; 2, inflorescence, $\times 1$; 3, flower, $\times 3$. Voucher specimen: Lemmer 600 in National Herbarium, Pretoria. Artist: Gillian Condy.



PLATE 2247 *Habenaria schimperiana*

a distinctly three-lobed or entire lip but in a few species, such as *H. epipactidea*, it is undivided.

The name *Habenaria* is derived from the Latin *habena* (reins), which describes the long strap-shaped divisions of the petals and the lip of the flowers of many species (Archer & Condy 2005). The species *H. schimperiana* commemorates the German botanist and plant collector George Heinrich Wilhelm Schimper (1804–1878), who collected in Egypt and Arabia from 1834–1836 and in Ethiopia in 1837 where he collected the holotype (*Schimper 1210*) at Siemen near Jomara.

Diagnostic features of *Habenaria schimperiana* are the long horizontally spreading pedicels and the flowers that hang downwards. Pedicels of the specimen found in Gauteng were 40 mm long including the ovary (pedicel only 30 mm) in contrast to the pedicel measurement (± 15 mm) given by Manning (1999). In tropical Africa the length of the pedicel including the ovary is said to be 20–40 mm (La Croix & Cribb 1995). This measurement is equivalent to the pedicel including the ovary of the specimen found in Gauteng. In the late evening the flowers emit a most unpleasant odour, like that of smelly feet (Williamson 1977). The collector of the Gauteng specimen (Mrs Petro Lemmer) refers in her label notes to the odour as ‘like that of rotten cream’. Very little is known about the pollination of *Habenaria* species. Most species appear to be adapted for moth pollination and some for wasp pollination. In South Africa *H. schimperiana* flowers from December to February (Manning 1999) and in tropical East Africa it flowers from July to August (Piers 1968).

The classification of the Orchidaceae family is currently under revision by means of molecular techniques. The genus *Habenaria* is placed in the large subtribe Habenariinae (tribe Orchideae, subfamily Orchidoideae) or in a more broadly circumscribed subtribe Orchidiinae (Pridgeon *et al.* 2001) together with other southern African genera—*Bonatea*, *Centrostigma*, *Cynorkis* and *Stenoglottis* (Archer & Condy 2005), and *Platycoryne* recorded in southern Africa in 2005 (Kurzweil & Burrows 2005). These genera form a natural group within the subtribe, which is characterised by a convex, stalked stigma. This subtribe comprises 23 genera worldwide, with about 930 species (La Croix & Cribb 1995). The six genera mentioned above are represented by 53 species in southern African (Archer & Condy 2005).

Habenaria schimperiana, together with two other species of the genus in southern Africa, namely *H. falcicornis* and *H. galpinii*, is placed in section *Replicatae*. Other species of this section are found in tropical Africa and outside the continent. *H. schimperiana* is closely related to *H. genuflexa* in that they both have leafy stems, many-flowered inflorescences, petals that are two-lobed almost to the base, and green flowers that hang downwards, with a white centre and an unpleasant smell. *H. schimperiana* differs from *H. genuflexa* in that the petal lobes are ciliate. In *H. genuflexa* the lower lobe is glabrous or papillose but not ciliate on the margin (La Croix & Cribb 1995).

Description (loosely taken from Manning 1999).—Plants robust, up to 1 m tall. *Leaves* cauline, 6–10, linear-lanceolate, up to 280 × 20 mm, acute. *Inflorescence* lax, many-flowered; bracts clasping pedicel, lanceolate, acuminate, 10–20 mm long;

pedicel horizontal, 15–40 mm long, with ovary angled, deflexed, \pm 10 mm long. *Flowers* green with white centre, unpleasantly scented. *Sepals*: median reflexed, concave, elliptic, 6–8 mm long, obtuse; lateral sepals deflexed and twisted, obovate with lateral apiculus, 9–11 mm long. *Petals* deeply bipartite, puberulous; upper lobe reflexed, linear, 5–8 mm long; lower lobe spreading downwards, elongate-lanceolate, 14.0–18.5 mm long, acute. *Lip* deeply tripartite; midlobe linear, 13–17 mm long; side lobes linear-lanceolate, 8–11 mm long; spur geniculate, sharply incurved beneath flower, twisted, much inflated in apical half, 10–15 mm long. *Anther* reflexed, \pm 3 mm tall, canals incurved, 5–6 mm long; stigmatic processes porrect, clavate, 5–7 mm long; central rostellum lobe subulate, 1–2 mm long. Plate 2247.

REFERENCES

- ARCHER, C. & CONDY, G. 2005. *Habenaria bicolor* and *H. kraenzliniana*. *Flowering Plants of Africa* 59: 52–59, tt. 2208, 2209.
- BOLUS, H. 1889. Contributions to South African botany, Part IV. *Journal of the Linnean Society* 25: 156–210.
- KURZWEIL, H. & BURROWS, S. 2005. *Platycoryne mediocris*. *Flowering Plants of Africa* 59: 60–66.
- LA CROIX, I. & CRIBB, P.J. 1995. Orchidaceae. *Flora zambesiaca* 11,1: 59–148. Flora Zambesiaca Managing Committee.
- MANNING, J.C. 1999. *Habenaria* Wild. In H.P. Linder & H. Kurzweil, *Orchids of southern Africa*: 110–136. Balkema, Rotterdam.
- PIERS, F. 1968. *Orchids of East Africa*. Cramer, Lehre.
- PRIDGEON, A.M., CRIBB, P.J., CHASE, M.W. & RASMUSSEN, F. (eds) 2001. *Genera Orchidacearum* II. Oxford University Press, Oxford.
- RICHARD, A. 1851. *Tentamen florum Abyssinicae* 2: 295. Paris.
- SUMMERHAYES, V.S. 1968. Orchidaceae (Part 1). In E. Milne-Redhead & R.M. Polhill, *Flora of tropical East Africa*: 1–235.
- SCHELPE, E.A.C.L.E. 1966. *An introduction to the South African orchids*. Purnell, Cape Town.
- STEWART, J., LINDER, H.P., SCHELPE, E.A. & HALL, A.V. 1982. *Wild orchids of southern Africa*. Macmillan South Africa, Johannesburg.
- WILLIAMSON, G. 1977. *The orchids of south central Africa*. Dent, London.

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PLATE 2248 *Serruria elongata*

Serruria elongata

Proteaceae

South Africa

Serruria elongata (P.J.Bergius) R.Br. in Transactions of the Linnean Society of London 10: 132 (1810); Meisner: 297 (1856); Phillips & Hutchinson: 660 (1912); Vogts: 44 (1982); Rebelo: 87 (1995); *Leucadendron elongatum* P.J.Bergius: 327 (1766). *Protea thyrsoides* Lam.: 240 (1792). *S. crithmifolia* Salisb. ex Knight: 83 (1809), superfluous name.

Described as early as 1766 by the eminent Swedish botanist Petrus Jonas Bergius, *Serruria elongata* is one of the commoner and more widespread members of the genus in the mountains of the southwestern Cape. Like many 18th century European botanists, Bergius never visited the Cape himself but indirectly obtained the specimen from which he described the species, in this case from Michael Grubb, a director of the Swedish East India Company who in turn purchased a collection of herbarium specimens from Jan Andreas Auge, the Dutch East India Company's master gardener, when he passed through the Cape in April 1764 while returning to Sweden from the southern Chinese city of Canton (known today as Guangzhou), where he traded as a merchant. This material became the basis of Bergius's famous 362-page book *Descriptiones plantarum ex Capite Bonae Spei*, published in Stockholm in 1767. It was one of the most important early publications devoted to the Cape flora. However, Bergius seems to have had a particular interest in the Proteaceae because a year earlier in 1766, in the *Transactions of the Royal Swedish Academy of Science*, he published a separate paper devoted exclusively to the Proteaceae in Grubb's collection, all of which he assigned to *Leucadendron*, including the present species. There are two specimens in the Bergius Herbarium in Stockholm, both labelled '*Leucadendron mihi elongatum*' ('my *Leucadendron elongatum*') in Bergius's hand, one obtained by Grubb, the other by C.H. Wänman who also collected it at the Cape but only returned to Sweden in 1768, after Bergius's name had been published in 1766. It is clear therefore that the Grubb specimen should be regarded as the holotype of the name.

Serruria, with somewhere between 54 and 60 species, is the largest genus of the Proteaceae endemic to the Western Cape, ranging from the Gifberg near Vanrhynsdorp to the Outeniqua Mountains above George, but is absent from the Swartberg. Other large Cape-centred genera have much greater ranges, with *Protea* and *Leucospermum* extending into central Africa and *Leucadendron* reaching KwaZulu-Natal.

Serruria elongata is confined to relatively mesic habitats, most frequently on the southern slopes of the coastal ranges at elevations up to 1 200 m, from the Hottentots Holland throughout the Kogelberg, Kleinmond, Klein River and Bredasdorp ranges to the Elim hills and Soetanysberg above Cape Agulhas, with pop-

PLATE 2248.—1, flowering branch, × 1; 2, perianth immediately prior to opening, × 4; 3, gynoecium showing pollen presenter, style, ovary and hypogynous scales, × 4; 4, mature fruit, × 4. Artist: Gillian Condy. Voucher specimen: Condy 172, National Herbarium, Pretoria.

ulations extending from Villiersdorp along the southern slopes of the Riviersonderend Mountains to an area slightly west of Stormsvlei at its easterly limit (Figure 1). It grows almost exclusively on soils derived from the Table Mountain Group sandstones, although near Struisbaai populations have been found on sand overlying Bredasdorp Group limestone. At a few localities such as Rooi Els and Pringle Bay, populations occur at sea level but this is unusual and mature plants here have a wind-sheared compact growth form due to the exposed maritime conditions.

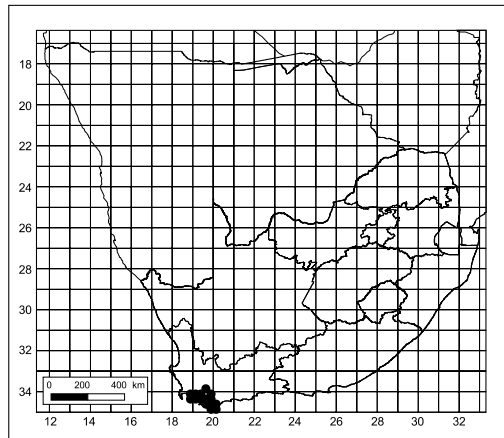


FIGURE 1.—Known distribution of *Serruria elongata*.

The inflorescence in this species is a complex branched structure, best described as a confluence, using the terminology of Johnson & Briggs (1975) for such elaborate inflorescences in the Proteaceae. In this and related taxa it consists of a stout peduncle on which is borne a panicle of pedunculate capitula having secondary branching, with the capitula opening in centrifugal succession (i.e. from the top downwards). The peduncle length is particularly variable in this species, ranging from 50 to 300 mm. Very short peduncles tend to be typical of extreme coastal habitats while longer peduncles are usually found in populations growing in more mesic, elevated, montane habitats. The specimen figured here from the lower slopes of Voorberg, Betty's Bay, is typical of the short-peduncled form and does not display the elongate peduncle that inspired the specific epithet.

Serruria elongata belongs to a distinctive group of five species in which the inflorescence architecture as described above, is similar. The other four are *S. leipoldtii*, *S. williamsii*, *S. confragosa* and *S. altiscapa*. This inflorescence structure together with straight perianths and styles probably represents the least specialised floral condition in the genus, from which more reduced specialised forms with single compact terminal capitula, strongly incurved perianths and incurved morphologically diverse styles can be derived. *S. elongata* is most closely related to *S. altiscapa* which is distinguished by its massive 700–1 240 mm long confluences with peduncles up to 900 mm long, whereas *S. elongata* has markedly shorter peduncles, 50–300 mm long, and shorter inflorescences up to 500 mm long. Significantly, both *S. elongata* and *S. altiscapa* occur sympatrically on the southern slopes of Blokkop above the Boland town of Villiersdorp and even flower simultaneously, yet there is no evidence of hybridisation between the two species, suggesting the existence of a strong genetic barrier between them.

Flowering takes place over an extended period from late July until November when the silvery pink inflorescences are produced in profusion, making some of the more compact forms very attractive garden subjects. Curiously, it has never been cul-

tivated at Kirstenbosch nor has it been offered in the nursery trade, possibly because of the difficulty of collecting viable seed and the tendency of most members of the genus to be short-lived in cultivation, rarely surviving more than a few years. One of the most delightful characteristics of this species is its strong, deliciously sweet perfume when flowering. It is worth growing for this reason alone. The perfume intensifies at night, suggesting the flowers may be moth-pollinated, although confirmatory observations on its pollination have not yet been made.

Like many fynbos shrubs, *Serruria elongata* is a relatively short-lived re-seeder, adapted to periodic burning followed by active seedling recruitment after a veld fire as the winter rains set in. The fruits are small, hairy and about 6–8 mm long, with a fleshy pedicellate base or elaiosome. These elaiosomes contain chemical stimulants attractive to several species of native ants, especially the Pugnacious Ant, *Anoplolepis steingroveri*, which gathers the fruits as they are shed and stores them in underground caches where they remain in a dormant state until the next veld fire stimulates germination, initiating a new regeneration cycle. Most mature plants begin to senesce and die after about 25 years if the interval between fires is not shorter.

Description.—Compact, rounded single-stemmed shrub 0.5–1.5 m tall, branching near base. *Branches* glabrous, reddish, with leaves clustered in upward facing pseudo-whorls towards end of each growth flush; lower leaves on each branch reduced to glabrous subulate bracts. *Leaves* tripinnatifid, 50–200 mm long, glabrous, upper surface canaliculate, occasionally with a few scattered villous hairs; petiole 10–60 mm long. *Inflorescence* a loose terminal panicle of capitula, 70–500 mm long, displaying second order branching; peduncle glabrous, reddish, 50–300 mm long, beset with numerous alternate subulate bracts; capitula spherical to ovoid, 12–20 mm in diam.; involucre bracts broadly ovate-acute, 4–6 × 2–3 mm, with alate hyaline margins; receptacle conic-ovoid, 4–8 mm long. *Floral bracts* ovate-acute to acuminate, 2–4 × 3–4 mm, tightly clasping perianth, apical margins involute. *Perianth* straight in bud, segments recurving equally at anthesis, 9–12 mm long, densely adpressed sericeous, glabrous, slightly inflated in tube region. *Style* straight, filiform, 10–12 mm long, glabrous. *Pollen presenter* clavate-obtuse; stigmatic groove terminal. *Ovary* ovoid, 1.5 mm long, densely sericeous. *Hypogynous scales* subulate-filiform, 2 mm long. *Fruit* an ovoid cylindrical achene, truncate and pedicellate at base, beaked apically, 4–6 × 2 mm. Plate 2248.

REFERENCES

- BERGIUS, P.J. 1766. *Leucadendron elongatum*. *Kungliga Vetenskapsademiens handlingar* 28: 327. Stockholm.
- BERGIUS, P.J. 1767. *Descriptiones plantarum ex Capite Bonae Spei*. Stockholm.
- BROWN, R. 1810. On the Proteaceae of Jussieu. *Transactions of the Linnean Society of London* 10: 15–226.
- JOHNSON, L.A.S. & BRIGGS, B.G. 1975. On the Proteaceae, the evolution and classification of a southern family. *Botanical Journal of the Linnean Society* 70: 83–182.
- KNIGHT, J. 1809. *On the cultivation of the plants belonging to the natural order of Proteeae*. London.
- LAMARCK, J.P.A.P.M. DE 1792. *Tableau encyclopedique et methodique* 1: 240. Paris.
- MEISNER, C.F. 1856. Proteaceae. In A.P. de Candolle, *Prodromus*, Part 14: 297. Masson, Paris.
- PHILLIPS, E.P. & HUTCHINSON, J. 1912. *Serruria*. *Flora capensis* 5: 660. Reeve, London.

- REBELO, T. 1995. *Sasol proteas. A field guide to the proteas of southern Africa*. Fernwood Press, Cape Town.
- VOGTS, M.M. 1982. *South Africa's Proteaceae. Know them and grow them*. Struik, Cape Town.

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PLATE 2249 *Kalanchoe crenata* subsp. *crenata*

Kalanchoe crenata subsp. *crenata*

Crassulaceae

Southern, eastern and tropical Africa

Kalanchoe crenata (Andr.) Haw. subsp. *crenata*, Haworth in Synopsis plantarum succulentarum: 109 (1812); Harvey: 379 (1862); Britten: 394, 395 (1871) in part; Hutchinson & Dalziel: 105, fig. 34 (1927); Cufodontis: 713, 714, figs 68–70 (1957); Jacobsen: 645 (1960); Batten & Bokelmann: 73, pl. 62(3) (1966) in part; Cufodontis: 320 (1969); Raadts: 126–131 (1977); Fernandes: 20–23 (1982); Fernandes: 47–49 (1983); Wickens: 42–45, fig. 6 (1987). *Verea crenata* Andrews: t. 21 (1798), as *Vereia*. *Cotyledon crenata* (Andr.) Ventenat: t. 49 (1804); Sims: t. 1436 (1812).

The genus *Kalanchoe*, with 144 species, is Old World in distribution, being known naturally from tropical Asia, Africa and particularly Madagascar (Descoings 2003). It is also known from eastern Australia where one species, *K. delagoensis*, there treated as *Bryophyllum delagoense*, has become naturalised (Dreyer & Makwabela 2000; Kapitany 2007). Other species such as *K. pinnata* have become invaders throughout the tropics (Thiede & Egli 2007).

Kalanchoe belongs to the near-cosmopolitan Crassulaceae, a family of about 34 genera and 1 400 species, with major centres of diversity in South Africa and Mexico (Thiede & Egli 2007). Altogether 13 *Kalanchoe* species are recognised in South Africa, excluding subspecific taxa and some insufficiently known species, but including *K. hirta*, which has been relegated to synonymy at times (Burgoyne 2006). *Kalanchoes* occur primarily in the summer-rainfall savanna region and are not found in more karroid shrublands south of the Orange River (Court 2000).

While the well-known Malagasy species of section *Bryophyllum* are often very showy bedding plants, bearing large pendulous bell-shaped flowers and sporting proliferous habits, those of section *Kalanchoe* from both Africa and Madagascar are less often seen in gardens. Members of the latter section are better appreciated as pot plants, the best known being the free-flowering flaming Katie, *K. blossfeldiana*. This Malagasy species, and some artificial hybrids of which it is one parent, are available in a range of dwarf cultivars with vibrantly coloured flowers. It enjoys widespread popularity as an indoor plant in temperate regions, particularly Europe and the USA.

Southern African *kalanchoes*, with their largely insignificant forms and dull-coloured blooms, have not been known locally for their garden potential, greater interest being focused on related genera in the Crassulaceae (the stonecrop or *plakkie* family), particularly pig's ears (*Cotyledon*) and *kliprosies* or rock roses (*Crassula*).

However, *Kalanchoe crenata* has good potential as a garden subject for subtropical forest gardens, but has not widely entered horticulture—at least not in South

Africa. In Europe it has been included amongst nearly 50 species recommended for growing under glass (Springate 1995). Its apparent rarity in our subregion may account for this oversight by the gardening community. Where it occurs, this prolific seeder is always rather localised, albeit sometimes even locally common. Its preference for moist forest margins and moist sheltered scrub may account for its relative obscurity—other regional *Kalanchoe* are more tolerant of drought and brighter light conditions, and are therefore typically more widespread in our arid countryside and thus better known. In the lower light of forests, blooms of a brilliant orange are produced by *K. crenata* under short-day conditions (Thiede & Eggli 2007) from May to July, when they brighten the forest undergrowth with their glowing intensity. Plants are sometimes even found on rotting logs in the understorey. By comparison, the other local species of *Kalanchoe* lack lustre and make relatively dull horticultural subjects. Plants of *K. crenata* subsp. *crenata* have been grown in Kloof near Durban, South Africa, for the past 10 years, during which period they have flowered annually, the flowering stems dying back to a short, persistent leafy base following the fruiting phase, before resprouting with multiple shoots in late summer. An abundance of seedlings have appeared around the parent plants. A rocky forest margin has been selected as the cultivation site, with plants growing well in shallow detritus overlying sandstone. Plants can be propagated by stem or leaf cuttings in spring and summer, as well as from seed. Brickell (1990) noted the frost tenderness of plants of this genus, which usually require a minimum of 7–15°C to survive—hardly an issue in the subtropical climate of Kloof!

The subject of this account is *Kalanchoe crenata* subsp. *crenata*, a highly polymorphic taxon, varying primarily in respect of flower colour and dimensions of the calyx and corolla, in leaf size and proportions, and vestiture throughout. Constant throughout its very wide distribution range, are the linear-lanceolate shape of the sepals and the position of the anthers, all eight of which are included within the corolla tube. A broad species concept for *K. crenata* was adopted by Toelken (1985) for his regional Flora account. We, however, for having seen both *K. crenata* and *K. hirta* growing naturally in KwaZulu-Natal, and without evident intermediates, prefer to recognise them as distinct. This narrower view is shared by Fernandez (1983), while Toelken (1985) has acknowledged the need for further collections and population-level studies to resolve fully this taxonomic issue.

Kalanchoe hirta was described by Harvey (1862), who distinguished it from *K. crenata* on the basis of its densely hispid character, and the shape of the calyx lobes which are ovate rather than linear-lanceolate. *K. hirta* is a more robust plant of drier open bushveld; it has much more yellow leaves, and is usually taller (to 1.5 m) than the glabrous and orange-flowered *K. crenata* which seldom exceeds 0.6 m in height. *K. hirta* is distinctly hairy—even the calyces of the yellow-flowered *K. hirta* are externally covered with short, rigid hairs. Shorter forms of *K. hirta* have been documented (Court 2000), as have sparsely pubescent forms of *K. crenata* (Fernandez 1983)—both records which have added to confusion over species boundaries between the two.

In southern Africa *Kalanchoe crenata* occurs from the Eastern Cape to central KwaZulu-Natal (Figure 1), but it is found in suitable habitat throughout eastern and

West tropical Africa. *K. hirta*, by comparison, has a much more restricted distribution within South Africa and southern Zimbabwe (Fernandes 1983). The leaves of the tropical African form are at least twice as long as broad, relative to southern African material which has somewhat broader leaves. This foliage character, associated as it is with the geographically isolated southernmost populations of *K. crenata*, led Toelken (1985) to raise the question of whether the taxon figured in the accompanying plate should in fact be recognised as a distinct subspecies. Indeed, of plants to the north, besides the typical subspecies, Fernandes (1982) recognised the very long-flowered *K. crenata* subsp. *bieensis* from Angola, and Fernandes (1983) the smaller-flowered *K. crenata* subsp. *nyassensis* from central Africa. This last-mentioned endemic bears pubescent-glandular flowers with clavate pedicels and the upper stamen rank exserted (Fernandes 1983; Wickens 1987). Although Descoings (2003) includes these two subspecies in the synonymy of *K. crenata*, we recognise them here pending a comprehensive re-assessment of infraspecific variability. A bolder and more inclusive synonymy for *K. crenata* will therefore be found in Descoings (2003). Interestingly, Fernandes (1982) implied that *K. crenata* is also found in Madagascar, but this claim remains unsubstantiated (see e.g. Rauh 1995, 1998 on kalanchoes from this succulent island paradise).

Kalanchoe rotundifolia, another species which, like *K. hirta*, prefers drier habitats, sometimes occurs in the approximate vicinity of *K. crenata*. Forms of *K. rotundifolia*, the exceedingly variable common kalanchoe, could be confused with *K. crenata* in the vegetative state but are separated readily on floral characters—the corollas of *K. rotundifolia* are usually red through bright to dull orange and the calyx lobes are no longer than 2 mm, while those of *K. crenata* are 3–8 mm and sometimes as long as 10 mm. *K. crenata* in South Africa bears bright orange flowers in many-flowered, rounded inflorescences. After setting seed, the stems and leaves wither, dying back to a persistent base which regenerates the following season. The leaves, which are fleshy and quite dense at the stem base, are conspicuously petiolate, oblong or oval in shape, with coarsely crenate margins.

Material of *Kalanchoe crenata* was first introduced to science in 1793 following its collection by Adam Afzelius in Sierra Leone; this, a yellow-flowered form, was subsequently grown on at Kensington Gardens in London by William Anderson before its

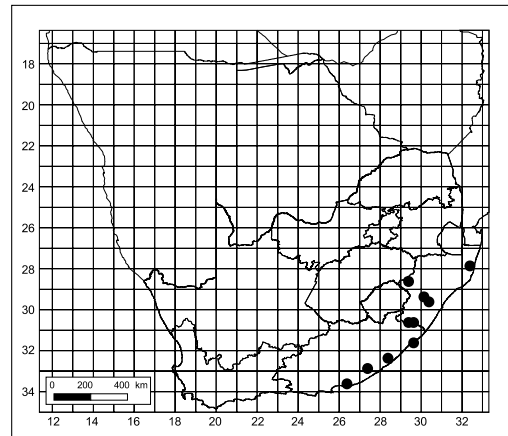


FIGURE 1.—Known geographical distribution of *Kalanchoe crenata* subsp. *crenata* in the FSA region based on specimens housed in the Compton Herbarium in Kirstenbosch, KwaZulu-Natal Herbarium in Durban, KwaZulu-Natal University Herbarium in Pietermaritzburg and National Herbarium in Pretoria. According to the literature also known from further northwards in Africa, but no specific records available.

description as the type species for the new genus *Verea* (as *Vereia*) (Andrews 1798). For a full account of its subsequent taxonomy and synonymy readers are referred to Raadts (1977) and Descoings (2003).

The specimen figured here was collected from Hella Hella Game Reserve on the Umkomaas River near Richmond, KwaZulu-Natal. It was found in moist soil at the base of an overflowing water tank, in partial shade. Trees in its company included *Pittosporum viridiflorum*, *Hippobromus pauciflorus*, *Searsia chirindensis* and an interesting new provincial record of *Vitex obovata* subsp. *wilmsii* (B. Porter 1, KwaZulu-Natal Herbarium, Durban). Although uncommonly encountered in South Africa, this species of *Kalanchoe* is believed to have naturalised in India, Malaysia and tropical America (Fernandes 1983).

The first trivial name accorded *Kalanchoe crenata* was scolloped-leaf vereia (Andrews 1798), which, like the name shortly thereafter provided by Sims (1812)—the scollop-leaved navel-wort—is nothing short of antiquated, with the former being quite inappropriate given that the genus *Verea* has for long been reduced to synonymy. Batten & Bokelmann (1966) simply called it *plakkie*, an overly generic term applied locally to many kalanchoes, and even to taxa within other genera in the Crassulaceae. The name yellow hairy kalanchoe has been applied to *K. crenata* (in part) (Pooley 1998), but would be better reserved regionally for plants matching Harvey's concept of *K. hirta*. In view of the above, we propose 'orange forest kalanchoe' as a suitable common name for the southern African form of *K. crenata*.

Kalanchoe crenata is known from the ethnomedicinal plant trade where whole flowering plants are traded as *mathongwe* and *maHogwe* in Durban (Cunningham 928, KwaZulu-Natal University Herbarium, Pietermaritzburg, and KwaZulu-Natal Herbarium, Durban) and *uMahogwe* in Johannesburg (Williams *et al.* 2001). Specific ethnomedicinal uses attributed to this species by Hutchings *et al.* (1996), given the broad taxon concepts adopted by these authors, relate rather to *Kalanchoe hirta* (e.g. see Hulme 1954). Its reported use in Madagascar (Hutchings *et al.* 1996) is questionable given that it has not been reported naturalised on the Red Isle; possible confusion in this respect probably relates to the existence there of the native *Bryophyllum crenatum* (Rauh 1995), today widely treated as a synonym of *K. laxiflora* (Raymond-Hamet & Marnier-Lapostolle 1964; Descoings 2003). Whether the usage profile of *K. crenata* is similar to that of *K. hirta* is open to surmise—in KwaZulu-Natal decoctions of the pounded leaves of the latter species are used as an anti-inflammatory to treat sprains and swellings (Hulme 1954). Plants of *K. hirta*, known to the Zulu by the different vernacular name *mbohloholoeshate* (Watt & Breyer-Brandwijk 1315, National Herbarium, Pretoria), are crushed and added to water for sprinkling charms to ward off evil spirits known as *mkovu* (Watt & Breyer-Brandwijk 1962).

The name *Kalanchoe* was published in 1763 by Adanson who based it on the phonetic transcription of the Chinese name 'Kalan Chauhuy' perhaps applicable to *K. spathulata* (Eggle & Newton 2004). The specific epithet *crenata* refers to the crenate leaf margins. This scalloped, toothed or notched edge character is nonetheless shared with many other members of the genus.

Description.— (based on Fernandes 1983; Wickens 1987). Multi-annual to perennial herb, succulent, often clumped. *Stems* 0.3–2 m tall when flowering, usually up to 0.6 m in southern Africa, erect, fleshy, terete, usually simple, sometimes branched, glabrous or glabrescent towards base, glabrous or pubescent-glandular above (hairs hyaline or pale tawny, thin, capitate-glandular, short, usually shorter than 0.5 mm). *Leaves* fleshy, decussate, horizontal to deflexed, petiolate, not very crowded below; lamina ovate or obovate-oblong to spatulate, 43–250(–300) × 15–120(–200) mm, base cuneate, all glabrous or sometimes upper ones sparsely pubescent-glandular, margins irregularly doubly crenate to sublobed, sometimes edged with red; petiole up to 40 mm long, flattened and grooved above, slightly broadened at base, often embracing stem, sometimes connate with opposite one. *Inflorescence* terminal, a paniculate many-flowered cyme up to 250(–300) mm long, glabrous or glandular-pubescent; panicle branches ± 45° with axis. *Pedicel* 2–7(–10) mm long, glabrous or glandular-pubescent; bracts linear, attenuate and acute to nearly filiform. *Flowers* 4-merous. *Calyx* lobes 4; sepals 1.0–1.5 mm broad at base, lanceolate to linear-lanceolate, 3–10 × 3–4 mm, acute to attenuate, connate at base for 0.1–1.0(–1.5) mm. *Corolla* tube 8–16(–22) mm long, bright salmon to red, deep red, orange (in southern Africa) or brick-coloured, lower part of tube sulphur-yellow to bright or deep yellow, pale or greenish yellow or white, glabrous or glandular-pubescent; lobes 4, oblong-lanceolate to elliptic, 4–8 × 2.5–5.0 mm, acute or subacute, with apicular mucro 0.5–1.0 mm long; corolla tube papery and somewhat rigid in fruit. *Stamens* 8, in 2 series, both episepalous and epipetalous whorls included within tube; filaments glabrous and medially fused to corolla; anthers of both whorls subequal, broadly oblong, 0.5–1.1 × 0.3–0.7 mm, with apical glands 0.05–0.10 mm diam; upper anther rank 1.0–2.5 mm below tube mouth. *Carpels* 4, free, linear-lanceolate, 5–10 mm long, terminating in style 0.75–4.50 mm long; nectary scales 4, linear, 2.0–3.5 mm long; ovules numerous. *Fruits* many-seeded, erect, follicles dehiscing xerochastically. *Seeds* ± 0.75 mm long, oblong, ribbed. Plate 2249.

REFERENCES

- ANDREWS, H. 1798. *Vereia crenata*. Scolloped-leaf vereia. *The botanist's repository*, Vol. 1: t. 21. London.
- BATTEN, A. & BOKELMANN, H. 1966. *Wild flowers of the Eastern Cape Province*. Books of Africa, Cape Town.
- BRICKELL, C. (ed.) 1990. *The Royal Horticultural Society gardeners' encyclopedia of plants and flowers*. Dorling Kindersley, London.
- BRITTEN, J. 1871. Order L. Crassulaceae. *Flora of tropical Africa* 2: 385–401.
- BURGOYNE, P.M. 2006. Crassulaceae. In G. Germishuizen, N.L. Meyer, Y. Steenkamp & M. Keith, A checklist of South African plants. SABONET Report No. 41: 336–369. SABONET, Pretoria.
- COURT, D. 2000. *Succulent flora of southern Africa*. Balkema, Rotterdam.
- CUFODONTIS, G. 1957. Erster Versuch einer Entwirrung des Complexes *Kalanchoe laciniata* (L.) DC. *Bulletin du Jardin Botanique de l'État Bruxelles* 27: 709–718.
- CUFODONTIS, G. 1969. Über *Kalanchoë integra* (Med.) O. Kuntze. *Osterreichische Botanische Zeitschrift* 114: 320.
- DESCOINGS, B. 2003. *Kalanchoe*. In U. Eggl, *Illustrated handbook of succulent plants: Crassulaceae*: 143–181. Springer Verlag, Berlin.
- DREYER, L.L. & MAKWARELA, A.M. 2000. Crassulaceae. In O.A. Leistner, Seed plants of southern Africa: families and genera. *Strelitzia* 10: 235, 236. National Botanical Institute, Pretoria.
- EGGL, U. & NEWTON, L.E. 2004. *Etymological dictionary of succulent plant names*. Springer Verlag, Berlin.

- FERNANDES, R.B. 1982. Fam. 70. Crassulaceae. In R.B. Fernandes & E.J. Mendes, *Conspectus florum angolensis*: 1–39. Instituto de Investigação Científica Tropical & Junta de Investigações Científicas do Ultramar, Lisbon.
- FERNANDES, R.B. 1983. Crassulaceae. *Flora zambesiaca* 7,1: 3–71.
- HARVEY, W.H. 1862. Order LIII. Crassulaceae D.C. *Flora capensis* 2: 327–380. Hodges, Smith, Dublin.
- HAWORTH, A.H. 1812. *Kalanchoe*. *Synopsis plantarum succulentarum*: 109, 110. London.
- HULME, M. 1954. *Wild flowers of Natal*. Shuter & Shooter, Pietermaritzburg.
- HUTCHINGS, A., SCOTT, A.H., LEWIS, G. & CUNNINGHAM, A.B. 1996. *Zulu medicinal plants. An inventory*. University of Natal Press, Pietermaritzburg.
- HUTCHINSON, J. & DALZIEL, J.M. 1927. Crassulaceae. *Flora of West tropical Africa* 1,1: 102–105. Crown Agents, London.
- JACOBSEN, H. 1960. *A handbook of succulent plants. Vol II. Ficus to Zygophyllum*. Blandford Press, London.
- KAPITANY, A. 2007. *Australian succulent plants. An introduction*. Kapitany Concepts, Boronia.
- POOLEY, E. 1998. *A field guide to wild flowers. KwaZulu-Natal and the eastern region*. Natal Flora Publications Trust, Durban.
- RAADTS, E. 1977. The genus *Kalanchoe* (Crassulaceae) in tropical East Africa. *Willdenowia* 8: 101–157.
- RAUH, W. 1995. *Succulent and xerophytic plants of Madagascar*, Vol. 1. Strawberry Press, Mill Valley.
- RAUH, W. 1998. *Succulent and xerophytic plants of Madagascar*, Vol. 2. Strawberry Press, Mill Valley.
- RAYMOND-HAMET & MARNIER-LAPOSTOLLE, J. 1964. Le genre *Kalanchoe* au Jardin Botanique 'Les Cèdres'. *Archives du Muséum National d'Histoire Naturelle* Septième Série, Volume VIII: 1–110; Plates I–XXXVII.
- SIMS, J. 1812. *Cotyledon crenata*. Scollop-leaved navel-wort. *Curtis's Botanical Magazine* 35: t. 1436.
- SPRINGATE, L.S. 1995. *Kalanchoë*. In J. Cullen, J.C.M. Alexander, A. Brady, C.D. Brickell, P.S. Green, V.H. Heywood, P.-M. Jørgensen, S.L. Jury, S.G. Knees, A.C. Leslie, V.A. Matthews, N.K.B. Robson, S.M. Walters, D.O. Wijmands & P.F. Yeo, *European Garden Flora* 4: 178–185. Dicotyledons (Part II). Cambridge University Press, Cambridge, UK.
- THIEDE, J. & EGGLI, U. 2007. Crassulaceae. In K. Kubitzki, *The families and genera of vascular plants. IX. Flowering Plants. Eudicots*: 83–118. Springer Verlag, Berlin.
- TOELKEN [as TÖLKEN], H.R. 1985. Crassulaceae. *Flora of southern Africa* 14: 1–244.
- VENTENAT, É.P. 1804. *Jardin de la Malmaison* 1: t. 49. Crapelet, Paris.
- WATT, J.M. & BREYER-BRANDWIJK, M.G. 1962. *The medicinal and poisonous plants of southern and eastern Africa*. Livingstone, Edinburgh and London.
- WICKENS, G.E. 1987. Crassulaceae. *Flora of tropical East Africa*: 1–66. Balkema, Rotterdam.
- WILLIAMS, V.L., BALKWILL, K. & WITKOWSKI, E.T.F. 2001. A lexicon of plants traded in the Witwatersrand *umuthi* shops, South Africa. *Bothalia* 31: 71–98.

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PLATE 2250 *Pomaria sandersonii*

Pomaria sandersonii

Fabaceae: Caesalpinioideae

South Africa

Pomaria sandersonii (Harv.) B.B.Simpson & G.P.Lewis in Kew Bulletin 58: 181 (2003). *Melanosticta sandersonii* Harv.: 270 (1862). *Hoffmannseggia sandersonii* (Harv.) Engl.: 25 (1888); Wood: 10, t. 233 (1901); Wood: 43 (1907) as *sandersonii*; Burt Davy & Pott Leendertz: 145 (1912) as *sandersonii*; Trauseld: 93 (1969); Brummitt & Ross: 421 (1974); Ross: 121 (1977).

The genus *Pomaria* consists of 16 species, nine distributed in North America, four in South America and three in southern Africa, mainly in subtropical dry grassland and wooded grassland (Lewis 2005). Until recently, the three members occurring in the *Flora of southern Africa* (FSA) area were known under *Hoffmannseggia*. After molecular and morphological studies (Simpson & Miao 1997; Simpson 1998) these taxa were found to be better placed under *Pomaria* than under *Hoffmannseggia* (Simpson & Lewis 2003) and this generic change has been accepted by botanists working on African flora (e.g. Brummitt 2007). The main morphological differences between the two genera are that the sepals in *Hoffmannseggia* are persistent in fruit, whereas those of *Pomaria* are shed before the fruits mature (Simpson 1999; Simpson *et al.* 2004; Simpson & Ulibarri 2006), and that the leaves of *Pomaria* are glandular punctate-dotted below, whereas *Hoffmannseggia* leaves are not glandular punctate. Other morphological characters that define *Pomaria* are the unique combination of the suffrutescent habit, usually fasciculate roots, valvate calyces, lateral stigmas, and punctuate glandular trichomes on the leaves and calyces, and fruits turning black with age, as well as complex dendritic non-glandular trichomes on the fruits. These complex trichomes on the fruits are sometimes more or less stellately branched, but in other cases have a long central axis with vertical setae along the entire shaft or primarily at the tip (Simpson & Lewis 2003). Furthermore, the African species of *Pomaria* are apparently the only known bipinnate Caesalpinioideae indigenous to southern Africa that have imparipinnate leaves, i.e. they terminate in a single pinna as opposed to a pair of pinnae (Ross 1977).

In a study investigating the leaf anatomy and secretory structures of *Hoffmannseggia* and *Pomaria* species, Lersten & Curtis (1994) found that all examined members of the *Pomaria* group had glands, making it a useful taxonomic character for comparing the group with some related taxa in which the presence of glandular trichomes is rare. The glands are visible as sunken, sessile, black spots on the lamina in dried specimens. Microscopic examination shows them to be solid, multicellular structures without any evident internal spaces.

It is still uncertain exactly how the genus *Pomaria* came to have its amphi-Atlantic distribution. With only three species in the southern half of the African continent,

PLATE 2250.—1, branch with flowers, × 1; 2, abaxial surface of leaflet showing gland dots, × 2; 3, flowering bract, × 1.5; 4, fruiting twig, × 1; 5, surface of pod, greatly enlarged; 6, seed, × 1. Voucher specimens: *Condy 208* (1, 2); *Condy 218* (3); *Pooley s.n.* (4–6) in National Herbarium, Pretoria. Artist: Gillian Condy.

one might suggest some type of long-distance dispersal event from the Americas. In recent years, theories on biological dispersal eastwards over the Atlantic Ocean have become more and more plausible (Houle 1998; Renner 2004). This is the most likely explanation for taxa, such as *Pomaria*, with disjunct distributions that cannot have been caused by continental drift due to their relatively recent origin when seen in a geological timeframe.

The genus *Pomaria* was named by Antonio Cavanilles in 1799 after Dominic Pomar, a Spanish botanist from Valencia and doctor to King Phillip III of Spain. The specific epithet *sandersonii* is named in commemoration of John Sanderson (1820–1881), a Scottish journalist, trader and draughtsman who arrived in Durban in March 1850. Although not a botanist by training, he had an active interest in this field, corresponding with Hooker at Kew and Harvey in Dublin and sending them herbarium material, seeds and bulbs. He also made useful pencil sketches, many of which were supplied to Kew together with the plants he collected (Gunn & Codd 1981).

Pomaria sandersonii, depicted in the accompanying plate, is the first species of this genus to be illustrated in this series. It is highly distinct and unusual, the young stems and leaf rachides being covered with conspicuous pink or reddish brown setae and the pods dark brown and also clothed with a dense, shaggy, pinkish indumentum. The species is distinguished from the other two southern African species by its reddish stems with conspicuous long trichomes, 2.5–14.0 mm long flowering pedicels and usually dark brown pods, instead of the 1–3 mm long pedicels and buff-coloured pods found in the others.

The suffrutescent habit of the species is of special interest. Suffrutescence is often associated with biomes where fire is a prevalent and recurring ecological driving force (Vogl 1974). *Pomaria sandersonii* occurs within the Grassland Biome of South Africa—a biome typically characterised by the absence of trees due to natural wild fires (Mucina & Rutherford 2006). Plants with woody elements residing in grasslands are usually suffrutescent in habit, enabling them to survive the removal of all above-ground parts while storing resources in underground woody or bulbous structures. This adaptation to fire has evolved over millions of years and ensures the survival of species where fires rage in late winter and early spring. *P. sandersonii* has a slender, woody underground rhizome from which new growth emerges in spring following natural wild fires or anthropogenic burning. As resources accumulate during the growing season, they are transported to the underground organs for storage during the drier and less productive winter season.

The root bark is used as an astringent and a tannin-rich red dye can be produced from the stem bark (Watt & Breyer-Brandwijk 1962).

Specimens of *Pomaria sandersonii* for the accompanying plate were collected from a roadside embankment on the approaching road to the Cavern Berg Hotel near the Amphitheatre in the Drakensberg Mountain Range in KwaZulu-Natal. The type specimen of *P. (Melanosticta) sandersonii* was cited by Harvey as 'Hab. Transvaal, J. Sanderson, Esq.' (Brummitt & Ross 1974; Ross 1977). Although Brummitt & Ross

(1974) and Ross (1977) could not locate the type specimen while writing their accounts of the African species of *Hoffmannseggia*, Harvey's original description fortunately enabled them to identify *Pomaria (Hoffmannseggia) sandersonii* without doubt. However, the distribution 'Transvaal' is in conflict with its known present-day distribution in KwaZulu-Natal and the Eastern Cape (Figure 1). The type was on loan to Imre Eifert at the University of Texas when Brummitt and Ross wrote their account, but as they were unaware of this, they designated a neotype, 'Sutherland s.n., Natal, Weenen County, 3–5,000 ft., Sept. & Oct. 1858' (neotype TCD). With the rediscovery of the original type after its return to Kew, the neotypification of Brummitt & Ross (1974) became superfluous (Simpson & Lewis 2003). It is thought that the specimen marked 'Transvaal' was probably collected by Sanderson en route from the then Natal to the former Transvaal and later mislabelled as having come from the Transvaal.

Our species usually occurs in dense communities in grassland. In the Drakensberg area, *Pomaria sandersonii* is often found only on the northern slopes (P. Bester pers. comm.). The clusters of pink flowers appear in October and November and the pods mature in December.

Description (partly after Ross 1977).—Suffrutex with several erect, herbaceous, annual stems, up to 400 mm high, arising from a slender woody rhizome. *Stems* reddish, with sparsely crisped to densely spreading hairs interspersed with conspicuous longer usually pink or reddish brown setae up to 2.5 mm long; dark glands present but inconspicuous except on leaflets and calyces. *Stipules* linear-lanceolate, 8–15 × 2 mm, with marginal setae or sometimes with distinctly branched trichomes, similar to those found on stem. *Leaves* bipinnate, imparipinnate; pinnae in 3–7 pairs plus a single terminal pinna; leaflets in 3–10 pairs, usually oblong to elliptic-oblong, (5–)10–14(–15) × 2.0–6.5 mm, glabrous on upper surface, with sparse hairs usually confined to midrib and margins, with black punctate glandular trichomes mainly along margins on lower surface, apices mostly acute, mucronate, rarely obtuse, base slightly oblique; petiole up to 5 mm long; rachis and petiole pubescent as on stem, with setae aggregated at insertions of pinnae and leaflets. *Inflorescence* a terminal, many-flowered raceme, (40–)85–120(–170) mm long; bracts ovate, up to 12 × 5 mm, pubescent, deciduous before buds open. *Flowers* unscented, red, pale to deep coral-pink or salmon-coloured. *Calyx* shortly tubed, 5-lobed; lobes unequal, upper lobes 5–7 × 0.5–2 mm, lower ones 6.0–10.5 × 4–7 mm. *Petals* 5, imbricate, unequal; upper one modified and ± funnellform, up to 9 × 7 mm, often with a pale to bright yellow patch near base; the others in two lateral pairs, obovate. *Stamens* 10, free;

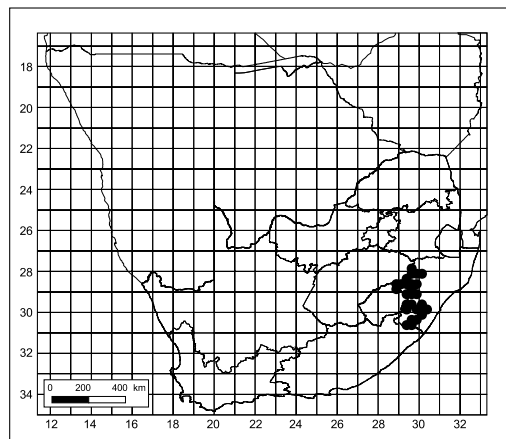


FIGURE 1.—Known distribution of *Pomaria sandersonii* based on specimens housed in the National Herbarium, Pretoria.

filaments alternately longer and shorter, up to 7 mm long, the shorter stamens with a characteristic bend in their filaments. *Ovary* subsessile, up to 4×1.5 mm. *Pods* obliquely oblong, straight or slightly curved, beaked, $25\text{--}46 \times 10\text{--}15$ mm, usually dark brown, covered with a dense shaggy pinkish indumentum of plumose setae and punctuate glandular trichomes. *Seeds* obovoid, somewhat flattened, 10×8 mm, smooth, buff-coloured, 3 or 4 per pod. Plate 2250.

REFERENCES

- BRUMMITT, R.K. 2007. *Pomaria*. In *Flora zambesiaca* 3,2: 183–186.
- BRUMMITT, R.K. & ROSS, J.H. 1974. The African species of *Hoffmannseggia* (Leguminosae–Caesalpinioideae). *Kew Bulletin* 29,2: 415–424.
- BURTT-DAVY, J. & POTT-LEENDERTZ, R. 1912. A first check-list of the flowering plants and ferns of the Transvaal and Swaziland. *Annals of the Transvaal Museum* 3,3: 119–182.
- ENGLER, A. 1888. Plantae Marlothiana. Ein Beitrag zur Kenntnis der Flora Südafrikas. *Botanische Jahrbücher* 10: 1–50. Engelmann, Leipzig.
- GUNN, M. & CODD, L.E. 1981. *Botanical exploration of southern Africa*. Balkema, Cape Town.
- HARVEY, W.H. 1862. LXX *Melanosticta*. In W.H. Harvey & O.W. Sonder, *Flora capensis* 2: 270. Hodges & Smith, Dublin.
- HOULE, A. 1998. Floating islands: a mode of long-distance dispersal for small and medium-sized terrestrial vertebrates. *Diversity and Distributions* 4: 201–216.
- LERSTEN, N.R. & CURTIS, J.D. 1994. Leaf anatomy in *Caesalpinia* and *Hoffmannseggia* (Leguminosae, Caesalpinioideae) with emphasis on secretory structures. *Plant Systematics and Evolution* 192: 231–255.
- LEWIS, G.P. 2005. Caesalpinieae. In G. Lewis, B. Schrire, B. Mackinder & M. Lock, *Legumes of the world*. Royal Botanic Gardens, Kew.
- MUCINA, L. & RUTHERFORD, M.C. (eds) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.
- RENNER, S.S. 2004. Plant dispersal over the tropical Atlantic by wind and by sea currents. *International Journal of Plant Science* 165 (July supplement): S23–S33.
- ROSS, J.H. 1977. *Hoffmannseggia*. *Flora of southern Africa* 16,2: 117–122.
- SIMPSON, B.B. 1998. A revision of *Pomaria* (Fabaceae) in North America. *Lundellia* 1: 46–71.
- SIMPSON, B.B. 1999. A revision of *Hoffmannseggia* (Fabaceae) in North America. *Lundellia* 2: 14–54.
- SIMPSON, B.B. & LEWIS, G.P. 2003. New combinations in *Pomaria* (Caesalpinioideae: Leguminosae). *Kew Bulletin* 58: 175–184.
- SIMPSON, B.B. & MIAO, B.-M. 1997. The circumscription of *Hoffmannseggia* (Fabaceae: Caesalpinioideae: Caesalpinieae) and its allies using morphological and cpDNA restriction site data. *Plant Systematics and Evolution* 205: 157–178.
- SIMPSON, B.B., TATE, J.A. & WEEKS, A. 2004. Phylogeny and character evolution of *Hoffmannseggia* (Caesalpinieae: Caesalpinioideae: Leguminosae). *Systematic Botany* 29,4: 933–946.
- SIMPSON, B.B. & ULIBARRI, E.A. 2006. A synopsis of the genus *Hoffmannseggia* (Leguminosae). *Lundellia* 9: 7–33.
- TRAUSELD, W.R. 1969. *Wild flowers of the Natal Drakensberg*. Purnell, Cape Town, Johannesburg, London.
- VOGL, R.J. 1974. *Effects of fire on grasslands*. In T.T. Kozłowski & C.E. Ahlgren, *Fire and ecosystems*. Academic Press, New York, San Francisco, London.
- WATT, J.M. & BREYER-BRANDWIJK, M.G. 1962. *The medicinal and poisonous plants of southern and eastern Africa*, edn 2. Livingstone, London.
- WOOD, J.M. 1901. *Natal plants* 3,3: 10, t. 233.
- WOOD, J.M. 1907. *Handbook of the flora of Natal*: 43.

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PLATE 2251 *Begonia homonyma*

Begonia homonyma

Begoniaceae

South Africa

Begonia homonyma Steud. Nomenclator botanicus edn 2: 194 (1840); Burt: 273, 274 (1973); Hilliard: 141, 142 (1976); Smith et al.: 180 (1986); McLellan: 5–7 (1997a); Pooley: 408, excl. fig. opp. (1998); Scott-Shaw: 46 (1999). *B. sinuata* E.Mey. ex Otto & A.Dietr.: 357 (1836) illegitimate name, not of Wall. ex Meisn. *B. sinuata* Graham: 192 (1838) not of Wall. ex Meisn.; Graham: t. 3731 (1839). *B. caffra* Meisn.: 501 (1841); Sonder: 481 (1862); Burt-Davy: 232 (1926); Irmscher: 136–138 (1961). *B. uncinata* [hort ex.] Klotzsch: 124 (1854). *Augustia caffra* (Meisn.) Klotzsch: 201 (1855). *B. dregei* Otto & A.Dietr. var. *caffra* A.DC.: 384 (1864). *B. dregei* Otto & A.Dietr. var. *sinuata* A.DC.: 384 (1864). *B. favargerii* Rech.: 33, 34, t. 1 (1905); Thonner: t. 107 (1915). *B. caffra* Meisn. var. *favargerii* (Rech.) Irmsch.: 137, 138 (1961). *B. rudatisii* Irmsch.: 129, 130 (1961); McLellan: 218, 219 (1997b). As *B. natalensis* Hook., Jacobsen: 111, pl. 24 (1 & 2) (1974).

The Begoniaceae consists of the monotypic *Hillebrandia* from Hawaii and *Begonia*, one of the largest genera of flowering plants, estimated variously to have roughly 1 400 (Smith *et al.* 1986) or as many as 1 600 species (Sands 2001), which are distributed mainly throughout the world's tropical forests. *Begonia* is comprised of succulent herbs or subshrubs and sometimes even climbers, with five representatives indigenous to the *Flora of southern Africa* region. Here, they extend farther into the temperate zone than any other members of the genus, with the possible exception of some Chinese taxa. This series has previously treated three of the five: *B. sutherlandii* (Plate 283 and as synonym *B. flava*, Plate 1233), *B. geranioides* (Plate 1698) and *B. dregei* (Plate 673, as synonym *B. richardsiana*).

Surprisingly, molecular phylogenetic studies have revealed that African begonias are not monophyletic (Plana *et al.* 2004), with southern African species showing more affinity to both South American (Plana *et al.* 2004) and Asian clades (Forrest *et al.* 2005) than to tropical African species. The split between South African and South American species has been dated to about 3 million years before present (Plana *et al.* 2004).

The current account is of a caudiciform begonia, *Begonia homonyma*, one of the largest and most handsome local species and known in cultivation for over 150 years. Following its arrival at the Berlin Botanic Garden, material was distributed widely as '*B. sinuata*' prior to its formal description (Graham 1839). The provenance of the material was evidently not documented upon its arrival, for by the time our species received its currently accepted epithet, Steudel (1840) believed it to be from Brazil. A further uncertainty relates to the identity of the collector who first presented the Berlin Garden with living plants—this was, however, most likely Johann Franz Drège. During the early months of 1832, Drège travelled northwards along the coast from Grahamstown to Port Natal (Durban) as a member of Dr Andrew Smith's expedition to Zululand. *En route* they traversed a number of sites from which *B. homonyma* is known today, including the Msikaba and Mtamvuna River mouths (Gunn & Codd

1981). Based on one of his collections made during this trip, *B. dregei* was named for Drège, described by Otto & Dietrich (1836) at the same time these authors named and distinguished the subject of this account.

In Pondoland and central KwaZulu-Natal *Begonia homonyma* can be confused with the highly variable *B. dregei*, a closely related species also in section *Augustia*. Although their geographic ranges overlap for the most part and both occur in the Mtamvuna Gorge, they have not yet been reported growing truly sympatrically. None of the *B. dregei* forms possess such large broad leaves, veins so strongly raised below (particularly near the sinus) and similar ratios of length to width (see description and Hilliard 1976). All forms of *B. dregei* share with *B. homonyma* the character of entire rather than bilamellate placentae. However, more recent studies have revealed some intergradation between the two taxa (McLellan 2000). While no evidence for interbreeding in nature has been found (McLellan 1997a; Matolweni *et al.* 2000), this occurs readily under controlled greenhouse conditions. As leaf shape and size vary within individual plants of both these species, limiting comparisons to fully expanded, adult leaves removes some confusion.

In the southern Lebombo Mountains *Begonia homonyma* can be confused with both *B. hirtella* (a thinly villous and atuberous introduction) and *B. sonderiana*, another large-leaved species with white/pink flowers (Crouch & McLellan 2008). However, *B. sonderiana* bears tubers rather than caudices, and characteristically presents female flowers with divided, not entire placentae. Its leaves are ovate-acuminate, with up to seven triangular lobes, coarsely and irregularly toothed—unlike the sub-entire ones of *B. homonyma*. A Brazilian garden escape recorded from the Port St John's area, *Begonia cucullata*, has also been confused with *B. homonyma*. It is, like *B. hirtella*, neither tuberous nor caudiciform, with a quite distinct leaf shape and venation (McLellan *et al.* 1994). Notably, leaf size alone should not be used to identify *B. homonyma*, for even larger-leaved forms of *B. sutherlandii* exist, most especially in the Qudeni Forest. All forms of Sutherland's begonia can be distinguished with ease as their flowers are orange.

The large asymmetric leaves led to *Begonia homonyma* being accorded the initial trivial name 'elephant's ear' (Graham 1839), a label today used widely and better retained for a variety of aroids. The radiating veins are strongly raised on the leaf underside; the sinuate margin led to the original epithet. In Pondoland, one observes plants with shorter stems and a greater degree of leaf succulence. Red-margined leaves have been recorded from the Mzamba Gorge population, and on leaves of plants from the Mtamvuna River a red spot is evident on the upper leaf surface at the petiole attachment point. In all the diverse forms of *B. homonyma* encountered, the leaves are arranged in an alternate manner along one of several succulent stems produced from each large, somewhat compressed caudex. These perennating organs may attain a diameter of 250 mm. Plants bloom from mid- to late summer, with flowers white or white tinged pink, becoming pinker in situations where they receive more light. Separate male and female flowers, each up to 30 mm across, are produced on the dichotomously branched cymes—several male flowers appearing before the first female flower matures.

The extensive synonymy of *Begonia homonyma* is indicative of the high morphological variation within the taxon, which is itself a reflection of its highly fragmented forest habitat, and concomitant subpopulation-level genetic isolation (McLellan 1997a; Matolweni *et al.* 2000). Very little gene flow seems to occur between plants in different forest patches in which this species occurs, indicating that both seed dispersal and pollen transfer are limited somehow. Despite the fact that seed is fine and light, wind is seldom present within the forest to scatter it widely as it falls as from a salt shaker on to the ground below. The pollinators of the species have been observed to be small flies, a group unlikely to transfer pollen from one forest pocket to the next (McLellan 1997a).

The most recent synonym is *Begonia rudatisii*, described by Irmscher (1961) from material collected a century ago by August Rudatis near Dumisa in southern KwaZulu-Natal. Of all the forms of *B. homonyma*, this one perhaps deserves some reconsideration of its status, although we include it currently as part of a broader concept for *B. homonyma*. It differs from many subpopulations of *B. homonyma* in several respects—by the shorter, stronger stems, the smaller caudices and the membranous, browner leaves with their more angulate lobes (Irmscher 1961). The leaves are occasionally disproportionately large (up to 250 mm) (McLellan 1997b; Pooley 1998) relative to other forms of *B. homonyma*, and the pistils are short and upright in relation to the petals—in all other members of section *Augustia* these are long and obliquely set (McLellan 1997b). Plants matching Irmscher's concept for *B. rudatisii* have been found at localities near Dumisa, and at Collywobbles along the Mbashee River in the Eastern Cape (McLellan 2000).

The specimen figured here was collected from the southern Lebombo Mountains of KwaZulu-Natal, from a ravine to the northeast of Gwalaweni Forest. At this site on the eastern edge of the Lebombos, tall-stemmed plants (0.8 m) with large caudices were found in shallow leaf litter on a steep rhyolite ridge. Here, on the southern aspect of the forest patch, they were thriving in semishade. Indeed, elsewhere in its range *B. homonyma* is generally found in the semishade of southern and eastern forest margins or on cliff ledges and rock falls within forest (Hilliard 1976). Consideration of herbarium collections has revealed this Lebombo site to be the most northern locality known for the species. The large caudex enables this species to escape the confines of deep moist shade and to take advantage of more xeric environments. Accordingly, in the Lebombos, one identifies a suite of drought-tolerant plant associates which are either poikilohydrous (the water content of the plant being determined by its surroundings): *Cheilanthes hirta* var. *nemorosa*, *Dracaena alet-riformis*, *Pyrrhosia africana*, *Streptocarpus confusus* subsp. *lebomboensis*, *S. haygarthii*, or succulent in character: *Asparagus macowanii*, *Cotyledon orbiculata*, *Gonatopus angustus*, *Kalanchoe neglecta*, *Plectranthus saccatus* var. *longitubus* and *P. verticillatus*. The small tree *Rinorea ilicifolia* is usually to be found nearby.

Although the southern and northern subpopulations of *Begonia homonyma* appear for the most part disjunct (Figure 1), it should be borne in mind that this taxon is always associated with Scarp Forest (FOz 5), which today exists as an archipelago of scattered patches ranging in altitude from near sea level to 600 m

(Rutherford *et al.* 2006). While plants of this *Begonia* species are accordingly found at low altitudes in close proximity to the coast (Hilliard 1976), particularly in Pondoland, they do occur as far inland as Pietermaritzburg and the Gwalaweni Forest in Maputaland. Southern and central subpopulations occur on sandstones; those in the far north have evidently adapted to rhyolites.

The Zulu, who know this species as *idlula* (Cunningham 2179, KwaZulu-Natal Herbarium), utilise the astringent, slightly bitter caudices for chest complaints and take infusions of the same to counteract *idliso*, poison believed administered in food (Hutchings *et al.* 1996). When not available, the smaller caudices of *Begonia dregei* are substituted (Von Ahlefeldt *et al.* 2003). Such is the overexploitation of *B. homonyma* for the trade in traditional medicine that Scott-Shaw (1999) gave its Red Data List (RDL) status as Vulnerable (A1cd); a more recent evaluation gives it as Endangered (C2a(i)) (V. Williams, pers. comm. 2008).

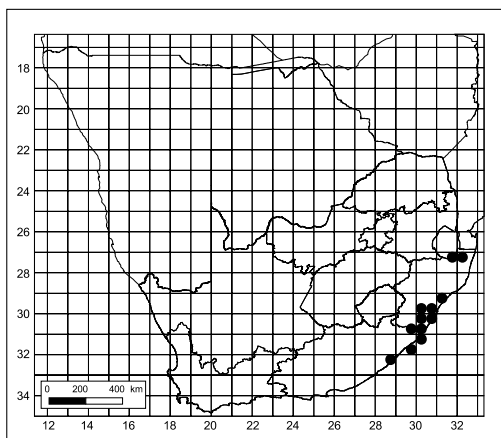


FIGURE 1.—Known distribution of *Begonia homonyma*.

The fascinating form of the caudices has also attracted the attention of succulent plant enthusiasts (Jacobsen 1974), in some measure possibly compounding this extraction issue. Fortunately, the species receives some degree of protection in a number of reserves such as Mkambati, Mtamvuna, Oribi Gorge, Krantzklouf and Gwalaweni. Given the low genetic diversity within single subpopulations—evidenced by remarkably site-limited morphological homogeneity—this species requires *in situ* management at a subpopulation level if it is to be conserved effectively (Matolweni *et al.* 2000).

Cultivation of *Begonia homonyma* is best undertaken in a manner that emulates the natural growing conditions, in which plants are well watered but extremely well drained. Accordingly, this species is best suited to pot or shaded rockery culture and will not readily tolerate planting out in open beds. In Kloof, KwaZulu-Natal, potted plants grow well on an eastern aspect where they receive a few hours of early morning sun. Caudices should be planted half exposed, allowing for roots to develop on the underside. Watering over the dormant winter period (from April to September) should be avoided. Between these months the aerial stems with their leaves senesce, dying back to the drought-tolerant caudex. Vegetative propagation is recommended (Jacobsen 1974), using stem cuttings taken in midsummer and striking these in a 2:1 mix of coarse sand and compost.

The name *Begonia* was first published in 1700 by Joseph Pitton de Tournefort, having been named by Charles Plumier in honour of Michel Bégon (1638–1710),

Intendant of the French Antilles when not Governor of French Canada, and a patron of botany. The specific epithet *homonyma* provided without comment by Steudel (1840) has been aptly described as ‘rather ugly’ (Burt 1973). It derives from the Greek *homos* (same) and the Latin *nomen* (name), to commemorate the original inappropriate use of the name *B. sinuata*, which first applied to the South African entity but was illegitimate. Only months before it was published for our species, the same epithet had been applied validly to an Asian begonia and could therefore not be used for another species (Burt 1973).

Description.—Perennial, succulent, glabrous, monoecious herb. *Stems* 1 to several, 0.3–1 m tall, erect, stout, fleshy, branched or simple, tinged red, nodes slightly swollen, leafy throughout; caudex large, compressed, grey-brown, up to 250 mm diam. *Stipules* 2, oblong-lanceolate, brown, membranous, persistent. *Leaves* alternate, obliquely ovate, up to 130(–250) × 70(–120) mm, base asymmetric, shallowly cordate, apex broadly acute, margins green to red, entire, sinuate or broadly and shallowly lobed, lobes rarely subserrate, thin-textured to semisucculent, crisp, light green to brown and waxy above, paler below; venation palmate to palmate-pinnate, often reddish, strongly raised below, veins decreasing in length upwards, ratio of length of vein running to leaf apex (main vein) to length of vein adjacent to main vein in broader half of leaf 1:(1.1–)1.3(–1.5); juvenile leaves white-spotted; petioles 30–50(–130) mm long, sometimes reddish, occasionally with single red dot on adaxial lamina at insertion point. *Inflorescences* protandrous, mainly in upper leaf axils, bracteate, cymose, dichotomous; peduncles slightly compressed. *Flowers* zygomorphic; tepals petaloid, white to pink or white tinged pink. *Male flowers*: tepals 2(3 or 4), outer pair transversely elliptic, 13 × 16 mm, cordate at base, inner pair shorter and narrower; stamens yellow, numerous; filaments free, 2–3 mm long; anthers 2-therous, dehiscent by lateral slits. *Female flowers*: tepals unequal, usually 5, outer ones elliptic to suborbicular, 6–10 mm long, inner ones 8–12 mm long, one often somewhat smaller; styles 3, connate at base, divided to ± half their length, branches stigmatic and spirally twisted, papillose; ovary inferior, ellipsoid, 14 × 5 mm, subequally 3-winged; placentae entire. *Fruit* a 3-winged loculicidal capsule, brown, membranous-walled, wings triangular, variable in shape and subequal, 20–22 × 15–20 mm across expanded wings. *Seeds* numerous, minute; testa reticulate. Plate 2251.

REFERENCES

- BURT, B.L. 1973. The name *Begonia sinuata*. *Notes from the Royal Botanic Garden Edinburgh* 32,2: 273, 274.
- BURT-DAVY, J. 1926. *A manual of the flowering plants and ferns of the Transvaal with Swaziland, South Africa*, Part I. Longmans, Green, London.
- CROUCH, N.R. & McLELLAN, T. 2008. Begoniaceae. *Begonia sonderiana*, a new KwaZulu-Natal record from the southern Lebombo Range, Maputaland, South Africa. *Bothalia* 38: 146, 147.
- DE CANDOLLE, A. 1864. *Prodromus systematis naturalis regni vegetabilis* 15: 1–522. Paris.
- FORREST, L.L., HUGHES, M. & HOLLINGSWORTH, P.M. 2005. A phylogeny of *Begonia* using nuclear ribosomal sequence data and morphological characters. *Systematic Botany* 30: 671–682.
- GRAHAM, R.C. 1838. Description of several new or rare plants which have lately flowered in the neighbourhood of Edinburgh, chiefly in the Royal Botanic Garden. *Edinburgh New Philosophical Journal* 24: 191–195.
- GRAHAM, R.C. 1839. *Begonia sinuata*. Sinuated begonia; or elephant’s ear. *Curtis’s Botanical Magazine* 66: t. 3731.
- GUNN, M. & CODD, L.E. 1981. *Botanical exploration of southern Africa*. Balkema, Cape Town.

- HILLIARD, O.M. 1976. Begoniaceae. In J.H. Ross, *Flora of southern Africa* 22: 136–144.
- HUTCHINGS, A., SCOTT, A.H., LEWIS, G. & CUNNINGHAM, A.B. 1996. *Zulu medicinal plants. An inventory*. University of Natal Press, Pietermaritzburg.
- IRMSCHER, E. 1961. Monographische revision de Begoniaceen Afrikas I. Sekt. *Augustia* und *Rostrbegonia* sowie einige neue Sippen aus anderen Sektionen. *Botanische Jahrbücher* 81: 106–188.
- JACOBSEN, H. 1974. *Lexicon of succulent plants*. Blandford Press, London.
- KLOTZSCH, J.F. 1854. *Monatsberichte der Königlichen Preussischen Akademie der Wissenschaften zu Berlin* 1854: 119–128.
- KLOTZSCH, J.F. 1855. Begoniaceen—Gattungen und Arten. *Abhandlungen der Königlichen Akademie der Wissenschaften zu Berlin* 1854: 121–255, 12 leaves of plates. Nicolaischen Buchhandlung, Berlin.
- MATOLWENI, L.O., BALKWILL, K. & McLELLAN, T. 2000. Genetic diversity and gene flow in the morphologically variable, rare endemics *Begonia dregei* and *Begonia homonyma* (Begoniaceae). *American Journal of Botany* 87,3: 431–439.
- McLELLAN, T. 1997a. Making sense of variation in *Begonia dregei*. *PlantLife* 17: 5–7.
- McLELLAN, T. 1997b. *Begonia rudatisii*. *The Begonian* 64: 218, 219.
- McLELLAN, T. 2000. Geographic variation and plasticity of leaf shape and size in *Begonia dregei* and *B. homonyma* (Begoniaceae). *Botanical Journal of the Linnean Society* 132: 79–95.
- McLELLAN, T., CLOETE, E.C. & BOSA, A.J.N. 1994. Naturalization of *Begonia cucullata* in the Port St. Johns region, Transkei. *South African Journal of Botany* 60: 136, 137.
- MEISNER, C.D.F. 1841. III. Begoniaceae. *Begonia* L. *Linnaea* 14: 501, 502.
- OTTO, C.F. & DIETRICH, A.G. 1836. *Allgemeine Gartenzeitung* 4: 357.
- PLANA, V., GASCOIGNE, A., FORREST, L.L., HARRIS, D. & PENNINGTON, R.T. 2004. Pleistocene and pre-Pleistocene *Begonia* speciation in Africa. *Molecular Phylogenetics and Evolution* 31: 449–461.
- POOLEY, E. 1998. *A field guide to wild flowers of KwaZulu-Natal and the eastern region*. Natal Flora Publications Trust, Durban.
- RECHINGER, K. 1905. *Annalen der Naturhistorischen Hofmuseums, Wien* 20: 33, 34, tab. 1.
- RUTHERFORD, M.C., POWRIE, L.W., LÖTTER, M.C., VON MALTITZ, G.P., EUSTON-BROWN, D.I.W., MATTHEWS, W.S., DOBSON, L. & MCKENZIE, B. 2006. Afrotropical, Subtropical and Azonal Forests. In L. Mucina & M.C. Rutherford, *The vegetation of South Africa, Lesotho and Swaziland. Strelitzia* 19: 584–614.
- SANDS, M.J.S. 2001. Begoniaceae. In J.J. Beaman, C. Anderson & R.S. Beaman, *The plants of Mt Kinabalu: 147–163*. Natural History Publications, Borneo, and Royal Botanic Gardens, Kew.
- SCOTT-SHAW, C.R. 1999. *Rare and threatened plants of KwaZulu-Natal and neighbouring regions*. KwaZulu-Natal Nature Conservation Service, Cascades, Pietermaritzburg.
- SMITH, L.B., WASSHAUSSEN, D.C., GOLDING, J. & KAREGEANNES, C.E. 1986. Begoniaceae, Part I: Illustrated key. Part II: Annotated species list. *Smithsonian Contributions to Botany* 60: 1–584, with 1 183 figures.
- SONDER, O.W. 1862. Order LVII. Begoniaceae, R.Br. In W.H. Harvey & O.W. Sonder, *Flora capensis* 2: 480, 481. Hodges, Smith, Dublin.
- STEUDEL, E.T. 1840. *Nomenclator botanicus seu: synonymia plantarum universalis*, edn 2. Cott, Stuttgart & Tübingen, Germany.
- THONNER, F. 1915. *The flowering plants of Africa. An analytical key to the genera of African phanerogams: t. 107*. Dulau, London.
- VON AHLEFELDT, D., CROUCH, N.R., NICHOLS, G., SYMMONDS, R., McKEAN, S., SIBIYA, H. & CELE, P. 2003. *Medicinal plants traded on South Africa's eastern seaboard*. Ethekwini Parks Department & University of Natal, Durban.

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PLATE 2252 *Diospyros whyteana*

Diospyros whyteana

Ebenaceae

Eastern parts of tropical and southern Africa

Diospyros whyteana (Hiern) F.White in De Winter & White in *Bothalia* 7: 458 (1961); White: 326 (1962); De Winter: 69 (1963); Palmer & Pitman: 1800 (1972); Von Breitenbach: 266 (1974); Drummond: 267 (1975); White: 269 (1983a); Pooley: 406 (1993); Van Wyk: 234 (1994); White & Verdcourt: 28 (1996); Van Wyk & Van Wyk: 184 (1997); Van Wyk et al.: 120 (2000); Coates Palgrave: 911 (2002); McClelland: 518 (2002). *Royena lucida* L.: 397 (1753) not *D. lucida* Hort. ex Loudon: 394 (1841); Hiern: 447 (1906). *Royena whyteana* Hiern: 25 (1894). *R. wilmsii* Gürke: 60 (1898). *R. goetzei* Gürke: 372 (1901). *R. nyassae* Gürke: 373 (1901). *R. lucida* L. var. *whyteana* (Hiern) De Winter & Brenan in Brenan & Collaborators: 499 (1954).

As early as 1753 Linnaeus described this plant as *Royena lucida*. When the southern African members of *Royena* were transferred to the genus *Diospyros* (White in De Winter & White 1961), the specific epithet 'lucida' could not be used because the name *D. lucida* (Loudon 1841) for a different species already existed and such a combination would have been considered as a later homonym (McNeill *et al.* 2006). Hence, in the same paper (De Winter & White 1961), White made the new combination *D. whyteana* based on *R. whyteana* Hiern (1894), the next available earliest name for our species.

The name *Diospyros* comes from the Greek *dios* = divine or godly, and *pyros* = wheat or fruit, meaning godly or divine fruit (Backer 1936; Glen 2004). The fruits of *Diospyros* species are often edible and some, like the commercially grown *D. kaki* (the Japanese persimmon), are delicious. The specific name honours Alexander Whyte (1834–1908), a Scottish horticulturist and plant collector who collected the type specimen. Under the encouragement and leadership of H.H. Johnston, Consul General in British Central Africa at the time, Whyte undertook a collecting trip to explore the Mount Mulanje [Milanji] region, south of Lake Shirwa in Malawi, in October and November 1891 (Hiern 1894). Whyte's specimens were sent to the British Museum and Kew in London where J. Britten, W.P. Hiern, E.G. Baker and others identified and described new species from his botanical collection.

This is the second representative of the genus as well as the family Ebenaceae to be figured in this series. Some species of the family are of considerable economic importance, either for their timber (ebonies) or their edible fruit (persimmons), while others are attractive garden ornamentals.

The genus *Diospyros* in southern Africa can be divided into four groups on the basis of the development of the calyx in the fruiting stage, whether it is accrescent or not (Figure 1). The first group is the acorn-berries (*D. inhacaensis* and *D. natalensis*),

PLATE 2252.—1, fruiting branch, × 1; 2, male flowers, × 3; 3, bladder-like calyx surrounding mature fruit opened up to show the red fruit inside, × 1. Voucher specimens: *Condy 150* (1 and 3) and *Fourie 2824* (2) in National Herbarium, Pretoria. Artist: Gillian Condy.

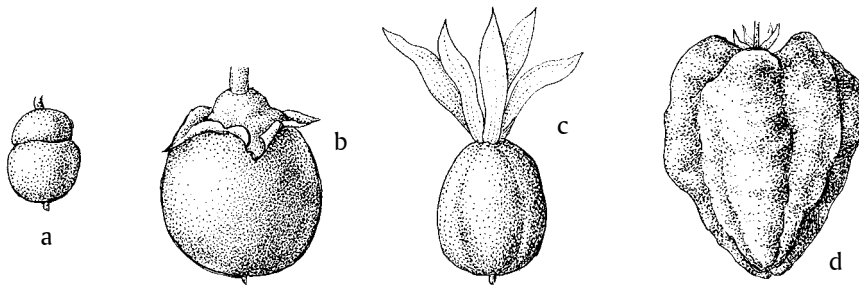


FIGURE 1.—The four types of fruit useful to group members of the genus *Diospyros* in southern Africa: a, *D. natalensis*, an example of the acorn-berries; b, *D. mespiliformis*, an example of the jackal-berries; c, *D. lycioides*, an example of the star-apples; d, *D. whyteana*, an example of the bladder-nuts. All $\times 1$. Voucher specimens: Schrire 911 (a), De Winter s.n.—photograph (b), Tinley 1327 (c) and Condy 150 (d) in National Herbarium, Pretoria. Drawings by: Gillian Condy.

in which the calyx does not enlarge but is persistent and cup-shaped at the base of the fruit, covering the fruit for \pm one third, the fruit thus resembling an acorn. The second group includes the jackal-berries (*D. chamaethamnus*, *D. mespiliformis* and *D. virgata*). In this group the calyx does not enlarge in the fruiting stage, but becomes thick and crisped or wavy, only covering the very base of the fruit. The third group is the largest and comprises the star-apples (*sterappels*) and fire-sticks (*krietekoms*), including *D. acocksii*, *D. austro-africana*, *D. galpinii*, *D. glabra*, *D. glandulifera*, *D. lycioides*, *D. pallens*, *D. ramulosa*, *D. rotundifolia*, *D. simii* and *D. villosa*. In these species, the calyx enlarges in the fruiting stage, with reflexed apices and radiating from the base of the fruit like a star, not enclosing it. The last group includes the bladder-nuts (*D. scabrida* and *D. whyteana*), in which the calyx enlarges, becomes inflated and almost or entirely encloses the fruit.

Diospyros whyteana is closely related to *D. scabrida* (Eastern Cape and KwaZulu-Natal Provinces of South Africa), which has elliptic, almost circular leaves, with the base square to lobed. Without fruit, it is often difficult to distinguish between these two species. The fruit of *D. whyteana* is fleshy and completely enveloped by the deeply lobed and accrescent calyx, whereas in *D. scabrida* it is halfway exposed and not enclosed by the enlarged and partly spreading calyx lobes.

Diospyros whyteana occurs in eastern South Africa, Lesotho, Swaziland, Mozambique, Zimbabwe, Zambia, Malawi and as far north in tropical East Africa as Tanzania (Figure 2). A typical afro-montane floristic element (White 1983b), it grows as an understorey shrub or small tree in coastal, mistbelt and montane forest, forest margins or in shady places on rocky outcrops in ravines.

In Von Breitenbach *et al.* (2001) *Diospyros whyteana* is listed as Tree No. 611, with common names given as bladder-nut, *swartbas*, *bostolbos* (Afrikaans), *mohlatšane* (Northern Sotho), *santinyana* (Swazi), *munyavhili* (Venda), *umkhaza*, *umtenatene* (Xhosa) and *umanzimane* (Zulu). The English common name bladder-nut refers to the fruit being completely enclosed in the inflated bladder-shaped calyx and the Afrikaans name *swartbas* refers to the blackish colour of the bark.

Although *Diospyros whyteana* has inconspicuous flowers, it is an attractive small ornamental tree with dark, glossy leaves. The fruits mature to bright red and attract birds even though they are covered by the papery calyx. This species is an excellent garden subject, particularly for a small garden (Winter 1984) and features in all the latest popular books on gardening with indigenous shrubs and trees in the region (e.g. Venter & Venter 1998; Joffe 2001; Johnson *et al.* 2002). It is sometimes used as a hedge plant or windbreak (Winter 1984) and makes a fine bonsai (Johnson *et al.* 2002).

The tree is easily propagated from seed, is fairly fast-growing and can also be used as a container plant. It needs moist, well-drained, nutrient-poor but humus-rich soil and is frost-resistant. The species will thrive in shady places in areas with cool or warm summers. Flowering time is from August to November.

Fruits are edible but have an unpleasant taste. Ground roasted seeds have been used as a substitute for coffee and in earlier days this plant was known as wild coffee. The bark has been used in traditional medicine for the treatment of menstrual pain, impotency and infertility. The roots have weak anticancer properties (Fouche *et al.* 2006). Formerly the wood was used to make implement handles. The moth *Ectoedemia royenicola* (Nepticulidae) breeds on the species (Kroon 1999). Leaves are browsed by game.

Description.—Evergreen, densely leaved shrub or tree up to 6 m, occasionally up to 13 m tall, single- or multistemmed, with irregular rounded crown, usually with an occasional bright orange or red leaf. *Bark* smooth, vertically fissured, dark grey to almost black with white patches; slash yellow, darkening to deep yellow; young twigs yellow-green or pinkish, with fine brownish hairs. *Leaves* alternate, simple; lamina lanceolate, narrowly elliptic to ovate-oblong, 25–50 × 14–25 mm, very glossy dark green above, pale green and sparsely hairy below, apex broadly acute to sub-acuminate, base almost rounded to lobed or cordate, margin entire, with fringe of long hairs; petiole 10–20 mm long. *Inflorescences* of male or female flowers borne on different plants, bracteate; bracts 2, leaf-like, ovate-lanceolate, 6 × 2 mm, separated by an internode, with a mixture of unicellular to multicellular and glandular hairs. *Male flowers* solitary, axillary, 5-merous, urceolate with spreading reflexed corolla, 5–10 mm long, white to cream, drooping on slender hairy stalks up to 20 mm long; stamens 10, all fertile, or sometimes replaced by staminodes 4–5 mm long; filaments

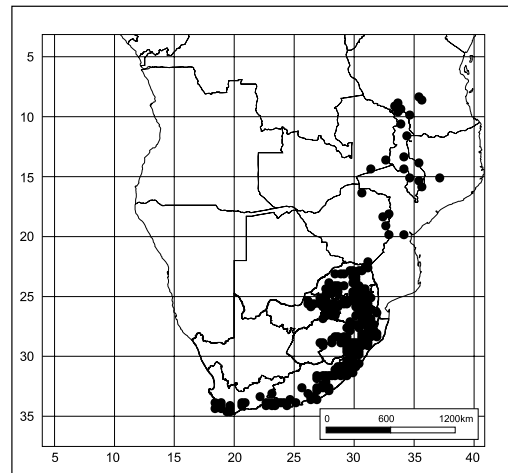


FIGURE 2.—Known distribution of *Diospyros whyteana* based on specimens housed in the National Herbarium, Pretoria, and on the literature (White 1983a; White & Verdcourt 1996).

5–10 mm long, hairless, included; pistillode conical, hairy, 4–6-locular. *Female flowers* in short axillary racemes; staminodes 6–10, 1.2 mm long; ovary conical, 20 × 1.5 mm, 4–6-locular, with 1 ovule per locule; styles 2 or 3; otherwise as in male flowers. *Fruit* a berry, red when ripe, ± globose, up to 20 mm diam., glabrescent, calyx persistent, accrescent, with 4 or 5 lobes joined to form an inflated, bladder-like structure completely enveloping fruit, often reddish brown, persistent through to next season. *Seeds* 2–4 per fruit, 8 mm long, pale brown. Plate 2252.

REFERENCES

- BACKER, C.A. 1936. *Verklarend woordenboek van wetenschappelijke plantennamen*. Visser, Batavia.
- BRENAN, J.P.M. & COLLABORATORS. 1954. Plants collected by the Vernay Nyasaland Expedition of 1946. *Memoirs of the New York Botanical Garden* 8: 409–510.
- COATES PALGRAVE, M. 2002. *Keith Coates Palgrave Trees of southern Africa*, revised edn 3. Struik, Cape Town.
- DE WINTER, B. 1963. *Diospyros*. *Flora of southern Africa* 26: 54–80. Botanical Research Institute, Pretoria.
- DE WINTER, B. & WHITE, F. 1961. Ebenaceae. New combinations in the genus *Diospyros*. *Bothalia* 7: 457, 458.
- DRUMMOND, R.B. 1975. A list of trees, shrubs and woody climbers indigenous or naturalised in Rhodesia. *Kirkia* 10: 229–285.
- FOUCHE, G., KHOROMBI, E., KOLESNIKOVA, N., MAHARAJ, V.J., NTHAMBELENI, R. & VAN DER MERWE, M. 2006. Investigation of South African plants for anticancer properties. *Pharmacologyonline* 3: 494–500.
- GLEN, H. 2004. *What's in a name?* Jacana, Johannesburg.
- GÜRKE, M. 1898. Ebenaceae africanae II. *Botanische Jahrbücher* 26: 60–73.
- GÜRKE, M. 1901. Die von W. Goetze am Rukwa-See und Nyassa-See sowie in den zwischen beiden Seen gelegenen Gebirgsländern, insbesondere dem Kinga-Gebirge gesammelten Pflanzen, nebst einigen Nachträgen zu Bericht. Ebenaceae. *Botanische Jahrbücher* 30: 372, 373.
- HIERN, W.P. 1894. The plants of Milanji, Nyassa-land, collected by Mr. Alexander Whyte. *Transactions of the Linnean Society, Botany Sér.* 2,4: 1–67.
- HIERN, W.P. 1906. Ebenaceae. In W.T. Thiselton-Dyer, *Flora capensis* 4,1: 444–478. Reeve, London.
- JOFFE, P. 2001. *Creative gardening with indigenous plants. A South African guide*. Briza, Pretoria.
- JOHNSON, D., JOHNSON, S. & NICHOLS, G. 2002. *Gardening with indigenous shrubs*. Struik, Cape Town.
- KROON, D.M. 1999. *Lepidoptera of southern Africa: host plants & other associations*. Lepidopterists' Society of Africa & the author, Jukskei Park & Sasolburg.
- LINNAEUS, C. 1753. *Species plantarum*. Salvius, Stockholm.
- LOUDON, J.C. 1841. *Gardener's Magazine*: 394. Published by author, London.
- McCLELAND, W. 2002. Ebenaceae. In E. Schmidt, M. Lötter & W. McCleland, *Trees and shrubs of Mpumalanga and Kruger National Park*. Jacana, Johannesburg.
- McNEILL, J., BARRIE, F.R., BURDET, H.M., DEMOULIN, V., HAWKSWORTH, D.L., MARHOLD, K., NICOLSON, D.H., PRADO, J., SILVA, P.C., SKOG, J.E., WIERSEMA, J.H. & TURLAND, N.J. (eds) 2006. *International Code of Botanical Nomenclature (Vienna Code) adopted by the Seventeenth International Botanical Congress Vienna, Austria, July 2005*. Gantner Verlag, Ruggell, Liechtenstein. [Regnum Vegetabile 146]
- PALMER, E. & PITMAN, N. 1972. *Trees of southern Africa*, Vol. 3. Balkema, Cape Town.
- POOLEY, E.S. 1993. *The complete field guide to trees of Natal, Zululand and Transkei*. Natal Flora Publications Trust, Durban.
- VAN WYK, B. [A.E.] & VAN WYK, P. 1997. *Field guide to trees of southern Africa*. Struik, Cape Town.
- VAN WYK, B. [A.E.], VAN WYK, P. & VAN WYK, B-E. 2000. *Photographic guide to trees of southern Africa*. Briza, Pretoria.
- VAN WYK, P. 1994. *Field guide to the trees of the Kruger National Park*, edn 3. Struik, Cape Town.
- VENTER, F. & VENTER, J.-A. 1998. *Making the most of indigenous trees*. Briza, Pretoria.
- VON BREITENBACH, F. 1974. *Southern Cape forests and trees*. Government Printer, Pretoria.

- VON BREITENBACH, J., DE WINTER, B., POYNTON, R., VAN DEN BERG, E., VAN WYK, B. [A.E.] & VAN WYK, E. 2001. *Pocket list of southern African indigenous trees*. Briza, Pretoria.
- WHITE, F. 1962. *Forest flora of Northern Rhodesia*. Oxford University Press, London.
- WHITE, F. 1983a. Ebenaceae. In E. Launert, *Flora zambesiaca* 7,1: 248–300. Flora Zambesiaca Managing Committee, London.
- WHITE, F. 1983b. The vegetation of Africa: a descriptive memoir to accompany the UNESCO/AETFAT/UNSO vegetation map of Africa. *Natural Resources Research* 20, UNESCO, Paris.
- WHITE, F. & VERDCOURT, B. 1996. Ebenaceae. In R.M. Polhill, *Flora of tropical East Africa, Ebenaceae*: 1–49. Balkema, Rotterdam.
- WINTER, J.H.S. 1984. *Diospyros whyteana*. *Veld & Flora* 70: 28.

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Aspidoglossum ovalifolium

Apocynaceae: Asclepiadoideae

Mozambique, South Africa and Swaziland

Aspidoglossum ovalifolium (Schltr.) Kupicha in Kew Bulletin 38: 649, 650 (1984); Germishuizen & Fabian: 316, Pl. 150 (1997); Lebrun & Stork: 98 (1997); Retief & Herman: 263 (1997); Nicholas: 683, fig. 9a, b (1999); Müller et al.: 16, 17 (2002); Victor et al.: 137 (2003); Braun et al.: 66 (2004); Marais: 93 (2004); Bester et al.: 119 (2006); Klopper et al.: 52 (2006). *Schizoglossum ovalifolium* Schltr.: 5 (1894a); Brown: 626 (1907). *S. striatum* Schltr.: 356 (1894b), 421 (1896); Brown: 631 (1907). *S. pumilum* Schltr.: 21 (1895a), 420 (1896); Brown: 628, 629 (1907). *S. robustum* Schltr.: 267 (1895b); Brown: 631 (1907); Wood: 84 (1907); Phillips: 191 (1917); Ross: 268 (1972); Gibson: t. 83 (1975); Compton: 449 (1976). *S. robustum* var. *inadense* N.E.Br.: 632 (1907); Bews: 167 (1921). *S. robustum* var. *pubiflorum* N.E.Br.: 632 (1907), in part; Bews: 167 (1921). *S. contracurvum* N.E.Br.: 628 (1907).

When *Aspidoglossum* was described by Meyer (1838), it consisted of only three species (*A. biflorum*, *A. fasciculare* and *A. heterophyllum*). Currently it includes some 34 species distributed throughout southern and tropical Africa. About 22 of them grow in southern Africa, mainly along the eastern side of the subcontinent (Leistner 2000). Various authors added to the genus, but Brown (1902, 1907) placed it in synonymy under *Schizoglossum*. Bullock (1952) resurrected the genus *Aspidoglossum*. Kupicha (1984) revised *Schizoglossum*, transferring many species to *Aspidoglossum* or the newly described genus *Miraglossum*.

The genera *Aspidoglossum*, *Schizoglossum*, *Miraglossum* and *Aspidonepsis* (Nicholas 1999) are closely related, with most of them appearing in a well supported clade in the recent molecular analysis by Goyder *et al.* (2007). According to Nicholas & Goyder (1992), *Aspidonepsis* and *Aspidoglossum* probably evolved from a common ancestor. Distinguishing characters of the four genera are compared in Table 1.

Schlechter (1894a) originally placed *Aspidoglossum ovalifolium* in *Schizoglossum*. When Kupicha (1984) revised *Schizoglossum*, she moved our species to *Aspidoglossum*, in the process placing a number of other taxa described by Schlechter (1894b, 1895a, b) and Brown (1907) into synonymy under it. She based her new circumscription of *A. ovalifolium* on comparative morphology and the dissection of large numbers of specimens. Kupicha used the structure of the leaf, corona, pollinaria and fruit to divide *Aspidoglossum* into four sections. Our species was placed in section *Verticillus* because of the leaves being whorled at least in the flowering branches.

Aspidoglossum ovalifolium is by far the most widely distributed of all species of *Aspidoglossum* in southern Africa and is extremely variable in morphology. *A. masaicum* (from tropical Africa) is the closest rival in terms of distribution range and variability. *A. ovalifolium* occurs from central Mozambique southwards to Swaziland and South Africa. In South Africa, it grows in the Eastern Cape, KwaZulu-Natal,

PLATE 2253.—1, apical portion of stem with flowers, × 1; 2, flower, × 4; 3, apical portion of stem with follicle, × 1; 4, cross section of leaf, × 6; 5, basal part of stem (above-ground) connected to neck and tuber (underground), × 1. Voucher specimens: Bester 8395 (1, 2, 4, 5), Bester 8455 (3) in National Herbarium, Pretoria. Artist: Gillian Condy.



G. Condy

PLATE 2253 *Aspidoglossum ovalifolium*

TABLE 1.—Distinguishing characters of the related genera *Aspidoglossum*, *Aspidonepsis*, *Miraglossum* and *Schizoglossum* (Kupicha 1984; Nicholas & Goyder 1992; Nicholas 1999)

	<i>Aspidoglossum</i>	<i>Aspidonepsis</i>	<i>Miraglossum</i>	<i>Schizoglossum</i>
Inflorescence	Fascicled, almost sessile near stem apex.	Not fascicled, rarely sessile.	Fascicled, sessile.	Always pedunculate (except in <i>S. bidens</i> subsp. <i>pachyglossum</i>).
Corona	Lamina-like, without a central sinus, usually with appendages from inner or upper surface, nonfleshy, dorsoventrally flattened.	Cucullate, saccate cavity with or without an appendage, fleshy, not dorsoventrally flattened.	Lobes thick, fleshy, not dorsoventrally or laterally compressed.	Form very variable, dorsoventrally flattened and often with 1 or 2 appendages on ventral face.
Pollinia	Sausage-shaped, and apically or subapically attached to the translator arms. Germination zone (when present) at the point of attachment between translator arms and pollinia.	Golf-club-shaped. No translucent germination zone present.	Sausage-shaped, without a defined germination zone.	Variably shaped, attached to the middle of the inner margin. Germination zone always present on circumference but never at point of attachment to translator arm.

Mpumalanga, Gauteng, North-West and Limpopo Provinces. Kupicha (1984), Lebrun & Stork (1997), and subsequently Müller *et al.* (2002) and Klopper *et al.* (2006) listed it for Mozambique, but it was omitted in the recent preliminary checklist of that country (Da Silva *et al.* 2004). A comprehensive search for the exact distribution points for the specimens from central Mozambique proved unsuccessful. This uncertainty is indicated by an arrow and question mark on the distribution map (Figure 1).

Aspidoglossum ovalifolium usually grows in grassland, sometimes near water, at altitudes of 500 m and above. Plants normally flower between September and April but, depending on the general weather conditions, sometimes flower totally out of season. Specimens have been collected from various habitats such as ridges, open grassland and open woodland, sometimes in areas dominated by the grasses *Themeda triandra*, *Hyparrhenia hirta* and *Digitaria eyelsii*. It has been found on deep red-brown clay and loam, and on stony, rocky or sandy, well-drained soils, in full sun. Plants are adapted to the fire regimes of the habitat in which they grow and survive as underground, carrot-shaped, tubers. Early spring burns seem to stimulate sprouting of the plants. This wide variety of habitats probably accounts for the extreme variability of this species (A. Nicholas, pers. comm.).

The generic name is derived from the Greek words *aspidos* (shield) and *glossa* (tongue) and refers to the square, shield-like corona lobes (Nicholas 1999; Figure 2a–c). During the early botanical exploration of southern Africa, it often happened that the description of a new taxon was based on only one or a few specimens. Because little material was initially available, the feature of the plant as reflected in the name sometimes proved to be inappropriate later. The type (the specimen with which the name is permanently associated) of *A. ovalifolium* is from Komgha in the Eastern Cape (Flanagan 1307). The leaves of the isotype housed at the National Herbarium in Pretoria are broadly elliptic (oval), hence the epithet *ovalifolium*. It comes from

Latin and means 'having oval leaves'. It is unfortunate that this name has to be applied to the taxon because only very few specimens of this taxon have oval leaves. It is, however, the oldest name and according to the rules of botanical nomenclature it has to be used for the taxon (Kupicha 1984). A similar example from this family is *Raphionacme hirsuta*—the type specimen has hirsute leaves, but those of most plants (and herbarium specimens) are actually glabrous.

The specimen illustrated in the accompanying plate was collected on 3 January 2008 at the Rietvlei Nature Reserve, southeast of Pretoria. The population is located among dolerite outcrops on a gentle southwestern slope above a small stream that runs into the Rietvlei Dam (2528CD). The voucher (*Bester 8395*) is the first herbarium specimen of our species from this quarter-degree square and, although previously listed for the reserve (Marais 2004), it is the first specimen from this location lodged at the National Herbarium in Pretoria. The fruiting follicle, collected on 28 February 2008 (*Bester 8455*), comes from the same population. The population consisted of about 25 plants (± 0.17 plants per m^2). Plants took about 3–10 weeks after pollination to form mature follicles with ripe seed ready for release. During this time, the region experienced a number of weeks of overcast weather and it is suspected that many flowers remained unpollinated or that the flowers and young fruit were aborted. In general, the production of mature follicles during this season was rather low.

During the 2007/2008 growing season, the author had the opportunity to visit several sites where this species grows. The flower size varies considerably between populations and localities. The larger-flowered specimens have the largest flowers in the genus. Plants do not only vary considerably in size, but also in flower colour. Those from Vryheid Hill Municipal Nature Reserve (KwaZulu-Natal) were large, had large flowers and the petals were a uniform green, with the corona lobes cream-coloured. Plants from Paulpietersburg (± 100 km northeast of Vryheid) were much smaller, had smaller flowers and the corolla was pale green with longitudinal purplish markings on the ventral surface. Plants similar to these were found at Drakensville. On the highveld near Breyten (Mpumalanga), plants tended to be large, with large flowers and a dark uniformly green corolla. Kupicha (1984) noted that several collections from Zululand had purple or dark brown flowers. They are, however, not unique to that area as she implied, but seem to be more widely distributed.

Aspidoglossum ovalifolium is a very variable species. The plants depicted here are large, the corona white with pink striping on the apical portion running into the appendage and horn. The list of synonyms reflects this variation and although

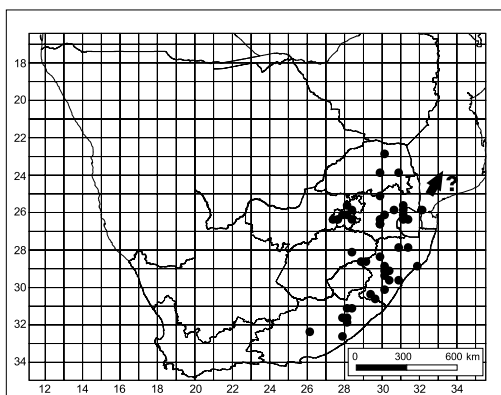


FIGURE 1.—Known distribution of *Aspidoglossum ovalifolium* in southern Africa. Localities in central Mozambique without precise details (Kupicha 1984; Lebrun & Stork 1997) indicated by arrow.

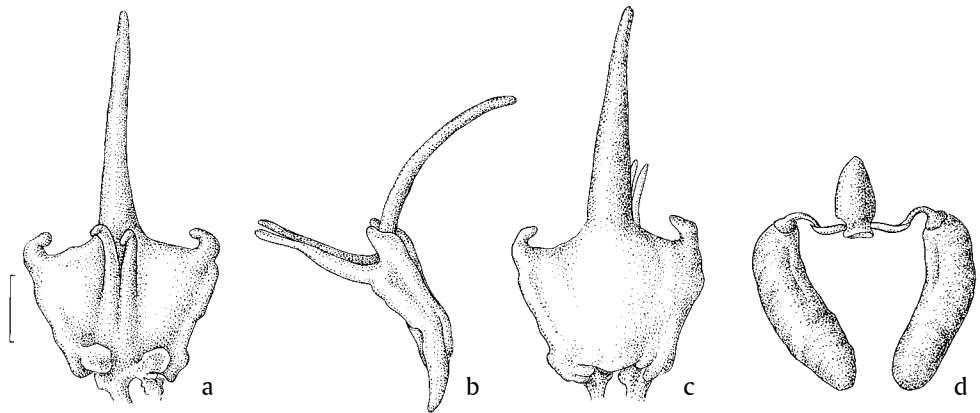


FIGURE 2.—*Aspidoglossum ovalifolium*. a–c: corona: a, ventral view; b, side view; c, dorsal view; d, pollinarium. Voucher specimen: Bester 8395 in National Herbarium, Pretoria. Drawings by Gillian Condy. Scale bars: a–c (at a), 1 mm; d, 1 mm.

Kupicha (1984) indicated that she had dissected at least 60 specimens (and probably examined many more), she was unable to define distinct infraspecific taxa. Although the distribution of the hairs on the corolla is usually of taxonomic value in *Aspidoglossum*, *A. ovalifolium* is one of a few exceptions where the ventral side can vary from glabrous to densely pubescent (Kupicha 1984). The author intends to study this variation further as he believes that the current concept may involve more than one taxon. Furthermore, a number of specimens at the National Herbarium in Pretoria determined as *Schizoglossum robustum* var. *pubiflorum* (currently partly in synonymy under *A. ovalifolium* and *A. validum* respectively) and not seen by Kupicha, may well prove to be a distinct taxon and need further investigation. Our species is most closely related to *A. validum*, which has a very restricted distribution in the Barberton-Nelspruit area of the Drakensberg in Mpumalanga.

Brown (1907) remarked on the difficulties of distinguishing between the species in the order *Asclepiadeae* as the flowers, leaves and stems are so alike. The only way to be sure of the determination is to dissect the flowers, but (in his words) ‘in dried specimens the structure of the corona is often so much altered by dehydration and applied pressure’ that a number of specimens have to be dissected before the true structure becomes apparent and a determination can be made. Studies involving modern techniques such as DNA analyses may further our understanding of the intimate relationships, both morphological and phylogenetic, of the plants in this group.

Description.—Perennial geophytic herb with milky latex. *Tuber* fleshy, napi-form, broadest above middle, 25–70 × 8–16 mm, pale cream-coloured, tuber crown 10–75 mm long, unbranched. *Stems* annual, 60–630 × 1–3 mm, stiffly erect, rarely branched, with short, fine to coarsely pubescent hairs, leafless towards base. *Leaves* numerous, opposite below inflorescence, usually in whorls of 3 in inflorescence, crowded towards apex, less so in taller specimens, subsessile or with petiole up to 3 mm long, ascending or erect, acicular, oblong, oblong-linear, linear, linear-lanceolate, lanceolate, broadly elliptic to ovate, 8.5–62.7 × 0.5–25.5 mm, above glabrous, pilose, coarsely

pubescent or slightly scabrous, below glabrous, pilose throughout or on midrib only; midrib prominent beneath; apex acute, apiculate, rounded; base attenuate, cuneate, obtuse or subtruncate; margins narrowly revolute. *Inflorescences* sessile at \pm upper half of stem, becoming crowded towards stem apex. *Flowers* 2–13 per node; pedicels 5–14 mm long, often shorter than leaves towards stem apex, pubescent to subglabrous. *Calyx* segments reflexed, ovate or ovate-lanceolate to acuminate, $2-6 \times 0.5-2.0$ mm, pilose with transparent to brown hairs. *Corolla* lobes free, spreading, flat or slightly replicate, elliptic-ovate to oblong, $4-8 \times 2-4$ mm, acute or subacute, colour variable, dark maroon, mauve, purple, olive-green or green striped brown or green striped purple, dorsal surface with hairs adpressed pilose, transparent or brown, rarely stiff and patent, ventral surface glabrous, puberulous or pubescent, hairs decreasing in length towards tip, margin hyaline, 0.5 mm wide, sometimes slightly revolute. *Corona* maroon, white marked with maroon, rose to pink to purple, greenish white, white or white with pink or with maroon blotches. *Staminal corona* erect, 3–7 mm long, overtopping staminal column, dorsiventrally compressed with apical process and ventral appendage; basal lobe $0.8-3.2 \times 1.8-3.7$ mm, dorsal face \pm quadrate, narrower towards base, lateral teeth minute, erect, falcate or occasionally horizontally spreading from shoulders, shoulders sloping to truncate, medially extended to a subulate point 1.6–5.3 mm long, ventral face with 2 vertical keels merging with ventral appendage, small auricle on each side of base; apical process usually straight; ventral appendage subulate or filiform, 1.4–2.2 mm long, variously inclined from straight to inflexed, entire, bifid or divided almost to base, usually shorter than process (Figure 2a–c). *Interstaminal corona* minute, up to 0.75 mm long, ligulate, alternating with outer corona, apical tip inserted in notch of staminal groove. *Staminal column* 1.5–3.5 mm long. *Style apex* truncate, crenate, with 5 small ovate lobes and slight central depression. *Anthers*: anther appendages obtuse, transversely elliptic, suborbicular-ovate to subreniform-ovate, tips inflexed over side of style apex; anther wings linear-triangular, ± 0.5 mm long, with rounded notch at base. *Pollinia* pendulous, sausage-shaped, $0.23-0.4 \times 0.40-1.2$ mm, slightly dorsiventrally compressed; germination zone present at point of attachment to translator arm; translator arms slender, 0.28–0.40 mm long, somewhat flattened and twisted, attached subapically to pollinium; corpusculum obovoid, $0.17-0.50 \times 0.15-0.40$ mm, not flanged, basal v-shaped fissure close to attachment with translator arm (Figure 2d). *Follicle* solitary, fusiform, broadest just below middle, tapering into an obtuse beak, $40-84 \times 5-12$ mm, covered with several vertical series of strigose, adpressed denticulate processes 1–4 mm long, surface with puberulous to short villous hairs; fruiting stalk swirled and then upturned, up to 10 mm long, lime-green. *Seeds* numerous, compressed-ovoid, $2.5-3.5 \times 0.8-1.5$ mm, dorsiventrally flattened; testa dark-coloured, with brown rugulose to favulariate ridges, minutely scabrid; apical coma white, individual hairs up to 2.2 mm long. Plate 2253.

REFERENCES

- BESTER, S.P., NICHOLAS, A. & VENTER, H.J.T. 2006. Apocynaceae. In G. Germishuizen, N.L. Meyer, Y. Steenkamp & M. Keith, *A checklist of South African plants*. South African Botanical Diversity Network Report No. 41. SABONET, Pretoria.
- BEWS, J.W. 1921. *The flora of Natal and Zululand*. City Printing Works, Pietermaritzburg.
- BRAUN, K.P., DLAMINI, S.V.D., MDLADLA, D.R., METHULE, N.P., DLAMINI, P.W. & DLAMINI, M.S. (compilers) 2004. *Swaziland flora checklist*. South African Botanical Diversity Network Report No.27. SABONET, Pretoria.

- BROWN, N.E. 1902. Asclepiadaceae. In W.T. Thiselton-Dyer, *Flora of tropical Africa* 4,1: 231–503. Reeve, London.
- BROWN, N.E. 1907. *Schizoglossum*. In W.T. Thiselton-Dyer, *Flora capensis* 4,1: 588–662. Reeve, London.
- BULLOCK, A.A. 1952. Notes on African Asclepiadaceae I. *Kew Bulletin* 1952: 405–426.
- COMPTON, R.H. 1976. The flora of Swaziland. *Journal of South African Botany*, Supplementary Vol. No.11.
- DA SILVA, M.C., IZIDINE, S. & AMUDE, A.B. 2004. *A preliminary checklist of the vascular plants of Mozambique*. Southern African Botanical Diversity Network Report No. 30. SABONET, Pretoria.
- GERMISHUIZEN, G. & FABIAN, A. 1997. *Wild flowers of northern South Africa*. Fernwood Press, Vlaeberg, Cape Town.
- GIBSON, J.M. 1975. *Wild flowers of Natal (coastal region)*. The Trustees of the Natal Publishing Trust Fund, Durban.
- GOYDER, D., NICHOLAS, A. & LIEDE-SCHUMANN, S. 2007. Phylogenetic relationships in subtribe Asclepiadinae (Apocynaceae: Asclepiadoideae). *Annals of the Missouri Botanical Garden* 94: 423–434.
- KLOPPER, R.R., CHATELAIN, C., BÄNNINGER, V., HABASHI, C., STEYN, H.M., DE WET, B.C., ARNOLD, T.H., GAUTIER, L., SMITH, G.F. & SPICHTER, R. 2006. *Checklist of the flowering plants of Sub-Saharan Africa. An index of accepted names and synonyms*. South African Botanical Diversity Network Report No. 42. SABONET, Pretoria.
- KUPICHA, F.K. 1984. Studies on African Asclepiadaceae. *Kew Bulletin* 38: 599–672.
- LEBRUN, J.D. & STORK, A.L. 1997. *Énumération des plantes à fleurs d'Afrique tropicale. Vol. IV–Gamopétales: Clethraceae à Lamiaceae*. Conservatoire et Jardin botaniques de la Ville de Genève.
- LEISTNER, O.A. 2000. Seed plants of southern Africa: families and genera. *Strelitzia* 10. National Botanical Institute, Pretoria.
- MARAIS, R. 2004. *A plant ecological study of the Rietvlei Nature Reserve, Gauteng Province*. M.Agric. thesis, University of the Free State, Bloemfontein. 108 pp.
- MEYER, E.H. 1838. Asclepiadaceae. *Commentariorum de plantis Africae australioris*. Fasc. 2. Leopold Voss, Leipzig.
- MÜLLER, B., STEGMANN, P. & ALBERS, F. 2002. *Aspidoglossum*. In F. Albers & U. Meve, *Illustrated handbook of succulent plants: Asclepiadaceae*: 16, 17. Springer-Verlag, Heidelberg.
- NICHOLAS, A. 1999. *A taxonomic reassessment of the subtribe Asclepiadinae (Asclepiadaceae) in southern Africa*. Ph.D. thesis, University of Durban-Westville, Durban.
- NICHOLAS, A. & GOYDER, D.J. 1992. *Aspidonepsis* (Asclepiadaceae) a new southern African genus. *Bothalia* 22: 23–35.
- PHILLIPS, E.P. 1917. A contribution to the flora of the Leribe Plateau and environs. *Annals of the South African Museum*, Vol. 16.
- RETIEF, E. & HERMAN, P.P.J. 1997. Plants of the northern provinces of South Africa: keys and diagnostic characters. *Strelitzia* 6. National Botanical Institute, Pretoria.
- ROSS, J.H. 1972. *The flora of Natal*. Botanical Research Institute, Pretoria.
- SCHLECHTER, R. 1894a. Beiträge zur Kenntnis Südafrikanischer Asclepiadaceen. In A. Engler, *Botanische Jahrbücher* 18, Beiblatt 45: 1–37.
- SCHLECHTER, R. 1894b Contributions to South African asclepiadology. *Journal of Botany* 32: 353–358.
- SCHLECHTER, R. 1895a. Beiträge zur Kenntnis Südafrikanischer Asclepiadaceen. In A. Engler, *Botanische Jahrbücher* 20, Beiblatt 51: 1–56.
- SCHLECHTER, R. 1895b Contributions to South African asclepiadology. *Journal of Botany* 33: 267–274.
- SCHLECHTER, R. 1896. Revision of extra-tropical South African Asclepiadaceae. *Journal of Botany* 34: 417–421.
- VICTOR, J.E., NICHOLAS, A., BRUYNS, P.V., VENTER, H.J.T. & GLEN, H.F. 2003. Apocynaceae. In G. Germishuizen & N.L. Meyer, *Plants of southern Africa: an annotated checklist*. *Strelitzia* 14. National Botanical Institute, Pretoria.
- WOOD, J.M. 1907. *Handbook of the flora of Natal*. Bennett & Davis, Durban.

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Lavrania haagnerae Apocynaceae: Asclepiadoideae–Ceropegieae*Namibia*

Lavrania haagnerae Plowes in U.S. Cactus and Succulent Journal 58: 122, 123, t. 119 (1986); Bruyns: 241–245, t. 242 (1993b); Alp: t. 11 (1994); Plowes: 3, 4 (1996); Bruyns: 302–305, t. 302 (1999); Meve & Liede: 161–168, t. 164 (2001); Meve: 178, t. 32 (2002); Bruyns 229–231 (2005); Loots: t. 4 (2005); Liede-Schumann & Meve (2006). *Hoodia haagnerae* (Plowes) Halda: 33 (1998). *Echidnopsis* sp., Plowes: 11, 12 (1982).

A number of special events led to the extraordinary discovery of this plant in 1969 and its description in 1986. While on a photographic tour to the Kaokoveld in Namibia, Clem and Peggy Haagner stopped to rest at the base of enormous cliffs in the 20 km long Khowarib Gorge (Plowes 1986). Wandering around, Peggy found the dislodged piece of an unfamiliar stapeliad together with an aloe lying at the base of one of the cliffs. On their return to South Africa, they shared their discovery with Darrel Plowes, an authority on the group, and gave him a cutting.

Plowes nurtured and grew the material and distributed a number of cuttings to various people and institutions, among others Dave Hardy at the Pretoria National Botanical Garden, and Phillip Alp, South African representative to the International Asclepiad Society (IAS). Plowes (pers. comm.) knew that it was a new taxon and initially believed that it belonged to *Echidnopsis*. His intention was to publish it as *Echidnopsis namibensis* (listed as such on the tag accompanying the holotype in spirits in the National Herbarium in Pretoria). With no further research on the group, it remained unnamed for some time. Eventually, some 17 years after its discovery, it was finally published as *Lavrania haagnerae* by Plowes (1986).

The genus *Lavrania* commemorates succulent expert John Lavranos—to whom this volume of *Flowering Plants of Africa* is dedicated. He was born in Greece in 1926 and moved to South Africa in 1952. Because of his interest in especially succulent plants, he has become a well-known collector of succulents throughout southern and eastern Africa (Gunn & Codd 1981). He discovered many new taxa, authored or co-authored numerous publications and collected many herbarium specimens. The epithet *haagnerae* recognises Peggy Haagner, who found the new species.

In the original description, the type locality was indicated as the Khowarib Gorge. Several attempts, by both Plowes and Bruyns, well-known author and expert on the stapeliad group, to relocate plants at this site were without success. In early January 1990, Bruyns located the first plants in the wild since 1969 (after some 21 years) about 20 km northwest of the type locality.

PLATE 2254—1, mature plant in cultivation in nursery of Pretoria National Botanical Garden, × 1; 2, face view of flower, × 4; 3, surface of corolla with papillae, × 15; 4, pollinarium, × 33. Voucher specimen: *Bester 8394* in National Herbarium, Pretoria. Artist: Gillian Condy.



PLATE 2254 *Lavrania haagnerae*

A note filed with the material of *Lavrania haagnerae* in the National Herbarium in Pretoria indicates that at the time of publication of the species, Dave Hardy regarded it either as of hybrid origin or as belonging to *Trichocaulon* (at that time, today *Larryleachia*). Because no other material was available at the time of the publication of *Lavrania*, it was difficult to take a definite decision on its acceptance or rejection (A. Nicholas, pers. comm.). Currently the placement of our species in the genus *Lavrania* does not seem to be questioned, but subsequent to publication of the genus the question arose whether *Larryleachia* should be included in *Lavrania* or not. This led to much debate by various authors of different opinion (Bruyns 1993c, 1999; Plowes 1993, 1996; Meve & Liede 2001).

Brown (1878) established the genus *Trichocaulon* to accommodate the small-flowered, spiny species of *Hoodia*. Later a number of smooth-stemmed, nonspiny taxa were also added (Brown 1909). Plowes (1992a) moved these smooth-stemmed trichocaulons to *Leachia* and then to *Leachiella* (Plowes 1992b) because the former genus had been illegitimately published. *Leachiella*, however, was also illegitimately published. This gave Bruyns (1993a) the opportunity to move them to *Lavrania*. When Bruyns (1993b) revised *Hoodia* and *Lavrania*, he placed *L. haagnerae* in a section of its own (section *Lavrania*) and the former trichocaulons in section *Cactoidea*. After this, Plowes (1996) published *Larryleachia* validly and moved all the species of *Lavrania* section *Cactoidea* into it. Subsequently a number of authors followed this placement in their checklists (Smith *et al.* 1997, Victor *et al.* 2003 and Klopper *et al.* 2006).

In the original description of the genus *Lavrania*, Plowes (1986) indicated that the features that distinguished *Lavrania* from the smooth-stemmed trichocaulons (today *Larryleachia*) were that the flowers were carried on the basal parts of the stem and that the corolla had papillae with a bristle on the tip. Although Bruyns (1999) published photographs showing that inflorescences are sometimes carried towards the apex of the stem, in most plants they are mainly found at the base (E. van Jaarsveld, pers. comm.; Plowes 1986, 1993, 1996; P. Bester, pers. observ.). Inflorescences higher up on the stems seem to be the exception rather than the rule. However, Bruyns (2005) further argued that the 'bristle-tipped papillae' on the face of the corolla are not unique for *Lavrania*, indicating that they are also found in *Larryleachia cactiformis*, *L. picta* and *L. perlata*. Bruyns (2005) then continued to argue that because of a lack of any other morphological differences (other than the mainly basal arrangement of inflorescences) *Lavrania haagnerae* should be grouped together with *Larryleachia*. Earlier, in an effort to resolve the question whether or not *Larryleachia* and *Lavrania* should be recognised as separate genera, Meve & Liede (2001) had concluded that their molecular evidence showed support for the separation of the groups. Bruyns (2005) pointed out that statistical support for the separation of the groups of Meve & Liede (2001) was, however, extremely low. Based on his own morphological data, *Lavrania* is generically most closely related to *Hoodia* (Bruyns 2000a) and based on his molecular data, to *Richtersveldia* (Bruyns 2005).

Bruyns (2005) believes that because of a lack of clear morphological differences between *Larryleachia* and *Lavrania*, both should be placed in *Lavrania* (the older name of the two). He continues to argue that, based on his own work and that of Meve

& Liede (2001), there is low statistical support for separation of the two genera and they should be consolidated. He sees it as an interesting case of the morphological data suggesting that two groups of species can be considered as one, while the molecular data provide no significant aid in resolving the placement of the species. The two genera are currently kept separate owing to the lack of evidence to convincingly support a nonmonotypic genus *Lavrania* (Bruyns 2005).

Lavrania haagnerae is very variable in size. Bruyns (2005) observed one clump that was about 0.15 m by almost 1 m. The upright stems have a neat appearance because of the rounded tubercles forming longitudinal rows. Each tubercle has a slight central depression containing the minute but persistent leaf. The flowers are striking with their mottling of roundish red spots against a yellow background. Bruyns (2005) depicts a number of the varying forms of flower colouring that grade from that of our plant to a corolla that is more finely spotted, sometimes so fine that the flowers appear to be almost plain yellow or finely dusted with red. The corolla is densely covered with conical, obtuse papillae on the inside. Although the illustrated plant appeared to be scentless, Bruyns reports that plants in the wild had an unusually strong odour reminiscent of dung and urine. The pinkish to red corona fits exactly into the corolla tube in the centre and produces small, sweat-like drops of nectar (Bruyns 2005).

Craven & Loots (2002) listed *Lavrania haagnerae* as Endangered because of its restricted extent of occurrence (confirmed from only two localities) and its continued decline due to collecting activities. At the time of their assessment, it was considered to be sought after by succulent collectors for its unusual features and habit. Unfortunately, even in the sterile state, it is unmistakable and because no similar-looking species grow in the vicinity, it cannot be confused with any other stapeliad. Further problems arise when uninformed locals start to collect plants to meet the demand created by collectors. Fortunately, the plants occur in extremely sparsely populated areas and the vertical cliffs where they grow are quite inaccessible. Despite the extremely local extent of occurrence (1 250–1 850 km²) and small number of subpopulations (two to four), Craven (2004) assumed that the inaccessibility of the habitat would ensure more stable populations compared to the earlier assessment in 2002. The threatened status was therefore changed to Least Concern (LC), using the RAMAS Red List version 2.0 software package (Craven 2004). Fortunately, because of its restricted distribution and endemic status in Namibia, this species is protected under Nature Conservation Ordinance 4 of 1975 of that country (Loots 2005).

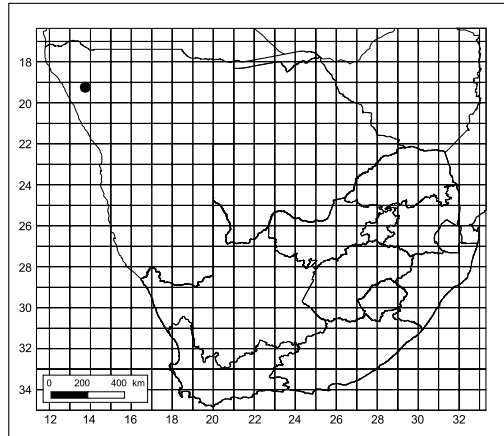


FIGURE 1.—Known distribution of *Lavrania haagnerae* in southern Africa, based on Bruyns (2005), Loots *et al.* (2005), E. van Jaarsveld (pers. comm.) and material in the Bolus Herbarium, Cape Town.

Like species of *Hoodia* and *Larryleachia*, *Lavrania* is found only in arid situations and is associated with the Namib Desert (Bruyns 2000b). *L. haagnerae* is of local occurrence in northwestern Namibia where it is endemic to the border area between the Damaraland and Kaokoveld regions (Figure 1). Thus far, it has been collected only from two localities, about 20 km apart, in the mountainous areas east of Sesfontein. It grows on vertical dolomite cliffs at an altitude of 700–900 m, sharing a niche with *Aloe dewinteri*, which occupies the same habitat. It is found in a unique, unusual habitat and forms part of a very specialised community that includes *Ceraria kuneneana* and species of *Albuca*, *Drimia* and *Oxalis*, among others (Figure 2). The veld type (at the bottom of the cliffs) is Mopane Savanna, and other plants against the cliffs include *Boscia albitrunca*, *Cadaba schroepelii*, *Commiphora anacardiifolia*, *C. glaucescens*, *C. multijuga*, a creeping *Cyphostemma* sp., *Grewia tenax* and *Maerua schinzii* (E. van Jaarsveld pers. comm.). It grows in clumps in situations that are quite difficult to reach, rooted in shallow pockets of soil in cracks or crevices on ledges against the rock faces of the vertical cliffs of the steep mountain slopes. The roots establish in pockets of soil and grow along the cracked veins in the rocks (Craven & Loots 2002). None of the closely related species of *Larryleachia* occupy these microhabitats (Bruyns 1993b).

The illustrated plant housed in the nursery of the Pretoria National Botanical Garden (PNBG) was allegedly committed to the care of Dave Hardy, accessioned as DSH 3/89 and planted on 6/20/1991. When the flowers are compared to those of the holotype depicted by Plowes (1986), it is quite apparent that it could be from the same clonal material. It is therefore assumed that the plant at PNBG is the cutting that Plowes originally gave to Hardy. Comparisons to flowers of other clone material from the holotype (Plowes 1986; Bruyns

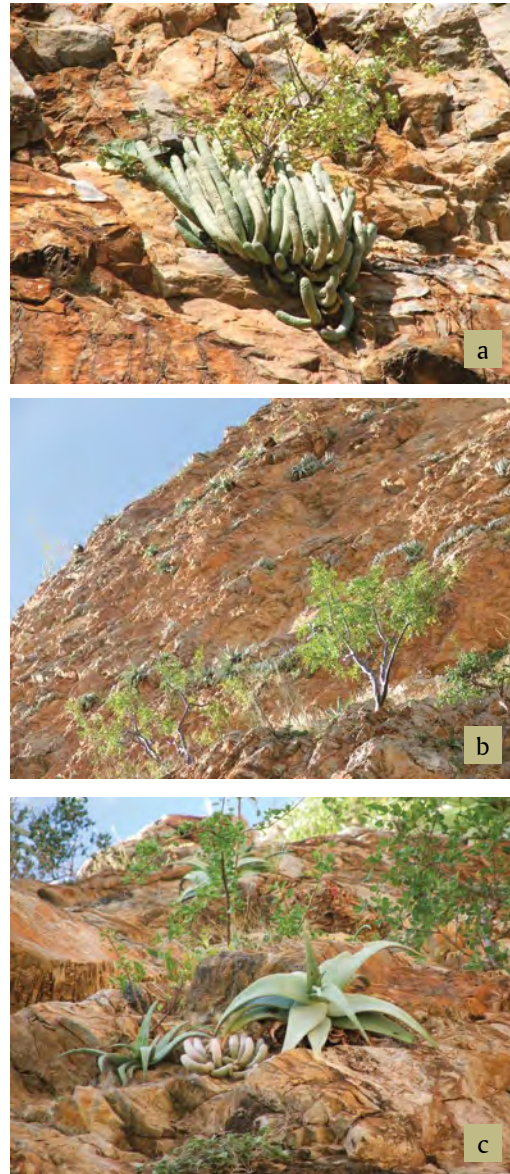


FIGURE 2.—*Lavrania haagnerae*: a, in habitat, multi-stemmed plant on rock faces; b, habitat on steep dolomite slope; c, growing together with *Aloe dewinteri*. Photographer: Ernst van Jaarsveld.

1993b, 2005; Meve 2001, 2002) support this notion.

Mature plants of *Lavrania haagnerae* collected from the wild and grown at Kirstenbosch National Botanical Garden flower annually (E. van Jaarsveld, pers. comm.). These plants come from an inselberg closer to Sesfontein and not from the Khowarib Gorge. Compared to the plants of Bruyns (illustrated in Bruyns 2005), the Van Jaarsveld plants are much thinner, grow faster and have developed numerous side branches from the base (*Van Jaarsveld 19879*). Since observations of the plant in the nursery of the Pretoria National Botanical Garden started in 2006, it also flowered annually. If the plants are properly cared for, they are relatively easy to cultivate.

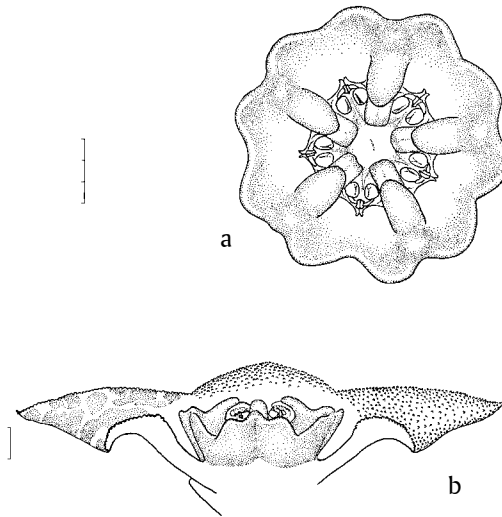


FIGURE 3.—*Lavrania haagnerae*: a, face view of gynostegium; b, cross section of a dissected flower. Scale bars: a, 3 mm; b, 1 mm. Drawings by P.V. Bruyns, who gave kind permission for reproduction from Bruyns (1993b, 2005).

Description.—Succulent perennial with clear latex. *Roots* fibrous. *Stems* in clumps of 3–100 (or more), cylindrical, procumbent-ascending, rigidly erect, glabrous, sometimes branching from base, 30–300 mm high, 15–30 mm diam., older stems grey- to blue-green or pale green, active growing region tinged pinkish purple, young side stems bright green; tubercles neatly arranged in longitudinal rows of 10–13, flattened, polygonal, rounded, tessellate, each with a much reduced but broadly conical, persistent, sessile leaf 0.5–1.0 mm long. *Inflorescence* extra-axillary, mainly on basal stem parts, \pm sessile, 1–5 per stem, bracteate. *Flowers* in clusters of 3–15, opening successively, strongly urine-scented, nectariferous; pedicel 2–12 \times 1–2 mm, glabrous; bracts triangular, caducous. *Calyx* \pm 2.5 \times 1.5 mm, rotate, basally fused, glabrous outside, lobes ovate-deltate to lanceolate to triangular, apically acute. *Corolla*: bud conical, depressed, fused over half to three quarters of total length; at full anthesis shallowly campanulate with slightly thickened mouth, 1.0–1.5 mm deep, 12–16 mm diam., rotate, fleshy (Figure 3b), pale whitish green below, glabrous, red-brown maculate on yellow background above, deeply lobed; lobes ovate-deltoid to broadly triangular(ovate), 3–4 \times 6 mm, horizontally spreading, densely covered with obtuse papillae (Figure 3b) each with apical bristle, apically acute, margins slightly reflexed. *Corona* 2-seriate, pink to purplish red, rotate, fleshy, \pm 2 \times 5 mm, arising from staminal column, glabrous, \pm sessile from base of corolla tube; outer corona lobes basally fused for \pm half their length, \pm 1.2 mm high, ascending, forming a shallow cup, ending in bifid to obtuse apex, laterally fused for \pm entire length to dorsal projection of inner lobe; inner corona lobes up to 2 mm long, incumbent on rectangular stamen, not exceeding it, linear, obtuse, with an obtuse ascending dorsal horn that is fused with but slightly taller than outer lobes, tips rounded (Figure 3a,b). *Anthers* 2-locular,

horizontal above style head, inversely T-shaped, free, margins rectangular, shrinking and exposing pollinia. *Gynostegium* sessile; style head white; pollinia yellow, broadly drop- to D-shaped, slightly ovoid, 0.3–0.5 × 0.2–0.5 mm, baseo-laterally attached to caudicles; caudicles straight, ascending, flattened, spatulate, acuminate, subbasally inserted in corpuscle, ± 0.25 × 0.12 mm; corpuscle rectangular-fusiform, with ellipsoidal basal projections, ± 0.28 × 0.12 mm. *Fruit* and *seed* not seen. Plate 2254.

REFERENCES

- ALP, P. 1994. Letters to the editor. *Lavrania haagnerae*. *Asklepios* 61: 11.
- BROWN, N.E. 1878. Stapeliae of Thunberg's herbarium. *Journal of the Linnean Society* (London) (Botany) 17: 162–172.
- BROWN, N.E. 1909. *Trichocaulon*. In W.T. Thiselton-Dyer, *Flora capensis* 4,1: 888–896. Reeve, London.
- BRUYNS, P.V. 1993a. New combinations in *Hoodia* and *Lavrania*. *South African Journal of Botany* 59: 342.
- BRUYNS, P.V. 1993b. A revision of *Hoodia* and *Lavrania* (Asclepiadaceae–Stapeliaceae). *Botanische Jahrbücher* 115,2: 145–270.
- BRUYNS, P.V. 1993c. Letters to the editor. *Asklepios* 58: 8, 9.
- BRUYNS, P.V. 1999. The status of *Larryleachia* Plowes and additional synonymy for *Lavrania* Plowes. *South African Journal of Botany* 65: 302–305.
- BRUYNS, P.V. 2000a. Phylogeny and biogeography of the Stapeliads 1. *Plant Systematics and Evolution* 221: 199–226.
- BRUYNS, P.V. 2000b. Phylogeny and biogeography of the Stapeliads 2. *Plant Systematics and Evolution* 221: 227–244.
- BRUYNS, P.V. 2005. *Stapeliads of southern Africa and Madagascar*, Vol. I. Umdaus Press, Hatfield, South Africa.
- CRAVEN, P. 2004. *Lavrania haagnerae*. In 2007 IUCN Red List of Threatened Species. www.iucnredlist.org. Accessed on 9 April 2008.
- CRAVEN, P. & LOOTS, S. 2002. Namibia. In J.S. Golding, *Southern African Plant Red Data Lists*. Southern African Botanical Diversity Network Report No.14: 61–92.
- GUNN, M. & CODD, L.E.W. 1981. *Botanical exploration of southern Africa*. Balkema, Cape Town.
- HALDA, J.J. 1998. Synopsis of the genus *Hoodia* Sweet ex Decne. *Acta Musei Rhicnoviensis (Section Nature)* 5,1: 28–33.
- KLOPPER, R.R., CHATELAIN, C., BÄNNINGER, V., HABASHI, C., STEYN, H.M., DE WET, B.C., ARNOLD, T.H., GAUTIER, L., SMITH, G.F. & SPICHTIGHER, R. 2006. *Checklist of the flowering plants of Sub-Saharan Africa. An index of accepted names and synonyms*. South African Botanical Diversity Network Report No. 42. SABONET, Pretoria.
- LIEDE-SCHUMANN, S. & MEVE, U. 2006. The genera of Asclepiadoideae, Secamonoideae and Periplocoideae (Apocynaceae). Descriptions, illustrations, identification, and information retrieval. Version: 21 September 2000. http://ftp://www.uni-bayreuth.de/departments/planta2/research/databases/delta_ascleps/index.html
- LOOTS, S. 2005. *Red Data Book of Namibian plants*. Southern African Botanical Diversity Network Report No. 38. SABONET, Pretoria.
- MEVE, U. 2002. *Lavrania*. In F. Albers & U. Meve, *Illustrated handbook of succulent plants: Asclepiadaceae*. Springer-Verlag, Heidelberg.
- MEVE, U. & LIEDE, S. 2001. Reconsideration of the status of *Lavrania*, *Larryleachia* and *Notechidnopsis* (Asclepiadoideae–Ceropegieae). *South African Journal of Botany* 67: 161–168.
- PLOWES, D.C.H. 1982. The stapeliads of South West Africa/Namibia. *Excelsa* 10: 5–26.
- PLOWES, D.C.H. 1986. A new stapeliad genus from South West Africa. *U.S. Cactus and Succulent Journal* 58: 119–123.
- PLOWES, D.C.H. 1992a. A preliminary reassessment of the genera *Hoodia* and *Trichocaulon* (Stapeliaceae: Asclepiadaceae). *Asklepios* 56: 5–15.
- PLOWES, D.C.H. 1992b. *Leachiella* Plowes: Stapeliaceae (Asclepiadaceae)—a new generic name. *Asklepios* 57: 15–16.

- PLOWES, D.C.H. 1993. Letters to the editor: *Hoodia* revision. *Asklepios* 58: 9, 10.
- PLOWES, D.C.H. 1996. *Larryleachia* and *Hoodia*: some new nomenclatural proposals. *Excelsa* 17: 3–28.
- SMITH, G.F., VAN JAARSVELD, E.J., ARNOLD, T.H., STEFFENS, S.E., DIXON, R.D. & RETIEF, J.A. (eds) 1997. *List of southern African succulent plants*. Umdaus Press, Pretoria.
- VICTOR, J.E., NICHOLAS, A., BRUYNS, P.V., VENTER, H.J.T. & GLEN, H.F. 2003. Apocynaceae. In G. Germishuizen & N.L. Meyer, *Plants of southern Africa: an annotated checklist*. *Strelitzia* 14: 154, 155. National Botanical Institute, Pretoria.

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of Condy

PLATE 2255 *Syncolostemon macranthus*

Syncolostemon macranthus

Lamiaceae

South Africa

Syncolostemon macranthus (Gürke) M.Ashby in *Journal of Botany*, London 73: 357 (1935); Trauseld: 163 (1969); Ross: 306 (1972); Codd: 26 (1976); Codd: 190 (1985); Killick: 82 (1990); Pooley: 218 (2003). *Orthosiphon macranthus* Gürke: 84 (1898). *Hemizygia cooperi* Briq.: 992 (1903).

Orthosiphon macranthus was described in 1898 by Gürke, a German botanist at the Berlin Botanical Museum. In 1935, Ashby transferred the species to the genus *Syncolostemon* published by Bentham in 1838 to accommodate certain plants collected by Drège during his visits to southern Africa. *Syncolostemon* is a member of the family Lamiaceae established by De Jussieu (1789) as the order 'Labiatae'. Currently the family comprises more than 240 genera and 6 500 species, following the family circumscription of Cantino *et al.* (1992). It is mainly a herbaceous and shrubby family, well represented in warmer, temperate regions but also found in the tropics, often at forest margins. The genus is placed in the subfamily Nepetoideae of the tribe Ocimeae, a large natural tribe of over 1 000 species, which is almost exclusively tropical.

The genus name *Syncolostemon* alludes to the structure of the stamens: *syn* (united), *kolos* (stunted) and *stemon* (pillar)—the lower pair of filaments are joined to the flower tube. The species name *macranthus* refers to the large flowers.

In 1848, Bentham established the section *Hemizygia* in the genus *Ocimum* to accommodate *O. teucrifolium*, which had been found to differ from typical *Ocimum* species in having the anterior staminal filaments fused at the base. Subsequently this section was raised to generic level as the genus *Hemizygia* (Briquet 1897). Codd (1985) noted that that the uppermost calyx tooth in *Syncolostemon macranthus* and *S. latidens* was broadly ovate as in *Hemizygia*, making the two species appear intermediate between *Syncolostemon* and *Hemizygia*. However, he retained them in *Syncolostemon* because of their close affinity with *S. densiflorus* and *S. rotundifolius*. More recent authors such as Paton & Hedge (1999), Paton & Balkwill (2001), Retief & Herman (2003), Klopper *et al.* (2006) and Retief (2006) have also kept the two genera separate. In a study based on macromorphological and molecular studies, Otieno (2004) treated *Hemizygia* as nested in *Syncolostemon*. He subsequently reduced the species of *Hemizygia* into the synonymy of *Syncolostemon*, the earlier name (Otieno *et al.* 2006a, b). The merging of *Hemizygia* into *Syncolostemon* has considerably enlarged the taxon. It now comprises 44 species, of which 39 are known only from southern Africa (here defined as including Botswana, Lesotho, Namibia, South Africa and Swaziland). *Syncolostemon* also occurs in India and Madagascar and most members of the genus are annual or perennial herbs and soft shrubs,

PLATE 2255.—1, mature flowering branch, × 1; 2, young flowering branch, × 1. Voucher specimen: *Condy 191* in National Herbarium, Pretoria. Artist: Gillian Condy.

characterised by the presence of fused anterior stamens, a feature that sets them apart from other genera in the tribe Ocimeae (Paton 1998).

Syncolostemon macranthus is characterised by a long corolla tube (20–25 mm) and a glandular-puberulous calyx and inflorescence rachis. This species, which is also commonly known as the long-flowered pink plume (Pooley 2003), flowers from October to April, with a peak in March. It is very attractive when in flower but has proved difficult to maintain in cultivation and has no known traditional use. *S. macranthus* is known only from a restricted

area of the KwaZulu-Natal Drakensberg between Cathedral Peak and Van Reenen's Pass, just extending into the eastern Free State (Figure 1) and inhabits mountain slopes, margins of stream banks, moist gullies, grassy scree slopes, fairly damp grassy slopes and forest margins. It is a near endemic of the floristic region known as the Drakensberg Alpine Centre (Van Wyk & Smith 2001). This eastern mountain region is centred on the mountains of Lesotho, which include the Maloti and Thaba Putsoa ranges, the southern and northern Drakensberg in KwaZulu-Natal, the Eastern Cape Drakensberg and the Witteberg. The summit vegetation on these mountain ranges largely comprises cushion-forming dwarf shrubs. Larger woody plants, such as *S. macranthus*, are restricted to sheltered places at lower altitudes (Pooley 2003). As a Drakensberg endemic, *S. macranthus* is regarded as rare because of its narrow distribution but it is not considered as threatened (Scott-Shaw 1999).

Description (after Codd 1985).—Aromatic, straggling shrub, 1.0–2.5 m high. *Stems* several from base, hispidulous. *Leaves* opposite; blade ovate to narrowly ovate, 20–45 × 12–20 mm, apex acute to obtuse, base obtuse to cuneate, surfaces beset with numerous sessile glands, scabrid with stiff, adpressed, unbranched, multicellular hairs mainly present on veins, lower surface prominently veined; margin obscurely crenate-dentate; petiole 2–8 mm long. *Inflorescence* usually paniculate, 80–180 mm long, fairly dense to lax; verticils (rarely 2-)4–6-flowered, 4–18 mm apart; bracts 3–5 × 3–4 mm; rachis glandular puberulous. *Calyx* cylindrical, 9–10 mm long, densely glandular puberulous; uppermost tooth obovate-elliptic, 2.0–2.5 mm long, distinctly larger than lower 4 narrowly deltoid teeth. *Corolla* 25–30 mm long, white, pink, pinkish mauve, mauve, light and darker shades of lilac or pale purple, tube 20–25 mm long, gradually widening to 5–6 mm at mouth, lower lip 3–5 mm long, usually deflexed at maturity. *Stamens* well exerted, often coiled; 2 upper filaments arising from ± halfway up corolla tube, glabrous. *Style* well exerted, minutely bilobed. *Nutlets* oblong. Plate 2255.

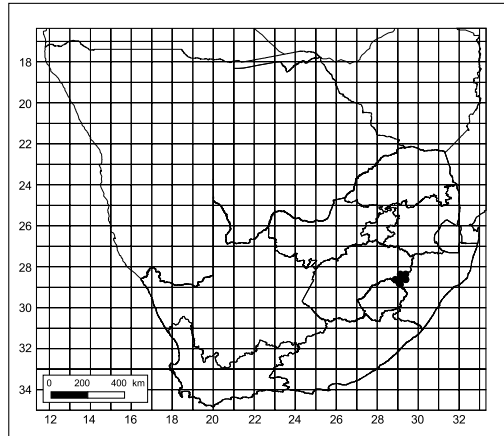


FIGURE 1.—Known distribution of *Syncolostemon macranthus*.

REFERENCES

- ASHBY, M. 1935. The genus *Hemizygia* Briquet. *Journal of Botany, London* 73: 357. Taylor & Francis, London.
- BENTHAM, G. 1838. In E.H.F. Meyer, *Commentariorum de plantis Africae australioris* 2: 231. Königsberg.
- BENTHAM, G. 1848. *Ocimum*. In A.P. de Candolle, *Prodromus systematis naturalis*: 31–44. Treuttel & Würtz, Paris.
- BRIQUET, J. 1897. *Hemizygia*. In A. Engler & K.A. Prantl, *Die natürlichen Pflanzenfamilien* 4, 3a: 368, 369. Engelmann, Leipzig.
- BRIQUET, J. 1903. Beiträge zur Kenntnis der Afrikanischen Flora XV. Labiatae. *Bulletin de l'Herbier Boissier sér. 2,3*: 992.
- CANTINO, P.D., HARLEY, R.M. & WAGSTAFF, S.J. 1992. Genera of Lamiaceae: status and classification. In R.M. Harley & T. Reynolds, *Advances in labiate science*: 511–522. Royal Botanic Gardens, Kew.
- CODD, L.E. 1976. The genus *Syncolostemon* (Lamiaceae). *Bothalia* 12: 21–27.
- CODD, L.E. 1985. *Syncolostemon*. *Flora of southern Africa* 28,4: 185–191. Botanical Research Institute, Pretoria.
- DE JUSSIEU, A.L. 1789. *Genera plantarum*. Herissant & Barrois, Paris.
- GÜRKE, M. 1898. Labiatae africanae IV. *Botanische Jahrbücher* 26: 74–85. Engelmann, Leipzig.
- KILLICK, D. 1990. *A field guide to the flora of the Natal Drakensberg*. Ball & Donker, Johannesburg.
- KLOPPER, R.R., CHATELAIN, C., BÄNNINGER, V., HABASHI, C., STEYN, H.M., DE WET, B.C., ARNOLD, T.H., GAUTIER, L., SMITH, G. & SPICHIGER, R. 2006. Lamiaceae. *Checklist of the flowering plants of Sub-Saharan Africa: an index of accepted names and synonyms*. Southern African Botanical Diversity Network Report 42: 384–406.
- OTIENO, D.F. 2004. Taxonomic delimitation, phylogeny and biogeography of *Hemizygia* and *Syncolostemon* (Ocimeae–Labiatae). Unpublished Ph.D. thesis, University of the Witwatersrand, Johannesburg.
- OTIENO, D.F., BALKWILL, K. & PATON, A.J. 2006a. A multivariate analysis of morphological variation in the *Hemizygia bracteosa* complex (Lamiaceae, Ocimeae). *Plant Systematics and Evolution* 261: 19–38.
- OTIENO, D.F., BALKWILL, K., PATON, A.J. & SAVOLAINEN, V. 2006b. A reassessment of *Hemizygia* and *Syncolostemon* (Ocimeae–Lamiaceae). *Taxon* 55: 941–958.
- PATON, A.[A.J.] 1998. New records and new combinations in *Hemizygia* and *Syncolostemon*. *Kew Bulletin* 53: 483–485.
- PATON, A.[A.J.] & BALKWILL, K. 2001. *Hemizygia stalmansii* (Labiatae), a new species from Mpumalanga, South Africa and Swaziland. *Kew Bulletin* 56: 491–496.
- PATON, A.J. & HEDGE, I.C. 1999. *Hemizygia*. In I.C. Hedge, R.A. Clement, A.J. Paton & P.B. Phillipson, *Flore de Madagascar et des Comores* 175: 108–112. Museum National d'Histoire Naturelle, Paris.
- POOLEY, E. 2003. *Mountain flowers: a field guide to the flora of the Drakensberg and Lesotho*. The Flora Publication Trust, Durban.
- RETIEF, E. 2006. Lamiaceae. In G. Germishuizen, N.L. Meyer, Y. Steenkamp & M. Keith, *A checklist of South African plants*. Southern African Botanical Diversity Network 41: 522–536.
- RETIEF, E. & HERMAN, P.P.J. 2003. *Syncolostemon*. In G. Germishuizen & N.L. Meyer, *Plants of southern Africa: an annotated checklist*. *Strelitzia* 14: 599. National Botanical Institute, Pretoria.
- ROSS, J.H. 1972. The flora of Natal. *Memoirs of the Botanical Survey of South Africa* No. 39: 306. Botanical Research Institute, Pretoria.
- SCOTT-SHAW, C.R. 1999. *Rare and threatened plants of KwaZulu-Natal and neighbouring regions*. KwaZulu-Natal Nature Conservation Service, Pietermaritzburg.
- TRAUSELD, W.R. 1969. *Wild flowers of the Natal Drakensberg*. Purnell, Johannesburg.
- VAN WYK, A.E. & SMITH, G.F. 2001. *Regions of floristic endemism in southern Africa. A review with emphasis on succulents*. Umdaus, Hatfield, Pretoria.

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Thorncroftia greenii

Lamiaceae

South Africa

Thorncroftia greenii K.Changwe & K.Balkwill, sp. nov., affinis *T. longiflorae* N.E.Br. sed corollis brevioribus (28–32 mm non 35–48 mm longis), foliis, caulibus et calycibus cum trichomatibus eglandulosis tenuioribus et trichomatibus glandulosis capitatis tenuioribus conspicuis, non trichomibus eglandulosis grossis et trichomatibus glandulosis capitatis inconspicuis differt.

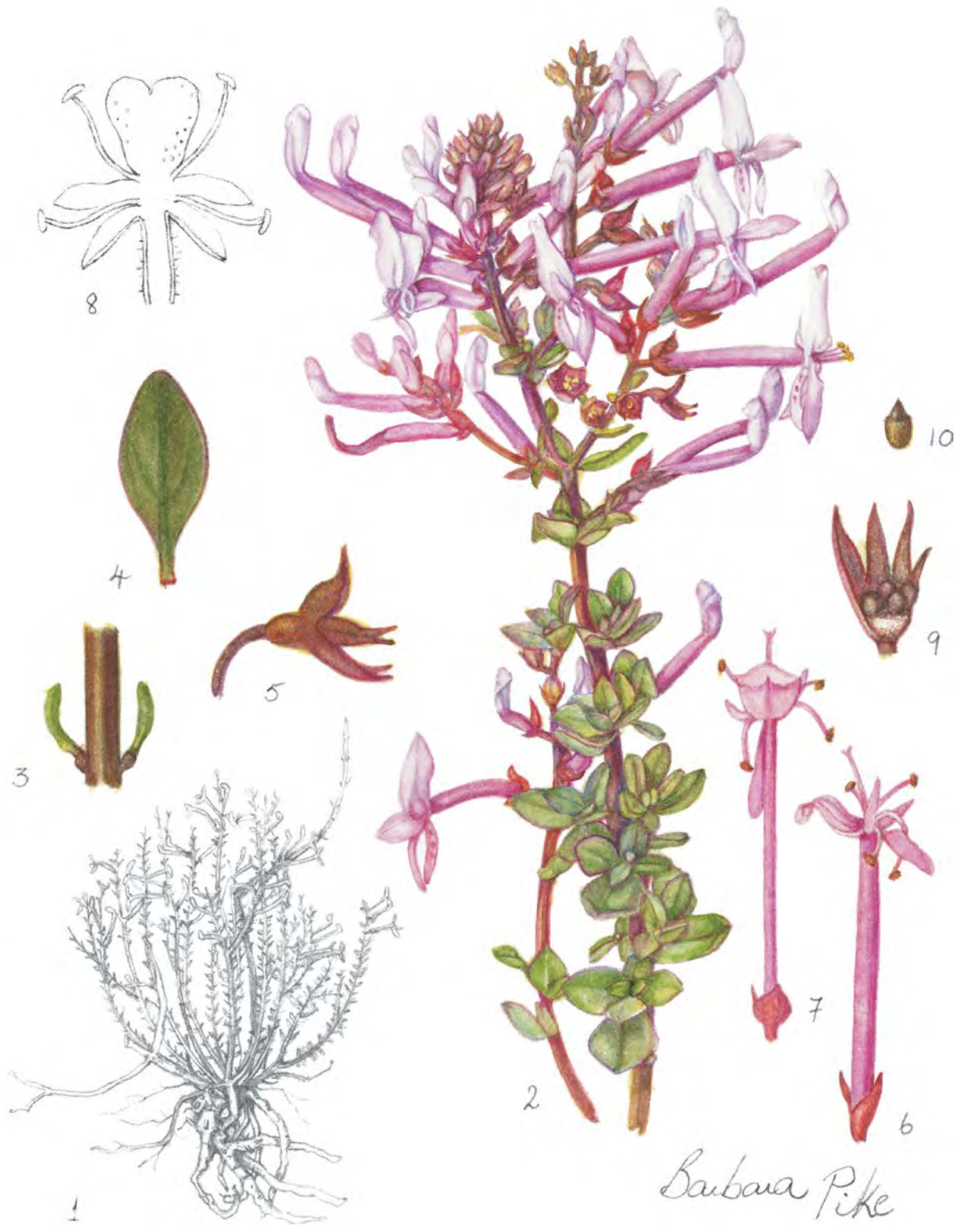
TYPE.—South Africa, Ngotshe District, about 30 km west of Louwsburg on the road to Bivane Dam (formerly Paris Dam) in northern KwaZulu-Natal, *Balkwill, Changwe & Green 12202* (J, holo.; K, PRE, iso.).

The large, widespread family Lamiaceae comprises about 238 genera and up to 6 500 species (Mabberley 2008) and occurs in warm, temperate regions (Retief 2000). There are four species of *Thorncroftia*: *T. longiflora*, *T. media*, *T. succulenta* and *T. thorncroftii*, known from Mpumalanga and Limpopo Provinces in South Africa and from Swaziland (Retief & Herman 2003; Klopper, *et al.* 2006). Changwe (2002) concluded that seven taxa should be recognised within this genus, which is endemic to southern Africa. One species has since been described as *T. lotterii* (Edwards 2006), one is described here and a third, which is allied to *T. succulenta*, awaits publication.

Brown (1912) named the genus after Mr George Thorncroft (1857–1934), a keen amateur botanist who collected extensively in the Barberton area. The new species is named in honour of Dave Mervin Green, another keen amateur botanist, who first collected it in 1996 in the Ngotshe District of KwaZulu-Natal. He was born on 8 May 1937 and spent most of his life farming near Estcourt, where he made an effort to get to know every plant, every fossil and every historical fact possible. He had a keen interest and concern for local people, conservation, local art, farming and machinery and was good at discussing issues and building relationships. He and his wife Dorothy extended generous hospitality to many academics, students and interested amateurs from a wide diversity of disciplines. Dave died tragically on 20 December 2007, leaving botany much the poorer for his passing.

The first author saw *Thorncroftia greenii* for the first time in 2001 growing in Dave Green's garden in Estcourt, KwaZulu-Natal. He immediately recognised it as a *Thorncroftia*, but assumed it to be a specimen of *T. longiflora* that might have been purchased at a Botanical Society plant sale. However, it transpired that it had been collected from the wild during a plant rescue mission to the Bivane (formerly Paris) Dam, near where the road crosses a quartzite ridge. This was the first record of the genus in KwaZulu-Natal. When keyed out in Codd (1985), these plants keyed to *T.*

PLATE 2256.—1, whole plant, × 0.1; 2, habit of flowering stem including inflorescences, × 2; 3, stem, × 2; 4, dorsal leaf surface, × 2; 5, calyx, × 3; 6, lateral view of flower, adaxial side to the right, × 2.5; 7, adaxial view of flower, × 2; 8, view of mouth of flower slit adaxially to show relative position of corolla lobes, × 3; 9, attachment of nutlets, × 3; 10, nutlet, × 5. Voucher specimen: *Balkwill, Changwe & Green 12202* in C.E. Moss Herbarium, Johannesburg. Artist: Barbara Pike.



Barbara Pike

longiflora, but there appeared to be some differences from the description. We have since discovered that Andrew Hankey and Sharon Turner, of the Walter Sisulu National Botanical Garden, had previously collected the species but identified it as *T. longiflora* (Hankey & Turner 1999). From 2001 to 2002, one of us (K.C.) undertook a revision of the genus to clarify the status of this taxon.

Thorncroftia greenii always has entire leaves, whereas the leaves in the other species are usually crenate or obscurely so. *T. greenii* and *T. longiflora* have smaller leaves (maximum length 20 mm) as opposed to a minimum of 25 mm in all other species. While *T. greenii* is morphologically similar to *T. longiflora*, it shows differences in trichomes and corolla length. *T. longiflora* has coarse eglandular trichomes and almost inconspicuous capitate glandular hairs, whereas *T. greenii* has very thin (fine) eglandular hairs with conspicuous fine capitate glandular hairs. The corolla is shorter (28–32 mm) in *T. greenii* than in *T. longiflora* (35–48 mm). The species are allopatric, making identification easier (Figure 1). *T. thorncroftii* is easily distinguished from the other species in the genus by its small flowers (shorter than 180 mm) and prostrate, herbaceous habit.

Thorncroftia greenii grows in the fissures and cracks of quartzite rock outcrops at altitudes between 1 000 and 1 160 m. Plants flower between March and April, while those of *T. longiflora* flower between March and July.

Southern Africa is divided into seven phytogeographic regions, the largest of these being the Sudano-Zambesian Region; this area includes most of the eastern half of South Africa, except the coastal belt (Werger 1978). A regional Centre of Endemism is an area that has more than 50% of its species endemic to that area and has a total of more than 1 000 endemic species (White 1983). Five Centres of Endemism are recognised within the Sudano-Zambesian Region, namely the Soutpansberg, Wolkberg, Sekhukhuneland, Barberton and Albany Centres, as well as a larger area of endemism termed the Maputaland-Pondoland Region (Van Wyk & Smith 2001). The Maputaland-Pondoland Region includes two centres of endemism, namely the Maputaland and Pondoland Centres.

Cladistic analysis showed that *Thorncroftia longiflora* is sister to *T. greenii*; both species occur in the Sudano-Zambesian phytogeographic region (Changwe 2002). However, *T. longiflora* has affinities with the Barberton Centre of Endemism, while *T. greenii* is endemic to northern KwaZulu-Natal, which does not fall in either the Maputaland or the Pondoland Centres of Endemism, although it is part of the larger Maputaland-Pondoland region of endemism. From cladistic data it was concluded

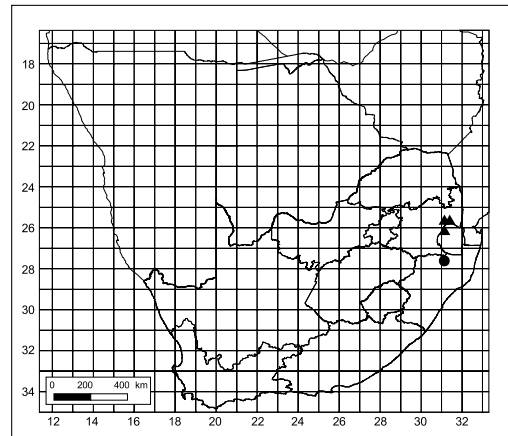


FIGURE 1.— Known distribution of *T. greenii* (●) and *T. longiflora* (▲).

that the genus had its origins in the Barberton Centre of Endemism (Changwe 2002). The disjunction in the distribution between *Thorncroftia greenii* and *T. longiflora* might have arisen through long-distance dispersal into KwaZulu-Natal. Alternatively, an ancestral population, that was more widely distributed, became divided into *T. longiflora* in the north and *T. greenii* in the south when major rivers incised the landscape, causing a barrier of intervening areas of lower altitude and thus unsuitable climate.

To date, only populations of *Thorncroftia greenii* that grow close to the road have been studied in any detail. The largest of these populations consisted of 2 000 to 3 000 plants. It appears to be healthy, with a full age range of many juveniles present; only three plants were observed to have been impacted by insects—one had scale insects, one had mealy bug and the other had insect galls. No grazing or browsing of this species was observed. However, at one point of the site some wattle trees are growing in close proximity and populations seem to be expanding, with many seedlings at their perimeter, and could pose habitat encroachment problems in the future. There is a low fuel load on these outcrops, so these plants are well protected against burning. Currently the main threat to the population is trampling by live-stock and during the removal and transport of boulders.

Changwe (2002) recommended a conservation status for *Thorncroftia greenii* in the Vulnerable (VU) category—VUB1 ab (i, ii, iii). This was based on occurrence in an area smaller than 20 000 km² (B), which is severely fragmented (1a) and a predicted decline of the population is inferred (1b), in extent of occurrence (i), area of occupancy (ii), and quality of habitat (iii) by the potential encroachment by the wattle trees and the trampling by cattle.

Description.—Herb or shrub with brittle, semisucculent stems, 0.3–1.0 m tall. *Stems* leafy, erect, almost rounded, sparsely branched, arising from a thickened rootstock, \pm 12 mm diam. at base, tapering to 3–4 mm diam. above, pubescent with very thin glandular hairs $75 \pm 15 \mu\text{m}$ long spreading, thin, simple, unicellular and multicellular, uniseriate eglandular hairs. *Leaves* opposite; blade elliptic to obovate, (7–)10–18(–20) \times 3–10 mm, cuneate at base, rounded at apex, entire or crenate with 4–10 teeth on margin, pubescent with thin capitate glandular hairs and simple, unicellular and multicellular, uniseriate eglandular hairs on both surfaces; petiole 5.0–6.5 mm long. *Inflorescence* sparse, main axis (100–)120–200(–260) mm long; bracts leaf-like, 4–6 \times 1.5–2.5 mm below, becoming progressively smaller and narrower to \pm 2.0–2.5 \times 1.0–1.5 mm above. *Flowers* solitary in axil of each bract; pedicel 4–9 mm long, pubescent with glandular hairs and with simple and multicellular uniseriate eglandular hairs. *Calyx* 6–7(–8) mm long, commonly covered with very thin glandular hairs, eglandular hairs prominent; the longest teeth 2.0–2.5 mm long, short teeth ovate-lanceolate, 1.0–1.5 mm long, acuminate, decurrent on tube, lower four teeth subequal, lanceolate-triangular. *Corolla* pink with purple spots on lateral lobes, pubescent with glandular and eglandular hairs; tube narrowly cylindrical, (25–)28–30(–32) mm long; central lobe oblong, 5–7 mm long; lower lobe boat-shaped, 6–7 mm long. *Stamens*: filaments lilac, exerted from corolla mouth 6.0–7.5 mm; anthers purple. *Style* lilac, lobes purple. *Fruit* a nutlet. Plate 2256.

SPECIMENS EXAMINED

—2628 (Johannesburg): Witwatersrand Botanical Garden, cultivated, (–AA), *Changwe, Balkwill & Paton 101* (J).

—2731 (Louwsburg): Ngotshe District, about 30 km west of Louwsburg beside road to Paris Dam on the Bivane River, (–CA), *Balkwill, Changwe & Green 12202* (J); Ngotshe District, about 30 km west of Louwsburg on the road to Bivane Dam, (–CA), *Balkwill, Changwe & Green 12203* (J); Ngotshe District, on the road to Bivane Dam, (–CA), *Balkwill, Changwe & Green 12204* (J), *Changwe, Balkwill & Green 102* (J).

REFERENCES

- BROWN, N.E. 1912. Diagnoses Africanæ, XLIX. *Kew Bulletin of Miscellaneous Information* 6: 270–283.
- CHANGWE, K. 2002. *Taxonomic studies of Thorncroftia (Lamiaceae) in Africa*. Unpublished M.Sc. thesis, University of the Witwatersrand, Johannesburg.
- CODD, L.E. 1985. In O.A. Leistner, *Flora of southern Africa* 28,4: 237–239. Botanical Research Institute, Department of Agriculture and Water Supply, Pretoria.
- EDWARDS, T.J. 2006. Notes on the Lamiaceae: a new *Tetradenia* and a new *Thorncroftia* from South Africa. *South African Journal of Botany* 72: 202–204.
- HANKEY, A. & TURNER, S. 1999. A new distribution record for *Thorncroftia longiflora* N.E.Br. (Lamiaceae). *PlantLife* 21: 32, 33.
- KLOPPER, R.R., CHATELAIN, C., BÄNNINGER, V., HABASHI, C., STEYN, H.M., DE WET, B.C., ARNOLD, T.H., GAUTIER, L., SMITH, G.F. & SPICHIGER, R. 2006. *Checklist of the flowering plants of Sub-Saharan Africa. An index of accepted names and synonyms*. South African Botanical Diversity Network Report No. 42. SABONET, Pretoria.
- MABBERLEY, D.J. 2008. *Mabberley's plant-book. A portable dictionary of plants, their classification and uses*, edn 3. Cambridge University Press.
- RETIEF, E. 2000. Lamiaceae (Labiatae). In O.A. Leistner, *Seed plants of southern Africa: families and genera. Strelitzia* 10: 29, 30. National Botanical Institute, Pretoria.
- RETIEF, E. & HERMAN, P.P.J. 2003. Lamiaceae. In G. Germishuizen & N.L. Meyer, *Plants of southern Africa: an annotated checklist. Strelitzia* 14: 584–600. National Botanical Institute, Pretoria.
- VAN WYK, A.E. & SMITH, G.F. 2001. *Regions of floristic endemism in southern Africa. A review with emphasis on succulents*. Umdaus Press, Hatfield, Pretoria.
- WERGER, M.J.A. 1978. Biogeographical division of southern Africa. In M.J.A. Werger, *Biogeography and ecology of southern Africa*: 145–170. Junk, The Hague.
- WHITE, F. 1983. *The vegetation of Africa: a descriptive memoir to accompany the Unesco/AETFAT/UNSO vegetation map of Africa*. Natural Resources Research XX. Unesco, Paris.

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Zaluzianskya glareosa Scrophulariaceae s.s., tribe Manuleeae*South Africa*

Zaluzianskya glareosa Hilliard & B.L.Burt in Notes from the Royal Botanic Garden Edinburgh 41: 30 (1983); Hilliard: 483, 484 (1994).

Zaluzianskya is a predominantly herbaceous genus of 55 species endemic to southern Africa, except for one species in the high mountains of East Africa (Hilliard 1994; Archibald *et al.* 2005). Many of the species are montane, with some occurring as high as the alpine meadows of the Drakensberg. However, a number of species occur at lower altitudes and in very diverse habitats, for example on coastal dunes (e.g. *Z. maritima*) or on sandy or gravelly flats and in river beds in the Karoo (e.g. *Z. venusta*; Hilliard 1994). *Zaluzianskya* is widely distributed throughout all the major climatic regions of South Africa, with perennial species common in eastern summer-rainfall areas, and annual species mainly in the winter-rainfall regions of the Western Cape (Hilliard & Burt 1983).

The genus is extremely variable in growth form, including sprawling mats, cushion-like herbs, simple or laxly branching herbs and rarely shrublets (e.g. *Zaluzianskya ovata*). Leaf shape, succulence and indumentum also vary, as do corolla tube length, lobe shape and coloration patterns (Hilliard 1994; Archibald *et al.* 2005). These features are all useful in distinguishing amongst the many species of *Zaluzianskya*.

Characteristic of *Zaluzianskya* are the attractive flowers with their often long, narrow corolla tube that widens only slightly at the apex, surrounded by five corolla lobes. Other distinguishing features include the inflorescence in the form of a terminal spike, bracts that are fused to a strongly ribbed, pleated calyx, stamen filaments that are decurrent to the base of the corolla tube (forming a channel around the style), a tongue-shaped stigma with marginal papillae, the more or less beaked capsule and the small pallid or mauve-grey seeds (Hilliard 1994).

Bentham (1836, 1846) first studied species now known as *Zaluzianskya* using the name *Nycterinia* D.Don. The transfers into *Zaluzianskya* were made by Walpers in 1844 and the name *Zaluzianskya* F.W.Schmidt was conserved against *Zaluzianskya* Neck. by Stafleu *et al.* (1978: 390). Working mainly on the summer-rainfall species, Bentham (1846) recognised two sections in *Nycterinia*: section *Zaluzianskya* (12 species; corolla lobes deeply bifid) and section *Holomeria* (four species; corolla lobes entire). In a revision of the entire genus, Hilliard (1994) recognised 55 species in four sections: *Zaluzianskya*, *Nycterinia*, *Macrocalyx* and *Holomeria*.

Zaluzianskya glareosa falls in section *Nycterinia*, being one of 19 species that flower nocturnally, opening at dusk or in low light. There is also one diurnal species in the



PLATE 2257 *Zaluzianskya glareosa*

section —*Z. microsiphon*. The section is characterised by bifid corolla lobes, a corolla that is deep red outside and white inside, usually without mouth patterns (or rarely an orange ring), four stamens and a nectary that is free from the ovary (Hilliard 1994).

This species is based on the type collection (Hilliard & Burt 12510) from the Upper Polela Cave in the Cobham Forest Reserve in the Underberg area of KwaZulu-Natal, where it was collected in February 1979. It has a montane distribution—extending from the low Drakensberg on the Mpumalanga–KwaZulu-Natal border along the face of the high Drakensberg in KwaZulu-Natal and on outlying spurs and mountains (mainly at altitudes of 1 250 to 2 750 m) to the mountains of the Transkei, the Cape Drakensberg and the Eastern Cape mountains as far west as Graaff-Reinet and possibly the Nieuweveld Mountains (Hilliard 1994) (Figure 1).

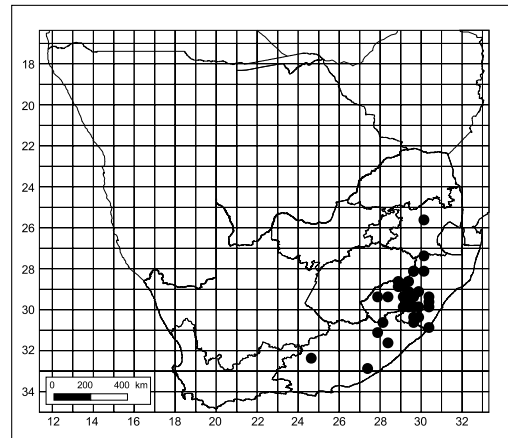


FIGURE 1.—Distribution of *Zaluzianskya glareosa* based on specimens in the National Herbarium, Pretoria, the Bews Herbarium, University of KwaZulu-Natal, Pietermaritzburg, and Hilliard (1994).

The species mostly grows in gritty areas, often around and in the crevices of rock sheets, on or below sandstone outcrops, in boulder beds or on grassy banks of rivers. It is a perennial herb with stems initially solitary and simple, but later branching from the base and becoming woody. In open places away from competition with other plants, *Zaluzianskya glareosa* develops a more or less sprawling, well-branched, bushy habit; in competition with grass, it sometimes remains single-stemmed (Hilliard & Burt 1983).

Zaluzianskya glareosa flowers mainly between December and April. The flowers open at dusk or in dull light and then emit a spicy fragrance. The spike is often few-flowered and is initially condensed, but it elongates as the fruits develop (Hilliard & Burt 1983; Hilliard 1994). As in at least three night-flowering species in section *Nycterinia* (Johnson *et al.* 2002), flowers of *Z. glareosa* are probably pollinated by hawkmoths. Like most other night-opening flowers in the section, they are radially symmetrical, the corolla limb is held horizontally and there is a thick ring of long hairs around the corolla mouth. In contrast, the flowers of the single diurnal species in section *Nycterinia*, *Zaluzianskya microsiphon*, are odourless, bilaterally symmetrical, hold their corolla limb vertically and lack the cirlet of hairs (or it is poorly developed). Long-proboscid flies are known to pollinate the latter species (Johnson *et al.* 2002; Anderson & Johnson 2008).

Similarities in flower form between sympatric night-flowering hawkmoth-pollinated species of *Silene* (Caryophyllaceae) and *Zaluzianskya* were first noted by Hilliard

& Burt (1983) and later by Manning (1987). In addition to their bifid petal lobes, hairs around the corolla mouth of *Zaluzianskya* closely approximate the dissected inner corona of *Silene*, and the corolla lobes in night-flowering species of both genera become reflexed when fully open (Johnson *et al.* 2002). This appears to be an example of convergent evolution due to a pollination syndrome.

The likely affinities of *Zaluzianskya glareosa* include *Z. spathacea*, a grassland species with a thick clump of vegetative buds on the crown, and *Z. schmitziae*, which has narrower leaves and smaller flowers (Hilliard & Burt 1983). Another closely allied species appears to be *Z. tropicalis* from the highlands of Zimbabwe and Mozambique (Hilliard & Burt 1983; Hilliard 1994). It resembles *Z. glareosa* in habit and general appearance, but differs in that its corolla lobes have glandular trichomes above, whereas those of *Z. glareosa* are glabrous. *Z. tropicalis* also usually has relatively long (0.5–0.8 mm) glandular hairs on the stem, leaves, bracts and calyx, whereas *Z. glareosa* lacks all but the smallest glandular hairs (Hilliard 1994).

Close relationships with *Zaluzianskya microsiphon* and/or *Z. pulvinata* and *Z. ovata* are suggested by the molecular phylogenetic study of Archibald *et al.* (2005), but there are low levels of support regarding the placement of these taxa. Also, only 23 of 55 species were included in the study and there is some lack of agreement between the phylogenies based on the chloroplast and nuclear data sets (mainly due to alternative placements of *Z. mirabilis*). *Z. pulvinata* (which forms a compact cushion of leaf rosettes) favours open stony places, while *Z. ovata* usually grows on partly shaded cliff faces. However, at very high altitudes *Z. ovata* will thrive in bare silty or gravelly patches (Hilliard 1994), and thus occurs in similar habitats to *Z. glareosa*. As noted above, *Z. microsiphon* is the only day-flowering member of the section *Nycterinia*.

The plant depicted here originated from material collected in February 1999 in the foothills of the Cathedral Peak area of the Drakensberg, below the Organ Pipes Pass, by Stefan Naser, at the time of the Plant Protection Research Institute in Pretoria. He found the plants in flower, mainly next to and below larger rocks, sometimes almost under their overhang, and usually on a sloping surface where there were not many other plants. Dr Naser grew the species from a shoot tip cutting and it started to flower soon afterwards. In a pot in light shade in Pretoria, *Zaluzianskya glareosa* 'turned out to be a very floriferous plant, producing new flowers as it grew, with pendent shoots and made more attractive by the coloured buds and dark reverse side of the petals when the flowers closed daily'. The accompanying colour plate was painted from this cultivated material about a year later.

Description (based on Hilliard 1994).—Herbaceous; flowering initially in seedling stage, then stems solitary, simple, erect, later branching from base and surviving for more than one season, these stems simple or branched, decumbent or ascending, becoming woody at base with small vegetative buds but never with a thick clump of vegetative buds, up to \pm 450 mm long, hairy, with \pm retrorse or spreading multicellular white hairs, leafy, often with axillary leaf tufts. *Taproot* becoming woody, up to 10 mm in diameter. *Leaves* spreading, linear, oblong, or narrowly elliptic to lan-

ceolate, rarely broadly elliptic, mostly 15–50(–60) × 2–8(–15) mm, base sometimes petiole-like, margins entire or often with a few small callose teeth, or occasionally more coarsely toothed, thinly hairy. *Flowers* opening at dusk or in dull light and then emitting a spicy fragrance; spike initially condensed, often few-flowered, elongating in fruit. *Bracts* adnate to calyx for 2.5–5.0 mm, lanceolate, 15–20(–30) mm long, entire, or with 1 or 2 pairs of teeth near apex, hairy. *Calyx* 7–13 mm long, lips 3.5–6.0 mm long, hairy. *Corolla* tube 27–50 mm long, with very short glandular hairs (up to 0.1–0.2 mm long), limb held horizontally, regular, mouth with cirlet of long globose hairs; lobes deeply notched, 5–10 mm long, crimson and glandular-puberulous outside, white inside, glabrous or sometimes with a few minute glandular hairs near base. *Stamens* 4, 2 anterior anthers 1.2–2.2 mm long, shortly exerted, 2 posterior ones 2.6–3.5 mm long, included. *Stigma* 5–10 mm long. *Capsule* 8–11 × 4–5 mm. *Seeds* ± 1.0–1.2 × 0.8 mm, angled, colliculate, pallid. Plate 2257.

REFERENCES

- ANDERSON, B. & JOHNSON, S.D. 2008. Coevolution in a plant-pollinator mutualism. *Evolution* 62: 220–225.
- ARCHIBALD, J.K., MORT, M.E. & WOLFE, A.D. 2005. Phylogenetic relationships within *Zaluzianskya* (Scrophulariaceae s.s., tribe Manuleae): classification based on DNA sequences from multiple genomes and implications for character evolution and biogeography. *Systematic Botany* 30: 196–215.
- BENTHAM, G. 1836. Synopsis of the Buchnereae, a tribe of Scrophulariaceae. In W.J. Hooker, *Companion to the Botanical Magazine* 1: 356–384.
- BENTHAM, G. 1846. Scrophulariaceae. In A.P. de Candolle, *Prodromus systematis naturalis regni vegetabilis* 10: 186–586. Treuttel & Würtz, Paris.
- HILLIARD, O.M. 1994. *The Manuleae. A tribe of Scrophulariaceae*. Edinburgh University Press, Edinburgh.
- HILLIARD, O.M. & BURTT, B.L. 1983. *Zaluzianskya* (Scrophulariaceae) in south eastern Africa and the correct application of the names *Z. capensis* and *Z. maritima*. *Notes from the Royal Botanic Garden Edinburgh* 41: 1–43.
- JOHNSON, S.D., EDWARDS, T.J., CARBUTT, C. & POTGIETER, C. 2002. Specialization for hawkmoth and long-proboscid fly pollination in *Zaluzianskya* section *Nycterinia* (Scrophulariaceae). *Botanical Journal of the Linnean Society* 138: 17–27.
- MANNING, J. 1987. *Zaluzianskya rubrostellata*. *The Flowering Plants of Africa* 49: t. 1950.
- STAFLEU, F.A., DEMOULIN, V., GREUTER, W., HIEPKO, P. & LINCZEWSKI, I.A., McVAUGH, R., MEIKLE, R.D., ROLLINS, R.C., ROSS, R., SCHOPF, J.M. & VOSS, E.G. 1978. International Code of Botanical Nomenclature. Adopted by the Twelfth International Botanical Congress, Leningrad, July 1975. *Regnum Vegetabile* 97. Bohn, Scheltema & Holkema, Utrecht.
- WALPERS, G.G. 1844. *Repertorium botanices systematicae*, 3. Leipzig.

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Dewinteria petrophila

Pedaliaceae

Namibia

Dewinteria petrophila (De Winter) Van Jaarsv. & A.E.van Wyk in *Bothalia* 37,2: 198 (2007). *Rogeria petrophila* De Winter: 106–108 (1961).

Dewinteria, a monotypic genus, differs from the closely related *Rogeria* by its peculiar dual seed dispersal strategy as well as its soft-textured, conventional fruit capsules and much smaller, oblong seed. *Rogeria* is a small, mainly African genus of erect, sturdy annuals or biennials bearing woody, often armoured fruit and much larger, flattened seed. The genus *Dewinteria* was recently described and named in honour of Bernard de Winter (1924–), eminent plant taxonomist and for many years Director of the former Botanical Research Institute in Pretoria (now incorporated in the South African National Biodiversity Institute). During a botanical expedition to Namibia from March to May 1957 (Gunn & Codd 1981), De Winter and his colleague Otto Leistner discovered plants of a semisucculent herb on a cliff face in the Kapupa River, on the road to Oropembe in the Kaokoveld. The plants turned out to be from a species new to science and it was described by De Winter (1961) as *Rogeria petrophila*. In his description, De Winter mentioned peculiar thread-like basal branches and the possibility of fruit dimorphism. Owing to the marked reproductive dimorphism displayed by the species, a phenomenon confirmed in recent years, as well as the distinctive shape and texture of the capsules and seeds, *R. petrophila* was subsequently recognised as a separate genus (Van Jaarsveld & Van Wyk 2007). The specific epithet *petrophila* is of Greek origin (*petra* = rock, *philus* = loving) and pertains to its rock-dwelling habitat.

Dewinteria petrophila grows in crevices and fissures in granite cliffs of the western Otjihipa Mountains, in the northwestern parts of the Kaokoveld, northern Namibia (Figure 1). This impressive and botanically poorly explored range lies just south of the Kunene River, the international border between Namibia and Angola. The species almost certainly occurs further north in the adjacent mountainous parts of southwestern Angola as well, especially the Serra Cafema range. South of the Kunene it occurs on the western margin of the escarpment mountains (east of the Marienfluss), from the twin-peaked Okahukumune Mountain to about 50 km south of the river. Although *D. petrophila* occurs on all aspects, plants are more abundant in southern positions at altitudes ranging from about 500–1 700 m. The average annual rainfall in the Kaokoveld varies from less than 50 mm along the coast to 350 mm in the highlands and occurs mainly in summer and autumn (Mendelsohn *et al.* 2002). We suspect the rainfall in the habitat of *D. petrophila* to be between 100 and 300 mm per annum. Plants grow in arid *Colophospermum mopane* savanna, with species

PLATE 2258.—Plant in flower, $\times 1$, in a granite fissure against the backdrop of its natural habitat on the Okahukumune Mountain adjacent to the Kunene River in northwestern Namibia. Voucher: Van Jaarsveld 21146 in Compton Herbarium, Kirstenbosch. Artist: Vicki Thomas.



PLATE 2258 *Dewinteria petrophila*

of *Commiphora* prominent. It shares its habitat with other cliff-dwellers such as *Aeollanthus neglectus*, *Kalanchoe lanceolata*, *Selaginella imbricata* and *Tetradenia kaokoensis*.

Dewinteria petrophila is a little-known, though very attractive, spreading biennial or weak semisucculent perennial with ivy-like leaves. It is a highly specialised chasmo-cremno-phyte (chasmo: referring to crevices and fissures; cremno: referring to a cliff habitat), endemic to the semi-desert parts of the Kaokoveld in north-western Namibia, a region known for its many restricted-range species (Van Wyk & Smith 2001). Although *D. petrophila* has a restricted distribution, it grows locally abundant. It was classified as a Red Data species by Craven (1999) and Loots (2005), but due to its abundance and secure cliff face habitat, in our opinion should not be listed. Not only is *D. petrophila* noteworthy for its unusual habitat preference, but it is even more remarkable for its highly specialised and very distinct dual reproductive strategy, an evolutionary adaptation known as amphicarp. It is also the first member of the Pedaliaceae, a family with highly diverse fruit types, known to be amphicarpic.

Generally, dispersal mechanisms of desert plants are well known and complex, often individualistic (Gutterman 1994). Dispersal strategies of plants on cliffs in semi-desert regions are even more complex. Because of the hazardous nature of cliffs, they are usually avoided by most larger mammals. On the other hand, cliffs also provide a stable, safe haven for many plants adapted to life in this seemingly inhospitable habitat. Although many plants may grow on cliffs opportunistically, some, known as obligate cremnophytes, such as *Dewinteria*, have made it their only or preferred habitat (Van Jaarsveld & Van Wyk 2003). The protection offered by the cliff face has its drawbacks; the vertical orientation of cliffs ensures a fast runoff following precipitation, resulting in a hyperarid environment—the reason why succulents are so well represented on cliff faces. Moreover, in southern Africa south-facing cliffs are in permanent shade in winter, whereas north-facing ones are exposed to constant radiation from the sun.

The substrate of the cliff-face habitat is also unusual, with small crevices and narrow ledges, containing very little, if any, soil. Plants growing in these limited spaces turn away from the cliff face towards the light, with gravity taking its toll and many adopting a pendent habit (so-called cliff hangers), a trait which is strongly genetically determined in some cremnophytes. Others grow in compact clusters (so-called cliff squatters), so as to minimise the pull of gravity. In a study of obligate or near-obligate succulent plants on cliff faces in South Africa and Namibia, one of us (EJVJ) has

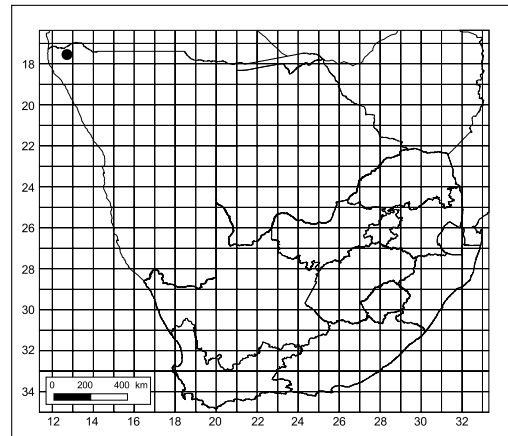


FIGURE 1.—Known distribution of *Dewinteria petrophila*.

found that, apart from their principal seed dispersal strategy (invariably by wind), about 80% have a vegetative back-up mode of dispersal (vivipary, bulbils, proliferation from the base, or simply rooting from stems, leaves etc.).

Nonsucculent or semisucculent plants growing on cliffs, such as species of *Dewinteria*, *Colpias* and *Stemodiopsis* in southern Africa, or the European *Cymbalaria muralis* (a species well known in horticulture), do not have the back-up of succulent tissue for long-term survival, including vegetative reproduction. They depend on other adaptations such as specialised, local dispersal of seed. *Colpias molle*, *Stemodiopsis* and *Cymbalaria muralis* (all members of the Scrophulariaceae) have modified inflorescences and/or flower stalks that, after fertilisation, grow negatively phototropic, resulting in the developing fruit being inserted in dark crannies and fissures—thus ‘sowing’ their own seed close to the parent plant. However, *Dewinteria* clearly stands apart in displaying two very different ways of seed dispersal. The first includes conventional aerial flowering branches with attractive, large, trumpet-shaped, cream- and purple to yellowish orange-coloured flowers succeeded by pointed capsules with large numbers of small, wind-dispersed seed. These capsules are held in an upright position (recurved when the plants are drooping) and require strong drafts to get the seeds airborne. However, the probability for a seed so dispersed to land in a suitable crevice on a cliff is not very good and is largely left to chance. The second strategy involves modified shoots with exceedingly reduced leaves at the base of the stem that grow directionally to enter very small crevices. Once inside a crevice, tiny, insignificant flowers that never open (technically described as cleistogamous flowers), are produced. These highly specialised flowers are followed by small heart-shaped capsules with up to five larger (compared to those in conventional capsules) oblong-obovoid seeds that germinate in the crevices near the parent plant. These larger seeds carry more food reserves than the smaller wind-dispersed ones, thus providing the seedlings with an advantage to survive in what is often little more than a crack in rock with essentially no soil. The seeds germinate when the situation becomes favourable.

Another noteworthy feature of *Dewinteria petrophila* is the presence of extrafloral nectaries at the base of the pedicels (flower stalks) and in the leaf axils, and their association with ants. Nectaries outside the flowers are encountered in a number of plant families, including the Pedaliaceae, a family in which these structures are particularly common (Van Wyk & Condy 2003). Nectar inside a flower serves as reward for pollinators, but elsewhere it is a reward to ants. The voracity of ants towards other insects is well known and the plant benefits from the association by the ants’ active patrol action that wards off any phytophagous insects; eggs of any insects deposited on the plant are also actively removed. This is a clear form of mutualism, a symbiotic relationship in which both partners benefit from the association. Although plants of *Dewinteria* are well protected from larger herbivores, they remain vulnerable to airborne insects (beetles, moths, butterflies etc.) which can easily feed on or lay their eggs on cliff-dwelling plants.

In our species, flowering takes place in the rainy summer season. The conventional flowers are large and conspicuous for such a small plant—ensuring visibility

of these widely spaced plants that have to attract the right pollinators (Snogerup 1971). The flowers are white or cream-coloured, tubular and up to 87 mm long (up to 55 mm in diameter when fully opened). Variation in the colour of the throat and tube has been observed. In plants from the northern region adjacent to the Kunene (Okahukumune Mountain) the throat and the lower parts of the tube are purplish maroon, while in plants from Otjhipu Mountain (further south) the throat is yellowish, becoming orange lower down. Pale-coloured, tubular flowers are usually an adaptation to a night- or dusk-flying pollinator. However, during a visit to its habitat (Otjhipu Mountain) in autumn 2008, the flowers were thoroughly observed throughout the day and a species of bee was observed fairly regularly visiting the flowers only in the early morning, the upper portion of its thorax clearly covered in pollen. It has been identified as probably a leaf-cutter bee belonging to the family Megachilidae. The size, number and shape of these flowers reflect the importance of gene flow, ensuring cross pollination and the resultant genetic flexibility assumed necessary for long-term survival. Seeds of our species (and of the Pedaliaceae in general) are covered with mucilage, a material also associated with the seed of other plants from desert or semidesert regions. Its function is to adhere and anchor the seed to the substrate (Van der Pijl 1982; Gutterman 1994).

Dewinteria petrophila is difficult to germinate in cultivation. Seeds of our plant were collected on the Okahukumune Mountain from conventional capsules in January 2005. The seeds were sown in a quartzite rock crevice in the succulent greenhouse at Kirstenbosch National Botanical Garden, Cape Town. The plant depicted here germinated in November 2006 and by February 2007 it was flowering profusely (with additional organic fertiliser), bearing up to eight open flowers at a time. The flowers were about 115 mm long, as opposed to 70 mm in habitat. While illustrating the plant in her studio, the artist noticed an odd scent being emitted by the flowers, reminiscent of burnt toast—in nature probably the lure that attracts the still unknown pollinator. She also noticed naturalised Argentine ants (*Linepithema humile*) visiting the extrafloral nectaries at the base of the flowers. If the difficulty with germination can be overcome, *D. petrophila* would be a worthwhile introduction as a pot plant or subject for rock gardens in arid regions.

Description (partly based on Van Jaarsveld & Van Wyk 2007).—Soft, somewhat trailing, branched, semisucculent herb, up to 200 mm long; base of stem slightly swollen, up to 5 mm diam. *Roots* fibrous. *Branches* 3–4 mm diam. at base, most parts covered with mucilage glands. *Specialised branchlets* filiform, up to 120 mm long, 0.25 mm diam., basally produced, trailing and entering crevices, usually dying back after fruiting. *Leaves on main branch* opposite, broadly cordate to kidney-shaped, up to 40 × 55 mm (in cultivation up to 70 × 90 mm), grey-green; margin coarsely dentate; petiole 20–60 mm long. *Leaves on specialised branchlets* entire, ovate, small, 2–4 × 0.6–1.7 mm; petiole 3–4 mm long. *Conventional aerial flowers* axillary, conspicuous, trumpet-shaped, up to 60–87 mm long, up to 55 mm diam. at apex; pedicel 1.2–4.0 mm long. *Calyx* slightly zygomorphic, 5-partite, persistent; lobes oblong-triangular, up to 3 mm long. *Corolla* slightly swollen at base, white or cream-coloured to pale yellow but maroon or orange in throat and tube, sparsely covered with mucilage glands; lobes 5, broadly ovate, somewhat 2-lipped, lower pair slightly larger

than upper 3. *Stamens* 4, arising from base of corolla tube, with a short staminode between the pairs; filaments filiform, slightly flattened, up to 12 mm long, pilose; anthers dorsifixed. *Ovary* elongate-conical, 2-chambered, placentation axile, with 3–5-seriate ovules; style up to 23 mm long; stigma capitate, up to 1.5 mm diam. *Cleistogamous flowers* on specialised branchlets, 2 mm long, light yellowish green, remaining closed; pedicels up to 1.5 mm long (from nectaries). *Calyx* 4-partite, persistent. *Conventional capsules* lanceolate in side view, 14–25 mm long, 5 mm diam., tapering into a curved apex, laterally flattened, dehiscing loculicidally; valves 2, chartaceous. *Specialised capsules* flattened, ovate to ovate-cordate, 5–8 × 4–6 mm, brown. *Seeds of conventional capsules* linear-oblong to club-shaped, slightly flattened, 2.0–2.2 mm long, minutely reticulate, brownish. *Specialised seeds* oblong-obovoid, 2.5–3.0 mm long. Plate 2258.

REFERENCES

- CRAVEN, P. 1999. *A checklist of Namibian plant species*. Southern African Botanical Diversity Network Report No. 7. SABONET, Windhoek.
- DE WINTER, B. 1961. *Rogeria petrophila*. In J.G. Anderson, L.E. Codd, R.A. Dyer, M.D. Henderson, D.J.B. Killick & B. de Winter, *New and interesting taxa from southern Africa*. *Kirkia* 1: 106–108.
- GUNN, M. & CODD, L.E. 1981. *Botanical exploration of southern Africa*. Balkema, Cape Town.
- GUTTERMAN, Y. 1994. Strategies of seed dispersal and germination in plants inhabiting deserts. *Botanical Review* 60,4: 373–425.
- LOOTS, S. 2005. *Red Data Book of Namibian plants*. Southern African Botanical Diversity Network Report No. 38. SABONET, Pretoria & Windhoek.
- MENDELSON, J., JARVIS, A., ROBERTS, C. & ROBERTSON, T. 2002. *Atlas of Namibia*. Phillip, Cape Town.
- SNOGERUP, S. 1971. Evolutionary and plant geographical aspects on chasmophytic communities. In P.H. Davis, P. Harper & I.C. Hedge, *Plant life in southwest Asia*: 157–170. The Botanical Society of Edinburgh.
- VAN DER PIJL, L. 1982. *Principles of dispersal in higher plants*. Springer-Verlag, Berlin.
- VAN JAARSVELD, E.J. & VAN WYK, A.E. 2003. Adaptations without barriers: succulent plants shaped by cliffs. *Aloe* 40: 98–103.
- VAN JAARSVELD, E.J. & VAN WYK, A.E. 2007. Pedaliaceae: *Dewinteria*, a new semisucculent, cliff-dwelling genus endemic to the Kaokoveld, Namibia. *Bothalia* 37: 198–201.
- VAN WYK, A.E. & CONDY, G. 2003. *Dicerocaryum forbesii* and *D. senecioides*. *Flowering Plants of Africa* 58: 118–133.
- VAN WYK, A.E. & SMITH, G.F. 2001. *Regions of floristic endemism in southern Africa. A review with emphasis on succulents*. Umdaus Press, Hatfield, Pretoria.

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O. Van de Kerckhove 2008

PLATE 2259 *Ixora foliicalyx*

Ixora foliicalyx

Rubiaceae

Madagascar

Ixora foliicalyx Guédès in Phytologia 60: 250 (1986).

The Rubiaceae, to which *Ixora* belongs, is the fourth largest angiosperm family after the Asteraceae, the Orchidaceae and the Fabaceae *sensu lato* (Leguminosae), and consists of more than 13 150 species and 615 genera (Davis & Bridson 2007). The family has a cosmopolitan distribution but is predominantly tropical. Many representatives are woody and the family is an important component of most tropical woody vegetation types. Rubiaceae is relatively poorly known, even though it encompasses the important tropical crop coffee and many (potential) ornamental plants.

Ixora belongs to subfamily Ixoroideae, tribe Ixoreae, and is a large genus of shrubs and small trees occurring in rain forests. Estimates of the number of species range between 300 and 400 (Mabberley 1987; Bridson 1988). *Ixora* is one of the few truly pantropical genera in the Rubiaceae with the centre of diversity from Southeast Asia to Malesia (especially Borneo). It has never been completely monographed but several regional treatments have been published. Those for continental Africa include treatments by Keay (1963), Bridson (1988, 2003) and De Block (1998). In continental Africa there are around 37 species but none occur in South Africa. A treatment of the about 40 Malagasy species is in preparation (De Block 2009).

The genus was described by Linnaeus (1753). The generic name *Ixora* is a corruption of the Sanskrit word *içvara* which means 'lord' and refers to the Hindu god Çiwa (Shiva). Backer (1936) reported that in Sri Lanka, flowers of *Ixora* were used as offerings for this god of destruction and fertility. The earliest species described were Asiatic ones; African and Malagasy representatives of the genus were recorded much later. The first continental African species was published in 1819 (*I. laxiflora* from West Africa; Smith 1819). The earliest publications of Malagasy *Ixora* species occurred more than 60 years later (e.g. Drake del Castillo 1897). This relatively late discovery of the African/Malagasy *Ixora* species is of course the result of the late start of the botanical exploration of the African continent. Although exploration started in the beginning of the 19th century, it did not gather momentum until the turn of the century.

Ixora was extensively studied by Bremekamp (1937a, b, 1938, 1940). During his revisions of the Malaysian and Burmese representatives of the genus he described more than 170 species (World checklist of selected plant families 2008) and provided an infrageneric classification, mainly based on inflorescence characters. Bremekamp

PLATE 2259.—Flowering branch, $\times 1$. Voucher specimen: De Block, Rakotonasolo & Randriamboavonjy 705 in the herbarium of the National Botanic Garden of Belgium, Meise. Artist: Omer Van de Kerckhove.

is reported to have had a narrow species concept (Corner 1941) and his work is now much in need of revision.

Species of *Ixora* are in cultivation in gardens and parks throughout the tropics and subtropics. In the USA and Europe they are familiar conservatory shrubs and nowadays can be purchased as house plants. A list of cultivated species is provided by Bridson for the African continent (2003: key) and the world (1992: key and descriptions). The most commonly cultivated species are Asiatic in origin, such as *I. coccinea* (English name: flame of the forest), *I. chinensis* and *I. finlaysonianana*. The former two species have brightly coloured red, yellow, orange, pink (or white forms) and the latter has white flowers. Although there are many handsome, usually white-flowered African and Malagasy species, only three are cultivated: the continental African *I. brachypoda* and *I. laxiflora* and the Malagasy *I. hookeri*. *I. foliicalyx*, the species discussed here, would certainly also make a spectacular ornamental.

Ixora has typical Rubiaceae characters: decussate leaf arrangement, leaf blades with entire margins, interpetiolar stipules and inferior ovaries. The genus is easily recognised by articulate petioles, trichotomously branched terminal inflorescences (flowers grouped in triads, Figure 1d), tetramerous flowers, an exerted style, a bilobed stigma with spreading stigmatic lobes, a single ovule/seed per locule and seed with a large adaxial hilar cavity. The genus is homogeneous in its characters, making identification at species level rather difficult. Leaves, flowers and fruits are often similar, but the variability of the inflorescences provides some distinguishing characters: sessile or pedunculate, lax or compact, pedicels present or absent, few to several hundred flowers, etc. (De Block 1998). A few Malagasy and Pacific species even have solitary flowers (e.g. *I. sambiranensis* from Madagascar) and some Pacific ones are cauliflorous (e.g. *I. cauliflora* from New Caledonia).

Madagascar boasts some 40 *Ixora* species, more than 15 of which are still undescribed (De Block 2009). All species are endemic, which is testament to Madagascar's unique and rich flora. Most taxa occur in the belt of humid forest along the east coast and in the north of the island. *I. foliicalyx* is easily distinguished from other Malagasy species by the following characters: large and strongly coriaceous leaves, well-developed calyces (to which the specific epithet *foliicalyx* refers) with a substantial tube and broad lobes (Figure 1d, e), long corolla tubes and large globose fruits. Furthermore, it is the only species with flowers that are square in shape when viewed from above at full maturity. This shape is caused by the folding back of the wide corolla lobes. Also unique among the Malagasy representatives is the cordate base and crispate margin of the corolla lobes (Figure 1a–c).

Like most Ixoroideae, *Ixora* exhibits secondary pollen presentation, also termed 'ixoroid pollen mechanism'. This is a reproductive strategy promoting outbreeding (Robbrecht 1988; Puff *et al.* 1996) and involves protandry and relocation of pollen from the anthers onto a pollen presenter (*receptaculum pollinis*). Protandry is a form of dichogamy (the separation in time of gender expression in a hermaphroditic flower) in which the anthers release the pollen before the stigma is receptive. In *Ixora*, this release of pollen occurs in the closed bud, with pollen being deposited on the upper

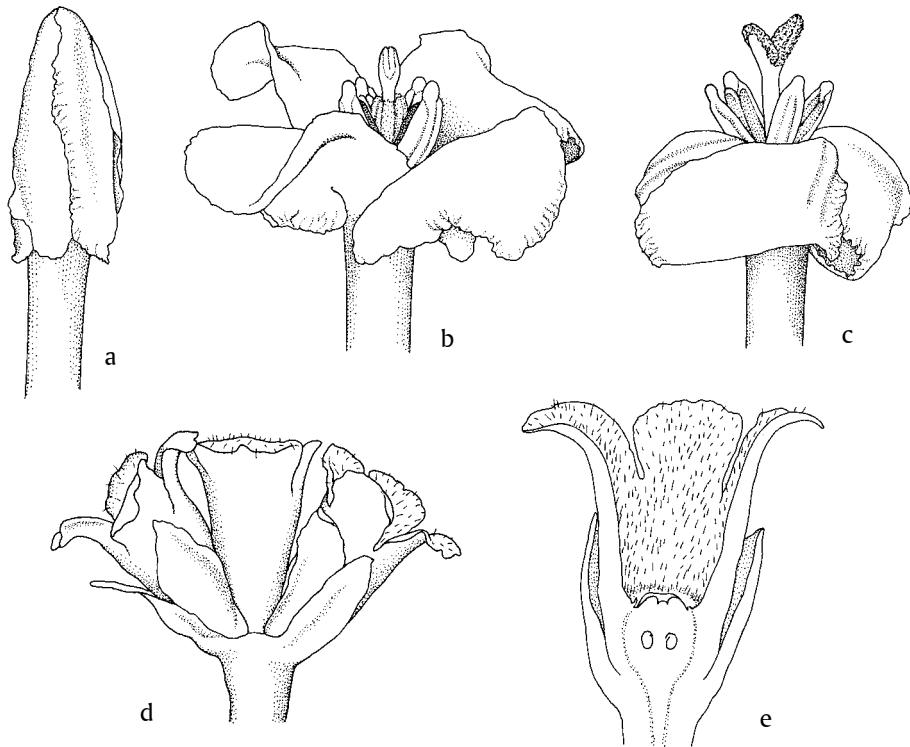


FIGURE 1.—Flowers of *Ixora foliicalyx*. a, upper part of flower bud, $\times 3$; b, flower in functionally male stage (note pollen deposited on upper part of the style), $\times 3$; c, flower in functionally female stage (note papillate inner surfaces of the stigmatic lobes), $\times 3$; d, ultimate flower triad (corollas removed), showing bracts and bracteoles, $\times 3$; e, longitudinal section through ovary, calyx and bracteoles, $\times 5$. Voucher specimen: De Block, Rakotonasolo & Randriamboavonjy 705 in the herbarium of the National Botanic Garden of Belgium, Meise. Drawings by: Omer Van de Kerckhove.

part of the style and/or the outside of the tightly appressed stigmatic lobes. This area of the style and stigma functions as pollen presenter. At anthesis, the flower opens and the pollen presenter becomes exposed (Figure 1b). The flower is then in a functionally male stage, during which pollen is readily available for pollinators. In the next stage (functionally female stage), the stigmatic lobes separate, exposing the papillate inner surfaces, which are receptive for pollen from other plants (Figure 1c).

Pollinators have never been observed for *Ixora foliicalyx* but the African and Malagasy *Ixora* species with whitish, long-tubed, fragrant flowers are generally moth-pollinated (Vogel 1954). Species with short corolla tubes, such as the Malagasy *I. platythyrsa* (corolla tube ± 17.5 mm long), are pollinated by small moths (phalaenophily; Nilsson *et al.* 1990). Those with longer corolla tubes are pollinated by hawk-moths (sphingophily). *I. foliicalyx* probably falls in the last group.

Ixora foliicalyx was first collected by the French collector J. Cloisel at the end of the 19th century (around 1891: Dorr 1997) near Fort-Dauphin, in the extreme south-eastern corner of Madagascar. It was found again in the same region in 1927 by the

French collector Humbert. From the 1950s onwards many specimens were collected and almost 100 years after its first collection, the species was described (Guédès 1986).

Ixora foliicalyx occurs in low-lying humid forest along the east coast of Madagascar, from the extreme south-east to the Masoala Peninsula (from $\pm 25^\circ$ to 15° S), reaching altitudes of about 600 m. The distribution map presented in Figure 2 represents the collecting localities of all herbarium specimens known to date. The discontinuity of the distribution area of the species is probably an artefact. Indeed, the whole east coast of Madagascar has the same vegetation type and soil conditions. However, low-lying humid forest is among the most threatened vegetation types in Madagascar, and in many places it is heavily degraded and fragmented or has disappeared altogether. Deforestation in this region has been going on for centuries and was already in an advanced stage in the early 1950s, when collecting of *I. foliicalyx* started in earnest. *I. foliicalyx* is clearly a species of the east coast lowland humid forest and the discontinuous distribution area must be interpreted as the result of habitat loss and unequal collecting effort.

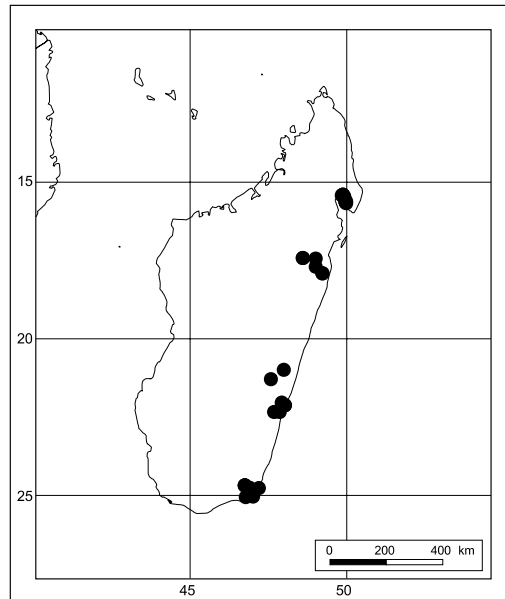


FIGURE 2.—Known distribution of *Ixora foliicalyx*.

Ixora foliicalyx flowers from December to March, with a flowering peak in January, and fruits occur from June to January (according to available herbarium specimens). Based on the number of vernacular names, the species is well known to the local people. Even so, use of *I. foliicalyx* seems to be restricted to the use of the wood, either for construction or as firewood. Vernacular names, as recorded from available herbarium specimens, are: *hanomafana*, *manosirana*, *matsompoangadyfotsy*, *menahy*, *natovavy*, *petrikaty*, *taholana*, *taolanosy*, *tsikala*, *tsivaka*, *tamioro*, *valotra* and *voandrint-sahona*.

Description.—Tree or large shrub, 4–15 m tall (dbh up to 800 mm reported); all external parts glabrous except for inflorescence axes. *Leaves* decussate, petiolate; petiole 5–20 mm long, base distinctly articulate; blade obovate or more rarely elliptic, 100–235 × 34–90 mm, strongly coriaceous, drying yellowish or pale brown; lateral nerves 6–14 pairs; apex shortly acuminate with acumen 2–8(–13) mm long; base cuneate, acute or obtuse; margin entire. *Stipules* interpetiolar, 4–6 mm long, shortly sheathing, then with free ovate-triangular lobes terminated by 2–7 mm long awns. *Inflorescences* terminal on main or lateral branches, subsessile or very shortly pedunculate (peduncle up to 10 mm long), 25–80 × 25–180 mm (corollas not included),

with 25–150 flowers, trichotomously branched, branching articulate throughout; axes glabrous or sparsely to more densely pubescent with short erect hairs, green or green tinged reddish; inflorescence-supporting leaves absent; central first-order axis 4–15 mm long, lateral first-order axes 10–55 mm long; bracts and bracteoles green or green tinged reddish; first-order bracts stipule-like but limbs more ovate and foliar blades rudimentary (blades up to 80 × 50 mm but usually much smaller); higher-order bracts similar but progressively modified higher up and ultimately with stipular parts absent and foliar parts broadly triangular and vaulted, up to 10 mm long. *Ultimate flower triads* with flowers sessile, subsessile or shortly pedicellate; pedicels up to 1.5(–3.0) mm long, those of central flower either equal to or shorter than those of lateral flowers; bracteoles present on lateral flowers but often absent on central ones, opposite at base of ovary, ovate or trilobed (consisting of a well-developed central lobe and two smaller lateral lobes), 3.5–8.0 mm long, tip acute to obtuse or rounded. *Flowers* tetramerous, hermaphroditic, sweetly scented. *Calyx* green or green tinged reddish, drying paler brown than ovary, moderately pubescent with appressed hairs inside, tube 2–4 mm long, with a ring of colleters at base inside, lobes variable in height and shape, broadly ovate to square, 1.5–6.0 mm long, tip acute, obtuse, rounded or irregularly truncate. *Corolla* square in shape when viewed from above at full maturity, tube (35–)47–85 mm long, white (often greenish white near base), lobes contorted to the left in bud, folded back at full maturity, broadly elliptical to almost quadrangular, 7–8 × 5.5–7.0 mm, white but turning yellow with age, base strongly cordate, tip rounded, margins crispate. *Stamens* exerted and spreading at anthesis, arising from throat of corolla tube, alternating with corolla lobes; filaments ± 0.5 mm long; anthers linear, 3.5–5.0 mm long, inframedifixed, sagittate, with short sterile apical appendage. *Ovary* bilocular, ± 2 mm long, green or more rarely reddish, drying dark brown; placentation axile, each locule containing a single ovule immersed in a large fleshy peltate placenta attached to middle of septum; style and stigma white or greenish white, style exerted 5–10 mm, stigmatic lobes 1–2 mm long. *Fruit* drupaceous, (sub)globose, usually with persistent calyx, 14–18 mm long, 13–17 mm wide, reddish green when ripe, containing (1)2 one-seeded, thin, crustaceous pyrenes. *Seeds* with convex abaxial side and flat adaxial side, with large adaxial subapical hilar cavity continuing into a basal vertical groove, ± 8 mm long, ± 7 mm wide, reddish brown; endosperm horny, embryo dorsal, somewhat curved, with foliaceous cotyledons; radicle inferior. Plate 2259.

REFERENCES

- BACKER, C.A. 1936. *Verklarend woordenboek der wetenschappelijke namen van de in Nederland en Nederlandsch Indië in het wild groeiende en in tuinen en parken gekweekte varens en hogere planten*. Noordhoff, Groningen.
- BREMEKAMP, C.E.B. 1937a. The Malaysian species of the genus *Ixora* (Rub.). *Bulletin du Jardin Botanique de Buitenzorg*, 3e Série 14: 197–367.
- BREMEKAMP, C.E.B. 1937b. The *Ixora* species of Burma and the Andaman Islands. *Journal of Botany (London)* 75: 108–111, 169–175, 260–266, 295–298, 318–326.
- BREMEKAMP, C.E.B. 1938. The *Ixora* species of Burma and the Andaman Islands. Additions and emendations. *Journal of Botany (London)* 76: 330–336.
- BREMEKAMP, C.E.B. 1940. The Malaysian species of the genus *Ixora* (Rub.). Additions and emendations. *Bulletin du Jardin Botanique de Buitenzorg*, 3e Série 16: 276–299.
- BRIDSON, D.M. 1988. *Ixora*. In D.M. Bridson & B. Verdcourt, *Flora of tropical East Africa, Rubiaceae* (Part 2): 610–617.

- BRIDSON, D.M. 1992. *Ixora*. In A. Huxley, *The New Royal Horticultural Society Dictionary of Gardening* 2 (D–K): 701–703. McMillan, London.
- BRIDSON, D.M. 2003. *Ixora*. *Flora zambesiaca* 5,3: 444–449.
- CORNER, E.J.H. 1941. Notes on the systematy and distribution of Malayan phanerogams. IV. *Ixora*. *The Gardens' Bulletin Straits Settlements Singapore* 11: 177–235.
- DAVIS, A.P. & BRIDSON, D.M. 2007. In V.H. Heywood, R.K. Brummitt, A. Culham & O. Seberg, *Flowering plant families of the world*: 284–287. Royal Botanic Gardens, Kew.
- DE BLOCK, P. 1998. The African species of *Ixora* (Rubiaceae–Pavetteae). *Opera Botanica Belgica* 9: 1–218.
- DE BLOCK, P. 2009. Revision of the Malagasy species of *Ixora*. (Rubiaceae–Ixoreae). *Opera Botanica Belgica* 16. In press.
- DORR, L.J. 1997. *Plant collectors in Madagascar and the Comoro Islands*. Royal Botanic Gardens, Kew.
- DRAKE DEL CASTILLO, M.E. 1897. In A. Grandidier, *Histoire physique, naturelle et politique de Madagascar. Histoire naturelle des plantes* 36,6, Atlas 4. Paris.
- GUÉDÈS, M. 1986. *Ixoras* malgaches nouveaux à fleurs solitaires. *Phytologia* 60: 243–250.
- KEAY, R.W.J. 1963. *Ixora* L. In F.N. Hepper, *Flora of West tropical Africa*, edn 2, 2: 140–144.
- LINNAEUS, C. 1753. *Species plantarum* 1. Stockholm.
- MABBERLEY, D.J. 1987. *The plant-book. A portable dictionary of the higher plants*. Cambridge University Press, Cambridge.
- NILSSON, L.A., RABAKONANDRIANINA, E., PETTERSSON, B. & RANAIVO, J. 1990. 'Ixoroid' secondary pollen presentation and pollination by small moths in the Malagasy treelet *Ixora platythyrsa* (Rubiaceae). *Plant Systematics and Evolution* 170: 161–165.
- PUFF, C., ROBBRECHT, E., BUCHNER, R. & DE BLOCK, P. 1996. A survey of secondary pollen presentation in the Rubiaceae. *Opera Botanica Belgica* 7: 369–402.
- ROBBRECHT, E. 1988. Tropical woody Rubiaceae: Characteristic features and progressions. Contributions to a new subfamilial classification. *Opera Botanica Belgica* 1: 1–271.
- SMITH, J.E. 1819. *Ixora*. In A. Rees, *The Cyclopaedia, or universal dictionary of arts, sciences, and literature* 19, n. 8. Longman, Hurst, Rees, Orme & Brown, London.
- VOGEL, S. 1954. Blütenökologische Typen als Elemente der Sippengliederung dargestellt anhand der Flora Südafrikas. Rubiaceae. *Botanische Studien* 1: 289–297. Fischer, Jena.
- WORLD CHECKLIST OF SELECTED PLANT FAMILIES 2008. The Board of Trustees of the Royal Botanic Gardens, Kew. <http://apps.kew.org/wcsp/cite.do> (accessed 20 August 2008).

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PLATE 2260 *Cineraria austrotransvaalensis*

Cineraria austrotransvaalensis

Asteraceae–Senecioneae

South Africa

Cineraria austrotransvaalensis Cron in South African Journal of Botany 60: 162 (1994); Cron et al.: 483 (2006).

Cineraria, a genus of 35 species, is essentially African with its centre of diversity in southern Africa, particularly in the KwaZulu-Natal midlands and Albany centre of the Eastern Cape (Cron *et al.* 2006). It ranges northwards mainly along the eastern highlands and rift valley mountains as far as Ethiopia, with *C. abyssinica* extending across the Red Sea into the mountains of Yemen and Saudi Arabia and a single species (*C. anampoza*) endemic to Madagascar. The genus comprises mainly perennial herbs and subshrubs with bright yellow radiate flower heads, and is not to be confused with the purple-flowered ‘cineraria’ of the horticultural trade, *Pericallis hybrida*, originating from the Canary Islands (Nordenstam 1978).

Cineraria is a Linnean genus, with the name derived from *cinereus*, referring to the grey or ash-coloured leaves of many of the species. Interestingly, *C. geifolia*, the only one of the 13 species first described by Linnaeus (1763) still remaining in *Cineraria*, does not have the cobwebby or woolly indumentum so characteristic of the genus. *C. geifolia* (*Herb. Clifford. Solidago 7*) is therefore the type for the genus (Phillips 1951: 833; Jarvis 2007: 418) and was illustrated by Jan Moninckx in Commelijn (1701: t. 73), reproduced in Wijnands (1983: Plate 28).

The laterally compressed cypsela (fruits) with distinct margins or wings are highly diagnostic for the genus *Cineraria*, as is the palmate venation of the leaves which are usually auriculate at the base of the petiole. It is a senecioid member of the tribe Senecioneae because it has ‘balusterform’ or dilated (as opposed to cylindrical) filament collars, discrete (vs. continuous) stigmatic areas, and radial endothelial thickening in the anthers (Nordenstam 1978; Cron *et al.* 2006). The cone-shaped or obtuse tip to the style is also a useful diagnostic feature.

Most species of *Cineraria* grow amongst rocks on mountain slopes or at the base of cliffs where they are protected against fire. They are usually found on the moister southern or southeastern aspects in southern Africa. *C. austrotransvaalensis* is no exception, occurring on the rocky ridges of the North West Province, Gauteng and near Standerton in southern Mpumalanga (Figure 1). These areas comprise the southern regions of the former Transvaal Province of South Africa and provide the

PLATE 2260.—1, branch showing deltoid-reniform, lobed upper leaves, pinnatifid bracts subtending flower heads in a corymb, × 1; 2, middle to lower leaf with conspicuous auricles, × 1; 3, involucre: bracts tinged purplish at tip, calyculus bracts descending peduncle, × 1.5; 4, disc floret with margined cypsela, × 4; 5, stamen, × 7; 6, style of disc floret, × 7; 7, ray floret with almost mature cypsela, × 4. Voucher specimen: Cron 720 in the C.E. Moss Herbarium, University of the Witwatersrand, Johannesburg. Artist: Barbara Pike.

basis for the specific epithet. The specimen illustrated here is from Linksfield Ridge in Johannesburg, the type locality of *C. austrotransvaalensis*, where it grows amongst the rocks on the cooler sides of the ridge.

The earliest collection of *Cineraria austrotransvaalensis* was from the hills near Standerton, Mpumalanga, during the period 1879 to 1880 by the Austrian/Polish (Krakow-born) botanist and geographer Anton Rehmann, one of the first persons to collect in the Transvaal. An early collection by the British medical practitioner Richard F. Rand from Bez Valley, Johannesburg, dates from 1902–1903 when he was

serving in the Medical Corps during the Anglo-Boer War (Gunn & Codd 1981). The species was collected from various localities in and around Johannesburg to as far afield as the koppies of Witpoortjie Kloof from 1918–1930 by Charles E. Moss, first professor of botany at the School of Mines and Technology, later the University of the Witwatersrand. Charles Moss's herbarium laid the foundation for the University's herbarium, later named after him.

Specimens of *Cineraria austrotransvaalensis* were previously included by Hilliard (1977) under *C. albicans*, a species that occurs at the top of sandstone gorges or on rocky outcrops in mainly the Pondoland region of KwaZulu-Natal and the Albany region of the Eastern Cape. *C. austrotransvaalensis* is distinguished from *C. albicans* by the extremely dentate margins of its leaves, a more highly branched synflorescence with more flower heads, as well as a more shrubby, robust growth form. The trichome complement of the leaves also differs from *C. albicans* (see Cron 1994 and Cron *et al.* 2006 for details). *C. austrotransvaalensis* also shows an affinity to *C. erodioides*, but lacks the procurvent auricles so characteristic of that species and is generally more tomentose-grey.

Because *Cineraria austrotransvaalensis* is fairly restricted and fragmented in its distribution and required habitat, it has been placed on the 'Orange List' of threatened plants (Victor & Keith 2004) and its continued existence is being monitored. Although it is sometimes quite abundant in its specific habitat where it occurs on the rocky hillsides, many of its localities in North West and Gauteng are threatened by development and are susceptible to fires caused by vagrants sleeping in the hills. The 'Orange List' has been developed in South Africa to record the conservation status of taxa that are rare and of particular concern but not on a Red List (Victor & Keith 2004).

Cineraria austrotransvaalensis grows as a low shrublet and is very attractive with its grey leaves and a mass of yellow flower heads in April, May and June, its main

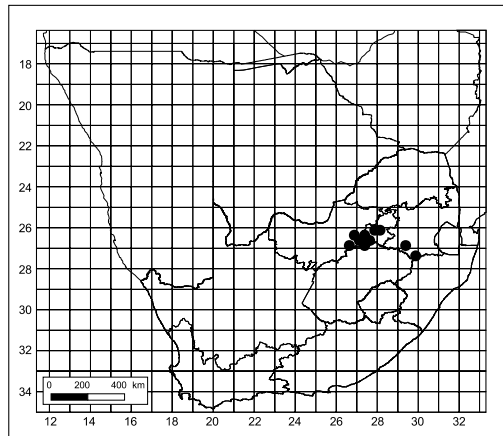


FIGURE 1.—Known distribution of *Cineraria austrotransvaalensis*.

flowering time. It would make a lovely garden subject, but attempts to cultivate it in private gardens have been of limited success as the species is very sensitive to insufficient moisture. It seems to thrive if it can root itself in a rocky crevice or a crack in concrete where its roots are unlikely to dry out, and it does best in partial shade. *C. saxifraga* is the only species of *Cineraria* to be widely cultivated and available from commercial nurseries as a garden plant in South Africa. It is also sensitive to habitat and moisture conditions, requiring partial shade and sufficient water at all times. Most species of *Cineraria* will germinate easily from seed/fruit.

Traditional medicinal uses are known for only two species of *Cineraria*, both used by the Southern Sotho (Watt & Breyer-Brandwijk 1962): *C. aspera* for asthma and tuberculosis and *C. lyratiformis* for colds and relieving colic. *C. lyratiformis* is also reported to be toxic to pigs and to taint the flavour of the milk and cheese of dairy cows at Ladybrand in the Free State (specimens in National Herbarium, Pretoria: *Dairy Officer* 5; *Fourie s.n.* sub PRE 44115), but this is the only species of *Cineraria* noted to do so and is one of the few weedy ones.

Description.—Perennial shrublet, up to 1 m tall. *Stems* woody, branching, tomentose, glabrescent. *Leaves* 5–7-lobed, palmately veined, upper leaves deltoid-reniform in outline, frequently pinnatifid at base, 11–38 × 13–53 mm, lower leaves deltoid-reniform to reniform in outline, often with one or two lateral pinnae on petiole; lamina 10–70 × 11–91 mm, adaxial surface tomentose to cobwebby, abaxial surface densely tomentose, rarely glabrescent; apex obtuse to rounded-obtuse; base cordate to subcordate to truncate; margin conspicuously dentate, 6–10 teeth per lobe; petiole 7–62 mm long, tomentose, glabrescent as leaves mature; auricles large and persistent, auriform. *Capitula* heterogamous, radiate, many in compound, branched corymbs; peduncles 5–31 mm from point of branching, tomentose (to cobwebby), usually glabrescent, bracteate. *Involucre* calyculate, calyculus descending on peduncle; involucre bracts 8–13, in a single series, 4–6 mm long, tomentose to cobwebby, glabrescent; margins scarios, green, tinged purplish at tip. *Ray florets* 8–10(–12), 7.5–10.5 mm long; limb 4.5–7.5 mm long, commonly 4-veined (rarely up to 11-veined), apex 3-dentate. *Disc florets* 38–53; corolla 4.5–6.0 mm long, 5-lobed. *Cypselae* obovate, laterally compressed, margined to narrowly winged, brown, 2.5–3.2 mm long, ciliate with hairs on faces. *Pappus* of many fine bristles, 3.2–4.5 mm long. Plate 2260.

REFERENCES

- COMMELIJN, J. 1697–1701. *Horti medici Amstelodamensis rariorum plantarum descriptio et icones. Pars prima, pars altera*. P. & J. Blaeu, Amsterdam.
- CRON, G.V. 1994. Two new species of *Cineraria* L. (Senecioneae, Asteraceae). *South African Journal of Botany* 60: 161–167.
- CRON, G.V., BALKWILL, K. & KNOX, E.B. 2006. A revision of the genus *Cineraria* (Asteraceae, Senecioneae). *Kew Bulletin* 61: 449–535.
- GUNN, M. & CODD, L.E. 1981. *Botanical exploration of southern Africa*. Balkema, Cape Town.
- HILLIARD, O.M. 1977. *Compositae in Natal*. University of Natal Press, Pietermaritzburg.
- JARVIS, C. 2007. *Order out of chaos: Linnean plant names and their types*. Linnean Society of London.
- LINNAEUS, C. 1763. *Species plantarum*, edn 2. Salvii, Stockholm.
- NORDENSTAM, B. 1978. Taxonomic studies in the tribe Senecioneae (Compositae). *Opera Botanica* 44: 1–84.

- PHILLIPS, E.P. 1951. The genera of South African flowering plants, edn 2. *Memoirs of the Botanical Survey of South Africa* No. 25. Department of Agriculture, Pretoria.
- VICTOR, J.E. & KEITH, M. 2004. The Orange List: a safety net for biodiversity in South Africa. *South African Journal of Science* 100: 139–141.
- WATT, J.M. & BREYER-BRANDWIJK, M.G. 1962. *The medicinal and poisonous plants of southern and eastern Africa*. Livingstone, Edinburgh & London.
- WIJNANDS, D.O. 1983. *The botany of the Commelins*. Balkema, Rotterdam.

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Guide for authors and artists

INTRODUCTION

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AUTHORS

All plates published in Volumes 1–49, are listed in the *Index* published in 1988. There are, however, many completed plates awaiting publication in *FPA*. Authors intending to have plants illustrated and written up for *FPA* are therefore advised to contact the Editor to establish whether a plant has not already been figured for *FPA*.

Authors are expected to supervise the execution of plates to ensure that they are botanically correct. As detailed under the section Artists, a write-up and/or plate will not be acceptable **unless a voucher specimen is made** of the figured specimen and preserved in a recognised herbarium.

Before writing up a text for *FPA*, the author should ascertain whether the plate has been approved by the journal's panel of referees consisting of both botanists and botanical artists. Only after approval of the plate, should the author produce the text for submission to the Editor. Approved contributions will be published when space allows. Those in which the names of new taxa are published for the first time, usually receive priority.

Manuscripts should be **submitted electronically** and should conform to the general style of the most recent issue of *FPA*. From Volume 58 onwards, literature references are treated as described under headings 1, 2 and 3 further on.

If practical, the electronic submission should be accompanied by a hard copy. The requirements are as follows:

- Data must be IBM-compatible and written in MSWord. If files are saved as Rich Text Format, other word processing packages may also be used.
- All paragraphs (including headings) must be left-aligned. Do not justify or centre anything. Do not indent paragraphs. Use Normal paragraph style throughout. Put an empty paragraph sign between text paragraphs.
- Do not break words, except hyphenated words.
- Use italics and bold where necessary.
- Use an N-dash for 'to' (Alt code is 0150) (e.g. 5–10 mm).

- Use an M-dash instead of parenthesis or to replace a colon, where appropriate (Alt code is 0151) (e.g. Description.—Small tree ...).
- Use the lower case x as times sign, with one space on either side of the x, for example 2 x 3 mm.
- Special characters such as degree signs, plus-minus, Greek letters, symbols for maps, etc.: please do not use the symbols provided by your word processing program—the graphic designer experiences problems with conversions from some word processing packages; rather use your own word or code which should be unique, self-explanatory, consistent and placed between angle brackets, for example <mu> for the Greek letter μ ; <degrees> for °; <pm> for \pm ; <open square> for \square , <solid dot> for \bullet . Please attach a list of your codes to the manuscript.

The following serves as a check-list of requirements for an *FPA* text:

1. **Synopsis.** The correct name of the plant together with its author/s and relevant literature (name of publication written out in full) is cited. Put a comma after the author's name if the publication that follows is his/her own; write the word 'in' after the author's name if the publication that follows is a journal or other work edited/compiled by someone else. Following this, are synonyms (listed chronologically) plus their author/s and relevant literature reference/s [reflecting only author, page and year of publication, e.g. Boris et al.: 14 (1966)], the whole synopsis in one paragraph. If there are many synonyms and literature references, restrict yourself to the most important ones. References should be arranged in chronological sequence; where two or more references by the same author are listed in succession, the author's name is repeated with every reference. Author citations of plant names should follow Brummitt & Powell (1992, *Authors of plant names*); for other authors, give full surnames followed by a colon, page number/s and date.
2. **Literature references in the text.** Should be cited as follows: 'Jones & Smith (1999) stated ...' or '..... (Jones & Smith 1999)' when giving a reference simply as authority for a statement. When more than two authors are involved, use the name of the first author followed by *et al.* Personal communications are given only in the text, not in the list of references; please include full initials to identify the person more positively.
3. **List of references.** All publications referred to in the synopsis and the text, but no others, are listed at the end of the manuscript under the heading References. The references are arranged alphabetically according to authors and chronologically under each author, with a, b, c, etc. added to the year if the author has published more than one work in a year. If an author has published both on his/her own and as senior author with others, the solo publications are listed first and after that, in strict alphabetical sequence, those published with one or more other authors. Author names are typed in capitals. Titles of books and journals are written out in full, in italics. In the case of books, the name of the publisher is followed by a comma and the place of publication.
4. **Text proper.** It should be written in language and style acceptable to both the scientist and informed lay person. The following features should, as far as possible, be described and discussed in the text:
 - Main diagnostic characters for a brief pen picture of the plant.
 - Affinities: how the taxon differs from its nearest allies; if necessary keys may be used to distinguish closely related taxa.

- History of the taxon, where and when first collected and by whom.
 - Geographical distribution in Africa: a distribution map, which will be handled as a figure, is essential; authors are welcome to submit a list of grid references from which the Editor's Office will produce the distribution map.
 - Ecology: habitat preferences etc.
 - Phenology: time of flowering, fruiting, etc.
 - Economic importance, edibility, medicinal use, toxicity, etc.
 - Cultivation potential and hints on cultivation.
 - Origin of the scientific names.
 - Common names in various languages.
 - Any other facts of interest to the scientist or lay person.
5. **Description.** This is a formal description of the taxon and not merely of the specimen illustrated. For measurements, use only units of the International System of Units (SI). Use only mm and/or m.
6. **Captions.** Supply a caption for the colour plate, indicating the relevant magnifications and/or reductions, and citing the voucher specimen used for the illustration, i.e. collector + number + herbarium (full name, not acronym) where the specimen is housed. The caption ends with the name of the artist. Also supply captions for the distribution map and any other figures you want to include (please use scale bars where relevant), making sure all figures are mentioned in the text.

ARTISTS

1. **Supervision.** All illustrations should be executed under the supervision of the botanist writing the text—to ensure botanical accuracy and to ensure that details considered important by the botanist are adequately depicted.
2. **Dimensions.** The dimensions to work to are 160 × 210 mm (width × height of image) or slightly smaller. Illustrations are printed as is, i.e. the same size. Only in exceptional cases are illustrations reduced or enlarged.
3. **Paper.** The paper must be of good quality and as white as possible. *Arches* or *Saunders Waterford* (hot-press, 300 gsm) is recommended. The use of board should be avoided.
4. **Watercolours.** The use of good-quality watercolours, e.g. Winsor & Newton (certain pigments fade with time) or Schmincke (colourfast), is essential. The use of black paint is not recommended as it is far too harsh and tends to kill colour. Similarly, white paint must be used with caution since it tends to dull adjoining colours and sometimes reproduces as a bluish colour. Its use should be limited to white hairs and certain highlights only. To reflect whiteness, endeavour to use the paper colour itself.
5. **Subject material, composition etc.** For obvious reasons, the subject material should be representative of the species being illustrated and should be in excellent condition. Drawing from photographs is not recommended: it is impossible to obtain the same detail from a photograph as from the living plant.

All parts should be measured by the artist and **magnifications indicated on the back of the plate** and the figure(s) where relevant.

The plate should not be overcrowded with too many small dissections. These should preferably be inserted as separate figures in the text. Dissections or habit sketches included on the plate should be in pencil or colour, not ink, whereas dissections or habit sketches to be used as separate text figures should be in ink.

A **voucher specimen** made of material from the plants(s) illustrated, must be preserved, given a collector's number and housed in a recognised herbarium as a permanent record. This is most important: **without a cited voucher specimen, the plate and write-up will not be accepted.**

Show clearly as many features as possible, for example apical buds, leaf axils, hairs, glands, bracts, stipules, upper and lower surfaces of leaves, showing venation, front, side and back view of flowers, mature fruit, habit and where necessary and feasible, the underground parts. The supervising botanist will know which features require accentuation.

The artist's signature must be unobtrusive, but clearly written, so that it will stand reproduction. Numbering of plant parts should be done in light pencil: permanent numbering will be done by the resident artist in consultation with the Editor. No other annotations should appear on the plate. Information such as species name, collector's name and number, date, locality, magnifications etc. should be written **on the back of the plate.**

6. *Dispatch of plates.* Plates should be carefully packed, flat, using a sheet of masonite or similar material to prevent bending, and sent by registered or insured post.

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Other technical publications of the South African National Biodiversity Institute

1. **Bothalia**: medium for publication of botanical papers dealing with the flora and vegetation of southern Africa, presenting new facts and items of general interest. Published: Vol. 1–39,1.
2. **Strelitzia**: a series of occasional publications on southern African flora replacing *Memoirs of the Botanical Survey of South Africa** and *Annals of Kirstenbosch Botanic Gardens**. Published: 1–23.
3. **SANBI Biodiversity Series**: occasional reports on projects, technologies, workshops, symposia and other activities initiated by or executed in partnership with SANBI. Published: 1–11.
4. **Flora of southern Africa**: a taxonomic treatment of the flora of the Republic of South Africa, Lesotho, Swaziland, Botswana and Namibia. Published: Vol. 1 (1966); 4,2 (1985); 5,1,1 (First part) (2000); 5,3 (1992); 7,2,1 (First part) (1999); 7,2,2 (1983); 9, Urticaceae (2001); 10,1 (1979); 13 (1970); 14 (1985); 16,1 (1975); 16,2 (1977); 16,3,6 (1988); 18,3 (1986); 19,3,1 (1993); 21,1 (1984); 22 (1976); 26 (1963); 27,4 (1980); 28,1 (2000); 28,4 (1985); 30,3,1 (1995); 31,1,2 (1986); 33,4,1 (2001); 33,7,2 (1983); 9 (Cryptogams: Characeae) (1978); Bryophyta 1,1 (1982); Bryophyta 1,2 (1987); Bryophyta 1,3 (1998); Hepatophyta 1,1 (1999); Pteridophyta (1986).
5. **Palaeoflora of southern Africa**: Molteno Formation (Triassic) Vol. 1, Introduction, *Dicroidium*; Prodrum of South African megafloras, Devonian to Cretaceous. Obtainable: A.A. Balkema Publishers, PO Box 1675, NL-3000 BR Rotterdam, The Netherlands. Molteno Formation (Triassic) Vol. 2. Gymnosperms (excluding *Dicroidium*). Three books published in the *Strelitzia* series (15, 20, 21).

Unless otherwise stated, available issues of these publications are obtainable from the Bookshop, South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa. E-mail: bookshop@sanbi.org

* For available issues, please see www.sanbi.org.

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