# Flowering Plants of Africa

Volume 60 June 2007

# 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 135.

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## History of this series

(note Afrikaans translation and changes in title)

**Volume 1 (1921) to Volume 24 (1944)**:
*The Flowering Plants of South Africa*

**Volume 25 (1945–1946) to Volume 26 (1947)**:
*The Flowering Plants of Africa*

**Volume 27 (1948–1949) to Volume 52 (1992–1993)**:
*The Flowering Plants of Africa*
*Die Blomplante van Afrika*

**Volume 53 (1994) to Volume 60 (2007)**:
*Flowering Plants of Africa*

**Cover illustration**: *Bruguiera gymnorrhiza* (Plate 2234)

# 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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## Next volume

Volume 61 is likely to appear in 2009.—The Editor

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# *MISSION*

*The mission of the South African National Biodiversity Institute is to promote the sustainable use, conservaton, appreciation and enjoyment of the exceptionally rich biodiversity of South Africa, for the benefit of all people.*

PLATE 2221 *Zantedeschia jucunda*

# *Zantedeschia jucunda* Araceae

*South Africa*

**Zantedeschia jucunda** *Letty* in Bothalia 7: 455 (1961); Letty: 12, t. 7 (1962); Letty: 13 (1973); Retief & Herman: 44 (1997).

*Zantedeschia*, a genus of eight species, is endemic mostly to South Africa, with one species known only from cultivation and another extending into south-central Africa northwards to Tanzania. The genus is well known among plant breeders and florists worldwide through its large number of decorative cultivars, marketed as garden and pot plants, and as cut-flowers. In the horticultural trade, zantedeschias are popularly known as arum lilies or calla lilies, both *Arum* and *Calla* being distinct genera in the Araceae and restricted to the northern hemisphere. The reason for the analogue ‘arum’ is the similarity between the leaves of *Zantedeschia* and *Arum*, and that for ‘calla’ is that our genus was initially classified as *Calla* by Linnaeus.

The genus *Zantedeschia* was named by Sprengel in honour of Professor Giovanni Zantedeschi (1773–1846), a botanist of Brescia, Italy. Letty (1961) was the first to draw attention to a striking yellow-flowered species from Sekhukhuneland that she called *jucunda* in reference to the pleasing appearance of the plants. The arrow-shaped, white-spotted leaves and large, bright yellow to cream-coloured and funnel-shaped spathes give the plant an attractive look, more so when in clumps. Our species is often confused with *Z. pentlandii* which also has a large yellow spathe, but the latter differs in its broad, less hastate, and usually unspotted leaves. Both species are narrow endemics, being restricted to the rocky grasslands of Sekhukhuneland, a region straddling the border of the Limpopo and Mpumalanga Provinces of South Africa.

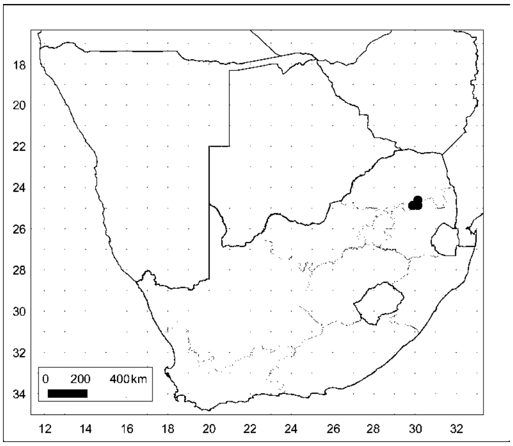

FIGURE 1.—Known distribution of *Zantedeschia jucunda*.

*Zantedeschia jucunda* is entirely confined to the summit of the Leolo Mountains in the Sekhukhuneland Centre of Floristic Endemism (Van Wyk & Smith 2001) (Figure 1). The plants occur right along the mountain range and are known as *magapule* in Pedi. Plants with chrome-yellow spathes from which the type description was drawn up (Letty 1961) are

PLATE 2221.—Plants of the southern form with darker yellow spathes in habitat, × 1. Voucher specimen: *Condy 142* in National Herbarium, Pretoria. Artist: Gillian Condy.

restricted to the southern parts of the mountain, while the spathes of those in the central and northern parts of the range are mainly creamy yellow or lemon-yellow. The only consistent macromorphological character that distinguishes these plants from *Z. pentlandii* is the triangular-hastate spotted leaves—this is uniform across the entire distribution of *Z. jucunda* on the Leolo range.

The description of the autecology of *Zantedeschia jucunda* is based on personal observations by one of us (Craib 2002–2003, 2003, 2004). The summit plateau of the Leolo Mountains is settled by pastoralists and small-scale agriculturalists practising seasonal dry-land farming, and *Z. jucunda* has now become commensal with these human activities. The people living on the mountain have built extensive systems of stone walls, particularly towards the southern section of the range. This walling is used to enclose livestock and is very loosely constructed from tumbled norite boulders. The walls contain numerous cavities at ground level, providing an ideal habitat for *Z. jucunda*, and we speculate that it has expanded its populations into these sites from the numerous rocky outcrops so typical of the Leolo Mountains.

*Zantedeschia jucunda* is often found in cultivated lands where rock outcrops have been left intact. It also frequents the piles of rocks removed when land is cleared for the planting of crops. Stone walls around homesteads and graveyards provide another artificial habitat. The natural habitat of the species consists of soil-filled cracks on the vast norite domes on the mountain summit. The plants grow gregariously in this habitat, their white-spotted leaves and richly coloured spathes closely packed together. Another common habitat is the rocky talus at the base of cliffs.

Plants come into flower in the second half of November, with the peak of the flowering season usually the last week of November and the first week of December. Unless the rains start early, at this time the grass cover on the Leolos is still brown, dry and dormant after the winter drought and the arums are a showy feature, their brightly coloured spathes being very conspicuous to pollinators. Pollination is usually most effective where groups of plants flower together. Fruits take 12 to 16 weeks to ripen, mostly in March and the first half of April. The seeds are encased in a yeasty smelling pulp that decomposes, releasing the tiny rough-surfaced seed. These could easily be distributed by water runoff, and their irregular shape and rough surface would allow them to lodge in small, soil-filled cracks in rocks. The strong yeasty smell of the pulp suggests that rodents may eat it and, if so, that they may take parts of ripening infructescences some distance from the plants. This would explain the presence of plants on cliff faces, amongst stone walls and in piles of rocks around agricultural land. The main reason for *Z. jucunda* being almost entirely associated with rocky habitats on the Leolo Mountains, is that newly germinated plants are very vulnerable to trampling by the abundant livestock in open loamy areas during the first six to ten weeks after germination.

Despite it being a Red Data plant, we observed that variable numbers of *Zantedeschia jucunda* were dug up from mostly the southern and south-central parts of the mountain and sold by the local people, many of whom are poor and unemployed. However, the plants were sold only during the peak of the flowering season at the time the data were collected. Social attitudes towards the sale of field-collected plants vary across the mountain. In some parts the activity is perceived as taboo, whereas in others it is a more regular practice. There were indications that arums growing in stone walls, particularly those around homesteads and graveyards, were not excavated. Social anthropological studies would be required to determine how cultural attitudes relate to the use and preservation of the species on the mountain.

*Zantedeschia jucunda* has great horticultural potential on account of its ornamental, hastate, white-spotted leaves and spectacular, bright yellow to cream-coloured spathes. A small-scale project to train a family living on the mountain to propagate the arums from seed for sale was started by one of us (C.C.) in conjunction with Random Harvest Nursery in Johannesburg, but the local people with whom we worked on the project had little, if any, interest in maintaining plants grown from seed. There is much scope to promote the sustainable use of this arum for horticultural purposes amongst local inhabitants, but these initiatives are hampered by problems such as the remoteness of the villages on the mountain summit. From our project it is not clear whether, in the long term, the transition could be made from the sale of field-collected tubers to those grown from seeds that are sourced from propagated parent stock. Our perception is that harvesting arums from stone walls is taboo and that no amount of persuading would encourage the local people to use these walls as a nursery.

Our species is best grown in well-drained soil, in large, deep earthenware containers. Plants should be kept in direct sunlight or in lightly dappled shade. They should be regularly watered in summer but kept dry in winter. The horticultural potential of *Zantedeschia jucunda* in its own right and also as a hybridisation subject has not yet been realised. This is surprising as *Z. elliotiana,* a species known only from cultivation, is common in the horticultural trade. It is popularly known as the ‘golden calla lily’ and is similar to *Z. jucunda* and *Z. pentlandii* in having large vibrant yellow spathes. It has white-spotted leaves like *Z. jucunda*, but differs in its broad leaves with rounded basal lobes (Singh *et. al* 1995). It is possible that the inaccessibility of habitats, which makes it difficult to collect material of *Z. jucunda* and *Z. pentlandii*, and the lack of knowledge of variation in these species are restricting their use in horticulture and plant breeding.

Vegetative and reproductive characters combined with distribution patterns are useful in demarcating species of *Zantedeschia* (Singh *et al*. 1995). The separate specific status of *Z. jucunda* is supported by the combination of triangular-hastate leaves that are densely spotted (through local mesophyll necrosis) and large, funnel-shaped, yellow spathes. *Z. jucunda* is closely related to *Z. albomaculata* and *Z. pentlandii*. All three species fall in section *Aestivae* (Singh *et al*. 1996) on account of their unscented inflorescences, lack of staminodes among the ovaries and the spathe that turns green when the berries ripen. *Z. jucunda* approaches *Z. albomaculata* in leaf characters but the spathes in the latter species are narrow, cylindrical and vary from white, cream, pale yellow to coral-pink. *Z. albomaculata* is furthermore the most widespread member of the genus, occurring in South Africa, Lesotho, Swaziland, Zambia, Zimbabwe, Angola, Malawi and Tanzania. *Z. jucunda* is similar to *Z. pentlandii* in its large, funnel-shaped, yellow spathes and both species are often referred to as the ‘yellow arums’. Using leaf characters, the two species are easily told apart. In *Z. pentlandii*, the leaves are oblong-hastate, glaucous green and very hardly ever spotted as opposed to the triangular-hastate, deep green and strikingly spotted leaves in *Z. jucunda*.

**Description**.—Perennial herb, seasonally dormant, up to 800 mm tall, glabrous. *Tuber* subglobose. *Cataphylls* 2, broad at base, tapering towards apex, margins folding inwards, mottled with purple at base on outside, white on inside. *Leaves* several, radical, up to 800 mm long, petiolate; petioles 100–300 mm long, with well-developed long sheath, base sometimes mottled with purple or white, sometimes with trichomes; blade triangular-hastate, 170–300 mm long, 50–150 mm wide across base, dark green, densely speckled with long, white, translucent spots, apex acute with a subulate tip, length of blade above basal lobes usually less than twice the width. *Inflorescence* appearing with leaves, 1 or 2 per plant. *Peduncle* long, subequal to longer than leaves, plain green or mottled with purple at base. *Spathe* a cup-shaped funnel, 100–160 mm long, limb spreading, slightly recurved backwards and tapering to a subulate tip, chrome-yellow, cream-coloured, creamy yellow or lemon-yellow, dark purple at base within, persistent in fruiting. *Spadix* cylindrical, tapering towards apex, shorter than spathe, 30–40 mm long; monoecious, apical part staminate, 20–25 mm long; basal part pistillate, ± 25 mm long, staminodes none. *Flowers* densely crowded, without a perianth, unisexual. *Male flowers* with stamens free; anthers 2 or 3, sessile, oblong, laterally compressed, dehiscing by apical pores; pollen white, extruded in a long, fine thread. *Female flowers* consisting of naked ovaries, ± 24 in number, spirally arranged; ovary ovoid, sessile, 3-locular; ovules 5–8 per locule; style short, ± 0.5 mm long; stigma truncate, covered by stigmatic papillae. *Berries* clustered, obovoid, 10–20 mm in diameter, mucilaginous, few- to many-seeded, green when ripe. *Seed* ovoid, verrucose, cream-coloured, viscid. Plate 2221.

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Y. SINGH*, C. CRAIB** and GILLIAN CONDY***

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* KwaZulu-Natal Herbarium, South African National Biodiversity Institute, P.O. Box 52099, Berea Road, 4007 South Africa.
** P.O. Box 67142, Bryanston, 2021 South Africa.
*** South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

# *Ornithogalum cremnophilum* Hyacinthaceae

*South Africa*

**Ornithogalum cremnophilum** *(Van Jaarsv. & A.E.van Wyk) J.C.Manning & Goldblatt* in Manning et al. in Edinburgh Journal of Botany 60: 547 (2004). *Albuca cremnophila* Van Jaarsv. & A.E.van Wyk: 73 (1999).

The species featured here is one of about 200 members of *Ornithogalum* (Manning *et al.* 2004). This genus, here treated in a broad sense to include, amongst others, also the genera *Albuca*, *Dipcadi*, *Galtonia*, *Neopatersonia* and *Pseudogaltonia*, has a wide distribution, mainly in Africa, Madagascar, Saudi Arabia, the Mediterranean and India. In South Africa, there is a concentration of species especially in the winter-rainfall areas of the Western and Northern Cape Provinces, as well as in the Eastern Cape.

The radical incorporation of several traditionally recognised genera under *Ornithogalum* by Manning *et al.* (2004) reflects the particular philosophical assumptions and procedures of a strict phylogenetic classification (Judd *et al.* 2002). Evolutionary classification is an alternative approach and one that gives due recognition to the morphological specialisation associated with particular evolutionary clades (Mayr & Ashlock 1991), even if the resultant taxa are paraphyletic (Brummitt 2003; Nordal & Stedje 2005). Proponents of the latter approach, to which we belong, would prefer to recognise the segregate genus *Albuca*, the genus under which the species treated here is alternatively placed. Choice of classification system is the prerogative of the user of a plant name and although we would prefer to refer to our plant as *Albuca cremnophila*, we treat it here as an *Ornithogalum* to satisfy editorial preference.

Ornithogalums occur in most vegetation types in South Africa but are found more commonly in the Succulent Karoo and Fynbos (strandveld, renosterveld) Biomes. In the winter-rainfall parts, they are summer-deciduous, but some species in the eastern regions of South Africa are evergreen. *Ornithogalum* is also well represented in grassland and thicket vegetation, on flats and hills, often in rocky places. The plants vary from very small (only a few millimetres high) to large and robust, such as *O. nelsonii* with leaves up to 600 mm long. The inflorescence of *O. clanwilliamae-gloria* from the Western Cape is up to 2 m tall! Leaves in the genus are mainly soft and narrow and arranged in rosettes, whereas the bulbs are mainly subterranean, though epigeous in a few species.

There are ± 140 species of *Ornithogalum* in South Africa and Namibia. *O. cremnophilum* is one of six members of the *Albuca* group of species confined to

PLATE 2222.—Part of habit, showing leaves, infructescence and inflorescence, all × 0.7. Voucher specimen: *Van Jaarsveld 12171* in Compton Herbarium, Kirstenbosch. Artist: Tamlin Blake.

PLATE 2222 *Ornithogalum cremnophilum*

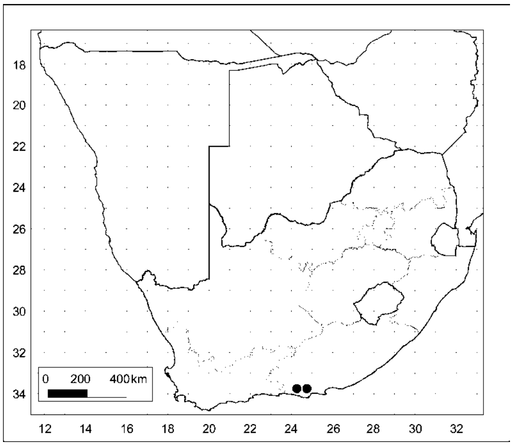

FIGURE 1.—Known distribution of *Ornithogalum cremnophilum*.

cliff faces or very inaccessible steep slopes, the others being *O. battenianum*, *O. crudenii*, *O. fastigiatum*, *O. shawii* and *O. thermarum*. *O. cremnophilum* is restricted to the sheer cliffs of the main tributaries of the Gamtoos River, namely the Kouga River to the south, the Baviaanskloof River in the northeast and the Grootrivier in the north (Figure 1). The closely related *O. battenianum* occurs on coastal cliffs and steep shale slopes, from the Kei to the Bashee River. Both these evergreen Eastern Cape species are cluster-forming, have epigeous or semi-epigeous bulbs with truncate tunics and bear erect, secund flowers, but here the resemblance ends. *O. cremnophilum* has spreading rosettes (solitary or forming clusters of up to three rosettes) of long, deeply channelled, very firm, pendent, succulent leaves. The leaves are dark green and tightly convolute, with the margins often touching and thus appearing cylindrical but terete towards the tips. The outer tepals are white, the inner tepals distinctly yellow-tipped. *O. battenianum*, on the other hand, has ascending rosettes of dense clusters of flattened, spreading leaves about 30 mm in diameter that are flaccid and slightly channelled at the base. The inflorescences are shorter than in *O. cremnophilum* and the tepals are white.

Our species grows at altitudes of 300–600 m and appears to be endemic to mineral-poor quartzitic sandstone cliffs (Table Mountain Group, Cape Supergroup) above the three river valleys in the Eastern Cape. Plants are scattered and the species is never common. In its shady, south-facing cliff habitat it is found together with *Aloe perfoliata*, *A. striata*, *Haemanthus albiflos*, *Bulbine latifolia*, *Crassula lactea*, *C. pellucida* subsp. *marginalis*, *C. perforata*, *C. perfoliata* var. *minor*, *Delosperma rogersiae*, *Lampranthus affinis*, *Othonna carnosa*, *O. triplinervia* and *Tromotriche baylissii.*

Temperatures in the habitat are mild to hot in summer, with an average daily maximum of 24–27°C. Winters are cooler but frost is rare or absent. It rains in summer and winter, with an average rainfall of 200–300 mm per year in the form of thundershowers and cyclonic winter rain. Although *Ornithogalum cremnophilum* flowers mainly in spring (October and November), it sometimes also flowers at other times of the year, especially after sufficient rain. The seeds are normally released towards the end of November or early December and are dispersed by the wind.

*Ornithogalum cremnophilum* and *O. battenianum* are both grown in large containers in the Botanical Society Conservatory at Kirstenbosch. *O. cremnophilum* is slow-growing, retaining its drooping rosettes and yellow-tipped inner tepals, but the flowers are not as conspicuous as in *O. battenianum*. The latter forms dense, subglobose clusters and bears very conspicuous, attractive white flowers, drawing much attention from visitors. In both species, the flowers have long, erect pedicels, up to 120 mm long at the base of the raceme and becoming shorter towards the apex.

Many species in the *Albuca* group, for example *Ornithogalum nelsonii*, have horticultural value but the horticultural potential of many others has not been fully exploited. *O. cremnophilum* is easily grown from seed or by division. The seed should be sown in shallow seed trays in sandy soil, covered with a thin layer of sand and kept moist. The best time is in spring or summer. Germination can be expected within three weeks. The seedlings have terete leaves which only later become channelled. They can be planted out into individual containers after a year. The plants develop an extensive root system and the container should provide sufficient space. It is a drought-tolerant species.

**Description**.—Evergreen, epigeous (rarely hypogeous) bulbous plants, solitary or forming small clusters. *Bulb* ovoid, 90 × 50–60 mm; tunics fleshy, grey-green, imbricate, truncate at tips. *Roots* fleshy, white, up to 3 mm in diam. *Leaves* in an apical rosette, drooping, succulent, firm, linear-attenuate, 30–1000 × 20–30 mm, dark green, glabrous, canaliculate, becoming terete towards tip, apex acute. *Inflorescence* a spreading to pendulous raceme up to 2 m long; peduncle up to 250 mm long; bracts acuminate, membranous, margin translucent; lower bracts up to 110 × 13 mm, gradually becoming smaller distally; pedicels erect, 35–50(–80) mm long (exceptionally 120 mm) becoming smaller distally (35 mm). *Flowers* secundly arranged, 20–25 mm long, dense, erect; outer tepals linear-obovate, 20–25 × 7–8 mm, white with green median portion; inner tepals ovate, 18–20 × 8–10 mm, white with hooded yellowish apex. *Filaments* 13 mm long, 2.5 mm in diameter at base. *Ovary* shortly stipitate, 6 mm long, 4 mm in diameter at base, 3-angular, basally each angle with raised twin tubercles; stigma linear-trigonous, 10 × 2 mm. *Capsule* 15 × 9 mm. *Seed* flat, 4 × 3 mm. Plate 2222.

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E.J. VAN JAARSVELD*[†], A.E. VAN WYK** and TAMLIN BLAKE***

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* Kirstenbosch National Botanical Garden, South African National Biodiversity Institute, Private Bag X7, Claremont, 7735 South Africa.

[†] Student affiliation: Department of Botany, University of Pretoria, University of Pretoria, Pretoria, 0002 South Africa.

** H.G.W.J. Schweickerdt Herbarium, Department of Botany, University of Pretoria, University of Pretoria, Pretoria, 0002 South Africa.

*** P.O. Box 491, Riebeeck West, 7306 South Africa.

# *Ledebouria ovatifolia* subsp. *scabrida* Hyacinthaceae

*KwaZulu-Natal, South Africa*

**Ledebouria ovatifolia** (*Baker*) *Jessop* subsp. **scabrida** *N.R.Crouch & T.J.Edwards*, subsp. nov., a subspecie typica papillis multicellularibus apicibus purpireis in pagina superiori foliorum et caulibus distinctis basalibus in bulbis differt.

TYPE.—KwaZulu-Natal, 2830 (Dundee): alongside road in hilly country 25 km from Muden towards Weenen, (–CC), (28°55′53.04″ S, 30°15′13.86″ E), September 2005, *Edwards & Crouch 3260* (NU, holotype).

While agreement on the number of genera and even subfamilies in the Hyacinthaceae worldwide has by no means been reached (Speta 1998; Pfosser & Speta 1999; Stedje 2001; Manning *et al*. 2004), consensus on the existence of approximately 900 species could likely be attained. This family of petaloid monocots is represented by three subfamilies in the *Flora of southern Africa* (*FSA*) region, one of two global centres of diversity (Speta 1998). The largest local subfamily is the Hyacinthoideae, comprising two tribes, the Massonieae, and the monotypic and highly restricted Pseudoprospereae. *Ledebouria*, with approximately 35 species, is the most widespread of the Massonieae genera represented in South Africa—it occurs from the *FSA* region throughout sub-Saharan Africa into northern Madagascar and the southern tip of India.

Since the genus *Ledebouria* was reinstated from *Scilla* on the basis of its stipitate ovary (Jessop 1970), a broader concept including both *Drimiopsis* and *Resnova* has been proposed (Manning *et al*. 2004). Regardless of one’s stance on this recent position, the subject of this account remains in *Ledebouria*. Jessop (1970) found floral characters highly useful in delimiting genera within the scillas, but much less so in circumscribing species. He noted that a number of vegetative characters used historically to delimit species had proven unsatisfactory. In particular, the purple markings of the leaves and leaf presentation (elevation and shape) are highly inconsistent, even within single populations. Subsequent investigations found the micromorphology of the adaxial leaf surface diagnostic for many species. Of the 15 South African species recognised by Jessop (1970), only three were recognised as well delimited by Venter (1993)—two of them (*L. hypoxidoides* and *L. viscosa*) partly on account of their leaf surface characters, and the third, *L. ovatifolia*, the type of which has a smooth fleshy leaf texture (Baker 1870). Subsequently, Venter & Edwards (1998) have described the narrow endemic *L. parviflora*, citing its unusual indumental character as diagnostic. Similarly, Edwards & Venter (2003) considered the corrugated upper leaf surface a valid character when they raised the

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PLATE 2223.—1, habit (in fruit), × 1; 2, leaf, lower surface, × 0.5; 3, papillae, upper leaf surface, × 10; 4, inflorescence with emerging leaves, surrounded by the shrivelled leaves of the previous season, × 1.5. Voucher specimen: *Edwards & Crouch 3260* in the herbarium of the University of KwaZulu-Natal, Pietermaritzburg. Artist: Angela Beaumont.

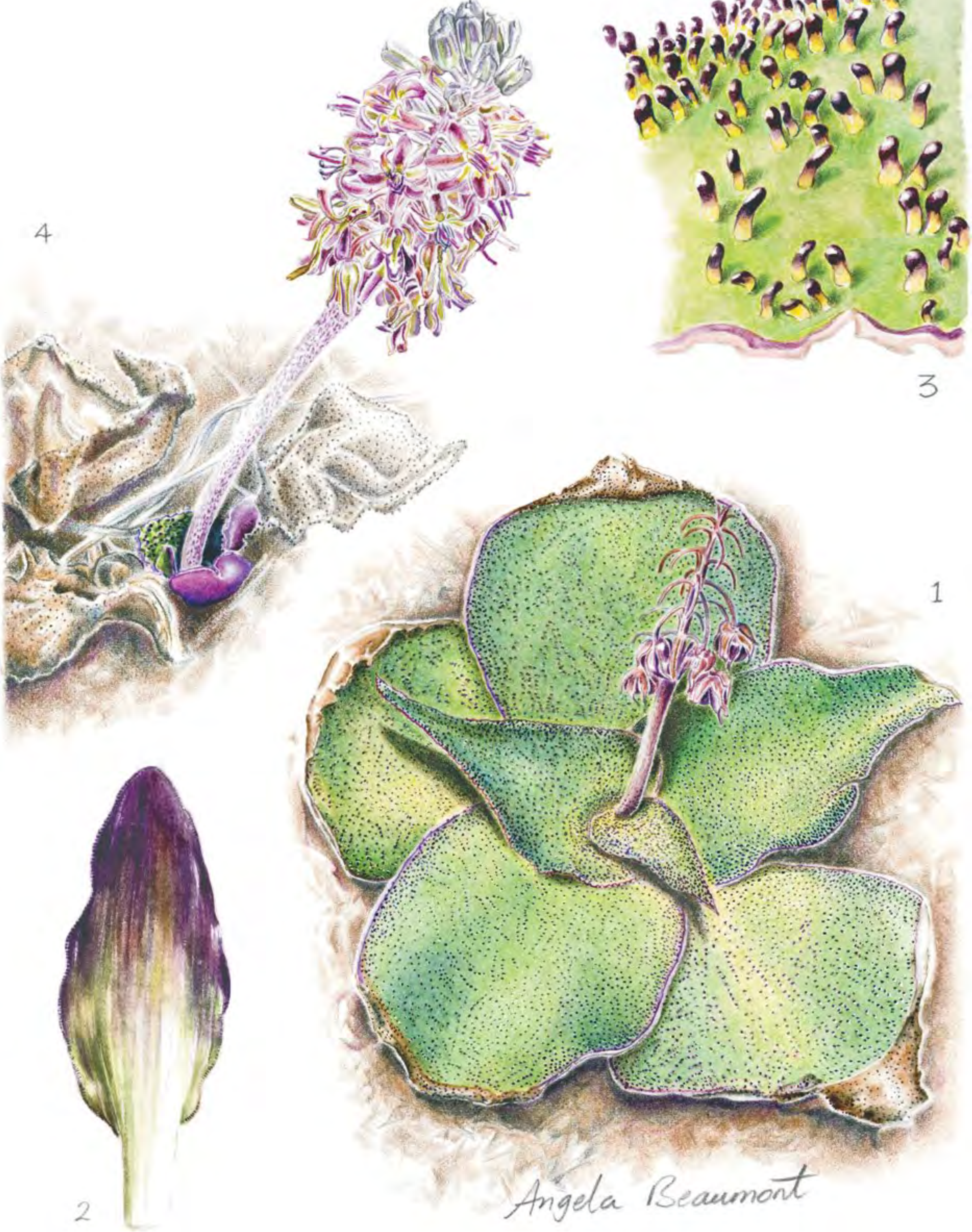

PLATE 2223 *Ledebouria ovatifolia* subsp. *scabrida*

narrow Wolkberg endemic *L. galpinii* from synonymy to species status. In a genus with rather conservative floral structures (Jessop 1970), except ovary form, ciliate or papillate leaf textures are important taxonomically for they are consistent and stable under a range of environmental conditions (Venter 1993; Venter & Edwards 1998). Despite its unremarkable leaf texture, Jessop considered *L. ovatifolia* to be one of the very few species to be well defined by qualitative characters—truncate bulb scales that produce copious threads on tearing—and this after relegating several entities to synonymy. A number of these names were first published in *The Flowering Plants of South Africa* by Van der Merwe (1944a, b), who at one time had intended to revise the regional *Scilleae*.

*Ledebouria ovatifolia* subsp. *scabrida* was discovered at Muden in October 2004. The ledebouria was found in fruit, growing interspersed with *Aloe vanrooyenii*. On returning to the site in September of the following year, flowering plants were found, and a type specimen was prepared. Other geophytes growing with the new taxon included *Drimia multisetosa*, *Albuca setosa*, *Hypoxis hemerocallidea* and *Cyrtanthus contractus*. Associated trees were *Acacia natalitia*, *Tarchonanthus camphoratus* and *Rhus pentheri*. Plants of subsp. *scabrida* are currently known only from this locality (Figure 1), with population numbers possibly limited to several hundred—a thorough survey is still required in midsummer when these deciduous plants are in full leaf. No other ledebourias were encountered during the two visits to the thornveld savanna locality, where the new taxon was found in shallow soils overlying dolerite. The exact proximity of the nearest population of subsp. *ovatifolia* is not known, although it is evidently within a 25 km radius (*Acocks 13863*, in National Herbarium, Pretoria). Nearby settlements are limited but they are close (within 500 m) and could possibly expand or trampling livestock could be introduced. Such close human habitation may bring plants into contact with medicinal plant harvesters, who, given the popularity of the typical subspecies in the ethnomedicinal plant trade (Cunningham 1988), are likely to undertake highly destructive harvesting.

The typical subspecies is distributed evenly throughout the north-eastern region of South Africa and within communities it is often common. The species occurs at altitudes of 155 to 2 200 m, in both moist and xeric habitats, and in edaphically diverse substrates that include dolerites (*Mogg 1491*, in National Herbarium, Pretoria). Subspecies *scabrida* is distinguished by the presence of prominent papillae on the upper leaf surface. This character is stable within the type population and under cultivation, although seedlings are initially less papillate. The evenly

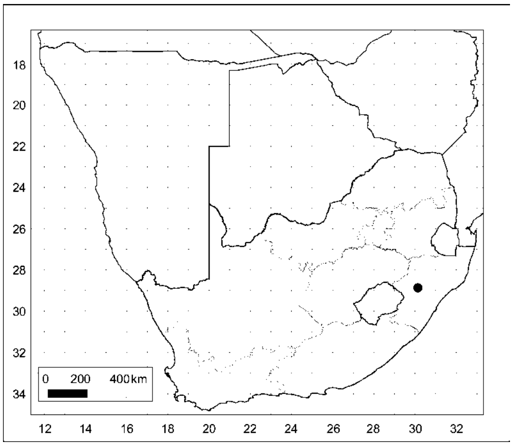

FIGURE 1.—Known distribution of *Ledebouria ovatifolia* subsp. *scabrida*.

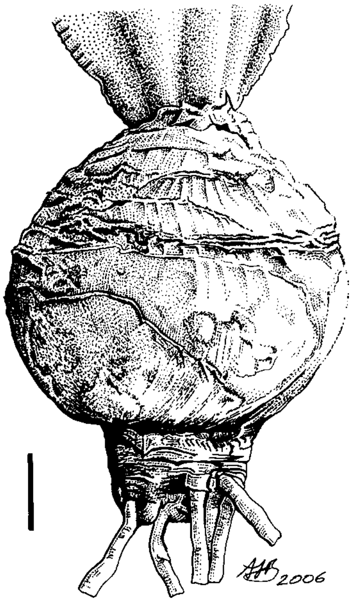

FIGURE 2.—The bulb of subsp. *scabrida* often has a basal stem up to 15 mm long, a rare feature in *Ledebouria*. Voucher specimen: *Edwards* & *Crouch 3260* in the herbarium of the University of KwaZulu-Natal. Artist: Angela Beaumont. Scale bar: 10 mm.

spaced papillae are purple-tipped and multicellular. They bestow the leaves of this taxon with a rough, scabrid texture. In all other respects the taxon conforms to the circumscription for *Ledebouria ovatifolia* (Baker 1870; Van der Merwe 1941; Venter 1993), including the production of copious threads in the bulb scales when torn (Badenhuizen 1954). However, one character warrants further mention and investigation: bulbs of subspecies *scabrida* often possess a basal stem (Figure 2) up to 15 mm long, a feature rare in the genus (Venter 1993) and not recorded for the typical form. The purple-green inflorescences are unremarkable on account of their small size and are easily overlooked in the field, especially as the leaves are only partly synanthous. Plants are maintained without difficulty in pot culture in a well-drained medium (two parts river sand to one part compost) when positioned in full sun. Avoid watering in winter between April and July.

The genus was named for Karl Friedrich von Ledebour (1785–1851), sometime Professor in Dorpat, Estonia; the specific epithet *ovatifolia* is derived from the Latin *ovata* and *folia* for its ovate or egg-shaped leaves, and the subspecies name from the Latin *scabrida* in reference to the characteristically rough upper leaf surface.

**Description**.—Perennial, deciduous, summer-growing, plants solitary. *Roots* white, terete, succulent. *Bulb* ovoid, hypogeal, 40–45(–54) × 40–46 mm; apex truncate; bulb scales fleshy, with copious threads when torn, white to pink inside; bulb plate extending 10–15 mm. *Leaves* just emerging at anthesis, 4 or 5, spreading, mostly appressed, ovate, 122–132 × 45–51 mm, with threads when torn, fleshy; adaxial surface green, densely papillate, papillae evenly spaced, yellow-green, tipped purple, 0.3 mm high, becoming more pronounced towards apex; abaxial surface glossy, green to purple, with occasional scattered purple papillae; venation obscure; margin scarious, purple to white; base canaliculate; apex acute. *Inflorescences* 1–4, densely racemose, 30–40-flowered, flaccid, ovoid, 35–45 × 25–30 mm, as long as leaves; scape basally compressed, 24–26 mm long, purple-green, with purple papillae towards base; rachis ridged, 26–30 mm long. *Bracts* membranous, 1 × 0.5 mm, linear, pink with minute bracteoles. *Flowers* small, close packed; pedicels spreading, 8–11 mm long, white. *Tepals* equal, oblong, fused at base, recurved when mature, closing around fruit, 5–8 × 1.5 mm, dusty pink, with a green keel; apex rounded. *Stamens* erect, 4.5 mm long; filaments purple, basal third green, epitepalous; anthers 0.7 mm long, cream-yellow. *Pistil* slightly longer than stamens; ovary superior, cylindrical, 6-lobed, 1.75 × 3 mm, lobes narrowly ellipsoid, apex forming shoulders; style 5 mm long, purple, basal third green, glabrous;

stigma presented above anthers; stipe 1 × 0.75 mm. *Capsule* 3-lobed, symmetrical, globose; base truncate. *Seeds* globose, surface strongly wrinkled, brown, 3–4 mm long. Plate 2223.

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N.R. CROUCH*, T.J. EDWARDS** and ANGELA BEAUMONT**

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* Ethnobotany Unit, South African National Biodiversity Institute, P.O. Box 52099, Berea Road, 4007 South Africa / School of Chemistry, University of KwaZulu-Natal, Durban, 4041 South Africa.

** School of Biological and Conservation Sciences, University of KwaZulu-Natal, Private Bag X01, Scottsville, 3209 South Africa.

# *Nerine pudica* Amaryllidaceae

*South Africa*

**Nerine pudica** *Hook.f.* in Curtis's Botanical Magazine 27: t. 5901 (1871); Baker: 101 (1888); Baker: 212 (1896).

*Nerine*, among several South African genera of geophytes, has held the attention of plantsmen from as early as the 17th century until the present. During this time their beautiful, long-lasting blooms have become so valued as garden ornamentals and cut-flowers that they currently qualify as some of the most sought after bulbous plants. Despite their importance in the horticultural industry, however, our knowledge of *Nerine* in the wild remains far from complete. Recent estimates of the number of *Nerine* species vary from 31 (Norris 1974) to 25 (sensu A.A. Obermeyer in Arnold & De Wet 1993 and Snijman & Archer 2003), a disparity that clearly shows the need for a detailed revision of the genus. To date 24 *Nerine* taxa have been illustrated in *Flowering Plants of Africa*. Featured here is one of the most poorly known species, *N. pudica*.

*Nerine pudica* was first described in 1871 by Sir Joseph Dalton Hooker, while serving as Director of the Royal Botanic Gardens, Kew, from 1865 to 1885. The aptly chosen name '*pudica*' means bashful, which alludes to the plants' somewhat demure flowering habit. The flowers are often slightly nodding and their tepals overlap for two thirds to three quarters of their length, rendering the perianth somewhat regular and trumpet-shaped. As a result, the sexual organs—the stamens and style—are more concealed than those in other *Nerine* species.

In addition to its unusual floral form, *Nerine pudica* is set apart in the genus by having exceptionally broad, lanceolate tepals, reaching 9–10 mm across in the upper third. Furthermore, the tepals are plane-edged with virtually no crisping and they are almost pure white, except for the delicate longitudinal pink streaking down the middle (see the accompanying plate and Manning *et al.* 2002: 312, figure bottom left).

Hooker's (1871) original description of *Nerine pudica* was based on a plant of unknown origin that flowered at Kew in 1868. Remarkably, no further information on the species came to hand until May 1925 when J. Dunston collected a few wild plants from the Western Cape mountains north of Genadendal, near Caledon, which resembled the original description and illustration of *N. pudica* almost perfectly. Apparently he was aware of the significance of his discovery because he made a more complete collection in April 1926. Both collections are preserved in the Bolus Herbarium, where they are mounted on a single sheet (*BOL89422*).

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PLATE 2224.—1, inflorescences, × 1; 2, mature bulb and foliage, × 1; 3, infructescence, × 1; 4, germinating seed, × 1. Voucher specimen: *Snijman 1918* in Compton Herbarium, Kirstenbosch. Artist: Auriol Batten.

PLATE 2224 *Nerine pudica*

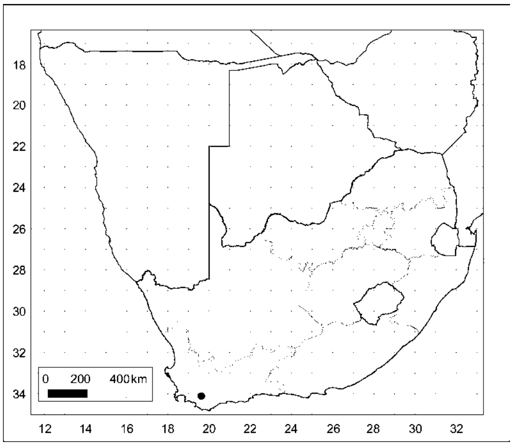

FIGURE 1.—Known distribution of *Nerine pudica*.

The known geographical distribution of our species is shown in Figure 1. In addition to the mountains near Caledon, Norris (1974) described the species as present in the high mountains above Stellenbosch. He appears to have inferred this distribution from a collection made by A.G.J. (Hans) Herre at Jonkershoek, Stellenbosch (*BOL89423*), that is lodged in the Bolus Herbarium under the name *Nerine pudica*. Although it lacks a collection date, it is probable that the collection was made some time before Hans Herre died in 1979 at the age of 84. Thus Norris, who visited the herbaria in Cape Town to study *Nerine* in 1971, probably did not see the specimen alive. It consists only of a dissected flower with its parts separately laid out on a gummed card and as such, is too incomplete to be confidently identifiable as *N. pudica*. It is quite possible that Norris may have assumed that the flower belonged to an inflorescence of *N. pudica* that is mounted next to it on the same sheet (*BOL27993*). This, however, bears a label which reads ‘ticket lost, May 1925, comm. R.H. Compton’.

Almost 50 years passed before the next collections of *Nerine pudica* were made and lodged in the Compton Herbarium, namely *M. Richfield s.n.* (*NBG173013*) in 1970, *J.A. Oakes & N.W. Oakes s.n.* (*NBG198759*) and *J.C. Paterson-Jones 40* in 1989, and *D.A. Snijman 1918* in 2004. All the plants originate from the Riviersonderend Mountains above the small village of Genadendal, which was established as a Moravian mission by George Schmidt in 1738 (Pettman 1931). The populations of *N. pudica* are found amongst scattered sandstone rocks on steep, relatively moist, south-facing slopes at altitudes of about 460–640 m. Although stimulated to flower in their hundreds after summer fires, the plants nevertheless continue to produce flowers in the intervening seasons, albeit less profusely. Flowering is limited to autumn, either just prior to leafing or when the new foliage begins to emerge. About a month later, the mature seeds fall from the delicate, membranous capsules and the green embryo promptly ruptures the seed coat and pushes the cotyledon’s sheathing base and radicle into the soil. Soon afterwards the first leaf emerges and helps the seedling establish a small bulb. The leaves are fully produced before midwinter and remain green until the onset of the dry summer season. As in most *Nerine* species, the shape of the infructescence in *N. pudica* is unspecialised. The seeds fall directly onto the ground and then may roll or be washed a short distance away from the parent plant.

To date, the best available taxonomic overview of *Nerine* is that of Norris (1974) who recognised 12 informal groups of species, based on vegetative and floral morphology. In his scheme, Norris treated *N. pudica* alone due to its unusual floral form. He nevertheless pointed out several similarities between *N. pudica* and *N. humilis*, namely: the scape is roundish in cross section; the scape and pedicels lack pubescence; and the bases of the filaments are without appendages. Although these shared features are not derived characters, Norris nevertheless took them to reflect an affinity between *N. pudica* and *N. humilis*. This alliance was also suggested by Zonneveld & Duncan (2006) in their study on the genome size in *Nerine*, but in contrast to the concept proposed here they considered *N. pudica* to be a variable species comprising plants from Worcester and Greyton.

In the past, nerines found on the lower slopes in the Bains and Du Toits Kloofs, between Paarl and Worcester, have repeatedly been referred to as *Nerine pudica* (Bond & Goldblatt 1984; Goldblatt & Manning 2000a; Manning *et al*. 2002). However, recent critical study of specimens from the winter-rainfall region of southern Africa has brought the identities of plants from these populations into question. They are similar to plants of *N. pudica* from the Riviersonderend Mountains in having somewhat broad, almost smooth tepals, but they differ from typical *N. pudica* in that the flowers are pink and held horizontally. Furthermore, the tepals stand apart from each other and all but the lowest tepal flare upwards. In addition, the tepals are at most 5–7 mm wide (compared with 9–10 mm in *N. pudica*) and the edges are distinctly crisped towards the tips rather than being almost entirely smooth. These specimens are thought to resemble *N. tulbaghensis*, which is currently placed in *N. humilis*, and are sufficiently different from *N. pudica* to be considered as incorrectly named in the past.

The pollination ecology in *Nerine* species is generally poorly known except for a few species. *Nerine sarniensis* belongs to a guild of red-flowered, summer-flowering plant species that are pollinated by the swift-flying Satyrid butterfly *Aeropetes tulbaghia*, commonly known as the Mountain Pride or Table Mountain Beauty (Johnson & Bond 1994). This is in contrast to *N. bowdenii* and possibly *N. angustifolia*, both characterised by wide open pink flowers and upwardly flared tepals bearing dark pink median stripes, which are pollinated by the long-proboscid flies *Prosoeca ganglbaueri* and *P. robusta* respectively (Goldblatt & Manning 2000b), which belong to the Nemestrinidae, a family commonly known as the tangle-veined flies. *Nerine marincowitzii* is the least specialised in being pollinated by honeybees (Snijman & Ward-Hilhorst 2003). The distinctive floral form and colour of *N. pudica* suggests the exploitation of another pollination system, possibly by solitary bees in the genus *Amegilla*, which are known to pollinate similar-looking species of *Gladiolus* in the region (Goldblatt *et al*. 2001), but its pollination biology is yet to be studied.

Although *Nerine pudica* is considered to be naturally rare (Snijman & Victor 2004), its montane habit is free of the threats that increasingly impact on Cape plants of the coastal lowlands. Of the six *Nerine* species that are currently considered to face a high risk of extinction, most are in the Eastern Cape.

Despite having been introduced into England in the 19th century, *Nerine pudica* has failed to gain popularity with *Nerine* growers in Britain and Europe, probably because of its modest habit. In South Africa, *N. pudica* is similarly poorly known amongst bulb growers. The only horticultural notes available for the species were made by Duncan (2002) based on experience of plants grown at Kirstenbosch National Botanical Garden, Cape Town. However, the identity of these plants (shown in Duncan 2002: 19) remains uncertain as they are more floriferous than any of the collections from the wild and the flowers have nonoverlapping tepals. Since the accession data indicated that the cultivated bulbs originated from Greyton close to Genadendal, the local residents with an interest in plants were approached for their assistance in finding populations of *Nerine* that were so floriferous. The only plants found, were some nerines that have been in cultivation in Greyton for more than 30 years (see *Meirhans s.n. NBG198772*). Although the origin of these plants is unknown, they are believed to have come from a deceased resident of Genadendal who may have selected and propagated an atypical form of *N. pudica* or hybridised wild plants of *N. pudica* with those from other species in his bulb collection.

The typically winter-growing *Nerine pudica* should respond well to the cultivation methods that suit other winter-growing species of the genus. As has been described by Duncan (2002), the bulbs of the winter-growing species are best grown in pots that receive morning sun and afternoon shade. Terracotta pots are recommended for places with a wet growing season, whereas plastic containers are more suitable in regions with a fairly dry climate. Like most species with bulbs that grow close to the surface, the pots do not have to be particularly large—a 20 cm diameter pot is ideal. The growing medium should combine good water-holding capacity with excellent drainage and should ideally be slightly acid or neutral. The base of the pot should be covered with a layer of stone chips or crocks followed by a 20 mm layer of compost, in which the roots can grow. The remaining space, in which the bulbs can rest with their necks partially exposed, should be filled with equal parts of sand and finely sifted compost. It is important to keep the plants dry during summer but they require regular, heavy watering at two-weekly intervals from midautumn until late spring. Once planted, the bulbs should be left undisturbed unless the pots become overcrowded. Additional feeding induces luxuriant leaf growth rather than flower production, so it is not recommended.

Referred to as recalcitrant, the spherical, fleshy seeds can be treated like those of *Brunsvigia*, *Crossyne*, *Hessea*, *Namaquanula* and *Strumaria*. As soon as the capsules break open, the seeds must be sown, preferably in deep seed trays filled with the same medium that suits mature bulbs. The seeds have to be thinly covered with soil and well watered, taking care not to disturb them. Once the first leaf appears, the seedlings should be watered every two weeks until the onset of summer. After two years, the young plants should be ready to be moved into pots. *Nerine pudica*, whose flowers are somewhat reminiscent of those of a miniature *Amaryllis belladonna*, should be a rewarding addition to any *Nerine* grower’s collection as they provide an excellent foil for the more commonly grown *Nerine* species.

**Description**.—Perennial, deciduous, bulbous herb, 200–400 mm high. *Bulb* solitary, globose, up to about 30 mm in diameter, covered with brown, parchmentlike tunics, cream-coloured and fleshy within, extended into a slender neck ± 35 mm long. *Leaves* 3, distichous, emerging at or shortly after flowering, suberect to spreading, narrowly lorate, 180–250 × 5–6 mm, slightly channelled, smooth, adaxial surface green, abaxial surface paler green, not flushed reddish maroon towards base. *Inflorescence* solitary, 1–4-flowered, 70–100 mm across, somewhat secund; scape straight, erect, 200–400 × 2–3 mm, pale green or finely mottled with brownish red, becoming solid brownish red proximally; spathe valves 2, lanceolate, 20–32 × 2.5 mm, membranous, becoming papery, rose-red; bracteoles 1–4, filiform, 6–20 mm long, white to pale pink. *Flowers* spreading horizontally or somewhat nodding, slightly zygomorphic, trumpet-shaped, 25–30 mm across above, white, with 6 delicate pink median stripes leading up the throat often extending to tips, base occasionally cream-coloured, entirely flushed pink when old, producing nectar; scent acrid. *Pedicels* straight, 12–30 × 1.5–2.0 mm, terete, spreading to suberect, pale green to pinkish brown, smooth, elongating to 30 mm in fruit. *Tepals* 6, free to base, oblong-lanceolate, 25–44 × 9–10 mm at ± two thirds above base, the two whorls overlapping for ± two thirds of their length, lacking prominent midrib, slightly recurved apically, lateral and lower tepals not falcate and upturned, becoming channelled with age; outer tepals fused to filament tube at base; inner tepals fused to filament tube for ± 4 mm; margins plane, rarely slightly undulate towards tip; apex mucronulate. *Stamens* 6, tightly clustered, closely surrounding style, placed close to lower tepal at anthesis, 25–35 mm long, shorter than tepals, the outer ± 5 mm longer than the inner; filaments connate for up to 2.5 mm at base, without appendages, straight and white, becoming upcurved and flushed pink apically at anthesis; anthers oblong, dorsifixed, latrorse, dehiscing longitudinally, 5–7 × 1.5 mm and maroon before opening; pollen whitish. *Ovary* spheroidal, 2–4 mm in diameter, glabrous, brownish red, trilocular, with ± 6 ovules per locule; style up to 30–40 mm long, slender, exceeding tepals and stamens, straight at anthesis then curving upwards apically, white, shading to pale pink distally; stigma shortly tricuspidate and minutely papillate when mature. *Capsule* thinly papery, 12 × 8 mm, loculicidally dehiscent, rapidly outgrown by seeds. *Seeds* ellipsoidal, succulent, 6 × 4 mm, green. Plate 2224.

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D.A. SNIJMAN*, J.C. MANNING* and AURIOL BATTEN**

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* Compton Herbarium, South African National Biodiversity Institute, Private Bag X7, Claremont, 7735 South Africa.

** 33 Union Avenue, Selbourne Extension, East London 5201, South Africa.

# *Hypoxis sobolifera* Hypoxidaceae

*South Africa*

**Hypoxis sobolifera** *Jacq.* in Collectaneorum supplementum: 53 (1796), with illustrations in Icones plantarum rariorum: t. 372 (1788); Ker Gawler: t. 711 (1804); Schultes & Schultes: 764 (1830); Fischer & Meyer: 51 (1846); Nel: 309 (1914).

*Hypoxis* is a diverse group of geophytic herbs characterised by hairy leaves and yellow (seldom white) star-shaped flowers. Species identification is generally difficult and based on geographical range and a combination of often subtle morphological, phenological and ecological differences. The genus comprises about 90 species, more than half of which are confined to Africa. Smaller centres of diversity are located in Australia and the Americas (mainly North America), with a single species in Asia.

In Africa, *Hypoxis* ranges from the Western Cape in South Africa through central Africa and beyond into western Africa, Ethiopia and Egypt, the bulk of the species being concentrated in sub-Saharan Africa. With about 30 species (22 endemic), the *Flora of southern Africa* region (South Africa, Lesotho, Swaziland, Namibia, Botswana) is the most species-rich centre for the genus, not only in Africa, but worldwide. A significant secondary centre of diversity with about 15 species is located in tropical East Africa (Wiland-Szymańska, pers. comm.), a large proportion of them endemic to the Eastern Arc Mountains of Tanzania (Lovett & Wasser 1993; Schipper & Burgess 2004).

The geographical range of *Hypoxis* in Africa reflects a temperate rather than tropical affinity and the genus is considered a typical afromontane floristic element. Biogeographically most African members of the genus are associated with grassland of the Afromontane Archipelago-like Regional Centre of Endemism (White 1983). This is a plant-geographical region (phytochorion) associated with the isolated, often widely scattered ‘islands’ of moist, temperate, high-altitude habitat throughout the African continent, therefore the designation ‘archipelago-like’.

Physiognomically the afromontane region consists mainly of grassland and forest. These two vegetation types have floristically little in common and may represent two distinct plant-geographical regions that coincidentally happen to occupy the same climatic refuge (Van Wyk & Smith 2001). The afromontane vegetation is believed to have covered much more extensive areas of the continent during cool, moist periods in the past. In fact, this plant-geographical region may well comprise

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PLATE 2225.—1, habit, × 1; 2, outer tepal, abaxial surface, × 3; 3, inner tepal, abaxial suface × 3; 4, stamen, × 5; 5, bract, × 1.5; 6, seed, × 15; 7, section of leaf, × 6; 8, bifurcate hair, × 13; 9, stellate hair, × 11. Voucher specimens: *Singh 576* (1–8) and *Singh 622* (9) in KwaZulu-Natal Herbarium, Durban. Artist: Gillian Condy.

PLATE 2225 *Hypoxis sobolifera*

the largest assemblage of ancient persistent floristic elements on the African continent (White 1978, 1981; Burgoyne *et al.* 2005).

The core area of *Hypoxis* diversity in Africa coincides with the Eastern Afromontane (Brooks *et al.* 2004) and Maputaland-Pondoland-Albany (Steenkamp *et al.* 2004) Hotspots. The term Hotspot refers to 34 major foci of endemism, at a global scale, all of which feature exceptional concentrations of species with high levels of endemism, and which also face exceptional threats of destruction (Myers *et al.* 2000; Mittermeier *et al.* 2004). Of the five other African Hotspots, *Hypoxis* has a noteworthy centre of diversity and endemism in only one of them, namely the Guinean Forests of West Africa Hotspot (Bakarr *et al.* 2004)

In southern Africa, species richness of *Hypoxis* is greatest in grasslands with summer rainfall, especially those with a strong afromontane affinity. These grasslands consist almost exclusively of perennial resprouters, including the so-called pre-rain flowers, a unique group of resprouters that flower and set seed before the first rains after the dormant season and especially following a fire (Van Wyk 2004). Several species of *Hypoxis* fall in this category. The genus is noticeably absent from most of the arid Succulent Karoo and Nama-Karoo Biomes. Species ranges vary from wide to very narrow, and in any one locality several species may occur sympatrically. The distribution of southern African endemics is likewise variable—for example *H. nivea* (featured on Plate 2226) is restricted to coastal forest in KwaZulu-Natal and the Eastern Cape, 12 species are inland endemics and nine species occur from the coast to the interior. Eight South African species range northwards into tropical Africa. Of these, *H. galpinii*, *H. hemerocallidea*, *H. parvifolia* and *H. rigidula* extend only as far as the *Flora zambesica* region, whereas *H. angustifolia*, *H. argentea*, *H. filiformis* and *H. obtusa* extend as far north as central and tropical East Africa. Following current taxonomic opinion (Wiland-Szymańska & Adamski 2002), *H. angustifolia* is regarded as one of the most widespread and variable species; it occurs in most countries in Africa as well as some of the western Indian Ocean Islands.

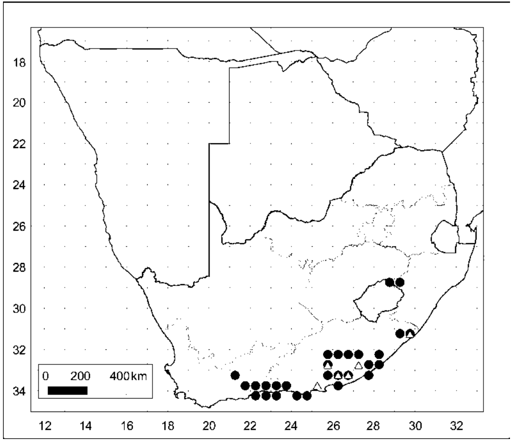

FIGURE 1.—Known distribution of *Hypoxis sobolifera*: ●, var. *sobolifera*; △, var. *pannosa*.

*Hypoxis sobolifera* is a South African endemic with a coastal and inland distribution. It occurs in the Western Cape, Eastern Cape and KwaZulu-Natal, from Stellenbosch in the south to Zululand in the north. Populations of the species are mainly coastal (Figure 1), but a few are noted from the foothills of the Drakensberg in KwaZulu-Natal. *H. sobolifera* grows in dune vegetation and open grasslands. In the Eastern Cape, the species occurs among short, dense coastal dune scrub. Along the beach in West Bank, East London, *H. sobolifera* forms mats in between rocks where it is sheltered from the salt spray. The species shows pronounced environmentally induced variation (phenotypic plasticity). Leaves of plants growing in the shade of trees or among tall grass are two to three times longer and broader than those growing in open grassland. The leaves of the larger plants are more sparsely hairy than those of smaller plants. This implies that hair density is reduced by the enlargement of leaf surface area that may be due to ecological change from full sun to partial shade.

Characters of the leaves, leaf indumentum and inflorescences help to define *Hypoxis sobolifera*. In this species the leaves are arranged in three ranks and are evenly covered with hairs on both surfaces, except in ageing leaves where hairs remain on margins only. Leaf hairs are bifurcate or stellate; stellate hairs are 6–10-armed, distinctly tufted and patent, white or brown on drying. Inflorescences in *H. sobolifera* are corymbose (2–6 flowers per inflorescence), the pedicels of lower flowers elongate (40–70 mm long). The species is closely related to and often confused with *H. villosa* which also has three-ranked hairy leaves and corymbose inflorescences. However, *H. sobolifera* differs from *H. villosa* in the type and distribution of leaf hairs. Leaves of *H. villosa* are sparsely to densely covered with hairs on the lower surface and margins. Leaf hairs in *H. villosa* are stellate, long, soft and appressed, with arms usually stacked one above the other in two rows opposite each other and parallel along the length of the leaf. They remain white on drying, very occasionally turning brown. Age affects hair characters in *H. sobolifera*—hairs on younger leaves and inflorescences turn brown on drying, while those on older leaves remain white. When present, leaves of the previous season are glabrous and strongly veined. The species can be readily identified by these leaves with hairs remaining on the margins and midribs, by the thickened, raised veins and by the corymbose inflorescences.

*Hypoxis sobolifera* is a floriferous species when growing in clumps and is worthy of cultivation for garden beds. Inflorescences are produced sequentially throughout the season. It is easily propagated by division of the rootstock. Care should be taken not to over-water plants. Towards the end of the growing season, the leaves turn brown and shaggy and should be removed. Plants in gardens flower readily in the absence of fire.

Jacquin (1796) described *Hypoxis sobolifera* and provided an illustration in *Icones plantarum rariorum*. The specific epithet *sobolifera* is derived from Latin and refers to the branching and spreading rootstock. The original rootstock gives rise to short stolons that develop into vertically orientated rootstocks that produce leaves apically and contractile roots towards the base. Through multiple stolon formation (sympodial branching) of the rootstocks, the plant spreads to form clumps, giving the species the common name ‘creeping *Hypoxis*’ (Ker Gawler 1804). Baker (1874) described a hairy-leaved specimen from the Cape as *H. pannosa*. In 1878, Baker recognised *H. sobolifera* and *H. pannosa* to be conspecific and he reduced both species to varieties of *H. villosa*. Nel (1914) reinstated *H. sobolifera* as a distinct species, with *H. pannosa* as a variety. He added a third variety, *H. sobolifera* var. *accedens*, applied to specimens with long, narrow leaves. However, here we recognise only two varieties in *H. sobolifera*, the typical variety and var. *pannosa*.

The accompanying plate shows the typical variety. Variety *pannosa* differs from var. *sobolifera* in having felt-like leaves and predominantly red-brown hairs. It occurs along the Eastern Cape coast, from Humansdorp in the south to Kentani in the north (Figure 1). Only a single collection, *Wood 3434* (Kew Herbarium, KwaZulu-Natal Herbarium), collected in 1886 is known from the slopes of the Drakensberg in KwaZulu-Natal, without a precise locality and is therefore not reflected on the map. To date, no other specimens of this variety have been collected so far inland. The epithet *pannosa* is derived from the Latin *pannosus* which means 'with appearance or texture of felt' and refers to the hairiness of the leaves. It is not possible to separate long, narrow-leaved plants as a formal variety as suggested by Nel (1914).

### Key to varieties of *Hypoxis sobolifera*

Hairs scattered over both surfaces of leaf, in distinct tufts, drying white or light brown . . . var. **sobolifera**
Hairs densely covering both surfaces of leaf, tufts obscured, drying red-brown . . . . . . . var. **pannosa**

**Description**.—Soft hairy herb, 100–200(–250) mm high, growing singly or in tufts forming large clumps. *Rootstock* subglobose or turbinate, 40–60(–100) × 20–50 mm, with few stout contractile roots, crowned by leaves and a mass of fibrous bristles from remains of old leaves, proliferating by means of short stolons, each developing into a new rootstock. *Leaves* 4–12, arranged in 3 ranks, lanceolate-linear, 100–300 × 10–25 mm, semi-erect, twisting towards apex, veins ± 20, slender, 2–4 submarginal ones thickened, raised on upper surface; hairs sparse to dense on one or both surfaces, more so on lower surface; hairs bifurcate or stellate (6–10 arms); arms radiating, patent, usually in distinct tufts, except when very dense then appearing appressed in dried pressed specimens, of varying lengths, short arms 0.5–0.6 mm, medium arms 1.0–1.5 mm and long arms 1.7–2.5 mm long, white, turning light brown in young leaves on drying, grey-white in old leaves on drying, falling off in leaves of previous season, resulting in blade becoming glabrous with age. *Scapes* 2–6 per plant, 80–300 × 1–2 mm; inflorescence corymbose, more noticeable when more than 2-flowered, hairy in upper part, indumentum white, turning brown on drying. *Bracts* one per flower, linear-subulate, 10–25 mm long, hairy below. *Flowers* 2–7, actinomorphic, basal two opposite, 1 or 2 upper tiers with 2 or 3 flowers each; pedicels unequal in length, 20–70 × 1.0–1.5 mm, hairy, lowermost 2–6 times longer than uppermost, bringing flowers to about the same height. *Tepals* yellow above; outer tepals 8–15 × 3.0–6.5 mm, pale green and densely hairy abaxially; inner tepals 8–14 × 3.5–7.5 mm, greenish, slightly hairy only abaxially along midrib. *Stamens* 6, with filaments subulate-linear, 3–4 mm long, arising from base of tepals; anthers 2–5 mm long, sagittate, apex clearly split, versatile, dehiscing by longitudinal slits. *Ovary* 2–4 mm long, 3-locular; style 1.5–2.5 mm long; stigma 2–3 mm long, pyramidal with 3 concave faces; ovules numerous, biseriate in each locule, placentation axile. *Fruit* an oblong or turbinate capsule opening by a circular slit, 6–12 × 4–5 mm, then splitting longitudinally into 3 lobes. *Seeds* ovoid or subglobose, 1.3–1.5 × 1.0–1.2 mm, black, glossy; testa papillate, papillae dome-shaped with cuticular folds, tips brown in some specimens. *Flowering* August–March. Plate 2225.

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Y. SINGH*[†], A.E. VAN WYK** and GILLIAN CONDY***

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* KwaZulu-Natal Herbarium, South African National Biodiversity Institute, P.O. Box 52099, Berea Road, 4007 South Africa.

[†] Student affiliation: Department of Botany, University of Pretoria, Pretoria, 0002 South Africa.

** H.G.W.J. Schweickert Herbarium, Department of Botany, University of Pretoria, Pretoria, 0002 South Africa.

*** South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

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# *Hypoxis nivea* Hypoxidaceae

*South Africa*

**Hypoxis nivea** *Y.Singh*, sp. nov., facile distinguitur foliis gracilibus membranaceis et floribus parvis albis. *H. angustifoliae* foliis similes sed minoribus exiguis albis differt. *H. parvulae* var. *albiflorae* et *H. membranaceae* stigmatibus globosis, in speciebus aliis pyramidatis, similis se ab his foliis angustioribus floribus minutis differt.

TYPE.—South Africa, KwaZulu-Natal, Kranzkloof Nature Reserve, *Singh 874* (NH, holotype; K, PRE, PRU, isotypes).

*Hypoxis* is the largest genus in the small family Hypoxidaceae. Eight other genera, namely *Curculigo*, *Hypoxidia*, *Molineria*, *Empodium*, *Pauridia*, *Rhodohypoxis*, *Saniella* and *Spiloxene* (Hilliard & Burtt 1978), are included in the family. The centre of diversity for the Hypoxidaceae is southern Africa, where six genera and about 90 species occur (Snijman & Singh 2003). All the genera are endemic to southern Africa, except *Hypoxis* which is found on all continents excluding Europe. *Hypoxis* is distinguished from the other southern African genera in its combination of hairy leaves, mostly yellow flowers and free tepals that are hairy on the undersurface. *Rhodohypoxis* is closely related to *Hypoxis*, from which it differs most noticeably in its white, red or pink tepals that are fused in the lower part to form a tube.

The text accompanying Plate 2225 depicting *Hypoxis sobolifera* in this volume gives background on the diversity and biogeography of the genus in Africa. White flowers are very rare in *Hypoxis* and only three of the about 90 species are not exclusively yellow-flowered—*H. membranacea*, *H. parvula* var. *albiflora* and the new species described here. All three white-flowered taxa are restricted to South Africa.

*Hypoxis membranacea* was described by Baker in 1878 and was known as the only white-flowered species for many years. Over a century later, Burtt (1988) described *H. parvula* var. *albiflora*, distinguished from the typical variety by its white tepals. The close affinity between *H. membranacea* and *H. parvula* is clear—they are closely related species that share, among other things, thin-textured leaves that become papery when dried, flexible inflorescences with one to three delicate flowers, and oblong to spherical stigmas held on filiform styles. Yellow-flowered species of *Hypoxis*, on the other hand, have pyramidal stigmas, except *H. angustifolia* in which the shape of the stigma varies from pyramidal to spherical and the ratio of style to stigma length varies (Nordal *et al.* 1985; Wiland-Szymańska & Adamski 2002). Moreover, the yellow-flowered species display only minor interspecific variation in floral morphology. This group of species have very similar-looking star-shaped flowers, with interspecific variation mainly in the size of floral

PLATE 2226.—1, plant in fruit, × 1; 2, plant in flower, × 1; 3, flower, × 3; 4, outer tepal, adaxial surface, × 6; 5, inner tepal, adaxial surface, × 6; 6, stamens, × 6; 7, seed, × 15; 8, portion of leaf surface, × 4. Voucher specimen: *Singh 874* in KwaZulu-Natal Herbarium, Durban. Artist: Gillian Condy.

PLATE 2226 *Hypoxis nivea*

parts and thickness of tepals. Therefore, in the about 30 species of *Hypoxis* with yellow flowers in the *Flora of southern Africa* region (South Africa, Namibia, Botswana, Swaziland and Lesotho) floral characters are of little use for identification purposes.

The oldest known herbarium specimen of the new white-flowered species was collected by John Medley Wood (*Medley Wood 771*, KwaZulu-Natal Herbarium) at Inanda, Durban, in November around 1875. Baker (1896) cited this specimen as *Hypoxis angustifolia* var. *buchananii*, but did not draw attention to the discrepancy in floral colour indicated on the label. Together with this specimen, Baker also cited *Medley Wood 426* (K, scan!) from Inanda, the latter which is indeed *H. angustifolia* var. *buchananii* (Singh, in press). The new *H. nivea* is very similar to *H. angustifolia* in vegetative facies and, when not in flower, it can easily be confused with the latter species. Furthermore, as in *H. angustifolia*, plants of the new species have narrow or broad leaves, thus recalling the two varieties of *H. angustifolia*.

Wood (1976) suggested that the *Hypoxis angustifolia*-like plants with white flowers be treated as putative hybrids between the yellow-flowered *H. angustifolia* and the white-flowered *H. membranacea*. However, it is unlikely that the white-flowered plants are of hybrid origin as the expected floral colour would be at least pale yellow in such a hybrid. The possible taxonomic status of the white-flowered entity as a potential new species or as a variety of *H. angustifolia* or as a hybrid, although unlikely, was investigated by the senior author as part of a revision of the genus in southern Africa (Singh in prep.). Extensive field observations and a comparative morphological study support the recognition of *H. nivea* as a distinct species (see below).

There has been a tradition to describe infraspecific entities in *Hypoxis* at the rank of variety rather than subspecies. This practice dates from 1878, when Baker described the first variety of *H. angustifolia*, namely var. *buchananii*. Amongst the southern African members of *Hypoxis*, two varieties are recognised in each of the five species, *H. angustifolia*, *H. argentea*, *H. parvula*, *H. rigidula* and *H. sobolifera*. These varieties are demarcated according to variation in leaf width, density of leaf indumentum or flower colour. In all these species, except *H. parvula*, the two varieties sometimes grow alongside each other, with plants displaying the intermediate character state found amongst them. This is not the case with the new white-flowered entity and it therefore does not qualify for varietal or other infraspecific rank. Plants of the new taxon form distinct populations and although they are sometimes located in the immediate vicinity of one or more of the related species, *H. angustifolia* or *H. membranacea*, they do not grow interspersed with either of them. Furthermore, there is no evidence of hybridisation between the new entity and *H. angustifolia* or *H. membranacea*. On this basis, the new entity is best treated as a species in its own right. The epithet *nivea* was chosen from the Latin *niveus* meaning ‘snow-white’, alluding to the unusual white floral colour in a genus that is predominantly yellow-flowered. The common name ‘white star-flower’ is suggested for the species.

*Hypoxis nivea* is easy to recognise by its membranous leaves which are similar to those of *H. angustifolia* and by its small, white flowers. The new species differs from *H. angustifolia* in its smaller, white flowers, thin-textured tepals, filiform filaments that are about one and half times as long as the anthers, filiform style and oblong to spherical stigmas (occasionally malformed). In these character states, *H. nivea* is closely related to the soft-leaved, white-flowered *H. membranacea* and *H. parvula* var. *albiflora*. In *H. angustifolia*, the flowers are yellow, tepals thicker in texture and the ratio of filaments to anthers and style to stigma is variable—see Nordal *et al.* (1985) and Wiland-Szymańska & Adamski (2002) for a discussion of this variation. *H. nivea* differs from *H. membranacea* in its narrow, linear, smooth leaves. In *H. membranacea*, the leaves are lanceolate and the upper surface bears translucent pustules that appear as dots to the naked eye. Leaf and floral differences amongst the white-flowered taxa are summarised in Table 1. Table 1 suggests that *H. nivea* is very similar to *H. parvula* var. *albiflora*. However, it can be separated from *H. parvula* by its long, slender leaves lightly covered in hairs and by the scapes that are equal to or slightly shorter than the leaves, with two or three flowers per inflorescence. *H. parvula* is distinguished by its short leaves, with a more dense indumentum and flowers that are held singly on slender scapes, overtopping the leaves. Our new species has a more restricted distribution than *H. angustifolia*, *H. membranacea* and *H. parvula*. Among these species, *H. angustifolia* is the most widespread in southern Africa and occurs in all provinces of South Africa except the Northern Cape. *H. parvula* is concentrated in the interior of KwaZulu-Natal, while *H. membranacea* occurs mostly along the coast of KwaZulu-Natal and the Eastern Cape, with a few populations recorded in the midlands of KwaZulu-Natal. *H. nivea* and *H. membranacea* prefer semishade conditions in coastal forest, while *H. parvula* is usually found in open rocky grassland in full sun.

*Hypoxis nivea* occurs in the Eastern Cape and KwaZulu-Natal, South Africa (Figure 1). Its southernmost occurrence is at Kentani in the Eastern Cape from

TABLE 1.—Differences between *Hypoxis nivea*, *H. membranacea* and *H. parvula* var. *albiflora*

| Character | | *H. nivea* | *H. membranacea* | *H. parvula* var. *albiflora* |
|---|---|---|---|---|
| Leaves | shape | linear | lanceolate | lanceolate |
| | size | 70–150 × 4–12 mm | 80–150 × 8–25 mm | 15–70 × 5–10 mm |
| | texture | membranous, smooth | membranous, upper surface with translucent pustules | membranous, smooth |
| | hairs | simple or bifurcate | stellate | simple, bifurcate or stellate |
| Flowers | scapes | equal to or slightly shorter than leaves | usually equal to or slightly shorter than leaves | overtopping leaves |
| | number per stalk | 2 or 3(4) | (1)2 or 3 | 1 |
| | size of tepals | 3–6 × 1.5–2.0 mm | 5–8 × 2.0–2.5 mm | 2.5–7.0 × 1.5–2.5 mm |
| Distribution | range | Eastern Cape and KwaZulu-Natal | Eastern Cape and KwaZulu-Natal | Mainly in KwaZulu-Natal, sparse in Eastern Cape and Mpumalanga |

where it extends northwards through the Pondoland Centre of Endemism into south-central KwaZulu-Natal. Localities from which *H. nivea* is known in Pondoland include the Umtamvuna and Mkambati Nature Reserves, where it occurs mainly in gorges of the Umtamvuna, Mnyameni and Mtentu Rivers. To the north of Pondoland, localities include Inanda and the Krantzkloof Nature Reserve, inland of Durban. At the Pondoland localities, the geology is Msikaba Formation sandstone (Van Wyk & Smith 2001), whereas the northern localities comprise Natal Group sandstone. Substrates at the southernmost localities in the Kentani region are probably sediments of the Karoo Supergroup. The species occurs at altitudes of 10–720 m.

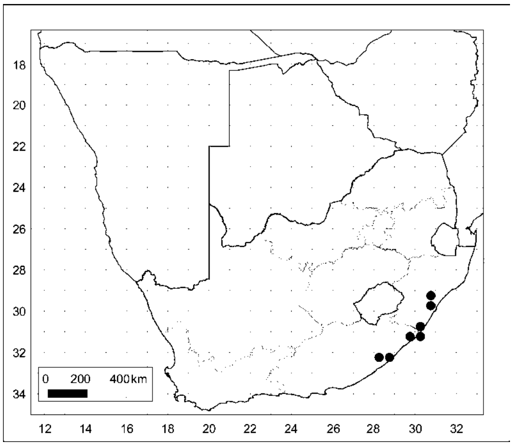

FIGURE 1.—Known distribution of *Hypoxis nivea*.

Populations of *Hypoxis nivea* are found in shade in forest. This habitat preference is rather unusual in the genus as most species in southern Africa are associated with sunny positions in open grassland, especially those grassland types with a strong afromontane (moist, temperate) affinity. Nevertheless, *H. nivea* is associated with a floristically enriched form of afromontane forest sometimes referred to as Coast Scarp Forest (MacDevette *et al*. 1989). Floristically, afromontane grassland and forest types are usually quite unrelated, despite the fact that they occur together in a mosaic, the one bordering on the other (Van Wyk & Smith 2001). *Hypoxis*, however, is of special biogeographical significance in that it is one of the very few predominantly grassland afromontane floristic elements that also have species adapted to the associated forest habitat.

Leaves of plants of the new species growing in deeper shade were found to be one and half times longer and wider than leaves of those in light shade, and these morphotypes correspond with the leaf width ranges for the varieties in *H. angustifolia*. According to Wiland-Szymańska & Adamski (2002), *H. angustifolia* var. *angustifolia* is restricted to Mauritius and possibly Réunion. But, the variety is upheld for southern Africa pending further studies on variation in the species for the region. Although local populations of *H. nivea* may contain many plants, there are few herbarium collections. Being winter deciduous, *H. nivea* is invisible at this time of year, and the emergent or small leaves may easily be overlooked when plants are not in flower. Moreover, most of the forested riverine gorges in the Pondoland Centre remain botanically unexplored. It is likely that more field work will reveal new localities of the species, especially in Pondoland.

The functional significance of yellow versus white flowers in *Hypoxis* is most probably associated with two different pollination strategies. This view is supported by the association of the two floral colours with two different types of stigma morphology (see above). Yellow-flowered species of *Hypoxis* in grassland are mainly visited by honeybees (*Apis mellifera scutellata*), here considered the principal pollinators of flowers in this colour group (see also Singh 1999). Flowers of *Hypoxis hemerocallidea*, a representative yellow-flowered southern African species, are visited almost exclusively by honeybees which collect pollen from the anthers; nectar is not produced in the flowers (Johnson & Anderson 2002). Judged by its floral syndrome, it is tempting to speculate that *H. nivea* is moth-pollinated (or at least not primarily honeybee-pollinated), a strategy to be expected in its shady forest floor habitat where honeybees are not often seen. However, field observations have not indicated any obvious nectar in the flowers. Furthermore, only pollen flowers are known in Hypoxidaceae (Kocyan & Endress 2001). Although lack of nectar would exclude nectar-feeding moths (e.g. Sphingidae) as potential pollinators, primitive pollen-eating moths (Zeugloptera) may still be involved. More field observations are required to monitor scent production and to positively identify the pollinator(s).

One of us (DS) has been studying aspects of the ecology of the new species in many parts of its range. *Hypoxis nivea* grows mostly in light shade on the floor of old growth (climax) forest. In support of the old growth state of the forest, it should be mentioned that at two sites, the Krantzkloof Nature Reserve inland from Durban and along the Mnyameni River in Pondoland, the very rare tree *Dahlgrenodendron natalense*, a palaeoendemic Pondoland Centre floristic element, grows in close proximity to *H. nivea*.

*Hypoxis nivea* usually occurs on rocky edges and ledges along predominantly south-facing aspects of dramatic river gorges or cliffs. In these temperate and shady settings with their shallow soils, there are usually relatively few plant species competing in the herbaceous layer. At almost all sites at which the species has been encountered, the most common associate is the sedge *Cyperus albostriatus* and the leaves of *H. nivea* may easily be mistaken for the emergent leaves of the latter. Other frequent associates include members of *Begonia*, *Plectranthus* and *Streptocarpus*. Inland of Durban, species growing with *H. nivea* include *S. haygarthii*, *S. molweniensis*, *B. sutherlandii*, *B. geranioides* and a pink-flowered form of *P. ciliatus*. In Pondoland, associates of the new species include *S. formosus*, *S. haygarthii*, *S. primulifolius* (in the Msikaba River gorge only) and *S. porphyrostachys*. At the Msikaba River locality, associates include *Crassula streyi*, *Plectranthus reflexus* and *Talbotia elegans*.

At a number of sites, *Hypoxis membranacea* has also been encountered in the general area of the new species, in thin soil on ledges within forest and on forest edges. Places in which *H. membranacea* were noted, however, tend to be drier and often more exposed. *H. angustifolia* var. *angustifolia* sometimes occurs in grassland–forest ecotones nearby, while *H. angustifolia* var. *buchananii* is sometimes also found along rivers and streams within the same gorges, in both open and less shaded situations where the forest canopy is more open or broken. *Medley Wood 426* from Inanda (see above) matches populations of *H. angustifolia* var. *buchananii*. In the Mnyameni River Gorge in Pondoland, *H. nivea* was noted on the boulders above and within 20 m of *H. angustifolia* var. *buchananii*, the latter growing prolifically amongst rocks in the river bed.

Overall, *Hypoxis nivea* appears to be a localised and rather rare species. Although it tends to be found in more precipitous situations, denudation of forest cover is a threat. Transformation of habitat was observed at two localities. One, a seam of forest in the Inanda area, is contracting as a consequence of the felling of the trees by a nearby community and the burning of hot grassland fires into its edge. Along the Mnyameni River, fairly extensive felling of trees was also noted, particularly along forest edges. As a consequence, the forest growth has become scrubby in parts and there is infiltration by alien invader plant species. These impacts and corresponding shrinkage of forest at these sites seem likely to continue and even escalate. We recognise the species as vulnerable according to the IUCN (2001) criteria for Red Data species. In the interest of conservation, it is important for taxonomists and ecologists to work closely with local authorities and communities in an attempt to conserve these special sites.

**Description**.—Solitary, slender, delicate perennial herb, 70–120 mm high. *Rootstock* a vertical rhizome, tuberous, globose to oblong, 8–10 mm in diameter or 1.5 times longer than wide, white within. *Roots* few, contractile. *Tunic* a papery sheath formed by remains of old leaf bases, membranous, white or brown. *Leaves* winter-deciduous, ± 6, tufted, linear, acuminate, 70–150 × 4–12 mm when flattened, pale green, paler approaching white at base, appearing almost glabrous, forming an inverted W from above, semi-erect, flaccid, thin and semitransparent against the light, apex browning in older leaves; veins 7–14, two on either side of midrib prominent on upper surface. *Indumentum* a mixture of simple and bifurcate hairs, mostly along margins and midrib, sparsely scattered on blade; hairs white, long, fine, visible to the naked eye. *Scape* axillary, equal to or slightly shorter than leaves, 50–80 × 1 mm, oval in cross section, covered with soft, white hairs. *Inflorescence* 1–5 per plant, corymbose; pedicels slender, 15–30 mm long, slightly longer in fruit. *Bracts* one per flower, subulate, 4–15 mm long, setaceous. *Flowers* actinomorphic, 2 or 3(4) per inflorescence. *Tepals* 3 + 3, white; outer whorl 3–6 × 1.5–2.5 mm, green and hairy abaxially; inner whorl, 3.0–6.5 × 1.25–2.00 mm, with green band along midrib and lightly hairy abaxially. *Stamens* 3 + 3, exserted; filaments filiform, white, arising from base of tepals, outer whorl slightly longer (2–3 mm) than inner whorl (1.5–2.5 mm); anthers sagittate, 1.0–2.5 mm long, yellow, versatile, opening by lateral slits; pollen yellow. *Ovary* subglobose, ± 1 mm in diameter, 3-locular; ovules numerous, biseriate in each locule, placentation axile; style filiform, 2–4 mm long; stigma minute, spherical, 0.4–0.5 mm in diameter, minutely lobed, white. *Fruit* a capsule, turbinate, 2.0–2.5 × 2.5–3.0 mm, opening by a circular slit, then splitting longitudinally into 3 lobes. *Seeds* globose to ovoid, ± 1 mm in diameter, black, papillate; papillae dome-shaped, micropapillate. *Flowering* (September) October–November. Plate 2226.

## SPECIMENS EXAMINED

Eastern Cape: Kentani, Manubie Forest, 26 November 1945, *Compton 17716* (NBG); Willowvale, Qora River mouth, river, 6 November 1991, *Cloete 1251* (NH); Elliotdale District, The Haven, 1 November 1966, *Gordon-Gray 949* (NU); Mkambati Nature Reserve, Mtentu River, 10 December 1986, *Jordaan 952* (NH, PRE), 14 December 1986, *Jordaan 1118* (NH, PRE); Mkambati Nature Reserve, tributary on northern side of Mtentu River, 12 December 1986, *Nicholas & Smook 2412* (KEI, NH, PRE).

KwaZulu-Natal: Port Shepstone, Umtamvuna Nature Reserve, Amphitheatre, 27 December 1982, *Abbott 657* (NH, Umtamvuna), Outeniqua Trail, 6 December 1984, *Abbott 2266* (Umtamvuna), Blue Gorge, 15 October 2005, *Abbott 8275* (PRU); Inanda, November ?, *Medley Wood 771* (NH); Port Shepstone, Umtamvuna Bridge, 6 September 1965, *Strey 5990* (NH, PRE); Port Shepstone, tributary of Uvongo River, farm of Mr Wichmann, 1 November 1981, *Van Wyk 5111* (PRU); Port Edward, Umtamvuna, Mnyameni River Gorge, 19 October 2005, *Singh 891*(NH).

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Y. SINGH*[†], D. STYLES**, A.E. VAN WYK*** and GILLIAN CONDY****

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* KwaZulu-Natal Herbarium, South African National Biodiversity Institute, P.O. Box 52099, Berea Road, 4007 South Africa.

[†] Student affiliation: Department of Botany, University of Pretoria, Pretoria, 0002 South Africa.

** P.O. Box 50030, Musgrave, 4062 South Africa.

*** H.G.W.J. Schweickerdt Herbarium, Department of Botany, University of Pretoria, Pretoria, 0002 South Africa.

**** South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

PLATE 2227 *Siphonochilus kirkii*

# *Siphonochilus kirkii* Zingiberaceae

*Sub-Saharan Africa*

**Siphonochilus kirkii** (*Hook.f.*) *B.L.Burtt* in Notes from the Royal Botanic Garden Edinburgh 40: 372 (1982); Lock: 15, t. 4 (1985); Plowes & Drummond: 5, 6 (1990); Smith: 37 (1998). *Cienkowskia kirkii* Hook.f.: t. 5994 (1872). *Kaempferia kirkii* (Hook.f.) Wittm. & Perring: 57, t. 1364 (1892); Baker: 294 (1898); Schumann: 68 (1904). *K. rosea* Baker: 295 (1898); Schumann: 279 (1902); Troupin: 266, 267 (1955); Andrews: 255 (1956). *K. montagui* F.M.Leight.: 57 (1932). *Cienkowskiella kirkii* (Hook. f.) Y.K.Kam: 11 (1980).

*Siphonochilus* is one of four zingiberaceous genera native to Africa, and with the exception of two moist forest species, the about 15 taxa are restricted to woodlands and grasslands, seasonal environments to which they have adapted by developing a geophytic, deciduous habit (Poulsen & Lock 1999). *Siphonochilus kirkii*, subject of this account, is the third member of this genus to be figured in *Flowering Plants of Africa*, the other two being *S. decorus* (as *Kaempferia decora*) (Plate 1199) and *S. aethiopicus* (Plate 2190). Inevitably, *S. kirkii*, the rose ginger, must be compared to the only other member of the genus occurring in the *Flora of southern Africa* region, *S. aethiopicus*, the well known wild ginger. Both are rarely seen in southern Africa, with *S. kirkii* known only from the eastern Caprivi Strip of Namibia (Figure 1). However, it is widespread in Africa, occurring throughout the *Flora zambesiaca* (*FZ*) region and further north into eastern tropical Africa. Although the two species are sometimes found in mixed populations, they are very unlikely to be confused—the plicate leaves and prominent aerial scapes of *S. kirkii* are quite distinct from the smooth leaves and ground-level flowers of *S. aethiopicus*. At anthesis, the leaves of *S. kirkii* are fully mature whereas those of *S. aethiopicus* are usually just emerging. The flowers of *S. kirkii* are consistently hermaphroditic while *S. aethiopicus* is rather famously polygamous (Crouch *et al*. 2003a), variably producing both perfect and female flowers, even on the same plant. Within the *FZ* region, *S. kirkii* is most likely to be confused with *S. carsonii* from which it can be distin-

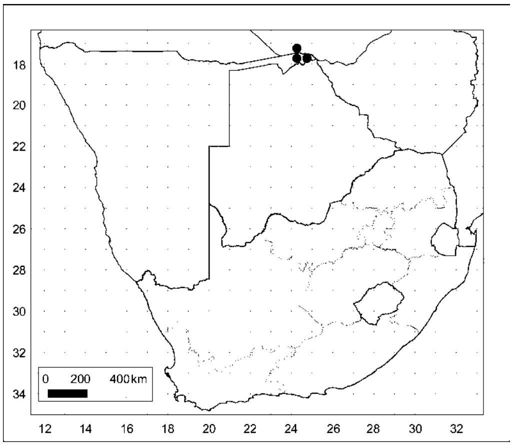

FIGURE 1.—Distribution of *Siphonochilus kirkii* in southern Africa, based on herbarium specimens housed at the National Herbarium, Pretoria. Known from: Sudan, Kenya, Uganda, Congo, Tanzania, Mozambique, Zimbabwe, Zambia, Namibia, Malawi (i.e. widespread throughout tropical Africa).

PLATE 2227.— 1, habit, reduced; 2, inflorescence, × 1; 3, leaf tip and margin, × 1; 4, stamen and style/ovary, × 1. Voucher specimen: *Condy 197* in National Herbarium, Pretoria. Artist: Gillian Condy.

guished by its greenish rather than brownish inflorescence bracts, and corolla lobes that are usually shorter than 25 mm (Lock 1985). As in *S. aethiopicus*, the leaves of *S. carsonii* are undeveloped or only partially developed at the time of flowering. Additionally, flowers of *S. carsonii* never present with dark purple marks flanking the yellow nectar guide on the median labellum lobe, as rose ginger plants sometimes do (Plate 2227), within even the same colony. These two species have been recorded growing sympatrically (Lock 1999). A second sub-Saharan ginger, *S. decorus*, is similar to *S. kirkii* in floral and vegetative form, but bears yellow flowers rather than mauve or pink ones.

In stark contrast to wild ginger, *Siphonochilus kirkii* does not possess strongly aromatic rhizomes, and for this reason has perhaps been overlooked by traditional medical practitioners throughout much of its extensive range. However, the intensity of rootstock flavour and scent may vary, thus regionally influencing traditional usage patterns. Cultural groups such as the Tonga of the central Zambezi River area deem the rose ginger useless and have no interest in the plant (*Scudder 32*, in National Herbarium, Pretoria). This is fortunate, otherwise it could be facing extinction through over-utilisation (Crouch *et al*. 2003a; Walter & Gillet 1998). The subterranean parts of *S. kirkii* comprise a short, thick rhizome from which numerous succulent roots radiate downwards, each with a central or distal tuberous swelling—somewhat reminiscent of a *Chlorophytum* rootstock. In Malawi, the dried and powdered roots are used to season a variety of foods, and a tuber is sometimes inserted into a chicken during cooking to both spice and colour it (Williamson 1975)—while the rootstock is not conspicuously pigmented, its exterior appearing dull grey, the rhizome is yellow in transverse section (*Müller 1763*, in National Herbarium, Pretoria). Williamson (1975) recorded the ciNyanja names of *manjanu* and *kurri*, and the ciYao appellation of *mbilicira*.

As in *Siphonochilus aethiopicus*, the flowers of *S. kirkii* are highly variable in size and colour, leading to its description under a variety of names subsequently reduced to synonymy. Considerable nomenclatural confusion with regard to the identity and circumscription of *Siphonochilus* is evident in the literature, but has been dealt with by Burtt (1982); the matter of authorship of *S. kirkii* synonyms has been further elucidated by Lock (1985). However, the taxonomy of our species remains incompletely resolved and further clarification of its relationship to poorly known taxa such as *Kaempferia pallida* (Troupin 1955) is required. The plant figured here was collected in Zimbabwe close to the type locality of one such entity, *K. montagui*, described in 1932 and introduced to the gardening world through Kirstenbosch as the ‘Mazoe Canna’. Indeed, plants do look very canna-like, for as with members of this tropical American genus, the calyx and corolla of our subject are membranous and rather inconspicuous, the showy flower portion consisting of three highly developed and colourful staminodes. The blooms are very slightly fragrant. Plants are herbs with about five leaves arranged for the most part distichously, but not fused to form a prominent false stem as in *S. aethiopicus*. The deeply channelled false petioles widen to elliptic blades, attractively plicate on account of their sunken oblique nerves, about 10 veins in all. The leaves are usually fully mature at the time of flowering, which in south-central Africa is between the months of October and February. Towards the equator, plants typically bloom later in the year, peaking in April but flowers are sometimes found as late as July. In habitat, specimens are found in semishade or shade on a wide variety of soils, though mostly more humus-rich ones, and show a distinct association with termitaria. This taxon is typically found in deciduous woodland at lower altitudes, and in the *FZ* region it is common in miombo woodland. Lock (1985) also recorded it from riverine forest and scrub, and from wooded grassland at altitudes up to 1 350 m. Within the *FSA* region it has been recorded in evergreen mopane woodland in well-drained sandy loam in full sun, or in dense grass under trees. Fire reportedly stimulates growth of this geophyte (*Quarré 796*, in National Herbarium, Pretoria).

At Kloof in South Africa, plants have been successfully grown in a well-drained loam in a sandstone rockery on a forest margin. Plants in deeper shade do not flower at all, but those receiving morning and early afternoon sun produce long-pedunculate racemes that arise from the base of the leafy shoot. The inflorescences attain a height of some 300 mm, bearing up to 20 rose-pink to mauve blooms, each about 60 mm across. While Kloof plants blossom in early December, Leighton (1932) reported that plants sent from northern Zimbabwe and cultivated at Kirstenbosch flowered slightly later, in January. Each bloom lasts only a day or two; fortunately the flowers open sequentially on each inflorescence, thus prolonging over several weeks the enjoyment one obtains from their exceptional beauty. Pollination is a mystery, although, like other gingers with flowers of similar size and hue (e.g. *Aframomum melegueta*), the flowers may be visited by long-proboscid bees (Lock *et al*. 1977), a hypothesis explored but not demonstrated for *Siphonochilus aethiopicus* (Crouch *et al*. 2003b). Propagation is reported only from seed, the rhizome being too small to divide safely as one might for other members of the genus. Fortunately, plants transplant easily (Plowes & Drummond 1990), although it is best to do this in winter when these deciduous plants are dormant.

The genus name is derived from the Greek words *siphono* (tube) and *chilos* (lip); it was originally proposed by Schlechter & Schumann (in Schumann 1904) and shortly thereafter formalised by Wood & Franks (in Wood 1911). The species is named for Sir John Kirk, doctor, explorer and later Consul General of Zanzibar. His coastal Tanzanian collection was grown on at Kew and designated as the type by Hooker (1872) in the original description of our plant as a species of *Cienkowskia*.

**Description** (based on Smith 1998).—Herbaceous perennial. *Rhizome* short and thick; succulent roots bearing small fusiform elongate tubers centrally or towards apex. *Leaf shoots* 200–400 mm long. *Leaves* 5–7, usually fully developed at anthesis, glabrous, tapering at base into a false channelled petiole up to 250 mm long (including leaf sheath); lamina undeveloped in basal 1–3 leaves, up to 170–310 × 55–100 mm, or ovate to elliptic, acuminate, glabrous; ligule obsolete; sheaths sulcate when dry. *Inflorescences* 1–4, borne separately from leaf shoot at same time as leaves, 1–15(–20)-flowered on a 200–350 mm long, terete, glabrous peduncle. *Flowers* hermaphrodite; floral bracts greenish, oblong to narrowly obovate, obtuse, the lower up to 65 × 20 mm, the upper up to 22 × 12 mm; pedicels 10–20 mm long. *Calyx* campanulate, 8–15 mm long, shallowly 3-lobed, each lobe with a subterminal subulate projection ± 1 mm long. *Corolla tube* ± 8 mm long; petals narrowly obovate to narrowly oblong, acute, 22–26 mm long, whitish, tinged with green or mauve. *Labellum* 3-lobed, lateral lobes rhomboid, mauve, ± 30 × 20 mm, median lobe broadly spathulate, emarginate, ± 45 × 45 mm, mauve with a central yellow mark with or without a dark purple mark at each side. *Stamen* ± 25 mm long; thecae ± 5 mm long, curved; connective prolonged into a ± 15 × 6 mm oblong petaloid crest. *Stigma* peltate. *Ovary* ± 6 mm long, trigonous. *Fruit* obovoid, trigonous, winged at angles, crowned with remains of calyx. *Seed* whitish, ± 5.5 × 3.0 mm, trigonous with basal elaiosome. Plate 2227.

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N.R. CROUCH*, G.F. SMITH** and GILLIAN CONDY***

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* Ethnobotany Unit, South African National Biodiversity Institute, P.O. Box 52099, Berea Road, 4007 South Africa / School of Chemistry, University of KwaZulu-Natal, Durban 4041, South Africa.

** Office of the Chief Director: Systematics Research and Collections, South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa / H.G.W.J. Schweickerdt Herbarium, Department of Botany, University of Pretoria, Pretoria, 0002 South Africa.

*** South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

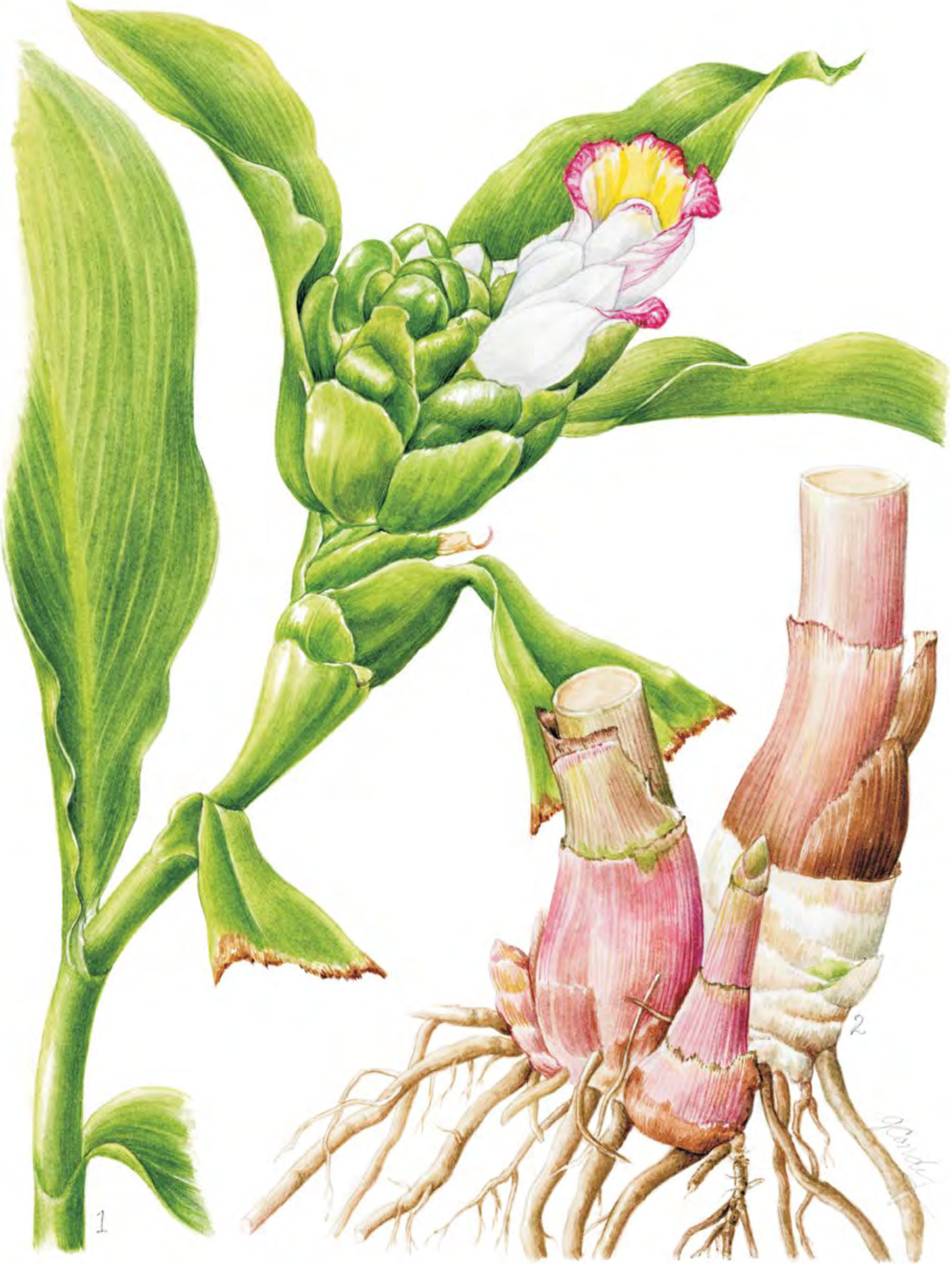

PLATE 2228 *Costus afer*

# *Costus afer* Costaceae

*Sub-Saharan Africa*

**Costus afer** *Ker Gawl*. in Botanical Register 8: t. 683 (1823); Hooker: t. 4979 (1857); Ridley: 131 (1887); Baker: 299 (1898); Schumann: 392, 393 (1904); Andrews: 253 (1956); Koechlin: 84–86 (1961); Koechlin: 92, 93 (1965); Hepper: 78 (1968); Lock: 842, 843 (1984); Lock: 9, 10 (1985). *C. pterometra* K.Schum.: 394, 395 (1904); Lock: 842, 843 (1984).

The pantropical family Costaceae is largely accepted as distinct from the Zingiberaceae and recognisable within order Zingiberales for its one-sided spiral arrangement of leaves (spiromonistichy) as well as for its unique floral morphology. In Costaceae flowers, the petaloid labellum is formed by the fusion of five petaloid staminodes to produce a large, often colourful structure that often exceeds in length the comparably insignificant corolla, whereas in Zingiberaceae the labellae are formed from the fusion of only three staminodes. Other features that distinguish the Costaceae from the Zingiberaceae include their nonaromatic vegetative body, well-developed and often multilayered hypodermis, stellate or druse-like silica bodies, and the complete absence of oil cells. Until recently the Costaceae with some 120 species comprised only four genera, *Costus*, *Dimerocostus*, *Monocostus* and *Tapeinochilos* (Larsen 1998). However, recent systematic (both molecular and morphological) and developmental studies have identified the polyphyletic character of *Costus*, resulting in its splitting into four genera: *Costus*, *Chamaecostus*, *Cheilocostus* and *Paracostus* (Specht & Stevenson 2006). A recent checklist of the flowering plants of sub-Saharan Africa (Klopper *et al*. 2006) catalogues 36 species of *Costus*, while acknowledging that several of them are insufficiently known. Further to revisionary work on the African members, only one of these 36 species (*C. englerianus*) has been transferred to the new *Paracostus* while the remainder are retained in *Costus*. Of the other newly defined genera, *Cheilocostus* is exclusively Asian while *Chamaecostus* comprises South American species (Specht & Stevenson 2006). Accordingly, the subject of this account, *Costus afer*, is retained in *Costus sensu stricto*.

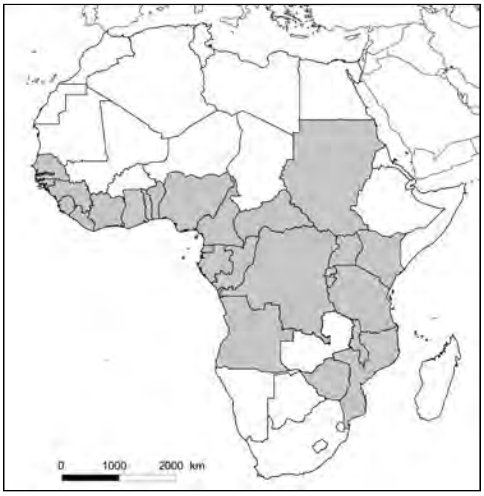

FIGURE 1.—Countries where *Costus afer* has been recorded.

Most African members of *Costus* are concentrated in West Africa, with rela-

PLATE 2228.—1, flowering stem, × 1; 2, rhizome, × 1. Voucher specimen: *Condy 198* in National Herbarium, Pretoria. Artist: Gillian Condy.

tively few distributed along the eastern seaboard of the continent and entering the *Flora zambesiaca* (*FZ*) region. The most southerly of these is *Costus afer*, which is also the most widespread African species, distributed at altitudes of between 190 and 1 200 m from Senegal in West Africa through the forested tropics to the south-eastern border of Zimbabwe (Figure 1). This variable species is commonly known as the spiral ginger on account of its characteristic spiral stems, a curious feature with considerable horticultural appeal. Various forms have been introduced to the nursery trade and cultivars with such endearing names as ‘Chocolate Kiss’ and ‘Popcorn Ball’ have been developed.

Besides spiral ginger, the plant has been provided with a variety of English common names: the smooth Sierra Leone costus, African costus, ginger lily, common ginger lily and the bush cane. Its vernacular names are even more copious, particularly in West Africa where it is most common, widespread and utilised for a variety of medicinal and nonmedicinal purposes. Burkill (1985) provides an extensive list of local names as well as a summary of its medicinal uses in that region. Various plant parts are used—from the sap of the leaves to decoctions of stems. Uses range from the treatment of eye and urethral infections to medication for rheumatism (Burkill 1985; Neuwinger 2000). Pharmacologists have in some instances validated traditional applications relating to inflammation (Moody & Okwagbe 2003) and pain relief (Anaga *et al*. 2004). In both Sierra Leone and Nigeria, stripped stems are chewed to counteract nausea (Hooker 1857; Burkill 1985). Neuwinger (2000) provides further ethnomedicinal information for East Africa where the plants are seemingly less important to the traditional pharmacopoeia, although they share common usage with West Africa in treatments for coughs and gonorrhoea. In Lower Dahomey, strips of the outer stem are woven into small baskets and table mats, and for this purpose the plants are sometimes cultivated (Usher 1974; Burkill 1985). More curiously, in Sierra Leone the dead are interred upon the canes of the spiral ginger, and when twins are born stems are laid by an anthill. In Ghana, plant parts are purposely positioned about homes and communities to act as protective charms and are even planted in sacred groves (Burkill 1985). Use of the plant by humans as a food source has not been documented, although chimpanzees have been observed to eat both fruits and pith (Peters *et al*. 1992).

Spiral ginger plants are decorative for their tall, leafy canes which twist spirally—particularly towards the apex. The glossy, spindle-shaped leaves spiral along the length of the canes, apically becoming inflorescence bracts and towards the base reduced to enveloping sheaths. The ligules are short and nonmembranous, and as they encircle the stem they have sometimes been referred to incorrectly as an ochrea. As stems mature, the sheaths enveloping the base become papery and turn a reddish brown. Single cone-like inflorescences are borne terminally either on leafy shoots or on leafless shoots that emerge directly from the rhizome, their bracts arranged spirally. Plants are clumped by virtue of their shortly creeping rhizomes; they present up to several flowers at any one time, each bract of the inflorescence characteristically subtending two consecutive flowers. The accompanying plate depicts the showy flowers, with the petaloid funnel-shaped labellum dominating the floral display and the petals much less conspicuous. A prominent central yellow strip colours the inside of the tubular labellum opposite the fertile anther and has been deemed a nectar guide facilitating bee pollination (Specht 2006), a character further enhanced by the reddish purple rim to the lip and by a slight spicy fragrance. The yellow guide leads the bees to nectaries located at the base of the gynoecium, in the process causing transfer of pollen from the anther of one flower to the stigma of another.

In cultivation in Kloof in KwaZulu-Natal, South Africa, flowers are produced from spring to late summer, with flowering becoming more erratic from April onwards. Up to two flowers are fully mature on an inflorescence at any one time, forcing pollinators to move between shoots and thus facilitate outcrossing. Plants are very easy to grow in frost-free regions in medium shade, in rich well-drained soil. Division of the rootstock is recommended for propagation purposes—fortunately the rhizome of spiral ginger is not widely creeping as in some *Aframomum* species (e.g. *A. angustiflorum*), and it is therefore less likely to naturalise if more widely cultivated in the subtropics. However, until its invasive potential is better assessed, it would be expedient to contain this vigorous grower in pots, ideally in semishade or in situations receiving morning sun. However, Walters *et al*. (1984), who list *Costus afer* as a European garden subject, point out that potted costus plants become root-bound and are susceptible to red spider mite. These authors suggested planting specimens along borders to allow plants free root-run. The clump-forming habit is aesthetically pleasing, with those canes located peripherally having a tendency to lean outwards in the manner of bamboos. Plants grow best when watered moderately, allowing the soil to dry but not completely so before further irrigation.

The specimen figured here was sourced in western Mozambique in an area to the northwest of Dombe, opposite the Chimanimani Mountains. However, its most southerly recorded locality is at the Haroni-Makurupini junction in the Rusitu Valley of Zimbabwe. The threat of over-collection has been cited by Mapaura & Timberlake (2002) as the reason for its Red Data status in Zimbabwe as Vulnerable (VU D2). Substantial destruction of its habitat in Zimbabwe has also been documented (Müller 1999). It does not appear to be considered threatened in neighbouring Mozambique where plants were encountered at an altitude of 600 m in moist forest, in semishade and shade, growing in red clay soil. Dominant trees at the site were *Trilepisium madagascariense*, *Erythrophleum suaveolens*, *Synsepalum brevipes*, *Tabernaemontana ventricosa* and *Rinorea arborea*, with *Newtonia buchananii* also present. The attractive understorey shrub *Piper umbellatum* and the bamboo-like *Olyra latifolia* grew alongside. The classification of this rainforest habitat corresponds best to the lowland forest type found in adjacent Zimbabwe (Müller 1999). Plants along the Mozambique/Zimbabwe border are exposed to high orographic rainfall which peaks in mid- to late summer.

Within south-central Africa, *Costus afer* is unlikely to be confused with the other two members of the genus—its aerial leafy canes clearly distinguish it from *C. macranthus* and *C. spectabilis*, both of which are acaulescent, their four leaves appressed to the ground. These latter taxa are both inhabitants of wooded grassland and deciduous woodland rather than moist forest; mixed populations with *C. afer* are accordingly unlikely. In East Africa, both *C. sarmentosus* and *C. subbiflorus* share similar habitats and may be confused with *C. afer*. However, they are distinguished by always having only one flower rather than two subtended by each inflorescence bract. *C. afer* is most likely to be confused with the very similar *C. dubius*, the inflorescence bracts of which again subtend only a single flower. *C. lucanusianus*, which occurs from Uganda westwards to Sierra Leone, also bears two flowers per bract, but has prominent ciliate ridges at the junction of the petiole and sheath (Lock 1985). At a glance, the spiral stems of *C. afer* also separate it from *Aframomum* in the closely related Zingiberaceae, species of which may co-occur with it.

The genus name *Costus* is Latin and is derived from an Oriental name for an aromatic root, while the epithet *afer* refers to the African origin of the type, which was collected in Sierra Leone by Mr George Don, a collector for the British Horticultural Society.

**Description** (based on Lock 1985).—Herbaceous perennial. *Rhizome* sympodial, fleshy, nonaromatic, shortly creeping, forming dense clumps. *Leaf shoots* 2–4 m tall, terete, unbranched. *Leaves* numerous, solitary, with sheathing base, spiromonistichous, elliptic to ovate, up to 150–350 × 35–95 mm, glabrous, pinnately veined, sometimes sparsely appressed pubescent beneath, apex acuminate, base rounded or subcordate; pseudopetiole 4–12 mm long; ligule coriaceous, green, glabrous, 4–8 mm long; sheaths green, often with purple blotches, striate when dry. *Inflorescence* a strobilaceous spike, subglobose, terminal on leafy shoots, sometimes produced on short basal shoots (West Africa); bracts oblong, convex, apex truncate to rounded, ± 35 × 30 mm, upper ones rather smaller, green with purple markings, each subtending two fully developed flowers; bracteoles boat-shaped, ± 25 × 8 mm, with a thickened rigid keel, pale green with pink markings and a thin pink scarious margin. *Flowers* bisexual, zygomorphic. *Calyx* funnel-shaped, 17–20 mm long, with three triangular apical teeth 5 mm long, sometimes with pink scarious margin; calyx teeth projecting 2–3 mm beyond bracts after anthesis; tube hairy outside at base. *Corolla tube* ± 20 mm long, hairy inside; petals 3, oblong-ovate, 30–40 × 12–14 mm, hooded at apex, semitransparent, white. *Labellum* broadly triangular, petaloid, opposite free petaloid stamen, funnel-shaped, ± 25 × 25 mm, white sometimes tinged pink, with a rich orange-yellow central band extending to base of tube. *Stamen* white, ovate, entire, ± 30 × 12 mm; anthers subterminal, 7–8 mm long, dehiscing introrsely. *Ovary* inferior, 3-locular; style filiform, passing between anther thecae; stigma funnel-shaped, margin ciliate; nectaries 2 in apex; ovules many, anatropous. *Fruit* globose, a fleshy trilocular capsule, crowned with remains of calyx. *Seed* black, arillate. Plate 2228.

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N.R. CROUCH*, G.F. SMITH** and GILLIAN CONDY***

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* Ethnobotany Unit, South African National Biodiversity Institute, P.O. Box 52099, Berea Road, 4007 South Africa / School of Chemistry, University of KwaZulu-Natal, Durban 4041, South Africa.

** Office of the Chief Director: Systematics Research and Collections, South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa / H.G.W.J. Schweickerdt Herbarium, Department of Botany, University of Pretoria, Pretoria, 0002 South Africa.

*** South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

# *Viscum crassulae* Viscaceae

*South Africa*

**Viscum crassulae** *Eckl. & Zeyh*., Enumeratio plantarum africae australis extratropicae: 357 (1837); Harvey: 580, 581 (1862); Sprague: 129, 130 (1915); Wiens & Toelken: 55 (1979); Polhill & Wiens: 289 (1998). *V. euphorbiae* E.Mey. ex Drège: 229 (1843), nom. nud.

The genus *Viscum* consists of about 100 species, widely distributed in the African (including Madagascar) and Asian tropics, with extensions into the northern temperate zones of Europe and Asia (Polhill & Wiens 1998). Some 17 species occur in southern Africa. *Viscum* belongs to the mistletoe family, Viscaceae, which contains seven genera and some 450 species worldwide (Germishuizen 2000)—typically shrubby, monoecious or dioecious, brittle, hemiparasitic, aerial parasites on other dicotyledons and occasionally on conifers. The leaves are opposite, simple and entire, sometimes reduced to scales. The inflorescence is a typical or modified dichasium subtended by a pair of usually fused bracts, known as the bracteal cup. Problems may be encountered when identifying species of *Viscum* because of the evolutionary loss of various organs such as leaves and because of the extreme reduction in size of reproductive structures (Polhill & Wiens 1998).

*Viscum crassulae* was first collected by Ecklon and Zeyher in the early 1830s at Botha’s Hill close to Grahamstown in what they thought was the Great Fish River Valley. However, Botha’s Hill is only 2 km north of Grahamstown on a prominent ridge of Witteberg quartzite at 740 m. The Great Fish River Valley lies some 25 km to the east. The name Botha’s Hill is derived from Theunis Botha, owner of the original farm Modderfontein, later called Tempe Farm. Ecklon and Zeyher reported it on an arborescent member of the Crassulaceae and named their new discovery after this group. Around 1832, Drège collected it in the Sundays River Valley and reported it on a species of *Euphorbia* (Dyer 1935). MacOwan (*MacOwan 2101* in the Bolus Herbarium, University of Cape Town, with a duplicate in the Selmar Schonland Herbarium, Grahamstown) collected the parasite in June 1873 at Cookhouse Drift on the Fish River where it grew on *Portulacaria afra* and also from Swart Ruggens, Graaff-Reinet. He investigated *V. crassulae* thoroughly and although he examined many *Crassula ovata*, he did not find it on this species, only on *P. afra* whose younger leaves the parasite strikingly resembles (Dyer 1935, and see accompanying plate). Dyer’s own investigations into the host plants over the period 1926 to 1929 confirmed that *V. crassulae* did not occur on any crassulaceous plant—indicating that the specific epithet of Ecklon and Zeyher is ‘quite probably a misnomer’ (Dyer 1935).

*Viscum crassulae*, only the second species of *Viscum* to be illustrated in this series, is highly distinct and unusual. It is rarely collected because of its incon-

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PLATE 2229.—1, branch with flowers and fruits on cultivated *Portulacaria afra* host (note host branches on the left, mistletoe on the right) × 1; 2, fruiting branch, × 2. Voucher specimen: *Van Jaarsveld 15314* in Compton Herbarium, Cape Town. Artist: Gillian Condy.

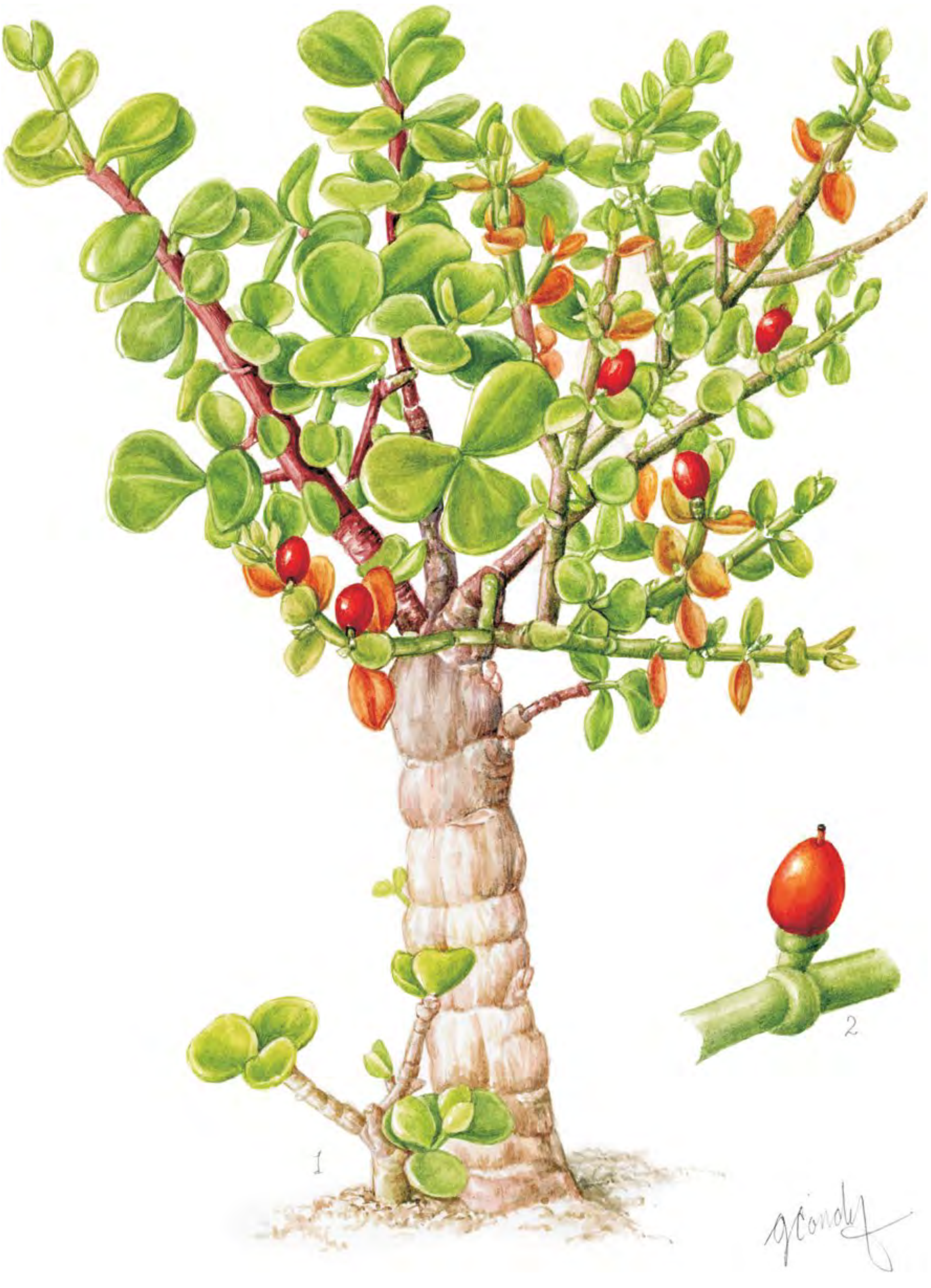

PLATE 2229 *Viscum crassulae*

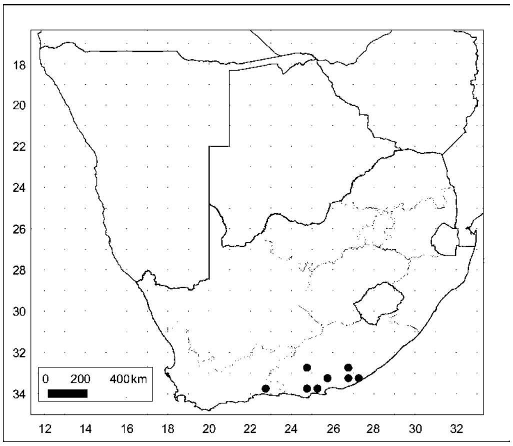

FIGURE 1.—Known distribution of *Viscum crassulae* based on specimens housed in the National Herbarium, Pretoria, Compton Herbarium, Cape Town, and Selmar Schonland Herbarium, Grahamstown.

spicuousness on its typical host, *Portulacaria afra*, or sometimes on species of *Euphorbia* (*Dyer 1563a* in Selmar Schonland Herbarium, Grahamstown, collected on *E. ×bothae*). The plant depicted here is endemic to the Thicket Biome of the Albany Centre of Floristic Endemism (Van Wyk & Smith 2001) (Figure 1) and was collected in Valley Bushveld in the Kouga Valley just below the Kouga Dam in October 1997 (*Van Jaarsveld 15314*). The plants were found to be locally common. Fresh fruits were collected from plants growing on *P. afra* and specimens were deposited at the Compton Herbarium. *V. crassulae* usually flowers in July and August and occasionally in late spring or summer. Fruits mature from spring onwards. Mature fruits were taken to the Kirstenbosch National Botanical Garden where seeds were placed on various *P. afra* host plants growing in Section B west of the Camphor Avenue in the Garden and in the Botanical Society Conservatory and in containers in the succulent nursery. Seeds were removed from the fruit prior to placement on distal portions of the host stem where they remained because of viscin, a sticky substance derived from the inner layer of the fruit wall and because they were wedged within a forked branch. Germination occurred within three weeks when the primary root emerged and curved towards the *Portulacaria* stem. The cotyledons of the seedling enlarged, became visible and the haustoria gradually thickened. The young plants were slow-growing at first but by 2003 had matured and flowered.

The mistletoes in the Conservatory were placed on a vigorous, large-leaved specimen of *Portulacaria afra* from Wylie’s Poort (Limpopo Province). They grew much faster than their smaller counterparts in the nursery or in Section B. In March 2006, the main branches measured 30 mm in diameter (green, and mottled grey) and the plants were around 450 mm tall (from the point of attachment to the tip of the main branch). These abnormal conditions are not reflected in the description below. The material illustrated here was taken from plants placed on *P. afra* from the Eastern Cape and kept in medium-sized containers in the succulent nursery where the plants flowered and fruited. The berries are striking and conspicuous, and are therefore easily spotted by frugivorous birds, which disperse the seed. The trials at Kirstenbosch showed that *Viscum crassulae* are readily cultivated on specimens of *P. afra*, making a beautiful combination, especially with the eye-catching red fruits.

Midgley & Joubert (1991) reported that *Viscum crassulae* and *V. rotundifolium* are indicators of elephant grazing intensity in the Addo Elephant National Park. They have a high nutrient and water content and because of this, it is clear that large herbivores have a negative effect on the abundance and size of parasitic plants, especially *V. crassulae*. Interestingly, the leaves of *V. crassulae* mimic the form of those of its host plant, *Portulacaria afra* (Wiens & Tölken 1979).

The common name for several species of *Viscum*, including *V. crassulae*, is *voëlent* (Afrikaans), referring to the sticky seeds that adhere to the beaks of birds when they eat the fruits and thus disperse the seeds (Smith 1966).

**Description** (partly after Polhill & Wiens 1998).—Leafy, deciduous, highly succulent semishrubs, rarely exceeding a length of 0.2–0.3 m. *Stems* very brittle and conspicuously wrinkled on drying, rounded, up to 6 mm in diameter; internodes especially in basal portion up to 20 mm long. *Leaves* entire, obovate-orbicular, (10–)15–20 × 3–6(–10) mm, glossy bright green, fleshy, surface smooth, apex blunt, rounded, base slightly oblique; petiole very short, up to 2 mm long. *Staminate flowers* in dichasia, 1–3 per axil. *Pistillate flowers* solitary (occasionally 2) in axils of leaves. *Berries* ovoid, 5–6(–8) × 4 × 4 mm, sessile, smooth, bright orange to scarlet; style persistent. Plate 2229.

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G. GERMISHUIZEN*, E.J. VAN JAARSVELD** and GILLIAN CONDY*

---

* South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

** South African National Biodiversity Institute, Kirstenbosch, Private Bag X7, Claremont, 7735 South Africa.

J Condy

PLATE 2230 *Cephalophyllum spissum*

# *Cephalophyllum spissum* Mesembryanthemaceae (Aizoaceae)

*South Africa*

**Cephalophyllum spissum** *H.E.K.Hartmann* in Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg 22: 176 (1988).

The generic name *Cephalophyllum* is derived from the Greek words *cephalos* (head) and *phyllon* (leaf), alluding to the compact heads formed by the leaves of many species. This name was first used by Haworth (1821) and applied to a section within the genus *Mesembryanthemum* comprising seven species, three of which were figured by Dillenius (1732), the illustrations now serving as lectotypes for the three names. The genus *Cephalophyllum* was first named by Brown (1925) of Kew in a key to several mesemb genera, but with no formal description, no type and no indication of the species belonging to it. He stated the following with regard to *Cephalophyllum*: 'Leaves ascending or spreading, crowded or in tufts or, on the flowering branches, with distinct internodes between the pairs, subterete or trigonous, not stout, finely pellucid-dotted when held against the light, stigmas 10–20'.

Within the genus *Cephalophyllum*, Hartmann (1983) distinguished two subgenera, *Homophyllum* and *Cephalophyllum*. *C. spissum* belongs to the subgenus *Homophyllum*, which is characterised by a compact growth form, the primary shoots indistinguishable from the secondary shoots. In subgenus *Homophyllum* the height of the top part of the fruit capsules is smaller than the basal part of the fruit, and the flowers have only a few rounded petals (Hartmann 1988). In contrast, in the subgenus *Cephalophyllum* the height of the top part of the fruit capsules is larger than the basal part, and the petals are numerous, with more pointed tips. However, the author has found this character not to be highly variable within the two subgenera.

The specific epithet *spissum* is derived from the Latin adjective *spissus*, meaning dense, compact or close together—alluding to the leaves, which form dense clusters.

The type of *Cephalophyllum spissum* was collected by Harry Hall on 10 July 1964 (*400/64NBG*!). He grew it at Kirstenbosch and took it to Louisa Bolus. This was the case with many mesembs, as, especially in the 1930s, Bolus had a large network of collectors who brought her live material from all over southern Africa. Later, when the plants flowered, they were usually painted by one of the artists collaborating with Bolus and then pressed as a herbarium specimen.

*Cephalophyllum spissum* is sometimes confused with *C. caespitosum*, for example in Smith *et al*. (1998) the captions to the illustrations of the two species

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PLATE 2230.—1, whole plant, showing habit, × 1; 2, open flower in longitudinal section, × 2; 3, open capsule, × 2. Voucher specimen: *Stirton & Boucher 6144* in National Herbarium, Pretoria. Artist: Gillian Condy.

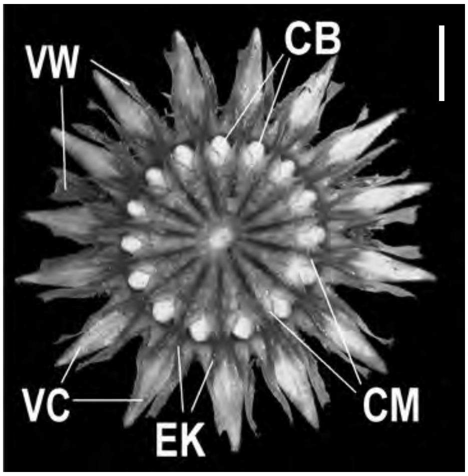

FIGURE 1.—Open fruit capsule of *Cephalophyllum spissum*. Voucher specimen: *P.M. Burgoyne 8690* in National Herbarium, Pretoria. CB = closing bodies, CM = covering membranes, EK = expanding keels, VC = valve covers, VW = valve wings. Scale bar: 10 mm.

should be switched. Both are anisophyllous (having leaves of unequal length) when young, the keels of the leaves finely serrulate. However, *C. spissum* differs from *C. caespitosum* in its longer trigonous leaves (30–55 mm) with definite sharp margins, whereas those of the latter species are more rounded. The two species can be further distinguished by the number of locules in the fruit capsules: 11–16 in *C. spissum* (Figure 1); 9–10 in *C. caespitosum*.

*Cephalophyllum spissum* is a highly succulent dwarf plant with a compact growth form. It reaches a diameter of up to 120 mm and a height of only 70 mm (including the inflorescence). In nature, the leaves of a pair differ somewhat in length, the longer one sometimes bent over the shorter one in older plants. This character is not shown in the accompanying plate, which depicts a young cultivated plant. Leaf margins are distinct and are serrulate when young, but this feature disappears with age. The triquetrous leaves are 45–60 mm long, connate at the base and blunt at the tip. Hartmann (2001) states that leaves are dark green from lack of wax particles, but field observations show that the leaves are always glaucous green in this species. In its natural habitat the solitary flowers appear in winter from July to August, depending on the rainfall. Flowering lasts only a few weeks. The flowers are pale salmon-pink or pale coral with a lighter centre and can be up to 60 mm in diameter. They open in midmorning, closing again in the afternoon; like most mesemb species, they are not self-fertile. When open, flowers are visited by bees, flies and other insects. The flowers are borne upright but, once fertilised, the pedicels become decumbent, the capsules lying on the soil surface when ripe.

Based on similarities in fruit characters, Hartmann (1988) placed *Cephalophyllum* within the Leipoldtia Group, which includes genera such as *Cheiridopsis*, *Fenestraria*, *Hallianthus*, *Jordaaniella* and *Leipoldtia*. However, these groupings have been found to be artificial when compared to molecular data (Klak *et al*. 2004).

*Cephalophyllum spissum* is endemic to white quartz patches of the Knersvlakte Bioregion (Figure 2) within the Succulent Karoo Biome (Mucina *et al*. 2005). The Knersvlakte lies north of Vanrhynsdorp in the Western Cape Province of South Africa and is known for its abundance of succulent plants, not only in terms of numbers of individuals per square metre but also in terms of numbers of species, many of which are found only in this area (Van Wyk & Smith 2001). *C. spissum* grows in well-drained soils derived from sedimentary rocks, thriving in stony spots of white quartz together with other Knersvlakte succulent endemics, which include species of *Aloe*, *Argyroderma*, *Conophytum*, *Crassula*, *Dactylopsis*, *Dicrocaulon*, *Drosanthemum*, *Monilaria*, *Oophytum*, *Ruschia* and *Tylecodon*. The white quartz patches are the result of weathered quartz veins that produce stones varying in pebble density and size (Ellis *et al*. 2006). The uniqueness of these white quartz patches has been documented by Schmiedel & Jürgens (1999). Topographically this area comprises level plains alternating with low rolling hills at altitudes varying from 200–350 m above sea level. Plants experience winter rainfall of 100–200 mm per annum.

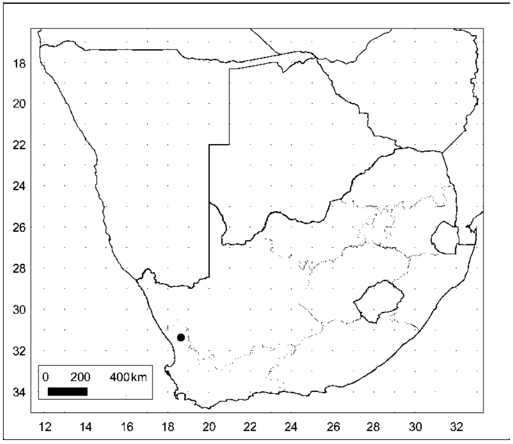

FIGURE 2.—Known distribution of *Cephalophyllum spissum*.

Conservation of this species on the Knersvlakte depends upon the successful implementation of a newly developed management plan, which forms a part of a network that has been recommended for conserving the Succulent Karoo (Lombard *et al*. 1999).

Growing *Cephalophyllum spissum* can be a challenge as the habitat where it grows is so unique that it is virtually impossible to duplicate it. Soils where these plants grow can have a low saline content with a low pH, or a high saline content with a neutral pH (Schmiedel & Jürgens 1999) and temperatures and precipitation are not easily duplicated. In spring and the early summer months, mist rolls in from the coast and dissipates only at about 11 o'clock in the morning, considerably adding to the precipitation (Olivier 2002)—vital for the survival of many species in this arid area but very difficult to imitate in a garden situation. A fine mist spray occasionally applied may compensate, but the light conditions that accompany true mist cannot be provided.

Fortunately *Cephalophyllum spissum* does not require these exact conditions and can be grown in gardens or under glass, in well-drained soil, watered in winter and kept dry in the summer months. Like most of its relatives, this species of *Cephalophyllum* can be grown from seed or from cuttings, which root when grown in river sand. Once roots have become established, the cuttings can be transferred to a well-drained soil mix and may flower in their second year. Insufficient bright light can change their appearance, making them somewhat etiolated and different from typical specimens. This is true for many succulents and in the past has resulted in many a 'new species' having been described based on unnatural hothouse-grown specimens. The showy salmon- or coral-pink flowers are a great reward for the succulent enthusiast but care must be taken to avoid over-watering and poor drainage, otherwise rot may set in. Some mesembs such as species of *Carpobrotus* and

*Sceletium* have medicinal value but nothing is known about the medicinal properties of *Cephalophyllum spissum*. No common names have been recorded for this species.

Seeds are retained in hygrochastic capsules which open when wet and close again when dry. This ‘packaging’ is so efficient that seed in capsules can remain viable for many years. The evolution of the hygrochastic capsule ensures that seeds are held back and that only a few at a time are scattered when conditions are favourable for germination. This retention of seed is known as atelechory (nondispersal of seed). There are many forms of atelechory but the particular one involved here is called synaptospermy (keeping together of seeds until germination occurs). Once the capsule has opened, seeds are dispersed by means of droplets of rain that exert pressure on the covering membranes, expelling the seeds. Studies by Parolin (2001) show that different species expel seeds at different distances.

**Description**.—Compact leaf succulent ± 40–70 mm tall. *Main stem* short, thick, branching above ground level, branches ± 10 mm in diameter. *Roots* becoming fibrous with age. *Leaves* apically trigonous, 45–60 mm long, sharply keeled, glaucous green, margins sharply angled, serrulate when young, becoming smooth with age, borne upright, spreading with age; surface flat, not papillate; leaves of a pair connate at base, the longer one sometimes bending over the shorter one. *Flowers* single, borne upright on a pedicel 30–40 mm long, pale salmon- or coral-pink, often with paler centre; peduncles bracteate; bracts one pair, borne at base of flower stalk, resembling small leaves. *Sepals* shorter than petals, fleshy, resembling leaves. *Petals* obovate to ovate-lanceolate, in three series, 110–150 per series. *Stamens*: filaments pale yellow, cream-coloured or white, inner ones papillate at base, outer ones epapillate or with only a few scattered papillae; pollen cream-coloured or white; staminodes absent. *Nectary* a ring comprising small dark green glands. *Ovary* inferior, concave at top, with 11–15 cells, placentas parietal, stigmas much shorter than stamens, varying from 11–15 in number, slender, recurved with fimbriate inner margins. *Fruit* a hygrochastic capsule, open when wet, closed when dry, decumbent when ripe, lying on soil surface, 12–14 mm in diameter, with 11–16 locules, top part of fruit smaller in height than base, expanding keels reaching halfway to tips of valves, slightly apart, parallel for a third of their length then diverging, tips acute, covering membranes well developed covering most of locule, each pair angled down towards centre of locule, valve wings broad, attached to distal tips of expanding keels, closing bodies large, white, completely covering distal ends of valves, with covering membranes curved around them. *Seeds* pale brown, subobovate, up to 1.25 mm long, surface smooth, micropyle appressed. *Chromosome number*: 2*n* = 18 or 27 (Hartmann 2001). Plate 2230.

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P.M. BURGOYNE*[†] and GILLIAN CONDY*

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* South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

[†] Research Fellow, Department of Environmental Sciences, College of Agriculture and Environmental Sciences, University of South Africa, P.O. Box 392, UNISA, Pretoria, 0003 South Africa.

Flowering Plants of Africa 60: 70–77 (2007)

# *Rabiea albipuncta* Mesembryanthemaceae (Aizoaceae)

*South Africa*

**Rabiea albipuncta** *(Haw.) N.E.Br.* in Gardeners' Chronicle 89: 53 (1931). *Mesembryanthemum albipunctum* Haw.: 126 (1826). *M. albipunctum* Haw. var. *majus* Haw.: 127 (1826). *Aloinopsis albipuncta* (Haw.) Schwantes: 178 (1926). *Nananthus albipunctus* (Haw.) N.E.Br.: 78 (1928). *R. albipuncta* (Haw.) N.E.Br. var. *major* L.Bolus: t. 109 (1958a).

*Rabiea albipuncta* was first described by Haworth (1826) as *Mesembryanthemum albipunctum* from material he obtained from Bowie who collected at the Cape of Good Hope. At this time all mesembs were placed in the genus *Mesembryanthemum* which only later was segregated into smaller, more clearly defined genera. One hundred years after its publication, Schwantes (1926) placed *R. albipuncta* in the genus *Aloinopsis*, which can be confused with *Rabiea* because members of both genera have thick rootstocks and pellucid (clear) or white dots on the leaves. *Aloinopsis*, however, has ovate to spatulate leaves, whereas those of *Rabiea* are trigonous to triquetrous, with sharp tips. Later Brown (1928) incorporated this taxon in the genus *Nananthus*. *Nananthus* and *Rabiea* share the characters of sharp leaves and thick rootstocks, but the flowers and capsules differ (see Table 1).

The genus *Rabiea* was established in 1930 in a key in *Gardeners' Chronicle* (88: 279). The generic name commemorates the plant collector Reverend W.A. Rabie of Fauresmith. Approximately a year later (1931) Brown listed six species for this genus, including also *Rabiea albipuncta*. Brown's description was based in part on Haworth's original description of *Mesembryanthemum albipunctum* and in part on a drawing of the type collected from the Cape of Good Hope by Bowie. Many years later, Bolus (1958a) published an illustration of the variety *major*, a new combination based on Haworth's *M. albipunctum* Haw. var. *majus* Haw., which has subsequently been found to be indistinguishable from the typical variety. In the same publication Bolus (1958b: 369–372) gave more information on the genus *Rabiea* and provided a key to the species.

The specific epithet *albipuncta* is derived from the Latin adjective *albus*, meaning dull white (rather than glossy white—*candidus*), and *punctus*, which refers to the points, dots or small spots with which the leaves are adorned. Spots are characteristic of the genus *Rabiea* as a whole and are present on the leaves of all species to a lesser or greater degree but other genera also have spots. Younger leaves have dark spots, which turn lighter with age. This colour change tends to be more prominent in wild plants and spots of plants grown in pots tend to remain dark.

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PLATE 2231.—1, whole plant, showing habit and open flowers, × 1; 2, open flower in longitudinal section, × 1.5; 3, open capsule, × 2. Voucher specimen: *H.F. Glen s.n.* (*PRE569273*) in National Herbarium, Pretoria. Artist: Gillian Condy.

G. Condy

PLATE 2231 *Rabiea albipuncta*

The first species listed in the key to the species of *Rabiea* (Brown 1931) is that of ‘*Rabiea*’ *carolinensis,* now placed in *Khadia*. Brown had access only to non-flowering material and stated ‘stigmas 6-?’ in the key, thus indicating that he had not seen flowers. It is easy to confuse *Rabiea* with *Khadia* when the plants are not in flower as both genera form dense caespitose clumps with sharp-tipped leaves. However, flowers, nectaries and fruits differ—in *Khadia* the flowers are white or shades of pink, whereas those of *Rabiea* are yellow. Holonectaries are present in *Khadia*, while *Rabiea* has a meronectary comprising 7–10 separate parts (Chesselet *et al*. 2001). The two genera also differ in geographical distribution, with *Khadia* found mainly in the northern provinces of South Africa while *Rabiea* occurs in the central parts of southern Africa. When in flower, members of *Rabiea* can also be confused with *Hereroa*, as both have yellow flowers. However, *Hereroa* has blunt, glaucous leaves with a rough epidermis. Differences between closely related genera and *Rabiea* are summarised in Table 1.

According to Bolus (1958b), *Rabiea albipuncta* can be distinguished from *R. jamesii* by the difference in leaf width (5 mm broad in *R. albipuncta,* 1.3 mm broad in *R. jamesii*). *R. jamesii* has dorsally rounded leaves becoming terete towards the apex while leaves of *R. albipuncta* are semiterete at the base and trigonous at the tip. Both *R. albipuncta* (Figure 1) and *R. difformis* have slender leaves without the keeled chin characteristic of *R. albinota* (Figure 2), but this character is not constant

TABLE 1.—Differences between *Rabiea* and closely related genera

| Character | *Aloinopsis* | *Nananthus* | *Rabiea* | *Khadia* | *Hereroa* |
|---|---|---|---|---|---|
| Habit | small caespitose clumps | small caespitose clumps | large caespitose clumps | large caespitose clumps or creeping | single plants to clumps |
| Distribution* | WC, EC | NW, FS, NC, WC, EC | FS, L, EC | LIM, NW, G, M | N, LIM, NW, G, FS, NC, WC, EC |
| Leaves | spatulate, rounded tips | decumbent, pointed tips | ascending, pointed tips | ascending, pointed tips | ascending, pointed tips to blunt-tipped |
| Flowers | pink, yellow or shades of yellow with central red stripe | shades of yellow with central red stripe | yellow | pink/white | yellow |
| Fruit | pale buff, spongy, multilocular, with wide valve wings | pale buff, spongy, multilocular, with wide valve wings | deep brown tannin spots distinct, woody, multilocular | deep brown, woody, 4-locular to multilocular | deep brown, woody, 5-locular |
| Roots | thick, fleshy taproot | thick, fleshy taproot | thick, semiwoody taproot | thick, woody taproot | thick taproot to fibrous roots |

* L = Lesotho. N = Namibia. South African provinces: EC = Eastern Cape; FS = Free State; G = Gauteng; LIM = Limpopo; M = Mpumalanga; NC = Northern Cape; NW = North-West; WC = Western Cape.

FIGURE 1.—*Rabiea albipuncta* with its sharp, ascending leaves in habitat near Lady Grey, Eastern Cape, South Africa. Voucher specimen: *Burgoyne 8882(z)* in National Herbarium, Pretoria.

and, from field observations, is displayed only by older mature leaves. The most prominent distinction between *R. albinota* on the one hand and *R. albipuncta* and *R. difformis* on the other, are the numerous white dots that are prominent on the leaves of the first species, especially on herbarium specimens, but are fewer and sometimes dark green or brownish green in the latter two species. The leaf tips of species of *Rabiea* sometimes whither and dry, forming a white necrotic spot (Smith *et al*. 1998: 227).

*Rabiea albipuncta* occurs in the Nama-Karoo and Grassland Biomes (Mucina *et al*. 2005) of the southeastern Free State and northern parts of the Eastern Cape in South Africa (Figure 3). Hartmann (2001: 237) shows the genus to be absent southwest of Lesotho, but specimens of *R. albipuncta* were recently found at Aliwal North, Zastron and Lady Grey, thus increasing the distribution range of this species. Rainfall in the distribution area of *R. albipuncta* occurs from mid- to very late summer, never exceeding 600 mm per annum. This species grows in well-drained soils derived from igneous or sedimentary rock. The plants thrive in rocky spots, usually in full sun or sometimes wedged between rocks, hidden by grass. This genus belongs to a group of plants that are found in the karroid areas of central South Africa and have yellow flowers. The flowers open in the late afternoon and produce a sweet scent attracting pollinators active at this time; they close again after sunset. Members of this yellow-flowered group include *Chasmatophyllum*, *Deilanthe*, *Hereroa*, *Prepodesma*, *Pleiospilos*, *Rabiea*, *Rhinephyllum*, *Rhombophyllum*, *Stomatium* and *Tanquana* (P. Burgoyne, personal observation).

Capsules are hygrochastic and open when wetted by rain, closing again when drier conditions prevail (Figure 4). This mechanism ensures that seeds are ejected at favourable times (Parolin 2001). The capsules dry and drop from the plants as they are squeezed out by new leaf growth. Many seeds are produced per capsule. They germinate readily and in a rockery mature plants are always surrounded by a host of smaller seedlings. The seedlings usually experience a spurt of growth in the rainy season and form small caespitose clumps within two years, flowering while still relatively small. A single flower

FIGURE 2.—*Rabiea albinota* in habitat near Cradock, Eastern Cape, South Africa. The older leaves have a keeled chin. Voucher specimen: *Burgoyne 10028(b)* in National Herbarium, Pretoria.

is produced at the very young stage. Species can be distinguished even as young seedlings.

The attractive leaves with their dotted surfaces vary from bright green to glaucous green and, depending on their origin, can be covered by varying numbers of dots. The plants are perennial and become larger with age, forming dense rounded clumps. Large numbers of flowers are produced together in late spring and summer, almost covering the clumps and providing a most spectacular display as they can reach a size of up to 35 mm in diameter.

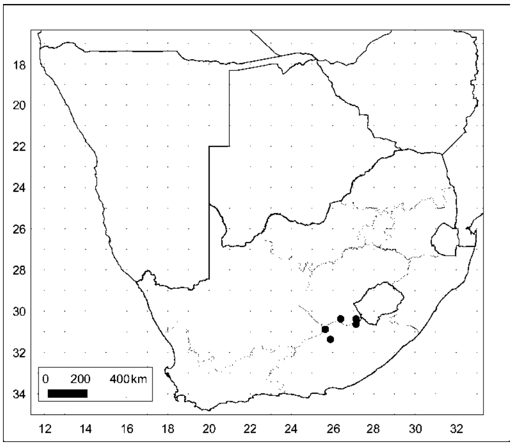

FIGURE 3.—Known distribution of *Rabiea albipuncta*.

Growing these plants can be tricky as they tend to rot from the centre when over-watered. Poor drainage can also lead to rot. They do well in rock gardens in sandy soil and should be watered sparingly, keeping in mind that they are best kept dry in the winter months. Under less than desirable conditions such as high out-of-season rainfall or low light intensity, *Rabiea albipuncta* is best kept under glass, with generous summer watering to mimic the thunderstorms of their natural habitat. They can be given a light watering in winter if they look stressed but should rather be kept dry. Bright sun is required to maintain the plants at their best, the white dots more prominent under these conditions. As they naturally grow in areas that receive severe frost and sometimes snow (Lesotho), they can withstand very cold winters.

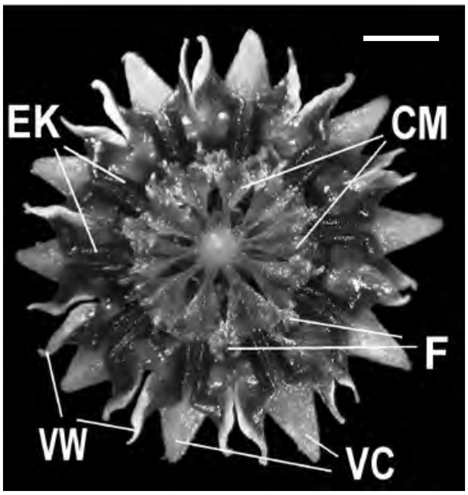

FIGURE 4.—Open fruit of *Rabiea albipuncta*. Voucher specimen: *P.M. Burgoyne 8882(z)* in National Herbarium, Pretoria. CM = covering membranes, EK = expanding keels, F = funicles, VC = valve covers, VW = valve wings. Scale bar: 5 mm.

Common names have not been recorded for *Rabiea albipuncta*, but the Griqua common name for a sister species, *R. albinota*, is *S'keng-keng* (Smith 1966: 560). In the past, the dried leaves of the latter were pulverised and mixed with snuff.

*Rabiea albipuncta* is relatively common where it occurs and it is not Red-listed. Populations are flourishing, with a representative selection of adults and juveniles present. Seed is abundant, indicating that pollination, seed set, germination and establishment are successful in this species.

**Description**.—Compact, dwarf perennials forming rounded, caespitose clumps up to 200 mm high. *Main stem* much reduced, forming a woody centre from which roots and leaves originate; branchlets with up to 6 pairs of crowded leaves, leaf sheaths enclosing internodes. *Roots* fleshy, forming a large thickened taproot sometimes becoming woody with age. *Leaves* opposite, succulent, 19–25 mm long, arranged in dense rosettes, trigonous with acute tip, covered with raised whitish or dark green dots, ascending, upper surface flat, lower surface rounded. *Flowers* solitary, terminal, opening between midday and midafternoon, closing towards evening; pedicels with basal bracteoles, elongating after anthesis. *Receptacle* semi-globose. *Calyx* 5–7-lobed, equally or subequally lobed, lighter green than leaves, up to 10 mm long, if subequally then outer 2 lobes larger than others, inner lobes with membranous margins, enfolding petals completely. *Petals* numerous, obtuse, linear, recurved, free, in 3 or 4 series, golden yellow becoming orange and withering with age, sometimes with orange tinge on undersurface. *Stamens* numerous (up to 80), erect; filaments white, 10–12 mm long, inner filaments papillate at base, outer filaments with only a few scattered papillae; anthers bright yellow; filamentous staminodes absent; pollen yellow. *Nectary* in a ring with 5–10 separate glands, positioned at upper rim of concave ovary. *Ovary* inferior, slightly concave at top, with 5–10 divisions, placentas parietal; stigmas 5–10, usually subulate, shorter than stamens, slender, deep orange, with fimbriate inner margins. *Fruit* a hygrochastic capsule with 5–10 locules, subglobose below valves, flat to convex above valves; expanding keels reaching to tips of valves, contiguous for half their length, then diverging, tips acute and ending in an awn; closing bodies absent; valve wings broad, covering membranes covering two thirds of locule, surface angled down towards centre of locule. *Seeds* subobovate, up to 1.25 mm long, surface finely tuberculate, pale brown, deep brown when older. Plate 2231.

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P.M. BURGOYNE*† and GILLIAN CONDY*

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* South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

† Research Fellow, Department of Environmental Sciences, College of Agriculture and Environmental Sciences, University of South Africa, P.O. Box 392, UNISA, Pretoria, 0003 South Africa.

Flowering Plants of Africa 60: 78–83 (2007)

# *Pelargonium luridum* Geraniaceae

*Angola, Zambia, Malawi, Mozambique, Zimbabwe and southern Africa*

**Pelargonium luridum** *(Andr.) Sweet*, A catalogue of plants sold by Colvill & Son: 2 (1822); Knuth: 365 (1912); Müller: 141 (1963); Trauseld: 109 (1969); Van der Walt & Ward-Hilhorst: 26 (1977); Webb: 56 (1984); Hilliard & Burtt: 168 (1987); Germishuizen & Fabian: 206 (1997); Germishuizen & Clarke: 81 (2003); Pooley: 208 (2003). *Geranium luridum* Andr.: 34 (1813). *Polyactium aconitophyllum* Eckl. & Zeyh.: 67 (1835). *Pelargonium aconitophyllum* (Eckl. & Zeyh.) Steud.: 283 (1841). *P. angulosum* Szyszyl.: 14 (1888). *P. rehmannii* Szyszyl.: 14 (1888). *P. zeyheri* Harv.: 276 (1860). *P. heckmannianum* Engl.: 335 (1902). *P. benguellense* (Welw. ex Oliv.) Engl.: 268 (1903). *P. longiscapum* Schltr. ex R.Knuth: 365 (1912).

*Pelargonium luridum* in the broad sense as treated here is a widespread and often locally abundant member of the family Geraniaceae in southern Africa's eastern grasslands. It also occurs in Angola, Zambia, Malawi, Mozambique and Zimbabwe (Figure 1). The species was first described as *Geranium luridum* by Andrews in 1813 but later Sweet (1822) placed it in *Pelargonium*. The genus name *Pelargonium*, established by L'Héritier (1789), is derived from the Greek word *pelargos*, referring to the fruit—like a stork's beak. The specific epithet *luridum* alludes to the colour of the flower—smoky or drab.

The taxon *Pelargonium luridum* has been described under different names several times because of its polymorphic leaves. Bullock (1959) reported on this interesting character as follows: 'The early seedling leaves are broadly rounded in outline, and but slightly and shallowly lobed. With approaching maturity the leaves become larger and progressively more dissected, but the adult leaves, with their stiffly erect petioles and dissection of the lamina into filiform segments showed a mark discontinuity from the variable form of the early leaves, which are always much smaller and are borne on weak petioles which allow the lamina to fall outwards. There is a return to the juvenile leaf-form each year, the first few leaves being relatively small but broad, and from slightly to deeply lobed; the change to the adult leaf-form is again quite abrupt, and the early leaves soon wither and die.'

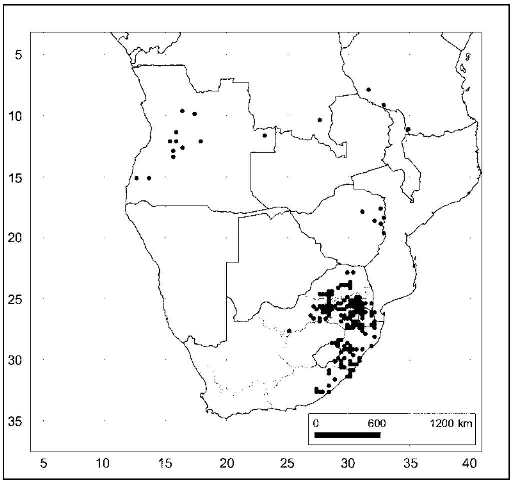

FIGURE 1.—Known distribution of *Pelargonium luridum* in a broad sense.

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PLATE 2232.—1, habit with mature leaves, × 1; 2, inflorescence, × 1; 3, one of the first leaves, × 1; 4, mericarp, × 1. Voucher: *Condy 196* in National Herbarium, Pretoria. Artist: Gillian Condy.

PLATE 2232 *Pelargonium luridum*

The genus *Pelargonium* occurs mainly in southern Africa (South Africa, Namibia, Botswana, Lesotho and Swaziland) and is represented by about 232 species in the region. The large number of species are conveniently divided into sections, which appear quite natural, since certain groups of species have evolved in a similar manner and possess similar characteristics. *P. luridum* is placed in the section *Polyactium* (The Pelargonium Page 2006). This section is characterised by subterranean tubers, lobed or pinnately divided leaves and star-like, unbranched, many-flowered inflorescences, the night-scented flowers with subequal petals (Van der Walt & Ward-Hilhorst 1977). Only one pseudo-umbel is borne on a flowering stalk (scape), except in the case of *P. schlechteri* (see Plate 2233). The map included here (Figure 1) displays the distribution of *P. luridum* in a broad sense, including localities where the taxa *P. heckmannianum* and *P. rehmannii* occur. However, these two species are regarded as distinct taxa following Knuth (1912) and not Müller (1963).

Pelargoniums grow in short grass, often in stony ground that sometimes becomes very dry during periods between rainfall. Plants growing in low-lying areas along vleis or watercourses sometimes lie in waterlogged soil for weeks on end after flooding. Members of the genus are also found in stony soil at the edges of sheets of exposed rock. These habitats are often associated with seepage areas on mountainsides. The abundance and success of the species are directly related to the wide range of grassland habitats in which they are able to thrive. *Pelargonium luridum* occurs in grassland on plains, hills and mountains, at up to about 2 500 m in the northern Drakensberg. The species used to be particularly common in the veld around Johannesburg but in recent times their numbers have been greatly reduced by urban and suburban developments. It readily colonises disturbed ground (C.C., personal observations).

*Pelargonium luridum* has a very long growing and flowering season, lasting from September until the first frost of the winter in early May. It is one of the very few species of *Pelargonium* that set little seed. The seeds are often parasitised by various insects, including lepidopterous larvae, and many flowers seem to escape pollination. However, the long flowering season of 6–9 months compensates for these circumstances. During this time, individual plants do produce some seeds that can be dispersed. The numbers of *P. luridum* are also limited by the density of the short grassland where they occur which, in years between grass fires, is often too dense for seeds to germinate and develop into young plants. Livestock, particularly cattle and sheep, graze the veld throughout the distribution range of *P. luridum*, trampling many seedlings before they have developed young tubers. The species is largely absent from the densely settled, overgrazed areas of KwaZulu-Natal where grasslands have become degraded through erosion and the establishment of annual and perennial weeds. It is often particularly abundant in road reserves—areas that escape grazing and trampling by livestock and where the road verges are burnt or mowed each winter, eliminating competition from dense grasses and herbs (C.C., personal observations).

Pelargoniums are easily propagated from seed sown just below the surface of the soil or by division of the numerous strings of tubers characteristic of the mature plants. The tubers have to be kept dry during the winter dormancy period from mid-May until the end of September. In summer-rainfall areas the plants do well when they are watered naturally by rain. *Pelargonium luridum* is easily cultivated in well-drained, gravelly soil in large, deep containers placed in direct sunlight or dappled shade. It is a good candidate for natural grassland gardens in areas where the veld can be left intact or recreated.

**Description** (partly after Müller 1963).—A perennial herb with a tuberous, woody rootstock and an erect scape up to 1 m high. *Trichome complement*: unbranched, short and long stiff hairs and sessile glandular trichomes. *Leaves* radical; lamina ovate to broadly ovate, 70–150 × 70–140 mm, shallowly lobed to pinnatisect or often more dissected with ultimate segments filiform to oblong or ovate, entire to serrate or crenate towards apex, apex acute to rounded, variously hairy, base cuneate to cordate; petiole up to 30–200 mm long; stipules linear to narrowly triangular, 15–40 × 1.5–5.0 mm. *Inflorescence*: scape unbranched, patently hairy, with a terminal pseudo-umbel; involucral bracts narrowly ovate, up to 16 mm long, apex acute to acuminate. *Flowers* zygomorphic, bisexual, pendulous, 5-merous; sepals narrowly ovate, up to 15 mm long, glandular, densely pubescent; petals narrowly obovate, 12–24 × 5–12 mm, white, yellow, salmon-pink or shades of pink; pedicel thin, up to 10 mm long; hypanthium prominently thicker than pedicel, ending in a pulvinus at base, ± 40 mm long. *Fertile stamens* 7. *Ovary*: basal part tomentose, rostrum pubescent; style 0.1–1.2 mm long; stigmas filiform. *Fruit* mericarps, 40–50 mm long, rostrate, tapering from base to apex, ending in a spirally twisted awn with long golden brown hairs when ripe. *Seeds* ± oblong-ovoid, 4.8–6.0 × 1.9–2.2 mm, pale brown. Plate 2232.

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E. RETIEF*, C. CRAIB** and G. CONDY*

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* South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

** P.O. Box 67142, Bryanston, 2021 South Africa.

# *Pelargonium schlechteri* Geraniaceae

*South Africa*

**Pelargonium schlechteri** *R.Knuth* in Botanische Jahrbücher 40: 72 (1907); Knuth: 365 (1912); Hilliard & Burtt: 168 (1987); Pooley: 38 (2003). *P. flabellifolium* Harv.: 277 (1860), illegitimate name.

*Pelargonium schlechteri* was described by Knuth in 1907 from material Conrad Beyrich collected in Pondoland (Eastern Cape Province) between 1887 and 1889. Beyrich was an engineer and traveller who joined Bachmann on an expedition to the area (Gunn & Codd 1981). The specific epithet commemorates Rudolph Schlechter, a German botanist and traveller who collected extensively in southern Africa between 1891 and 1898. *P. schlechteri* is an acaulescent geophyte characterised by a flower stalk (scape) with two to four pseudo-umbels, bicoloured flowers and large, leathery, prominently veined leaves.

The species is treated here as a distinct taxon, following Hilliard & Burtt (1987), Pooley (2003) and The Pelargonium Page (2006). The latter currently recognises *Pelargonium schlechteri* as ‘sectionless’. However, it shows strong similarity to *P. luridum* and is currently kept in the section *Polyactium* after Knuth (1912). The two species grow together in several areas, for example in the Ukhahlamba Drakensberg Park (Cathedral Peak). The most obvious difference between them is the two pseudo-umbels of flowers borne at intervals along the scape (the naked flower stalk arising from the ground) in *P. schlechteri*, as opposed to one pseudo-umbel in *P. luridum*. The character of two pseudo-umbels of flowers is not always constant and plants with three or four pseudo-umbels of flowers also occur (see Trauseld 1969: 108). Further studies are required to ascertain whether *P. schlechteri* hybridises with *P. luridum* where the plants occur together. *P. schlechteri* has much larger tubers than *P. luridum*, in fact amongst the largest in the genus—about 300 mm long and 160–200 mm wide in old plants. The leaves are also enormous, up to 240 mm wide, larger than the leaf sizes normally attained in *P. luridum*.

*Pelargonium schlechteri* is mainly an inhabitant of the steep, rocky grassland of the northern Drakensberg and its associated eastern foothills in KwaZulu-Natal. It also occurs in the Free State, Mpumalanga and the Eastern Cape (Figure 1). The species is best represented in the Cathedral Peak and Mont-aux-Sources region of the Drakensberg where it is a component of the geophytic flora, frequently occurring at 2 000–2 400 m. It grows in deep soil on stream banks or around large boulders. This habitat is often encountered on the steep eastern slopes of the Drakensberg. In deep gulleys, the plants compete with tall grasses but as they are so robust they are able to elevate their flowering stems above the grasses. *P. luridum* is

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PLATE 2233.—1, scape with two pseudo-umbels, × 1; 2, leaf, × 1. Voucher specimen: *Condy 178* in the National Herbarium, Pretoria. Artist: Gillian Condy.

PLATE 2233 *Pelargonium schlechteri*

rarely encountered in this habitat and is usually a plant of short, drier, rocky grassland where it grows together with *P. schlechteri*. Where the plants occur together, the specific environmental requirements of *P. schlechteri,* particularly for deep moist soil, generally cause it to be much less abundant than *P. luridum*.

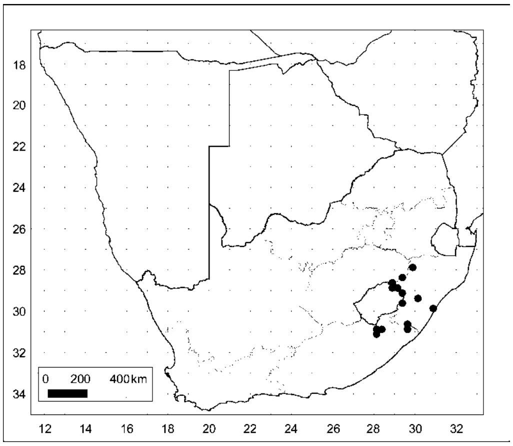

FIGURE 1.—Known distribution of *Pelargonium schlechteri*.

Fire plays a significant role in the life cycle of *Pelargonium schlechteri*. The plants flower at their best after a winter grass fire has cleared moribund grass and herbs from the habitat. Pelargoniums often grow together with the Drakensberg cycad, *Encephalartos ghellinckii*, in the Cathedral Peak area. A good flowering season for *P. schlechteri* can be expected in summer after fires have thoroughly blackened the trunks of *E. ghellinckii*. The species flowers from the second half of October until around late December, with a peak in November. The flowering season is usually slightly earlier than the beginning of the long flowering period of *P. luridum*. Seeds are dispersed mostly from the end of November and during December.

*Pelargonium schlechteri* has much horticultural potential on account of its striking pseudo-umbels of flowers and large, impressive leaves. The plants have to be cultivated in large, deep pots to ensure that the tubers have enough room to reach flowering size. They require an acid, loose soil mixture and do best in situations where they receive morning sunlight. These conditions approximate those found in the natural habit. The tubers have to be kept continually moist immediately before and during the flowering period in early summer. The species can be propagated by division of the tubers or from seed. Seeds should be sown in late spring, at least 140 mm apart and just under the surface of the soil. Germination is best when the seeds are exposed to successive showers of rain.

**Description**.—Acaulescent geophyte with scape up to 1 m tall. *Trichome complement*: unbranched, short or long stiff hairs, multicellular, curly hairs and sessile glandular trichomes; scape, petiole and leaf sparsely patently hairy. *Leaves* alternate, prominently veined; lamina leathery, broadly ovate, 120–190 × 140–280 mm, deeply lobed, base truncate, apices of lobes dentate, margins of lobes distantly toothed, ciliate; petiole up to 240 mm long. *Inflorescence*: scape unbranched, usually with 2 pseudo-umbels of flowers, occasionally with 3 or 4 pseudo-umbels; involucral bracts narrowly ovate, ± 8–10 mm long, apex long-acuminate. *Flowers* zygomorphic, bisexual, pendulous, 5-merous; pedicel thin, ± 20 mm long; hypanthium prominently thicker than pedicel, ending in a pulvinus at base, ± 30 mm long. *Sepals* imbricate, connate at base, narrowly ovate, ± 10 mm long, with unbranched, multicellular, curly hairs along prominent margin. *Petals* obovate, 8–12 × 4–10 mm, bicoloured, mauve, maroon or purple in centre with yellow, dull yellow or white edges. *Fertile stamens* 7. *Ovary* hirsute; style of varying length; stigmas filiform. *Fruit* with mericarps rostrate, tapering from base to apex, ± 30 mm long, ending in a spirally twisted awn with long golden brown hairs when ripe. *Seeds* ± oblong-ovoid, 6 mm long. Plate 2233.

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E. RETIEF*, C. CRAIB** and GILLIAN CONDY*

---

* South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.
** P.O. Box 67142, Bryanston, 2021 South Africa.

PLATE 2234 *Bruguiera gymnorrhiza*

# *Bruguiera gymnorrhiza* Rhizophoraceae

*East coast of Africa, Australia, Indian Ocean and western Pacific islands*

**Bruguiera gymnorrhiza** *(L.) Lam.*, Tableau encyclopédique et méthodique, Botanique 2,2: t. 397 (1797); Peters: 72 (1861); Sonder: 514 (1862); Engler, A: 8, 12; B: 338, 404, 408; C: 287 (1895); Sim: 65, t. 70 (1909); Marloth: 221, t. 141 (1925); Pole Evans: 7 (1936); Arènes: 34 (1954); Lewis: 6 (1956); Ding Hou: 461 (1958); Dale & Greenway: 395 (1961); Gomes e Sousa: 54 (1966); Gomes e Sousa: 600 (1967); Palmer & Pitman: 1609 (1972); Berjak et al.: 36 (1977); Coates Palgrave: 655 (1977); Li: 869 (1977); Torre & Gonçalves: 87 (1978); MacNae & Fosberg: 493 (1981); Smith: 607 (1981); Matthew: 570 (1986); Scott: 3 (1990); Du Puy: 253 (1993); Pooley: 348 (1993). *Rhizophora gymnorrhiza* L.: 443 (1753). *R. conjugata* L.: 443 (1753).

Classical Greek science was an amazing mixture of hard facts, hearsay, speculation and old wives' tales. Only in relatively recent centuries has it been possible to begin to unscramble the texts that have been passed down to us. One of these is the oldest surviving botany book, *Enquiry into plants*, written by Theophrastus of Eresius in about 342 BC. Theophrastus was no different from his teacher, Aristotle, in recording apparently incredible tales; he recites one he obtained from a Greek sailor, to the effect that just off the coast of the legendary island of Serendip, there was a marvellous forest, which stood on dry land at low tide, but which was so deeply submerged at high tide that they could moor their ships to the topmost branches of the trees. Anyone going to the harbour of Colombo, Sri Lanka, can check on the sailor's veracity, for the mangrove swamp is still there. Theophrastus's account is undoubtedly the oldest surviving written note on the subject of this plate, the black mangrove.

The generic name honours Jean Guillaume Bruguière(s), who was born in Montpellier, France, in 1750 and died from fatigue after a long voyage in the Orient in Ancona, Italy, in 1798. A botanical artist, traveller and plant collector, he was sent by the French government on an expedition to Madagascar, Réunion, Mauritius and Kergeulen Island and collected at the Cape in 1792. The specific epithet is derived from two Greek words meaning 'open (or exposed) roots', and refers to the knee roots, which project just far enough above the mud to trip unwary visitors to the swamp. In fact, these roots are a means of conducting air to the true roots, which are under water at all times.

The family Rhizophoraceae includes some 16 genera and 120 species, many of which are mangroves, concentrated in the Old World tropics, but by no means unknown in the New World. *Bruguiera* differs from *Rhizophora* in having unbranched prop roots, and leaves without the sharp apical point characteristic of *Rhizophora*. It has recently been established that sterile specimens of *Bruguiera* may be distinguished from *Rhizophora* by the bundle scars in the leaf scars: in

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PLATE 2234.—1, branch with leaves and flowers, × 1; 2, immature flowers, × 1; 3, fruit, × 1. Voucher: *Pooley 2524* in KwaZulu-Natal Herbarium, Durban. Artist: Elsa Pooley.

*Bruguiera* there are three traces, but in *Rhizophora* several (generally about seven) arranged in a semicircle. In *Bruguiera* the calyx is divided into 8–14 lobes, and there are as many petals and twice as many stamens as calyx lobes. The seedling falls with the fruit when mature. In *Rhizophora* and *Ceriops* (which latter genus does not grow further south than Kosi Bay, South Africa), the seedling falls out of the fruit when mature, and the calyx lobes and petals are no more than six. In *Ceriops* the prop roots are arched, but in *Bruguiera* they are more or less straight. Another mangrove of superficially similar appearance is *Sonneratia alba* (of the family Sonneratiaceae), which reaches its southern limit on the east coast of Africa in the Espirito Santo estuary, near Matola-Rio, a suburb of Maputo, Mozambique.

The genus *Bruguiera* consists of six species, of which only *B. gymnorrhiza*, the most widespread, occurs in Africa. The genus reaches its greatest diversity in Australia (five species) and India (four species). In some species of the genus the flowers are in small inflorescences, but our species and its nearest relatives have solitary flowers. In our species the hypanthium is not distinctly ribbed, as it is in *B. sexangula* (an Asian and Australian species) and *B. exaristata* (Timor, New Guinea and Australia). In our species, the flowers are usually longer than 30 mm, but in other species they are generally shorter, sometimes much shorter.

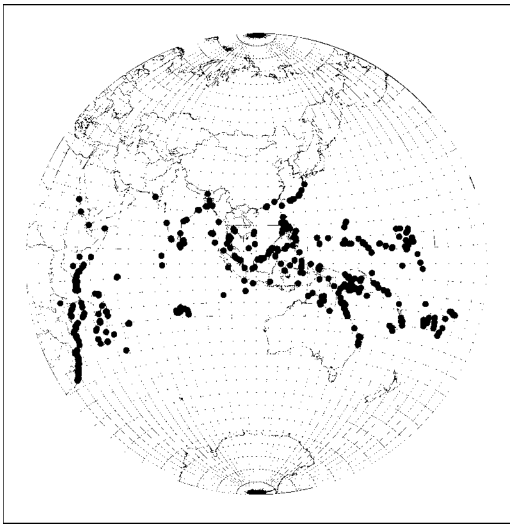

FIGURE 1.—Known distribution of *Bruguiera gymnorrhiza*. Data were obtained from the Herbarium of the Bishop Museum in Honolulu, the United States National Herbarium of the Smithsonian Institution in Washington, the Natural History Museum in London, the Kew Herbarium in Richmond, Surrey, the Bolus Herbarium of the University of Cape Town, the Selmar Schonland Herbarium of the Rhodes University in Grahamstown, the National Herbarium of SANBI in Pretoria, the Herbarium of the University of KwaZulu-Natal in Pietermaritzburg, the KwaZulu-Natal Herbarium of SANBI in Durban, and published sources.

The southwestern limit of *Bruguiera gymnorrhiza*, the commonest South African mangrove, is not far from East London in the Eastern Cape. From there, it occurs in coastal swamps along the East African coast as far as Kenya, and as far east as Tonga and Polynesia (Figure 1). Mangrove swamps are home to a distinctive assemblage of animals, including several species of crabs, mudskippers (fish with the ability to leave the water) and molluscs. In South Africa, the Wattle-eyed Flycatcher (*Platysteira peltata*) often feeds in groves of *Bruguiera*. The seeds of the black mangrove, like those of its relatives, germinate on the tree and are dropped as cigar-shaped propagules or seedlings which soon grow a short stem with a few leaves. If the propagule is not held fast in the mud near the parent tree, it may be washed out to sea by the ebb tide, and the leaves will then act as sails, carrying it to a potential new home on some other shore. Van Steenis (1984) records that a few populations of *B. gymnorrhiza* have been seen growing in fresh water. One of the best known of these is on Christmas Island (Du Puy 1993). At any time of the year the black mangrove may be seen with young leaves, adult leaves and yellow leaves about to fall. The trees concentrate salt in the oldest leaves, and it is these that turn yellow when killed by excessive concentrations of brine between the cells, which cause them to die of desiccation. Fallen leaves form an important part of the diet of the crabs that live in great numbers in the mud among the roots of mangrove trees.

In South Africa, Ezemvelo KwaZulu-Natal Nature Conservation has laid out two excellent nature trails where one can observe the ecology of a mangrove swamp at close quarters. At Beachwood Mangroves, in the northern suburbs of Durban, there is a boardwalk passing through almost pure stands of both *Bruguiera gymnorrhiza* and *Avicennia marina*. The walk takes about an hour. At Umlalazi Nature Reserve, almost in Mtunzini, about 120 km north of Durban, there is a trail through an estuarine swamp.

*Bruguiera gymnorrhiza* features in the South African National Tree List as No. 527, with common names black mangrove, *swartwortelboom* (Afrikaans), *isiKungati*, *isiQungati* (IsiXhosa) and *isiHlobane* (IsiZulu). The word mangrove is derived from the Spanish *mangal*, referring to a single mangrove tree. Thus strictly, the English word indicates the entire forest. The Tamil name for this tree, *kandal*, is attested by Van Rheede's (1686) *Hortus malabaricus*, and is still in common use three centuries later. The bark yields a black pigment which is used for dye or paint, which with suitable chemical manipulation can yield various colours from orange through red to purple. The wood is hard and red, and can be used for posts, construction, fuel, charcoal and (young branches) for making the fish traps characteristic of Tongaland in South Africa. In some parts of the world the leaves and seedlings are regarded as edible. The black mangrove has been grown to stabilise soils on seashores. The leaves are medicinal (*Abbott & Bates 27* in Herbarium of the Bishop Museum, Honolulu, and United States National Herbarium of the Smithsonian Institution, Washington) and in the Caroline Islands they are used to treat children's diseases (*Alkire 95* in United States National Herbarium of the Smithsonian Institution, Washington). In Hawaii, where our species is naturalised (it is too far from the nearest natural population for the propagules to survive the voyage on their own), it is called *Kukuna o Kala*, meaning 'rays of the sun'. The calyces are used to make lei (necklaces of flowers, nowadays usually given to arriving tourists).

The black mangrove is surprisingly easy to maintain in cultivation, if one can give it the right climate. In Pretoria, South Africa, where there is occasional frost, it cannot be maintained outdoors, but it grows well in and around Durban, which is about 10°C warmer in winter. In fact, the Botany Department of the University of Durban-Westville used the trees as tub plants in the corridors where they were more attractive and certainly more eye-catching than the *Ficus benjamina* with plaited stems that is usually used in such situations. All these mangroves seem to need is a suitable container of black, nutrient-rich mud, which must be kept wet. In an oral presentation at a conference of the South African Association of Botanists several years ago, G.S. Naidoo of the aforementioned Department showed that *Bruguiera* actually grows better with tap water than sea water. The first experimental evidence that our tree can be grown in fresh water was supplied by Teysmann, who grew plants from seed in a freshwater swamp at Bogor Botanical Garden, Indonesia, and flowered them in 1857 (Van Steenis 1984). This population is reported to have become self-perpetuating. Although these trees can survive a light frost if it is followed by a warm day, they generally succumb to continuous cold if it lasts for more than a few days, as it often does on the highveld of South Africa.

Our thanks are due to the Curators of the Herbarium of the British Museum in London, the Kew Herbarium in Richmond, Surrey, and the United States National Herbarium of the Smithsonian Institution in Washington for facilities granted to one of us (HFG) to study their material of this species, and to the Smithsonian Institution for a short-term visitorship. We are indebted to Dr George Staples of Bishop Museum, Honolulu, for the information about uses of this species in Hawaii.

**Description**.—Evergreen tree up to 7 m tall, with angled pneumatophores (knee roots). *Bark* brown to grey or almost black, shallowly, narrowly, longitudinally fissured, adhering, fibrous; furrows of trunk forming broad ridges; terminal buds glabrous, pointed, stout, sessile, 20–30 mm long, with 1 pair of imbricate, grey or brown bud scales visible; twigs glabrous, stout, dull, plain, grey; lenticels smooth, conspicuous, lighter coloured than bark; opposite leaf scars with 3 bundle scars each, not meeting, joined by stipular scars. *Leaves* opposite, decussate, simple, crowded at ends of branches; petioles 10–30 mm long, glabrous or nearly so; lamina elliptical, 60–120 × 20–60 mm; apex acute; base cuneate; surface coriaceous, emerald-green, yellowing with age, glossy, paler below; margin entire, revolute. *Stipules* interpetiolar, up to 40 × 10 mm, lanceolate. *Flowers* bisexual, axillary, solitary, pendent, sturdy; petals and sepals nearly equal in size; calyx tubular, thick, fleshy, triquetrous, red outside, yellow to green inside, lobes 10–14; corolla consisting of 10–14 free, oblong, white to creamy or rarely orange petals ± 15 mm long; pedicel ± 10 mm long. *Stamens* ± 24, in pairs; filaments free, 12–14 mm long, arising from disc, all the same length. *Gynoecium* of 1 free carpel; ovary inferior, 2–4-locular; style 1. *Fruit* a glabrous, leathery berry up to 25 mm long, falling with the cigar-shaped, 250 mm long seedling. Plate 2234.

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H.F. GLEN* and ELSA S. POOLEY**

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* KwaZulu-Natal Herbarium, South African National Biodiversity Institute, P.O. Box 52099, Berea Road, 4007 South Africa.

** P.O. Box 295, Scottburgh, 4180 South Africa.

# *Stenostelma umbelluliferum* Apocynaceae: Asclepiadoideae

*South Africa*

**Stenostelma umbelluliferum** *(Schltr.) S.P.Bester & Nicholas* in Bothalia: 48 (2007). *Schizoglossum umbelluliferum* Schltr.: 24 (1895); Brown: 622 (1907); Kupicha: 668 (1984); Müller et al.: 263 (2002); Bester & Victor: 8 (2005a); Bester & Victor: 166 (2005b); Bester et al.: 146 (2006). *Xysmalobium involucratum* (E.Mey.) Decne. in part, Nicholas: 589, 599, 600 (1999); Victor et al.: 168, 176 (2003); Klopper et al.: 80, 87 (2006).

Rudolf Schlechter originally described our species in 1895 (at that stage assigned to *Schizoglossum*), after a collecting trip to South Africa. He had collected a single specimen in the Pretoria area in late spring 1893 (Gunn & Codd 1981). Schlechter (1895) noted that his new find and *Schizoglossum orbiculare* seemed so closely related that he first thought they were the same taxon. However, he argued that apart from the habit of the plant, the shape of the corona was also different—round in *Schizoglossum orbiculare* and narrowly oblong and dorsiventrally flattened in the new material (Figure 1). Brown (1907) also thought that our species might be conspecific with the closely related *Schizoglossum orbiculare* and *S. crassipes*, but he only saw the original material of the latter and his arguments were based purely on this and on the descriptions of the other taxa.

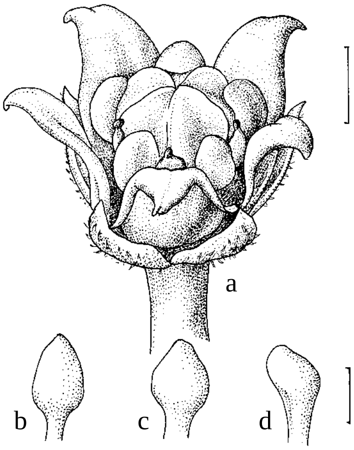

FIGURE 1.—*Stenostelma umbelluliferum*. a, flower; b–d, corona: b, ventral view; c, side view; d, dorsal view. Drawings by Gillian Condy. Scale bars: a, 1 mm; b–d, 0.7 mm.

The re-discovery of our species a few years ago (after a gap of 109 years) happened purely by chance. At the end of 2003, the first author had to identify a herbarium specimen collected on the plains north of the Magaliesberg. After numerous and unsuccessful attempts to identify the specimen and not being able to match the material at the National Herbarium, he sought the help of the second author, who recognised it as *Schizoglossum umbelluliferum*—the plants indeed conformed to the description of this species in every detail. Already in 2002, Müller *et al*. stated that: '*Stenostelma* is distinguished by the conical shape of the style head, which is covered by conspicuous connective appendages and a staminal column which form small hollows.' According to them and Kupicha (1984), *Schizoglossum umbelluliferum* was merely one of many unresolved species that were included in *Schizoglossum*, but which should be referred to the genus *Stenostelma*. Our species

PLATE 2235.—1, fruiting plant with follicles and a tuber, × 1; 2, flowering plant showing deeply seated tuber, underground neck part of stem and auxiliary buds from where annual resprouting takes place, × 1; 3, seed with coma, × 1. Voucher specimens: *Bester 5245a* (1, 3) and *5245b* (2) in National Herbarium, Pretoria. Artist: Gillian Condy.

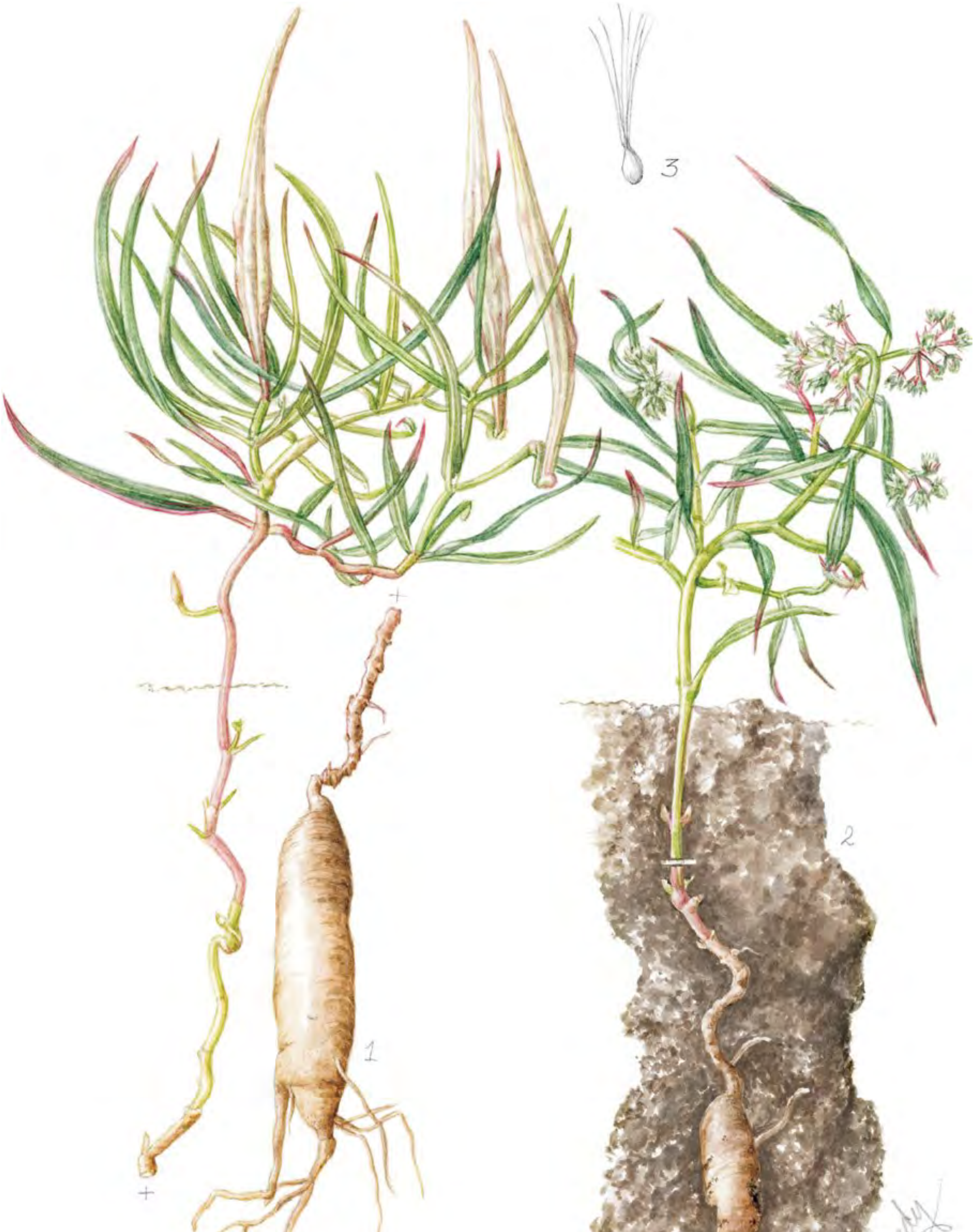

PLATE 2235 *Stenostelma umbelluliferum*

was recently transferred to the genus *Stenostelma* (Bester & Nicholas 2007) and can be easily distinguished from the other southern African species currently recognised in this genus by its small size (38–200 mm tall) and its spherical, slightly dorsiventrally flattened corona with no extended horns, teeth or other processes (Figure 1).

After its re-discovery, the existence of this taxon in the Pretoria area was communicated to the Nature Conservation Section of the Gauteng Department of Agriculture, Conservation and Environment (GDACE). Because of the historical rarity of the taxon, it was immediately, but temporarily, placed on the Red Data List for plants in Gauteng and its conservation status in the interim assessed as Data Deficient (DD) (Mace & Stuart 1994; J.E. Victor & M. Phab, pers. comm.). As there was an urgent need for a full assessment of the taxon, fieldwork to establish a more exact distribution range was undertaken.

The initial distribution range after its re-discovery in two populations in the Christiaanville-Montana area, coincided with an important development node identified by the Tshwane Metropolitan Municipality. Although categorised as DD, these populations were highly threatened due to the planned development of the area and the fact that they were linked only by highly fragmented agricultural smallholdings. After reassessment by the Threatened Species Programme of the South African National Biodiversity Institute, in conjunction with Gauteng Nature Conservation, it was categorised as Critically Endangered, pending a survey of the general area to establish a more precise distribution range. After this survey, the status of the taxon was further lowered and at the time of writing it is listed as Near Threatened (NT). The conservation status of this species has thus undergone a number of changes since its re-discovery: from Data Deficient to Critically Endangered (because of only two known populations), and then to Vulnerable (after more sites between the two large known populations had been found) and eventually to Near Threatened when more populations were found in the vicinity of Orchards, the distribution then extending westwards to just outside Brits and into the North-West Province to the Sonop area (directly west of the town of Brits).

The presence of this plant and the various assessments of its conservation status have led to much controversy among both developers and landowners in the area. Due to its placement on the Red Data List, many landowners were denied permission for development of their properties despite the Tshwane Metropolitan Municipality and some developers already having spent much effort and resources on development of services in the area. As residential and other developments were encouraged by the Municipality, confrontation between developers and Gauteng Nature Conservation caused frustration and triggered much public debate on the issue (Meyer 2005).

Initially, after the re-discovery, *Stenostelma umbelluliferum* was thought to be a Gauteng endemic but field observations during the survey revealed a more precise distribution range. *S. umbelluliferum* is distributed in the North-West, Gauteng, KwaZulu-Natal and Free State Provinces of South Africa (Figure 2). Closer investigation of the specimen *Acocks 11774* in the National Herbarium, identified as

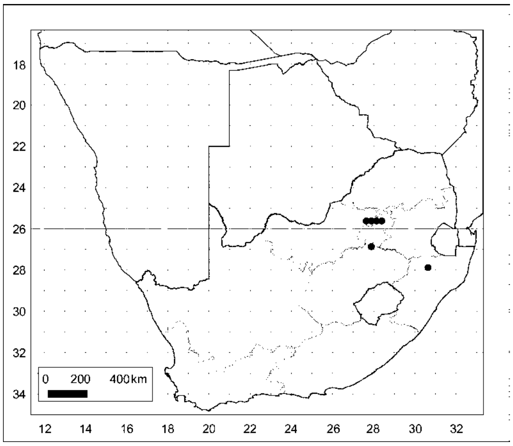

FIGURE 2.—Known distribution of *Stenostelma umbelluliferum* in South Africa.

*Schizoglossum* sp., showed it to be *Stenostelma umbelluliferum*. This sparked further and wider searches for more plants on the Golugola plain near the Bloedrivier Station south of Vryheid (KwaZulu-Natal) in a similar habitat of black turf where Acocks had collected his plant in 1945. The area is highly overgrazed and the building of a dam near the station might have destroyed the population there. During two field trips, extensive searches for *Stenostelma umbelluliferum* at this locality proved unsuccessful.

The collections at the National Herbarium were again searched for any further specimens matching *Stenostelma umbelluliferum* and recently *Kroon 12084* (identified as *Schizoglossum eustegioides*) from Sasolburg (Free State) were found. The follicle on this sheet is very short and lacks the distinct processes on the outer surface, but it is long and smooth—typical of our species. Macroscopically the specimen also resembles the Pretoria specimens of *Stenostelma umbelluliferum*. A further feature that distinguishes our species from *Schizoglossum eustegioides* is a rib on the outside of the corona of the latter. The corolla tips are also more acute in *S. eustegioides* and the corona is more flattened, almost stalked, and as long as the gynostegial column.

Fruiting and sterile specimens that conform to *Stenostelma umbelluliferum* were also collected near Marikana and on the plains north of Rustenburg. This material still has to be followed up in the next flowering season. Searches were extended further north to just south of Thabazimbi and to the Springbok flats south of Bela-Bela (Warmbaths) and Settlers in Limpopo Province. A taxon believed to be related to our species was collected just southwest of Settlers.

In Gauteng and the North-West Province the habitat is under immense pressure from agriculture (various crops being planted in these extremely fertile soils as well as trampling by cattle), mining and residential and commercial developments. The senior author has found the plants mainly in more open grassy areas, but believes that these openings are secondary in origin, caused by clearing for agriculture—in sparsely vegetated grassy habitats the plants can flower before they are overtopped by the grass layer. The Free State site has not yet been visited but the habitat information on the herbarium sheet indicates the same general preference for soil along a drainage line where the plants grow on the banks of the Rietspruit west of Sasolburg.

*Stenostelma umbelluliferum* has been found at altitudes of 1 050–1 280 m. The plants are opportunistic, depending on favourable conditions and have been found in flower from September to March, peaking from October to January. After good rains, plants in flower have been encountered as late as April. Some plants with fruiting follicles have been observed as early as mid-September, indicating that they may flower even earlier, depending on weather conditions. We have found the species in savanna of Mixed Bushveld on deep, black turf soils mainly associated with or near drainage lines, in fully exposed situations as well as in light shade (mainly of *Acacia* species). It is associated with (at least in Gauteng and the North-West Province) a mosaic of 'Norite Black Turfveld' (Acocks 13b) and '*Acacia* veld' (Acocks 13c), listed by Acocks (1988) as part of his 'Other Turf Thornveld'.

Observations made during field trips in search of the species revealed some information on the biology of the plant. Only once were possible pollinators, preliminarily identified as belonging to the group Miridae, seen on the plants. The seeds seem to be easily distributed by the wind, with the establishment of young plants relatively successful. Young seedlings grow very quickly and form an extremely long primary root before growth of the above-ground stems and leaves takes place. Very few large plants have been found and most plants seemed relatively young. Seed set has been observed to be good.

Various parasitic infestations by insects were observed, in many cases causing the plants to wilt and terminate above-ground growth. These include oleander aphids (*Aphis nerii*) (Figure 3a), the milkweed bug (*Spilostethus pandurus*) (Figure 3b) and net-winged beetles (*Lycus* sp.) (Picker *et al*. 2004). The globular appearance of fruit follicles on the accompanying plate was initially thought to be due to the mature stage of the developed fruit. However, after the colour plate had been drawn, the specimens were examined and the follicles were found to be full of feeding larvae of some kind (Figure 3c). Only the seeds had been eaten and the coma remained uninfected.

Other herbs associated with turf soils found in association with our species include *Asclepias eminens*, *Corchorus asplenifolius*, another species of *Corchorus*, *Hemizygia pretoriae*, *Hermannia coccocarpa*, *H. depressa*, *Hybanthus enneaspermus*, *Jamesbrittenia aurantiaca*, *Jatropha schlechteri*, *Kohautia caespitosa*, *Polygala hottentotta*, *Rhynchosia monophylla*, *R. totta*, *Schizoglossum eustegioides*, *Stenostelma capense* and *S. corniculatum.*

The generic name *Stenostelma* originates from two Greek words: *steno* meaning 'narrow' or 'slender' and *stelma* meaning 'crown'. This refers to the corona with a long, drawn-out process or horn in the type species of the genus (*Stenostelma capense*) but, ironically, in *S. umbelluliferum* the corona has no processes or horns. Although Schlechter (1895) gave

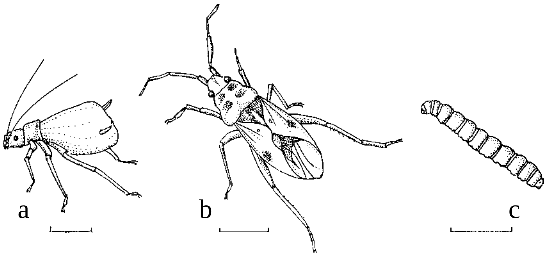

FIGURE 3.—Insects seen on *Stenostelma umbelluliferum*. a, oleander aphid, *Aphis nerii*; b, milkweed bug, *Spilostethus pandurus*; c, larva found feeding on follicle. Drawings by Gillian Condy. Scale bars: a, 1 mm; b, 3 mm; c, 2 mm.

no indication of the origin of the specific epithet, it is assumed to allude to the way the flowers are carried in the inflorescence, typically forming a globose or subglobose umbel.

Discussions with farm workers in the Cynthiavale area where populations of our plant have also been discovered, revealed that it does not seem to be used traditionally. Some of the workers did recognise the plant from photographs but said that they did not know of any traditional or other uses. It grows rather easily from seed, but mature plants dug up and replanted two years ago have not flowered yet. Because of the milky latex and small size of the plant it does not seem to have horticultural potential. It would probably interest only those with a passion for this group of plants.

The plant illustrated on the accompanying plate was collected on 13 October 2004 at Doornpoort, on the northern outskirts of Pretoria where it was found in open grassland scattered with *Acacia karroo* and associated with drainage lines and deep, black turf soils.

**Description** (based on Bester & Nicholas 2007).—Perennial geophytic herb with milky latex; aerial parts annual, 38–200 × 40–300 mm. *Tuber* fleshy, napiform, broadest above middle, 50–100(–140) × 4–18 mm, pale cream-coloured, outer layer fibrous. *Underground stem* arising from tuber crown, 30–110 mm long, containing numerous adventitious points, usually unbranched; internodes 22–25 mm long. *Aerial stems* arising from apex of underground stem, 1–6-branched from soil level with further secondary branching, erect-spreading to decumbent from base; internodes 3–12 mm long, densely foliate. *Leaves* opposite, 9–16 per branch, narrowly linear to triangularly linear, up to 90 × 5 mm, acute, base attenuate to cuneate, usually narrowing into a very short petiole, nearly glabrous, green to tinged purple above, becoming dark pink to maroon with age, paler green towards main vein, paler beneath, margins revolute especially distinct in younger leaves. *Inflorescence* umbellate, axillary, alternate, up to 22 umbels per plant, up to 7 per branch, (1–)3–28 flowers per umbel; peduncles 5–30 mm long, pubescent; pedicels 2–18 mm long, drooping after flowering, puberulous, hairs flat, multicellular; bracts linear to narrowly lanceolate, up to 1.5 × 0.24 mm. *Flowers* 5-merous. *Calyx* free, erect to spreading-erect, lobes lanceolate, 0.8–1.5 × 0.45–0.65 mm, half as long as corolla, acute, dark green, outside glabrous, inside glabrous to puberulous. *Corolla* ± divided to base; lobes oblong-lanceolate, obliquely notched, 1.8–0.24 × 0.10–0.12 mm, revolute, pinkish inside, greenish outside, both sides darkening to maroon as they mature; apex rounded to obtuse. *Staminal corona* arising at base of staminal column; lobes free, erect, ovate to oblong-ligulate, 0.5–0.8 × 0.4–0.6 mm, obtuse to acute, basally ovoid, keeled on sides, inner surface flat, outer surface bulged. *Staminal column* cylindrical or barrel-shaped, 0.7–1.1 mm high. *Stamens*: anther wings triangular, broadest at base or middle, 0.2 × 0.1 mm; anther appendages ovate to broadly ovate, 0.35–0.4 × 0.2–0.3 mm, apex obtuse to acute. *Pollinaria* solitary, pendulous in each anther sac, obliquely pear-shaped. *Ovaries* 2, subinferior, many-ovuled, glabrous; styles fused into a stylar column, terete, style head orbicular to conical-orbicular; translators from lateral surface of style head invertedly y-shaped, 60–140 × 40 μm, caudicles filiform, widely diverging, apically fused to corpusculum, corpusculum oblong-narrowly ovoid to oblong-ovoid, subacute. *Follicles* up to 4 per branch, usually 1(2) per umbel, narrowly fusiform, up to 85 × 8 mm, non-inflated, ± equally tapering at both ends but becoming slightly broader at extreme tip, minutely papillate or puberulous, green striped with cream to green, maturing to darker green turning to pinkish then maroon, or sometimes green to glaucous with darker lateral striations, usually longer than 70 mm at maturity; fruiting stalk swirled and then upturned. *Seeds* 25–45 per follicle, broadly ovate, 3.0–3.5(–4.0) × 1.4–1.6 mm, dorsiventrally flattened, bifacial, minutely rugulose to favulariate, margin up to 0.3 mm broad, ridges very dark brown, with pale brown wing; coma up to 22 mm long. Plate 2235.

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S.P. BESTER*, A. NICHOLAS** and GILLIAN CONDY*

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* South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

** School of Biology and Conservation Science, University of KwaZulu-Natal, Private Bag X54001, Durban, 4000 South Africa.

# *Orbea elegans* Apocynaceae: Asclepiadoideae

*South Africa*

**Orbea elegans** *Plowes* in *Asklepios* 90: 14–17 (2004a); Plowes: 2 (2004b); Klopper et al. 72 (2006); Bester et al.: 136 (2006).

The genus *Orbea* is probably one of the stapeliad genera that have undergone the most taxonomic changes since its description. It was originally described by Haworth (1812) and shortly thereafter sunk into *Stapelia* (Schultes 1820). This view was upheld until Leach (1975) reinstated the genus, placing 13 species in it. At that stage most of the known species were allocated to either *Stapelia* or *Caralluma*. Leach (1978) increased *Orbea* to 20 species and created *Orbeopsis*, *Orbeanthus* and *Pachycymbium* as being closely related to *Orbea*, but these genera were sunk by Bruyns (2002) who moved all their taxa as well as those of *Angolluma* back to *Orbea*. Bruyns also moved one taxon out of *Orbea* to a new genus called *Ballyanthus*. A detailed account of the taxonomic history of *Orbea* is given in the revision by Bruyns (2002). The genus consists of about 56 species distributed throughout Africa, concentrated in the southern and northeastern parts of Africa, and extending onto the coastal zones and central plateau of the Arabian Peninsula (Bruyns 2003, 2005; Leistner 2005). *Orbea elegans* is the most recently described species (Plowes 2004a) and in this paper the distribution, possible hybrid origin and conservation status are discussed.

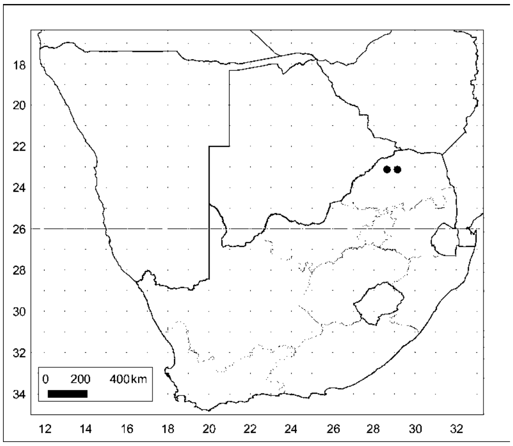

FIGURE 1.—Known distribution of *Orbea elegans* in southern Africa.

A single plant of this handsome little *Orbea* was found on the southeastern foothills of the Blouberg in the Limpopo Province of South Africa (Figure 1; Plowes 2004a) by P.J.D. Winter and E.P. Nienaber (Winter, pers. comm.) on an excursion to that area in 1996. Both the sterile stems and the flowers are extremely attractive and elegant—hence the specific epithet *elegans*. The stems are mottled in streaks of different shades of green in summer, but become purplish in the dry season, and they have very prominent spreading, tapering teeth. The flower morphology is also extremely distinct and it is distin-

PLATE 2236.—1, habit, × 1; 2, side view of the annulus and corona, × 5; 3, pollinarium, × 40 (after drawing provided by P.V. Bruyns). Voucher specimen: *Winter 6852*, cultivated from the clonotype in Silverton (Pretoria), housed in the National Herbarium, Pretoria. Artist: Gillian Condy.

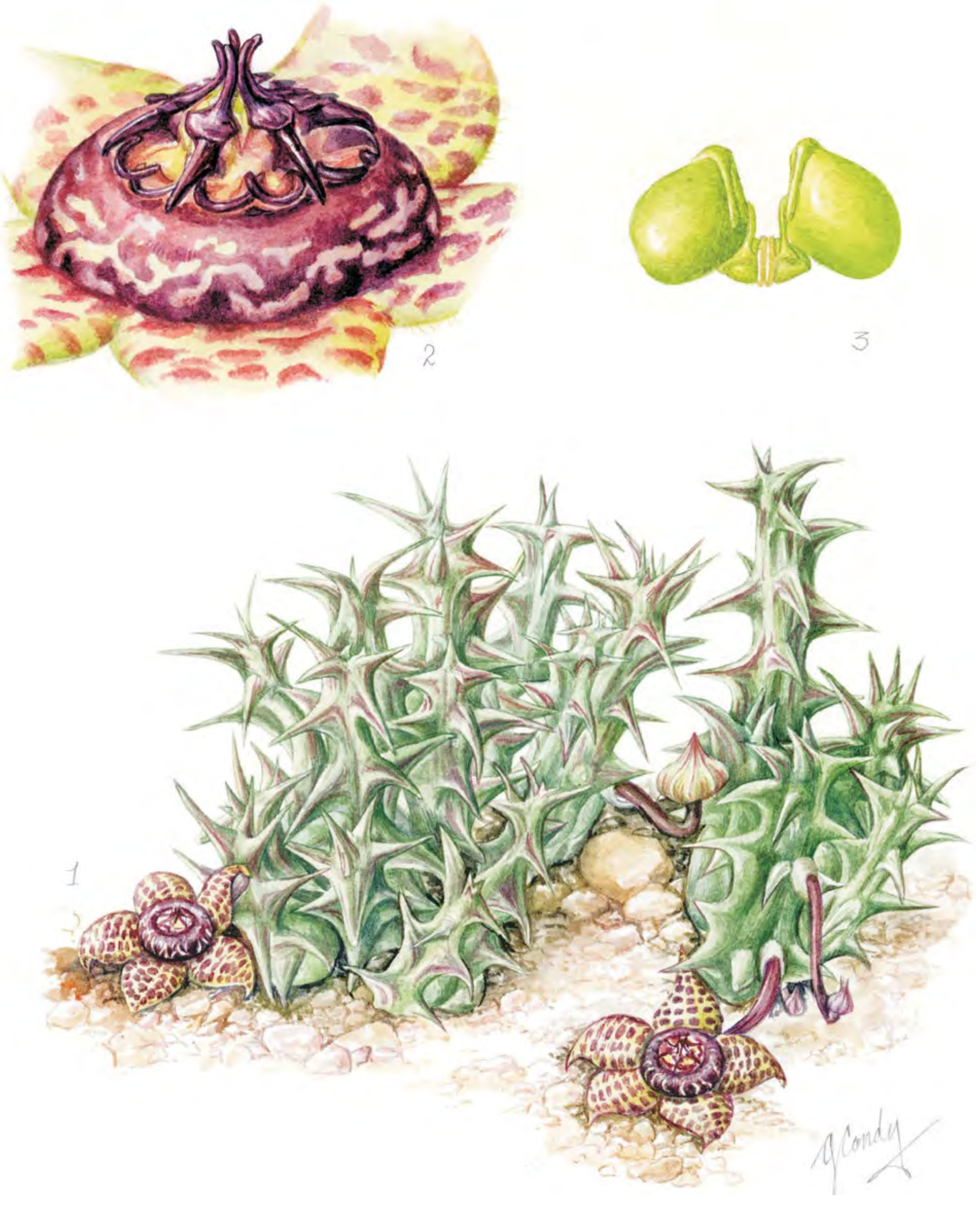

PLATE 2236 *Orbea elegans*

guished from other *Orbea* species by the attractive spotted corolla that is cream-coloured with purplish maroon spots and a relatively large, raised annulus.

The accompanying painting was made from cuttings cultivated by Winter from the clonotype in Pretoria. Plants flower annually from January to March, sometimes to May. They are very floriferous and in larger plants various stems will form flowers simultaneously. Flowers develop consecutively at the base of the stem. The pedicel is carried either horizontally or deflexed, ultimately bending upward at the tip, presenting the flower bud and later the full flower upwards. The flower buds form a very prominent point where the corolla tips join.

The holotype is housed in the National Herbarium in Pretoria (Plowes 2004a). D.C.H. Plowes sent this material to the herbarium with Dr L. Viljoen. At that time Viljoen informed the author of a previous collection that he had made of this species in 1968 during an 'Operation Wildflower' expedition, a plant rescue operation in preparation for the building of the Glen Alpine Dam. This plant came from a spot southwest of the type locality. It was cultivated by him at Fourways (Gauteng) and photographed when it flowered. Compared to the plant from Blouberg which grew in relatively deep, sandy soil in a flattish microhabitat under some trees on a generally steep and rocky slope (Winter, pers. comm.), the plant from Glen Alpine grew on a flat, sandy, savanna plain (Viljoen, pers. comm.). The flowering material of a cutting that Viljoen obtained from Plowes (originating from the Blouberg) looks superficially very similar to that from Glen Alpine but with some subtle differences. When the material collected in 1968 from the Glen Alpine area flowered, the flowers did not resemble those of any species that Viljoen knew at the time, and because he was led to believe that it might be of hybrid origin, he left the matter at that. Unfortunately no specimen was made of the Glen Alpine plant and the plants in Viljoen's collection eventually died. One can therefore only comment on the differences as seen in the photographs that he took. Although the corona itself does not look markedly different in shape and size on the slides as compared to the clonotype material, the colour patterning of the corolla and annulus and the shape of the corolla appear to be slightly different. The maroon-purple spots are not as well expressed in Viljoen's Glen Alpine plant and are more irregular than rounded compared to the Blouberg specimen, and the annulus has more cream coloration on it. The corolla segments are also more rounded at the base, deltate in shape. However, this variation is not enough to separate the two collections and to the author it does not suggest an abnormal range of variation within the taxon.

Hybrids are frequently formed from plants that are grown together in cultivation. Such hybrids will never be found naturally where the parents do not grow in the same area. Bruyns (2005) reports that numerous putative, both intergeneric and interspecific, hybrids are known from southern Africa, and list a number of examples. One of these is the hybrid *Tavaresia barklyi* × *Stapelia gettliffei* that occurs naturally north of the Soutpansberg. The Blouberg, Soutpansberg and their immediate environments, amongst several other mountain chains, are reported to house the largest number of species of the genus *Orbea* (Bruyns 2005). Species of *Orbea* that occur in the vicinity of the type locality of *O. elegans* include *O. carnosa* subsp.

*keithii*, *O. carnosa* subsp. *carnosa*, *O. lutea* subsp. *lutea*, *O. maculata* subsp. *maculata*, *O. melanantha*, *O. rogersii* and *O. tapscottii*. Apart from these, a number of other stapeliads are also found in the vicinity, including *Duvalia polita*, *Huernia zebrina*, *Piaranthus atrosanguineus*, *Stapelia gettliffei*, *S. gigantea* and *S. kwebensis*. With this number of species occurring together, the possibility of hybrid origin of *O. elegans* has to be considered.

P.V. Bruyns (pers. comm.), an authority on the group, considers that *Orbea elegans* might possibly be of hybrid origin involving probably (at least) *O. maculata*. Plowes (2004a) notes the similar coloration of *O. elegans* and *Huernia zebrina* subsp. *magniflora*, and mentions that these taxa occupy the same geographical range and that both have a very distinct annulus—all indications of possible hybridisation, although he does not support that possibility. However, Bruyns did not examine flowers of *O. elegans* at the time, but in the light of the known distribution it seems to be a very dubious species to him—'a species must have a distribution' to make it a species (Bruyns, pers. comm.). He argues that 'when, for example, the hybrids of *Hoodiopsis triebneri* and *Huernia distincta* are examined, ... the hybrid origin is obvious in the first case and proven in the case of *Huernia distincta*. Both these "species" have been collected widely and repeatedly, but almost always as single plants. This could be a good indication of hybridization. So, *O. elegans* may be a hybrid or it may not be. One needs to relocate it with more than one specimen and try to pollinate it and see what happens with the seed to be able to accept or reject it as a species.'

Generally one would expect natural hybrids to be found as single plants, never in populations—and this may possibly be the case here. *Orbea elegans* is only based on the type from the one known locality and images from a second imprecise locality, in both cases from single plants only. Normally it is very risky to base the description of a taxon on material that was found as a single plant. One should try to locate additional plants or populations or obtain more individuals from the known localities in order to determine the degree of variation in the taxon in question and to ascertain its conservation status. Such plants can then be examined more fully and the validity of the taxon as a pure species can be tested through experimental breeding.

According to Plowes (2004a), *Orbea elegans* is geographically most closely related to *O. maculata* and *O. tapscottii*, but he rejects the possible hybrid origin between these two species merely on the basis of the colour difference with regard to *O. tapscottii*. Because of the raised annulus, deltate shape of the corolla and the rows of maroon spots on the corolla in *O. elegans* and the presence of vibratile marginal cilia as well as the rhizomatous stems in *O. maculata*, the latter could also be ruled out as a possible parent. The shape of the annulus that supports the corona places *O. elegans* in the section *Stultitia* of Leach (1978), while it keys out to near *O. umbracula* and *O. halipedicola*, which are geographically distant species. *Stapelia clavicorona*, from the northern slopes of the Soutpansberg, exhibits the same strange case as *O. elegans* in having a distinct coronal shape, not closely related to any other known member of its genus. However, *S. clavicorona*, unlike *O. elegans*, is known from various populations with many individuals.

*Orbea elegans* is grown quite easily from cuttings. Although plants in cultivation seem to be very floriferous, no development of fruit has been reported, indicating that pollination does not occur in cultivation. When growing cuttings, one has to obey the general rules for growing stapeliads, here summarised from Oliver (1998): grow the plants in a well-drained medium of equal parts of washed river sand, potting soil and topsoil; water regularly in summer, gradually lengthening the dry periods towards winter, stopping totally in midwinter and resuming watering again in springtime—water sparingly rather than excessively. Plants can survive long periods without water, but be sure to water them before they shrink too much and will not be able to recover. Orbeas, in general, are easily propagated by stem cuttings taken during the active season—this will ensure good rooting before the plants enter their dormant phase in winter. Cuttings can flower in their first year, depending on the size of the cutting. The most common pests include scales on the stems and mealy bugs on the roots. The latter can cause fungal infections that may devastate plants within days. When stem rot is seen, the affected parts should immediately be cut away and disposed of. The rest of the plant should then be quarantined to prevent infection of any other parts or plants. Various commercial pesticides or environmentally friendly, homemade concoctions can be used to fight pests.

In the light of only the one known locality of Winter and the reported locality of Viljoen, *Orbea elegans* has been assessed as CR (Critically Rare) using the revised categories of the IUCN classification system for threatened species (http://www.sanbi.org accessed on 26 May 2006). This was because no more plants could be found in the wild—even after various attempts were made to locate more plants. These searches were, however, restricted to the slopes of the Blouberg. Plowes cultivated material from stems he received from Winter that had originated from the original collection (clonotype) and the description (Plowes 2004a) was based on that material. After a revisit to the original type locality, Winter discovered that the plant had disappeared. It was presumably washed away by local flooding as evidence of this was visible at the site. The only known material at present is that which is in cultivation. For all practical purposes, *Orbea elegans* will be considered as extinct in the wild if more plants cannot be found. There is therefore a need for further fieldwork focusing on the area between the Blouberg and the Glen Alpine Dam to make a proper Red Data assessment of the status of this taxon.

**Description** (adapted from Plowes 2004a).—Stems up to 70 × 5 mm, greyish green with dull purple streaks becoming prominent towards tips of teeth; teeth slender, horizontally spreading, up to 12 mm long, with a pair of minute denticles. *Flowers* arising extra-axillary, alongside teeth near base of stem, up to 3 at extended time intervals, prostrate, facing upwards, 35 mm in diameter; pedicel horizontal or reflexed with distal end turning upwards, 25 mm long. *Sepals* 5 mm long, acute. *Corolla*: lobes ovate-acute, 10 × 15 mm, slightly rugulose, creamy yellow with dark maroon elliptical spots in ± 4 rows on basal half but smaller and irregular near apex and onto annulus; corolla tube formed entirely by annulus ± 1 mm deep, annulus prominent, raised, dark purplish maroon, 15 mm in diameter, 2 mm high, with a depression in centre containing the shortly stipitate 5 mm high dark purple

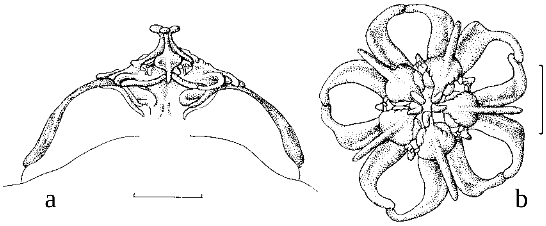

FIGURE 2.—*Orbea elegans*. a, side view of a partly dissected flower. b, face view of the gynostegium. Scale bars: a, 3.4 mm; b, 2.6 mm. Drawings by G. Condy—based on drawings by P.V. Bruyns from the holotype at National Herbarium, Pretoria (*Nienaber & Winter 434*, sub *Plowes 8986*).

gynostegium. *Corona*: outer lobes 8 mm across, divided to base into spreading pairs of inwardly arching lobes overlapping at tip and with somewhat recurved margins, with a small spreading deltoid tooth ± 0.8 mm long lower down on gynostegium (Figure 2); inner lobes incumbent and pressed to back of anthers, broad and dorsiventrally flattened at base with incised margins, tapering above into nearly cylindrical connivent-erect and then recurved tips, with spreading, laterally flattened dorsal horn filling the space between adjacent pairs of outer corona lobes. Plate 2236.

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S.P. BESTER* and GILLIAN CONDY*

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* South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

PLATE 2237 *Momordica foetida*

# *Momordica foetida* Cucurbitaceae

*Tropical and southern Africa*

**Momordica foetida** *Schumach*. in Schumacher & Thonning, Beskrivelse af Guineeiske planter: 426 (1827); Cogniaux: 451 (1881); Cogniaux & Harms: 41, Fig. 4 (1924); Burtt Davy: 227 (1926); Hutchinson & Dalziel: 181 (1927); Meeuse: 47 (1962); Jeffrey: 29, t. 2, Fig. 7 (1967); Jeffrey & Mann: 424, t. 101 (1978); Jeffrey: 42, Fig. 65.14 (1995); Pooley: 80 (1998). *M. cordifolia* E.Mey. ex Sond.: 492 (1862).

The Cucurbitaceae is a widespread family found mostly in tropical and subtropical countries. It consists of some 120 genera and 735 species. Members of the family are annual or perennial herbs or shrubs, and only one species is a tree. The plants are monoecious or dioecious and flowers are mostly unisexual, with yellow or white petals. Tendrils are almost always present and the leaves are alternate and variable. The fruit is often an indehiscent berry or a gourd with one to many, often flattened seeds. Many species are of economic importance and are cultivated as food plants, for example cucumber, melon, pumpkin and watermelon. The Cucurbitaceae is represented in southern Africa by some 18 genera and 75 species, and several of them have already been presented in this series.

Species of *Momordica* are recognised by the seeds that are almost always enveloped in reddish pulp and by the often prominent bracts subtending the male flowers. The fruits can be dry, linear-fusiform and few-seeded, but are usually fleshy and muricate or with distinct protuberances or with soft spines, ultimately dehiscent, often orange or scarlet. The genus name *Momordica* probably refers to the sculptured seeds that look as if they had been bitten; the Latin *mordeo* means to bite. *Momordica* is an Old World genus of about 47 species, 39 of which occur in tropical Africa and eight in temperate and tropical Asia or tropical Australia. Eight species are indigenous in southern Africa, mostly in the eastern parts of the area with a rainfall of 600–1 200 mm per year. The two species that are cultivated as vegetables (*M. balsamina* from Africa, Asia and Australia, and *M. charantia* from tropical Africa and Asia) have become invasive throughout the warmer parts of the Americas. The annual *M. charantia* has been introduced into southern Africa and sometimes escapes from cultivation in the Mpumalanga and KwaZulu-Natal Provinces of South Africa.

*Momordica foetida* grows naturally in Africa from south of the Sahara to southern Africa, from Sierra Leone in the west to Ethiopia and Eritrea in the east and then down to northeastern Namibia and Swaziland as well as the Limpopo, Mpumalanga, KwaZulu-Natal and Eastern Cape Provinces of South Africa (Figure 1).

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PLATE 2237.—1, twig showing stem, leaves and tendrils, × 1; 2, male flower, × 1; 3, female flower, × 1; 4, twig with dehiscing fruit showing seeds, × 1. Voucher specimen: *Condy 163* in National Herbarium, Pretoria. Artist: Gillian Condy.

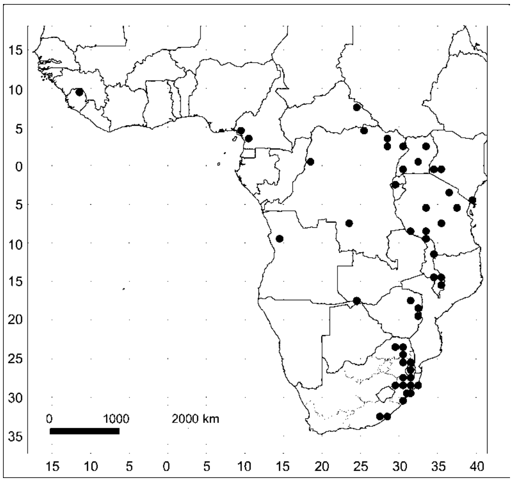

FIGURE 1.—Distribution of *Momordica foetida* based on specimens in the National Herbarium, Pretoria.

In southern Africa it grows at altitudes of 275 to 1 700 m above sea level; in tropical Africa it grows from about sea level to 3 450 m. *Momordica foetida* occurs in rain forest, woodland, wooded grassland and open grassland, also in forest edges and clearings, margins of swamps and secondary thickets, and often in riverine fringes. In southern Africa, it has been collected from the margins of *Podocarpus* forests, mopane sandveld, *Acacia karroo* woodland, open grassland with, for example, *Setaria chevalieri*, and also from disturbed grassland. It often climbs in or over hygrophilous scrub and other shrubs, bushes or herbs. It can grow in dry to well-drained to moist, often stony or organically rich, sandy or lateritic red loamy or clay soil. *M. foetida* grows in full sun as well as in light or dark shade under trees, also on open hillsides with gentle northeastern to southern slopes. It can become a weed and coloniser of disturbed ground and old cultivations.

In southern Africa, the main flowering time is from December to March, while the main fruiting time is from January to May. In tropical Africa, this species flowers in all months of the year, but mainly in October and November; it also fruits in all months, but mainly in November.

The specific epithet *foetida* refers to the foul smell of all parts of this plant, especially when crushed. Several collectors of specimens in the National Herbarium in Pretoria remark on this feature on their labels. *Mogg s.n.* refers to the pungent smell of urine, while *Gerstner 5811* describes it as a ‘lavatory smell’. *Mogg 13677* states that the foetid smell causes taints in milk.

This plant, known as *nku* in Sepedi, *nngu* in Tshivenda and *iNtshungu* in isiZulu, is often used as a vegetable and is sometimes cultivated as such. The leaves are cooked as a spinach while even the sticky, bright-red sheath covering the seed is occasionally eaten (*Gerstner 5811*). Presumably the foul smell disappears during the cooking process. According to Nesamvuni *et al*. (2001), the leaves are harvested all year round in Venda and can be stored dried and raw for 9–12 months. They are usually cooked with tomatoes and groundnuts. The nutrient content per 100 g of plant was found to be 94.0 kJ, with 3.3 g protein and 3.15 g fibre. Steyn *et al*. (2001) recorded that *Momordica foetida* had the following micronutrient content per 100 g of cooked leaves: Ca—1.06 mg, Fe—3.38 mg, Zn—0.42 mg, Vitamin C—20.6 mg, Beta-carotene—5.4 mg. Birds such as bulbuls also eat the seeds.

*Momordica foetida* is often used in traditional medicine in various parts of Africa. Watt & Breyer-Brandwijk (1962) list the following: The Zulu drink a decoction of the root or the leaf for the treatment of boils; the preparation also contains *Pittosporum viridiflorum* and *Vernonia natalensis*. They take an infusion or a decoction of the runner as a sedative for an irritable stomach. The Chagga use the leaf as a remedy for earache; elsewhere in tropical Africa it is used for roundworm. In Uganda, an infusion of the leaf and root is taken as an abortifacient and ecbolic. Feeding tests in rabbits with the fresh immature fruit and with the dried plant have proved that it is not poisonous. In Tanzania the fruit pulp is used to poison weevils, moths and ants and also as a repellent. The Benne tribe use the roots with *Strophanthus* species in arrow poisons. Hutchings *et al*. (1996) report that the Zulu take medicines made from crushed leaves and stems for high blood pressure and also for diabetes. In Guinea, leaf infusions are administered as antispasmodic enemas. Leaves are used for malaria in Rwanda. Foetidin was isolated from the whole plant and unripe fruit and shown to be identical to charantin. Extracts from the leaves showed antitrichomonas activity against *Trichomonas vaginalis*.

*Momordica foetida* is recognised by its flecked young stems, its unlobed, more or less cordate leaves and its densely and softly spiny fruit.

The specimen depicted on the accompanying plate was collected by the artist near the Cavern Berg Hotel in the Bergville District in the northern Drakensberg, KwaZulu-Natal, in April 2004.

**Description**.—Mostly dioecious, perennial herb with woody, tuberous rootstock; all parts foetid. *Stems* rather stout, trailing or climbing up to 6 m, grooved and usually flecked with darker green when young, ± glabrous to rather densely white-tomentose especially at nodes, when old becoming rather woody with pallid bark and rooting at nodes. *Leaves* broadly ovate-cordate to triangular-cordate in outline, 60–180 × 40–190 mm, unlobed, narrowly decurrent into petiole, subglabrous above, subglabrous to grey-tomentose below especially on veins, membranous, apex acute or acuminate, margin subentire with minute denticulate teeth to distinctly sinuate-dentate; petiole 15–170 mm long, pubescent, green-flecked like stems. *Tendrils* simple or bifid. *Male flowers* 1–9, opening singly, fasciculate at apex of a 20–250 mm long peduncle and immediately subtended by an elliptic, obovate-spathulate or broadly ovate-cordate, entire to dentate, glabrous or hairy bract 5–30 × 5–50 mm ± enclosing buds when large; pedicels 5–70 mm long, glabrous to densely tomentose; receptacle tube broadly obconic, 3–8 mm long, lobes lanceolate, ovate or triangular, 5–10 × 5–8 mm, obtuse or rounded at apex, convex and often with few short, soft spines on lower part outside, shortly ciliate near apex, brown to purplish black with green margins; petals caducous, white, cream, yellow or orange, marked with dark green/brown/black at base, obovate, 15–35 × 10–25 mm, 3 with incurved orange scales inside at base; stamens 3; thecae triplicate; anthers coherent in centre of flower. *Female flowers* solitary, on 15–130 mm long stalks usually bracteate in lower half (occasionally also bearing 1–3 male flowers); bract 3–20 mm long; ovary ovoid and beaked, 8–25 × 4–10 mm, densely and softly papillose-spinose; receptacle tube broad and shallow, 2.0–2.5 mm long, lobes ± triangular to strap-shaped, 2–10 mm long, acute, obtuse, rounded or somewhat dilated and green at apex, black at base; petals similar to those of male flower, 15–35 × 18–25 mm, 3 with scales inside at base; staminodes 3. *Fruit* long-stalked, 50–200 mm long, fleshy, ± ellipsoid, 35–80 × 25–50 mm, bright orange-yellow when ripe and dehiscing into 3 valves, densely and softly spiny; spines fleshy, pointed, somewhat recurved, 7–13 mm long, without apical bristle; pulp scarlet, surrounding exposed seeds with a sticky bright red sheath at maturity. *Seeds* brown, ± oblong in outline, compressed, ± 10 × 6 × 3 mm; testa sculptured, 2-grooved at margins; cotyledons hypogeous. Plate 2237.

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W.G. WELMAN* and G. CONDY*

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* South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

PLATE 2238 *Coccinia palmata*

Flowering Plants of Africa 60: 118–122 (2007)

# *Coccinia palmata* Cucurbitaceae

### *South Africa and Swaziland*

**Coccinia palmata** *(Sond.) Cogn.* in Monographiae phanerogamarum 3: 540 (1881); Wood: 54 (1907); Bews: 202 (1921); Burtt Davy: 231 (1926); Meeuse: 96 (1962); Pooley: 80 (1998). *Cephalandra palmata* Sond.: 493 (1862); Wood: t. 283 (1902). *Cephalandra mackenii* Naudin: 17 (1866).

*Coccinia* is an Old World genus of about 30 species, with all but one confined to Africa. *C. grandis* occurs naturally in tropical Africa, Arabia, tropical Asia and Australasia; it has been introduced in the West Indies and tropical South America. Seven indigenous species are found in southern Africa, in all regions except the Western Cape Province of South Africa. Species of this genus are herbaceous creepers, usually with a tuberous rootstock, and are recognised by the more or less oblong, fleshy fruit that is always quite smooth, glabrous, scarlet and longer than 35 mm when ripe. The many seeds are distinctly compressed and both the male and female flowers (on separate plants) have short receptacle tubes. The genus name *Coccinia* refers to the red ripe fruit, from the Latin *coccineus* meaning deep red, from scarlet to carmine and crimson. The species name *palmata* refers to the hand-shaped leaves with five lobes. In southern Africa, *C. palmata* is unique among the species of *Coccinia* by being glabrous and having bifid tendrils.

*Coccinia palmata* is naturally confined to Swaziland and South Africa where it grows in the Limpopo, Mpumalanga, KwaZulu-Natal and Eastern Cape Provinces (Figure 1). It prefers a mean annual rainfall of about 800 mm to more than 1 200 mm and grows from about sea level to 2 010 m altitude. It grows in poorly to well-drained soils such as black clay, loam or red sand that can be humus-rich or stony; the geology has been described as sandstone or quartzite. It can grow on very steep to gentle slopes of dunes, hills or ravines with a northern to southern aspect, in full sun or semishade. It is sometimes found in grassland, but mostly in thickets, open woodland or riverine, coastal, marsh, secondary and primary forests where it usually grows at the edges

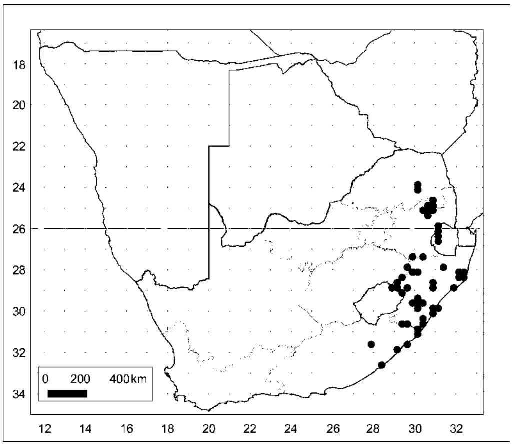

FIGURE 1.—Known distribution of *Coccinia palmata*, based on specimens in the National Herbarium, Pretoria.

PLATE 2238.—1, twig with leaves, tendrils and male flowers, × 1; 2, twig with tendrils and fruit, × 1. Voucher specimen: *Condy 164* in National Herbarium, Pretoria. Artist: Gillian Condy.

and in open patches. *C. palmata* has also been collected in disturbed and cultivated areas such as cane fields, pine plantations, abandoned avocado orchards and road edges.

This species flowers mainly from November to March and bears fruit mainly from November to May; the flowers wither quickly. The leaves fall in autumn but the fruit remain on the plant for months, ripening and softening, and providing food for insects, birds, monkeys and antelope during the dry winter. Most of the stem eventually disintegrates back to the persistent rootstock, which sprouts again in spring.

According to Johnson *et al*. (2002) and Nichols (2004), this attractive climber with the common name wild cucumber (*wildepampoentjie* or *bospampoentjie* in Afrikaans), will grow in full sun and semishade and can be useful in gardens to cover a fence or trellis. It is grown from seed by squashing a ripe fruit, cleaning out the seeds and sowing them in a tray of seedling mix or directly into the soil. Alternatively, an over-ripe fruit can be mashed and the pulp spread where needed in the garden. Seedlings develop rapidly and will cover a fence or trellis in a matter of weeks, the plants growing to full size within a single season. This is a short-lived perennial; some plants die after a single season. It is advised that seed be planted in the garden every year until the population is self-sustaining. *Coccinia palmata* needs good rainfall or plenty of water. The rootstock should survive frost.

According to Hutchings *et al*. (1996), Zulu people administer infusions of dried fruit of *Coccinia palmata* (*uthangazane omncane* or *iwehlati*) as enemas or take these infusions as purgatives. Pooley (1998) reported that the leaves are cooked as a spinach.

The International Plant Names Index (on the website of the Royal Botanic Gardens, Kew) lists *Coccinia palmata* M.Roem. from 1846 that is apparently based on *Bryonia palmata* L. and refers to a species in Asia. If *C. palmata* M.Roem. is validly published, *C. palmata* (Sond.) Cogn. would be illegitimate as a later homonym, and if so, apparently *C. mackenii* would be the correct name to use (M. Thulin pers. comm.). According to Mabberley (1985), the name *C. mackenii* was first validly published by Huber (1865) and the author citation should be Naudin ex Huber. These points need further investigation.

Meeuse (1962) cited the specimen *Earthy (1?)* in the Bolus Herbarium (Herb. No. *18612*) from Sul do Save in southern Mozambique as *Coccinia palmata*. However, this specimen is actually *C. rehmannii* Cogn. Jeffrey (1978) listed *C. palmata* sensu Meeuse under *C. rehmannii*; this referred only to the misapplication of this name on the cited specimen *Earthy (1?)*. Lebrun & Stork (1991) incorrectly listed *C. palmata* (Sond.) Cogn. as a synonym of *C. rehmannii*—*C. palmata* does not occur in tropical Africa.

The specimen depicted on the accompanying plate was collected by the artist near the Cavern Berg Hotel (Bergville District) in the northern Drakensberg of KwaZulu-Natal in early May 2004, where it was growing in full sun.

**Description**.—Perennial herbaceous climber with a large tuberous rootstock, glabrous or occasionally somewhat hairy in young parts. *Stems* usually annual, 0.5–9 m long, branched, slender, sulcate, becoming corky with age. *Leaves* suborbicular to ovate-oblong in outline, 40–120 mm in diameter, firm, herbaceous to somewhat coriaceous, dark green above, paler below, sometimes slightly glaucescent, smooth on both surfaces or finely punctate-scabrid on upper one, often with a few black glands near base on lower one, deeply palmately 5-sect; lobes ovate to oblong-lanceolate, acute or acuminate, terminal one slightly larger than the two lateral ones, basal ones distinctly smaller; margins from minutely and remotely denticulate to occasionally lobulate with dentitions callous-toothed; sinuses between lobes usually subacute to rounded; basal sinus subrotundate to narrow; petioles slender, striate, 10–60 mm long. *Tendrils* bifid, often unequally so. *Male flowers*: peduncles 1- to racemosely 8-flowered, slender, 20–100 mm long, 1-flowered ones articulated at apex; pedicels nearly filiform, articulated at apex, 8–25 mm long; calyx glabrous, receptacle 3–6 mm long, 5–7 mm in diameter, sepals 3–4 mm long; corolla pale yellow, 10–20 mm long, segments acute; anthers orange. *Female flowers*: solitary, peduncle up to 60 mm long; staminodes oblong, long-pubescent, 2–3 mm long, 1.5–2.0 mm broad; ovary oblong-linear to fusiform, glabrous, ± 15 mm long. *Fruit* oblong-fusiform to narrowly ellipsoid, 50–80 × 20–35 mm, acute, ripening red from lower end. *Seeds* ± spear-shaped, ± 6.5–8.0 × 3–4 × 1.5 mm, finely rugulose, dirty white. Plate 2238.

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W.G. WELMAN* and G. CONDY*

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* South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

PLATE 2239 *Helichrysum adenocarpum* subsp. *adenocarpum*

# *Helichrysum adenocarpum* subsp. *adenocarpum* Asteraceae

*Zimbabwe, Mozambique, South Africa, Swaziland, Lesotho*

**Helichrysum adenocarpum** *DC*. in Prodromus 6: 180 (1838); Harvey: 229 (1865); Moeser: 335 (1910); Batten & Bokelmann: 156, t. 125, 2 (1966); Hilliard: 239 (1977); Hilliard: 277 (1983).

The Asteraceae (Compositae) is the largest flowering plant family, with about 1 535 genera and 25 000 species. It has a cosmopolitan distribution and is absent only from Antarctica. There are about 250 genera and 2 300 species of Asteraceae in southern Africa. *Helichrysum* in the broad sense contains about 600 species, found largely in Africa and Madagascar, also in Europe, Asia and Australia; about 240 species are widely distributed in southern Africa. The genus belongs to the tribe *Gnaphalieae* of the Asteraceae, with about 175 genera worldwide, but particularly in southern Africa and Australia. Miller (1754) described this genus as '*Elichrysum*' from the Greek *(h)elios* (sun) and *chrysos* (gold), although only some species have yellow flower heads. Persoon (1807) corrected the name to *Helichrysum* and this conserved name is still used today. The species name is also derived from the Greek and describes the glandular fruit: *aden* (gland) and *carpus* (fruit).

Hilliard (1983) classifies *Helichrysum adenocarpum* with 10 others in Group 28 of the genus *Helichrysum*; they are herbaceous perennials with one or more tufts of radical leaves and simple, erect flowering stems with usually one flower head with white to pink, red or purple bracts. All species in this group are from the summer-rainfall area of the eastern parts of southern Africa and several are endemic to the Drakensberg range.

*Helichrysum adenocarpum* is distinguished from the other species in this group by: hairy ovaries, 15–20 mm long flower heads with glossy involucral bracts, pubescent or woolly leaves, elliptic to suborbicular radical leaves, and flowering stems that are borne lateral to the leaf rosette. The flowering stems are terminal in the uncommon and closely related *H. monticola* from Swaziland and KwaZulu-Natal, which is often confused with specimens of subsp. *adenocarpum* with white or pinkish bracts. Subsp. *adenocarpum* exhibits much variation in stature, leaf size and indumentum, number of heads on the flowering stem, and colour of the involucral bracts. Plants with one-headed stems are common above altitudes of about 1 200 m, those with many-headed stems occurring from sea level to about 1 800 m, but there are many exceptions. Plants with pure white bracts have been recorded only below about 600 m and grow mixed with plants with multicoloured bracts.

The subsp. *adenocarpum* depicted here, is distributed from the eastern highlands of Zimbabwe and neighbouring Mozambique southwards to Swaziland,

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PLATE 2239.—1, basal rosettes with flowering stems, × 1; 2, hermaphrodite flower, × 10; 3, female flower, × 10; 4, pappus bristle, × 10. Voucher specimen: *Condy 193* in National Herbarium, Pretoria. Artist: Sibonelo Chiliza.

Lesotho and South Africa in the Limpopo, Mpumalanga, Free State, KwaZulu-Natal and Eastern Cape Provinces (Figure 1). In southern Africa it grows at a very wide range of altitudes, from 15–3 050 m, with a mean annual precipitation of 600–1 200 mm or more. It is common in various kinds of fairly moist grassland such as montane and alpine grassland, Dohne Sourveld and Highland Sourveld, quite often with *Themeda triandra* and also various other grasses such as *Aristida junciformis*. It has also been recorded from so-called palm veld and *Protea* savanna as well as low ericoid vegetation.

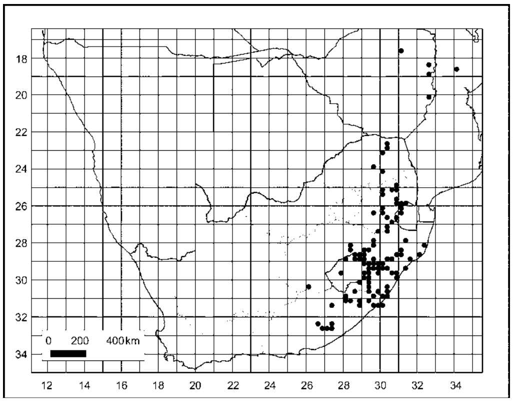

FIGURE 1.—Known distribution of *Helichrysum adenocarpum* subsp. *adenocarpum* in Africa, based on specimens in the National Herbarium, Pretoria.

This subspecies grows in poorly to well-drained, usually moist to occasionally dry loam, clay and sandy, dark peaty or humus-rich, gravelly or stony, often shallow soil and also in dark brown sandy loam or sandy coastal soil and shale. The lithology has been described as Cave Sandstone, Table Mountain Sandstone, Moodies quartzite or SKB quartzite. The plants are often found in wet areas such as seepages, mist zones, marshy areas, along streams and in other damp and even exposed, windy, moist situations that could be snow-covered in winter. The habitat is on flat areas such as mountain summit plateaus as well as on slopes of mountains or hills (gentle, moderate to steep or very steep) on all aspects, but mainly south- and east-facing. This plant is often seen on rocky outcrops, stony ridges, under cliffs or in other rocky areas and also in protected dips and depressions. It can grow in full sun or partial shade and also in heavily grazed and regularly or occasionally burnt grassland.

The subsp. *adenocarpum* is one of the many components of the summer-rainfall grasslands with perennial roots and annual stems, an adaptation to drought, fire and frost. Several of these plants flower before the first real summer rains. Flowering specimens of subsp. *adenocarpum* have been collected in all months of the year, but mainly from February to May, peaking in March.

Another subspecies of *Helichrysum adenocarpum* is recognised, namely the subsp. *ammophilum* described by Hilliard in 1973 (*ammophilum* refers to its sand-loving habit). It is consistently of robust habit (up to 1 m tall), has glandular, very rarely woolly leaves, a many-headed inflorescence and involucral bracts that are invariably pure white. It is confined to the Tongaland coastal plain from Maputo Bay and Inhaca Island in Mozambique to the Lower Tugela area in KwaZulu-Natal and grows in sandy, poorly drained grassland, generally flowering from August to April. The subsp. *adenocarpum* is widespread from near sea level to the top of the escarpment, but is absent from the Mozambique-Zululand coastal plain where it is replaced by subsp. *ammophilum*.

Although southern Africa is rich in attractive species of *Helichrysum*, this is only the second taxon to be figured in this series. In 1933, *H. summo-montanum*, a small shrub with fairly large white to red or purple flower heads, appeared as Plate 483 in *The Flowering Plants of South Africa* (Dyer 1933), with Cythna Letty as artist. It is a rare endemic from the Mt Anderson area (Lydenburg District) in Mpumalanga.

The specimen depicted on the accompanying plate was collected by the artist in April 2005 near the Cavern Berg Hotel in the Bergville District of KwaZulu-Natal where it grew in well-drained, rocky grassland on a southwest-facing slope.

**Description** (after Hilliard 1983).—Perennial herb in small colonies; rootstock woody, often shallowly rooted, crowned with 1–several leaf rosettes. *Flowering stems* lateral, decumbent or erect, 40–450 mm long, simple or forking above into a few- to many-headed very open corymb, glandular-pubescent or woolly, closely leafy. *Radical leaves* prostrate, suborbicular to elliptic-oblong, 15–40(–140) × 15–25(–40) mm, mostly loosely grey-woolly or cobwebby, sometimes only glandular-pubescent. *Cauline leaves* oblong to lanceolate, smaller than radical ones and passing into inflorescence bracts, woolly, cobwebby or glandular-pubescent, often without wool when radical leaves are woolly. *Heads* heterogamous, campanulate, 15–20 mm long, ± 25–35 mm across radiating bracts. *Involucral bracts* in 9–11 series, graded, loosely imbricate, much exceeding flowers, glossy, acute, white or white-tipped rose, crimson or scarlet, or wholly rose, purple or crimson, fading to grey when old. *Flowers* ± 165–520, 20–90 female, 145–500 hermaphrodite, yellow, often tipped red. *Achenes* 0.75 mm long, barrel-shaped, with myxogenic duplex hairs. *Pappus* bristles several, barbellate to subplumose in upper part, bases nude, not cohering. Plate 2239.

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W.G. WELMAN* and SIBONELO CHILIZA*

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* South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

# *Berkheya radula* Asteraceae: Arctoteae

*Zimbabwe, Botswana, South Africa*

**Berkheya radula** (*Harv.*) *De Wild*. in Icones selectae horti thenensis 2: 89 (1901); Burtt Davy: 571 (1935); Roessler: 244 (1959); Pope: 241 (1992); Retief & Herman: 294 (1997). *Stobaea radula* Harv.: 491 (1865). *Crocodilodes radula* (Harv.) Kuntze: 333 (1891). *B. adlami* Hook.f.: t. 7514 (1897); Eyles: 520 (1916).

Many representatives of the genus *Berkheya* are characterised by vicious spiny leaves and involucral bracts and are therefore not often collected and appreciated. Yet their bright yellow or more rarely white or purple flower heads make an impressive sight in the field. Although the species of *Berkheya* are fairly common and widespread throughout southern Africa, none have ever been illustrated for *Flowering Plants of Africa*.

The genus *Berkheya* comprises about 75 species of which 71 occur in southern Africa, a few going into tropical and eastern Africa and only two species reaching northern Africa. The genus belongs to the tribe Arctoteae in the subfamily Cichorioideae of the family Asteraceae and is the largest genus in this tribe. The tribe comprises 16 genera of which only one (*Cymbonotus* from Australia) occurs outside Africa. Most taxa of the remaining genera occur in southern Africa, many of them endemic to a specific area.

Representatives of the genus *Berkheya* are either herbs or subshrubs with alternate or radical, rarely opposite, leaves which sometimes are decurrent on the stem. The flower heads are borne singly or in groups on long peduncles at the tips of the branches. The heads have mostly conspicuous bright yellow or sometimes purple, rarely whitish, ray florets and yellow or purple disc florets. In some species ray florets are absent. The involucral bracts are connate at the base. The fruits (cypselae) are obovoid, hairy or glabrous, crowned by short or long pappus scales or scale-like bristles and are embedded in the receptacle.

The genus name *Berkheya* commemorates the Dutch botanist Johann le Franq van Berkhey (1729–1812), the genus originally described in 1788 by Ehrhart, a German botanist and pupil of Linnaeus. The specific name *radula* means rough, probably referring to the rough leaf surfaces.

*Berkheya radula* inhabits moist areas like stream banks, vleis, around pans and seasonally wet areas such as roadsides and occurs in Zimbabwe, Botswana and the South African provinces Limpopo, North-West, Gauteng, Mpumalanga, Free State

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PLATE 2240.—1, basal leaves of rosette and upper part of stem with flower heads, × 1; 2, cypsela, × 3. Voucher specimen: *Herman, Retief & Grobler 1540* in National Herbarium, Pretoria. Artist: Gillian Condy.

PLATE 2240 *Berkheya radula*

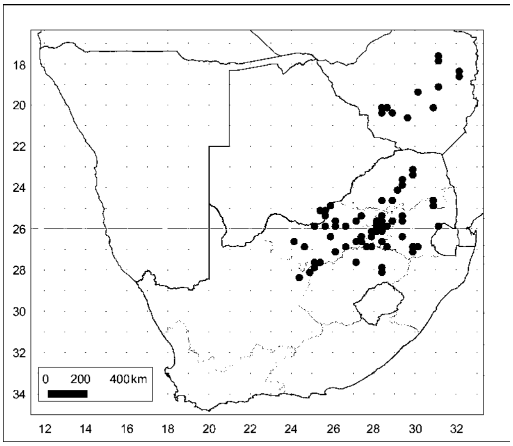

FIGURE 1.—Known distribution of *Berkheya radula*.

and Northern Cape (Figure 1). The plants flower from about September to May, with the peak flowering time from December to March. This species does not seem to be threatened at present.

The author made an interesting observation after collecting *Berkheya radula* in the Colbyn Valley peat area in Pretoria, Gauteng. He searched in vain for plants with ripe fruit but collected some specimens with closed involucres, presumably immature inflorescences. However, after drying, the involucres opened and released large numbers of mature fruit. It seems that the involucres close up after pollination, the fruits developing inside the closed structures. At maturity, the involucres open and the fruits are released.

According to Watt & Breyer-Brandwijk (1962), Kwena and Tswana men drank a decoction of *Berkheya radula* for back pain around the kidneys. Men of the Filabusi area in southern Zimbabwe used to rub the powdered plant into swollen testicles. Manyika herbalists washed themselves with an infusion prepared from the roots of this plant once a month. Smith (1966) recorded the common name *boesmansrietjie* (Afrikaans) for this plant, alluding to rural children picking the young, hollow stems, scraping off the spiny wings and eating the hollow stems—in the cleaned condition the stems resemble reeds (Afrikaans: *rietjies*).

**Description**.—Perennial subrosulate herb up to 1 m high from a rootstock. *Stems* single, erect, branched in upper part, ribbed, winged, wings bicolorous, spinose-dentate, with spines similar to those on leaf margins, densely hairy and glandular just below flower heads. *Leaves* alternate, sessile or subsessile, diminishing quickly in size upwards, lower leaves subrosulate, large, elliptic, irregularly pinnatilobate, up to 400 × 150 mm, discolorous, upper surface bright green, roughly hairy with scattered, short, bulbous-based hairs, glabrescent, lower surface densely white tomentose, apex rounded, base cuneate, margins sinuate-spinescent, spines 1–7 mm long, reddish brown, upper leaves sessile, linear-triangular, spinose-dentate, running down stem as wings. *Capitula* (flower heads) heterogamous, radiate, terminal, mostly 4 (but sometimes up to 18), laxly arranged. *Involucre* widely campanulate, involucral bracts in ± 4 rows, each row connate at base, with a few solitary bracts on outside, bracts linear, up to 15 × 1.5–4.0 mm, spinescent on margins, spines up to 3 mm long, apex spinose-acuminate, apical spine up to 4 mm long, reddish or yellowish. *Receptacle* epaleate, deeply alveolate, enveloping fruits. *Ray florets* in 1 row, up to 38 mm long, apex 3–5-lobed, sometimes deeply so, sterile, bright yellow. *Disc florets* bisexual, fertile, infundibuliform, up to 10 mm long, deeply 5-lobed, lobes up to 3.5 mm long, yellow. *Anthers* up to 4.5 mm long, with ovate-lanceolate apical appendage, caudate and calcarate. *Style* up to 12 mm long, upper part thickened and separated from lower part by circle of short hairs, style branches 2.5 mm long. *Cypsela* (fruit) turbinate, 3 × 1.0–1.5 mm, glabrous, whitish, sometimes 5-angled. *Pappus* scales 10, oblong, 1.0–1.4 × 0.5–0.8 mm, straw-coloured, apex rounded, lacerate. Plate 2240.

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P.P.J. HERMAN* and GILLIAN CONDY*

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* South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

## Note on Plate 1970 in *Flowering Plants of Africa* 50 (1988)

Examination of the specimens and associated literature of the genus *Astridia* in the National Herbarium, Pretoria, South Africa, has revealed that Plate 1970 of *Astridia velutina* in *Flowering Plants of Africa* 50 (1988) does not match the accompanying text.

Characters of the capsule and the shape and colour of the petals of the plant depicted in Plate 1970 are unmistakably those of *Hartmanthus pergamentaceus*. Unfortunately there are no voucher specimens for Plate 1970 in the National Herbarium. Without flowering or fruiting material, members of the two genera can be confused. Differences between them can be summarised as follows:

| Character | *Astridia* | *Hartmanthus* |
|---|---|---|
| Leaves | Surface velutinous | Surface smooth |
| Flower colour | White, cream, pink, mauve, orange and red | Pink and mauve |
| Capsules | With closing bodies and covering membranes | Without closing bodies; covering membranes reduced or absent |

P.M. BURGOYNE*†

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* South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.
† Research Fellow, Department of Environmental Sciences, College of Agriculture and Environmental Sciences, University of South Africa, P.O. Box 392, UNISA, Pretoria, 0003 South Africa.

# Guide for authors and artists

## INTRODUCTION

Contributions from authors and artists are most welcome. The policy of the Editorial Committee of *Flowering Plants of Africa* (*FPA*) is to obtain contributions from as wide a range of authors and artists as possible and to depict a rich and interesting mix of plants from all over Africa. All contributions are assessed by referees.

Plates that have already been published in colour in some other journal or magazine are generally not acceptable for *FPA*.

Authors and/or artists are advised to contact the Editor before any work is undertaken with a view to publication in *FPA*: The Editor, *Flowering Plants of Africa*, South African National Biodiversity Institute, Private Bag X101, 0001 PRETORIA [Tel. (012) 843-5000; Fax (012) 804-3211]. E-mail: germishuizen@sanbi.org

## 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 ±; <open square> for ☐, <solid dot> for •. 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-pressed, 300 gsm) is recommended. The use of board should also be avoided, as it cannot be curved over the drum of the scanner.

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. Rather use indigo to produce dark tones. 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 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. 1–37,1.

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: 1–19.

3. **SANBI Biodiversity Series**: occasional reports on projects, technologies, workshops, symposia and other activities initiated by or executed in partnership with SANBI. Published: 1–6.

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*; Prodromus 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*). One book published in the *Strelitzia* series (15).

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

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

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