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Petalidium konkiepense (Acanthaceae), a new species from Namibia

WESSEL SWANEPOEL[1,2,4]* & ABRAHAM E. VAN WYK[2,3,5]
[1]*Independent Researcher, P.O. Box 21168, Windhoek, Namibia*
[2]*H.G.W.J. Schweickerdt Herbarium, Department of Plant and Soil Sciences, University of Pretoria, Pretoria, 0002 South Africa*
[3]*South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa*
[4] *wessel@kaokosafari.com; https://orcid.org/0000-0002-0181-3543*
[5] *braamvanwyk@gmail.com; https://orcid.org/0000-0002-0437-3272*
** Author for correspondence*

Abstract

Petalidium konkiepense, here described as a new species, is only known from the Gariep Centre of Plant Endemism in southern Namibia, where it grows on arid hillsides and along drainage lines. Diagnostic morphological characters for *P. konkiepense* include the rigid, cylindrical distal stems (quadrangular when young), grey or dark brownish grey bark (white to cream when young), densely puberulent vegetative parts with widely spaced robust glandular and eglandular trichomes, and the oblanceolate leaves with prominent midrib and principal lateral veins. A comparison of some of the more prominent features to differentiate *Petalidium konkiepense* from its morphologically most similar relatives, *P. linifolium* and *P. cymbiforme*, is provided. Based on IUCN Red List categories and criteria, a conservation assessment of Endangered under criteria B1 is recommended for the new species.

Keywords: desert, endemism, flora, Gariep Centre, Ruellieae, taxonomy

Introduction

At present, 44 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, six for South Africa, and 29 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). In the present contribution a rare new species of *Petalidium* is described. According to available distribution records, this new entity is endemic to the Namibian part of the Gariep Centre of Endemism—a biogeographical region rich in range-restricted plant species in southern Namibia and adjacent northwestern South Africa (Van Wyk & Smith 2001).

In March 2022 while studying the *Petalidium* holdings in the National Herbarium of Namibia (WIND), it was clear that certain specimens from the area between the Fish River and the Konkiep River in southern Namibia belong to an undescribed taxon. These specimens are characterized by oblanceolate leaves, with a conspicuous and prominent midrib, as well as principal lateral veins. Bracteoles are white and papery with conspicuous reticulation. The localities were subsequently visited by one of us (WS), and the plants studied in habitat.

Hitherto the new species has been confused with *P. linifolium* Anderson (1863: 25) with which it shares morphological similarities, especially in having relatively narrow leaves and distinct venation of the bracteoles. *Petalidium linifolium* is probably its closest relative and differs from it in a combination of characters. We also compare the new species with *P. cymbiforme* Schinz (1926: 145), a narrow-leaved species with which its range overlaps.

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Methods

Morphological descriptions and ecological information presented here are based on field observations and material collected following extensive field work in Namibia. Diagnostic features for the new species, *P. linifolium*, and *P. cymbiforme* were determined through examination of fresh material, as well as high-resolution images of type material available on JSTOR Global Plants (https://plants.jstor.org/). This was supplemented by the study of the protologues and 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 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 konkiepense 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 linifolium,* differing by having the leaf lamina oblanceolate or rarely a few narrowly lanceolate (*sensu* Lindley), flat, subconduplicate to conduplicate towards the apex (*vs*. linear or narrowly lanceolate [*sensu* Lindley], flat, often recurved towards the apex), pale green or yellow-green and not glossy (*vs.* pale to bright green and glossy, covered with a glutinous secretion), with midrib and 1–4 principal lateral veins each side (*vs*. principal lateral veins absent), venation prominent both sides (*vs*. adaxially only), indumentum puberulent, abaxially often with widely spaced short-stalked glandular and robust long-stalked multi-cellular glandular trichomes in addition (*vs*. glabrous, except for short conical trichomes adaxially).

Type:—NAMIBIA. ǁKharas Region: Bethanien District, Farm Soutkuil 181. Along track to Farm Wegdraai 179, ca. 1 km from northernmost farmstead, 2717AD, 806 m, 26 August 2022, *Swanepoel 613* (holotype WIND!; isotypes PRE!, PRU!).

Woody, dwarf shrub up to 1 m tall. *Stems* multi-stemmed from just below or above ground level from thick rootstock or main stem, up to 150 mm in diam., bark rough and fissured, grey or dark brownish grey; older distal stems rigid, cylindrical, bark smooth or longitudinally fissured, cream or white; young stems quadrangular, green, becoming white with age, puberulent, usually with widely spaced, long, robust, multi-cellular glandular or eglandular trichomes, glabrescent, cystoliths visible. *Leaves* opposite and decussate on new shoots, fascicled on older stems, subsessile; lamina oblanceolate, rarely few narrowly lanceolate (*sensu* Lindley), flat, often subconduplicate to conduplicate towards apex, often appearing linear (when dry margin strongly involute towards midrib), up to 24.0 × 4.4 mm, pale green, semi-succulent, puberulent, usually with widely spaced short-stalked glandular and robust long-stalked multi-cellular glandular trichomes on margins and abaxially on venation, apex acute, margin entire, slightly incrassate, midrib and 1–4 principal lateral veins conspicuous, pale green or pale yellow, prominently raised on both surfaces, cystoliths visible on both surfaces, often conspicuous on veins and margins. *Flowers* solitary, axillary; bracts absent; pedicels (below bracteoles) 3–6 mm long; bracteoles ovate, symmetrical, membranaceous, 15–21 × 9–12 mm, apex attenuate, apiculate, base sub-cordate, cordate, rounded or truncate, white or cream, often violet, indigo or brown in places, venation reticulate, prominent both sides, conspicuous, green, dark green, brown, violet or indigo, puberulent abaxially, with scattered short-stalked glandular trichomes in addition, midrib rectilinear, main veins and margins with widely spaced, robust, long-stalked, multi-cellular glandular and eglandular trichomes up to 4.5 mm long, adaxially glabrous to sparsely puberulent with short-stalked glandular trichomes in places, margins sparsely lanate, cystoliths linear or linear-oblanceolate, visible on midrib and lateral veins, often conspicuous. *Calyx* 6.1–10.9 mm long including basal tube of 1.6–3.3 mm long, lobes 5, regular, lanceolate, acute, unequal, 2.9–7.0 × 1.2–1.7 mm; puberulous abaxially and with scattered multi-cellular stalked glandular trichomes of various lengths, strigose adaxially with short-stalked glandular trichomes in addition, margins ciliate. *Corolla* with narrow unexpanded portion of tube cylindrical, slightly narrowing towards expanded part, laterally slightly flattened, 26–37 mm long with lobes straightened, narrow portion 8.0–11.8 mm long, 1.9–3.6 mm diam., expanded portion 10.0–11.8 mm long, distal part of narrow portion and expanded portion puberulous outside with scattered short-stalked glandular trichomes in addition, inside of anticous portion towards mouth with few long stiff white hairs, throat puberulous, inside otherwise glabrous; lobes patent,

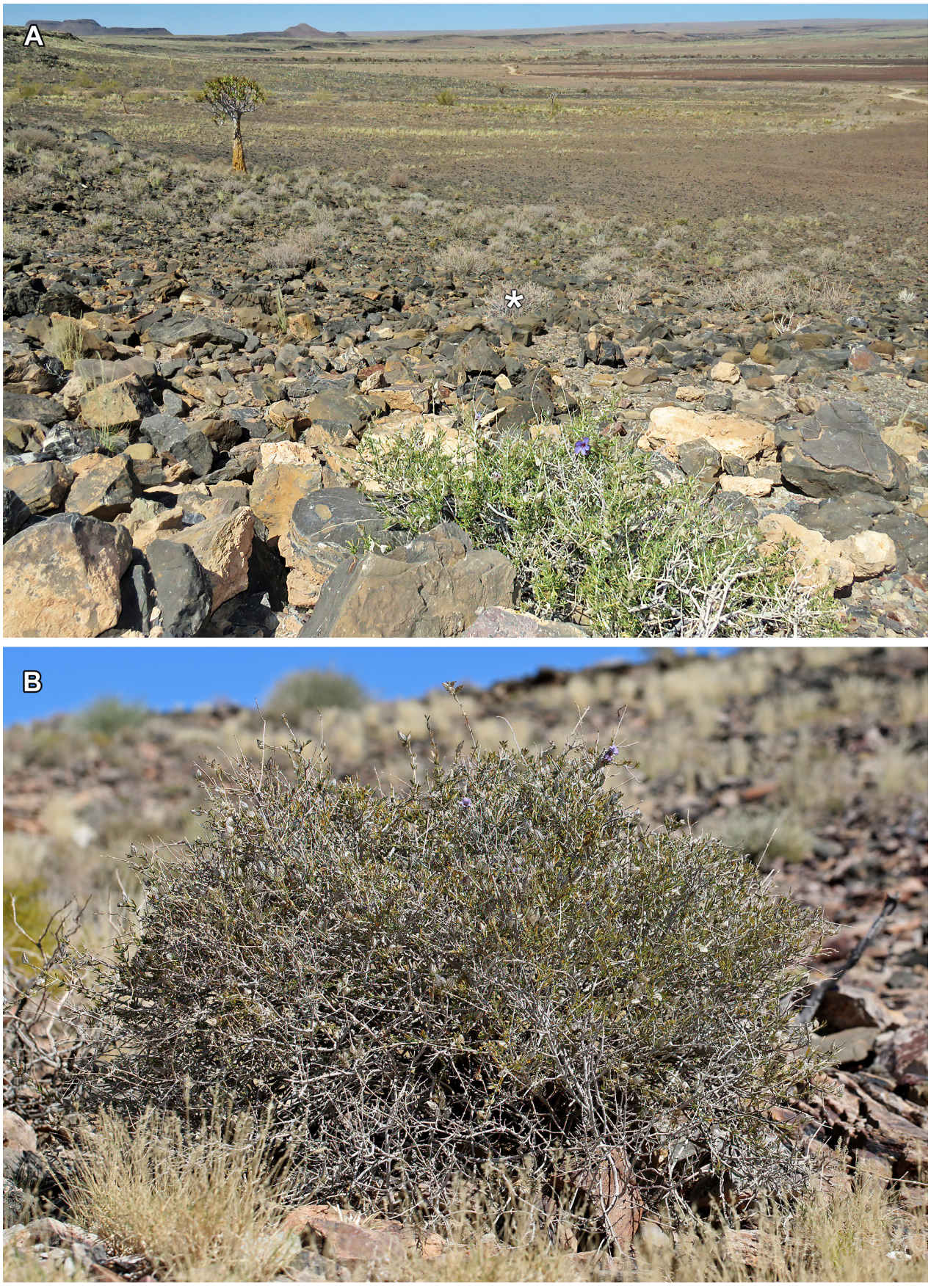

FIGURE 1. *Petalidium konkiepense*, habitat and habit. **A.** Plant in flower (right foreground) with several plants (low greyish dwarf shrubs—one marked with an asterisk—in background), growing among limestone rocks of the Nama Group (Farm Churutabis-Sonntagsbrunn 108, ||Kharas Region, Namibia). **B.** Mature plant, mainly past flowering, with persistent bracteoles (Farm Soutkuil 181, ||Kharas Region, Namibia). Photographs by W. Swanepoel.

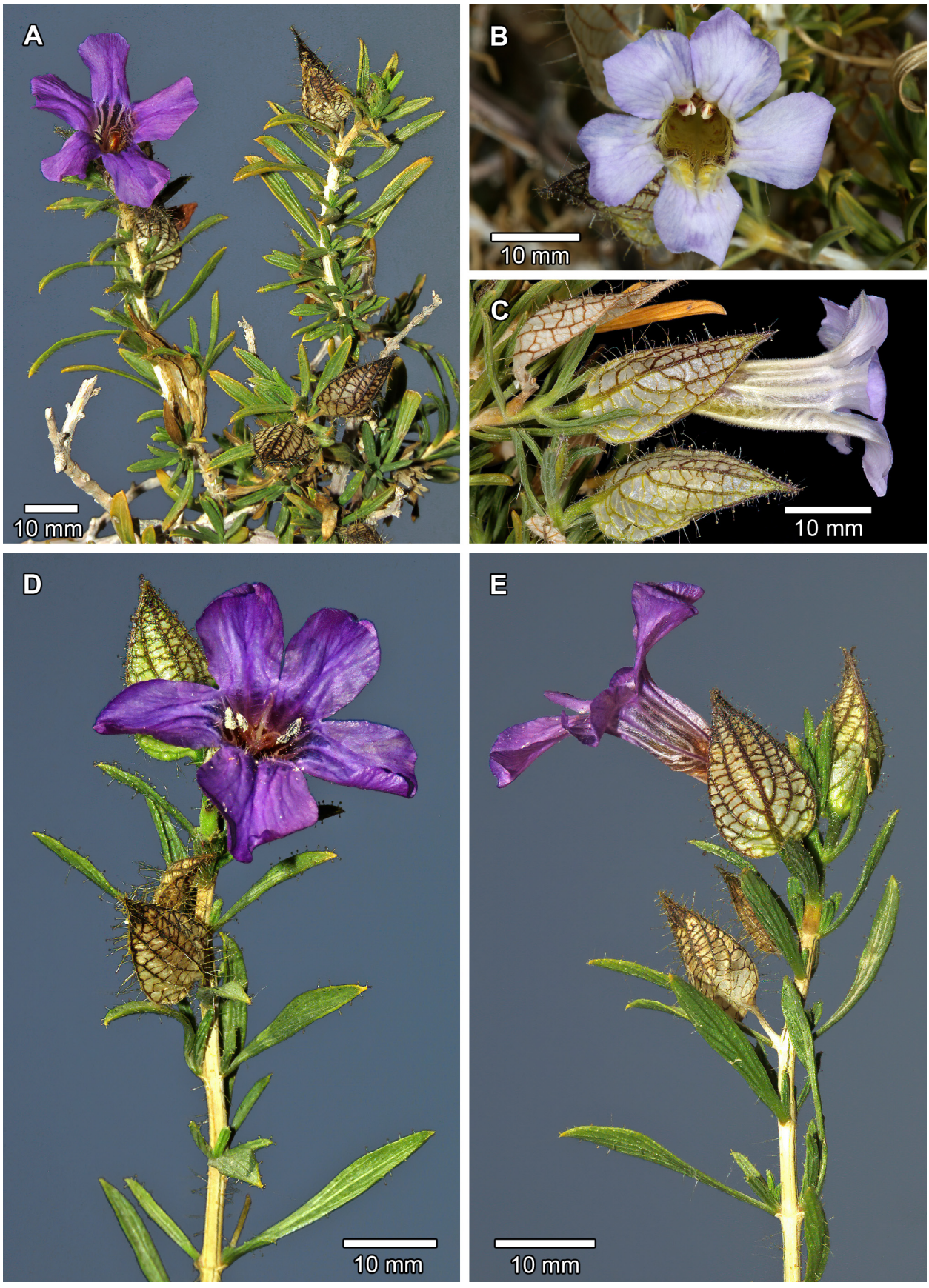

FIGURE 2. *Petalidium konkiepense*, morphology of flowers and leaves. **A.** Branchlet showing narrow leaves and violet flower. **B.** Flower in front view; mauve variation. **C.** Flower in side view, with bracteoles; mauve variation. **D.** Leafy shoot with flower in front view, and with bracteoles; violet variation. **E.** Leafy shoot with flower in lateral view, and with bracteoles; violet variation. Photographs by W. Swanepoel.

obovate, apices rounded, often retuse or truncate, margins entire, upper lobes free for 80–90%, overlapping, 10.0–11.1 × 7.5–12.5 mm, lateral lobes 10.0–13.1 × 7.0–13.1 mm, front lobe 10.0–12.6 × 8.0–13.7 mm, lobes violet (heliotrope), mauve or blue, front lobe with two narrowly triangular nectar guides, the latter pale yellow, indigo or inconspicuous, sometimes prominent, lateral lobes with two narrowly triangular indigo markings towards base; palate chestnut towards base of expanded portion, slightly prominently transversely 6–8-ribbed. *Stamens* didynamous, inserted dorsally in throat, free parts of filaments fused for 1.4–2.0 mm at base, fused part prominent, adnate to tube, free parts tapering towards apex, flattened, sparingly puberulous with few short-stalked glandular trichomes, longer filament 6.3–8.0 mm long, shorter filament 4.4–5.0 mm long, outer filament trace decurrent to base of tube, puberulous; filament curtain phaulopsoid (Manktelow 2000); anthers 2-thecous, thecae oblong, equal, 3.0–3.5 mm long with scattered short-stalked glandular trichomes, apex obtuse, base with short lobes (sagittate). *Gynoecium* ca. 23 mm long; ovary ovoid, laterally compressed, 2.0 × 1.0–1.3 mm, inserted on fleshy disc, towards apex with scattered short-stalked glandular trichomes; style filiform, 14–19 mm long, puberulous with in addition very short-stalked glandular trichomes, stigma lobes linear, unequal, longer lobe 1.0–1.6 mm long, shorter lobe ca. 0.5–1.2 mm long. *Capsule* elliptic, 6.5–7.0 × 3.4–5.0 mm long, tawny, glossy, glabrous; seeds not seen.

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

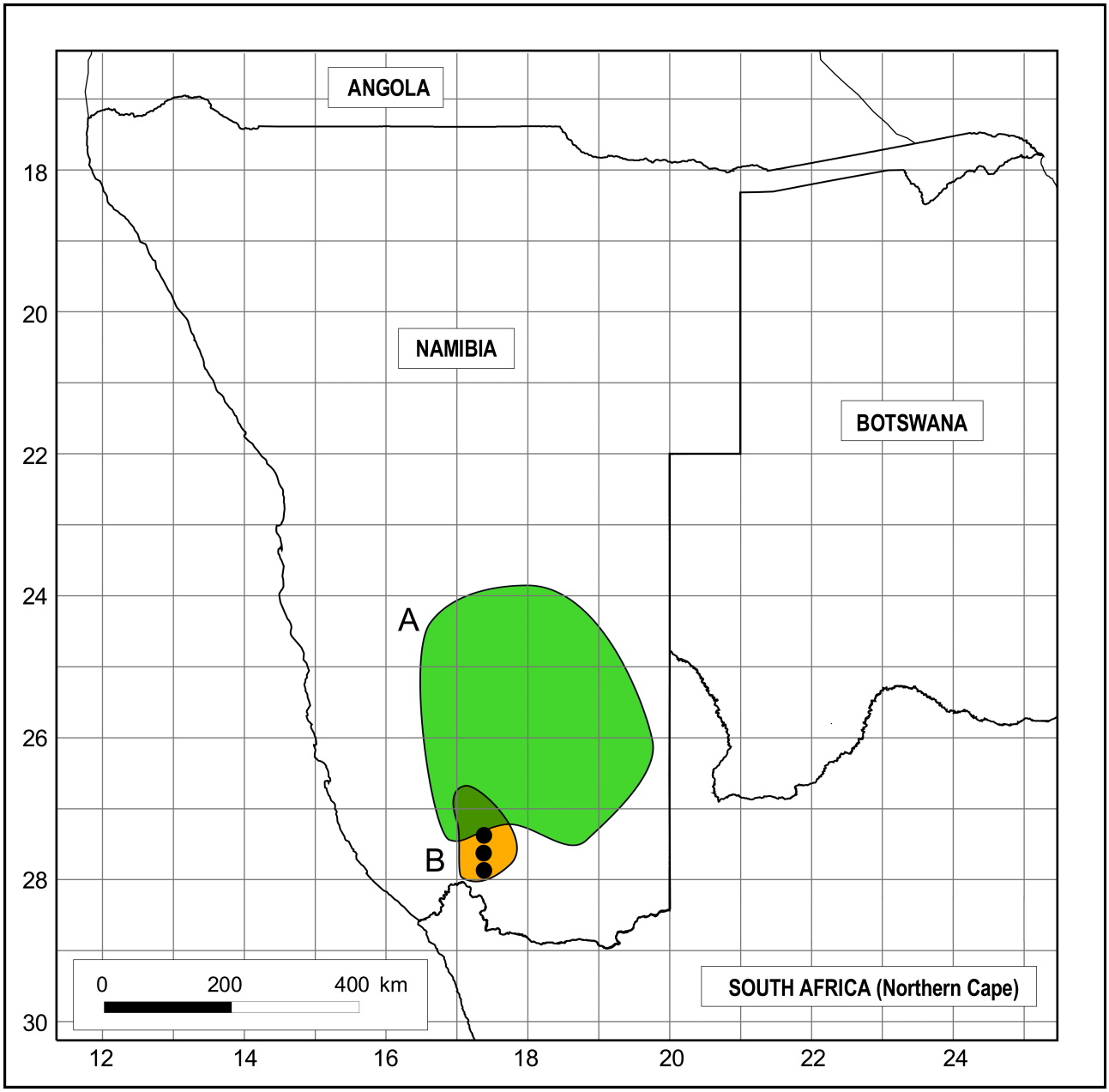

FIGURE 3. Known distribution of *Petalidium konkiepense* (black dots; ●) based on specimens in Herb WIND. Also depicted are the distribution ranges of *P. linifolium* (A. green) and *P. cymbiforme* (B. orange).

Distribution and habitat:—At present, *Petalidium konkiepense* is only known from the area between the lower Fish and Konkiep rivers. All known populations fall within the drainage area of the Konkiep River on the farms Churutabis-Sonntagsbrunn 108, Soutkuil 181, and Bobbejaankrans 180 in southern Namibia (Fig. 3). It occurs in the Northwest Canyon Lands Landscape unit of Burke (2017) on arid hillsides and along drainage lines at elevations of 780–900 m a.s.l., ca. 155 km inland from the Atlantic Ocean. Plants grow in shallow clayey soil among limestone or shale rocks (Fig. 1) of the sedimentary Nama Group (Mendelsohn *et al*. 2002). Average annual rainfall in the area is less than 50 mm and falls mainly in summer (Mendelsohn *et al.* 2002).

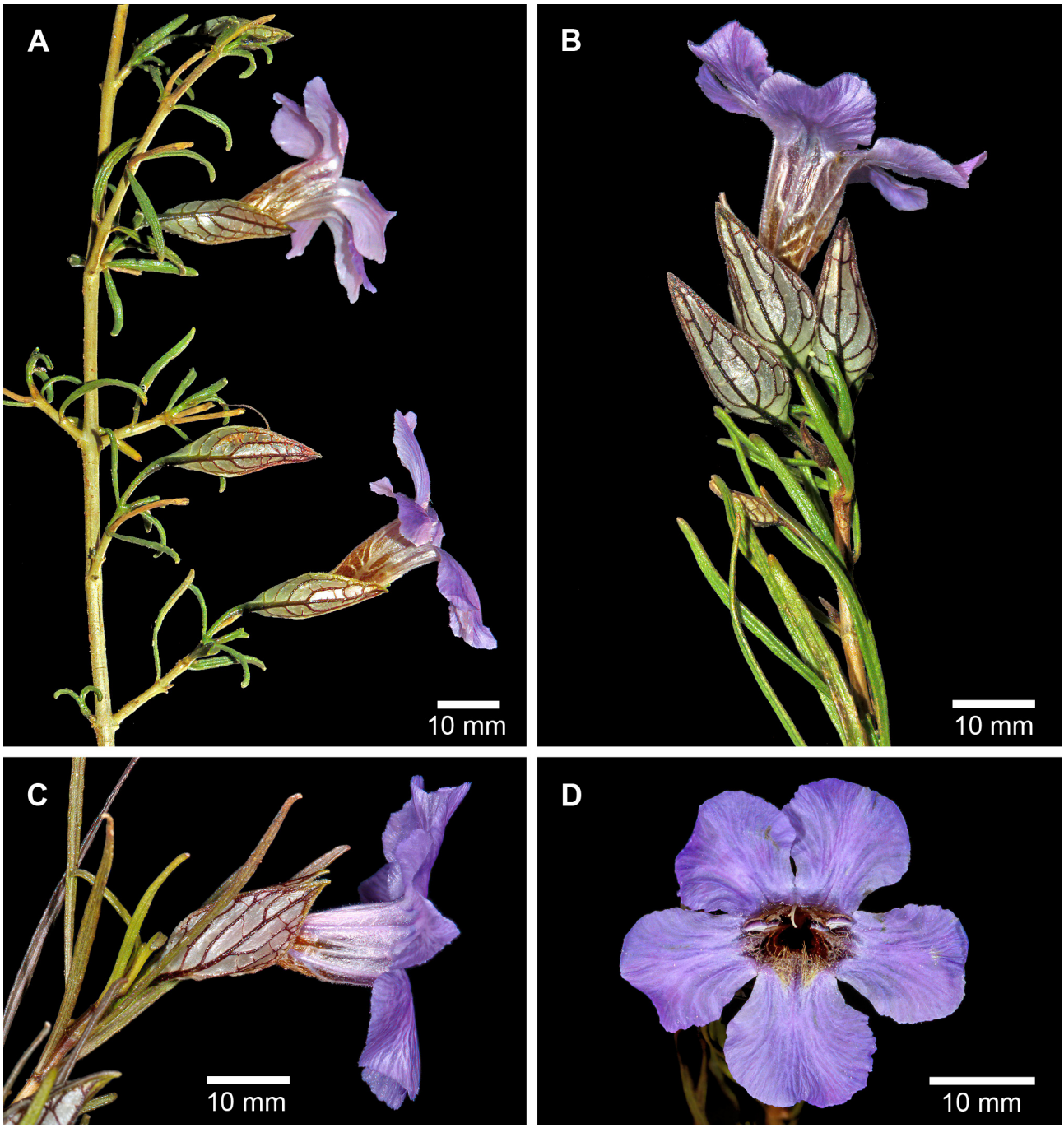

FIGURE 4. *Petalidium linifolium*, flower and leaf morphology. **A.** Branchlet with relatively short linear leaves, flower and bracteoles. **B.** Branchlet with relatively long linear leaves, flower and bracteoles. **C.** Flower and bracteoles in lateral view. **D.** Flower in front view. Photographs by W. Swanepoel.

Conservation status:—*Petalidium konkiepense* is known from only one location with four small sub-populations where it is 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. *Petalidium konkiepense* is here considered to be in immediate conservation danger due to its restricted distribution. Although protected in the Canyon Nature Park,

prolonged droughts and rising temperatures seem to have a negative effect on the species, since in all the subpopulations most plants show signs of die-back and are in poor condition with many dead branches. Admittedly, some plants manage episodic drought by dying back and resprouting, so this is not necessarily an indication that plants are in immediate danger of dying. Hence monitoring of the plants over a longer period of time is recommended to establish the permanence of the observed die-back. Given the small extent of occurrence (EOO) of 119 km², the single location, and the observed die-back on most of the mature individuals, a conservation status of Endangered EN B1ab(v) is proposed (IUCN 2012).

Etymology:—The specific epithet refers to the Konkiep River (a tributary of the Fish River) in the Gariep Centre of Plant Endemism in southern Namibia. The name "Konkiep" (also spelled "Koin kieb", "Konkip", or "Koanquip") is derived from the Khoesaan language Khoekhoegowab (Alexander 1838, Sprigade & Moisel 1904, Nienaber & Raper 1983, Raper *et al*. 2014). Its meaning, however, is uncertain and has most probably been lost in time. It has been claimed by some authorities that "Konkiep" is an adaptation of "Goageb" (also spelled "Goangib"), which is said to mean "the swollen twin river" (Nienaber & Raper 1983, Raper *et al*. 2014). However, we do not find this explanation convincing as, according to probably the earliest report on the geography of the region by Alexander (1838), Goageb (as "Gnuanuip"), is the name of a tributary of the Konkiep (as "Koanquip") River.

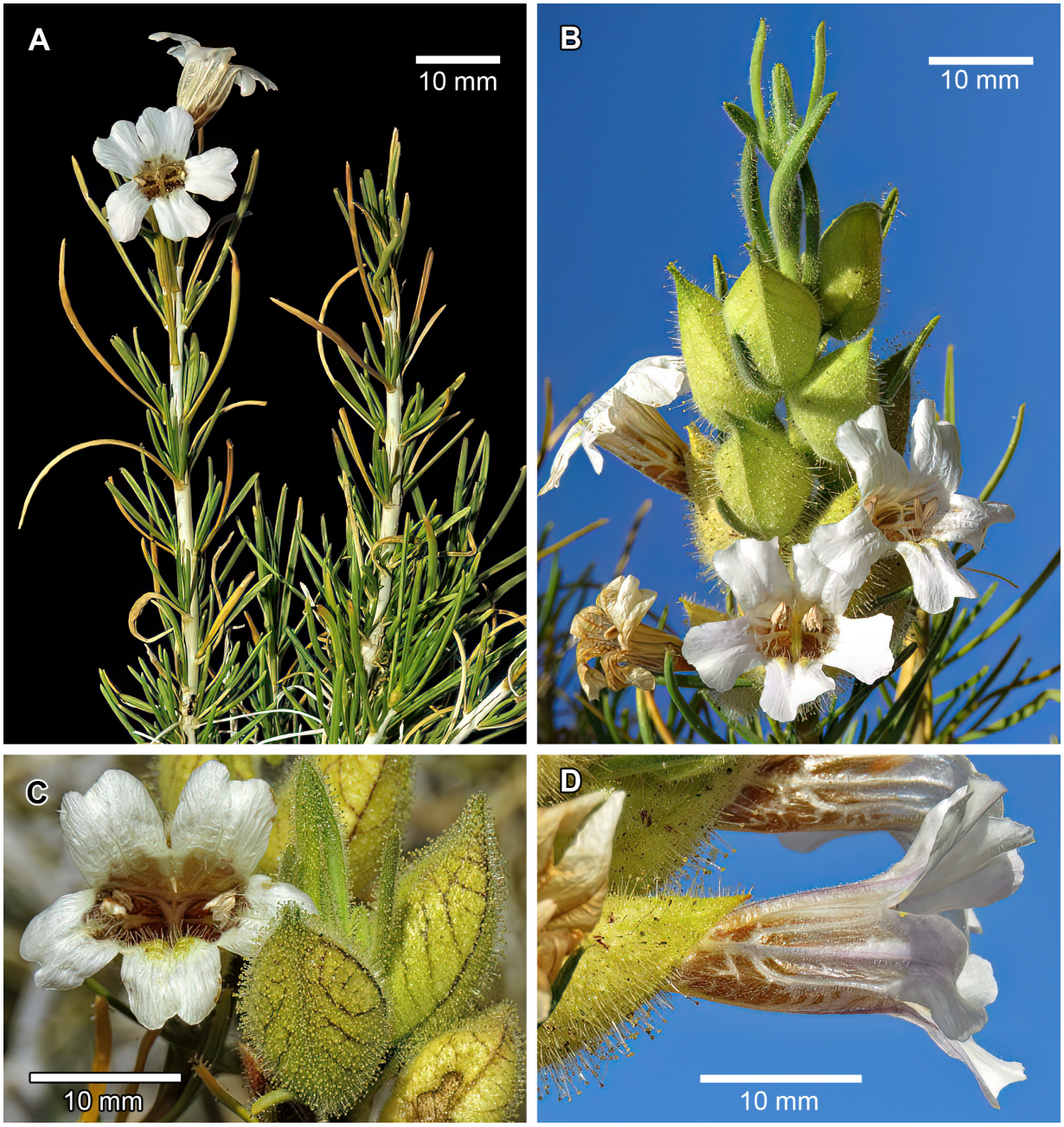

FIGURE 5. *Petalidium cymbiforme*, flower and leaf morphology. **A.** Branchlet with flowers and linear leaves. **B.** Shoot showing flowers and bracteoles. **C.** Flower in front view, with bracteoles. **D.** Flower in lateral view. Photographs by W. Swanepoel.

Notes:—In addition to *P. linifolium* (Fig. 4), the new species can also be confused with *P. cymbiforme* (Fig. 5), a species with relatively narrow leaves and a more or less similar distribution range (Fig. 3). However, the leaves of *P. konkiepense* are oblanceolate, rarely lanceolate (*sensu* Lindley) with principal lateral veins (*vs.* linear, rarely lanceolate [*sensu* Lindley], with lateral veins absent), the bracteoles are membranaceous, white or cream in colour (*vs.* cartilaginous, green, or pale green), and the colour of the corolla of *P. konkiepense* is violet ("heliotrope"), mauve or blue (*vs*. white or cream). Some of the morphological features to distinguish among *P. konkiepense*, *P. linifolium*, and *P. cymbiforme* are provided in Table 1. Also see Figs 4 & 5.

TABLE 1. Prominent morphological differences between *Petalidium konkiepense*, *P. linifolium*, and *P. cymbiforme*.

Character	*P. konkiepense*	*P. linifolium*	*P. cymbiforme*
Leaves (shape)	Oblanceolate to narrowly lanceolate (*sensu* Lindley), often appearing linear when dry	Linear or narrowly lanceolate (*sensu* Lindley), flat when dry	Linear, rarely narrowly lanceolate (*sensu* Lindley), appearing needle-like when dry
Leaves (size) (mm)	Up to 24.0 × 4.4	Up to 42.0 × 5.1	Up to 50.0 × 3.1
Leaves (apex)	Acute	Obtuse	Acute or obtuse
Leaves (venation)	Conspicuous (darker green than rest of lamina), raised ad- and abaxially	Conspicuous (darker green than rest of lamina), raised adaxially	Inconspicuous (ca. same colour as rest of lamina), raised adaxially
Leaves (principal lateral veins)	1–4 each side of midrib	Absent	Absent
Leaves (succulence)	Semi-succulent	Not succulent	Not succulent
Leaves (colour)	Pale green or yellow-green, not glossy	Pale to bright green, glossy (covered with glutinous secretion)	Pale to bright green, not glossy
Leaves (indumentum)	Puberulent, usually with widely spaced short-stalked glandular and robust long-stalked multi-cellular glandular trichomes on margins and abaxially on veins; not glabrescent	Usually with scattered very short conical trichomes adaxially especially on midrib, otherwise glabrous; not glabrescent	Puberulous or puberulent (trichomes uni- or multi-cellular) and with scattered sessile and short-stalked glandular trichomes and widely spaced robust long-stalked variously sized multi-cellular glandular trichomes; glabrescent
Leaves (cystoliths on veins)	Usually conspicuous	Inconspicuous or not visible	Inconspicuous or not visible
Bracteoles (shape & texture)	Ovate, membranaceous	Narrowly ovate, rarely ovate, membranaceous	Ovate or narrowly ovate, cartilaginous
Bracteoles (colour)	Mostly white or cream, retaining colour when dry; not glossy	White or cream, retaining colour when dry; glossy	Pale green or yellow-green, straw-coloured when dry; not glossy
Bracteoles (venation)	Reticulate, prominent both surfaces	Reticulate, prominent both surfaces	Reticulate, usually inconspicuous
Bracteoles (apex)	Attenuate, apiculate	Acute, rarely attenuate and apiculate	Attenuate, apiculate
Pedicels below bracteoles (length, mm)	3–6	4–22	2–5
Bracteoles (indumentum (abaxially)	Puberulent, usually with in addition scattered stalked glandular trichomes and on veins and margins robust, long-stalked trichomes up to 4.5 mm long	Glabrous, sometimes sparsely puberulent towards margins and apex	Puberulous and with scattered stalked glandular and robust long-stalked multi-cellular glandular trichomes up to 1.2 mm long
Bracteoles (size) (mm)	15–21 × 9–12	12–20 × 5–13	17–21 × 10–12
Calyx (length) (mm)	6.1–10.9	6.7–9.3	9.4–10.5
Calyx (indumentum)	Sparsely puberulous abaxially with scattered multi-cellular stalked glandular trichomes of various lengths in addition; strigose adaxially with short-stalked glandular trichomes in addition	Sparsely puberulous abaxially towards margin and apex, with scattered very short-stalked and sessile glandular trichomes in addition; strigose adaxially with scattered sessile glandular trichomes in addition	Puberulous abaxially with short-stalked glandular trichomes and robust multi-cellular glandular and eglandular trichomes in addition; adaxially strigose
Corolla (length) (mm)	26–37	17–29	24–29
Corolla (indumentum) (outside)	Distal part of narrow portion and expanded portion puberulous with scattered short-stalked glandular trichomes in addition	Distal part of narrow portion and expanded portion sparingly puberulous with scattered very short-stalked glandular trichomes in addition	Distal part of narrow portion and expanded portion puberulous
Corolla (colour of lobes)	Violet (heliotrope), mauve or blue	Violet (heliotrope), mauve or blue	White or cream
Anthers (length) (mm)	3.0–3.5	2.5–2.9	3.2–3.5
Distribution	ǁKharas Region, area between lower Fish River and lower Konkiep River	Hardap Region from Kalkrand southwards to Great Karas and northern Hunsberge Mountains in ǁKharas Region	ǁKharas Region, from southwest of Goageb south to Fish River Canyon and Hunsberge Mountains between Nuob and Fish rivers

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: Farm Churutabis-Sonntagsbrunn 108, at entrance gate to Fish River Lodge, 2717AD, 784 m, 27 August 2022, *Swanepoel 615* (WIND!); On Soutkuil, 2717CB, 30 June 1986, *Craven 2512* (WIND!); Farm Bobbejaankranz [Bobbejaankrans], on road from Soutkuil to house, 2717CB, 22 September 1989, *Craven 3493* (WIND!); Bethanien District, Farm Soutkuil No. 181, 2717CB, no date, *Owen-Smith 1203* (WIND!); Farm Soutkuil 181, track between Soutkuil and Farm Wegdraai 179, 5.7 km from northernmost farmstead on Soutkuil, 2717CB, 894 m, 26 August 2022, *Swanepoel 614* (WIND); Farm Soutkuil 181, 2717CD, 14 July 1988, *Craven 3332* (WIND!); Farm Soutkuil 181, approaching Soutkuil house from southern side, 2717CD, 1 July 1991, *Craven 3936* (WIND!).

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