TWO NEW SPECIES OF LIMOSELLEAE FROM WESTERN SOUTH AFRICA: *TRIEENIA OCCULTA* AND *ZALUZIANSKYA REGALIS*

The tribe Manuleeae Benth. is a common and characteristic element of the Cape flora, and has been comprehensively revised by Hilliard (1994). Since then the circumscription of the tribe has been substantially expanded to include both the tribe Selagineae Horan. (Kornhall *et al.* 2001) and the genus *Limosella* L. (Kornhall & Bremer 2004). The group, now known as tribe Limoselleae Dumort. and comprising ± 635 species in 29 genera, remains almost entirely southern African in distribution.

Here we describe a new species each of *Trieenia* and *Zaluzianskya* from recent collections in the Western and Northern Cape. We searched BOL, NBG and SAM (herbarium acronyms after Holmgren *et al.* 1990), the main herbaria with good representation of collections of Cape species, for additional records of the two new species, with little success. This is not surprising as these herbaria were all consulted by Hilliard for her revision of the group (Hilliard 1994). The single additional collection of *Z. regalis* that we located at NBG (*Oliver 9609*)

was at that time in the Stellenbosch Herbarium (STE), which amalgamated with NBG in 1996, and was not consulted by Hilliard.

1. *Trieenia* Hilliard is a small genus of nine species endemic to the mountains of the Cape Floristic Region (CFR). Seven of the known species are local endemics of the Cedarberg and adjacent Cold Bokkeveld Mountains, where they are often sympatric, with just two species found south of this: *T. longipedicellata* Hillard, endemic in the Du Toitskloof and Hottentots Holland Mountains; and *T. glutinosa* (Schltr.) Hilliard, which is widely distributed throughout the mountains of the southwestern and southern Cape as far east as the Kouga and Great Winterhoek Mountains. The genus is readily recognized by the bushy habit, broad, deeply toothed leaves, bracts usually adnate to the base of the pedicel only, and the small, trumpet-shaped, white or mauve flowers marked with an orange patch running from the base of the posterior (posticous) lip down the back of the tube (Hilliard 1994). All of the species are restricted to deeply shaded rock overhangs or caves at high altitude in sandstone. They are generally poorly represented in herbaria, leading Hilliard (1994) to observe that 'much more field work is needed before the distribution patterns are fully established and the total number of species known'.

Cape Town residents Ivor and Cora Jardine have spent several years carefully and thoroughly documenting the flora around their weekend cottage in the Swartruggens Mountains, a relatively poorly collected portion of the CFR on the arid eastern fringe of the Cold Bokkeveld. Their activities have already produced a new species of *Hesperantha* (Iridaceae) (Goldblatt & Manning 2007) and here we describe another of their collections, a new species of *Trieenia*, named for the uncharacteristically included anthers (Latin *occultus*, hidden). In all other species thus far known, at least the anterior (anticous) pair of stamens is exserted, although the posterior pair may be either exserted or shortly included (Hilliard 1994).

Trieenia occulta *J.C.Manning & Goldblatt*, sp. nov.

Herba perennis vel suffruticosa mollis base lignosa, caulibus foliosis sed scaposis infra racemos, densiter glanduloso-puberulis pilis patentibus 0.1–0.2 mm longis, foliis petiolatis ovatis 10–20(–30) × 5–15(–20) mm profunde laceratis vel grosse dentatis paribus 2–4(–6) dentorum munitis, glanduloso-puberulis, pilis patentibus 0.1–0.2 mm longis, floribus 3–7 subsecundis, pedicellis 3–7 mm longis, bracteis inferioribus ovatis vel subfoliaceis, superioribus linearo-lanceolatis 2–5 × 0.8–2.0(–5.0) mm, glanduloso-puberulis ad basem pedicellis adnatis, corolla alba lobis malvinis vel caeruleis vividis, floribus subroseis ubi siccis, tubo infundibuliformi 6–7 mm longo, lobis ovatis ad subrotundis ± 1.0–1.5 mm longis, staminibus 4 inclusis, anthera attingentibus 1.5–2.0 mm infra orem tubi, stylo incluso ± 4 mm longo, parum ultra antheras attingenti, in summo ± 1 mm stigmatico, capsulis ampulliformibus 4–5 × 2.0–2.5 mm.

TYPE.—Western Cape, 3219 (Wuppertal): Swartruggens, Farm Knolfontein, 60 km NE of Ceres, 1 252 m, deep overhang/cave in rock, (–DC), 3 December 2008, *I. & C. Jardine 1031* (NBG, holo.; MO, iso.).

Short-lived perennial herb or soft shrublet up to 450 mm high, well branched from woody base; stems decumbent or diffuse, up to 2 mm diam. at base; leafy but scapose below racemes, densely glandular-puberulous with patent hairs 0.1–0.2 mm long. *Leaves* opposite but uppermost alternate, petiolate; blade ovate, 10–20(–30) × 5–15(–20) mm, thin-textured and bright green, deeply lacerate or coarsely toothed, with 2–4(–6) pairs of teeth, occasionally 1 or more primary lobes with smaller secondary tooth (sometimes only on proximal margin), both surfaces glandular-puberulous with patent hairs 0.1–0.2 mm long, base tapering into petiole 4–10 mm long, shorter than blade. *Flowers* (1–)3–7, subsecund in very lax racemes terminating all branchlets, sometimes 1–few smaller secondary racemes developing to produce an open panicle; pedicels becoming shorter acropetally, 3–7 mm long; lowermost bracts ovate or almost leaflike with one pair of teeth but upper bracts linear-lanceolate, 2–5 × 0.8–2.0(–5.0) mm, glandular-puberulous as in leaves, adnate to base of pedicel only. *Calyx* obscurely bilabiate, tube 0.5–1.0 mm long, lobes lanceolate, 2.0–2.5 × 0.5–0.8 mm, enlarging in fruit, glandular-puberulous as in leaves, posterior lip split almost to base, anterior lip split ± halfway. *Corolla* white with mauve or bright blue lobes but whole flower drying pinkish; tube funnel-shaped, 6–7 mm long, cylindric in lower ± 4 mm and ± 1 mm diam., abruptly expanded above and ± 2 mm diam. at mouth, thinly glandular-puberulous outside, limb ± 3 mm diam., base of posterior lip thinly bearded with clavate hairs, sometimes extending around mouth of tube below all lobes, lobes ovate to subrotund, posterior lobes ± 1 × 1 mm, anterior lobe ± 1.5 × 1.5 mm. *Stamens* 4, inserted ± midway up tube, included, anthers reaching 1.5–2.0 mm below mouth of tube; filaments glabrous, 0.7–0.8 mm long, posterior filaments shortly decurrent; anthers ± 0.4 mm long. *Style* included, ± 3 mm long, reaching slightly beyond anthers; stigma ligulate with marginal papillae, ± 1 mm long. *Capsules* flask-shaped, 4–5 × 2.0–2.5 mm, thinly glandular-puberulous. *Seeds* up to 20 in each locule, ± 0.3 × 0.4 × 0.2 mm, irregularly wrinkled in longitudinal bands, pale watery yellow. *Flowering time*: December to January. Figures 25; 26.

Distribution and ecology: thus far known from several rock overhangs on the Farm Knolfontein in the Swartruggens Mountains northeast of Ceres (Figure 27). Plants grow in shallow sandy loam, their roots wedged in cracks in the rock, in deeply shaded situations under overhangs or shallow caves. They appear to be restricted to situations that are permanently shaded, favouring east-facing situations where they are sheltered from the afternoon sun. The plants are very brittle and exude a resinous smell when touched. They are browsed by hyraxes.

Diagnosis and relationships: *Trieenia occulta* is distinguished by its very lax racemes (sometimes developed into weak panicles) of funnel-shaped flowers, the tube 6–7 mm long, with both pairs of anthers included in the lower three-fourths of the tube. Most species of *Trieena* have densely racemose or capitate inflorescences, and the very lax racemes of *T. occulta* suggest a relationship with *T. frigida* Hilliard, a poorly known species from the Cold Bokkeveld, and *T. schlechteri* (Hiern.) Hilliard, from there and the Cedarberg. The flowers in both of these species, however, are very much smaller. The corolla tube in *T. schlechteri* measures only 2–3 mm

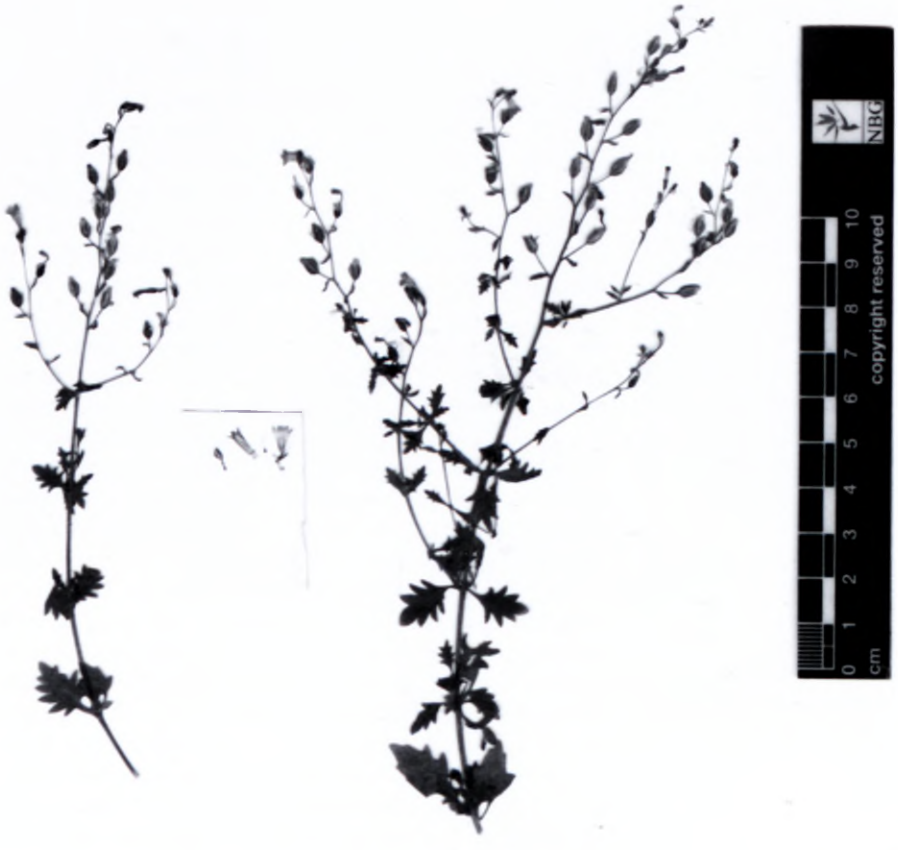

FIGURE 25.—*Trieenia occulta*, *I. & C. Jardine 1031* (NBG). Flowering stems showing racemose inflorescence.

long (therefore half the size of *T. occulta*), and both pairs of stamens are exserted; the tube in *T. frigida* is ± 4.5 mm long, the anterior pair of stamens is exserted, and the posterior pair is included, with the filaments decurrent almost to the base of the tube.

Of the two, *Trieenia occulta* is most likely to be confused with *T. frigida*, which also has the lower bracts ± leaf-like (always linear and less than 1 mm broad in *T. schlechteri*) but this species, although known only from a single, fruiting specimen collected at Elandskloof in the Cold Bokkeveld, is immediately distinguished by its glandular-pilose stems and leaves, with hairs up to 1.0–1.5 mm long (Hilliard 1994), and very much shorter pedicels, 0.75–2.0 mm long, with the bract adnate to both the pedicel and base of the calyx. In contrast, the stems and leaves in *T. occulta* are glandular-puberulous with very short hairs up to 0.2 mm long, and the pedicels measure 3–7 mm long. Pedicels of similar length are known only in the aptly named *T. longipedicellata* from the Du Toitskloof and Hottentots Holland Mountains but this species has very leafy racemes of smaller flowers with the tube 3–4 mm long.

We are unable to distinguish an orange patch below the posterior lip in *Trieenia occulta* (also not mentioned in the colour notes on the type collection), evidently characteristic of the genus (Hilliard 1994). This is seldom mentioned on the collecting labels of the other species that we have examined and is thus evidently easily overlooked or may actually be lacking in this species.

Other specimens seen

WESTERN CAPE.—3219 (Wuppertal): Swartruggens, Farm Knolfontein, 60 km NE of Ceres, 1 241 m, (–DC), 13 January 2008, *I. & C. Jardine 1067* (E, MO, NBG); 15 January 2008, *I. & C. Jardine 1079* (E, NBG).

2. *Zaluzianskya* F.W.Schmidt (including *Reyemia* Hilliard) (Archibald *et al.* 2005) is one of the larger genera in the tribe, comprising ± 60 species of mainly southern African annual and perennial herbs. It is distinguished by its spikes of long-tubed flowers with the corolla only slightly inflated at the apex, bracts adnate to the plicate, strongly ribbed calyx, filaments decurrent to the base of the tube to form a channel enclosing the style, and ± beaked capsule with pale beige or mauve seeds with colliculate testa. The genus is currently divided into four sections (Hilliard 1994), primarily on the basis of flower colour, shape of the corolla lobes, and on the time of anthesis. Section *Zaluzianskya* subsect. *Zalusianskya* is distinguished by its mainly diurnal flowers with moderately-sized calyx and mostly retuse or bifid corolla lobes, often coloured pink or mauve. It comprises 15 species of annual herbs distributed primarily across the drier western and central parts of South Africa.

One of the most distinctive species in subsection *Zaluzianskya* is *Z. violacea* Schltr., diagnosed by an unusual vestiture on the stems, comprising short, retrorse, eglandular hairs (often mixed with tiny patent glands), and by its relatively long corolla tubes, 10–25 mm long, covered with delicate, acute, eglandular hairs (Hilliard 1994). Populations of plants from dolerite-derived clay flats west of Calvinia with the retrorsely-haired stems of *Z. violacea* have larger, strikingly patterned flowers with unusually long perianth tubes, well outside the normal dimensions of the species. The colouring and dimensions of these larger-flowered plants are discordant with nearby populations of *Z. violacea* and, combined with the difference in ecology, suggest that they represent a distinct species that we describe here as *Z. regalis* for its showy, magenta flowers (Latin *regalis*, regal).

FIGURE 26.—*Trieenia occulta*, *I. & C. Jardine 1031* (NBG). A, leaves showing variation; B, calyx with narrow bract adnate to base of pedicel; C, corolla opened out, showing included stamens—two central lobes comprise posterior lip; D, ovary and style; E, capsule from lowermost flower with leaf-like bract. Scale bar: A, 20 mm; B–E, 10 mm. Artist: John Manning.

Zaluzianskya regalis *J.C.Manning & Goldblatt*, sp. nov.

Haec species quoad caulem pilis retrorsis eglandulosis cum glandulis parvis patentibus intermixtis vestitum et tubum corollae sat longum pilis mollibus acutis pubescentem ad *Z. violaceam* proxime accedit, sed ab ea tubo corollae longiore (35–40 mm contra 10–25 mm longo), limbo majore (15–18 mm contra 7–12 mm diam.), stylo 30–35 mm (contra 11–18 mm) longo et lobulis perianthii atrocarneis ad magenteis (contra malvinis vel flavis) differt.

TYPE.—3119 (Calvinia): ± 10 km southeast of Nieuwoudtville on Calvinia road, in damp dolerite, (–AC), 21 September 2001, *J. Manning 2642* (NBG, holo.; E, MO, iso.).

Annual herb, 70–100 mm high; primary stem erect, soon branching from base; branches ascending or decumbent, mostly simple, pubescent with retrose, acute hairs up to 0.3 mm long, mixed with minute, gland-tipped hairs, distantly leafy, mostly with only 1 pair above cotyledons. *Leaf* blade ovate, tapering below and petiolate, mostly

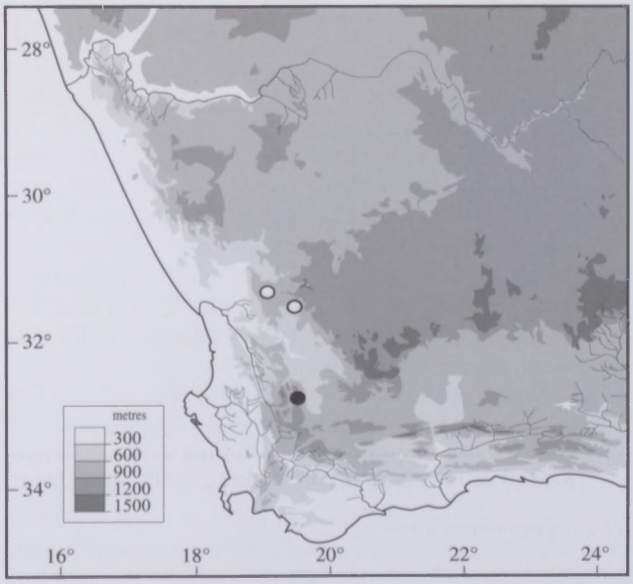

FIGURE 27.—Known distribution of *Trieenia occulta*, ●; *Zaluzianskya regalis*, ○.

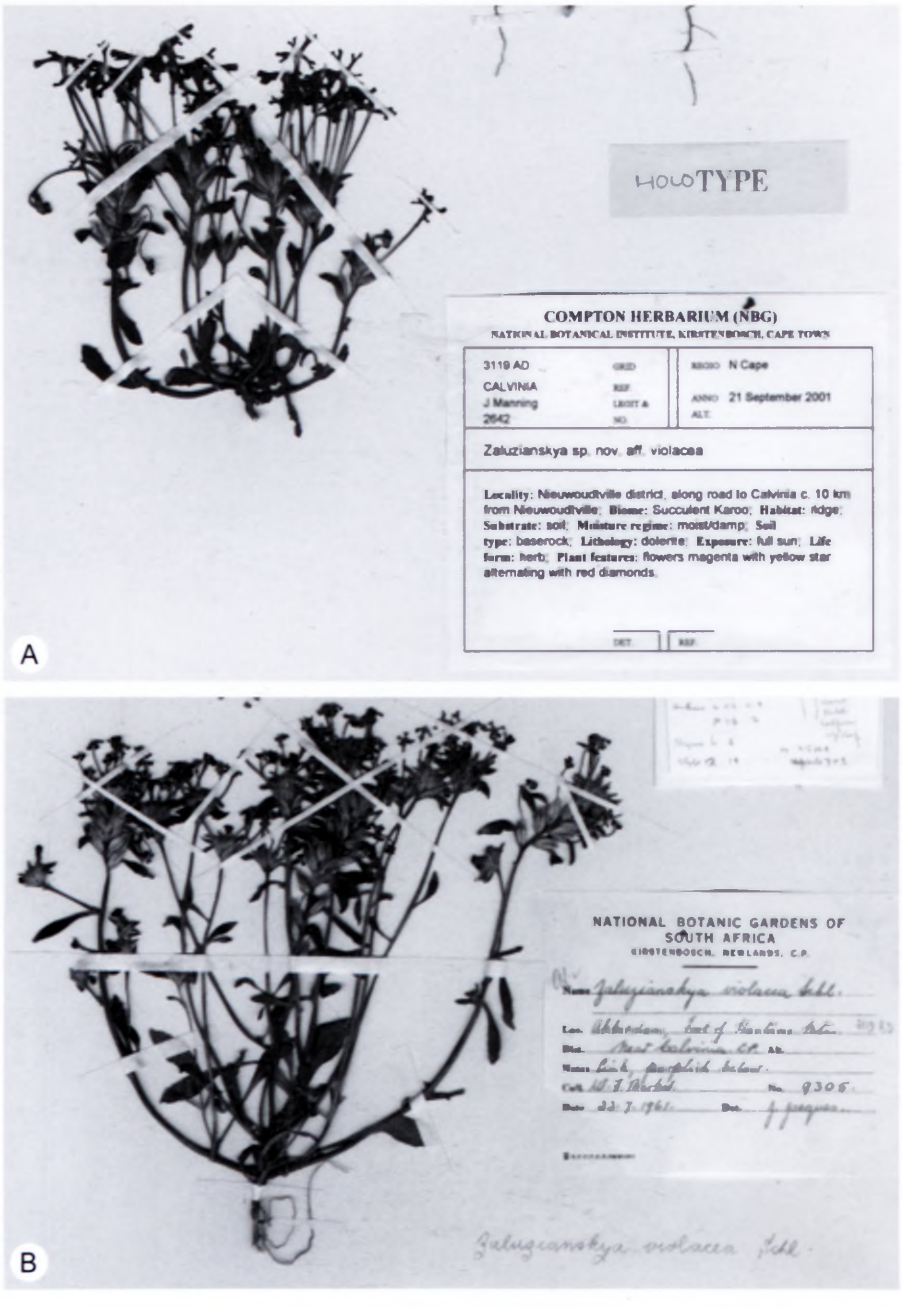

FIGURE 28.—A, *Zaluzianskya regalis, Manning 2642* (NBG); B, *Z. violacea, Barker 9305* (NBG).

10–15 × 5–8 mm, obscurely dentate, both surfaces shortly pubescent with acute hairs mixed with minute, gland-tipped hairs. *Flowers* 4–10, at first crowded in heads but elongating into short spikes in fruit, diurnal; bracts adnate to calyx for 4–5 mm, elliptic to ovate in distal part, contracted into broad, membranous shaft, lowermost 13–14 × 2–6 mm, shortly pubescent on both surfaces, more densely on proximal half, hairs patent or ± retrorse, sometimes longer on margins and then up to 1 mm long. *Calyx* 7–8 mm long, lobes 2–3 mm long, densely pubescent with delicate, acute hairs up to 0.8 mm long, mixed with minute, gland-tipped hairs. *Corolla* tube cylindrical, 35–40 mm long, densely pubescent with delicate, acute hairs mixed with minute gland-tipped hairs up to 0.8 mm long; limb 15–18 mm diam., actinomorphic, lobes Y-shaped, 6–8 × 5–7 mm, minutely glandular-haired posteriorly, deep pink to magenta with deep yellow star-shaped patch around mouth, rays extending shortly up sinuses and enclosing dark red diamond-shaped blotch extending halfway or almost entirely up shaft, mouth encircled by sparse, stiff, acute hairs. *Stamens* usually 4 or anterior pair aborted, posterior pair included, anthers ± 2 mm long, anterior pair exserted, anthers 0.1–0.2 mm long. *Ovary* ± 5 mm long, with small, rounded nectariferous gland, ± 0.4 mm long; style 30–35 mm long; stigma included, ± 4 mm long. *Capsules* 8–9 × 3–4 mm. *Seeds* obscurely angled, angles narrowly winged, ± 0.8 × 0.5 mm, pale yellow. *Flowering time:* late August to late September. Figures 28A; 29A; 30A.

Distribution and ecology: known so far from two populations west of Calvinia (Figure 27). Plants are locally common on seasonally damp clay flats derived from dolerite rock.

Diagnosis and relationships: arguably the most brilliantly flowered member of the genus, *Zaluzianskya regalis* is an annual herb with retrorsely-haired stems and relatively large, dark pink to deep magenta flowers marked in the mouth with a yellow star surrounded by conspicuous red diamonds. The perianth tube is 35–40 mm long and covered in long, soft, acute hairs mixed

FIGURE 29.—A, *Zaluzianskya regalis, Manning 2642* (NBG); B, *Z. violacea*. Photographer: John Manning.

with minute, gland-tipped hairs, and both pairs of stamens are usually developed.

The retrorse hairs on the stem of *Zaluzianskya regalis* are diagnostic of a small group of closely allied species in subsection *Zaluzianskya* centred on the Roggeveld and Hantam Plateau (Hilliard 1994). *Z. regalis* is distinguished in the alliance by having the largest and brightest flowers, with a corolla tube 30–40 mm long, limb 15–18 mm in diameter, and style 30–35 mm long. The dark pink or magenta limb is boldly marked with a star-shaped yellow patch around the mouth, the rays bifid and extending shortly up the sinuses to enclose a conspicuous dark red diamond- or spade-shaped patch that covers most of the shaft of each corolla lobe (Figure 30A). Both *Z. pilosissima* and *Z. violacea* have smaller, pink or pale mauve flowers with inconspicuous red flecks around the yellow eye (Figures 28B; 29B; 30B; Manning & Goldblatt 1997) (occasional pale yellow-flowered plants with a darker eye have also been recorded in *Z. violacea*). The corolla tube in both species is 10–25 mm long, the limb 7–12 mm in diameter, and the style 9–18 mm long.

Zaluzianskya pilosissima is distinguished from *Z. violacea* by its more densely pubescent bracts, and flowers in which only the posterior two stamens are developed (both pairs are usually present in *Z. violacea*). It is distributed across the Upper Karoo from Middelpos and Sutherland on the Roggeveld Escarpment eastwards to Carnarvon and Fraserburg, whereas *Z. violacea* ranges slightly to the north and west, from the Knersvlakte across the Hantam and Roggeveld Plateaus as far south as Middelpos.

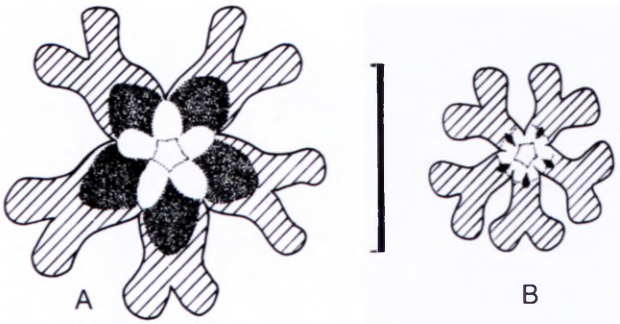

FIGURE 30.—Perianth patterning. A, *Zaluzianskya regalis*. B, *Z. violacea*. Scale bar: 10 mm. Artist: John Manning.

Zaluzianskya regalis appears to be restricted to seasonally moist, heavy clay soils derived from dolerite, in contrast to the lighter clays or loamy soils favoured by *Z. pilosissima* and *Z. violacea*. Similar edaphic segregation between sister species on doleritic clays and on Karoo shales has been documented in several other genera on the Hantam-Bokkeveld (Manning & Goldblatt 2004).

Other specimen seen

NORTHERN CAPE.—3119 (Calvinia): Klein Platberg to Wilgenbos, SW of town, (–DA), 31 August 1990, *E.G.H. Oliver 9609* (NBG).

ACKNOWLEDGEMENTS

Michelle Smith kindly prepared the electronic figures. Material was collected under permits from Northern Cape Nature Conservation and CapeNature.

REFERENCES

ARCHIBALD, J.K., MORT, M.E. & WOLFE, A.D. 2005. Phylogenetic relationships within *Zaluzianskya* (Scrophulariaceae *s.s.*, tribe *Manuleeae*): classification based on DNA sequences from multiple genomes and implications for character evolution and biogeography. *Systematic Botany* 30: 196–215.

GOLDBLATT, P. & MANNING, J.C. 2007. New species and notes on *Hesperantha* (Iridaceae) in southern Africa. *Bothalia* 37: 177–182.

HILLIARD, O.M. 1994. *The Manuleae, a tribe of Scrophulariaceae*. Edinburgh University Press, Edinburgh.

HOLMGREN, P.K., HOLMGREN, N.H. & BARNETT, L.C. 1990. *Index Herbariorum. Part 1: the herbaria of the world*. New York Botanical Garden, New York.

KORNHALL, P. & BREMER, B. 2004. New circumscription of the tribe Limoselleae (Scrophulariaceae) that includes the taxa of the tribe Manuleeae. *Botanical Journal of the Linnean Society* 146: 453–467.

KORNHALL, P., HEIDARI, N. & BREMER, B. 2001. Selagineae and Manuleeae, two tribes or one? Phylogenetic studies in the Scrophulariaceae. *Plant Systematics and Evolution* 228: 199–218.

MANNING, J.C. & GOLDBLATT, P. 1997. *Nieuwoudtville; Bokkeveld Plateau and Hantam*. Wild Flower Guide 9: 155. Botanical Society of South Africa, Cape Town.

MANNING, J.C. & GOLDBLATT, P. 2004. Two new species of *Romulea* (Iridaceae: Crocoideae) from the western Karoo, Northern Cape and notes on infrageneric classification and range extensions. *Bothalia* 34: 17–22.

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

* 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.
MS. received: 2009-06-05.