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Systematics, Anatomy

A new species of *Cyrtanthus* (Amaryllidaceae: Cyrtantheae) from the Agulhas Plain, Western Cape, South Africa

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ABSTRACT

Described is a new species of *Cyrtanthus* within the monogeneric tribe Cyrtantheae (Amaryllidaceae: Amaryllidoideae) from the low-lying Agulhas Plain, Western Cape, South Africa. Known from the Nuwejaars Wetlands area, *Cyrtanthus novus-annus* occupies habitats transitional between Elim Ferricrete Fynbos and Central Rûens Shale Renosterveld. The erect, mostly solitary-flowered inflorescence has a nearly sessile, funnel-shaped flower in common with *C. guthrieae*, which occurs on the mountains close to Bredasdorp in acidic soils of Overberg Sandstone Fynbos. The two species differ in the size, colouring, and markings of the flowers and in their flowering times. Their morphological similarity and the close proximity of their habitats suggest that *C. novus-annus* and *C. guthrieae* constitute an example of edaphically differentiated sister taxa, a pattern found in several other endemics of the region, as well as in the sister pair *Brunsvigia elandsmontana* and *B. marginata* (tribe Amaryllideae) from contrasting habitats in Swartland lowland alluvium and the abutting sandstone mountains, respectively.

1. Introduction

Cyrtanthus Aiton, in the monogeneric tribe Cyrtantheae, includes nearly 50 taxa which range from southern Africa to East Africa (POWO, 2022). The actinomorphic or zygomorphic flowers are variously tubular, funnelform or ventricose, presenting a level of floral diversity that mostly exceeds that of other genera in Amaryllidaceae (Meerow and Snijman, 1998). Other diagnostic features are the often partly hollow scape, the self-compatible flowers in most species, and the winged phytomelan-rich seeds. Although the karyotypes show considerable internal structural change the basic chromosome number, $x = 8$, is stable (Ising, 1970).

Taxonomic revisions of *Cyrtanthus* have been contributed by Dyer (1939), Nordal (1979), Reid and Dyer (1984), and Duncan et al. (2016), the latter authors having provided an updated but artificial key to the species. The phylogenetic study by Snijman and Meerow (2010), using plastid *nrhF* and nrDNA ITS sequences, enabled the recognition of three informal species groups within the genus and revealed that the three major lineages have repeatedly converged on various suites of morphological characters, apparently as an adaptation to shared classes of pollinators. More than half of the species are present in the core Cape Floristic Region, many of them well-known narrow endemics (Duncan et al., 2016; Snijman, 2012). The unexpected discovery in 2019 of a small population of *Cyrtanthus* on the Agulhas Plain that could not be matched with any known taxon has prompted the description here of one further species.

2. Materials and methods

The species description is based on living plants collected in the wild and all photographs of the plants are from their natural habitats. Material in BOL, NBG, and SAM was examined to determine any earlier records of the species (acronyms according to Thiers, 2022) and iNaturalist (2022) was checked for relevant additional observations.

3. Taxonomy

Cyrtanthus novus-annus *Snijman*, sp. nov.

New species allied to *C. guthrieae* L.Bolus, with which it has few, linear leaves, an erect, mostly solitary-flowered inflorescence and a nearly sessile, funnel-shaped flower. It differs in its lower stature, ± 160 mm when flowering, smaller delicate pink flowers which appear in mid to late summer, smaller tepals 20–25 × 7–8 mm with dark pink keels, and short stamens exserted from the throat by 10–15 mm.

Type: South Africa. Western Cape, Caledon (3419): Agulhas Plain, about 5 km E of Elim, Farm Modder Valley, Nuwejaars Wetlands Special Managed Area, (–DB), 29 Jan. 2022, *Snijman and G.Nichols 2389* (NBG holo.; PRE iso.).

Deciduous bulbous herb, up to 160 mm tall at flowering. *Bulb* solitary, hypogeal, ± ovoid, 30 × 25 mm, narrowed to a short neck ±

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5 mm long; outer tunics thinly papery, pale to dark brown; inner tunics fleshy, cream-coloured. *Leaves* absent or 1(2) at flowering, erect, linear, 75 × 1 mm, glabrous, hemiterete in cross section, without prominent veins, flushed red proximally. *Inforescence* 1(2)-flowered; scape erect or rarely slightly curved, up to 130 × 2 mm, scarcely tapering distally, brownish pink, usually with a grey bloom, solid throughout; spathe bracts 2, suberect, narrowly lanceolate, 18–30 × 3 mm at base, membranous, soon scarious, pale pinkish with darker pink midrib, margins in-rolled distally. *Flower* actinomorphic, erect; pedicel 1 mm long; perianth narrowly trumpet-shaped, ± 40–50 mm long, pale cream- to greenish lemon-coloured in throat, longitudinally marked with darker pink or brownish pink on tube, tepal keels and outer tepal tips, delicate pink and glistening on tepal edges, faintly acrid-scented; *tube* ± straight, ± 20 mm long, ± 2 mm diam. in proximal half, widening to ± 10 mm at throat; *tepals* regularly spreading, oblong-lanceolate, 20–25 × 7–8 mm, overlapping to ± midway or if separate in proximal quarter then widening and slightly overlapping ± midway, keel 7-veined, outer whorl slightly wider than inner and tips shortly mucronate. *Stamens* slightly biseriate, outer whorl equal or slightly unequal, ± 15 mm long, inserted in throat, inner whorl equal, ± 10 mm long, inserted on inner tepals ± 5 mm above throat and then decurrent, otherwise free, slightly incurved and narrowed distally, pale lemon-coloured to white; anthers dorsifixed, oblong, 2 mm long, yellow. *Ovary* ellipsoidal, ± 5 × 3 mm, greenish; ovules axile. *Style* central, erect, slender, as long as or up to ± 3 mm shorter than stamens, pale cream- or lemon-coloured. *Stigma* truncate, minutely tricuspidate and papillate. *Capsule* narrowly ellipsoidal, ± 20 × 7 mm. *Seeds* winged. *Flowering time*: end of December to end of January, infrequently in early March. Fig. 1A–C.

Distribution and habitat: Cyrtanthus novus-annus is known from only two farms on the Agulhas Plain, Modder Valley and the adjacent Hazevlakte, both of which are part of the Nuwejaars Wetlands Special Managed Area, approximately five km east of Elim (Fig. 2). The two populations, comprising three and two small subpopulations respectively, together cover an area of less than 5 km^2 along the low south-facing slopes of a small east-west ridge. A total of less than 250 plants are confined to stony patches of shallow loam at elevations of 35–45 m above sea level. The low, open vegetation includes elements of both Central Rûens Shale Renosterveld and Elim Ferricrete Fynbos (Rebelo et al., 2006), which suggests the habitat is a transition zone. The bulbs grow singly and scattered amongst renosterbos, *Dicerothamnus rhinocerotis* (L.f.) Koekemoer (Asteraceae), *Leucadendron modestum* I.Williams, *Leucospermum heterophyllum* (Thunb.) Rourke (Proteaceae), small-leaved Cape elements including *Stoebe rugulosa* Harv. (Asteraceae) and the narrowly endemic *Lobostemon collinus* Schltr. ex C.H.Wright (Boraginaceae), sparse graminoids, geophytes including *Micranthus filifolius* Goldblatt & J.C.Manning and *Tritonia flabellifolius* (D.Delaroche) G.J.Lewis (Iridaceae), and a few succulents (Aizoaceae and Crassulaceae). In wetter areas nearby these mixed patches are replaced by pure stands of Elim Ferricrete Fynbos and on the heavier soils a short distance to the south by Central Rûens Shale Renosterveld (Rebelo et al., 2006).

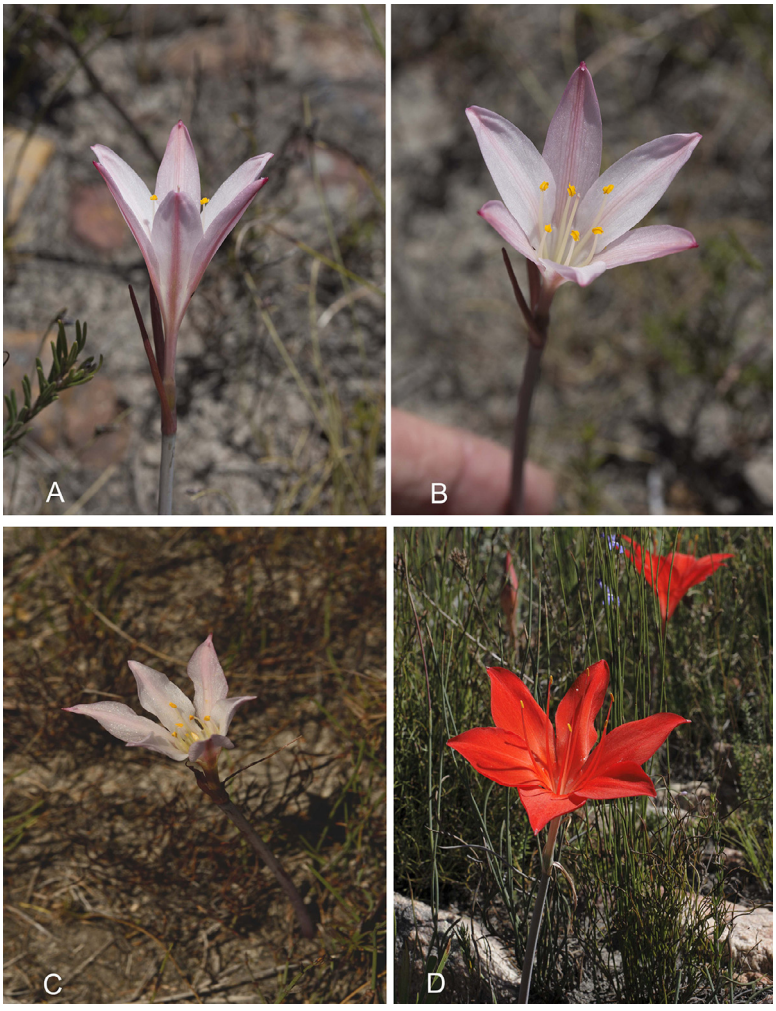

Fig. 1. Flowering plants. A–C, *Cyrtanthus novus-annus*; D, *C. guthrieae*. Photographs by G. Nichols (A and B); J. Manning (C); C. Paterson-Jones (D).

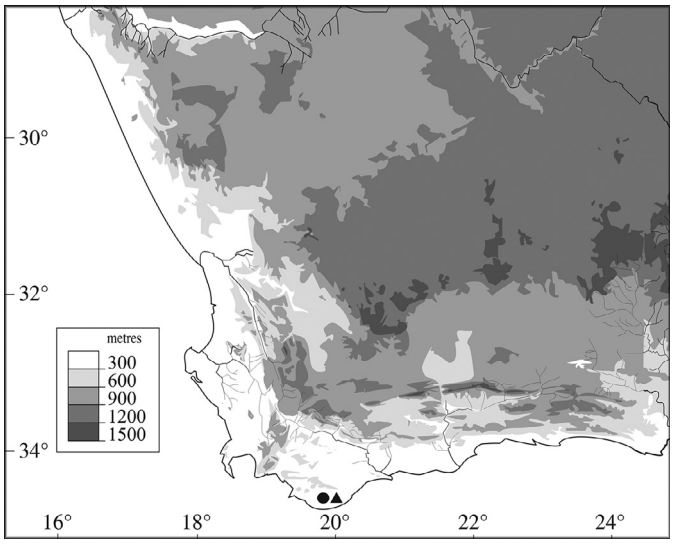

Fig. 2. Distribution of *Cyrtanthus novus-annus* (•); *C. guthrieae* (▲).

Diagnosis: The plant's erect inflorescence of 1(2) funnel-shaped actinomorphic flowers, with a straight funnel-shaped perianth tube, exserted stamens, and minutely tricuspidate stigma indicate a close alliance with three other narrow endemics in the *Monella* group of species, sensu Snijman and Meerow (2010), viz. *C. guthrieae* L.Bolus from nearby Bredasdorp, *C. elatus* (Jacq.) Traub from George, along the southern coast of Western Cape, and *C. montanus* R.A.Dyer from the Baviaanskloof Mountains, Eastern Cape. The latter two species differ markedly, however, in having more than two, invariably distinctly pedicellate flowers per inflorescence, and strap-shaped leaves (>10 mm wide), unlike the almost sessile, one or rarely two flowers per inflorescence and linear leaves (<3 mm wide) in *Cyrtanthus novus-annus* and *C. guthrieae.* Despite their similar morphology, these two species are easily distinguishable.

Cyrtanthus guthrieae, with its large, concolorous scarlet to vermillion flowers (Fig. 1D), which appear in March and April, is restricted to acidic soils in Overberg Sandstone Fynbos on the eastern tip of Soetmuisberg, adjacent to Bredasdorp, about 20 km northeast of Modder Valley and Hazevlakte (Fig. 2). The tepals are characteristically large (40–52 × 17–25 mm) and in sunlight they appear to be covered in gold dust, the filaments are well exserted (30–35 mm) from the throat, and the style slightly exceeds the stamens in length. *Cyrtanthus novus-annus,* in contrast, has smaller delicate pink flowers with darker pink keels, which appear in mid- to late summer. The tepals are smaller, 20–25 × 7–8 mm in size, the stamens are shortly exserted from the throat by 10–15 mm, and the style is slightly shorter than or as long as the stamens. The outer longer stamens of some flowers in *C. novus-annus* are slightly unequal, showing plasticity that is not known in *C. guthrieae*. This subtle feature suggests a possible more distant relationship to *C. leptosiphon* Snijman in the *Monella* group, a zygomorphic-flowered, long tongue fly-pollinated species, which is endemic to Swellendam Silcrete Fynbos (Rebelo et al., 2006; Snijman, 1999).

Discussion: In general, fire is an important trigger for initiating flowering in *Cyrtanthus* and it can result in mass flowering, which earned the plants the vernacular name "firelilies". Neither *C. guthrieae* nor *C. novus-annus* is a fire specialist however, as they flower independently of fire. *Cyrtanthus guthrieae* is pollinated by *Aeropetes tulbaghia* (Linnaeus), a large brown satyrid butterfly that flies in late summer, usually at high elevations (Johnson and Bond, 1994). Given its similar brush-type inflorescence *C. novus-annus* is likely to be butterfly-pollinated as well, possibly by smaller summer-flying lycaenid butterflies.

Important ecological drivers on the Agulhas Plain are the edaphically diverse substrates, notably the extensive ferricrete surface remnants, which are uncommon in the core Cape Floristic Region (Thwaites and Cowling, 1988). Correlations between percentage endemism and soil variables suggest that edaphic specialization has been important in the evolution of local endemics on the Agulhas Plain. Several examples of locally endemic putative sister taxa, which occur on different but closely juxtaposed substrata, are known (Cowling et al., 1992). Given their morphological similarity and the close proximity of their habitats, it is likely that *C. novus-annus* and *C. guthrieae* constitute edaphically differentiated sister taxa. A similar sister pair in Amaryllidaceae is also known in the southwestern area of Western Cape near Wellington, where the pink-flowered *Brunsvigia elandsmontana* Snijman is restricted to Swartland alluvial lowlands and the striking red-flowered *B. marginata* (Jacq.) Aiton is confined to sandstone and granite mountains of the nearby Boland (Snijman, 2001).

Additional specimens examined

South Africa. WESTERN CAPE: **3419 (Caledon):** Cape Agulhas, Modder Valley, Farm RE/17/240, Nuwejaars Wetlands Special Managed Area, (–DB), 17 Jan. 2022, *E.Brink and G.Nichols 01* (NBG). https://www.inaturalist.org/observations/105207766. https://www.inaturalist.org/observations/105663633. https://www.inaturalist.org/observations/108356622

Conservation notes

The dispersal capability of the plant's winged seeds allows the small patches of *C. novus-annus* to be regarded as two populations, separated by agricultural land cleared of natural vegetation. Given the small total number of mature individuals (<250) and the restricted area of occupancy (<5 km^2), I propose the species qualifies for the category Endangered. Currently known threats are encroaching invasive alien plants and grazing cattle.

Etymology

The species epithet honours the recent restoration of biodiversity in the Nuwejaars Wetlands area.

Declaration of Competing interest

The author declares that I have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Further Reading

Meerow, A.W, Snijman, D.A, 1998. Amaryllidaceae. In: Kubitzki, K (Ed.), The families and genera of Vascular Plants. 3, Springer, Berlin, pp. 83–110.