



Petalidium karasbergense (Acanthaceae), a new species from Namibia

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Abstract

Petalidium karasbergense, here described as a new species, is only known from the Groot Karasberge (Great Karas Mountains) in southeastern Namibia where it grows on arid hillsides in dwarf shrubland. Diagnostic morphological characters for *P. karasbergense* include the rigid, tapering and often spinescent distal stems and lateral branchlets, grey, grey-white or grey-black bark (white to cream when young), strigulose, glabrescent vegetative parts, oblanceolate to narrowly obovate leaves, and the free to almost free bracteole pairs (not connate at the base). A comparison of some of the more prominent features to differentiate *Petalidium karasbergense* from *P. parvifolium*, its morphologically most similar relative, and *P. lucens* with which its distribution range marginally overlaps, is provided. Based on IUCN Red List categories and criteria, a conservation assessment of Vulnerable VU D1 is recommended for the new species.

Keywords: desert, endemism, flora, Great Karas Mountains, Groot Karasberge, *Petalidium lucens*, *Petalidium parvifolium*, Ruellieae, taxonomy

Introduction

At present, 39 described species of *Petalidium* Nees von Esenbeck (1832: 75) are recognized in Africa. Northwestern Namibia and adjacent southwestern Angola is the main centre of diversity for the genus, with 29 species recorded for Namibia, 13 for Angola, five for South Africa, and 31 for the *Flora of southern Africa* region (South Africa, Namibia, Botswana, Eswatini, and Lesotho) (Germishuizen & Meyer 2003, Figueiredo & Smith 2008, Swanepoel 2020, Swanepoel & Manzitto-Tripp 2022, Swanepoel *et al.* 2022, Swanepoel & Van Wyk 2023). In the present contribution a new species of *Petalidium* is described. Based on field work and available distribution records in herbaria, this new entity is endemic to the Groot Karasberge (Afrikaans for “Great Karas Mountains”), a mountain complex in southeastern Namibia.

In March 2022 while studying the *Petalidium* holdings in the National Herbarium, Pretoria (PRE) and the herbarium of the National Botanical Research Institute in Namibia (WIND), it was found that certain specimens from the Groot Karasberge and environs in the ||Kharas Region, southeastern Namibia, do not quite fit the description of any of the known taxa in that region. These specimens are characterized by rigid tapering stems (often spinescent) with decussate lateral branching and oblanceolate to narrowly obovate leaves with relatively small, cream-brown papery bracteoles with conspicuous reticulation. Among these collections the specimen *Auret 5617* in Herb. PRE was filed under *P. parvifolium* C.B. Clarke ex Schinz (1926: 146) and specimen *Hasheela HHa0020* under *P. lucens* Obermeijer (1936: 155) in Herb. WIND and under *P. parvifolium* in Herb. PRE. The gatherings *Dinter 5150* and *5154* were cited in the protologue of *P. wilmaniae* Obermeijer (1936: 156), a species subsequently shown to be a synonym of *P. parvifolium* (Meyer 1961, 1968, Swanepoel *et al.* 2022). Pending further field observations, all these specimens were provisionally assigned by us to *P. lucens* (Swanepoel *et al.* 2022). The localities of all these gatherings were subsequently visited by one of us (WS) and plants of this deviant entity were studied in habitat. This enabled us to conclude that they belong to a new species, here described as *P. karasbergense*.

Hitherto *P. karasbergense* has been confused with *P. lucens* and *P. parvifolium* since the three taxa share morphological similarities, especially in having oblanceolate leaves. *Petalidium parvifolium* (in the sense lectotypified by Swanepoel *et al.* 2022) is probably morphologically the closest relative of *P. karasbergense*, but differs from it in a combination of characters described below.

Methods

Morphological descriptions and ecological information presented here are based on field observations and material collected following extensive field work in Namibia. Diagnostic features were determined through examination of fresh material, as well as high-resolution images of type material available through JSTOR Global Plants (<https://plants.jstor.org/>). This was supplemented by study of the protologues and herbarium collections of WIND, PRE, and the H.G.W.J. Schweickerdt Herbarium of the University of Pretoria (PRU). These herbaria were consulted for possible collections of the new species (herbarium abbreviations follow Thiers 2019). A 6.5–45.0× magnification stereo microscope was used for studying morphological features. Descriptive terminology follows Beentje (2016) and Manktelow (2000). Locality information for specimens cited also provides the quarter degree grid squares following the degree reference system of Edwards & Leistner (1971). The distribution map was compiled from specimen data using ArcView 3.1 software. Conservation assessment follows IUCN (2012) recommendations.

Taxonomic treatment

Petalidium karasbergense Swanepoel & A.E.van Wyk, *sp. nov.* (Figs 1 & 2)

Diagnosis:—A woody dwarf shrub up to 1 m tall, morphologically most similar to *Petalidium parvifolium*, differing in having the distal stems and lateral branchlets tapering to a blunt or spinescent apex (*vs.* cylindrical); indumentum on vegetative parts strigulose (*vs.* scattered sessile glandular trichomes); young growth not glutinous (*vs.* covered with a glutinous secretion [glossy]); leaf lamina subconduplicate towards recurved apex (*vs.* flat or subreduplicate, apex slightly recurved); bracteoles free or almost free from base (*vs.* distinctly connate towards base), indumentum (abaxially) on bracteoles strigulose (*vs.* scattered sessile glands, towards base sometimes with very short stalked glandular trichomes in addition).

Type:—NAMIBIA. ||Kharas Region: Groot Karasberge [Great Karas Mountains], Farm Tsaraxaibis 275, ca. 2 km north of Smôrenswind homestead along Road D612, opposite reservoir, 2719AD, 985 m, 24 August 2022, *Swanepoel 616* (holotype WIND!; isotypes PRE!, PRU!).

Woody, dwarf shrub up to 1 m tall. *Stems* multi-stemmed from just below or above ground level from a thick rootstock or main stem, up to 150 mm in diam., bark rough and fissured, grey, grey-white or grey-black; distal stems and lateral branchlets tapering to a blunt or spinescent apex, some bearing brachyblasts with tightly arranged phyllopodia (persistent petiolar bases, ca. 0.5–1.0 mm long), bark smooth or longitudinally fissured, cream or white, lateral branchlets usually decussate; young stems strigulose, glabrescent. *Leaves* opposite and decussate on new shoots, fascicled on older stems, lateral branchlets and brachyblasts, subsessile, petiole up to 1.6 mm long; lamina oblanceolate to broadly oblanceolate or narrowly obovate, flat, often subconduplicate towards apex, up to 19 × 7 mm, dark green, strigulose with trichomes pointing backwards, glabrescent, apex truncate, emarginate or acute, recurved, margin entire, often tinged maroon, midrib and 1–3 principal lateral veins slightly prominent adaxially, midrib conspicuous abaxially, yellow-green, darker in herbarium material, cystoliths linear, inconspicuous. *Flowers* solitary, axillary; bracts absent; pedicels (below bracteoles) up to 4 mm long; bracteoles separate from base or connate ≤ 1 mm, elliptic or narrowly ovate, symmetrical, flat, membranaceous, apex attenuate, acute or obtuse, base cuneate or rounded, cream-brown, venation reticulate, prominent adaxially, conspicuous, green or green-brown, strigulose both sides and on margins, glabrescent, 10.5–11.5 × 5.0–6.2 mm, cystoliths not visible. *Calyx* ca. 6 mm long including basal tube of ca. 2 mm long, glabrous except for few short-stalked glandular and simple trichomes towards lobe apices; lobes 5, regular, narrowly triangular, acute, unequal, 3.5–4.0 mm long. *Corolla* with narrow unexpanded portion of tube cylindrical, slightly narrowing towards expanded part, laterally slightly flattened, glabrous except for few short-stalked glandular trichomes, ca. 27 mm long with lobes straightened, limb ca. 21 mm diam., narrow portion ca. 10 mm long, ca. 2.9 mm diam., expanded portion ca. 10 mm long, inside of narrow portion puberulous distally, inside of expanded portion cinnamon, puberulous proximally, anterior part with few long stiff white simple trichomes; lobes patent, obovate, apices widely retuse, margins entire, upper lobes free, overlapping, ca. 7.8 × 7.0 mm, lateral lobes ca. 7.1 × 7.1 mm,

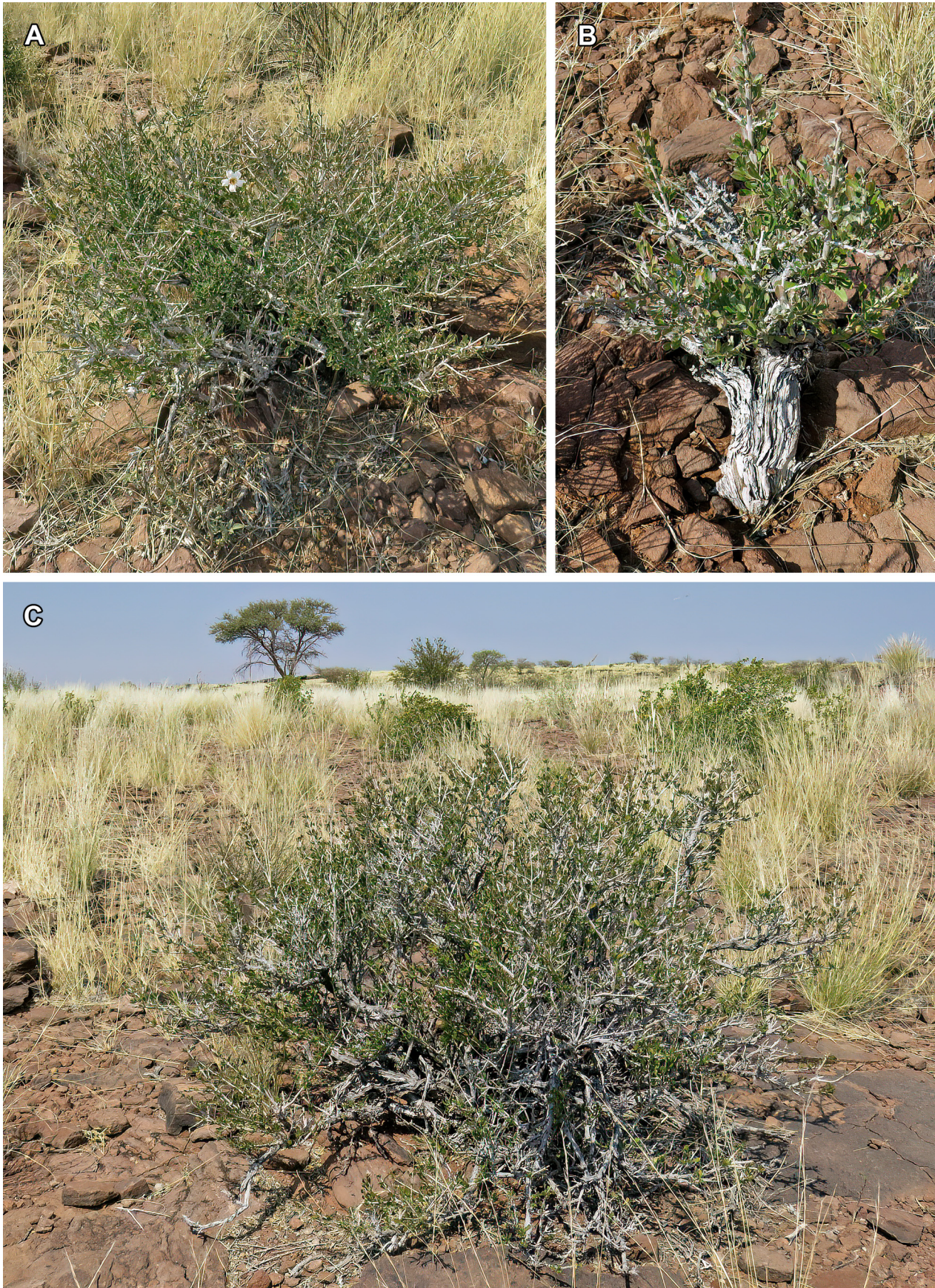


FIGURE 1. *Petalidium karasbergense*, habitat and habit. **A.** Plant (ca. 50 cm high) with open flower. **B.** Old, stunted plant showing thick, woody stem (ca. 8 cm in diameter). **C.** Mature plant (ca. 80 cm high) in habitat; surrounded by sandstone rocks of the Nama Group. Photographs by W. Swanepoel.

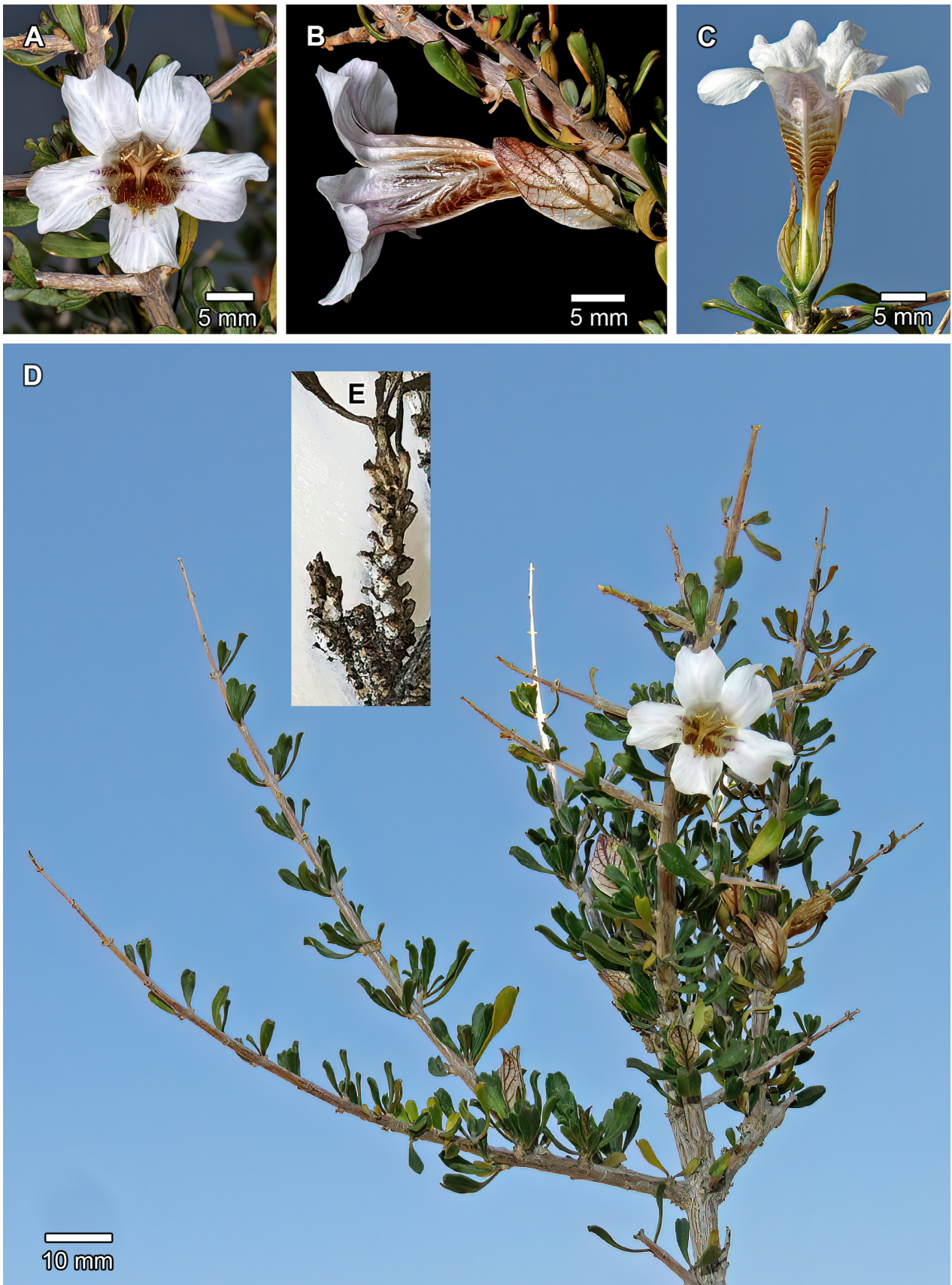


FIGURE 2. *Petalidium karasbergense*, morphology of flowers, stems, and leaves. **A.** Flower in front view. **B.** Flower with bracteoles in lateral view. **C.** Flower viewed from below; note the bracteoles that are not connate at the base, hence the calyx is clearly visible over the whole of its length. **D.** Branchlet showing an open flower, persistent bracteoles, and leafy side shoots (some tapering to a spinescent tip). **E.** Enlarged portion of *Auret 5617* in Herb. PRE showing three brachyblasts, the longest one with several phyllopodia, the latter each ca. 1 mm long. Photographs by W. Swanepoel (A–D) and A.E. van Wyk (E).

front lobe ca. 8.0×7.5 mm, lobes white or cream-white, occasionally with a faint lilac tinge, two narrowly triangular nectar guides on front lobe pale yellow with purple patches, two narrowly triangular markings towards base of lateral lobes purple; palate outside cinnamon towards base of expanded portion, prominently transversely ca. 10-ribbed, especially on inside. *Filaments* 4, didynamous, inserted dorsally in throat, fused portion of filaments ca. 1.6 mm long, free portion tapering towards apex, slightly flattened, sparingly puberulous towards base, long filaments ca. 8.8 mm long, short filaments ca. 6.2 mm long, outer filament trace decurrent to base of tube, puberulous; filament curtain phallopoid (Manktelow 2000); anthers 2-thecous, thecae oblong, equal, ca. 2.5 mm long with few simple trichomes. *Gynoecium* ca. 19.7 mm long; ovary ovoid, laterally compressed, 2.0×1.3 mm, inserted on a fleshy disc, glabrous; style filiform, ca. 15.8 mm long, puberulous towards base, stigma lobes linear, unequal, longer lobe ca. 1.2 mm long, shorter lobe ca. 0.5 mm long. *Capsule* not seen.

Phenology:—Flowers and developing fruit have been recorded in January, March, April, and August.

Distribution and habitat:—At present, *Petalidium karasbergense* is only known from the Groot Karasberge and environs where it occurs in small colonies on arid stony slopes, 260–310 km from the Atlantic Ocean at elevations of 800–900 m (Fig. 3). Plants grow in Karas Dwarf Shrubland on shallow soil among sandstone rocks (Fig. 1) of the sedimentary Nama Group (Mendelsohn *et al.* 2002). Average annual rainfall in the area is 100–200 mm (Mendelsohn *et al.* 2002).

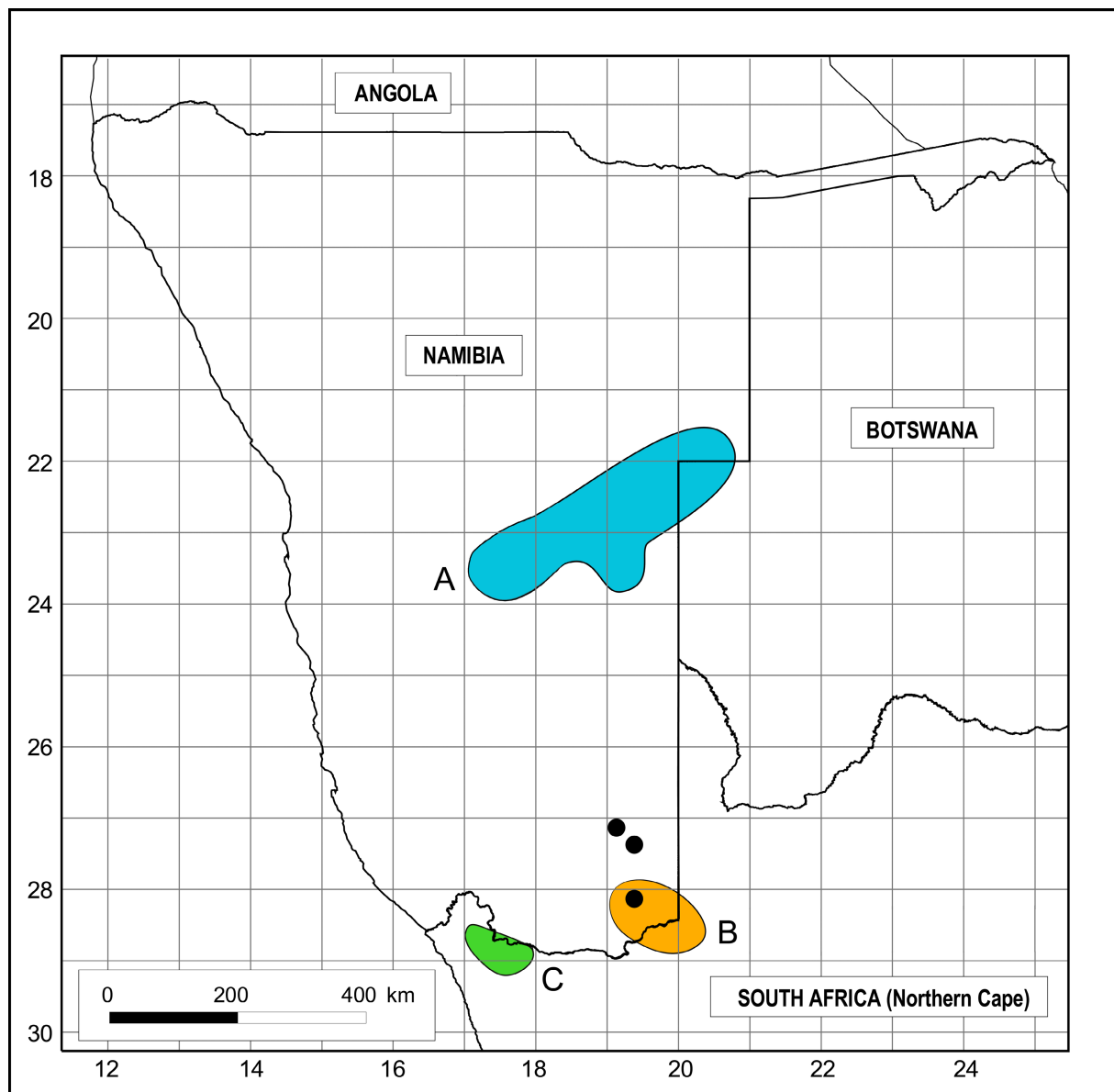


FIGURE 3. Known distribution of *Petalidium karasbergense* (black dots; ●) based on specimens in Herbs WIND and PRE. Also depicted are the distribution ranges of *P. parvifolium* (A. blue), *P. lucens* (B. orange), and *P. mannheimerae* (C. green). Note that as a result of further field work the ranges of *P. parvifolium* and *P. lucens* as depicted in Swanepoel *et al.* (2022) have been slightly adjusted on the present map.

Conservation status:—*Petalidium karasbergense* is known from only one location with four small sub-populations, all of which are on commercial farmland. It is locally common at the type locality with about 70 plants seen and all in good condition. Although a brief search at various other localities with seemingly suitable habitat did not reveal any plants, it is probably more widespread than currently known. Due to the small, estimated population size of less than 1000 mature individuals, a conservation status of Vulnerable VU D1 is proposed for *Petalidium karasbergense* (IUCN 2012).

Etymology:—The specific epithet refers to the Groot Karasberge in southeastern Namibia, the mountain complex to which the new species is confined.

Notes:—In addition to *P. parvifolium* (see “Diagnosis” above), the new species can be confused with *P. lucens* and *P. mannheimeriae* Swanepoel *et al.* (2022: 5) due to similarities in the habit, leaves and flowers. However, the indumentum on vegetative parts of *P. karasbergense* is strigulose (*vs.* dense short simple or stellate trichomes, usually with isolated dendritic trichomes in addition [*P. lucens*]; puberulent, usually with robust, multi-cellular stalked glandular or eglandular trichomes in addition [*P. mannheimeriae*]). The leaves of *P. karasbergense* are recurved at the apex and not succulent (*vs.* apex not recurved [*P. lucens*] and semi-succulent [*P. mannheimeriae*]). The corolla lobes of *P. karasbergense* are predominantly white or cream-white and superficially similar to those of *P. mannheimeriae* (*vs.* mauve [*P. lucens*]). The distribution ranges of *P. lucens* and *P. karasbergense* marginally overlap (Fig. 3), although at no locality has the two species been found to grow sympatrically. *Petalidium mannheimeriae* is endemic and *P. lucens* near-endemic to the Gariiep Centre of Endemism in Namibia and South Africa (Van Wyk & Smith 2001, Swanepoel *et al.* 2022). Some of the morphological features to distinguish between *Petalidium karasbergense*, *P. parvifolium*, and *P. lucens* are provided in Table 1; also see Fig. 4.

TABLE 1. Prominent morphological differences between *Petalidium karasbergense*, *P. parvifolium*, and *P. lucens*.

Character	<i>P. karasbergense</i>	<i>P. parvifolium</i>	<i>P. lucens</i>
Habit (distal stems and lateral branchlets)	Tapering, often spinescent, rigid	Cylindric, flexible	Cylindric, rigid
Indumentum on vegetative parts	Strigulose (simple trichomes)	Scattered sessile glandular trichomes	Dense short simple or sessile stellate trichomes (with 2 or 3 branches), usually with isolated dendritic trichomes in addition; glabrescent
Young growth (stems and leaves)	Not glutinous	Covered with a glutinous secretion (glossy)	Not glutinous
Leaf blade (shape)	Oblanceolate to broadly oblanceolate or narrowly obovate, often subconduplicate towards apex; margins entire	Oblanceolate or narrowly obovate, flat or subreduplicate; margins entire, sometimes sparsely crenate-serrate towards apex	Oblanceolate to linear-lanceolate, broadly oblanceolate, broadly lanceolate, narrowly elliptic or ovate, flat; margins entire
Leaf blade (size) (mm)	Up to 19 × 7	4–30 × 2–11	Up to 32 × 17
Leaves (apex)	Truncate, emarginate or acute; recurved	Rounded to obtuse, apiculate; slightly recurved	Acute or obtuse; not recurved
Bracteoles (shape; degree of fusion)	Elliptic or narrowly ovate; free or free almost to base	Lanceolate-ovate; clearly connate towards base	Ovate to broadly ovate; connate towards base
Bracteoles (colour)	Cream-brown	White	White
Bracteoles (apex)	Acute, attenuate or obtuse	Acute, sometimes apiculate	Acute with a long mucro
Bracteoles (indumentum abaxially)	Strigulose; margins strigose	Scattered sessile glands, towards base sometimes with very short glandular trichomes in addition; margins lanate with short-stalked glandular trichomes in addition	Puberulent with short-stalked glandular trichomes in addition, some often robust, margins lanate
Bracteoles (size) (mm)	10.5–11.5 × 5.0–6.2	10–12 × 4–5	18–20 × 15
Corolla (size)	ca. 20 mm long, 21 mm diam.	ca. 13 mm long, 17 mm diam.	ca. 24 mm long, 20 mm diam.
Corolla (upper lobes) (shape; fusion)	Obovate; free	Oblong; connate for 25% of length	Obovate; free
Corolla (palate)	ca. 10-ribbed	5- or 6-ribbed	5–7-ribbed
Corolla (indumentum: outside)	Glabrous except for few short-stalked glandular trichomes	Puberulous	Scattered short-stalked glandular and isolated eglandular multi-cellular trichomes

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TABLE 1. (Continued)

Character	<i>P. karasbergense</i>	<i>P. parvifolium</i>	<i>P. lucens</i>
Corolla (colour of lobes)	White or cream-white, occasionally with a faint lilac tinge	Mauve, white or white with lilac tinge	Mauve
Corolla (nectar guides)	Front lobe: pale yellow with purple patches Lateral lobes: purple Upper lobes: absent	Front lobe: yellow with brown patches Lateral lobes: brown Upper lobes: brown	Front lobe: cream Lateral lobes: beige Upper lobes: beige
Filaments (length) (mm)	Short filaments: ca. 6.2 Long filaments: ca. 8.8	Short filaments: ca. 4.3 Long filaments: ca. 5.7	Short filaments: ca. 6.5 Long filaments: ca. 8.7
Anthers (length) (mm)	ca. 2.5	ca. 2.2	ca. 3.3
Anthers (indumentum)	Few simple trichomes	Scattered short-stalked glandular and few simple trichomes	Scattered short-stalked glandular trichomes
Style (indumentum)	Puberulous towards base	Puberulous with short-stalked glandular trichomes in addition	Puberulous
Distribution	Namibia (Groot Karasberge in the Kharas Region)	Botswana (Kgalagadi District), Namibia (Omaheke and Khomas Regions)	Namibia (Kharas Region) and South Africa (Northern Cape Province)

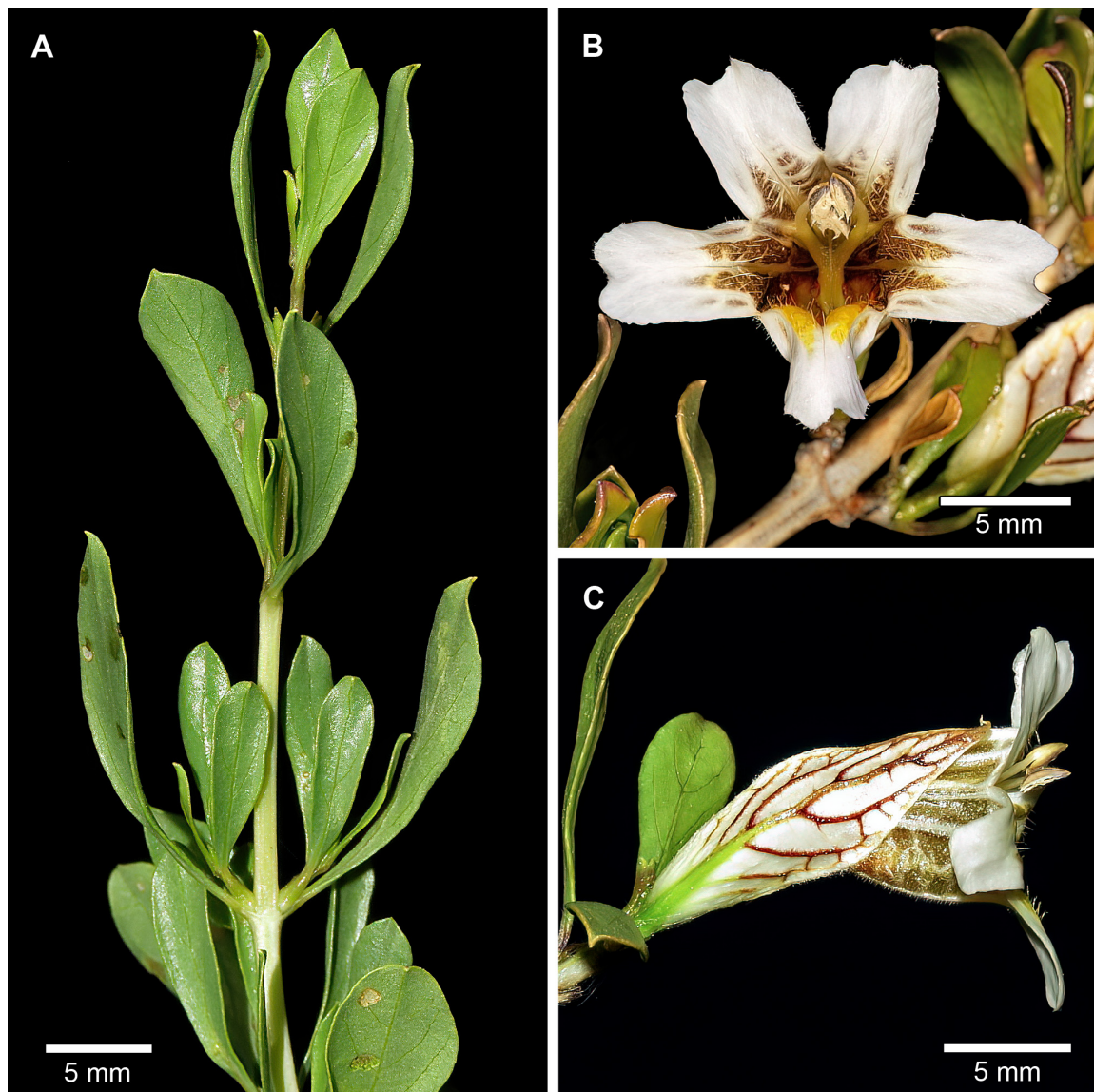


FIGURE 4. *Petalidium parvifolium*, flower and leaf morphology. **A.** Branchlet showing glossy, non-succulent leaves; blade \pm flat and margins without long, robust, multi-cellular trichomes and isolated, robust, stalked glandular trichomes (present in *P. mannheimerae*). **B.** Flower in front view showing nectar guides. **C.** Flower in lateral view showing white bracteoles with conspicuous venation. Photographs by W. Swanepoel. Republished from Swanepoel *et al.* (2022).

All the mentioned species are from the infrageneric group composed of plants with regular, five-parted calyces (Obermeijer 1936, Tripp *et al.* 2017).

Additional specimens examined (paratypes):—NAMIBIA, ||Kharas Region: Keetmanshoop District, Aob, Great Karas Mountains [Groot Karasberge], 2719AA, 18 April 1924, *Dinter 5150 & 5154* (PRE!); Karasburg, Numdis, in rante, 2719AD, January 1975, *Auret 5617* (PRE!); Karasburg District, along the main road from Karasburg to Ariamsvlei, 2819AB, 811 m, 6 March 2008, *Hasheela HHa0020* (PRE!, WIND!).

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References

- Beentje, H. (2016) *The Kew plant glossary: an illustrated dictionary of plant terms*, 2nd ed. Kew Publishing, Kew, 184 pp.
- Edwards, D. & Leistner, O.A. (1971) A degree reference system for citing biological records in southern Africa. *Mitteilungen der Botanischen Staatssammlung München* 10: 501–509. [<https://biostor.org/reference/185348>]
- Figueiredo, E. & Smith, G.F. (2008) *Plants of Angola/Plantas de Angola*. *Strelitzia* 22. South African National Biodiversity Institute, Pretoria, pp. 1–279. [<https://www.sanbi.org/documents/plants-of-angola-strelitzia-22/>]
- Germishuizen, G. & Meyer, N.L. (Eds.) (2003) *Plants of southern Africa: an annotated checklist*. *Strelitzia* 14. National Botanical Institute, Pretoria, 1231 pp.
- IUCN (2012) *IUCN red list categories and criteria: Version 3.1, 2nd edn*. IUCN Species Survival Commission, Gland, Switzerland and Cambridge U.K., iv + 32 pp.
- Manktelow, M. (2000) The filament curtain: a structure important to systematics and pollination biology in the Acanthaceae. *Botanical Journal of the Linnean Society* 133 (2): 129–160.
<https://doi.org/10.1111/j.1095-8339.2000.tb01539.x>
- Mendelsohn, J., Jarvis, A., Roberts, C. & Robertson, T. (2002) *Atlas of Namibia*. Philip, Cape Town, 200 pp.
- Meyer, P.G. (1961) Beiträge zur Kenntnis der Acanthaceen Südwestafricas (III). *Mitteilungen der Botanischen Staatssammlung München* 4: 59–72. [<https://biostor.org/reference/185199>]
- Meyer, P.G. (1968) Acanthaceae. *Prodromus einer Flora von Südwestafrika* 130: 1–65.
- Nees von Esenbeck, C.G. (1832) Acanthaceae India Orientalis. In: Wallich, N. (Ed.) *Plantae Asiaticae rariores: or descriptions and figures of a select number of unpublished East Indian plants*, vol. 3. Treuttel & Würtz, London, pp. 70–117.
<https://doi.org/10.5962/bhl.title.468>
- Obermeijer, A.A. (1936) The South African species of *Petalidium*. *Annals of the Transvaal Museum* 18: 151–162.
- Schinz, H. (1926) Acanthaceae. *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich* 71: 145–146.
- Swanepoel, W. (2020) *Petalidium kaokoense* (Acanthaceae), a new species from Namibia. *Phytotaxa* 468 (3): 236–242.
<https://doi.org/10.11646/phytotaxa.468.3.1>
- Swanepoel, W. & Manzitto-Tripp, E. (2022) *Petalidium sesfonteinense* (Acanthaceae), a new species from the Kaokoveld, Namibia. *Phytotaxa* 549 (8): 127–135.
<https://doi.org/10.11646/phytotaxa.549.2.1>
- Swanepoel, W., Nanyeni, L. & Van Wyk, A.E. (2022) *Petalidium mannheimerae* (Acanthaceae), a new species from Namibia and South Africa, with notes on the taxonomic identity of *P. parvifolium*. *Phytotaxa* 561 (1): 1–13.
<https://doi.org/10.11646/phytotaxa.561.1.1>
- Swanepoel, W. & Van Wyk, A.E. (2023) *Petalidium konkiepense* (Acanthaceae), a new species from Namibia. *Phytotaxa* 585 (1): 29–38.
<https://doi.org/10.11646/phytotaxa.585.1.3>
- Thiers, B. (2019) *Index Herbariorum: A global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual

Herbarium. Available from <http://sweetgum.nybg.org/ih/> (accessed October 2022)

Tripp, E.A., Tsai, Y.E., Zhuang, Y. & Dexter, K.G. (2017) RADseq dataset with 90% missing data fully resolves recent radiation of *Petalidium* (Acanthaceae) in the ultra-arid deserts of Namibia. *Ecology and Evolution* 7 (19): 1–17.

<https://doi.org/10.1002/ece3.3274>

Van Wyk, A.E. & Smith, G.F. (2001) *Regions of floristic endemism in southern Africa: a review with emphasis on succulents*. Umdaus Press, Hatfield, Pretoria, 199 pp.