

# *Kamiesbergia*, a new monotypic genus of the Amaryllideae-Strumariinae (Amaryllidaceae) from the north-western Cape

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## ABSTRACT

**Kamiesbergia** Snijman is a new monotypic genus from raised granite outcrops in the north-western Cape. A member of the subtribe Strumariinae of the Amaryllideae, it is most closely related to *Hessea* Herb. and *Namaquanula* D. & U. Müller-Doblies. The dissimilar inner and outer stamens, the uniquely club-shaped inner filaments and the novel insertion of the filament in the proximal quarter of the anther connective are the main apomorphies of the genus. The number of rare and monotypic genera of Amaryllidaceae in this region is comparable to that of Andean South America.

## UITTREKSEL

**Kamiesbergia** Snijman is 'n nuwe monotipiese genus van die hoërliggende granietriwwe in die Noordwes Kaap. Dit is 'n lid van die subtribus Strumariinae van die Amaryllideae en is die naaste verwant aan *Hessea* Herb. en *Namaquanula* D. & U. Müller-Doblies. Die verskille tussen die binneste en buitenste meeldrade, die unieke knuppelvormige binneste helmdrade en die ongewone aanhegting van die helmdraad aan die proksimale kwart van die helmbindsel is die hoofapomorfe van die genus. Die aantal skaars en monotipiese genusse van die Amaryllidaceae in hierdie streek kan vergelyk word met 'n soortgelyke verskynsel in die Andes-gebergtes van Suid-Amerika.

## INTRODUCTION

The tribe Amaryllideae *sensu* Traub (1965, 1970) and Dahlgren *et al.* (1985) is uniquely defined by bisulcate pollen grains (Dahlgren & Clifford 1982; Dahlgren *et al.* 1985; Erdtman 1966; Schulze 1984). As presently circumscribed (Müller-Doblies 1985), the subtribe Strumariinae of the Amaryllideae currently includes four small and three monotypic genera (*Namaquanula* D. & U. Müller-Doblies, *Hessea* Herb., *Carpolyza* Salisb., *Strumaria* Jacq., *Bokkeveldia* D. & U. Müller-Doblies, *Gemmaria* Salisb. and *Tedingea* D. & U. Müller-Doblies). Character states common to these genera are the actinomorphic flowers and the reduced size of the plants. Exclusively southern African, the subtribe comprises approximately 35 species, which are concentrated in the semi-arid winter rainfall regions of the Cape Province and southern Namibia.

Phylogenetic studies in the Strumariinae (Snijman unpubl.), revealed an undescribed *Hessea*-like species from the north-western Cape. A character analysis confirmed the presence of bisulcate pollen grains but indicated that the taxon did not fit into any known genus of the Strumariinae. The new species lacks the synapomorphy of  $x = 10$  and the adnation of the filaments to the style, which characterises *Carpolyza*, *Strumaria* and its close allies *Bokkeveldia*, *Gemmaria* and *Tedingea*; it lacks the centrifixed anther insertion which is synapomorphic for *Hessea*; and is without the adaxially-hooked filaments which characterise *Namaquanula*. Character states unique to the new taxon are the dissimilar inner and outer stamens, the club-shaped distal half of the inner filaments, and the filament attachment near to the base of the anther connective.

Since this new species lacks all the derived character states of the genera already described within the Strumariinae, and since it possesses a set of unique characters that justifies its separation at the generic level, the taxon is described here as the new monotypic genus *Kamiesbergia*.

## MATERIALS AND METHODS

This study was based on herbarium material from BM, BOL, K, NBG, PRE, SAM and WIND. Ecological information was derived from field studies during the flowering, fruiting and leafing stages of the species. Fresh non-acetolyzed pollen grains for scanning electron microscopy (SEM) were dehydrated in ethanol, critical point dried and coated with Au/Pd. Photographs were taken with a Cambridge 200 SEM at 10 kv. Chromosome data were gathered from actively growing root tips, pretreated with saturated alphabromonaphthalene at 4°C for 24 hours, then fixed in 1:3 acetic acid/ethanol. The root tips were hydrolysed in normal hydrochloric acid at 60°C for six minutes, stained with Feulgen for 30 minutes, counterstained with 2% aceto-orcein and then squashed. Photographs were taken with a Zeiss Axioskop.

***Kamiesbergia stenosphon* Snijman**, gen. nov. et sp. nov., ex affinitate generum *Namaquanula* D. & U. Müller-Doblies, *Hessea* Herb., *Strumaria* Jacq. *sensu lato* et *Carpolyza* Salisb. sed cum nullo genere satis congruit: ab *Carpolyza Strumariaeque* absentia ullius commisure inter stylum et filamenta recedit; ab *Namaquanula* absentia hamuli adaxialis filamentorum differt; ab *Hessea* absentia antherae centrifixae differt. Ab omnibus his generibus filamentis dissimillimis, filamentis interioribus claviformibus supra medium, antheris sub-basifixis differt.

**TYPE.** —Cape, 3018 (Kamiesberg): Kamiesberg, near Karas on E slopes of Rooiberg, (–AC), 28-4-1988, *Snijman 1175* (NBG, holo.; K, PRE).

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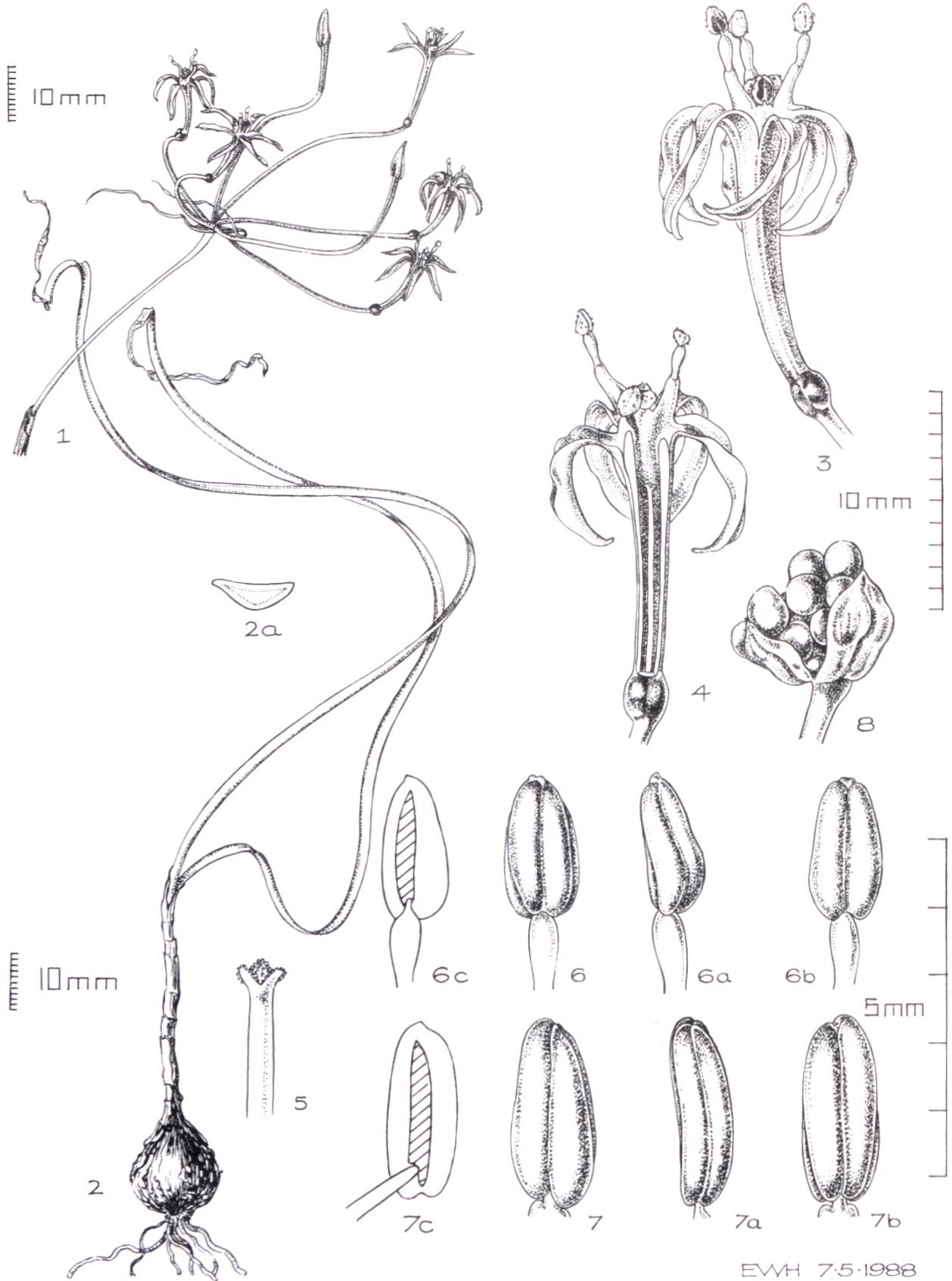


FIGURE 1.—*Kamiesbergia stenosphon*. 1, inflorescence; 2, bulb and leaves; 2a, transverse section of leaf; 3, whole flower; 4, section of flower; 5, stigma; 6, anther attachment of inner stamens, ventral view; 6a, lateral view; 6b, dorsal view; 6c, section showing sub-basifixed insertion, connective hatched; 7, anther attachment of outer stamens, ventral view; 7a, lateral view; 7b, dorsal view; 7c, section showing sub-basifixed insertion, connective hatched; 8, capsule and seeds (drawn from Snijman 1175).

Bulbous perennial herb, up to 210 mm tall. *Bulb* solitary, deep-seated, subglobose, 12–30 mm across, with thin light-brown parchment-like outer tunics, fleshy and whitish within, extended into a long slender neck up to 110 mm. *Leaves* absent at anthesis or rarely persisting to anthesis, 2(–3), spreading, narrowly lorate, 60–300 × 1–3 mm, glabrous, with the adaxial surface shallowly canaliculate, subtended by a subterranean non-amplexicaul prophyll. *Inflorescence* slightly spreading, 40–80 mm across; scape stiffly erect, 50–140 mm long, 1–2 mm diam., greyish pink to leaden-grey, breaking off at the base in fruit; spathe valves linear-lanceolate, 15–30 × 1–2 mm; bracteoles filiform, up to 5 mm long. *Flowers* 5–9, ascending, hypocrateriform, pale lemon-yellow, usually with a greenish to reddish brown tube, flushed dorsally with reddish brown on the outer tepals, ageing to light brown, scentless; pedicels straight to upwardly curved, 35–60 mm long, green. *Tepals* recurving from a narrow 8–12 mm long tube, narrowly lanceolate, 6–8 × 2–3 mm, slightly channelled. *Stamens* in 2 unequal whorls, epitepalous, filaments basally connate into a greenish yellow tube extending to 0,5–1,0 mm above the perigone throat, free above, reduced to a 0,25 mm long filiform free tip in the outer whorl, prominent and spreading in the inner whorl; the inner filaments free for 3–4 mm, clavate in the distal half with a subulate tip; anthers dorsifixed near the base, ± 2,5 mm long and maroon before opening; the outer anthers occluding the perigone throat after dehiscence; pollen cream-coloured. *Ovary* subglobose, 2–3 mm across, with up to 4–6 ovules per locule. *Style* erect, slender throughout, up to 5–11 mm long, remaining included in the perigone tube; stigma shortly trifid, shortly penicillate on the inner surface. *Fruit* a subglobose, papery, loculicidal capsule, 7,5 mm across. Seeds fleshy, ovoid, up to 2,5 mm across, reddish brown when ripe. *Chromosome number*:  $2n = 22$ . Figure 1.

*Flowering time* extends from the end of April to May. In most bulbs the foliage leaves commence growth shortly after flowering and subsequently die back at the onset of the summer drought. Occasionally some bulbs which occupy wetter, cooler sites have been noted with green leaves throughout the summer.

*Diagnostic features* of *K. stenosphon* are the form of the stamens and anther insertion. The inner filaments are at least twelve times as long as the outer filaments and are uniquely club-shaped in the distal half with a subulate tip. The stamens of the short outer whorl occlude the perigone throat after dehiscence. Unlike the medifixed anthers common to all other Strumariinae, the filaments

of *Kamiesbergia* are attached in the proximal quarter of the connective (Figure 1.6c & 1.7c).

The presence of a perigone tube is considered to be plesiomorphic in the subtribe (Müller-Doblies 1985). In most species of *Hessea* the perigone tube is reduced and the tubular component is formed by the extension of the perigone/stamen confluence into a winged tube, a feature which is considered to be derived (Müller-Doblies 1985). Only *H. longituba* D. & U. Müller-Doblies has a pronounced smooth perigone tube comparable to that of *K. stenosphon*, which may suggest a close relationship between the two taxa. A critical evaluation of the key androecial states in *Hessea* and *K. stenosphon* however, does not support such a relationship.

The main synapomorphy for *Hessea* is the insertion of the filament into a connective sheath, in which the length of the dorsal wall almost equals that of the ventral wall: a condition known as centrifixed anther insertion (Müller-Doblies 1985). This character state is interpreted as the extreme in a morphological series ranging from dorsifixed to subcentrifixed and centrifixed anther insertion, with each state being found in the Strumariinae. In contrast, a transformation series between the centrifixed anther insertion of *Hessea* and the almost basifixed anther insertion (without a connective sheath) of *K. stenosphon* could not be established from current data. Thus a sister group relationship between the two genera cannot be inferred.

The bisulcate pollen grains are globose, isopolar and have scattered large spinulae on the surface (Figure 2). The karyotype of *K. stenosphon* (Figure 3) comprises a pair of large submetacentric chromosomes; six pairs of medium-sized metacentric to submetacentric chromosomes, of which one pair is a satellite chromosome; and four pairs of shorter metacentric to submetacentric chromosomes. The chromosome phenotypes are similar to those of most Amaryllideae with  $x = 11$  (Goldblatt 1972, 1976; Jones & Smith 1967). A karyotype of  $x = 11$  is considered basic in the family (Inariyama 1937; Meerow 1984; Satô 1938).

*Distribution and habitat* records indicate that *K. stenosphon* is rare. Known populations are restricted to the north-western Cape and are widely disjunct in the eastern Kamiesberg and near Pofadder (Figure 4). In the Kamiesberg, the deep-seated bulbs grow in loamy soils which accumulate in seasonally moist crevices and water-worn gullies on massive exposed granite domes, at

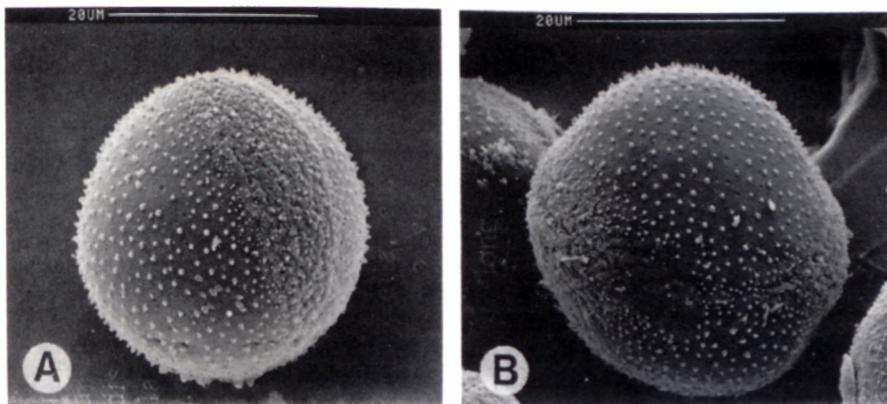


FIGURE 2.—Bisulcate pollen grains of *Kamiesbergia stenosphon*, Snijman 1175. A, equatorial view, longitudinal position; B, equatorial view, transverse position. Scale bars = 20 µm.



FIGURE 3.—Mitotic metaphase in *Kamiesbergia stenosiphon*, Snijman 1175,  $2n = 22$ ,  $\times 665$ ; the arrow indicates the satellite chromosome.

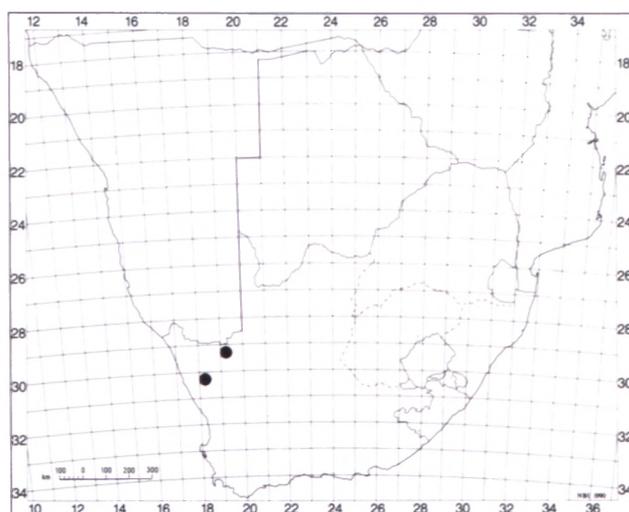


FIGURE 4.—The known geographical distribution of *Kamiesbergia stenosiphon*.

elevations of approximately 610 m. Dwarf succulent shrubs and the fern species *Cheilanthes multifida* (Swartz) Swartz constitute the associated plant community. *Kamiesbergia stenosiphon* occupies similar habitats at Namies near Pofadder, on large granite outcrops amid the sandy plains of Bushmanland (J.J. Lavranos pers. comm.).

Meerow (1987) has drawn attention to the number of small or rare monotypic genera amongst the pancratioid Amaryllidaceae in the northern Andean of South America.

The discovery of *Kamiesbergia*, a further monotypic genus in the Amaryllidaceae, brings into focus the parallels which exist in this respect between the Amaryllidaceae of South Africa and the Andean Amaryllidaceae of South America. Goldblatt's suggestion (Meerow 1985) that similar evolutionary patterns exist between the Amaryllidaceae of these two geographical centres is yet to be examined.

CAPE.—2919 (Pofadder): Numis [Namies], near Pofadder, (—AC), *Lavranos 20311* (PRE). 3018 (Kamiesberg): Kamiesberg, near Karas on E slopes of Rooiberg, (—AC), *Snijman 1175* (K, NBG, PRE); near Karas on E slopes of Rooiberg, (—AC), *Snijman 1179* (NBG).

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