

A taxonomic revision of *Tenicroa* (*Hyacinthaceae*, *Urgineoideae*) – including four new species and two new combinations

Michael PINTER¹, Mario MARTÍNEZ-AZORÍN², Manuel B. CRESPO², María Ángeles ALONSO-VARGAS²,
Martin PFOSSER³ & Wolfgang WETSCHNIG¹

with 11 figures

Key words: *Asparagaceae*, *Hyacinthaceae*, *Urgineoideae*, *Scilloideae*, *Urgineae*, *Tenicroa*, *Drimia*, *Urginea*, flora of Southern Africa, revision, taxonomy, new species, new combinations.

Summary

PINTER M., MARTÍNEZ-AZORÍN M., CRESPO M. B., ALONSO-VARGAS M. Á., PFOSSER M. & WETSCHNIG W. 2020. A taxonomic revision of *Tenicroa* (*Hyacinthaceae*, *Urgineoideae*) – including four new species and two new combinations. – *Phyton* (Horn, Austria) 60: 61–92, with 11 figures.*

Within the framework of a taxonomic revision of *Hyacinthaceae* subfamily *Urgineoideae* (*Asparagaceae* tribe *Urgineae*) combining morphological and genetic data from numerous samples across its whole range of distribution, we here present a taxonomic revision of *Tenicroa*. Species of *Tenicroa* have a very intricate history and therefore, unlike many others, they have been placed by time in eight different genera. *Tenicroa* is characterized by having (mostly) synanthous leaves and sheathing cataphylls with raised darker transversal ridges, diurnal stellate flowers with white tepals having a distinct narrow, reddish-brown or greenish band, subbasifixed anthers, and the ovary elliptic-oblong to oblong, with an elongate, deflexed and often sigmoid style, and a papillate stigma. In this context, we here describe four new species (*T. applanata*, *T. fibrosa*, *T. namibensis*, *T. polyantha*) and present two new combinations (*T. flexuosa*, *T. unifolia*) in this genus. An identification key is provided for the 12 accepted species in the genus.

1. Introduction

The family *Hyacinthaceae* includes about 1000 species, which are distributed throughout Africa, Europe, and Asia. The small genus *Oziroë* RAF. (RAFINESQUE 1837: 53) is the only member which is native to South America (SPETA 1998a, b, APG 2003). The family is divided into four subfamilies (*Hyacinthoideae*, *Ornithogaloideae*, *Oziroëoideae* and *Urgineoideae*) which correspond to monophyletic clades in the phylogenetic analyses (SPETA 1998a, b, PFOSSER & SPETA 1999, MANNING & al. 2004, MARTÍNEZ-AZORÍN & al. 2011). Alternatively, *Hyacinthaceae* are treated as subfamily *Scilloideae* of family *Asparagaceae*, and subsequently the former subfamilies are treated as the tribes *Hyacintheae*, *Ornithogaleae*, *Oziroëeae* and *Urgineae* (APG 2009, 2016, CHASE & al. 2009). The treatment as *Hyacinthaceae* at family rank is favored here. Subfamily *Urgineoideae* is mainly distributed in Africa and

Europe, but is also found in western Asia, with one representative as far east as Thailand (WISITTIPANICH & SARAPHOL 2019).

At generic level, the treatments of *Urgineoideae* are still controversial, and SPETA (1998a, b) already commented on the unsatisfactory situation in this subfamily. During the last decades, on the one hand SPETA and collaborators as well as MARTÍNEZ-AZORÍN and collaborators mostly supported narrow generic concepts (SPETA 1998a, b, PFOSSER & SPETA 2001, MARTÍNEZ-AZORÍN & al. 2013a, 2017, 2018, 2019a, b, c, CROUCH & al. 2018, PINTER & al. 2013, 2019), in which the subfamily *Urgineoideae* comprises ca 30 genera, excluding *Igidia* SPETA (SPETA 1998b: 70, cf. WETSCHNIG & al. 2007). On the contrary, MANNING and collaborators (GOLDBLATT & MANNING 2000, MANNING & al. 2002, 2004, MANNING & GOLDBLATT 2018) accept only two genera – *Bowiea* HARV. ex HOOK.f. (HOOKER 1867: t. 5619) and *Drimia* JACQ. ex WILLD. (WILLDENOW 1799:

¹) University of Graz, Institute of Biology, Division Plant Sciences, NAWI Graz, Holteigasse 6, 8010 Graz, Austria (e-mail: michael.pinter@uni-graz.at)

²) Depto. Ciencias Ambientales y Recursos Naturales (dCARN), Universidad de Alicante, P. O. Box 99, E-03080 Alicante, Spain (e-mail: mmartinez@ua.es)

³) Biocenter Linz, J.-W.-Klein-Str. 73, 4040 Linz, Austria

*) Printed volume published ## ### ####

165) – based on molecular data with limited sampling (see MARTÍNEZ-AZORÍN & al. 2019b), and therefore, *Drimia* in this very wide sense is extremely heterogeneous in morphology and mixes groups with distinct biogeographical differences.

The systematic studies in *Urgineoideae* showed that some genera were para- or polyphyletic as originally circumscribed or interpreted by later authors (see PFOSSER & SPETA 2001, 2004, MANNING & al. 2004, PFOSSER & al. 2012; MARTÍNEZ-AZORÍN & al. unpubl.). Previous phylogenetic studies strongly support the multigeneric arrangement in *Urgineoideae* (PFOSSER & SPETA 2001, 2004, PFOSSER & al. 2012, PINTER & al. 2013, MARTÍNEZ-AZORÍN & al. 2019a), with the consequence of the recircumscription of some already existing genera (MARTÍNEZ-AZORÍN & al. 2019b, c) and the description of new ones (CROUCH & al. 2018, MARTÍNEZ-AZORÍN M. & al. 2013a, 2017, 2018, 2019a, PINTER & al. 2013, 2019, SPETA 2016).

More detailed information on generic circumscriptions within subfamily *Urgineoideae* can be found in MARTÍNEZ-AZORÍN & al. (2013a, b, 2015, 2019b) and PINTER & al. (2013, 2019). As already shown by MARTÍNEZ-AZORÍN & al. (2011) in the sister subfamily *Ornithogaloideae*, when a sufficient selection of DNA regions is included in the phylogenetic analyses, clear morphological features are congruent with the clades, which are acceptable at generic rank. A similar study evaluating alternative and more consistent generic concepts is still lacking in *Urgineoideae* and is the aim of our ongoing research (MARTÍNEZ-AZORÍN & al. unpubl.).

In the last decades some studies accept only about 100 species within the whole subfamily (compare MANNING & al. 2004, MANNING & GOLDBLATT 2018), but due to the lack of detailed comprehensive taxonomic revisions and our current knowledge of this subfamily across its broad distribution range, we consider the number of species to be at least double (compare MARTÍNEZ-AZORÍN & al. 2019b).

Tenicroa RAF. (RAFINESQUE 1837: 52) is a genus distributed in South Africa and southern Namibia (OBERMEYER 1980, PINTER & al. 2013, SPETA 1998a, b). Since its description in 1837, *Tenicroa* had to go through a changeful history. Unlike many other genera of *Hyacinthaceae*, species of *Tenicroa* have been placed by time in eight different genera. In the very beginning, the early known species were treated as *Anthericum* L. (JACQUIN 1794, 1797, see also Fig. 1; WILLDENOW 1799), most probably due to their flower resemblance, such as *A. bipedunculatum* JACQ. (JACQUIN 1796: 88) = *Chlorophytum triflorum* (AIT.) KUNTH (1843: 606), fide OBERMEYER (1980). Up to now, they had been assigned to genera like *Albuca* L. (KER GAWLER 1805, 1818, 1821), *Drimia* (JESSOP 1977, GOLDBLATT & MANNING 2000, MANNING &

GOLDBLATT 2003, 2018), *Ornithogalum* L. (KUNTH 1843), *Phalangium* MILL. (POIRET 1804), *Pilasia* RAF. (RAFINESQUE 1837), *Sypharissa* SALISB. (SALISBURY 1866, OBERMEYER 1980), and *Urginea* STEINH. (STEINHEIL 1834, DUTHIE 1928, ADAMSON 1942, LEWIS 1952). These nomenclatural changes have produced an intricate situation reflected in the extensive synonymy.

The genus *Tenicroa* is characterized by having (mostly) synanthous leaves and sheathing cataphylls with raised darker (purple or brown) transversal ridges enclosing their bases. The flowers are sweetly scented, diurnal, stellate at full anthesis with the white tepals subpatent, free and having a distinct narrow, reddish-brown or greenish band visible on both sides but more evident abaxially. The stamens are suberect to spreading, slightly curved, with subbasifixed anthers, and the ovary ovate-oblong to oblong-globose, with an elongate, deflexed and curved or sigmoid style, and papillate stigma.

Those evident characteristics in the circumscription of *Tenicroa*, as well as its distinction from *Urginea* found approval by most researchers in the subfamily (JESSOP 1977, OBERMEYER 1980, 1981, SPETA 1980, 1998a, b, PFOSSER & SPETA 2001, MARTÍNEZ-AZORÍN & al. 2019b, PINTER & al. 2013), whereas GOLDBLATT & MANNING (2000), MANNING & al. (2004) and MANNING & GOLDBLATT (2018) synonymized *Tenicroa* with *Drimia* s.l. Furthermore, MANNING & GOLDBLATT (2018) erected two different sections within their very broad *Drimia* to accommodate species fitting the traditional concept of *Tenicroa*: *D. sect. Juncifoliae* J. C. MANNING & GOLDBLATT (2018: 107), including *D. juncifolia* J. C. MANNING & J. M. J. DEACON (in MANNING & GOLDBLATT 2018: 107) and *D. decipiens* J. C. MANNING & GOLDBLATT (2018: 109), and *D. sect. Sypharissa* (SALISB.) J. C. MANNING & GOLDBLATT (2018: 111) recognizing three of the four species accepted by OBERMEYER (1980), namely *D. multifolia* (G. J. LEWIS) JESSOP (JESSOP 1977: 278), *D. fragrans* (JACQ.) J. C. MANNING & GOLDBLATT (in GOLDBLATT & MANNING 2000: 711), and *D. exuviata* (JACQ.) JESSOP (JESSOP 1977: 276). *Tenicroa filifolia* (JACQ.) OBERM. (OBERMEYER 1981: 577) is considered as a synonym of the latter, although it can be easily distinguished from all other species as shown in the present work. As already commented in MARTÍNEZ-AZORÍN & al. (2019b) the morphological characters provided by MANNING & GOLDBLATT (2018) to segregate the two sections are not convincing.

Our field work as well as detailed studies of herbarium specimens and cultivated material during the last decade have evidenced the existence of some undescribed species of *Tenicroa* and the convenience of accepting some species placed in synonymy by other authors, as shown below. A taxo-

nomic revision of *Tenicroa* is presented including 12 accepted species, among which four are described as new, and the two taxa *Urginea flexuosa* ADAMSON (1942: 240) and *Urginea unifolia* A. V. DUTHIE (1928: 8) are transferred to *Tenicroa*. Complete morphological descriptions and information on synonymy, nomenclatural types, ecology and distribution (see also the maps in Fig. 11), are presented for all accepted taxa, as well as an identification key for the included species.

2. Materials and methods

Detailed morphological studies were undertaken on natural populations, cultivated specimens and herbarium vouchers, as elaborated upon in MARTÍNEZ-AZORÍN & al. (2007, 2009). Specimens from the following herbaria were studied: ABH, B, BOL, E, GH, GRA, GZU, HAL, K, M, MO, NBG, P, PRE, S, TCD, UPS, WIND, WU and Z (acronyms according to THIERS 2020+). Authors of cited taxa follow IPNI (2020+). Orthography of geographical names and grid-number system follow LEISTNER & MORRIS (1976). Measurements of leaf length and width, as well as the size of tepals, stamens and ovary presented in the morphological descriptions were taken on fresh material. Measurements on dry specimens can show lower values. The measurements of MANNING & GOLDBLATT (2018) are used for *Tenicroa juncifolia* and *T. decipiens*, and measurements of *T. flexuosa* were taken from herbarium specimens, as no living material was available. The WW numbers correspond to the accession numbers of the living plant collection cultivated at the Botanical Garden of the Institute of Biology, Division Plant Sciences, NAWI Graz, University of Graz.

3. Taxonomic treatment

3.1. Description of the genus

Tenicroa RAF., Fl. Tellur. 3: 52 (1837). — Typus generis: *Tenicroa fragrans* (JACQ.) RAF. ≡ *Anthericum fragrans* JACQ. (Fig. 1c, 6)

= *Pilasia* RAF. (RAFINESQUE 1837: 53). — Typus generis: *Pilasia filifolia* (JACQ.) RAF. ≡ *Anthericum filifolium* JACQ. (Fig. 1a, 5).

= *Sypharissa* SALISB. (SALISBURY 1866: 37) ≡ *Drimia* sect. *Sypharissa* (SALISB.) J. C. MANNING & GOLDBLATT (2018: 111) ≡ *Urginea* sect. *Sypharissa* (SALISB.) BAKER (1873: 216) pro parte (only *Urginea fragrans*, *U. filifolia*, *U. exuviata*). — Typus generis: *Sypharissa exuviata* (JACQ.) SALISB. ex OBERM. ≡ *Anthericum exuviatum* JACQ. (Fig. 1b, 3).

= *Drimia* sect. *Juncifoliae* J. C. MANNING & GOLDBLATT (2018: 107). — Typus sectionis: *Drimia juncifolia* J. C. MANNING & GOLDBLATT ≡ *Tenicroa juncifolia* (J. C. MANNING & J. M. J. DEACON) MART.-AZORÍN & al.

Deciduous bulbous plant. Bulb hypogeous, solitary or proliferous, with few to many fleshy scales from compact to rarely loose, outer ones brownish, dry and membranous; cataphylls sheathing, 1–6, amplexicaul, surrounding the leaf-bases, length depending on depth of bulb, exposed apical part membranous, with raised, purple or brown transverse ribs, withering with aging. Roots usually long, stout and branched, sometimes numerous and thin, in some populations fleshy and distinctly tuberous. Leaves 1–80(–100) per bulb, narrowly linear, rigid, commonly coriaceous or rarely soft, synanthous or rarely hysteranthous, 0.5–5 mm in diam., glabrous, smooth. Inflorescence 1 (rarely 2) per bulb, a stalked raceme, erect, few- to many-flowered; scape terete, usually erect, sometimes slightly bent or with distinct sigmoid curves, smooth; pedicels 2–12 mm long, subpatent; bracts ovate-lanceolate, acuminate or acute, distinctly spurred, the lowermost with a distinct long (usually broad) acute spur, as long as or longer than the bract, spurs reduced in upper bracts; bracteoles lacking. Flowers pentacyclic, trimerous, stellate, patent to erect-patent, diurnal, open for part of the day, sweetly scented; perianth white with a distinct, narrow, reddish brown or greenish central band bordered by a pinkish frame visible on both sides, but more evident abaxially; tepals 6, biseriate, spreading-patent at full anthesis, free. Stamens 6, biseriate, surrounding the ovary; filaments filiform, usually with a slight bend in the upper third, suberect to slightly spreading, adnate basally to the tepals for < 1 mm, smooth, glabrous; anthers oblong, yellow, basifixed to subbasifixed, dehiscing by longitudinal slits along the whole thecae length. Ovary 3-locular with septal nectaria, elliptic, ovate-oblong to oblong-globose, green, sometimes with a purple stripe at the boundaries of the carpels; style white, terete, elongate, declinated, deflexed and often curved to strongly sigmoid, usually protruding downwards from the fascicle of filaments below the anthers (showing enantiostyly), rarely as long as, but commonly distinctly longer than the ovary; stigma papillate. Capsule ovoid or elliptic to oblong, 5–22 × 3–9 mm, trigonous, loculicidal, splitting to the base, the 3 valves with thickened margins, the withered perigone segments forming an apical cap. Seeds flat, irregularly elliptical to irregularly circular in lateral view, brown, with a loose, verrucous, shiny testa.

Etymology: *Tenicroa* [*Taenichroa*] (greek, taenis = ribbon; -chromus = colored). RAFINESQUE (1837) states that *Tenicroa* means “colored ribbon”. He invented thousands of names, many of them with an intricate etymology, so the most probable derivation is from the Greek terms taeni- (from taenis) = ribbon and -chrous (from -chromus) = colored

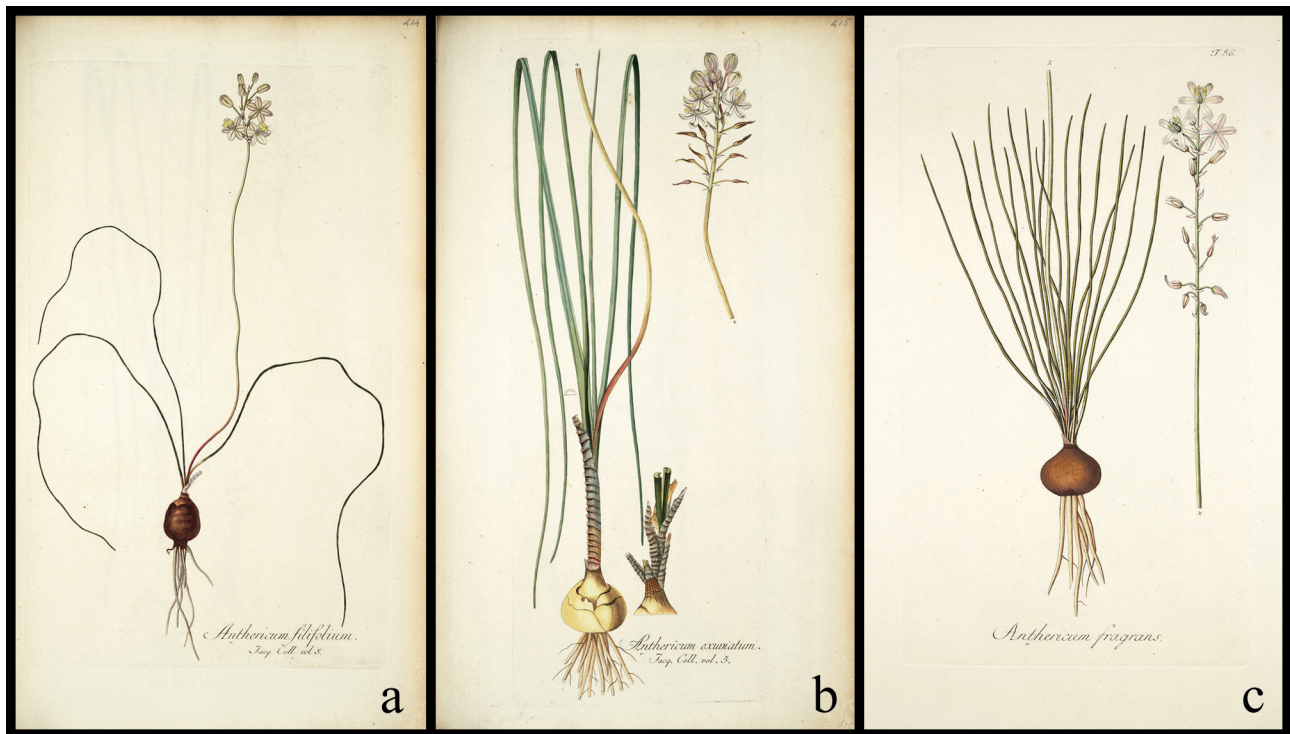


Fig. 1. Lectotypes (icons) of JACQUIN'S *Tenicroa* species described as *Anthericum*. (a) *A. filifolium* in *Icones plantarum rariorum* 2: t. 414 (1794). – (b) *A. exuviatum* in l.c.: t. 415. – (c) *A. fragrans* in *Plantarum rariorum Horti Caesarei Schoenbrunnensis* 1: t. 86 (1797).

(*Taenichroa*). Most likely RAFINESQUE re-wrote it freely as *Tenicroa*.

Main diagnostic characters and taxonomic relationships: All species of *Tenicroa* share a unique combination of morphological characters, such as the sheathing cataphylls with raised darker transversal ridges and the synanthous (rarely hysteranthous), narrowly linear leaves; diurnal, stellate flowers with white tepals having a distinct narrow, reddish-brown or greenish band more evident abaxially, subbasifixed anthers, and the ovary ovate-oblong to oblong-globose, with an elongate, deflexed and commonly sigmoid style, and a papillate stigma, which allow unequivocal attribution to the genus. Qualitative characters of flower and inflorescence, together with vegetative characters (such as bulb and leaves), enable a confident recognition of *Tenicroa*-species. In our phylogenetic analyses of *Tenicroa* (including 21 samples), samples of this genus form an independent and strongly supported clade which is related to *Urgineopsis*. This clear phylogenetic evidence, together with the combination of distinct morphological characters mentioned above, provides a solid basis for accepting *Tenicroa* at genus rank and supports a multigeneric concept for *Urgineoideae* (MARTÍNEZ-AZORÍN & al. unpubl.).

Phenology: In habitat plants are flowering from mid August to February and fruiting from late September to March.

Distribution: The highest diversity of the genus is centered in the Cape winter rainfall region, with extensions as far east in the Cape as Port Elizabeth and Grahamstown and reaching southern Namibia in the north.

Karyology: $2n = 20$ (fide SPETA 1998a, b, PFOSSE & SPETA 2001)

As already stated by GOLDBLATT & al. (2012), there are no formally published chromosome counts for *Tenicroa* and the number given by SPETA is without any references and listing of the samples and species, but consistent within *Urgineoideae* (cf. GOLDBLATT & al. 2012).

Number of species: In the present revision, 12 species are accepted in *Tenicroa*.

3.2. Taxonomic treatment of *Tenicroa* species

3.2.1. ***Tenicroa applanata*** M. PINTER, MART.-AZORÍN, M. B. CRESPO & WETSCHNIG, **spec. nova** (Fig. 2)

Type: SOUTH AFRICA. Western Cape. Cape Town (3318): near Tinie Versveld Wild Flower Reserve, between Darling and Yzerfontein (-AD), 122 m elevation, 20 September 2015, M. MARTÍNEZ-AZO-

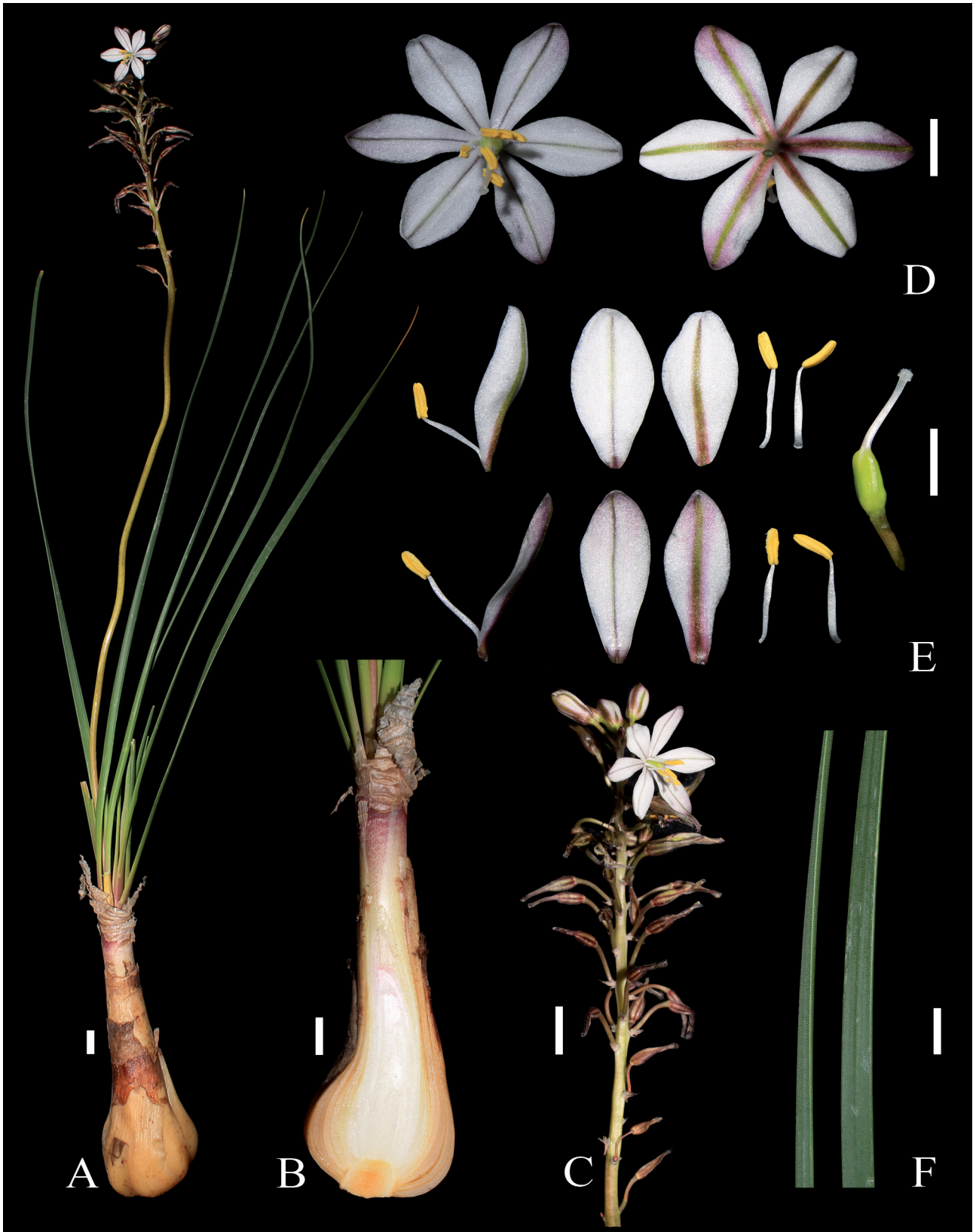


Fig. 2. *Tenuicroa applanata* M. PINTER & al. (corresponding to MMA1128, type locality). (A) Habitus of a whole plant. – (B) Bulb in longitudinal section, with detail of the sheathing cataphyll. – (C) Raceme. – (D) Flower in apical and dorsal view. – (E) Dissected flower: inner tepals and stamens above, outer ones below, and gynoecium. – (F) Section of the leaves. – Scale bars: A–C 1 cm, D–F 5 mm.

RÍN, M. PINTER, M. B. CRESPO & M. Á. ALONSO MMA1128 (holotype: GRA!; isotype: ABH!).

Description: Deciduous bulbous plant. Bulb hypogeous, solitary, elongated-ovate, 3.5–4.0 × 10 cm (incl. neck), outer tunics dry, membranous brownish to yellowish, inner scales yellowish to whitish, adherent, compact; cataphylls 3–4, sheathing, membranous, brownish to whitish, with raised brownish transverse ribs, often torn or withered from the top. Leaves present at flowering time, 8–15, flat (0.5–1 mm thick), 30–35 × 0.3–0.5 cm, light green, glabrous, margins slightly thickened basally. Inflorescence a stalked raceme, erect, 1 per bulb; scape 28–32 cm long, 2–3 mm in diam. at the base, usually reddish brown or reddish green; raceme moderately dense, overtopping the leaves, 8–11 cm long, 25–35-flowered, all-sided; bracts elongated-ovate, acute, 2.5–4 mm long, distinctly spurred; spur acute, lowermost up to 5 mm long, others shorter than the bract; pedicels erecto-patent, spreading, 8–10 mm long. Flowers diurnal, fragrant, stellate; perigone spreading patent; tepals 6, elliptic, almost free, 12–13.5 × 5–6 mm, white with a narrow, green and pinkish longitudinal median stripe better defined on the abaxial side. Stamens erect to spreading, somewhat curved, 8–9 mm long; filaments 6, filiform, basally adnate to the perigone for < 1 mm, the free parts 6–7 mm long, white, smooth; anthers 6, yellow, subbasifixed, oblong, 2.5–3 mm long, dehiscing with longitudinal slits up to the whole thecae length. Ovary oblong, 5 × 2 mm, pale green, glabrous; style elongate, deflexed, only very slightly sigmoid, 5–6 mm long, protruding downwards from the fascicle of filaments below the anthers, white to whitish; stigma papillate. Capsules and seeds unknown.

Etymology: Named after the distinctive flattened leaves (lat., *applanatus* = flattened, horizontally extended).

Phenology: In habitat *Tenicroa applanata* flowers in September.

Habitat: This species is restricted to the Fynbos Biome and occurs in sandy to loamy soils in FRg 2 Swartland Granite Renosterveld. It is characterised by a mean annual precipitation from 360 to 790 mm (mean: 520 mm), peaking from May to August with mists common in winter, a mean annual temperature of ca 16 °C and ca 3 days of frost incidence per year (MUCINA & RUTHERFORD 2006).

Distribution: *Tenicroa applanata* is only known from the type locality near Tinie Versveld Wild Flower Reserve in the vicinity of Darling, Western Cape Province (Fig. 11d). Further studies are needed to ascertain the distribution range of the species.

Diagnostic characters: *Tenicroa applanata* is easily identified by the elongated-ovate, yellowish bulb (more than double in length than its width), and the flattened leaves up to 5 mm wide, a character unique in the genus.

lowish bulb (more than double in length than its width), and the flattened leaves up to 5 mm wide, a character unique in the genus.

3.2.2. ***Tenicroa decipiens*** (J. C. MANNING & GOLDBLATT) MART.-AZORÍN, M. B. CRESPO, M. PINTER & WETSCHNIG, *Phytotaxa* 427: 294 (2019b).

Basionym: *Drimia decipiens* J. C. MANNING & GOLDBLATT, *Strelitzia* 40: 109 (2018). — Type: SOUTH AFRICA. Western Cape. Wuppertal (3219): Swartruggens, near turnoff to Kagga Kamma at summit of Skitterykloof, (-DC), 27 November 2017, J. C. MANNING 3637 (holotype: NBG!).

Description: Deciduous bulbous plant. Bulb hypogeous, solitary, suglobose, 1.5–2 cm in diam., scales adherent, ± imbricate, white, drying membranous and pale brown; cataphyll solitary, involute, translucent-membranous, lightly barred. Leaf usually hysteranthous, rarely synanthous, solitary, erect, terete-filiform, 10–15 × 0.1–0.15 cm, glabrous. Inflorescence a stalked, moderately lax raceme 10–30 cm long with rachis 2–5 cm long, (2–)4–8-flowered, flowers 3–6 mm apart; scape erect or weakly flexuous, reddish green, ± 1 mm diam., glabrous; bracts ovate-cucullate, auriculate, 1.0–2.5 mm long, lowermost with spur to 3.5 mm long; pedicels spreading, 4–7 mm long. Flowers diurnal, spreading, stellate; tepals 6, outer ones elliptic, 8–9 × 3–4 mm, inner ones ovate, 8–9 × 4–5 mm, connate at base up to 0.5 mm, spreading, white with dark keel better defined on the abaxial side. Filaments suberect around ovary, subulate-filiform and tapering, 4–5 mm long, white; anthers 6, yellow, subbasifixed, oblong, ± 2 mm long, dehiscence longitudinal. Ovary ovoid, 2.5–3.0 mm long, pale green; style weakly deflexed, 4–5 mm long, white; stigma globose-papillate. Capsules ovoid, 7–9 × 3–4 mm, flushed purple along sutures when fresh. Seeds angular, wrinkled, 1.5–2.0 mm long, dull black.

Etymology: Named *decipiens* (lat. *decipiens* = misleading, deceiving), because in flower the species is confusingly similar to smaller forms of *T. exuviata* (sensu MANNING & GOLDBLATT 2018, who include *T. filifolia*, *T. flexuosa* and *T. unifolia* in synonymy of *T. exuviata*).

Phenology: Plants flower from late November to early December; flowers opening in the early morning and lasting until late afternoon.

Habitat: *Tenicroa decipiens* is restricted to the Fynbos Biome and occurs on loamy flats in open, arid fynbos. The vegetation is characterised as FFq2 Swartruggens Quarzite Fynbos and shows a winter-rainfall climate. The mean annual precipitation lies between 200–620 mm (mean: 330 mm) peaking in the period from May to August, and the mean annual temperature is ca 14 °C with 10–20 days of

frost incidence per year (MUCINA & RUTHERFORD 2006).

Distribution: *Tenicroa decipiens* is known from the summit plateau of the Swartruggens in Western Cape Province of South Africa and based on current knowledge it seems to be restricted to that area. Further studies are needed to ascertain the real distribution of the species (Fig. 11e).

Diagnostic characters: *Tenicroa decipiens* is recognized by the rather lax raceme of stellate, moderately sized flowers with a weakly deflexed style longer than the ovary and with a globose-papillate stigma. The solitary terete leaf is usually withered at flowering, rarely still present. It can be confused with smaller (younger) plants of *T. exuviata* as well as *T. flexuosa* or *T. unifolia*, but the cataphyll of the latter three species is strongly horizontally barred, whereas in *T. decipiens* it is membranous with only traces of barring. On the Swartruggens other species are sympatric, but *T. decipiens* flowers slightly later in the season, and so it comes into bloom while others are already in fruit.

Additional material studied: SOUTH AFRICA. Western Cape. Wuppertal (3219): 60 km NE of Ceres, Knolfontein, Swartruggens (-DC), 1178 m elevation, 8 December 2009, I. JARDINE & C. JARDINE 1263 (NBG!). – Knolfontein, Swartruggens, 60 km NE of Ceres (-DC), 1173 m elevation, 4 December 2012, I. JARDINE 1983 (NBG!); 12 December 2017 [fruiting], I. JARDINE 2772 (NBG!). – (N of road east) Knolfontein, Swartruggens, 60 km NE of Ceres (-DC), 1149 m elevation, 28 November 2016, I. JARDINE 2625 (PRE!).

3.2.3. *Tenicroa exuviata* (JACQ.) SPETA, Linzer biol. Beitr. 12: 195 (1980). (Fig. 1b, 3)

Basionym: *Anthericum exuviatum* JACQ., Icon. pl. rar. 2: 18, t. 415 (1794). – Type: SOUTH AFRICA. Crescit ad Promontorium bonae Spei. Lectotype: icon in JACQUIN (1794: t. 415) (Fig. 1b). – Epitype designated here: Bredasdorp (3420): N side of Potberg, Bredasdorp Div. (-BC), ca 400 ft elevation, 13 November 1962, J. P. H. ACOCKS 23016 (PRE0046767-0!).

≡ *Phalangium exuviatum* (JACQ.) POIR. (POIRET 1804: 243).

≡ *Albuca exuviata* (JACQ.) KER GAWL. (KER GAWLER 1805: t. 871).

≡ *Urginea exuviata* (JACQ.) STEINH. (STEINHEIL 1834: 330).

≡ *Ornithogalum exuviatum* (JACQ.) KUNTH (KUNTH 1843: 369).

≡ *Drimia exuviata* (JACQ.) JESSOP (JESSOP 1977: 276).

≡ *Sypharissa exuviata* (JACQ.) SALISB. ex OBERM. (OBERMEYER 1980: 113)

Description: Deciduous bulbous plant. Bulb hypogeous, solitary, globose, 1.5–4.5 cm in diam., frequently forming a neck, outer tunics pale brown to dirty yellow when drying, scarious, inner scales yellowish to whitish, sometimes with a pinkish tinge on the outermost layer, broad, fleshy, gradually tapering into cataphylls. Roots many, thick and fleshy, nearly unbranched; cataphylls 1–6, sheathing, membranous, brownish to greyish, with prominent raised brown transverse ribs. Leaves present at flowering time, suberect or sprawling, (in young plants 1–)3–5, canaliculate, sometimes up to 70 × ca 0.3 cm, coriaceous, dull darker green or sometimes glaucous, glabrous. Inflorescence erect or suberect, 1 per bulb, about as long as leaves (sometimes slightly longer or shorter); scape 30–50 cm long, 2–3 mm in diam. at base, usually purple or reddish-brown; raceme moderately dense, 2.5–9 cm long, (10–)15–25(–35) flowered, all-sided; bracts ovate-lanceolate, acute to acuminate, length of bracts and spurs highly variable among populations, bracts 4–15 mm long, distinctly spurred; lowermost spur 6–18 mm long, upper ones gradually reduced in length; pedicels erecto-patent spreading, ca 5(–15 in fruit) mm long. Flowers diurnal, fragrant, stellate; perigone spreading; tepals 6, oblong, almost free, 10–14 × 3.5–5 mm, white with a narrow, greenish longitudinal median stripe with a flush of pink better defined on the abaxial side. Stamens erect to spreading, somewhat curved, 8–9 mm long; filaments 6, filiform, basally adnate to the perigone for < 1 mm; the free parts 6–7 mm long, white, smooth; anthers 6, yellow, subbasifixed, oblong, ca 3 mm long, dehiscent with longitudinal slits up to the whole theca length. Ovary ovate-oblong, 4–5 × 2 mm, pale green, glabrous; style elongate, deflexed and sigmoid, 5–8 mm long, protruding downwards from the fascicle of filaments below the anthers, white; stigma papillate. Capsules oblong-ovoid, 15–25 × 8–10 mm in lateral view. Seeds many, irregularly elliptical, flat, papery-winged, 9–11 × 7–8 mm in lateral view, brown, with a loose, verrucous, shiny testa.

Etymology: Named after the characteristic sheathing, membranous cataphylls (lat., exuviatus = skinned, cast off, shed).

Phenology: This species produces flowers from late August to early December, with mainly the Eastern Cape and higher altitude populations flowering in November and December. Fruits appear from November. ADAMSON & SALTER (1950) commented that it flowers only after fires. Our field work evidenced that most flowering populations were not influenced by fire.

Habitat: This species is widely distributed in the Fynbos and Succulent Karoo biomes and occurs on sandy or stony ground in open patches of vegeta-

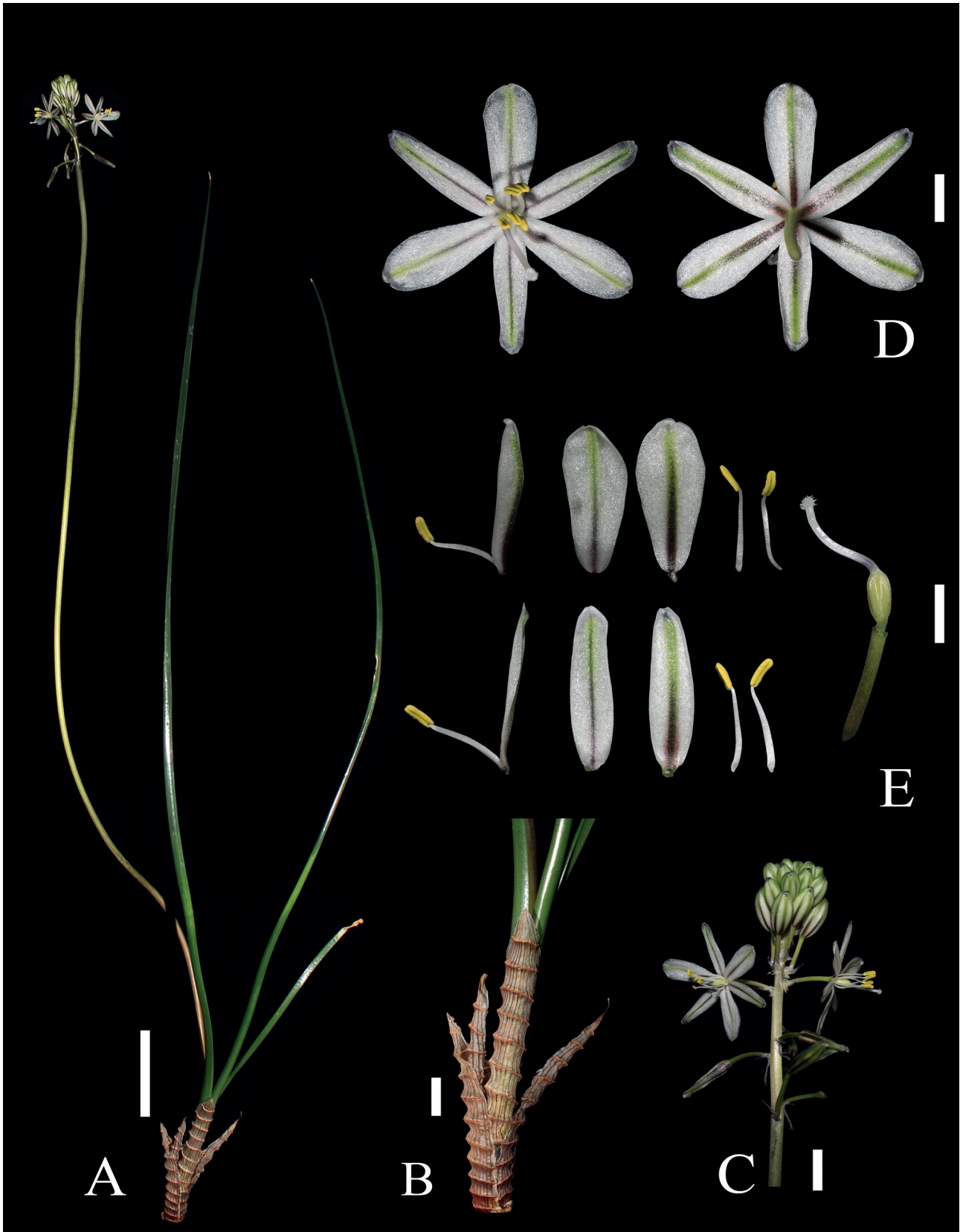


Fig. 3. *Tenicroa exuviata* (JACQ.) SPETA (corresponding to WW03912). (A) Habitus of a whole plant. – (B) Detail of the sheathing cataphylls. – (C) Raceme. – (D) Flower in apical and dorsal view. – (E) Dissected flower: inner tepals and stamens above, outer ones below, and gynoecium. – Scale bars: A 5 cm, B–C 1 cm, D–E 5 mm.

tion or shallow soils on granitic outcrops (MUCINA & RUTHERFORD 2006).

Distribution: *Tenicroa exuviata* is known from a wide distribution, ranging from the Cape winter-rainfall regions in the Richtersveld in the north, as far east in the Cape as Port Elizabeth and Grahamstown (Fig. 11a). Within this range there are populations known near the coast as well as in mountainous areas.

Diagnostic characters: In the protologue, JACQUIN (1794: 18, t. 415) gives the following brief diagnosis for *Anthericum exuviatum*: “filamentis glabris; radice bulbosa; foliis subulatis, foris convexis, latus concavis, erectis, basi inclusis vaginae scariosae & transversim striatae; scapo simplici. Tota planta, donata vagina unica. Portio alterius, donatae vaginis sex.” Although short, it gives some characters typical for this species, namely the canaliculate leaves and the up to six, scarios, sheathing cataphylls with prominent transversal ribs. A more detailed description is provided in the *Collectaneorum supplementum* (JACQUIN 1796: 89–90), and characters of the bulb were added: the shape being roundish, 1.5 inch in diam. [ca 3.8 cm], tunicate, pale, dirty yellowish-brown. In fact, *T. exuviata* is a variable species and may be confused with others especially in the juvenile stage. The best characters to distinguish the species are the solitary, globose bulb ± forming a neck; the inner scales extending into the cataphylls (up to 6) which are usually stiff and mostly complete and not withered as in many other species; the thick and fleshy roots; the canaliculate, coriaceous leaves; and the erect to suberect inflorescence about as long as (sometimes slightly longer or shorter than) the leaves. The closest species is undoubtedly *T. polyantha* which differs in the dense raceme with (30–)50–70 flowers, the large hypogeous bulb with long and hard, sheathing cataphylls and the 5–6 leaves withering from the tip at full anthesis. Furthermore, it is worth mentioning that in some collections the thick and fleshy, almost tuberous roots are very distinctive (e.g., MMA1196, MMA1200, MMA1211), a character probably related to their arid habitat, acting as water storage. Further studies are necessary to evaluate the significance of those populations. Moreover, it has not escaped our notice that some populations (e.g., LEIPOLDT 3137, LEIPOLDT 3860, LIEBENBERG s.n.) approach the lower values in the number of flowers counted in *T. polyantha*. We treat those collections under *T. exuviata*, as to our present knowledge this is just restricted to very few findings and all other diagnostic characters are congruent with those of *T. exuviata*. It is also pointed out that at the first sight juvenile plants of *T. exuviata* may be confused with *T. unifolia*, as they often show only one leaf, but in the former the bulb scales are never distichously ar-

ranged, the cataphylls are usually not solitary, the leaf canaliculate (at least basally) and the roots are thicker.

Additional material studied: SOUTH AFRICA. Northern Cape. Vioolsdrif (2817): Richtersveld, Kambroekop, Namakwaland (-AC?), 13 September 1929, H. HERRE s.n. (NBG!). – Springbok (2917): Little Namaqualand, Distr. Steinkopf (-BC?), October 1926, G. MEYER s.n., Herb MARLOTH 13302 (PRE!). – Hondeklipbaai (3017): 2,1 km west of N7 on way to Namakwa National Park (-BB), 741 m elevation, 25 September 2015, M. MARTÍNEZ-AZORÍN, M. PINTER, M. B. CRESPO & M. Á. ALONSO MMA1196 (ABH!); 3,2 km west of N7 on way to Namakwa National Park (-BB), 699 m elevation, 25 September 2015, M. MARTÍNEZ-AZORÍN, M. PINTER, M. B. CRESPO & M. Á. ALONSO MMA1200 (ABH!); 3,5 km west of N7 on way to Grootvlei (-BB), 762 m elevation, 25 September 2015, M. MARTÍNEZ-AZORÍN, M. PINTER, M. B. CRESPO & M. Á. ALONSO MMA1204 (ABH!); 9,7 km west of N7 on way to Grootvlei (-BB), 645 m elevation, 25 September 2015, M. MARTÍNEZ-AZORÍN, M. PINTER, M. B. CRESPO & M. Á. ALONSO MMA1211 (ABH!); Kamieskroon, ca 3 km N of Kamieskroon on road to Namakwa N.P. (-BB), 795 m elevation, 15 August 2016, M. MARTÍNEZ-AZORÍN, M. B. CRESPO, M. Á. ALONSO, J. L. VILLAR, A. VICENTE, J. MORENO & A. TERRONES MMA1681 (ABH!). – Kamiesberg (3018): Welkom, Khamiesberg, near Garies (-AC), 4000 ft elevation, 16 October 1954, E. ESTERHUYSEN 23724 (BOL!). – Calvinia (3119): Calvinia Div., between Oorlogs Kloof & Papkuilsfontein (-AC), September 1939, C. L. LEIPOLDT 3103 (BOL!); Lokenburg, W. Mt. K. occ. in patches (-CA), ca 2300 ft elevation, 25 September 1955, J. P. H. ACOCKS 18554 (K!).

Western Cape. Vanrhynsdorp (3118): Near Vanrhynsdorp (-DA), September 1895, C. LEIPOLDT s.n. (BOL!); Vredendal road from Vanrhynsdorp (-DA), 8 September 1949, W. F. BARKER 5690 (NBG!); Top of Houbert on Matsikamaberg Pass, SE of Vanrhynsdorp (-DD), 502 m elevation, 31 August 2011, M. MARTÍNEZ-AZORÍN, A. MARTÍNEZ-SOLER & R. MCKENZIE MMA782 (ABH!). – Clanwilliam (3218): Sandveld between Greys Pass & Graafwater also Nardouw Pass (-BA), August 1940, C. L. LEIPOLDT 3137 (BOL!); Near Goedverwacht (-DC), 210 m elevation, 31 August 2017, M. MARTÍNEZ-AZORÍN, M. B. CRESPO, M. Á. ALONSO, M. PINTER MMA1913 (ABH!). – Wuppertal (3219): Willems River, Calvinia, C.P. (-AC), 3000 ft elevation, Sep, C. L. LEIPOLDT 812 (NBG!); Farm Thee River, S of Citrusdal (-CC), January 1979 [in fruit], photo 9 April 1979, MÜLLER-DOBLIES 79017 (PRE, photographs 7415!, 7415-2!); Knolfontein, Swartruggens 60 km NE of Ceres (-DC), 1145 m elevation, 29 September 2006, I. JARDINE & C. JARDINE 492 (NBG!); Knolfontein, Swartruggens 60 km NE of Ceres (-DC), 1162 m elevation, 12 October 2006, I. JARDINE & C. JARDINE 530 (NBG!). – Saldanha (3317): Tops of Hills north of Saldanha Bay (-BB), 6 September 1928, J. HUTCHINSON 301 (BOL!, GRA!, PRE!). – Cape Town (3318): West Coast National Park, Posberg, near view point (-AA), 167 m elevation, 20 September 2015, M. MARTÍNEZ-AZORÍN, M. PINTER, M. B. CRESPO & M. Á. ALONSO MMA1130 (ABH photo!); granite hills above Kreeftebaai, south arm of Saldanha (-AA), 9 September 1966, G. P. ROURKE 587 (NBG!); Plaas Platteklip, Darling District (-AD), September 1981, flowered in PRE, L. C. C. LIEBENBERG s.n. (PRE!);

Sandige Stellen der 3ten Höhe am Tafelberge (-CD), 03 September 1827, C. F. ECKLON 35 (S!, 2 sheets); Cap, im Gebirge bei der Kapstadt (-CD), 1829, C. F. ECKLON & C. L. P. ZEYHER (HAL!); Farm Klipheuvel N of Durbanville (-DA), 15 September 1982, L. VAN ZYL 3146 (NBG!, PRE!); Burgers Post Farm, near Pella (-DA), ca 200 m elevation, 22 November 1979, C. BOUCHER & P. SHEPHERD 4920 (NBG!, PRE!); Post Office with radio masts – just N of Klipheuvel (-DA), 16 September 1982, L. VAN ZYL 3113 (NBG!, PRE!); Paardeberg, between Wellington and Malmesbury, Kwepersfontein (-DB), 312 m elevation, 12 September 2011, G. NICOLSON & D. ROETS 432 (NBG!); In collibus prope Brakenfell (-DC), 300 ft elevation, September 1908, DÜMMER 1988 (E!); Tygerberg Nature Reserve: Areas A & C (-DC), 24 September 1975, LOUBSER 3079 (NBG!); Botlaryberg, on farm Koopmanskloof, NW slope (-DD), ca 1200 ft elevation, 20 September 1988, J. BEYERS 105 (NBG!); Jonkershoek, unt. Hang [lower slope] (-DD), 400 m elevation, 22 November 1946, S. REHM s.n. (M!). – Worcester (3319): Gydouw (-AB), 3 October 1942, C. L. LEIPOLDT 3860 (BOL!); Klip Koppie, Nieuwoudtville (-AC), 5 November 1962, [fruiting], W. F. BARKER 9763 (NBG!); Feuchte schattige Orte in Nieuwekloof (-AC), 500–1000 ft elevation, 18 October 1828, J. F. DREGE 8744b (P!); Swaarmond, Ceres Div. (-AD), 2 October 1924, R. S. ADAMSON s.n. (BOL!); Between Karoo Poort & Ceres (-BA), 30 September 1933, F. M. LEIGHTON 21219 (BOL!); Kap, Du-toits Kloof (-CA), 1000–2000 ft elevation, 1826–1834, J. F. DREGE 8744a (HAL!, K!); Karoo Garden (-CB), 1100 ft elevation, 30 September 1976, M. B. BAYER 248 (NBG!, PRE!); Southern slope of Langerug koppie, Worcester (-CB), 2 September 1980, I. B. WALTERS 2125 (NBG!); S. slope of Quaggasberg (-CD), 800 ft elevation, 18 September 1974, A. MAUVE & I. OLIVER 269 (NBG!). – Montagu (3320): Cogmanskloof (Mr. Conradie's farm), Montagu (-CC), 14 October 1981, A. A. MAUVE & HUGO 257 (PRE!); Langebergen near Montagu (-CC), 28 October 1954, E. ESTERHUYSEN 23864 (BOL!). – Ladismith (3321): Seven Weeks Poort mt., northern slopes (-AD), 2000 m elevation, 30 December 1928, H. ANDREAE 1299 (PRE!); In declivibus montosis – Garcia's Pass in dit. Riversdale (-CC), ca 1500 ft elevation, October 1904, H. BOLUS s.n. (BOL!); Langeberg, Bergfontein (-DC), 470 m elevation, 30 October 1990, D. J. McDONALD 1971 (NBG!); Langeberg, Bergfontein, along path from Bergfontein to Welgevonden on lower S slopes of Witelsvoorberg (-DC), 470 m elevation, 30 October 1990, D. J. McDONALD 1971 (PRE!). – Oudtshoorn (3322): In saxosis in summi Zwartberg Pass – in dit. Prince Albert (-AC), ca 5200 ft elevation, December 1904, H. BOLUS 11654 (BOL!). Caledon (3419): Babylonische Thurms Berge [Babilonstoringberge], 2te Höhe (-AC), November 1825, C. F. ECKLON (S!); +/- 12 km NW of Napier, Fairfield Farm (-BD), 180 m elevation, 11 November 1994, J. KEMPER 743 (NBG!). – Bredasdorp (3420): De Hoop (-AD), <200 m elevation, October 1969, C. V. v. d. MERWE 1163 (PRE!); Bokkerivier Farms, flat SE of camping site (-BB), 9 November 1963, N. HORROCKS 115 (NBG!); Potberg, Klipfontein farm at lower NW slopes of Potberg (-BC), 180 m elevation, 19 October 1978, BURGERS 1485 (PRE!). – Riversdale (3421): Vermaaklikheid (-AC), 60 m elevation, 12 October 1985, P. BOHNEN 8614 (NBG!); 10 miles S of Albertinia, Riverdale Div. (-BC), ca 600 ft elevation, 6 November 1962, J. P. H. ACOCKS 22883 (PRE!).

Eastern Cape. Steytlerville (3324): Vryheid Farm, Suuranys Mountains (-CC), 1 October 1984, C. H. STIRTON 10899 (NBG!). – Port Elizabeth (3325): Farm Stockdale 387 (east of Aasvoelkrans, Pearston region), Sneeu-berg, Between homestead and first poplar grove along the Naudeshoekspruit (-AD), 1350 m elevation, 31 October 2006, V. R. CLARK & S. RAMDHANI 130 (GRA!); Port Elizabeth (-DC), s.d., LAIDLEY s.n. (Z!); Port Elizabeth (-DC), October 1928, D. CORY 44 (GRA!); Port Elizabeth (-DC), 25 October 1908, J. F. DREGE 294 (GRA!, sheet I & II); Grassy flat 3 m west of Port Elizabeth (-DC), 28 October 1946, F. H. HOLLAND 4366 (BOL!); near Port Elizabeth, Redhouse (-DC), 27 November 1996, R. URTON 1170 (GRA!); Wellington Park, north facing slope (-DC), 3 November, M. VATES s.n. (GRA!); near the Zwartkops River, Uitenhage Div. (-DC), 50–500 ft elevation, C. L. P. ZEYHER 4248 (K!); Humewood (-DC), October 1911, T. V. PATERSON 2167 (GRA!). – Grahamstown (3326): Rockcliff near Sidbury (-AC), November 1904, M. DALY 803 (GRA!, PRE!); Ght commonage, (Glen Graig) between brick factory and dam (-BC), 14 November 2009, A. P. DOLD s.n. (GRA!); Waaiheuvel, Alex. District (-CB), 30 November 1953 [in fruit], E. E. A. ARCHIBALD 5367 (GRA!); Bushman's River – Spadena Halt (-DA), 200–300 ft elevation, 10 October 1952, E. E. A. ARCHIBALD 4508 (GRA!, specimen & drawing); Bushman's River Bridge (-DA), 500 ft elevation, 23 October 1953, E. E. A. ARCHIBALD 5314 (PRE!).

3.2.4. *Tenicroa fibrosa* M. PINTER, MART.-AZORÍN, M. B. CRESPO & WETSCHNIG, *spec. nova* (Fig. 4)

Type: SOUTH AFRICA. Western Cape. Vanrhynsdorp (3118): 21 m. S.S.W. of Vredendal (-CD), ca 500 ft elevation, 26 August 1958, J. P. H. ACOCKS 19713 (holotype: PRE!; isotypes: BOL!, M!)

Description: Deciduous bulbous plant. Bulb hypogeous, solitary, ovoid, 2.5–4 × 4–5.5 cm, outer tunics dry, dark-brown, often solid, inner scales yellowish, compact; cataphyll solitary, sheathing, membranous, greyish, with raised brownish transverse ribs. Leaves present at flowering time, 6–16, filiform, terete, rigid, ca 10–35 × 0.1 cm, stiff, green, glabrous, bases of leaves of previous shoot generations persistent around the apical part of the bulb forming a fibrous neck. Inflorescence a stalked raceme, erect, 1 per bulb; scape 10–25 cm long, ca 2 mm in diam. at base, purplish-brown at the base, greenish to the tip; raceme dense to moderately dense, 1.3–4.5 cm long, 5–20(–30)-flowered, all-sided; bracts ovate-lanceolate, acuminate, ca 4–5 mm long, distinctly spurred; spur acute, lowermost about as long as the bract; pedicels erectopate, spreading, ca 5–10 mm long. Flowers diurnal, fragrant, stellate; perigone spreading patent; tepals 6, elliptic-oblong, almost free, 8–12 × 4–6 mm, white with a narrow, purplish-green longitudinal median stripe, better defined on the abaxial side. Stamens erect to spreading, somewhat curved, 6–8 mm long; filaments 6, filiform, basally adnate to the perigone for < 1 mm; the free parts 4–6 mm long,

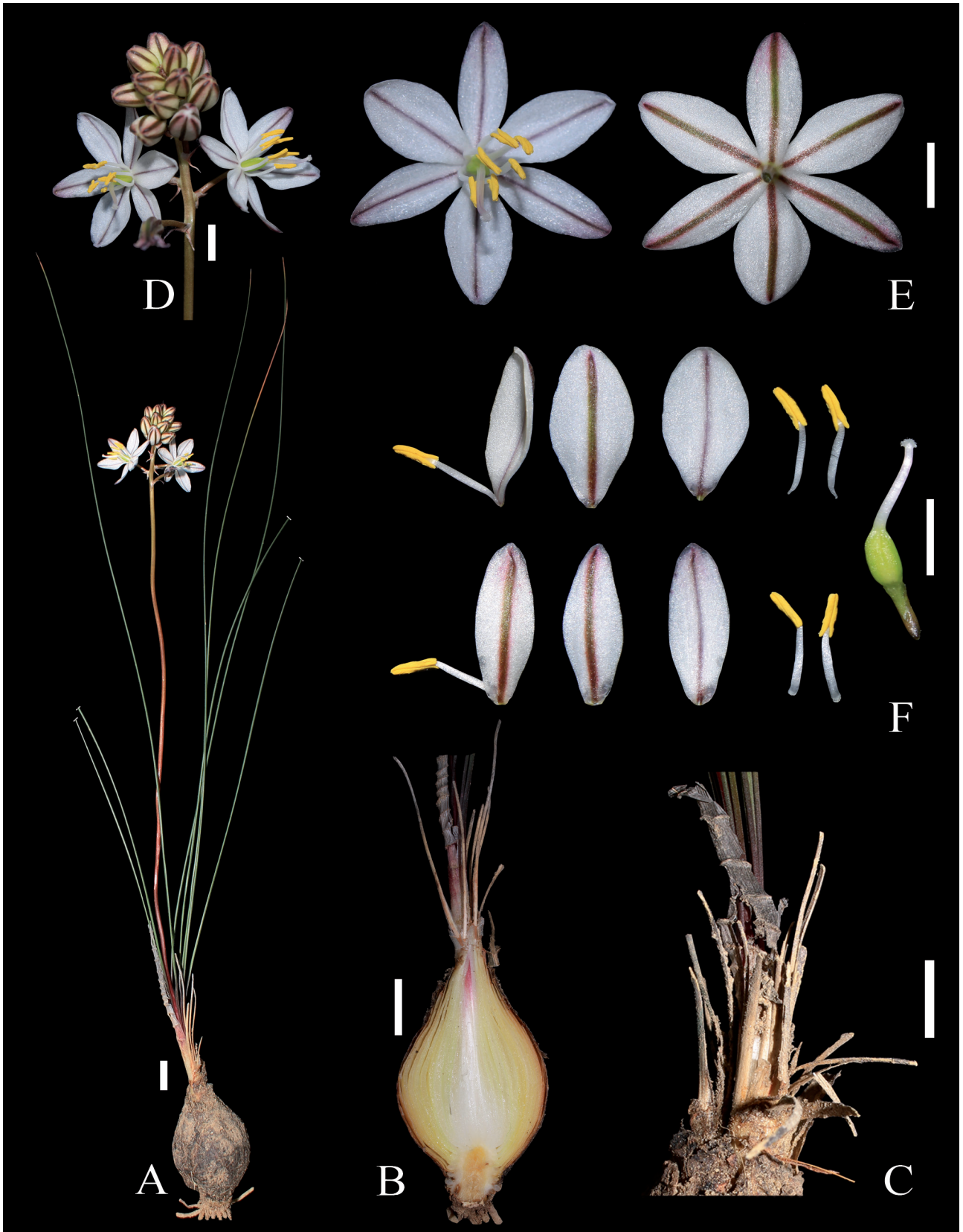


Fig. 4. *Tenciroa fibrosa* M. PINTER & al. (corresponding to MMA1203). (A) Habitus of a whole plant. – (B) Bulb in longitudinal section. – (C) Detail of the sheathing cataphyll. – (D) Raceme. – (E) Flower in apical and dorsal view. – (F) Dissected flower: inner tepals and stamens above, outer ones below, and gynoecium. Scale bars: A–C 1 cm, D–F 5 mm.

white, smooth; anthers 6, yellow, subbasifixed, oblong, 2.5–3.2 mm long, dehiscent with longitudinal slits up to the whole thecae length. Ovary elliptic, 3–4 × 2 mm, pale green, glabrous; style elongate, deflexed and slightly sigmoid, 5–6 mm long, protruding downwards from the fascicle of filaments below the anthers, white; stigma papillate. Capsules elliptic-oblong, 10–13 × 6–7 mm in lateral view. Seeds unknown.

Etymology: Named after the characteristic persistent dry leaf-bases of previous shoot generations around the apical part of the bulb forming a fibrous neck. (lat., fibra = fibre; fibrosus = covered in fibres), resembling those of some species in the *Albuca setosa* species complex.

Phenology: In habitat *Tenicroa fibrosa* flowers from mid August to September and it is expected that fruits appear from late September to October.

Habitat: This species can be found in the Fynbos and the Succulent Karoo Biome, where it occurs in sandy and loamy-sandy soil. In the Fynbos Biome it occurs in the more arid vegetation units classified as FFs1 Bokkeveld Sandstone Fynbos and FFd 2 Leipoldtville Sand Fynbos which are characterised in having a winter-rainfall regime with rain peaking from May to August. The mean annual precipitation ranges from 130–450 mm, the mean annual temperature is between 17–18 °C, and frost occurs 3–10 days per year. The population known in the Succulent Karoo Biome is found in SKn 1 Namaqualand Klipkoppe Shrubland, characterised by seasonal winter-rainfall with rain events occurring from May to September, episodic periods of drought of one or two years in succession (MAP: ca 160 mm) and dew present in winter. Mean annual temperature is 16.6 °C and frost occurs for about 8 days per year, but can vary widely every year (MUCINA & RUTHERFORD 2006).

Distribution: To date the species is known from the type locality SSW of Vredendal and very few other collections on the Bokkeveld Plateau and Namaqualand (Fig. 11f). Further research is needed to ascertain the whole distribution of the species.

Diagnostic characters: *Tenicroa fibrosa* is characterized by the solitary, ovoid bulb with dark-brown, often hardened outer tunics, the solitary cataphyll, the 6–16 filiform, rigid leaves, and the bases of leaves of previous shoot generations persistent around the apical part of the bulb forming a distinct fibrous neck. *T. fibrosa* may be confused with *T. filifolia* or smaller forms of *T. exuviata*, but the latter is distinguished by the globose bulb with scarious outer tunics being pale brown or dirty yellow, numerous cataphylls, and the usually 3–5 canaliculate, coriaceous leaves. From *T. filifolia* it can be distinguished by the solitary cataphyll [vs several],

the distinct fibrous neck [vs no fibres or just very few persistent leaf-bases never fibrous], the linear, terete, stiff, rigid leaves [vs leaves hemiterete, often sigmoid] and the erect, straight scape [vs being sigmoid in parts].

Additional material studied: SOUTH AFRICA. Northern Cape. Hondeklipbaai (3017): 3.5 km west of N7 on way to Grootvlei (-BB), 762 m elevation, 25 September 2015, M. MARTÍNEZ-AZORÍN, M. PINTER, M. B. CRESPO & M. Á. ALONSO MMA1203 (ABH!). – Calvinia (3119): between Oorlogskloof & Papkuilsfontein (-AC), September 1939, C. L. LEIPOLDT 3102 (BOL!). – Cape Town (3318): Seven Sisters Mt. (-DB), 4200 ft elevation, 14 January 1951, E. ESTERHUYSEN 18320 (BOL!, PRE!).

3.2.5. *Tenicroa filifolia* (JACQ.) OBERM., J. S. African Bot. 47: 577 (1981). (Fig. 1a, 5)

Basionym: *Anthericum filifolium* JACQ., Icon. pl. rar. 2: 18, t. 414 (1794). — Type: SOUTH AFRICA. Crescit apud Namaquas ad Promontorium bonae Spei. Lectotype: icon in JACQUIN (1794: t. 414) (Fig. 1a). – Epitype designated here: Western Cape. Simonstown (3418): Cape Peninsula, Karbonkelberg, locally common on burnt patch on upper slopes (-AB), 29 October 1944, F. M. LEIGHTON 754 (BOL125703!).

= *Phalangium filifolium* (JACQ.) POIR. (POIRET 1804: 242).

= *Albuca filifolia* (JACQ.) KER GAWL. (KER GAWLER 1821: t. 557).

= *Urginea filifolia* (JACQ.) STEINH. (STEINHEIL 1834: 329).

= *Pilasia filifolia* (JACQ.) RAF. (RAFINESQUE 1837: 536).

= *Ornithogalum filifolium* (JACQ.) KUNTH (KUNTH 1843: 369).

= *Sypharissa filifolia* (JACQ.) SALISB. ex OBERM. (OBERMEYER 1980: 113).

= *Drimia filifolia* (JACQ.) J. C. MANNING & GOLDBLATT (in GOLDBLATT & MANNING 2000: 711).

= *Anthericum spiratum* THUNB. (THUNBERG 1794: 62) — Syntypes: “Cap. b. spei”, THUNBERG s.n. (UPS-8413, UPS-8414, microfiche!).

= *Tenicroa planifolia* U. MÜLL.-DOBLIES & D. MÜLL.-DOBLIES nom. nud. in sched.

= *Sypharissa planifolia* U. MÜLL.-DOBLIES & D. MÜLL.-DOBLIES nom. nud. in sched.

Description: Deciduous bulbous plant. Bulb hypogeous, solitary, occasionally enclosing 2–3 daughter bulbs, ovoid to pyriform, 3.4–4.5 × 5–7 cm (incl. neck), outer tunics brown when drying, membranous, inner scales whitish, thin, somewhat loose; cataphylls 2–4, sheathing, membranous-scarious, brownish, sometimes somewhat purplish at the base, with raised brownish transverse ribs, often partially torn or withered above. Leaves present at flowering time, 4–8(–15), fili-

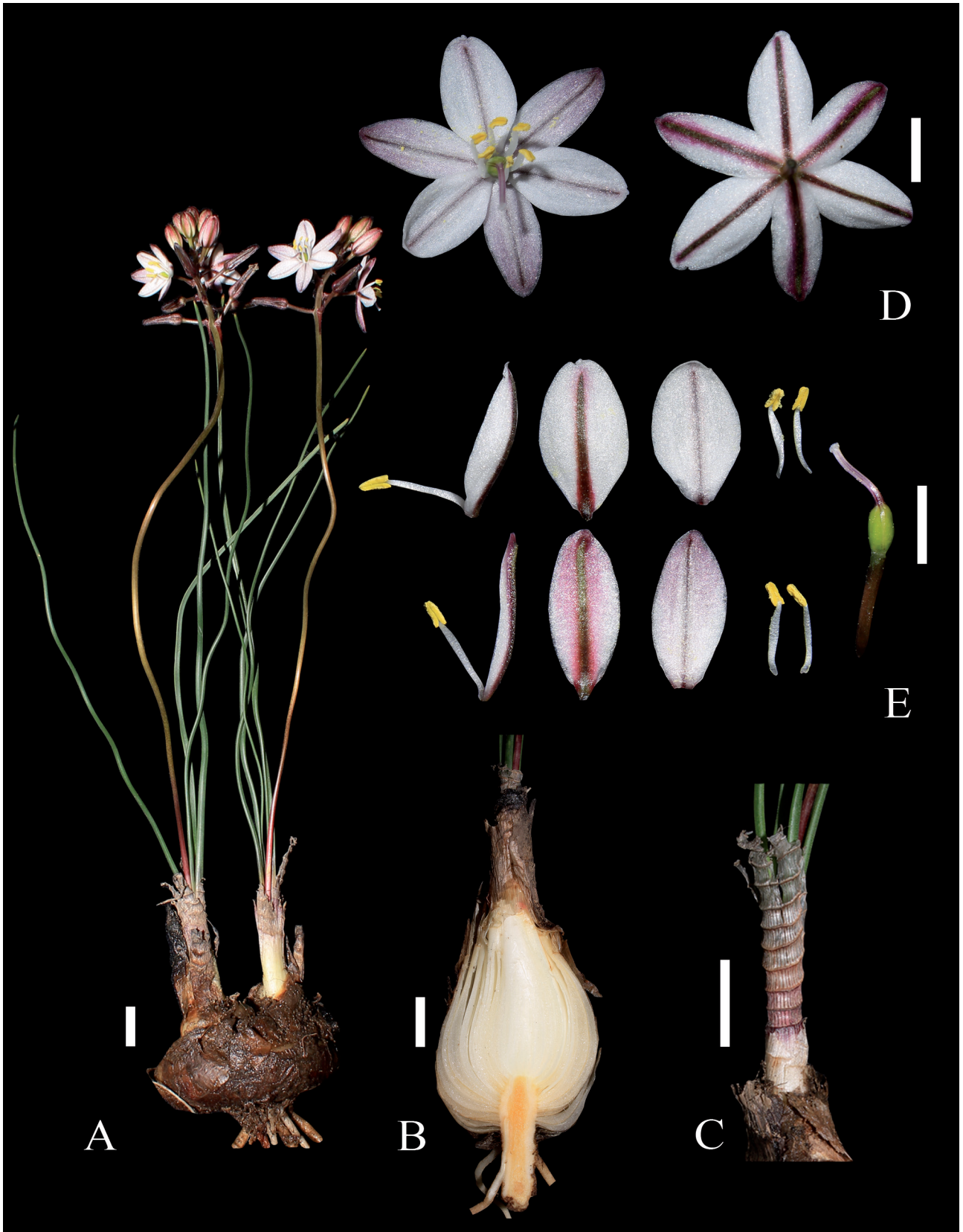


Fig. 5. *Tenucroa filifolia* (JACQ.) OBERM. (corresponding to MMA1106). (A) Habitus of a whole plant. – (B) Bulb in longitudinal section. – (C) Detail of the sheathing cataphyll. – (D) Flower in apical and dorsal view. – (E) Dissected flower: inner tepals and stamens above, outer ones below and gynoecium. Scale bars: A–C 1 cm, D–E 5 mm.

form, hemiterete, coriaceous to rigid, usually characteristically flexuose in shape, 13–26 × 0.15–0.2 cm, dark green, glabrous. Inflorescence a stalked raceme, erect, 1 per bulb; scape 10–25 cm long, 1.5 mm in diam. at base, basally red, upper portions greenish; raceme moderately dense, 2–2.5 cm long, 7–16-flowered, all-sided; bracts ovate-lanceolate, acuminate, 4 mm long, distinctly spurred; spur acute, lower ones 7–9 mm long, upper ones gradually reduced in length, ca 2 mm long; pedicels erecto-patent, spreading, 6–8 mm long. Flowers diurnal, fragrant, stellate; perigone spreading to patent; tepals 6, elliptic, almost free, 10–10.5 × 4–5.5 mm, white with a narrow, green and pinkish longitudinal median stripe better defined on the abaxial side. Stamens erect to spreading, somewhat curved, 6–6.5 mm long; filaments 6, filiform, basally adnate to the perigone for < 1 mm; the free parts 5 mm long, white, smooth; anthers 6, yellow, subbasifixed, oblong, 1.8–2 mm long, dehiscing with longitudinal slits up to the whole thecae length. Ovary ovate-oblong, 4 × 1.5 mm, light green, glabrous; style elongate, deflexed and sigmoid, ca 5 mm long, protruding downwards from the fascicle of filaments below the anthers, white to whitish; stigma papillate. Capsules oblong-globose, 8–9 × 6–7 mm in lateral view. Seeds many, irregularly elliptical to irregularly circular, flat, papery-winged, 3–5 × 2–3 mm in lateral view, dark brown to black, with a loose, verrucous, shiny testa.

Etymology: Named after the filiform leaves of the species (lat., filum = thread, string, filament; -folius, -a, -um = -leaved).

Phenology: Plants flower in habitat from September to October and fruits appear in November. Some populations are flowering later in November to early December and interestingly those are mainly from higher altitudes, which may have an influence on the blooming period.

Habitat: *Tenicroa filifolia* is known from various vegetation units throughout the Fynbos Biome. It is growing in sandy to loamy soils exemplarily in Olifants Sandstone Fynbos FFs3, Kogelberg Sandstone Fynbos FFs11, Boland Granite Fynbos FFg2, Peninsula Granite Fynbos FFg3, and Swartland Granite Renosterveld FRg2. All are characterized by a regime of winter-rainfall peaking from May to August. The ground mainly consists of acidic lithosol soils deriving from Ordovician Sandstones of the Table Mountain Group or from Cape Granite. The precipitation varies at a very broad scale from 250 to 3000 mm per year and heavy mist precipitation is common to summits and adjacent south- and east-facing slopes in FFs11, whereas like in FFg2 mists are common in winter. The mean annual temperature lies between 14 and 16 °C and the frost incidence is between 2–3 days a year, but can occur up

to 10 days in the Olifants Sandstone Fynbos (MUCINA & RUTHERFORD 2006).

Distribution: The species is fairly frequent from the Cape Peninsula to the north as far as Clanwilliam and Vanrhynsdorp, as well as to the east as far as Bredasdorp and Swellendam. Few populations are also known from the Northern Cape in the Kamiesberg Mountains. (Fig. 11b).

Diagnostic characters: JACQUIN (1794: 18, t. 414) described *Anthericum filifolium* with a very brief diagnosis as follows “filamentis glabris; radice bulbosa; foliis filiformibus, flexuosis, glabris; scapo simplice, flexuoso”. All characters mentioned are shared with the other species in the genus, except the leaves and scape being ‘flexuosus’ (= sigmoid, gently curved). The full, more detailed description follows, as often in JACQUIN’S descriptions, in *Collectaneorum supplementum* (JACQUIN 1796: 93–94). In our extensive herbarium and field studies we came across localities and many collections with plants fitting with JACQUIN’S plant. So the combination of the filiform, hemiterete, coriaceous to rigid leaves often with sigmoid curves, the inflorescence about as tall as or only slightly taller than the leaves, the characteristic shape of the scape also being sigmoid in parts and the ovoid to pyriform bulb which occasionally encloses 2 or 3 daughter bulbs are the distinctive characters for *T. filifolia*. A point to consider is that in very few collections there can be parts of single or just very few persistent leaf-bases, but never fibrous neither forming a distinct neck like in the related *T. fibrosa*. Furthermore, in *T. fibrosa* the leaves are terete and linear [vs hemiterete and distinctly flexuose in *T. filifolia*].

Additional material studied: SOUTH AFRICA. Northern Cape. Kamiesberg (3018): Between Buffels River & Pedros Kloof (-AA), 2000–3000 ft elevation, s.d., J. F. DREGE 2677 b (K!); Kamiesberg Mountains, Farm Damsland ± NW of ruined homestead (-AC), 1130 m elevation, 29 October 2007, D. A. SNIJMAN 2201 (NBG!). – Calvinia (3119): Nieuwoudtville (-AC), 15 November 1930, E. E. GALPIN 10509 (PRE!).

Western Cape. Vanrhynsdorp (3118): Klaver (-DC), August 1932, G. J. LEWIS s.n. (BOL!); Giftberg [Gifberg] (-DD), 2 September 1948, R. H. COMPTON 20784 (NBG!). – Clanwilliam (3218): Clanwilliam, am Fluss Olifantsrivier und bei Villa Brakfontein (-BD), September, C. L. ZEYHER 76.9 (E!, GH!, GRA!, HAL!, PRE!, UPS!, WU!); Clanwilliam (-BD), C. L. P. ZEYHER s.n. (K!). – Wuppertal (3219): On road to Heuningvlei (-AA), 25 October 1977, I. M. EMDON 130 (NBG!); Cederberg S. F., Welbedacht flats (-AC), 920 m elevation, 22 October 1989, D. C. LE MAITRE 590 (NBG!, PRE!); Duiwelsgat, Grasvlei (-AC), 22 November 1996, M. W. VAN ROOYEN, H. M. STEYN & A. J. DE VILLIERS 279 (NBG!); Cederberg, Middelberg Plateau (-AC), 4200 ft elevation, September 1927, R. H. MARLOTH 2213 (BOL!); Cedarberg Forest Reserve: Base of Rondeheuvel, near Driehoek (-AC), 28 October 1977, I. M. EMDON 202 (NBG!, PRE!); Eikerbom, Clanwilliam Div. (-AC), 26 September

1934, F. M. LEIGHTON 21619 (BOL!); Ezelbank (-AC), October 1929, J. THODE A2097 (NBG!, PRE!); Ezelbank (-AC), 3000-4000 ft elevation, October 1929, J. THODE s.n. (NBG!); Clanwilliam Div., Modderfontein (-CA), 6 September 1933, R. H. COMPTON 4288 (NBG!); Modderfontein, Clanwilliam D. (-CA), 1 September 1930, M. C. GILLET 3680 (NBG!); Citrusdal (-CA), 1 September 1951, W. F. BARKER 7395 (NBG!); Citrusdal vlei (-CA), 10 September 1945, R. H. COMPTON 17108 (NBG!); Cederberg – Gonnafontein. N of track near plot 20 (-CB), 900 m elevation, 7 October 2000, U. POND UP187 (NBG!); Bottom of Dasklip Pass, Porterville side (-CC), c. 500 m elevation, 7 October 1981, A. A. MAUVE & HUGO 14 (NBG!, PRE!); 60 km NE of Ceres, Knolfontein, Swarttruggens (-DC), 1220 m elevation, 2 November 2010, I. JARDINE 1446 (NBG!); Knolfontein, Swarttruggens, 60 km NE of Ceres (-DC), 1204 m elevation, 24 October 2011, I. JARDINE 1708 (NBG!). – Cape Town (3318): In arenosis prope Hopefield (-AB), 13 September 1894, R. SCHLECHTER 5327 (GRA!, Z! 2 sheets); In fields near Hopefield (-AB), September 1931, J. C. LETTY 24 (PRE!); Sandige Stellen bei Klipfontein (-AD), C. L. P. ZEYHER 4249 (K!); Mamre Hills (-AD), 22 September 1943, R. H. COMPTON 14950 (NBG!); Near Waylands Nature Reserve, ca 4 km south east of Darling (-AD), 151 m elevation, 20 September 2015, M. MARTÍNEZ-AZORÍN, M. PINTER, M. B. CRESPO & M. Á. ALONSO MMA1127 (ABH!); Darling Flora Reserve (-AD), 18 September 1967, W. F. BARKER 10507 (NBG!, 2 sheets); Darling Reserve (-AD), 11 October 1967, [flow. Nat. Bot. Garden 13 August 1968, Fig. for F. P. A. by A. v. d. MERWE (100)] A. A. MAUVE s.n. (PRE!); Darling distr., Voetomgewig van rotsige kop van naasaan plaas tot Platteklip (-AD), September 1976, L. C. C. LIEBENBERG 8265 (K!, PRE!); Darling, Farm Platteklip (-AD), September 1976 [in cult.], L. C. C. LIEBENBERG 8265A (PRE!, photograph 7190-1); Farm Platteklip near Darling (-AD), October 1976 [in cult.], L. C. C. LIEBENBERG 8265A (PRE!, photograph 7190-3); Mamre Hills (-CB), 22 September 1942, W. F. BARKER 2357 (NBG!); Camps Bay, lower hillsides, Blinkwater, Cape Peninsula (-CD), 12 September 1956, CASSIDY 27 (NBG!); ofvanför [above] Camps Bay (-CD), 17 September 1936, A. HAFSTRÖM s.n. (S!); In clivis montis tabularis (-CD), 600 ft elevation, October 1908, R. NELSON 635 (E!); steinige Stellen der 3. Höhe auf der nördlichen Seite des Tafelberges (-CD), 3 September 1827, C. F. ECKLON 35 (S!); Cape Town (-CD), s.d., F. A. ROGERS 1617 (Z!); västsidan af Taffelberget [west side of Table Mountain] (-CD), 25 September 1936, A. HAFSTRÖM & G. LINDBERG (S!); Post Office property with radio masts – just N of Klipheuvel (-DA), 16 September 1982, L. VAN ZYL 3189 (NBG!, PRE!); Klein Dassenberg, Kanonkop, eastern hill (-DA), 6 September 1986, A. FELLINGHAM 1152 (NBG!); Wellington (-DB), 13 September 1941, R. H. COMPTON 11625 (NBG!); Paardeberg, between Wellington and Malmesbury. Kwepersfontein, ± 400 m SE of labourers cottages (-DB), 265 m elevation, 14 September 2011, G. NICHOLSON & D. ROETS 469 (NBG!); Wellington (-DB), October 1915, R. MARLOTH 7139 (PRE!); sandige Stellen der Fläche bei Duikersvallei [Duikersvlei] (-DC), 16 February 1827, C. F. ECKLON s.n. (S!); Langverwacht above Kuils River: main kloof (-DC), 221 m elevation, 1 October 1973, E. G. H. OLIVER 4705 (PRE!); On hills west of Elsjes River [Elsies Rivier] (-DC), 8 September 1918, N. S. PILLANS 4107 (BOL!); Damp, sandy place near Bottelary Rd. (-DD), 8 September 1934, J. P. H. ACOCKS 2407 (S!); Jonkershoek belt 13 EN, the eastern

segment of the large cut-off belt 13 at Jakkalsvlei, burnt 4-yearly, northern side of valley, with steepish SW slope (-DD), 1300-2300 ft elevation, 24 October 1962, H. C. TAYLOR 4191 (NBG!); Jonkershoek State Forest, below Swartboskloof parking area (-DD), 368 m elevation, 20 September 1977, E. F. KRUGER 293 (NBG!, PRE!); Banhoek Valley (-DD), 1 October 1945, E. ESTERHUYSEN 11924 (BOL!, PRE!); Jonkershoek belt 13, Jonkershoek Forest Reserve, the eastern segment of the large cut-off belt 13 at Jakkalsvlei, burnt 4-yearly, northern side of valley, with steepish SW slope (-DD), 1300-2300 ft elevation, 1 September 1963, H. C. TAYLOR 5147 (PRE!); Jonkershoek, Stellenbosch (-DD), 18 September 1943, F. Z. VAN DER MERWE 2687 (PRE!); Jonkershoek State Forest Valley (-DD), ca 1200 ft elevation, 13 October 1975, E. F. KRÜGER 38 (NBG!, PRE!); Biesievlei, Jonkershoek (-DD), 1050 ft elevation, 7 November 1945, H. B. RYCROFT 1013 (PRE!); Jonkershoek Nature Reserve, south of end side of Dam (-DD), 285 m elevation, 17 September 2015, M. MARTÍNEZ-AZORÍN, M. PINTER & M. B. CRESPO MMA1106 (ABH!). – Worcester (3319): De Hoek, Saron, Tulbagh C.P. (-AA), 11 September 1949, W. F. BARKER 5831 (NBG!, sheet I & II); Saron flats, Tulbagh C.P. (-AA), 9 September 1960, W. F. BARKER 9230 (NBG!); On road to Visgat – Agterwitzenbergvlakte (-AA), 29 October 1977, I. M. Emdon 254 (PRE!); Ceres Div., Gydouw (-AB), 3 October 1942, C. L. LEIPOLDT 3861 (BOL!); Gydo (-AB), 4000 ft elevation, 10 November 1946, R. H. COMPTON 18747 (NBG!); Prince Alfreds Hamlet (-AD), 6 October 1941, R. H. COMPTON 11975 (NBG!); Flats N.W. of Prince Alfred Hamlet (-AD), 150 ft elevation, 9 October 1974, E. G. H. OLIVER 5053 (NBG!, PRE!); Ceres – Ceres Peak (-AD), October 1933, J. P. H. ACOCKS 1855 (S!); Michells Pass, slope below Castle Rocks (-AD), 16 November 1947, E. ESTERHUYSEN 14155 (BOL!); Michells Pass, stony slopes above kloof (-AD), 16 November 1952, E. ESTERHUYSEN 20723 (BOL!); In shallow soil on rocky S slopes of Castle Rocks (-AD), 5 December 1948, E. ESTERHUYSEN 14689 (PRE!); In clivis montis Hex River Valley (-BC), 1000 ft elevation, 1881, W. TYSON 600 (GRA!, PRE!); Dutoits Kloof (-CA), 3000-4000 ft elevation, J. F. DREGE 8744aa (K!, P!); Dutoits Kloof (-CA), 1000-2000 ft elevation, J. F. DREGE 8744a (S!); Bains Kloof (-CA), 3000 ft elevation, 17 January 1945, R. H. COMPTON 16915 (NBG!); Baviaanskloof, Bains Kloof Mt. (-CA), 3000 ft elevation, 2 January 1940, E. ESTERHUYSEN 1785 (BOL!); Wellington, Bainskloof (-CA), 26 November 1998, J. C. MANNING 2205 (NBG!); Valley at foot of Slanghoek Pile (-CA), 7 September 1998, P. GOLDBLATT & J. C. MANNING 11008 (MO!); In ericetis in convalle flum. Breede River prope „Darling Bridge“ (-CA), 800 ft elevation, November 1879, H. BOLUS s.n. (BOL!); near Worcester (-CB), August 1980, flowered PRE September 1981, MÜLLER-DOBLIES 80134 (PRE!, 2 sheets); near Worcester (-CB), September 1980, MÜLLER-DOBLIES 80134 (PRE-photo 7862-3!); Onk-laarberg 20 miles S of Worcester (-CB), December 1924, R. H. MARLOTH 117 (PRE!); Franshoek Pas [Franschoek Pass] (-CC), October 1934, P. M. VAN NIEKERK (NBG!); French Hoek Pass [Franschoek Pass] about 1 km south of summit above road (-CC), 701 m elevation, 9 October 1973, C. BOUCHER 2334 (PRE!); Between Worcester & Villiersdorp (-CD), 1 October 1951, W. F. BARKER 7528 (NBG!); On farm “Kanetvlei” Mr. J. C. FAURE, near homestead in sandy soil (-DA), 18 September 1980, I. B. WALTERS 2247 (NBG!). – Montagu (3320): Poort N of Pienaarskloof, Ceres Div.

(-AA), ca 945 m elevation, 12 September 1965, J. P. H. ACOCKS 23709 (M!, PRE!); Constable, Worcester Div. (-AD), 4 October 1940, E. ESTERHUYSEN 4381 (BOL!); Constable, Laingsburg (-AD), 4 October 1940, P. BOND 665 (NBG!); Donker Kloof, Montagu (-CC), 26 September 1946, W. F. BARKER 18492 (NBG!). – Ladismith (3321): Muiskraal Vley near Garcias Pass (-CC), ca 1200 ft elevation, 3 October 1897, GALPIN 4747 (PRE!); Attakwaskloof, near summit of old Vortrekker Pass (-DD), 2800 ft elevation, 22 November 1972, K. R. VISSER 38 (NBG!). – Simonstown (3418): Hout Bay, Cape Peninsula (-AB), 4 September 1941, R. H. COMPTON 11296 (NBG!, 2 sheets); Llandudno, Cape Peninsula (-AB), 18 September 1943, R. H. COMPTON 14814 (NBG!); Karbonkelberg (-AB), 1800 ft elevation, 29 October 1944, R. H. COMPTON 16351 (NBG!); In clivis pone summum Houts Bay prope Cape Town (-AB), 250 ft elevation, October 1891, MACOWAN 1562 (GH!, K!, PRE!, Z!); Klein Leeukop Mt. (-AB), 28 September 1981, C. H. STIRTON 9445 (PRE!); Cape of Good Hope, Simon's Bay (-AB), September 1855, C. WRIGHT 221 (K!, P!); Cape Peninsula, Seepage zone in sandy soil above Kommetjie township (-AB), 14 September 1974, P. GOLDBLATT 2647 (PRE!); Kommetjie hills, Cape Peninsula, C.P. (-AB), 20 September 1949, M. STEYN 647 (NBG!); Between Modderdam & Redhill, Cape Peninsula (-AB), 19 September 1967 [collected in fruit 11 November 1965, Fld. Hort. Herb. 19 September 1967, Fld. Hort. Herb. 26 September 1967], W. F. BARKER 10363 (NBG!); Between Modderdam & Redhill, Cape Peninsula (-AB), 11 November 1965 [in fruit], [Flowered in garden 27 September 1966], W. F. BARKER 10363 (NBG!); Cape Peninsula: at the south-western slope of Red Hill near Simonstown (-AB), 15 September 1938, E. WALL s.n. (S!); Fish Hoek (-AB), 13 September 1896, A. H. WOLLEY DOD 1782 (BOL!); Cape de Bonne-Espérance (-AD?) 1831, J. VERREAUX (TCD!); Cap du b. esp. [Cap de Bonne Espérance] (-AD?), s.d. (P!); C.B.S. [Caput bonæ spei] (-AD?), s.d., W. H. HARVEY 819 (K!); Prom. bon. spei [Promontorio bonæ spei] (-AD?), 1800-1817, HESSE s.n. (HAL!); Faure, Ollemans Vlei (-BB), 24 September 1950, M. E. JOHNS s.n. (NBG!); Lower Wellington, Sneeuwkop (-BB), s. d., E. ESTERHUYSEN 12486 (BOL!); Helderberg ½ way up (-BB), 23 October 1928, J. B. GILLET 1797 (BOL!); Kleinmond, Kogelberg State Forest, about 1 km NE of Oudebosch house (-BD), 60 m elevation, 10 October 1991, VLOK, VAN WYK & SCHUTTE 16 (NBG!, sheet I & II); Kogelberg State Forest, In Palmiet River bed (-BD), 40 m elevation, 18 December 1991, I. KRUGER 197 (NBG!). – Caledon (3419): hills near Grabouw (-AA), 300 m elevation, October 1924, H. ANDREAE 1084 (NBG!, PRE!); above Houw Hoek (-AA), 20 September 1938, M. C. GILLET 4290 (K!); Slopes of the Groenland Mts. above Molteno Trust Farms (-AA), 11 October 2000, P. GOLDBLATT 11635 (MO!); Lekkerwater, Caledon (-AB), 9 November 1941, W. F. BARKER 1886 (NBG!); Farm Rootheuwel, N of Babilonstoringberge (-AC), 4 September 2001, D. SNIJMAN 1840 (NBG!); Bot River [Botrivier] (-AC), 6 October 1955, G. VAN NIEKERK 651 (PRE!); Tussen huistuin [between gardens], Botrivier (-AC), 400 ft elevation, 27 September 1929, G. C. NEL s.n. (NBG!); W. Grenzmondvlei, Hermanus (-AC), 30 September 1928, M. C. GILLET 3 (BOL!); Kleinmond, voet van berg (-AC), June 1948, M. P. DE VOS 1076 (NBG!); Hermanus, Copull Farm, Road to Stanford (-AD), 10 m elevation, 24 September 1991, S. L. WILLIAMS 1313 (MO!); Zwellendam, auf den Bergen in Kleinrivierskloof (-AD),

1000-3000 ft elevation, C. L. P. ZEYHER 129 (PRE!); Upper north slope of Galgeberg (-BA), 14 December 1981, E. VAN JAARSVELD & A. BEAN 6465 (NBG!); Drayton siding (-BA), 16 October 1984, P. L. PERRY 3221 (NBG!); Bushmans River, Swellendam (-DA), 24 September 1941, R. H. COMPTON 11913 (NBG!); Bosheuwel (-DD), 40 m elevation, 16 October 1986, R. M. COWLING 3206 (NBG!). – Bredasdorp (3420): Bontebok Park, Bredasdorp (-AB), 8 October 1950, B. E. MARTIN 584 (NBG!); Swellendam (-AB), October 1917, R. MARLOTH 8634 (PRE!).

3.2.6. *Tenicroa flexuosa* (ADAMSON) M. PINTER, MART.-AZORÍN, M. B. CRESPO & WETSCHNIG, **comb. nova**

Basionym: *Urginea flexuosa* ADAMSON, J. S. African Bot. 8: 240 (1942). — **Type:** SOUTH AFRICA. Western Cape. Cape Town (3418): Cape Peninsula, Smitswinkel Bay (-AD), 3 January 1941, ADAMSON 3099 (holotype: BOL140326!; isotypes: NBG sub SAM0056131-0!, K000257378!).

Description: Deciduous bulbous plant. Bulb hypogeous, solitary, broad ovate, somewhat compressed laterally, 1.5–2 × 2–2.5 cm long, whitish, outer tunics thin, membranous, brownish, inner scales thicker and fleshy, scales compact to slightly loose, elongated apically and forming a distinct neck up to 3 cm; cataphyll sheathing, membranous, whitish or brownish, with purplish to brownish transverse ribs. Leaves present at flowering time, usually 2 (rarely 1 or 3), hemiterete, upper side flat, 20–35 × 0.1–0.15 cm, sinuous, flexuous, glabrous. Inflorescence a stalked raceme, erect, 1 per bulb; scape 18–55 cm long, 1.5–2 mm in diam. at the base, purple at the base to greenish brown in the upper parts; raceme lax, 1–4(–9) cm long, 2–8(–11)-flowered, all-sided; bracts acute, 3–4(–7) mm long, distinctly spurred; lowermost spur about double in length of the bract; pedicels patent, ca 5–8 mm long. Flowers diurnal, fragrant, stellate; perigone spreading; tepals 6, elliptic to obovoid, almost free, 9–12 × 3–5 mm, white, with a pinkish tinge and a narrow, purplish-green, longitudinal median stripe better defined on the abaxial side. Stamens erect, somewhat curved, 6–8 mm; filaments 6, filiform, basally adnate to the perigone for < 1 mm; the free parts 4–6 mm long, white, smooth; anthers 6, yellow, subbasifixed, oblong, 2.5–3 mm long, dehiscing with longitudinal slits up to the whole thecae length. Ovary ovate, 3–4 × 1.5–2 mm, glabrous; style elongate, deflexed and curved, 5–6 mm long, protruding downwards from the fascicle of filaments below the anthers, white; stigma papillate. Capsules 12–13 × 5 mm in lateral view. Seeds many, irregularly elliptical, flat, papery-winged, 4 × 2 mm in lateral view, black.

Etymology: Named after its sinuous leaves (lat., flexuosus = curved, sinuous).

Phenology: *Tenicroa flexuosa* usually flowers from mid November to mid February in habitat, and fruits appear from late February to March.

Habitat: The species is restricted to the Fynbos Biome, where it grows in humus-rich soils mainly in the Sandstone Fynbos classified as FFs4, FFs9, FFs11 and Sand Fynbos as FFd5. Those vegetation units are characterized by a winter-rainfall regime with rain peaking from May to August. Whereas in the Cederberg (FFs4), Peninsula (FFs9) and Kogelberg Sandstone Fynbos (FFs11) the acidic lithosol soils derived from Ordovician sandstones of the Table Mountain Group, in the Cape Flats Sand Fynbos (FFd5) it is of tertiary origin. At a broad scale the precipitation is highly variable from 180 to 3000 mm per year, as coastal areas show a significant high impact of mists in winter. The mean annual temperature is between 14 and 16 °C and the frost incidence 2 or 3 days a year, but can be up to 30 days in the Cederberg Sandstone Fynbos (MUCINA & RUTHERFORD 2006).

Distribution: *Tenicroa flexuosa* is known mainly from the Cape Peninsula and its surroundings as far east as Kleinmond and from the Middelberg Plateau and Van Rhyns Pass (Fig. 11e).

Diagnostic characters: The species seems to be closely related to *Tenicroa unifolia* and *T. decipiens*, but is readily distinguished by the long-necked bulb [vs neck short or lacking], the (mostly) two synanthous leaves [vs 1; hysteranthous in *T. decipiens*], as well as the flowering time in January and February [vs September to October in *T. unifolia*, November to early December in *T. decipiens*].

Comments on the type collection: In the first description of *Urginea flexuosa* ADAMSON (1942: 241) mentions "Smitswinkel Bay, ADAMSON 3099 (type in Herb. Bolus)" as the type specimen. The label of BOL140326 reads "*Urginea flexuosa* ADAMSON, No. 3099, Smitswinkel Bay, black sand, R. S. A. ADAMSON, Jan. 3. 1941", what corresponds exactly with the information in the first description. Further two sheets with the same collecting number are deposited in NBG (sub SAM0056131-0) and K (K000257378). On those labels the locality data given is „near Patrys Vlei“. As the collecting number (ADAMSON 3099) and the date (3 January 1941), as well as the specimens mounted are exactly alike, we regard those differences as mistakes in the transcription of the labels. So, all three are to be seen as type material (BOL = typus auctoris, holotype; SAM and K = isotypes).

It is worth mentioning that a similar case is found in an additional specimen given by ADAMSON with his collecting number 2754. Here the locality is said to be „Patrys Vlei“ (ADAMSON 1942: 241), but on the label of a specimen deposited in PRE (PRE0049729-0) it is written „near Paulsberg“.

Additional material studied: SOUTH AFRICA. Western Cape. Calvinia (3119): Top of Van Rhyns Pass, S side (-AC), 6 November 1962, W. F. BARKER 9792 (NBG!); Van Rhyns Pass near Nieuwoudtville (-AC), November 1933, T. VAN SON 36608 (PRE!). – Wuppertal (3219): Cedarberg, Middelberg (-AC), 5200 ft elevation, December 1967, O. KERFOOT 6163 (NBG!); Middelberg Plateau, Cedarberg (-AC), 14 December 1941, R. H. COMPTON 12730 (NBG!); Cederberg Mts., Middelberg Plateau (-AC), 14 December 1941, E. ESTERHUYSEN 7225 (BOL!, K!). – Cape Town (3318): Kenilworth Race Course (-CD), 18 February 1941, T. M. SALTER 8607 (K!, PRE!); Kenilworth Race Course (-CD), 22 March 1968 [in fruit], E. ESTERHUYSEN 31949b (BOL!); In planitia montis tabularis prope Long Kloof (-CD), 1000 ft elevation, December 1907, R. DÜMMER 999 (E!); Cape Peninsula, Table Mt. – slopes above Skeleton (-CD), 26 December 1944, E. ESTERHUYSEN 11227 (BOL!); Twin Peaks (-DD), 4500 ft elevation, 31 December 1967, O. KERFOOT K6245 (NBG!, 2 sheets, PRE!). – Worcester (3319): Hansies Berg (-AB), 4500 ft elevation, 17 December 1944, R. H. COMPTON 16719 (NBG!); Lower slopes of Naudesberg, Koo (-DB), 22 November 1959, W. F. BARKER 9114 (NBG!). – Simonstown (3418): near Constantiaberg (-AB); 1 January 1896, WOLLEY DOD 752 (BOL!), Klaasjagers Farm (-AB), 500 ft, 23 January 1934, R. H. COMPTON 4701 (BOL!); Constantiaberg swamp (-AB), 2800 ft elevation, 17 December 1939, R. H. COMPTON 8264 (NBG!); Table Mt. near Wynberg Reservoirtower Plateau (-AB), 24 January 1929, J. B. GILLET 3362 (BOL!); Arends Kop, Cape Peninsula (-AB), 2 January 1941, R. H. COMPTON 10310 (NBG!); Noord Hoek Mt. (-AB), 2000 ft elevation, 7 January 1945, R. H. COMPTON 16902 (NBG!, 2 sheets); Silvermine (-AB), 1200 ft elevation, 27 December 1942, R. H. COMPTON 14276 (NBG!); Muizenberg (-AB), 6 December 1889, GUTHRIE 353 (NBG!); Cirkels Vlei (-AD), 15 January 1946, R. H. COMPTON 17922 (NBG!); vid vägen mellan Smitswinkel Bay och Goda Hoppsudden [on the road between Smitswinkel Bay and Cape of Good Hope] (-AD), 18 January 1935, A. HAFSTRÖM s.n. (S! 2 sheets); Smiths Farm, Cape Peninsula (-AD), 16 January 1936, R. H. COMPTON 6045 (NBG!); Cape Peninsula, Paulsberg (-AD), 20 December 1939, R. S. ADAMSON 2754 (PRE!); Cape Flats inter Claremont et sinum False-Bay (-BA), 30 ft elevation, 28 February 1892, R. SCHLECHTER 446 (Z!); Hangklip B. B. Commonage N of Clarence Drive (-BD), 17 January 1998, 15 m elevation, C. E. JOUBERT 204 (PRE!); Near Klein Palmiet River Bank, Somersfontein farm, Elgin Basin (-BD), ca 245 m elevation, 16 November 1971, C. BOUCHER 1718 (NBG!, PRE!). – Caledon (3419): Kleinmond, vlakke aan voet van berg (-AC), 27 December 1947, M. P. DE VOS 766 (NBG!); Grashoek, Bredasdorp (-DB), 6 December 1938, E. WALL 130 (S!).

3.2.7. *Tenicroa fragrans* (JACQ.) RAF., Fl. Tellur. 3: 53 (1837). (Fig. 1c, 6)

Basionym: *Anthericum fragrans* JACQ., Pl. hort. Schoenbr. 1: 45, t. 86 (1797). – Type: SOUTH AFRICA. Western Cape. Lectotype: icon in JACQUIN (1797: t. 86) (Fig. 1c). – Epitype designated here: Western Cape. Vanrhynsdorp (3118): Summit of Gifberg (-DA), ca 2000 ft elevation, 16 November

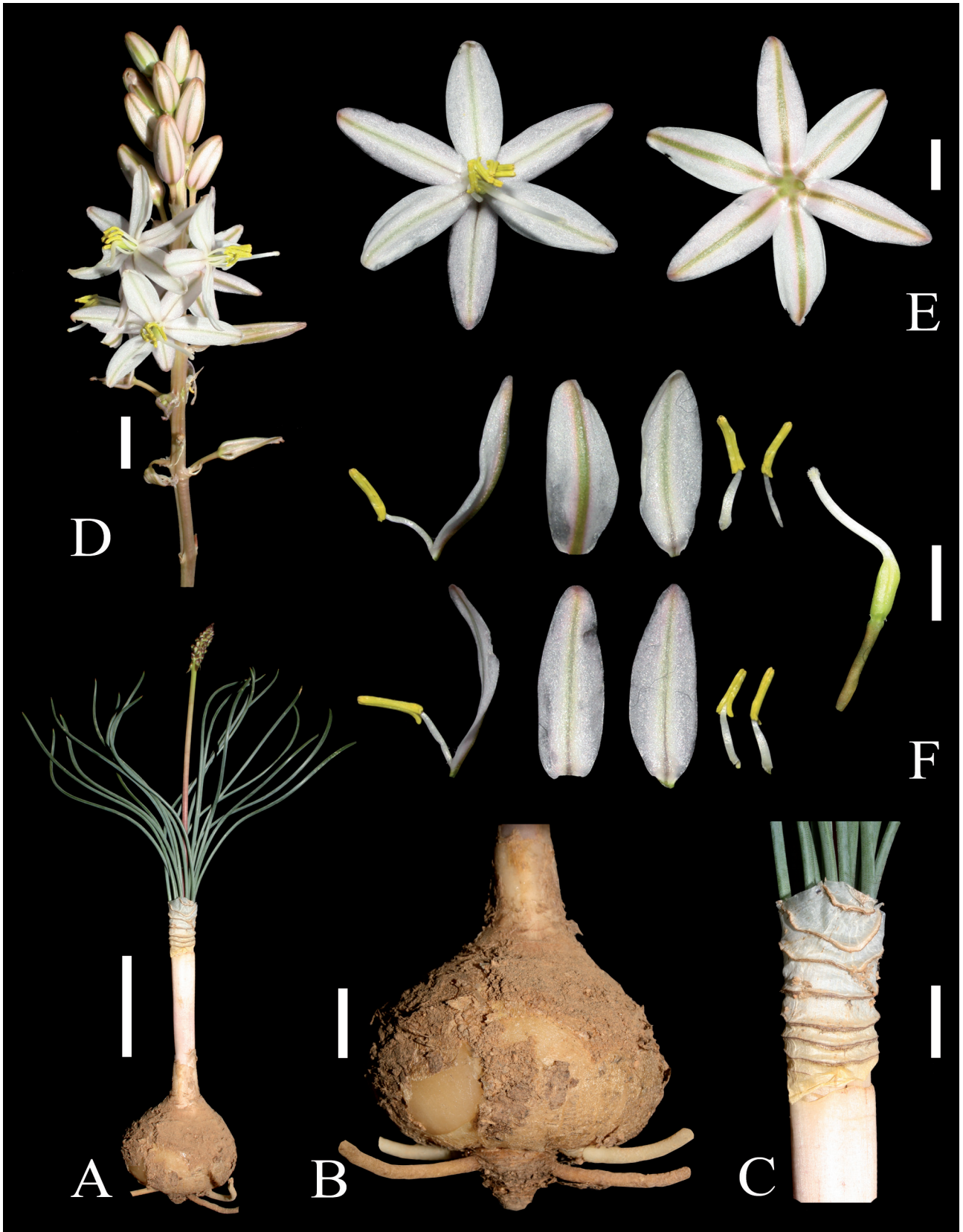


Fig. 6. *Tenciroa fragrans* (JACQ.) RAF. (corresponding to WW05273). (A) Habitus of a whole plant. – (B) Detail of the bulb. – (C) Detail of the cataphyll. – (D) Raceme. – (E) Flower in apical and dorsal view. – (F) Dissected flower: inner tepals and stamens above, outer ones below, and gynoecium. – Scale bars: A 5 cm, B–D 1 cm, E–F 5 mm.

1970, H. HALL 3906 (NBG91254!, 2 sheets; PRE0046756-0!).

= *Phalangium fragrans* (JACQ.) POIR. (POIRET 1804: 247).

= *Urginea fragrans* (JACQ.) STEINH. (STEINHEIL 1834: 328).

= *Ornithogalum fragrans* (JACQ.) KUNTH (KUNTH 1843: 366).

= *Sypharissa fragrans* (JACQ.) SALISB. ex OBERM. (OBERMEYER 1980: 113).

= *Drimia fragrans* (JACQ.) J. C. MANNING & GOLDBLATT (in GOLDBLATT & MANNING 2000: 711).

= *Albuca fugax* KER GAWL. (KER GAWLER 1818: t. 311). — Type: SOUTH AFRICA. “The drawing was taken from a sample which flowered in June last in Mr. GRIFFIN’s conservatory at South Lambeth, and was introduced by a bulb which had been sent from the Cape.” (holotype: icon in KER GAWL. 1818: t. 311).

Description: Deciduous bulbous plant. Bulb hypogeous, mostly gregarious, globose to subglobose, 2.5–8 cm in diam., outer tunics dry, very thin, membranous, brownish, inner scales pale apricot, adherent, compact, succulent; cataphyll solitary, sheathing, lower parts somewhat fleshy, upper membranous, whitish with raised brown transverse ribs. Leaves present at flowering time, 15–25 (less in juvenile plants), terete, narrowly linear, somewhat thickened, 20–30 × 0.1–0.2 cm, glaucous, purplish basally, glabrous. Inflorescence a stalked raceme, erect, 1 per bulb; scape 35–45 cm long, ca 3 mm in diam. at the base, greenish, slightly purplish at the base; raceme dense, slender, 10–15 cm long, much longer than the leaves, 30–40-flowered, all-sided; bracts ovate-lanceolate, acuminate, 2.5–5 mm long, distinctly spurred; lowermost spur up to 1 cm long, upper ones shorter than the bracts; pedicels erecto-patent, spreading, 8–9 mm long. Flowers diurnal, very fragrant, stellate; perigone spreading to patent; tepals 6, elliptic-oblong, narrow, almost free, 12–13 × 5–6 mm, white with a narrow, green longitudinal median stripe better defined on the abaxial side. Stamens erect to spreading, somewhat curved, 8–9.5 mm long; filaments 6, filiform, basally adnate to the perigone for < 1 mm, the free parts 5–6 mm long, white, smooth; anthers 6, yellow, subbasifixed, oblong, 3.5–4 mm long, dehiscing with longitudinal slits up to the whole thecae length. Ovary oblong, 4–4.5 × 1.5–2 mm, pale green, glabrous; style elongate, deflexed, strongly sigmoid, ca 7 mm long, protruding downwards from the fascicle of filaments below the anthers, white; stigma papillate. Capsules ovoid to obovoid, 16–20 × 10–12 mm in lateral view. Seeds many, irregularly elliptical flat, papery-winged, 5–8 × 3–5 mm in lateral view, brown, with a loose, verrucous, shiny testa.

Etymology: Named after the sweetly scented flowers (lat. fragrans = fragrant, pleasantly scented).

In fact, this is a feature present in nearly all species of *Tenicroa* and therefore not a distinctive character.

Phenology: Plants are flowering in nature from mid September to November. Interestingly one gathering (HANEKOM 2086, in PRE!) flowered in May, what is far out of range.

Habitat: Most populations of *Tenicroa fragrans* are commonly found in the Fynbos biome, where it occurs in sandy areas mostly in vegetation units classified as FFs1 Bokkeveld Sandstone Fynbos and FRg2 Swartland Granite Renosterveld. Those are characterised by winter-rainfall peaking from May to August (MAP ranging from 160 to 790 mm) and a mean annual temperature of around 16 °C with 3–10 days of frost incidence per year. The northern populations are native to the Succulent Karoo biome and found in the SKn1 Namaqualand Klipkoppe Shrubland which shows rain events from May to September and dew present in winter (MAP: ca 160 mm). Episodic periods of drought of one or two years in succession are common, the mean annual temperature is 16.6 °C and frost occurs for about 8 days per year (MUCINA & RUTHERFORD 2006).

Distribution: The main center of distribution reaches from the Worcester area to Malmesbury, northwards to Vanrhynsdorp and on the Bokkeveld Escarpment to Calvinia, where it is found in sandy areas often growing in colonies. It is worth mentioning that the species is also known from a few populations in the surrounding of Kamieskroon, where it does not seem to be common (Fig. 11c)

Diagnostic characters: This species is easily recognized by the fascicle of many (15–25) glaucous leaves 1–2 mm in diam. [vs ca 0.5 mm leaf diam. in *T. multifolia*], the mostly gregarious habit and the tall, slender inflorescence overtopping the leaves about twice their length.

Additional material studied: SOUTH AFRICA. Northern Cape. Hondeklipbaai (3017): 13 km from Kamieskroon along road to Soebatsfontein (-BB), 700 m elevation, 12 September 1993, A. & B. STRID 37814 (NBG!); 3.2 km west of N7 on way to Namakwa National Park (-BB), 699 m elevation, 25 September 2015, M. MARTÍNEZ-AZORÍN, M. PINTER, M. B. CRESPO & M. Á. ALONSO MMA1201 (ABH!); ca 2 km NE of the entry to Namaqua N.P. (-BB), 603 m elevation, 16 October 2015, M. PINTER WW05273 (ABH!); *ibid.*, 31 October 2015, M. PINTER WW05276 (ABH!); Hondeklip Bay, 18 km N of Groen River near Sabies (-DA), 200 m elevation, 3 September 2002, P.V. BRUYNS 9223 (NBG!). — Calvinia (3119): Nieuwoudtville (-AC), coll. in September 1930, fl. in hort. L. BOLUS November 1931, L. BOLUS s.n. (BOL!); Uitkomst Farm S. W. of Nieuwoudtville (-AC), 28 September 1970, W. F. BARKER 10754 (NBG!); Near Nieuwoudtville waterfall (-AC), 26 October 1983, D. SNLJMAN 649 (NBG!, PRE!); Nieuwoudtville, An-

nex Kranskloof 794, U18 (-AC), 733 m elevation, 26 October 2000, W. A. J. PRETORIUS 621 (MO!, NBG!); Farm Driefontein, Dwykakop (-AD), October 1921, R. MARLOTH 10644 (PRE!); Prinshof P4402, Lokenburg (-CA), [annot. photographed] 7 October 1954, J. P. H. ACOCKS 17743 (PRE!); Lokenburg (-CA), ca 2100 ft elevation, 5 November 1955, J. P. H. ACOCKS 18572 [=17743, bulbs sent from same locality in Oct. 1954] (PRE!); Lokenburg (-CA), 4 October 1956, J. P. H. ACOCKS 17743 (NBG!, PRE!, both photographs); Aan de Doorns (-CB), ex hort 7 October 1985, M. B. BAYER 4445 (NBG!); Worcester Commonage (-CB), 30 August 1985, M. B. BAYER 4841 (NBG!); On farm "Reiers Rus" (Mr. E. BRUWER) (-CB), 4 October 1980, I. B. WALTERS 2297 (NBG!). – Sutherland (3220): 2 km south-east Konstabel Station east of Touws River (-AD), 23 November 1979, M. B. BAYER 2000 (NBG!); 20 miles E by N of Sutherland (-BC), 5000 ft elevation, 23 September 1953, J. P. H. ACOCKS 17204 (PRE!).

Western Cape. Vanrhynsdorp (3118): 17 miles W of Klawer (-DC), 22 November 1952, R. K. GODFREY s.n. (PRE!), Nardouwsberg, N of Witbakenkop (-DC), 1300 ft elevation, 3 September 1984, E. G. H. OLIVER 8582 (NBG!, PRE!); Top of Gifberg [Gifberg] Pass, south of Vanrhynsdorp (-DD), 595 m elevation, 23 September 2015, M. MARTÍNEZ-AZORÍN, M. PINTER, M. B. CRESPO & M. Á. ALONSO MMA1181 (ABH!); Gifberg plateau (-DD), 591.79 m elevation, 15 October 2015, M. PINTER WW05272 (ABH!). – Clanwilliam (3218): Near Clanwilliam (-BB), 25 November 1946, C. L. LEIPOLDT s.n. (NBG!); Betw. Clanwilliam & van Rhynsdorp (-BB), November 1952, R. K. GODFREY 1254 (NBG!); Het Kruis, Piquetberg (-DA), 29 September 1943, W. F. BARKER 2597 (NBG!); Piquetberg Div., Antonies Rivier [Krom Antonies Rivier] (-DA), 29 September 1943, F. M. LEIGHTON s.n. (BOL!); In arenosis Witwater – prope Piquetberg (-DC), 1895, H. BOLUS 8624 (BOL!, K!, PRE!); Piquetberg (-DC), 900 elevation, October 1892, GUTHRIE 2711 (NBG!, 2 sheets); On farm Deze Hoek (-DC), October 1931, LETTY 87 (PRE). – Wuppertal (3219): Wolfberg, high plateau (-AA), 1600 m elevation, 7 November 1981, R. BAASCH 58.81 (NBG!); Clanwilliam Div., sandy flats near Bidouw River (-AA), 22 September 1952, G. J. LEWIS s.n. (BOL!); N Cederberg, Koupoort (-AC), 3000 ft elevation, 21 October 1945, E. ESTERHUYSEN 12154 (BOL!, 2 sheets); Cederberg, Matjiesrivier Nature Reserve, Wildenhondskloof (-AD), 600 m elevation, 5 October 1997, R. LECHMERE-OERTEL (NBG!); Cederberg – Gonnafontein, sandy flats S of plot 4 at river level / Gibsons old camp (-CB), 900 m elevation, 18 November 2000, U. POND UP237 (NBG!); Theerivier, Citrusdal (-CC), 28 May 1973, W. J. HANEKOM 2086 (PRE!, PRE! photographs); Theerivier, Citrusdal (-CC), 25 May 1975, W. J. HANEKOM 2086A (PRE!, 2 sheets); Swartruggens, Groenfontein (-DC), 19 November 1991, P. A. Bean & M. VIVIERS 2748 (BOL!); Knolfontein, Swartruggens 60 km NE of Ceres (-DC), 1244 m elevation, 26 October 2006, I. JARDINE & C. JARDINE 567 (NBG!); Knolfontein, Swartruggens 60 km NE of Ceres (-DC), 1161 m elevation, 16 October 2011, I. JARDINE 1705 (NBG!); Groenfontein, Zeekoegat 137, West of Riet Rivier (-DC), 900 ft elevation, 2 November 2001, M. S. STOBIE 8a (NBG!); Groenfontein, Zeekoegat 137, West of Riet Rivier (-DC), 900 ft elevation, 2 November 2001, M. S. STOBIE 8b [young plant] (NBG!). – Saldanha (3317): Saldanhabay, in dunis (-BB), September 1918, R. MARLOTH 8028 (PRE!). – Cape Town (3318): In fields near Hopefield (-AB), September

1931, J. C. LETTY 38 (PRE); 25 m. N.W. of Darling (-AD), ca 600 ft elevation, 15 October 1959, J. P. H. ACOCKS 20701 (BOL!, K!, M!, NBG! photograph, PRE!); near Waylands Nature Reserve, ca 4 km south east of Darling (-AD), 141 m elevation, 20 September 2015, M. MARTÍNEZ-AZORÍN, M. PINTER, M. B. CRESPO & M. Á. ALONSO MMA1125 (ABH!); Klipfontein, Malmesbury (-BC), 16 September 1982, L. VAN ZYL (3239). – Worcester (3319): Welbedacht (-AA), 22 September 1952, A. MIDDLEMOST 1742 (NBG!, 2 sheets); In convalle Hex River, prope De Doorns (-BC), ca 1700 ft, October 1907, H. BOLUS 13209 (BOL!, PRE!); Sanddrift Kloof, Hex River Mountains (-BC), 3 October 1949, E. ESTERHUYSEN 15967 (BOL!).

3.2.8. *Tenicroa juncifolia* (J. C. MANNING & J. M. J. DEACON) MART.-AZORÍN, M. B. CRESPO, M. PINTER & WETSCHNIG, *Phytotaxa* 397: 294 (2019b).

Basionym: *Drimia juncifolia* J. C. MANNING & J. M. J. DEACON, in MANNING & GOLDBLATT, *Strelitzia* 40: 107 (2018). – Type: SOUTH AFRICA. Western Cape. Cape Town (3318): 'Paarl, Brier's Louw Nature Reserve', (-DD), 23 November 2013, J. DEACON 3078 (holotype: NBG).

Description: Deciduous bulbous plant. Bulb hypogeous, solitary, depressed-globose, 3–4 cm diam., scales adherent, imbricate with hard, dry base of blades persisting; cataphylls 2, membranous with overlapping margins, pale with thickened horizontal bars. Leaves hysteranthous, dry remains still present at flowering, 9 to 13, suberect, straight or arcuate, but slightly helically twisted when dry, stiff and leathery, linear, hemiterete, 6–10 × 0.1–0.15 cm, margins scabridulous, dark green, entire blade or only basal portion persisting and sclerotic. Inflorescence a moderately dense, cylindrical raceme 20–30 cm long with rachis 2–4 cm long, densely 10–20-flowered, flowers mostly 2–5 mm apart, but the lowest sometimes more distant. Scape sometimes weakly flexuous, ± 1 mm diam., glabrous; bracts transversely ovate, auriculate, apiculate, lower 2–2.5 mm long with spur 3–4 mm long; pedicels suberect, 3–5 mm long. Flowers diurnal, spreading, stellate, strongly rose-scented; tepals connate at base up to 0.5 mm, spreading or slightly reflexed, slightly cucullate, outer ones ovate, ± 5 × 2 mm, inner ones ovate-oblong, ± 5 × 3 mm, pale lemon yellow with green or brownish keels better defined on the abaxial side. Filaments suberect, subterete and tapering, ± 3 mm long. Anthers subbasifixed, oblong, 1.5–2.0 mm long, dehiscing longitudinally, yellow with yellow pollen. Ovary ellipsoid-truncate, ± 2 mm long, greenish yellow; style slightly deflexed, ± 2 mm long, columnar, white; stigma globose-papillate. Capsules ovoid-ellipsoid, 6–9 × 3–6 mm in lateral view. Seeds compressed, elliptical and peripherally winged or irregularly folded, 2–3 mm diam., glossy black, testa almost smooth (obscurely scalariform-colliculate).

Etymology: Named after the distinctive character of the narrow stiff leaves (lat., iunceus = rush-like; -folius, -a, -um = -leaved).

Phenology: Plants flower in October and November; flowers opening in the morning and fading in the afternoon.

Habitat: This species is restricted to the Fynbos Biome and occurs on an ironstone outcrop in loamy pockets in FFa 3 Swartland Alluvium Fynbos. It lies within the winter-rainfall regime with a broadly varying mean annual precipitation (320–980 mm, MAP: 656 mm), peaking from May to August, a mean annual temperature of ca 17 °C and ca 3 days of frost incidence per year (MUCINA & RUTHERFORD 2006).

Distribution: To date *Tenicroa juncifolia* is only known from the type population near Paarl in the Western Cape Province of South Africa (Fig. 11e). Further studies are needed to ascertain the distribution of the species.

Diagnostic characters: *Tenicroa juncifolia* is recognised by the rather compact raceme of stellate, fragrant flowers with a weakly deflexed style, and the distinctive foliage. Growing plants have distinctive, horizontally barred, membranous cataphylls surrounding the base of the tuft of very stiff, linear-hemiterete leaves with scabridulous margins, the dry, wiry leaves persisting partially or entirely into the flowering period.

Additional material studied: SOUTH AFRICA. Western Cape. Cape Town (3318): Paarl, Brier's Louw Nature Reserve, (-DD), 16 Aug. 2014 [leafing], J. C MANNING 3452 (NBG).

3.2.9. *Tenicroa multifolia* (G. J. LEWIS) OBERM., J. S. African Bot. 47: 577 (1981). (Fig. 7)

Basionym: *Urginea multifolia* G. J. LEWIS, Ann. S. African Mus. 40: 9 (1952). — **Type:** SOUTH AFRICA. Northern Cape. Hondeklipbaai (3017): Namaqualand, 27 miles south of Springbok (-BB), 27 July 1950, fl. at S.A.M. 14 August 1950, G. J. LEWIS 2302 (holotype: NBG sub SAM0060870-0!)

= *Drimia multifolia* (G. J. LEWIS) JESSOP (JESSOP 1977: 278).

= *Sypharissa multifolia* (G. J. LEWIS) OBERM. (OBERMEYER 1980: 114).

= *Urginea capillifolia* SCHLECHTER nom. nud. in sched.

Description: Deciduous bulbous plant. Bulb hypogeous, mostly gregarious, globose, 2.5–3.5 cm in diam., outer tunics reddish-brownish when drying, membranous, inner scales yellowish or whitish, adherent, compact, soft and fleshy; cataphyll solitary, sheathing, membranous, whitish, with finely raised transverse ribs. Leaves present at flowering time, very numerous, 30–50(–80), filiform, spreading and strongly incurved at the apex, forming a glo-

bose structure, (4–)5–8(–10) × 0.05 cm, light green, glabrous. Inflorescence a stalked raceme, erect, 1 per bulb; scape 7–12(–30) cm long, 1.5–2 mm in diam. at base, pale green; raceme short, dense, (1.5–)2.5–7(–10) cm long, (5–)7–12(–25) –flowered, all-sided; bracts ovate, acute, 3–4 mm long, distinctly spurred; lowermost spur as long or slightly longer than the bract; pedicels patent, spreading, 6–11 mm long. Flowers diurnal, fragrant, stellate; perigone spreading to patent; tepals 6, elliptic-oblong, almost free, 10–12 × 4–5 mm, white or sometimes with a pale mauve tinge, with a narrow, green longitudinal median stripe better defined on the abaxial side. Stamens erect to slightly spreading, somewhat curved, 6–8 mm long; filaments 6, filiform, basally adnate to the perigone for < 1 mm; the free parts ca 5 mm long, white, smooth; anthers 6, yellow, subbasifixed, oblong, 2–2.5 mm long, dehiscing with longitudinal slits up to the whole thecae length. Ovary ovate-oblong, ca 4 × 2 mm, pale green, glabrous; style elongate, deflexed and sigmoid, longer than the stamens, white to whitish; stigma papillate. Capsules erect, trilobulate, loculicidal to the base, 9–12 × 6–8 mm in lateral view, broadly ovoid, subtriquetrous, light brown. Seeds many (up to 60 per capsule), flat, 4–5 × 2–3 mm, irregularly elliptical in lateral view, brown, with a loose, verrucous, metallic to golden shiny testa.

Etymology: Named after the high number of leaves characteristic for the species (lat., multus, -a, -um = many; -folius, -a, -um = -leaved).

Phenology: The species is flowering usually from September to mid October in habitat.

Habitat: The species can be found in the Succulent Karoo and Fynbos biomes where it occurs in sandy or clayey, stony soil mainly of the SKn1 Namaqualand Klipkoppe Shrubland and FRg1 Namaqualand Granite Renosterveld. The area is located in the winter-rainfall region and has its peaks between May and September (MAP ranging from 130 to 370 mm) and a mean annual temperature between 14 and 17 °C (MUCINA & RUTHERFORD 2006).

Distribution: The species is found mainly in the Northern Cape Province in Namaqualand in the surroundings of Springbok and Steinkopf, as well as in the Kamiesberge. There are also gatherings far north from around Khuboes, from the Bokkeveld Plateau and far south in the Western Cape Province from north of Lemoenpoort. The species was comparatively rarely collected, so further studies are needed to get better knowledge of its whole distribution range (Fig. 11d).

Diagnostic characters: *Tenicroa multifolia* is easily distinguished from all other members of the genus by the fascicle of many (30–50(–80)), thin (ca 0.5 mm in diam. or less), filiform, apically incurved leaves forming a globose bunch, by the inflo-

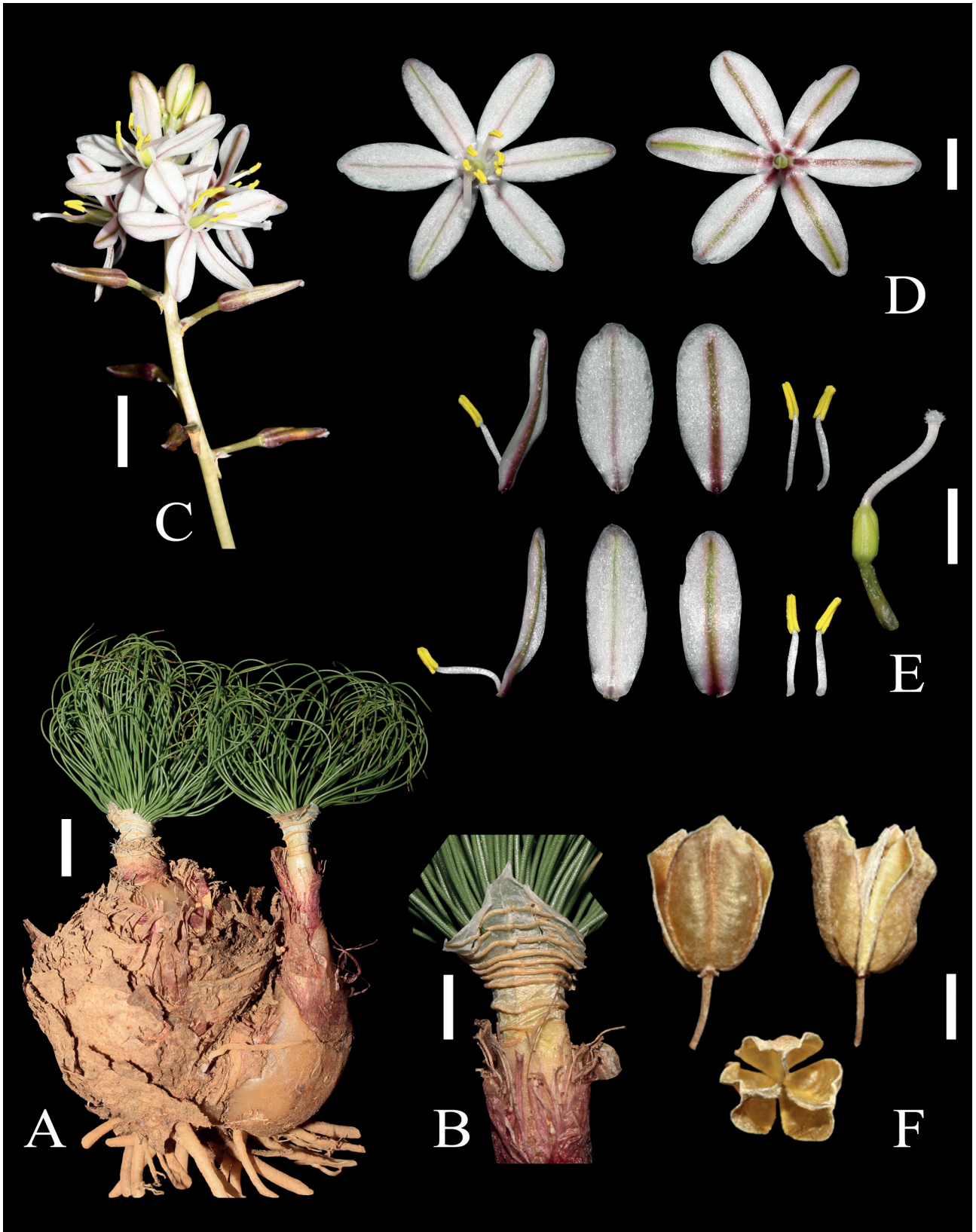


Fig. 7. *Tenicroa multifolia* (G. J. LEWIS) OBERM. (corresponding to MMA1814). (A) Habitus of a whole plant. – (B) Detail of the sheathing cataphyll. – (C) Raceme. – (D) Flower in apical and dorsal view. – (E) Dissected flower: inner tepals and stamens above, outer ones below, and gynoecium. – (F) Capsules in lateral and apical view. – Scale bars: A and C 1 cm, B and D–F 5 mm.

rescence overtopping the leaves, and by the solitary, whitish cataphyll with finely raised transverse ribs.

Additional material studied: SOUTH AFRICA. Northern Cape. Oranjemund (2816): Sandveld at Kubus (-BD), June 1926, R. MARLOTH 6867 (PRE!). – Springbok (2917): North of Steinkopf (-BB), 800 m elevation, September 1995, G. & F. WILLIAMSON 5698 (NBG!); Summit of Bulletrap (-BD), August 1995, G. & F. WILLIAMSON 5702 (NBG!); Bulletrap Pass (-BD), early September 1995, G. & F. WILLIAMSON 5702 (NBG!); Platjesfontein (-DA), September 1995, G. & F. WILLIAMSON 5712 (NBG!); Namaqualand, Springbok (-DB), 28 September 1950, P. VAN HEERDE s.n. (BOL!); 8 ½ miles W by S of Springbok, sandy valley in Namaqu. broken veld (-DD), ca 2300 ft elevation, 22 September 1957, J. P. H. ACOCKS 19563 (M!). – Hondeklipbaai (3017): Namaqualand, 27 miles south of Springbok (-BB), 27 July 1950, W. F. BARKER 6310 (NBG!, topotype); l'Aus in collibus (-BB), 2600 ft elevation, 13 September 1897, R. SCHLECHTER 11222 (B!, GRA!, PRE!). – Kamiesberg (3018): Leliefontein (-AB), ex hort 30 September 1985, LAVRANOS & BLECK 22232 (NBG!); Farm Witwater, near campsite between Bloudraai and Witwater (-AC), 3500 ft elevation, 12 October 1981, A. LE ROUX & M. RAMSEY 676 (NBG!); Little Namaqualand, De Kom (now farm Karas) 3 miles from Leliefontein, in the Kamies-

bergen (-AC), 4300 ft elevation, October 1940, C. L. LEIPOLDT 3378 (BOL!); NE of Garies, Kamiesberg, ca 2 km NW of turn off to Leliefontein from Studers Pass road, near farmhouse (-AC), 1123 m elevation, 21 August 2017, M. MARTÍNEZ-AZORÍN, M. B. CRESPO, M. Á. ALONSO, M. PINTER MMA1814 (ABH!). – Calvinia (3119): Nieuwoudtville Reserve (-AC), 12 October 1983, P. L. PERRY & D. SNIJMAN 2377 (NBG!); between Oorlogskloof & Papkuilsfontein (-AC), 24 September 1939, C. L. LEIPOLDT s.n. (BOL!); Kareekom, ca 25 m N by W of Calvinia (-AD), ca 3000ft elevation, 25 September 1955, O. A. LEISTNER 477 (PRE!); Farm 'Vanrhynshoek' – Hantamsberg (-BD), 1463 m elevation, 10 October 1983, pressed ex hort. 11 October 1983, M. THOMAS 44 (NBG!); S of Calvinia, Kareebomfontein W of Rebuni (-DA), September 1974 [flowered PRE 31 August 1978], HANEKOM 2405 (PRE! photographs 7189, 7189-1, 7189-3).

Western Cape. Worcester (3319): Moordkuil 3 km N Lemoenpoort (-CD), 18 August 1990, ex hort. 6 September 1991, P. L. PERRY 3765 (NBG!).

3.2.10. *Tenicroa namibensis* M. PINTER, MART.-AZORÍN, M. B. CRESPO & WETSCHNIG, **spec. nova** (Fig. 8)

Type: NAMIBIA. – ||Karas. Witputz (2716): ||Karas (-AC), 797 m elevation, 12 August 2001, C. A. MANNHEIMER CM1607 (holotype: WIND!).

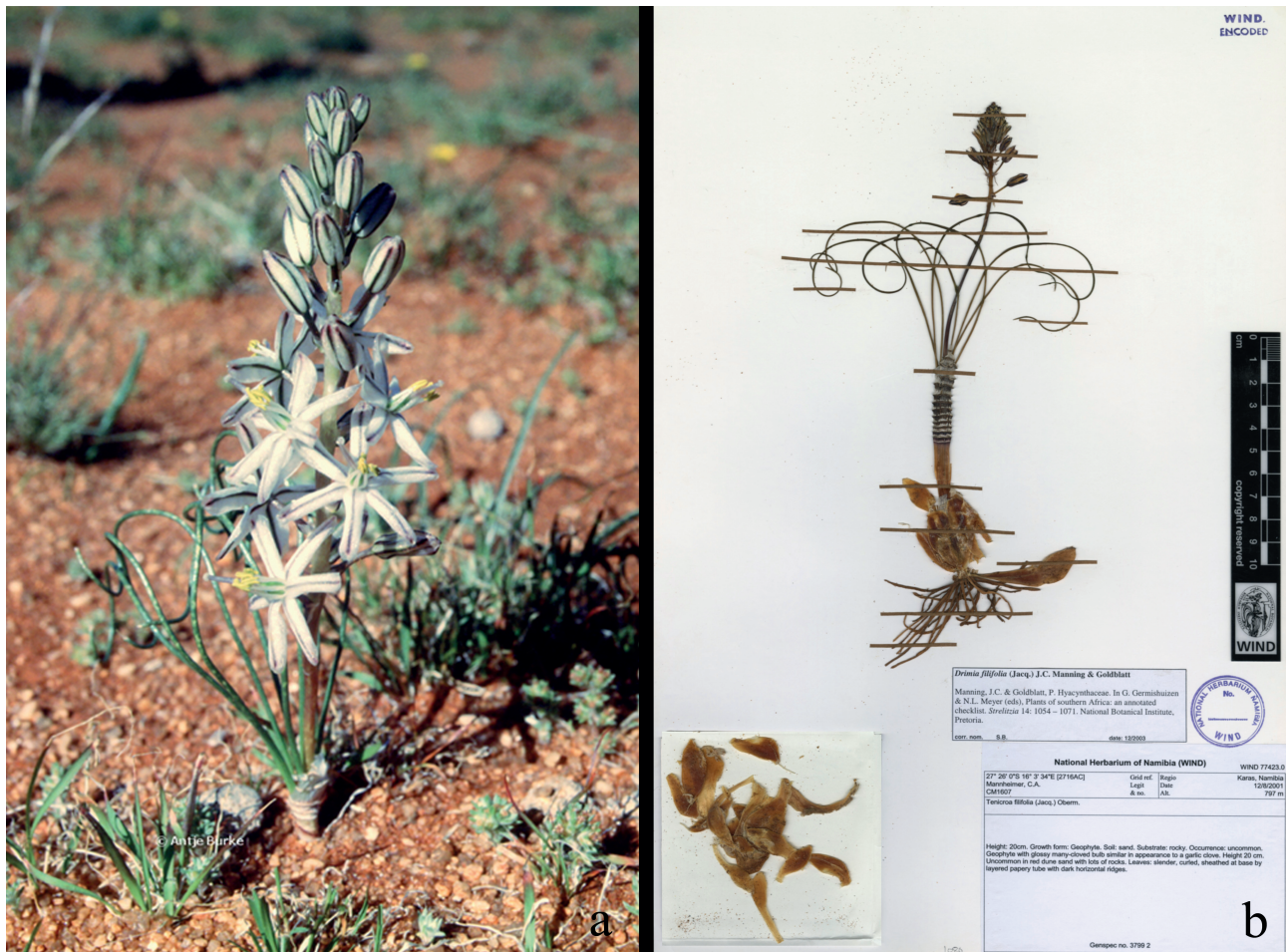


Fig. 8. *Tenicroa namibensis* M. PINTER & al. (A) Plant in habitat, A. BURKE 96247 (photograph: A. BURKE). – (B) Holotype in WIND, C. A. MANNHEIMER CM1607.

Description: Deciduous bulbous plant. Bulb hypogeous, solitary, transverse-elliptic, 4.5–6 × 2.5–3 cm, scales white, glossy, very loose, many-cloved (garlic-like) and fleshy, with a slightly spicy smell; cataphyll solitary, sheathing, papery white with raised dark brown to blackish horizontal ridges. Leaves present at flowering time, 4–11, 12–25 × ± 0.1 cm, linear, slender, glabrous, often coiled distally. Inflorescence a stalked raceme, erect, 1 per bulb; scape 10–20 cm long, ca 2 mm in diam. at base, deep purple grading into pale pink on underground part; raceme moderately dense, 1.8–3.5 cm long, 6–25-flowered, all-sided; bracts ovate, acute, 2–3 mm long, distinctly spurred; lowermost spur 3.5–5 mm long, upper ones reduced; pedicels erecto-patent, spreading, 4–7 mm long (up to 9 mm long when fruiting). Flowers diurnal, fragrant, stellate; perigone spreading-patent to slightly reflexed. Tepals 6, oblong, narrow, almost free, 8–10 × 3–4 mm, light pink to purple, with a greenish ± broad longitudinal median stripe better defined on the abaxial side; stamens erect to spreading at full anthesis, somewhat curved, 7–8 mm long; filaments 6, filiform, basally adnate to the perigone for < 1 mm; the free parts 4–5 mm long, white, smooth; anthers 6, yellow, subbasifixed, oblong, 3–3.5 mm long, dehiscing with longitudinal slits up to the whole thecae length. Ovary elliptic-ovate, 3–3.5 × 2 mm, glabrous; style elongate, deflexed and slightly sigmoid, ca 5 mm long, protruding downwards from the fascicle of filaments below the anthers, white; stigma papillate. Capsules 8–11 mm long in lateral view. Seeds unknown.

Etymology: The epithet refers to the distribution and endemic status of the species in Namibia.

Habitat: *Tenicroa namibensis* is known from the Desert Vegetation Zone in the Southern Namib classified as 3a Desert and Succulent Steppe where it occurs in red dune sand with lots of rocks or in sandy plains in full sun. The area is characterised by winter-rainfall climate, fairly large barren desert plains with sand dunes in the western parts near the coast and stony hills and higher mountains (e.g., Klinghardt Mountains) further inland (GIESS 1998).

Phenology: In habitat the species flowers from August to early September.

Distribution: *Tenicroa namibensis* is only known from a few localities scattered in the ||Karas-region of Namibia (Fig. 11d), representing the only species occurring in Namibia based on our current knowledge. Due to its habitat in very remote and often inaccessible areas further studies are needed to evaluate the distribution range of the species.

Diagnostic characters: *Tenicroa namibensis* shows a unique combination of morphological characters such as the hypogeous, solitary, transverse-elliptic, many-cloved bulb with white, glossy,

completely loose and fleshy scales; the slender, glabrous, often coiled leaves ± 1 mm in diam. surrounded by a single white to whitish cataphyll which shows dark brown or blackish, raised transversal ribs, and the stellate flowers with the perigone spreading to strongly reflexed.

Additional material studied: NAMIBIA. ||Karas. Aus (2616): Farm Kubub LU15 (-CB), 09 September 1973, W. GIESS 12857 (K!, PRE!, M); Namibfläche gegen Tsirubberge (-CC), 19 August 1963, H. MERXMÜLLER & W. GIESS 2978 (M). – Bogenfels (2715): Distr. LUS: Klinghardtberge, nördlicher Teil (-BD), fruiting, 19 September 1963, H. MERXMÜLLER & W. GIESS 32114 (M); Hoehster, Klinghardt Mts. (-BD), 16 October 1978, flowered PRE August 1979, D. S. HARDY 4670 (PRE photograph 7244-1!); Hoehster, Klinghardt Mts. (-BD), September 1978 [photo 27 August 1980], D. S. HARDY 4670 (PRE photograph 7859-4!). – Witputz (2716): Sperrgebiet, between Aurus and Klinghardt mountains (-AC), 644 m elevation, 12 August 2001, L. SMOOK 11343 (PRE!); ||Karas Region, Scorpion Mine (-DC), 30 October 1997, A. BURKE 97236 (PRE!).

3.2.11. *Tenicroa polyantha* M. PINTER, MART.-AZORÍN, M. B. CRESPO & WETSCHNIG, **spec. nova** (Fig. 9)

Type: SOUTH AFRICA. Western Cape. Cape Town (3318): Langebaan, eastern end of town (-AA), 55 m elevation, 20 September 2015 [in flower], M. MARTÍNEZ-AZORÍN, M. PINTER, M. B. CRESPO & M. Á. ALONSO MMA1139 (holotype: GRA!; isotype: ABH!).

Description: Deciduous bulbous plant. Bulb hypogeous, solitary, globose, 6.5–7.5 × 6–6.2 cm long (incl. neck), outer tunics yellow-brownish when drying, membranous, inner scales yellowish to whitish, compact, fleshy; cataphylls 3–6, sheathing, stiff, brown, 20–22 cm long, with raised brown transverse ribs, lowermost ones often weathered. Leaves present at flowering time, 4–6, coriaceous, canaliculate, 35–45 × 0.4–0.5 cm, green, glabrous, tip often withered. Inflorescence a stalked raceme, erect, 1 per bulb; scape 40–42 cm long, 4–5 mm in diam. at base, usually reddish-brown; raceme dense, 7–8 cm long, (30–)50–70-flowered, all-sided; bracts ovate-lanceolate, acuminate, 6–7 mm long, distinctly spurred; lowermost spur up to 12 mm long, acute, broad; pedicels patent, spreading, ca 12 mm long. Flowers diurnal, fragrant, stellate; perigone spreading, subpatent; tepals 6, elliptic-oblong, almost free, 12–13.5 × 4–6 mm, white with a ± narrow, purple longitudinal median stripe with greenish and pinkish margins better defined on the abaxial side. Stamens erect to slightly spreading, somewhat curved, 9–10 mm long; filaments 6, filiform, basally adnate to the perigone for < 1 mm; the free parts 7–8 mm long, white, smooth; anthers 6, yellow, subbasifixed, oblong, 3 mm long, dehiscing with longitudinal slits up to the whole thecae length. Ovary ovate-oblong, 5–5.5 × 2 mm, light green, glabrous; style elongate,

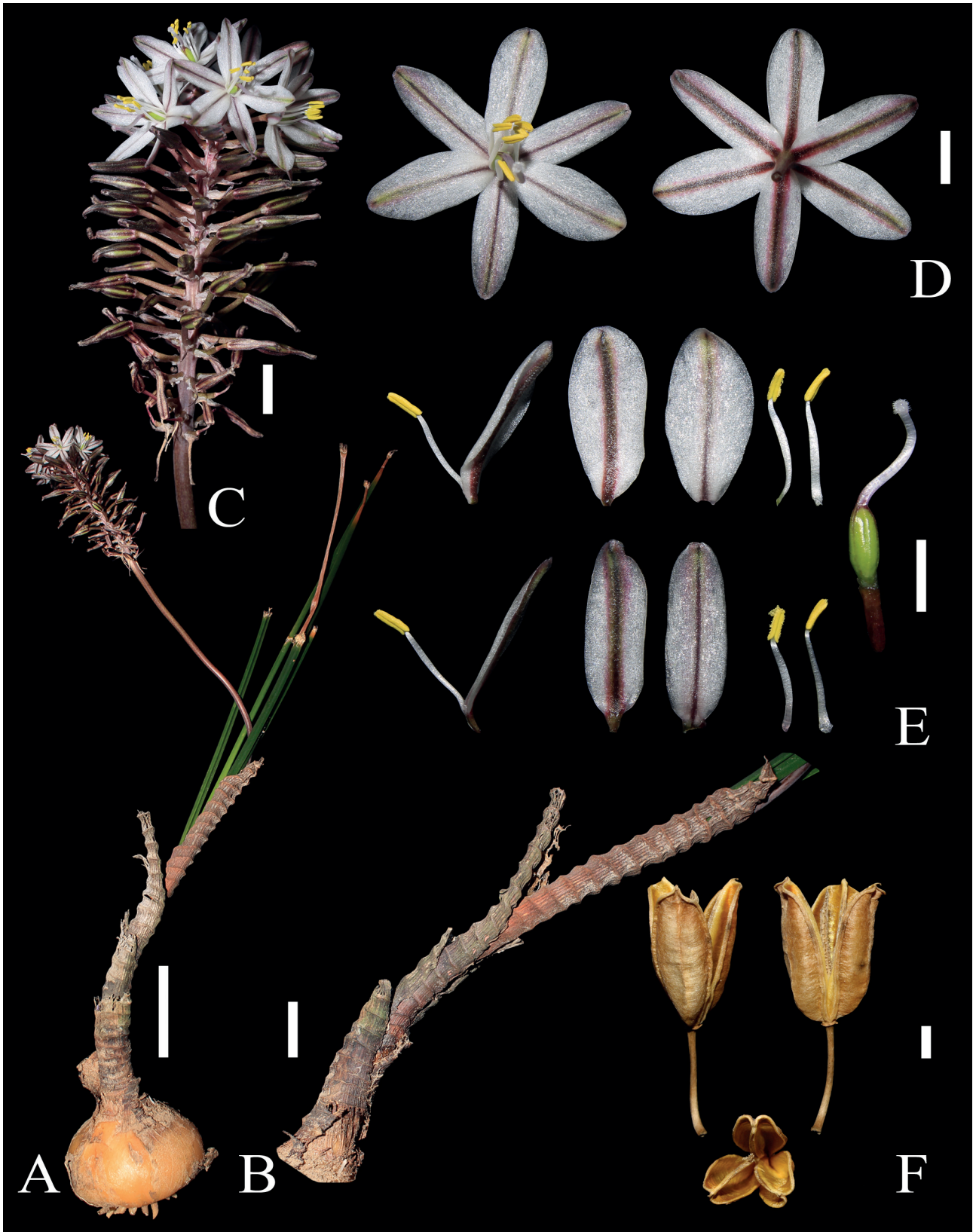


Fig. 9. *Tencroa polyantha* M. PINTER & al. (corresponding to MMA1139, type locality). (A) Habitus of a whole plant. – (B) Detail of the sheathing cataphylls. – (C) Raceme. – (D) Flower in apical and dorsal view. – (E) Dissected flower: inner tepals and stamens above, outer ones below, and gynoecium. – (F) Capsules in lateral and apical view. – Scale bars: A 5 cm, B 2 cm, C 1 cm, D–F 5 mm.

deflexed and strongly sigmoid, 7–8 mm long, protruding downwards from the fascicle of filaments below the anthers, white with some tinge of pink; stigma papillate. Capsules oblong, 17–22 × 7–9 mm, pale brown. Seeds many, irregularly elliptical to irregularly circular, flat, papery-winged, 7–9 × 6–7 mm in lateral view, brown, with a loose, verrucous, coppery to golden shiny testa.

Etymology: Named after the distinctive high number of densely arranged flowers (greek, poly = many; anthos, latinized to anthus, -a, -um = -flowered).

Phenology: Plants flower from September to early October in habitat and are fruiting from early October to November.

Habitat: This species is restricted to the Fynbos Biome and occurs in sandy soil in the Western Strandveld vegetation unit in FS 2 Saldanah Granite Strandveld. It is characterized by mainly cyclonic annual rainfall varying from north to south (MAP: 283 mm) and by the significant contribution of advective sea fog and dew to the moisture in summer and autumn. Mean annual temperature is 16 °C and frost rarely occurs (MUCINA & RUTHERFORD 2006).

Distribution: *Tenicroa polyantha* is only known from the type locality and a few further collections in the vicinity of Langebaan, and southwards in the coastal areas and in plains inland in the Western Cape Province. Further field studies are needed to ascertain its whole distribution range (Fig. 11f).

Diagnostic characters: *Tenicroa polyantha* is characterized by the combination of a dense, (30–)50–70-flowered raceme, the large hypogeous bulb with often long and stiff, sheathing cataphylls, and the 4–6 coriaceous, canaliculate leaves mostly withering from the tip when the plant is at full anthesis. *Tenicroa polyantha* is closely related to *T. exuviata* but the former differs in the dense very many-flowered raceme, the generally more stout and robust habit, and the usually slightly broader tepals.

Additional material studied: SOUTH AFRICA. Western Cape. Saldanha (3317): Donkergat on Saldanha Bay (-BB), 3 October 1968, H. HALL 3130 (NBG!); Donkergat (-BB), 1 November 1968 [fruiting], H. HALL 3130 (NBG!). – Cape Town (3318): Langebaan, near Myburgh Park (-AA), 84 m elevation, 10 October 2015 [fruiting], M. PINTER WW05223 (ABH!); among rocks south-east slope of rocky hill about a mile south of Langebaan to the lagoon (-AA), October 1932, PILLANS 6818 (BOL!); Langebaan (-AA), September 1932, G. J. LEWIS s.n. (BOL!); Malmesbury Commonage (-BC), 14 September 1953, G. J. LEWIS 3621 (NBG!, photocopy); near Malmesbury (-BC), August 1932, G. J. LEWIS s.n. (BOL!); In collibus prope Groenekloof (-CB), 1878, H. BOLUS 4354 (BOL!); Sandy flats about 4 miles E. of Melkbos Strand (-DA), 15 October 1935, J. P. H. ACOCKS 5337 (S!).

3.2.12. *Tenicroa unifolia* (A. V. DUTHIE) M. PINTER, MART.-AZORÍN, M. B. CRESPO & WETSCHNIG, **comb. nova** (Fig. 10)

Basionym: *Urginea unifolia* A. V. DUTHIE, Ann. Univ. Stellenbosch 6: 8 (1928). – Type: SOUTH AFRICA. Western Cape. Cape Town (3318): Stellenbosch Division. Stellenbosch Flats (-DD), 03 October 1927, DUTHIE 1891 (holotype: NBG0197708-1! and -2!; isotype: BOL140325!).

= *Urginea ecklonii* sensu A. V. DUTHIE (DUTHIE 1928: 6), non BAKER (1892: 6)

= *Urginea duthieae* ADAMSON (ADAMSON 1942: 238) = *Drimia duthieae* (ADAMSON) JESSOP (JESSOP 1977: 278) – Type: SOUTH AFRICA. Western Cape. Cape Town (3318): Stellenbosch Flats (-DD), 17 October 1925, DUTHIE 1790 (holotype: NBG0197709-0!; isotype: K000400569!).

Description: Deciduous bulbous plant. Bulb hypogeous, solitary, 1.5–3 × 1.5–2.5 cm, without a long neck, whitish or pinkish, scales adherent, distichously arranged, outer tunics pale pink or brownish when drying, membranous, inner scales whitish with a pinkish outermost layer, compact, fleshy; cataphyll solitary, sheathing, closely clasping, membranous, greyish to brownish, with prominent raised brownish transverse ribs. Leaf present at flowering time, 1, tapering, 20–45 × 0.1–0.25 cm, green, glabrous. Inflorescence a stalked raceme, erect, somewhat flexuose, 1 per bulb; scape 11–30 cm long, ca 1 mm in diam. at base, from purplish at the base to greenish within the raceme; raceme lax, 1–2.5 cm long, 3–8(–13)-flowered, all-sided; bracts ovate-lanceolate, acuminate, membranous, 4–8 mm long, distinctly spurred, lowermost spur up to 10 mm long; pedicels erecto-patent, spreading, 2–4 mm long. Flowers diurnal, fragrant, stellate; perigone spreading patent; tepals 6, broadly elliptic to oblong, almost free, 8–10 × 3.5–4.5 mm, white with a purplish tinge and a narrow, green longitudinal median stripe better defined on the abaxial side. Stamens erect to spreading, slightly curved, 7–8 mm long; filaments 6, filiform, white, smooth, basally adnate to the perigone for < 1 mm; the free parts 5.5–6 mm long; anthers 6, yellow, subbasifixed, oblong, 2 mm long, dehiscing with longitudinal slits up to the whole thecae length. Ovary ovate-oblong, 4 × 1.5 mm, green, glabrous; style white, elongate, deflexed, only very slightly sigmoid, 4 mm long, protruding downwards from the fascicle of filaments below the anthers; stigma papillate. Capsules erect, trilobulate, loculicidal to the base, 10–12 × 4–6 mm in lateral view, elliptic-oblong, subtriquetrous, light brown. Seeds flat, 4–5 × 3–4 mm, irregularly broad elliptical in lateral view, brown, with a loose, verrucous, metallic shiny testa.

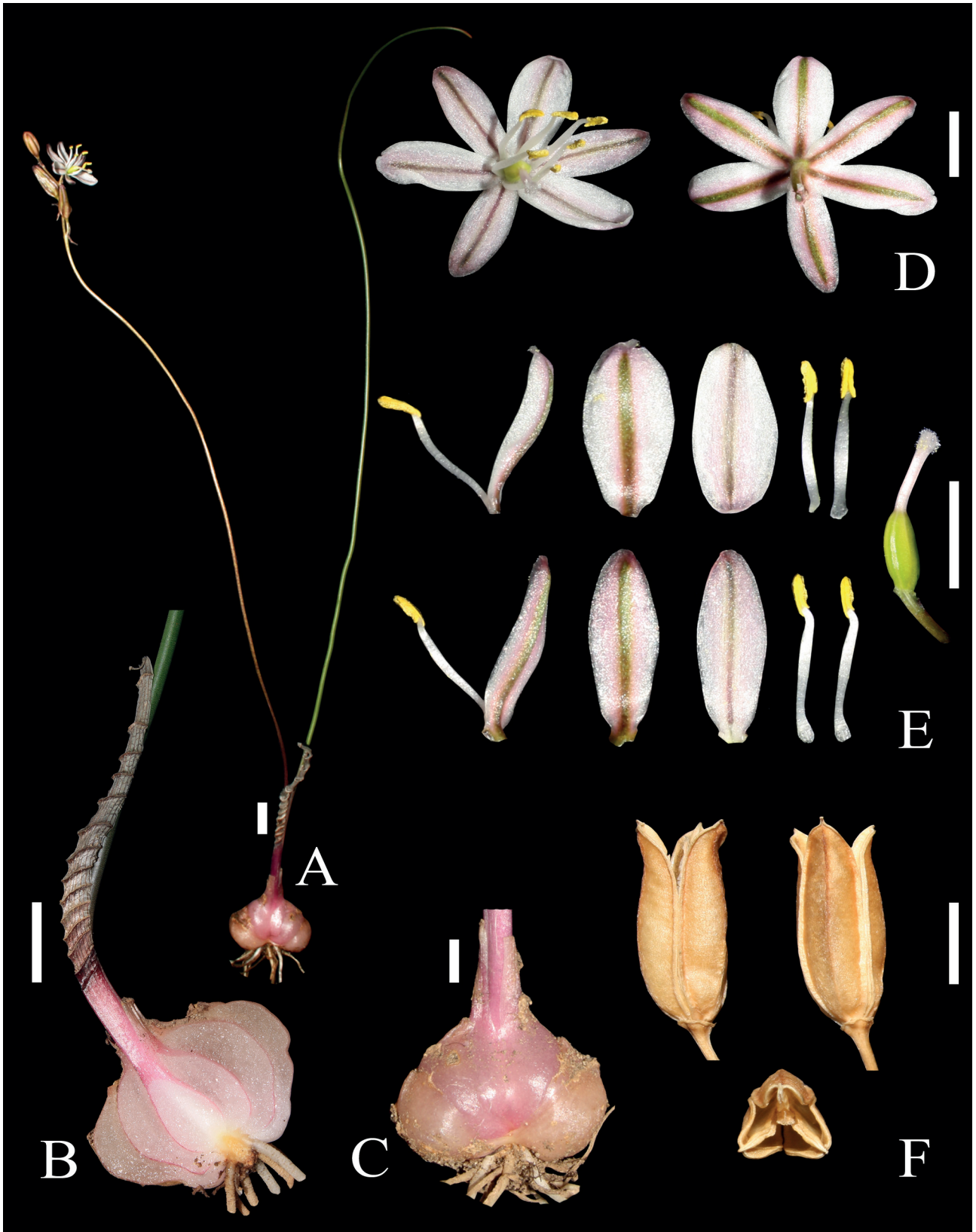


Fig. 10. *Tenicroa unifolia* (A. V. DUTHIE) M. PINTER & al. (corresponding to WW05222). (A) Habitus of a whole plant. – (B) Bulb in longitudinal section, with detail of the sheathing cataphyll. – (C) Bulb. – (D) Flower in apical and dorsal view. – (E) Dissected flower: inner tepals and stamens above, outer ones below, and gynoecium. – (F) Capsules in lateral and apical view. – Scale bars: A–B 1 cm, C–F 5 mm.

Etymology: Named after the distinctive character in having a solitary leaf (lat., unus, -a, -um = one; folius, -a, -um = -leaved).

Phenology: In habitat *Tenicroa unifolia* flowers from late September to October and fruits appear from mid October to November.

Habitat: *Tenicroa unifolia* is restricted to the Fynbos Biome and occurs in open fynbos in rather sandy soil in the Granite Fynbos and Granit and Dolerite Renosterveld Vegetation Unit. Here it can be found, e.g., in areas classified as FFg 2 Boland Granite Fynbos and FRg 2 Swartland Granite Renosterveld. Those are characterised by a mean annual precipitation ranging from 360 to 2220 mm and peaking from May to August, with mists common in winter. The mean annual temperature is 15–16 °C and frost occurs on about 2 or 3 days per year (MUCINA & RUTHERFORD 2006).

Distribution: *Tenicroa unifolia* is known from the Cape Peninsula and the surroundings of Stellenbosch where it seems to be locally frequent near rivers and rivulets, as well as from a few scattered findings in the Cape Agulhas and Swartland Municipality and the northernmost locality near Clanwilliam (Fig. 11f). Due to its somewhat cryptic mode of life it is easily overlooked, and further research is needed to establish its distribution range more accurately.

Diagnostic characters: *Tenicroa unifolia* is easily distinguished from related species (e.g., *T. flexuosa* and *T. decipiens*) by the combination of the bulb scales distichously arranged, the synanthous, single terete leaf and the mostly single sheathing cataphyll closely clasping.

Comments on the type collection: In the protologue of *Urginea unifolia*, DUTHIE (1928: 8–9) mentions “Herb. Univ. Stell., Flora Reg. Stell. 1891” as the type collection. It is yet deposited in NBG and consists of 2 sheets inventoried under a single barcode number (NBG0197708-1 & NBG0197708-2). The collecting date in NBG0197708-1 is October 1927 and it consists of seven plants at full anthesis with few fruits in an early stage, whereas NBG0197708-2 consists of two plants showing fully developed fruits and October 1925 as the date with the addition “golf course etc.” to the locality on the label. A further sheet with the same collecting number is deposited at BOL (BOL140325), which reads “3 October 1927” and shows a single plant at anthesis with some fruits developing. As the collecting numbers (DUTHIE 1891) as well as the specimens mounted are exactly the same, we regard the date in NBG0197708-2 as a mistake in the transcription of the labels. Furthermore, in DUTHIE (1928: plate 5) flowering and fruiting plants are shown on the same slide. So, all three are to be regarded as type material (NBG = holotype; BOL = isotype).

Additional material studied: SOUTH AFRICA. Western Cape. Wuppertal (3219): Clanwilliam C.P., Pakhuis Pass upper slopes (-AA), 19 October 1965, [fruiting above camp site near river], W. F. BARKER 10361 (NBG!). – Cape Town (3318): Malmesbury C.P., Darling Flora Reserve (-AD), 4 October 1956, W. F. BARKER 8652 (NBG!); Malmesbury C.P., Darling Flora Reserve (-AD), 4 October 1956, G. J. LEWIS 5074 (NBG!); Riebeeck Kasteel Viswater (-BD), October 1927, E. MARKOTTER 8757 (NBG!); Cape Peninsula, Ndabeni (CD-), 4 November 1941, T. M. SALTER 8698 (BOL!, NBG!); Pinelands (-CD), 9 November 1941, R. S. ADAMSON 3270 (PRE!); Hard, gravelly flats between Paarl Rd. & the railway near Mulder’s Vlei (-DD), 27 October 1934, J. P. H. ACOCKS 3389 (S!); Bellevue farm: Bottelary Road west of Koelenhof (-DD), ca 350 ft elevation, 30 September 1975, M. F. THOMPSON 2626 (NBG!); near Jonkershoek Staatsbos, ca 1 km west of parking area to the waterfall (-DD), 327 m elevation, [fynbos near river], 17 September 2015, M. MARTÍNEZ-AZORÍN, M. PINTER & M. B. CRESPO MMA1102 (ABH photo!); near Jonkershoek N.R. (-DD), 336 m elevation, 7 October 2015, M. PINTER WW05222 (ABH!). – Worcester (3319): Head of Du Toits Kloof, Paarl Div. (-CA), 2500 ft elevation, November 1937, N. S. PILLANS 8477 (BOL!). – Simonstown (3418): Cape Peninsula, Schusters Kraal (-AB), 10 October 1945, W. F. BARKER 3899 (NBG!); Diep River Flats (-AB), October 1915, R. MARLOTH 7140 (PRE!). – Caledon (3419): In collibus circa Elim – distr. Bredasdorp (-DA), 1896, H. BOLUS (BOL!). – Bredasdorp (3420): Hill top above Cape Agulhas (-AC), 9 November 2011, P. GOLDBLATT & L. PORTER 13735 (MO!, NBG!); De Hoop, Ryspunt, between houses near dunes (-CB), 50 ft elevation, 18 October 1984, M. VAN WYK 2084 (NBG!, PRE!).

3.3. Identification key to the species of *Tenicroa*

- 1 Leaves (usually) absent when flowering 2
- 1* Leaves present when flowering 3
- 2 Raceme moderately lax, 2–8-flowered; tepals pure white with dark keel, 8–9 mm long; leaf 1, filiform-terete, with entire margins 2. *T. decipiens*
- 2* Raceme dense, 10–20-flowered; tepals pale yellow with dark keel, ± 5 mm long; leaves 9–13, hemiterete with scabridulous margins 8. *T. juncifolia*
- 3 Bulb laterally compressed, bulb scales ± distichously arranged; leaves 1–2(–3) 4
- 3* Bulb globose, ovoid or pyriform, bulb scales spirally arranged; leaves 4 or more 5
- 4 Leaf 1; bulb without a long neck; flowering usually from late September to October 12. *T. unifolia*
- 4* Leaves 2(–3); bulb with a long neck; flowering usually Nov.–Feb. 6. *T. flexuosa*
- 5 Leaves terete, hemiterete or canaliculate 6
- 5* Leaves flat 1. *T. applanata*
- 6 Bulb scales completely loose, fleshy; cataphylls whitish with a distinct dark brown or blackish transversal banding 10. *T. namibensis*
- 6* Bulb scales compact; cataphylls transversally purple or brown barred 7
- 7 Leaves more than 15 8
- 7* Leaves less than 15 9
- 8 Leaves green, thin (ca 0.5 mm in diam.), 30–50(–80) per bulb, inflorescence exerted above the leaves about twice of their length 9. *T. multifolia*

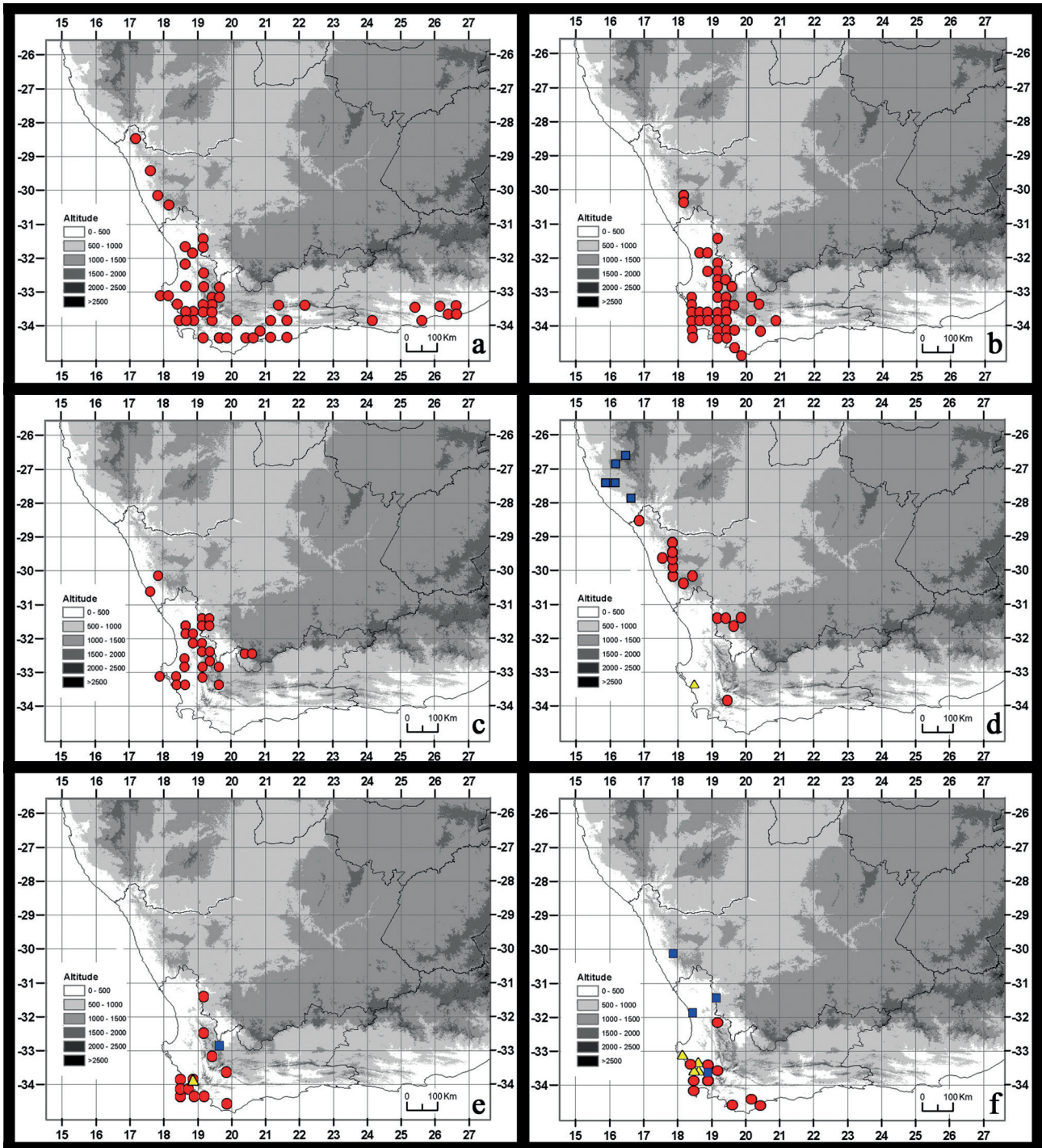


Fig. 11. Distribution maps of the 12 *Tenicroa* species. (a) *T. exuviata*. – (b) *T. filifolia*. – (c) *T. fragrans*. – (d) *T. applanata* (yellow triangle), *T. multifolia* (red circle), *T. namibensis* (blue square). – (e) *T. decipiens* (blue square), *T. flexuosa* (red circle), *T. juncifolia* (yellow triangle). – (f) *T. fibrosa* (blue square), *T. polyantha* (yellow triangle), *T. unifolia* (red circle).

8* Leaves glaucous, thickened (1–2 mm in diam.), 15–25 per bulb; inflorescence slender, exserted above the leaves more than twice of their length.... 7. *T. fragrans*
 9 Bulb ovoid to pyriform, outer tunics brown or dark brown; raceme short (1.3–2.5(–4.5) cm); leaves terete or hemiterete 10

9* Bulb globose, outer tunics yellowish or pale brown; raceme long, (2.5–) 4.5–9 cm; leaves canaliculate 11
 10 Outer tunics membranous; cataphylls 2–4; leaves hemiterete, distinctly flexuose; old leaf-bases not persistent as a fibrous neck at the apex of the bulb 5. *T. filifolia*

- 10* Outer tunics solid; cataphyll solitary; leaves terete, stiffly linear; old leaf-bases persistent as a fibrous neck at the apex of the bulb 4. *T. fibrosa*
- 11 Raceme lax to moderately dense, flowers 10–20
..... 3. *T. exuviata*
- 11* Raceme dense, flowers (30–)50–70..... 11. *T. polyantha*

Acknowledgements

This work was partly supported by the University of Graz (Austria), Fundación Ramón Areces (Spain), H2020 Research and Innovation Staff Exchange Programme of the European Commission, project 645636: 'Insect-plant relationships: insights into biodiversity and new applications' (FlyHigh), the grant ACIE18–03, UAUSTI18–02 and UAUSTI19–08 from the University of Alicante (Spain). Rhodes University (Dept. of Botany) and the Selmar Schonland Herbarium (GRA) provided working facilities for the second author between 2009 and 2011. A grant from the Republic of South Africa to the senior author (W. W.) in 1987 to collect material used for this study is highly appreciated. We thank D. BELLSTEDT, L. MUCINA, A. MARTÍNEZ-SOLER, C. MANNHEIMER, S. RUGHEIMER and F. CHASE for their invaluable help with field work in South Africa and southern Namibia. We acknowledge the help of all herbarium curators who kindly provided material and information. Sincere thanks go to F. CHASE for providing the scan of the holotype of *Tenicroa namibensis* at WIND and to A. BURKE for sharing the slide used in the illustration. We also would like to thank all the numerous garden and plant enthusiasts who publish valuable information and images on plants on the internet and who contribute substantially to the increase of knowledge. All managers of Nature Reserves are thanked for allowing us access. The Department of Environment and Nature Conservation of Northern Cape Province and CapeNature of Western Cape Province kindly granted plant collecting permits (collecting and export permit numbers FLORA046/2010, FLORA047/2010, FLORA069/2011, FLORA070/2011, FLORA061/2/2015, FLORA062/2/2015, FLORA0057/2017, FLORA0058/2017, AAA008-00031-0028, 0027-AAA008-00699, 0028-AAA008-00203). The Ministry of Environment and Tourism of Namibia provided research/collecting permit (Permit number 2192/2016).

References

ADAMSON R. S. 1942. Some Peninsula species of *Urginea*. – Journal of South African Botany 8: 237–242.

ADAMSON R. S. & SALTER T. M. (eds.) 1950. Flora of the Cape Peninsula. – Cape Town, Juta. 889 pp.

APG (Angiosperm Phylogeny Group) 2003. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. – Botanical Journal of the Linnean Society 141: 399–436. <<http://dx.doi.org/10.1046/j.1095-8339.2003.t01-1-00158.x>>.

APG (Angiosperm Phylogeny Group) 2009. An update of the Angiosperm Phylogeny Group Classification for the orders and families of flowering plants: APG III. – Botanical Journal of the Linnean Society 161: 105–121. <<http://dx.doi.org/10.1111/j.1095-8339.2009.00996.x>>.

APG (Angiosperm Phylogeny Group) 2016. An update of the Angiosperm Phylogeny Group Classification for the orders and families of flowering plants: APG IV. – Botanical Journal of the Linnean Society 181: 1–20. <<https://doi.org/10.1111/boj.12385>>.

BAKER J. G. 1873. Revision of the genera and species of *Scilleae* and *Chlorogaleae*. – Journal of the Linnean Society, Botany 13: 209–292.

BAKER J. G. 1892. *Liliaceae* novae Africae australis herbarii regii Berolinensis. – Botanische Jahrbucher fur Systematik, Pflanzengeschichte und Pflanzengeographie 15(3), Beiblatt zu den Botanischen Jahrbuchern 35: 5–8.

CHASE M. W., REVEAL J. L. & FAY M. F. 2009. A subfamilial classification for the expanded asparagalean families, *Amaryllidaceae*, *Asparagaceae* and *Xanthorrhoeaceae*. – Botanical Journal of the Linnean Society 161: 132–136. <<https://doi.org/10.1111/j.1095-8339.2009.00999.x>>.

CROUCH N. R., MARTÍNEZ-AZORÍN M., CRESPO M. B., PINTER M. & ALONSO-VARGAS M. Á. 2018. *Zingela* (*Asparagaceae*, *Scilloideae*), a distinct new urGINEOID genus from KwaZulu-Natal, South Africa. – Phytotaxa 371: 33–41. <<https://doi.org/10.11646/phytotaxa.371.1.4>>.

DUTHIE A. V. 1928. Contribution to our knowledge of the Stellenbosch Flora. The species of *Urginea* of the Stellenbosch flats. – Annale van die Uniwrsiteit van Stellenbosch, Reeks B. Annals of the University of Stellenbosch 6(2): 3–16.

GIESS W. 1998. A preliminary Vegetation Map of Namibia, 3rd Revised Edition from GIESS 1971. – Dinteria 4: 5–16.

GOLDBLATT P. & MANNING J. C. 2000. Cape Plants. A conspectus of the Cape flora of South Africa. – Strelitzia 9: 743 pp.

GOLDBLATT P., MANNING J. C. & FOREST F. 2012. A review of chromosome cytology in *Hyacinthaceae* subfamilies *Urgineoideae* and *Hyacinthoideae* (tribes *Hyacintheae*, *Massonieae*, *Pseudoprosperae*) in sub-Saharan Africa. – South African Journal of Botany 83: 134–144.

HOOKE [f.] J. D. 1867 *Bowiea volubilis*. – Curtis's Botanical Magazine Ser. 3, 23: t. 5619.

IPNI 2020. The International Plant Names Index. – <<http://www.ipni.org>> (accessed June 2020).

JACQUIN N. J. 1794. Icones plantarum rariorum 2. 22 pp., plates 201–454. – C. F. Wappler; Vindobonae.

JACQUIN N. J. 1796. Collectaneorum supplementum. 171 pp. – C. F. Wappler; Vindobonae.

JACQUIN N. J. 1797. Plantarum rariorum Horti Caesarei Schoenbrunnensis 1. 70 pp., plates 1–129. – C. F. Wappler; Vindobonae.

JESSOP J. P. 1977. Studies in the bulbous *Liliaceae* in South Africa 7. The taxonomy of *Drimia* and certain allied genera. – Journal of South African Botany 43: 265–319.

KER GAWLER J. B. 1805. *Albuca exuviata*. – Curtis's Botanical Magazine 22: t. 871.

KER GAWLER J. B. 1818. *Albuca fugax*. – The Botanical Register 4: t. 311.

KER GAWLER J. B. 1821. *Albuca filifolia*. – The Botanical Register 7: t. 557.

KUNTH C. S. 1843. Enumeratio plantarum omnium hucusque cognitarum, secundum familias naturales disposita, adjectis characteribus, differentiis et synonymis 4. – J. G. Cotta; Stuttgartiae et Tubingae. 752 pp.

- LEISTNER O. A. & MORRIS J. W. 1976. Southern African place names. – *Annals of the Cape Provincial Museum* 12: 1–565.
- LEWIS G. J. 1952. *Plantae novae Africanae*. – *Annals of the South African Museum* 40: 6–14.
- MANNING J. C. & GOLDBLATT P. 2003. *Hyacinthaceae* – In: GERMISHUIZEN G. & MEYER N. L., *Plants of southern Africa – an annotated checklist*. – *Strelitzia* 14: 1054–1071.
- MANNING J. C. & GOLDBLATT P. 2018. Systematics of *Drimia* JACQ. (*Hyacinthaceae: Urgineoideae*) in southern Africa. – *Strelitzia* 40: 173 pp.
- MANNING J. C., GOLDBLATT P. & SNIJMAN D. 2002. The color encyclopedia of Cape bulbs. – Timber Press; Portland, OR. 486 pp.
- MANNING J. C., GOLDBLATT P. & FAY M. F. 2004. A revised generic synopsis of *Hyacinthaceae* in Sub-Saharan Africa, based on molecular evidence, including new combinations and the new tribe *Pseudoprosperae*. – *Edinburgh Journal of Botany* 60(3): 533–568. <<http://dx.doi.org/10.1017/S0960428603000404>>.
- MARTÍNEZ-AZORÍN M., CRESPO M. B. & JUAN A. 2007. Taxonomic revision of *Ornithogalum* subg. *Cathissa* (SALISB.) BAKER (*Hyacinthaceae*). – *Anales del Jardín Botánico de Madrid* 64(1): 7–25.
- MARTÍNEZ-AZORÍN M., CRESPO M. B. & JUAN A. 2009. Taxonomic revision of *Ornithogalum* subg. *Beryllis* (*Hyacinthaceae*) in the Iberian Peninsula and the Balearic Islands. – *Belgian Journal of Botany* 142(2): 140–162.
- MARTÍNEZ-AZORÍN M., CRESPO M. B., JUAN A. & FAY M. F. 2011. Molecular phylogenetics of subfamily *Ornithogaloideae* (*Hyacinthaceae*) based on nuclear and plastid DNA regions, including a new taxonomic arrangement. – *Annals of Botany* 107: 1–37. <<http://dx.doi.org/10.1093/aob/mcq207>>.
- MARTÍNEZ-AZORÍN M., CRESPO M. B., DOLD A. P., WETSCHNIG W., PINTER M., PFOSSER M. & VAN JAARSVELD E. 2013a. *Sagittanthera* (*Hyacinthaceae, Urgineoideae*), a new buzz pollinated genus from the Eastern Cape Province of South Africa. – *Phytotaxa* 98(2): 43–54. <<http://dx.doi.org/10.11646/phytotaxa.98.2.2>>.
- MARTÍNEZ-AZORÍN M., CRESPO M. B. & DOLD A. P. 2013b. *Drimia cochlearis* (*Hyacinthaceae*), a new species from South Africa. – *Systematic Botany* 38: 332–338. <<http://dx.doi.org/10.1600/036364413X666831>>.
- MARTÍNEZ-AZORÍN M., CRESPO M. B., DOLD A. P., PINTER M. & WETSCHNIG W. 2015. New combinations and lectotype designations in *Asparagaceae* subfam. *Scilloideae*. – *Phytotaxa* 201(2): 165–171. <<http://dx.doi.org/10.11646/phytotaxa.201.2.7>>.
- MARTÍNEZ-AZORÍN M., CRESPO M. B., PINTER M. & WETSCHNIG W. 2017. *Aulostemon* (*Asparagaceae, Scilloideae*), a new genus from South Africa. – *Phytotaxa* 321(3): 287–293. <<https://doi.org/10.11646/phytotaxa.321.3.6>>.
- MARTÍNEZ-AZORÍN M., CRESPO M. B., ALONSO-VARGAS M. Á., DOLD A. P., PINTER M. & WETSCHNIG W. 2018. *Austronea* (*Asparagaceae, Scilloideae*), a new genus from southern Africa, including the description of seven new species. – *Phytotaxa* 365(2): 101–129. <<https://doi.org/10.11646/phytotaxa.365.2.1>>.
- MARTÍNEZ-AZORÍN M., CRESPO M. B., PINTER M., SLADE J. M. & WETSCHNIG W. 2019a. *Iosanthus* (*Hyacinthaceae* subfam. *Urgineoideae*), a new genus from southern Africa to include *Ornithogalum toxicarium* and its removal from *Ornithogaloideae*. – *Plant Biosystems* 153(4): 580–588. [Published online 18 Dec 2018]. <<https://doi.org/10.1080/11263504.2018.1527793>>.
- MARTÍNEZ-AZORÍN M., CRESPO M. B., ALONSO-VARGAS M. Á., DOLD A. P., CROUCH N. R., PFOSSER M., MUCINA L., PINTER M. & WETSCHNIG W. 2019b. New combinations in the tribe *Urgineae* (*Asparagaceae* subfam. *Scilloideae*) with comments on contrasting taxonomic treatments. – *Phytotaxa* 397(4): 291–299. <<https://doi.org/10.11646/phytotaxa.397.4.3>>.
- MARTÍNEZ-AZORÍN M., DOLD A. P., CRESPO M. B., PINTER M., ALONSO-VARGAS M. Á. & WETSCHNIG W. 2019c. A taxonomic revision of *Geschollia* (*Asparagaceae, Urgineae*) – from a monotypic genus towards its diversification, including the description of five new species. – *Phytotaxa* 427(2): 85–114. <<https://doi.org/10.11646/phytotaxa.427.2.1>>.
- MUCINA L. & RUTHERFORD M. C. (eds.) 2006. The vegetation of South Africa, Lesotho and Swaziland. – South African National Biodiversity Institute, Pretoria. 807 pp.
- OBERMEYER A. A. 1980. The genus *Sypharissa* (*Liliaceae*). – *Bothalia* 13: 111–114.
- OBERMEYER A. A. 1981. Some name changes in the *Urgineae* complex. – *Journal of South African Botany* 47(3): 577.
- PFOSSER M. & SPETA F. 1999. Phylogenetics of *Hyacinthaceae* based on plastid DNA sequences. – *Annals of the Missouri Botanical Garden* 86: 852–875. <<https://doi.org/10.2307/2666172>>.
- PFOSSER M. F. & SPETA F. 2001. Bufadienolide und DNA-Sequenzen: Über Zusammenhalt und Aufteilung der *Urgineoideae* (*Hyacinthaceae*). – *Stapfia* 75: 177–250.
- PFOSSER M. F. & SPETA F. 2004. From *Scilla* to *Charybdis* – is our voyage safer now? – *Plant Systematics and Evolution* 246: 245–263. <<http://dx.doi.org/10.1007/s00606-004-0153-z>>.
- PFOSSER M. F., KNIRSCH W., PINTER M., ALI S. S., DUTTA S. & WETSCHNIG W. 2012. Phylogenetic relationships of Malagasy *Hyacinthaceae*. – *Plant Ecology and Evolution* 145(1): 65–72.
- PINTER M., CRESPO M. B., ILG I., LUIDOLD A. K., MARTÍNEZ-AZORÍN M., MÜLLER-DOBLIES U., MÜLLER-DOBLIES D., PFOSSER M. & WETSCHNIG W. 2013. *Mucinaea* (*Hyacinthaceae-Urgineoideae*), a remarkable new genus from Namaqualand (Northern Cape Province, South Africa). – *Phyton* (Horn, Austria) 53(2): 289–304.
- PINTER M., MARTÍNEZ-AZORÍN M., CRESPO M. B., ALONSO-VARGAS M. Á., WETSCHNIG W. 2019. *Striatula* (*Hyacinthaceae, Urgineoideae*), a new genus from South Africa and southern Namibia. – *Phyton* (Horn, Austria) 59(1–2): 91–98. [Published online 17 Dec 2019]. <<https://doi.org/10.12905/0380.phyton59-2019-0091>>.
- POIRET J. L. M. 1804. *Encyclopédie Méthodique, Botanique* 5. – C. H. Agasse; Paris. 748 pp.
- RAFINESQUE C. S. 1837. *Flora Telluriana* 3. – H. Probasco; Philadelphia, PA. 100 pp.
- SALISBURY R. A. 1866. *The genera of plants*. – J. van Voorst; London. 143 pp.
- SPETA F. 1980. Karyosystematik, Kultur und Verwendung der Meerzwiebel (*Urginea* STEINH., *Liliaceae* s.l.). – *Linzer Biologische Beiträge* 12(1): 193–238.
- SPETA F. 1998a. *Hyacinthaceae*. – In KUBITZKI K. (ed.), *The families and genera of vascular plants* 3: 261–285. – Springer. Berlin.

- SPETA F. 1998b. Systematische Analyse der Gattung *Scilla* L. s.l. (*Hyacinthaceae*). – *Phyton* (Horn, Austria) 38: 1–141.
- SPETA F. (†) 2016. Substitution of an illegitimate generic name in Hyacinthaceae, and validation of names of already described species in *Ornithogalum* (Hyacinthaceae) and *Pinguicula* (Lentibulariaceae). (Edited by Walter GUTERMANN and Elise SPETA.) – *Phyton* (Horn, Austria) 56(2): 153–159.
- STEINHEIL A. 1834. Note sur le genre *Urginea* nouvellement formé dans la famille des Liliacées. – *Annales des Sciences Naturelles; Botanique sér. 2*, 1: 321–332.
- THIERS B. 2020. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. <<http://sweetgum.nybg.org/ih/>>. (continuously updated; accessed June 2020)
- THUNBERG C. P. 1794. *Prodromus Plantarum Capensium, quas in Promontorio Bonae Spei Africes, annis 1772–1775, collegit Carol. Pet. THUNBERG.* – J. Edman; Upsaliae. 83 pp.
- WETSCHNIG W., KNIRSCH W., ALI S. S. & PFOSSER M. 2007. Systematic position of three little known and frequently misplaced species of *Hyacinthaceae* from Madagascar. – *Phyton* (Horn, Austria) 47(2): 321–337.
- WILLDENOW C. L. 1799. *Caroli a Linné Species Plantarum. Editio Quarta, vol. 2* (1). 823 pp. – Impensis G. C. Nauk; Berolini [Berlin].
- WISITTIPANICH S. & SARAPHOL S. 2019. *Drimia indica* (*Asparagaceae, Scilloideae*), a new record for Thailand. – *Thai Forest Bulletin (Botany)* 47(1): 69–72.

(Received 15 May 2020, accepted 16 Jun 2020)