

# *Marijordaania* (Celastraceae: Cassinoideae), a new monotypic genus from South Africa

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## Abstract

**Background and aims** – The species name *Gymnosporia filiformis*, validly published in a 1927 revision of South African Celastraceae, was based on syntypes representing both *Maytenus cordata* and a new species. Subsequent studies supported the distinction of *Gymnosporia* and *Maytenus* as separate genera. From 1984, this new species was provisionally referred to by the designation “*Maytenus* sp. A”. *Maytenus* in Africa comprises a diverse group of species not closely related to the New World members of *Maytenus*. Here, we clarify the taxonomic identity and generic placement of *G. filiformis*, and compare it with species with which it has historically been confused.

**Material and methods** – Descriptions and observations are based on extensive field work, supported by conventional taxonomic methods, including study of relevant literature and herbarium collections.

**Key results** – The name *Gymnosporia filiformis* is lectotypified using a syntype representing “*Maytenus* sp. A”. We describe a new monotypic genus, *Marijordaania*, to accommodate “*Maytenus* sp. A”, and propose the new combination, *Marijordaania filiformis*. An amended description is provided for the species. It is morphologically quite different from *Maytenus cordata*, but also from *Maytenus acuminata* and *Maytenus abbottii*, species with which it has been confused in the past. *Marijordaania filiformis* grows in the understorey of evergreen Scarp Forest and is relatively rare, known with certainty only from KwaZulu-Natal and the Eastern Cape provinces, South Africa. A preliminary conservation assessment suggests that *M. filiformis* should be classified as Endangered.

**Conclusion** – *Marijordaania filiformis* is a taxonomically isolated species with no apparent close relatives among African Celastraceae. While the generic status of other African members of *Maytenus* still needs to be resolved, it would not impact the taxonomic status of *Marijordaania*. In a recent key for Celastraceae genera based on morphology and geography, *M. filiformis* ran to the genus *Euonymus*, but this association lacks support from available molecular evidence.

## Keywords

Celastraceae, Celastroideae, gutta-percha, lectotypification, Maputaland-Pondoland-Albany Hotspot, new genus, Pondoland Centre, Scarp Forest, taxonomy

## INTRODUCTION

In her taxonomic revision of South African Celastraceae, Davison (1927) adopted a broad concept of the genus *Gymnosporia* (Wight & Arn.) Benth. & Hook.f., including in it the genus *Maytenus* Molina. Among the newly described species in this revision was *Gymnosporia filiformis* Davison. Additionally, she recognised

*Gymnosporia cordata* (E.Mey. ex Sond.) Sim, based on *Celastrus cordatus* E.Mey. ex Sond., as a distinct species. The principal objective of this contribution is to clarify the taxonomic identity of *Gymnosporia filiformis*. After lectotypification, we propose the description of a new genus to accommodate this species. Moreover, we underscore the historical confusion between *Gymnosporia filiformis* and *Gymnosporia cordata*, particularly in herbaria.

Loesener (1942) transferred Davison's unarmed African species of *Gymnosporia* to *Maytenus*, a genus which had, up to that time, been regarded as being restricted to the New World (mainly tropical and subtropical America). *Gymnosporia cordata* then became *Maytenus cordata* (E.Mey. ex. Sond.) Loes. However, there is no mention of *Gymnosporia filiformis* in Loesener's otherwise comprehensive worldwide revision of the Celastraceae. Exell in Exell and Mendonça (1952) did not support the distinction between these two genera and transferred some of the mostly armed species of *Gymnosporia* to *Maytenus*. Subsequently, Marais (1960), in his enumeration of members of *Maytenus* in southern Africa, followed a similar broad generic concept, and treated all the southern African species of *Gymnosporia* under *Maytenus*. Marais relegated *Maytenus cordata* to the synonymy of *Maytenus acuminata* (L.f.) Loes. In addition, Marais also placed *Gymnosporia filiformis* in the synonymy of *Maytenus acuminata*, pointing out that this would need to be confirmed by further study. Marais' broad concept of *Maytenus acuminata* would prevail without challenge for at least the next 20 years.

In the early 1980s, Anthony Thomas Dixon (Tony) Abbott (1936–2013), a farmer and amateur botanist, undertook in-depth explorations of the flora in southern KwaZulu-Natal and Pondoland, South Africa. Based on field observations, Abbott questioned the validity of botanists applying, at the time, the name *Maytenus acuminata* to what he perceived as four distinct species growing sympatrically in the Umtamvuna Nature Reserve. In response to Abbott's claims, one of us (AEvW) re-evaluated Marais' (1960) classification of *Maytenus* in southern Africa. Available taxonomic evidence strongly supported the recognition, not only of *Maytenus acuminata* (in a narrow sense), but also *Maytenus cordata*, *Gymnosporia filiformis* (pro parte, as it turned out to be based on mixed collections – further details can be found below), and a morphologically distinct new species, provisionally placed in *Maytenus* and described as *Maytenus abbottii* A.E.van Wyk (Van Wyk 1984). As it lacked thorns and did not morphologically resemble *Gymnosporia* in a strict sense, Van Wyk (1984) suggested that, pending further study, the designation *Maytenus* sp. A – not to be confused with “*Maytenus* sp. A” sensu Schmidt et al. (2002) – be used for *Gymnosporia filiformis*. Abbott commissioned Lynne Nichols to prepare colour illustrations from live material of the four species involved, and these were subsequently published (Abbott 1985). Evidence from chemotaxonomy also supported the recognition of these four species (Rogers et al. 2000).

More recently, extensive taxonomic studies on Celastraceae in southern Africa provided robust evidence supporting the distinction of *Gymnosporia* and *Maytenus* as separate genera, a perspective previously expressed by Hou (1955). Consequently, *Gymnosporia* was reinstated as a distinct genus from *Maytenus* for the southern African species exhibiting characters such as dioecy and thorns (Jordaan and Van Wyk 1999, 2006).

Comprehensive analyses considering both morphological and molecular characters supported the recognition of a New World *Maytenus* and a primarily Old World *Gymnosporia* (McKenna et al. 2011; Biral et al. 2017; Simmons et al. 2023). The removal of *Maytenus* from Africa, left the former African members of *Maytenus* as a polyphyletic group, necessitating a reclassification into natural segregate genera (McKenna et al. 2011; Biral et al. 2017). Available morphological and molecular evidence supports a distinct taxonomic position for *Gymnosporia filiformis*, leading us to place it in a genus of its own through lectotypification in this present contribution.

## MATERIAL AND METHODS

Descriptions and observations in the present paper are based on extensive field work conducted over many years by both authors in the natural habitat of plants, including members of the Celastraceae, primarily focusing on KwaZulu-Natal and the Eastern Cape regions of South Africa. This was supplemented by study of relevant literature and herbarium collections. One of us (RGCB) visited Krantzklouf Nature Reserve in Durban and Umtamvuna Nature Reserve near Port Edward to conduct fieldwork and morphological observations on specifically *Maytenus* sp. A, as well as associated members of *Maytenus*.

The following herbaria were visited to examine specimens: NH, NU, PCE (now incorporated in NU), PRE, PRU, and UDW (now incorporated in NU). Photographs of selected specimens were obtained from SAM and BOL. Also consulted were high-resolution images of type material available in K on the Internet through JSTOR Global Plants (2023). Liquid-preserved flowering and fruiting material of *Maytenus* sp. A and *Maytenus cordata* was obtained from the spirit collection of PRU. Herbarium abbreviations follow Thiers (2023).

In the section “Additional material examined”, locality citations were reproduced as per the specimen labels. In some cases, the spelling of the locality name was either corrected or an alternative spelling was provided. The correction or alternative spelling is included in square brackets. Specimens are arranged according to the Degree Reference System proposed by Edwards and Leistner (1971). The grid references are supplied between brackets after each locality cited. Collections are ordered in numerical sequence according to one-degree squares, with records from the same one-degree square in quarter-degree square alphabetical order, and records from the same quarter-degree square arranged alphabetically according to the collector's name. Where quarter-degree references were not available on specimen labels, they have been supplied by us and are shown in square brackets. Some quarter-degree grid references were corrected, and in such instances, the correct references are included in square brackets following the reference on the collectors' labels. The distribution map was compiled from specimen

data using ArcGIS software and the centroid grid values of the quarter-degree grid system derived from the localities provided. The original base map is based on the GTOPO30 global digital elevation model, and colours were modified in Global Mapper v.6.06 (Global Mapper Software LLC 2004–2005).

A preliminary conservation assessment was conducted using the standard procedures based on IUCN guidelines (IUCN 2012; IUCN Standards and Petitions Committee 2022). GeoCAT (Bachman et al. 2011) was used to estimate Extent of Occurrence (EOO) and Area of Occupancy (AOO) using the 2 km cell width recommended by the IUCN Standards and Petitions Committee (2022).

In this paper, we follow the recently proposed more natural classification of the Celastrales by Simmons et al. (2023). According to this updated classification, 13 subfamilies are recognised in Celastraceae. Notably, the traditionally recognised subfamily Celastroideae, as for example employed by Simmons (2004), is now more narrowly defined. Within this revised framework, certain members previously placed in Celastroideae, such as *Maytenus* sp. A, are now classified in subfamily Cassinoideae.

## RESULTS AND DISCUSSION

### Identity of *Gymnosporia filiformis*, and lectotypification of the name

When Davison (1927) validly published the name *Gymnosporia filiformis*, she based it on four gatherings, without designating a holotype. Thus, these four gatherings are syntypes. The protologue of the name comprises a concise morphological description in Latin, a rather detailed citation of the four gatherings, a line drawing based on one of the syntypes, and an identification key to the group of species and infraspecific taxa with which *G. filiformis* is associated. For each gathering, Davison (1927) supplied the collector's name, number, and locality, and the herbarium(s) where the specimen is housed, in most instances with the corresponding herbarium accession number.

In the protologue, Davison did not explicitly explain her concept of the taxon, nor did she give an indication of its morphologically most similar relatives. However, the choice of specific epithet and the key provide clues. In the description, the peduncles (technically “pedicels”) are described as “...filiformi, circa 2 cm. longi...”. In her identification key to the infrageneric taxa of *Gymnosporia*, a primary distinction is made between two groups of taxa based on inflorescence type: “Fasciculatae”, for those with flowers in fascicles (probably representing very condensed cymose inflorescences), and “Cymosae”, for those with flowers in cymes. *Gymnosporia filiformis* appears in the key to the “Cymosae”. In the first couplet of this key, *Gymnosporia cordata* is differentiated by its leaves being sessile and cordate at the base, whereas *G.*

*filiformis* conforms to the contrasting statement with leaves petiolate and not cordate at the base. The key then progresses through several statements to a final couplet, which differentiates between *G. filiformis* and *G. acuminata*. Here, the lead for *G. filiformis* states: “Pedicels about 2 cm. long or more; leaves rounded at the base”, whereas the contrasting statement for *G. acuminata* reads: “Pedicels up to 0.5 cm. long; leaves cuneate at the base”. From all of this, it is clear that Davison recognised *G. filiformis* as a taxon distinct from both *Maytenus cordata* and *Maytenus acuminata* based on its leaves being petiolate without a cordate base, and flowers with slender and relatively long pedicels (about 20 mm or more).

A weakness of Davison's key is her rather narrow concept of *Maytenus cordata*. While “typical” forms of this species are easily recognised by essentially sessile leaves with a cordate lamina base, other forms are also frequently encountered with short, but distinctly petiolate leaves with a rounded or cuneate lamina base. To add to the potential confusion, *Maytenus cordata* occasionally has flowers with relatively long pedicels, though these rarely exceed 20 mm in length.

A study of the four syntypes of *Gymnosporia filiformis* showed that three of the four gatherings, namely *Wood* 8257 (NH9205), *Wood* 9987 (NH10543), and *Wood* 11608 (SAM0007363-9), represent *Maytenus cordata*. Moreover, the illustration provided for *Gymnosporia filiformis* in the protologue was based on *Wood* 11608, thus it depicts *Maytenus cordata*. Davison herself was also confused by the similarity between these two species, seeing that a duplicate of one of the syntypes, *Wood* 9987 (K), was cited under *Maytenus cordata* (Davison 1927: 300). The fourth gathering, *Wood* 734 (with sheets cited in BOL, K, and NH), represents a different taxon, conspecific with the species designated as *Maytenus* sp. A by Van Wyk (1984).

In the original description of *Gymnosporia filiformis* (Davison 1927), the ovary is described as 3-locular. However, upon dissecting the flowers of *Maytenus* sp. A, we consistently observed that the ovary is 5-locular. Marais (1960), in his provisional placement of *Gymnosporia filiformis* as a synonym of *Maytenus acuminata*, also noted that flowers he dissected from the former exhibited 5 locules. Hence, the number of locules described by Davison contradicts the condition observed in *Maytenus* sp. A. We suspect that Davison's statement in the original description might have been based on flowers from one or more of the three syntypes belonging to *Maytenus cordata*, as both *Maytenus cordata* and *Maytenus acuminata* have 3-locular ovaries. It is also worth noting that Marais claimed the presence of more than two ovules in each locule, but we have always observed only two ovules, casting doubt on his figure.

According to Art. 9.3 of the International Code of Nomenclature for algae, fungi, and plants (Turland et al. 2018), a lectotype should be designated from the original material if a type is found to belong to more than one taxon. This situation applies in the case of the name *Gymnosporia filiformis*, considering that it is based on

syntypes representing two different taxa. Furthermore, Art. 19.14 ruled that when the original material represented more than one taxon, the name must remain attached to the specimen that corresponds most nearly with the original description or diagnosis. Based on the evidence supplied in the protologue, Davison's intention was clearly to describe a taxon that morphologically (ignoring the discrepancy in the number of locules in the ovary) most closely resembles *Maytenus* sp. A, a species represented by the syntype *Wood* 734. Hence, under the formal taxonomic treatment below, we lectotypify the name *Gymnosporia filiformis* with a specimen from this particular gathering in K, namely K000035898. We have chosen this particular specimen because it is of good quality and contains all relevant information.

### Generic position of *Gymnosporia filiformis*

The delineation of genera within Celastraceae has historically faced difficulties due to the limited presence of distinctive morphological characters in both vegetative and reproductive features. This is further complicated by high levels of morphological homoplasy. However, recent advancements in molecular studies have proven informative in recognising specific clades, thereby aiding in the establishment of more natural generic and higher-level taxonomic groupings (e.g. Simmons et al. 2008, 2023; McKenna et al. 2011). In the study by McKenna et al. (2011), *Gymnosporia filiformis* (referred to as “*Maytenus filiformis* ined.”; the voucher specimen representing *Maytenus* sp. A, hence complying with the lectotypification of the species as presented here) and *Maytenus cordata*, along with various other celastraceous species and genera, were conclusively placed within a strongly supported African clade (jackknife support = 100; bootstrap support = 100). However, *Gymnosporia filiformis*, *Maytenus cordata*, and *Maytenus abbottii* did not form a cohesive clade, indicating that each of these species might be more appropriately classified within its own genus. Regrettably, *Maytenus acuminata* was not included in the sampling.

In a subsequent comprehensive phylogenetic analysis of the Celastrales conducted by Simmons et al. (2023), *Gymnosporia filiformis* (again referred to as “*Maytenus filiformis* ined.”) is situated within a strongly supported clade (jackknife support = 100), forming a grouping alongside *Maytenus abbottii*. Additionally, *Maytenus cordata* is found in a moderately supported clade (jackknife support = 78) along with *Robsonodendron eucleiforme* (Eckl. & Zeyh.) R.H.Archer. However, despite these molecular findings, there is in our view no obvious morphological evidence indicating a close relationship between *Gymnosporia filiformis* and *Maytenus abbottii* (Table 1). Notably, *Maytenus abbottii*, based on morphological characters as documented by Van Wyk (1984), stands out as perhaps the most distinctive among the *Maytenus* species in southern Africa that are yet to be assigned to separate genera. Consequently, in our

opinion, the molecular evidence presented by Simmons et al. (2023) is insufficient on its own to warrant the classification of *Gymnosporia filiformis* and *Maytenus abbottii* within the same genus.

In Simmons' (2004) morphology- and geography-based identification key to the genera of the Celastraceae, *Gymnosporia filiformis* ran to the genus *Euonymus* L. However, molecular studies, although based on a limited sampling of members of *Euonymus*, did not suggest a close phylogenetic relationship between *Gymnosporia filiformis* (as “*Maytenus filiformis* ined.”) and *Euonymus* (Simmons et al. 2008; McKenna et al. 2011). In light of both molecular and morphological evidence supporting the isolated taxonomic position of *Gymnosporia filiformis* (as lectotypified), we here establish a new monotypic genus, *Marijordaania*, to accommodate this species. Although the unresolved generic status of several other African members within Celastraceae, currently classified under *Maytenus*, warrants further investigation, we assert that the introduction of *Marijordaania* will not impact the delineation of other yet-to-be-recognised genera.

The identification of diagnostic morphological characters for the new genus proved quite difficult, given the prevalent trend of subtle morphological variation among currently acknowledged genera in the family. In plant taxonomy, two types of diagnoses can be employed: one providing essential characters and another offering differential characters (Stearn 1993: 143). While not mandatory according to the International Code of Nomenclature for algae, fungi, and plants (Turland et al. 2018: Art. 38.1) – given that we have furnished a comprehensive species description – we have opted to include a diagnosis for the new genus. However, due to the absence of readily identifiable close generic relatives in terms of both morphology and phylogeny, we have chosen to present a diagnosis emphasising mainly essential characters. Particularly diagnostic vegetative features are the alternate leaves and vascular bundles lacking gutta-percha (trans-1,4-polyisoprene). Diagnostic reproductive features include the few-flowered cymose inflorescences and flowers with a fleshy disc, distinctly divided into 5 discoid subunits (lobes), the latter raised and alternating with the petals with each of the five stamens inserted in the centre of a discoid subunit. In addition, the ovary is 5-locular and almost entirely included in and adnate to the disc.

## TAXONOMIC TREATMENT

***Marijordaania*** A.E.van Wyk & R.G.C.Boon, **gen. nov.**  
urn:lsid:ipni.org:names:77336437-1

**Type species.** *Marijordaania filiformis* (Davison) A.E.van Wyk & R.G.C.Boon.

**Diagnosis.** A member of Celastraceae, subfamily Cassinoideae (sensu Simmons et al. 2023), belonging to a clade of African members of the family (sensu McKenna et al. 2011), but taxonomically isolated without

obvious close relatives. Often confused with *Maytenus cordata*, but distinguished from this and other unarmed African species still placed in *Maytenus* by the following combination of characters: shrub or small tree, without elastic threads (gutta-percha; trans-1,4-polyisoprene); stems distinctly angular when young; inflorescences cymose, 1- or 2(3)-flowered; flowers 5-merous, with pedicel slender, pendant, usually 35–40 mm long, articulated ca 0.5 mm from the base; floral disc present, fleshy, distinctly divided into 5 discoid subunits (lobes), the latter raised and alternating with the petals; stamens 5, each inserted in the centre of a discoid subunit; filaments very short (ca 1 mm); anthers dorsifixed; ovary 5-locular, almost entirely included in and adnate to the disc, with 2 erect collateral ovules in each locule; style ca 0.5 mm long, stigma capitate; fruit a loculicidally dehiscent capsule; seeds lacking postchalazal vascular bundles, with the basal portion enveloped for ca two-thirds or more its length with a fleshy, white aril, the latter mostly smooth-surfaced, but sparsely puberulent towards the base.

**Description.** As for the species.

**Etymology.** The generic name commemorates Dr Marie Jordaan (née Prins) [1948–], in recognition of her considerable contributions towards the taxonomy of the southern African flora in general, and the Celastraceae in particular.

*Marijordaania filiformis* (Davison) A.E. van Wyk & R.G.C. Boon, **comb. nov.**

urn:lsid:ipni.org:names:77336438-1

Figs 1–3, Table 1

*Gymnosporia filiformis* Davison, *Bothalia* 2: 311. 1927. (Davison 1927).

“*Maytenus* sp.” (Pooley 1993: 264).

“*Maytenus* sp. A” sensu Van Wyk (1984) non Schmidt et al. (2002) (Coates Palgrave 2002: 596; Boon 2010: 308).

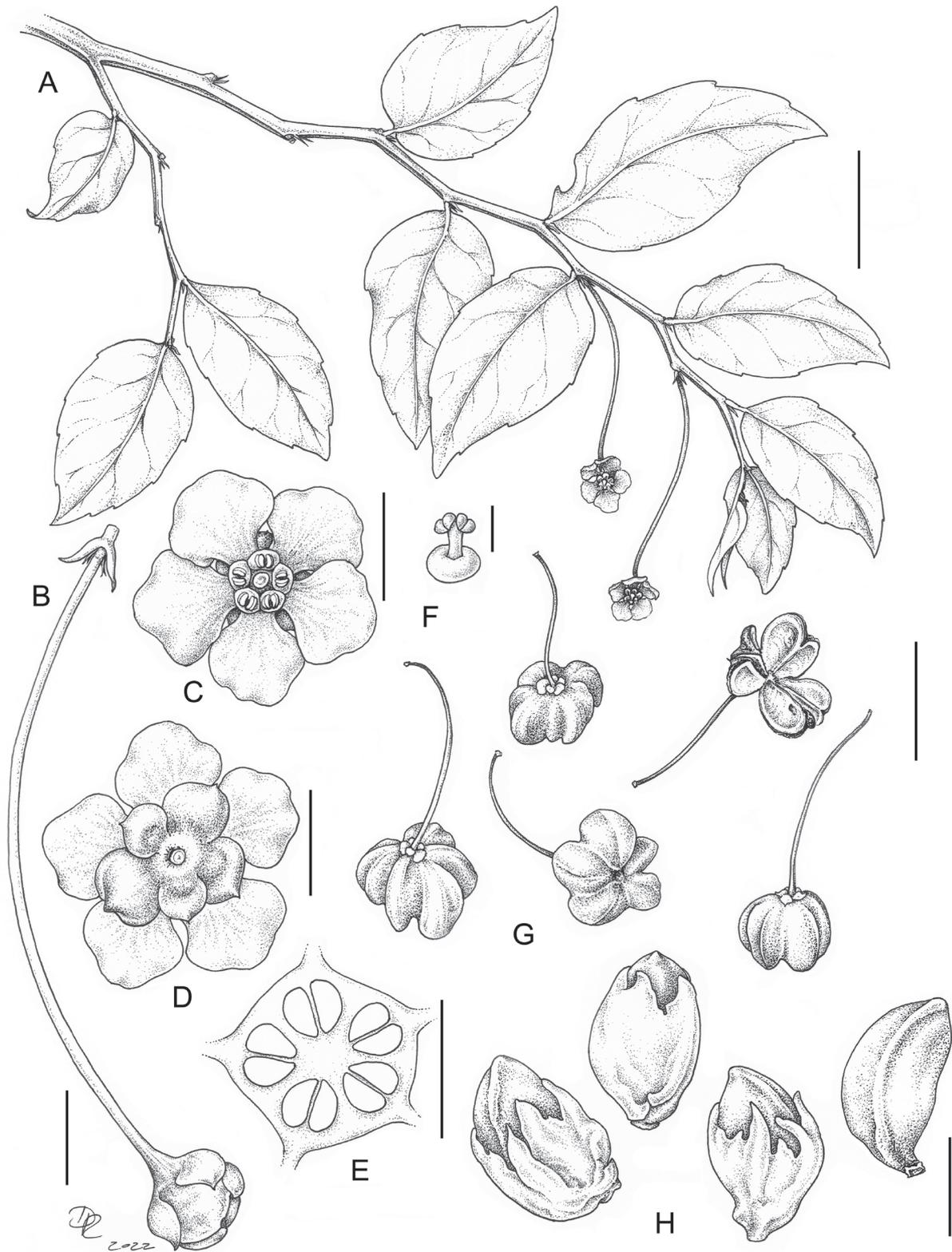
**Illustrations.** Abbott (1985: 11, *Gymnosporia filiformis* Davison p.p., top plate); Pooley (1993: 265, *Maytenus* sp., two photographs in top row); Boon (2010: 309, *Maytenus* sp. A, three photographs in bottom row); Van Wyk et al. (2011: 447, *Maytenus* sp. A).

**Type.** SOUTH AFRICA • Natal [KwaZulu-Natal], Inanda [2830DB]; recd. Jan. 1880 (K), Dec. 1881 (BOL); *Wood* 734; lectotype (**designated here**): K [K000035898]; isolectotypes: K [K000035899], BOL, PRE [PRE0259491-0].

**Description.** Evergreen, slender, lax, semi-scandent, sometimes ascending, shrub or rarely a small tree up to 6(–8) m tall, unarmed, glabrous, leaves and bark lack elastic threads on breaking; new growth reddish, reddish brown, or bronze. Trunk usually multi-stemmed from ground level, up to ca 10 stems, usually fewer, possibly producing suckers from subterranean roots, individual stems up to ca 40 mm diam. near ground level. Bark smooth, grey-brown, much-covered in crustose lichen. Branches slender, flexuose, initially reddish brown, soon changing to green, 4-lined due to 2 narrow wings

extending down the stem from the leaf base, with pale, moderately dense lenticels when young, finally terete, grey, lenticels obscure. Stipules marcescent, free, paired, lateral, lanceolate, 0.4–0.5 mm long. Leaves simple, alternate, distichous, ovate or elliptic, (15–)40–65(–92) × (10–)20–35(–45) mm; base rounded; apex acute to narrowly acute or acuminate, rarely obtuse, mucronulate, gland-tipped; margin flat, glandular-denticulate to glandular-serrulate mainly in the distal half to two-thirds, with up to 18 irregularly- and well-spaced, dark teeth on each margin, usually fewer; chartaceous to thinly coriaceous; mature leaves dark green above, some leaves with ca circular patches of crustose, grey lichen, paler green below; midrib on adaxial surface prominent, raised and angled, raised in the proximal half of the abaxial surface and rounded, becoming plane in the distal half, brochidodromous; secondary (principal lateral) veins ca 6–10 pairs, raised on adaxial surface, obscure on abaxial surface; tertiary veins coarsely reticulate, distinct on adaxial surface, indistinct below. Petiole ca 1.5–2 mm long, canaliculate above, decurrent, forming raised lines on branchlets. Inflorescences cymose, solitary, axillary, 1- or 2(3)-flowered, peduncle 2–5 mm long, tipped by persistent lanceolate bracts 1–2 mm long, ca 1 mm wide. Flowers bisexual, actinomorphic, pentamerous, ca 10 mm in diam.; pedicel filiform, pendant, (20–)35–40(–45) mm long, articulated ca 0.5 mm above the base, reddish green. Sepals free, unequal with 2 smaller outer ones, 3 larger inner ones, green, pinkish green to pink-red with margin entire, whitish, the outer ones ca sub-orbicular, ca 1 × 1.5 mm; margin entire; apex rounded and shortly mucronate, the inner ones sub-orbicular, ca 1.5 × 2.5 mm, apex rounded or obtuse, shortly mucronate. Petals sub-orbicular, ca 4.5–5 × 3.5 mm; base cuneate; apex rounded; margin undulate, entire, central part pink-red, fading distally into a white margin. Stamens with filaments arising from the centre of the disc lobes, erect, ca straight, terete, gradually widening to the base, ca 0.5 mm long; anthers dorsifixed, directed upwards, dehiscent by longitudinal slits; pollen pale yellow. Disc prominent, ca 3 mm in diam., comprising 5 discoid subunits, each ca 1 mm in diam., fleshy, green to pale yellowish green or yellowish. Ovary almost entirely included in and adnate to the disc, 5-locular with 2 erect collateral ovules in each locule; style ca 0.5 mm long; stigma capitate. Fruit capsular, 1–5-locular, flattened globose and lobed, ca globose when 1-locular, dehiscent loculicidally to the base, ca 8–12 × 15–17 mm in dry specimens, tipped by the persistent style and stigma, smooth, light yellowish green, calyx persistent, sepals revolute. Seed red-brown, 7–8 × 5 mm; aril white enveloping more than half the seed, margin irregularly lobed, smooth-surfaced but sparsely puberulent towards the base.

**Distribution.** Floristically, the range of *Marijordaania filiformis* (Fig. 3) falls within the Maputaland-Pondoland Region (Van Wyk and Smith 2001), which is more or less congruent with the Maputaland-Pondoland-Albany Hotspot, one of 36 global biodiversity hotspots (Steenkamp



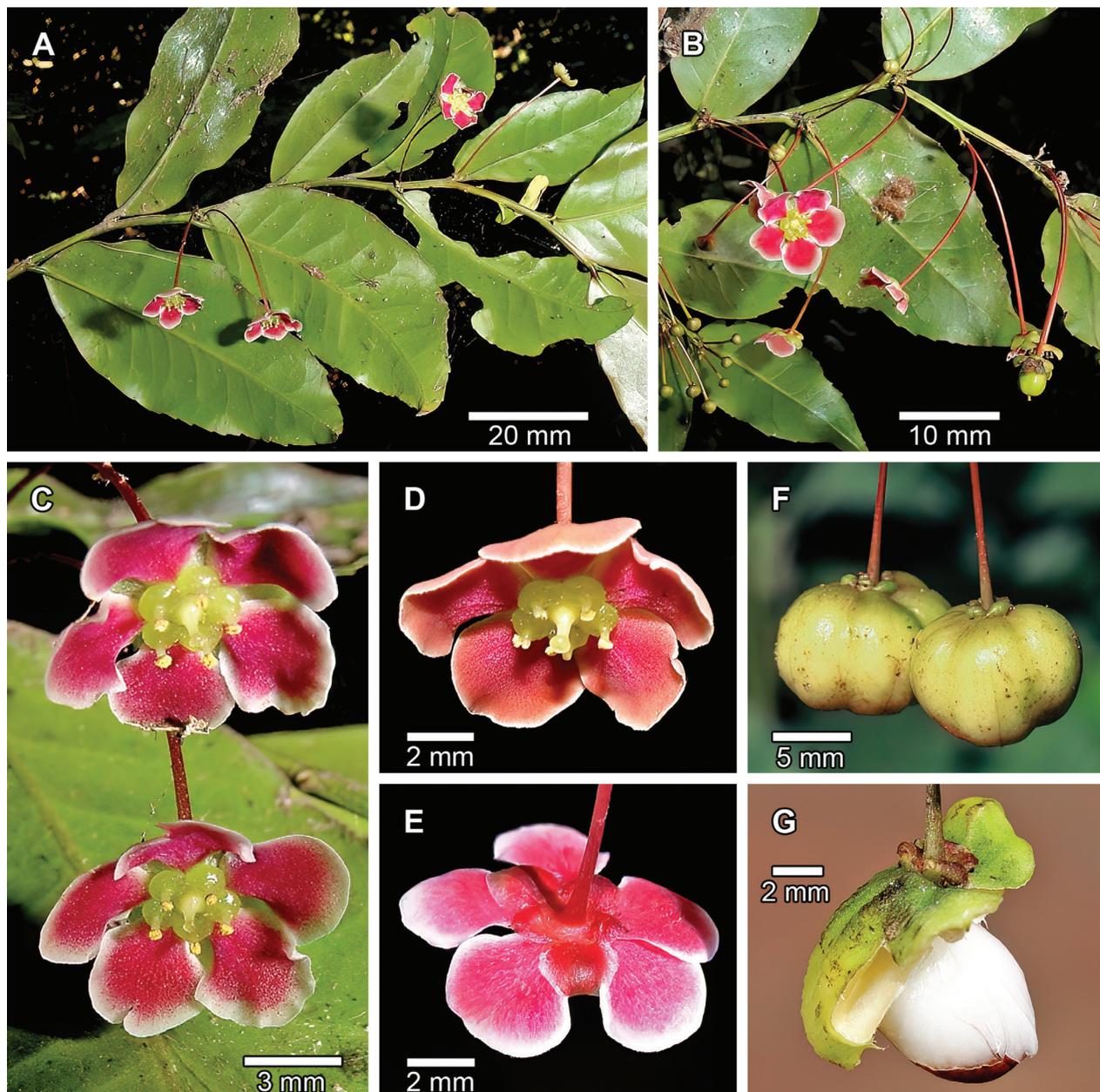
**Figure 1.** *Marijordaania filiformis*. **A.** Flowering branchlet. **B.** Inflorescence, showing short peduncle with bracts and a single flower in bud (just before anthesis). **C.** Flower, viewed from above. **D.** Flower, viewed from below. **E.** Transverse section of ovary, showing five locules, each with two ovules. **F.** Single stamen, inserted on swollen, discoid, lobe of disc. **G.** Selection of almost mature, intact fruit, plus one old, dehiscent and empty one; shape varies depending on the number of ovules that develops into seed. **H.** Seeds, three with the aril intact, one with aril removed. Scale bars: A, G = 20 mm; B–D, H = 5 mm; E, F = 1 mm. A based on *Jordaan 394* (NH), B–F from *Abbott 1798* (PRU; spirit collection), and G–H from *Abbott 6082* (PRU; spirit collection). Drawn by Daleen Roodt.

et al. 2004). According to confirmed (vouchered) records, it occurs from Ongoye Forest Nature Reserve in KwaZulu-Natal in the north to Dwesa-Cwebe Nature Reserve at the mouth of the Mbashe River in the Eastern Cape in the south. Within this range, the species is known from ca 12 disjunct localities.

Additionally, there are four other possible or probable localities for the species (Fig. 3). The northernmost two are on privately-owned farms about 20 km apart in the Lebombo or Lubombo Mountains of Eswatini (formerly Swaziland), where they were photographed, and material was collected around 2004 (Linda Loffler

pers. comm. 10 Aug. 2022). The southern one of these localities is about 265 km north of Ongoye Forest Nature Reserve in KwaZulu-Natal, South Africa. Unfortunately, the herbarium specimen has been lost, but a plant was collected and cultivated. It still survives in a garden in Mbabane, Eswatini (Linda Loffler pers. comm. 10 Aug. 2022). However, the presence of the species in Eswatini still needs confirmation since there is no herbarium voucher specimen available.

The third potential locality for the species is the Ozwatini Plateau north of Ndwedwe in central KwaZulu-Natal, South Africa. A specimen from here (Scott-Shaw



**Figure 2.** *Marijordaania filiformis*. A. Flowering branchlet, viewed from below; note distichous arrangement of leaves. B. Branchlet showing flowers borne on long, slender, and pendant pedicels; also present is a young developing fruit. C. Flowers; note each stamen inserted on a swollen discoid subunit of the disc. D. Flower viewed obliquely from the side. E. Flower, viewed from below. F. Fruit, intact and almost mature. G. Fruit, dehiscent, showing a dark-coloured seed partly covered by a white aril. Photographs A–C by Sharon Louw; D–G by Richard Boon.

2057 in CPE, now incorporated in NU) might be *M. filiformis*, but the flowers are too young to be certain. The fourth possible locality is the Majuleni Forest located along a small tributary of the Mtentu River near Baleni, Pondoland, Eastern Cape, South Africa. This locality is almost certainly correct, but it is based on a photographic record with no voucher specimen having been preserved (Dorothy McIntyre pers. comm. 4 Mar. 2019; Sinegugu Zukulu pers. comm. 28 Jul. 2023).

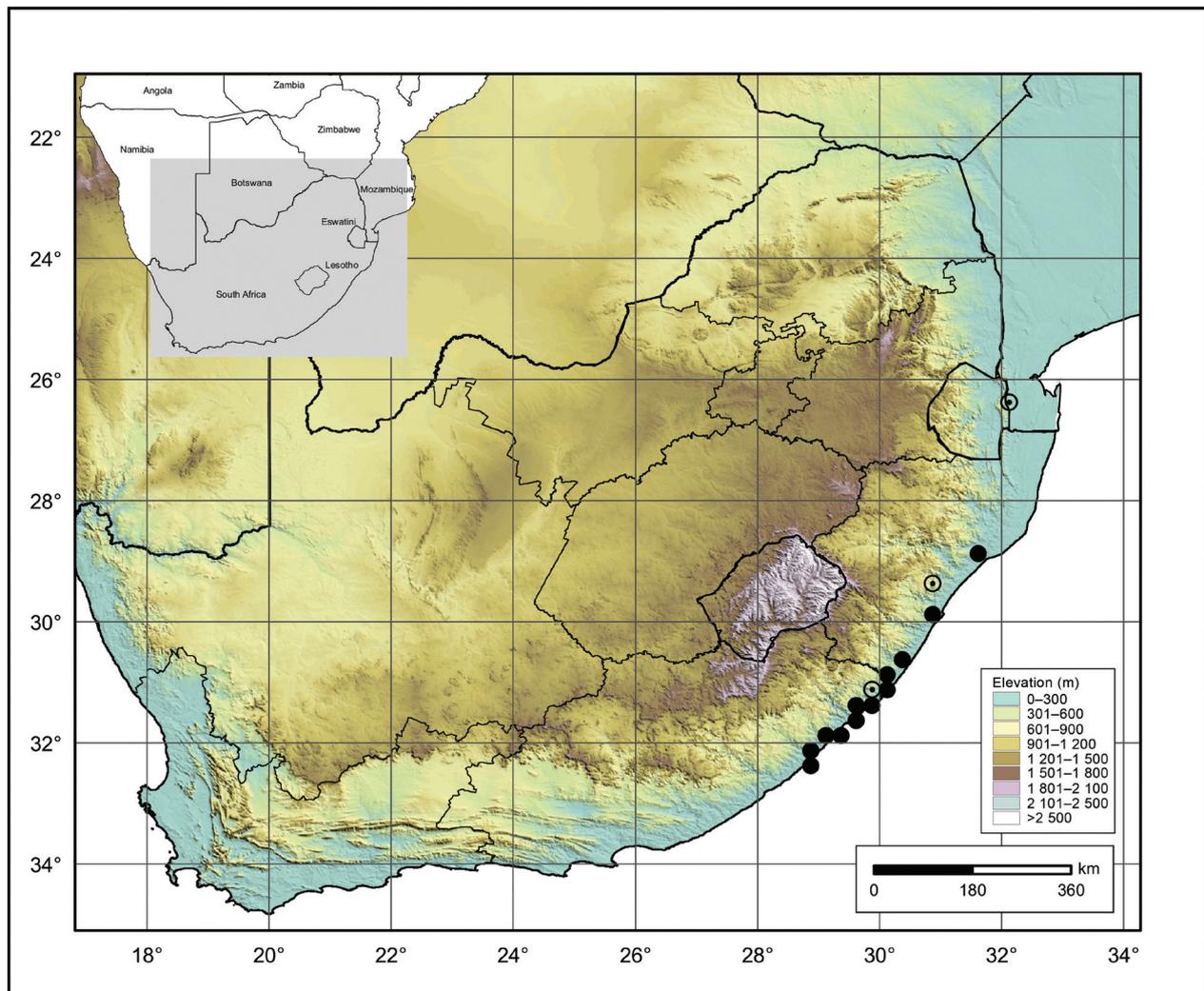
**Habitat and ecology.** *Marijordaania filiformis* occurs in the understorey of sub-tropical Scarp Forest (vegetation type FOz5 of Mucina and Rutherford 2006; SANBI 2006–2018), where it grows in deep shade near watercourses and rocky places, such as at the base of cliffs. It is found from near sea level at southern localities (probably above 50–100 m, but exact collecting information is unknown) to elevations of about 470 m in the north.

The geology of the parent rock where the species is found can be igneous, metamorphic or sedimentary (Johnson et al. 2006). South of Port St Johns in the Eastern

Cape, it is associated with sedimentary rock of the Karoo Supergroup, further north in Pondoland with Msikaba Formation sandstone, at Durban it is associated with Natal Group sandstone, and at Ongoye Forest Nature Reserve, it is associated with granite-gneiss of the Ongoye Complex. If it occurs in the Lubombo or Lebombo Mountains of Eswatini, it will likely be associated with rhyolitic lavas of the Jozini Formation.

Essentially, very little is known about animals associated with *M. filiformis*. Whitefly pupae of the family Aleyrodidae were found on the leaf undersides at the Krantzklouf Nature Reserve, Durban. It is noteworthy that similar whitefly pupae were observed in a photograph, most likely of our species, in the Majuleni Forest, Pondoland.

**Phenology.** Fertile material is infrequently encountered and, when present, there are usually few flowers and fruit. Flowering and fruiting are apparently not linked to seasons as fertile material has been collected in most months of the year.



**Figure 3.** Topographical map showing the known distribution of *Marijordaania filiformis*. Solid circles indicate localities supported by herbarium specimens; open circles with small central dots depict sight and other records in need of vouchers (details in text). The insert shows a map of southern Africa with names of countries; the grey rectangle indicates the area depicted by the topographical map.

**Vernacular names.** English vernacular names in use are “red-flowered false silkybark” and “red-flowered silkybark”, and Afrikaans names are “rooiblomvalssybas” and “rooiblomsybas” (Boon 2010; Van Wyk et al. 2011). The first mentioned of these English and Afrikaans names are the ones recommended by the Dendrological Society of South Africa (Von Dürckheim et al. 2014). No names have been recorded in any of the other local languages.

**Preliminary IUCN conservation assessment.** Endangered: (EN) C2a(i). The EOO of *M. filiformis* was estimated at 6865 km<sup>2</sup>. The AOO calculated was 56 km<sup>2</sup> using the recommended 2 km cell width. The areas were determined using the localities where the species has been collected. Only one herbarium collection included geographic coordinates, therefore the localities used in the assessment are not precise. A 2 km cell width seems reasonable given that the species occurs in relatively small, discrete forest patches surrounded by unsuitable habitat. A 2 km cell drawn around the estimated localities includes most of the forest at that location.

*Marijordaania filiformis* occurs in 15 subpopulations as defined by the IUCN (2012). There are no estimates of the population or subpopulation sizes. In our experience, the species occurs only in small numbers where it is found. It seems unlikely that there are more than 100 mature individuals in any subpopulation, which means the overall population size is probably fewer than 1500. Some subpopulations may be too small to be viable in the long-term.

Most subpopulations are separated from the nearest subpopulation by large distances and unsuitable habitat, thus genetic or demographic exchange seems unlikely. In three cases, two subpopulations are about 6 km apart and there are forest links in between. In these instances, it could alternatively have been assumed that plants at the two localities belong to a single larger population. However, *M. filiformis* has specific habitat requirements, is rare within suitable habitat, and produces few flowers and fruits, which means that subpopulations separated by even fairly small distances are probably functionally disconnected.

Several of the subpopulations are protected in statutory conservation areas. Subpopulations that are inadequately protected are threatened by degradation of their forest habitat. *Marijordaania filiformis* is not known to be used for traditional purposes. The species occupies rocky habitats, which affords it protection from wildfire. Individuals that grow adjacent to rivers are probably at risk of being killed or damaged by floods. Both wildfire and flooding are likely to increase across the species' range due to climate change. The species probably reproduces mainly clonally, which means that genets in the subpopulations are genetically identical.

There is no evidence for a large reduction in population size, which is required for threatened Category A. The EOO and AOO distribution thresholds of Vulnerable and Endangered respectively are met for Category B, but only one of the three conditions is met (B2(b)),

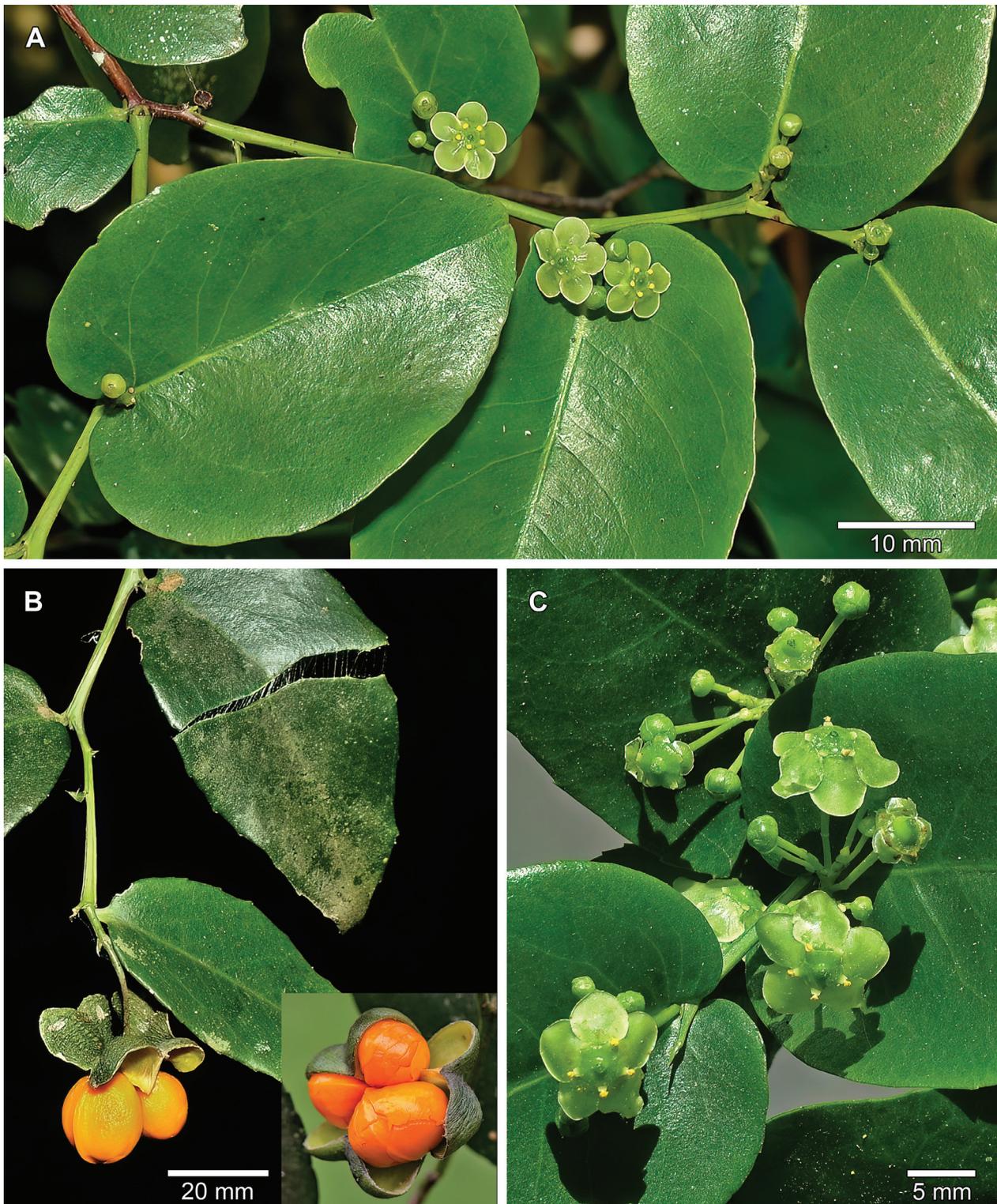
therefore the taxon does not qualify in this category. It is possible, perhaps even likely, that the estimate of 1500 mature individuals is too high and the species qualifies for Vulnerable in Category D1, but unfortunately there is no evidence to support this, and there are insufficient data to do the quantitative analysis required to qualify for Category E.

While the size and rate are unknown, the species' population size is inferred to be declining due to apparent ongoing infrequent recruitment and establishment of new plants, and habitat degradation at some localities. With an estimated population size of < 2500 individuals and < 250 mature individuals in each sub-population, the species should be classified as Endangered (EN) C2a(i). There is a need to survey the subpopulations more fully to get a better understanding of threats and population size and trends.

**Additional material examined.** SOUTH AFRICA – **KwaZulu-Natal** • Zululand, Ngoye [Ongoye Forest Nature Reserve], [2831DC]; 18 Aug. 1985; *Abbott* 2682; PCE, PRU • Mtunzini District, left hand branch of Ngoya Forest Road [Ongoye Forest Nature Reserve], [2831DC]; 20 Feb. 1961; *Wells & Edwards* 95; NU, PRE • Krantzkloof Nature Reserve, (2930DD); 12 Jul. 2014; *Boon* 69; NH • Krantzkloof Nature Reserve, (2930DD); 29 Jan. 1984; *Jordaan* 304; NH • Kloof Nature Reserve [Krantzkloof Nature Reserve], Pinetown District, [2930DD]; 16 Feb. 1966; *Moll* 3021; NU, PRE • Durban, Krantzkloof Nature Reserve, (2930DD); 20 Jan. 1988; *Van Wyk* 8243; PRU • Krantzkloof Nature Reserve, north of Kloof Falls Road, (2930DD); 20 Jan. 1988; *Williams* 158; NH • Ntimbankulu [Ntimbankulu Nature Reserve], (3030CB); 21 Jun. 1984; *Abbott* 2002; PCE, PRU • Oribi Gorge [Oribi Gorge Nature Reserve], [3030CB]; Sep. 1996; *Edwards* 1438; NU • Umtamvuna Nature Reserve, Smedmore Forest, (3130AA) [3030CC]; 22 Feb. 1986; *Abbott* 3018; NH, NU, PRU • Umtamvuna Nature Reserve, Smedmore Forest, (3030CC); 27 Jul. 1986; *Abbott* 3217; PRU • Umtamvuna Nature Reserve, Smedmore Forest, (3030CC); 23 Apr. 1989; *Abbott* 4366; PRU • Umtamvuna Nature Reserve, Smedmore Forest, (3030CC); 11 May 1992; *Abbott* 5768; PRU • Umtamvuna Nature Reserve, Smedmore Forest, (3030CC); 9 Jul. 2008; *Abbott* 8901; PRU • Umtamvuna-natuurrreservaat [Umtamvuna Nature Reserve], Smedmore-woud [Smedmore Forest], (3030CC); 10 Jun. 1982; *Abbott* s.n.; PRU • Umtamvuna Nature Reserve, Smedmore Forest, (3030CC); 14 Jul. 1983; *Jordaan* 264; NH • Smedmore [Smedmore Forest, Umtamvuna Nature Reserve], [3030CC]; 10 Jun. 1982; *Nicholson* 2259; NU, PRE • Umtamvuna Nature Reserve, Smedmore Forest, (3030CC); 4 Sep. 1994; *Van Wyk* BSA 2576; PRU • Umtamvuna Nature Reserve, Smedmore Forest, (3030CC); 15 Oct. 1984; *Van Wyk & Lowrey* 6826; PRU • Umtamvuna Nature Reserve, Smedmore [Smedmore Forest], (3030CC); 15 Oct. 1984; *Van Wyk & Lowrey* 6827; PRU • Umtamvuna Nature Reserve, Smedmore [Smedmore Forest], (3030CC); 15 Oct. 1984; *Van Wyk & Lowrey* 6831; PRU • Umtamvuna Gorge, Umtamvuna

Valley bottom, [3130AA]; 10 Nov. 1994; *Meter 100*; NU. – **Eastern Cape** • Mbotyi, Ntsubane Forest, (3129BC); 21 Aug. 1989; *Abbott 4416*; PRU • Mkambati Nature Reserve, Daza Riverine Forest, (3129BD); 11 Nov. 1984; *Jordaan 329*; NH • Mkambati Nature Reserve, (3129BD); 11 Dec.

1986; *Jordaan 1016*; NH • Lwandile north of Umtata River mouth, Nkwintyini Forest, (3129CC/DD) [3129CC]; 7 Apr. 1990; *Cooper 253*; NH, PRE • Upper Bulawa Forest near Mpande, (3129CD); *Cooper 262*; NH • Port St Johns, Mount Sullivan, (3129BC) [3129DA]; 2 Oct. 1988;



**Figure 4.** *Maytenus cordata*. A. Flowering branchlet; note cordate leaf bases and flowers with relatively short pedicels. B. Branchlet with mature, dehiscent fruit, showing seed with orange-yellow aril; insert shows a dehiscent capsule with seeds completely enclosed by an orange aril. Upper right hand leaf blade broken in half and gently pulled apart to show the presence of silvery elastic threads of gutta-percha. C. Inflorescences with flowers, borne on relatively short, erect or spreading pedicels. Photographs by Richard Boon.

**Table 1.** Prominent morphological differences between *Marijordaania filiformis* and the three species of *Maytenus* with which it has been confused in the past. The true generic status of these three African species of *Maytenus* still needs to be assessed.

Character	<i>Marijordaania filiformis</i>	<i>Maytenus cordata</i>	<i>Maytenus acuminata</i>	<i>Maytenus abbottii</i>
<b>Habit</b>	Semi-scandent shrub or slender tree to 6 m	Erect shrub or slender tree to 4 m	Erect shrub or tree to 15 m	Erect shrub, occasionally semi-scandent, rarely a slender tree to 4 m
<b>Elastic threads (gutta-percha; trans-1,4-polyisoprene)</b>	Absent	Present	Present	Present
<b>Inflorescences</b>	Peduncles with 1- or 2(3)-flowered cymes	Peduncles with 2–10-flowered cymes	Peduncles with 2–20-flowered cymes; rarely fasciculate	Peduncles with 1–4 abbreviated racemes
<b>Pedicels (length)</b>	(20–)35–40(–45) mm	5–12(–20) mm	5–10(–14) mm	5–10(–12) mm
<b>Pedicels (articulation)</b>	Ca 0.5 mm above the base	1–2.5 mm above the base	2–4 mm above the base	At the base
<b>Flowers (merosity)</b>	5-merous	5-merous	5-merous	4-merous
<b>Flowers (predominant colour)</b>	Pink-red	Pale green	Cream or white, often tinged pink, rarely pink-red	White or cream, occasionally tinged pale pink
<b>Disc (presence)</b>	Present	Present	Present	Obscure (absent?)
<b>Disc (morphology)</b>	Fleshy, divided into 5 discoid subunits (lobes), the latter convex below filaments	Fleshy, discoid, concave, not subdivided	Fleshy, discoid, concave, not subdivided	No distinct disc; perhaps represented by a narrow strip of tissue around the base of the style
<b>Stamens (insertion)</b>	Filaments arising from centre of disc lobes	Under margin of disc	Under margin of disc	Filaments flattened and widening towards base to form a staminal tube
<b>Ovary (number of locules)</b>	5	(1–)3	3	2–4
<b>Seeds (postchalazal vascular bundles)</b>	Absent	Absent	Absent	Present
<b>Aril (colour)</b>	White	Orange	Orange	White
<b>Aril (surface)</b>	Glabrous, sparsely puberulent towards base	Glabrous	Glabrous	Puberulent

*Abbott 4153*; PCE, PRU • Mount Sullivan, Nenga Forest, (3129DA); 11 Jan. 1989; *Abbott 4206*; PCE, PRU • Port St. Johns, Silaka Nature Reserve, (3129DA); 4 Aug. 1988; *Van Wyk 8407*; PRU • Port St. Johns, Mtambala Forest Station, (3129DA); 5 Aug. 1988; *Van Wyk 8429*; PRU • The Haven [The Haven Hotel], Elliotdale District, [3228BB]; 13 Feb. 1967; *Gordon-Gray 1347*; NU • Transkei, Dwesa Nature Reserve, S. of Mendu River Mouth, (3228BD); 1 Aug. 1988; *Van Wyk 8334*; PRU.

**Notes.** In nature, sterile, fresh material of *Marijordaania filiformis* can potentially be confused primarily with *Maytenus cordata* (Fig. 4). The previous association of the former with *Maytenus acuminata* and *Maytenus abbottii* was not because of morphological similarities, but due to the broad species concept adopted for *Maytenus acuminata* by Marais (1960). Selected morphological features to distinguish among *Marijordaania filiformis*, *Maytenus acuminata*, *Maytenus cordata*, and *Maytenus abbottii* are provided in Table 1.

A particularly reliable field character for the identification of some southern African members of the Celastraceae is to test for the presence of elastic

(rubbery) threads associated with the phloem tissue of, among others, the leaf venation and bark (Van Wyk and Van Wyk 2019). These threads are composed of gutta-percha (trans-1,4-polyisoprene) and are found in several members of the Celastraceae (e.g. Drennan et al. 1987; Simmons 2004). For this test, crease a fresh leaf blade transversely and slowly, very gently pull it apart along the crease for about 2 mm. If gutta-percha is present, silvery elastic threads will connect the two halves of the blade (Fig. 4B). Elastic threads are absent in *Marijordaania filiformis*, but are always present in *Maytenus cordata*, *Maytenus acuminata*, and *Maytenus abbottii*.

The long, pendant, filiform pedicels of *Marijordaania filiformis* are usually 35–40 mm long, whereas in the other species they are mostly shorter than 10 mm during flowering. The pedicels may elongate when in fruit, but never match the length of those in *M. filiformis*. *Marijordaania filiformis* has pink-red petals with white margins (Fig. 2A–E), as opposed to pale green petals in *Maytenus cordata* (Fig. 4A, C), white or cream petals in *Maytenus abbottii* (occasionally with a pale pink tinge), and cream or white petals which may exhibit pink tinges in

*Maytenus acuminata*. In *Maytenus cordata* and *Maytenus acuminata*, the filaments are flattened and inserted under the margin of the disc. In *Maytenus abbottii*, the filaments are flattened and united at the base, forming a short, cup-shaped staminal tube. Additionally, the filaments are incurved apically and the anthers are directed downwards. In *M. filiformis*, the filaments are straight, terete, and inserted into the centre of the discoid lobes (Figs 1C, F, 2C, D), with the anthers directed upwards. In *M. filiformis*, the aril is white (Fig. 2G), puberulent at the base only, and encloses most of the seed. *Maytenus abbottii* has a white, puberulent aril, which envelopes only the basal portion of the seed with long, free lobes that exceed the length of the seed. The aril in *Maytenus acuminata* and *Maytenus cordata* is orange and completely surrounds the seed (Fig. 4B).

Additional differences include *Maytenus abbottii* having tetramerous flowers, while the other species have pentamerous flowers. *Maytenus acuminata* reaches tree proportions and often grows in exposed positions such as forest margins and around rock outcrops. On the other hand, the other species are slender shrubs to small trees, predominantly occupying forest interior habitats, often in deep shade. *Maytenus cordata* is a more erect plant with glossier leaves, and its new growth is green, in contrast to the bronze to reddish green new growth observed in *M. filiformis*.

Unlike the situation in nature, dried material of *Marijordaania filiformis* can easily be confused with that of *Maytenus cordata* in herbaria, especially those forms of the latter with shortly petiolate leaves and a rounded or cuneate lamina base. Unfortunately, testing for elastic threads in herbarium material is unreliable, and especially in older material the threads may no longer be detectable. As explained earlier, Davison (1927) confused these two species, despite the herbarium material being in flower. One of us (AEvW) has also erroneously cited as a voucher for *Marijordaania filiformis* p.p. a specimen of *Maytenus cordata* (Wood 11608 in NH) (Van Wyk 1984). Probably the most reliable character in the case of herbarium specimens with flowers is to dissect an ovary and confirm the number of locules; five in *Marijordaania filiformis*, three in *Maytenus cordata*.

In herbaria, *Marijordaania filiformis* can, in addition to the difference in the number of locules, also be distinguished from *Maytenus cordata* by its flowers being larger, ca 10 mm in diam. [vs smaller, ca 6 mm], cymes 1- or 2(3)-flowered [vs more floriferous, usually 6–8-flowered, these opening successively over time], pedicels (20–)35–40(–45) mm long, pendant [vs 4–10(–20) mm, erect or spreading], and articulated ca 0.5 mm above the base [vs (1.5) 2.0–4.0(–8) mm]. The part of the pedicel below the articulation is persistent, hence providing a useful taxonomic character for distinguishing between the two species, especially in herbarium specimens of which the open flowers have already been shed.

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