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Reinstatement of the name *Petalidium ovatum* (Acanthaceae), with an amplified description of the species

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Abstract

The name *Petalidium ovatum* is reinstated and an amplified description is provided for a species of *Petalidium* confined to Namibia. *Petalidium ovatum* used to be treated as a synonym of the widespread *P. englerianum*, but morphological characters support the reinstatement. *Petalidium ovatum* is a range-restricted species, only known from the Khorixas-Bergsig area 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. ovatum* include the pale grey, often almost white, appearance of the plants, vegetative parts with a dense white indumentum of both stellate and dendritic trichomes, flowers borne in short few-flowered dichasia, bracts oblanceolate with apices acute or obtuse, and bracteoles widely ovate. The flowers of *P. ovatum* are distinctive in having the anterior corolla lobe partly or completely yellow, the others burgundy, and with the two upper lobes connate towards the base for almost half their length. A comparison of some of the more prominent morphological features to differentiate *Petalidium ovatum* from *P. englerianum*, its morphologically most similar relative, is provided. Based on IUCN Red List categories and criteria, a conservation assessment of Least Concern (LC) is recommended for the reinstated species.

Key words: desert, endemism, flora, Kaokoveld, Kaokoveld Centre of Endemism, Kunene Region, Ruellieae, Khorixas, Bergsig, lectotypification, taxonomy

Introduction

At present, ca. 38 described species of *Petalidium* Nees von Esenbeck (1832: 75) are recognized in Africa, including ca. 33 in the *Flora of southern Africa* region (South Africa, Namibia, Botswana, Eswatini, and Lesotho), of which 31 have been recorded for Namibia (Germishuizen & Meyer 2003, Swanepoel 2020, Swanepoel & Manzitto-Tripp 2022, Swanepoel *et al.* 2022, Swanepoel & Van Wyk 2023a, b). Here, we recognise yet another species of *Petalidium* for which the name *P. ovatum* (Schinz 1890: 198) Clarke (1899: 90) is reinstated. We also provide an amplified description and images for the species. The name *P. ovatum* has been treated as a synonym of *P. latifolium* (Schinz 1890: 31) Clarke (1899: 88) by Obermeijer (1936), but more recently Meyer (1968) relegated both *P. ovatum* and *P. latifolium* to the synonymy of *P. englerianum* (Schinz 1890: 197) Clarke (1899: 89). *Petalidium ovatum*, as far as is known, is endemic to 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, Craven 2009).

The Kaokoveld is a pronounced centre of diversity and endemism for *Petalidium* (Craven 2009, Tripp *et al.* 2017) and other Acanthaceae (e.g., Tripp & Dexter 2012, Darbyshire *et al*. 2020), hence the recognition of yet another member of *Petalidium* in this region is not unexpected. A study of the *Petalidium* holdings in the Herbs WIND and PRE revealed several earlier collections of *P. ovatum*, all filed under *P. englerianum*.

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In June 2021 one of us (WS) was shown photographs of certain shrubby plants from the Kaokoveld by a staff member of Wilderness Safaris with the request to provide identifications. Amongst these were two different members of *Petalidium*, one of which was immediately recognized as being from an unfamiliar taxon. The picture of the latter was taken in the vicinity of the Damaraland Camp in the hilly country between the Huab and Springbok rivers. In March 2022, during an expedition to the area, one of us (WS) found the plants, characterized by a dwarf shrub habit, single- or multi-stemmed from ground level and appearing almost white due to the presence of a dense white indumentum of stellate and dendritic trichomes, and with flowers borne in short dichasia with burgundy and yellow bi-coloured corolla lobes. Material was collected and initially we suspected it to be a new species. However, a comparison with the type specimens of valid names treated as synonyms of currently recognised species of *Petalidium* confirmed that this entity matches the original material on which the name *Pseudobarleria ovata* Schinz (1890: 198) was based. The latter species was subsequently transferred to *Petalidium* with the new combination *Petalidium ovatum* (Schinz) Clarke (1899: 90).

Hitherto material of *P. ovatum* has most often been confused in herbaria with *P. englerianum*. The two taxa share morphological similarities, especially in both having a dense white indumentum that gives the plants an almost white appearance, and both occur in northern Namibia, with *P. ovatum* restricted to the Kunene Region. *Petalidium englerianum* is most similar morphologically, but differs from *P. ovatum* by a combination of characters (Table 1).

TABLE 1. Prominent morphological differences between *Petalidium ovatum* and *P. englerianum*.

Character	*P. ovatum*	*P. englerianum*
Bark (colour on distal stems)	Younger stems: cream-brown Older stems: brown	Younger stems: pale grey Older stems: dark grey or dark grey-brown
Indumentum (vegetative parts)	Dense sessile or short-stalked stellate and longer dendritic trichomes; not appearing matted	Dense sessile or short-stalked stellate trichomes (rarely few dendritic in addition); appearing matted
Leaves (lamina shape)	Ovate, rotund or subrotund	Narrowly to broadly elliptic, oblong-elliptic, oblanceolate or rarely ovate
Leaves (lamina apex)	Acute, rounded, emarginate or truncate	Acute, rounded or obtuse
Leaves (lamina base)	Cuneate, rounded, subcordate or truncate	Attenuate, rarely cuneate
Leaves (lamina ratio length:width)	1–1.5:1	1.7–3.1:1
Leaves (lamina size) (mm)	10–51 × 6–38	12–90 × 7–33
Bracteoles (shape)	Broadly ovate	Variable: ovate, narrowly obovate, oblanceolate, lanceolate or oblong-elliptic
Bracteoles (size) (mm)	10–15 × 7–14	10.5–17.0 × 3.4–13.5
Corolla (upper lobes)	Connate for 45–50% their length	Connate for ca. 20–40% their length
Corolla lobes (colour)	Anterior lobe yellow, dotted burgundy at insertion of trichomes, burgundy towards margins or burgundy on lateral margins only; other lobes burgundy	Anterior lobe yellow; other lobes pale yellow or orange, the latter usually fading to brownish orange in spent flowers
Ovary (indumentum)	Glabrous	Scattered short-stalked glandular trichomes towards apex
Distribution	Namibia, Kunene Region from Khorixas to Bergsig in the catchment area of the Huab River (Kaokoveld Centre of Endemism)	Namibia, Kunene Region to the east of Khorixas; Otjozondjupa and Oshikoto Regions and eastwards to northwestern Botswana

Methods

Morphological descriptions and ecological information presented here are based on field observations and material collected during extensive field work in Namibia over many years. Diagnostic features for *Petalidium ovatum*, *P. pilosibracteolatum* Merxm. & Hainz in Suessenguth & Merxmüller (1955: 69), *P. variabile* Clarke (1899: 92), and *P. englerianum* were determined through examination of fresh material and high-resolution images (including images of type material) available on the Internet through JSTOR Global Plants (https://plants.jstor.org/) and at Herb. Z+ZT (https://www.herbarien.uzh.ch/en/herbarien-zzt). This was supplemented by the study of relevant literature (including the protologues) and herbarium collections. The herbaria of the National Botanical Research Institute in Namibia (WIND), South African National Biodiversity Institute, Pretoria (PRE), and Royal Botanic Garden Edinburgh (E) were consulted for possible collections of *P. ovatum* (herbarium abbreviations follow Thiers 2023). 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. Threat status assessment follows IUCN (2012) guidelines and recommendations.

Taxonomic treatment

Petalidium ovatum (Schinz) Clarke (1899: 90) (Figs 1–3)

Basionym:—*Pseudobarleria ovata* Schinz (1890: 198).

Type:—NAMIBIA. Kunene Region: Kaokofelt auf Korikas [Kaokoveld at Khorixas], fruct. – 0.60 m [shrublet – 0.60 m], 18 March 1885, Belck 20 [lectotype Z+ZT, Z-000000110 photo!, designated here (or perhaps holotype)]. Reasons for the lectotypification are supplied under "Typification" below.

Erect woody dwarf shrub to 1 m tall, single- or multi-stemmed from just above ground level; all vegetative parts with a dense white indumentum of sessile or short-stalked stellate and longer bottle brush-like dendritic trichomes, glabrescent on older stems and leaves. *Stems*: main stem up to 120 mm diam., bark fissured, grey-white; bark on distal stems cream-brown or brown, peeling in long, thin, narrow strips; young stems quadrangular, white or grey-white. *Leaves* opposite and decussate, younger leaves clustered in axils, petiolate; lamina ovate, rotund or subrotund, 10–51 × 6–38 mm, rarely glabrescent, white to grey-white to dark greyish green, cystoliths inconspicuous, linear-oblong or linear-oblanceolate; apex acute, rounded, emarginate or truncate, sometimes minutely apiculate, base cuneate, rounded, subcordate or truncate, shortly decurrent onto petiole, margins entire; midrib slightly prominent above and below, principal lateral veins 2–5 each side, slightly prominent below; petiole 2–15 mm long. *Flowers* in short dichasia, bracts foliaceous, oblanceolate, 4–13 × 1.4–2.5 mm, apex acute or obtuse, sessile; pedicel (below bracteoles) up to 5 mm long; bracteoles broadly ovate, usually asymmetric, coriaceous, apex acute, sometimes slightly acuminate, base rounded or truncate, cream to creamy brown, sometimes light grey-green, reticulation prominent on both sides, pale green, cream-brown when dry, ca. 10–15 × 7–14 mm, indumentum abaxially similar to vegetative parts, adaxially with additional short-stalked glandular trichomes or glabrous, margin lanate towards apex, cystoliths visible, especially adaxially, straight or curved. *Calyx* ca. 5.5 mm long including basal tube ca. 1.4 mm deep, with scattered sessile or subsessile glandular trichomes, sparingly puberulous towards apex and strigose towards base adaxially; lobes 4, lanceolate, acute, 3.1–4.2 mm long. *Corolla* 14.8–18.3 mm long with lobes straightened, narrow unexpanded portion cylindrical or slightly widening towards throat, laterally compressed, 7.2–9.1 mm long, 2.8–3.5 mm diam., expanded portion 2.1–2.4 mm long, corolla glabrous outside except narrow tube distally and expanded portion sometimes sparsely puberulous with short simple trichomes in addition, inside puberulous on anterior side of narrow portion, long patent eglandular trichomes on anterior side of expanded portion; anterior lobes yellow, dotted burgundy at insertion of trichomes, burgundy towards margins or on lateral margins only, other lobes burgundy, lower lobe obovate, patent, sometimes recurved, 4.7–5.1 × 5.1 mm, upper lobes narrowly obovate or oblong, connate for 45–50% of their length, erect or suberect, ca. 4.7–5.6 × 3.1 mm, lateral lobes narrowly obovate or oblong, patent, ca. 4–5 × 3 mm, lobe apices rounded, truncate or widely retuse, all lobes with long, stiff, patent, white eglandular trichomes, all lobe margins entire; palate prominently transversely 4-ribbed. *Filaments* didynamous, inserted dorsally in throat, each pair comprising a long and short filament connate for 1.3–1.6 mm at base, connate part prominent, adnate to tube, with scattered short-stalked glandular and few bifurcate trichomes, long filament 3.7–4.0 mm long, short filament 2.3–2.8 mm long; filament curtain reduced (*sensu* terminology of Manktelow 2000); anthers 2-thecous, thecae oblong with minute spurs at base, ca. 1.7 mm long, sparsely puberulous with in addition scattered short-stalked glandular and bifurcate eglandular trichomes. *Gynoecium* ca. 13.6 mm long; ovary ovoid, laterally compressed, ca. 2.6 ×1.7 × 1.1 mm, situated in fleshy disc, glabrous, ovules flattened-ovoid, 0.6–0.7 mm long; style filiform, ca. 10.4 mm long, puberulous, stigma lobes linear, slightly flattened, subequal, longer lobe ca. 0.6 mm long, shorter lobe 0.3 mm long. *Capsule* flattened, ellipsoid or ovoid, 7.5–8.6 × 4.3 × 2.5–3.0 mm, chestnut, glossy, sides smooth, glabrous. *Seeds* cordate, ca. 3.2–3.9 × 2.8 mm, densely covered with white long hygroscopic trichomes.

Phenology:—Flowers and fruit have been recorded from February to May (late summer to autumn).

Typification:—In the protologue of the name *Pseudobarleria ovata*, Schinz (1890) cited a single gathering, namely *Belck 20*, collected in 1885 from near Khorixas, Namibia, but did not specify a particular specimen or the institution housing it. As pointed out by McNeill (2014) if, prior to 1958, a single gathering is indicated as the basis

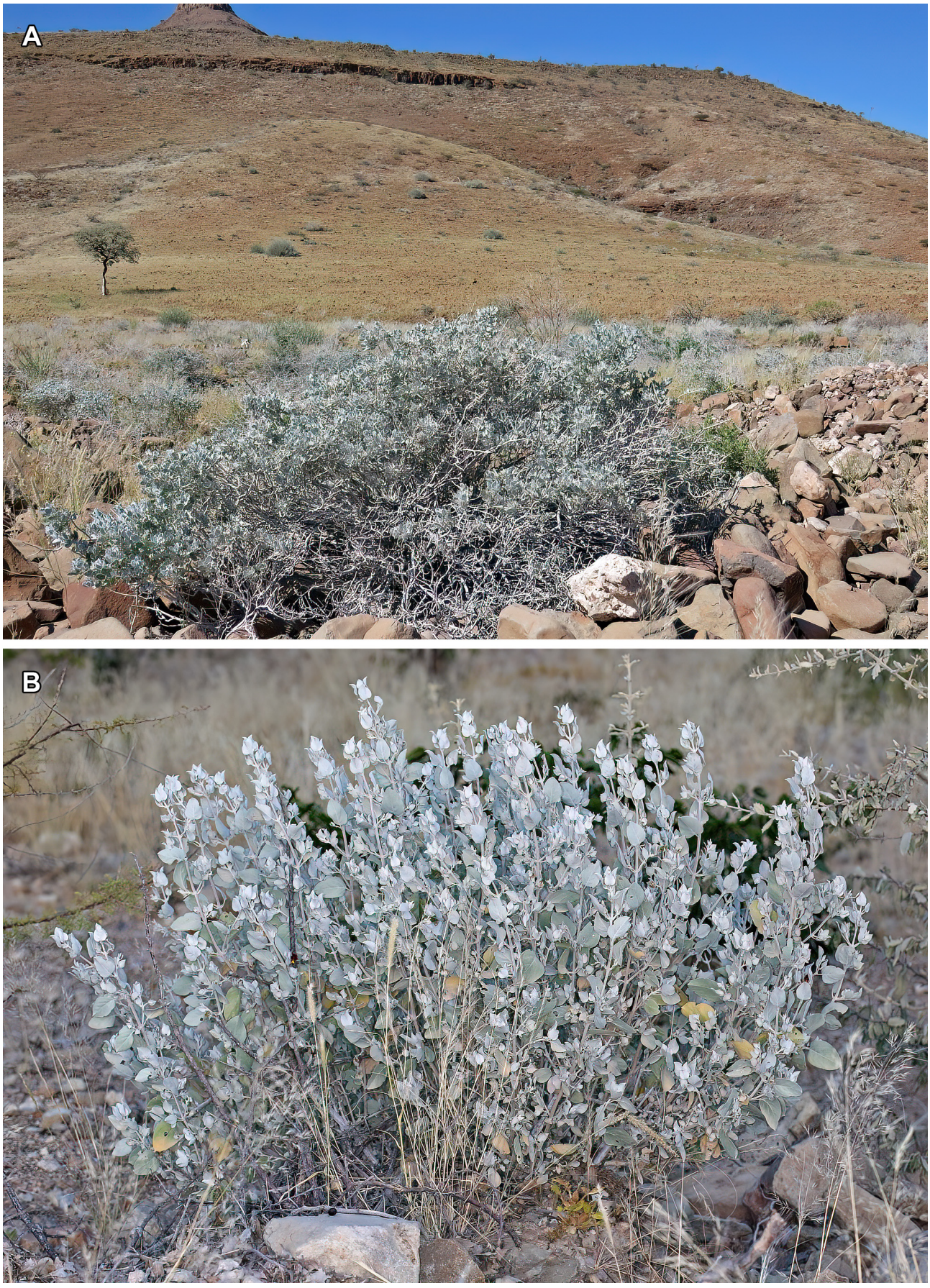

FIGURE 1. *Petalidium ovatum*, habitat and habit. **A.** Plant (ca. 600 mm high) on arid hillside at Grootberg, highest point on road C39 between Vrede and Bergsig. **B.** Plant (ca. 500 mm high) in ephemeral riverbed, Farm Inhoek 482, 8 km from Khorixas on road C39. Photographs: W. Swanepoel.

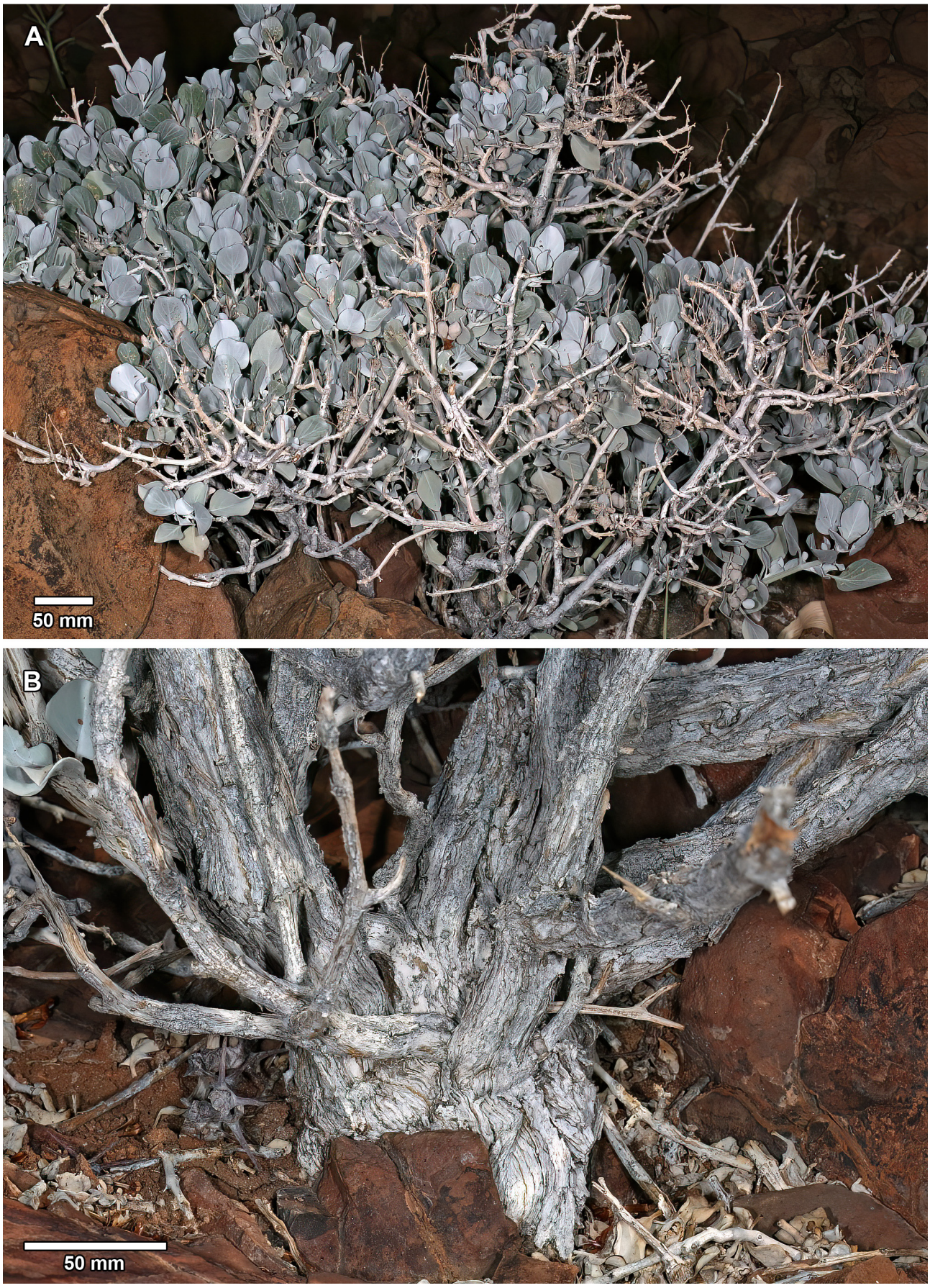

FIGURE 2. *Petalidium ovatum*, habit. **A.** Dwarf shrub, ca. 350 mm high (at Farm Fonteine 717). **B.** Base of mature plant showing woody stems with fissured greyish white bark (at Farm Fonteine 717). Photographs: W. Swanepoel.

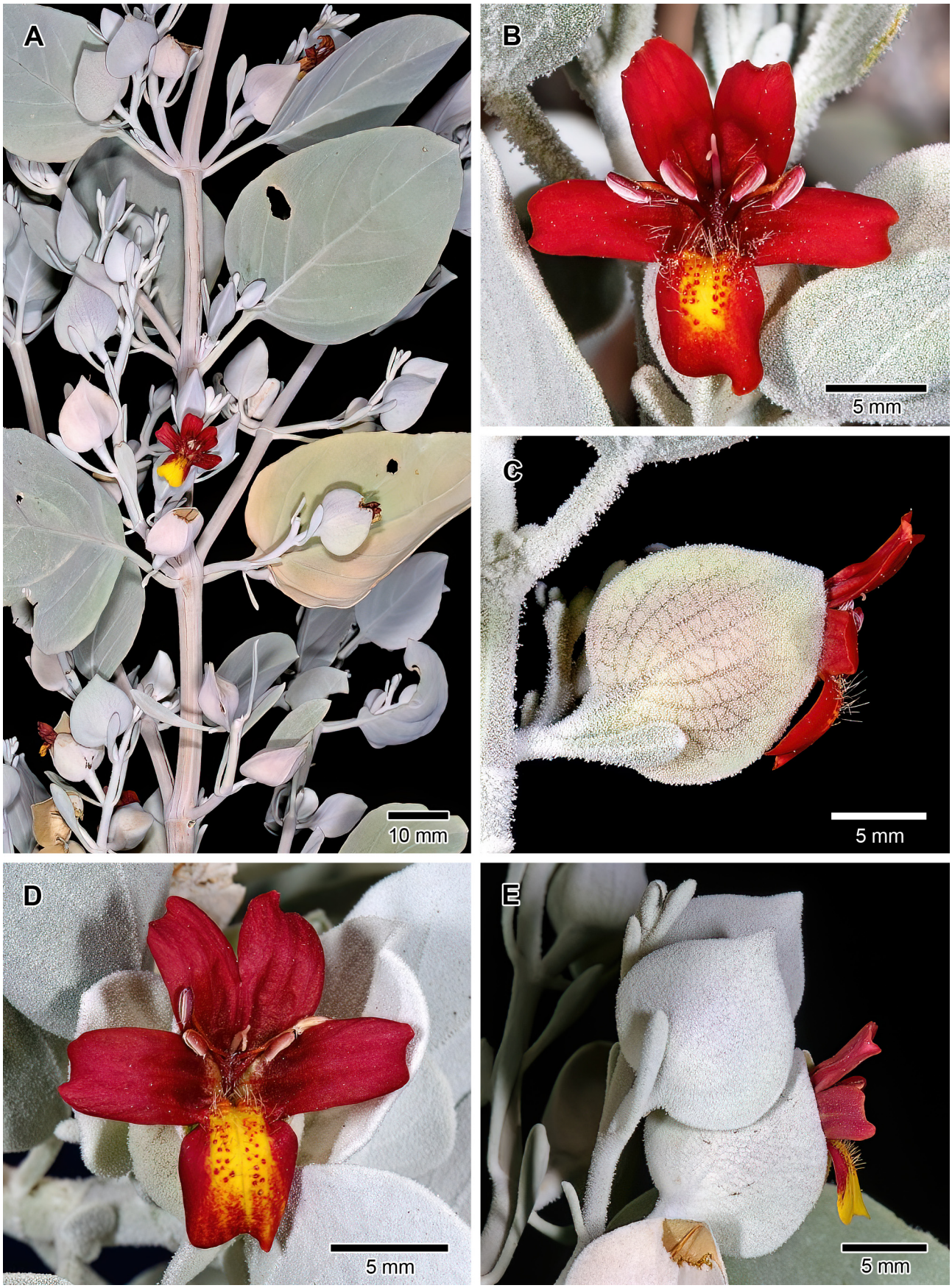

FIGURE 3. *Petalidium ovatum*, leaf (A) and flower morphology (B–E). **A.** Branchlet with leaves and flowers. **B.** Flower in front view. **C.** Flower in lateral view; note widely ovate bracteole with venation ca. visible. **D.** Flower in front view. **E.** Flower in lateral view; note bracteoles with indumentum particularly dense and venation not visible. Photographs: W. Swanepoel.

of a new taxon, "...there will be a holotype only if it can be established that the author used no other element and if the gathering is represented by a single specimen—because the specimens that comprise the gathering are syntypes" (Turland *et al.* 2018: Art. 40.2, Note 1). We were able to locate only one specimen of *Belck 20*, which is currently held in Herb. Z+ZT. However, Obermeijer (1936) mentioned that she had seen *Belck 20*, but did not specify Herbarium Z when acknowledging various herbaria from which she studied specimens. This suggests the possibility of a duplicate of *Belck 20* existing elsewhere, most likely in Herb. B, which she explicitly mentioned. In fact, it has been documented (Urban 1916: 328) that Herb. B received 226 numbers from Waldemar Belck between 1881 and 1885. Thus, circumstantial evidence suggests that there may have been multiple sheets of *Belck 20*, possibly also in Herb. B. Nevertheless, no specimens from this collection are extant in Herb. B, leading to the assumption that the original specimen(s) were likely destroyed during a World War II bombing raid in 1943.

Swiss botanist Hans Schinz (1858–1941) was based in Zürich, where he served as the Director of the Botanical Garden and held the position of Professor of Botany at the University of Zürich (Glen & Germishuizen 2010). Therefore, it is highly likely that Schinz had access to the specimen of *Belck 20* currently housed in Herb. Z+ZT when he described *Pseudobarleria ovata.* This particular specimen also includes a determinavit label on which Schinz has written "*Petalidium latifolium* (Schinz) C.B. Clarke" and "*Petalidium ovatum* Schinz," dated March 1920. Additionally, a determinavit slip by P.G. Meyer dated 1957 is affixed to this sheet, and on it is written "*Petalidium englerianum* (Schinz) C.B. Clarke var. *ovatum* (Schinz) Hainz ex P.G. Meyer *comb. nov.* ined." However, it should be noted that this designation by Meyer was never validly published. Given the likelihood of duplicates of *Belck 20* existing at the time of the original publication of the name *Pseudobarleria ovata*, we have designated the specimen held in Herb. Z+ZT as a lectotype, but with the additional qualification "or perhaps holotype," as suggested by McNeill (2014).

Diagnostic characters:—*Petalidium ovatum* is a woody dwarf shrub up to 1 m tall, morphologically most similar to *P. englerianum* from which it differs in having an indumentum on vegetative parts of both stellate and dendritic trichomes (*vs*. stellate only or rarely few dendritic in addition); lamina ovate, rotund or subrotund (*vs*. narrowly to broadly elliptic, oblong-elliptic, oblanceolate or rarely ovate), lamina length:width ratio of 1.0–1.5:1.0 (*vs*. 1.7–3.1:1.0); bracteoles broadly ovate (*vs*. ovate, narrowly obovate, oblanceolate, lanceolate or oblong-elliptic); corolla upper lobes connate for 45–50% of their length (*vs*. 20–40%), anterior lobe yellow, or yellow with burgundy in places (*vs*. always yellow), other lobes burgundy (*vs*. pale yellow or orange, usually fading to brownish orange).

Distribution and habitat:—At present, *Petalidium ovatum* is only known from the Khorixas-Bergsig area in the Kaokoveld Centre of Endemism, northwestern Namibia (Fig. 4). The specimen *Müller 1666* from north of Orupembe (most northwestern point in Fig. 4), is located ca. 300 km to the northwest of the known core range of *P. ovatum*. It morphologically seems to conform in all respects to *P. ovatum* and probably represents a second, outlier population of the species. *Petalidium ovatum* occurs on arid hillsides, drainage lines and along seasonally dry riverbeds at elevations of 650–1000 m a.s.l., about 70–160 km from the Atlantic Ocean. Average annual rainfall in the area is 100–250 mm (Mendelsohn *et al.* 2002).

Conservation status:—*Petalidium ovatum* is locally common and probably more widespread in suitable habitats than currently recorded. It is here considered not in immediate conservation danger because it occurs in sparsely to unpopulated areas and does not seem to be utilised by humans. The extent of occurrence is estimated at <20000 km² (3300 km²) with less than 10 (7) subpopulations. However, since no decline in population size is known, it is here ranked as Least Concern (LC) (IUCN 2012).

Notes:—Hitherto in herbaria, *Petalidium ovatum* has most often been confused with *P. englerianum* (Fig. 5), a species from which it differs in indumentum, leaf, and flower characters. This confusion was further entrenched by Meyer's (1968) treatment of *P. ovatum* as a synonym of *P. englerianum*. Both of these species were first validly described by Schinz (1890) in the genus *Pseudobarleria* (Anderson 1863: 26). The morphological similarity between these two species was already highlighted by Schinz (1890) when he did not describe the floral features of *Petalidium ovatum*. Instead, Schinz (1890) stated that the details in the construction of its flower correspond perfectly to those of *Petalidium englerianum*, hence the description of the latter should be consulted. Obviously, the conspicuous difference in corolla colour between these two species was not reflected by the limited herbarium material available to Schinz. Some of the morphological features to distinguish between *P. ovatum* and *P. englerianum* are provided in Table 1.

The known distribution of the two species (Fig. 4), does not overlap: *P. ovatum* occurs in northwestern Namibia from Khorixas westwards to near Bergsig, whereas *P. englerianum* occurs from the east of Khorixas to Outjo, Otjiwarongo, Otavi, Etosha National Park, Tsumeb, Grootfontein and further eastwards across the Kalahari Sandveld to Tsumkwe and into northwestern Botswana.

Petalidium ovatum can also be confused with *P. pilosibracteolatum* and *P. variabile* with which it shares a similar habit and pale grey, sometimes almost white, appearance. However, it can easily be distinguished from both by the indumentum on vegetative parts of *P. ovatum* that consists of both dense stellate and longer dendritic trichomes (*vs.*

densely strigose) and from *P. pilosibracteolatum* by the bracteoles lacking long simple trichomes (*vs*. present). In general, *P. ovatum* is much more densely pubescent on the vegetative parts than the other two species, which gives it a whiter appearance.

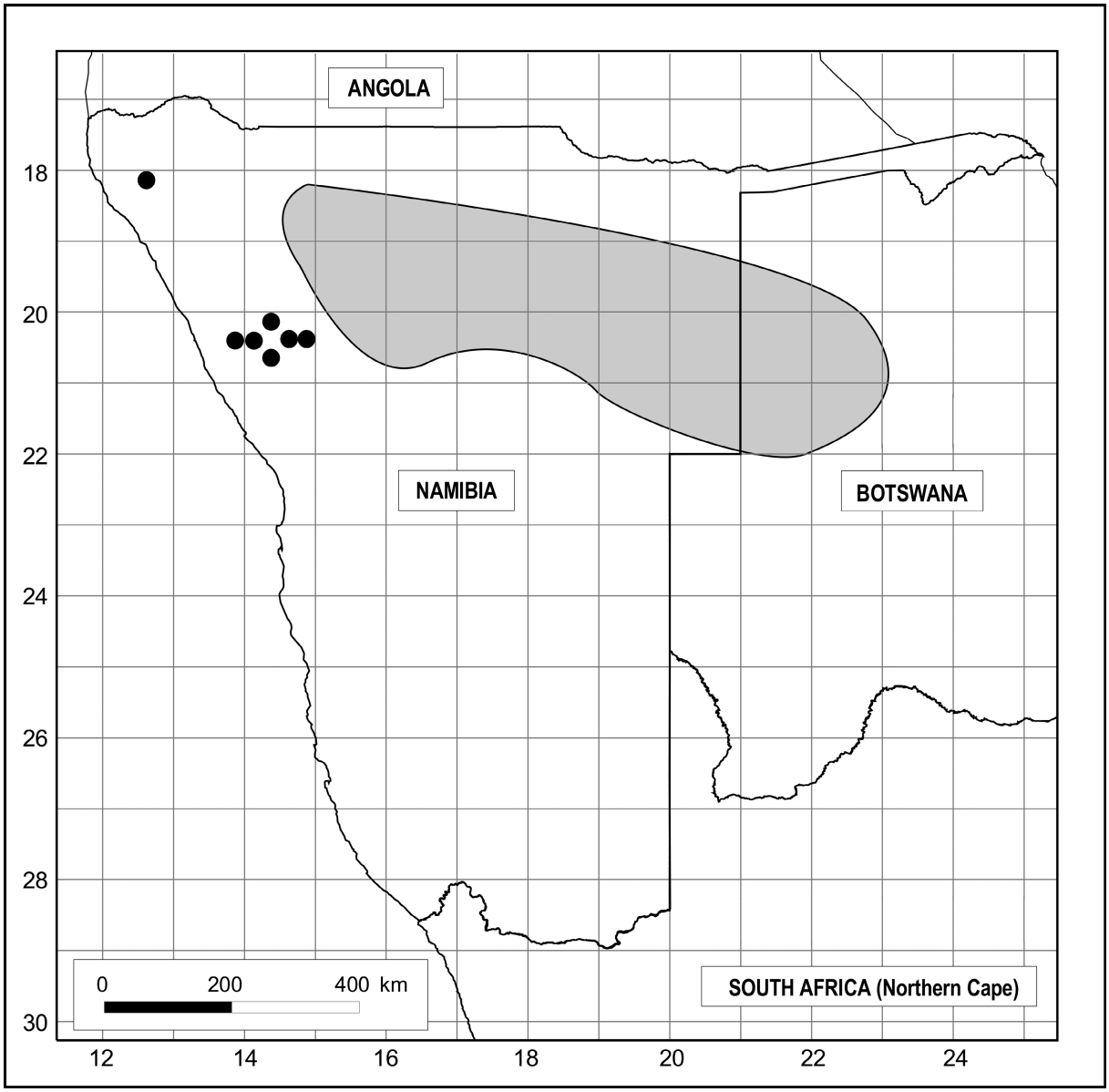

FIGURE 4. Known distribution of *Petalidium ovatum* (black dots; ●) and the distribution range of *P. englerianum* (shaded grey); based on herbarium specimens in Herbs E, PRE, WIND, and Z+ZT.

All the mentioned species, including *P. ovatum*, are from the group composed of plants with irregular, four-parted calyces (Obermeijer 1936, Tripp *et al*. 2017). We can confirm that the material hitherto attributed to *P. englerianum* used in molecular studies (Tripp *et al.* 2017) is from authentic *P. englerianum*. The phylogenetic position of *P. ovatum* is therefore not known at present, but we expect that it is closely related to *P. englerianum* and *P. ramulosum* Schinz (1916: 434), which form a clade in recent phylogenetic studies (Tripp *et al*. 2017, Loiseau *et al*. 2023). *Petalidium ramulosum* has a similar indumentum and white appearance, while its flower more closely resembles that of *P. ovatum*, at least in the colouration of the corolla. The latter two species have a very disjunct distribution and entirely different growth forms (prostrate growing via runners in *P. ramulosum* versus an upright shrub in *P. ovatum*).

Additional specimens examined:—NAMIBIA, Kunene Region: Kaokoland, 16 km north of Orupembe waterhole, 1812BA, May 1979, *Müller 1666* (WIND!); Farm Driefontein (OU 716) auf Gesteinsfläche, 2013BD, 30 March 1974, *Merxmüller & Giess 30612* (WIND!); 1.5 km north of Nugas homestead—|Owe ||ganas Spring at eastern bank of Nugas River—on ridge, 2014AB, 18 February 1998, *Loutit 145* (WIND!); Farm Fonteine 717, 2.5 km northeast of springs, 2014AC, 718 m, 19 March 2022, *Swanepoel 617* (WIND!); Farm Fonteine 717, 3.4 km northeast of springs, 2014AC, 663 m, 20 March 2022, *Swanepoel 618* (WIND!); Grootberg, highest point on road C39 between

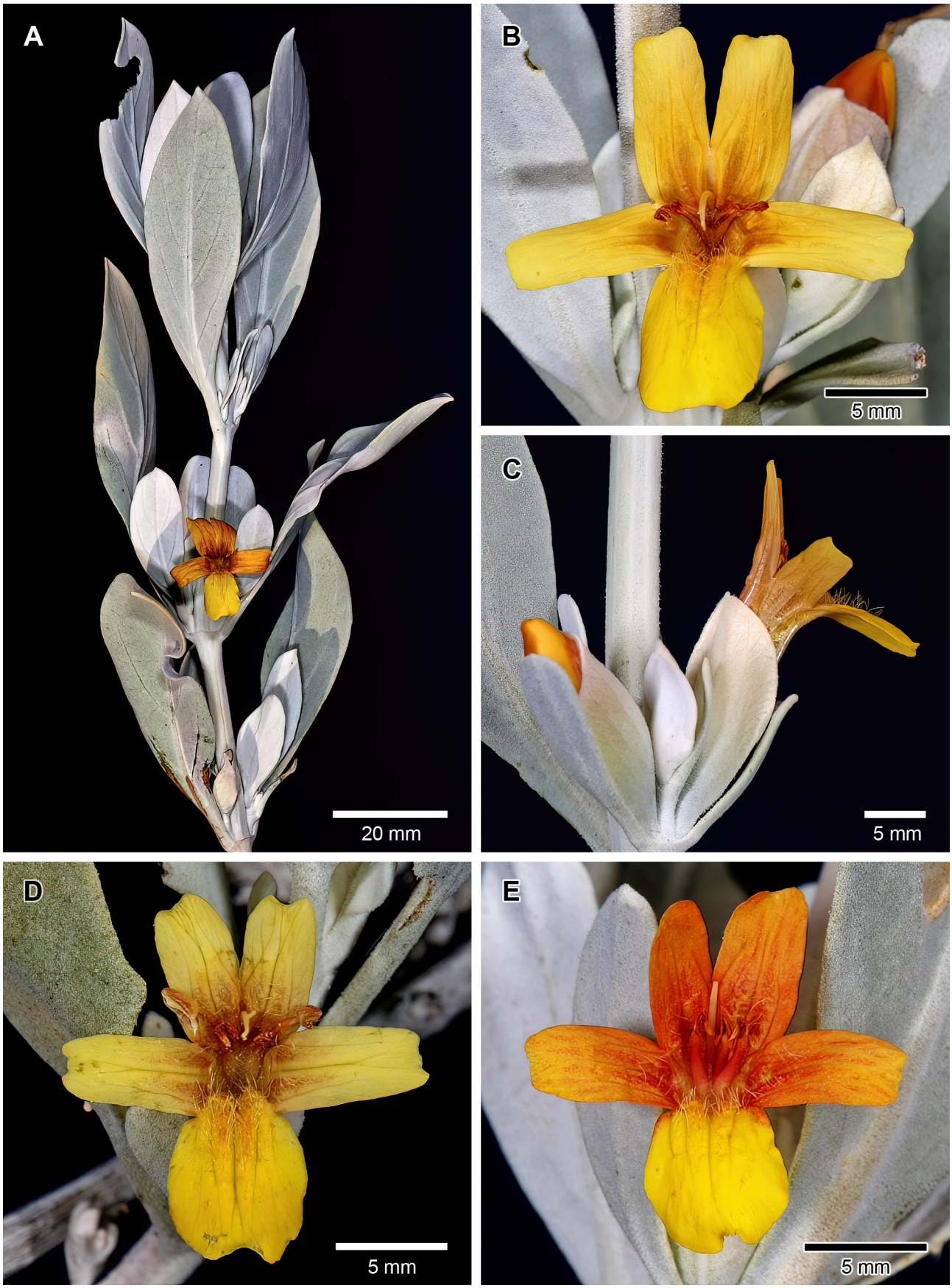

FIGURE 5. *Petalidium englerianum*, leaf (A) and flower morphology (B–E). **A.** Branchlet with leaves and flower, the latter starting to fade. **B.** Flower in front view. **C.** Flower in lateral view. **D.** Flower in front view. **E.** Relatively old flower; upper corolla lobes having turned brownish orange as they are fading. Photographs: W. Swanepoel.

Vrede and Bergsig, 2014AC, 893 m, 20 March 2022, *Swanepoel 619* (WIND!); Farm Bergsig 714, 6 km south of Bergsig village on road C39, 2014AC, 997 m, 11 May 2022, *Swanepoel 622* (WIND!); south of Bergsig on rocky red sandstone plain with scattered *Euphorbia* bushes, 2014AC, 4 May 2022, *Dexter & Loiseau 7686* (WIND!, E!); south of Bergsig on rocky red sandstone plain, 2014AC, 4 May 2022, *Dexter & Loiseau 7722* (WIND!, E!); Petrified Forest, 2014BC, August 1950, *Strey 2652* (PRE!); Farm OU 516, Sandsteinruecken, 2014BC, 13 April 1964, *Giess & Barnard 7920* (PRE, WIND!); Farm Rooiberg (OU 517), Versteinerter Wald, 2014BC, 14 May 1966, *Giess 9430* (PRE!, WIND!); District Outjo: Versteinerter Wald, Farm Rooiberg Outjo 724, 2014BC, 9 April 1968, *Meyer 1155* (PRE!, WIND!); Farm Naauwpoort 511, 2 km northeast of Petrified Forest on road C39, 2014BC, 755 m, 11 May 2022, *Swanepoel 621* (WIND!); Khorixas Townlands (Fransfontein Block)—outskirts of town on hillside, 2014BD, 5 March 1998, *Loutit 149* (WIND!); Farm Inhoek 482, 8 km from Khorixas on road C39 in riverbed, 2014BD, 878 m, 10 May 2022, *Swanepoel 620* (WIND!); On top of mountain slightly southwest of parking area at Twyfelfontein, 2014CB, 2 March 2004, *Schubert, Hochobes & Lutombi SS368* (WIND!); Twyfelfontein, 2014CB, 7 April 2004, *Burke 04099* (WIND!).

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