



Petalidium hoarusibense (Acanthaceae), a new species from Namibia

WESSEL SWANEPOEL^{1,2,4*} & ABRAHAM E. VAN WYK^{2,3,5}

¹Independent Researcher, P.O. Box 21168, Windhoek, Namibia

²H.G.W.J. Schweickerdt Herbarium, Department of Plant and Soil Sciences, University of Pretoria, Pretoria, 0002 South Africa

³South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa

⁴wessel@kaokosafari.com; <https://orcid.org/0000-0002-0181-3543>

⁵braamvanwyk@gmail.com; <https://orcid.org/0000-0002-0437-3272>

*Author for correspondence

Abstract

Petalidium hoarusibense, hitherto misidentified as *P. rossmannianum* and *P. ohopohense*, is here described as a new species. It is a range-restricted species, only known from the area to the south and southeast of Okandjombo in the Kaokoveld Centre of Endemism, northwestern Namibia, where it grows on arid hillsides and along ephemeral riverbeds and drainage lines. Diagnostic characters for *P. hoarusibense* include the pale grey appearance of the plants, single or multi-stemmed from a thick rootstock, vegetative parts with a dense white indumentum of short dendritic, simple and bifurcate trichomes appearing matted, flowers borne in short, few-flowered dichasia, and bracteoles narrowly ovate or elliptic, deeply concave, appearing cobwebbed due to a mixture of loosely entangled long simple and dendritic trichomes. The flowers of *P. hoarusibense* are distinctive in having the lobes magenta with the anterior lobe sometimes slightly lighter shaded than the others and with two separate narrowly triangular yellow nectar guides. A comparison of key morphological features distinguishing *P. hoarusibense* from *P. kaokoense*, its closest relative in appearance, as well as from *P. ohopohense*, *P. rossmannianum*, *P. sesfonteinense*, and *P. welwitschii*, 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, Kaokoveld Centre of Endemism, Kunene Region, Namib Desert, Ruellieae, Okandjombo, Hoarusib River, taxonomy

Introduction

Currently, 42 described species of *Petalidium* Nees von Esenbeck (1832: 75) are recognised in Africa. The primary area of diversity for this genus is located in northwestern Namibia and neighbouring southwestern Angola. Of these, 32 species are recorded for Namibia, 13 for Angola, six for South Africa, and 34 for 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, 2024, Swanepoel *et al.* 2023, 2024). In the present contribution a new species of *Petalidium* is described. Based on available distribution records, this new entity appears to be confined 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 a botanical expedition to the Okandjombo area in November 2023, 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, vegetative parts with short, simple, bifurcate and dendritic trichomes, and bracteoles appearing cobwebby due to a mixture of loosely entangled long simple and dendritic trichomes. In May 2024 during a subsequent expedition the plants were in flower, enabling identification of the taxon 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. kaokoense* Swanepoel (2020: 237). In his treatment of *P. rossmannianum* Meyer (1961: 68) in the *Prodromus einer Flora von Südwestafrika*, Meyer (1968) lists three gatherings under form “e”, of which two (*Giess & Leippert 7409* and *De Winter & Leistner 5667*), represent the new species, and the third (*Giess & Leippert 7453*), the recently described *Petalidium namibense*

Swanepoel & Van Wyk (2024: 129). A study of the *Petalidium* holdings in the Herbs PRE, PRU, and WIND revealed one additional earlier collection of the new species (*Kers 1198*), filed under *P. ohopohense* Meyer (1973: 108).

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, *P. kaokoense*, *P. ohopohense*, *P. rossmannianum*, and *P. sesfonteinense* Swanepoel & Manzitto-Tripp (2022: 128) were determined through examination of fresh material and the type material in Herb. WIND. This was supplemented by the study of the protologues and available herbarium collections. The herbaria of the National Botanical Research Institute in Namibia (WIND), the South African National Biodiversity Institute, Pretoria (PRE), and the University of Pretoria (PRU) were consulted for possible collections of the new species (herbarium codes follow Thiers 2024). A 6.5–45.0× magnification stereo microscope was used for studying morphological features. Descriptive terminology follows Manktelow (2000), Beentje (2016), and Hewson (2019). 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 hoarusibense Swanepoel & A.E.van Wyk, *sp. nov.* (Figs 1, 2 & 4A)

Diagnosis:—A woody dwarf shrub up to 1.2 m tall, morphologically most similar to *Petalidium kaokoense*, from which it differs in having indumentum on the bracteoles cobwebbed, consisting of a mixture of loosely entangled simple and dendritic trichomes up to 2.5 mm long, with in addition scattered short-stalked glandular trichomes (*vs.* matted/compact, stellate and dendritic, shorter, up to 0.5 mm long, lacking glandular trichomes); corolla glabrous outside (*vs.* exposed part strigose); nectar guides on anterior lobe narrowly triangular, separate (*vs.* linear-oblong, confluent or nearly so).

Type:—NAMIBIA. Kunene Region: 1812 (Sanitatas), Hoarusib River Gorge, 23 km south of Okandjombo (–BD), 458 m a.s.l., 17 May 2024, *Swanepoel 644* (holotype WIND!; isotypes PRE!, PRU!).

Erect woody dwarf shrub up to 1.2 m tall; all vegetative parts with dense white indumentum of short dendritic trichomes with three or more lateral branches, sometimes rebranching, usually some trichomes longer and bottlebrush-like, also simple or bifurcate trichomes in addition, glabrescent, branches of trichomes on stems and petioles irregular, trichomes on leaf lamina shorter with lateral branches straight. *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, white, brownish white or greyish white; older distal stems terete, bark smooth or peeling in short flakes or in long, thin, narrow strips, cream-white, or grey-white; young stems quadrangular, pale green or yellow-green, becoming white or cream-white with age, cystoliths visible, short, circular, elliptic or oblanceolate. *Leaves* opposite and decussate on new shoots, fascicled on older stems; petiole 5–13 mm long; lamina narrowly ovate to ovate, lanceolate (*sensu* Lindley) or elliptic, flat, or sub-conducuplicate towards apex, up to 40 × 22 mm, green but appearing ashy grey due to dense indumentum, apices acute, rarely obtuse or rounded, bases cuneate, decurrent, margins entire, often sub-undulate, midrib prominently raised on both sides, 3–5 principal lateral veins slightly prominent adaxially, cystoliths visible adaxially, linear. *Flowers* in short axillary dichasia; bracts foliaceous, linear, oblanceolate or lanceolate (*sensu* Lindley), sessile, 7–12 × 1–2 mm, indumentum of dendritic trichomes (sometimes lacking adaxially) with scattered small, stalked glandular trichomes in addition; pedicels (below bracteoles; “peduncle” of some authors) up to 1 mm long; bracteoles narrowly ovate or elliptic, deeply concave, coriaceous, ca. 9 × 5 mm, connate proximally for up to 1.2 mm, apex acute, pale green, cream-brown when dry, venation reticulate, indumentum appearing cobwebby abaxially, consisting of a mixture of loosely entangled irregular simple and dendritic trichomes up to 2.5 mm long, the latter with few lateral branches



FIGURE 1. *Petalidium hoarusibense*. Habitat and habit. **A.** Mature plant ca. 800 mm high (greyish shrub in foreground), growing among dark grey sedimentary rocks of the Swakop Group along the banks of the Hoarusib River near Okandjombo, Namibia. **B.** Base of plant showing several branches arising from the main stem just above ground level, each covered with rough, fissured, greyish white bark. Photographs by W. Swanepoel.



FIGURE 2. *Petalidium hoarusibense*. Morphology of leaves and flowers. **A.** Shoot with flower and leaves, the latter with dense, greyish white indumentum. **B, C.** Flower in front (**B**) and side (**C**) view; note bracteoles (some of spent flowers) with cobwebby indumentum. **D, E, F, G.** Flowers in front view, each from a different plant to show variation. Note all corolla lobes of a flower being ca. similarly coloured in various shades of magenta, or lateral and upper lobes slightly darker shaded than the anterior lobe, sometimes (as in **D, E, G**) with darker magenta or maroon triangular nectar guides; anterior lobe adaxially with two narrowly triangular yellow nectar guides. Photographs by W. Swanepoel.

towards apex, with in addition scattered small, stalked glandular trichomes with the more robust ones multicellular, indumentum adaxially of scattered short-stalked glandular trichomes, strigose towards apex, margin lanate towards apex, cystoliths visible both sides, linear or curved, dense. *Calyx* ca. 6 mm long including basal tube of ca. 1.1 mm deep, lobes 4, regular, narrowly triangular, lanceolate when flattened, acute, unequal, 4.0–4.9 mm long, 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, 14–15 mm long with lobes straightened, narrow portion ca. 7 mm long, 2.1–2.4 mm diam., expanded portion at slight angle to anterior side of narrow portion, 3.5–4.9 mm long, outside glabrous, inside of anticus portion towards mouth puberulous and with few long stiff white simple trichomes, otherwise glabrous; palate prominently transversely 5–7-ribbed; lobes patent with respect to corolla tube axis, anterior lobe ovate, obovate or rectangular (subrotund when flattened), 4.0–5.5 × 4.0–5.5 mm, lateral lobes rectangular (obovate or subrotund when flattened), 3.6–4.8 × 2.8–3.2 mm, upper lobes obovate or rectangular (elliptic when flattened), 3.8–4.8 × 2.9–3.5 mm, connate for ca. 45% of their length, overlapping, lobe margins entire, apices retuse, irregularly crenulate, lobes magenta, lateral and upper lobes sometimes slightly darker shaded than anterior lobe, lobes sometimes discolourous then abaxially (outside) whitish magenta, anterior lobe adaxially (inside) with two narrowly triangular yellow nectar guides, other lobes sometimes with short triangular maroon nectar guides, lobes glabrous except for few long stiff white simple trichomes towards bases adaxially (inside). *Stamens* didynamous, inserted dorsally in throat, fused portion ca. 1.2 mm long, free parts slightly tapering towards apex, with few to scattered simple and short stalked glandular trichomes, long filaments 3.0–3.4 mm long, short filaments 1.6–1.8 mm long, outer filament with basal ridge (“trace”) from point of insertion on corolla decurrent to ca. 4.9 mm from base of tube, puberulous; filament curtain reduced (*sensu* terminology of Manktelow 2000); anthers 2-theous, thecae linear-elliptic or linear-oblong, equal, ca. 1.6 mm long including short basal spur, maroon-white with widely spaced short-stalked glandular trichomes. *Gynoecium* 9.7–11.6 mm long; ovary ovoid, laterally compressed, ca. 1.3 × 1.3 mm, inserted in fleshy disc, glabrous; style filiform, ca. 8.2 mm long, puberulous, stigma lobes linear, unequal, longer lobe 0.4–1.3 mm long, shorter lobe 0.3–0.9 mm long. *Capsule* flattened ovoid or ellipsoid, ca. 5.5 × 3.5 mm, tawny, glossy, glabrous; seeds cordate, ca. 3.4 × 2.6 mm, densely covered with white hygroscopic trichomes.

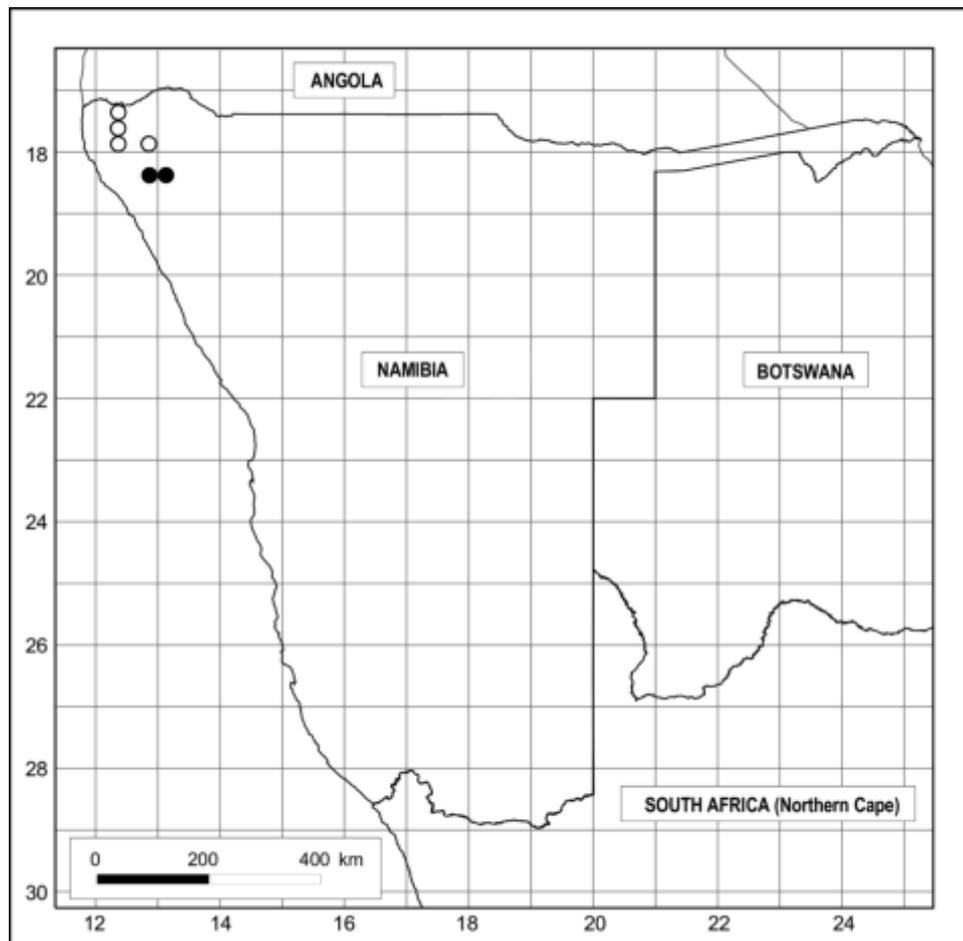


FIGURE 3. Known distribution of *Petalidium hoarusibense* (black dots) and *P. kaokoense* (open circles). Based on herbarium specimens in Herbs. PRE, PRU, and WIND.

Phenology:—Flowers and fruit have been recorded from March to June.

Distribution and habitat:—*Petalidium hoarusibense* is currently known only from the mountainous area along the Hoarusib River and its tributaries to the east and south of Okandjombo. This area is part of the Great Escarpment in northwestern Namibia (Fig. 3). *Petalidium hoarusibense* occurs on arid hillsides and along drainage lines at elevations of 450–700 m a.s.l., 64–88 km inland from the Atlantic Ocean. The region receives less than 100 mm of annual rainfall, mostly during the summer months (Atlas of Namibia Team 2022). Additionally, fog from the Atlantic Ocean may provide some moisture (Mitchell *et al.* 2020), as this area experiences fog on 1–5 days per year (Atlas of Namibia Team 2022). However, fog-derived moisture is not considered to be a significant contributor to the water requirements of this species.

Conservation status:—*Petalidium hoarusibense* has been recorded at several localities in an area of ca. 20 × 18 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. Many dead plants can be seen on the hill sides, probably due to prolonged droughts in the area. *Petalidium hoarusibense* is here provisionally ranked as Vulnerable VU B1 (a), (b).v (IUCN 2012).

Etymology:—The specific epithet refers to the Hoarusib River and its catchment to which *Petalidium hoarusibense* is endemic.

Notes:—*Petalidium hoarusibense* is morphologically most similar to *P. kaokoense*, perhaps its closest relative. Hence these two species were compared in the diagnosis above. Some of the morphological features to distinguish between *P. hoarusibense* and *P. kaokoense* are also provided in Table 1. Also see Fig. 4.

TABLE 1. Prominent morphological differences between *Petalidium hoarusibense* and *P. kaokoense*.

Character	<i>P. hoarusibense</i>	<i>P. kaokoense</i>
Leaves (indumentum)	Short dendritic trichomes, sometimes rebranching, usually some trichomes longer and bottlebrush-like, also simple or bifurcate trichomes in addition	Short stellate and dendritic trichomes, some dendritic ones with apical gland
Bracteoles (indumentum abaxially/outside)	Appearing cobwebby; trichomes long, irregular, simple and dendritic up to 2.5 mm long, with in addition scattered short-stalked glandular trichomes	Appearing matted; trichomes similar to that on leaves but slightly longer (up to 0.5 mm long), rarely with widely spaced longer more robust multicellular dendritic trichomes in addition; glandular trichomes absent
Calyx (length) (mm)	Ca. 6 mm, including basal tube of ca. 1.1 mm	Ca. 10 mm, including basal tube of ca. 2 mm
Calyx (indumentum)	Strigose both surfaces, scattered short-stalked glandular trichomes in addition abaxially	Strigose on both surfaces; glandular trichomes lacking
Corolla lobes (indumentum adaxially/inside)	Long stiff simple trichomes towards bases	Anterior lobe with long stiff simple trichomes towards base; other lobes glabrous
Corolla lobes (colour)	Magenta; lateral and upper lobes slightly darker shaded than anterior lobe, lobes sometimes discoloured then white-magenta abaxially	Discoloured, maroon (vinaceous) adaxially, white-maroon abaxially
Corolla nectar guides (anterior lobe)	Narrowly triangular, yellow, markings separate	Linear-oblong, yellow, markings confluent or nearly so
Corolla tube (indumentum outside)	Glabrous	Exposed (from bracteoles) part strigose
Distribution	Namibia; mountainous area along the Hoarusib River and its tributaries to the east and south of Okandjombo	Namibia; Hartmann Mountains and Omungwindi area west of Etanga



FIGURE 4. *Petalidium hoarusibense*; flowers, compared with those of other species with leaves covered in a rather similar-looking whitish grey indumentum of mainly dendritic trichomes. **A.** *P. hoarusibense*; corolla lobes adaxially magenta, with yellow nectar guides on anterior lobe narrowly triangular and separate. **B.** *P. kaokoense*; corolla lobes adaxially maroon (vinaceous), with yellow nectar guides on anterior lobe linear-oblong, confluent or nearly so. **C.** *P. sesfonteinense*; colour of corolla lobes very variable: white, pink, magenta, apricot, yellow or cream (more images in Swanepoel & Manzitto-Tripp 2022). **D.** *P. welwitschii*; corolla lobes cream or mauve, with claret longitudinal lines. **E.** *P. ohophense*; corolla lobes mauve to violet-red. **F.** *P. rossmannianum*; corolla white, with pinkish centre. Photographs by W. Swanepoel.

The new species can also be confused with several other species of *Petalidium* from the Kunene Region, Namibia, with dense, white indumentum and flowers borne in short axillary dichasia, notably *Petalidium ohopohense*, *P. rossmannianum*, *P. sesfonteinense*, and *P. welwitschii* Moore (1880: 227). However, *P. hoarusibense* is readily differentiated from these species by the magenta corolla lobes [*vs.* mauve to violet-red (*P. ohopohense* {Fig. 4E}), white (*P. rossmannianum* {Fig. 4F}), white, pink, magenta, apricot, yellow or cream (*P. sesfonteinense* {Fig. 4C}), and cream or mauve with claret longitudinal lines (*P. welwitschii* {Fig. 4C & D})]. Those forms of *P. sesfonteinense* with magenta flowers, as in *P. hoarusibense*, can be distinguished by differences in the indumentum of the bracteoles (see below). In addition, *Petalidium hoarusibense* has the outside of the corolla glabrous [*vs.* exposed part strigose (*P. rossmannianum*)]. Indumentum of the bracteoles of *P. hoarusibense* consists of among others long eglandular dendritic trichomes (up to 2.5 mm long, appearing cobwebby) [*vs.* < 0.5 mm, appearing matted or trichomes scattered (*P. ohopohense*, *P. rossmannianum*, and *P. sesfonteinense*), and simple, glandular (*P. welwitschii*)].

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: Kaoko Otavi–Sanitatas, 27 miles to S [Sanitatas], 1812BD, 8 June 1963, *Kers 1198* (WIND!); Tributary to Hoarusib River, 8 km S of Okandjombo, 1812BD, 733 m, 17 May 2024, *Swanepoel 641* (WIND!); Tributary to Hoarusib River, 9 km S of Okandjombo, 1812BD, 623 m, 17 May 2024, *Swanepoel 642* (WIND!); Tributary to Hoarusib River, 14 km S of Okandjombo, 1812BD, 540 m, 17 May 2024, *Swanepoel 643* (WIND!); 10.5 miles W of Otjihu, 1813AC, 3 May 1957, *De Winter & Leistner 5667* (PRE!); 2 Meilen W Omutati, 1713CC [1813AC], 8 June 1963, *Giess & Leippert 7409* (WIND!); 6 km from Okomutati towards Okandjombo on District Road 3707, 1813AC, 679 m, 24 March 2024, *Swanepoel 640* (WIND!).

The locality of *Giess & Leippert 7409* is indicated as “2 miles westlich Omutati” [two miles west of Omutati] in quarter degree square 1713CC, with the habitat described as a mountain gorge. A site visit revealed that a point two miles (3.2 km) west of Omutati is at the village of Etanga, one of the major villages to the west of Opuwo. The topography here is rather flat, lacking any gorges or mountains nearby. In quarter degree square 1813AC is another place called Omutati (also called Okomutati) and here the habitat corresponds with the description on the label. This point is less than 3 km from the locality of *Swanepoel 640*. Hence, for the purposes of the distribution map, the quarter degree square of *Giess & Leippert 7409* is thus taken as 1813AC.

Acknowledgements

We would like to thank Dr Hester Steyn, SANBI, for preparing the distribution map. The curator and staff of the National Herbarium of Namibia (WIND), National Herbarium of South Africa (PRE), and H.G.W.J. Schweickerdt Herbarium (PRU) are thanked for their assistance during visits to the herbarium. The first author is especially grateful to his wife Hannelie and to Marië Ueckermann, Gifford Swart, and Pikkie Hoffman for assistance and support during field trips, and would also like to acknowledge the financial support from the Nedbank Go Green Fund (Kaokoflora Project). The University of Pretoria is thanked for financial support and the use of facilities.

References

- Atlas of Namibia Team. (2022) *Atlas of Namibia: its land, water and life*. Namibia Nature Foundation, Windhoek, 390 pp.
- Beentje, H. (2016) *The Kew plant glossary: an illustrated dictionary of plant terms*, 2nd ed. Kew Publishing, Kew, 184 pp.
- Craven, P. (2009) *Phytogeographic study of the Kaokoveld Centre of Endemism*. Ph.D. Thesis. University of Stellenbosch, Stellenbosch, 234 pp. [<https://hdl.handle.net/10019.1/1325>]
- Darbyshire, I., Kiel, C.A., Astroth, C.M., Dexter, K.G., Chase, F.M. & Tripp, E.A. (2020) Phylogenomic study of *Monechma* reveals two divergent plant lineages of ecological importance in the African savanna and succulent biomes. *Diversity* 12 (6): a237 [25 pp.]. <https://doi.org/10.3390/d12060237>
- Dexter, K.G., Swanepoel, W., Loiseau, O., Darbyshire, I., Nanyeni, L., Gonçalves, F.M., Chase, F. & Manzitto-Tripp, E.A. (2023) High endemism of the genus *Petalidium* (Acanthaceae) in the highlands and escarpments of Angola and Namibia. *Namibian Journal of Environment* 8: 135–147. [<https://nje.org.na/index.php/nje/article/view/volume8-dexter>]

- 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, 279 pp. [<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.
- Hewson, H.J. (2019) *Plant indumentum: a handbook of terminology*, revised ed. Australian Biological Resources Study, Commonwealth Department of the Environment and Energy, Australia, 47 pp. [<https://www.biodiversitylibrary.org/bibliography/176095>]
- IUCN. (2012) *IUCN red list categories and criteria: Version 3.1*. 2nd ed. Gland, Switzerland and Cambridge U.K., iv + 32 pp.
- Loiseau, O., Manzitto-Tripp, E.A., Swanepoel, W. & Dexter, K.G. (2023) Net diversification rates of the woody plant genus *Petalidium* (Acanthaceae) are highest in the ancient and arid Namib Desert. *Frontiers in Ecology and Evolution* 11: 1–10. <https://doi.org/10.3389/fevo.2023.1193728>
- 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/10.1006/bojl.1999.0309>
- Meyer, P.G. (1961) Beiträge zur Kenntnis der Acanthaceen Südwestafrikas (III). *Mitteilungen der Botanischen Staatssammlung München* 4: 59–72. [<https://www.biodiversitylibrary.org/item/52384#page/747/mode/1up>]
- Meyer, P.G. (1968) Acanthaceae. *Prodromus einer Flora von Südwestafrika* 130: 1–65.
- Meyer, P.G. (1973) Neue und enig bekannte Acanthaceen aus dem Kaokoveld (Südwestafrika). *Mitteilungen der Botanischen Staatssammlung München* 11: 101–113. [<https://www.biodiversitylibrary.org/item/51768#page/111/mode/1up>]
- Mitchell, D., Henschel, J.R., Hetem, R.S., Wassenaar, T.D., Strauss, W.M., Hanrahan, S.A. & Seely, M.K. (2020) Fog and fauna of the Namib Desert: past and future. *Ecosphere* 11 (1): e02996 [40 pp.]. <https://doi.org/10.1002/ecs2.2996>
- Moore, S. (1880) Enumeratio Acanthacearum Herbarii Welwitschiani Angolensis. *Journal of Botany, British and Foreign* 18: 225–233. [<https://www.biodiversitylibrary.org/item/108761#page/236/mode/1up>]
- 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://www.biodiversitylibrary.org/item/9716#page/172/mode/1up>]
- Obermeijer, A.A. (1936) The South African species of *Petalidium*. *Annals of the Transvaal Museum* 18: 151–162.
- 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., Dexter, K.G., Loiseau, O. & Van Wyk, A.E. (2023) Reinstatement of the name *Petalidium ovatum* (Acanthaceae), with an amplified description of the species. *Phytotaxa* 626 (3): 159–169. <https://doi.org/10.11646/phytotaxa.626.3.2>
- Swanepoel, W. & Manzitto-Tripp, E. (2022) *Petalidium sesfonteinense* (Acanthaceae), a new species from the Kaokoveld, Namibia. *Phytotaxa* 549 (2): 127–135. <https://doi.org/10.11646/phytotaxa.549.2.1>
- Swanepoel, W., Manzitto-Tripp, E.A., Dexter, K.G. & Van Wyk, A.E. (2024) *Petalidium etendekaense* (Acanthaceae), a new species from Namibia, with notes on the taxonomic identity of *P. glutinosum*. *Phytotaxa* 636 (1): 35–47. <https://doi.org/10.11646/phytotaxa.636.1.3>
- 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. (2023a) *Petalidium konkiepense* (Acanthaceae), a new species from Namibia. *Phytotaxa* 585 (1): 29–38. <https://doi.org/10.11646/phytotaxa.585.1.3>
- Swanepoel, W. & Van Wyk, A.E. (2023b) *Petalidium karasbergense* (Acanthaceae), a new species from Namibia. *Phytotaxa* 609 (1): 1–9. <https://doi.org/10.11646/phytotaxa.609.1.1>
- Swanepoel, W. & Van Wyk, A.E. (2024) *Petalidium namibense* (Acanthaceae), a new species from Namibia. *Phytotaxa* 671 (2): 128–138. <https://doi.org/10.11646/phytotaxa.671.2.2>
- Thiers, B. (2024) *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 September 2023)

- Tripp, E.A. & Dexter, K.G. (2012) Taxonomic novelties in Namibian *Ruellia* (Acanthaceae). *Systematic Botany* 37 (4): 1023–1030.
<https://doi.org/10.1600/036364412X656509>
- 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.