

***Felicia douglasii* (Asteraceae-Astereae), a distinctive new species from the Cape Floristic Region, South Africa**

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1. Introduction

Felicia Cass. (Asteraceae) is the largest of the African members of tribe Astereae, and comprises ±90 species from southern and tropical Africa to Arabia. As currently circumscribed, it is rather weakly diagnosed by the herbaceous or shrubby habit, mostly radiate capitula with epaleate receptacle, ± concolorous rays, mostly bisexual disc florets, and eglandular cypselas with several scabrid or barbellate pappus bristles (Grau, 1973; Herman et al., 2000; Manning and Goldblatt, 2012).

Astereae, with an estimated 222 genera and ± 3100 species worldwide, are the second-largest tribe of Asteraceae (Brouillet et al., 2009). Phylogenetic relationships among the African genera of Astereae are still incompletely resolved, however, and the monophyly of *Felicia* itself is questionable. The ITS phylogeny of the tribe published by Brouillet et al. (2009) remains the most comprehensive phylogenetic survey of the group, and confirms the circumscription of subtribe Homochrominae (= subtr. Feliciinae) by Grau (1973) as a strictly African taxon that includes the ‘*Amellus* group’ of genera (*Felicia* Cass. and its allies). Generic circumscriptions within the *Amellus* group have long been unstable (Grau, 1971; Nesom, 1994) and *Felicia*, the largest genus in the alliance, is currently poorly circumscribed and lacking in evident apomorphies. It in effect comprises the residue of species after various small segregates diagnosed by one or more derived character states have been removed. These include *Amellus* L. (12 spp.), *Chrysocoma* L. (± 20 spp.), *Nolletia* Cass. (12 spp.), *Poecilolepis* Grau (2 spp.), *Polyarrhena* Cass. (4 spp.), *Roodebergia* B.Nord. (1 sp.) and *Zyrphelis* Cass. (= *Gymnostephium* Less.) (±23 spp.) (Poovan et al., 2017).

Generic relationships within Astereae are currently being investigated by Poovan et al. (2017) in preparation for a new phylogenetically-based classification of the genera. This will facilitate a more meaningful analysis of patterns of speciation in the group. Until then we provisionally follow the existing generic circumscriptions in the tribe.

Felicia was monographed by Grau (1973), who segregated the species among six sections defined by habit, number of series of involucre bracts, and the development of style branch appendages. Since then little further taxonomic work has been published on the genus apart from the description of a new species from east tropical Africa (Beentje, 1999) and two new

annual species from the Western Cape of South Africa (Manning and Goldblatt, 2002; Ortiz, 2007).

Here we describe a new shrubby species from the Kouga and Baviaanskloof mountains of Eastern Cape, brought to our attention by ecologist Douglas Euston-Brown and named for him. *Felicia douglasii* has a distinctive erect habit and corymbose synflorescences, distinctive varicoloured disc florets with purple throat and yellow lobes, white or pale pink ray florets with a darker reverse, and unusual glabrous cypselas.

2. Materials and methods

We examined all relevant material in BOL, NBG, PRE and SAM (acronyms following Thiers, 2017) as being the herbaria with the most significant collections from the Cape Floristic Region.

Felicia douglasii J.C.Manning & Magee, *sp. nov.* Type: South Africa, Eastern Cape, Willowmore (3323): Baviaanskloof Mountains, Speekhout farm, 'Die watergat', on steep rocky slopes either side of the waterfall and rock pool, 835 m, (–DB), 8 Oct 2016, *D. Euston-Brown 5035* (NBG, holo.).

Erect, single-stemmed, diffusely twiggy shrub to 1.5 m, stems slender, well-branched above, branches ascending, leafy distally but leafless below, young branches puberulous-scabridulous, 0.7–1.0 mm diam., maroon. *Leaves* alternate, spreading to slightly deflexed, petiolate, blade narrowly elliptic to oblanceolate, 9–20 × 2–4 mm, apiculate-uncinate, subglabrous but glandular-puberulous adaxially along midrib, sometimes only towards base, margins recurved, scabridulous, obscurely trinerved from base, midrib impressed above and raised beneath, lateral veins inconspicuous, thinly leathery, apple green above but paler beneath, petiole 2–4 mm long. *Capitula* 1 to 3 in small terminal and axillary corymbs clustered at the branch tips forming corymbose synflorescences of up to ± 20 capitula, peduncles filiform, 10–17 mm long, puberulous, maroon; involucre campanulate, ± 4 mm diam., involucre bracts 4-seriate, lanceolate, glabrous but ciliate distally and apically, uni-nerved with resinous vittae, inner two series 3–4 × 0.5–0.8 mm, margins narrowly hyaline, outer two series much smaller, 1–2 mm long. *Ray florets* 7 to 11, female-fertile, limb narrowly elliptic, white or pale pink with pale blue reverse, 5–6 × 1.5 mm. *Disc florets* numerous, hermaphrodite, corolla whitish with purple throat and yellow lobes, ± 3 mm long, lower part of tube sparsely puberulous, ± 1.5 mm long, upper part glabrous, ± 1.0 mm long, lobes recurved, 0.5 mm long, glabrous or with a few glandular hairs. *Anther* bases obtuse, apical appendages narrowly lanceolate. *Style* branches with short triangular appendage. *Cypselas* obovate, 2.0–2.5 × 1.0–1.5 mm, glabrous, glossy dark reddish brown, margins thickened and sometimes paler; pappus bristles numerous, subequal, ± 3 mm long, barbellate, deciduous, whitish. *Flowering time*: September to October. (Fig. 1).

Distribution and ecology: *Felicia douglasii* is currently known from three populations in the Kouga and Baviaanskloof Mountains (Fig. 2) at the eastern end of the Core Cape Floristic Region in the Eastern Cape, South Africa (Manning and Goldblatt, 2012). It is an element of

Kouga Sandstone Fynbos and Kouga Grassy Sandstone Fynbos (Mucina and Rutherford, 2006), and the plants seem to prefer steep, well shaded, south- or southeast-facing slopes, on or at the base of rock slabs or cliffs, which form seepages after good rains. The collection from the Kouga Mountains is from near the top of the mountain at 1059 m altitude, in mesic mountain fynbos with *Protea neriifolia* R.Br. and *Leucadendron eucalyptifolium* H. Buek ex Meisn. abundant. The Bosrug collection in the Baviaanskloof Mountains is also from high in the mountains at 1082 m altitude, in a sheltered gully in more arid fynbos with *Leucadendron nobile* I. Williams, *Protea repens* (L.) L. and *Protea lorifolia* (Knight) Fourc. abundant. The Speekhout collection is from slightly lower altitude near the bottom of the mountain at 835 m altitude in the transition zone between Kouga Grassy Sandstone Fynbos and Albany Thicket, on a steep south-facing slope in a sheltered gully, adjacent to a perennial mountain stream. The single-stemmed habit of the species is typical of plants that regenerate from seed.

Diagnosis and relationships:

Felicia douglasii is a single stemmed, upright shrub to 1.5 m tall, with the leaves crowded at the end of the branches and the lower parts leafless, giving the plants a rather diffuse, twiggy look (Fig. 1A). The leaves are spreading or slightly deflexed and shortly petiolate with a narrowly elliptic or oblanceolate blade $9\text{--}20 \times 2\text{--}4$ mm, apiculate-uncinate with recurved, scabridulous margins but otherwise subglabrous although glandular-puberulous adaxially along the midrib, sometimes only towards base.

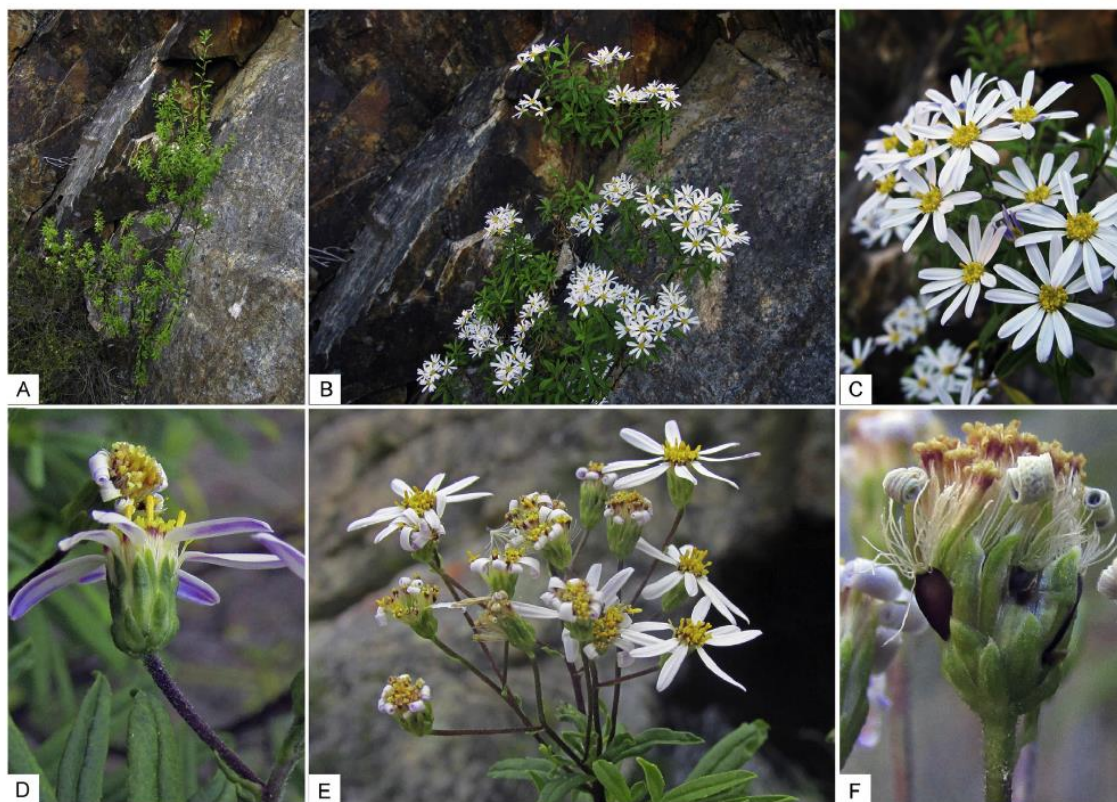


Fig. 1. *Felicia douglasii*. (A) Plant showing shrubby, single stemmed habit; (B) synflorescences clustered at the ends of the branches; (C) white or pale pink ray florets; (D) 4-seriate involucre, ray florets with pale blue reverses, and varicoloured disc florets with purple throat and yellow lobes; (E) corymbose synflorescences; (F) glabrous cypselas with deciduous pappus bristles. Photographs: Douglas Euston-Brown. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

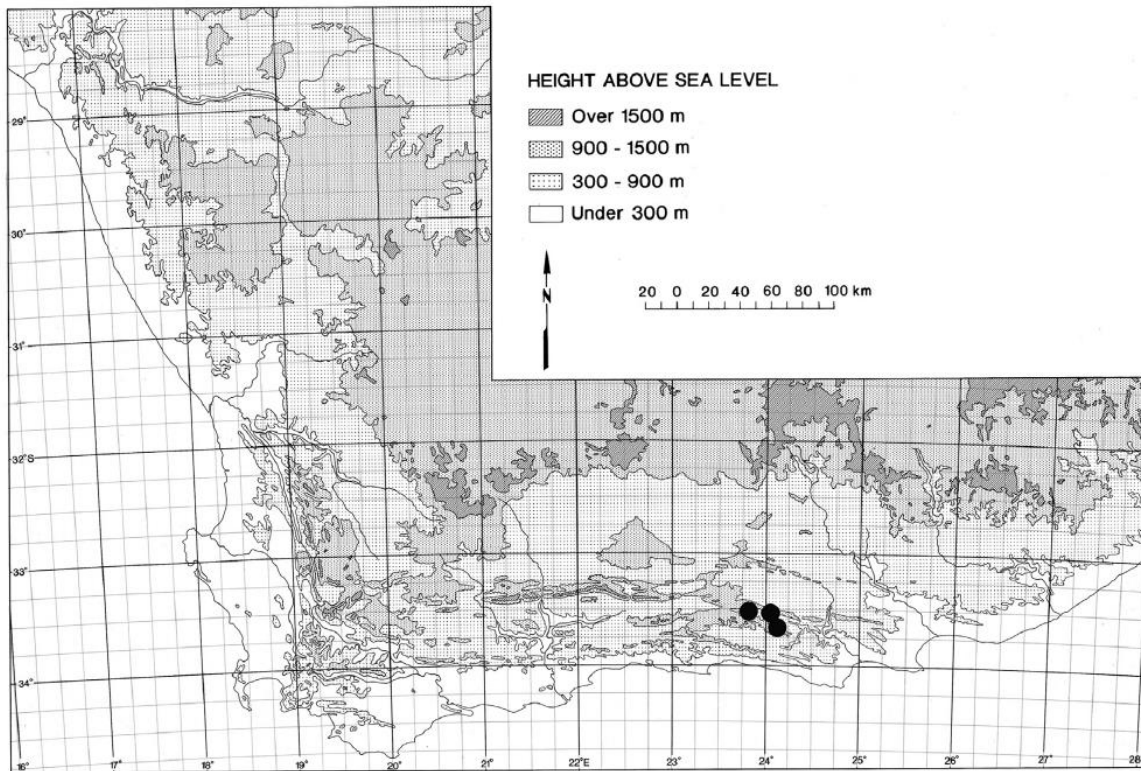


Fig. 2. Distribution of *Felicia douglasii*.

The inflorescence is diagnostic for the species, with relatively small capitula in lax terminal and axillary corymbs clustered at the ends of the branches (Fig. 1B, C & E). The rays are white or pale pink with a pale blue reverse, and the disc florets are distinctive in having a purple throat and yellow lobes (Fig. 1D). The characteristic purple throat is present even in bud, and is thus not related to ageing of the florets. The cypselas are glabrous and smooth, and dark reddish brown in colour, with subequal, deciduous pappus bristles (Fig. 1F).

Four other species of *Felicia* are known with glabrous ray and disc cypselas, viz. *F. aethiopica* (Burm.f.) Bolus & Wolley-Dod ex Levyns, *F. ebracteata* Grau, *F. ferulacea* Compton and *F. venusta* S. Moore, but all are small shrubs up to 50 cm high with moderately large, solitary capitula with a biseriate involucre (Grau, 1973).

The relationships of *Felicia douglasii* are unclear. The shrubby habit, alternate leaves, and multiseriate involucre are plesiomorphic in *Felicia* but the corymbose synflorescences are unique for the genus, in which the capitula are \pm solitary and only rarely somewhat aggregated at the ends of the branches, notably in sect. *Anhebecarpaea* DC. The glabrous cypselas are also unusual. Most species of *Felicia* have variously pubescent or sericeous cypselas, and species with glabrous cypselas are found in just two shrubby sections in the genus, viz. sect. *Anhebecarpaea* [*F. echinata* (Thunb.) Nees, *F. nordenstamii* Grau and *F. westae* (Fourc.) Grau] and sect. *Felicia* [*F. aethiopica* (Burm.f.) Bolus & Wolley-Dod ex Levyns, *F. ebracteata* Grau, *F. ferulacea* Compton and *F. venusta* S. Moore]. It is therefore possible

that the relationships of *F. douglasii* lie with one of these two sections, although there are no evident close allies in either section.

The three species of sect. *Anhebecarphaea* have glabrous ray cypselas but scabridulous disc cypselas, and the section is further characterised by its imbricate foliage and large capitula aggregated in subcorymbose clusters at the branch tips, and persistent pappus on the cypselas. The capitula in *F. douglasii* are relatively small and the pappus is deciduous, posing problems for its inclusion here. Sect. *Felicia*, with 28 species, is rather broadly circumscribed without any evident apomorphies, and *F. douglasii* could be accommodated here, largely by default.

Felicia douglasii cannot be included in any of the other sections recognised by [Grau \(1973\)](#) due to significant morphological incongruences in habit (sects. *Dracontium* Grau, *Lignofelicia* Grau and *Longistylus* Grau), involucre (sect. *Neodetris* Grau) or style branches (sect. *Longistylus*). The white or pale pink rays with a pale blue reverse and the glabrous cypselas of *F. douglasii* are suggestive of the small genus *Polyarrhena* Cass. ([Grau 1970](#)), but that genus is diagnosed by an apomorphic apical collar on the cypselas which is lacking in *F. douglasii*. The distinctive varicoloured disc florets with purple throat and yellow lobes are not recorded in either *Felicia* or *Polyarrhena*, and molecular evidence will likely prove critical for clarifying the relationships of *F. douglasii*.

Conservation notes:

The three known populations of the species, one in the Kouga Mountains and two in the Baviaanskloof Mountains, are estimated to number between 100 and 200 plants. However, we suspect that the inaccessibility of the habitat is the main reason for the species not having been collected before, and additional populations are likely to occur elsewhere as the habitat is quite prevalent in both mountain ranges. There has been very little disturbance by alien invasions or other factors, and we suggest that the species should be listed as Rare on the national red list ([Raimondo et al. 2009](#)) since there are no perceived threats.

2.2. Additional specimens seen

South Africa. EASTERN CAPE. 3323 (Willowmore): Baviaanskloof Mountains, Speekhout farm, “Die water gat”, on steep rocky slopes either side of the waterfall and rock pool, 835 m, (–DB), 14 Feb 2016 [fruit dispersed], *D. Euston-Brown 4540* (NBG). 3324 (Steytlerville): Baviaanskloof Mountains, Bosrug 4 × 4 track to radio mast, below first shale band in SE facing gully, 1082 m, (–CA), 12 Oct 2016, *D. Euston-Brown 5064* (NBG); Kouga Mountains, east of Kougakop, 200 m east from the top of Groot Kommandokloof, on the 4X4 track, 1059 m, (–CA), 25 Sept 2011, *D. Euston-Brown 1357* (NBG); 20 Dec 2011 [fruit already dispersed], *D. Euston-Brown 1696* (NBG).

Acknowledgments

We are grateful to Douglas Euston-Brown for bringing this interesting species to our attention, for ensuring that adequate material was available for description, and for providing ecological notes. Funding from the National Research Foundation Grant No. 93384 is acknowledged. The referees provided valuable suggestions.

References

- Beentje, H.J., 1999. A new genus and some new species of Compositae from East Tropical Africa. *Kew Bulletin* 54, 97–102.
- Brouillet, L., Lowrey, T.K., Urbatsch, L., Karaman-Castro, V., Sancho, G., Wagstaff, S., Semple, J.C., 2009. Astereae. In: Funk, V.A., Susanna, A., Stuessy, T.S., Bayer, R.J. (Eds.), *Systematics, Evolution, and Biogeography of Compositae*, 589–629. International Association for Plant Taxonomy, Vienna.
- Grau, J., 1970. Die gattung *Polyarrhena* Cass. (Asteraceae-Astereae). *Mitteilungen der Botanischen Staatssammlung München* 7, 347–368.
- Grau, J., 1971. On the generic delimitation of some South African Astereae. *Mitteilungen der Botanischen Staatssammlung München* 10, 275–279.
- Grau, J., 1973. Revision der gattung *Felicia* (Asteraceae). *Mitteilungen der Botanischen Staatssammlung München* 9, 195–705.
- Herman, P.P.J., Retief, E., Koekemoer, M., Welman, W.G., 2000. Asteraceae (Compositae). In: Leistner, O.A. (Ed.), *Seed Plants of Southern Africa: Families and Genera*. *Strelitzia* 10. National Botanical Institute, Pretoria.
- Manning, J.C., Goldblatt, P., 2002. A distinctive new species of *Felicia* (Asteraceae-Astereae) from Western Cape, South Africa. *Bothalia* 32, 193–195.
- Manning, J., Goldblatt, P., 2012. *Plants of the Greater Cape Floristic Region 1: The Core Cape Flora*. *Strelitzia* 29. South African National Biodiversity Institute, Pretoria.
- Mucina, L., Rutherford, M.C., 2006. *The Vegetation of South Africa, Lesotho and Swaziland*. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.
- Nesom, G.L., 1994. Repartition of *Mairia* (Asteraceae: Astereae). *Phytologia* 76, 85–95.
- Ortiz, S., 2007. A new species of *Felicia* L. (Asteraceae, Astereae) from South Africa. *Botanical Journal of the Linnean Society* 154, 545–548.
- Poovan, J., Magee, A.R., Boatwright, J.S., Manning, J.C., 2017. Generic circumscriptions and relationships of *Felicia* and allies (Asteraceae, Astereae). *South African Journal of Botany* 109, 364.
- Raimondo, D., Von Staden, L., Victor, J.E., Helme, N.A., Turner, R.C., Kamundi, D.A., Manyama, P.A., 2009. *Red List of South African Plants*. *Strelitzia* 25. South African National Biodiversity Institute, Pretoria.
- Thiers, B., 2017. *Index Herbariorum: a global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual Herbarium (Accessed 2017/06/03. <http://sweetgum.nybg.org/ih/>).