

Three new species and two new combinations in the Aizoaceae from the Western and Northern Cape of South Africa

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Abstract

Three new species of Aizoaceae from the Western Cape are described. *Octopoma tanquam* Klak and *Vlokia montana* Klak are dwarf shrubby or mat-forming succulents which belong to the Ruschieae in the Ruschioideae. *Mesembryanthemum knolfonteinense* Klak of the Mesembryanthemoideae is a geophyte. *Octopoma tanquam* inhabits relatively low lying arid areas within the Tanqua Karoo and the Little Karoo and is thought to be closely allied to the two species of *Octopoma* found in the Little Karoo. Both *V. montana* and *M. knolfonteinense* grow at relatively high altitudes within the fynbos biome. In addition, *Ruschia littlewoodii* L.Bolus is transferred to *Phiambolia*, and two new combinations are made in *Antimima* for *Ruschia hexamera* L.Bolus and *Ruschia radicans* L.Bolus.

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1. Introduction

The tribe Ruschieae of Aizoaceae subfamily Ruschioideae incorporates ±1560 species of shrubby succulents (Hartmann, 2001), predominantly found within the Succulent Karoo region of Southern Africa. Although the tribe has diversified extensively in the more arid parts of the winter rainfall region of the Succulent Karoo, there are currently 550 species of Ruschieae listed as occurring in the more mesic Cape Flora (Goldblatt and Manning, 2000). However, within the Cape Flora the majority of the Ruschieae prefer more arid places at lower altitudes, often shales, and only a few species are found at high altitudes in fynbos vegetation, including *Esterhuysenia alpina* L.Bolus or *Vlokia ater* S.A.Hammer. These species are frequently covered with snow during the winter.

Subfamily Mesembryanthemoideae, which is sister to the Ruschioideae, comprises the single genus *Mesembryanthemum*, with 102 species (Klak et al., 2007). Mesembryanthemoideae, in contrast to the Ruschieae, includes annual species as well as perennials, among which nine have evolved a geophytic life form. Of these, eight belong to the *Phyllobolus* group, with the ninth, *M. rapaceum* L., in the *Psilocaulon* group. In this

contribution, one new species from the Tanqua Karoo, one from the Swartruggens Mountains along on the southwestern margin of the Tanqua and a third from the Keeromsberg northeast of Worcester are described. All measurements and observations are based on mature leaves, fresh flowering material and mature capsules. Specimens from BOL and NBG were examined for this study (acronyms follow Holmgren et al., 1990).

2. Species treatments

2.1. Mesembryanthemum knolfonteinense, Klak sp. nov., a *M. resurgente*, floribus cum staminodeis filamentis, genitalis non occultis, seminibus non cristatis, a *M. oubergense* planta grandiore et floribus grandioribus, seminibus non cristatis differt

Type: South Africa, Western Cape, Swartruggens, farm Knolfontein, Grasberg (3219DC), 1180 m, 14 September 2008, Klak 1770 (BOL, holo.).

Deciduous, clump-forming geophyte, 20–45 × 60–120 mm, with carrot-shaped tuber 130–190 × 10–20 mm; stems weakly lignified, very short and not clearly visible. Leaves decussate, slightly alternate in inflorescence, subcylindrical to dorsiventrally flattened, 19–25 × ±3 mm, mesomorphic, bladder cells not prominent. Inflorescence 1(–3)-flowered, pedicels 7–9 mm

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long. *Flowers* with 5 sepals, 35–42 mm diam., petals and filamentous staminodes cream-coloured, reproductive parts exposed. *Androecium* fused into a tube, pollen yellow. *Gynoecium*: placentation axile; *stigmas* 5, long and slender, apically recurved, ± 5 mm long, yellowish. *Fruits* 5-locular, top raised ± 4 –6 mm tall, lower part shortly funnel-shaped, ± 5 mm long, open fruit 18–20 mm diam., closed fruit 9–11 mm diam., valve wings present and inflexed over the valves, without seed pockets. *Seeds* D-shaped, 1.6–1.8 mm long, without a crest, dark brown, testa scalariform-colliculate.

2.1.1. Ecology and distribution

Mesembryanthemum knolfonteinense (Fig. 1) is so far only known from the top of the Grasberg in the Swartruggens Mountains (Fig. 2), where it was first collected by Ivor Jardine. The plants grow in flat, open patches of shallow ground, between low outcrops of sandstone in arid fynbos, in which other succulent elements such as species of *Crassula* and

members of the *Ruschieae* also abound. Since they occur at an altitude of nearly 1200 m, the plants may be covered with snow during the winter.

In 2008 plants begun flowering in October and continued to December (Fig. 3). Mature fruits (Fig. 4) were collected at the end of March 2009. By this time all of the leaves had withered, but the fruits remained on the plants.

2.1.2. Discussion

The tuberous root, the seed surface structure and the floral morphology place *M. knolfonteinense* in the *Phyllobolus* group of species (Klak et al., 2007). The three species *M. knolfonteinense*, *M. resurgens* and *M. oubergense* are all clump-forming geophytes with very short stems and only the leaves visible above the ground. They cannot be mistaken for any of the other geophytic species of *Mesembryanthemum*, which have a prostrate to decumbent or scrambling habit (Gerbaulet, 1997). In terms of overall size of the plant, *M. knolfonteinense*



Fig. 1. Type of *Mesembryanthemum knolfonteinense* Klak, Klak 1770 (BOL).

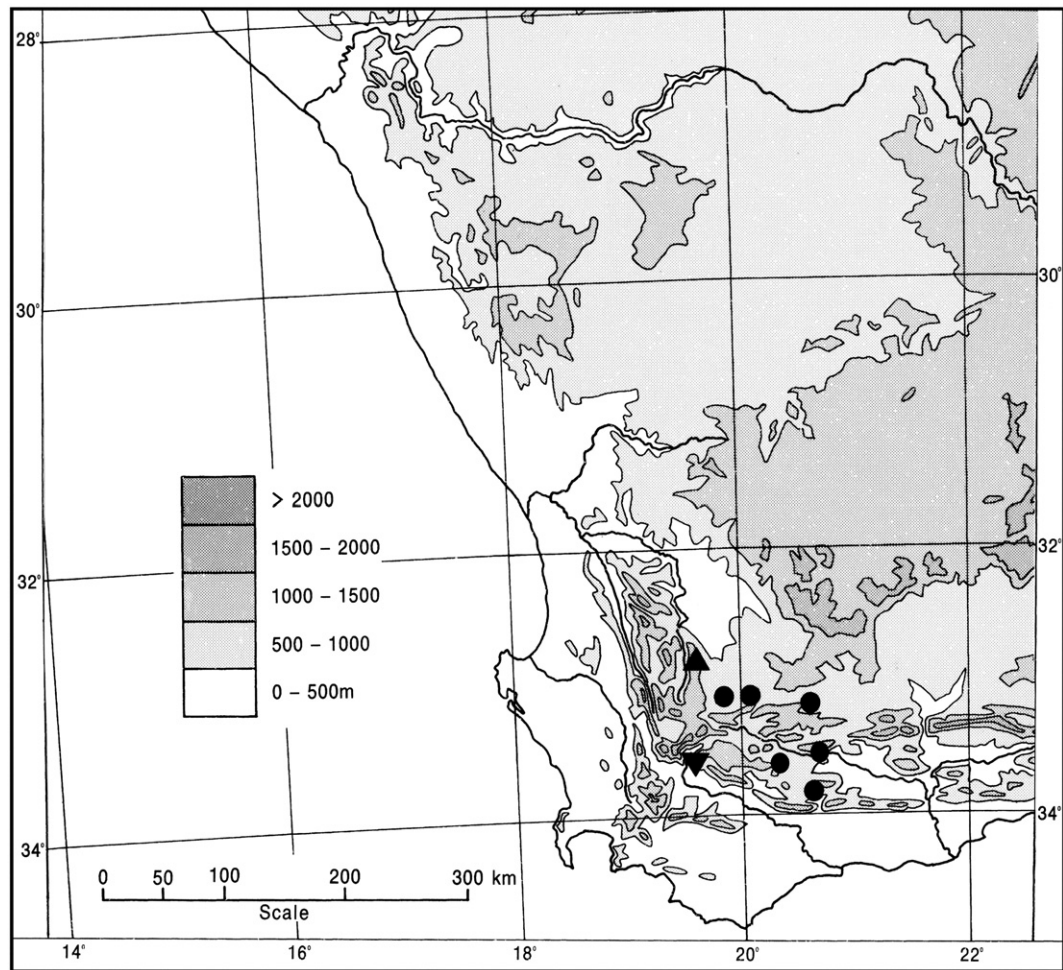


Fig. 2. Map showing the distributions of *Mesembryanthemum knolfonteinense* (▲), *Octopoma tanquanum* (●) and *Vlokia montana* (▼).

is most similar to *M. resurgens* (20–45 × 50–110 mm), but differs from that species considerably in its floral morphology. In *M. resurgens* the reproductive parts are hidden by the petaloid staminodes and there are no filamentous staminodes, but in *M. knolfonteinense* the stamens and stigmas are visible and filamentous staminodes are present (Fig. 2). Further distinguish-

ing characters between *M. knolfonteinense* and *M. resurgens* are found in the leaves, which are decussate in *M. knolfonteinense*, but alternate in *M. resurgens*. The third of the clump-forming species, *M. oubergense*, is overall a more delicate plant (10–30 × 25–40 mm). Although similar to *M. knolfonteinense* in floral and leaf morphology, the maximum flower size in *M. oubergense*



Fig. 3. *Mesembryanthemum knolfonteinense* in flower, Klak 1770 (BOL). Photo: P.V. Bruyns.



Fig. 4. Top view onto open fruit and side view of fruit of *Mesembryanthemum knolfonteinense*, Klak 1770 (BOL). Photo: P.V. Bruyns.

is ± 30 mm in diameter (Gerbaulet, 1997) versus 35–42 mm diam. in *M. knolfonteinense*. The seeds of *M. knolfonteinense* also lack the crest that is characteristic of both *M. resurgens* and *M. oubergense* (Gerbaulet, 1997).

In addition, flowering in *M. oubergense* (September) and *M. resurgens* (July to September) begins earlier than in *M. knolfonteinense*, which flowers from October to December.

The relationships among the species of the *Phyllobolus* group were poorly resolved and supported in the molecular analysis by Klak et al. (2007), and the relationships of the geophytic species to the others within this group remain uncertain.

The distribution of *M. resurgens* is quite extensive and it has been recorded from the Kamiesberg across the Bokkeveld and Roggeveld Escarpments and the Moordenaarskaroo to Matjiesfontein. In the northern part of its range *M. resurgens* occurs in areas receiving relatively high rainfall, whereas in the south-easterly parts of its range the records are from areas with substantially lower rainfall. Whereas the distribution ranges of *M. resurgens* and *M. oubergensis* are mainly found within the Succulent Karoo region (Gerbaulet, 1997), *M. knolfonteinense* is found at the northeastern margin of the Cape Floral Region. All three species are always found on shallow soils.

2.1.3. Etymology

The plant has been named after the farm Knolfontein, where it was discovered. The word *knol* means tuber or bulb in

Afrikaans and is descriptive of the habit of *M. knolfonteinense* as well as many other species in the area.

Additional material examined: South Africa, Western Cape, Knolfontein, top of Grasberg (3219DC), 1 Oct. 2009, Jardine 1184 (NBG).

2.2. *Octopoma tanquamum*, Klak sp. nov., an *O. octojugo* *O. quadrisepaloque fructibus cum 6 loculis et alis valvae latioribus differt*

Type: South Africa, Western Cape, Tanqua Karoo, 7 km west of Matjiesfontein, Farm Aasvoëlbos (3320BA), 26 May 2007, Bruyns 10797 (BOL, holo.!).

Densely branched dwarf succulent shrublet to ± 80 mm tall. **Stems** woody, branching from base, to 5 mm thick, internodes ochre to greyish, 4–6 mm long. **Leaves** basally connate, surface smooth, free parts spreading and somewhat trigonous in cross-section, acute without apical tooth or mucro, keels finely denticulate. **Inflorescence** 1-flowered, bracteoles embracing the base of the flower. **Flowers** to 27 mm diam., petals and filamentous staminodes cream-coloured, inner petals shorter than outer, filamentous staminodes collected into a cylinder around the stamens, all elements epapillate or the inner with few, short papillae. **Fruits** 6-locular, top convex with low rims, base funnel-shaped, closing bodies largish, valve wings broad, broadest at their middle, without additional closing devices below covering

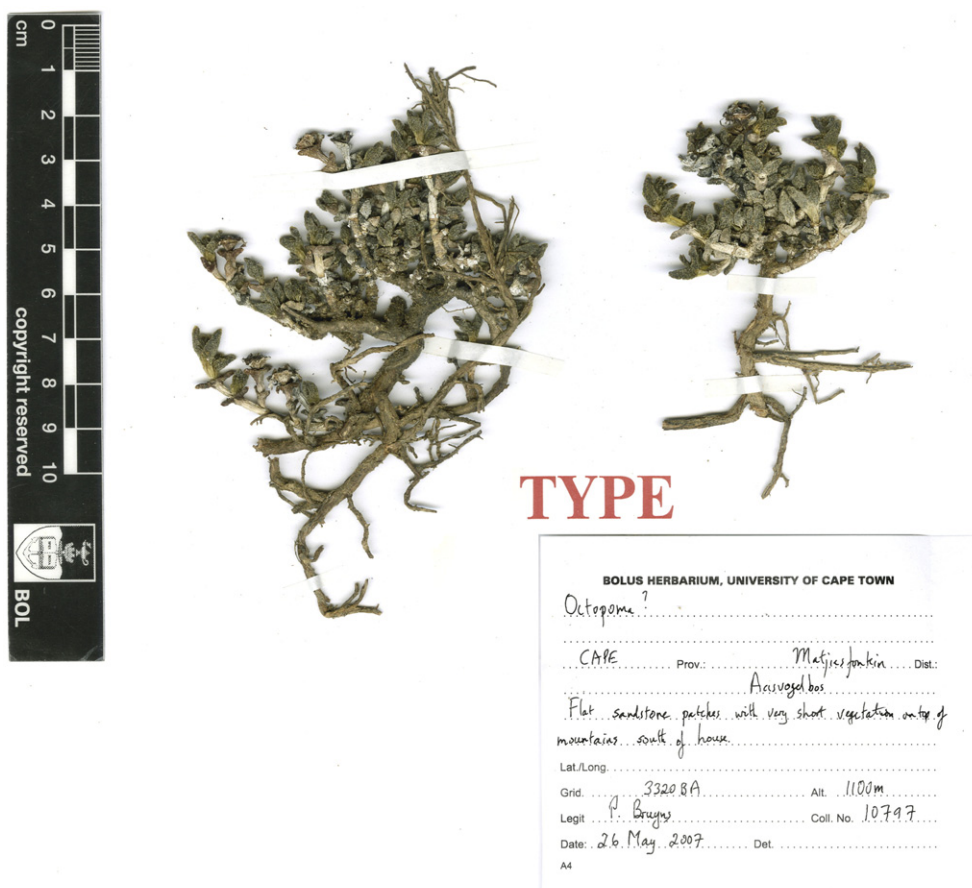


Fig. 5. Type of *Octopoma tanquamum* Klak, Bruyns 10797 (BOL).

membranes, expanding keels broad and diverging towards top, not ending in awns. *Seeds* D-shaped, ± 0.9 mm long, without a crest, pale, ochre coloured, almost smooth.

2.2.1. Ecology and distribution

Octopoma tanquamum (Fig. 5) was first collected by Cape Town succulent expert P.V. Bruyns in May 2002 in the Little Karoo, on the western foot of the Warmwaterberg on the farm Tilney. The species has subsequently been collected several times, mainly in the Tanqua Karoo, extending from a little north of Karooport in the west, through Matjiesfontein and into the Little Karoo (Fig. 2). The species prefers flat or gently sloping, slightly gravelly, loamy areas, at altitudes ranging from 750 to 1100 m. It is always associated with Succulent Karoo vegetation.

The distribution ranges of the other two species of *Octopoma* which occur in the Little Karoo are slightly further to the south-east: *O. octojuge* (L.Bolus) N.E.Br. and *Octopoma quadrisepalum* (L.Bolus) H.E.K.Hartmann have been recorded from Eierpoort to Barrydale and Ladysmith, but have not been found growing sympatrically. As in *O. tanquamum* they prefer loamy soils, but usually with plenty of additional quartz pebbles on the surface.

Octopoma tanquamum flowers from mid October to November (Fig. 6). Similarly, *O. octojuge* and *O. quadrisepalum* also flower between October and January.

2.2.2. Discussion

Octopoma is a genus of eight species and has been subdivided into two groups based on differences in fruit morphology (Hartmann, 1998a). Group 1 (*O. quadrisepalum*, *O. octojuge* and *O. subglobozum*) is characterized by capsules with narrow valve wings, covering membranes without or with small additional closing devices, and large closing bodies; group 2 (the remaining five species) has capsules without valve wings, covering membranes with distinct closing rodlets, and small closing bodies.

The main characteristics of *Octopoma*, which distinguish it from *Ruschia* and *Leipoldtia*, are the 6- to 8-locular fruits, with no or only narrow valve wings (Hartmann, 1998a). In *Ruschia* the fruits are 5 (rarely 6)-locular, usually with no valve wings,



Fig. 6. *Octopoma tanquamum* in flower, Klak 1724 (BOL). Photo: P.V. Bruyns.



Fig. 7. Top view onto open fruit of *O. tanquamum*, Klak 1724 (BOL). Photo: P.V. Bruyns.

whereas in *Leipoldtia* the fruits are ± 10 -locular with broad valve wings. *Octopoma tanquamum* exhibits several of the fruit characters of *Octopoma*, including the 6-locular fruits, largish closing body, and no additional closing devices below the covering membranes (Fig. 7). The presence of broad valve wings is novel for the genus. On the basis of the fruit morphology *O. tanquamum* should be placed in group 1. Infrageneric variation in fruit morphology has been observed in several genera, most notably in *Drosanthemum* (Hartmann and Bruckmann, 2000). Therefore, the presence of valve wings in the fruits of *O. tanquamum* and their absence in the other species of *Octopoma*, does not exclude a close relationship between them.

In terms of overall habit *O. tanquamum* is most similar to the two species in the Little Karoo. The leaves of *O. tanquamum* show largely the same features as *O. octojuge*, in that the free parts of the leaves are trigonous and spreading. In contrast, in *O. quadrisepalum*, the free parts of the leaves are almost globose. In addition, *O. tanquamum* and *O. octojuge* have white or cream flowers, whereas the flowers are pink in *O. quadrisepalum*.

2.2.3. Etymology

The species has been named after the Tanqua Karoo, where most of the populations have been found.

Additional specimens examined: South Africa, Western Cape: East of Karooport (3319BB), 17 Aug. 2002, Bruyns 9158, (BOL); 7 km west of Matjiesfontein, Aasvoëlbos Farm (3320BA), 28 May 2007, Klak 1441, (BOL); Touwsrivier distr., Tanqua Karoo, Melkboskraal Farm, (3320AA), 12 Sep. 2006, Klak 1373, (BOL); Bloutoring station (3320CB), 22 June 2009, Bruyns 11381 (BOL); Sewefontein Farm (3320DA), Bruyns 11389 (BOL); Tilney Farm, (3320DC), 26 May 2002, Bruyns 9025 (BOL).

2.3. *Vlokia montana*, Klak sp. nov., a *V. atre foliis anguste cymbiformibus, planta tegetes densae formanti differt*

Type: Western Cape Province, Worcester, Keeromsberg (3319DA), 2000 m, 27 Aug. 2006, Bruyns 10515 (BOL, holo).

Dwarf, mat-forming succulents to 80 mm diam. *Stems* much reduced, rooting at nodes. *Leaves* narrowly boat-shaped, back (adaxial surface) rounded but slightly keeled towards apex, fused basally for 2–3 mm, free parts 6–9 × 3.5–5.0 mm, thick, grey-green with minute dark dots. *Inflorescence* 1-flowered, pedicels short, to 3 mm long. *Flowers* 22 mm diam., pale pink, filamentous staminodes and stamens conically collected, filamentous staminodes apically recurving with age, white. *Stigmas* 6, pollen yellow. *Nectaries* consisting of a crenulate ring. *Fruits* 6-locular, top only very little raised, rims not raised, lower part half-globose, keels diverging from base and ending in awns, covering membranes without additional closing appendages at their distal ends, valve wings reduced to narrow seams, closing body absent. *Seeds* 0.7 mm long, brown, minutely rugulose.

2.3.1. Ecology and distribution

Vlokia montana is known from two collections only, i.e. from the Keeromsberg, northeast of Worcester and from Ben Heatlie, which lies ca. 1.8 km NW of the Keeromsberg (Fig. 2). The plants prefer to grow on sandstone pavements in shallow soil at an altitude from 1920 to 2000 m, where they are regularly covered in snow during the winter. Few species of Aizoaceae are found in relatively moist fynbos at high altitudes in the fold mountains of the southwestern Cape. Apart from *Vlokia*, these included also species of *Esterhuysenia* and *Lampranthus*, which are exclusively found in fynbos at these altitudes. As in species of *Esterhuysenia*, both species of *Vlokia* grow in rocky places. *Vlokia ater* and *V. montana* (Fig. 8) grow on flat expanses of sandstone in shallow pans filled with black soil and covered with fine quartz gravel. *Vlokia ater* is known from two localities on the Waboomsberg, which are separated by a few kilometres (Hammer, 1994). The Waboomsberg, which is ±12 km north of Montagu, lies some 51 km to the east of Keeromsberg. Thus the two species are geographically well separated. *V. montana* was first collected by P.V. Bruyns in November 1987. In 2004, N.Helme recollected this species, but no fresh flowering material was available to describe it. Therefore a collection by P.V. Bruyns, made in August 2006,



Fig. 8. Habitat of *Vlokia montana* on the Keeromsberg at 2000 m, Bruyns 10515 (BOL). Photo: P. V. Bruyns.



Fig. 9. Flowering plant of *Vlokia montana*, Bruyns 10515 (BOL). Photo: P. V. Bruyns.

which later flowered in Cape Town, was used to describe the species.

The flowering time of *V. montana* is from late September to November (Fig. 9). In contrast, *V. ater* flowers in early spring, from August to September.

Additional material examined: South Africa, Western Cape: Kwadousberg, Ben Heatlie, (3319DA), 24 Oct. 2004, Helme 3136 (NBG).

2.3.2. Discussion

Vlokia was established fairly recently to accommodate a single species, *V. ater* (Hammer, 1994). Due to an unusual combination of character states this species had not been possible to place in any of the existing genera. The monotypic genera *Didymaotus* and *Antegibbaeum* as well as *E. alpina* were discussed as possible close relatives to *Vlokia* (Hammer, 1994). In a molecular analysis of chloroplast and nuclear markers, *Vlokia ater* was found to belong to a clade with *Antegibbaeum*, *Braunsia vanrensburgii*, *Hammeria meleagris*, *Smicrostigma* and *Zeuktophyllum* (Klak et al., 2003). Unfortunately, neither *Didymaotus* nor *E. alpina* was included in the molecular study. However, two other species of *Esterhuysenia*, *E. drepanophylla* and *E. mucronata* that were included, did not belong to the clade into which *V. ater* and *Antegibbaeum* fell. Most members of this clade are endemic to the Little Karoo, with outliers in the Tanqua Karoo, although *B. vanrensburgii* is found between Bredasdorp and the lower Breede River. Morphologically, no characters could be identified which are unique to this group (Klak et al., 2003). One of the few characteristics which they share is the absence of closing bodies in their fruits, which is likely to be a plesiomorphic character state.

Vlokia montana shares many characteristics with *V. ater*, so that there is no doubt that the two species are closely related. In particular they share similar, 6-locular fruits, without closing bodies and with much reduced or absent valve wings, and an almost flat top and a hemispherical lower part (Fig. 10). Florally they are also very similar and the main differences between the two species are found in the habit and the shape of the leaves. Plants of *V. ater* are very sparsely branched and form trailing



Fig. 10. Top view onto open fruit and side view of fruit of *Vlokia montana*, Bruyns 10515 (BOL). Photo: P.V. Bruyns.

stems, but the stems are much more branched in *V. montana*, forming low and dense mats (Fig. 11). The leaves of both species are roughly boat-shaped, with marked dark spots below the epidermis. However, the leaves of *V. montana* are much narrower and more slender than those of *V. ater*, where the leaves are almost as broad and thick as they are long (usually about 10×8 mm in *V. ater*). In addition, the leaves are much more strongly keeled along the back than in *V. montana*, where the back is mostly rounded and only slightly keeled towards the apex.

The shift in flowering time towards late spring in *V. montana* compared to early spring in *V. ater* is a good indication that the two species are reproductively isolated from one another.

2.3.3. Etymology

The epithet “*montana*” alludes to the montane habitat of this species.

3. New combinations

3.1. A new combination and a new synonym in *Phiambolia* (Ruschioideae)

Phiambolia currently includes ten species, most of which are recorded from the area between Clanwilliam, Ceres and the Tanqua Karoo (Klak, 2008). The main characteristics for recognizing the genus are the xeromorphic, minutely papillate leaves, the 5-locular fruits without closing bodies and the presence of valve wings. Differences and similarities to the closely related genera *Ruschia*, *Lampranthus* and *Amphibolia* were discussed previously (Klak, 2003; p. 113; Table 1). Species placed in this genus are either creeping (*P. hallii* (L.Bolus) Klak, *P. goudouensis* (L.Bolus) Klak) or form medium to large, erect shrubs to 1 m tall. In addition, species typically prefer soils derived from sandstone and are often associated with arid fynbos. However, the genus has never been fully revised, so that the limits and distributions of the species are still incompletely known.

Phiambolia stayneri (L.Bolus) Klak is one of the most unusual species in the genus and may not really belong here (Klak, 2008). Its taxonomic position has been uncertain since its description as *Amphibolia stayneri* L.Bolus (Bolus, 1966), and it has since been transferred into both *Ruschia* and *Lampranthus*. The species differs from all other non-creeping species of *Phiambolia* by having a tuberous rootstock and by

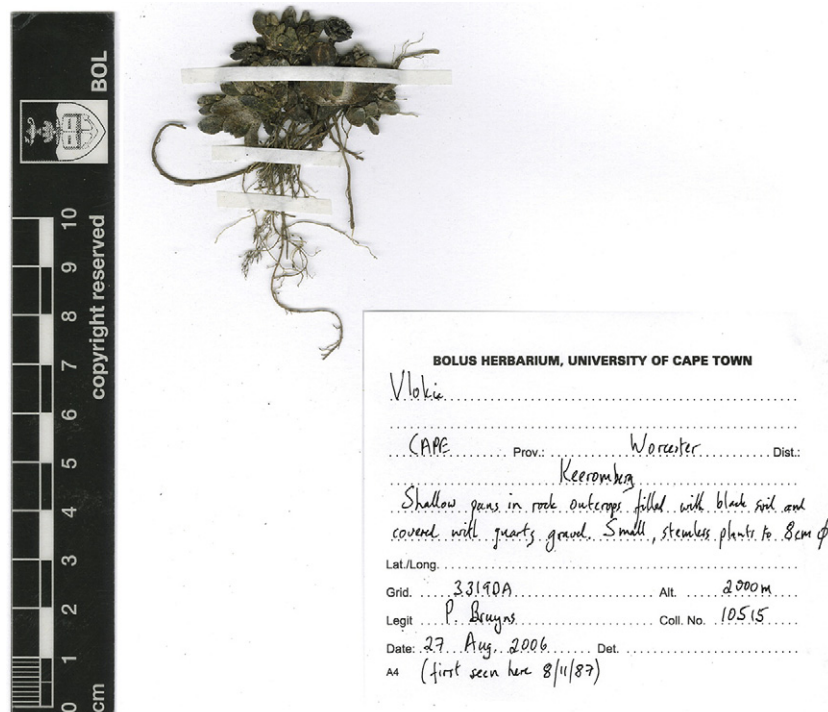


Fig. 11. Type of *Vlokia montana*, Bruyns 10515 (BOL).

being much smaller, since it reaches a maximum height of 7 cm. In addition, it is found in islands of soil derived from shales which are surrounded by fynbos vegetation as opposed to soils derived from sandstone soils in which the other species of *Phiambolia* always occur. It has been collected only rarely. The type collection of *P. stayneri* was made by F.J. Stayner in 1965 between the Matroosberg and the Theronberg Pass. It was recollected only in 2001, from Klondyke Farm near the base of the Matroosberg. The northernmost collection of this species was made in the Swartruggens on the farm Knolfontein, which is ± 60 km NE of Ceres. The south-easternmost collection is from the base of Keeromsberg northeast of Worcester. The plants were found at altitudes ranging from 850 to 1330 m, where they may also be covered by snow during the winter.

A recent study of specimens in the Bolus herbarium revealed that the type of *Ruschia littlewoodii* L. Bolus is very similar to that of *P. stayneri*. *Ruschia littlewoodii* was collected six years earlier than *P. stayneri* by R. Littlewood, who found the plants 35 miles north of Ceres on the road to Citrusdal at the base of a koppie. Littlewood commented that the plants grow in “the transition stage between *Protea* veld and Karoo,” which corresponds to the habitat in which *P. stayneri* is found. Although no fruits are present on the type collection, the characteristic tuberous rootstock and the habit of *R. littlewoodii* suggest that it is not distinct from *P. stayneri*. In the protologue the flowers of *R. littlewoodii* were described as lacking filamentous staminodes. However, a dissection of the flowers mounted on the type sheet show that at least a few filamentous staminodes are present. The two species are therefore considered to be conspecific. Since *R. littlewoodii* was described earlier, a new combination is necessary.

Phiambolia littlewoodii (L. Bolus) Klak comb. nov.

Ruschia littlewoodii L. Bolus, J. S. Afr. Bot. 27: 51 (1960). Type: South Africa, [Western Cape], Klipfontein, 38 miles north of Ceres on the Citrusdal road, Oct. 1959, Littlewood KG 603/59 (BOL, holo.!).

= *Amphibolia stayneri* L. Bolus ex Toelken & Jessop, Bothalia 12: 64 (1976), syn. nov. *Amphibolia stayneri* L. Bolus, J.S. Afr. Bot. 32: 126 (1966), nom. illegit. *Ruschia dissimilis* G.D. Rowley, Nat. Cact. Succ. J. 33: 62 (1978). *Lampranthus dissimilis* (G.D. Rowley) H.E.K. Hartmann, Bradleya 16: 67 (1998). *Phiambolia stayneri* (L. Bolus ex Toelken & Jessop) Klak, Bradleya 21: 113 (2003). Type: South Africa, [Western Cape], between Matroosberg and Theronberg Pass, 4000 ft, Sep. 1965, Stayner sub KG 258/65 (BOL, holo.!).

Additional specimens examined: South Africa, Western Cape: Swartruggens, Knolfontein Farm (3219DC), 13 Sep. 2008, Klak 1761 (BOL); Theronberg Pass (3319BC), 22 May 2005, Klak 1148 (BOL); Klondyke Farm (3319BC), 24 Aug. 2001, Klak 714 (BOL); Gydouwerberg, Die Erf Farm (3319AB), 16 June 2006, Klak 1209 (BOL); eastern foot of Keeromsberg (3319DA), 27 Aug. 2006, Bruyns 10507 (BOL).

3.2. Two new combinations in *Antimima* (*Ruschioideae*)

Brown (1930) described *Antimima* and placed in it a single species, *A. dualis* (N.E.Br.) N.E.Br. In a study of the Ruschiinae,

Dehn (1989) concluded that about 100 species should be transferred from *Ruschia* to *Antimima*. The new combinations were only later formally published by Hartmann (1998b). Characteristics of *Antimima* are 5(-6)-locular fruits with large closing bodies, isophyllous or heterophyllous leaves, and 1(-3)-flowered inflorescences (rarely in well developed cymes) (Hartmann, 1998b). In addition, the leaves in species of *Antimima* often have a papillate epidermal surface, whereas they are typically smooth in *Ruschia*. Notably, 6-locular fruits are rare in both *Ruschia* and *Antimima*.

Antimima crassifolia (L. Bolus) H.E.K. Hartmann and *Antimima pilosula* (L. Bolus) H.E.K. Hartmann both have 6-locular fruits and both are known from northern Namaqualand and the Richtersveld. In terms of their fruit morphology, *A. pilosula* differs from *A. crassifolia* by having fruits with broad valve wings, whereas valve wings are absent in *A. crassifolia*. Recent investigations of herbarium material indicate that a specimen collected by Pillans in 1926 in the Richtersveld is conspecific with *A. crassifolia*. This specimen was described by L. Bolus in 1928 as *Ruschia hexamera* L. Bolus. The type specimens of both *R. hexamera* and *A. crassifolia* possess 6-locular fruits, with closing bodies and both lack valve wings. In addition, the epidermis of the leaves is papillate, the inflorescence is 1-3-flowered and the petaloid and filamentous staminodes are pink to white in both type specimens. Apart from the type specimens, few other collections have been made. Investigations of the fruits of the type specimens have shown that the closing bodies of *R. hexamera* as well as of *A. crassifolia* (drawing of a fruit on the type sheet) are not as large as is typical of *Antimima*, where the closing bodies usually block the entire exit of the locule. However, the relatively long expanding keels and the papillate epidermis in both type specimens are characteristics of species of *Antimima*. Similar characteristics are also found in *Astridia*, which mainly differs by having larger flowers that are 30–70 mm diam. and short expanding keels (Hartmann, 2001). Clearly *R. hexamera* is best placed in *Antimima*. Since *R. hexamera* was described much earlier than *A. crassifolia*, a new combination is made below.

A further species, *Ruschia radicans*, is here transferred into *Antimima* based on the study of living and herbarium material. This species has so far remained in *Ruschia*, since the type lacks fruiting material, which made the placement of this species uncertain. It was collected by Leipoldt in May 1928 at the Doorn River bridge north of Clanwilliam. The re-collection of this species from the type locality allowed the investigation of mature fruit material. The fruits were found to have large closing bodies, which block the exit of the locule and is a characteristic for *Antimima*.

In the past, this species has been confused with another prostrate species, *Antimima granitica* (L. Bolus) H.E.K. Hartmann (= *A. limbata* N.E.Br.), which is found in coastal habitats, typically on granitic or gneissic rock slabs from Hondeklipbay to Ganzekraal. Both species have a compact centre and usually form long prostrate branches. In contrast to many other species in *Antimima* neither of the two species form a protective dry sheath during the resting stage, but the leaves persist throughout the dry summer season. *Antimima radicans* differs from *A. granitica* by

having leaves that are distinctly longer than broad, $10\text{--}15 \times 5$ mm. In contrast, the leaves of *A. granitica* are shorter and are only slightly longer, than they are broad and thick, $5\text{--}10 \times 5\text{--}7 \times 4\text{--}5$ mm. In both species the keels often have a red tinge.

Apart from the type locality, the species is also known from Eendekuil. Collections from Vanrhynsdorp were also identified as *A. radicans* but a more detailed study is necessary to assess taxonomic differences between *A. radicans* and *A. watermeyerii* (L.Bolus) H.E.K.Hartmann, which was described from the Vanrhynsdorp area and is thought to differ mainly by the more compact habit (as opposed to the creeping) from *A. radicans*.

For the meantime, *R. radicans* is transferred to *Antimima*.

Antimima hexamera (L.Bolus) Klak comb. nov.

Ruschia hexamera L.Bolus, Notes Mesembryanthemum 1: 144 (1928). Type: South Africa, [Northern Cape], hills near Brakfontein, between September and October 1926, *Pillans* 5703 (BOL, holo.!).

= *Ruschia hexamera* L.Bolus var. *longipetala* L.Bolus, Notes Mesembryanthemum 2: 237 (1931). Type: South Africa, [Northern Cape], Port Nolloth, without date, *M. Schlechter* sub *SUG* 8367 (BOL, holo.!).

= *Ruschia crassifolia* L.Bolus, Notes Mesembryanthemum 3: 338 (1958), syn. nov. *Antimima crassifolia* (L.Bolus) H.E.K. Hartmann, Bothalia 28(1): 71 (1998). Type: South Africa, [Northern Cape], Lekkersing, June 1954, *H.Hall* sub *BOL* 25758 (BOL, holo.!).

Additional material examined: South Africa, Northern Cape: Boegoeberg Suid (2816DC), 26 Oct. 1985, *Van Jaarsveld* 8229 (NBG); Karoedab Poort (2917AA), 18 July 1970, *Wisura* 1625 (NBG); along road from Port Nolloth to Lekkersing (2816BD), 3 Sep. 2001, *Klak* 776 (BOL); between Port Nolloth and Lekkersing (2917AA), 4 Sep. 2001, *Klak* 780 (BOL).

Antimima radicans (L.Bolus) Klak, comb. nov.

Ruschia radicans L.Bolus, Notes Mesembryanthemum 1: 146 (1928). *Mesembryanthemum pronum* N.E.Br., Gard. Chron. 87, ser.3: 32 (1930). Type: South Africa, [Western Cape], Doornbosch bridge, Clanwilliam, 8 May 1928, *Leipoldt* NBG 1411/25 [herbariumsheet III, lecto!, selected by Hartmann, *Bradleya* 17: 64 (1999)].

Additional material examined: South Africa, Western Cape: Farm Draaihoek, near Eendekuil (3218DB), 30 June 2002, *Klak*

999 (BOL); Eendekuil, Sep. 1933, *L.Bolus* sub *NBG* 1521/33 (BOL).

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