

# Eight new species of *Moraea* (Iridaceae) from southern Africa with range extensions and morphological notes in the genus

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## ABSTRACT

We describe eight new southern African species in the largely sub-Saharan African genus *Moraea* L., one from the winter-dry Great Karoo and the others from the winter-rainfall zone of the southwest of the subcontinent. *M. striata* Goldblatt & J.C.Manning (subg. *Visciramosae* Goldblatt) from the southern foothills of the Great Swartberg Mtns has khaki-green flowers with reflexed tepal limbs streaked with dark lines. The acaulescent *M. singularis* Goldblatt & J.C.Manning (subg. *Umbellatae* Goldblatt & J.C.Manning) with terete leaf blades is restricted to the dry, interior foothills of the Kamiesberg in Northern Cape. *M. filamentosa* Goldblatt & J.C.Manning, subg. *Acaules* (Baker) Goldblatt & J.C.Manning, is described from the dry interior of Namaqualand in Northern Cape. The species is closely allied to the widespread *M. falcifolia* Klatt. In subg. *Polyanthes* (Goldblatt) Goldblatt & J.C.Manning, we describe *M. thermanum* Goldblatt & J.C.Manning (sect. *Hexaglottis* (Vent.) Goldblatt) from southwestern Namibia, allied to *M. brevituba* (Goldblatt) Goldblatt, and *M. lazulina* Goldblatt & J.C.Manning (sect. *Pseudospicata* Goldblatt & J.C.Manning) from the Little Karoo, until now confused with *M. exiliflora* Goldblatt but differing in its larger flowers with strongly reflexed tepals. The new *M. petricola* Goldblatt & J.C.Manning (subg. *Viesuseuxia* (D.Delaroche) Goldblatt), is restricted to higher elevations of the Pakhuis Mtns of northern Western Cape. Lastly, in subg. *Homeria* (Vent.) Goldblatt & J.C.Manning, we recognize *M. doleritica* Goldblatt & J.C.Manning with pale yellow flowers and anthers exceeding the style branches, restricted to dolerite outcrops in the Great Karoo, and *M. eburnea* Goldblatt & J.C.Manning from the northern foothills of the Klein Swartberg, which has a single, basal leaf and pale yellow flowers with filaments free distally. *Moraea* now has 222 species, including 203 in southern Africa, of which 200 are endemic to the region. In addition to describing new species, the paper brings to light range extensions of a further eight species: *M. barnardii* L.Bolus, *M. elliotii* Baker, *M. exiliflora* Goldblatt, *M. falcifolia* Goldblatt & J.C.Manning, *M. fenestralis* (Goldblatt & E.G.H.Oliver) Goldblatt, *M. louisabolusiae* Goldblatt, *M. tulbaghensis* L.Bolus and *M. unguiculata* Ker Gawl. Each of the species falls into one of the subgenera mentioned for the new species except *M. fenestralis* which belongs in subg. *Galaxia*.

## INTRODUCTION

The African and Eurasian *Moraea* Mill. (Iridaceae: Iridoideae) is centred in the southern African winter rainfall region in the southwest of the subcontinent where the genus is both most diverse and most species rich (Goldblatt *et al.* 2002; Schnitzler *et al.* 2011). Of the 11 subgenera recognized in a revised classification of the genus (Goldblatt *et al.* 2013), all occur in the region and all but one of them are endemic or centred there. Patterns of speciation in the winter rainfall region, an area of diverse soils and varied, but often low, rainfall, has resulted in the evolution of many extremely local endemics, several known from just one or very few populations. It is not surprising, therefore, that most of the eight new species described here are narrow endemics, and that five of them were discovered only in the past five years in spite of many years of field exploration by the authors as well as others. Just one, *M. filamentosa* Goldblatt & J.C.Manning, first collected in 1958, has been known for some time but was until now referred to *M. falcifolia* Klatt. Including these novelties,

*Moraea* now comprises 222 species, all but two of them restricted to sub-Saharan Africa. The species described here are arranged following the new the classification of the genus by Goldblatt *et al.* (2013).

## NEW SPECIES

Subg. *Visciramosae* Goldblatt

Sect. *Multifolieae* Goldblatt & J.C.Manning

1. ***Moraea striata*** Goldblatt & J.C.Manning, sp. nov.

TYPE.—South Africa, Western Cape, 3322 (Oudtshoorn): foothills of the Great Swartberg, Rust-en-Vrede, road from entrance to waterfall, (–BD), 8 Oct. 2012, Goldblatt & Porter 13858 (NBG, holo.; MO, iso.).

Plants 450–600 mm high. *Corm* including tunics 20–25 mm diam.; tunics brown, sticky internally, accumulating as coarse matted fibres forming collar around base of stem. *Stem* 2–5-branched from upper nodes, sticky below nodes; branches short, arching outward above sheathing leaf, erect distally; sheathing leaves 30–40 mm long, acute-attenuate. *Foliage leaves* 3, all basal, linear, falcate, often trailing distally, channelled, V-shaped in cross section with pronounced keel, 4–5 mm wide when opened flat. *Rhipidial spathes* grey-green, becoming dry distally, acute-attenuate, inner 30–40 mm long, outer ± half as long. *Flowers* dull khaki, tepal limbs fully reflexed, with several longitudinal dark brown-grey lines along entire length, outer tepal limbs with pale yellow nectar guides at bases;

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outer tepals 25–30 × 10–11 mm, claws ± 7 mm long, with dark basal nectary; inner tepals 22–25 × ± 8 mm. *Stamens* with filaments ± 10 mm long, free but contiguous in lower 6 mm, diverging in distal 4 mm; anthers ± 4 mm long, buff-yellow, shortly exceeding stigmatic lobes; pollen orange-red. *Ovary* ± cylindric, 5–6 mm long; style branches ± 6 × 5 mm, crests erect, broadly wedge-shaped, 6–7 mm long, outer margins lightly serrated, with broad, entire petaloid stigmatic appendage ± 4 mm long. *Capsules* and *seeds* unknown. *Flowering time*: October, probably also November; flowers opening 14:00–15:00 and fading at sunset. Figure 1.

*Distribution*: evidently a local endemic of the Oudtshoorn section of the Great Swartberg (Figure 2), *Moraea striata* was recorded twice in 2012 on clay slopes at the southern foot of the range. There appear to be no earlier records of the species.

*Diagnosis*: the sticky stems, distinctive branching pattern and stigmatic appendage place *Moraea striata* in subg. *Visciramosa* where the unequal floral bracts and more than two foliage leaves correspond with sect. *Multifoliae*, one of the two sections of the subgenus. Flowers of *M. striata* are predominantly dull greyish green or dull khaki, the outer tepal limbs with pale yellow nectar guides at the base and finely streaked with dark grey longitudinal lines running almost the length of the limbs. The anthers are buff-yellow and the pollen bright orange. The tepal limbs of both whorls are fully reflexed and the filaments are contiguous in the lower half but free to the base, a feature also characteristic of subg. *Visciramosae*. A particularly unusual feature of *M. striata* is that the leaf blades are V-shaped in cross section with a sharply angled keel. Similar leaves are known in very few species of the genus, none of subg. *Visciramosae*, in which rounded keels are typical.

*Moraea striata* most closely resembles *M. bubalina* Goldblatt, a species of the western, winter rainfall Karoo, which also has three leaves but flowers with broad, diverging tepal claws forming a wide cup, the tepal limbs buff to brown and reflexed to about 45°. *M. bubalina* also has a short, acute stigmatic appendage up to 2 mm long, very different from the large, petaloid stigmatic appendage about 4 mm long in *M. striata*. Flowers of *M. striata* bear a superficial resemblance to those of *M. inconspicua* Goldblatt in their fully reflexed tepals but the flowers of that species are much smaller, the outer tepals 12–18 mm long (vs. 25–30 mm in *M. striata*), and it consistently has two foliage leaves and subequal, finely veined rhipidial spathes.

#### *Additional specimen*

WESTERN CAPE.—3321 (Ladismith): foothills of the Great Swartberg, road to Calizdorp W of turnoff to Swartberg Pass, (–DB), 8 Oct. 2012, Goldblatt & Porter 13855 (MO, NBG).

Subg. *Umbellatae* Goldblatt & J.C.Manning

2. *Moraea singularis* Goldblatt & J.C.Manning, sp. nov.

TYPE.—South Africa, Northern Cape, 3018 (Kamiesberg): Vaalputs, NECSA site, (–BA), Platbakies Succulent Karoo, 2 Aug. 2011, Van Rooyen 2827 (PRU, holo.).

Plants small, acaulescent 30–40 mm high. *Corm* spindle-shaped, ± 10 mm diam., tunics of grey-brown, wiry, reticulate fibres. *Stem* with 1–4 congested branches at ground level. *Leaves* 3, clustered at ground level, lowermost longest, inserted on stem at ground level, falcate, terete, 50–80 mm long, 0.8–1.0 mm diam., upper 2 leaves much shorter, recurved, bifacial, channelled or with short terete blade up to 20 mm long. *Rhipidial spathes* green, outer leaf-like, recurved distally, 25–30 mm long, inner ± as long. *Flowers* rotate, pale to golden yellow, limbs of all tepals with brown, spear- or lozenge-shaped nectar guide near base, tepal claws ascending, forming cup enclosing base of filament column, limbs spreading, inner usually twisted through 90° distally; tepals united for 2 mm, claws ± 1 mm long, limbs obovate-pandurate, truncate, outer ± 12 × 6 mm, inner slightly smaller. *Stamens* with filaments ± 5 mm long, connate in a smooth, cylindric column ± 4 mm long, free and diverging in upper 1 mm; anthers ± 3 mm long, yellow; pollen yellow. *Ovary* cylindric, ± 10 mm long, included; style branches divided almost to base into terete-involute arms diverging on either side of each anther, ± 1.5 mm long, stigmatic at apices, crests reduced, ± 1 mm long. *Capsules* and *seeds* unknown. *Flowering time*: late July to early August. Figure 3.

*Distribution and ecology*: known from two localities along the eastern foot of the Kamiesberg massif in central Namaqualand (Figure 2), *Moraea singularis* grows on gravel flats derived from granite bedrock. The species is too poorly known to assess its conservation status, but we provisionally suggest a listing of RARE. We see no threat to its continued existence in this remote and thinly populated area of minimal importance to farming activity. So inconspicuous is the species that it is easily overlooked unless in bloom. Plants flower for just a few days in any year and unusually early after the first rains of the season. We suspect the species has a wider range than is presently recorded.

*Diagnosis*: an acaulescent species, *Moraea singularis* is recognized by its underground stem and short, terete leaf blades. The yellow flowers, with both inner and outer tepals limbs bearing brown nectar guides, have tepal claws only ± 1 mm long forming a narrow cup including the base of the smooth filament column. The tepal limbs are obovate-pandurate, the inner three slightly smaller than the outer and twisted through 90°. The asymmetric corms with brown corm tunics accord best with subg. *Umbellatae* as do the outer rhipidial spathe, which sheaths the inner spathe only in the lower half and arches outward distally, and also the darkly veined tepals and brown nectar guides. Unique to the subgenus is the terete blade of the basal leaf, while the upper leaves are either channelled entirely or terete distally.

#### *Additional specimen*

NORTHERN CAPE.—3018 (Kamiesberg): NE of Kamieskroon, near Rooifontein, (–AB), 27 Aug. 2006, Gwynne-Evans s.n. (NBG, photo.).

Subg. *Acaules* (Baker) Goldblatt & J.C.Manning

3. *Moraea filamentosa* Goldblatt & J.C.Manning, sp. nov.



FIGURE 1.—*Moraea striata* (Goldblatt & Porter 13858). A, flowering plant; B, androecium and style. Scale bar: A, 10 mm; B, 2 mm. Artist: John Manning.

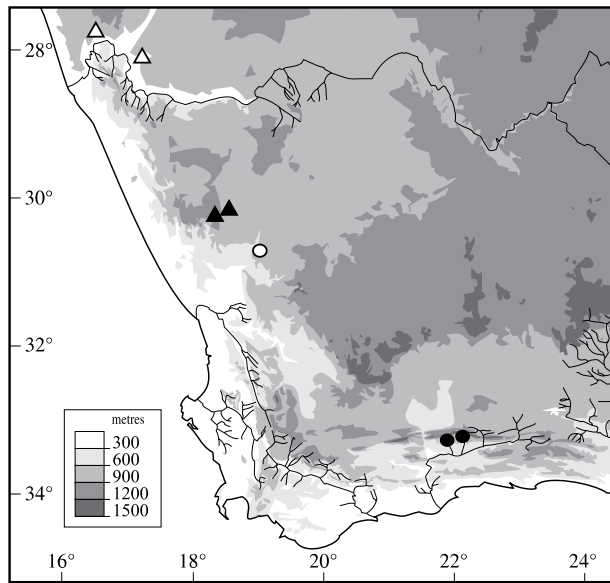


FIGURE 2.—Distribution of *Moraea filamentosa*, ○; *M. thermarum*, △; *M. singularis*, ▲; *M. striata*, ●.

TYPE.—South Africa, Northern Cape, 3019 (Loeriesfontein): 22 miles [ $\pm$  34 km] N of Loeriesfontein, (–DA), May 1958, *Hall 1385* (NBG, holo.).

Plants acaulescent,  $\pm$  20 mm high including flowers. *Corm*  $\pm$  12 mm diam.; tunics of medium-textured, shaggy fibres. *Stem* with congested branches at ground level. *Foliage leaves* several, blades falcate, channelled, up to 10 mm long, up to 1.2 mm wide when opened flat, with thickened, hyaline main vein on abaxial surface, apex obtuse, margins hyaline, ciliolate. *Rhipidial spathes*: outer not distinct from leaves, with broad, membranous sheaths, inner  $\pm$  membranous, floral bracts membranous, dry, elongate, often irregularly torn,  $\pm$  as long as leaves. *Flowers* possibly white, markings and orientation of tepals not known; outer tepals lanceolate,  $\pm$  14  $\times$  4 mm, claws  $\pm$  5 mm, limbs probably spreading, inner tepals  $\pm$  12  $\times$  2 mm, possibly erect. *Stamens* with filaments  $\pm$  4.5 mm long, united in lower half; anthers  $\pm$  2.5 mm long, evidently yellow. *Ovary* elongate, fertile part club-shaped,  $\pm$  5 mm long; style branches broad,  $\pm$  4 mm long, crests triangular,  $\pm$  4 mm long, erect. *Capsules* and *seeds* unknown. *Flowering time*: May.

*Distribution*: known only from a single collection from north of Loeriesfontein (Figure 2). The habitat is not known.

*Diagnosis*: *Moraea filamentosa* is a dwarf, acaulescent species reaching no more than 20 mm high including the flowers. Despite their small size, the leaves are distinctive, having broad, membranous sheaths and falcate, channelled blades with obtuse apices, ciliolate margins, and a thickened ridge in the midline of the abaxial surface. A remarkable feature not known in any other species of *Moraea* is that the floral bracts are elongate, membranous, and about as long as the leaves, thus visible as pale filamentous threads among the leaf blades. The flowers are small, with outer tepals  $\pm$  14 mm long, but otherwise typical of *Moraea*, with filaments united

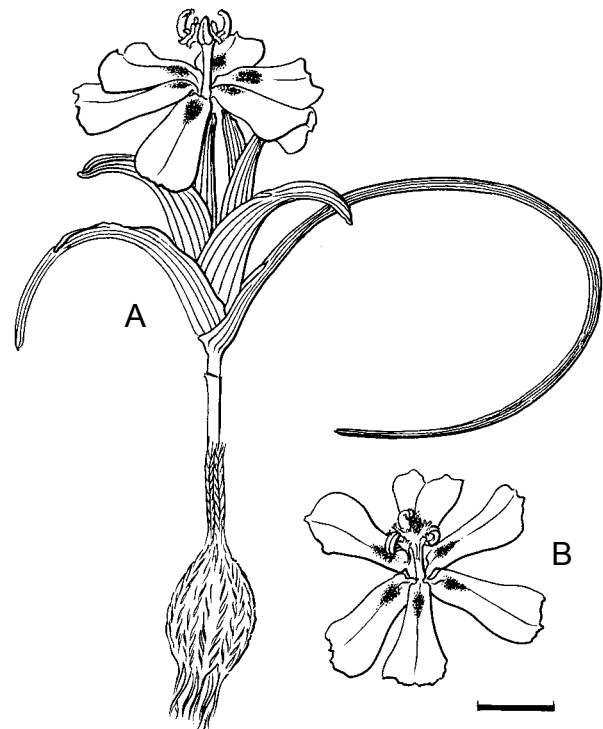


FIGURE 3.—*Moraea singularis* (Van Rooyen 2827 and Gwynne-Evans s.n.). A, flowering plant; B, flower. Scale bar: 10 mm. Artist: John Manning.

in the lower half, broad style branches, and prominent erect crests. The species appears to be most closely related to *M. falcifolia*, which has a broadly similar habit but is a larger plant with larger flowers, the outer tepals mostly 18–22 mm long, and long, tapering leaves up to 100 mm long with acute tips.

Although discovered in 1958, the species has remained unnamed until now. The hope that additional material would come to hand has not been fulfilled and we have decided to describe the species from the two plants that comprise the collection, hoping its formal naming will stimulate a search for more plants.

Subgen. *Polyanthes* (Goldblatt) Goldblatt & J.C.Manning

Sect. *Hexaglottis* (Vent.) Goldblatt

4. *Moraea thermarum* Goldblatt & J.C.Manning, sp. nov.

TYPE.—Namibia, 2817 (Violsdrif): Karas, Ai-Ais Hot Springs Game Park, along Orange River, (–AA), on cliff face, 13 Sept. 2012, *A. Burke 12035* (WIND, holo.).

Plants 30–100 mm high. *Corm* 10–15 mm diam.; tunics of dark brown to black fibres, extending upward as short stiff bristles. *Stem* simple or 1- or 2-branched; branches shortly stalked; sheathing leaves 1 or 2, 11–17 mm long. *Cataphylls* reddish brown. *Foliage leaves* 3 or 4, all  $\pm$  basal, trailing or pendant, 80–120  $\times$  1–3 mm, undulate and loosely twisted, margins crisped, with 1 conspicuous lateral vein per side. *Rhipidial spathes* green or becoming dry from tips, acute, inner 15–25 mm long, outer  $\pm$  half as long. *Flowers* fugaceous, yellow,

stellate, tepals connate into short cylindrical tube  $\pm 1.5$  mm long, limbs spreading, elliptic,  $\pm 15 \times 5$  mm, shortly clawed, claws 0.5–1.0 mm long. *Stamens* with filaments united only at base (seeming free),  $\pm 5$  mm long; anthers  $\pm 3$  mm long, straight and suberect before dehiscence, yellow. *Ovary* included in spathes, style arms paired, filiform, spreading, 4–5 mm long. *Capsules and seeds* unknown. *Flowering time*: mid-September to October. Figure 4.

*Distribution*: known from two collections fringing the Huib Hoch Plateau in southern Namibia, one from the summit of the Aurusberg and the other along the Orange River near Ai-Ais (Figure 2). Plants are confined

to shaded cliff faces, growing wedged in cracks in the rocks, recorded in one instance as granite.

*Diagnosis*: resembling *Moraea namaquana* (Goldblatt) Goldblatt in its trailing, undulate or crisped leaves and stalked lateral inflorescences, *M. thermanum* is distinguished by its narrower, linear leaves, 1–3 mm wide with a single lateral vein on each side and somewhat smaller flowers with a distinct perianth tube  $\pm 1.5$  mm long, the ovary included in the spathes. *M. namaquana*, which grows in open rocky ground, is a more robust species, with leaves 5–11 mm wide with 2 conspicuous lateral veins per side, and the tepals are free to the base.



FIGURE 4.—*Moraea thermanum* (Burke 12035 and Williamson & Hammer 4564). A, flowering plant; B, flower; C, androecium and style. Scale bar: A, B, 10 mm; C, 5 mm. Artist: John Manning.

*Additional specimen*

NAMIBIA.—**2716** (Witpütz): Karas, summit of Aurusberg, ± 1 000 m, (–CB), rock cracks in shade on southern aspect, 2 Nov. 1992, G. Williamson & S. Hammer 4564 (NBG).

Sect. *Pseudospicatae* Goldblatt & J.C.Manning

5. *Moraea lazulina* Goldblatt & J.C.Manning, sp. nov.

TYPE.—South Africa, Western Cape, 3322 (Oudtshoorn): Schoemanshoek, Kranskloof, eastern foot of rocky hill, in stony sandstone ground, (–AC), 8 Oct. 2012, Goldblatt & Porter 13859 (NBG, holo.; MO, PRE, iso.).

Plants 160–350 mm high. *Corm* ± conical, 12–18 mm at widest diam., with numerous small cormlets around base; tunics of medium-textured, matted, dark grey fibres. *Stem* flexuose, 1–5-branched, rarely simple. *Foliage leaf* solitary, linear, longer than stem, erect to falcate, narrowly channelled, 2–3 mm wide when opened flat. *Rhipidial spathes* with brown, attenuate tips, inner 33–45 mm long, outer ± half as long. *Flowers* fugaceous, blue, outer tepal limbs with white nectar guides sometimes edged with dark blue, limbs of both whorls reflexed >45°, inner often more so than outer, unscented; outer tepals ± lanceolate, 22–27 × 8–9 mm, limbs 15–18 mm long, claws 7–8 mm long, inner tepals 17–20 × 5–7 mm. *Stamens* with filaments 8 mm long, united in lower half; anthers ± 5 mm long, grey-blue; pollen white or pale blue. *Ovary* ± cylindrical, 5–6 mm long; style branches ± 7 × 5 mm, crests narrowly wedge-shaped, 7–8 mm long. *Capsules* and *seeds* unknown. *Flowering time*: mid-September to late October; flowers open ± 15:00 and collapse at dusk. Figure 5.

*Distribution*: relatively widespread in the Little Karoo, *Moraea lazulina* extends from near Barrydale (J.J. Vlok pers. comm.) and the Rooiberg south of Calitzdorp to De Rust, east of Oudtshoorn and Perdepoort in the upper Long Kloof (Figure 6). Plants occur in rocky sandstone ground and on limestone slopes near the Congo Caves on the lower southern slopes of the Great Swartberg.

*Diagnosis*: blue-flowered *Moraea lazulina* has until now usually been associated with a second Little Karoo species, *M. exiliflora* Goldblatt, which also has a solitary, narrowly channelled basal leaf, and sometimes even with multi-leaved *M. bipartita* L.Bolus. *M. lazulina* has significantly larger flowers than *M. exiliflora* and is typically a taller plant, usually with a moderately branched stem. The flowers are always blue with large, white nectar guides and outer tepals 22–27 × 8–9 mm, inner tepals 17–20 × 7 mm and filaments ± 8 mm long, whereas *M. exiliflora* has smaller, pale blue, mauve or white flowers with yellow (or white) nectar guides and outer tepals 14–17 × 4.5–6.0 mm, inner tepals 13–15 × 4.5–6.0 mm, and filaments ± 4.5 mm long. Other features of *M. lazulina* are likewise larger than in *M. exiliflora*. The form of the flowers also differs to some extent, the tepal limbs of *M. lazulina* being reflexed more than 45°, the inner sometimes more so than the outer. In contrast, the tepal limbs of *M. exiliflora* are laxly spreading to reflexed up to 30°.

*Additional specimens*

WESTERN CAPE.—**3321** (Ladismith): Oudshoorn–Calitzdorp road, 30.6 km E of Vanwyksdorp turnoff, (–DB), 16 Aug. 1985, Steiner 952 (NBG). **3322** (Oudtshoorn): limestone slopes near Congo Caves, (–AC), 8 Oct. 2012, Goldblatt & Porter 13862 (MO). Perdepoort, N of Camfer, sandstone slope burned last summer, (–CD), 28 Sept. 2004, Goldblatt & Porter 12574 (MO).

Subg. *Vieusseuxia*

6. *Moraea petricola* Goldblatt & J.C.Manning, sp. nov.

TYPE.—South Africa, Western Cape, 3220 (Wupperdal): Pakhuis peaks, ± 5 km NW of Kliphuis, Rheboksvlei Extension 185, 925 m, (–AA), 25 Oct. 2008, Helme 5726 (NBG, holo.).

Plants ± 30 mm high. *Corm* globose, ± 12–16 mm diam.; tunics of grey-brown, medium-textured, netted fibres, accumulating in fibrous collar around base of stem. *Stem* three internodes long above ground, unbranched, sheathing leaves with dry attenuate apices, 35–40 mm long. *Foliage leaf* solitary, basal, linear, narrowly channelled, 2/3 to ± as long as stem, ± 2 mm wide opened flat. *Rhipidial spathes* with dry, attenuate apices, inner ± 40 mm long, outer ± half as long. *Flowers* lasting 3 days, purple, outer tepal limbs with white, wedge-shaped nectar guides at bases, laxly spreading to weakly reflexed; outer tepals ± 20 mm long, claws 5–6 mm long, ascending; inner tepals ± 9 mm long, limbs spreading, ± 4 mm long, 3-lobed with long, tapering central cusp and short, rounded, obtuse lateral lobes, claws ± 5 mm long, ascending, tapering from narrow base to wide apex. *Stamens* with filaments ± 8 mm long, united in smooth cylindrical column in lower ± 3 mm, diverging distally; anthers ± 5 mm long, dark purple; pollen red. *Ovary* ± cylindrical, ± 8 mm long, exserted; style ± 5 mm long, branches ± 8 × 2 mm long, ascending, held above subtending limbs, crests narrowly wedge-shaped, ± 4 mm long. *Capsules* and *seeds* unknown. *Flowering time*: October to mid-November.

*Distribution*: as far as we know, *Moraea petricola* (Latin: “growing in rocky sites” and also recalling Kliphuis [Stone house] Peak nearby) is restricted to higher elevations in the mountains to the north of Pakhuis Pass in the northern Cedarberg (Figure 6). Known from just one collection, it almost certainly has a wider range than the present record indicates but is, nevertheless, a fairly local endemic. Available information makes it impossible to accurately assess its conservation status, although its range is presently in a pristine habitat, disturbed only by occasional fires. We provisionally suggest a status of RARE.

*Diagnosis*: collected just once in flower in 2008 and subsequently found in vegetative state in 2012, *Moraea petricola* is a typical member of subg. *Vieusseuxia* in its solitary basal leaf, 3-lobed inner tepals and, we infer, long-lived flowers. The purple flowers have narrow, white, wedge-shaped nectar guides edged with dark purple on the outer tepal limbs. The inner tepals have unusually broad, 3-lobed limbs with a prominent, linear, reflexed central cusp and rounded lateral lobes. The flowers in general recall *M. decipiens* Goldblatt & J.C.Manning, particularly in colour and shape, but

have much longer filaments,  $\pm 8$  mm long (vs. 3.5–4.0 mm in *M. decipiens*), a style  $\pm 5$  mm long (vs.  $\pm 2$  mm) and shorter tepal claws, 5–6 mm (vs. 8–9 mm). The relatively long style branches are held well above the subtending outer tepals limbs, whereas in *M. decipiens*

the style branches are appressed to the tepal claws and the inner tepals curve upward rather than having reflex limbs with the central cusp directed downward. Additional collections of this rare species are needed to confirm our current observations based on limited material.



FIGURE 5.—*Moraea lazulina* (Goldblatt & Porter 13859). A, flowering plant; B, androecium and style. Scale bar: A, 10 mm; B, 2 mm. Artist: John Manning.



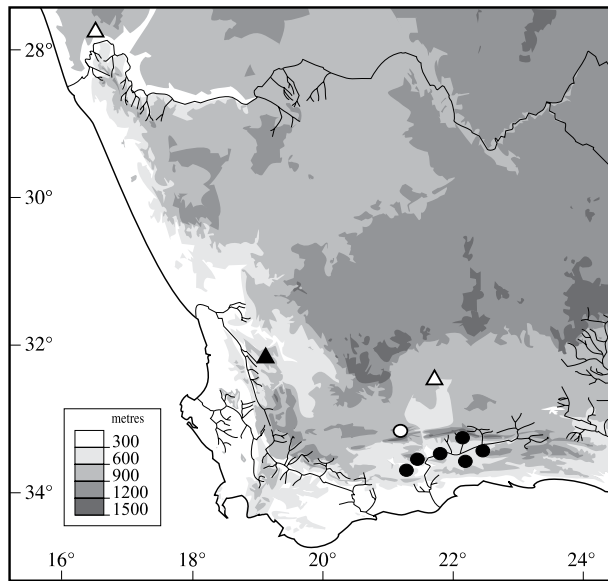


FIGURE 6.—Distribution of *Moraea doleritica*,  $\Delta$ ; *M. eburnea*,  $\circ$ ; *M. lazulina*,  $\bullet$ ; *M. petricola*,  $\blacktriangle$ .

Subg. *Homeria* (Vent.) Goldblatt & J.C.Manning

Sect. *Stipanthera* (Goldblatt) Goldblatt & J.C.Manning

7. *Moraea doleritica* Goldblatt & J.C.Manning, sp. nov.

TYPE.—South Africa, Western Cape, 3221 (Merweville): Great Karoo,  $\pm$  52 km S of Fraserburg to Leeu Gamka, low dolerite outcrops below Great Escarpment, (–CB), 27 Sept. 2012, Goldblatt & Porter 13806 (NBG, holo.; MO, PRE, iso.).

Plants 350–450 mm high. *Corm* unknown. *Stem* with (1)2 or 3 branches from penultimate node, bearing a single sheathing leaf 45–55 mm long, attenuate,  $\pm$  dry and light brown midway through flowering. *Cataphylls* dry, brown and broken at flowering. *Foliage leaf* solitary, linear, fibrotic, falcate, longer than stem, narrowly channelled, 2–3 mm wide when opened flat. *Rhipidial spathes* pale grey-green, dry and light brown in upper half, attenuate, with fine white nerves evident, inner 50–65 mm long at anthesis, outer  $\pm$  half as long, inner elongating after flowering to enclose ripening capsules. *Flowers* fugaceous, pale yellow, outer tepal limbs with deeper yellow nectar guides at base with fine dark dots; outer tepals obovoid-pandurate, 25–27 mm long, limbs  $\pm$  20 mm long, claws of both whorls  $\pm$  6 mm long, ascending to form narrow cup including lower half of filament column, limbs spreading and twisted through  $\pm$  45° distally, inner tepals  $\pm$  22  $\times$  7 mm. *Stamens* with filaments 7–8 mm long, united for most of their length in smooth, cylindrical column, free and diverging in upper 0.7 mm; anthers  $\pm$  8 mm long before anthesis, 5–6 mm after releasing pollen, then tips arching inward, exceeding style branches, yellow, pollen yellow. *Ovary* cylindrical, usually exserted,  $\pm$  12 mm long; style branches  $\pm$  4 mm long, crests  $\pm$  linear, erect,  $\pm$  1.5 mm long. *Capsules* and *seeds* unknown. *Flowering time*: mid-September and

October; flowers opening early morning and collapsed by 11:00. Figure 7.

*Distribution*: known only from the Great Karoo between Leeu Gamka and Fraserburg in Western Cape (Figure 6), *Moraea doleritica* is evidently restricted to dolerite outcrops. Plants of both populations that we encountered grew only among large, partly buried dolerite rocks, their corms tightly wedged in crevices in the bedrock. The species is so far known from just two populations only a few kilometres apart and south of the Nuweveld Mtns that comprise this section of the Great Escarpment. It is the only Great Karoo endemic species of the genus.

*Diagnosis*: the pale yellow flowers with relatively well developed style branches and short, erect crests and, in particular, the filaments, free distally for a short distance, are somewhat unusual for subg. *Homeria* and recall *M. pallida* (Baker) Goldblatt and *M. cookii* (L.Bolus) Goldblatt as well as two Namaqualand species, *M. schlechteri* (L.Bolus) Goldblatt and *M. knersvlakensis* Goldblatt. The latter two species have multiple foliage leaves whereas *M. cookii* and *M. pallida* as well as *M. doleritica* have a single foliage leaf and we suggest that *M. doleritica* may be most closely related to these two species. The spreading tepals twisted distally through about 45° of *M. doleritica* are also found in *M. cookii* and *M. pallida*, another reason to consider them related. Both *M. cookii* and *M. pallida* have a relatively broad leaf clasping the lower part of the stem, thus rather different to the particularly long, narrowly channelled, and relatively rigid, tough, fibrotic leaf of *M. doleritica*. The range of *M. doleritica* in the Great Karoo is complimentary to that of *M. cookii* and *M. pallida*. *M. cookii* is widespread in southern Africa, extending from the Cedarberg in Western Cape through the mountains of the Karoo to Lesotho and *M. pallida* occurs across the Upper Karoo through Free State to Mpumalanga.

8. *Moraea eburnea* Goldblatt & J.C.Manning, sp. nov.

TYPE.—South Africa, Western Cape, 3321 (Ladismith): Seweweekspoort to Laingsburg near Farm Vleiland, northern foothills of the Klein Swartberg Mtns, (–AC), 25 Sept. 2004, Goldblatt & Porter 12561 (NBG, holo.; K, MO, PRE, iso.).

Plants 150–200 mm high. *Corm* unknown. *Stem* mostly 2–4-branched, flexed above sheaths of basal and cauline leaves, sheathing leaves 30–40 mm long, attenuate, dry and light brown in distal half. *Cataphylls* dry, brown,  $\pm$  fibrous at flowering. *Foliage leaf* solitary, basal, linear, falcate,  $\pm$  twice as long as stem, narrowly channelled,  $\pm$  2 mm wide when opened flat, often dry and trailing distally. *Rhipidial spathes* dry and light brown in distal half, attenuate, inner 30–35 mm long, outer almost half as long. *Flowers* fugaceous, pale ivory-yellow, limbs of all tepals with deeper yellow nectar guides at bases, spreading; outer tepals narrowly obovate, 20–25  $\times$  7–8 mm, limbs 18–22 mm long, claws of both whorls  $\pm$  2 mm long, ascending as a narrow cup including lower half of filament column, inner tepals 18–21  $\times$  6–7 mm. *Stamens* with filaments  $\pm$  5 mm long, united in smooth, cylindrical column 4 mm long, free and





FIGURE 7.—*Moraea doleritica* (Goldblatt & Porter 13806). A, flowering plant (without corm); B, androecium and style; C, style. Scale bar: A, 10 mm; B, 2 mm; C, 1 mm. Artist: John Manning.

diverging in upper 1 mm; anthers  $\pm 3$  mm long before anthesis,  $\pm 2$  mm after releasing pollen, exceeding style branches, yellow; pollen yellow. *Ovary* spindle-shaped, usually exserted,  $\pm 5.5$  mm long; style branches flattened,  $2.5 \times 1.5$  mm long, with broad stigmatic lobes, crests  $\pm$  linear, erect,  $\pm 1$  mm long. *Capsules* obovoid,  $\pm 10$  mm long. *Seeds* unknown. *Flowering time*: September to mid-October.

*Distribution*: known only from the Farm Vleiland north of the Klein Swartberg Mtns (Figure 6).

*Diagnosis*: the relatively small, pale yellow flowers of *Moraea eburnea* have moderately well developed, flattened style branches terminating in unusually broad stigmatic lobes and short, erect crests somewhat unusual in subg. *Homeria*, as are the filaments, united in a smooth, cylindrical column about 4 mm long, but free and diverging on the upper 1 mm. The distally free filaments and moderately well developed style branches suggest that *M. eburnea* may be most closely related to the *M. pallida* group (sect. *Stipantherae*) as most other species of subg. *Homeria* have the filaments completely united. If this assignment is correct, *M. eburnea* is by far the smallest member of the alliance. The slender stem and narrow leaf place *M. eburnea* in an isolated position in the group. Relationships in subg. *Homeria* are difficult to assess by phenetic comparison (Goldblatt 1981) and molecular study using plastid DNA sequences have so far provided no useful insights except that the *M. pallida* group (including *M. cookii*, *M. pallida* and *M. reflexa* Goldblatt) is retrieved as a clade sister to the remaining species of subg. *Homeria* (Schnitzler *et al.* 2011; Goldblatt *et al.* 2013). Of the 37 species of subg. *Homeria*, only *M. eburnea* and *M. doleritica* remain to be included in any molecular analysis.

#### RANGE EXTENSIONS AND MORPHOLOGICAL NOTES

1. *Moraea barnardii* L.Bolus (subg. *Vieusseuxia*): has small, white outer tepals flecked with dark blue and undulate margins, bright red pollen and lacking inner tepals. The distinctive *M. barnardii* is known for certain from Shaw's Pass, south of Caledon (Goldblatt 1976), where it has been collected repeatedly. It is not common there but plants are scattered on the sandstone slopes east and west of the summit of the Pass and bloom well only after a veld fire. There is also an unconfirmed and somewhat doubtful record from near Gansbaai (Gillett 4311 BOL), some distance to the southeast. Because of its narrow range, *M. barnardii* is currently regarded as Critically Rare (CR) (Raimondo *et al.* 2009). We report here a possible new locality for the species, from near the mouth of the Palmiet River, Kleinmond (Gillett 4250 BR, MO). The collection, made by J.B. Gillett in 1938, and until now identified as *M. tripetala*, conforms closely to type of *M. barnardii*. The flowers lack inner tepals entirely, the outer tepal limbs have undulate edges and the filaments,  $\pm 8$  mm long, are united for  $\pm 1.5$  mm. The dark-coloured anthers, the original colour of which is no longer evident, are only 3 mm long, thus conforming closely to *M. barnardii*, in which the anthers are 3–4 mm long in the type population. Like Gillett's collection from Gansbaai, the Palmiet River record requires confirmation. If correct, the conservation status of the species will require revision.

2. *Moraea elliotii* Baker (subg. *Polyanthes*): as currently circumscribed, single-leaved and usually blue-flowered, *M. elliotii* extends through eastern southern Africa from the Grahamstown area of Eastern Cape through KwaZulu-Natal to Limpopo and Swaziland and with an outlying record from Malawi (Goldblatt 1986, 1993). New collections from west of Grahamstown expand the geographic range of *M. elliotii* and call into question its circumscription. Plants matching the type, which is from Mpumalanga, have ascending tepal claws and spreading to ultimately half reflexed inner and outer tepal limbs (the form is illustrated in Goldblatt 1986), filaments usually 3.5–4.5 mm long united in the lower 1.5–2.0 mm and style branches 8–10 mm long. Plants of the two Eastern Cape collections have somewhat different flowers, the inner tepals ultimately spread from the base and are somewhat twisted in propeller fashion, the filaments are united only basally and the long style branches lie appressed to the outer tepals claws for almost their entire length. The leaves are also unusual, having tightly inrolled margins and seeming terete and are inserted above ground level. Flowers of the Elandsberg population are white with purple-edged nectar guides, but those from the Suuranys Mtns have pale, grey blue flowers. The floral form in these two collections is a good match for flowers of *M. elliotii* illustrated in Pooley (1998), *Wild Flowers of KwaZulu-Natal*, which also have a white perianth. The circumscription of *M. elliotii* needs re-examination. We note here that at least the synonym *M. juncifolia* N.E.Br. (Brown 1929), based on plants from the Saddleback, Barberton, Mpumalanga, has a terete leaf inserted on the stem above ground level. We are unable to resolve the question as to whether *M. elliotii*, as presently interpreted, comprises two species, with the terete-leaved plants, often with white to pale grey-blue flowers a separate taxon, but wish to draw attention to the question.

EASTERN CAPE.—3324 (Steytlerville): Suuranysberg, (–CC), Nov. 2011, *Smith s.n.* (NBG); Elandsberg, pass from Patensie to Melkhouboom via Mimosa Vale, crest of hill 'white with mauve markings,' (–DB), 22 Oct. 1993, *Bean & Viviers 3057* (BOL).

3. *Moraea exiliflora* Goldblatt (subg. *Polyanthes*): when described (Goldblatt 1986) *Moraea exiliflora* was known from only two collections, both from Towerkop in the Klein Swartberg near Ladismith in the Little Karoo. New collections have expanded its range considerably: there are records from the Touwsberg, foothills of the Kammanassie Mtns, southwest of Ladismith, and from the upper Long Kloof southwest of Uniondale. Plants at the Long Kloof site are restricted to relatively dry, west-facing, rocky sandstone slopes and flower in unburned, dry fynbos vegetation dominated by Restionaceae and *Bobartia*. *M. exiliflora* is clearly not a rare endemic of the Little Karoo but is a moderately widespread, although poorly collected, species. Its apparent rarity is evidently due in part to its small flowers with for example, outer tepals  $14\text{--}18 \times 4.5\text{--}6.0$  mm, inner tepals  $13\text{--}15 \times 2.5\text{--}3.5$  mm and anthers 3.0–3.5 mm long. It also has an unusual flowering phenology: flowers open in the late afternoon; those of the population near Uniondale opened after 16:00 and collapsed by 18:00, a pattern that probably reflects that for the entire species. *M. exiliflora* is most easily confused with *M. lazulina*, described in this paper, which also has a single

foliage leaf and a similarly shaped flower but is a taller, more robust plant with larger flowers. The similarly proportioned flowers of *M. lazulina* have outer tepals 22–27 × 7–9 mm (limbs 14–18 mm long), inner tepals 17–20 × 7 mm and anthers ± 5 mm long. The tepals are strongly reflexed, at least to 50°, the inner tepals often more strongly reflexed than the outer, whereas tepals of *M. exiliflora* are laxly spreading to slightly reflexed, mostly < 15° below horizontal.

WESTERN CAPE.—**3321** (Ladismith): NE slopes of Touwsberg above Farm Boerboonfontein 115, (–CA), 7 Oct. 1993, *Snijman 1394* (NBG). **3322** (Oudtshoorn): roadside near Mons Ruber Winery, (–CB), 8 Sept. 2002, *Goldblatt & Porter 12556A* (MO); southern foothills of Kammanassie Mtns, between Koutjie and Scheeperskraal, (–DA), *Vlok & Schutte 274* (MO); Avontuur to Herold, sandstone slopes above Farm Kykoe, (–DD), 19 Sept. 2010, *Goldblatt & Porter 13558* (MO, NBG), 26 Sept. 2012, *13802* (MO, NBG).

4. *Moraea falcifolia* Goldblatt & J.C.Manning (subg. *Acaules*): widespread in arid and semi-arid southern Africa, *M. falcifolia* extends from southern Namibia and Namaqualand across Bushmanland and the Upper and Great Karoo to Alexandria in Eastern Cape and to Kuruman and Kimberley in Northern Cape (Goldblatt 1976, Goldblatt & Manning 2009). Here we report a significant range extension of the species from Jacobsbaai on the Atlantic coast of Western Cape near Saldanha, some 120 km north of Cape Town. The most southwesterly records until now are from Vredendal and Vanrhynsdorp, some 160 km to the north. This record is notable also for perianth colour: predominantly white with yellow nectar guides at the bases of the outer tepal limbs and large dark marks at the apices of the inner tepal claws, features typical of nearly all populations of *M. falcifolia*, but the style crests also have large dark pigmentation on the lower half, rarely present in the species.

We also draw attention to a collection of *Moraea falcifolia* from the plateau of the Kamiesberg of central Namaqualand, above 1 000 m. Plants of this population are the most robust in the species, the leaves reaching to 100 mm long and the flowers are the largest so far recorded. For example, the outer tepals are 25–26 mm long, the inner ± 24 mm long, whereas until now outer tepals have been described as 15–22 mm long, the inner 13–20 mm long; the length of the anthers and ovary, 4–5 mm long are the same as recorded for *M. falcifolia*. The inner tepals of this population lack the characteristic purple marks otherwise, as far as we know, universal in the species, and when collected the inner tepals were suberect, whereas the limbs are spreading in other populations. The features of this population significantly expand the circumscription of *M. falcifolia*. Typical *M. falcifolia* has been recorded near Kamieskroon not far distant from the unusual population we describe here but at significantly lower elevation, ± 400 m. Apart from the size of most features, the Kamiesberg population conforms in general aspect to *M. falcifolia*.

NORTHERN CAPE.—**3018** (Kamiesberg): Namaqualand, Kamiesberg, plateau above Kamieskroon, along Buffels River on road to Pedroskloof, deep sand, (–AA), 17 Sept. 2001, *Goldblatt & Porter 11907* (K, MO, NBG, PRE).

WESTERN CAPE.—**3217** (Vredenburg): Saldanha District, Jacobsbaai, limestone ridge, (–DD), July 2007, *Claassens s.n.* (NBG, photo only).

5. *Moraea fenestralis* (Goldblatt & E.G.H.Oliver) Goldblatt (subg. *Galaxia*): originally described as *Gal-*

*axia fenestralis* (Goldblatt & Oliver 1993) and transferred to *Moraea* by Goldblatt (1998), *M. fenestralis* was then known from granite outcrops in eastern Namaqualand near Kliprand in Northern Cape. A new record from the granite hills east of Okiep near Springbok (*Helme 6619*, NBG), made in July 2010, is therefore surprising. Plants from this site, flowering in July, have very pale pink flowers with yellow anthers, filaments united in a column, diverging in upper ± 2 mm and leaves with a translucent central line, and thus correspond closely to the type and other collections of the species. *M. fenestralis* is inconspicuous even in bloom and we suspect there are other populations awaiting discovery in the area between Kliprand and Springbok–Okiep area, a distance of over 125 km.

NORTHERN CAPE.—**2917** (Springbok): Namaqualand, granite ridge top 6 km E of Okiep, (–DB), 17 July 2010, *Helme 6619* (NBG).

6. *Moraea louisabolusia* Goldblatt (subg. *Homeria*): described in 1981 as *Homeria bolusia* Goldblatt, *Moraea louisabolusia* was then known from northern Western Cape in the Clanwilliam District in the hills near Kransvlei and the lower slopes of the Nardouw Mtns and from Northern Cape on the Bokkeveld escarpment at Lokenburg. Plants matching the species have now been recorded in the Kamiesberg on the slopes of Rooiberg in central Namaqualand (*Goldblatt & Manning 9767*). Plants from the Kamiesberg differ very little from those already known. They have a single foliage leaf inserted above ground level, a stem flexed above the sheaths of the foliage and sheathing leaves and yellow flowers with short, erect tepal claws and filaments largely united in a slender smooth column but free distally. The free portion of the filaments is ± 1 mm long vs. 0.5 mm in plants from elsewhere and the style crests are ± 1.5 mm long vs. 1 mm long in earlier collections. The Kamiesberg record is significant as it extends the range of *M. louisabolusia* some 160 km to the north of its next nearest known station and outside the Core Cape flora region (Manning & Goldblatt 2013).

NORTHERN CAPE.—**3018** (Kamiesberg): Kamiesberg, Farm Karas [Welkom], low spurs of Rooiberg, (–AD), 26 Sept. 1993, *Goldblatt & Manning 9767* (MO, NBG).

7. *Moraea tulbaghensis* L.Bolus (subg. *Viesseuxia*): the southwestern Cape *Moraea tulbaghensis*, now including *M. neopavonia* R.C.Foster (Goldblatt & Manning 2002), is allied to *M. villosa* (Ker Gawl.) Ker Gawl., the two sharing villous leaves and stems and flowers with broad, ± suborbicular to broadly ovate outer tepal limbs up to 38 mm long with prominent, contrasting, dark-coloured nectar guides (Goldblatt 1976, 1986). Most populations of *M. tulbaghensis* have bright orange or occasionally red flowers with deep blue to iridescent green nectar guides. The species differs from *M. villosa*, which has purple or mauve, rarely greenish white or even orange flowers, outer tepals 22–38 × 20–35 mm, anthers 6–10 mm long, not exceeding the relatively long style crests (2.5)5.0–8.0 mm long. In *M. tulbaghensis* the outer tepals are mostly 15–20 × 15–20 mm and the anthers, 7–10 mm long, and always exceed the short style crests, 1–2 mm long. Plants resembling these two species, discovered on the western slopes of Riebeeck Kasteel Mtn, have white tepals with dark blue nectar guides, a colour combination most consistent with

*M. villosa*, but the anthers,  $\pm 9$  mm long, exceeding the style crests, only  $\pm 2$  mm long. These dimensions are consistent with *M. tulbaghensis* as are other features of the flower except for the somewhat broader outer tepal limbs (up to 23 mm wide vs. 15–20 mm) (Table 1). We conclude that the Riebeek Kasteel population represents a striking colour morph of *M. tulbaghensis* with slightly broader outer tepals not before recorded in the species but differing in no other taxonomically significant features. The population also represents a modest range extension for the species, which has been recorded from the Tulbagh Valley and in the Berg River Valley and adjacent hills from the outskirts of Paarl in the south to Korningberg near Piketberg.

WESTERN CAPE.—3318 (Cape Town): western flank of Riebeek Kasteel Mtn, clay slope, (–BD), 25 Sept. 2009, *Goldblatt & Porter 13448* (MO, NBG, PRE).

8. *Moraea unguiculata* Ker Gawl. (subg. *Vieusseuxia*): across its wide range, from Steinkopf in northern Namaqualand to Graaf Reinett and Port Elizabeth, *M. unguiculata* has prominently trilobed inner tepals, the central, linear-attenuate lobe coiled inward and the lateral lobes broader, obtuse and shorter than the central (Goldblatt 1976; Goldblatt & Manning 1995). A population referred here from the top of the Langkloof in the southern Kamiesberg in Northern Cape (*Goldblatt & Manning 10425*, MO, NBG), flowering 18 Nov. 1995, stands out in having  $\pm$  linear-filiform inner tepals  $\pm 20$  mm long (the tightly coiled distal half makes exact measurement impossible), with slightly wider membranous tissue in the middle. In addition, the filaments are united in a column  $\pm 5.5$  mm long but free in the upper 2.5 mm and the anthers,  $\pm 4$  mm long, have an unusually prominent apiculus  $\pm 1$  mm long. Until now we have regarded this as a local morph of the species and of trivial significance. Typical *M. unguiculata* is, however, now known to occur throughout the upper Kamiesberg including the Langkloof and the hills near Leliefontein, a short distance to the north (e.g. *Goldblatt & Porter 13576* MO, NBG; *Goldblatt & Porter 13692*, MO, NBG). These plants have the prominently trilobed inner tepals exactly conforming to the type. The filaments in these Kamiesberg populations are united in a column up to 10 mm long and free for  $\pm 1.3$  mm and the anthers are  $\pm 6$  mm long, with a short apiculus  $\pm 0.5$  mm long. Vari-

ation in populations of *M. unguiculata* in Namaqualand needs to be carefully compared with the divergent population before we can assess the significance of its discordant features. Provisionally we prefer not to expand the circumscription of *M. unguiculata* and the divergent population is not accommodated in keys to the genus.

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TABLE 1.—Comparison of critical taxonomic features of *Moraea tulbaghensis* and *M. villosa*

Taxon	Flower colour	Outer tepal limbs (mm)	Inner tepals (mm)	Style branches (mm)	Style crests (mm)	Anther length (mm)
<i>M. villosa</i>	Purple or mauve, rarely greenish white, even orange, with dark blue or purple nectar guides.	22–38 $\times$ 20–35	16–30	5–7 $\times$ 8	(2.5)5.0–8.0	6–10
<i>M. tulbaghensis</i>	Bright orange or occasionally red with deep blue to iridescent green nectar guides.	(12)15–30 $\times$ 15–20	15–25	5–7 $\times$ 3–5	1–2	7–10
Riebeek Kasteel plants	White with dark blue nectar guides.	$\pm 21 \times 23$	$\pm 16$	5.5 $\times$ 2	$\pm 2$	$\pm 9$

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