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Petalidium namibense (Acanthaceae), a new species from Namibia

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Abstract

Petalidium namibense, hitherto confused with *P. englerianum*, *P. rossmannianum*, and the widespread *P. variabile*, is here described as a new species. It is a range-restricted species, only known from the area to the southwest, west and northwest of Puros in the Kaokoveld Centre of Endemism, northwestern Namibia, where it grows at the base of rocky outcrops, on arid hillsides, and along ephemeral riverbeds and drainage lines. Diagnostic characters for *P. namibense* include the pale grey appearance of the plants, corky bark on older stems, vegetative parts with a dense white indumentum of relative long dendritic trichomes appearing lanate, flowers borne in short few-flowered dichasia, and bracteoles narrowly ovate. The flowers of *P. namibense* are distinctive in having the two upper corolla lobes discolorous, abaxially light brown, adaxially vermilion, without nectar guides, and connate towards the base for 25–40% of their length. The anterior lobe is adaxially magenta with two relative long, narrowly triangular yellow nectar guides. The two lateral lobes are adaxially vermilion, or distally magenta, grading to vermilion towards the throat, and lack conspicuous nectar guides. A comparison of key morphological features distinguishing *P. namibense* from *P. sesfonteinense*, its closest relative in appearance, as well as from *P. englerianum*, *P. rossmannianum*, and *P. variabile*, is provided. Based on IUCN Red List criteria, a provisional conservation assessment of Vulnerable (VU) is recommended for the new species.

Key words: endemism, flora, Kaokoveld Centre of Endemism, Kunene Region, Namib Desert, Ruellieae, Puros, taxonomy

Introduction

Currently, 41 described species of *Petalidium* Nees von Esenbeck (1832: 75) are recognised in Africa. The primary centre of diversity for this genus is located in northwestern Namibia and neighbouring southwestern Angola. Namibia is home to 31 species, while 13 species are recorded in Angola, six in South Africa, and 33 species are noted in the *Flora of southern Africa region*, which includes South Africa, Namibia, Botswana, Eswatini, and Lesotho (Germishuizen & Meyer 2003, Figueiredo & Smith 2008, Swanepoel 2020, Swanepoel & Manzitto-Tripp 2022, Swanepoel *et al.* 2022, Dexter *et al.* 2023, Swanepoel & Van Wyk 2023a, b, Swanepoel *et al.* 2023, 2024). In the present contribution a new species of *Petalidium* is described. According to available distribution records, this new entity is restricted to the Namibian part of the Kaokoveld Centre of Endemism—a biogeographical region rich in range-restricted plant species in northwestern Namibia and adjacent southwestern Angola (Van Wyk & Smith 2001).

During several botanical expeditions to the Puros area, one of us (WS) encountered an unfamiliar *Petalidium* characterised by its dwarf shrub habit, multi-stemmed from just below or above ground level, white peeling bark (corky on older stems), relative long dendritic trichomes, and flowers in short dichasia. The plants were in flower, enabling the taxon to be identified as an undescribed species. The new species can be confused with several other members of *Petalidium* in northwestern Namibia with which it shares morphological similarities, especially in features of the indumentum, leaves, and flowers. Its closest relative is probably *P. sesfonteinense* Swanepoel & Manzitto-Tripp (2022: 128). In his treatment of *P. rossmannianum* Meyer (1961: 68) in the *Prodromus einer Flora von Südwestafrika*, Meyer (1968) lists three specimens under form “e”, of which one (Giess & Leippert 7453), represents the new species.

A study of the *Petalidium* holdings in the Herbs PRE and WIND revealed several earlier collections of the new species, all filed either under *P. englerianum* (Schinz 1890: 197) Clarke (1899: 89), *P. rossmannianum*, or *P. variabile* Clarke (1899: 92).

The Kaokoveld Centre is a pronounced centre of diversity and endemism for *Petalidium* (Craven 2009, Tripp *et al.* 2017, Dexter *et al.* 2023, Loiseau *et al.* 2023) and related Acanthaceae (e.g., Tripp & Dexter 2012, Darbyshire *et al.* 2020). The Centre is botanically still underexplored, hence the identification of yet another new species in this region is not unexpected.

Methods

Morphological descriptions and ecological information presented here are based primarily on field observations and material collected following extensive field work in Namibia. Diagnostic features for the new species and *P. sesfonteinense* were determined through examination of fresh material, the type material in Herb. WIND, as well as high-resolution images of type material of previously described species of *Petalidium* available on JSTOR Global Plants (<https://plants.jstor.org/>). This was supplemented by the study of the protologues and available herbarium collections in the National Botanical Research Institute in Namibia (WIND), the South African National Biodiversity Institute, Pretoria (PRE), and the University of Pretoria (PRU) (herbarium abbreviations follow Thiers 2024). 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. A preliminary conservation assessment was conducted using the standard procedures based on IUCN (2012) recommendations.

Taxonomic treatment

Petalidium namibense Swanepoel & A.E.van Wyk, *sp. nov.* (Figs 1–3)

Diagnosis:—A woody dwarf shrub up to 1 m tall, morphologically most similar to *Petalidium sesfonteinense*, differing by having the leaf lamina ovate, elliptic, suborbicular or orbicular (*vs.* ovate, elliptic or oblanceolate); bracteoles with trichomes dendritic, interspersed with glandular ones (*vs.* trichomes glandular with in addition appressed simple ones towards base); corolla shorter, 15.0–17.5 mm (*vs.* 20–24 mm long), upper lobes rectangular, smaller, 4.9–5.2 × 2.9–3.2 mm (*vs.* obovate, 5.8–8.2 × 3.5–4.3 mm), upper and lateral lobes differently coloured than anterior lobe with nectar guides absent or inconspicuous (*vs.* all lobes similarly coloured, nectar guides on upper and lateral lobes conspicuous).

Type:—NAMIBIA. Kunene Region: 1812 (Sanitatas), Namib Desert, 3 km north of Khumib River, 4 km east of Skeleton Coast Park boundary, gneiss ridge (–DA), 377 m a.s.l., 23 May 2022, *Swanepoel 636* (holotype WIND!; isotypes PRE!, PRU!).

Erect, hemispherical or procumbent woody dwarf shrub up to 0.8 m tall; all vegetative parts with a dense white indumentum of dendritic trichomes, the trichomes sparsely branched or bottlebrush-like, sometimes rebranching, appearing lanate, interspersed with few or scattered short-stalked glandular trichomes, the latter often concealed by the much longer dendritic ones. *Stems* single or multi-stemmed from just below or above ground level from thick rootstock or main stem, up to 120 mm in diam., bark rough and fissured, corky in older plants, grey or blackish grey; older distal stems cylindrical, bark smooth, often longitudinally fissured or rough and corky, cream-white, cream-brown or grey; young stems quadrangular, green, becoming cream-white with age, glabrescent, cystoliths visible. *Leaves* opposite and decussate on new shoots, fascicled on older stems; petiole 1–14 mm long; lamina ovate, elliptic, suborbicular or orbicular, flat, often sub-conduplicate towards apex, up to 42 × 26 mm, green, apices rounded or acute, usually apiculate, bases cuneate, truncate or rounded, margins entire, often subinvolute, midrib and 3–6 principal lateral veins prominently raised adaxially, cystoliths not visible; indumentum on leaves with short bifurcate trichomes in addition. *Flowers* in short axillary dichasia; bracts foliaceous, lanceolate (*sensu* Lindley), linear-lanceolate or oblanceolate, sessile, 6–13 × 1–2 mm; pedicels (below bracteoles; “peduncle” of some authors) up to 1 mm long; bracteoles narrowly ovate, slightly asymmetrical, coriaceous, ca. 11 × 5 mm, connate proximally for up to 2.5 mm, apex acute or acuminate, pale green, cream-brown when dry, venation reticulate, indumentum abaxially similar to vegetative parts but trichomes

longer and more robust, adaxially strigose towards apex and with additional short-stalked glandular trichomes or glabrous, margin lanate towards apex, cystoliths visible both sides, linear or curved, dense. *Calyx* 5.9–6.5 mm long including basal tube of 0.9–1.5 mm deep, lobes 4, regular, narrowly triangular, acute, unequal, 3.9–5.6 × 0.6–1.4 mm, anticus lobe indistinctly bifid; strigose both sides, scattered short-stalked glandular trichomes in addition abaxially. *Corolla* with narrow unexpanded portion of tube cylindrical, laterally slightly flattened, 15.0–17.5 mm long with lobes straightened, narrow portion 7.4–8.2 mm long, ca. 2.3 mm diam., expanded portion at a slight angle to anterior side of narrow portion, 3.9–4.5 mm long, outside glabrous, sometimes sparingly puberulous on posterior side, inside of anticus portion towards mouth puberulous and with few long stiff white simple trichomes, inside otherwise glabrous; lobes patent with respect to corolla tube axis, anterior lobe obovate, margins entire, apices retuse or truncate, 5.0–5.7 × 4.7–5.5 mm, lateral and upper lobes rectangular (upper lobes obovate when flattened), margins often revolute, apices retuse or truncate, lateral lobes 4.0–4.9 × 2.6–3.5 mm, upper lobes 4.9–5.2 × 2.9–3.2 mm, connate for 25–40% of their length, slightly overlapping, discolorous, abaxially light brown, adaxially vermilion, anterior lobe adaxially magenta with two narrowly triangular yellow nectar guides, the two lateral lobes adaxially vermilion or carmine distally, grading into vermilion towards throat, lacking nectar guides or nectar guides inconspicuous, slightly darker in colour than that of the associated lobes, lobes glabrous except for few long stiff white simple trichomes towards bases adaxially; palate prominently transversely 4- or 5-ribbed. *Stamens* didynamous, inserted dorsally in throat, fused portion 1.1–1.7 mm long, free parts slightly tapering towards apex, glabrous, long filaments ca. 4.0 mm long, short filaments ca. 2.6 mm long, outer filament with basal ridge from point of insertion on corolla (“trace”) decurrent to 4.2–5.7 mm from base of tube, puberulous; filament curtain reduced (*sensu* terminology of Manktelow 2000); anthers 2-thecous, thecae linear-elliptic, equal, ca. 2.3 mm long including short basal spur, cream-brown with scattered short-stalked glandular trichomes. *Gynoecium* 12.0–13.8 mm long; ovary ovoid, laterally compressed, 1.1–1.7 × 0.8–1.4 mm, inserted in fleshy disc, glabrous; style filiform, 10.0–11.8 mm long, puberulous, stigma lobes linear, unequal, longer lobe ca. 1.0 mm long, shorter lobe ca. 0.7 mm long. *Capsule* flattened ovoid, ca. 5.5 × 3.1 mm, tawny, glossy, glabrous; seeds cordate, ca. 3.1 × 2.4 mm, densely covered with white hygroscopic trichomes.

Phenology:—Flowers and fruit have been recorded from February to November.

Distribution and habitat:—At present, *Petalidium namibense* is only known from the area to the southwest, west and northwest of Puros, between the lower Sechomib and Hoarusib rivers below the Great Escarpment in northwestern Namibia (Fig. 4). The specimen *Moss & Jacobsen K312* from the Hoanib River Valley (southernmost point in Fig. 4) is located ca. 70 km to the south of the known core range of *P. namibense*. It morphologically seems to conform in all respects to *P. namibense* and probably represents a second, outlier population of the species. *Petalidium namibense* occurs at the base of rocky outcrops, on arid hillsides, and along drainage lines at elevations of 280–560 m a.s.l., 20–55 km inland from the Atlantic Ocean. Average annual rainfall in the area is less than 100 mm and falls mainly in summer (Atlas of Namibia Team 2022). In certain parts of the Namib Desert, fog from the Atlantic Ocean is a regular and vital source of moisture, particularly for smaller animals (Mitchell *et al.* 2020). Although the area in the distribution range of *P. namibense* experiences fog about 5–10% of the year (Atlas of Namibia Team 2022), the poor condition of the plants during droughts suggests that they may not benefit significantly from this moisture source.

Conservation status:—*Petalidium namibense* has been recorded at several localities in an area of ca. 55 × 20 km where it is occasional to locally common. 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. Even though it is protected within the Skeleton Coast National Park, where its range slightly extends, a recent survey of its distribution area revealed numerous recently dead plants, likely due to extended droughts. *Petalidium namibense* is here provisionally ranked as Vulnerable VU B1a(iii), (b)iii (IUCN 2012).

Etymology:—The specific epithet refers to the Namib Desert to which *Petalidium namibense* is endemic. The Namib Desert in its broadest definition, stretches along the Atlantic Ocean from Saõ Nicolau (Bentiaba) in Angola through Namibia to the Olifants River in South Africa (Seely 2004, Goudie & Viles 2015).

Notes:—*Petalidium namibense* is morphologically most similar to *P. sesfonteinense*, perhaps its closest relative. Hence these two species were compared in the diagnoses above. Some of the morphological features to distinguish between *P. namibense* and *P. sesfonteinense* are provided in Table 1; also see Fig. 5. An identification key to distinguish between these two species, as well as *P. englerianum*, *P. rossmannianum*, and *P. variabile*, is provided below.

When not in flower and especially in the case of herbarium specimens, the new species can also be confused with several other species of *Petalidium* from the Kunene Region, Namibia, with dense indumentum and similar inflorescences, notably *Petalidium kaokoense* Swanepoel (2020: 237), *P. ohopohense* Meyer (1973: 108), *P. rossmannianum*, and *P. welwitschii* Moore (1880: 227). However, the indumentum of *P. kaokoense* consists of stellate trichomes interspersed with a few dendritic ones (*vs.* dendritic trichomes interspersed with scattered short-stalked

glandular trichomes); some branches of the dendritic trichomes of *P. ohopohense* bear a terminal gland and the corollas are pilose on the outside (*vs.* trichome branches eglandular and corolla glabrous outside); the dendritic trichomes on the leaves and bracteoles of *P. rossmannianum* are very small with short lateral branches, interspersed with scattered stellate trichomes, and the expanded part of the corolla tube is puberulous (*vs.* dendritic trichomes larger, longer branched, interspersed with scattered short-stalked glandular trichomes, corolla glabrous outside); the bracteoles of *P. welwitschii* are covered abaxially with scattered villose trichomes up to 4 mm long (*vs.* bracteoles appearing lanate due to dense layer of dendritic trichomes).

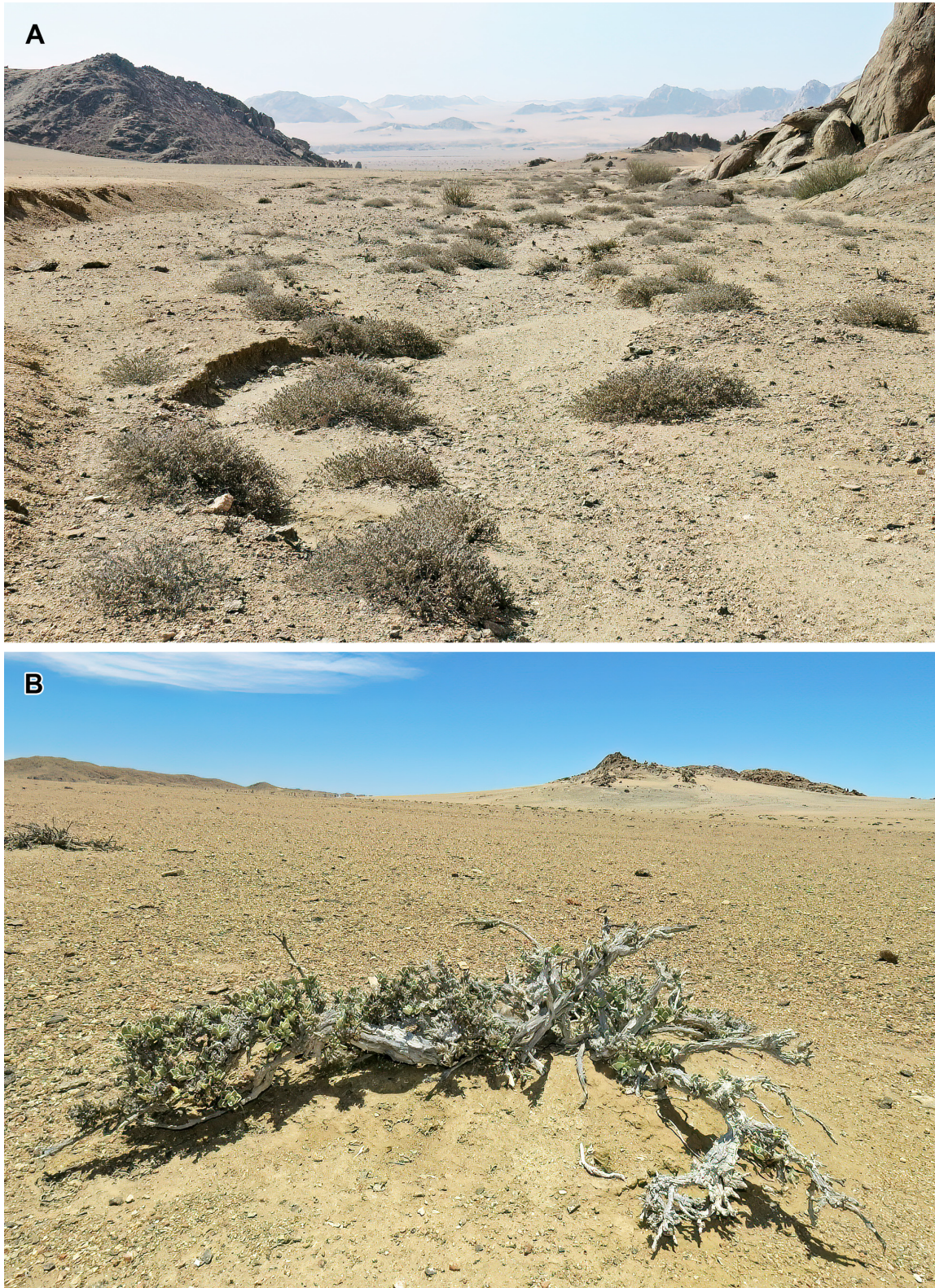


FIGURE 1. *Petalidium namibense*, habitat and habit. **A.** Several plants (dark grey dwarf shrubs) growing in the bed of an ephemeral drainage line. **B.** Ancient windswept plant sprouting from persistent woody stems with corky bark. Photographs by W. Swanepoel.



FIGURE 2. *Petalidium namibense*, habitat and habit. **A.** Mature plant (ca. 0.5 m high) with greyish appearance, growing among rocks. **B.** Multiple stems (thickest ca. 80 mm in diam.) from base of a relatively old plant, each covered with thick corky bark. Photographs by W. Swanepoel.

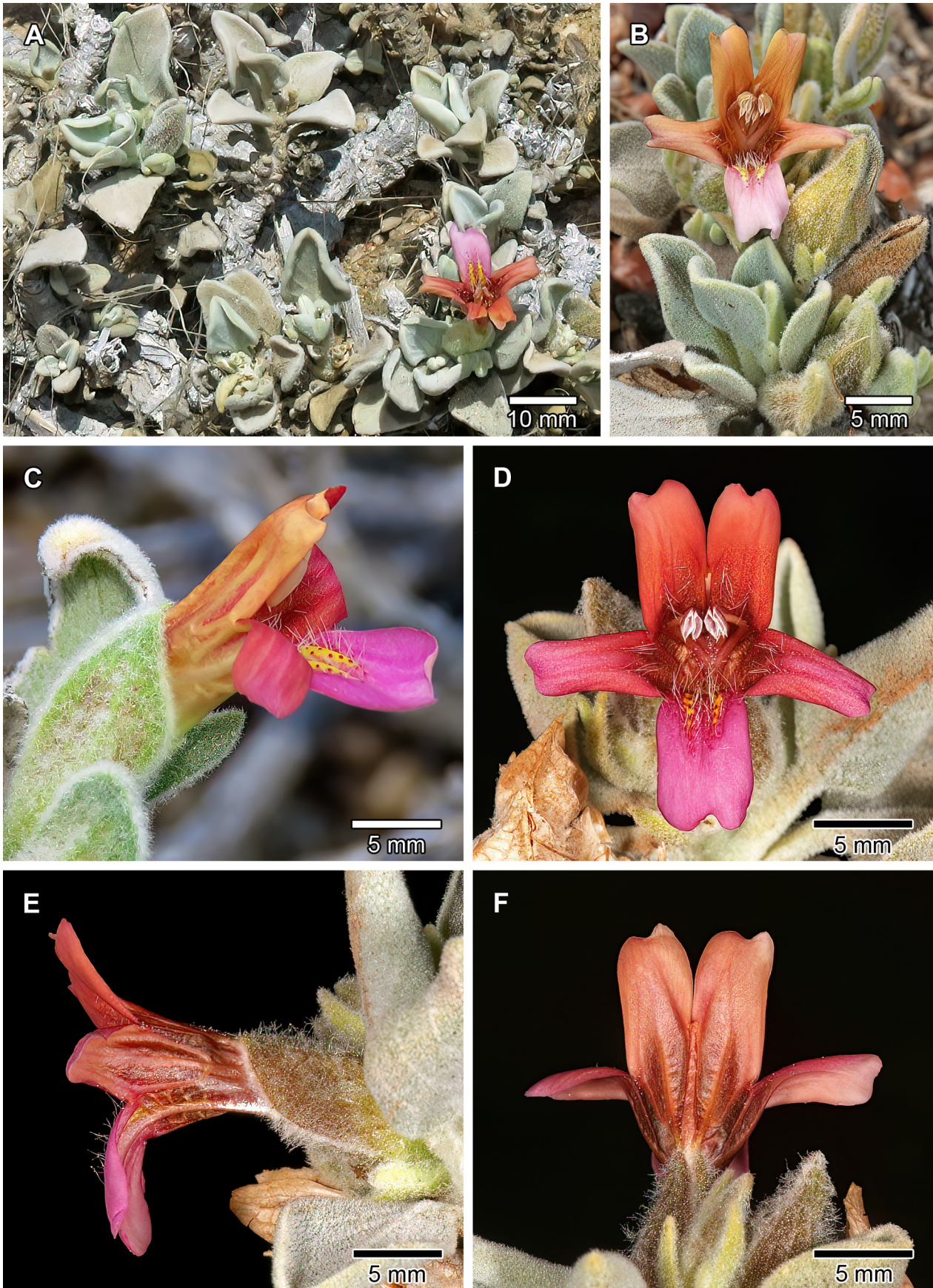


FIGURE 3. *Petalidium namibense*, morphology of leaves and flowers. **A.** Flower, reduced shoots, and congested leaves; leaves with dense greyish indumentum. **B.** Flower in the process of fading as indicated by its pale colours. **C.** Newly opened flower with bracteoles in oblique lateral view; note brownish abaxial colour of posterior corolla lobes. **D.** Flower in front view. **E.** Flower with bracteoles in lateral view. **F.** Flower in dorsal view. Photographs: W. Swanepoel.

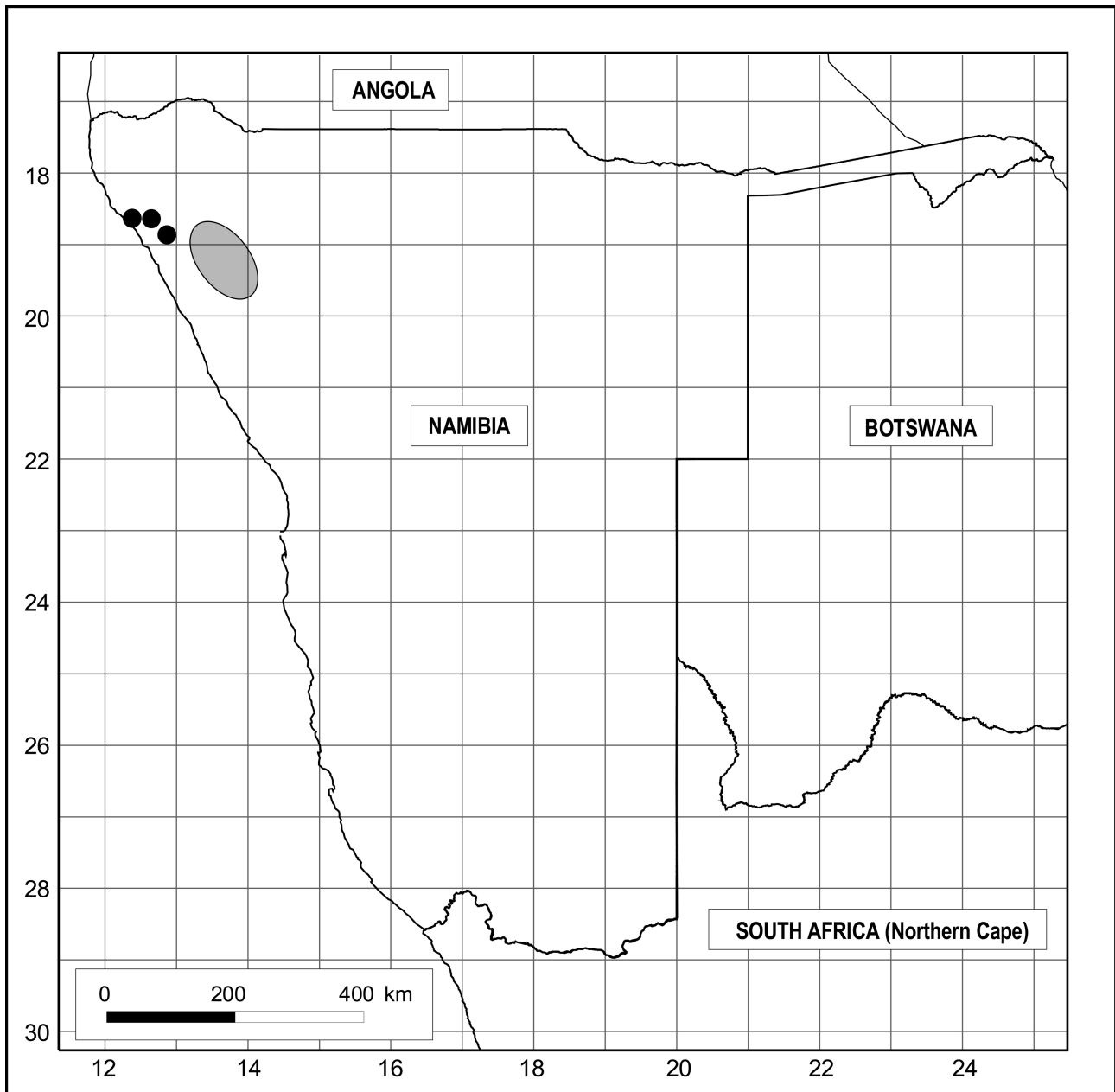


FIGURE 4. Known distribution of *Petalidium namibense* (black dots; ●) based on specimens in Herbs PRE and WIND. Also depicted are the distribution range of *P. sesfonteinense* (shaded grey), based on Swanepoel & Manzitto-Tripp (2022).

All the mentioned taxa are from the group composed of plants with irregular, four-parted calyces (Obermeijer 1936, Tripp *et al.* 2017).

Additional specimens examined (paratypes):—NAMIBIA, Kunene Region: 7 km southwest of Ogams Fountain, 1812CB, 406 m, 5 November 2023, *Swanepoel 639* (WIND!); Namib-Kiesfläche 14 Meilen nördlich Sarusas, 1812DA, 9 June 1963, *Giess & Leippert 7453* (PRE!, WIND!); 20 Meilen nordöstlich Sarusas Ost, 1812DA, 26 April 1966, *Giess 9416* (PRE!, WIND!); 30 km west-northwest of Puros along track to Skeleton Coast National Park, 1812DA, 456 m, 30 May 2018, *Swanepoel 635* (WIND!); 8 km southeast of Ogams Fountain, 1812DA, 551 m, 5 November 2023, *Swanepoel 638* (WIND!); Puros, rocky terrain opposite Hoarusib River, 1812DD, 292 m, 3 November 2023, *Swanepoel 637* (WIND!).



FIGURE 5. *Petalidium sesfonteinense*, morphology of leaves and flowers. **A.** Flowers, shoots, and leaves; greyish leaves are still densely covered in trichomes; green leaves almost glabrous. **B–E.** Flowers in front view showing variation in corolla colour and lobe margins, with two yellow nectar guides. Photographs: W. Swanepoel. Republished from Swanepoel & Manzitto-Tripp (2022).

TABLE 1. Morphological differences between *Petalidium namibense* and *P. sesfonteinense*.

Character	<i>P. namibense</i>	<i>P. sesfonteinense</i>
Bark on older stems	Corky	Not corky
Leaves (shape)	Ovate, elliptic, suborbicular or orbicular	Ovate, elliptic or oblanceolate
Bracteoles (indumentum (abaxially))	Dense dendritic trichomes, sparsely branched or bottlebrush-like, sometimes rebranching, interspersed with few or scattered short-stalked glandular trichomes	Dense glandular trichomes of various lengths and long multi-cellular glandular trichomes, sometimes interspersed with very long multicellular bifurcate eglandular or dendritic trichomes; strigose towards base
Calyx (length) (mm)	5.9–6.5	6.6–7.2
Calyx (indumentum)	Strigose both sides, scattered short-stalked glandular trichomes in addition abaxially	Strigose in places on both surfaces
Corolla (length) (mm) (lobes straightened)	15.0–17.5	20–24
Corolla narrow portion (size) (mm)	7.4–8.2 long, ca. 2.3 diam.	ca. 10 long, 3.2 diam.
Corolla expanded portion (length) (mm)	3.9–4.4	ca. 6
Corolla upper lobes (shape, fusion, and size) (mm)	Rectangular (obovate when flattened), 4.9–5.2 × 2.9–3.2 mm, connate for 25–40% of their length, slightly overlapping	Obovate, 5.8–8.2 × 3.5–4.3, connate for 20–30% of their length, overlapping or not
Corolla lateral lobes (shape and size) (mm)	Rectangular, 4.0–4.9 × 2.6–3.5	Oblong, 5.2–7.8 × 3.2–4.5
Corolla anterior lobe (shape and size) (mm)	Obovate, 5.0–5.7 × 4.7–5.5	Broadly obovate, 5.5–8.8 × 6.2–7.2
Corolla lobes (colour, adaxially)	Anterior magenta; upper vermillion; laterals vermillion or distally magenta, grading to vermillion towards throat	All lobes similarly coloured: white, pink, magenta, apricot, yellow, or cream
Corolla nectar guides (upper and lateral lobes)	Absent or inconspicuous, slightly darker than lobe colour	Conspicuous, maroon
Corolla (indumentum) (outside)	Glabrous, sometimes sparingly puberulous on posterior side	Glabrous
Distribution	Northwest, west and southwest of Puros to the Skeleton Coast National Park including the lower Hoanib River	Sesfontein and the surrounding mountainous area up to Tomakas in the west and Warmquelle in the east

Identification key to *Petalidium namibense*, *P. englerianum*, *P. rossmannianum*, *P. sesfonteinense*, and *P. variabile*

Note: To accurately distinguish between different species of *Petalidium*, it is important to consider both the characteristics of the leaf indumentum and the colour and indumentum of the flowers. Keep in mind that in many species, the density of the leaf indumentum changes significantly with age, often transitioning from very dense in young leaves to sparse or even hairless in older leaves. A key diagnostic feature is the dominant type of eglandular trichome found on the leaves, which can be simple, stellate, or dendritic.

1. Leaves with indumentum a mat of simple, appressed, eglandular trichomes *P. variabile*
- Leaves with indumentum a mat of either stellate or dendritic trichomes, interspersed with other types 2.
2. Leaves with trichomes mainly stellate; corolla anterior lobe yellow, other lobes orange or pale yellow adaxially, lobes lacking conspicuous nectar guides *P. englerianum*
- Leaves with trichomes mainly dendritic; corolla lobes variously coloured (rarely yellow), anterior lobes with conspicuous yellow, narrowly triangular, nectar guides 3.

3. Dendritic trichomes on leaves interspersed with very short, simple (appressed), bifurcate ones and in addition longer, more robust, stellate-dendritic ones; corolla strigose-puberulous outside, lobes white adaxially..... *P. rossmannianum*
- Dendritic trichomes on leaves interspersed with very small, short-stalked glandular trichomes, concealed by the mat of larger dendritic ones, interspersed with bifurcate ones in addition or not; corolla usually glabrous outside (sometimes sparingly puberulous on posterior side), lobes variously coloured, rarely white.....4.
4. Flowers with corolla lobes all similarly coloured adaxially, apricot, cream, magenta, pink, yellow or white (rarely); corolla outside always glabrous*P. sesfonteinense*
- Flowers with corolla lobes differently coloured adaxially, upper lobes vermillion, anterior lobe adaxially magenta, two lateral lobes adaxially vermillion or carmine distally, grading into vermillion towards throat; corolla outside glabrous, sometimes sparingly puberulous on posterior side.....*P. namibense*

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