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Notes on new and misunderstood taxa of *Cyrtanthus* (Amaryllidaceae: Cyrtantheae) from the Western Cape, Eastern Cape and KwaZulu-Natal, South Africa

D.A. SNIJMAN*

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ABSTRACT

Cyrtanthus **aureolinus** Snijman is a new, rare species of fire lily, which is localized in a vlei on the northern slopes of the Groot Swartberg, Western Cape. The upright or slightly spreading, yellow to cream-coloured flowers and the perigone tube which gradually widens to the throat suggest that it is closely related to the Western Cape endemic, *C. ochroleucus* (Herb.) Burch. ex Steud., and *C. mackenii* Hook.f., a variable species from southern KwaZulu-Natal and Eastern Cape. The species differs mainly by the shape, size and position of the tepals and the length of the filaments. *Cyrtanthus mackenii* var. *cooperi* (Baker) R.A.Dyer is raised to subspecies rank as *C. mackenii* subsp. **cooperi** (Baker) Snijman. Its hysteranthous leaf habit and grassland habitat differ from the riverine habitat of the evergreen *C. mackenii* subsp. *mackenii*. Described in detail are *C. aureolinus*, *C. ochroleucus*, and *C. mackenii*.

INTRODUCTION

Found in southern and East Africa, *Cyrtanthus* Aiton, comprising about 55 species, is one of the largest genera in the family Amaryllidaceae. Throughout its distribution, *Cyrtanthus* has species adapted to cope with fire and because of this specialization they are commonly known as fire lilies.

In the Cape Floristic Region, some of the first plants to flower in response to summer fires and sufficient moisture are species of *Cyrtanthus* which characteristically produce their inflorescences in advance of the leaves. In the heat of summer, however, their flowering is often fleeting, hence many populations of *Cyrtanthus* in the Cape Fold Mountains are infrequently seen or probably yet to be recorded. This became evident after a wild fire burnt a large tract of arid fynbos on the dry northern slopes of the Groot Swartberg, east of Oudtshoorn, Western Cape, in December 2004. Two to three weeks later, a large population of *Cyrtanthus* appeared in a blackened seepage zone on the lower slopes and the stand of yellow flowers promptly attracted attention from local nature conservationists and botanists. Field and morphological studies of the newly discovered population in relation to other species of *Cyrtanthus* with tubular, yellow flowers have confirmed that the plants are distinct from all the currently known species of the genus and they are described here as a new species, *C. aureolinus*.

Due to the discovery of *C. aureolinus*, its putative close allies, *C. ochroleucus* (Herb.) Burch. ex Steud. and *C. mackenii* Hook.f., were examined in detail. The morphological variability within and among populations of the two varieties of *C. mackenii* was re-assessed in relation to phenology and habitat. Consequently, the rank of *C. mackenii* var. *cooperi* (Baker) R.A.Dyer is raised to that of subspecies as *C. mackenii* subsp. *cooperi* (Baker) Snijman. To accommodate the taxonomic changes and new data, *C. mackenii* and *C. ochroleucus* are described and mapped in full.

Cyrtanthus aureolinus *Snijman*, sp. nov., floribus tubularibus et aureis ad *C. ochroleucum* (Herb.) Burch. ex Steud. et *C. mackenum* Hook.f. accedens, differt filamentis exterioris 5 mm longis et filamentis interioris 7 mm longis, staminibus perigonio exserto, et florifero tante post ignem.

TYPE.—Western Cape, 3322 (Oudtshoorn): Swartberg Mountains, N side of mountain on property directly W of Meiringspoort and abutting Swartberg Nature Reserve, (–BC), 14-1-2005, *J.H.J.Vlok & A.L.Schutte 505* (NBG, holo.; PRE).

Semi-evergreen, bulbous geophyte, 220–300 mm tall when flowering. *Bulb* solitary, hypogeal, ovoid, up to 30–45 × 25–30 mm, narrowed to a slender neck 40–60 × 8–15 mm; outer tunics brown and papery; inner tunics cream-coloured and fleshy. *Leaves* developing sequentially, either absent or 2 or 3 newly emerging at flowering, finally up to 4, strap-shaped, up to 300 × 5–9 mm, suberect to recurved, ± channelled, glabrous; abaxial surface with 3 or 4 prominent median veins, not keeled; margin smooth. *Inflorescence* 4–10-flowered, solitary or occasionally 2 per bulb; scape erect, up to 250 mm long, 5–8 mm diam. at base, tapering distally up to 4–6 mm at apex, round to slightly compressed in t/s, green with a reddish blush towards base, hollow; spathe valves 2, outer sheathing inner at base, lanceolate, exceeding the pedicels, up to 45–65 × 7–9 mm (at base), membranous, suberect and flushed ox-blood red when fresh, later turning brown and reflexing; bracteoles several, linear, up to 15 mm long; pedicels suberect to slightly spreading, up to 40 × 1.5 mm at anthesis, lengthening up to 50 mm and becoming more rigid when fruiting, green to pale brown. *Flowers* erect to spreading slightly above the horizontal, opening sequentially, sulphur-yellow, sometimes with 6 diffuse green median bands from perigone base to tepal tips, firm, unscented, apparently without nectar; perigone tube dilated gradually to throat, straight or slightly

* Compton Herbarium, South African National Biodiversity Institute, Private Bag X7, 7735 Claremont, Cape Town.
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curved distally, 29–40 mm long, ± 3 mm diam. at base, widening gradually to 6–8 mm diam. at throat; tepals narrowly ovate, slightly spreading, neither reflexed nor rolled back, 12–15 × 5–7 mm, subacute at apex; outer tepals sometimes slightly narrower than inner, shortly mucronate. *Stamens* biseriate, regular, attached slightly below and in perigone throat, both whorls shortly exserted; outer filaments ± 5 mm long, attached ± 1 mm lower than inner; inner filaments ± 7 mm long; anthers dorsifixed, ± 4.5 mm long before dehiscing, yellow; pollen yellow. *Ovary* ellipsoidal, somewhat 3-angled, ± 5 × 2 mm, green; ovules axile, ± 25 per locule; style usually pressed against upper tepals, as long as or slightly longer than perigone, reaching up to 40 mm; stigmatic branches 3, spreading, slender, ± 2.0 × 0.5 mm, truncate, shortly papillate towards apex. *Capsule* ovoidal, ± 15 × 8 mm. *Seeds* unknown. Plate 1.

Phenology and pollination: the first flowers appear two to three weeks after summer fires. Individual flowers fade after a few days, but a many-flowered inflorescence may remain attractive for approximately one week. The response of individual plants is also staggered, so the entire flowering period lasts approximately three weeks. Although most individuals produce at least one leaf while flowering, the full complement of leaves is present only later in the season. Thereafter the plants remain evergreen until burnt by another fire.

Cyrtanthus aureolinus shows the typical fire lily response of not flowering in the seasons between fires. Observations in the early morning indicate that the flowers are visited by honeybees which alight on the tepals but do not enter the perigone tube. In the absence of nectar, pollen appears to be their only floral reward.

Diagnostic features: in its floral characters, particularly the form, position and colour of the flowers, *Cyrtanthus aureolinus* resembles *C. ochroleucus* from the Langeberg, Western Cape, and to a lesser degree the Eastern Cape and KwaZulu-Natal species, *C. mackenii*. All three species have somewhat tubular flowers with ± equally long perigone tubes that widen gradually from the base to the throat and have small tepal lobes. Although the flowers of *C. mackenii* and *C. ochroleucus* vary in colour from yellow to cream-coloured or rarely white, they resemble the clear yellow flowers of *C. aureolinus* in being upright to somewhat spreading, and are seldom horizontally spreading.

Despite their many similarities, these species can be distinguished florally mainly by the shape, size and position of the tepals, and by the length of the filaments (Table 1). The narrowly ovate to oblong tepals in *Cyrtanthus aureolinus* and *C. ochroleucus* are more than twice as long as broad and slightly spreading, unlike those of *C. mackenii* which are ovate, less than twice as

TABLE 1.—Morphological characters that distinguish *Cyrtanthus mackenii*, *C. aureolinus*, and *C. ochroleucus*

	C. mackenii subsp. *mackenii*	*C. mackenii* subsp. *cooperi*	*C. aureolinus*	*C. ochroleucus*
Bulb habit	forming offsets	solitary	solitary	solitary
Leaf width	7–18 mm	7–11 mm	5–9 mm	± 3 mm
Leafing phenology	synanthous	mostly hysteranthous	emerging at flowering after fire, otherwise evergreen	mostly hysteranthous
Pedicel length at anthesis	up to 27 mm	up to 30 mm	up to 40 mm	up to 12 mm
Flower(s)				
position:	suberect to nodding	suberect to spreading horizontally	suberect to spreading above horizontal plane	suberect to slightly spreading
per inflorescence	3–6(–8)	3–8(9)	4–10	2–6
periodicity per inflorescence	simultaneous	simultaneous	sequential	simultaneous
colour	clear yellow, cream-coloured or white	dull yellow or cream-coloured, tinged pink	bright yellow, plain or tinged green	dull yellow or cream-coloured, tinged pink or green
scent	sweet	spicy and bittersweet	unscented	dull and bittersweet
Perigone				
tube length	36–45 mm	25–47 mm	29–40 mm	33–50 mm
throat diam.	6–8 mm	4.0–5.5 mm	6–8 mm	5–6 mm
Tepal				
shape	ovate	ovate	narrowly ovate	narrowly ovate to oblong
length × width	5–10 × 3.5–5.0 mm	3.5–6.0 × 2.5–4.0 mm	12–15 × 5–7 mm	7–11 × 3–4 mm
position	patent to rolled back	slightly recurved to rolled back	slightly spreading	slightly spreading
Filament				
length: outer and inner	± 1 & ± 1 mm	± 1 & ± 1 mm	± 5 & ± 7 mm	± 2 & ± 4 mm
insertion on perigone: outer and inner	3–4 mm below throat and in or up to 2 mm below throat	5 mm below throat and 2 mm below throat	± 1 mm below throat and in throat	± 3 mm below throat and in throat
Flowering phenology	Jun.–Sep.(–Nov.), without fire	(late Jul.)Aug.–Sep.(–Nov.), not strictly fire dependent	Jan., strictly after fire	Oct.–Dec., not strictly fire dependent
Habitat	stream banks in coastal forest	grassland	permanent seepage in fynbos	dry flats or N slopes in fynbos
Distribution	S KwaZulu-Natal, E Cape	S KwaZulu-Natal, E Cape	W Cape, N slopes Groot Swartberg	W Cape, Langeberg, Albertinia plain

long as broad and patent or rolled back at anthesis. The filaments, however, are most diagnostic. In *C. aureolinus* both the outer and inner whorls of filaments (5 and 7 mm long respectively) extend beyond the perigone throat. Those of *C. ochroleucus* are slightly shorter (± 2 and ± 4 mm respectively) and only the inner filaments extend beyond the throat. In contrast, both the outer and inner filaments in *C. mackenii* are very short (± 1 and ± 1 mm respectively) and the stamens remain included in the perigone throat or within the upper part of the tube.

If the features of the tepals and stamens that characterize the species are also significant for determining affinities, then *Cyrtanthus aureolinus* is closest to *C. ochroleucus*. The perigone throat of *C. aureolinus,* however, is wider than that of *C. ochroleucus* and its leaves are broad and smooth, unlike the narrow leaves of *C. ochroleucus* which are minutely papillate on the margin and midvein. Both species are found in the fynbos of the Western Cape where they occupy different habitats and display dissimilar flowering habits.

Distribution and habitat: *Cyrtanthus aureolinus* is confined to damp habitats on the northern foothills of the Groot Swartberg, west of Meiringspoort (Figure 1). The only known population, covering an area of ± 15 × 40 m in size, is found in a permanent seepage zone in arid fynbos, where sandstone-derived soils meet a band of loam-rich soils at ± 800 m. In winter the area is waterlogged but it remains sufficiently wet in summer to support a population of the clicking stream frog, *Strongylopus grayii* (Smith). In periods between fires (of ± 18–40 years) the seepage zone is dominated by large clumps of restioids which form dense, fibrous tussocks at their base. Most individuals of *C. aureolinus* grow between these clumps, but in the wetter parts of the vlei, they are found on the raised tussocks. They are absent from the wettest parts of the site.

Other specimen examined

WESTERN CAPE.—3322 (Oudtshoorn): Farm Wilgermond, northern slopes of Groot Swartberg, W of Meiringspoort, ± 800 m, (–BC), 19-1-2005, *Snijman 1980* (K, NBG, PRE).

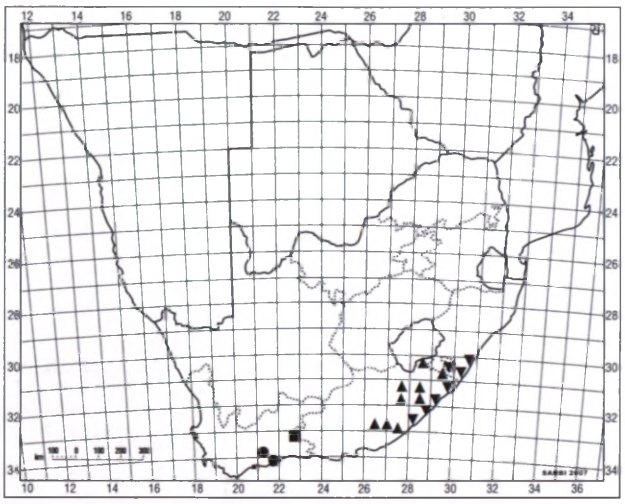

FIGURE 1.—Distribution of *Cyrtanthus ochroleucus*, ●; and *C. aureolinus*, ■, in Western Cape Province; and *C. mackenii* subsp. *mackenii*, ▼; and *C. mackenii* subsp. *cooperi*, ▲, in KwaZulu-Natal and Eastern Cape Province.

Re-assessment of Cyrtanthus mackenii *and* C. ochroleucus

The discovery of *Cyrtanthus aureolinus*, which is putatively most closely related to *C. ochroleucus*, makes it necessary to focus attention on the questionable identity of a group of hysteranthous-leaved plants from the grasslands of the Eastern Cape, northeast of King William's Town—a problem raised by Reid & Dyer (1984) and to some extent by Turrill (1960). Reid & Dyer (1984) pointed out that these populations are found in the same area as *C. mackenii* var. *cooperi*, but remarked that the plants might possibly represent outliers of *C. ochroleucus*, a species originally collected by William Burchell whose travels in the Cape never extended northeast of the Great Fish River (McKay 1943). The inconsistent naming of these particular plants is reflected in Batten & Bokelmann (1966: 31, t. 25, fig. 4) who referred to the plants from near King William's Town as *Cyrtanthus* sp., and those from near East London as *C. ochroleucus* (t. 24, fig. 1). In contrast, Manning (2001: 74, fig. 1 & 81, fig. 4) referred to both as *C. mackenii*.

In an attempt to resolve the relationships of the Eastern Cape plants to *Cyrtanthus mackenii* and *C. ochroleucus*, all the South African herbarium material (BOL, GRA, NBG, NH, PRE, SAM) belonging to this complex was studied together with the types of *C. ochroleucus*, *C. mackenii* var. *mackenii* and *C. mackenii* var. *cooperi*.

The types of *Cyrtanthus mackenii* var. *cooperi*—*Cooper 1806* (K, NH, PRE) collected in British Kaffraria, the eastern part of today's Eastern Cape Province—all lack leaves which strongly suggests that the leaves are hysteranthous. Furthermore, the pressed inflorescences (on the sheets at K and PRE) closely resemble those of the hysteranthous-leaved plants from the Eastern Cape referred to by Reid & Dyer (1984) with regard to flower number, perigone tube length, size of the perigone throat (4 mm wide), and shape and size of the tepals (ovate and 4 × 3.5 mm). This close similarity is in contrast to the more distant likeness found between *C. ochroleucus* and the hysteranthous-leaved Eastern Cape plants which are in question. Despite their shared hysteranthous-leaved state, they differ in leaf width (± 3 vs 7–11 mm); tepal shape (narrowly ovate to oblong vs ovate); tepal size (7–11 × 3–4 vs 3.5–6.0 × 2.5–4.0 mm); and flowering time (Oct.–Dec. vs Aug.–Oct.). Moreover, no intermediates between the two elements are known and their distribution ranges are disjunct, separated by a gap of ± 750 km.

Based on the above comparison, the resemblance of the hysteranthous-leaved plants from the Eastern Cape to the type of *Cyrtanthus mackenii* var. *cooperi* is considered to be sufficiently close to warrant their inclusion in *C. mackenii* var. *cooperi.* This is in agreement with Baker's (1896) circumscription of the taxon which he originally named *C. lutescens* var. *cooperi* Baker.

Following the inclusion here of the Eastern Cape's populations of hysteranthous-leaved plants into *Cyrtanthus mackenii* var. *cooperi*, is the need to re-assess the classification of *C. mackenii* into two varieties which

Dyer (1939) and Reid & Dyer (1984) distinguished primarily by the possession of yellow to cream-coloured rather than white flowers. To do so, this comparison has incorporated field data on flowering and leafing phenologies and habitat which are often missing from herbarium records.

The descriptions of *Cyrtanthus mackenii* (Dyer 1939; Turrill 1960; Reid & Dyer 1984) mention that the species reproduces vegetatively from bulblets. Field data, however, indicate that this habit is confined to the typical variety and leads to the formation of large clumps of bulbs with several shiny, evergreen leaves. Furthermore, the flowers of *C. mackenii* var. *mackenii* are sweetly scented, the perigone has a fairly broad throat (6–8 mm wide), and the tepals (5–10 × 3.5–5.0 mm) are ovate and vary from patent to rolled back at anthesis. Distributed from near Port Shepstone in southern KwaZulu-Natal southwards along the Eastern Cape coast, the plants grow most often on the shaded banks of permanent streams, in patches of remnant forest which seldom or never burn. They flower mainly in winter, from June to September, or rarely as late as November.

In contrast, *Cyrtanthus mackenii* var. *cooperi* is deciduous and has solitary bulbs that produce two to five glaucous leaves each season. The flowers have a strong spicy scent with a 4.0–5.5 mm wide perigone throat, and short, ovate tepals (3.5–6.0 × 2.5–4.0 mm) that are slightly recurved to rolled back at anthesis. Populations belonging to this taxon are plentiful in seasonally damp places in open, rolling grassland but occasional plants can be found in drier situations. They have been recorded from the Midlands of southern KwaZulu-Natal, near Kokstad, through to King William's Town, Eastern Cape, and close to East London where they approach the coast. Although the plants do not depend on fire to flower, they are known to flower most prolifically in the spring (August to October) following winter fires. With few exceptions, the bulbs produce new leaves slightly later in the season.

Despite the subtle nature of the floral features that separate these taxa, they may play a role in attracting a slightly different range of pollinators. This, together with the slightly asynchronous flowering times and their discrete habitats, may impose some level of reproductive isolation upon the taxa. It is apparent, nevertheless, that these morphological, phenological and habitat differences reflect a level of discontinuity that warrants more than varietal delimitation, especially as the populations of the two taxa occupy different, albeit partially sympatric, geographical ranges, namely the coast versus the Midlands of southern KwaZulu-Natal and the Eastern Cape. The only places where populations of the two taxa co-occur are where patches of forest extend inland into the temperate grasslands along major river courses. This interpretation, consequently, excludes the coastal, evergreen plants with yellow flowers that Dyer (1939) and Reid & Dyer (1984) previously considered to belong to *C. mackenii* var. *cooperi*.

Based on the above conclusions, *C. mackenii* var. *cooperi* is elevated to subspecies rank, *C. mackenii* subsp. *cooperi*. The full descriptions of *C. mackenii* and *C. ochroleucus* are given below.

Cyrtanthus mackenii *Hook.f.* in The Gardener's Chronicle and Agricultural Gazette: 641 (1869); Baker: 57 (1888); Baker: 225 (1896). Type: Natal [KwaZulu-Natal], *P.C. Sutherland s.n.* in Herb. Hookerianum, July 1864 (*K000366180*, lecto.; designated here, image only seen).

Bulbous geophyte, 180–530 mm tall when flowering. *Bulb* hypogeal, up to 20–50 × 15–35 mm, narrowed to a neck 10–80 × 7.5–15.0 mm; outer tunics brown and papery; inner tunics cream-coloured and fleshy. *Leaves* narrowly lanceolate, up to 400 × 7–18 mm, suberect to recurved, slightly channelled, glabrous; abaxial surface with 3 prominent median veins. *Inflorescence* 3–8(9)-flowered; scape erect to curved, up to 450 × 5–8 mm diam. at base, tapering distally up to 3–5 mm at apex, round to slightly compressed in t/s, hollow; spathe valves 2, outer sheathing inner at base, lanceolate, shortly exceeding pedicels, up to 25–60 × 4–8 mm (at base), membranous, suberect and flushed pinkish when fresh, later reflexing and turning brown; bracteoles several, linear, up to 20 mm long; pedicels suberect to slightly spreading, up to 27 × ± 1.5 mm at anthesis, lengthening up to 30 mm and becoming more rigid when fruiting. *Flowers* opening ± simultaneously, white to yellow often suffused with apricot-pink; nectar unknown; perigone tube dilated gradually to throat, slightly to distinctly curved; tepals ovate, outer shortly mucronate. *Stamens* biseriate, regular; filaments ± 1 mm long; anthers dorsifixed, 2.0–2.5 mm long before dehiscing, yellow; pollen yellow. *Ovary* ellipsoidal, somewhat 3-angled, 4–5 × 3 mm; ovules axile, ± 25 per locule; style usually pressed against upper tepals, as long as or rarely slightly longer than perigone tube, reaching up to ± 45 mm; stigmatic branches 3, spreading, slender, ± 1 mm long, truncate, shortly papillate towards apex. *Capsule* ovoidal, 10–20 × 7–10 mm. *Seeds* 5 × 3 mm, winged, dark shiny brown.

subsp. **mackenii**

Dyer: 79 (1939); Reid & Dyer: 16 (1984).

C. mackenii var. *cooperi* (Baker) R.A.Dyer, pro parte, excluding the type of this taxon: 79 (1939); Reid & R.A.Dyer, pro parte, excluding the type of this taxon: 17 (1984).

Illustrations: Phillips: t. 33 (1921); Turrill: t. 368 (1960); Batten & Bokelmann: t. 24, fig. 6 [as *C. mackenii* var. *cooperi* (Baker) R.A. Dyer] (1966); Manning: 75, fig. 1 top right (2001).

Evergreen, often semi-aquatic bulbous geophyte. *Bulbs* clumped, forming numerous offsets. *Leaves* present at flowering, 4 or 5, shiny green; margin smooth. *Inflorescence* solitary per bulb; scape green often with a reddish blush towards base; pedicels green. *Flowers* 3–6(–8), suberect to slightly nodding, clear yellow, cream-coloured or white, sweetly scented; perigone tube 36–45 mm long, ± 2 mm diam. at base, widening gradually to 6–8 mm diam. at throat; tepals ovate, patent to rolled back, 5–10 × 3.5–5.0 mm, obtuse at apex; outer tepals as wide as inner. *Stamens* included in perigone throat and upper part of perigone tube; outer filaments attached 3–4 mm below throat; inner filaments attached in perigone throat, rarely up to 2 mm below throat. *Ovary* green.

Phenology: flowering starts in June and usually lasts until September, but can extend into early November. The leaves are evergreen.

Diagnostic features: the plants, commonly known as Ifafa lilies, are clump-forming and produce several leaves which persist throughout the year. The usually sweet-smelling flowers have ovate tepals that are patent to rolled back at anthesis and the stamens are characteristically included in the fairly broad perigone throat (Table 1). Populations of white-flowered plants are fairly localized and have been recorded from the Port Shepstone District in KwaZulu-Natal near the mouths of the Umzimkulu and Umtamvuna Rivers, and in the Eastern Cape near the Great Kei River mouth. Elsewhere in the distribution range, populations occasionally have cream-coloured flowers, but most often the flowers are yellow.

Distribution and habitat: Cyrtanthus mackenii subsp. *mackenii* is distributed along the Indian Ocean coastal belt from Port Shepstone southwards to Port Edward, KwaZulu-Natal, and from Port St Johns to just south of the Great Kei River, Eastern Cape. Scattered populations have also been recorded a short distance inland along the banks of large rivers (Figure 2). The plants favour partially shaded habitats, amongst rocks on the edge of watercourses in remnant patches of Scarp Forest and Southern Mistbelt Forest (*sensu* Mucina *et al.* 2005).

Specimens examined

KWAZULU-NATAL.—2930 (Pietermaritzburg): Malvern, (–DD), 22-7-1951, *Kent s.n.* (*NH40424*). 3029 (Kokstad): Umzimkulu, (–BD), Aug. 1967, *Gardner s.n.* (*NH57299*). 3030 (Port Shepstone): Isipingo, (–BB), Jun. 1882, *Wood 1336* (K, NH); Ifafa, (–BC), Feb. 1885, *Knox 2103* (PRE), Aug. 1916, *Lansdell s.n.* (*NH16127*); Natal coast, Ifafa Dist., (–BC), May 1883, *Tyson 2103* (BOL, K, SAM); The Valleys, (–CB), 8-7-1952, *Martin 936* (NBG), 3-10-1937, *Mogg 13945* (PRE); Oribi Gorge, (–CB), 16-8-1980, *Schrire 1850* (NH); Umzimkulwana River, (–CB), July 1916, *Thode 2515* (NH); Umtamvuna Nature Reserve, (–CC), 31-7-1982, *Abbott 170* (PRE), 11-7-1977, *Nicholson 1784* (PRE), 15-6-1969, *Strey 8745* (PRE), 15-7-1975, *Van Wyk 1669* (PRE), 14-7-1976, *Venter 1004* (PRE), 18-7-1995, *Victor 1381* (PRE). Inexact locality: Natal, *Gerrard s.n* (*K000366179*).

EASTERN CAPE.—3129 (Port St Johns): Mbotyi, on river banks, 50 ft [15 m], (–BC), 9-9-1961, *Batten s.n.* (*NBG60489*); Mbotyi, on river banks, 100 ft [30 m], (–BC), 10-9-1962, *Batten s.n.* (*NBG66279*); Mbotyi, on river banks, 200 ft [60 m], (–BC), 12-8-1963, *Batten s.n.* (*NBG69947*); Magwa Estates, (–BC), 7-9-1979, *Germishuizen 1193* (PRE); Ntsubane Forest Station, Fraser's Falls, (–BC), 24-8-1976, *Venter & Vorster 101* (PRE); 2 km from forestry station on road to [van bosbou stasie op pad na] Mboyti, (–BC), 12-7-1976, *Venter 886* (PRE); Coffee Bay, (–CC), Oct. 1919, *Tyson s.n.* (PRE *TM20573*); ± 2.5 km from Umzimvubu bridge at Port St Johns, (–DA), 20-8-1998, *Abbott 7296* (NBG). 3228 (Butterworth): Tsolorha, Bashee River, (–BA), *Van Jaarsveld 16903* (NBG); Cwebe Forest, (–BB), 14-9-1998, *Winter s.n.* (*NBG179726*); between Qora and Mazeppa Bay, (–BC), *Winter 513* (NBG); Dwesa Nature Reserve, (–BD), *Winter 496* (NBG); Kei River mouth, margins of streams, (–CB), Aug. 1889, *Flanagan 300* (BOL, PRE, SAM); banks of Kei River, 200 ft [60 m], (–CB), July 1894, *Flanagan 2335* (BOL, NBG); Kentani Dist., (–CB), July 1911, *Pegler 28* (PRE); Nyutura, (–CB), 12-7-1966, *Strey 6641* (NH, PRE), 12-7-1966, *Ward 5724* (PRE); half mile [0.8 km] E of Nenga Post Office (–CC), 17-7-1955, *Codd 9275* (PRE); Farm Hill and Dale, near Haga Haga, in stream bed and banks, 60 m, (–CC), 8-8-2001, *McMaster s.n.* (*NBG177935*); near Haga Haga, (–CC), *McMaster s.n.* (*NBG182889*).

subsp. **cooperi** *(Baker) Snijman*, stat. et comb. nov.

C. mackenii var. *cooperi* (Baker) R.A.Dyer, syn. nov.: 79 (1939). *C. lutescens* var. *cooperi* Baker, Handbook of the Amaryllideae: 58 (1888); Baker: 225 (1896). Type: British Kaffraria [Eastern Cape], 1860, *T.Cooper 1806* (*K000400308*, lecto.; [designated by Reid & Dyer: 17 (1984)], image only seen; NH!, PRE!).

C. lutescens sensu Hook.f.: 89: t. 5374 (1863), non Herb.: 129. t. 33, fig. 14 (1837) [= *C. ochroleucus* (Herb.) Burch. ex Steud.]

Illustrations: Batten & Bokelmann: t. 24, fig. 1, [as *C. ochroleucus* (Herb.) Burch. ex Steud.]; t. 25, fig. 4 [as *C.* sp.] (1966); Manning: 75, fig. 1 top left & 81, fig. 4 (2001).

Deciduous, bulbous geophyte, 180–530 mm tall when flowering. *Bulb* solitary. *Leaves* developing sequentially, absent at flowering, rarely 1or 2 emerging at end of flowering period, finally up to 5, green or glaucous; margin smooth or minutely rough. *Inflorescence* solitary or occasionally 2 per bulb; scape glaucous with a pinkish blush. *Flowers* 3–8(9), suberect to spreading horizontally, cream-coloured to dull yellow, often suffused with apricot-pink on tube; scent spicy, usually bittersweet; perigone tube 25–47 × ± 2 mm diam. at base, widening gradually up to 4.0–5.5 mm diam. at throat; tepals ovate, slightly recurved to rolled back, 3.5–6.0 × 2.5–4.0 mm; outer tepals slightly narrower than inner, with somewhat subacute and shortly mucronate tips; inner tepals with round tips. *Stamens* included in upper part of perigone tube and throat, outer attached ± 5 mm below throat, inner attached ± 2 mm below throat. *Ovary* green or pinkish grey.

Phenology: the flowering period which often follows winter fires starts at the end of July at low altitudes (30 m) and peaks in September, but a few individuals continue flowering until November at high altitudes (1 800 m). The plants flower in the seasons between fires so are not true fire lilies. The leaves are absent during the main flowering period in September and begin to emerge from scattered individuals in October. Leafing continues throughout summer until the onset of the dry season when the bulbs become dormant over winter.

Diagnostic features: the plants are solitary and deciduous, and the leaves mostly reach maturity after flowering. The perigone tube has a relatively narrow throat with small, ovate tepals (Table 1). The flowers are most often dull yellow but in populations from around Maclear, Umtata, Stutterheim, and King William's Town, the perigone tube is pinkish cream to apricot. Often the flowers have a spicy scent.

Distribution and habitat: populations of *Cyrtanthus mackenii* subsp. *cooperi* are usually concentrated in seasonally damp places in open grassland where they are most prolific, but occasional individuals are also found in dry grassland. The distribution extends through the Sub-Escarpment Grassland Bioregion in East Griqualand and the Transkei (sensu Mucina *et al.* 2005), below the Amathole Mountains around King William's Town and Stutterheim and to grassy flats in the vicinity of East London. In the northern parts of the range, populations are found at altitudes of up to 1 400 m but in the south they reach the coast (Figure 2).

Specimens examined

KWAZULU-NATAL.—3028 (Matatiele): between Swartberg and Matatiele, (–BD), 29-9-1962, *Strey 4315* (PRE). 3029 (Kokstad): Farm Thornham, Kokstad, (–CB), 10-10-1972, *Coleman 633* (NH); Kokstad golf course, (–CB), Oct. 1966, *Germishuizen 100* (PRE); Kokstad, (–CB), Sep. 1940, *Sister Mildred 267* (NBG); circa Kokstad, (–CB), Oct. 1883, *Tyson 1550* (BOL); Harding, 3000 ft [914 m], (–DB), Sep. 1928, *Oliver 19* (NH).

EASTERN CAPE.—3127 (Lady Frere): Elliot, (–BD), 30-9-1935, *Reynolds s.n.* (*PRE37783*), 5-10-1935, *Reynolds s.n.* (*BOL22397*); 12 miles [19 km] N of Cala, (–BD), 16-10-1953, *Theron s.n.* (*PRE37793*); 3 km on road to McLeantown, (–DA), 30-9-1976, *Stirton 6289* (PRE); 10 miles [16 km] S of Cala Pass on road to Engcobo, (–DB), Sep. 1940, *Reynolds 3605* (PRE). 3128 (Umtata): near Ugie, (–AA), 6-10-2001, *Adendorff s.n.* (NBG); Maclear commonage, 1 470 m, (–AB), 30-8-1993, *Bester 715* (NH); Maclear commonage, 1 380 m, (–AB), 13-10-1993, *Bester 1201* (NH); 1 mile [1.6 km] W of Maclear railway station, (–AB), *Reynolds 3033* (PRE); Farm Borva, ± 12 km SSE of Xuxa drift siding, 1 410 m, (–AC), 1-9-1993, *Bester 754* (PRE), *755* (NH); Tsolo Agricultural College, 900 m, (–BD), 9-10-1990, *Cloete 508* (NH); Bazeia, in low moist places, 2000 ft [609 m], (–CB), *Bauer 242* (GRA); Umtata, 2500 ft [625 m], (–DB), 1-9-1962, *Bokelmann s.n* (*NBG62902*); Umtata, (–DB), 13-9-1997, *Singh & Baijnath 243* (NH, PRE). 3226 (Fort Beaufort): Katberg, 6000 ft [1 829 m], (–BC), Nov. 1926, *Dyer 760* (GRA, PRE); Katberg, no date, *H.Hutton s.n.* (*K000400306*). 3227 (Stutterheim): Stutterheim Div., Dohne Research Station, (–CB), 21-8-1942, *Acocks 9022* (PRE); Stutterheim Dist., towards Kologha, 880 m, (–CB), 28-9-1997, *McMaster 30* (NBG); Stutterheim Dist., adjacent to Van Rensburgdorp, 860 m, (–CB), 28-9-1997, *McMaster 31* (NBG); grassy valley above Komgha, 4000 ft [1 218 m], (–DB), Sep. 1889, *Flanagan 294* (BOL, GRA, PRE); Berlin, King William's Town Dist., (–DC), 14-9-1954, *Marais 445* (GRA); Gonubie, grassy flats, (–DD), 20-5-1961, *Batten s.n.* (*NBG60457*). 3327 (Peddie): Bufffalo Pass, East London, (–BB), 7-1-1945, *Barker 3520* (NBG); East London, 20–100 ft [61–30 m], (–BB), 10-9-1962, *Batten s.n.* (*NBG62903*); 1 mile [1.6 km] from Bonza Bay, (–DD), 20-7-1955, *Comins 1255* (PRE). Inexact locality: British Kaffraria, *Cooper 3225* (*K000400310*), *C.Hutton s.n.* (*K000400310*).

Cyrtanthus ochroleucus *(Herb.) Burch. ex Steud.*, Nomenclator botanicus 1,4 (edn 2): 475 (1840). *Monella ochroleuca* Herb.: 29 (1821). Type: [Western Cape] Riversdale Div., on or near the Langebergen, *W.J.Burchell 7144* (K, lecto.; here designated, image only seen).

C. lutescens Herb. var. *lutescens*: 129, t. 33, fig. 14 (1837), nom. superfl.

Deciduous, bulbous geophyte, 130–360 mm tall when flowering. *Bulb* hypogeal, ovoidal, 30–40 × 30–35 mm, narrowed to a short neck up to 10 × 7–10 mm; outer tunics brown and papery; inner tunics cream-coloured and fleshy. *Leaves* developing sequentially, either absent or 1 newly emerging at flowering, 2 or more, linear, at least 100 × up to 3 mm, suberect; abaxial surface with a prominent median vein, keeled; margin and midvein minutely papillate. *Inflorescence* 2–6-flowered, solitary per bulb; scape erect, up to 320 × 5 mm (at base), tapering distally up to ± 3 mm at apex, round to slightly compressed in t/s, dull green, hollow; spathe valves 2, outer sheathing inner at base, lanceolate, exceeding pedicels, up to 25 × ± 3.5 mm (at base), membranous, suberect and pinkish when fresh, later reflexing and turning brown; bracteoles several, linear, up to 15 mm long; pedicels suberect to slightly spreading, dull green, up to 12 × ± 1.5 mm at anthesis, lengthening up to 15 mm and becoming more rigid when fruiting. *Flowers* erect to slightly spreading, opening ± simultaneously, cream-coloured to dull yellow, suffused with pink or green on perigone tube sometimes extending to tepals, with a bittersweet scent; nectar unknown; perigone tube dilated gradually to throat, slightly curved, 33–50 mm long, ± 2 mm diam. at base, widening gradually up to 5–6 mm diam. at throat; tepals narrowly ovate to oblong, slightly spreading, neither reflexed nor rolled back, 7–11 × 3–4 mm, outer tepals ± as wide as inner tepals, shortly mucronate at apex; inner tepals obtuse. *Stamens* biseriate, regular; outer stamens included; inner stamens shortly exserted; outer filaments ± 2 mm long, attached ± 3 mm below perigone throat; inner filaments ± 4 mm long, attached in perigone throat; anthers dorsifixed, 2 mm long before dehiscing, dark yellow; pollen yellow. *Ovary* ellipsoidal, ± 5 × 3 mm, dull green; ovules axile, ± 25 per locule; style usually pressed against upper tepal, slightly shorter than perigone, reaching up to 47 mm; stigmatic branches 3, short, spreading, slender, ± 1 mm long, truncate, shortly papillate towards apex. *Capsule* unknown.

Phenology: the plants flower from October to December, mostly in advance of the leaves, but in a few individuals one newly emerging leaf may be present. After flowering, the leafing habit remains poorly known.

Diagnostic features: Cyrtanthus ochroleucus is distinguished by its hysteranthous leaves which are narrow (± 3 mm wide) and minutely papillate on the margin and midvein, by the suberect tubular flowers which are cream-coloured to dull yellow, and by the short (± 2 mm) outer filaments and longer (± 4 mm) inner filaments so that only the inner stamens are exserted from the perigone throat. The similarities and differences between *C. ochroleucus* and its close allies, *C. aureolinus* and *C. mackenii*, are summarized in Table 1.

Distribution and habitat: this species is only known from fynbos on the lower northern slopes of the Langeberg, and on the Albertinia coastal plain, Western Cape (Figure 2). Populations have been found in stony or sandy habitats and, although the bulbs flower after fire, they also flower in the intervals between fires. The plants grow singly and are scattered in open patches.

Nomenclatural note: Herbert (1821) based his original description of *Monella ochroleuca* Burch. (the basionym of *C. ochroleucus*) on the herbarium collections of Burchell, but he failed to cite any particular specimen. The original diagnosis of *M. ochroleuca* states that it is allied to *M. odora* (Ker Gawl.) Burch. (based on *C. odorus* Ker Gawl.) but that it is distinguished by having yellow-white flowers. *Cyrtanthus odorus* itself is a distinctive species which is characterized by hysteranthous leaves, suberect, tubular flowers with small tepals and, in contrast to *C. ochroleucus*, has dark red flowers.

Herbert (1837) later adopted the name *C. lutescens* for *M. ochroleuca*, which he explicitly referred to as a synonym, and he cited *Burchell 7144* as the only preserved specimen. There can be little doubt that the diagnosis of *M. ochroleuca* clearly distinguishes it from other taxa and that the name is validly published. Thus *C. lutescens* is considered to be nomenclaturally superfluous and is illegitimate. The lectotype of *C. ochroleucus* that has been designated here is *Burchell 7144* (K) which consists of leafless, flowering bulbs with narrowly tubular flowers that appear to be held upright.

Specimens examined

WESTERN CAPE.—3321 (Ladismith): Garcia's Pass, (–CC), Oct. 1904, *H.Bolus s.n.* (*BOL111388*, PRE); Langeberg above Corente River, (–CC), Nov. 1908, *Muir 191* (PRE); Corente River Farm, Riversdale Dist., (–CC), Nov. 1908, *Muir 5379* (PRE); Oudenbosch at foot of Langeberg, stony slope recently burned, (–CC), 16-12-1979, *Oliver 7550* (NBG, PRE); Langeberg, NE of Garcia's Pass, W

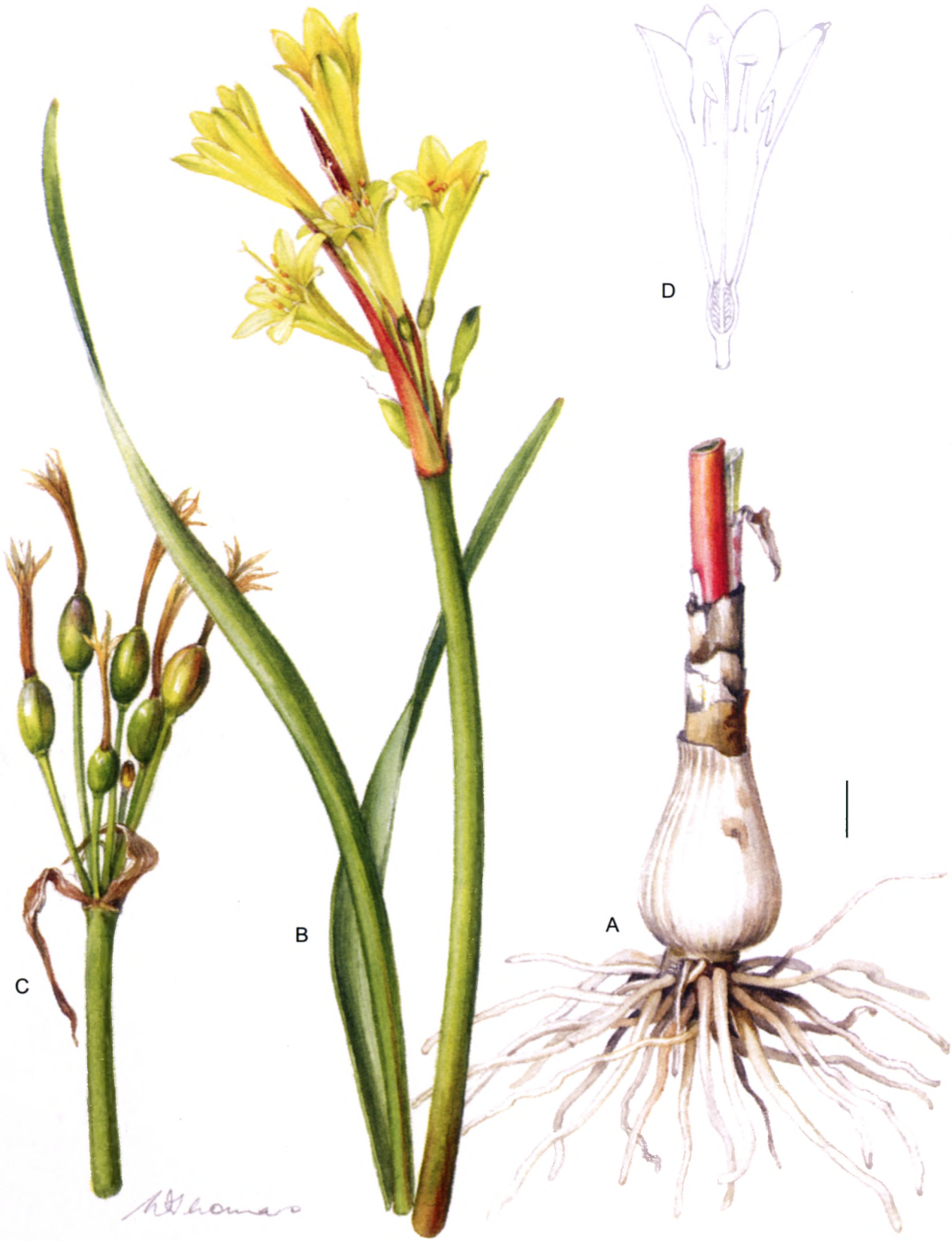

PLATE 1.—*Cyrtanthus aureolinus*, *Snijman 1980*. A, bulb; B, leaves and inflorescence; C, young infructescence; D, half flower laid open. Scale bar: A–C, 10 mm; D, 15 mm. Artist: Vicki Thomas.

of Welgemoed, in old fire break, 2150 ft [655 m], (–CD), 13-12-1984, *Oliver 8639* (NBG, PRE); Langeberg at Bergfontein, 350 m, (–DC), 14-12-1979, *Oliver 7529* (NBG). 3421 (Riversdale): Farm Vogelstruis, in coastal fynbos, (–BC), *Horstmann s.n.* (*NBG167767*).

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