

Caesia sabulosa (Hemerocallidaceae), a new species from the Greater Cape Region of South Africa

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Abstract

The new species *Caesia sabulosa* Boatwr. and J.C.Manning from deep sands along the West Coast of South Africa and sandy flats in the Cederberg and Bokkeveld Escarpment is described. It is distinguished by its extensively branched rhizome resulting in a robust, clump-forming habit, and unique ‘palisade’ root system of closely packed, hard, vertical roots; mostly larger flowers; erect fruiting pedicels; and details of the seed testa sculpturing.

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1. Introduction

Caesia R.Br. comprises ±11 species of tufted, grass-like plants with delicate, short-lived, white, blue or purple flowers in which the perianth twists spirally when they fade (Henderson, 1987; Obermeyer, 1973). Some of the species have very colourful, horizontally barred filaments with alternate yellow, white and purple transverse bands in various patterns (Fig. 1). The main centre of diversity for the genus is in Australia, where eight species are found, seven of them endemic (Henderson, 1987). One species occurs in Madagascar and an additional two species are found in South Africa, predominantly in the Western Cape (Obermeyer, 1973). The two South African species were last studied by Obermeyer (1973) who transferred *Nanolirion capense* (H.Bolus) Benth. and Hook. to the genus *Caesia* [as *Caesia capensis* (H.Bolus.) Oberm.] and also placed several species into the synonymy of *Caesia contorta* (L.f.) Dur. and Schinz, based on studies of herbarium specimens, concluding that these represent different forms of one variable species. However, further field studies are crucial to understanding the

variation in the *C. contorta* complex to ascertain whether it indeed represents a single species.

The familial placement of the genus has been somewhat volatile with various authors assigning it to different families, i.e. Asphodelaceae subfamily Anthericoideae (Dahlgren and Clifford, 1982), Anthericaceae (Dahlgren et al., 1985), Phormiaceae (Chase et al., 1996), Johnsoniaceae (Clifford and Conran, 1998) and Hemerocallidaceae (Chase et al., 2000; Fay et al., 2000). Recent molecular data place *Caesia* in the “hemerocallid clade”, which includes members of the families Hemerocallidaceae, Johnsoniaceae and Phormiaceae and which is sister to Asphodelaceae and Xanthorrhoeaceae (Devey et al., 2006). The most recent classification system of the Angiosperm Phylogeny Group (APG III, 2009), proposes a greatly expanded concept of the previously monotypic family Xanthorrhoeaceae to include both the Asphodelaceae and the “hemerocallid clade” but we follow the more conservative classification of APG II (2003), which retains Hemerocallidaceae in an expanded circumscription to include Johnsoniaceae and Phormiaceae rather than including it within a broad concept of Xanthorrhoeaceae.

Here we describe a new species of *Caesia* that was previously recognized informally as *Caesia* sp. 1 in Goldblatt and Manning (2000), raising to the 12 number of species in the genus. This work forms part of a broader systematic and taxonomic study of

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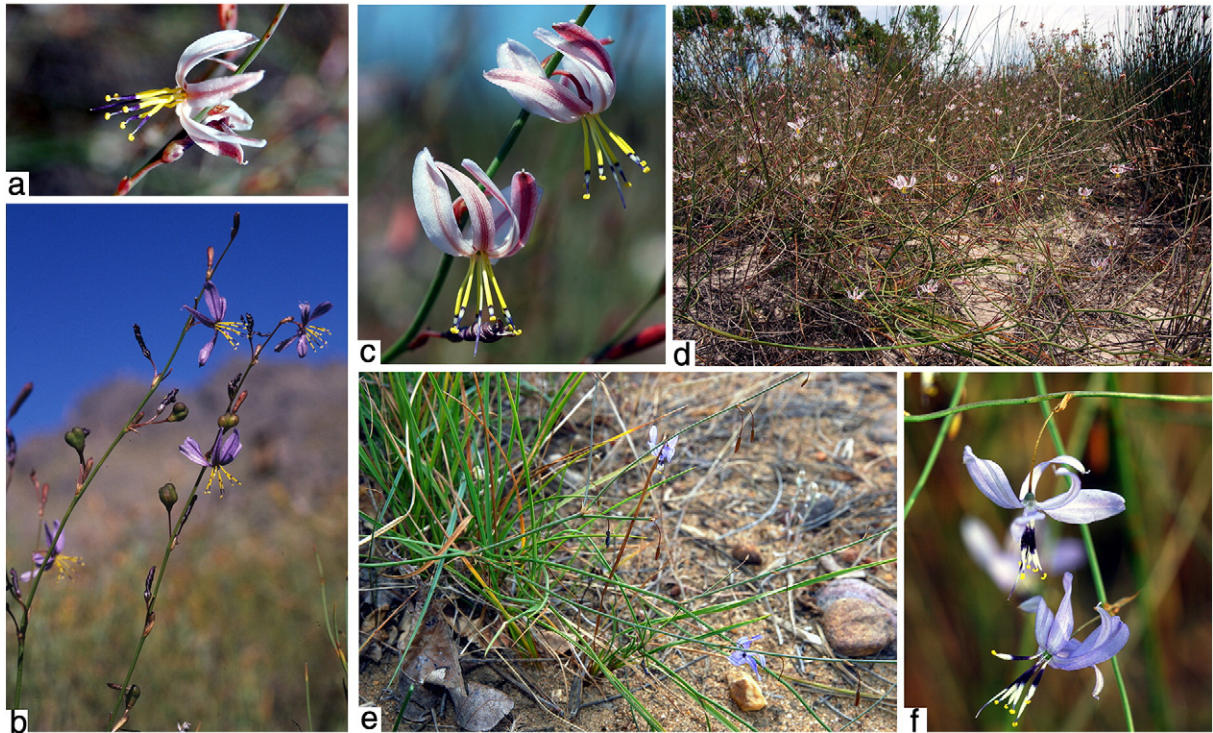


Fig. 1. Habit and flowers of *Caesia sabulosa* (a–d) and *C. contorta* (e–f). Note the transverse bands on the filaments and styles (a–c, f). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

the South African species and their relationship to their Australian counterparts, including field work to unravel the variation within the species and their circumscription.

2. Materials and methods

Morphological data on the new species were gained through field studies, as well as examination of herbarium material from BOL, K, NBG and PRE (abbreviations according to Holmgren et al., 1990). Seed surface sculpturing of the three South African *Caesia* species was examined with an LEO S440 fully analytical Scanning Electron Microscope (SEM) after being coated with gold. This was done at the Electron Microscope Unit, University of Cape Town. Voucher information of the species studied is listed in Table 1. Drawings were done using a stereoscope (WILD M4A) with a *camera lucida* attachment.

3. Species treatment

Caesia sabulosa Boatwr. and J.C.Manning sp. nov., *Caesia contortae* (L.f.) Dur. and Schinz foliis longis distichis conduplicatis, panicula divaricate ramosa et capsulis tripartibus

globosis ad obovoideas similis, sed rhizomate extensi horizontali cum systemate radicum verticali, habitu robusto formanti caespites, pedicellis erectis fructiferis differt.

Type: Western Cape, Bokbaai Farm, south-west of Darling [3318 AC], 1 January 1993, Goldblatt & Manning 9496 (NBG, holo.; K, MO, iso.).

Rhizomatous perennial to 0.6 m, grass-like and growing in clumps, forming extensive patches up to 2 m diam. *Rhizome* woody, extensively branched; roots stiff and tapering, extending vertically downwards, closely packed and palisade-like (horizontal rhizome with many long, vertical roots creating the impression of a palisade fence). *Leaves* distichous, erect, conduplicate, linear-lanceolate, 200–600 × 7–10 mm, acute, glabrous, bases sheathing and pink. *Inflorescence* a divaricately branched panicle; peduncle erect, terete, 3–5 mm diam. at base; bracts ovate, 2–4 × 2–3 mm, membranous, white or pink; pedicels short, buds sessile, ±3–5 mm long at anthesis, ultimately ±5–8 mm long in fruit. *Flowers* 1–2 in each axil, nodding, pale pink or mauve to blue with purplish midribs, open all day and fading in the afternoon, apparently unscented, caducous with perianth twisting spirally when faded; tepals recurved, connate in basal ±1 mm, outer elliptical, mucronate

Table 1
Voucher data of *Caesia* species examined for seed testa sculpturing.

Species	Locality	Voucher specimen
<i>C. capensis</i>	Western Cape: Groot Winterhoek Mountains	Marloth 1643 (PRE)
<i>C. sabulosa</i>	Western Cape: Bokbaai farm, south-west of Darling	Goldblatt & Manning 9496 (NBG)
<i>C. contorta</i>	Western Cape: Nature's Valley Reserve	Compton 15333 (NBG)
<i>C. contorta</i>	Western Cape: Jonker's Hoek	Lubke et al. 66 (PRE)

with conspicuous papillose apical tuft, $10\text{--}12 \times 2.0\text{--}2.5$ mm, inner narrowly obovate, emarginate, $10\text{--}12 \times 2.5\text{--}3.0$ mm. *Stamens* 6, erect but often with sigmoid bend near base; filaments filiform, retrorsely scabridulous, basal two-thirds yellow and upper third white separated by dark purple band or upper third purple with white tip or yellow with purple bands, inserted at top of perianth tube, outer ± 8 mm long, inner ± 10 mm long; anthers yellow, $1.0\text{--}1.5$ mm long. *Ovary* globose, $\pm 1.0\text{--}1.5$ mm long, green,

with 2 or 3 ovules per locule; style straight, filiform, scabridulous, basal two-thirds yellow and upper third white separated by dark purple band or upper third purple with white tip or yellow with purple bands, ± 10 mm long. *Capsule* turbinate, tripartite, $3\text{--}5 \times 3\text{--}5$ mm, abscising when ripe and tardily dehiscent, pale brown. *Seeds* globose to subreniform, $\pm 2.0\text{--}2.5 \times 2 \times 2$ mm, black, surface striate-verrucose; strophiole white, fleshy. *Flowering time*: November–January (Figs. 1a–c; 2).



Fig. 2. Morphology of *Caesia sabulosa* (a–i) and *C. contorta* (j–o). (a) whole plant; (b) flower; (c) extensive horizontal rhizome; (d) bract; (e1) seed in ventral view; (e2) seed in lateral view; (f) gynoeceium; (g1) outer tepal; (g2) inner tepal; (h) ripe dehiscent capsule; (i) capsule on upright pedicel; (j) flower; (k) gynoeceium; (l1) outer stamen; (l2) inner stamen; (m) tufted node on the peduncle; (n) capsule; (o) whole plant. Voucher specimens: (a–b, d, f–h) Boatwright & Manning 362 (NBG); (c) Boatwright & Manning 258 (NBG); (e, i) Goldblatt & Manning 9496 (NBG); (j–l, n) Boatwright & Manning 257 (NBG); (m, o) Manning s.n. (NBG). Scale bars: (a, c, m, o) 1 cm; (b, d–l, n) 1 mm.

4. Diagnostic characters

Caesia sabulosa resembles the widespread *C. contorta* in its long, distichous, conduplicate leaves, divaricately branched panicle, and deciduous, tripartite, turbinate capsules in which mostly one or sometimes two locules ripen, but the two species differ considerably in habit and root structure, flower colour in some forms, and details of the fruit and seeds. The rhizome in *C. sabulosa* is extensively branched, with the result that the species develops a distinctive, clumped growth habit (Fig. 1d), with the larger clumps reaching up to 2 m in diameter. The species grows in deep, sometimes coastal sands often in association with restioid taxa, and the root system is well-adapted to the loose substrate, producing numerous hard, tapering roots that are closely packed along the rhizomes and that grow vertically downwards into the soil, forming a dense, palisade-like structure serving to anchor the plants securely. The pink to deep blue flowers are borne in stiffly erect panicles that project above the foliage (Fig. 1d), and anthesis takes place during the morning, with the flowers fading during the afternoon. The fruiting pedicels remain erect, and the capsules are shed as soon as they ripen, collecting around the base of the plant. The rhizome in *C. contorta* is far less extensive, with the plants typically solitary (Fig. 1e), and the roots are wiry and spreading. The pale blue to purple flowers are borne in sprawling

or trailing panicles that develop characteristic tufts of leaves from the lower leaf axils (Fig. 1e), and anthesis takes place only in the early afternoon, with the flowers fading in the early evening. The fruiting pedicels are recurved, with the capsules nodding.

The remaining South African species, *C. capensis* is a small caespitose and mat-forming plant less than 80 mm high with subumbellate inflorescences or solitary flowers with smooth filaments.

Surface sculpturing of the seeds is taxonomically informative in the three South African species and has also been used as a key character in the Australian species (Henderson, 1987; Fig. 3). The seeds of the three South African species are black with fleshy white strophioles, reniform in *C. capensis* and *C. contorta* but globose in *C. sabulosa*. The fleshy strophioles (generally referred to as elaiosomes) attract ants which carry the seeds to their nest thus distributing the seeds away from the mother plant and providing protection from predation or unfavourable conditions (myrmecochory; Lengyel et al., 2010). Surface sculpturing in all three species is striate-verrucose, with a mix of large and small tubercles. In *C. sabulosa* and *C. capensis* the large tubercles are surrounded by valleys of much smaller tubercles, with the larger tubercles arranged in irregular clusters in *C. capensis* and in short, narrow rows in

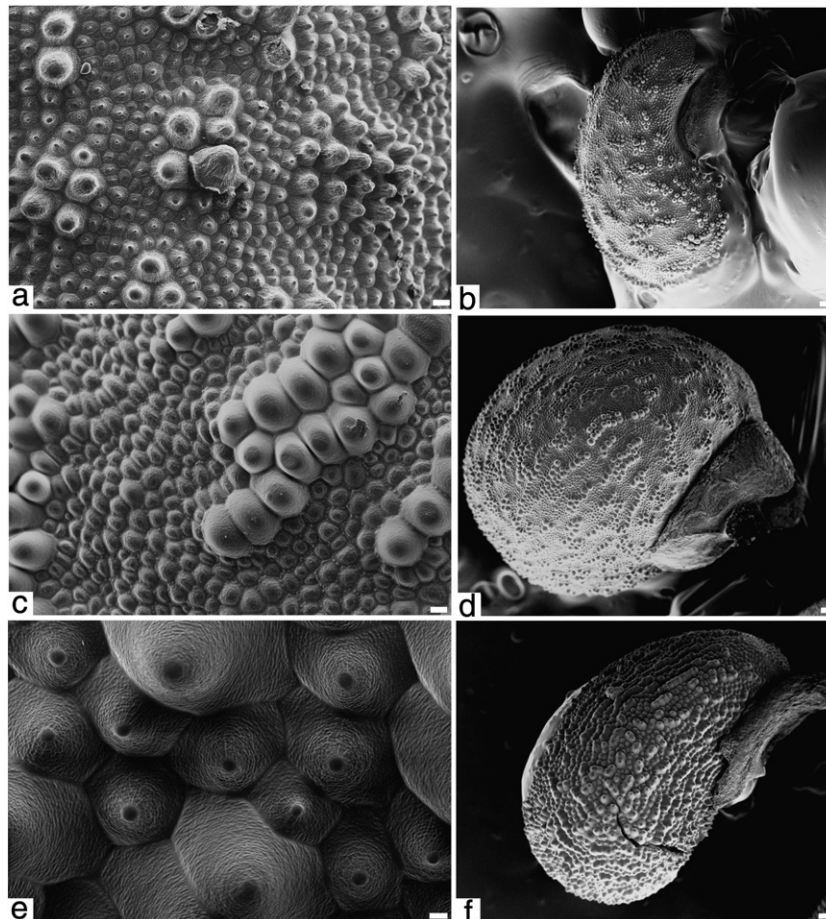


Fig. 3. Scanning electron micrographs of the seeds surfaces of *Caesia capensis* (a–b), *C. sabulosa* (c–d) and *C. contorta* (e–f). Voucher specimens: (a–b) *Marloth 1643* (PRE); (c–d) *Goldblatt & Manning 9496* (NBG); (e–f) *Compton 15333* (NBG). Scale bars: (a, c) 20 μ m; (b, d, and f) 100 μ m; (e) 10 μ m.

C. sabulosa (Fig. 3a–d). In *C. contorta* the tubercles in the valleys are diagnostically only somewhat smaller than the large tubercles, which are distributed randomly (Fig. 3e–f). In *C. capensis* and *C. contorta* the tubercles are conical, terminating in a small conspicuous point, while in *C. sabulosa* the tubercles are spherical and smooth.

5. Distribution and habitat

Caesia sabulosa grows in deep sands along the Western Cape coast, from Silverstroomstrand to Redelinghuys (in Atlantis Sand Fynbos, Hopefield Sand Fynbos and Leipoldville Sand Fynbos plant communities; Rebelo et al., 2006) and as far

north as Kotzesrus in Namaqualand (in Namaqualand Strandveld; Rebelo et al., 2006), and inland along the Cederberg and Bokkeveld Mountains (in Cederberg Sandstone Fynbos and Bokkeveld Sandstone Fynbos; Rebelo et al., 2006; Fig. 4). A similar distribution pattern is evident in another psammophilous species, *Babiana ringens* (L.) Ker Gawl. (Goldblatt and Manning, 2007). Typical populations of *C. sabulosa* along the West Coast south of Redelinghuys have distinctive, pink flowers but populations from the Bokkeveld Escarpment and Cederberg have a blue or purple perianth. They show the characteristic rather rigid panicles with large flowers and erect capsules of the coastal forms and we include them here pending further field work to understand this floral variation.

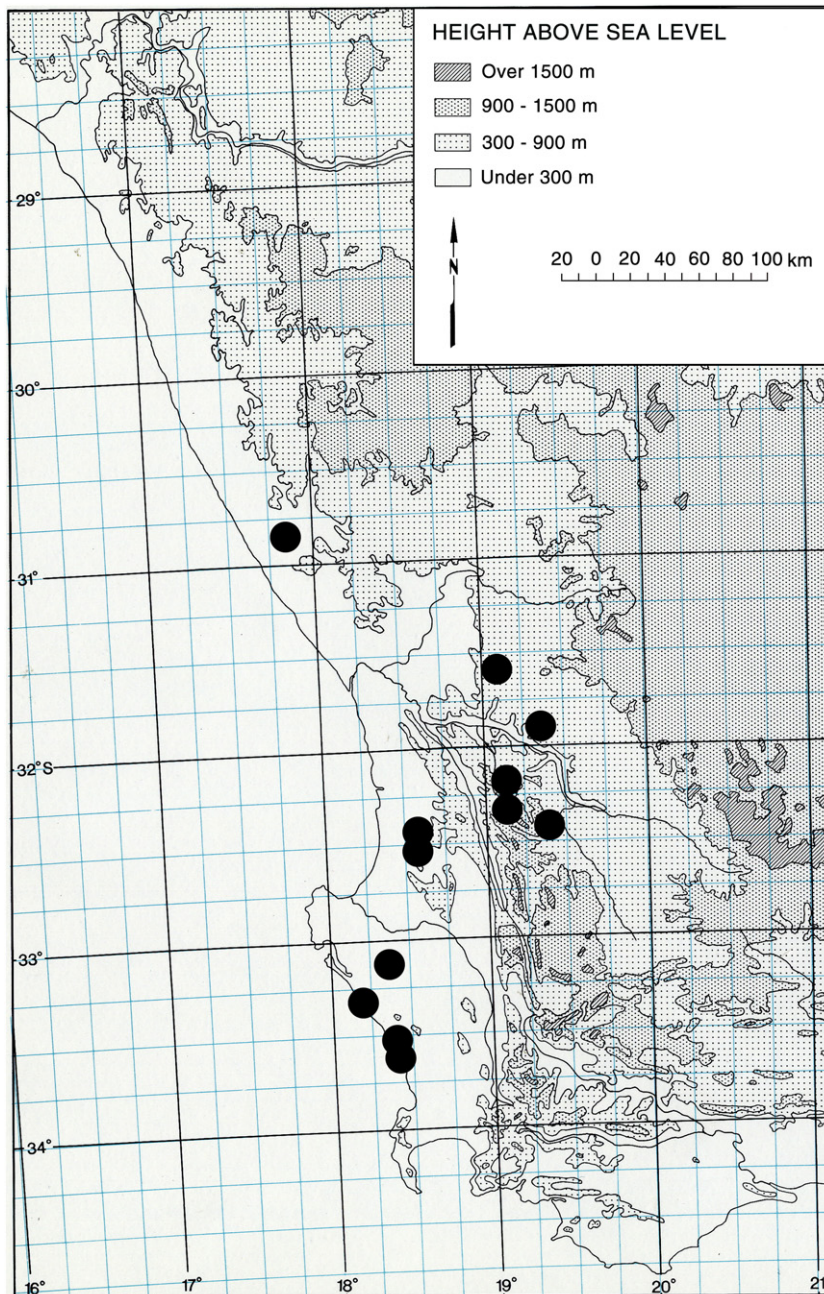


Fig. 4. Known geographical distribution of *Caesia sabulosa*.

C. contorta has a widespread, mainly more inland distribution from the Cederberg and Clanwilliam east as far as Port St. Johns, usually in stony clay or gravelly soils, while *C. capensis* is a high altitude species restricted to mountain peaks around Worcester (Du Toit's Peak, Groot Winterhoek Mountains, Hex River Mountains, Matroosberg, Wemmershoek Mountains) and on the Seweweekspoort Mountains (Goldblatt and Manning, 2000).

5.1. Additional specimens examined

- **3017** (Hondekliptaai): 4.8 mls [7.72 km] north–north-west of Kotzerus (–DD), 11 January 1963, *Acocks 23400* (BOL, PRE).
- **3119** (Calvinia): Nieuwoudtville, Oorlogskloof Nature Reserve, M21, 31°30'26"S 19°7'1"E (–CA), 7 November 2000, *Pretorius 636* (NBG); near the top of Botterkloof Pass (–CD), 8 November 1961, *Barker 9633* (NBG 3 sheets).
- **3218** (Clanwilliam): 1 km south of Redelinghuys, 32°29.196'S 18°32.045E (–BC), 6 December 2006, *Helme 4026* (NBG); 5 km south-west of Redelinghuys, mid south slopes of Mierberg, west of Oloff Berghspas, 32°30'52.4"S 18°30'26.8"E (–DA), 20 September 2007, *Helme 4853* (NBG).
- **3219** (Wuppertal): Heuningvlei (–AA), 6 January 1999, *Manning s.n.* (NBG, 2 sheets); North Cederberg, Path Heuningvlei to Krakadoupas (–AA), 28 December 1983, *Taylor 10863* (NBG); Cederberg, Middelberg Plateau (–AC), December 1939, *Esterhuysen 2460* (BOL 2 sheets, NBG 2 sheets), 14 December 1941, *Esterhuysen 7200* (BOL, NBG); lower eastern slopes below Krakadou near Ceder plantation (–AC), 28 December 2004, *Gwynn-Evans 2166* (BOL); Cederberg Wilderness Area, Groot Koupoort (–AC), 19 January 1977, *Haynes 1280* (NBG, PRE); Cederberg, Kleine Valey (–AC), 9 November 1956, *Taylor 1843* (NBG 2 sheets); Matjiesrivier Nature Reserve, 32°29'90"S 19°27'50"E (–AD), 21 November 1999, *Low 5841* (NBG, 2 sheets).
- **3318** (Cape Town): ca. 6 km south-east of Hopefield on Koperfontein 347 near powerlines, 33°06'48.5"S 18°22'02.0"E (–AB), 26 August 2008, *Helme 5604* (NBG); Darling district, Klawervlei Farm (–AD), 15 December 1988, *Manning 1023* (NBG); just after turn-off to Silwerstroomstrand on the R27 to Velddrif (–CB), 2 April 2009, *Boatwright & Manning 258* (NBG), 26 November 2009, *Boatwright & Manning 362*; roadside on R27 between Bokbaai turn-off and Rondeberg (–CB), 18 November 1995, *Goldblatt & Manning 10437* (NBG).

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