

Gazania lanata and *G. splendidissima*: Two new species of Asteraceae (tribe Arctotideae) from the Greater Capensis, with an updated key for the genus

A.R. Magee^{a,b,*}, J.S. Boatwright^{a,b}, L. Mucina^c

^a South African National Biodiversity Institute, Compton Herbarium, Private Bag X7, Claremont 7735, Cape Town, South Africa

^b Department of Botany and Plant Biotechnology, University of Johannesburg, P.O. Box 524, Auckland Park 2006, Johannesburg, South Africa

^c Department of Environment & Agriculture, School of Science, Curtin University of Technology, G.P.O. Box U1987, Perth WA 6845, Australia

Received 9 April 2010; received in revised form 18 May 2010; accepted 27 May 2010

Abstract

Two new species of *Gazania* Gaert. (Asteraceae, tribe Arctotideae) from the Greater Cape Floristic Region of South Africa are described. *Gazania lanata* Magee & Boatwr., a local endemic of dolomite lenses near Robertson, is distinguished by the spatulate to sublyrate, simple or weakly pinnatilobed leaves, the bristle-like hairs along the inflorescence and the densely lanate vestiture of the young growth and involucre. *Gazania splendidissima* Mucina, Magee & Boatwr. from the arid Namaqualand coast between Port Nolloth and Hondeklipbaai, is distinguished by the suffrutescent habit, semi-succulent leaves with a densely mealy uppermost surface, and prominently maculate involucre. An updated key to the now 18 recognised *Gazania* species is provided to facilitate identification of these and existing taxa in the genus.

© 2010 SAAB. Published by Elsevier B.V. All rights reserved.

Keywords: Arctotideae; Asteraceae; *Gazania splendidissima*; *Gazania lanata*; Greater Cape Floristic Region; New species; Taxonomy

1. Introduction

Gazania Gaert. is an attractive ornamental genus of Asteraceae well known for its horticultural appeal, with several species and horticultural hybrids widely cultivated in gardens across the world. The genus is placed within the tribe Arctotideae, subtribe Gorteriinae, based on the connate, acute involucre bracts, the four-lobed, neuter ray florets, the sclerified margins of the disc floret lobes and molecular data (Funk et al., 2004; Karis, 2007). *Gazania* was last revised by Roessler (1959) who recognised 16 species, all of which (with the exception of the widespread *G. krebsiana* Less., extending into tropical East Africa) are endemic to southern Africa and mostly restricted to the Greater Cape Floristic Region. A recent molecular study of the genus, based on both plastid and nuclear DNA sequence data, indicated a very recent divergence (ca. 6.6 mya), with only seven of the 15 included species retrieved as monophyletic (Howis et al., 2009).

The remaining species were included in a poorly resolved clade, called the “*krebsiana-rigens* clade”. Despite the low sequence divergence for this clade, morphological variation within the group strongly supports the recognition of several readily distinguishable species and highlights the need for a comprehensive taxonomic revision of the genus.

In this paper two distinct new species of *Gazania* are described, one from the Namaqualand coast in the Northern Cape (= *Gazania* sp. nov. in Howis et al., 2009) and the other from the surrounds of Robertson in the Western Cape (= *Gazania* sp.1 in Goldblatt and Manning, 2000). An amended and updated key to the now 18 recognised species is also included in order to facilitate identification of the species. It is based on the species concepts proposed by Roessler (1959) and on a study of herbarium material at BOL, NBG (including SAM and STE) and GRA.

2. Updated key to the species of *Gazania*

1. Plants annual:
2. Involucre base with a prominent collar
.....*G. lichtensteini*

* Corresponding author. South African National Biodiversity Institute, Compton Herbarium, Private Bag X7, Claremont 7735, Cape Town, South Africa. Tel.: +27 21 7998881; fax: +27 21 7614151.

E-mail address: A.Magee@sanbi.org.za (A.R. Magee).

2. Involucral base without a prominent collar:
3. Involucre with several rows of linear-lanceolate parietal bracts extending from the base; base of involucre with a fleshy truncate disc*G. tenuifolia*
3. Involucre distinctly connate below for at least half its length, parietal bracts irregularly placed, oblong; base of involucre obtuse, without a fleshy truncate disc
.....*G. pectinata*
1. Plants perennial:
4. Leaves alternate and spaced along the trailing stems:
5. Leaves mostly simple; petioles not ciliate; George to Mozambique
.....*G. rigens*
5. Leaves pinnate; petioles ciliate; West Coast to Cape Hangklip
.....*G. maritima*
4. Leaves rosulate, basal or crowded at the tips of the branches:
6. Leaf surface glabrous beneath
.....*G. othonnites*
6. Leaf surface white felted-araneose beneath:
7. Involucre rim consisting of 2 or 3 rows of terminal acuminate bracts (i.e. those with scarious margins) and 1 to several distinct rows of deltoid, prominently acuminate parietal bracts (i.e. those with prominent ciliate margins):
8. Petioles not ciliate; involucre base somewhat intrusive; plants often with a basal tuft of persistent leaf bases; Humansdorp to KwaZulu-Natal
.....*G. linearis*
8. Petiole conspicuously ciliate; involucre base not intrusive, somewhat fleshy; leaf bases not persisting as a basal tuft; Vanrhynsdorp to Joubertina
.....*G. ciliaris*
7. Involucre rim consisting of 2 or 3 rows of terminal acute to acuminate bracts (i.e. those with scarious margins) and only a few oblong to lanceolate, obtuse to acute parietal bracts, more or less irregularly placed along the connate portion:
9. Involucre glabrous to mealy (rarely very sparsely pilose in *G. krebsiana*):
10. Ray florets white; leaves pinnatifid, segments subtriangular; leaf segments and involucral bracts prominently spine-tipped
.....*G. jurineifolia*
10. Ray florets yellow, orange or red; leaves simple to pinnatisect, segments if present elliptic to oblanceolate; leaf segments and involucral bracts not prominently spine-tipped:
11. Uppermost surface of the leaves araneose to densely white felted-araneose, in addition to being sometimes sparsely to very densely echinate:
12. Woody shrublet; uppermost leaf surface densely white felted-araneose
.....*G. schenckii*
12. Rhizomatous herb; uppermost leaf surface araneose:
13. Involucre broadly campanulate, 10–18 mm wide; all leaves regularly pinnatisect
.....*G. leiopoda*
13. Involucre campanulate, 7–10 mm wide; leaves simple to weakly pinnatilobed
.....*G. heterochaeta*
11. Uppermost surface of the leaves glabrous to sparsely echinate:
14. Densely branched suffrutex; leaves simple, linear, <3 mm wide, spine-tipped; Sneeuberg endemic
.....*G. caespitosa*
14. Rhizomatous herb; leaves simple, linear-lanceolate to pinnatisect, usually >3 mm wide, segments not prominently spine-tipped; widespread
.....*G. krebsiana*
9. Involucre densely pilose to densely echinate (concentrated near the base of the involucre in *G. lanata*), surface often also mealy to lanate:
15. Involucre, in addition to being echinate, also densely lanate
.....*G. lanata*
15. Involucre, in addition to being pilose to echinate, sometimes also mealy:
16. Uppermost leaf surface, in addition to being sparsely echinate, also prominently mealy; leaves semi-succulent; suffrutices with woody prostrate branches; involucre usually appearing distinctly maculate due to the contrast between the numerous dark hair bases and the prominent mealy involucre surface
.....*G. splendidissima*
16. Uppermost leaf surface glabrous or densely echinate, never mealy; leaves herbaceous; plants tufted rhizomatous herbs; involucre usually appearing immaculate due to the absence, or presence of fewer dark hair bases:
17. Involucre broadly campanulate, 10–18 mm wide; upper surface of leaves densely echinate; Springbok to Garies
.....*G. leiopoda*
17. Involucre campanulate, 8–10 mm wide; upper surface of leaves glabrescent to sparsely echinate; Calvinia to Humansdorp:
18. Leaf lobes linear to oblanceolate (rarely obovate) with irregularly serrate margins (rarely entire); innermost terminal involucral bracts acuminate; plants sticky
.....*G. serrata*
18. Leaf lobes elliptic or sometimes linear to oblanceolate with invariably entire margins; innermost terminal involucral bracts acute; plants not sticky
.....*G. rigida*

3. Taxonomic treatment

3.1. *Gazania lanata*

G. lanata Magee & Boatwr. species nova, *G. heterochaetae* DC. *foliis spatulatis ad lyrata et adaxialiter araneosis similis, sed pilis echinatis secus pedunculum et involucrum ambos* (in *G. heterochaeta absentibus*), *parte involucrorum dense lanata connata (glabra ad farinosam in G. heterochaeta) et praesentia aliquot bractearum parietalium secus partem connatam involucrorum* (in *G. heterochaeta absentium v. paucarum*) *differt.*

Type: South Africa, Western Cape Province, Worcester district (3319): dolomite slope at quarry north of lime works

near Robertson (–DB), 07 September 1997, *Goldblatt & Manning 10729* (NBG, holo.; MO, iso.) (Fig. 1).

Tufted, cushion-forming perennial, 0.06–0.1 m tall. *Leaves* crowded at base, sub-erect to spreading, spatulate to sublyrate, 50–70 × 7–15 mm, simple to weakly pinnatilobed with terminal and uppermost lateral lobes well developed and lowermost lateral lobes small or obsolete; lobes oblong, 5–9 × 3–6 mm, mucronate, araneose on upper surface, white felted-araneose beneath, scabrid hairs along lamina becoming more spinose

along margins. *Capitula* heterogamous, radiate, ca. 50–60 mm in diam., solitary; peduncles ±100 mm long, pilose. *Involucre* campanulate, 15–18 mm × 12–13 mm, densely lanate and with scattered bristle-like hairs becoming more numerous near base of involucre; terminal bracts 2 or 3-seriate, inserted on rim, connate for about three quarters of involucre, outer terminal bracts narrowly ovate, acuminate, 3–4 mm long, inner terminal bracts narrowly ovate, acuminate, 5–7 mm long, parietal bracts narrowly oblong to lanceolate, acute, 4–7 mm long, scattered



Fig. 1. Holotype of *Gazania lanata* (Goldblatt & Manning 10729, NBG).

along connate portion. *Receptacle* unknown. *Ray florets* neuter, uniseriate, ± 12 ; lamina 25–28 mm long, orange, marked adaxially. *Disc florets* hermaphrodite, numerous, corollas ± 7 mm long, yellow, lobes triangular, erect, margins sclerified. *Anthers* ± 3 mm long, bases sagittate, appendages mucronate. *Style* terete, thickened slightly near the apex, branches linear. *Ovary* unknown (Fig. 2).

3.1.1. Distribution and ecology

G. lanata is apparently a narrow endemic of the surrounds of Robertson, Breede River Valley, in the Western Cape Province (Fig. 3). It occurs at the foot of the Langeberg Mountains and grows in shallow, skeletal soils developed over lenses of dolomite of the Precambrian Norree Formation, part of Bredasdorp Group (Gresse and Theron, 1992), in semi-dry shrublands of Breede Shale Renosterveld (Rebello et al., 2006).

3.1.2. Diagnostic characters

G. lanata most closely resembles *G. heterochaeta* DC. in the spatulate to sublyrate, simple to weakly pinnatilobed leaves that are araneose on the uppermost surface (Fig. 2C), but differs in the echinate peduncle (glabrous to mealy in *G. heterochaeta*), the densely lanate involucre with scattered bristle-like hairs becoming more numerous near the base of involucre (glabrous to mealy in *G. heterochaeta*) and the conspicuous presence of several parietal bracts (Fig. 2A). The species shares the bristle-

like hairs on the involucre with *G. splendidissima*, *G. leiopoda* (DC.) Roessler, *G. serrata* DC. and *G. rigida* (Burm.f.) Roessler but can easily be distinguished by the densely lanate vestiture of the involucre and young growth.

3.1.3. Conservation status

This species is known so far only from one population immediately adjacent to an active quarry. Since we presume that it might be a local edaphic (dolomite) endemic, the taxon deserves attention of conservation authorities. Due to insufficient data we cannot establish its IUCN (2010) conservation status satisfactorily and therefore, for the time being, it should be considered in the category DD (Data Deficient).

3.1.4. Notes

This species is known from a single collection by Goldblatt and Manning and was recognised by these authors as an undescribed species, viz. *Gazania* sp. 1 (Goldblatt and Manning, 2000).

3.2. *Gazania splendidissima*

G. splendidissima Mucina, Magee & Boatwr. *species distincta frutescens ramis ligneis prostratis, foliis semisucculentis dense adaxialiter farinosis et abaxialiter araneosis*

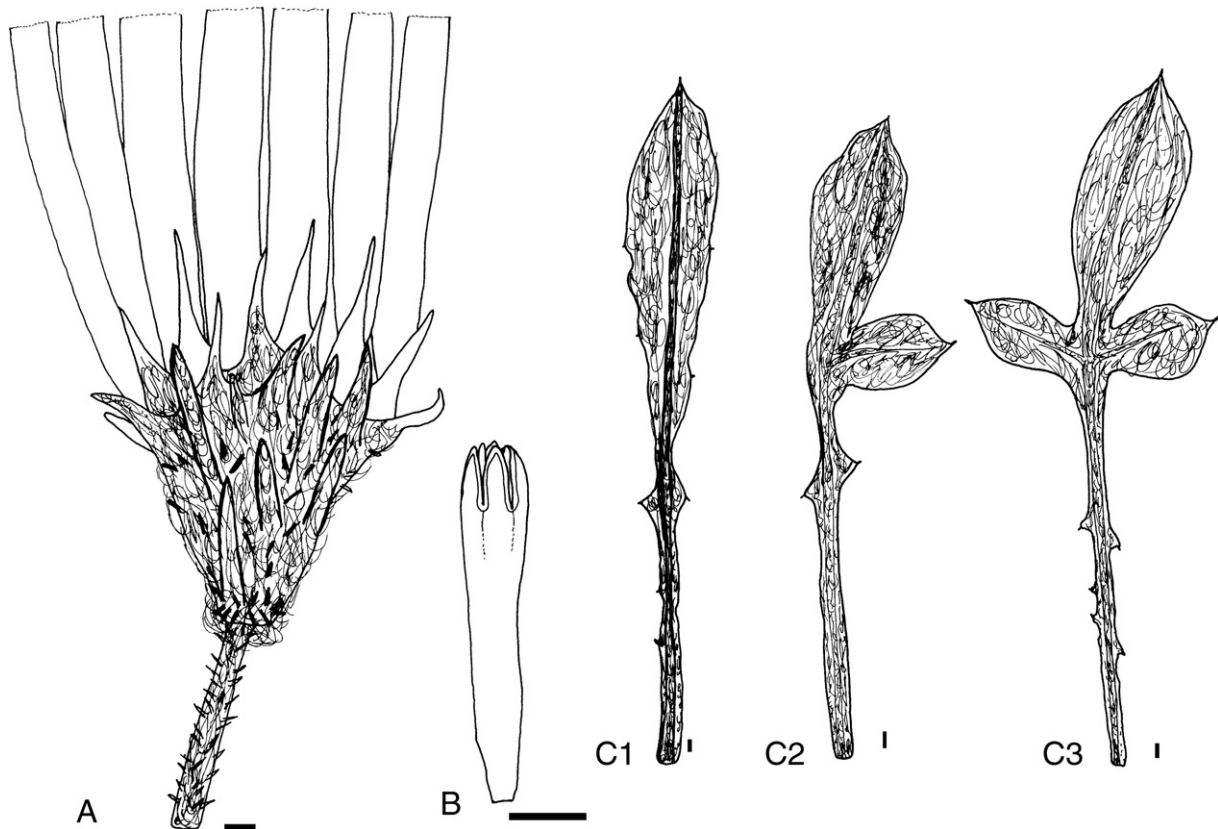


Fig. 2. *Gazania lanata*. (A) capitulum; (B) floret; (C1–C3) abaxial view of leaves. Voucher: Goldblatt & Manning 10729, NBG. Scale bars: 1 mm. Artist: J.S. Boatwright.

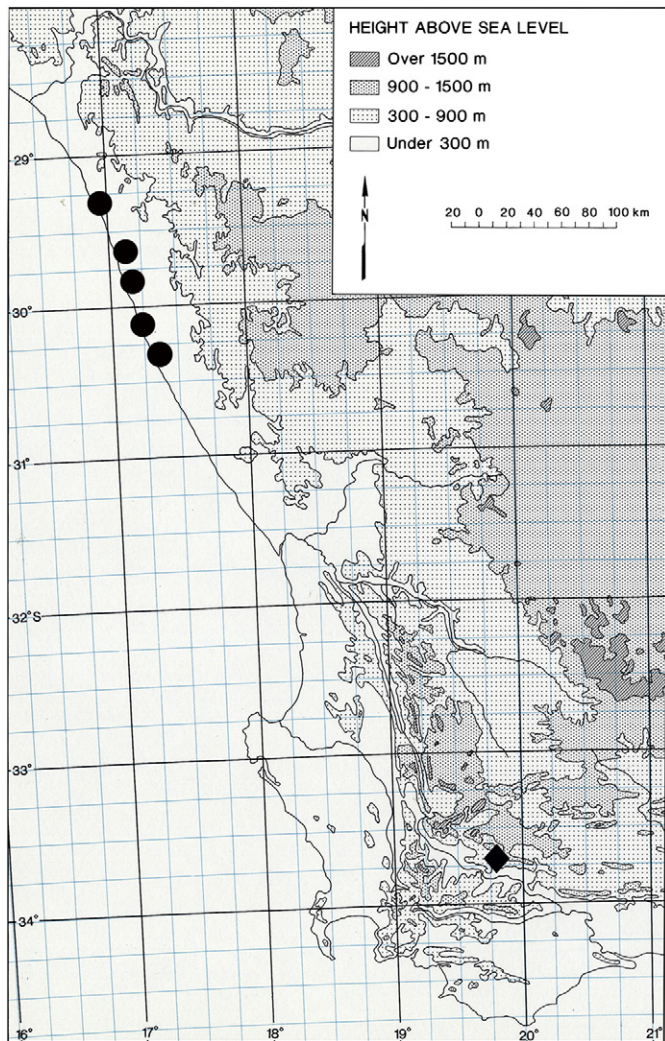


Fig. 3. Known geographical distribution of *Gazania lanata* (diamond) and *G. splendidissima* (circles).

coactis albis, pedunculo glabro, et pilis echinatis partialiter atheris conferenti cum involucre prominente farinoso.

Type: South Africa, Northern Cape Province, Hondeklipbaai district (2916): Port Nolloth, south of McDougall's Bay (–BD), 19 September 2001, *Mucina & Santos Guerra 7237/4* (NBG, holo.; GRA, iso.).

Spreading suffrutex, 0.1–0.2 m tall, branches woody, prostrate. *Leaves* clustered at branch tips, erect, 25–70 (–140) × 7–15 (–25) mm, simple to pinnatilobed, semi-succulent, lobes oblong to narrowly oblong, 2–8 (–25) × 1.5–3.0 (–3.5) mm, mucronate, densely mealy on upper surface, white felted-araneose beneath, spinose hairs restricted largely to midrib and margins of uppermost surface. *Capitula* heterogamous, radiate, 40–65 mm in diam., solitary, peduncles 50–150 mm long, glabrous, sometimes with sparse mealy patches. *Involucre* campanulate, 9–15 mm × 10–15 mm, densely mealy and with numerous bristle-like hairs, maculate, hair base and surrounding involucre black, terminal bracts 2 or 3-seriate, inserted on rim, connate for three quarters of involucre, outer terminal bracts narrowly ovate to

lanceolate, acute to acuminate, 2–5 mm long, inner terminal bracts narrowly ovate, acute to acuminate, 4–7 mm long, parietal bracts oblong to lanceolate, obtuse to acute, 2–10 mm long, absent or few, scattered along connate portion. *Ray florets* neuter, uniseriate, 12 to 21; lamina 15–30 mm long, spreading, narrowly elliptic, golden-yellow to orange, marked with black adaxially in basal 3–6 mm. *Disc florets* hermaphrodite, numerous, corollas 5.0–6.5 mm long, yellow, lobes triangular, erect, margins sclerified. *Anthers* ±3 mm long, bases sagittate, appendages mucronate. *Style* terete, thickened slightly near apex, branches linear. *Ovary* narrowly obovate, villous; pappus of biseriate, lorate scales (Figs. 4 and 5).

3.2.1. Distribution and ecology

Gazania splendidissima is endemic to a narrow strip of coast between Port Nolloth and Hondeklipbaai (Fig. 3), where it is primarily restricted to the ecotone between the upper (elevated) beach and adjacent (often flat) coastal dune systems. The upper reaches support sparse herbaceous and dwarf-shrub Namib Seashore Vegetation and Namaqualand Seashore Vegetation, and the coastal dunes support either (partly succulent) shrublands of Richtersveld Coastal Duneveld in the surrounds of Port Nolloth, or Namaqualand Coastal Duneveld further south (Mucina et al., 2006). All habitats are outside the direct salt-water splash influence but receive some salt spray, especially during stormy and windy weather. Further inland *G. splendidissima* was also found to grow on coastal granites (Molyneux Reserve in Kleinsee). Common accompanying species sharing the coastal habitats with *G. splendidissima* include *Drosanthemum luederitzii* Schwantes, *Salsola nollothensis* Aellen, *Arctotis decurrens* Jacq., *Asparagus capensis* L., *Fenestraria rhopalophylla* N.E.Br. subsp. *aurantiaca* (N.E.Br.) H.E.K.Hartmann, *Hypertelis angrae-pequenae* Friedrich, *Psilocaulon dinteri* (Engl.) Schwantes, *Pteronia glabrata* L.f. and *Amellus nanus* DC.

3.2.2. Diagnostic characters

G. splendidissima shares the glabrous to mealy involucre with numerous bristle-like hairs (Fig. 5G) with *G. leiopoda*, *G. rigida* and *G. serrata*. It is, however, readily distinguished from these species by the suffrutescent habit (Fig. 4B; vs. rhizomatous herbs), the semi-succulent leaves (Fig. 4B–D; vs. herbaceous), the densely mealy uppermost leaf surface (Fig. 4B–D; vs. more or less glabrous), the glabrous to mealy peduncle (Fig. 5G; vs. usually pilose) and the maculate involucre (Fig. 5G, vs. immaculate). The distinct maculation is caused by the contrast between the numerous dark hair bases and the prominent mealy involucre surface. Although the involucre hairs may sometimes become darker at their bases in *G. rigida* and *G. serrata* the involucre appears generally immaculate due to the sparser hairs.

3.2.3. Conservation status

Gazania splendidissima is a local endemic limited to specific coastal habitats. Similar habitats in the region are under threat of coastal diamond mining and to a lesser extent disturbance caused by vehicles driving along the coast. While *G. splendidissima* is known from only about 10 macro-localities,

the natural *in situ* recruitment from seeds seems to be abundant and young plants and seedlings have been discovered regularly (L. Mucina pers. obs.). Using IUCN criteria (IUCN, 2010), a ranking of VU A4c; B1ab(ii, iii, iv) is recommended for *G. splendidissima* (L. von Staden pers. comm.).

3.2.4. Notes

This species appears to have been first collected by Neville Stuart Pillans at Port Nolloth in October 1924 and these

collections were highlighted by Roessler (1959, pg. 386), in his revision of the genus, as requiring further investigation due to uncertainty regarding their affinities.

3.2.5. Additional specimens examined

South Africa. **2016 (Port Nolloth):** McDougall's Bay (–BD), 24 September 1978, Raitt 299 (PRE); September 1998, Koekemoer 1166 (PRE); south of McDougall's Bay (–BD), 2 February 1996, Desmet 110995/2 (BOL); 8 September 1982,



Fig. 4. A–B: The typical coastal habitats supporting large population of *G. splendidissima* in McDougall's Bay (Port Nolloth). C–E: habit of two colour forms of *G. splendidissima* (orange: Port Nolloth., yellow: Hondeklipbaai). All photos: L. Mucina.

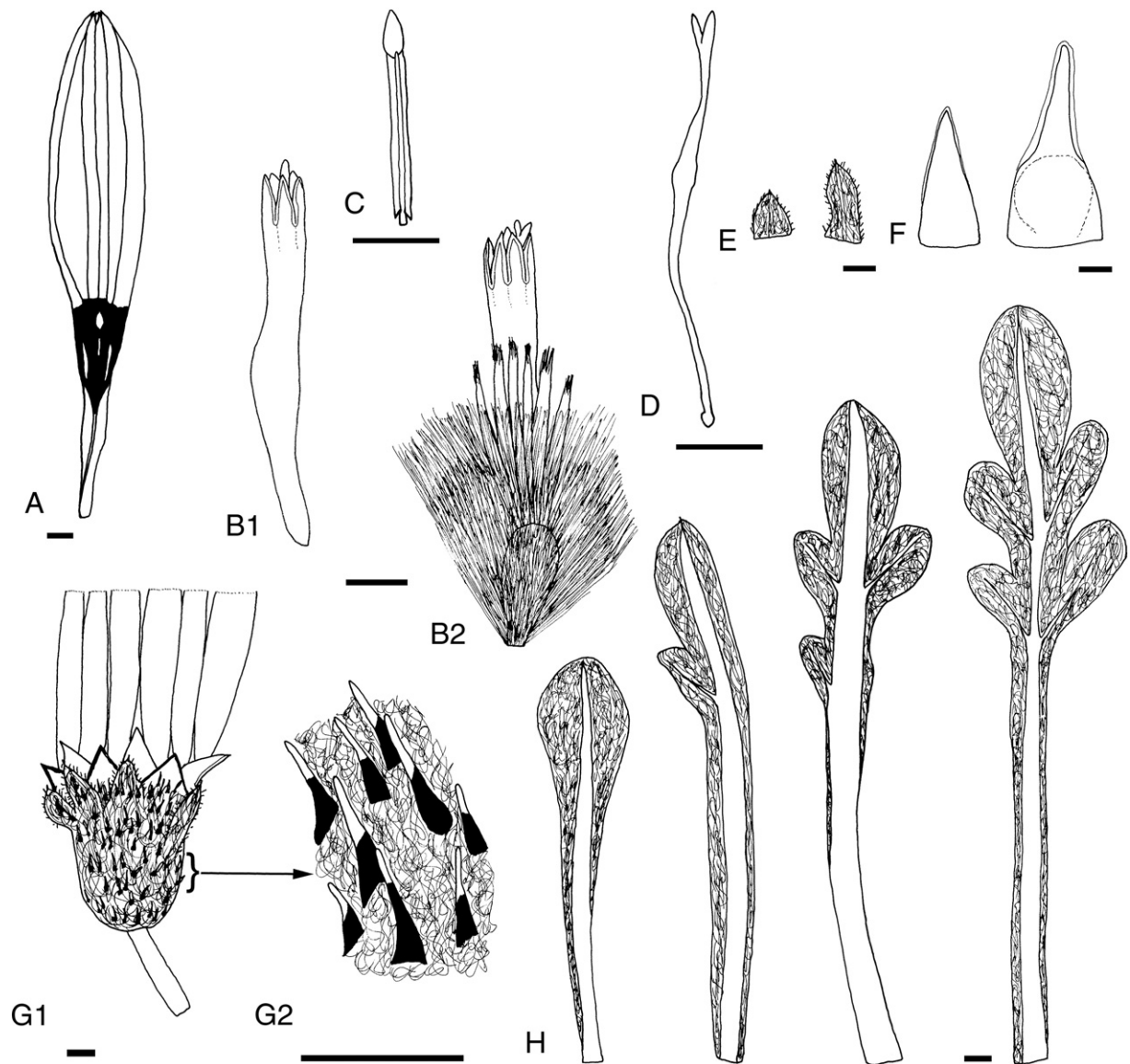


Fig. 5. *Gazania splendidissima*. (A) Corolla of ray floret; (B1) corolla of disc floret; (B2) disc floret; (C) single anther; (D) style; (E) parietal bracts; (F) innermost terminal bracts; (G1) capitulum; (G2) vestiture of capitulum; (H) abaxial view of leaves. Vouchers: (A–D, E right bract only, F right bract only) *Hugo* 2835, NBG; (E left bract only, F left bract only, G–H) *Mucina & Santos Guerra* 7237/4 (NBG). Scale bars: 1 mm. Artist: J.S. Boatwright.

Mauve 5416 (PRE). **2917 (Springbok)**: 2 km south of Kleinsee (–CA), 28 September 1981, *Hugo* 2853 (NBG); Kleinsee, south of mouth (–CA), 21 August 1978, *Le Roux & Ramsey* 136 (PRE); Kleinsee, Molyneux Reserve (–CA), *McKenzie* RM 1306 (GRA); Kleinsee, Rooiklippias (–CA), 5 September 2005, *Mucina* 050905/02 (GRA); Kleinsee, Swartstraat on Farm Brazil (–CC), 29 August 1978, *Le Roux & Ramsey* 246 (PRE); Brazil Farm, Melkbospunt (–CC), 28 August 2007, *Low et al.* 13613, 13597 (NBG). **3017 (Hondekliipbaai)**: 4.3 km west of Koiingnaas on farm Koiingnaas 475 (–AA), 4 September 1986, *Le Roux & Lloyd* 482 (NBG); Hondekliipbaai (–AC), 2 September 1985, *Bredenkamp* 2173 (PRE); Hondekliipbaai, coast at the Police Station (–AC), 4 September 2006, *Mucina* 040906/33 (GRA, NBG); north side of Hondekliipbaai, October 1924, *Pillans* 18084 (BOL); 4 miles south of Hondekliipbaai, October 1924,

Pillans 18085 (BOL); south of Hondekliipbaai, October 1924, *Pillans* 18087, 18088 (BOL).

Acknowledgements

We thank CapeNature and Northern Cape Department of Tourism, Environment and Conservation for providing collecting permits; Dr G. Koorsen (University of Johannesburg) for translating the diagnoses into Latin; Mrs L. von Staden (SANBI) for providing the IUCN Red List assessment for *G. splendidissima*; Mrs M. Smith (SANBI) for scanning the type material of *Gazania lanata*; Dr E. Retief (SANBI) for sending scanned images of requested specimens from PRE; and Drs P. Goldblatt (MO) and J.C. Manning (SANBI) for bringing *G. lanata* to our attention.

References

- Funk, V.A., Chan, R., Keeley, S.C., 2004. Insights into the evolution of the tribe Arctoteae (Compositae: subfamily Cichorioideae s.s.) using *trnL-F*, *ndhF*, and ITS. *Taxon* 53, 637–655.
- Goldblatt, P., Manning, J.C., 2000. Cape Plants: a conspectus of the Cape Flora of South Africa. *Strelitzia*, 9. National Botanical Institute, Cape Town and Missouri Botanical Garden, St. Louis.
- Gresse, P.G., Theron, J.N., 1992. The Geology of the Worcester Area. Department of Mineral and Energy Affairs, Pretoria.
- Howis, S., Barker, N.P., Mucina, L., 2009. Globally grown, but poorly known: species limits and biogeography of *Gazania* Gaert. (Asteraceae) inferred from chloroplast and nuclear DNA sequence data. *Taxon* 58, 871–882.
- IUCN, 2010. IUCN Red List of Threatened Species. Version 2010.1. <http://www.iucnredlist.org/2010> accessed on 29 March 2010.
- Karis, P.O., 2007. Tribe Arctotideae. In: Kadereit, J.W., Jeffrey, C. (Eds.), *The Families and Genera of Vascular Plants VIII: Asterales*. Springer-Verlag, Berlin, pp. 200–207.
- Mucina, L., Jürgens, N., Le Roux, A., Rutherford, M.C., Schmiedel, U., Esler, K.J., Powrie, L.W., Desmet, P.G., Milton, S.J., Boucher, C., Ellis, F., Lambrechts, J.J.N., Ward, R.A., Manning, J.C., Midgley, G.F., 2006. Succulent Karoo Biome. In: Mucina, L., Rutherford, M.C. (Eds.), *The Vegetation of South Africa, Lesotho and Swaziland*. *Strelitzia*, 19. SANBI, Pretoria, pp. 220–299.
- Rebelo, A.G., Boucher, C., Helme, N., Mucina, L., Rutherford, M.C., Smit, W.J., Powrie, L.W., Ellis, F., Lambrechts, J.J., Scott, L., Radloff, F.G.T., Johnson, S.D., Richardson, D.M., Ward, R.A., Procheş, S.M., Oliver, E.G.H., Manning, J.C., Jürgens, N., McDonald, D.J., Janssen, J.A.M., Walton, B.A., Le Roux, A., Skowno, A.L., Todd, S.W., Hoare, D.B., 2006. Fynbos Biome. In: Mucina, L., Rutherford, M.C. (Eds.), *The Vegetation of South Africa, Lesotho and Swaziland*. *Strelitzia*, 19. SANBI, Pretoria, pp. 52–219.
- Roessler, H., 1959. Revision der Arctotideae–Gorteriinae (Compositae). *Mitteilungen der Botanischen Staatssammlung München* 3, 71–500.