



Six new species of Ruschieae (Aizoaceae) and further notes in *Ruschia*

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ABSTRACT

We describe six new species of the Ruschieae (Aizoaceae). *Astridia parviflora* is described from patches of quartz-gravel north of Kleinsee in Namaqualand in the Northern Cape. This collection extends the known distribution of *Astridia* from the Richtersveld to south of Port Nolloth. Three of the new species of *Ruschia* can be placed in recognized subgenera: *Ruschia variabilis*, from near Kleinsee in the Northern Cape, with basally fused, smooth leaves, ternate flowers, (5-) 6 (-8)-locular fruits with closing bodies, is placed in subg. *Tumidula*; *Ruschia pseudocrassa* from Bushmanland along the eastern borders of Namaqualand has highly fused leaves with apical teeth and solitary flowers and is placed in subg. *Ruschia*; *Ruschia joubertiniana* from fynbos in the Kouga mountains near Joubertinia, in the Eastern Cape has 11- to 12-locular fruits and laterally compressed leaves and is placed in subg. *Cymbifolia*. *Ruschia rupestris*, from the Montagu and Ladismith districts in the Western Cape, is unplaced within *Ruschia* as the fruits (which lack a closing body) do not agree with any of the existing subgenera in *Ruschia*. This new species is closely allied to *Ruschia altigena* and *R. karrooica*, which share the solitary flowers as well as similar leaves and fruits.

From shady kloofs between Steytlerville and Uitenhage in the Eastern Cape, we describe *Lampranthus umbra-ticola*. The species differs from *L. coralliflorus* by its smaller flowers and from *L. stayneri* since its fruits do not close again once opened.

In addition, we clarify the identity of *Ruschia indurata*, a rare and localized endemic on calcretes from Beaufort West, for which we correct an earlier lectotypification. Lastly, we place *Ruschia lawsonii*, *R. aristata* and *R. knysnana* back in *Ruschia*.

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1. Introduction

Recent fieldwork in the Cape Provinces of South Africa, led to the discovery of six new species, which belong to the large and diverse tribe Ruschieae (Ruschioideae, Aizoaceae). These new species form part of a larger study, also involving analyses of molecular data, which aims to clarify which species belong to the various subgenera recognized within *Ruschia* Schwantes. It also aims to investigate the relationships between these subgenera as well as their relationships to the rest of the Ruschieae. The description of these new species will make names available for use in this phylogenetic study (Klak et al., in prep.).

Three of the new species, one in *Astridia* and two in *Ruschia*, are from the Northern Cape. The other three species, two of *Ruschia* and one *Lampranthus*, are from the Western and Eastern Cape Provinces.

Characteristics of *Astridia* are the big, usually papillate leaves, large flowers and their often papillate seeds (Hartmann, 2017a). The fruits are *Ruschia*-like: they possess distinct, hook-shaped closing bodies, they lack valve wings, have a funnel-shaped base, tops with

high rims and have short expanding keels so that the valves only open into a vertical position. Whereas species of *Ruschia* have mostly 5-, rarely 6-locular fruits, the species of *Astridia* have mostly 6-locular fruits.

Dehn (1992) distinguished nine subgenera in *Ruschia*, with brief descriptions of how to recognize them, but he never indicated which species belonged to each subgenus. From these short diagnoses, we place the new species into these subgenera where possible.

One new species is described in *Lampranthus* N.E.Br. Species of *Lampranthus* are succulent perennial shrubs, mostly of which are confined to the winter rainfall region between south-western Namibia and the Western Cape. Several species are also found along the south coast of South Africa, with one occurring as far as the southern part of Kwazulu-Natal (Klak, 2012). The latest compilation included 194 species in *Lampranthus* (Hartmann, 2017b), whereas a conspectus of *Lampranthus* estimated 95 spp. as a more realistic number (Klak, 2012). The relatively soft, only slightly xeromorphic leaves which are hardly fused at their bases; the lack of closing bodies and the large (rarely narrow) valve wings of the capsules have been used to delimit *Lampranthus*. Recent fieldwork in the Eastern Cape led to the discovery of a new species of *Lampranthus*, which appears to be restricted to partially shaded areas in kloofs, and which is

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characterized by fruits where the valves do not close again once they have opened.

We make a correction to the lectotypification of *Ruschia indurata*, which belongs to *Ruschia* subg. *Ruschia* on account of its highly fused, apically toothed leaves and solitary flowers. This species has a dwarf, compact habit and is a rare endemic on calcretes near Beaufort West in the Western Cape.

Lastly, we re-instate three species in *Ruschia*. These are *Antimima lawsonii* (L.Bolus) H.E.K. Hartmann, *Esterhuysenia knysnana* (L.Bolus) van Jaarsv. and *Erepsia aristata* (L.Bolus) Liede & H.E.K. Hartmann, as these three are closely related to two of the species discussed here. While we focus our discussion here on their morphology and distributions, their phylogenetic position is known (Klak et al., in prep.). Re-establishing the correct names here will form the foundation for a detailed discussion of the clades retrieved in this comprehensive molecular phylogenetic study of *Ruschia* (Klak et al., in prep.).

2. Materials and methods

Morphological data were obtained through examination of fresh as well as pressed material in the herbaria at BOL and NBG (abbreviations from [Theirs, 2020+](#)). Data on distributions was gathered from

herbarium material and the records are listed according to the quarter-degree system of [Edwards and Leistner \(1971\)](#).

3. Taxonomy

3.1. New species

1 *Astridia parviflora* Klak sp. nov. (Fig. 1)

Type: South Africa, Northern Cape, Kwaganap River, between Port Nolloth and Grootmis (2917 AC), 14 Jul. 2014, 150 m above sea level (hereafter abbreviated as a.s.l.), Klak 2396 (BOL, holo., barcode: BOL0232478, K iso.).

Diagnosis: Differs from all other species of *Astridia* by its smaller flowers (to 30 mm diam. as opposed to 30–70 mm).

Large, robust, densely branched, stiff, erect succulent shrub to 50 × 50 cm. *Stem and branches* woody, densely leaved, internodes grey, smooth, 17–19 mm long. *Leaves* opposite, spreading to inclined, pale glaucous green, trigonous, narrowing towards tips, shortly fused, with upper side flattened, sides inflated, 30–55 mm long, 10 × 9 mm, epidermis velvety from short, hair-like papillae. *Flowers* solitary,

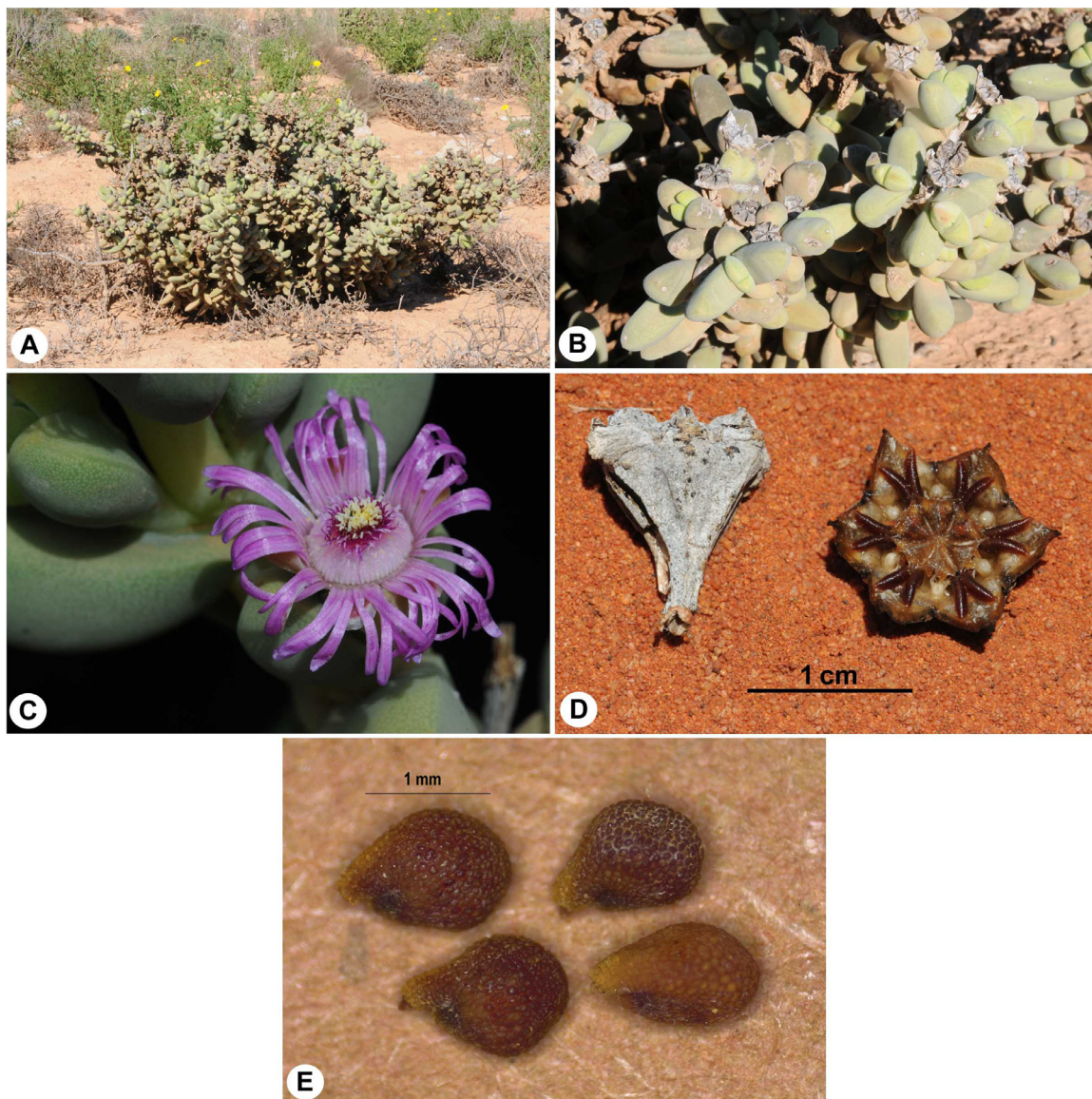


Fig. 1. *Astridia parviflora*. A. Habit. B. Leaves and fruits. C. Flower. D. Side view of closed (left, l) and top view of open fruit (right, r). E. Seeds.

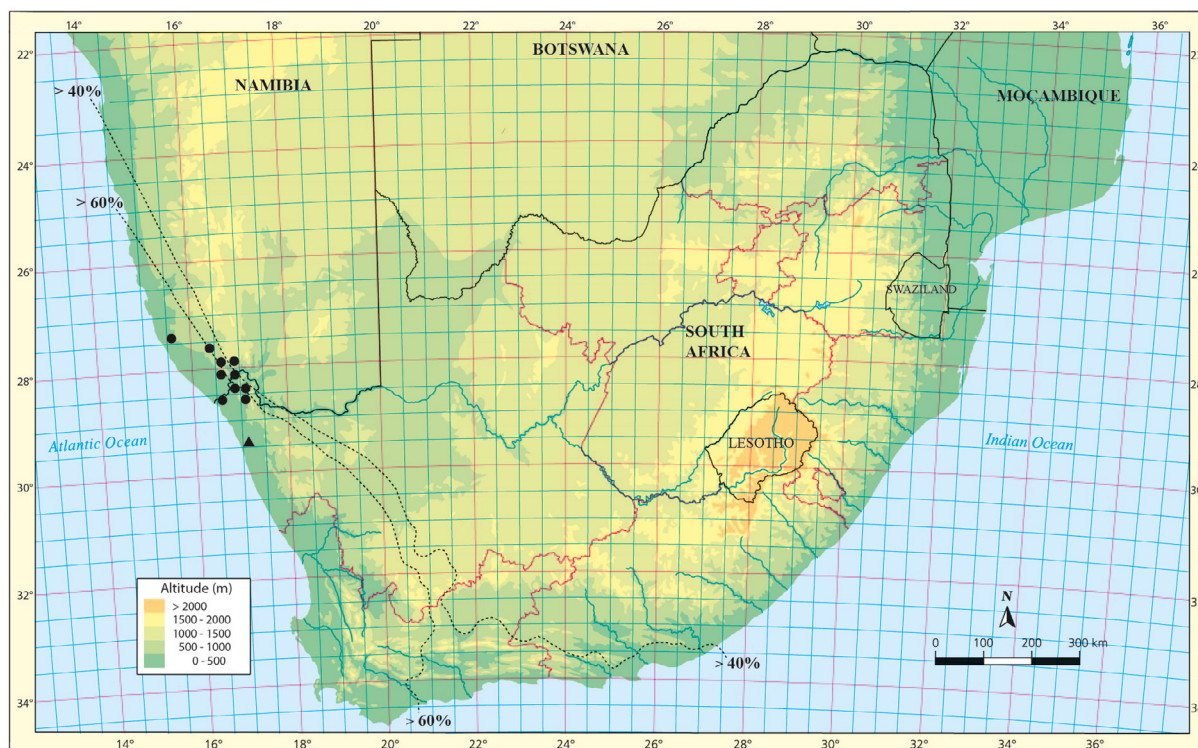


Fig. 2. Distribution of *Astridia* (circles) and of *A. parviflora* (triangle).

terminal and on side branches to 2 cm long, \pm sessile, 25–30 mm diam, bracts thick, leaf-like, 1 cm long, 6.5 mm broad and thick, calyx lobes 6, of \pm equal length, 2 slightly succulent, to 4×2 mm, 4 with membrane margins, to 7.5 mm long, petaloid staminodes in 1–2 rows, pale pink, with central darker pink stripe, 0.8–1.1 mm broad, obtuse to lanceolate, filamentous staminodes and stamens collected in center into cone, filamentous staminodes in \pm 2 rows, as long as the stamens, curled back at tips, 5×1 –2 mm, stamens numerous, in \pm 6 rows, pink in upper third, outer stamens 5 mm long, inner ones shorter to 2.5 mm long, papillate around middle, pollen yellow, stigmas 6, slender, greenish-yellow, 4.5×0.8 mm, smooth, top of ovary flat but with conspicuous raised lobes, nectary a dark green crenulate ring. *Capsule* grey, 6-locular, \pm 10 mm diam., rims 2–5 mm high, lower part shortly obconic, 7 mm deep, covering membranes complete, with conspicuous rod-shaped closing bodies, expanding keels diverging, short, valves only opening into erect position, valve wings absent. *Seeds* brown, to 1.3 mm long, tuberculate.

3.1.1. Distribution and ecology

The species is known only from the Kwaganap River south-east of Port Nolloth, in the arid winter-rainfall region of northern Namaqualand (Fig. 2). Here it occurs on shallow loamy soils overlaying gneiss with quartz-gravel on the surface, at a low altitude of around 150 m a.s.l. Flowering takes place from July to August (Fig. 1C). *Astridia parviflora* is common in the type locality. Further populations may occur in similar habitats at the Holgat River, between Port Nolloth and Alexander Bay.

3.1.2. Distinguishing features and relationships

Astridia parviflora is a large, robust shrub to 50 cm tall and broad, which stands out prominently among the dwarf succulent shrubs where it occurs. The leaves are finely velvety and the fruits are typical for *Astridia*, i.e. 6-locular, with rod-shaped closing bodies, no valve wings and short keels. It is one of the few species in the genus with pale pink flowers (also known in *A. dulcis* L.Bolus and *A. velutina*

Dinter), whereas most other species have red, yellow, white or occasionally magenta to lilac flowers.

This new species is somewhat similar to *Antimima pilosula* (L. Bolus) H.E.K. Hartmann and *Eberlanzia gravida* (L.Bolus) H.E.K. Hartmann, which are also robust shrubs with thick leaves and a velvety epidermis. However, these two differ from it in the broad valve wings of their fruits. Members of *Ruschia* share several features found in *Astridia* (Hartmann, 2017a) and evidence from molecular data places *Astridia* near to some members of *Ruschia* (Klak et al., 2013), albeit with only weak support.

3.1.3. Etymology

The epithet refers to the relatively small flowers of the new species.

3.1.4. Conservation status

We consider that this species is rare. Its habitat requirements are very specific: it has been found only near large patches of quartz-gravel close to the sea. Given the isolation and the habitat-specificity of the known population, we recommend that it is Vulnerable and placed on the Red Data List of South African plants.

1 *Ruschia variabilis* Klak sp. nov. (Fig. 3)

Type: South Africa, Northern Cape, between Port Nolloth and Grootmis (2917 AC), 19 Jul. 2021, 150 m a.s.l., Klak 2919 (BOL, holo., barcode: BOL0232477).

Diagnosis: Differs from species of subg. *Tumidula* by its 5- to 8-locular fruits; from subg. *Cymbifolia* by the fusion of its leaves into a sheath; from *Stayneria* by its smaller flowers (to 25 mm diam. as opposed to \pm 40 mm in *Stayneria*); from *Astridia* by its 5- to 8-locular fruits and flowers in cymes of 1–3 (as opposed to strictly 6-locular fruits and solitary flowers in *Astridia*).

Sturdy, chunky erect succulent shrub to 30×20 cm, with woody stem and branches. *Leaves* opposite, glaucous, spreading, trigonous,

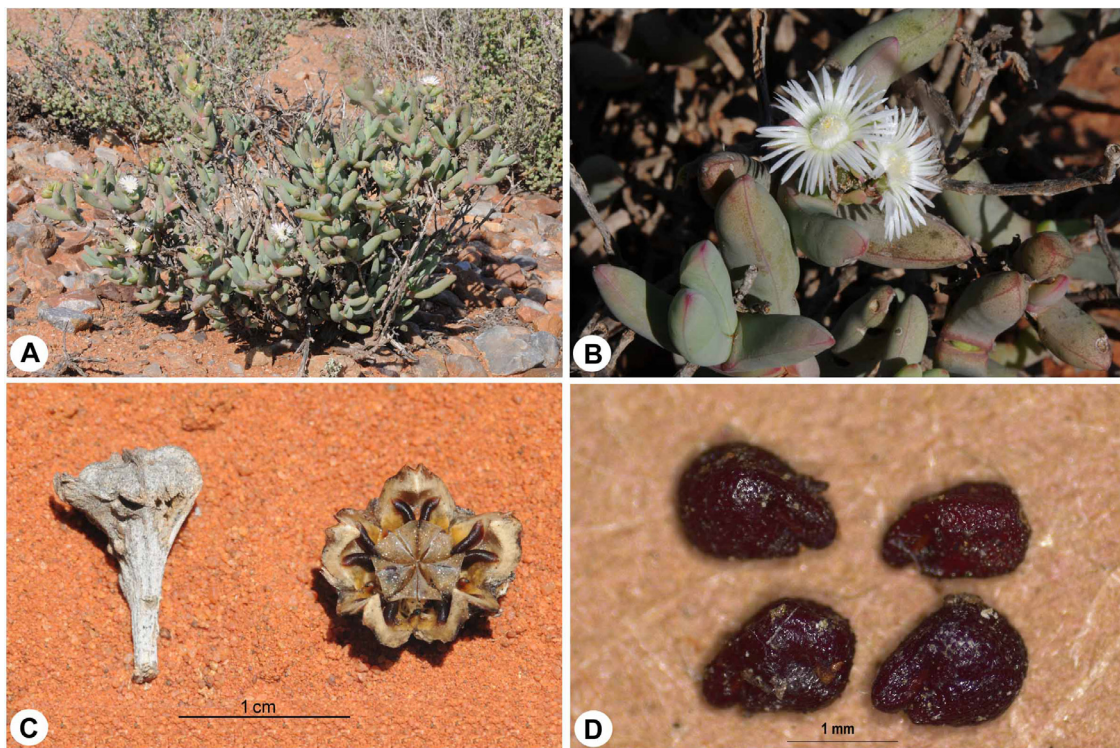


Fig. 3. *Ruschia variabilis*. A. Habit. B. Leaves and flowers. C. Side view of closed (l) and top view of open fruit (r). D. Seeds.

fused into a sheath 15–20 mm long, with a line where the leaves are fused, tips pointed, free parts 37–55 mm long, 8–10 mm broad and thick, epidermis smooth. Flowers in cymes of 1–3, 20–25 mm diam., pale pink to almost white, pedicels to 2 mm long, calyx lobes 6–7, 2 more succulent than the others, $\pm 10 \times 5$ mm, with membranous flap along the edge, bracts leaflike, thick and succulent, to $19 \times \pm 7$ mm wide and thick; petaloid staminodes in 2 rows, $8\text{--}10 \times 0.7\text{--}0.9$ mm, lanceolate to obtuse, filamentous staminodes fused with stamens at bases, $4.5\text{--}6.0 \times 0.2$ mm, in 2–3 rows, with hair-like papillae in lower half, collected into cone around stamens; stamens numerous, filaments white, 2.5–5.0 mm long, inner ones shortest, white, with hair-like papillae around the middle, in 3–4 rows, pollen yellow; stigmas 5–8, greenish yellow, pointed, $2\text{--}3.5 \times 0.5$ mm, feathery, broadest at middle, top of ovary slightly raised in the center, but without any lobes; nectary in a green, crenulated ring. Capsule (5-) 6- (to 8-) locular on the same plant, c. 9 mm diam., top raised to 3 mm, with low rims, lower part 4–5 mm deep, short funnel shaped, keels touching at base and then diverging, covering membranes firm and with additional conspicuous closing ledge below, closing bodies rod-shaped, valve wings absent. Seeds dark brown, $1.2\text{--}1.3 \times \pm 1$ mm, D-shaped, almost smooth.

3.1.5. Distribution and ecology

Ruschia variabilis is known only from the Kleinzee area, between Grootmis and 20 km north of Kleinzee, in the arid winter-rainfall region of northern Namaqualand (Fig. 4). Here it occurs in stony, gravelly soil or on quartzitic gneiss or schist slopes, at low altitudes from 10–170 m a.s.l., within a few kilometres of the sea. Plants were found in flower from July to August, with their main flowering-time in July.

3.1.6. Distinguishing features and relationships

Ruschia variabilis forms erect, chunky shrubs, with (5-) 6- (to 8-) locular fruits on the same plant. Its chunky appearance is suggestive of species of *Astridia*, all of which differ by having solitary flowers and strictly 6-locular fruits. The smooth leaves which are fused into a

short sheath and the ternate, moderately sized (to 25 mm diam.) flowers place this species into subg. *Tumidula* (where solitary flowers are only known in *Ruschia lineolata* (Haw.) Schwantes). Since members of this subgenus are characterized by 5-locular fruits, with small closing bodies and no valve wings, the frequently higher number of locules in *R. variabilis* distinguishes this species from the others. *Stayeria*, a monotypic genus endemic to the Worcester-Robertson area in the Western Cape, is closely allied to members of subg. *Tumidula* (Klak et al., 2013) and differs by having 5- to 8-locular fruits which, once they have opened, do not close completely again.

3.1.7. Etymology

The epithet refers to the variable number of locules typical for this species.

3.1.8. Conservation status

Plants were found in a restricted area (Fig. 4) on low hills close to the sea, which are characterized by a cooler climate than areas further inland and away from the sea. In addition, the substrate where it occurs differs from the sandy coastal habitat surrounding these low hills. As we consider the habitat preference of this species to be rather specific, we suggest a status of vulnerable (VU) for this species.

3.1.9. Additional specimens investigated

South Africa. NORTHERN CAPE: **2917 (Springbok)**: Kleinzee (-CA), 10 m a.s.l., 10 Jul. 1998, Klak 483 (BOL); Grootmis (-CA), steep quartzitic slope, 30 m a.s.l., 8 Aug. 2017, Van Munster 23 (BOL); Grootmis (-CA), in a mix of crumbling gneiss and schist, 16 m a.s.l., 18 Jul. 2021, Klak 2911 (BOL).

1 *Ruschia pseudocrassa* Klak sp. nov. (Fig. 5)

Type: South Africa, Northern Cape, Kamiesberg (3018), Farm Uitval (-DB), 1 Sep. 2022, 850 m a.s.l., Bruyns 14124 (BOL, holo, barcode: BOL0232476, K iso).

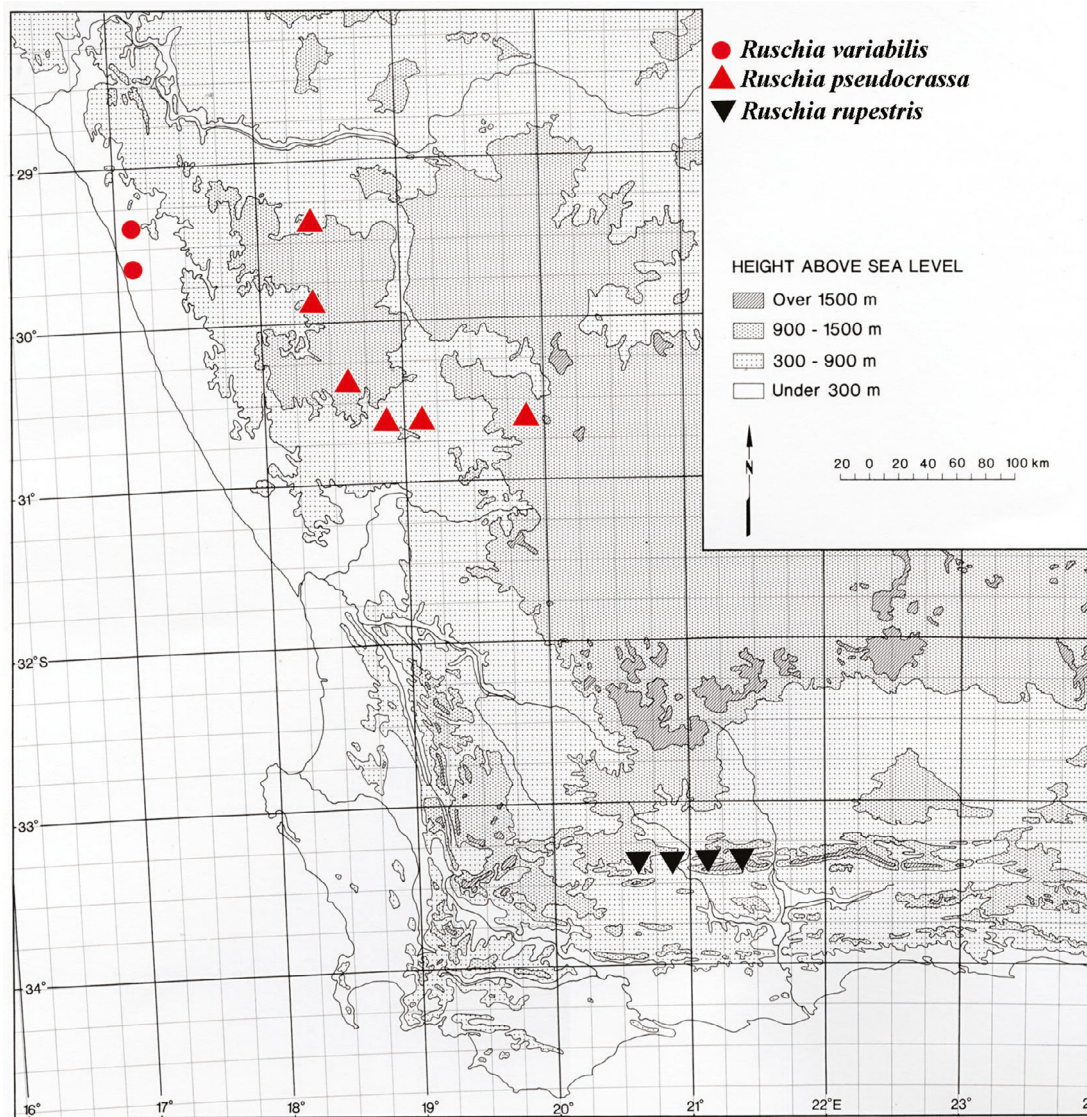


Fig. 4. Distribution of new species of *Ruschia*: *R. variabilis* (circle), *R. pseudocrassa* (triangle), *R. rupestris* (inverted triangle).

Diagnosis: Differs from *Ruschia crassa* by having smooth leaves and erect to tangled branches, whereas leaves are velvety from long papillae and branches are erect in *R. crassa*.

Densely branched succulent shrub, 30–50 × 40–100 cm, branches erect to tangled, old stems grey and woody, basal part very woody, internodes 14–15 × 6–7 mm. *Leaves* opposite, grey, fused into a sheath and clasping the branch, without a line, free parts spreading, somewhat heart-shaped, keeled on the back, 8–10 mm long, 5.5–7 mm broad and thick, with inconspicuous tooth, epidermis smooth, with dark dots below the epidermal surface. *Flowers* solitary, white, to 20 mm diam., sessile, calyx lobes 5, to 5 mm long, about equal length, 2 slightly succulent, pedicels short, petaloid and filamentous staminodes filiform, in 1–2 rows, petaloid staminodes ± 8 × 0.5 mm, filamentous staminodes and stamens free to bases, of about equal length and collected into a cone around the centre, some curling backwards, ± 5 × 0.3 mm, with hair-like papillae, stamens numerous, in 3–4 rows, papillate from middle towards bases, pollen yellow, stigmas 5, feathery, green, ± 4.5 mm long, top of ovary with raised lobes, nectary in a green, crenulated ring. *Capsule* 5-locular, ± 9 × 10 mm, rims raised to 2 mm, lower part funnel-shaped, covering membranes thick and spongy, with ledge below, keels short, diverging and not touching at bases, only open into an erect position,

closing bodies hook-shaped, valve wings absent. *Seeds* ochre, smooth, 1.1–1.2 × 0.9 mm, somewhat d-shaped.

3.1.10. Distribution and ecology

This species is widespread across Bushmanland and some of the eastern parts of Namaqualand and is known from the Gamoep, Kamiesberg and Louriesfontein districts (Fig. 4). It occurs on gravelly, calcareous or gneissic flats, at altitudes of 750–1000 m a.s.l. It flowers between August and September.

3.1.11. Distinguishing features and relationships

Ruschia pseudocrassa forms spreading shrubs 30–50 × 40–100 cm. The free parts of the leaves are short, and the leaves clasp the stem to form a sheath. Thus, the plants superficially appear to be “stem”-succulents, like members of *Mesembryanthemum* subg. *Juncea*. There are several largish species in *Ruschia* subg. *Ruschia* such as *R. grisea* and *R. abbreviata*, which have developed this trait, but these have a less conspicuous, 1-toothed keel on their leaves than is typical for *R. crassa* and *R. pseudocrassa*. In addition, the branches are thicker in *R. crassa* and *R. pseudocrassa* compared to both *R. grisea* and *R. abbreviata*. An important character which distinguishes species in subg. *Ruschia* is whether the leaf-surface is smooth

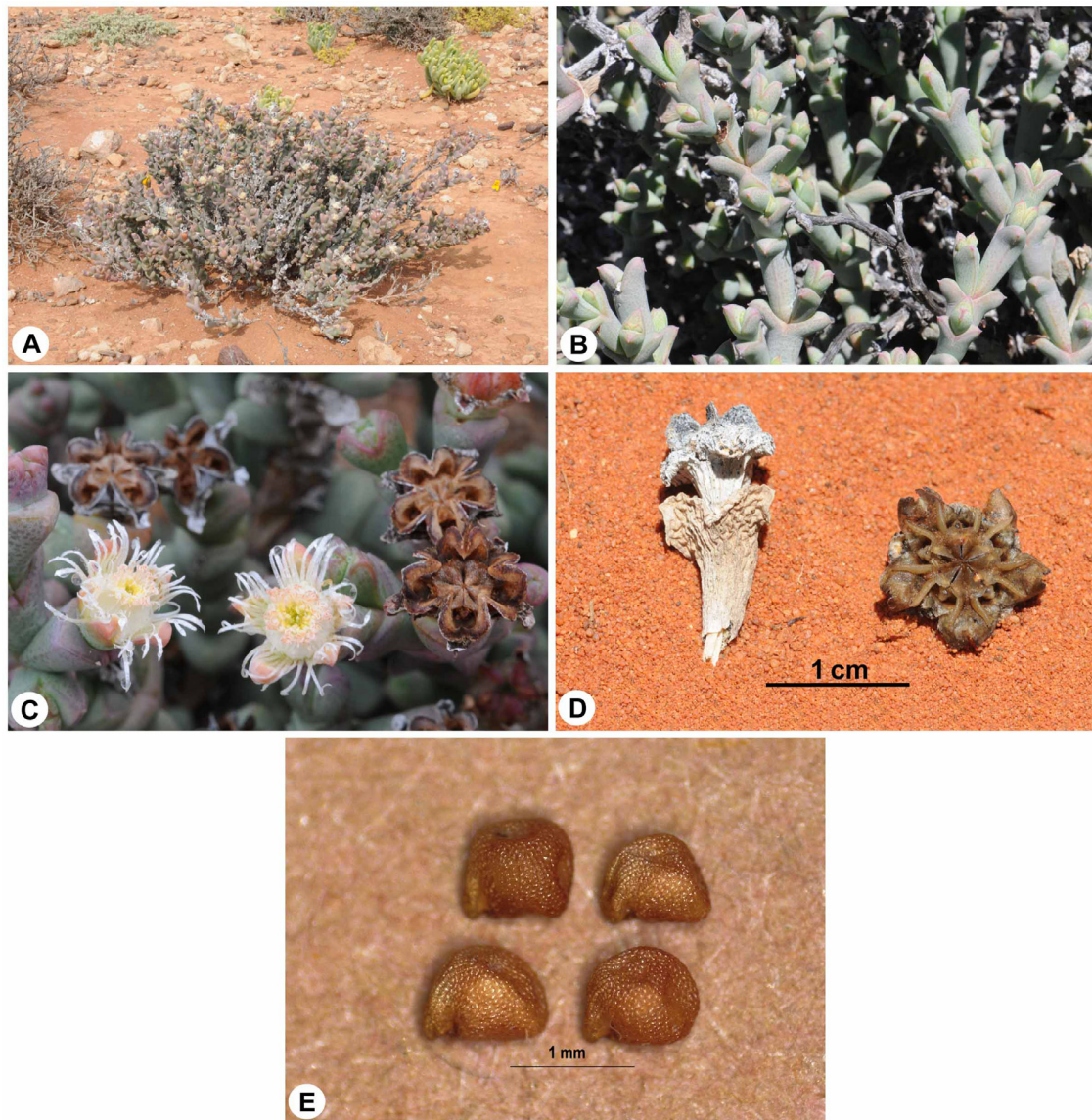


Fig. 5. *Ruschia pseudocrassa*. A. Habit. B. Leaves. C. Flowers and fruits. D. Side view of closed (l) and top view of open fruit (r). E. Seeds.

or distinctly papillate. *Ruschia pseudocrassa* and *R. crassa* are similar, particularly in herbarium specimens. However, they can be easily separated by the distinctly velvety leaves of *R. crassa*, which contrast with the much smoother leaves of *R. pseudocrassa*.

3.1.12. Etymology

The epithet refers to its similarity to *Ruschia crassa*.

3.1.13. Conservation status

The species is widespread and the area where it occurs is not arable, except for grazing. As yet, no mining activities are present in this area. For these reasons, we suggest a status of least concern (LC).

3.1.14. Additional specimens investigated

South Africa. NORTHERN CAPE: **2918 (Gamoep)**: Kamiesberg, S of Paulshoek (-AD), 5 Oct 2021, 1000 m a.s.l., *Klak* 2992 (BOL); Bushmanland, farm Kouberg (-CD), 12 Jul 2008, 930 m a.s.l., *Klak* 1678 (BOL); Gamoep, farm Vaalkoei (-CD), 16 Jul 2021, 974 m a.s.l., *Klak* 2896 (BOL); **3018 (Kamiesberg)**: At turn-off from Pofadder to Kliprand, Farm Boonstevlei 398 (-BC), 21 Aug 1990, A. Le Roux 4154 (NBG); 10 km north of Kliprand (-BC), 4 Aug 2022, 926 m a.s.l., *Klak*

3108 (BOL); **3019 (Louriesfontein)**: Farm Taaiboshoek (-CA), 13 June 1999, 750 m a.s.l., *Bruyns* 7876 (BOL); Calvinia, along Brandvlei road, farm Witputs (-DB), 950 m a.s.l., 22 Mar 2019, *Klak* 2663 (BOL); 9 Sep 1999, *Bruyns* 7957 (BOL).

1 *Ruschia joubertiniana* Klak sp. nov. (Fig. 6)

Type: South Africa, Eastern Cape, Willowmore (3323), near Joubertina, Kouga Wilderness, Farm Kleinrivier, (-DB), 7 Jan 2008, 500 m a.s.l., *Klak* 1589 (BOL, holo, barcode: 46184; NBG, iso).

Diagnosis: Differs from all other species in *Ruschia* by the 11–12 locules of its capsules (5–8 in all other *Ruschia*). It differs from *Erepsia* since the end of the placenta is detached in the capsule and forms a hood (end of placenta not detached in *Erepsia*) and by the absence of a hypanthium (present in *Erepsia*).

Erect, sparsely branched, succulent shrub to 40 × 30 cm, with erect branches to 35 cm tall, becoming woody with age, basal branches 6–7 mm diam., internodes 20–30 × ± 2.5–3 mm, brown, older one's grey. Leaves opposite, triquetrous, with sharp tips, glaucous, with dark dots, erect to spreading, joined to the stem in the lower third of their length for 3–9 mm, and curved outwards

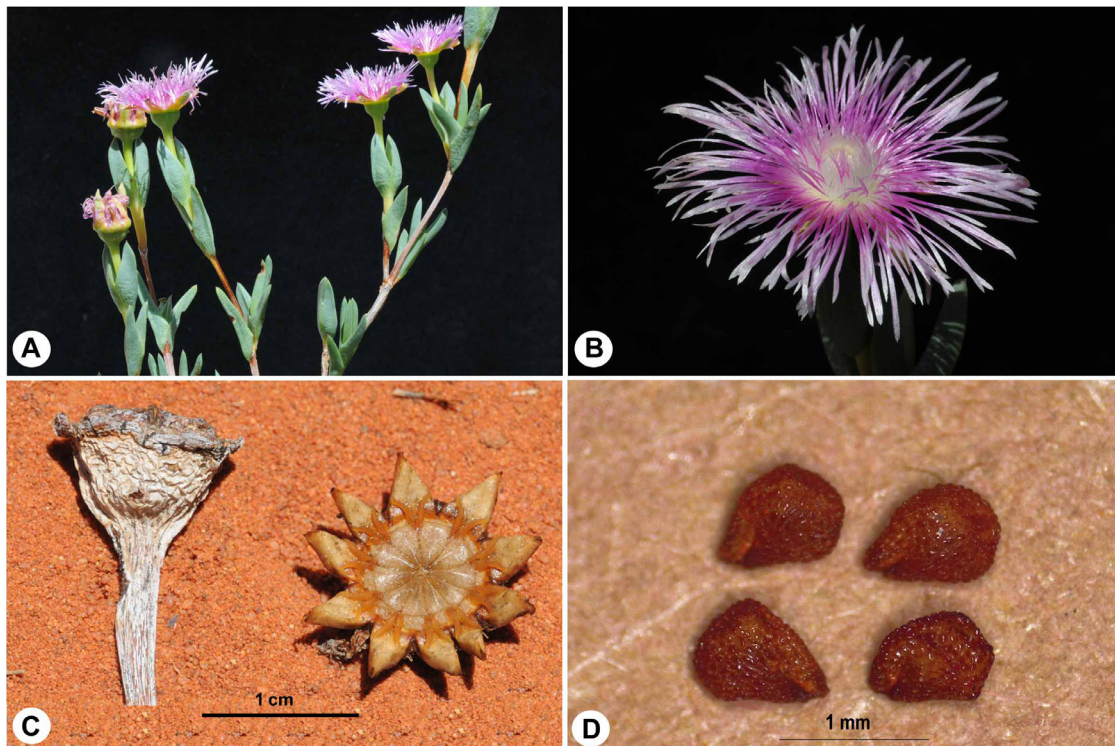


Fig. 6. *Ruschia joubertiniana*. A. Habit. B. Flower. C. Side view of closed (l) and top view of open fruit (r). D. Seeds.

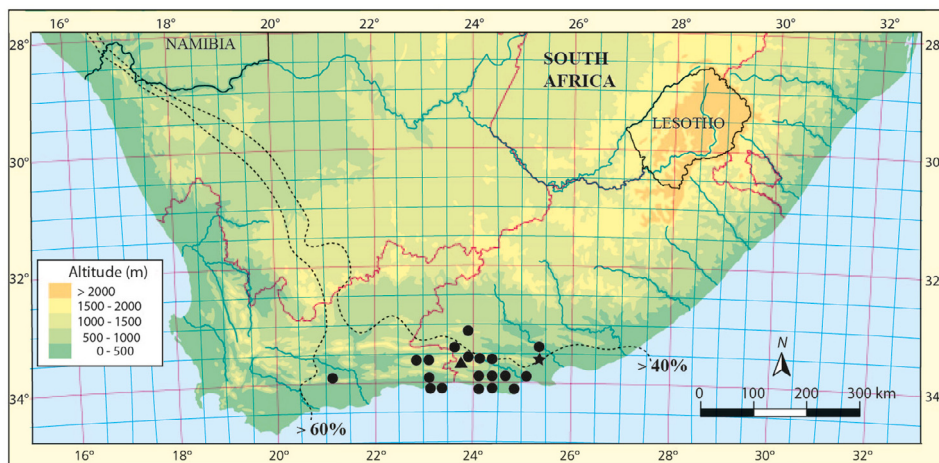


Fig. 7. Distribution of species of *Ruschia* subg. *Cymbifoliae*. *R. joubertiniana* (triangle), *R. knysnana* (circle) and *R. aristata* (star).

towards their bases, thus forming a triangle between the two opposite leaves, keels cartilaginous, some with finely serrulate keel, epidermis smooth, 20–27 mm long, 5–6 mm broad and thick. Flowers solitary, 25–40 mm diam., pedicels erect, 7–20 mm long, bracts succulent, leaf-like; sepals 6, succulent, 3 with membranous wings; petaloid and filiform staminodes numerous, filiform, curved over the centre of the flower, petaloid staminodes pink, 10.5×0.7 mm, shortest petals to ca. 5 mm long, filiform staminodes white, papillate at base, 4×0.1 – 0.2 mm, stamens about as long as filiform staminodes, papillate at base, in 3–4 rows, pollen white; stigmas 10–12, green slender, smooth, 1.5×0.2 mm, top of ovary flat, nectary forming conspicuous green crenulated ring. Capsule 10- to 12-locular, 10–14 mm diam., top dome shaped and raised to 5 mm, with low rims, lower part bowl- to funnel-shaped to 5 mm deep, without wings, closing bodies absent, placenta forming a hood, covering membranes curved up at ends, but without additional closing device below,

keels parallel first then diverging, valve wings absent. Seeds light brown to ochre, 0.8 – 0.9×0.6 – 0.7 mm, slightly collucate.

3.1.15. Distribution and ecology

Ruschia joubertiniana is known only from the type locality at Kouga Wilderness (Fig. 7). It is, however, likely that this species occurs in similar habitats on neighbouring mountains. It prefers sandstone soil among fynbos. The species is rare in mature fynbos, where it grows among tall shrubs such as species of *Protea*. However, the species may form large populations after fires, when the soil is enriched and no shading or competition for nutrients occurs from other taller shrubs. Plants were collected at 500 m a.s.l. Flowering occurs in October.

3.1.16. Distinguishing features and relationships

Ruschia joubertiniana is characterized by 10- to 12-locular fruits, solitary showy pink flowers with numerous filiform petaloid

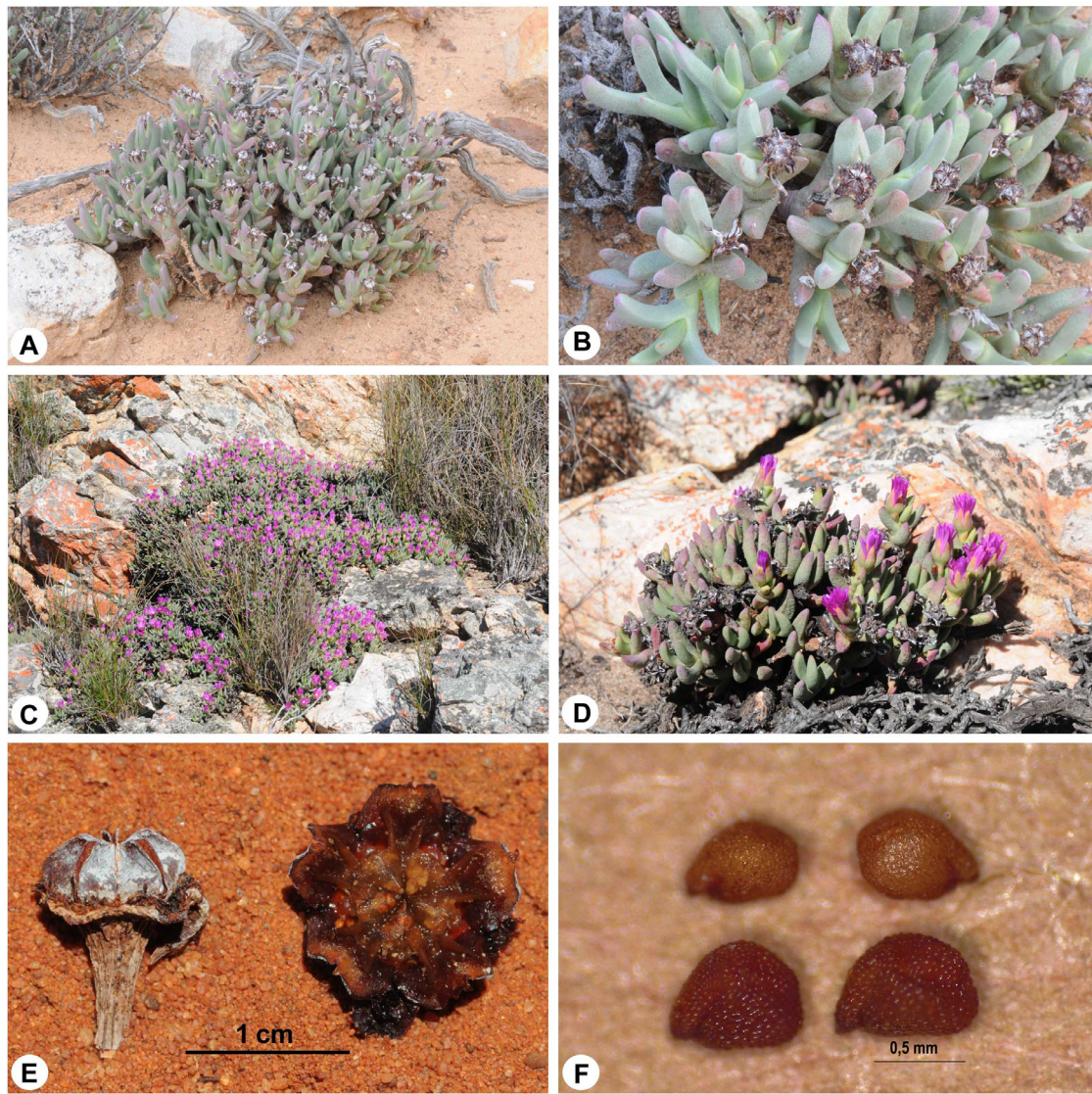


Fig. 8. *Ruschia rupestris* (A, B, E, F) and *R. altigena* (C, D, F). **A.** Habit. **B.** Leaves and fruits. **C.** Low spreading habit of older plants of *R. altigena*. **D.** Younger plants of *R. altigena* are similar in habit to *R. rupestris*. **E.** Side view of closed (l) and top view of open fruit (r). **F.** Seeds of *R. rupestris* (top) and *R. altigena* (bottom). The smaller size and lighter colour in *R. rupestris* can readily be seen.

staminodes. Typically, the shorter inner petals and the filamentous staminodes curve over the center of the flower, but no hypanthium is present. The leaves are joined to the stem and usually curve outwards towards their bases. Thus, the leaves are not joined to each other to form a sheath as in subg. *Tumidula*. This arrangement of leaves is typical for subg. *Cymbifolia* (see also discussion under section C for *Ruschia aristata* (L.Bolus) L.Bolus). The high number of locules distinguish it from other members of subg. *Cymbifolia*, which are 5- to 9-locular.

3.1.17. Etymology

The epithet refers to the area where this species was discovered.

3.1.18. Conservation status

The distribution of *Ruschia joubertiniana* is insufficiently known. It is possible that the species is rare, so that increased fire frequencies may form a threat. However, the agricultural use of the area is severely limited by its a rugged and dissected nature. We recommend a conservation status of data deficient (DD).

1 *Ruschia rupestris* Klak sp. nov. (Fig. 8)

Type: South Africa, Western Cape, 5 km east of Seweweekspoort on road to Bosluiskloof (-AD), 1110 m a.s.l., 3 Apr 2021, Klak 2854 (BOL, holo, barcode: BOL0232474).

Diagnosis: Differs from *Ruschia altigena* by a more upright habit and height of 15–25 cm (prostrate and < 15 cm tall in *R. altigena*). In addition, in *R. rupestris* endocarpal closing bodies are missing and the placentas form broad open hoods (only small closing bodies present in *R. altigena*).

Clump-forming dense succulent shrub 15–25 × 30–50 cm, with some prostrate branches and with erect flowering branches, basal part very woody, to 9 mm diam, internodes 4–15 × ± 4 mm, black or grey. Leaves opposite, trigonous, with rounded keel, tips pointed, dark, dirty green, spreading, fused into a sheath to 9 mm long, sheath without a line, 12–25 (–36) mm long, 4–6 mm broad and thick, old, blackened leaves drying up and persisting on plant for several years. Flowers solitary, 15–20 mm diam., pedicels short, 6–8 mm long, bracts at base of pedicel, to 4 × ± 1 mm, sepals 5.7–10 mm long, subequal, slightly succulent, without membranous margins; petaloid

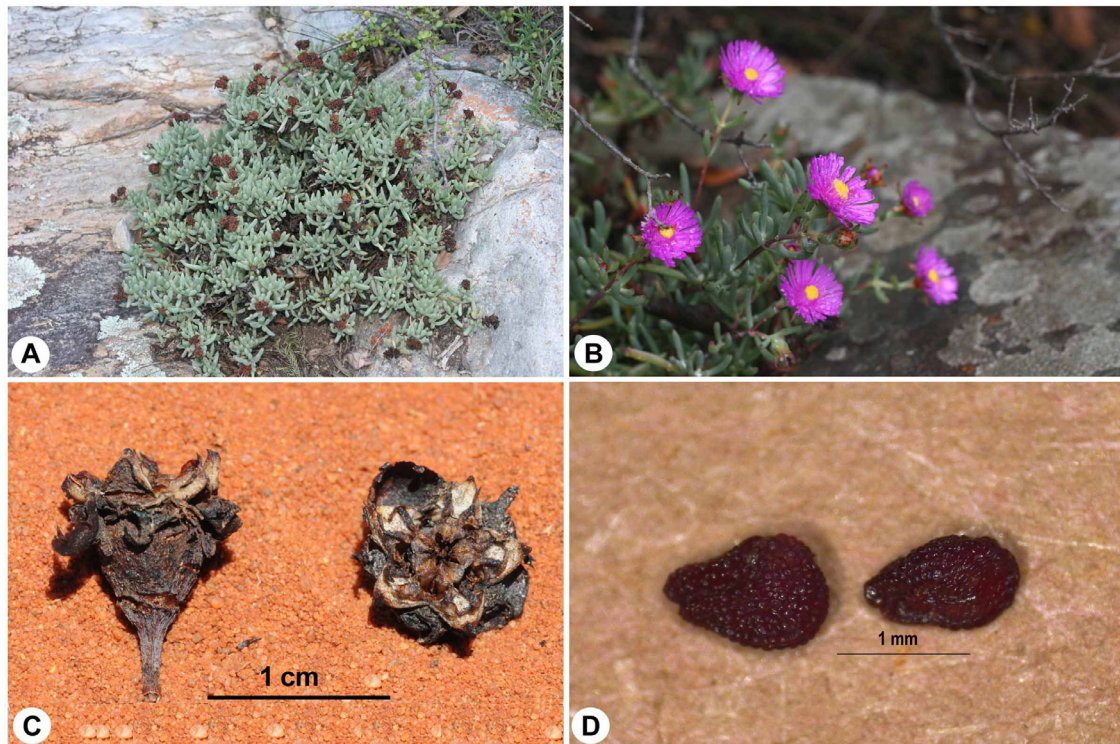


Fig. 9. *Lampranthus umbraticola*. A. Habit. B. Flowers. C. Side view of open (l) and top view of open fruit (r). D. Seeds.

staminodes magenta, 2–3-seriate, \pm same length, $6.5\text{--}9 \times 0.7\text{--}0.9$ mm, lanceolate to obtuse, filamentous staminodes few, collected in the center and about the same length as the stamens, $4.5\text{--}5.0 \times 0.1\text{--}0.2$ mm; stamens numerous, outer stamens \pm 5 mm long, in 4–5 rows, papillate at base, pollen white; stigmas 5, short, $3.2\text{--}3.5$ mm long, yellowish, top of ovary raised in the center to ± 1.2 mm; nectary forming green, crenulated ring. *Capsule* 5-locular, 6–8 mm diam., top raised to 2 mm, with low rims, lower part 4 mm deep and top-shaped, covering membranes firm, with inconspicuous ridge below, keels slender, widely separated at their bases, slightly lacerated in upper parts, long so that valves open into a horizontal position, closing bodies absent, placenta forming broad open hood detached at the top and from which funicles arise, valve wings absent. *Seeds* ochre, finely colliculate to almost smooth, $0.6\text{--}0.7 \times 0.5\text{--}0.6$ mm.

3.1.19. Distribution and ecology

The species is known from the Montagu and Ladismith districts (Fig. 4), on sandstones of the Witteberg-Series, either on lower slopes or on flat rocky areas, typically in the transitional area from sandstones to shales. These spots, at altitudes from 820 to 1060 m a.s.l., are rich in other succulent species. Flowering occurs from November to December.

3.1.20. Distinguishing features and relationships

Ruschia rupestris is closely allied to *R. altigena*. The two species differ in their habit: *R. rupestris* forms cushions with some prostrate branches and with erect flowering branches to 25 cm tall (Fig. 8A, B), whereas older plants of *R. altigena* form dense, spreading mats (Fig. 8C), where the flowering branches are less than 15 cm tall. *Ruschia altigena* occurs at higher altitudes, from ± 1300 to 1700 m a.s.l., on rocky sandstone outcrops within *fynbos*, where few other succulents are found. *Ruschia karrooica* (L.Bolus) L.Bolus, which is known from Matjiesfontein, near Laingsburg, may be a further close relative. The latter species has an erect habit, but shares the highly fused

leaves, solitary flowers and broad open hoods, instead of closing bodies.

3.1.21. Etymology

The epithet refers to the rocky habitats to which the species is confined.

3.1.22. Conservation status

Due to its preference for rocky habitats which are not arable, the absence of any mining activities in the area and the relatively wide occurrence, we suggest a status of Least Concern (LC).

3.1.23. Additional specimens investigated

South Africa. WESTERN CAPE: **3320 (Montagu)**: Witteberg, north aspect (-BC), 10 Nov. 1935, ± 3000 ft, F.M. Leighton s.n. (BOL, barcode 39865); Farm Varsbokkraal, entrance to Zuurkloof (-BD), 857 m a.s.l., 4 Apr 2021, Klak 2865 (BOL); 9 Aug 2013, Bruyns 12585 (BOL); **3321 (Ladismith)**: Farm Vleiland, entrance to kloof (-AC), 820 m a.s.l., 26 Jun 2021, Klak 2871 (BOL); Bosluiskloofpass (-AD), 1054 m a.s.l., 2 Sep 2008, Klak 1716 (BOL);

1 *Lampranthus umbraticola* Klak & Strydom, sp. nov. (Fig. 9)

Type: South Africa, Eastern Cape, between Steytlerville and Uitenhage, farm Kleinrivier, Springgatkloof (-CA), 450 m a.s.l., 7 Jan. 2022, Klak 3051 (BOL, holo, barcode: BOL0232473, NBG, iso).

Diagnosis: Differs from *Lampranthus coralliflorus* (Salm-Dyck) N.E. Br. by its smaller flowers (40–60 mm diam. in *L. coralliflorus*); from *L. stayneri* (L.Bolus) N.E.Br. by the fruits remaining open (fruits opening and closing repeatedly in *L. stayneri*) and by its equally-sized calyx lobes, all less than half the length of the petals (unequal in length, with two at least as long as the petals in *L. stayneri*).

Succulent cushion-forming or pendulous low shrub to 20×120 cm, stem and branches spreading-ascending, occasionally rooting at nodes, 30–60 cm long, woody, internodes smooth, brown, $15\text{--}30 \times \pm 2$ mm. *Leaves* subfalcate, terete, spreading, shortly fused

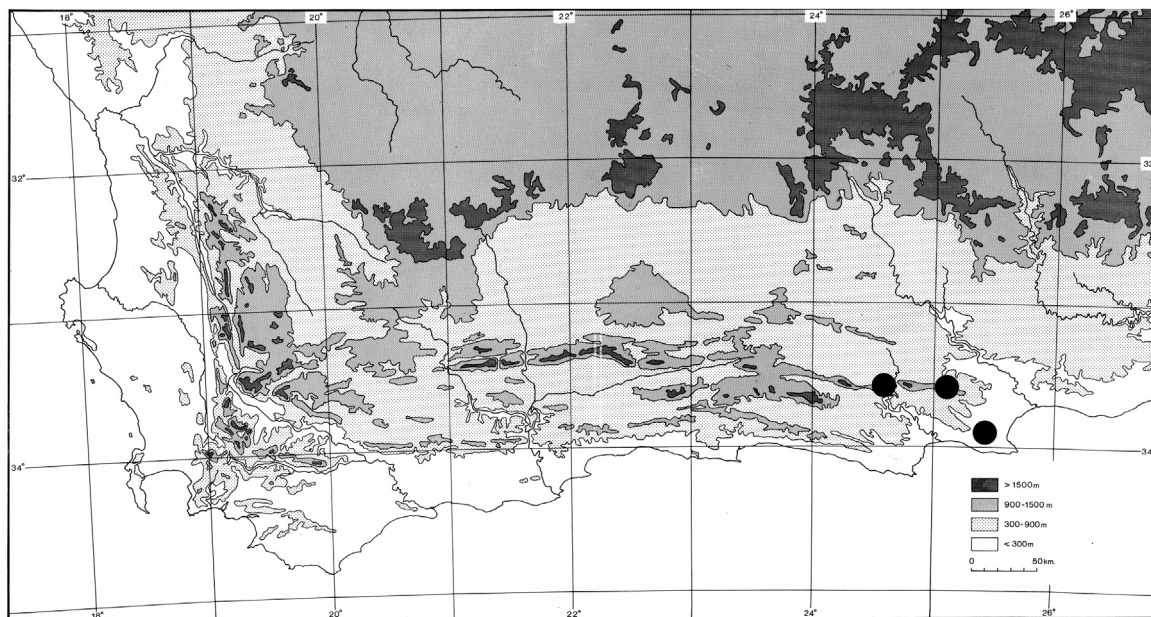


Fig. 10. Distribution of *Lampranthus umbraticola*.

at bases, epidermis smooth with wax covering, glaucous, apically suffused with reddish, 13–30 mm long, 3–4 mm broad and thick. Flowers mostly solitary or more rarely 2–3, 20–30 mm diam., pedicels short, 7–20 mm long, bracts at their middle, to 13 mm long; calyx lobes 5, somewhat cup-shaped, subequal, shorter than the petals, 3 with conspicuous membranous edge; petals magenta to pink, 2–3-seriate, outer row 16×1.5 mm, obtuse, often emarginate, inner rows shorter, to 7 mm long, filamentous staminodes in 1–2 row, collected into a cylinder around the stamens with tips recurved, 5×0.3 mm, papillate at base, filaments white, numerous, papillate toward the base, 4–5 mm long, pollen yellow; stigmas 5, slender, 3.5–4 mm long, subulate, smooth, top of ovary raised; nectary a conspicuous crenulated ring. Fruits 5-locular, dark rusty-brown, remaining open once opened, 8–10 mm diam., upper part to 3 mm high, rims low, lower part broadly funnel-shaped to bowl-shaped, to 8 mm deep, valve wings broad, keels diverging and not touching at bases, inner side of keel lacerated towards the tips, covering membranes firm, spongy, without additional closing devices below. Seeds dark brown, kidney-shaped, $1.2–1.3 \times 0.8–0.9$ mm, colliculate.

3.1.24. Distribution and ecology

Lampranthus umbraticola is known only from the Eastern Cape between Steytlerville and Uitenhage (Fig. 10). The plants prefer partially shaded, rocky, well drained soils in kloofs, within mesic vegetation but with many succulents, on shallow sandy soils derived from sandstones on outcrops of rocks or ledges on cliffs. It occurs at altitudes of 400–700 m a.s.l. The similar *L. stayneri* always prefers open habitats on soils derived from shales. The leaves in *L. umbraticola* vary greatly in size depending on the extent of exposure of the plant and the availability of water. Those at Vanstadensberg were only 13 mm long, whereas at Kleinrivier they reached 30 mm long. There are several species in the *Ruschieae* where the fruits, once opened by rain, do not close again. This includes *Scopelogena verruculata* (L.) L. Bolus, *Roosia* Van Jaarsv., as well as species of *Stoeberia* Dinter & Schwantes. Flowering takes place in January.

3.1.25. Distinguishing characters and relationships

Lampranthus umbraticola has a similar habitat and habit to *L. coralliflorus*, which also occurs in rocky situations and on ledges on cliffs in sandstone soils. The two species can be separated easily by their different flower-size: these are 4–6 cm diam. in *L. coralliflorus* and

only to 3 cm diam. in *L. umbraticola*. It should also not be confused with *L. stayneri*, in which the flowers are similar but are ternate, whereas they are mostly solitary in *L. umbraticola*. In addition, once expanded, the fruits remain open in *L. umbraticola*, whereas they open and close repeatedly in *L. stayneri*. A further difference is that in *L. stayneri* the calyx lobes are very unequal, with two of them often overtopping the petals, whereas in *L. umbraticola* they are all of equal size and are shorter than the petals.

There are also many similarities with *L. fugitans* L. Bolus, which is a low, spreading species that is found on sandstone rocks between East London in the Eastern Cape and Port Shepstone in Natal. However, the flowers of *L. fugitans* are always solitary and are considerably larger at 40–50 mm diam. In addition, *L. fugitans* differs by its prostrate habit, whereas *L. umbraticola* forms cushions with somewhat ascending branches.

3.1.26. Etymology

The epithet refers to the preference of this species for at least partially shaded positions.

3.1.27. Additional specimens investigated

South Africa. EASTERN CAPE: **3324 (Steytlerville)**: Blaauw Koppen 202, kloof on west side of Groot River Poort (–DA), 680 m a.s.l., 3 Nov. 1999, P. Desmet 2278 (BOL, NBG); **3325 (Port Elizabeth)**: Between Steytlerville and Uitenhage, farm Kleinrivier, Springgatkloof (–CA), 450 m a.s.l., 11 Jun 2021, L. Strydom 45 (BOL); Vanstadensberg (–CD), 415 m a.s.l., 8 Jul. 2021, E. Goosen sub L. Strydom 41 (BOL); Conservation status unknown.

3.2. Correction of lectotypification of *Ruschia indurata* (L. Bolus) Schwantes

Louisa Bolus (1922: 136) based her protologue for *R. indurata* on three different collections, all of which had been cultivated at Kirstenbosch for several years. An illustration was made by Mary Page in November 1917 of the type, showing a single clump, but citing all three collections at the top of this drawing as the voucher (Fig. 12). Noteworthy is that the three collections came from three widely separated localities. One is from the Western Cape, at Beaufort West (*Mathews sub NBG 2393/17*). The other two are from the Eastern

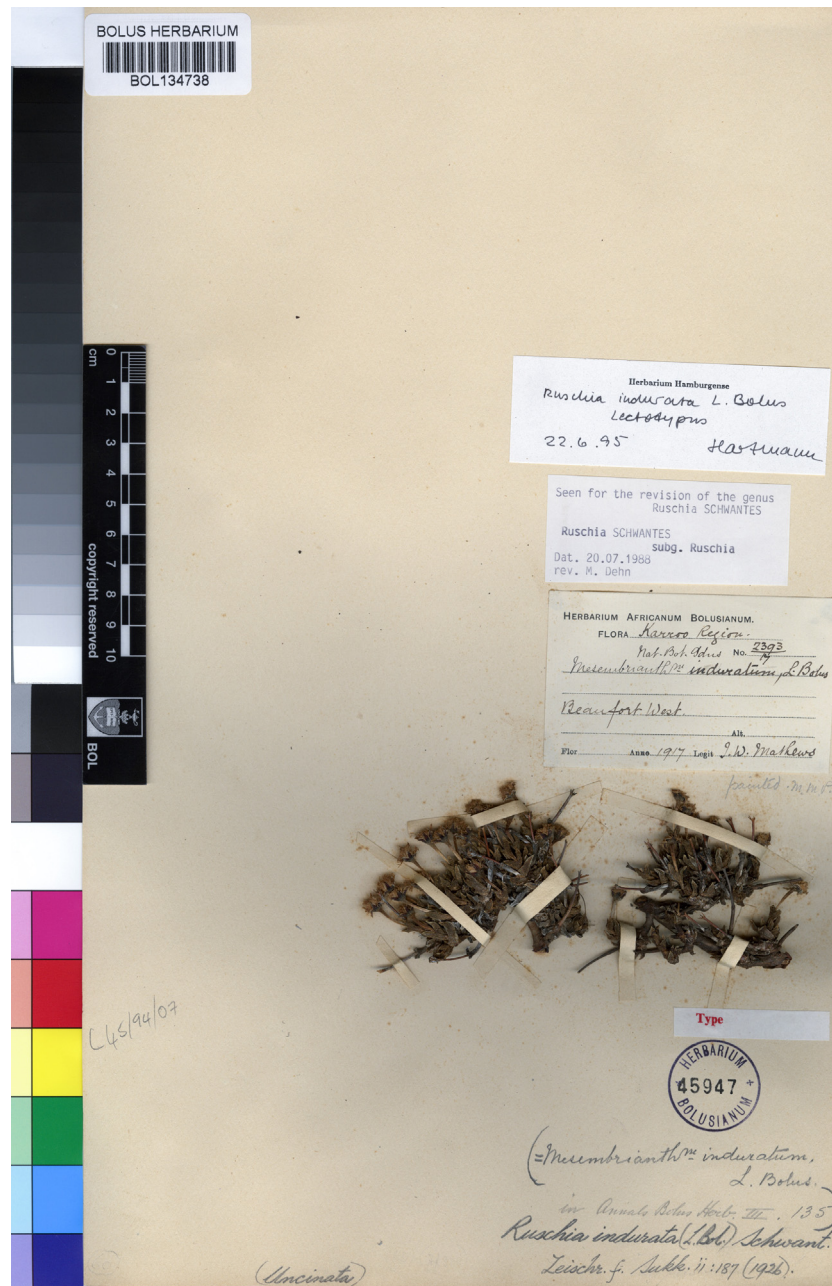


Fig. 11. Lectotype of *Ruschia indurata* designated by H.E.K. Hartmann on 22nd June 1995. Collection by J.W. Mathews sub NBG 2393/17 (barcode BOL134738) made at Beaufort West.

Cape, from Steytlerville (*E. Pillans* sub NBG 383/16) and from Steynsburg (*H. de Villiers* sub NBG 266/16).

Hartmann (1999: 53) indicated Pillans' collection from Steytlerville as the lectotype. However, neither Pillans' nor de Villiers' collections are in the Bolus Herbarium. Only one of the three syntypes, the collection by Mathews (Fig. 11), is in the Bolus Herbarium. An annotation on this sheet indicates that Hartmann selected this collection as the lectotype in 1995. We therefore conclude that Pillans' collection was cited in error by Hartmann (1999).

Recent field work in the Beaufort West area suggests that *Ruschia indurata* is a rare species, endemic to certain calcritic pavements on the floor of the valley. So far, only a few localities within the same calcrete formation near Beaufort West are known where this species occurs.

Ruschia indurata is one of several dwarf succulent species in subgenus *Ruschia*, which are characterized by enclosed internodes,

leaves that are toothy towards their apices and 5-locular capsules where the interior of the capsule disintegrates, so that soon only five pungent bundles remain on the stalk and project above the plant (Fig. 13A).

Bolus (1931: 241) noted that *Ruschia pulvinaris*, which was based on the gathering *R. du Plessis* sub NBG 2004/29 from Steynsburg, is very similar to *R. indurata*. The overall dimensions of the two species are superficially similar, but *R. indurata* differs from *Ruschia pulvinaris* by its more compact habit (Fig. 13A, B) and its smaller leaves (4–8 (–10) mm long in *R. indurata*, to 13 mm long in *R. pulvinaris*). Although plants of *R. pulvinaris* also form cushions, these cushions are much larger and older plants often spread to 50 cm diam. (Fig. 13D). Noteworthy is also the difference in the color of the leaves, which is a glaucous-green in *R. pulvinaris* as opposed to whitish-grey in *R. indurata*. The whitish-grey color of the leaves is typical for several species in the tribe Ruschieae that are endemic to calcretes and



Fig. 12. Illustration of *Ruschia indurata* (*Mesembryanthemum induratum*). Here three collections are cited (top corner), as in the protologue. Artist: M.M. Page.

limestones (e.g. *Antimima lawsonii* (L.Bolus) H.E.K.Hartmann, *Lamp-ranthus ceriseus* (L.Bolus) L.Bolus and *Ruschia calcicola* (L.Bolus) L. Bolus).

Ruschia pulvinaris grows in shallow soil overlying slabs of shale at altitudes of around 1450–1460 m a.s.l. (higher than the 900 m a.s.l. recorded for *R. indurata*). Despite superficial similarities, the two species show important differences in their ecological niches.

Closely related is also *Ruschia rigens* L.Bolus, from the Bloemfontein area in the Free State. This shares the characteristics of the leaves and inflorescences, but forms more substantial cushions to 15 cm tall and has longer and thicker leaves, 25–30 × 4 mm. All three species flower from late spring into summer, from October to December.

Our field work around Beaufort West and an investigation of herbarium specimens at BOL and NBG show that no similar species to *R. indurata* have been recorded from this area. We therefore conclude that the application of the name *R. indurata* must refer to the species which is endemic to the calcretes near Beaufort West. We believe that Bolus was mistaken that the collection from Steynsburg is the same as that from Beaufort West. As Pillans' collection from Steytleville is not at BOL, the identity of the species remains uncertain and requires further investigation.

Due to the confusion surrounding this species, we provide a detailed description below.

Ruschia indurata (L.Bolus) Schwantes, Z. Sukkulantenk. 2: 187 (1926). *Mesembryanthemum induratum* L.Bolus, Ann. Bolus Herb. 3: 135 (1922).

Lectotype (cited erroneously by Hartmann in 1999 in Bradleya 17: 53 and corrected here): [South Africa, Western Cape], Beaufort West, 1917, J.W. Mathews sub NBG 2393/17 (BOL!, barcode BOL134738, Fig. 11).

Densely branched dwarf succulent forming low cushions 3–5 × 5–12 cm, becoming woody at base, internodes not visible. Leaves opposite, grey, trigonous, fused into a sheath to 1 mm long, free parts spreading, keeled on the back, 4–8 mm long, ± 2 mm broad and thick, with 1 conspicuous tooth below the apex, tips pointed, epidermis smooth and with dark dots below surface. Flowers solitary, pink, to 15 mm diam., almost sessile, pedicel to 5.5 mm long, calyx lobes 5, to 3 mm long, about equal length, 2 slightly succulent, petaloid staminodes in 2 rows, to 6.5 × 0.7 mm, filamentous staminodes in 2 rows, 3.5–4 × 0.5 mm, filamentous staminodes and stamens free to bases, of about equal length and collected into cone around center, with hair-like papillae in lower third, pollen yellow, stigmas

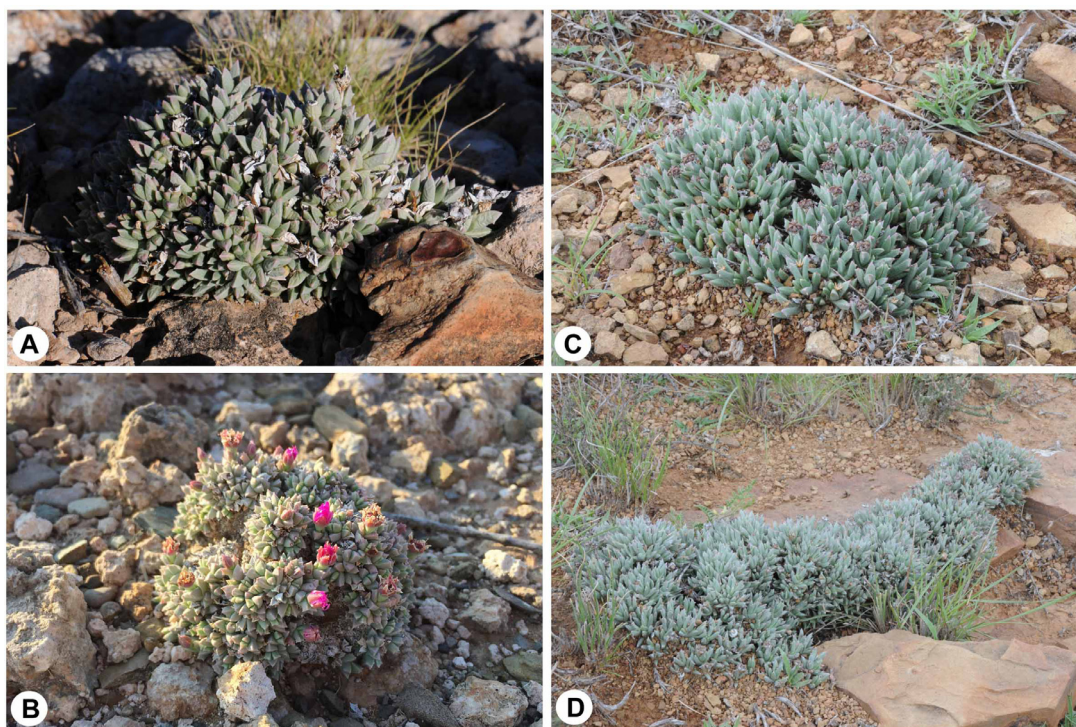


Fig. 13. Habit of *Ruschia indurata* (A, B) and *R. pulvinaris* (C, D). *Ruschia indurata* forms dense cushions only, occasionally with short side branches extending beyond the cushion (A), whereas old plants of *R. pulvinaris* may spread and form extensive, much laxer cushions (D).

5, slender, yellow-green, ± 3.5 mm long, nectary a distinctly green crenulated ring. Capsule 5-locular, interior disintegrating so that only five pungent bundles on persistent fruit stalk remain and project above the plant, ± 6 mm diam., rims raised to ± 1 mm, lower part funnel-shaped, to 3 mm deep, covering membranes flexible, with distinct ledge below, keels slender, short, diverging and not touching at bases, valves opening into erect position, closing bodies hook-shaped, valve wings absent. Seeds ochre, $\pm 0.9 \times 0.7\text{--}0.8$ mm, somewhat D-shaped, almost smooth.

3.2.1. Distribution and ecology

Ruschia indurata is restricted to pavements of calcrete near Beaufort West, in the Western Cape (Fig. 14), at around 900 m a.s.l. Flowering is from November to December.

3.2.2. Distinguishing features and relationships

Ruschia indurata is a highly compact dwarf succulent which forms a dense cushion in which the internodes are not visible on the branches (Fig. 13A, B). The leaves persist and are whitish grey. *Ruschia indurata* is related to *R. rigens* L. Bolus and *R. pulvinaris* L. Bolus and all three species are characterized by triquetrous, sharply pointed leaves, with a conspicuous subapical tooth. In all three the flowers are solitary and the fruits soon fall out of their bases after ripening, leaving the firm stalk and five pungent bundles projecting above the plant in their places. *Ruschia indurata* is the smallest in stature of these three species (see discussion above).

3.2.3. Conservation status

The area where *Ruschia indurata* occurs is threatened by the extension of an additional Eskom Powerline. Due to the highly specialized habitat, the proximity to Beaufort West and subsequent urbanization, we recommend a status of threatened.

3.2.4. Additional specimens investigated

South Africa. WESTERN CAPE: **Beaufort West (3222)**: Farm Steenbokkies (-BC), 10 Jan. 2013, 890 m a.s.l., Klak 2171 (BOL).

C. Re-instating *Antimima lawsonii*, *Erepsia aristata* and *Esterhuysenia knysnana* in *Ruschia*.

Molecular and morphological investigations in *Ruschia* led to the discovery that three species previously placed in *Ruschia*, which were later transferred to other genera, need to be re-instated in *Ruschia* as they group closely with members of *Ruschia* (Klak et al. in prep). We re-instate these species here (prior to the publication of our molecular analysis of *Ruschia*) as they share numerous striking morphological attributes and phylogenetic relationships with two of the species discussed above, namely *Ruschia indurata* and *R. joubertiniana*. A detailed discussion on the subgenera of *Ruschia* based on both molecular and morphological characters, as well as a full list of the membership and diagnostics for each subgenus will be given by Klak et al. (in prep).

1 *Ruschia lawsonii*

(L.Bolus) L.Bolus had been transferred to *Antimima*, as *Antimima lawsonii* (L.Bolus) H.E.K. Hartmann, with some apparent hesitation as it grows far from any other member of *Antimima* and also lacks the characteristically large closing bodies of *Antimima* (Hartmann, 1998). This species falls within the typical distribution range of *Ruschia*, which extends over large parts of southern Africa, including its summer rainfall areas (Hartmann, 2017c). In addition, *R. lawsonii* possesses the smaller closing bodies which are diagnostic for *Ruschia* (Hartmann, 1998). Superficially, *R. lawsonii* (Fig. 15) closely resembles *R. indurata* (Fig. 11). Both species form compact cushions where the internodes are hidden. The leaves in both species are whitish grey, but *R. indurata* has several small teeth along the keels of its leaves (Fig. 11), whereas in *R. lawsonii* (Fig. 15) the leaves are apically sharply pointed but without any teeth along the keels.

Both species are restricted to outcrops of calcrete. Like *R. indurata*, *R. lawsonii* is rare and is only known from a few collections near Kimberley (Fig. 14). Here we re-instate *Antimima lawsonii* (L.Bolus) H.E.K. Hartmann in *Ruschia* and place it in subg. *Ruschia* in accordance with the results of our molecular analysis (Klak et al., in prep.).

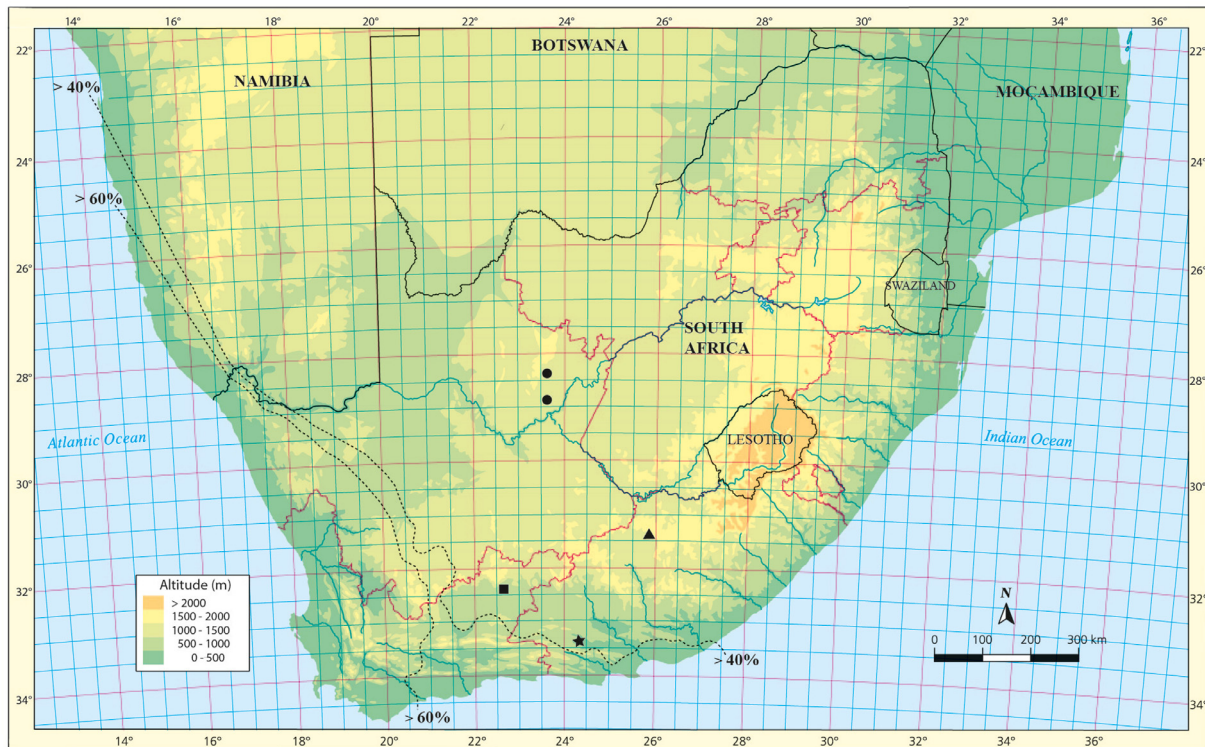


Fig. 14. Distribution of *Ruschia indurata* (square) and *R. lawsonii* (circle). Missing syntype collections of *R. indurata*, which are likely to refer to other species, are indicated: *H. de Villiers* sub NBG 266/16 from Steynsburg (triangle) and *E. Pillans* sub NBG 383/16 from Steytleville (star).

Ruschia lawsonii (L.Bolus) L.Bolus, Notes Mesembryanthemum [H.M.L. Bolus] 3: 219 (1950), *Mesembryanthemum lawsonii* L.Bolus, Annals of the Bolus Herbarium 4: 85 (1927), *Antimima lawsonii* (L. Bolus) H.E.K. Hartmann, Bothalia 28: 74 (1998). Type: South Africa, Kalahari Region, Hay division, Papkuil (2823BC), Aug. 1912, *L. Lawson* s.n. sub BOL18551 (BOLI, barcode: BOL129312).

3.2.5. Additional specimens investigated

South Africa. NORTHERN CAPE: **2823 (Griekwastadt)**: Postmasburg, farm Silverstream (-BC), 5 Jan. 2016, *Klak 2508* (BOL); 15 km NNW of Campbell (-DC), *Haumann* s.n. (BOL).

1 *Ruschia aristata*

L.Bolus was transferred to *Erepsia* Section *Crassifoliae*, as *Erepsia aristata* (L.Bolus) Liede & H.E.K. Hartmann, on account of several similarities with this section of *Erepsia* (Hartmann, 1998). Striking similarities with *Erepsia* include the multi-locular fruits (i.e., with (9–)10 (–13) locules), the absence of closing bodies and petals which curve over the centre of the flower (Hartmann, 1998). Typical features of *Ruschia* are fruits with 5 (–6) locules and small closing bodies and flowers where the filamentous staminodes are gathered around the stamens into a central cone. However, several species in *Ruschia* associated with subg. *Cymbifoliae*, also lack closing bodies. In *R. aristata* the uppermost parts of the placentas are detached and form open hoods, whereas in *Erepsia* the upper portions of the placentas are not detached. In *R. aristata* the flowers are solitary and showy (to c. 30 mm diam.) and their many filamentous staminodes curve over the centre of the flower. Notably, there is no hypanthium in *R. aristata* (Fig. 16). The presence of a hypanthium 0.7–2 mm high is a diagnostic feature for *Erepsia* (Liede, 1989). The notable absence of a hypanthium in *R. aristata* appears to have been overlooked when this species was transferred to *Erepsia* (Hartmann, 1998). Furthermore, this species is only found in the Eastern Cape (Fig. 7). This contrasts strongly with the restriction of all other species of *Erepsia* to the

south-western Cape (Liede, 1989) and also casts doubt on whether *R. aristata* is correctly placed in *Erepsia*.

Ruschia joubertiniana (see above) and also *R. staminodiosa* L.Bolus share the “odd” flowers and fruits with *R. aristata*, except that in *R. staminodiosa* the fruits are 5-locular (Hartmann, 2017c). Our molecular phylogeny places these three species in one clade with other members of *Ruschia* (Klak et al., in prep.), which shows that locule-number may range from 5 to 12 in some clades of *Ruschia*. This is similar to the range of locules observed in *Erepsia* (5–13 locules, Liede, 1989) or even in smaller genera such as the bitypic *Hartmanthus* S.A. Hammer (where the fruits have either 5 or 8–10 locules, Hammer and Hartmanthus, 1995). We therefore re-instate *Erepsia aristata* in *Ruschia* and place it in subg. *Cymbifolia*.

Ruschia aristata L.Bolus, Notes Mesembryanthemum 2: 369 (1932), *Erepsia aristata* (L.Bolus) Liede & H.E.K. Hartmann, *Bradleya* 16: 64 (1998). Lectotype (selected by Hartmann 2017: 566): *Harcourt-Wood 235* (BOL 45918, barcode: BOL132173).

3.2.6. Additional collections investigated

South Africa. EASTERN CAPE: **3325 (Port Elizabeth)**: Uitenhage div., Groendal (-CB), Sep. 1939, *J.R. James* (BOL); 27 Feb. 2021, *L. Strydom 9* (BOL); Chases Kloof (-CB), 4 Dec. 1974, *E. Blake* s.n. (BOL).

1 *Ruschia knysnana*

(L.Bolus) L.Bolus was transferred to *Esterhuysenia* by van Jaarsveld, 2017 based on the “presence of apiculate leaves, the absence of valve wings and long awns at the end of expanding keels”. However, both its morphology and its distribution made the placement of *R. knysnana* in *Esterhuysenia* uncertain (van Jaarsveld, 2017). Aberrant characteristics of *R. knysnana* from typical members of *Ruschia* are the 6-locular fruits (though the fruits are 5-locular in all other *Esterhuysenia*) and the absence of closing bodies. Like *E. aristata*, *E. joubertiniana* and *E. staminodiosa*, the upper part of the placenta is slightly

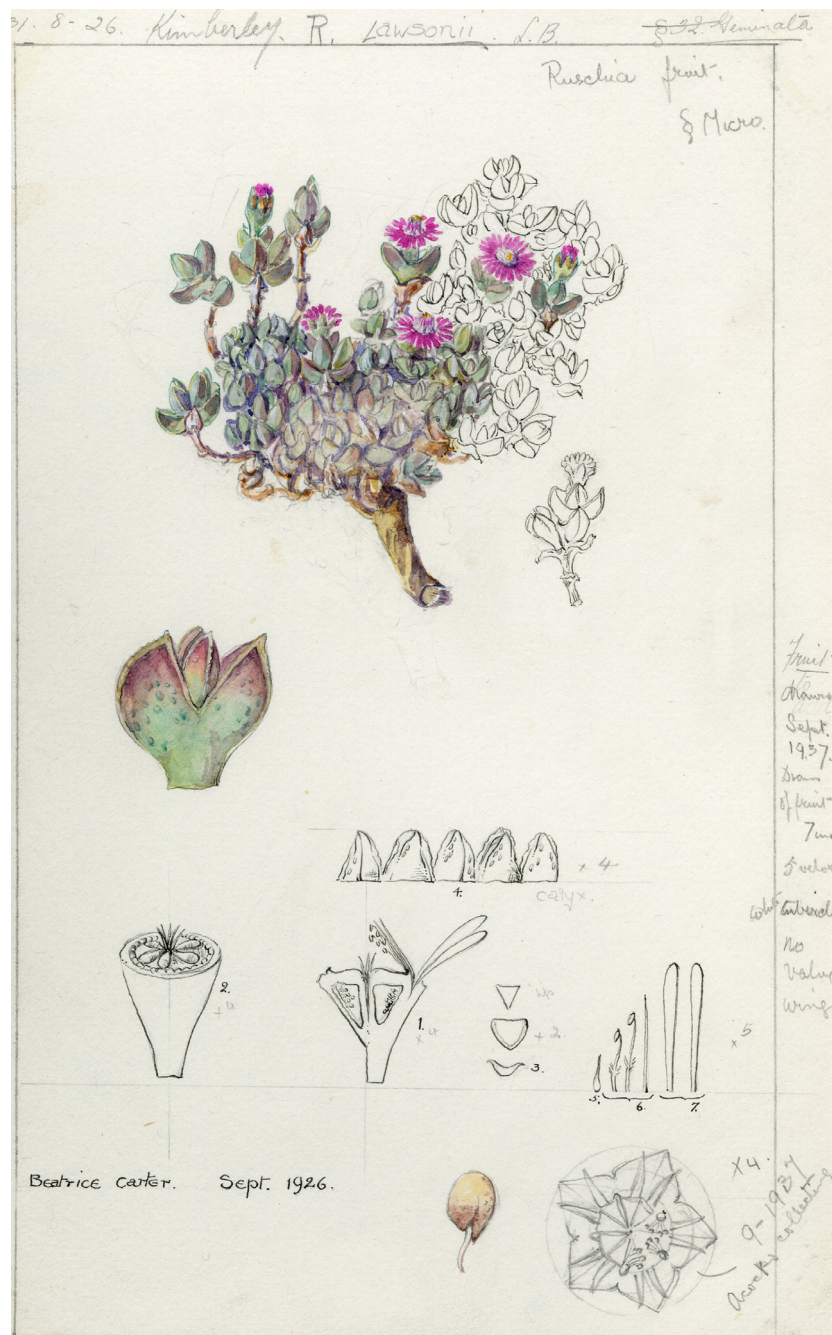


Fig. 15. Illustration of *Ruschia lawsonii*. Artist: B. Carter.

detached (van Jaarsveld, 2017), but the filamentous staminodes do not curve over the centre of the flower in *R. knysnana* (Fig. 17). A further important feature which the four species share are the way the leaves are attached to the branch. Notably, the leaves are not fused into a sheath, but are separated at their bases so that a triangle is formed between the pair of leaves and the branch (Fig. 6, Figs. 16 and 17). The importance of the leaves was recognized by Dehn (1992), who based his subgeneric classification of *Ruschia* primarily on morphology of the leaves and only then followed by inflorescence characters. In all species of *Esterhuysenia* the leaves are fused towards their bases, so that the old leaves typically remain on the plant once they have dried up. In addition, as in the case of *R. aristata*, *R. knysnana* occurs (Fig. 7) considerably further to the east of the other species of *Esterhuysenia*, which are confined to the south-western Cape. We re-

instated *Esterhuysenia knysnana* in *Ruschia* and place it in subg. *Cymbifolia* on account of its leaves, fruits and flowers (Dehn, 1992).

Ruschia knysnana (L.Bolus) L.Bolus, Notes Mesembryanthemum 1: 146 (1928), *Mesembryanthemum knysnanum* L.Bolus, Annals of the Bolus Herbarium 4: 97 (1927), *Esterhuysenia knysnana* (L.Bolus) van Jaarsv., Ill. Handb. Succ. Pl. Aizoaceae, ed. 2 1: 582 (2017). Lectotype (selected here): Knysna (3423AA), Feb. 1924, Duthie 671 (BOL, barcode: BOL134786). *Ruschia knysnana* (L.Bolus) L.Bolus var. *angustifolia*, Notes Mesembryanthemum 1: 146 (1928). Lectotype (selected here): Humansdorp div., Uitvlugt (3324CD), 2000 ft., Feb. 1924, Fourcade 2971 (BOL, barcode: BOL134793).

3.2.7. Additional collections investigated

South Africa. WESTERN CAPE: **3321 (Ladismith)**: Garcias Pass, Waterfall valley (-CC), 609 m a.s.l., 7 Dec. 1980, P.A. Bean 523 (BOL);



Fig. 16. Illustration of *Ruschia aristata*. Artist: B. Carter.

3322 (Oudtshoorn): Kammanassie Mountains (-DB), 8 Aug 1983, P.A. Bean 1186 (BOL); E of Montagu Pass on road to Uniondale, hill N of Eensaamheid (-DB), 16 Jul. 1980, P.A. Bean 382b (BOL); **3423 (Knysna):** Kafferskop Bosreservaat (-AB), 230 m a.s.l., 5 Jan. 2022, Klak 3041 (BOL);

EASTERN CAPE: 3323 (Willowmore): Farm Tweefontein (-BB), 800 m a.s.l., 12 Dec. 2001, Bruyns 8955 (BOL); Nuwekloof Pass (-BC), 3

Dec 2006, Klak 1424a (BOL); 8 miles south-west of Uniondale (-CA), 3 Sep. 1951, Acocks 16028 (BOL); Prince Alfred's Pass, 1 km north of Diep River Heights (-CC), 300 m a.s.l., 26 Jan. 2006, Klak 1174 (BOL); De Vlugt (-CC), J.F.V. Phillips 1196 (BOL); Buffels Nek (-CC), Fourcade 1262 (BOL); Avontuur (-CC), 1 Apr. 1969, Liebenberg s.n. (BOL); Near Kouga Peak and Smutsberg (-DB), 14 Nov. 1944, E. Esterhuysen 11031 (BOL); 5 km north-east of Kransfontein (-DD), 410 m a.s.l., 7 Jan.



Fig. 17. Illustration of *Ruschia knysnana*. Artist: M.M. Page.

2008, *Klak 1585* (BOL); 3 km east of Joubertina - Onder Kouga (-DD), 500 m a.s.l., 25 Oct 2018, *Bruyns 13540* (BOL); **3324 (Steytlerville)**: Baviaanskloof, Geelhoutbos (-CA), 370 m a.s.l., 28 Jan. 2006, *Klak 1183* (BOL); 14 km east of Geelhoutbos (-CB), 436 m a.s.l., 31 Jan. 2006, *Klak 1196* (BOL); Kouga hills (-CC), 12 Nov. 1941, *E. Esterhuysen 6747* (BOL); Rietvlei (-DC), 11 Nov. 1941, *E. Esterhuysen 6744* (BOL); **3325 (Port Elizabeth)**: Kirkwood area, Kabouga (-AD), 800 m a.s.l., 26 Aug. 2000, *Bruyns 8408* (BOL); Van Stadens Gorge (-CC), *A. Grant sub NBG182/27* (BOL); Godetia Drive (-DC), 103 m a.s.l., 8 Jan. 1922, *Klak 3054* (BOL); **3424 (Humansdorp)**: Witteelsbosch (-AA), *Fourcade*

2976 (BOL); Between Clarkson and Palmiet Vlei (-AB), 228 m a.s.l., 1 Apr. 1924, *Fourcade 2993* (BOL); Kromme River (-BB), 1 Apr. 1924, *Fourcade 2991* (BOL).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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