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Senecio namibensis (Asteraceae: Senecioneae), a new species from Namibia

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Abstract

Senecio namibensis is described as a new species known only from the northern part of the Namib Desert in northwestern Namibia. It is a range-restricted species near-endemic to the Kaokoveld Centre of Endemism. These dwarf shrubs grow on rocky outcrops under harsh desert conditions. Diagnostic characters for *Senecio namibensis* include the annual or perennial habit, succulent leaves, and radiate capitula with 3–6 yellow ray florets. A comparison of some of the more prominent morphological features to differentiate between *S. namibensis* and its possible nearest relatives, *S. englerianus* and *S. flavus*, is provided. All three species have superficially similar looking succulent leaves, but an obvious difference is that the capitula in *S. englerianus* are discoid and in *S. flavus* disciform or obscurely radiate. Based on IUCN Red List categories and criteria, a conservation assessment of Least Concern (LC) is recommended for the new species.

Keywords: endemism, flora, Kaokoveld Centre of Endemism, Namib Desert, *Senecio englerianus*, *Senecio flavus*, succulent, taxonomy

Introduction

Senecio Linnaeus (1753: 866) (Asteraceae: Senecioneae) is one of the largest genera of flowering plants comprising ca. 1000 species with an almost worldwide distribution (Pelser *et al.* 2007, Funk *et al.* 2009). Members of *Senecio* can be recognized by the campanulate or cup-shaped calyculate involucre with free bracts, disc floret styles with separated stigmatic areas, truncate tips and sweeping hairs, and the numerous white, slender, barbellate pappus bristles (Pelser *et al.* 2007). In the recent past ca. 292 described species of *Senecio* were recognized in the *Flora of southern Africa* [FSA] region (Namibia, Botswana, South Africa, Eswatini, and Lesotho), 32 of which occur in Namibia (Germishuizen & Meyer 2003, Klaassen & Kwembeya 2013). The large size of the genus *Senecio* has been an obstacle to both a worldwide and local revision, and there is an urgent need for more taxonomic studies on the group.

In this paper, a new species of *Senecio* that is near-endemic to the southern part of the Kaokoveld Centre of Endemism, a biogeographical region rich in range-restricted plants and animals in northwestern Namibia and adjacent southwestern Angola (Van Wyk & Smith 2001), is described. During a botanical expedition to the Kaokoveld in April 2019, one of us (WS) encountered an unfamiliar member of the Asteraceae with a dwarf shrubby habit and succulent leaves on a rocky hill north of the Khumib River. A second population was found in the valley of the Hoarusib River. The plants had cordate, succulent leaves, and capitula with ray florets. On a follow-up visit in May 2022 to the Khumib River, the plants were again in flower and fruit, enabling fertile material to be collected and the entity to be identified as an undescribed species of *Senecio*. Further herbarium study of the *Senecio* holdings in the National Herbarium of Namibia (WIND) revealed several other collections of this species, all filed under either *S. englerianus* Hoffmann (1888: 279) or *S. flavus* (Decaisne 1834: 265) Schultz Bipontinus (1845: 319, t. 107).

The new species morphologically most closely resembles *S. englerianus* and *S. flavus*, all three species that share superficially similar-looking succulent leaves. The two described species are phylogenetically closely related and together form a strongly supported clade called the “Petiolate Clade” (Coleman *et al.* 2003; bootstrap value: 100) or *S. englerianus*-*S. flavus* Clade (Pelser *et al.* 2007; bootstrap value: 100; Bayesian consensus percentage: 100). An affinity of the new species to this clade is suggested by similarities in habit and leaf morphology (herbaceous-succulent dwarf shrubs with petiolate leaves, usually cordate).

Materials and methods

All relevant types available on the internet through JSTOR Global Plants (<https://plants.jstor.org/>) were examined, as well as all herbarium material from WIND (abbreviation following Thiers 2022). The species was also studied in the field in Namibia where diagnostic features for both the new species and *S. englerianus* were determined through examination of live material. This was supplemented by study of relevant literature (including the protologues) (Alexander 1979, Coleman *et al.* 2001, 2003, Milton 2009). As imaging equipment, a 6.5–45.0× magnification stereo microscope was used for determining morphological features. Descriptive terminology follows Beentje (2016). The distinction between “ordinary” and “fluked” pappus bristles in *Senecio* is based on the definitions of Drury & Watson (1966). “Fluked” bristles are flexuous and do not detach easily in a mature cypsella; their middle region is thin-walled and filamentous, the lumina relatively narrow; cells in the middle and apical regions having their lower ends produced to form external elongations or spines; the distal two or three pairs of pappus cells appear “condensed”. The distribution map was compiled from specimen data using ArcView 3.1 software. For all collections, quarter degree grid squares are supplied according to the Degree Reference System proposed by Edwards & Leistner (1971). Conservation assessment follows IUCN (2012) recommendations.

Taxonomic treatment

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

Diagnosis:—Dwarf shrub up to 0.4 m high, morphologically most similar to *Senecio englerianus* and *S. flavus*: from *S. englerianus* it differs in having the leaf blade cordate to suborbicular or reniform (*vs.* cordate, suborbicular, reniform, ovate or oblate); blade base cordate to deeply cordate (*vs.* cordate-reniform or truncate); capitula radiate (*vs.* discoid); involucre usually shorter and narrower: 5.3–7.4 mm long, 3.5–4.0 mm diam. (*vs.* 6.3–8.0 mm long, 4.4–5.6 mm diam.); from *S. flavus* it differs in having the capitula distinctly radiate (*vs.* disciform or obscurely radiate; ray florets scarcely longer than involucre); involucre usually shorter and wider: 5.3–7.4 mm long, 3.5–4.0 mm diam. (*vs.* 7.0–9.5 mm long, 2.7–2.9 mm diam.); pappus bristles free, non-fluked and lacking hook-like apical appendages [*vs.* ca. 33%—according to Coleman *et al.* (2003) and Milton *et al.* (2022)—of pappus bristles connate and fluked—see “Materials and methods” for definition of “fluked” bristles—with grappling hook-like apical appendages].

Type:—NAMIBIA. Kunene Region: 1812 (Sanitatas), Namib Desert, gneiss ridge, 3 km north of Khumib River and 4 km east of Skeleton Coast Park boundary (–DA), 377 m a.s.l., 23 May 2022, *Swanepoel 585* (holotype WIND!; isotypes PRE!, PRU!).

Single-stemmed annual or short-lived perennial dwarf shrub, glabrous, herbaceous to succulent, up to 0.4 m high, cushion-forming when perennial. *Branches* succulent, brittle, pale green, glaucous, short, 10–35 mm long before rebranching. *Leaves* alternate and spirally arranged, fleshy to succulent, pale green or grey-green, glaucous, lower and middle cauline leaves petiolate with blade cordate to suborbicular or reniform, ca. flat, apex acute or rounded, base subcordate to deeply cordate, margins coarsely dentate with 5 or 9 teeth each side or almost entire, veining palmately, inconspicuous, not prominent, 5–40 × 8–45 mm, fleshy, up to 2.5 mm thick; petiole 3–38 mm long, up to 2 mm diam., brittle, pale green, angle with blade abaxially ca. 120 degrees (ca. patent), blade appearing peltate due to deeply cordate base; upper cauline leaves sessile, sub-amplexicaul to amplexicaul, irregular, up to 12 × 12 mm. *Inflorescences* axillary or terminal, capitula solitary or cymously twice-forked, 15–95 mm long, pale green. *Peduncle* 11–50 mm long, 0.6–0.8 mm in diam. (at capitulum 1.0–1.2 mm diam.), erect, with up to 4 lanceolate or narrowly triangular bracts towards capitulum, ca. 1 mm long, calyculus bracts 5–7, lanceolate or narrowly triangular, 0.8–2.0 mm long. *Capitula* 2 or 3 per inflorescence, heterogamous with female ray florets and fertile hermaphrodite disc florets, other peripheral florets

(between ray florets) similar to disc florets, radiate, slightly convex, 9–11 mm diam. (including rays), yellow-flowered. *Receptacle* flat, indistinctly alveolate, convex and verrucose when dry. *Involucre* cupuliform, 5.5–6.3 mm long, 3.5–4.0 mm diam., involucre bracts 10–13, lanceolate, concave in transection, free, 5–6 × 0.7–1.1 mm, herbaceous, margins membranous, acute, pale green with a purple tinge, glaucous, patent to reflexed when in fruit. *Ray florets* 3–6, yellow, corolla 5.0–7.9 mm long (including ray), tube terete, ca. 0.4 mm diam.; ray yellow, elliptic-oblong with 4 or 5 darker longitudinal lines, 2.5–4.4 mm long, 40–55% as long as the involucre, apex rounded or truncate, entire or with 1–4 denticulate teeth, glabrous; ovary oblong, terete, white, densely papillate (not twin hairs), 1.4–1.8 mm long, 0.5 mm diam., ovule oblong, 1.3–1.5 mm long, 0.3 mm diam.; style 2.9–3.2 mm long, ca. 0.2 mm diam., terete; branches ca. 0.8 mm long, flattened, grooved, minutely papillate (sweeping hairs) towards truncate apex; pappus copious, ca. 52, minutely barbellate bristles, 2.5–3.6 mm long, of “ordinary” type (sensu Drury & Watson 1966), erect, persistent, white. *Cypselae* oblong, terete, angular, grooved, dark brown, white-papillate, ca. 2.4 mm long, ca. 0.5 mm wide. *Disc florets* ca. 30, pale yellow-green, corolla 3.9–4.5 mm long; tube cylindrical, 1.4–1.6 mm long, 0.4 mm diam.; limb ca. 2.5 mm long, gradually widening from 0.4 mm to 0.8 mm diam. at apex; lobes 5, deltoid-ovate, 0.5–0.8 mm long, thickened abaxially towards apex, glabrous; anthers ca. 1.8 mm long including ovate apical appendage; filament collar balusterform; style ca. 3.8 mm long, 0.2 mm diam., terete, branches as for ray florets; ovary narrowly oblong, densely papillate, ca. 1.8 mm long, 0.5 mm diam., terete, ovary, ovule, pappus and cypselae as for ray florets.



FIGURE 1: *Senecio namibensis*, habit of plant just past peak flowering (at type locality). Leaf blades moderately fleshy, suborbicular with base cordate and margins dentate; capitula radiate. Photograph by W. Swanepoel.

Phenology:—Flowers and fruit were recorded from February to September.

Distribution, habitat, and ecology:—At present *Senecio namibensis* is known only from ten localities in the Namibian part of the Namib Desert, from the Khumib River in the north to the Rössing Mountains in the south (Fig. 4). This part of the Namib Desert falls mainly in the Namib zone of the Kaokoveld Centre of Endemism (Van Wyk & Smith 2001). *Senecio namibensis* occurs approximately 20–32 km from the coast in the north to 30–60 km in the south, with a maximum distance of 75 km in the centre of its distribution at a locality south of the Huab River. It occurs in small colonies of a few plants each in sandy gravel at the base of rocks and boulders in hilly areas, at elevations of 150–500 m a.s.l., with annual average rainfall up to 100 mm (Mendelsohn *et al.* 2002).



FIGURE 2. *Senecio namibensis*, plants in flower, showing habit and variation in leaf morphology (at type locality). **A.** Leaves succulent; blade with base strongly cordate, margin conspicuously dentate; capitula radiate. **B.** Leaves succulent; blade with base weakly cordate, margin weakly dentate. Photographs by W. Swanepoel.

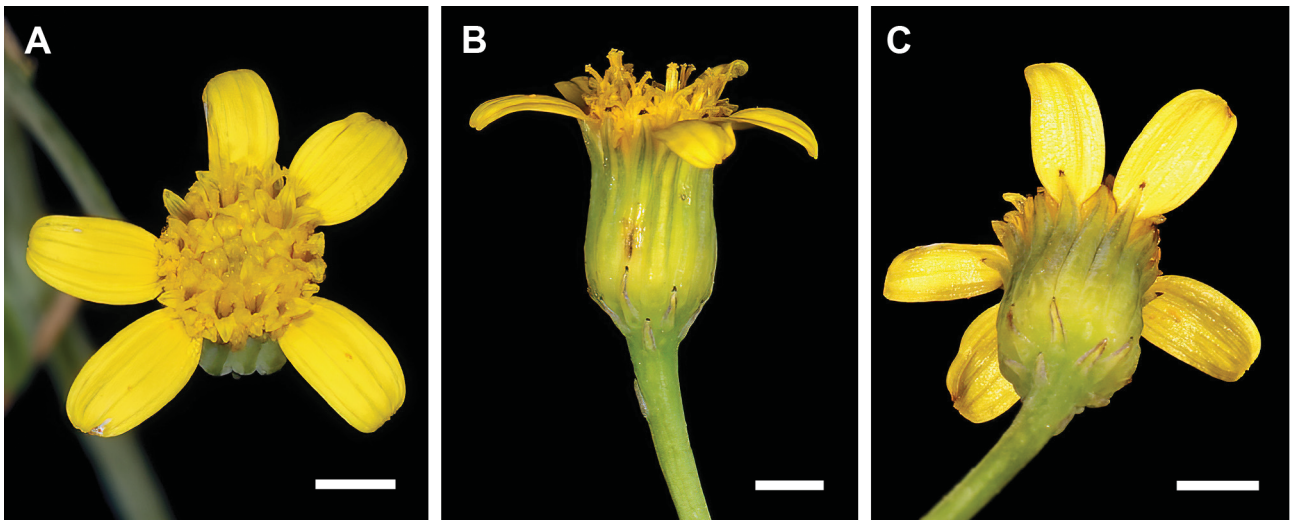


FIGURE 3. *Senecio namibensis*, morphology of capitula. **A.** Capitulum viewed from above, showing female ray florets and fertile hermaphrodite disc florets. **B.** Capitulum viewed from the side, showing calyculate and involucre bracts. **C.** Capitulum viewed obliquely from below, showing calyculate and involucre bracts. Scale bar = 2 mm. Photographs by W. Swanepoel.

Conservation status:—Although rare and only known from a small area, *Senecio namibensis* is probably not threatened at present. The entire known population occurs within either uninhabited or protected areas (Skeleton Coast and Dorob National Parks, including several conservancies). No signs of damage caused by animals or humans were present on any of the *in situ* specimens examined. The extent of occurrence is estimated at < 20000 km² (7425 km²) with only 10 subpopulations. However, since no decline or extreme fluctuations in population size or numbers are known, it is here ranked as Least Concern (LC) (IUCN 2012).

Etymology:—The specific epithet refers to the Namib Desert, which, 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:—The distribution of *Senecio namibensis* does not overlap with that of its two suggested nearest relatives. *Senecio namibensis* occurs to the east (further inland) of the range of *S. englerianus* and to the west of *S. flavus* (Fig. 4). Some of the more prominent morphological features to distinguish among the three species are provided in Table 1.

Milton *et al.* (2022) report *S. englerianus* as being dimorphic for capitulum-type (mostly non-radiate, occasionally radiate), citing as reference Jürgens *et al.* (2021), which refers to the “<https://southernafricanplants.net>” website. On the *Senecio englerianus* (as “*Senecio engleranus*”) page of this website, a photograph of a plant with yellow rays is shown (FotoID: 10798, E. Erb, Namibia, 16-08-2006), probably the basis for the statement that the capitula in *S. englerianus* are dimorphic. However, the plant in the photograph almost certainly represents *S. namibensis*, although it is not possible to confirm this based on a photograph alone. *Senecio vulgaris* Linnaeus (1753: 867) from the British Isles has also been reported as being either radiate or non-radiate. In this case, the polymorphism arose by introgression of a cluster of regulatory genes from the radiate *S. squalidus* Linnaeus (1753: 869) (originating from Sicily) into the non-radiate *S. vulgaris* after the introduction and spread of the former from Europe to the British Isles (Kim *et al.* 2008). Due to the absence of related species of *Senecio* in the area of distribution of *S. englerianus*, from which it could have obtained radiate capitula, the possibility of *S. namibensis* being a radiate variant of *S. englerianus* is ruled out as highly unlikely. In support of separate species status for *S. namibensis* is also the combination of other morphological differences between it and *S. englerianus*, notably the shorter and narrower involucre (Table 1).

Unrelated asteraceous species within the range of *Senecio namibensis* with which it can be confused, are *Dauresia alliariifolia* (Hoffmann 1888: 280) Nordenstam & Pelsner (2005: 76) and *Engleria africana* Hoffmann (1888: 273), due to similarities in leaf characters. However, *Dauresia alliariifolia* has white branches (*vs.* green), an ecalyculate involucre (*vs.* calyculate) and discoid white- or yellow-flowered capitula (*vs.* radiate, yellow-flowered). *Engleria africana* has much larger capitula, ca. 12 mm long (*vs.* 5.3–7.4 mm), the involucre consists of three rows of involucre bracts (*vs.* one row) and the peripheral florets lack rays (*vs.* ray florets present).

TABLE 1. Prominent morphological differences between *Senecio namibensis*, *S. englerianus*, and *S. flavus*.

Character	<i>S. namibensis</i>	<i>S. englerianus</i>	<i>S. flavus</i>
Habit (duration)	Annual or short-lived perennial	Annual or short-lived perennial	Annual
Leaves (lower and middle cauline)			
Blade shape	Cordate to suborbicular or reniform	Cordate, suborbicular, reniform, ovate or oblate	Triangular to cordate, ovate, ovate-oblong or suborbicular
Blade base	Cordate to deeply cordate	Cordate-reniform or truncate	Cordate or truncate
Blade size (mm)	5–40 × 8–45	3–35 × 4–35	10–70 × 10–60
Blade-petiole attachment	ca. 120 degrees (ca. patent)	ca. 180 degrees (same plane)	Not seen
Inflorescence (length) (mm)	15–95	16–40	20–60
Capitula	Radiate	Discoid	Disciform or obscurely radiate
Peduncle (length) (mm)	11–50	8–34	3–23
Involucre size (mm)	5.3–7.4 long, 3.5–4.0 diam.	6.3–8.0 long, 4.4–5.6 diam.	7.0–9.5 long, 2.7–2.9 diam
Involucre bracts (length) (mm)	ca. 5–6	ca. 6–7	ca. 7–8
Ray florets per capitulum	3–6	Absent	Absent, or obscurely radiate with ray florets scarcely longer than involucre
Pappus	Bristles free, non-fluked, lacking hook-like apical appendages	Bristles free, non-fluked, lacking hook-like apical appendages	ca. 33% of bristles connate-fluked with grappling hook-like apical appendages
Distribution (Fig. 4)	Namibia, Northern to Central Namib Desert, from the Khumib River to just north of the Khan River, ca. 20–32 km from the coast in the north to ca. 30–60 km in the south; largely confined to the Kaokoveld Centre of Endemism	Namibia, Northern to Central Namib Desert from the Khumib to the Kuiseb River, from the coast to ca. 15 km inland in the north to ca. 35 km inland in the south	Namibia, from the Brandberg in the Central Namib Desert to Aroab in the southeast and to the Orange River in the south, ca. 57–100 km from the coast in the north to ca. 90–400 km in the south; South Africa, Northern Cape Province; Northern Africa

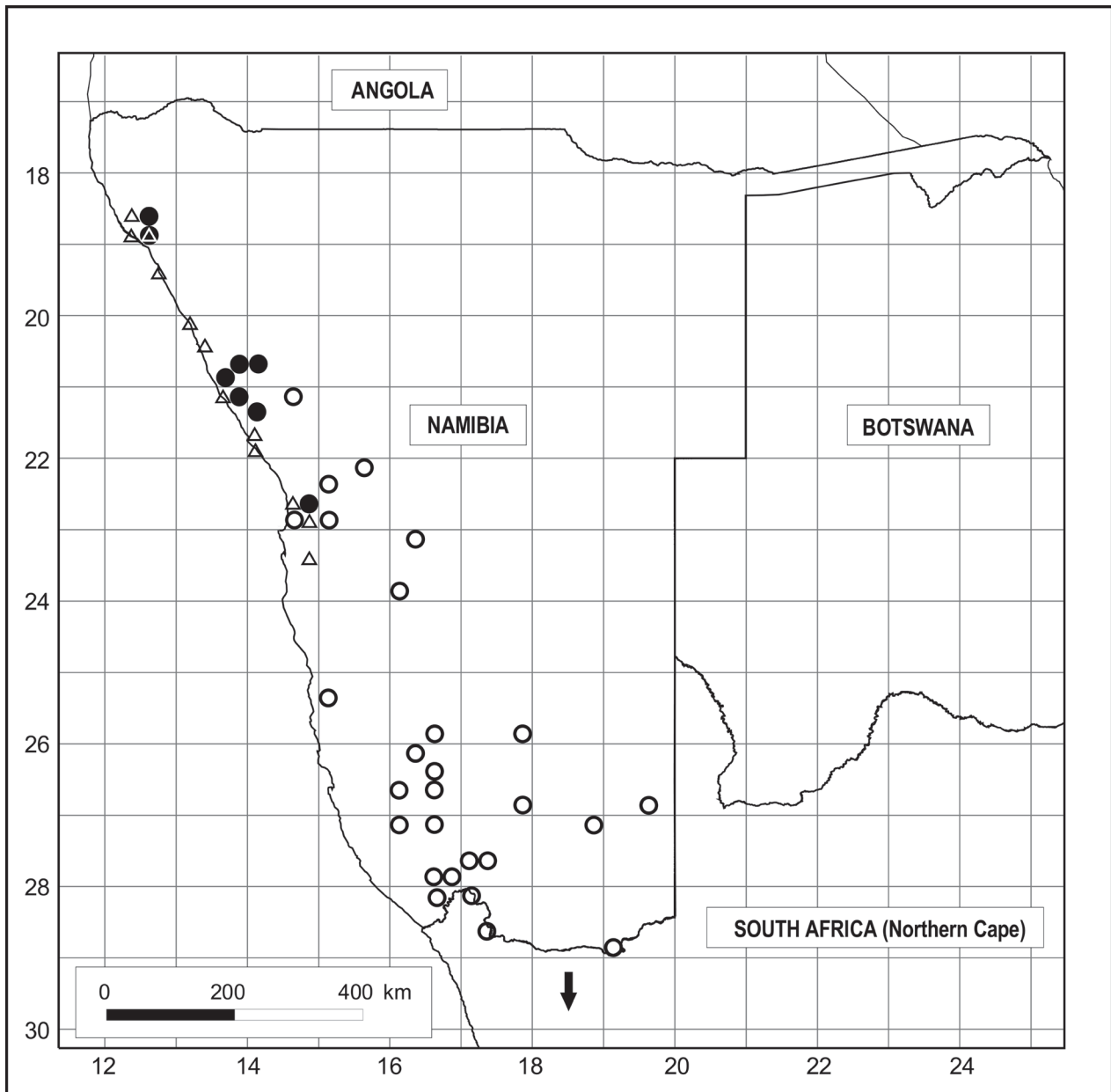


FIGURE 4. Known distribution of *Senecio namibensis* (solid circles) and *S. englerianus* (open triangles). Also plotted are the known distribution of *S. flavus* (open circles) in Namibia; its range extends further south (arrow) into the Northern Cape, South Africa, but those localities, as well as its disjunct distribution in Northern Africa, are not shown. Source: herbarium records in WIND.

Additional specimens examined (paratypes):—NAMIBIA. Kunene Region: **1812 (Sanitatas):** Khumibrivier se droë loop (–DC), 7 May 1962, *Kotze 124* (WIND!). **2013 (Unjab mouth):** Huab River area north of Gaias (–DB), 27 August 1977, *Craven 510* (WIND!); Foot of mountains along Huab River (–DC), 12 August 1979, *Müller & Loutit 1164* (WIND!). **2014 (Welwitschia):** Damaraland, between Huab and Mikberg (–CA), 11 September 1993, *Günster 9391* (WIND!). Erongo Region: **2113 (Cape Cross):** 30 km east of Ugabmond (–BB), 16 August 1979, *Müller & Loutit 1213* (WIND!). **2114 (Uis):** Messum crater (–AC), 15 May 2000, *Hachfeld 119244* (WIND!). **2214 (Swakopmund):** Rössingberge (–DB), 27 February 1958, *Merxmüller & Giess 1735* (WIND!); Westseite Rössing (–DB), 8 May 1969, *Homann, Benseler & Mittendorf 23* (WIND!).

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