

Three new species of *Gladiolus* (Iridaceae) from South Africa, a major range extension for *G. rubellus* and taxonomic notes for the genus in southern and tropical Africa

J.C. MANNING* and P. GOLDBLATT**

Keywords: *Gladiolus* L., Iridaceae, Namibia, new species, South Africa, Tanzania, taxonomy

ABSTRACT

Three new species of *Gladiolus* L. are described from South Africa. *G. dolichosiphon* is the second known member of series *Blandus* from the mountains of the Little Karoo in Western Cape, and is distinguished from other members of the long-tubed, pink-flowered *G. carneus* complex by its 5 or 6 linear leaves, creamy pink to salmon flowers with a tube 30–50 mm long and longer than the dorsal tepal, and its late summer flowering. *G. karoocicus* from the Klein Roggeveld and the northern foothills of the Witteberg, is a spring-flowering species allied to *G. permeabilis* but has bright, canary-yellow flowers with the lower part of the lower tepals involute and conspicuously auriculate. *G. reginae* is an edaphic endemic of the Sekhukhuneland Centre of Floristic Endemism in Mpumalanga, and flowers in autumn. It is evidently a glabrous member of section *Densiflorus* series *Scabridus*, distinguished by its long-tubed flowers, streaked with red on the lower tepals and blotched with red in the throat. Anomalously, however, it has the tubular inner bracts and large capsules diagnostic of section *Ophiolyza* series *Oppositiflorus*. A re-examination of the morphology suggests that series *Scabridus* is better placed in section *Ophiolyza* and a slightly revised classification of *Gladiolus* in southern Africa is proposed. We also propose the replacement name *G. sulcatus* for the Tanzanian species, *G. sulcatus* Goldblatt, a later homonym of *G. sulcatus* Lam. Finally, a recent sighting of what appears to be *G. rubellus* from northern Namibia constitutes the first record of this species in the country and a major range extension from its previous known occurrence in southeastern Botswana.

INTRODUCTION

Gladiolus L., now including some 262 species, is the largest genus of Iridaceae subfamily Crocoideae. It is also the largest genus of Iridaceae in Africa, where 168 species are now known from southern Africa, 82 species from tropical Africa, eight in Madagascar, and a scant 10 in Eurasia. The genus is taxonomically well researched, and recent monographs exist for Madagascar (Goldblatt 1989), tropical Africa–Arabia (Goldblatt 1996), and southern Africa (Goldblatt & Manning 1998). New species continue to be discovered, however, and two have since been added to the genus from southern Africa (Manning *et al.* 1999), another from the Democratic Republic of Congo (Geerinck 2001) and two more have been recognized from Zimbabwe and Mozambique (Goldblatt 2008). Here we describe a further three species from South Africa. *Gladiolus reginae* Goldblatt & J.C.Manning from northwestern Mpumalanga was discovered during a botanical survey of the Steelpoort River Valley, which transects the Sekhukhuneland Centre of Floristic Endemism (Van Wyk & Smith 2001), a region that is still poorly explored botanically. This interesting species is evidently a member of series *Scabridus* (currently placed somewhat uncomfortably at the end of section *Densiflorus* in the classification of the southern African species) but it displays the critical characteristics of section *Ophiolyza*. As a result, we have reassessed the taxonomic position of series *Scabridus* within the genus. A second species, *G. karoocicus* Goldblatt & J.C.Manning of section *Hebea*, from the Western Karoo, was discovered in the spring of 2006, a year of unusually ample rainfall in this semi-arid winter rainfall zone. A third new species, *G.*

dolichosiphon Goldblatt & J.C.Manning, from the mountains of the Little Karoo in Western Cape, was collected in early 2008, although a previously unplaced collection was made two decades earlier.

In addition to describing these new species, we take this opportunity to provide a new name for the Tanzanian *Gladiolus sulcatus* Goldblatt. After examining the checklist of Iridaceae being prepared for the *World checklist of selected plant families* (R. Govaerts pers. comm. 2007), we have learned that the name is a later homonym, and therefore illegitimate. Finally, a recent collecting trip to northwestern Namibia produced what is evidently a new record for that country of *G. rubellus* Goldblatt, previously thought to be endemic to southeastern Botswana.

***Gladiolus dolichosiphon* Goldblatt & J.C.Manning, sp. nov. (section *Blandus*)**

Plantae 200–400 mm altae, cormo subgloboso 10–15 mm diam., tunicis externis aetate in fibras molles solutis, cataphyllis supra terram purpurascensibus obscure viridibus vel albis maculatis, foliis 6 vel 7, inferioribus 3 basalibus grandioribus laminibus linearibus ad anguste ensiformibus 1.5–4.0(–6.5) mm latis marginibus hyalinis foliis caulibus sine laminis, caule simplici vel 1-ramoso, spica ad basem inflexa inclinata 4- vel 5-(ad 7-)flora, ramis 1- vel 2-floris, bractea externa subacuta vel infime attenuata 20–30(–35) mm, interna subacuta ad apicem indivisa, floribus pallide cremeis vel salmoneis inodoris, tepalis inferioribus maculis pallidis medianis circumscriptio atrorubro praeditis, tubo perianthii cylindrico (30–)40–55 mm longo, tepalis inaequalibus lanceolatis dorsalibus 30–40 × 15–17 mm prorsum supra stamina arcuatis, lateralibus superioribus 25–28 × 12–14 mm, inferioribus tribus prorsum extensis basi ± 2 mm connatis, 20–25 × 4–5 mm, filamentis 16–20 mm longis, antheris 8–9 mm longis, stylo arcuato ramis 8–9 mm longis.

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

** B.A. Krukoff Curator of African Botany, Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166, USA.

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FIGURE 1.— *Gladiolus dolichosiphon*, Schutte & Vlok 941. Photographer: Jan Vlok.

TYPE.—Western Cape, 3321 (Ladismith): Rooiberg, south of track between Rooiberg Pass and Bailey's Peak, (–DB), 7–23 February 2008, *A.L. Schutte & J. Vlok 941* (NBG, holo.; K, MO, iso.).

Plants 200–400 mm. *Corm* subglobose, 10–15 mm diam.; outer tunics decaying into soft fibres, pale greyish brown. *Stem* inclined outward above basal leaves, unbranched or with a small lateral branch from axil of one or both uppermost leaves, 1–2 mm diam. below main spike. *Cataphylls* flushed purple above ground and obscurely mottled with green or white. *Leaves* 6 or 7, lower 3 basal and largest, reaching or shortly exceeding spike; blades linear to narrowly sword-shaped, 1.5–4.0(–6.5) mm wide, midrib slightly thickened and margins hyaline; upper 2 cauline leaves without blades, sometimes subtended by a lateral branch each, margins open to base. *Spike* flexed at base, inclined, weakly flexuose, 4- or 5(–7)-flowered, subsecund, lateral branches 1- or 2-flowered; bracts foliose, outer subacute or lower attenuate, 20–30(–35) mm, green flushed purple distally, inner slightly shorter or up to two thirds as long, subacute and not forked apically. *Flowers* pale creamy or salmon pink, lower three tepals each with a pale lozenge-shaped median mark outlined in dark red, unscented; perianth tube cylindric, expanded in upper 10 mm, straight or arched distally, (30–)40–55 mm long; tepals unequal, lanceolate, dorsal largest, 30–40 × 15–17 mm, arching forward over stamens and curved upwards distally, upper laterals 25–28 × 12–14 mm, extending forward and curving outward in distal third to half, lower three tepals basally fused for ± 2 mm, narrowly lanceolate, 20–25 × 4–5 mm, in profile shorter than upper tepals. *Filaments* 16–20 mm long, exerted 10–14 mm from tube; anthers 8–9 mm long, purple with cream-coloured pollen. *Ovary* ovoid, ± 5 mm long; style arching beneath dorsal tepal, dividing just before or just beyond anther apices, branches 5–6 mm long. *Capsule* and *seeds* unknown. *Flowering time*: late January to mid-February. Figure 1.

Distribution and ecology: known from two collections from the mountains around Ladismith in the western Little Karoo (Figure 2), where it has been recorded from the top of the Klein Swartberg at an altitude of 1 900 m and from the Rooiberg at over 1 300 m. Plants occur on cooler south-facing slopes in seasonally wet situations, on rocky outcrops or along kloofs. On both occasions *Gladiolus dolichosiphon* was collected on trips that had been undertaken in response to fires that had occurred the preceding summer and while it, like many *Gladiolus* species, evidently flowers well after fire, it is probably not a true pyrophile.

The long-tubed, pink flowers with red markings on the lower tepals, are similar to several other *Gladiolus* species, as well as other Iridaceae, that are adapted to

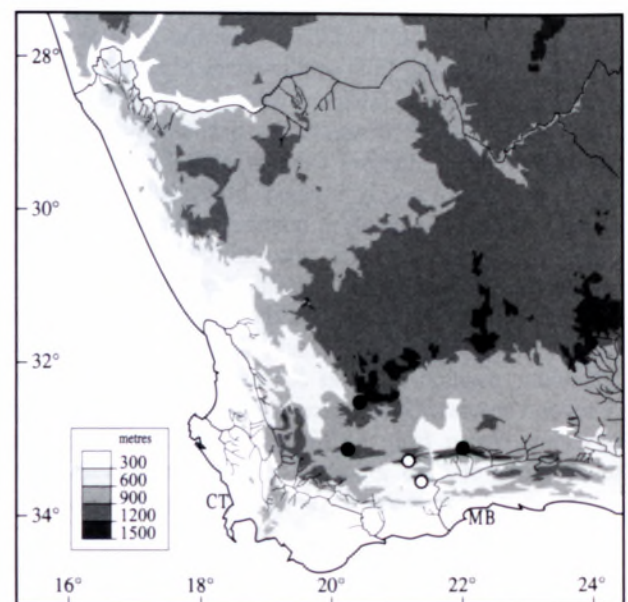


FIGURE 2.—Known distribution of *Gladiolus dolichosiphon*, O; *G. karooicus*, ●.

pollination by long-proboscid flies in the families Tabanidae and/or Nemestrinidae (Goldblatt & Manning 1999) and there is no doubt that *G. dolichosiphon* is likewise adapted to this pollination system.

Gladiolus dolichosiphon was first collected in February 1986 on the Klein Swartberg by ecologist Jan Vlok while checking on the condition of plants of *Protea pruinosa* after a fire the previous year. This puzzling collection could not be identified, however, and was not included by Goldblatt & Manning (1998) in their revision of the genus in southern Africa. In February 2008, Jan Vlok, accompanied by AnneLise Vlok and Willem Wagenaar from CapeNature, encountered a population of *Gladiolus* in flower on the Rooiberg during a biodiversity survey of the mountain. Suspecting that it was of interest, they collected ample material and photographed the flowers. From this it was clear that the plants represented an undescribed species and further investigation in the herbarium revealed the earlier collection from the Klein Swartberg, which is undoubtedly the same species.

Diagnosis and relationships: the basal fan of narrowly lanceolate leaves and spike of relatively large, long-tubed, pink flowers with median lozenge-shaped markings on the lower three tepals, place *Gladiolus dolichosiphon* among the species of section *Blandus* series *Blandus*. Centred on the variable *Gladiolus carneus* Delaroché, series *Blandus* currently includes 13 species endemic to the mountains of the southwestern Cape, making *G. dolichosiphon* the fourteenth member of the alliance and one of just two that are known from the inland mountains of the Little Karoo. The other Little Karoo species, *G. aquamontanus* Goldblatt & Vlok, is another discovery of Jan Vlok's and this hydrophyte is restricted to the Great Swartberg, where it grows in perennial streams and on wet cliffs.

The relationships between the nine members of the cream- or pink-flowered *Gladiolus carneus* complex are poorly understood. Members of the alliance are distinguished primarily on the relative lengths of the perianth tube and tepals, the proportions of the upper and lower

tepals, and on flowering time and geographical distribution (Goldblatt & Manning 1998) (Table 1).

In its narrow, linear leaves and creamy pink or pale salmon flowers with the tube longer than the dorsal tepal, and the lower tepals with median, lozenge-shaped markings, *Gladiolus dolichosiphon* has a marked similarity to *G. bilineatus*, a local endemic to the southern foothills of the Langeberg, where it occurs mainly in a narrow band along the renosterveld-fynbos transition, and flowers in autumn, in March and April. *G. bilineatus* has just three leaves, usually only the lower one or two with a well-developed blade, 6–8 mm wide, and flowers with a perianth tube 50–70 mm long. *G. dolichosiphon*, from the interior Little Karoo mountains on seasonally moist slopes at high altitude in fynbos, flowers in late summer, in February. Plants have 6 or 7 linear leaves with blades mostly less than 5 mm wide, and a perianth tube 30–55 mm long. These differences in foliage, flower morphology, ecology and distribution are all significant in the context of species delimitation in the *G. carneus* complex.

Etymology: Greek *dolicho*, long; *tubus*, tube, referring to the long perianth tube.

Other material seen

WESTERN CAPE.—3321 (Ladismith): top of Klein Swartberg Mountains, next to Besemfontein track, (–AD), 3 February 1986, Vlok 1407 (NBG).

***Gladiolus karoocicus* Goldblatt & J.C.Manning, sp. nov. (section *Hebea*)**

Plantae 150–500 mm altae, cormo conico 25 × 15 mm, foliis usitate 4 laminis linearibus ± 2 mm latis, folio caulino vaginato, caule simplici vel 1–2-ramoso, spica 2- ad 5-flora, bracteis 20–25 mm longis, floribus bilabiatis flavis perodoratis, tubo perianthii subcylindrico ± 12 mm longo, tepali inaequalibus, dorsalibus ± 25 × 10 mm arcuatis, tepalis lateralibus superioribus erectis, tepalis lateralibus inferioribus 12 × 4 mm in dimidio inferiore marginibus incurvis tubum calcariformem formantibus, filamentis ± 15 mm longis 10 mm ex tubo exsertis, antheris ± 8 mm longis, stylo arcuato ramis ± 2.5 mm longis.

TABLE 1.—Selected characteristics of members of *Gladiolus carneus* complex. Distribution data follows centres of endemism in Goldblatt & Manning (2000)

	<i>carneus</i>	<i>pappei</i>	<i>geardii</i>	<i>aquamontanus</i>	<i>undulatus</i>	<i>angustus</i>	<i>buckerveldii</i>	<i>bilineatus</i>	<i>dolichosiphon</i>
Corn	developed	developed	developed	vestigial	developed	developed	poorly developed	developed	developed
Leaf number	4 or 5	3 or 4(5)	7–9	(4)5 or 6	4 or 5	4 or 5	5 or 6	3	6 or 7
Leaf width (mm)	(2–)6–14(–19)	1.6–3.0	14–28	8–15	5–12	(3–)5–10	25–35	6–8	1.5–4.0(–6.5)
Perianth colour	white to pink	pink	pinkish purple	pale mauve-pink	pinkish cream-coloured to greenish	cream-coloured to pale yellow	cream-coloured to pale greenish	creamy pink to pale salmon	creamy pink or salmon
Tube length (mm)	(15–)25–38(–45)	30–35	30–40	(25–)34–40	52–75	(45–)60–110	45–50	50–70	(30–)40–55
Dorsal tepal length (mm)	28–40(–50)	26–30	40–55	30–35	40–50	32–40	28–32	± 23	30–40
Tube:dorsal tepal	≤	≥	<	≥	>	>	>	>	>
Tepal shape	lanceolate	lanceolate	lanceolate	lanceolate	attenuate	lanceolate	lanceolate	lanceolate	lanceolate
Distribution	NW, SW, LB, SE	SW	SE	KM	NW, SW	NW, SW	NW	LB	KM
Flowering time	Oct.–Nov. (Dec.)	Oct.–Dec.	Nov.–Dec.	Nov.–Dec.	Nov.–Dec.	Oct.–Nov.	Dec.–Jan.	Mar.–Apr.	Feb.

TYPE.—Northern Cape, 3320 (Sutherland): Klein Roggeveld, Komsberg Pass, along seasonal stream in damp gully, in shaly gravel, (–DA), 8 September 2006, *Goldblatt & Porter 12804* (NBG, holo.; K, MO, PRE, iso.).

Plants 150–500 mm high. *Corm* conical, 25 × 15 mm; outer corm tunics brown and papery, decaying below into fine to medium-textured fibres. *Stem* suberect, or inclined, flexed outward above sheath of third leaf, simple or with one or occasionally two branches. *Cataphylls* pale and membranous, uppermost reaching shortly above ground and then dull purple. *Leaves* usually 4, more if plants branched, lower 3 with expanded blades, lower 2 longest and reaching at least to base of spike or shortly exceeding it; blades linear, ± 2 mm wide, firm-textured, slightly twisted, midrib moderately thickened, margins evidently not thickened; cauline leaf or leaves short and largely sheathing. *Spike* inclined ± flexuose, 2–5-flowered; bracts grey-green, sometimes flushed purplish above, often dry and pale near apices, outer 20–25 mm long, inner two thirds to almost as long as outer, acute, not forked at tip. *Flowers* yellow, dorsal and upper laterals flushed and veined grey-purple outside, lower laterals deep yellow in proximal half and turning dull purple on fading, sweetly violet-scented; perianth tube subcylindric, slightly wider near apex, ± 12 mm long; tepals unequal, all narrowed below into claws, lanceolate, dorsal largest, ± 25 × 10 mm, arched and hooded over stamens, tip curving upward, upper laterals erect, distal halves arching over dorsal tepal, adaxial margins often touching one another, ± 25 × 7 mm, windowed between lower halves of dorsal and upper lateral tepals, lower 3 tepals joined to upper laterals for ± 2 mm and to each other for ± 3 mm, lower laterals with erect claws ± 1.5 mm long, limbs horizontal, ± 12 × 4 mm, expanded distally, margins of proximal half involute to form tube extending backward as auricles, lower median ± 15 × 8 mm long, arching downward in distal third. *Filaments* unilateral and contiguous, arched under dorsal tepal, ± 15 mm long, exerted 10 mm from tube; anthers ± 8 mm long, parallel and contiguous, light purple; pollen whitish. *Ovary* oblong, ± 5 mm long; style arching over stamens, dividing opposite upper third of anthers, branches ± 2.5 mm long, not or barely exceeding anthers. *Capsules* obovoid and rounded apically or ellipsoid, 15–20 mm long. *Seeds* ovate, 5–7 × 4–5 mm, broadly winged, translucent golden brown, with dark seed body ± 2 mm diam. *Flowering time*: mid-August to mid-September. Figure 3.

Distribution and ecology: *Gladiolus karoovicus* is restricted to the Klein Roggeveld and nearby foothills of the Witteberg (Figure 2). The type collection was made in the Komsberg, the scarp separating the high Roggeveld from the Klein Roggeveld but the species has also been recorded from the northern foothills of the Witteberg at Memorial, west of Matjiesfontein, and from near Prince Albert and the foot of the Great Swartberg. It is mostly encountered in damp gullies and along seasonal streams in gravelly, decomposed shale and tillite, among grass clumps and low shrubs. *G. karoovicus* occurs sympatrically with the common and widespread *G. venustus*, also section *Hebea*, which favours drier, more exposed sites. The bright yellow flowers, moderately long peri-

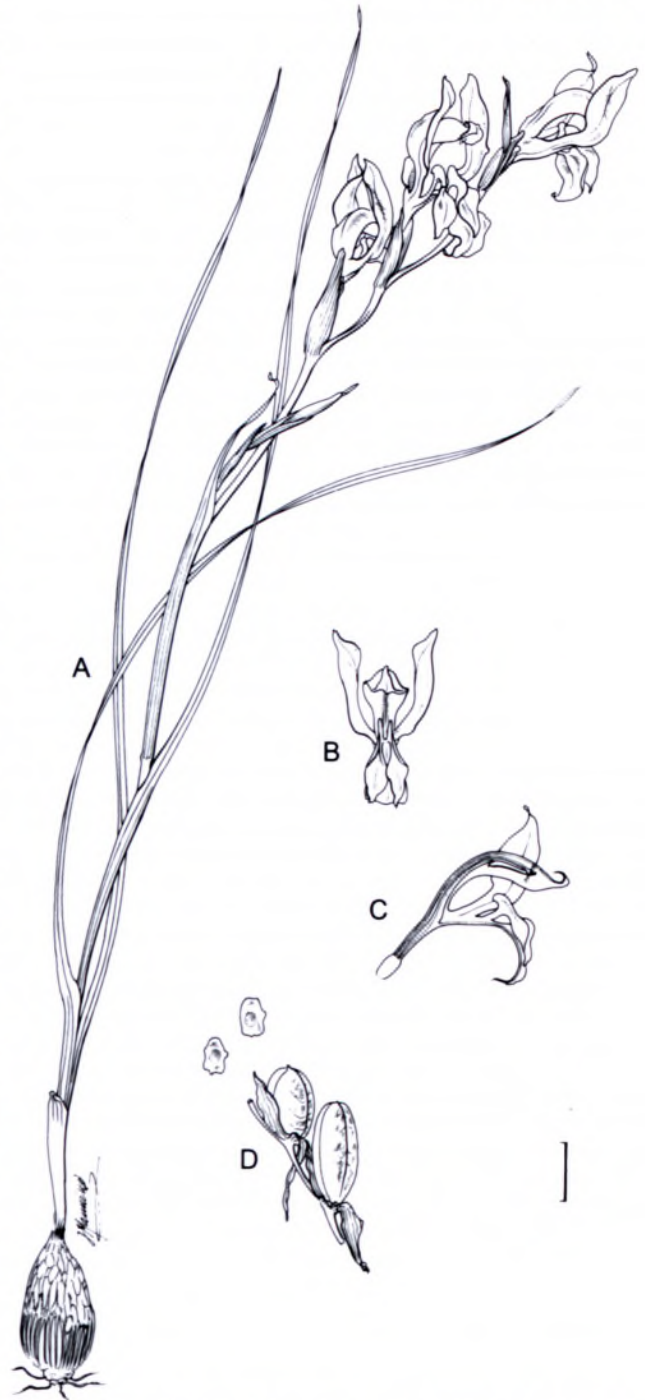


FIGURE 3.—*Gladiolus karoovicus*, *Goldblatt & Porter 12804* (NBG). A, flowering plant; B, flower front view; C, half flower; D, capsules and seed. Scale bar: 10 mm. Artist: John Manning.

anth tube, and sweet floral scent suggest that the species is pollinated by long-tongued bees.

In a remarkable coincidence, *Gladiolus karoovicus* was independently discovered by three different parties in the spring of 2006. This was a year of unusually good rains for the western Karoo and it is likely that this attracted botanical collectors to the region as well as encouraging good flowering in the species.

Diagnosis and relationships: *Gladiolus karoovicus* has the unusually narrow, linear leaves without thickened margins, clawed tepals, and distinctive dark seed body characteristic of section *Hebea* (Goldblatt & Manning 1998) and there is no doubt that it should be placed here.

Within section *Hebea*, the soft-textured corm tunics and ellipsoid capsules closely resemble those of members of series *Permeabilis* and on this basis we conclude that *G. karoocicus* is probably immediately allied to the small group of species that includes *G. permeabilis*, *G. stellatus* and *G. wilsonii*, comprising the members of the alliance that occur in the winter rainfall zone of southern Africa. *G. karoocicus* is distinctive in series *Permeabilis* on account of its bright yellow flowers with geniculate lower tepals that are involute and tubular in the basal half of the blades, with conspicuous auricles above the claw. In *G. permeabilis* and *G. wilsonii* the lower tepals are \pm recurved and although slightly canaliculate, they are evenly narrowed towards the claw and not at all auriculate. In addition, the flower colour is generally dull brownish or lilac, or white. *G. stellatus* has very distinctive, stellate, actinomorphic flowers.

The curiously constructed flowers of *G. karoocicus* are remarkably similar to those of *G. venustus* (series *Deserticola*, also section *Hebea*) in their sharply flexed, auriculate lower tepals but the members of this species group share derived woody, clawed corm tunics, a scalloped flower spike, and distinctive, squat, barrel-shaped, apically retuse capsules. In addition, the seed body in series *Deserticola* is brown and not black. The floral similarities between *G. karoocicus* and *G. venustus* are thus evidently the result of convergence, possibly the result of pollinator-driven selection. When not in fruit, the two species are separated by the differences in their corm tunics, which are soft in *G. karoocicus* and woody in *G. venustus*, and by differences in the orientation of the upper lateral tepals. In *G. venustus* the upper laterals are suberect from the base and not significantly fused to the lower tepals, whereas in *G. karoocicus* the upper laterals are fused to the lower tepals for \pm 2 mm and thus horizontal in this basal portion, but abruptly suberect in the distal, free portion, resulting in the presence of the characteristic window between the upper lateral tepals and the lower tepals.

Etymology: *karoocicus*, from the karoo, the semi-arid and arid interior part of South Africa.

Other material seen

WESTERN CAPE.—3320 (Montagu): Matjiesfontein, Memorial Siding, among monuments, (–AB), 1 September 2006, J.C. McMaster s.n. (NBG, photo.), 1 November 2006 (fruit), Manning 3171 (NBG); Komsberg Pass, approximately halfway up pass, (–DB), 22 September 2007, V.R. Clark & C. Kelly 102 (GRA, NBG), 3322 (Oudtshoorn); Prince Albert, hill ENE of village on road to Platberg, (–AA), 31 August 2006, J.P. Roux s.n. (NBG, photo.).

***Gladiolus reginae* Goldblatt & J.C. Manning, sp. nov.** (section *Ophioylza*)

Plantae 0.4–1.5 m altae, cormo subglobozo \pm 20 mm diam., tunicis papyraceis vel aetate aliquantum fibrosis, foliis 8 vel 9 inferioribus 6 vel 7 basalibus grandioribus laminis anguste ensiformibus (3–)5–10 mm latis, caule simplici vel 1-ramoso, spica erecta 7- ad 16-flora disticha floribus suboppositis vel oppositis, bracteis mollibus pallide viridibus siccantibus pallide stramineis post anthesin bractea, externa (20–)22–32 mm longa interna ad apicem minute furcata marginibus connatis in dimidio inferiore, floribus pallide carneis, tepalis inferioribus tribus lateraliter atrorubro-suffusis in tertia parte basali, in

dimidio basali striatis, inodoris, tubo perianthii obliquiter infundibuliformi 33–35 mm longo, tepalis inaequalibus superioribus tribus grandioribus ad basem erectis recurvatis distaliter lanceolato-attenuatis marginibus leviter undulatis, tepalo dorsali 33 \times 11–12 mm, superioribus lateralibus 32–34 \times 10–12 mm, inferioribus tribus per 1 mm connatis 29–30 \times 9–10 mm, filamentis 17 mm longis ex tubo 7 mm exsertis, antheris 8–9 mm longis purpureis, stylo arcuato ramis 4 mm longis.

TYPE.—Mpumalanga, 2430 (Pilgrim's Rest): Kennedy's Vale, Two Rivers Mine, hills west of bridge over Klein Dwarsrivier, (–CC), 26 March 2008, Manning & Valente 3156 (NBG, holo.; K, MO, NBG, PRE, iso.).

Plants 0.4–1.5 m. Corm subglobose, \pm 20 mm diam.; outer tunics papery, becoming irregularly broken and somewhat fibrous with age. Stem erect or inclined outward above basal leaves, unbranched or occasionally with a branch from axil of uppermost stem leaf, 2–3 mm diam. below spike. Cataphylls brownish above ground. Leaves 8 or 9, lower 6 or 7 basal and largest, reaching to base of spike or above; blades narrowly sword-shaped, (3–)5–10 mm wide, relatively soft-textured with midrib raised but other veins and margins not thickened, slightly twisted in distal half, remaining 2 or 3 leaves cauline and smaller, uppermost largely or entirely sheathing, margins open to base. Spike erect, 7–16-flowered, flowers in two ranks, subopposite and 60–90° apart, or opposite; bracts soft-textured, pale green becoming pale straw-coloured and dry shortly after anthesis, outer (20–)22–32 mm long, inner slightly shorter or \pm as long, minutely forked apically, margins fused in basal half and thus tubular below. Flowers pale flesh-pink, tepal sutures and tube flushed deeper salmon, lower three tepals flushed deep red laterally in basal third, basal half streaked with three main and two minor longitudinal lines, upper three tepals flushed deep red at base and filaments deep red in basal third, unscented; perianth tube obliquely funnel-shaped, slightly arched distally, 33–35 mm long, basal cylindrical portion 25–27 mm long; tepals unequal, upper three larger, erect below, recurved in distal half, lanceolate-attenuate, margins slightly undulate, dorsal tepal horizontal in basal half and deeply concave, 33 \times 11–12 mm, upper laterals 32–34 \times 10–12 mm, lower three tepals joined for an additional 1 mm, lower laterals shortest, 28–29 \times 9–10 mm, lower medial 30 \times 9–10 mm. Filaments 17 mm long, exserted 7 mm from tube; anthers 8–9 mm long, purple; pollen cream-coloured. Ovary ovoid, \pm 6 mm long; style arching beneath dorsal tepal, dividing at or beyond anther tips, branches 4 mm long. Capsule obovoid, 30 \times 12 mm, 3-lobed and retuse apically. Seeds oval to oblong, 8–10 \times 4–6 mm, \pm evenly winged or wing not developed on one side, rich brown, seed body relatively large, \pm 3 mm diam. Flowering time: mid-March to mid-April. Figure 4.

Distribution and ecology: *Gladiolus reginae* is currently known only from two populations along the lower slopes of the Dwarsrivier Mountains (Figure 5), one on the Two Rivers Platinum Mine concession and the second on Steelpoort Park, some 5 km to the west. Plants grow in open woodland, partially shaded by shrubs and trees, and are largely restricted to rocky outcrops, where the corms are wedged in pockets of humus between the



FIGURE 4.—*Gladiolus reginae*, Manning & Valente 3156 (NBG). A, corm and flowering stem; B, inner bract; C, half flower; D, capsule and seeds. Scale bar: 10 mm. Artist: John Manning.

rocks. Geologically the substrate has been identified as the igneous rock gabbro-norite (G. Deall pers. comm.), which contains slightly higher concentrations of heavy metals than granite, thus weathering into heavy metal-enriched soils (Van Wyk & Smith 2001). *G. reginae* may thus be considered another of the several edaphic endemic species of *Gladiolus* that have been identified in Iridaceae (Goldblatt & Manning 1996, 1998).

The Dwarsrivier is a tributary of the Steelpoort River, which bisects the Sekhukhuneland Centre of Floristic Endemism identified by Van Wyk & Smith (2001). This mountainous region is relatively poorly known botanically but its rocks hold large reserves of chrome and platinum-group metals, and the area supports a rich flora of local edaphic endemics. *Gladiolus reginae* is one of two

Gladiolus species endemic to the Sekhukhuneland Centre. The first to be described, *G. sekukuniensis* P.J.D. Winter, is restricted to alkaline calcretes (Manning *et al.* 1999). Although over 100 species of plants are estimated to be endemic or near-endemic to the Sekhukhuneland Centre (Van Wyk & Smith 2001), the endemic Iridaceae thus far known include just these two species of *Gladiolus*. As far as is known, *Gladiolus* is the only genus of Iridaceae in which species have evolved that are tolerant of heavy metals (Goldblatt & Manning 1996, 1998).

The long-tubed, unscented, pale pink flowers of *Gladiolus reginae* are evidently adapted to pollination by long-proboscid flies, and its co-occurrence with the labiate shrub *Orthosiphon tubiformis*, which is pollinated by *Stenobasipteron wiedmannii* (Nemestrinidae) (Goldblatt

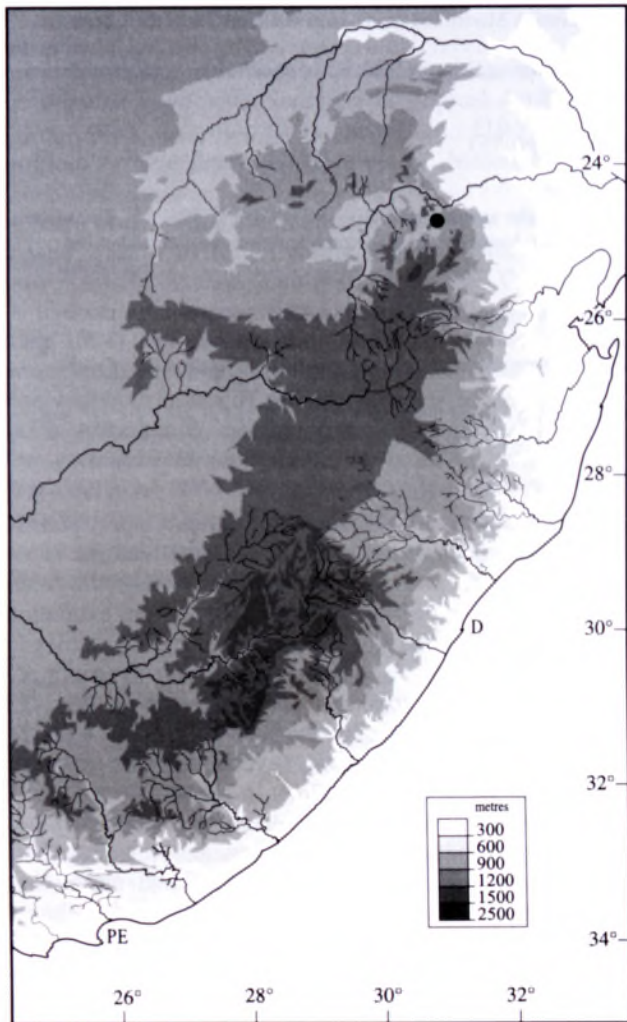


FIGURE 5.—Known distribution of *Gladiolus reginae*, ●.

& Manning 1999) makes it all but certain that *G. reginae* is a member of this pollination guild. Intriguingly, the species exudes minute droplets of dilute photosynthate from the tips of the inner and outer bracts. These attract numerous ants, which crawl over the inflorescence axis among the flowers. We noted a similar strategy in *G. pole-evansii* J.Verd. (Goldblatt & Manning 1998) and speculated that ants may play a defensive role in deterring predators. This phenomenon had not been noted in any other species of *Gladiolus*.

The species was brought to our attention by Graham Deall, who encountered a population near Steelpoort dur-

ing a botanical survey of the area in February 2006. In the same season a second population was photographed in the nearby Twin Rivers Platinum Mine concession by geologist Louise Fouche. A visit to the Steelpoort locality in February 2007 after a very dry summer was unsuccessful and the corms had evidently failed to sprout. Good flowering plants were, however, found on a second visit to the Twin Rivers Platinum Mine site in March 2008, following good summer rains. Although plants appear to be locally common where they occur, the extent of the species distribution is evidently very limited, making it vulnerable to increased transformation of the habitat.

Diagnosis and relationships: despite the lack of pubescence on the stems or leaves, numerous features point to a relationship with members of series *Scabridus*. These include the tall stature of the plants and their narrow, relatively soft-textured leaves without visibly thickened margins, papery outer corm tunics, ± erect spike with 2-ranked, moderately sized, pink flowers, thin-textured, pale bracts, and large, obovoid capsules. Its habitat, in hot, dry savanna, is also consistent with this relationship. Within the series, *Gladiolus reginae* is florally most similar to *G. scabridus* M.P.de Vos from northern KwaZulu-Natal but the glabrous stem and leaves, and the pale salmon or flesh-pink flowers with a deep red centre, including the base of the filaments, points to a closer relationship with *G. pavonia* Goldblatt & J.C.Manning from northeastern Mpumalanga. *G. reginae* differs from *G. pavonia* in lacking the characteristic stolons of the latter species, in its longer floral tube, 33–35 mm vs. ± 16 mm, and in its attenuate rather than acute tepals.

In general appearance, particularly the long-tubed pink flowers with tubular inner bracts, *Gladiolus reginae* resembles *G. dolomiticus* Oberm., another savanna species from northern South Africa. This dolomite endemic, however, is covered with a velvety pubescence on leaves and stem, the leaf blades are distinctly fibrotic, have thickened margins, the flowers have a shorter tube, 18–27 mm long, and the lower tepals are marked with a median pale blotch rather than with red streaks.

Etymology: Latin *reginae*, queen, after the legendary Queen of Sheba (Saba), who controlled rich gold mines in eastern Africa, in a reference to both the type locality of the species on the site of a platinum mine and to the beauty of its flowers.

Other material seen

MPUMALANGA.—2430 (Pilgrim’s Rest): Steelpoort Park, (–CC), March 2006 (photo.), April 2006 (fruit), *G. Deall s.n.* (NBG).

IDENTIFICATION KEYS

The following replacement couplets are provided for insertion in the relevant keys to the species published in *Gladiolus in southern Africa* (Goldblatt & Manning 1998).

Key to section *Blandus* (page 52)

- 13. Perianth tube longer than the dorsal sepal, (30–)40–100 mm long
- 14. Tepals attenuate and strongly undulate; lower tepals slightly shorter than the upper *G. undulatus*
- 14'. Tepals obtuse to acute, not attenuate and weakly undulate; lower tepals usually about two-thirds as long as the upper
- 15. Leaves four or five; flowers cream to yellowish with prominent spear-shaped markings in red on the lower tepals; flowering October to November; West coast mountains and flats *G. angustus*
- 15'. Leaves three to seven; flowers salmon with red linear markings on the lower tepals; flowering February to April; southern Cape and Little Karoo

- 15a. Leaves three, the blades 6–8 mm wide; perianth tube 50–70 mm long; flowering March and April, southern foothills of the Langeberg *G. bilineatus*
 15a'. Leaves six or seven, the blades 1.5–6.5 mm wide; perianth tube 30–55 mm long; flowering February, Little Karoo mountains. *G. dolichosiphon*
 13'. Perianth tube shorter than to ± as long as the dorsal tepal, (15–)20–50 mm long

Key to section *Hebea* (page 55)

- 29'. Perianth tube 9–15 mm long; dorsal tepal 16–33 mm long
 29a. Flowers bright yellow; lower lateral tepals with lower half of blade involute-tubular and auriculate *G. karooicus*
 29a'. Flowers whitish to dull grey, purple or brownish yellow; lower lateral tepals with lower half of blade canaliculated and clawed but not auriculate *G. permeabilis*

Key to sections *Densiflorus* and *Ophiolyza* (page 50)

- 60'. Leaves narrow and usually exceeding the spikes, in a lax fan usually arising some distance above the ground; leaf blades always with a prominent midrib and sometimes secondary veins also developed
 60a. Plants glabrous; perianth tube 33–35 mm long; lower tepals streaked with red and base of filaments flushed dull red *G. reginae*
 60a'. Plants glabrous or pubescent; perianth tube 10–27 mm long; lower tepals not streaked and filaments concolorous 7

CLASSIFICATION

The discovery of *Gladiolus reginae*, a member of series *Scabridus* (see above), highlights several morphological inconsistencies in the current placement of the series in section *Densiflorus* Goldblatt & J.C.Manning. These are examined in detail here.

The current classification of *Gladiolus* in southern Africa recognizes seven sections, diagnosed principally by the shape, number and insertion of the leaves on the stem, the shape and number of the flowers, and the size of the capsules (Goldblatt & Manning 1998). Sections *Densiflorus* and *Ophiolyza* (Klatt) Goldblatt & J.C.Manning are characterized by the possession of several basally inserted, lanceolate leaves arranged in a fan, and flowers without distinct spade- or lozenge-shaped markings on the lower tepals. Both are predominantly or entirely restricted to the summer rainfall region. Section *Densiflorus* is recognized by its many-flowered, subsecund spike and small capsules, less than 10 mm long, and section *Ophiolyza* by its generally large stature and especially by flowers with sharply recurved lower tepals.

There is little doubt that *Gladiolus reginae* is correctly placed in series *Scabridus*, despite the lack of the pubescence on leaves and/or stem that characterizes many members of the series. The large stature of the plants, their slender, soft-textured leaves without thickened margins, and the 2-ranked spike of moderately large, pink flowers with the lower tepals marked with red longitudinal lines are all characteristic of the series. Series *Scabridus* is currently included in section *Densiflorus* but its placement at the end of the section and just before section *Ophiolyza* indicates its somewhat intermediate character.

The possibility that the series is incorrectly placed in section *Densiflorus* is highlighted by the observation that *Gladiolus reginae* shares several highly distinctive features with *G. pole-evansii*, a member of section *Ophiolyza*. The most unusual of these is the fusion of the margins of the inner bracts in the basal portion such that they are tubular below. This characteristic was identified as diagnostic of series *Oppositiflorus* by Goldblatt & Manning (1989). Its occurrence in *G. reginae* must thus be interpreted either as a homoplasy, or as evidence for a closer alliance between the species (and by inference

the entire section *Scabridus*) and series *Oppositiflorus*. The shared occurrence of other unusual features in *G. reginae* and *G. pole-evansii*, however, makes the latter interpretation more likely. These include the exudation of droplets from the tips of the bracts and bracteoles (a character unknown elsewhere in the genus), the subopposite or opposite arrangement of the flowers in the spike (a second diagnostic characteristic of series *Oppositiflorus* and found also among several other members of series *Scabridus* but anomalous in section *Densiflorus*), the recurving lower tepals (diagnostic of section *Ophiolyza*) and the large, obovoid capsules (characteristic of most members of series *Scabridus* and anomalous in section *Densiflorus*). Coupled with this is the shared development of velvety pubescence in several members of both series *Scabridus* and *Oppositiflorus* and its otherwise total absence in section *Densiflorus*.

All the evidence thus indicates that series *Scabridus* is misplaced in section *Densiflorus* and is actually closely allied to series *Oppositiflorus* of section *Ophiolyza*. We accordingly move the series to that section. The exact relationship between series *Scabridus* and series *Oppositiflorus* is less easily determined, however, and we retain the two as separate pending further study. Until then it is least disruptive to merely transfer series *Scabridus* from the end of section *Densiflorus* to the beginning of section *Ophiolyza*, a move that will not require rearrangement of the sequence of species in the current classification (Table 2).

TABLE 2.—Summary of revised classification of *Gladiolus* in southern Africa

<i>Gladiolus</i> L.
Section <i>Densiflorus</i> Goldblatt & J.C.Manning [series not listed]
Section <i>Ophiolyza</i> (Klatt) Goldblatt & J.C.Manning
Series <i>Scabridus</i>
Series <i>Oppositiflorus</i>
Series <i>Ecklonii</i>
Series <i>Ophiolyza</i>
Section <i>Blandus</i> (Baker) Goldblatt [series not listed]
Section <i>Linearifolius</i> (M.P.de Vos) Goldblatt & J.C.Manning [series not listed]
Section <i>Heterocolon</i> O.Kuntze [series not listed]
Section <i>Hebea</i> (Pers.) Benth. & Hook. [series not listed]
Section <i>Homoglossum</i> (Salisb.) Goldblatt & J.C.Manning [series not listed]

NEW NAME

***Gladiolus sulcatus* Goldblatt**, nom. nov., pro *G. sulcatus* Goldblatt, *Gladiolus* in tropical Africa: 113 (1996), nom. illeg. non *G. sulcatus* Lam.: 119 (1791) [= *Babiana hirsuta* (Lam.) Goldblatt & J.C.Manning].

The name *Gladiolus sulcatus* Goldblatt (1996) is a later homonym for *G. sulcatus* Lam. (March 1791), now *Babiana hirsuta* (Lam.) Goldblatt & J.C.Manning (= *Babiana thunbergii* Ker Gawl.) (Goldblatt & Manning 2006). We rename the species *G. sulcatus*, thus preserving the reference in the specific epithet to the finely ribbed leaves of this rare species of central Tanzania. Although *G. sulcatus* Lam. is a superfluous name for *Antholyza hirsutus* Lam., it is nevertheless valid (McNeill *et al.* 2006 Art. 52.3). Possibly Lamarck (1791) provided the new epithet in *Gladiolus* because he was aware of the impending publication of *G. hirsutus* Jacq., dated imprecisely as 'late' 1791.

RANGE EXTENSION

Gladiolus rubellus Goldblatt, a member of section *Heterocolon*, is readily recognized by its small, scarlet flowers with bright yellow markings on the lower lateral tepals, hooded dorsal tepal, and linear leaves with thickened margins and midrib, the margins raised at right angles to the blade (Goldblatt 1993; Goldblatt & Manning 1998). It is currently known only from a small region of southeastern Botswana, between the towns of Lobatse and Molepolole. Plants grow in stony ground in dry savanna and flower in late summer and autumn, between January and March.

On a recent field trip to northern Namibia by staff of the South African National Biodiversity Institute, a species of *Gladiolus* was photographed in the Baynes Mountains in the northwest of the country that represents a species not before recorded for the country. It is evidently close to *G. rubellus*, although the flowers may differ slightly in the relative proportions of the lower tepals, possibly less intense red colouring of the perianth, and leaf margins that are thickened rather than raised at right angles to the blade surface. It is difficult to assess these characters more accurately from a single photograph but there is no doubt as to the importance of this record as just three species of *Gladiolus* are currently known from the summer rainfall part of Namibia, *G. dalenii* van Geel, *G. permeabilis* subsp. *edulis* (Burch. ex Ker Gawl.) Oberm. and *G. saccatus* (Klatt) Goldblatt & M.P.de Vos, all of them widespread in southern Africa. Pending the collection of additional material, we include the Baynes Mountain population in *G. rubellus*, thereby extending the range of the species some 1 300 km to the northwest and rendering it no longer endemic to Botswana.

Material examined

NAMIBIA.—1712 (Posto Velho): Cunene Region, Baynes Mountains, Omavanda Mountains, open savanna on gentle SE slope, (–BB), 25–30 April 2008, *G. Nicolson s.n.* (NBG, photo.).

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