

A TAXONOMIC REVISION OF
Calobota
(FABACEAE, CROTALARIEAE)

James Stephen Boatwright, Patricia May Tilney and Ben-Erik van Wyk



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TRELITZIA

This series has replaced *Memoirs of the Botanical Survey of South Africa* and *Annals of the Kirstenbosch Botanic Gardens*, which the South African National Biodiversity Institute (SANBI) inherited from its predecessor organisations.

The plant genus *Strelitzia* occurs naturally in the eastern parts of southern Africa. It comprises three arborescent species, known as wild bananas, and two acaulescent species, known as crane flowers or bird-of-paradise flowers. The logo of SANBI is partly based on the striking inflorescence of *Strelitzia reginae*, a native of the Eastern Cape and KwaZulu-Natal that has become a garden favourite worldwide. It symbolises the commitment of SANBI to champion the exploration, conservation, sustainable use, appreciation and enjoyment of South Africa's exceptionally rich biodiversity for all people.

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Abstract

A taxonomic revision of the genus *Calobota* Eckl. & Zeyh. (Fabaceae, Crotalariaeae) is presented. Sixteen species are recognised in the genus. Among these, *Calobota namibensis* Boatwr. & B.-E.van Wyk is described as new from southwestern Namibia. The anatomy of the leaves, stems and fruit walls was studied and revealed important characters to distinguish *Calobota* from other genera of the tribe Crotalariaeae. These include isobilateral leaves (palisade parenchyma both adaxially and abaxially) as opposed to dorsiventral leaves (e.g. in *Wiborgia* Thunb. and *Wiborgiella* Boatwr. & B.-E.van Wyk), and thick-walled fruit with gelatinous fibres in some species. The absence of mucilage cells in the epidermis of the leaves is also an important distinguishing character for the genus with respect to *Aspalathus* L., *Lebeckia* Thunb., *Rafnia*

Thunb., *Wiborgia* and *Wiborgiella*. *Calobota* differs from other closely related genera in the tribe in the following combination of characters: late bark formation, uni- or trifoliate to simple, laminar leaves, hairy petals (*C. cuspidosa* (Burch.) Boatwr. & B.-E.van Wyk and *C. psiloloba* (E.Mey.) Boatwr. & B.-E.van Wyk are exceptions), anther configuration of 4+5+1 and laterally compressed or terete, usually pubescent pods. A detailed taxonomic study of the genus is presented here, including a key to the species, descriptions, typifications, distributions, phylogenetic relationships and illustrations.

Keywords: Anatomy, *Lebeckia*, *Lebeckia* sect. *Stiza*, Fabaceae, Namibia, North Africa, Papilionoideae, South Africa, *Spartidium*, *Wiborgiella*.

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Photographs:

Front cover – *Calobota angustifolia* (typical form) by B.-E. van Wyk

Top of back cover – *Calobota sericea* by J.S. Boatwright

Bottom of back cover – *Calobota sericea* by J.S. Boatwright

Inside the cover (collage) – *Calobota cytisoides*

Page vi – *Calobota pungens* by B.-E van Wyk

New species in this volume:

Calobota namibensis Boatwr. & B.-E.van Wyk, sp. nov. (pg. 61)



Introduction

The genus *Calobota* Eckl. & Zeyh. was reinstated to accommodate the 16 species of the *Calobota* group (Boatwright et al. 2009), previously included in the genus *Lebeckia* Thunb. As originally described by Ecklon & Zeyher (1836), the genus consisted of two species, *C. cytisoides* (Berg.) Eckl. & Zeyh. and *C. pulchella* (Andrews) Eckl. & Zeyh., which in actual fact represent the same taxon (now *C. cytisoides*). *Calobota* was later reduced to a section of an expanded concept of *Lebeckia* by Bentham (1844) and several species included here by Bentham were previously placed in other genera by Ecklon & Zeyher (1836). Harvey (1862) followed Bentham's sectional classification in the last revision of the genus *Lebeckia* where 24 species were recognised. In Boatwright et al. (2009) *Calobota* was recognised again at genus rank, which also included *Lebeckia* section *Stiza* E.Mey. and the monotypic *Spartidium* Pomel, based on a phylogenetic study of the tribe Crotalariaeae (Boatwright et al. 2008, 2009). The study of Boatwright et al. (2008), based on molecular (nrITS and *rbcL*) and morphological data, indicated that the genus *Lebeckia* is not monophyletic and the division into three genera was subsequently proposed by Boatwright et al. (2009), viz. *Lebeckia* s.s. with 14 species, *Calobota* with 16 species and *Wiborgiella* Boatwr. & B.-E.van Wyk with 10 species (Le Roux & Van Wyk 2007, 2008, 2009; Boatwright et al. 2010; Boatwright & Helme 2014). These genera form part of the so-called Cape group of genera of the Crotalariaeae, along with

Aspalathus L., *Ezoloba* B.-E.van Wyk & Boatwr., *Rafnia* Thunb. and *Wiborgia* Thunb. (Boatwright et al. 2008, 2011). Most recently, the genus *Lotononis* (DC.) Eckl. & Zeyh. was also divided into five genera, increasing the total number of genera in the Crotalariaeae to 16 (Boatwright et al. 2011).

The species of *Calobota* occur throughout the Greater Cape Region (Manning & Goldblatt 2012; Snijman 2013) and extend into Namibia. Some are important components of the Sperrgebiet, a species-rich area of southwestern Namibia (Burke & Mannheimer 2004), while two other species, one described herein and *C. obovata* (Schinz) Boatwr. & B.-E.van Wyk, are endemic to Namibia (Craven & Vorster 2006). *Calobota saharae* (Coss. & Dur.) Boatwr. & B.-E.van Wyk, however, is endemic to North Africa and occurs in Algeria, Morocco and Libya (Polhill 1976). *Calobota* can be distinguished from *Lebeckia* and *Wiborgiella* by a combination of the following characters: late bark formation, leaves that are uni- or trifoliolate to simple, laminar; petals hairy (*C. cuspidosa* (Burch.) Boatwr. & B.-E.van Wyk and *C. psiloloba* (E.Mey.) Boatwr. & B.-E.van Wyk are exceptions); an anther configuration of 4+5+1; and fruit as laterally compressed or terete, usually pubescent pods. In contrast, *Lebeckia* has distinctive acicular leaves, glabrous petals and an anther configuration of 5+5 while *Wiborgiella* has brown stems (early bark formation), glabrous petals and a 4+6 anther arrangement.

Lebeckia has laterally compressed, semi-terete or terete pods while the pods are usually inflated in *Wiborgiella* (Le Roux & Van Wyk 2009; Boatwright et al. 2010). The species

within *Calobota* are often difficult to distinguish from one another due to the similarity between related species and this motivated the need for a modern taxonomic revision.

Ethnobotany and chemistry

ETHNOBOTANY

Species of *Calobota* have limited ethnobotanical uses. *Calobota psiloloba* has been cited as being poisonous, while *C. angustifolia* (E.Mey.) Boatwr. & B.-E.van Wyk and *C. sericea* (Thunb.) Boatwr. & B.-E.van Wyk are used as remedies for colds (Watt & Breyer-Brandwijk 1962; Van Wyk & Gericke 2000). *Calobota sericea* is also popular as firewood in Namaqualand (Van Wyk & Gericke 2000).

CHEMISTRY

The distribution patterns of secondary metabolites in plants, although sometimes erratic, have the potential to provide valuable insight into phylogenetic relationships. This is especially true for the Fabaceae and more specifically the Papilionoideae, where chemical patterns are often in agreement with other evidence (Gomes et al. 1981; Van Wyk 2003; Wink 2003). Some classes of compounds have been found to be more useful markers than others, such as alkaloids and flavonoids in legumes. Several syntheses of the available data and literature on alkaloids and flavonoids of papilionoid legumes are available (e.g. Harborne 1969, 1971; Mears & Mabry 1971; Salatino & Gottlieb 1980; Gomes et al. 1981; Kinghorn & Smolenski 1981; Kinghorn et al. 1982; Hegnauer & Grayer-Barkmeijer 1993; Southon 1994; Hegnauer & Hegnauer 1992–2001).

Alkaloids

Detailed studies of alkaloids in the Crotalariaeae have made it possible to thoroughly evaluate their distribution patterns across genera. Their taxonomic value was discussed by Van Wyk et al. (1988) and Van Wyk & Verdoorn (1990). All genera have been studied except *Bolusia* Benth., for which chemical data are still largely lacking. The chemical structures of all the various alkaloids are presented in Van Wyk & Verdoorn (1990). The Podalyrieae and Crotalariaeae differ from all other genistoids in the absence of α -pyridone alkaloids and from most other tribes in the accumulation of hydroxylated lupanines and their esters, especially in their seeds (Van Wyk 2003). Within the Crotalariaeae, three groups can be distinguished based on alkaloid data (Van Wyk & Verdoorn 1990; Van Wyk 1991a):

1. An unspecialised group without α -pyridone alkaloids and without esters of alkaloids (*Aspalathus*, *Calobota*, *Lebeckia*, *Rafnia*, *Wiborgia* and *Wiborgiella*, the so-called Cape group).
2. A group specialising in lupanine-type esters of alkaloids (*Euchlora* Eckl. & Zeyh., *Ezoboloba*, *Leobordea* Del., *Listia* E.Mey., *Pearsonia* Dummer, *Robynsiophyton* R.Wilczek and *Rothia* Pers., i.e. the *Pearsonia* clade).
3. A group with macrocyclic pyrrolizidine alkaloids (*Crotalaria* L. and *Lotononis* s.s. (DC.) Eckl. & Zeyh.).

These groups are largely consistent with those retrieved by phylogenetic studies on the Crotalariaeae based on molecular (nrITS and *rbcL*) and morphological data. The genera of the Cape group form a monophyletic, although moderately supported clade while the *Pearsonia* clade receives strong support (Boatwright et al. 2008), as is also indicated by the chemical data. *Calobota* species, much like species of *Lebeckia*, contain much higher quantities of quinolizidine alkaloids when compared to *Wiborgiella* species, which contain very low quantities. The latter are more similar morphologically to species of *Wiborgia* in which alkaloids are practically absent (Van Wyk & Verdoorn 1989).

The presence of macrocyclic pyrrolizidine alkaloids in *Crotalaria* and *Lotononis* s.s. is unique within the Crotalariaeae and was thought to support a sister relationship between these genera (Van Wyk & Verdoorn 1990; Van Wyk 2003). It is now clear, however, that the occurrence of these alkaloids are rather the result of convergence, as these genera do not share a sister relationship (Boatwright et al. 2008). Quinolizidine alkaloids, which are present in most of the other genera of the Crotalariaeae, are absent from *Crotalaria* and *Lotononis* s.s., but present in species of *Euchlora*, *Ezoloba*, *Leobordea* and *Listia*, and they do not co-occur with pyrrolizidine alkaloids in the same species (Van Wyk & Verdoorn 1990; Boatwright et al.

2011). The pattern of alkaloids generally supports the new generic classification system for *Lotononis* (Boatwright et al. 2011). *Lotononis* s.s. appears to accumulate only pyrrolizidine alkaloids. The presence of pyrrolizidine alkaloids also supports the sister relationship between the Crotalariaeae and Genisteae as these are the only tribes that have genera bearing pyrrolizidine alkaloids (Van Wyk 2003).

Flavonoids

Flavonoids in legumes and within the Crotalariaeae have not been as well studied as alkaloids, possibly due to the somewhat erratic patterns found in flavonoid data which limit their utility (Harborne 1971; Van Wyk 2003). The occurrence of isoflavonoids in the Papilionoideae and the absence of a hydroxyl group in position five in all legumes are useful characters from flavonoid data (Hegnauer & Grayer-Barkmeijer 1993; Van Wyk 2003). Seed flavonoids appear to be more conservative than those of the leaves (Hegnauer & Grayer-Barkmeijer 1993; De Nysschen et al. 1998).

De Nysschen et al. (1998) showed that the Crotalariaeae and the Podalyrieae have the same four major seed flavonoids (butin, 3'-hydroxydaidzein, orobol and vicenin-2; chemical structures presented in De Nysschen et al. 1998), but none of these compounds are present in African Genisteae.

Phylogenetic relationships

MOLECULAR DATA

In Boatwright et al. (2008), 11 species of *Calobota* were included in a phylogenetic study of the tribe Crotalariaeae. *Calobota* was weakly supported as monophyletic by separate analyses of *rbcL* and ITS, but strongly supported by the combined *rbcL*/ITS and combined *rbcL*/ITS/morphological data. Although the sampling was not comprehensive, some strongly

supported groups were noted. *Calobota cuspidosa*, *C. psiloloba* and *C. pungens* (Thunb.) Boatwr. & B.-E.van Wyk were strongly supported as being closely related. *Calobota cytioides* and *C. sericea* were strongly supported as sister taxa, as were *C. angustifolia* and *C. lotononoides* (Schltr.) Boatwr. & B.-E.van Wyk. The expansion of *Calobota* to include *C. saharae* (previously the monotypic genus *Spartidium*) was also supported by molecular data.

Horticultural potential

The legume family is the second largest in the Cape flora (Manning & Goldblatt 2012) and as such there are several species that have become popular horticultural specimens. Species of *Cyclopia* Vent., *Indigofera* L., *Liparia* L., *Podalyria* Willd., *Psoralea* L., *Sutherlandia* R.Br. ex Ait. and *Virgilia* Poir. are already sold in nurseries, but there are several species from other genera, including *Calobota*, which can still be developed as ornamentals (Brown & Duncan, 2006). Seeds of *C. cytisoides* can already be purchased at selected seed suppliers and germinate readily

after scarification or smoke treatment, as is the case with most fynbos legumes (Brown & Duncan 2006). Plants of *C. cytisoides* can reach a height of up to 2 m, and with their striking, sweet-scented, yellow flowers should make a bold garden subject. Specific details on the cultivation of *Calobota* species are unavailable, but conditions will likely be the same as for other fynbos legumes that are presently being cultivated, e.g. *Aspalathus*, *Liparia* and *Podalyria*, which are largely grown in well-drained soil and need water during winter in summer-rainfall areas.

Materials and methods

Morphological data were obtained from herbarium specimens as well as fresh plant material from field excursions. Specimens were preserved in FAA (Sass 1958; formaldehyde: acetic acid: 96% alcohol: water; 10:5:50:35) and silica (Chase & Hill 1991). All these collections are housed in the University of Johannesburg Herbarium (JRAU). Specimens of *Calobota* from the following herbaria were also studied: BM, BOL, GRA, J, JRAU, K, NBG (including SAM and STE), P, PRE, S, SBT, UPS and WIND. Online photographs of the collections of B, M, TCD and Z were also studied. The material was arranged according to geographical distribution so that the relevant measurements and observations could be done within several geographical populations. At least three measurements per specimen were done where possible. Mature flowers from material fixed in FAA or flowers rehydrated from rich herbarium specimens were dissected and mounted in glycerol. Specimens from which dissections were made are listed in Boatwright (2009). Floral characters recorded were: pedicel length, length of the bracts and bracteoles, flower length, length of the calyx, length of the calyx tube, depth of the upper, lateral and lower sinuses of the calyx, width of the upper, lower and lateral calyx lobes, length and width of the standard-, wing- and keel petals and the length of the claws of each petal. Drawings of vegetative and reproductive structures were done using

a stereoscope (WILD M3Z) with a *camera lucida* attachment, and drawings were done by the first author.

Data on the mapped distribution of the various species were gathered from the herbarium material, field notes and from Leistner & Morris (1976, for southern African taxa). The data for each species, with the exception of *C. saharae*, are recorded using the Quarter Degree Reference System (Edwards & Leistner 1971; also Leistner & Morris 1976). The basic unit used in this system is the one-degree square of latitude and longitude, which is designated by a Degree Reference Number (degrees of latitude and longitude of the northwest corner) and the district name of that square.

For anatomical studies, fresh material was fixed in FAA or dried material was rehydrated by briefly boiling in distilled water and then fixing in FAA for 24 hours. The method of Feder & O'Brien (1968) for embedding in glycol methacrylate (GMA) was used, except that the final infiltration in GMA was done for a minimum of five days. Sections were stained by the periodic acid Schiff/toluidine blue (PAS/TB) staining method (Feder & O'Brien 1968) and mounted. Voucher information for the material used in the anatomical studies can be found in Boatwright (2009). Micrographs were taken with a JVC KY-F1030 digital camera.

Vegetative morphology and anatomy

HABIT AND BRANCHES

All species of *Calobota* are perennial, multi-stemmed shrubs usually about 1.0–1.5 m, but *C. cuspidosa* can reach a height of up to 4 m (Figure 1). *Calobota lotononoides* is a decumbent shrublet, to 0.5 m in height, and has extensive underground branches. This species appears to be adapted to sandy habitats as the underground branches allow the stems and leaves to emerge above ground when they become buried (Boatwright & Van Wyk 2007). *Calobota acanthoclada* (Dinter) Boatwr. & B.-E.van Wyk, *C. cuspidosa*, *C. psiloloba*, *C. pungens* and *C. spinescens* (Harv.) Boatwr. & B.-E.van Wyk are spinescent shrubs, with the branch ends and inflorescences terminating in spines. The typical form of *C. angustifolia* sometimes has spinescent branches, but is more often not spinescent.

The young branches in species of *Calobota*, with the exception of *C. acanthoclada*, are green as opposed to the brown colour found in most species of *Wiborgiella* (Boatwright et al. 2010). This is due to the presence of several chlorenchyma layers below the epidermis (Figure 2), a feature usually found in papilionoid legumes when the leaflets are reduced or absent (Metcalf & Chalk 1950). Although green stems are also found in other genera of the Crotalariaeae, notably *Crotalaria*, *Lebeckia*, *Lotononis* and *Rafnia*, it is a useful character to distinguish *Calobota* from *Wiborgiella* and *Wiborgia*. In these last two genera, a periderm with tanniferous

deposits is initiated early, giving even young stems a brownish colour (Boatwright et al. 2010). Some species of *Calobota*, such as *C. pungens* and *C. saharae*, lack leaves on mature branches and in these it is likely that the stem performs the main photosynthetic function. The epidermis in most species is covered by a thick cuticle and the epidermal cells are bottle-shaped (Figure 2).

LEAVES

Leaves in *Calobota* vary from trifoliolate or rarely five-foliolate to unifoliolate or simple. In three species with unifoliolate leaves, *C. cuspidosa*, *C. psiloloba* and *C. pungens*, the juvenile leaves are trifoliolate and become unifoliolate on the mature branches (Dahlgren 1970; Polhill 1976; Boatwright et al. 2009). A similar reduction has been observed in *C. obovata*, which also has unifoliolate leaves restricted to the mature branches. Whether those of species with simple leaves have arisen in the same way, as suggested by Dahlgren (1970), should be investigated by studying the juvenile leaves of these species. The leaves of *Calobota* species are invariably laminar, rather than acicular and phyllodinous as found in *Lebeckia*, usually with long, slender petioles. Blade margins in *Calobota* are entire and stipules are lacking. The leaves are always pubescent or at least pilose. The leaf arrangement in *Calobota* is alternate and widely spaced, but in *C. acanthoclada* and *C. spinescens* the leaves are fasciculate. This

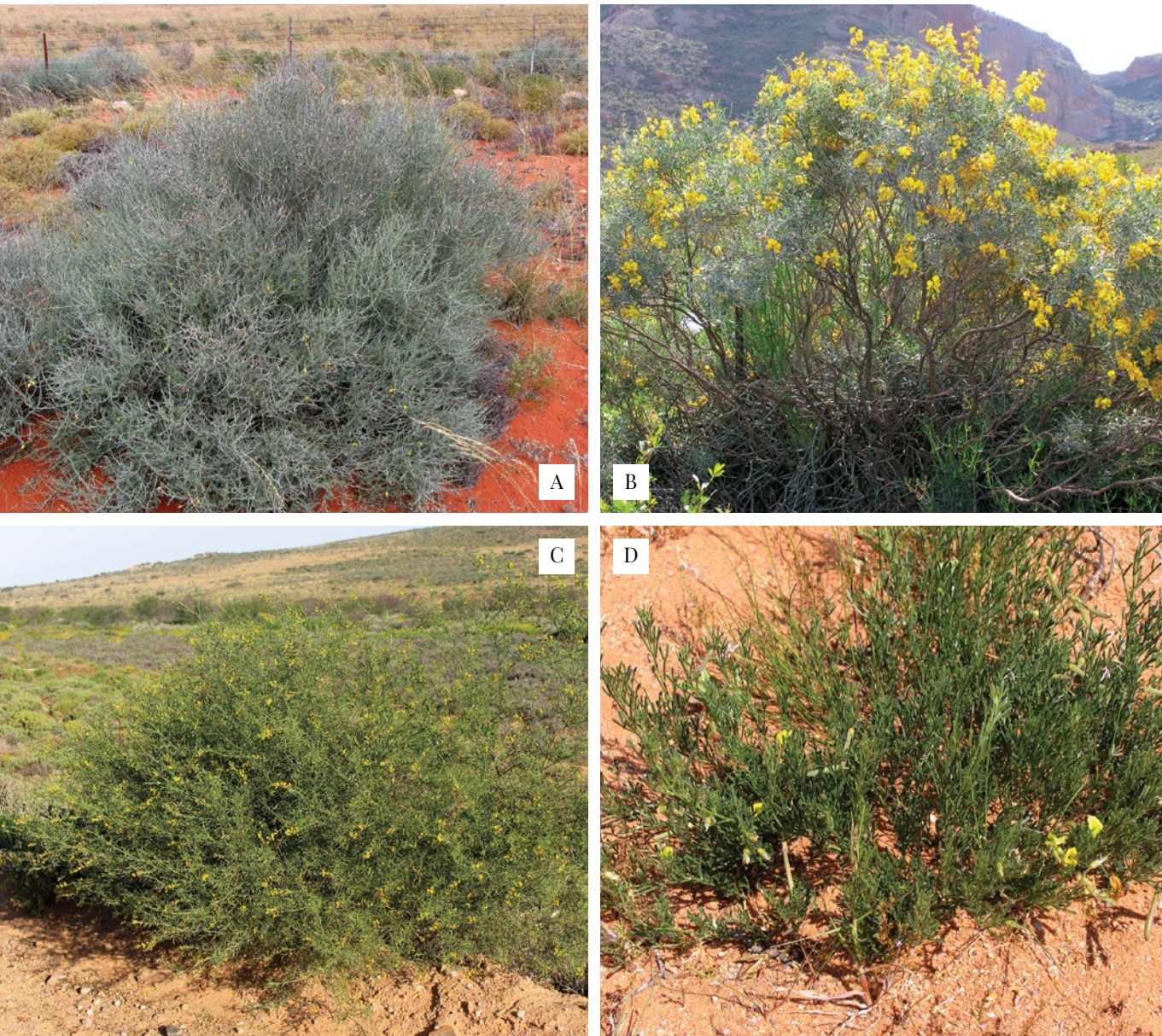


Figure 1.—Habit of *Calobota* species. A, *C. cinerea*; B, *C. cytisoides*; C, *C. balenbergensis*; D, *C. lotononoides*; [on next page]: E, *C. pungens*; F, *C. cuspidosa*; G, *C. spinescens*; H, *C. sericea*. Photographs: A–E, G–H: J.S. Boatwright; F: B.-E. van Wyk.

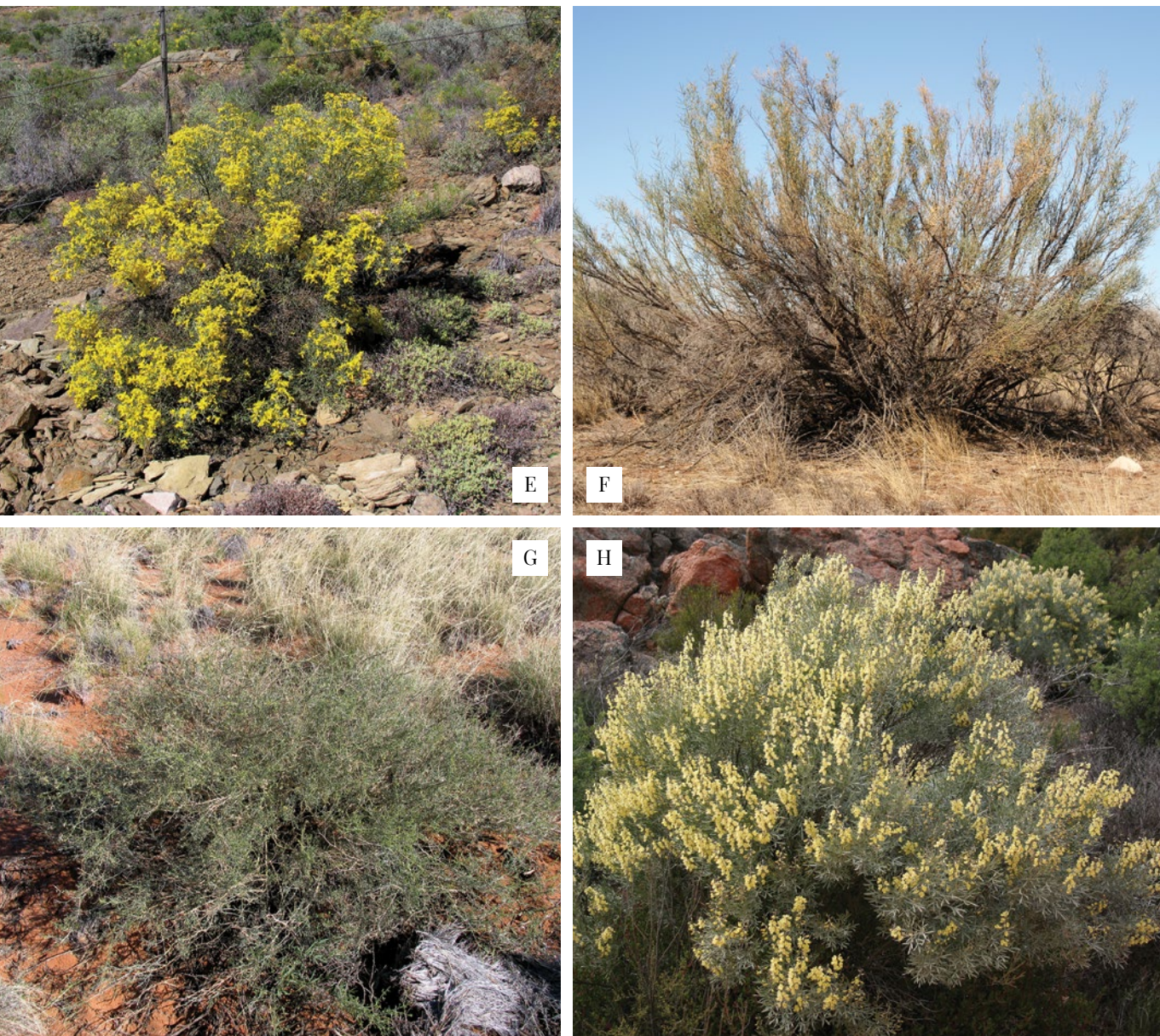


Figure 1. (cont.)—Habit of *Calobota* species. [previous page]: A, *C. cinerea*; B, *C. cytisoides*; C, *C. halenbergen-sis*; D, *C. lotononoides*; [this page]: E, *C. pungens*; F, *C. cuspidosa*; G, *C. spinescens*; H, *C. sericea*. Photographs: A–E, G–H: J.S. Boatwright; F: B.-E. van Wyk.

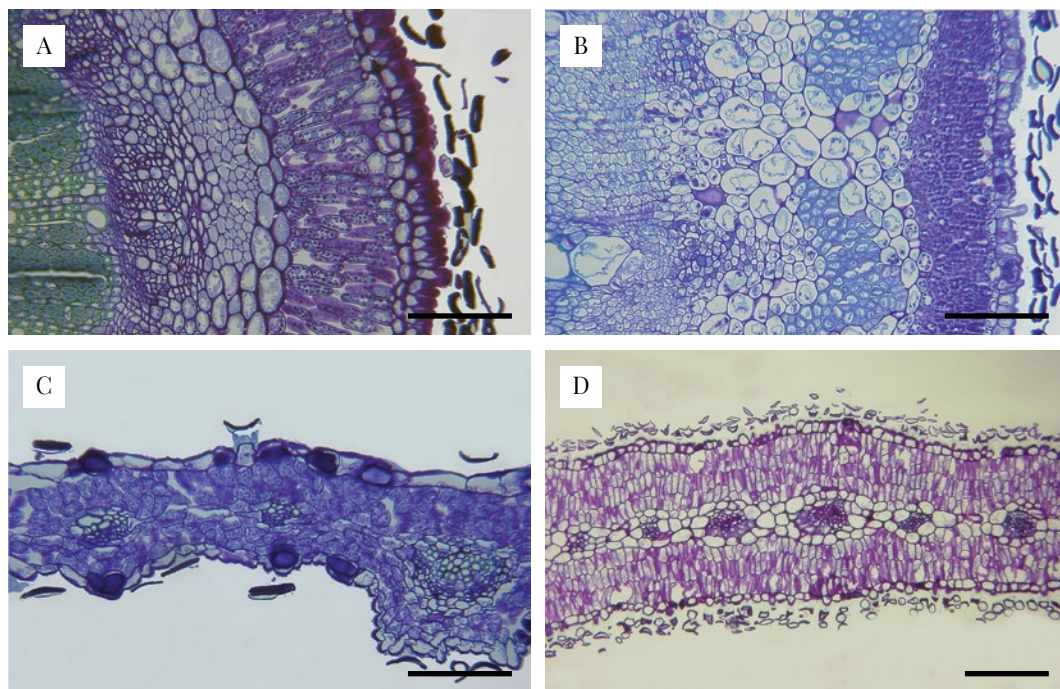


Figure 2.—Transverse sections through the stems and leaves of *Calobota* species. A, portion of the stem of *C. spinescens* showing several layers of chlorenchyma below the epidermis (Boatwright *et al.* 158, JRAU); B, portion of the stem of *C. angustifolia* showing several layers of chlorenchyma below the epidermis (Boatwright *et al.* 138, JRAU); C, portion of the juvenile leaf of *C. pungens* showing the presence of mucilage cells in the epidermis (Boatwright *et al.* 106, JRAU); D, portion of the leaf of *C. obovata* showing the isobilateral mesophyll (Kers 152, WIND). Scale bars: A–C, 0.1 mm; B, 0.2 mm.

is a useful character, especially to distinguish *C. spinescens* from *C. angustifolia*. Leaflet shape varies from oblanceolate to elliptic or obovate to suborbicular and less often spatulate. The apices may be acute, obtuse, retuse, truncate, mucronulate or recurved-mucronate, and the base of the leaflets angustate, attenuate or cuneate. *Calobota angustifolia* is a highly variable species and four regional forms can be distinguished, mainly on leaf size, shape and especially the width of the leaflets.

Anatomical study of the leaves of *Calobota* species (Figure 2) provided contrasting characters with those of *Lebeckia* and *Wiborgiella*. In *Calobota*, the leaves are isobilateral and lack mucilage cells in the epidermis. Transverse sections through juvenile leaves of *C. pungens* show mucilage cells in the epidermis (Figure 2), suggesting that there is a developmental loss of these cells in *Calobota*. *Calobota saharae* is an exception in that mucilage cells remain present in mature leaves. Gregory

& Baas (1989) speculate that these cells are usually associated with plants that occur in Mediterranean climates, and consistent with this, *C. saharæ* is endemic to Mediterranean North Africa. In *Lebeckia* the acicular leaves

show the palisade parenchyma adjacent to the epidermis and mucilage cells are present. *Wiborgiella* species have dorsiventral leaves (with both palisade and spongy parenchyma) and mucilage cells are present in the epidermis.

Reproductive morphology and anatomy

INFLORESCENCE

The inflorescence in *Calobota* is fairly uniform in structure, and all species have terminal racemes that vary only in length and in the number of flowers per raceme (Figure 3). Terminal racemes are rather common in Papilionoideae and also in the Crotalariaeae (Polhill 1976). Notably in *C. elongata* (Thunb.) Boatwr. & B.-E.van Wyk, the inflorescence is a densely flowered spike, with more than 100 sessile flowers (Dahlgren 1967).

FLOWERS

Flower size is somewhat diagnostic at species level in *Calobota*. The largest flowers are found in *C. cytisoides* and *C. sericea* (to 35 mm and 24 mm long, respectively) and *C. cuspidosa* has flowers to 20 mm long. Remaining species range from 17 mm long in *C. linearifolia* (E.Mey.) Boatwr. & B.-E.van Wyk and *C. saharae* to less than 12 mm long in *C. elongata*, *C. halenbergensis* (Merxm. & A.Schreib.) Boatwr. & B.-E.van Wyk, *C. namibensis*, *C. psiloloba* and *C. angustifolia*. The consistently yellow petals (Figure 3) are usually pubescent in *Calobota* or at least pilose along the dorsal midrib of the standard petal, with the exception of *C. cuspidosa* and *C. psiloloba* that have totally glabrous petals. Floral pedicels are short in most species, but may be longer in *C. cytisoides* (to 11 mm) and *C. psiloloba* (to 6 mm) or absent in *C. elongata*.

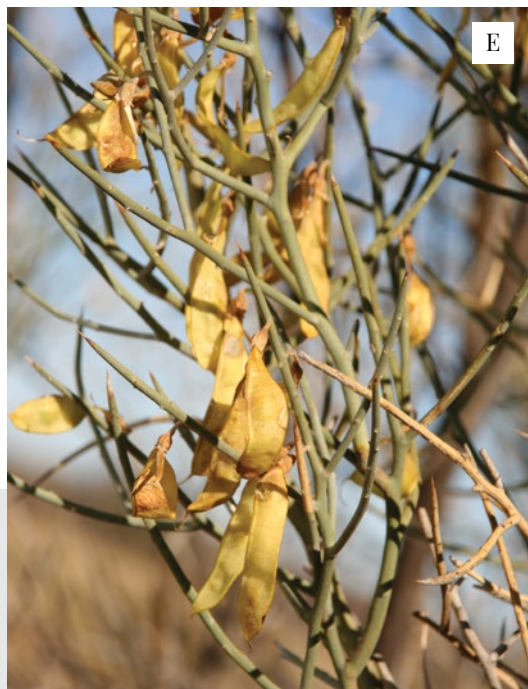
Bracts and bracteoles vary little among species. A single bract is located at the base of the pedicel, with two bracteoles further up near the middle of the pedicel. These bracts and bracteoles are small, linear and adaxially pubescent, except in *C. cytisoides* and *C. obovata* where they are often ovate.

In the flower, the calyces of *Calobota* species are typically of the lebeckioid type (Polhill 1976) and are subequally lobed, with the upper sinus often deeper than the lateral or lower sinuses and the carinal lobe consistently narrower than the others. The outer surface of the calyx is usually pubescent, pilose or at least glabrescent. The tips of the calyx lobes are minutely pubescent on the inner surface, which is found in most of the genera of the Cape group of the Crotalariaeae, with the notable exception of *Aspalathus*.

The standard petal is mostly widely ovate in the species of *Calobota*, but is elliptic in *C. elongata*, orbicular in *C. halenbergensis* and transversely oblong in *C. lotononoides*. The apices are either acute or obtuse, except in *C. psiloloba* and *C. lotononoides*, which have emarginate apices. The claws are relatively short and less than 6 mm long, except in *C. cuspidosa*, *C. cytisoides* and *C. lotononoides* where the claws are longer. Basal callosities are only found only in *C. cytisoides*. The standard petal is usually pubescent in *Calobota* species or at least with pilose hairs along the dorsal midrib, except in *C. cuspidosa*.



Figure 3.— Flowers and fruit of *Calobota* species. A, *C. cytisoides*; B, *C. sericea*; C, *C. pungens*; D, *C. cinerea*; E, *C. cuspidosa*; F, *C. angustifolia*. Photographs: A, C–E: B.-E. van Wyk; B, F: J.S. Boatwright.



and *C. psiloloba*, which have totally glabrous standard petals.

The shape of the wing petals is fairly uniform in the genus and mostly oblong with obtuse apices. They are either shorter than the keel petals (*Calobota cinerea* (E.Mey.) Boatwr. & B.-E.van Wyk, *C. cuspidosa*, *C. linearifolia*, *C. namibensis*, *C. obovata*, *C. psiloloba*, *C. pungens*), as long as or shorter than the keel petals (*C. acanthoclada*, *C. cytisoides*, *C. spinescens*, *C. sericea*), as long as or longer than the keel petals (*C. elongata*, *C. saharae*, *C. angustifolia*) or markedly longer than the keel petals (*C. halenbergensis*, *C. lotononoides*). *Calobota lotononoides* is unique within the genus in having the lamina of the wing petals twice as long as those of the keel petals; the wing petal laminae of the other species are never more than 1.3 times longer than those of the keel petals (Boatwright & Van Wyk 2007). The wing petals are glabrous in most species, but pilose in *C. acanthoclada*, *C. cinerea*, *C. linearifolia*, *C. obovata* and *C. pungens*. Sculpturing is present in all species on the upper basal and upper central parts of the wing petals. In some species, e.g. *C. cytisoides*, *C. elongata* and *C. sericea*, the sculpturing extends to the lower basal, lower central and upper/lower distal parts of the wing petals (cf. Stirton 1981).

Keel petals are boat-shaped with obtuse apices and pockets are invariably present in all *Calobota* species. The petals are either pubescent (*C. acanthoclada*, *C. cinerea*, *C. linearifolia*, *C. cytisoides*, *C. namibensis*, *C. obovata*, *C. pungens* and *C. sericea*) or glabrous (*C. psiloloba*, *C. cuspidosa*, *C. elongata*, *C. halenbergensis*, *C. lotononoides*, *C. saharae*, *C. angustifolia*). In *C. spinescens* the keel petals may be either pilose or glabrous.

The value of staminal characters in the genistoid legumes is well known (Polhill 1976; Schutte & Van Wyk 1998; Boatwright et al. 2009) and provide reliable characters to segregate *Calobota* and *Wiborgiella* from *Lebeckia* s.s (Boatwright et al. 2009). The species of *Calobota* have a 4+5+1 anther arrangement (four long basifixed anthers, five short dorsifixed anthers and an intermediate carinal anther), while those of *Lebeckia* have a 5+5 arrangement (the carinal anther resembles the long basifixed anthers) and species of *Wiborgiella* have a 4+6 arrangement (the carinal anther resembles the short dorsifixed anthers).

The pistil in *Calobota* is subsessile or shortly stipitate, usually with a linear ovary and up-curved style. The ovary may be either pubescent or glabrous, while the style is always glabrous. The ovary may contain as few as three to six ovules (*C. elongata*, *C. namibensis*) or as many as 34 ovules (*C. cytisoides*). The style is longer than the ovary in *C. namibensis*.

The nectar of *Calobota* species is generally sucrose-rich (Van Wyk 1993), typical of most bee-pollinated legumes. The potential pollinators of some of the Cape genera of the Crotalariaeae were studied by Gess & Gess (1994). They found that the flowers of *C. spinescens* and *C. sericea* were visited by solitary aculeate Hymenoptera, specifically Masarinae and Megachilinae of the tribes Megachilini and Anthidiini. Some species of Xylocopinae also occasionally visited *C. sericea* and *Apis mellifera* L. was also often abundant. The megachiline and masarine visitors were able to trip (displacement of the keel petals to come into contact with the pollen) the flowers of *C. spinescens*, but not those of *C. sericea* suggesting that they are potential pollinators of

only the former. *Apis mellifera*, however, was the only species that was able to trip the flowers of *Calobota sericea* making it a potential pollinator of this species (Gess & Gess 1994, 2004, 2006). The diversity of flower visits to other species of *Calobota* and the Crotalarieae has been recorded by Gess & Gess (2003).

FRUIT

The pods seen in *Calobota* species vary from laterally compressed and membranous to terete and glabrous or pubescent. The pods are generally many-seeded, with the exception of *C. elongata* where the pods are small,

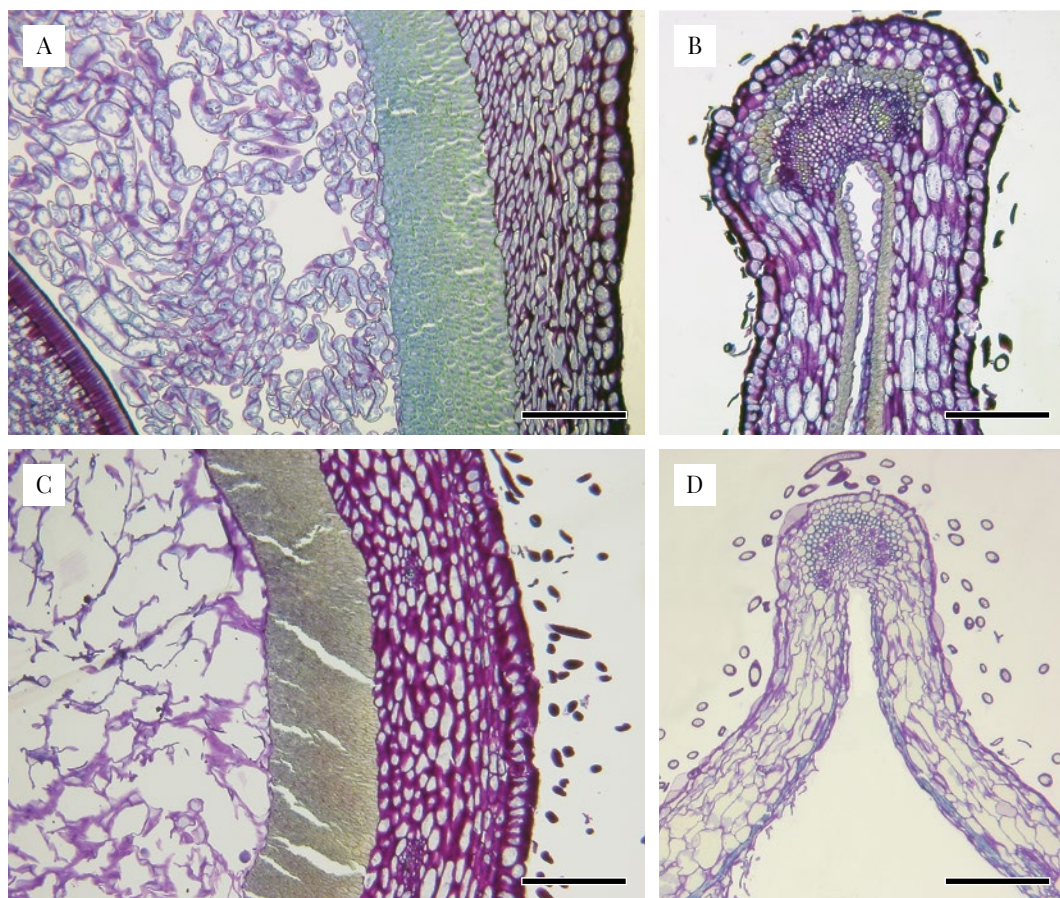


Figure 4.—Transverse sections through the fruit walls of *Calobota* species showing thick-walled (A, C) and thin-walled (B, D) pods. Note the mass of multicellular hairs associated with the endocarp in A, C. A, *C. angustifolia* (Boatwright et al. 138, JRAU); B, *C. spinescens* (Boatwright et al. 158, JRAU); C, *C. sericea* (Boatwright et al. 151, JRAU); D, *C. elongata* (Van Wyk 2562b, JRAU). Scale bars: A–D, 0.2 mm

light and usually single-seeded. In this species, the petals dry out but are persistent and serve as wings for the dispersal of the tiny pod by wind, through a rolling action in the open sandy places where these plants typically grow. A similar adaptation to wind dispersal is found in *Leobordea* sect. *Syndlistus* (B.-E. van Wyk) B.-E. van Wyk & Boatwr. (Van Wyk 1991b).

Anatomically there are two types of fruit walls in species of *Calobota*, distinguished by their thickness (Figure 4) (type I and III according to Le Roux et al. 2011). It is also one of only two genera in Crotalariaeae in which gelatinous fibres are found in the endocarp, which is associated with a dense mass of multicellular hairs which give the appearance of a white sponge to the naked eye and seem to envelop the seed, perhaps to serve some

protective function. In the species with thin-walled pods, the mesocarp is thinner and has only one or two rows of sclerenchyma cells adjacent to the endocarp (Figure 4). One or rarely two layers of cells make up the endocarp and the sponge-like dense mass of hairs is absent. The segregation of *Lebeckia* s.s. into three genera is supported by fruit anatomical data (Le Roux et al. 2011).

SEEDS

In *Calobota* the seeds are reniform or oblong-reniform and vary from light brown to pink, sometimes with brown mottling, and generally have a brown hilum. The surface is smooth in all but one species, namely *C. lotononoides*, which has rugose seeds (Boatwright & Van Wyk 2007).

Taxonomic treatment

Calobota Eckl. & Zeyh., Enum. Pl. Afric. Austral. [Ecklon & Zeyher] 2: 192. [Jan.] 1836; Boatwr. & B.-E.van Wyk, S. African J. Bot. 75: 553. 2009. *Lebeckia* sect. *Calobota* (Eckl. & Zeyh.) Benth., London J. Bot. 3: 358–361. 1844. p.p. LECTOTYPE (designated by Boatwright et al. 2009: 552): *Calobota cytisoides* (Bergius) Boatwr. & B.-E.van Wyk.

Acanthobotrya Eckl. & Zeyh., Enum. Pl. Afric. Austral. [Ecklon & Zeyher]. 2: 192. [Jan] 1836, p.p. LECTOTYPE (designated by Boatwright et al. 2009: 552): *A. pungens* Eckl. & Zeyh. [= *Calobota psiloloba* (E.Mey.) Boatwr. & B.-E.van Wyk].

Stiza E.Mey., Comm. Pl. Afr. Austral. [Meyer] 1: 31. [Feb.] 1836. *Lebeckia* sect. *Stiza* (E.Mey.) Benth., London J. Bot 3: 355, 1844. LECTOTYPE (designated by Boatwright et al. 2009: 552): *Stiza erioloba* E.Mey. [= *Calobota pungens* (Thunb.) Boatwr. & B.-E. van Wyk].

Spartidium Pomel, Nouv. Mat. Fl. Atl.: 173. 1874. TYPE: *S. saharae* (Coss. & Durieu) Pomel.

[Note: As mentioned by Bentham (1844), *Acanthobotrya* is a mixed concept representing at least four different genera, including species of *Calobota*, *Wiborgia* and *Wiborgiella*. However, the diagnosis agrees with the concept of *Stiza* E.Mey. in the linear-oblong, compressed fruits.]

Woody, sometimes spinescent shrubs or shrublets; branches thick and woody; young branches green, with chlorenchyma and lacking bark (except in *C. acanthoclada*), pubescent, often sericeous. *Stipules* absent. *Leaves* unifoliate or digitately trifoliate (rarely 5-foliate), sometimes caducous so that mature plants appear leafless, seasonally deciduous in some species; petioles shorter or longer than leaflets, pubescent; leaflets oblanceolate to elliptic or obovate to suborbicular, less often spatulate, pubescent. *Inflorescence* terminal, few to multi-flowered racemes or rarely a spike; pedicels pubescent; bracts linear

to obovate, pubescent, caducous; bracteoles linear, pubescent, caducous. *Flower* with corolla yellow, usually pubescent or at least pilose along the median section of the standard petal (except in *C. cuspidosa* and *C. psiloloba*); calyx subequally lobed, upper sinus often deeper than the lateral or lower sinuses, carinal lobe narrower than the others, pubescent or at least glabrescent, tips of lobes minutely pubescent on inner surface; standard linear to widely ovate, with basal callosities in *C. cytisoides*; wing petals narrowly oblong to oblong or slightly ovate, longer or shorter than the keel, terminal parts sometimes

pubescent; apex obtuse; keel petals oblong, pockets invariably present, terminal parts sometimes pubescent; apex obtuse; anthers dimorphic, four long, basifixed anthers alternating with five ovate, dorsifixed anthers, carinal anther intermediate in size and shape between the basifixed and dorsifixed anthers; pistil subsessile to very shortly stipitate; ovary linear to slightly elliptic, with four to many ovules, pubescent or glabrous; style longer or shorter than the ovary, curved upwards, glabrous. *Fruits* as pods laterally compressed or terete, linear to oblong, few- to many-seeded, glabrous or pubescent, dehiscent or indehiscent; endocarp glabrous or hairy. *Seeds* reniform to oblong-reniform, or less often suborbicular; colour variable, light pink to pink, sometimes mottled with brown; hilum round, brown or black; surface smooth (rugose only in *C. lotononoides*; seeds of *C. namibensis*, *C. obovata* and *C. saharae* not seen).

Diagnostic characters

Bark formation is late, so that the twigs remain green and photosynthesising, while

bark formation is early in most species of *Wiborgiella*, so that even the young twigs are not green but covered in brown bark (this is also true of *Wiborgia* species). The green twigs are a useful diagnostic character, visible even in sterile herbarium specimens. *Calobota* also differs from *Wiborgiella* in the hairy petals (*C. cupidosa* and *C. psiloloba* are exceptions) seeing that the petals are glabrous in *Wiborgiella*. The most reliable diagnostic character to distinguish *Calobota* from *Wiborgiella* is the anther configuration of 4+1+5 (4+6 in the latter). The pods are semiterete or laterally compressed in *Calobota* and usually pubescent, whereas pods are terete or rarely laterally compressed in species of *Wiborgiella* and always glabrous.

Notes on distribution

The species of *Calobota* occur in the Eastern, Northern and Western Cape provinces, with some restricted to Namibia. One species, *C. saharae*, is endemic to North Africa where it occurs on sand dunes from Libya to Algeria and Morocco (Polhill 1976).

KEY TO THE SPECIES OF *CALOBOTA*

- 1a. Plants strongly spinescent shrubs; pods laterally compressed, often falcate 2
- 2a. Plants leafless shrubs, if leaves present then widely separated 3
- 3a. Petals pilose; ovary pubescent; pods densely tomentose 13. *C. pungens*
- 3b. Petals glabrous; ovary glabrous; pods glabrous 4
- 4a. Flowers usually (15–)16–18(–20) mm long; pods (21–)28–49(–53) mm long; plants restricted to the Northern Cape 4. *C. cuspidosa*
- 4b. Flowers usually 8–11 mm long; pods 14–17(–33) mm long; plants restricted to the Eastern Cape 12. *C. psiloloba*
- 2b. Plants shrubs with leaves present, leaves fasciculate 5
- 5a. Leaves trifoliolate; young stems green; pods constricted between the seeds 16. *C. spinescens*
- 5b. Leaves simple; young stems brown; pods not constricted between the seeds 1. *C. acanthoclada*
- 1b. Plants not spinescent (or if rarely spinescent then pods terete); pods terete, if rarely laterally compressed then plants not spinescent, but erect or virgate, leafless shrubs restricted to North Africa 6
- 6a. Leaflets widely obovate or orbicular, 8–25 mm wide 7
- 7a. Leaves trifoliolate; inflorescences long (80–432 mm), spicate and densely flowered (more than 100 flowers); pods ovate to elliptic, 5–8 × 1.5–4.0 mm, 1- to 2-seeded 6. *C. elongata*
- 7b. Leaves unifoliolate (basal leaves rarely trifoliolate); inflorescences short (24–85 mm), racemose and 7- to 16-flowered; pods linear, 30–40 × 4–5 mm, 5- to 7-seeded 11. *C. obovata*
- 6b. Leaflets elliptic to oblanceolate, linear, spatulate, or rarely ovate or obovate, less than 10 mm wide (if leaflets elliptic to oblanceolate and rarely more than 10 mm wide then plants large shrubs up to 2 m with large flowers, 18–35 mm long) 8
- 8a. Wing petals longer than keel 9
- 9a. Plants pilose and not sericeous; pods glabrous; pistil glabrous 7. *C. halenbergensis*
- 9b. Plants sericeous; pods pubescent or sericeous; pistil pubescent or sericeous 10
- 10a. Leaflets not folded inward and directed to the same side; flowers 7–11 mm long; wing petals up to 1.3 × as long as the keel 2. *C. angustifolia*
- 10b. Leaflets conduplicate and secund; flowers 12–15 mm long; wing petals 2 × as long as the keel 9. *C. lotononoides*
- 8b. Wing petals shorter than keel 11
- 11a. Leaves trifoliolate and petiolate 12
- 12a. Flowers medium-sized (11–16 mm long); standard petal reflexed; wing petals with sculpturing restricted to the upper basal and upper central parts; pods tomentose 3. *C. cinerea*
- 12b. Flowers generally large (between 13 and 35 mm long); standard petal upright; wing petals with sculpturing extending to the lower basal, lower central and upper or lower distal parts; pods glabrous or sericeous 13
- 13a. Leaflet apices mucronulate; calyx glabrous; ovary glabrous; pods glabrous 5. *C. cytisoides*
- 13b. Leaflet apices acute; calyx sericeous; ovary sericeous; pods sericeous 15. *C. sericea*
- 11b. Leaves simple and sessile 14
- 14a. Leaflets and stems sericeous or silky; pods short-sericeous 8. *C. linearifolia*
- 14b. Leaflets and stems not sericeous; pods glabrous or densely pubescent 15
- 15a. Leaflets elliptic to ovate; keel petals glabrous; pistil glabrous; pods glabrous; restricted to North Africa 14. *C. saharae*
- 15b. Leaflets linear; keel petals densely pubescent; pistil densely pubescent; pods densely pubescent; restricted to Namibia 10. *C. namibensis*

1. ***Calobota acanthoclada*** (Dinter) Boatwr. & B.-E.van Wyk, S. African J. Bot. 75: 553. 2009. Basionym: *Lebeckia acanthoclada* Dinter, Repert. Spec. Nov. Regni Veg. 30: 196. 1932. TYPE: NAMIBIA, Granietberge [2715 AD], *Dinter 6694* (lectotype, designated here, B, photo!).

Lebeckia spathulifolia Dinter, Repert. Spec. Nov. Regni Veg. 30: 197. 1932. TYPE: NAMIBIA, Kleinfonteiner Fläche [2516 BB], *Dinter 3735* (holotype, B, photo!; isotypes, BM!, PRE!, SAM!, Z, photo! 2 sheets).

Lebeckia candicans Dinter, Repert. Spec. Nov. Regni Veg. 30: 198. 1932. TYPE: NAMIBIA, Kleinfonteiner Fläche [2516 BB], *Dinter 3737* (holotype, B, photo!; isotypes, BM!, BOL!, NBG!, PRE!, S!, Z, photo!).

Small, erect or decumbent, multi-stemmed, spinescent shrub up to 1 m in height. *Branches* all brown; young branches slightly sericeous to pilose, not green; older branches covered with brown bark, pilose. *Leaves* simple, persistent; petiole absent; fasciculate, sericeous on both surfaces, spathulate, sessile, 6–20 × 1–2 mm, apex recurved-mucronate, base angustate. *Inflorescence* 12–25 mm long, racemose, with 3 to 5 flowers; pedicel 2–3 mm long; bract 1.5–2.5 mm long, linear, sericeous; bracteoles 0.5–1.0 mm long, linear, sericeous. *Flowers* 9–12 mm long, bright yellow. *Calyx* 5–7 mm long, densely sericeous; tube 2.5–4.0 mm long; lobes 2–4 mm long, subulate. *Standard* 9.5–14.0 mm long; claw linear, 2–5 mm long; lamina ovate, 6.5–8.5 × 7–8 mm; apex acute; dorsal surface densely sericeous. *Wings* 9.5–11.0 mm long; claw 2.5–3.5 mm long; lamina oblong, as long as or shorter than keel, 6.0–7.5 × 2.5–3.0 mm, pilose, with 5–7 rows of sculpturing. *Keel* 10.0–12.5 mm long; claw 3–4 mm long; lamina boat-shaped, 6.5–8.5 × 3.5–4.5 mm, pilose to sericeous on terminal parts. *Pistil* subsessile to shortly stipitate, pubescent; ovary linear, 7.0–9.5 × 0.7–1.0 mm with 9 to 16 ovules;

style shorter than ovary, 3.5–5.5 mm long. *Pods* linear, laterally compressed, sericeous, subsessile to shortly stipitate, 12–19 × 1.5–3.0 mm, ±4- to 5-seeded, dehiscent; endocarp glabrous. *Seeds* oblong-reniform to suborbicular, 1.5–2.5 × 1.0–2.5 mm, mature seeds light brown to orange, surface smooth (Figure 5). *Flowering time*: flowering specimens have been collected from February through to October.

Distribution and habitat

Calobota acanthoclada is mainly found in Namibia but extends into the Richtersveld of South Africa (Figure 6). A collection that was made in the Cederberg (Western Cape Province) suggests that the species extends even further south into South Africa. It grows on sandy loam, rocky soil, limestone or dolomitic limestone at altitudes of between 170 and 1 300 m.

IUCN Red List category

Considered Endangered (EN) by Raimondo et al. (2009).

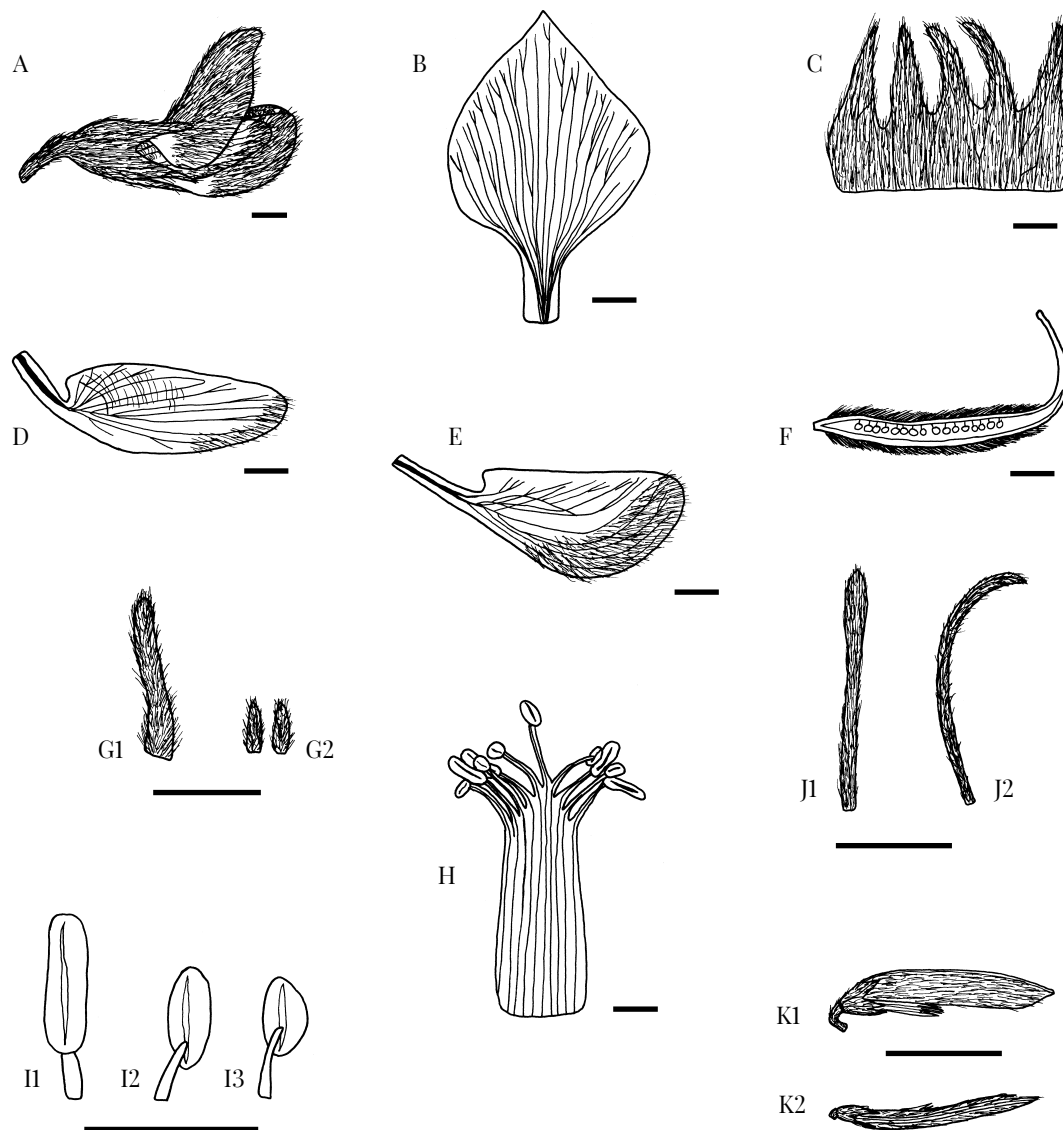


Figure 5.—Morphology of *Calobota acanthoclada*. A, flower in lateral view; B, standard petal; C, outer surface of the calyx (upper lobes to the left); D, wing petal; E, keel petal; F, pistil; G1, bract; G2, bracteoles; H, androecium; I1, long, basifixed anther; I2, intermediate carinal anther; I3, short, dorsifixed anther; J1, J2, leaves in abaxial view; K1, pod in lateral view; K2, pod in dorsal view. A–G: *Mannheimer CM2012a*, WIND; H–I: *Williamson 3376*, BOL; J: *Mannheimer et al. CM 899*, WIND; K: *Pillans 5149*, BOL. Scale bars: A–I, 1 mm; J, K, 10 mm.

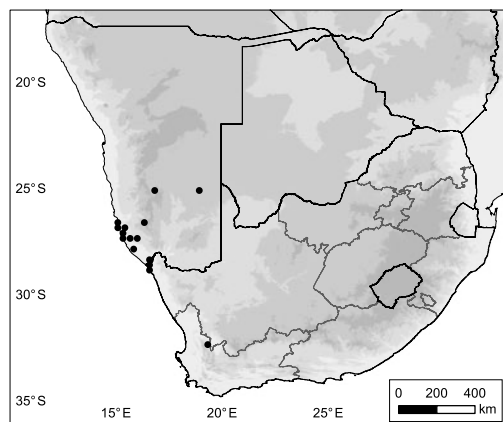


Figure 6.—Distribution of *Calobota acanthoclada*.

Discussion

This species is similar to *C. spinescens* in the fasciculate leaves, ovate and sericeous standard petal and spinescent habit, but the branches are brown and not green as in *C. spinescens* (and indeed all other species of *Calobota*). It also differs in the simple leaves (trifoliolate in *C. spinescens*), smaller flowers and shorter calyx lobes. The pods are not constricted between the seeds as is the case in *C. spinescens*.

Dinter 6694 cited by Dinter (1932) is still extant in B and is here chosen as lectotype. Dinter (l.c.) cited only a single collection (*Dinter 3735*) in the original description of *Lebeckia spathulifolia* and also only one collection (*Dinter 3737*) in the description of *Lebeckia candicans*. The specimens in B of these collections are still extant.

Additional specimens examined

NAMIBIA. **2516** (Helmeringhausen): Kleinfonteiner Flache (–BB), *Dinter 6269* (B, BOL). **2518** (Tses): Kavisberge (–BB), *Dinter 6293* (B, BM); *Merxmüller & Giess 28445* (PRE, WIND). **2615** (Lüderitz): Klinghardt Mountains (–CA), *Clark & Müller 345* (WIND); 1.0 ml. [1.61 km] south of Lagoon, Lüderitz Bay (–CA), *Giess & Van Vuuren 669* (K, PRE, WIND); between Elizabeth Bay and Kolmanskop, towards coast along old mine road (–CA), *Mannheimer CM2012a* (WIND); Lüderitz (–CA), *Merxmüller & Giess 3076* (PRE, WIND); Lüderitz, on road to Diazpunt (–CA), *Müller & Jankowitz 270* (WIND); proposed wind farm site, east of Grosse Bucht (–CC), *Mannheimer & Burke CM 1700* (WIND); Grillenthal, blue dolomite hills on the road south to Oranjemund from Lüderitz in the Diamond Area No. 1 (–CD), *Bean & Oliver 2425* (BOL, NBG); Sperrgebiet South, 1.5 km north of Grillenthal (–CD), *Jürgens 28103* (PRE). **2616** (Aus): 56 mls [90.1 km] west of Aus, Schotterhang (–CB), *Leippert 4080* (WIND). **2715** (Bogenfels): ca. 5 km north of Pomona (–AB), *Burgoyne 8270* (PRE); Pomona (–AB), *Dinter 6366* (BM, BOL, NBG 2 sheets, K, PRE, S, WIND); along road to Pomona (–AB), *Mannheimer et al. CM899* (WIND); Rote Kuppe, Chamais road (–BC), *Bartsch SB 1043* (WIND); 13 km west of Bogenfels houses, at ridge running south of road (–BC), *Mannheimer CM961* (WIND); Klinghardt Mountains (–BD), *Dinter 3980* (BOL, PRE); Boegoeberg (–DD), *Dinter 6574* (B, photo!, BM!); *Mannheimer CM1015* (WIND); summit of the Boegoeberg (–DD), *Williamson 2594a* (BOL 2 sheets).

SOUTH AFRICA. **2816** (Oranjemund): Brandkaros (–BC), *Venter 8863* (PRE); 0.5 km east of Brandkaros on road to Anniesfontein (–DA), *Botha 3201* (PRE); Richtersveld, Kortdoorn (–DA), *Jürgens 22585* (PRE); Witbank (–DC), *Pillans 5149* (BOL, K). **3219** (Wupertal): Oudekraal farm between Ramkraal and Oukraal, Cederberg (–AD), *Koekemoer 2467* (PRE). **Precise locality unknown:** Nautilus, *Kinges 2580* (PRE); Summit of Kortderm, *Williamson 3376* (BOL).

2. ***Calobota angustifolia*** (E.Mey.) Boatwr. & B.-E.van Wyk, S. African J. Bot. 75: 553. 2009. Basionym: *Lebeckia angustifolia* E.Mey., Linnaea 7: 155. 1832. *Acanthobotrya angustifolia* (E.Mey.) Eckl. & Zeyh., Enum. Pl. Afric. Austral. [Ecklon & Zeyher] 2: 194. Jan. 1836. TYPE: SOUTH AFRICA, s. loc., *Ecklon s.n.* (lectotype, designated here, S!).
Spartium sericeum Ait. in Hortus Kew. [W.Aiton] 3: 12. 1789, non *Lebeckia sericea* Thunb.
 TYPE: SOUTH AFRICA, Cape of Good Hope, *Masson s.n. sub BM000794145* (lectotype, designated here, BM, photo!, specimen on the left).
Lebeckia multiflora E.Mey., Comm. Pl. Afr. Austral. [Meyer] 1: 34. Feb. 1836. TYPE: SOUTH AFRICA, betw. Holrivier & Mierenkasteel [3118 CB], *Drège 6474 III, C'* (lectotype, designated here, P!; isolectotypes, BM!, K!, PRE!, S!).
Lebeckia decutiens E.Mey. var. α *canescens* E.Mey., Comm. Pl. Afr. Austral. [Meyer] 1: 34. Feb. 1836. TYPE: SOUTH AFRICA, near Heerenlogement [3118 DC], *Drège s.n. III, E, a'* (lectotype, designated here, P!; isolectotype, BM!, K!).
Lebeckia multiflora var. *parviflora* Schinz in Abhandl. Bot. Ver. Prov. Brandenb. 30: 157. 1888. *Lebeckia parvifolia* (Schinz) Harms in Engl. Pflanzenw. Afr. 3(1) (Engl. & Drude, Veg. der Erde 9): 545 (1915). TYPE: NAMIBIA, Angra Pequena [2615 CA], *Schinz 811* (lectotype, designated here, Z, photo!; isolectotype, BOL!, K!).

Erect or spreading, multi-stemmed, unarmed or rarely spinescent shrub up to 2 m in height. *Branches* green; young branches sericeous, older branches sericeous or glabrous with brown bark. *Leaves* digitately trifoliate, very variable, deciduous; petiole longer or shorter than leaflets, 8–45 mm long; leaflets linear to oblanceolate, alternate, sericeous, subsessile, terminal leaflet 5–30 × 0.5–5.0 mm, lateral leaflets 4–25 × 0.5–4.0 mm, apex acute, base cuneate. *Inflorescence* 20–200 mm long, with 7 to 40 flowers; pedicel 1–2 mm long; bract 1–3 mm long, linear, pubescent; bracteoles 0.5–2.0 mm long, linear, pubescent. *Flowers* 7–11 mm long, bright yellow. *Calyx* 4.0–6.5 mm long, pubescent; tube 2.5–4.5 mm long; lobes 1.0–3.5 mm long, deltoid. *Standard* 6.5–13.0 mm long; claw

linear, 2.0–4.5 mm long; lamina widely ovate, 4–9 × (3.8–)4.5–10.0 mm, pilose along dorsal midrib; apex obtuse. *Wings* 7–13(–14) mm long; claw 2.5–4.5(–5.5) mm long; lamina oblong, as long as but more often longer than keel, 4.5–8.5 × 2.0–4.5 mm, glabrous, with 4–12 rows of sculpturing. *Keel* 6.5–12.5 mm long; claw 2.5–4.5(–5.5) mm long; lamina boat-shaped, 4–8 × 2.5–5.0 mm, glabrous. *Pistil* subsessile to shortly stipitate, pubescent; ovary linear, 5.0–9.5 × 0.5–1.1 mm with 11 to 20 ovules; style shorter than ovary, 2.5–5.0 mm long. *Pods* linear, terete, sericeous, subsessile to shortly stipitate, 18–35 × 2–4 mm, 5- to 12-seeded, dehiscent; endocarp hairy. *Seeds* oblong-reniform, 2.5–3.5 × 1.5–2.0 mm, mature seeds light brown or light orange, sometimes mottled with

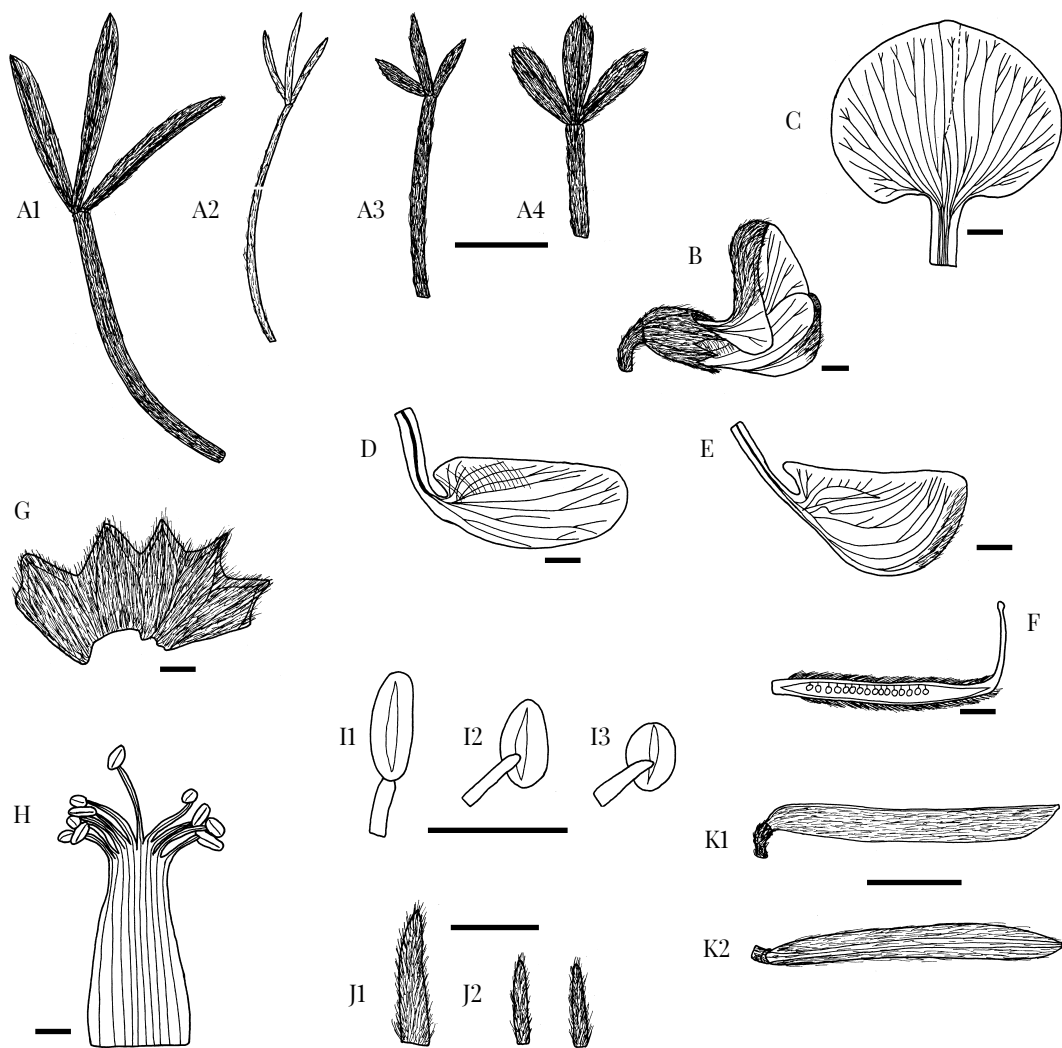


Figure 7.—Morphology of *Calobota angustifolia*. A1–A4, leaves in abaxial view; A1, typical form; A2, Oran-jemund form; A3, short-leaved form; A4, broad-leaved form; B, flower in lateral view; C, standard petal; D, wing petal; E, keel petal; F, pistil; G, outer surface of the calyx (upper lobes to the left); H, androecium; I1, long, basifixed anther; I2, intermediate carinal anther; I3, short, dorsifixed anther; J1, bract; J2, bracteoles; K1, pod in lateral view; K2, pod in dorsal view. A1: *Boatwright et al.* 138, JRAU; A2: *Ward* 12435, WIND; A3: *Giess & Robinson* 13177, WIND; A4: *Stirton & Zantovska* 11426, NBG; B: *Boatwright et al.* 139, JRAU; C: *Van Wyk* 2847, JRAU; D–F: *Boatwright et al.* 139, JRAU; G: *Lewis* 4705, NBG; H, I: *Boatwright et al.* 139, JRAU; J: *Whitehead* 80.9.8, WIND; K: *Boatwright et al.* 138, JRAU. Scale bars: A & K, 10 mm; B–J, 1 mm.

brown, surface smooth (Figure 7). *Flowering time*: flowers for most of the year, January to November.

Distribution and habitat

Calobota angustifolia is widely distributed along the West Coast of South Africa and Namibia (Figure 8). It forms an important component of Western Strandveld (FS 1 Lambert's Bay Strandveld, FS 5 Langebaan Dune Strandveld; Rebelo et al. 2006), Richtersveld (SKr 3 Gariep Mountain Succulent Shrubland and disturbed areas of SKr 13 Southern Richtersveld Scorpionstailveld; Mucina et al. 2006) and Namaqualand Sandveld (SKs 2 Northern Richtersveld Yellow Duneveld, SKs 4 Richtersveld Sandy Coastal Scorpionstailveld, SKs 5 Richtersveld Red Duneveld, SKs 6 Oograbies Plains Sandy Grassland and SKs 13 Klawer Sandy Shrubland, the latter recorded as *C. halenbergensis* instead of *C. angustifolia*; Mucina et al. 2006). Rebelo et al. (2006) recorded *C. sericea* as an important component of FS 4 Saldanha Limestone Strandveld, but it is *C. angustifolia* that occurs in that area.

IUCN Red List category

Considered of Least Concern (LC) by Raimondo et al. (2009).

Discussion

Calobota angustifolia is similar to *C. lotononoides*, but differs in that it is an erect, divaricately branched shrub usually more than 1 m in height with inflorescences that sometimes terminate in a spine; the wing petals are almost as long as or slightly longer than the

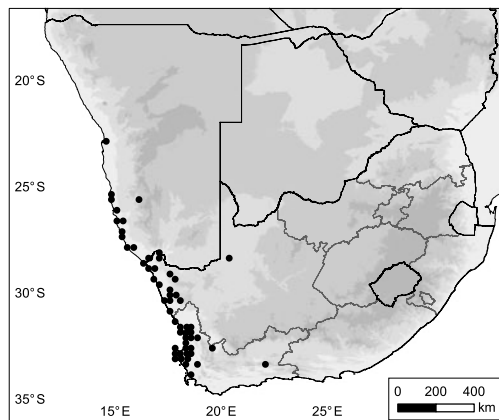


Figure 8.—Distribution of *Calobota angustifolia*.

pilose keel petals and the seeds are pale pink with a smooth surface (*C. lotononoides* is a small [up to 0.5 m], decumbent shrublet with unarmed inflorescences, extremely long wing petals, glabrous keel petals and the seeds are brown with beige spots and a rugose surface). It is also similar to *C. halenbergensis*, but differs in the sericeous leaves, pilose keel petals, hairy ovary and sericeous pods with up to 12 seeds (in *C. halenbergensis* the leaves are pilose, the keel petals glabrous and the ovary and pods glabrous with up to 7 seeds in the latter).

On the Ecklon specimen (Ecklon *s.n.* in S), the type of *C. angustifolia* is represented by the two branches mounted at the bottom right-hand side of the sheet – one with several flowers, the other with a single bud. Meyer (1832) incorrectly cites the type locality as ‘Uitenhage?’, but expresses doubt by placing a question mark after the locality. The specimen in S comprises mixed elements, but the

two branches referred to above are accompanied by a label in Meyer's handwriting stating '*Lebeckia angustifolia mihi*'. The specimen *Masson s.n. sub BM000794145* also comprises mixed elements. The two specimens on the left were collected by Masson and are marked with '1' on the tape on the stems. The specimen on the right was grown in the gardens at Kew and has the note 'Hort. Kew 1781' associated with it. According to Stafleu and Cowan (1976), most of the Aiton types are in the Banks collection in BM. *Drège 6474 'III, C'* in P bears the type locality, shows the features of the plant described by Meyer, has the characteristic Drège field labels and is therefore chosen as lectotype of *Lebeckia multiflora*. *Drège s.n. 'III, E, a'* in P displays the diagnostic characters described by Meyer, bears the type locality and is here chosen as lectotype of *Lebeckia decutiens* var. *α canescens*. The collection by Schinz (*Schinz 811*) is chosen as lectotype of *L. multiflora* var. *parviflora* as it displays the characters of the variety and is listed in the protologue.

Regional variation

Four regional forms can be recognised based on leaf morphology and geographical distribution:

FORM A (typical form)

Erect shrubs up to 1.8 m in height, often spinescent. *Leaflets* linear to narrowly oblanceolate, sericeous, terminal 10–30 × 0.5–2.0(–2.5) mm, lateral 8–23 × 0.5–2.0(–2.5) mm; petiole 11–35 mm long. *Inflorescence* 27–90 mm long; with 10 to 27 flowers; pedicel 1–2 mm long; bract 1.5–2.0 mm

long, bracteole 0.5–1.5 mm long. *Flowers* 9–11 mm long. *Calyx* 4.5–6.0 mm long; tube 3.5–4.5 mm long; lobes 1–3 mm long. *Standard* 9–13 mm long; claw 2.5–4.5 mm long; lamina 5.5–9.0 × (–3.5) 4.5–10.0 mm. *Wings* 8.5–13.0(–14.0) mm long; claw 3.0–4.5(–5.5) mm long; lamina 5.5–8.5 × 2.0–3.5 mm, glabrous, with 5–8 rows of sculpturing. *Keel* 8.0–12.5(–13.0) mm long; claw 3.5–4.5(–5.5) mm long; lamina 4.5–7.5 × 2.5–4.5 mm, glabrous. *Pistil* ovary 5.5–9.5 × 0.5–1.1 mm with 11 to 20 ovules; style 3–5 mm long. *Pods* sericeous, 18–35 × 2–3 mm.

Distribution and habitat

This form occurs around the Berg River, Piquetberg, Clanwilliam, Velddrif, Lambert's Bay, Vredenburg, Hopefield, Langebaan, Saldanha, Vanrhynsdorp, Heerenlogement, Wallekraal, Hondeklipbaai, Garies and Kleinsee on the West Coast of South Africa and does not extend into Namibia. It grows in well-drained sand, sandy loam, red sand or sand dunes between sea level and 500 m above.

Diagnostic characters

This form differs from the other forms in the long, narrow leaflets and relatively short pods. The inflorescences are often spine-tipped. Populations of this form around Klawer and Vanrhynsdorp have very long wing petals and small flowers.

FORM B (broad-leaved form)

Erect or spreading shrubs up to 2 m in height, sometimes spinescent. *Leaflets* obovate to widely oblanceolate, sericeous, terminal 5–25 × 2–5 mm, lateral 5–25 × 2–4 mm;

petiole 8–30 mm long. *Inflorescence* 20–65 mm; with 7 to 18 flowers; pedicel 1–2 mm; bract 2 mm long, bracteole 1.0–1.5 mm long. *Flowers* 9–11 mm long. *Calyx* 5.0–6.5 mm long; tube 3.5–4.0 mm long; lobes 1.0–2.5 mm long. *Standard* 10–11 mm long; claw 3.0–3.5 mm long; lamina 6.5–8.0 × 7.5–10.0 mm. *Wings* 10.5–11.5 mm long; claw 3–4 mm long; lamina 6.5–8.0 × 2.5–4.5 mm, glabrous, with 4–7 rows of sculpturing. *Keel* 10–11 mm long; claw 3.5–4.0 mm long; lamina 6.5–8.0 × 3.5–5.0 mm, glabrous. *Pistil* with ovary 7.0–8.5 × 0.7–1.1 mm with 11 to 15 ovules; style 4.5–5.0 mm long. *Pods* sericeous, 25–35 × 3 mm.

Distribution and habitat

Occurs from the Saldanha area to Elands Bay, Clanwilliam, Lambert's Bay, Doring Bay, the mouth of the Olifants River, Brand-se-baai, Garies, Wallekraal, Port Nolloth and Walvis Bay along the West Coast of South Africa and Namibia. It grows in deep limestone, calcareous sand or dunes at altitudes of between 4 and 50 m and is grazed by livestock.

Diagnostic characters

This form differs from the others in the broad leaflets (always more than 2 mm wide) and relatively short inflorescences.

FORM C (short-leaved form)

Erect or virgate shrubs up to 2 m in height. *Leaflets* linear to oblanceolate, very densely sericeous, terminal 2–13 × 1–2 mm, lateral 2–7 × 0.5–1.0 mm; petiole relatively long, 9–45 mm long. *Inflorescence* 30–200 mm

long; with 8 to 40 flowers; pedicel 1 mm long; bract 2–3 mm long, bracteole 1.5–2.0 mm long. *Flowers* 7–10 mm long. *Calyx* 4–6 mm long; tube 2.5–4.0 mm long; lobes 1.5–3.5 mm long. *Standard* 7.5–9.0 mm long; claw 2–3 mm long; lamina 5.5–6.5 × 5.5–7.0 mm. *Wings* 8.5–10.0 mm long; claw 2.5–4.0 mm long; lamina 6–7 × 3–4 mm, glabrous, with 4–10 rows of sculpturing. *Keel* 7.5–8.5 mm long; claw 2.5–3.5 mm long; lamina semi-circular, 4–5 × 3.0–3.5 mm, glabrous. *Pistil* with ovary 5.5–6.5 × 0.7–1.0 mm with 13 to 18 ovules; style 3.0–3.5 mm long. *Pods* densely sericeous, 20–40 × 3–4 mm.

Distribution and habitat

This form of *Calobota angustifolia* is restricted to Namibia and occurs in the Lüderitz Bay area, including Boegoeberg, Bogenfels, Pomona, Chamaïs and Alexander Bay. It grows in well-drained or coarse sand, sometimes on rocky soil or dolomite outcrops at altitudes of between 20 and 120 m. It is heavily grazed by livestock.

Diagnostic characters

In this form the leaflets are very short with relatively long petioles.

FORM D (Oranjemund form)

Erect shrubs up to 1.5(–1.8 m) in height. *Leaflets* narrowly oblanceolate, sericeous, terminal 5–14 × 0.5–1.0 mm, lateral 5–9 × 0.5–1.0 mm; petiole 12–35 mm. *Inflorescence* 30–100 mm long; with 13 to 15 flowers; pedicel 1–2 mm long; bract 1–3 mm

long, bracteole 1.0–1.5 mm long. *Flowers* 7–10 mm long. *Calyx* 4.5–5.0 mm long; tube 3.0–3.5 mm long; lobes 1–2 mm long. *Standard* 6.5–8.0 mm long; claw 2–3 mm long; lamina 4.0–5.5 × 5.5–6.5 mm. *Wings* 7.0–8.5 mm long; claw 2.5–3.5 mm long; lamina 4.5–5.5 × 3.0–3.5 mm, glabrous, with 8–12 rows of sculpturing. *Keel* 6.5–8.0 mm long; claw 2.5–3.5 mm long; lamina 4.0–4.5 × 3.0–3.5 mm, glabrous. *Pistil* with ovary 5–6 × 0.8–1.0 mm with 12 to 19 ovules; style 2.5–3.5 mm long. *Pods* sericeous, 20–32 × 2–3 mm.

Distribution and habitat

This form is centered in the Oranjemund district. It occurs in sandy areas, alluvial sand and dunes near the mouth of the Orange River and in the Oranjemund mining area at altitudes of between 10 and 100 m.

Diagnostic characters

Leaflets of the Oranjemund form are short and very narrow and the pods are also relatively short.

Additional specimens examined

NAMIBIA. **2214** (Swakopmund): Walvis Bay (–DC), *Heywood s.n.* (NBG). **2514** (Spencer Bay): ca. 2 km east of coast near East Hill between Oyster Cliffs and Easter point (–BD), *Seely & Ward 54* (WIND); Spencer Bay (–DB), *Giess & Robinson 13177* (K, S, PRE, WIND); *Sydow 10179* (WIND). **2516** (Helmeringhausen): Halbinsel (–CA), *Walter 56* (WIND). **2615** (Lüderitz): Schurmhaudeberg (–AA), *Hardy & Venter 4437* (K, PRE, WIND); 14 mls [22.53 km] east of Lüderitz Bay (–CA), *Acoks 15654* (K, PRE 2 sheets); Lüderitz peninsula (–CA), *Clark & Müller 337* (WIND); *De Winter & Hardy 7894* (K, WIND); *Mannheimer CM2020*

(WIND); Lüderitz Bay (–CA), *De Winter & Giess 6233* (BOL, K, PRE, WIND); *Dinter 3838* (BM, BOL, K, NBG, PRE, S); *Dinter 5996* (BM, BOL, K, NBG 2 sheets, PRE); *Giess & Van Vuuren 678* (PRE, WIND); *Lavranos & Pebleman 19641* (WIND 2 sheets); *Leuenberger et al. 3306* (PRE, WIND); *Merxmüller & Giess 28275* (K, PRE, WIND); *Metz s.n.* (WIND 2 sheets); *Peter 47177* (K); *Range 363* (BOL); *Meyer 56* (WIND); *Volk 12825* (WIND); *Wall s.n.* (S); 13 mls [20.92 km] east of Lüderitz, road to Aus, Grasplatz (–CA), *Giess & Van Vuuren 738* (PRE, WIND); Lüderitz (–CA), *Hobart-Hampden 11* (BM); *Lavranos & Barod 15409* (WIND); *Moss 11462* (BM); *Rogers 29588* (K 2 sheets); just outside Lüderitz along main road (–CA), *Mannheimer CM2015* (WIND); Angra Pequena (–CA), *Marloth 4663* (NBG, PRE); *Schenck 9* (PRE); Lüderitz lagoon (–CA), *Merxmüller & Giess 3133* (WIND); Lüderitz, just outside township (–CA), *Müller & Jankowitz 275* (WIND); Essy Bay (–CA), *Strobbach 151* (WIND); Lüderitz Bay, Halbinsel (–CA), *Walter 56* (WIND); *Wendt s.n.* (WIND 2 sheets); Aus (–CB), *Regius 23c* (WIND); Grasplatz (–CB), *Merxmüller & Giess 3052* (PRE, WIND); *Venter 9160* (PRE). **2715** (Bogenfels): Pomona (–AB), *Dinter 6336* (BM, BOL, K, NBG 2 sheets, PRE); *Kolle 13560b* (NBG, PRE); *Wall s.n.* (S); *Whitehead 80.9.8* (WIND); along road to Pomona (–AB), *Mannheimer et al. CM898* (WIND); blue rocky ridge on way to Pomona town (–AB), *Mannheimer CM 924* (WIND); Bogenfels (–AD), *De Winter & Giess 6220* (K, PRE, WIND); *Merxmüller & Giess 28326* (WIND); area and surrounds north-east of Bogenfels Arch (–AD), *Powrie LWP1170* (WIND); Diamond Area 1 (–AD), *Watmough 867* (PRE); Chamais (–DC), *Merxmüller & Giess 28319* (K, PRE, WIND); Chamais valley in rock (–DC), *Williamson 2647* (BOL); 3 km east of Chamais Bay (–DC), *Williamson 4980* (WIND); Boegoeberg (–DD), *Merxmüller & Giess 28304* (PRE, WIND); *Williamson 2575* (BOL). **2816** (Oranjemund): between Oranjemund and check point (–BC), *Gess & Gess 97/98/68* (J, WIND); Oranjemund (–CB), *Merxmüller & Giess 2267* (BM, K, WIND); sandy area near mouth of Orange River at Oranjemund (–CB), *Metelerkamp 290* (BOL); *Schenck 238* (PRE); north of Orange River (–CB), *O'Callaghan et al. 5* (NBG, PRE); hills northeast of Alexander Bay (–CB), *O'Callaghan et al. 67* (NBG, PRE); south bank of lagoon at mouth of Orange River

(-CB), *Pillans* 5636 (BOL); Oranjemund, near airport turnoff from main entrance road (-CB), *Ward* 11136 (K, PRE, WIND); Orange River, upper estuary (-CB), *Ward* 12435 (PRE); mining area 1 (-CB), *Williamson* 4844, 4851 (WIND); k122 mining area Ev5 control plot (-CB), *Williamson* 4884 (WIND).

SOUTH AFRICA. **2816** (Oranjemund): Witbank (-DC), *Pillans* 5207 (BOL, K); 40 km from Port Nolloth on road to Alexander Bay (-DD), *Germishuizen* 4770 (PRE, WIND); *Germishuizen* 4771 (PRE); 32 km from Port Nolloth on road to Alexander Bay (-DD), *Germishuizen* 4813 (PRE). **2817** (Vioolsdrif): 'ad ostia fluvii Garip' (-AA), *Drège s.n.* 'III, B' (P, K); sides of dry river bed at Kuboos (-AC), *Pillans* 5429 (BOL). **2820** (Kakamas): Farm Harperspot, east of Riemvasmaak (-AD), *Gubb KMG13032* (WIND). **2916** (Port Nolloth): Port Nolloth (-BD), *Bolus* 9503 (K); *Galpin* & *Pearson* 7605 (BOL, K, NBG, PRE); *Marloth* 4747 (NBG, PRE); 1 km south of McDougalls Bay (-BD), *Raith* 302 (NBG); between Port Nolloth and Holgat (-BD), *Schlechter s.n. sub STE* 10850 (NBG 2 sheets); Port Nolloth, at turn-off to McDougall Bay (-BD), *Van Wyk* 2847 (JRAU 2 sheets); 9 km east of Port Nolloth (-BD), *Zietsman* & *Zietsman* 823 (PRE). **2917** (Springbok): sand by roadside between Anenous and Chubiessis outspan (-BA), *Pearson* 5978 (BOL, K); Oubeep Bay (-BD), *Le Roux* & *Ramsey* 144 (NBG); 2 km south of Kleinsee (-CA), *Hugo* 2849 (PRE 2 sheets); Buffels River mouth (-CA), *Le Roux* & *Parsons* 23 (PRE); Kleinsee (-CA), *Theron* 3858 (PRE); between Brakwater and Komaggas (-DC), *Compton* 22071 (BOL, NBG). **3017** (Hondeklipbaai): 6 mls [9.65 km] southeast of Hondeklipbaai (-AD), *Hall* 899 (BOL, NBG); Farm Oubees 339, 1.2 km east of Oubees/Wildepaardehoek boundary fence and 4.7 km east of Springbok, Soebatsfontein road (-BA), *Le Roux* & *Lloyd* 670 (NBG); between Brakwater and Komaggas (-BB), *Compton* 22071 (BOL, NBG); 3 mls [4.83 km] northwest of Wallekraal Post Office (-BC), *Acocks* 14933 (K, PRE 2 sheets); 5 mls [8.05 km] northwest of Wallekraal (-BC), *Hall* 895 (NBG 2 sheets); Wallekraal, near Hondeklipbaai (-BC), *Stirton* 6036b (K, PRE); 15 mls [24.14 km] east of Wallekraal on road to Garies (-BC), *Thompson* 1090 (K, NBG); Groen River Mouth (-DC), *Le Roux* & *Ramsey* 276 (K, NBG, PRE); *Le Roux* & *Ramsey* 280 (NBG). **3018**

(Kamiesberg): Ezelkop, Garies (-AC), *Scheffler* 266 (NBG). **3117** (Lepelfontein): Brand-se-baai (-BD), *De Villiers* 34 (PRE, WIND); *De Villiers* 48, 49 (PRE); *Van Rooyen* 2200 (PRE). **3118** (Vanhynsdorp): mouth of Olifants River, Papendorp (-CA), *Arnold* 916 (PRE); Vredendal, Olifants River Mouth (-CA), *Le Roux* & *Ramsey* 62 (NBG); Olifants River Mouth (-CA), *O'Callaghan* 657 (NBG, PRE); Vredendal road (-CB), *Steyn* 464 (NBG); Doringbaai (-CC), *Boucher* 4054 (NBG, PRE); *Hugo* 2924 (PRE); Holrivier (-CB), *Drège s.n.* (S); between Vredendal and Lambert's Bay (-CD), *Lewis* 4705 (NBG); *Schutte* 269 (JRAU); 10.7 km from Doringbaai to Donkinbaai (-CD), *Stirton* 6077 (K, PRE); Zandkraal (-DA), *Acocks* 14840 (PRE); 11.7 km south of Redelinghuys (-DA), *Acocks* 24284 (K, PRE); Kys, southeast of Vredendal (-DA), *Bayer* 6396 (PRE); Farm Liebendal, Vredendal (-DA), *Hall* 3701 (NBG 2 sheets); Klawer (-DC), *Andreac* 474 (NBG, PRE); Heerenlogement (-DC), *Esterhuysen* 5547 (BOL); Vanrhynsdorp, foot of Nardousberge below Witbakenkop on old Clanwilliam, Vanrhynsdorp road (-DC), *Hilton-Taylor* 1613 (NBG); western aspect of koppie on Vanrhynsdorp road, Klawer (-DC), *Lavis* 20236 (BOL, K 2 sheets); 6 mls [9.65 km] north of Klawer (-DC), *Maguire* 142 (NBG 2 sheets); 6 mls [9.65 km] south of Klawer (-DC), *Salter* 5612 (BM, BOL, K, PRE). **3217** (Vredenberg): Stompneus Point (-DB), *Taylor* 1515 (NBG); Britannia Bay (-DB), *Taylor* 5189 (NBG, K, PRE); Farm Trekossenkraal (-DD), *Boucher* 7065 (NBG); Cape Columbine Lighthouse (-DD), *Horrocks* 182 (NBG 2 sheets); slopes south of Vredenburg (-DD), *Hutchinson* 247 (BM, BOL, K, PRE); granite hills near Vredenburg (-DD), *Marloth* 7945 (PRE). **3218** (Clanwilliam): Farm Brakke Kuil 9, on road from Laaiplek to Elands Bay (-AB), *Bösenberg* & *Rutherford* 394 (NBG); Lamberts Bay (-AB), *Acocks* 14182 (K, PRE), *Clarke* 633 (K, PRE); *Henrici* 3309 (PRE); *Muir s.n.* (NBG); *Pole-Evans* 26 (PRE); *Walsh s.n.* (PRE); Groendam (-AB), *Stirton* 9349 (PRE); 5 km from Lamberts Bay to Elands Bay (-AB), *Stirton* & *Zantovska* 11426 (JRAU, NBG, PRE); Wadrifoutpan (-AB), *Stirton* 9340 (PRE); Farm Middelpoos (-AB), *Stirton* 9387 (PRE); Nortier Experimental Station, Lambert's Bay (-AB), *Van Breda* 614 (NBG); *Van Breda* 4435 (PRE); 2 mls [3.22 km] from Redelinghuys on Aurora road (-AD), *Barker* 9722 (NBG); Elands Bay (-AD), *Barker* 2627 (NBG),

Britton 22 (NBG, PRE); *Pillans 7962* (BOL); *Taylor 3912* (NBG); *Taylor 3915* (PRE); *Walsh s.n.* (PRE); Vredendal road from Graafwater (–BA), *Barker 8545* (NBG 3 sheets); between Leipoldville and Graafwater (–BA), *Esterhuysen 3765* (NBG); *Leipoldt 3765* (BOL, NBG); Nieuwoudtville turn-off after Graafwater on road to Lamberts Bay (–BA), *Stirton 9197* (PRE); Farm Rietfontein, Graafwater (–BA), *Van Blerk 38* (PRE); 5 mls [8.05 km] from Clanwilliam on Lamberts Bay road (–BB), *Gillett 4045* (PRE); Rocher Pan Nature Reserve (–CB), *Heyl 44* (NBG, PRE); *Le Roux & Van Rooyen 1* (NBG); on road to Hopefield from Velddrif (–CC), *Boatwright et al. 138* (JRAU); road from Velddrif to Saldanha Bay (–CC), *Boatwright et al. 139* (JRAU); Velddrif (–CC), *Compton 15940* (NBG); *Goldblatt 6016* (PRE); *Lewis 899* (NBG); *Mauve 5356* (K, PRE); 1 km from road between Velddrif and Vredenburg on road to Stompneusbaai (–CC), *Grobbeelaar 2546* (PRE); Velddrif, next to road before the bridge going over the Berg River (–CC), *Le Roux 3* (JRAU 4 sheets); between Hopefield and Paternoster (–CC), *Leipoldt 3764* (BOL); 1 ml [1.61 km] from Velddrif, on banks of Berg River (–CC), *Marsch 1265* (K, NBG, PRE); ca. 6 km east of Velddrif, near Ouwerf (–CC), *O'Callaghan 1237* (NBG); Berg River Station (–CD), *Barker 4050* (NBG); railway enclosure along road 0.5 mls [0.8 km] from Berg River Station (–CD), *Boucher 83* (NBG, PRE); South side of Berg River (–CD), *Leighton 614* (BOL); Piquetberg (–DA), *Van Aarde s.n.* (NBG); Kapteinskloof (–DC), *Stirton 6132b* (K, PRE). **3219** (Wuppertal): Doorn River

Mouth (–DA), *Compton 11036* (NBG); Doorn River (–DA), *Schlechter 8059* (BM, BOL, K, PRE 2 sheets). **3317** (Saldanha): 20 m off road in shooting range camp parallel to dunes (–BB), *Blake 91* (NBG); Hoedjies Bay (–BB), *Bolus 12652* (PRE); Saldanha Bay (–BB), *Grey s.n.* (K); *Marloth 10188* (PRE); koppie north of Saldanha Bay (–BB), *Van Wyk 2696* (JRAU 5 sheets). **3318** (Cape Town): Lagoonside, Langebaan (–AA), *Axelsson 445* (NBG); roadside south of Langebaan village (–AA), *Boucher 2811a* (NBG); near Langebaan (–AA), *Chaplin s.n.* (NBG); *Marloth 13176* (PRE); Geelbek (–AA), *Compton 19906* (NBG); Langebaan Peninsula above Preekstoel (–AA), *O'Callaghan & Steensma 1650* (NBG); Hopefield (–AB), *Bachmann 1889* (BM, K); 10.7 mls [17.22 km] from Hopefield to Vredenberg (–AB), *Marsh 182* (NBG, PRE); 14 km from Hopefield to Langebaanweg (–AB), *Stirton 10709* (K); Schrywers Hoek (–AD), *Macnac 1020* (PRE); near Bergrivier and Zwartland (–BD), *Ecklon & Zeyher 1346* (S); sandy hill slopes behind the village Langebaan (–DC), *Leighton s.n. sub BOL 32422* (BOL). **3322** (Oudtshoorn): Waenskloof, Cango Valley (–AC), *Moffett 494* (PRE). **Precise locality unknown:** Olifantsrivier, *Drège s.n.* (P); without locality, *Galpin & Pearson 7579* (PRE); *Leipoldt s.n.* (NBG); *Range 1941* (NBG); Bokkeveld Mountains, *Leipoldt 730* (PRE); Little Namaqualand, *Krapohl 11142* (PRE); Lus district, *Merxmüller & Giess 2349* (WIND); sandy ravine below Doornpoort, *Pearson 6017* (BOL, K); Waterkloof at Doornpoort, *Pillans 5377* (BOL); Namaqualand, *Scully s.n.* (NBG).

3. ***Calobota cinerea*** (E.Mey.) Boatwr. & B.-E.van Wyk, S. African J. Bot. 75: 553. 2009. Basionym: *Lebeckia cinerea* E.Mey., Comm. Pl. Afr. Austral. [Meyer] 1: 35. Feb. 1836. TYPE: SOUTH AFRICA, hills near Noagas [grid unknown], *Drège s.n. III, B'* (lectotype, designated here, P!, flowering specimen on the left; isoelectotypes, BM!, K!, P!).

Lebeckia cinerea var. *schäferi* Dinter, Plantae novae Schäferianae: 342. 1920. TYPE: NAMIBIA, 'Granitberg zwischen Bogenfels und Prinzenbucht' [2715 AD], *Schäfer 598* (B†?, specimen not located).

Erect, multi-stemmed, unarmed shrub up to 1.5 m in height. *Branches* green; young branches sericeous or silky to tomentose; older branches sericeous or silky with light brown bark. *Leaves* digitately trifoliolate, deciduous; petiole 3–14 mm long, longer or shorter than leaflets; leaflets widely obovate to elliptic or oblanceolate, alternate, sericeous on both surfaces, subsessile, terminal leaflet 5–21 × 1.5–6.0 mm, lateral leaflets 3–17 × 1.5–5.0 mm; apex recurved-mucronulate to acute; base cuneate. *Inflorescence* 30–200 mm long, racemose, with 5 to 30 flowers; pedicel 2–3 mm long; bract 1–4 mm long, linear, sericeous; bracteoles 1–4 mm long, linear, sericeous. *Flowers* 11–16 mm long, pale to bright yellow. *Calyx* 5–8 mm long, sericeous; tube 3.5–5.0 mm long; lobes 1.5–3.5 mm long, deltoid. *Standard* 11.0–13.5 mm long; claw linear, 3.5–4.5 mm long; lamina ovate, 8–10 × 7–11 mm; apex obtuse; dorsal surface densely pubescent. *Wings* 9–13 mm long; claw 2.5–3.5 mm long; lamina oblong, shorter than keel, 5.5–8.5 × 3–4 mm, glabrous or rarely pilose, with 5–8 rows of sculpturing. *Keel* 11–14 mm long; claw 3.5–4.5 mm long; lamina boat-shaped, 7.5–10.0 × 4.5–5.5 mm, pilose. *Pistil* subsessile to shortly stipitate, pubescent;

ovary linear, 6–8 × 0.8–1.2 mm with 10 to 16 ovules; style shorter than ovary, 5.0–8.5 mm long. *Pods* linear, terete, subsessile to shortly stipitate, 15–40 × 2–4 mm, ±5- to 6-seeded, tomentose, dehiscent; endocarp hairy. *Seeds* oblong-reniform to reniform, 2–3 × 1.5–2.0 mm, mature seeds light brown to orange, often mottled with brown, surface smooth (Figure 9). *Flowering time*: mainly flowering in spring (August to November) and fruiting within the same period. Some specimens collected in Namibia were flowering and fruiting in April and May.

Distribution and habitat

Calobota cinerea occurs from southwestern Namibia southwards to South Africa as far south as Clanwilliam (Figure 10). It occurs on well-drained, sandy, loamy soil or red sand often next to rivers, at altitudes of between ca. 100 and 500 m. It is recorded to be grazed by livestock or gemsbok. According to Mucina et al. (2006), *C. cinerea* is an important component of Richtersveld (SKr 6 Stinkfontein Eastern Apron Shrubland) and Namaqualand Sandveld (SKs 2 Northern Richtersveld Yellow Duneveld, SKs 5 Richtersveld Red Duneveld, Sks 6 Oograbies

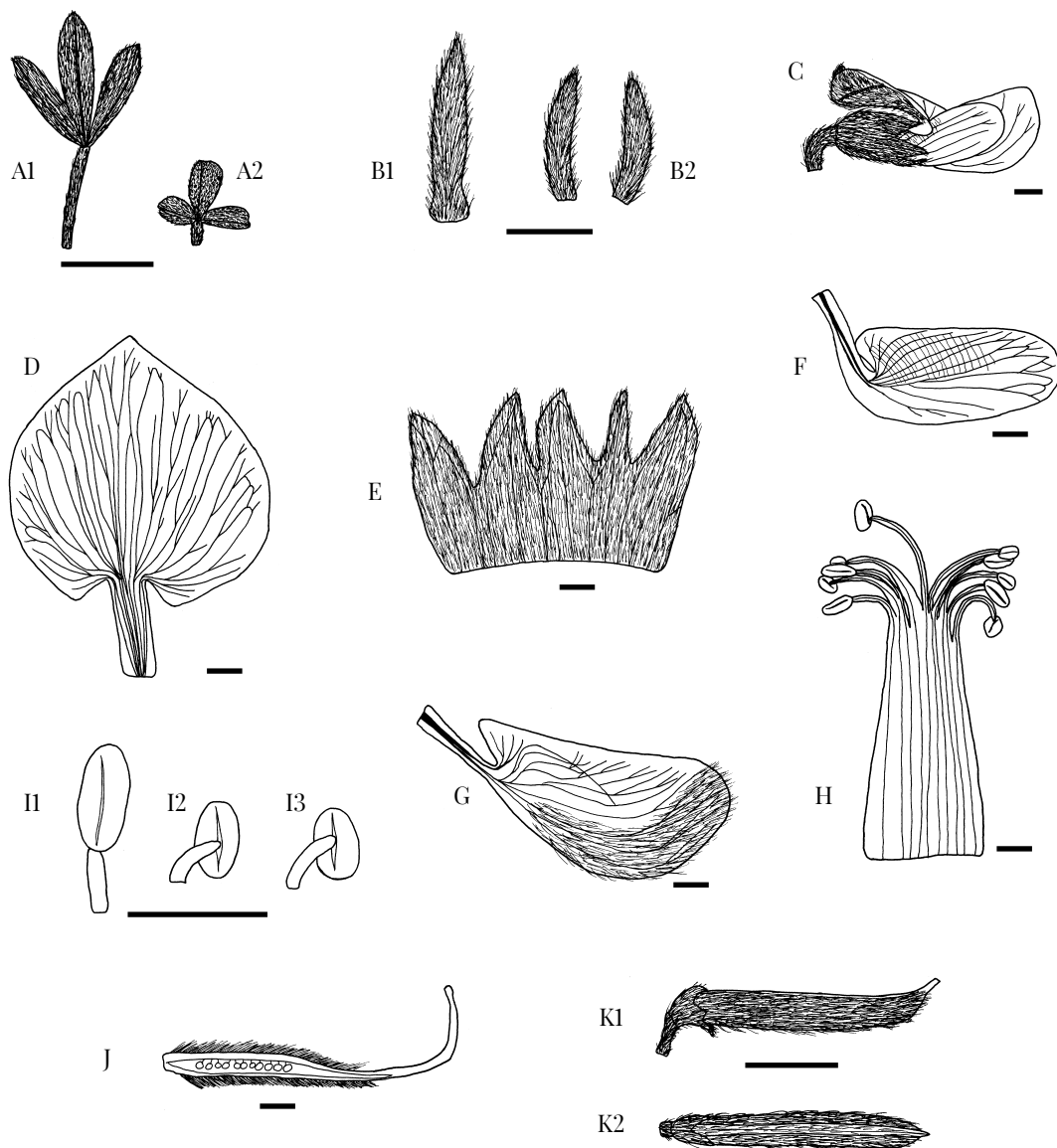


Figure 9.—Morphology of *Calobota cinerea*. A1, A2, leaves in abaxial view; B1, bract; B2, bracteoles; C, flower in lateral view; D, standard petal; E, outer surface of the calyx (upper lobes to the left); F, wing petal; G, keel petal; H, androecium; I1, long, basifixed anther; I2, intermediate carinal anther; I3, short, dorsifixed anther; J, pistil; K1, pod in lateral view; K2, pod in dorsal view. A1: *Boatwright et al. 136*, JRAU; A2–K: *Boatwright et al. 150*, JRAU. Scale bars: A & K, 10 mm; B–J, 1 mm.

Plains Sandy Grassland, SKs 8 Namaqualand Coastal Duneveld).

IUCN Red List category

Considered of Least Concern (LC) by Raimondo et al. (2009).

Discussion

Calobota cinerea is similar to *C. linearifolia*, but differs in the low, spreading habit as opposed to the virgate or erect habit of *C. linearifolia*. The leaves are trifoliate and obovate to elliptic or oblanceolate as opposed to the simple linear to oblanceolate or spathulate leaves of *C. linearifolia*. In *C. cinerea* the inflorescences are more densely flowered with up to 30 flowers (up to nine flowers in *C. linearifolia*), the pods are tomentose and not constricted between the seeds, and the seeds light brown to orange or mottled with brown (pods sericeous, constricted between the seeds and the seeds light brown or grey in *C. linearifolia*).

The Drège specimen in P was annotated by Meyer himself and is here chosen as lectotype.

Additional specimens examined

NAMIBIA. **2518** (Tses): Kosisberge (–BB), *Wall* 2 (S). **2615** (Lüderitz): Angra Pequena (–BA), *Marloth* 4809 (PRE); *Marloth* 14109 (K); Kosisberge (–CB), *Dinter* 6292 (BM, BOL, K, NBG); Halenberg (–CB), *Merxmüller & Giess* 3089 (WIND). **2616** (Aus): near Aris on the Gariiep (–BD), *Drège s.n. 'III, B'* (BM, P); Farm Klein-Aus (–CA), *Merxmüller & Giess* 2998 (PRE, WIND); 15 mls [24.14 km] west of Aus (–CB), *Giess & Van Vuuren* 833 (K, WIND). **2715** (Bogenfels):

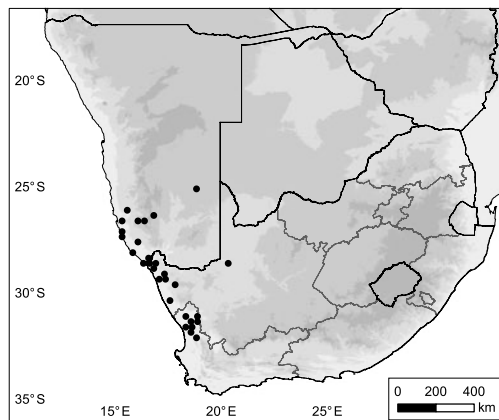


Figure 10.—Distribution of *Calobota cinerea*.

Pomona (–AB), *Dinter* 6346 (BM 2 sheets, BOL, K, NBG 2 sheets, PRE); *Wall s.n.* (S); Pomona area, west facing slope ± 15 km from houses going east (–AB), *Mannheimer et al. CM889* (WIND); Prince of Wales Bay (–AB), *Marloth* 5248 (PRE); Granite Mountain (Granietberg) near Bogenfels (–AD), *Schäfer* 13 (NBG). **2716** (Witputz): Diamond Area 1, Inselberg, at beacon 992, end of Uguchab River (–CA), *Germishuizen* 10170 (PRE). **2815** (Diamond Area): Klinghardt Mountains (–BB), *Dinter* 3918 (BM, BOL, NBG, PRE, S).

SOUTH AFRICA. **2816** (Oranjemund): ± 40 km from Brandkaros (red dune area) near farm fence (–BC), *Petersen s.n.* (NBG); Oranjemund (–CB), *Clark* 8 (WIND); sandy depressions north of Witbank (–DA), *Pillans* 5221 (BOL, K); 38 mls [61.14 km] north of Port Nolloth on way to Alexander Bay (–DA), *Werger* 517 (K, PRE); Goariepvlakte (–DB), *Jürgens* 22334 (PRE); 35 km from Port Nolloth on road to Alexander Bay at Holgat River (–DD), *Germishuizen* 4772 (PRE, WIND); Holgat (–DD), *Jürgens* 22734, 28804 (PRE). **2820** (Kakamas): Between Augrabies and Anenous (–CB), *Bolus* 428 (BM, BOL, K, NBG, PRE); *Bolus* 6548 (BOL, K). **2917** (Springbok): Anenous flats, ca. 8 km west of Farm Grasvlakte (–AB), *Goldblatt & Manning* 9461 (K, NBG); on road to Port Nolloth from Steinkopf (–AC), *Boatwright et al.* 150 (JRAU); sandy

slope 40 km east of Port Nolloth (–AC), *Goldblatt & Manning 9289* (NBG); 15 mls [24.14 km] north of Port Nolloth (–AC), *Herre s.n.* (NBG); between Kaus, Natvoet and Doornpoort (–AD), *Drège s.n.* (S); Farm Nuwefontein 147 northwest of windmill at 28th mile (–DB), *Le Roux 4038* (NBG). **3017** (Hondeklipbaai): Taaibosvlei in dunes (–BC), *Marloth 12418* (NBG, PRE). **3118** (Vanhynsdorp): Hardeveld southwest of Nuwerus (–AB), *Marloth 8233* (NBG, PRE); sand-dunes near Doorn River (–BB), *Marloth 2637* (NBG, PRE); Farm Quaggaskop, 16 km on Douse the Glim turn-off, 24 km north of Vanhynsdorp (–BC), *Le Roux 2066* (NBG); towards ‘Douse the Glim’, Knersvlakte (–BD), *Stirton 9373* (PRE); Lutzville (–CB), *Stirton 6062* (PRE); Vredendal road (–DA), *Barker 5692* (BOL, NBG 2 sheets); Farm Liebendal (–DA),

Hall 3700 (NBG 2 sheets); between Vredendal and Lutzville (–DA), *Lückhoff s.n.* (NBG); 53 km from Clanwilliam to Vanhynsdorp (–DA), *Stirton 5944* (K, PRE); Farm Spes Bona, Inedendahl (–DC), *Department of Agriculture 29* (PRE); Klawer (–DC), *Henrici 3344* (PRE); western aspect of koppie, Vanhynsdorp road near Klawer (–DC), *Lavis 20235* (BOL). **3218** (Clanwilliam): 8 km from Clanwilliam on road to Vanhynsdorp (–BB), *Boatwright et al. 136, 210* (JRAU); 5 km north of Clanwilliam (–BB), *Grobbelaar 2004* (PRE); 10 km before Clanwilliam from Vanhynsdorp (–BB), *Van Wyk 2598* (JRAU 2 sheets, PRE). **Precise locality unknown:** without locality, *Drège s.n.* (K); Sandveld, Richtersveld, *Herre s.n. sub STE 11879* (NBG); Andaus Poort, *Marloth 12250* (NBG, PRE).

4. **Calobota cuspidosa** (Burch.) Boatwr. & B.-E.van Wyk, S. African J. Bot. 75: 553. 2009. Basionym: *Spartium cuspidosum* Burch., Trav. S. Africa 1: 348. 1822. *Genista cuspidosa* (Burch.) DC., Prodr. [DC.] 2: 147. 1825. *Lebeckia cuspidosa* (Burch.) Skeels, U. S. D. A. Bur. Pl. Industr. Invent. Seeds 233: 38. 1911; *Lebeckia cuspidosa* (Burch.) Druce, Rep. Bot. Exch. Club Brit. Isles 1916: 631. 1917., nom illeg. TYPE: SOUTH AFRICA, Betw. Gati-kamma & Klaarwater [now Griquatown; 2823 CC], *Burchell 1697* (holotype, K!).

Lebeckia macrantha Harv. in Harv. & Sond., Fl. Cap. [Harvey] 2: 83–84. 1862; Wilman, Preliminary checklist of the flowering plants and ferns of Griqualand West (south-ern Africa): 53. 1946. TYPE: SOUTH AFRICA, ‘Zooloo country’ [grid unknown], *Miss Owen s.n.* (holotype, TCD, photo!).

Erect, multi-stemmed spinescent shrub up to 4 m tall. *Branches* green; young branches sparsely pubescent; older branches pubescent to glabrous with light brown bark. *Leaves* unifoliolate or rarely trifoliolate, deciduous; petiole short, 1–2 mm long (up to 5 mm long when trifoliolate); alternate, upper and lower surfaces pilose, linear to slightly obovate, 6–9(–15) × 2–3(–6) mm; apex obtuse to shallowly retuse; base attenuate. *Inflorescences* (25–)40–60(–90) mm long, racemose, with (4–)6 to 12(–24) flowers; pedicel 2–4(–5) mm long; bract 0.9–1.2 mm long, triangular to slightly linear; bracteoles 0.5–0.8(–1.0) mm long, slightly ovate. *Flowers* (15–)16–18(–20) mm long, bright yellow. *Calyx* (3.8–)4.4–5.4 mm long, pubescent on the outer surface; tube (2.5–)3.0–4.0 mm long; lobes narrowly triangular, (1.2–)1.8–2.4(–2.9) mm long, del-toid. *Standard* 11.0–18.5 mm long; claw linear, 3–6 mm long; lamina ovate, 8.5–12.5 × (7.5–)8.0–10.0 mm, glabrous; apex obtuse. *Wings* 10–16 mm long; claw (3–)5–6 mm long; lamina oblong, shorter than the keel, (7.5–)9.0–10.5 × (3.0–)4.0–5.5 mm,

glabrous, with 5 rows sculpturing. *Keel* 13.5–19.0 mm long; claw (3.5–)5.0–7.0 mm long; lamina oblong, 10.0–12.5 × 5–6 mm, glabrous. *Pistil* shortly stipitate, glabrous; ovary linear, 7–14 × 1.0–1.6 mm with 9 to 11 ovules; style shorter than ovary, 5.5–9.0 mm long. *Pods* oblong to slightly falcate, laterally compressed, shortly stipitate, (21–)28–49(–53) × (5–)6–10 mm, ±4– to 6-seeded, gla-brous, indehiscent; endocarp glabrous. *Seeds* reniform, 3–4 × 2.5–3.0 mm, mature seeds light brown, surface smooth (Figure 11). *Flowering time*: this species flowers mainly in spring and summer (October to January), but flowering also sometimes occurs in win-ter (April to May).

Distribution and habitat

Calobota cuspidosa occurs in the North-ern Cape Province and is centred around the towns of Kuruman and Griquatown at altitudes of between 975 and 1 700 m. It is mainly found in rocky, loamy or sandy soils (Figure 12). According to Rutherford et al. (2006) this species is an important,

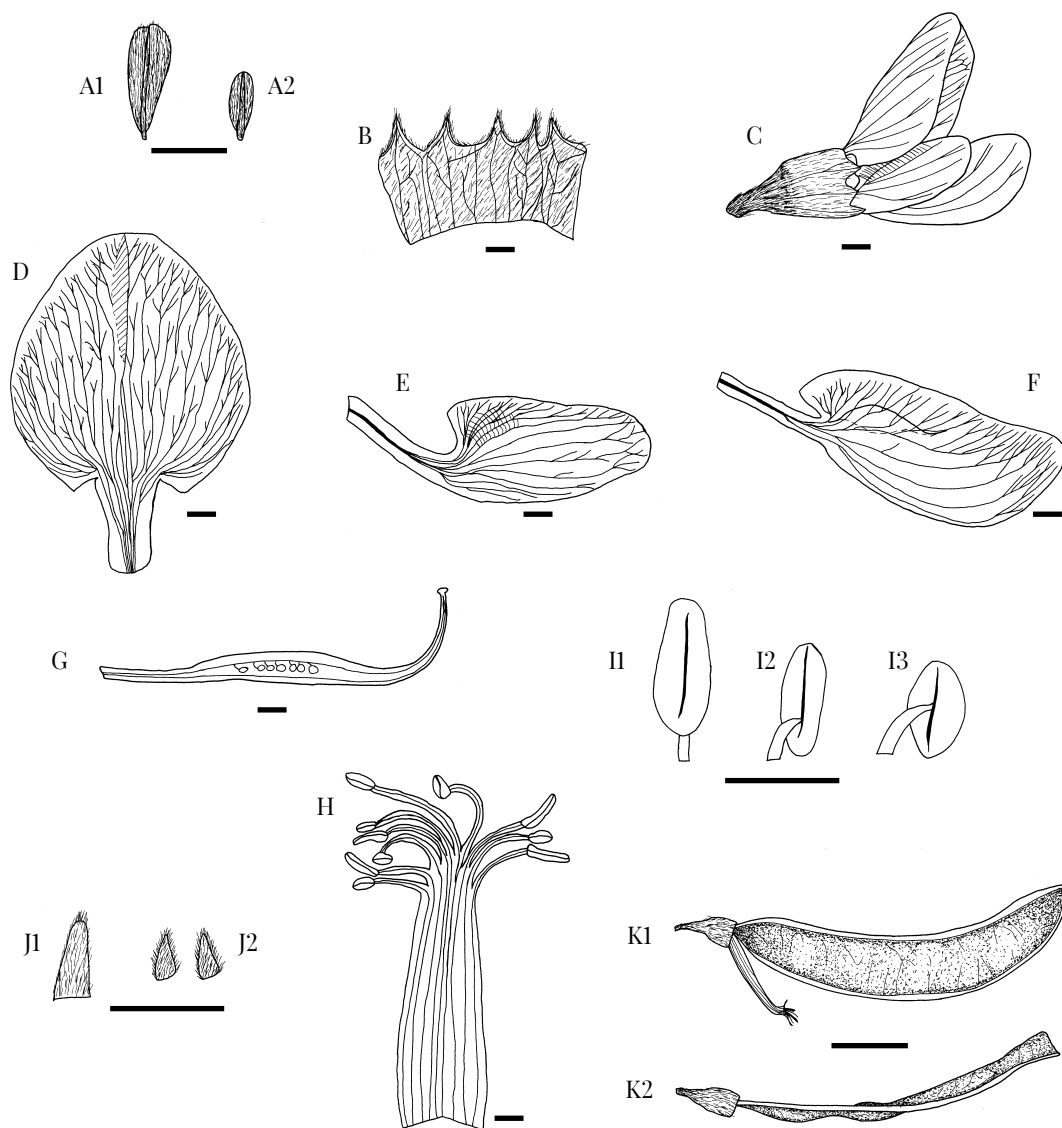


Figure 11.—Morphology of *Calobota cuspidosa*. A1, A2, leaves in abaxial view; B, outer surface of the calyx (upper lobes to the left); C, flower in lateral view; D, standard petal; E, wing petal; F, keel petal; G, pistil; H, androecium; I1, long, basifixed anther; I2, intermediate carinal anther; I3, short, dorsifixed anther; J1, bract; J2, bracteoles; K1, pod in lateral view; K2, pod in dorsal view. A1: *MacDonald 76/3*, NBG; A2: *Ethel Anderson 591*, BOL; B: *Gubb 12584*, PRE; C–H: *Van Wyk 3055*, JRAU; I: *Gubb 12584*, PRE; J: *Van Wyk 3055*, JRAU; K: *Boatwright et al. 92*, JRAU. Scale bars: A & K, 10 mm; B–J, 1 mm.

prominent component of Kuruman Mountain Bushveld (SVk 10 Eastern Kalahari Bushveld) where it is common in low, open bushveld.

IUCN Red List category

Considered of Least Concern (LC) by Raimondo et al. (2009).

Discussion

Calobota cuspidosa is similar to *C. psiloloba*, but the large flowers, pods and seeds are distinctive for the former (in *C. psiloloba* the flowers, pods and seeds are much smaller). *Calobota cuspidosa* reaches heights of up to 4 m, while *C. psiloloba* only reach heights of 1.2 m. The young stems in this species are normally densely tomentose and the older ones remain at least slightly pubescent (in *C. psiloloba* the branches are glabrous or only slightly pubescent).

The specimen *Miss Owen s.n.* in TCD is the only one cited by Harvey in the original description of *Lebeckia macrantha* and was also seen by him as is indicated by the exclamation mark following the specimen citation in Harvey (1862). It must therefore be the holotype of *L. macrantha* despite the incorrect locality.

Additional specimens examined

SOUTH AFRICA. **2723** (Kuruman): Batlaros, Bosjesmans doorn (–AC), *Silke* 16785 (BOL); ca. 10 km west of Kuruman on the road to Olifantshoek (–AD), *Dlamini, Nkuna & Van Wyk EvW577* (K); Kuruman (–AD); *Pole-Evans* 2108, 2480 (K, PRE); *Van Son s.n.*

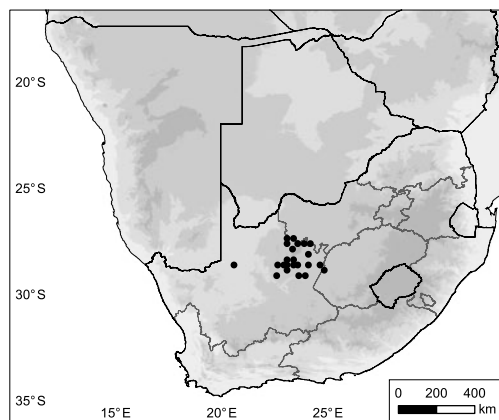


Figure 12.—Distribution of *C. cuspidosa*.

sub TRV 31766 (PRE); On road to Olifantshoek (–AD), *Germishuizen* 5614 (BOL, PRE); 3 mls [4.8 km] east of Kuruman (–AD), *Grobbelaar* 1112 (PRE); Kuruman Municipal Reserve (–AD), *MacDonald* 76/3 (J, NBG, PRE); Buta Asbestos Mine (–AD), *Pecters, Gericke & Burelli* 264 (J, PRE); ca. 12 km from Kuruman to Vryburg (–AD), *Van Wyk* 3053 (JRAU); 11 km from Kuruman to Vryburg (–AD), *Van Wyk* 3055 (JRAU); Kuruman Hills (–AD), *Verdoorn & Dyer* 1763 (PRE, K); Vredebron, Blikfontein (–CA), *Gubb KMG* 10989 (PRE); 10 km west of Kuruman on road to Upington (–CA), *Van Wyk BSA1241* (PRE, WIND); 30 km from Kuruman to Billingshurst (–CD), *Arnold & Musil* 500 (PRE); Hillsides from Griquatown to Khosis (–CD), *Bryant* J379 (PRE); 30 km southeast of Kuruman (–DA), *Jordaan CBK* 26 (PRE); Road from Reivilo to Kuruman, farm Mattana (–DB), *Joffe* 650 (PRE). **2724** (Taung): Blesmanspost (–CA), *Burt-Davy* 9665 (K). **2820** (Kakamas): Cape Plateau, Baviaans ‘Kloof’ [= Baviaans Krantz], (–DA), *Hutchinson* 3001 (BOL, K, PRE). **2822** (Glen Lyon): Hills at Vaalwater (–DA), *Acocks* 2455 (BOL 2 sheets, K 2 sheets); between Griquatown and Volop, Bakenkop, north of tarred road (–DB), *Gubb KMG* 10988 (PRE). **2823** (Griquatown): Postmasburg (–AC), *Wilman s.n.* (K); 19.5 km from Griquatown to Campbell (–AD), *Boatwright et al.* 92 (JRAU); between Postmasburg and Griquatown

(-CA), *Hutchinson 3039* (BM, BOL, K, PRE); Jasper veld (-CB), *Wilman 4685* (K); Griquatown commonage, the Asbestos Hills (-CC), *Acocks H1049* (PRE); Griquatown (-CC), *Barret-Hamilton s.n.* (BM); *Botha 2996* (PRE); *Burchell 1697*, *Pole-Evans 22* (K, PRE); 1 ml [1.6 km] east of Griquatown (-CC), *Leistner 890* (K, PRE); ca. 5 km from Griquatown on R64 on the road to Upington (-CC), *Van Wyk 2534* (JRAU 3 sheets); Broken Hill, north of Campbell (-DA), *Germishuizen 8523* (PRE). **2824** (Kimberley): Koopmansfontein, Farm Geluk (-AA), *Hanekom 2214* (K, PRE);

Schmidtsdrift, Ruigtefontein (-CA), *Gubb KMG 12584* (PRE); 9 mls [14.5 km] west of Schmidtsdrift (-CA), *Leistner & Joynt 2690* (K, PRE); Schmidtsdrif (-CA), *Wall s.n.* (S); Barkly West, Tierfontein (-DA), *Acocks 719* (K 2 sheets); 14 mls [22.5 km] from Vryburg on Schweizer Reneke road (-DD), *Carr 5* (PRE). **2922** (Prieska): 6 mls [9.6 km] west of Abrahamsdam (-BA), *Codd 1263* (K, PRE). **2923** (Douglas): Mazelsfontein Griqualand West (-BA), *Anderson 591* (BOL, PRE); near Douglas (-BB), *Kotze 783* (PRE). **Precise locality unknown:** Namaland, *Marloth 1042* (PRE, 2 sheets).

5. **Calobota cytisoides** (Bergius) Eckl. & Zeyh., Enum. Pl. Afric. Austral. [Ecklon & Zeyher] 2: 191 Jan. 1836. Basionym: *Spartium cytisoides* Bergius, Descr. Pl.: 199. 1767; L.f., Suppl. Pl. 320. 1781. *Lebeckia cytisoides* (Bergius) Thunb., Nov. Gen. Pl. [Thunberg]: 143. 1800. TYPE: SOUTH AFRICA, e Cap. B. Spei [grid unknown], *Grubb s.n. sub Bergius 236.57* (holotype, SBT!).

Ebenus capensis L., Mant II: 264. 1771. *Cytisus capensis* Lam., Encycl. [Lamarck] 2: 249 (1786); *Lebeckia capensis* (L.) Druce, Rep. Bot. Exch. Club Brit. Isles 1916: 631. 1917. TYPE: not seen.

Crotalaria pulchella Andrews, Bot. Repos. (dup) 6: plate 417 (Jan–Mar 1805). *Lebeckia pulchella* (Andrews) Walp., Linnaea 13: 477 (1839). *Calobota pulchella* (Andrews) Eckl. & Zeyh., Enum. Pl. Afric. Austral. [Ecklon & Zeyher] 2: 191 (Jan. 1836). TYPE: Andr. Bot. Repos. (dup) 6: plate 417. 1805. (iconotype).

?*Lebeckia marginata* E.Mey., Comm. Pl. Afr. Austral. [Meyer] 1: 35. Feb. 1836. TYPE: without locality, *Drège s.n.* (S!).

Erect, diffuse, multi-stemmed, unarmed shrub up to 2 m in height. *Branches* green; young branches sericeous; older branches sericeous to pilose with brown bark. *Leaves* digitately trifoliate to rarely 5-foliate, persistent; petiole (8–)10–40 mm long, as long as or shorter than leaflets; leaflets elliptic to oblanceolate, alternate, sericeous, subsessile, terminal leaflet (12–)14–55 × 3–10(–17) mm, lateral leaflets (11–)13–45 × 3–9(–15) mm, apex mucronulate to somewhat truncate, base angustate. *Inflorescence* 70–255(–300) mm long, racemose, with 7 to 25 flowers; pedicel relatively long, 3–11 mm long; bract 3–6 mm long, elliptic to ovate, pubescent on outer surface; bracteoles 1–4(–5) mm long, narrowly ovate to linear, pubescent on outer surface. *Flowers* 18–35 mm long, bright yellow. *Calyx* 9–13 mm long, glabrous or very rarely pilose; tube 6.5–10.5 mm long; lobes 1.5–4.0 mm long, deltoid. *Standard* with

basal callosities, 18.5–27.0 mm long; claw linear, 4–9 mm long; lamina widely ovate, 13–19 × 14.5–26.5 mm; sericeous along dorsal midrib and apex; apex obtuse. *Wings* 18–28 mm long; claw 5.5–9.0 mm long; lamina oblong to ovate, shorter or ± as long as keel, 12.5–17.5 × 7–12 mm, glabrous, with 9–16 rows of sculpturing; apex obtuse. *Keel* 19.0–29.5 mm long; claw 6.0–12.5 mm long; lamina boat-shaped, 13–20 × 6–10 mm, sericeous on terminal parts; apex obtuse. *Pistil* subsessile to shortly stipitate, glabrous; ovary linear, 14–22 × 1.2–2.0 mm with 20 to 34 ovules; style shorter than ovary, 7.5–13.5 mm long, glabrous. *Pods* linear, sometimes somewhat clavate, terete, subsessile to shortly stipitate, 45–70 × 3–5 mm, ± 5- to 18-seeded, glabrous, dehiscent; endocarp hairy. *Seeds* oblong-reniform, 2.8–3.5 × 2.0–2.6 mm, mature seeds light brown, surface smooth (Figure 13). *Flowering time*: mainly flowering

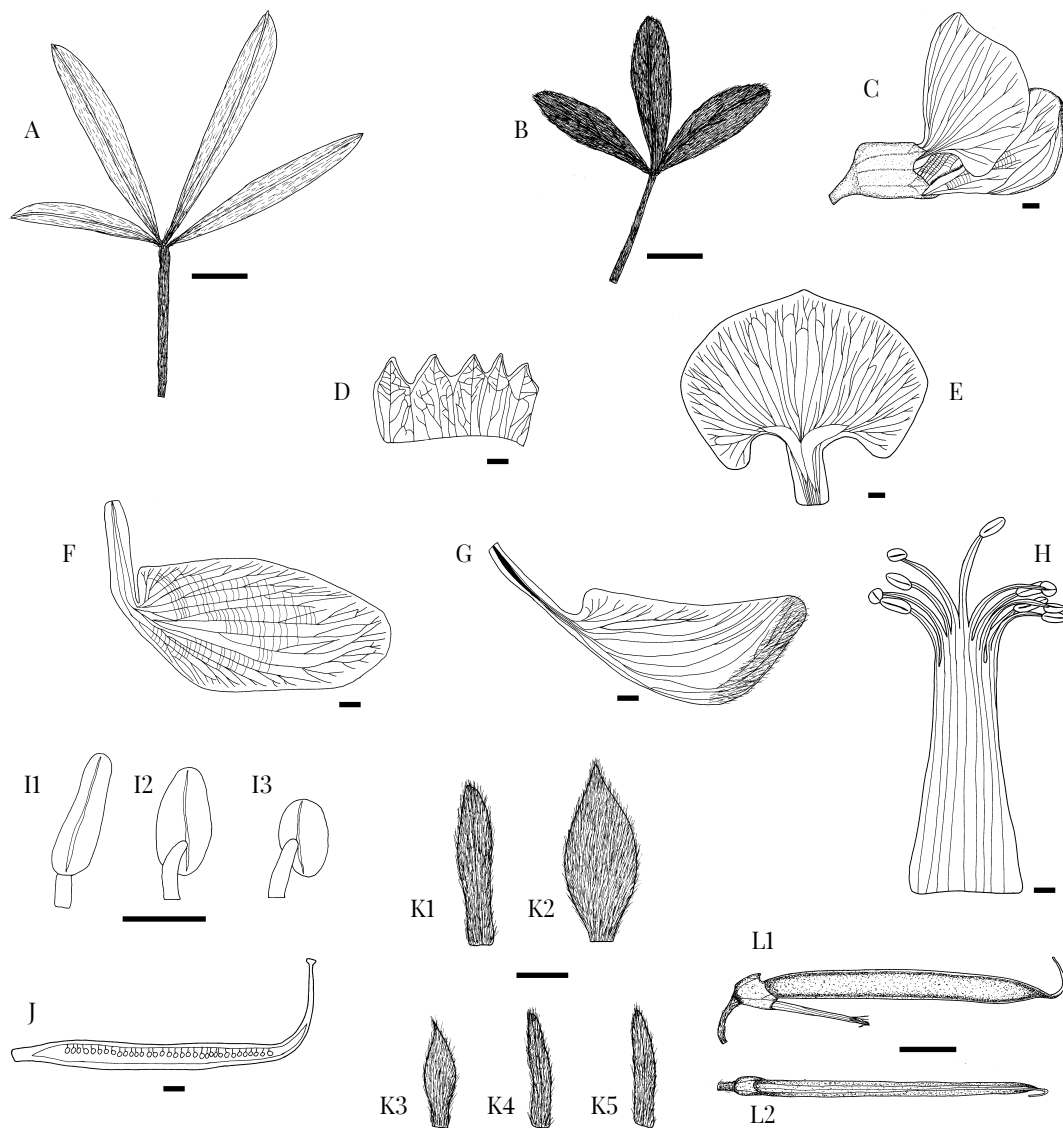


Figure 13.—Morphology of *Calobota cytisoides*. A, B, leaves in abaxial view; C, flower in lateral view; D, outer surface of the calyx (upper lobes to the left); E, standard petal; F, wing petal; G, keel petal; H, androecium; I1, long, basifix anther; I2, intermediate carinal anther; I3, short, dorsifix anther; J, pistil; K1, K2, bracts; K3–K5, bracteoles; L1, pod in lateral view; L2, pod in dorsal view. A: *Van Wyk 3117*, JRAU; B: *Le Roux 2*, JRAU; C–K1, K4, K5: *Boatwright et al. 114*, JRAU; K2, K3: *Barker 9694*, NBG; L: *Van Wyk 2439*, JRAU. Scale bars: A, B & L, 10 mm; C–J, 1 mm.

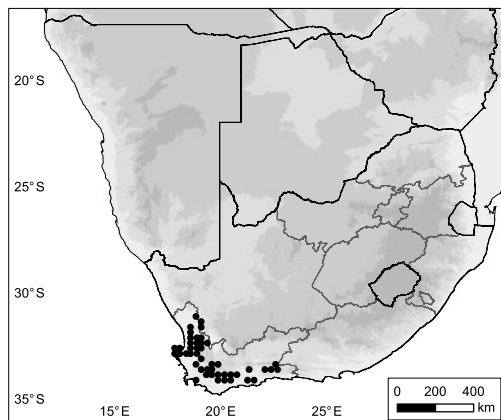


Figure 14.—Distribution of *Calobota cytisoides*.

and fruiting in late winter to spring (June to November), one flowering specimen was collected in April.

Distribution and habitat

Calobota cytisoides is a common and widely distributed species. It can be found from Oudtshoorn through the Western Cape to around Montagu and Worcester and northwards through Wupperthal and Clanwilliam as far as Paardekraal north of Nieuwoudtville (Figure 14). It has a more southern distribution than the closely related *C. sericea* and has been collected at altitudes of between 20 and 1 000 m in renosterveld vegetation on sandstone, shale, well-drained sand and clay. *Calobota cytisoides* is often found on western, southern or southwestern slopes, along rivers or in riverbeds and also along disturbed roadsides. Rebelo et al. (2006) and Mucina et al. (2006) list this species as an important

component of Shale Fynbos (FFh 8 Montagu Shale Fynbos), Shale Renosterveld (FRs 9 Swartland Shale Renosterveld, listed as *C. cinerea*), and Rainshadow Valley Karoo (SKv 7 Robertson Karoo).

IUCN Red List category

Considered of Least Concern (LC) by Raimondo et al. (2009).

Discussion

Calobota cytisoides is similar to *C. sericea*, but differs in the mucronulate leaf apices, long pedicels, larger flowers, sometimes ovate bracts and bracteoles, glabrous or pilose calyx, larger and glabrous pistil and pods (in *C. sericea* the leaf apices are acute, the pedicels shorter, the flowers smaller, the bracts and bracteoles always linear, the calyx sericeous and the pistil and pods shorter and pubescent).

According to Stafleu & Cowan (1976), Henry Andrews was a botanical painter and engraver. His artworks were based on living specimens, but no herbarium specimens are known to exist. Due to the fact that the painting in *Botanist's Repository for New and Rare Plants, London* (dup) 6 (plate 417) leaves no doubt as to the identity of the species, we here choose it as iconotype of *Crotalaria pulchella*. *Lebeckia marginata* was described by Meyer (1836) without listing locality information. The only specimen located is in S and is sterile, but the mucronulate apices of the leaflets look similar to those of *Calobota cytisoides*. This taxon might merely represent a synonym of the latter as suggested by Ecklon and Zeyher (1836), but its identity remains unclear.

Additional specimens examined

SOUTH AFRICA. **3118** (Vanrhynsdorp): 'Pillar se punt', northern point of Bokkeveld Mountains, plateau on farm Paardekraal (–BB), *Van Wyk 1248* (NBG, PRE, UPS); Vleikraal, east of Klawer (–DA), *Walters 178* (K, NBG); 17.2 km from caravan park, Clanwilliam on old road to Citrusdal (–DC), *Gess 91/92/1* (GRA); 23.9 km from Clanwilliam (–DC), *Gess 91/92/10* (GRA); Klawer (–DC), *Lavis 29233* (BOL); 29 km from Clanwilliam to Vanrhynsdorp (–DC), *Stirton 5943* (K, PRE). **3119** (Calvinia): Vanrhyns Pass (–AC), *Acocks 14717* (K, PRE 2 sheets); *Bond 1147* (NBG); *Esterhuysen 5312* (BOL); *Schutte 286* (JRAU 2 sheets); *Van Wyk 3117* (JRAU); Skuinshoogte Pass (–AC), *Niemand 1* (JRAU); Nieuwoudtville, Oorlogskloof Nature Reserve (–AC), *Pretorius 105* (NBG, PRE, WIND); Nieuwoudtville (–AC), *Schmidt 636* (K); Meulsteenvlei near Nieuwoudtville (–AC), *Taylor 3942* (NBG); Lokenberg, Stinkfontein Hills (–CA), *Leistner 451* (NBG, PRE). **3217** (Vredenburg): Vredenburg (–DB), *Grobelaar 2549* (PRE); above Stompneus (–DB), *Booyesen 141* (NBG); 1 ml [1.61 km] east of Paternoster (–DD), *Barker 9694* (NBG 2 sheets); Kasteelberg (–DD), *Strid & Strid 38078* (NBG). **3218** (Clanwilliam): Graafwater (–BA), *Compton 24209* (NBG); Bulshoek Barrage, Olifants River Valley (–BB), *Barker 6426* (NBG 2 sheets); Clanwilliam (–BB), *Bayliss BRI593* (GRA, K, PRE, S); *Davidson s.n.* (J); *Ecklon & Zeyher 17* (NBG); *Eliovson 161* (J); *Henrici 2105* (PRE); *Levyns 1282* (BOL); along road from Clanwilliam to Algeria (–BB), *Boatwright et al. 207* (JRAU); Olifants Dam (–BB), *Compton 20015* (BOL, NBG 2 sheets); Clanwilliam south of town next to Olifants River (–BB), *De Vos 1717* (NBG, PRE); near Clanwilliam on road to Biedouw Valley (–BB), *Joffe 959* (PRE); Ramskop Wild Flower Garden (–BB), *Le Roux 2476* (BOL, NBG); rocky hills near Clanwilliam (–BB), *Parker 3589* (BOL, K, NBG); Pakhuis Pass (–BB), *Schutte 262, 264* (JRAU); Bakhoogte near Clanwilliam (–BB), *Stirton 9195* (PRE); Nardouwskloof Farm (–BB), *Stirton 9364* (PRE); Boschklouf (–BB), *Thorne s.n.* (NBG); between Koperfontein and Malmesbury (–BC), *Barker 4067* (BOL, NBG); on Citrusdal road 8 mls [12.87 km] from Clanwilliam (–BD), *Gillett 4082* (BOL, PRE); Olifants

River Valley, 23 km north of Citrusdal (–BD), *Hugo 426* (K, NBG, PRE); Rondegat River, 10 km from Algeria to Clanwilliam (–BD), *Stirton 5926a* (K, PRE); roadside between Citrusdal and Clanwilliam (–BD), *Taylor 10630* (NBG, PRE); *Van Wyk 2313* (JRAU 2 sheets); halfway between Clanwilliam and Citrusdal (–BD), *Van Wyk 2439* (JRAU 2 sheets); *Van Wyk 2441* (JRAU); Olifants River Valley between Klawer and Citrusdal (–BD), *Wilman 828* (BOL); St Helena Bay, Steenberg Cove (–CA), *Wisaru 1710* (NBG); on road between Misverstand Dam and Velddrif (–CC), *Le Roux 2* (JRAU 2 sheets); 9 mls [14.48 km] from Velddrif to St. Helena Bay (–CC), *Marsch 1272* (K, NBG); 2 mls [3.22 km] north-west of Sauer Post Office (–CD), *Acocks 14534* (K, PRE 3 sheets); Moutonsvlei, west of Piquetberg Mountain complex (–DA), *Goldblatt 7197* (NBG, PRE, S); base of north slopes below nek at head of Kapteinskloof, Piquetberg (–DA), *Pillans 7701* (BOL); Het Kruis (–DA), *Stephens & Glover 8686* (BM, NBG 2 sheets, K, PRE); Kapteinskloof (–DA), *Stirton 6133a* (K, PRE); near Warmbad (–DB), *Hutchinson 1132* (BM, BOL, K, PRE); Olifants River Valley (–DB), *Marloth 7121* (PRE); Piekienierskloof Pass (–DB), *Van Wyk 3219* (JRAU); 3 km south of Piquetberg (–DC), *Ihlenfeldt 1023* (PRE); 3 mls [4.83 km] from Piquetberg up Versfeld Pass (–DC), *Thompson 762* (K, NBG, PRE); outside Piquetberg (–DC), *Thorne s.n.* (NBG); Piquetberg (–DD), *Bolus 13536* (BOL, PRE 2 sheets); *Grant 4714* (PRE); *Guthrie 2584* (NBG); *Schlechter 5233* (BM, BOL, K); *Schlechter s.n. sub TRV 3377* (PRE); roadside near Piquetberg (–DD), *Hafström & Acocks 2312* (PRE 2 sheets, S); 3 km south of Piquetberg (–DD), *Ihlenfeldt 1023* (PRE); 2 mls [3.22 km] along Piquetberg to Velddrif road (–DD), *Marsh 795* (NBG, PRE). **3219** (Wuppertal): pass into Biedouw Valley, 6.2 mls [9.98 km] from turnoff from Clanwilliam–Calvinia road (–AA), *Marsh 388* (K, NBG, PRE); bottom of Biedouw Pass (–AA), *Mauve & Oliver 89* (NBG, PRE); Pakhuis (–AA), *Salter 1660* (BM, BOL, K); Pakhuisberg (–AA), *Schlechter 139* (PRE); *Schlechter 8657* (PRE); *Schlechter 8659* (BM, K, S); Pakhuis Pass (–AA), *Stokoe s.n. sub SAM 52520* (NBG); Pakhuis Pass, east side near Big Bends and gravel pit (–AA), *Taylor 11560* (NBG, PRE); Uitkyk Pass, into Biedouw valley (–AA), *Thompson 2926* (K, NBG); Cederberg State Forest, Grootkloof (–AC), *Andrag 272* (NBG, PRE); Nieuwoudt Pass (–AC), *Barnes s.n.* (BOL); Olifants

River near Algeria (–AC), *Boatwright et al.* 119 (JRAU) Cederberg Reserve (–AC), *Hubbard* 34 (NBG); Wupperthal, just outside town on road to Clanwilliam (–AC), *Grobbelaar* 2975 (PRE); Wupperthal (–AC), *Stirton* 6399 (K, PRE); Garskloof, near Algeria (–AC), *Stirton* 9192 (PRE); near turn-off to Algeria on old National road (–AC), *Van der Walt s.n.* (NBG, PRE); ca. 8 km from Algeria on road to Clanwilliam (–AC), *Van Wyk* 2568 (JRAU 2 sheets, PRE); Cedarberg, Forest Reserve, Langrug (–AC), *Viviers* 510 (NBG, PRE); Brakfontein (–AD), *Ecklon & Zeyher* 1332 (K, PRE, S); south of Trekkloof Pass (–AD), *Low* 2942 (NBG); Wuppertal (–AD), *Thode* A1987 (K, PRE); *Thorne s.n.* (NBG); *Van Rooyen et al.* 696 (NBG); Warm Baths, Clanwilliam division (–CA), *Edwards* 252 (PRE); near Citrusdal (–CA), *Steyn* 391 (NBG 2 sheets); just north-east of Citrusdal (–CA), *Strid & Strid* 37340 (NBG). **3318** (Cape Town): Riebeeck Wes (–BD), *Coffer s.n.* (NBG); Riebeeck Castle (–BD), *Drège s.n.* III, D, a' (BM, K, S); *Pillans* 9788 (BOL); *Stark & Co. s.n.* (BOL). **3319** (Worcester): Farm Welbedacht, Biedouw Vally (–AA), *Johannesburg Botanical Garden* 3876 (PRE); Hex River (–BC), *Bolus* 5152 (K); *Marloth* 1605 (PRE); *MacOwen* 1605 (BM, K, NBG, UPS); main road passing De Doorns, east of town (–BC), *Mauve & Oliver* 136 (NBG, PRE); Hex River Pass (–BD), *Eliovson* 318 (J); *Gray s.n. sub BOL* 26052 (BOL, K); 5 mls [8.05 km] from Worcester on Bains Kloof road (–CA), *Story* 2902 (PRE); Fairy Glen Hiking trail, Worcester (–CB), *Cupido* 146 (NBG); 3.5 mls [5.63 km] from Worcester on road to Rawsonville (–CB), *Grobbelaar* 1183 (PRE); 6 km from Worcester on road to Ceres (–CB), *Grobbelaar* 2796 (K, PRE); Worcester Veld Reserve (–CB), *Henrici* 3807 (BOL, NBG); *Midgley & Rosenberg* 7 (NBG 2 sheets, PRE); *Olivier* 101 (NBG); *Van Breda & Joubert* 2177 (K); Farm Vrolikheid, McGregor (–CB), *Jooste* 192 (NBG); Blinkberg Pass, Tuinkloof (–CB), *Stirton* 5907 (K); National road bridge at Breede River (–CB), *Taylor* 3729 (BOL, K, NBG); Karoo Botanical Garden, Worcester (–CB), *Barker* 5944 (BOL, NBG 3 sheets); *Dobay* 52 (NBG); *Niemand* 14 (JRAU); *Van Wyk* 1408a (JRAU); Fairy Glen, lower slopes of Brandwag Mountains (–CB), *Stirton* 9143 (PRE); Brandwagt, in Fairy Glen Kloof (–CB), *Van Breda SKF574* (K, PRE); Robertson veld (–CB), *Walters* 380 (NBG); roadside Worcester west en route Brandwacht (–CB), *Walters* 588 (NBG); Brandwacht (–CB), *Walters* 1237

(NBG); hillside Voordenberg, near De Wet station (–CB), *Walters* 2481 (NBG); between Worcester and Stettyns (–CD), *Rycraft* 1732 (NBG); De Doorns (–CD), *Moss* 6798 (BM, J), *Schmidt s.n.* (NBG); Stettyns (–CD), *Van Rensburg* 386 (K, NBG 2 sheets, PRE); Farm Doringkloof, southern foothills of Voetpadsberg (–DA), *Morley* 506 (NBG); Hex River Kloof (–DA), *Sidey* 1878 (PRE, S 2 sheets); Farm Doringkloof, foothills of Voetpadsberg (–DA), *Van Wyk* 66 (NBG, PRE, UPS); Jonaskop (–DC), *Bayliss BRI1228* (K, PRE); on plains between Assegaikloof and Breede River (–DC), *Bowie s.n.* (BM); Robertson (–DD), *Levyns* 2812 (BOL); Vrolikheid Nature Reserve (–DD), *Van der Merwe* 2969a (K, PRE). **3320** (Montagu): Kogmanskloof (–CC), *Court* 399 (GRA), *Gillett* 4521 (BOL); *Mundt s.n.* (K); Bonnievale (–CC), *Du Preez* 321 (NBG); *Rothman NBG221/34* (NBG); *Van Breda & Joubert* 1948 (K); near Hassaquaskloof and Kogmanskloof (–CC), *Ecklon & Zeyher* 1333 (K, S); 15 mls [24.14 km] beyond Montagu on Barrydale road (–CC), *Marais NBG525/62* (NBG 2 sheets); Bonnievale, hills of Bokkeveld beds (–CC), *Marloth* 11811 (NBG 2 sheets, PRE); 5 km before Montagu (–CC), *Van Wyk* 544 (NBG, PRE); Goudmyn, between Bonnievale and Robertson (–CC), *Van Wyk* 2705 (JRAU); Olifantsberg (–CC), *Viviers* 422 (NBG 2 sheets, PRE); Scheepersrus (–CD), *Johnson* 147 (NBG 2 sheets); Barrydale (–DC), *Galpin* 3922 (GRA, PRE), *Morris* 161 (BOL, NBG 2 sheets); *Wall* 3 (S 2 sheets); 15 mls [24.14 km] west of Barrydale (–DC), *Gillett* 1897 (BOL, K); 20 km from Barrydale on road to Montagu (–DC), *Grobbelaar* 2246 (PRE); 47 km from Montagu on road to Barrydale (–DC), *Grobbelaar* 2782 (K, PRE); shaly hills at Barrydale (–DC), *Hafström & Acocks* 2314 (PRE); 19 mls [30.57 km] south of Barrydale (–DC), *Martin* 403 (NBG 2 sheets); alongside road up to Wildehondskloof Pass between Montagu and Barrydale (–DC), *McDonald* 1568 (NBG, PRE); crossroad at Barrydale (–DC), *Nel s.n. sub STE* 18105 (NBG); between Barrydale and Montagu (–DC), *Rycraft* 2627 (NBG 3 sheets); *Van Nickerk* 582 (K); top of Wildehondskloof Pass (–DC), *Van Wyk* 2651b (JRAU). **3321** (Ladismith): Gamka Mountain Reserve, alongside road to Paardebond (–CB), *Cattell & Cattell* 169 (K, NBG, PRE). **3322** (Oudtshoorn): 7 mls [11.26 km] south-west of De Rust (–BC), *Theron* 2071 (BOL, K, PRE, UPS); Oudtshoorn (–CA), *Besselaar s.n.* (NBG); along roadside from Oudtshoorn to De Rust (–CA), *Boatwright et al.*

114 (JRAU); Farm Die Krans (–CB), *Dahlstrand* 2004 (NBG, PRE); *Dahlstrand* 2312 (NBG, PRE); Oudtshoorn, near Farm Oude Muragie (–CB), *Vlok* 2150 (PRE); Farm Doornkraal, 3 mls [4.83 km] east of De Rust (–DA), *Dahlstrand* 1469 (J, PRE). **3418** (Simons-town): near Steenberg's Cove, Vredenburg (–BB), *Taylor* 1535 (NBG 2 sheets). **3419** (Caledon): Brakfontein (–BB), *Schlechter* 5279 (BM, BOL, S 2 sheets, PRE); Krommerivier (–BB), *Shaw* 5624 (BOL, K); Riviersonderend Mountains at Stormvallei, Assegaaikloof and Breede River (–BB), *Zeyher* 2320 (K, PRE 2 sheets). **3420** (Bredasdorp): Breede River (–AA), *Mundt* 37

(K); 8 km from Stormsvlei to Swellendam (–AA), *Stirton* 6147 (K, PRE); Stormsvlei (–AA), *Taylor* 4048 (NBG 2 sheets); Swellendam (–AB), *Burchell* 7475 (K); barren mountain ridges on the Riviersonderend at Storm Valley, Hassaquaskloof and Breede River (–AB), *Zeyher* 2320 (PRE 3 sheets). **3421** (Riversdale): near Platte Kloof (–AA), *Muir* 671 (PRE); Roadside near Riversdale (–AB), *Bayliss* BRIB422 (PRE); *Martin* 9649 (GRA). **Precise locality unknown:** Cape, *Bowie s.n.* (K); without locality, *Drège s.n.* (K, PRE); e Cap. b. Spei, *Sparrman s.n.* (S); *Thunberg s.n.* (S); *Thunberg s.n. sub UPS* 16413, 16414 (UPS).

6. ***Calobota elongata*** (Thunb.) Boatwr. & B.-E.van Wyk, S. African J. Bot. 75: 553. 2009. Basionym: *Crotalaria elongata* Thunb., Prodr. Pl. Cap.: 125. 1800. TYPE: SOUTH AFRICA, 'Carro prope Bockeveld' [grid unknown], *Thunberg s.n. sub THUNB-UPS 16544* (lectotype, designated here, UPS!).

Lebeckia melilotoides R.Dahlgren, Bot. Not. 120: 268–271. 1967. TYPE: SOUTH AFRICA, Platfontein, east of Hottentots Holland Kloof [3319 BB], *H. Hall 177* (holotype, NBG!; isotypes, NBG!, PRE!, S!).

Erect to procumbent, virgate, multi-stemmed, unarmed shrub up to 1 m in height. *Branches* green or light brown, young and older branches densely sericeous. *Leaves* digitately trifoliate, persistent; petiole longer or shorter than leaflets, 8–29 mm long; leaflets widely obovate, alternate, sericeous, subsessile, terminal leaflet 13–32 × 8–20 mm, lateral leaflets 10–32 × 6–16 mm, apex obtuse or retuse, base cuneate. *Inflorescence* 80–432 mm long, spicate, with more than 100 flowers; flowers sessile, bract 5–7 mm long, linear, densely tomentose; bracteoles 2–5 mm long, linear, densely tomentose. *Flowers* 8–11 mm long, pale yellow. *Calyx* 4.5–6.0 mm long, tomentose; tube 3.5–5.0 mm long; lobes 1.1–1.7 mm long, deltoid. *Standard* 10–12 mm long; claw linear, 2.5–3.5 mm long; lamina narrowly ovate to elliptic, 7.5–9.0 × 5–6 mm, pilose along dorsal midrib; apex obtuse. *Wings* 10.5–12.0 mm long, claw 3.5–4.0 mm long, lamina oblong, as long as or shorter than keel, 6–8 × 2.5–3.5 mm, glabrous, with 5–6 rows of sculpturing. *Keel* 9.5–12.0 mm long, claw 3.0–4.5 mm long, lamina boat-shaped, 6.5–8.0 × 3.5–4.5 mm, glabrous. *Pistil* subsessile to shortly stipitate, densely pubescent, ovary linear to elliptic, 5.5–6.5 × 0.6–1.0 mm with 3 to 6 ovules; style ± as long as the ovary,

6–7 mm long. *Pods* ovate to elliptic, terete, densely pubescent, subsessile, 5–8 × 1.5–4.0 mm, 1- to 2-seeded, indehiscent; endocarp glabrous. *Seeds* reniform, 2.4–3.0 × 1.3–2.0 mm, mature seeds light brown to light pink, often mottled with brown or grey, surface smooth (Figure 15). *Flowering time*: late spring to summer (October to November).

Distribution and habitat

This species occurs between Touws River and Ceres on sandy soil or dunes at ca. 600 m and has been recorded to be both avoided and grazed by livestock (Figure 16).

IUCN Red List category

The conservation status of this species was assessed as Vulnerable (VU D1+2) by Raimondo et al. (2009). *Calobota elongata* is largely restricted to the Tanqua Karoo and it is estimated that less than 1 000 individuals are left. It is threatened by overgrazing and building activities.

Discussion

This species is superficially similar to *Calobota obovata*, but differs in the habit (a virgate

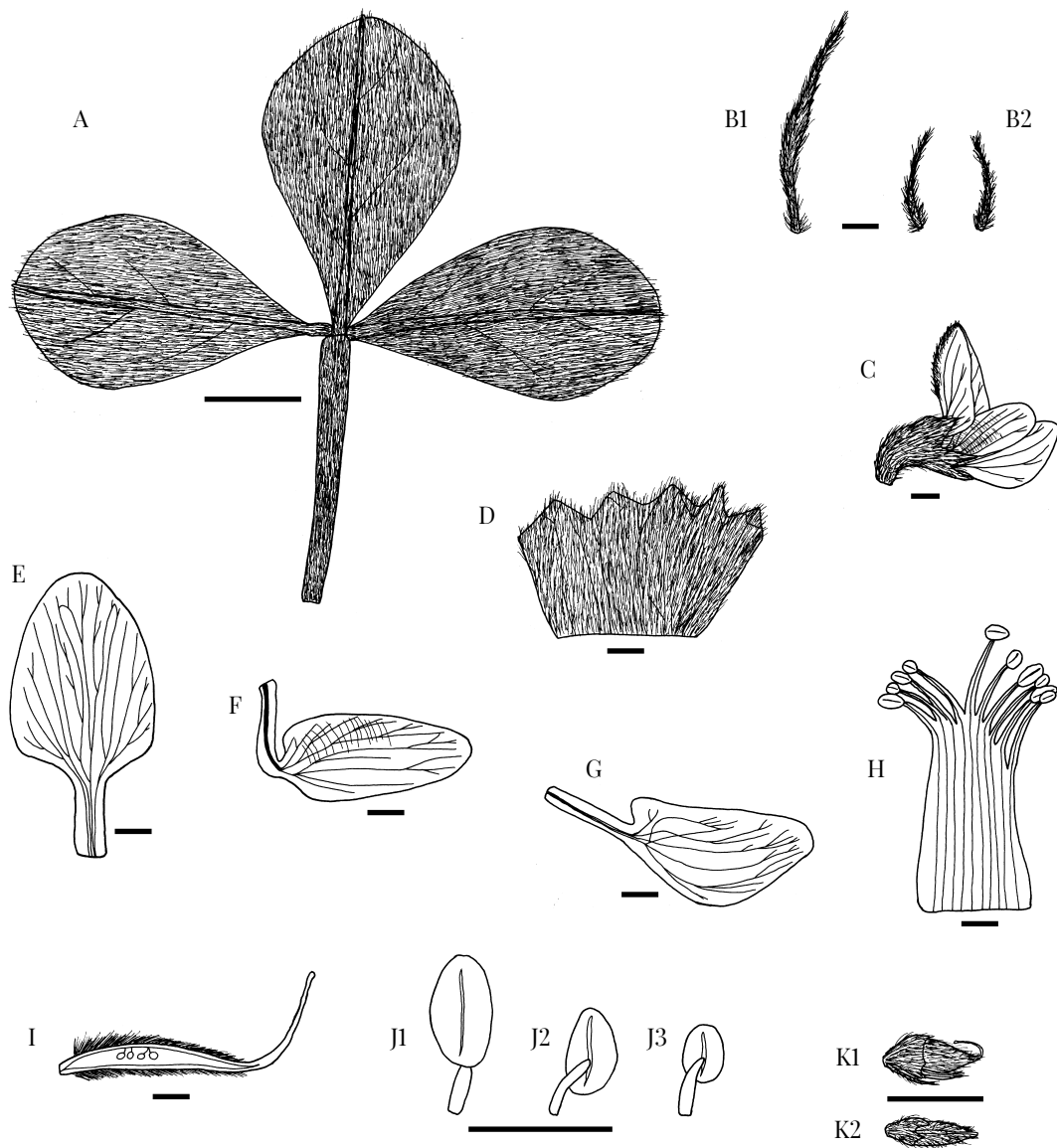


Figure 15.—Morphology of *Calobota elongata*. A, leaf in abaxial view; B1, bracts; B2, bracteoles; C, flower in lateral view; D, outer surface of the calyx (upper lobes to the left); E, standard petal; F, wing petal; G, keel petal; H, androecium; I, pistil; J1, long, basifixed anther; J2, intermediate carinal anther; J3, short, dorsifixed anther; K1, pod in lateral view; K2, pod in dorsal view. A–B, D–J: *Van Wyk 2229*, JRAU; C: *Hall 177*, NBG; K: *Van Breda 4486*, PRE. Scale bars: A & K, 10 mm; B–J, 1 mm.

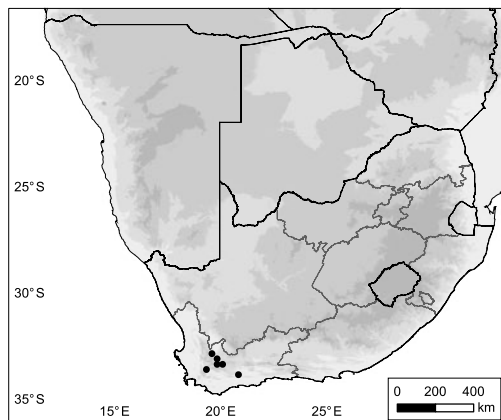


Figure 16.—Distribution of *Calobota elongata*.

shrub with unbranched flowering stems arising at ground level), trifoliolate leaves, dense, spicate inflorescences with smaller, sessile flowers, long, narrow bracts and bracteoles, very short calyx lobes, ovate to elliptic standard petal with a pilose midrib, wing petals that are longer than keel, fewer ovules in the ovary and shorter, tomentose pods with less seeds (in *C. obovata*, a much-branched woody shrub, the leaves are unifoliolate, the inflorescences racemose, the flowers pedicellate, the bracts and bracteoles ovate, the calyx lobes longer, the standard petal densely pubescent and widely ovate and the wing petals shorter than the keel, numerous ovules present in

the ovary and the pods are velvety and many-seeded). The growth form of *C. elongata* is very interesting and deserves further study. Field observations showed that new flowering stems are formed at ground level around the periphery of the plant each year and these remain quite prostrate until anthesis. As fruit formation progresses, the branches curl upwards and inwards, so that the small fruits are dispersed from some distance above the ground. The central part of the plant comprises infertile and senescent stems from previous seasons.

Thunberg s.n. sub THUNB-UPS 16544 is the only specimen in Thunberg's Herbarium; it is annotated on the reverse side of the specimen by him and so is here designated as lectotype of *Calobota elongata*.

Additional specimens examined

SOUTH AFRICA. **3219** (Wuppertal): Ceres Karoo, near Beukes Fountain (–DC), *Schlieben & Van Breda 9811* (K, NBG, PRE). **3319** (Worcester): Verkeerde-vlei (–BD), *Van Wyk 2229* (2 sheets), *2230, 2562b* (2 sheets), *2710* (JRAU); Farm Littouw (–CB), *Van Breda 4461* (PRE). **3320** (Montagu): near Railway line ca. 5 km south of Touws River (–AC), *Van Breda 4486* (PRE); Leopard Rock Private Nature Reserve, Doornrivier (–DD), *Vlok 2842* (NBG). **Precise locality unknown:** south end of Tanqua Karoo, *Story 3606* (K, PRE).

7. ***Calobota halenbergensis*** (Merxm. & A.Schreib.) Boatwr. & B.-E.van Wyk, S. African J. Bot. 75: 553. 2009. *Lebeckia halenbergensis* Merxm. & A.Schreib., Bull. Jard. Bot. État Bruxelles 27: 276. 1957. TYPE: NAMIBIA, Lüderitz South, Halenberg [2615 CB], *Dinter* 6632 (holotype, M, photo!; isotypes, BM! 2 sheets, K!, NBG!, PRE!, S!, Z, photo!).

Lebeckia decutiens var. *β glabrata* E.Mey., Comm. Pl. Afr. Austral. [Meyer] 1: 34. Feb. 1836. TYPE: SOUTH AFRICA, 'Karoo inter Goedemanskraal et Kaus' [2917 AD], altit. 2000 ped., *Drège s.n. 'III, B'* (lectotype, designated here, P!).

Multi-stemmed shrub up to 1.5 m in height. *Branches* green; young branches pilose; older branches pilose or glabrous with light brown bark. *Leaves* digitately trifoliolate, persistent; petiole 18–40 mm long, longer than leaflets; leaflets narrowly oblanceolate to linear, alternate, pilose on both surfaces, subsessile, terminal leaflet 5–30 × 0.5–1.5(–2.0) mm, lateral leaflets 4–16 × 0.5–1.0 mm, apex acute, base cuneate. *Inflorescence* 47–155 mm long, with 10 to 20 flowers; pedicel 1–2 mm long; bract 1–3 mm long, linear, pubescent on outer surface; bracteoles 0.5–1.5 mm long, linear, pubescent on outer surface. *Flowers* 7–11 mm long, yellow. *Calyx* (3.5–)4.0–6.0 mm long, pilose to glabrescent on outer surface; tube 2.5–4.0 mm long; lobes 1–2 mm long, subulate. *Standard* 7.0–11.5 mm long, claw linear, 2–4 mm long, lamina widely ovate to orbicular, 4–7 × 4.5–8.0 mm, pilose along dorsal midrib; apex obtuse. *Wings* 8–11 mm long, claw 2.5–4.0 mm long, lamina oblong, longer than keel, (4.5–)5.5–7.0 × (2.2–)2.5–3.5 mm, glabrous, with 6–9 rows of sculpturing. *Keel* 7.0–9.5 mm long, claw 2.5–4.0 mm long, lamina boat-shaped, 4.0–5.5 × 2.5–4.0 mm, glabrous or sometimes pilose on terminal parts. *Pistil* subsessile to

shortly stipitate, glabrous; ovary linear, 4.5–7.5 × 0.8–1.1 mm with (8–)13 to 18(–22) ovules; style shorter than ovary, 2–4 mm long. *Pods* linear, terete, glabrous, subsessile to shortly stipitate, 16–32 × 2–4 mm, ±3- to 7-seeded, dehiscent; endocarp hairy. *Seeds* oblong reniform to reniform, sometimes somewhat angular, 2.0–3.2 × 1.3–2.0 mm, mature seeds light brown to light orange, often mottled with brown, surface smooth (Figure 17). *Flowering time*: specimens in flower and fruit have been collected from March to October; the main flowering period appears to be late winter to spring (June to October).

Distribution and habitat

Calobota halenbergensis occurs from the Lüderitz area in southwestern Namibia southwards into South Africa as far as Garies, south of Springbok (Figure 18). It can be found on well-drained sandy loam, rocky sandstone, gravelly or loose red sand often in dry riverbeds or along disturbed roadsides at altitudes of between ca. 50 and 1 000 m above sea level. According to Mucina et al. (2006) it is an important component of Namaqualand Hardeveld (SKn 4 Namaqualand Heuweltjieveld)

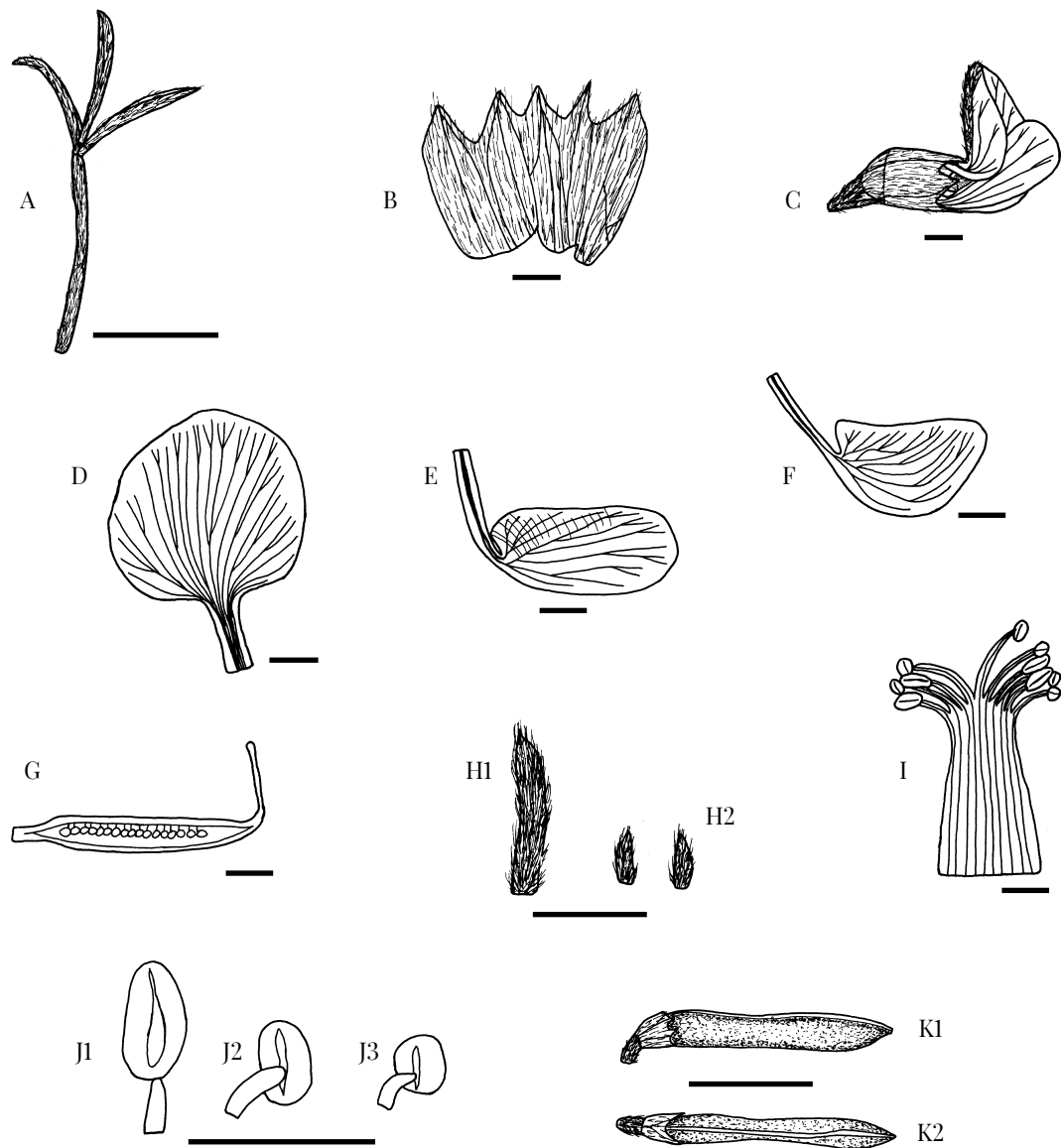


Figure 17.—Morphology of *Calobota balenbergensis*. A, leaf in abaxial view; B, outer surface of the calyx (upper lobes to the left); C, flower in lateral view; D, standard petal; E, wing petal; F, keel petal; G, pistil; H1, bract; H2, bracteoles; I, androecium; J1, long, basifixed anther; J2, intermediate carinal anther; J3, short, dorsifixed anther; K1, pod in lateral view; K2, pod in dorsal view. A, C–F, H–K2: *Boatwright et al. 146*, JRAU; B: *Middlemost 2129*, NBG; G: *Salter 5549*, PRE. Scale bars: A & K, 10 mm; B–J, 1 mm.

and Namaqualand Sandveld (SKs 7 Namaqualand Strandveld, SKs 8 Namaqualand Coastal Duneveld, SKs 11 Namaqualand Arid Grassland, SKs 12 Namaqualand Spinescent Grassland). Specimen label information indicates that it is grazed by livestock.

IUCN Red List category

Considered of Least Concern (LC) by Raimondo et al. (2009). The conservation status of *Calobota halenbergensis* in Namibia has been assessed as lower risk (LR-nt) by Golding (2002).

Discussion

Calobota halenbergensis is similar to *C. angustifolia*, but differs in the pilose leaves, glabrous keel petals and glabrous, fewer seeded pods (and pistil). In *C. angustifolia* the leaves are sericeous, the keel petals pilose and the pods (and pistil) sericeous with more seeds.

The specimen *Drège s.n. 'III, B'* in P displays the type locality and the characteristic glabrous pods of *Calobota halenbergensis* and is therefore chosen as lectotype of *Lebeckia decutiens* var. *β glabrata*.

Additional specimens examined

NAMIBIA. **2615** (Lüderitz): Halenberg (–CB), *Dinter* 3805 (BM, BOL 2 sheets, K, NBG); 23 km from Rotkop Station on power line track (–DC), *Kolberg & Maggs* 184 (WIND). **2616** (Aus): plains around Garub (–CA), *Strobbach* 577 (WIND). **2618** (Keetmanshoop): river at Spitzkop (–AD), *Wiss* 2059 (WIND). **2715** (Bogenfels): 9.8 km south of Grillental on main north–south road between Lüderitz and Alexander

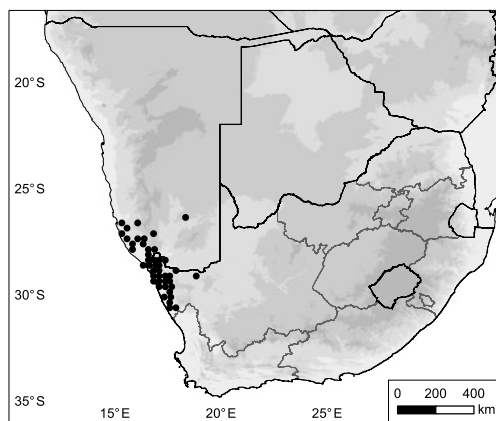


Figure 18.—Distribution of *Calobota halenbergensis*.

Bay (–AB), *Powrie* LWP1163 (WIND); Klinghardt Mountains, dark rock mountain east of a patch of shifting dunes in the valley ca. 5 km northeast of Sargdeckel, on the road south to Oranjemund from Lüderitz in the Diamond Area 1 (–BC), *Bean & Oliver* 2445 (BOL, NBG, PRE); Klinghardt Mountains (–BC), *Dinter* 3987 (BOL); *Müller* 830 (PRE, WIND); Namitas, south of Klinghardt basin (–BD), *Mannheimer* CM2107 (WIND); 20 km east of Kakaoberg Escarpment (–DB), *Jürgens* 28153 (PRE); Boegoeberg (–DD), *Dinter* 6552 (BM). **2716** (Witputz): Klinghardt Mountains, koppie southwest face (–AC), *Mannheimer* CM1455 (WIND); Diamond area 1, Polly Mountain (–AD), *Wendt* 20/2 (WIND); Udabib Mountain (–BB), *Müller* 810 (K, PRE, WIND); sandy flats at the base of Rooiberg sandstone mountain (–CB), *Bean & Oliver* 2386 (NBG, PRE); Diamond Area 1, Aurusberg (–CB), *Burke* 96225 (WIND); *Oliver* 10112 (WIND); Sperrgebiet, central Aurus Valley (–CB), *Jürgens* 28205 (PRE); Aurus at new camp (–CB), *Mannheimer* CM2418 (WIND); Farm Spitzkop (–DC), *Giess* 14639 (WIND); *Wiss* 2059 (WIND 3 sheets); Zebrafontein (–DD), *Merxmüller & Giess* 3310, 28861 (K, PRE, WIND); *Müller & Horn* 1615 (WIND); Rosh Pinah, west of airfield (–DD), *Zietsman* 1831 (WIND). **2816** (Oranjemund) 15 km west of Rosh Pinah on road to

Obib (–BA), *Giess 13820* (K, WIND); Diamond Area 1, Valley between Obib Mountain Peak and Obib dunes (–BA), *Van Wyk 9034* (PRE, WIND); 40 km from Brandkaros (–BC), *Petersen s.n.* (NBG).

SOUTH AFRICA. 2816 (Oranjemund): between Brandkaros and Grootderm (–BC), *Venter 8199* (PRE); Numees (–BD), *Jürgens 22149* (PRE); *McDonald 739* (NBG, PRE); Annisvlakte (–BD), *Jürgens 22322* (PRE); Oranjemund (–CB), *Merxmüller & Giess 2266* (BM, K, PRE, WIND); 70 km north of Oranjemund (–CB), *Williamson 4900* (WIND); 38 mls [61.14 km] north of Port Nolloth, on way to Alexander Bay (–DA), *Werger 519* (K); Goariep-Passage (–DB), *Jürgens 22485* (PRE); Goariepvlakte (–DB), *Jürgens 23119* (PRE); near Doringbank, between Lekkersing and Kuboes (–DB), *Van Wyk 2836* (JRAU, 4 sheets); Holgat River (–DB), *Wisura 2499* (NBG); Sukkel (–DD), *Jürgens 22739* (PRE); between Port Nolloth and Holgat (–DD), *Pillans 5191* (K). **2817** (Vioolsdrif): bed of Kubus River (–AC), *Hardy & Venter 4757* (PRE, WIND); northwest slope of Noemiesberg down to Grasvlakte (–AD), *Smook 7937* (PRE); in flats between Blackhills and Wildepaardenrant (–CA), *Thompson & Le Roux 288* (K, NBG); Eksteensfontein (–CA), *Venter 8053* (PRE); 5 mls [8.05 km] west of Stinkfontein (–CC), *Leistner 3400* (K, WIND); Lekkersing (–CC), *Thorne s.n.* (NBG); 7 mls [11.26 km] beyond Stinkfontein on way to Kuboes, near Skouerfontein (–CC), *Werger 431* (K, PRE, WIND); Blomhoek, 5 km from Eksteensfontein on road to Kubus (–DD), *Germishuizen 4723* (PRE). **2916** (Port Nolloth): 16 km north of Port Nolloth on road to Alexander Bay (–BB), *Germishuizen 5315* (BOL, PRE); 38 mls [61.14 km] east by south of Port Nolloth (–BD), *Acocks 14236* (K, PRE 2 sheets); Port Nolloth (–BD), *Bolus 427* (BM, BOL, K, NBG, PRE, UPS); 2 mls [3.22 km] east of Port Nolloth (–BD), *Marloth 12661* (NBG, PRE); between Port Nolloth road and Stinkfontein (–BD), *Middlemost 2129* (NBG 2 sheets, S); 25 mls [40.23 km] after Anenous Pass (–BD), *Schlechter sub STE 10890* (NBG 2 sheets, K, PRE). **2917** (Springbok): 37.5 km from Port Nolloth on road to Steinkopf (–AA), *Clarke 640* (K, PRE); Anenous Flats along road to Eksteensfontein (–AB), *Goldblatt & Manning 9284* (NBG); on road to Port Nolloth from Steinkopf (–AC), *Boatwright et al. 149, 190* (JRAU); Anenous Pass (–BA), *Germishuizen 4838* (PRE);

Goldblatt 6002 (K, PRE, S); *Van Wyk 3086* (JRAU 5 sheets); *Van Wyk 6189* (PRE); 10 mls [16.09 km] northwest of Steinkopf (–BC), *Salter 5549* (BM, BOL, K, PRE); 5 mls [8.05 km] south of Komaggas (–CA), *Compton 22794* (NBG); Sandkop gate at Kleinsee (–CA), *Le Roux 5183* (NBG); Komaggas (–CA), *Maguire 400* (NBG 4 sheets); Grootmis, at Springbok turnoff on Port Nolloth–Kleinsee road (–CA), *Rösch & Le Roux 560* (PRE); just northeast of Grootmis (–CA), *Strid & Strid 37734* (NBG); between Spektakel and Kleinsee (–CB), *Grobbeelaar 1962* (PRE); Farm Langhoogte on Port Nolloth turn-off from Springbok–Kleinsee road just north of waterpipe (–CB), *Le Roux 3959* (NBG); Spektakel (–DA), *Compton 11508* (NBG, PRE); *Esterhuysen s.n. sub PRE 53706* (PRE); bottom of Wildepaardehoek Pass (–DC), *Van Jaarsveld 1392* (PRE). **2918** (Gamoep): Karuchab [Arragaab], Richtersveld (–BB), *Herre s.n. sub STE 11887* (NBG); Karuchabpoort, Lekkersing (–BB), *Oliver, Tölken & Venter 145* (PRE). **3017** (Hondekliptbaai): Farm Koningnaas 475 on road from Hondekliptbaai to Koningnaas (–AB), *Le Roux & Lloyd 353* (NBG); ca. 6 km north of Koningnaas on Springbok road (–AB), *Van Wyk 2848* (JRAU, 2 sheets); 3 km southwest of Soebatsfontein on road to Wallekraal (–BA), *Le Roux 2899* (NBG); Farm Doornfontein 464, Portion 1, Steenkamp Kraal (–BA), *Le Roux 4557, 4630* (NBG); on road from Garies to Hondekliptbaai (–BC), *Boatwright et al. 146* (JRAU); Wallekraal, between Garies and Hondekliptbaai (–BC), *Compton 5485* (BOL, NBG); Wallekraal (–BC), *Pillans 17970* (BOL); 5 km from Wallekraal to Garies (–BC), *Stirton 6053* (K); Horees, ca. 30 mls southwest of Kamieskroon (–BC), *Van Breda 4085* (PRE); Farm Sandkraal, 40 km west of Garies (–DA), *Hilton-Taylor 1371* (NBG, PRE); 12.9 km from Garies–Hondekliptbaai road on road to Soutfontein, Farm Sandkraal (–DA), *Steiner 2172* (NBG, PRE); in red sand near Garies (–DB), *Esterhuysen s.n.* (K, NBG 2 sheets, PRE). **Precise locality unknown:** between Port Nolloth and Augrabies Poort, *Bolus 6457* (K); Doornpoort, *Compton 20633* (NBG 3 sheets); Kalkfontein, near river, *Marloth 12273* (NBG 4 sheets, PRE); kloof by Doornpoort, Richtersveld, *Herre s.n. sub STE 11865, 11866* (NBG); Noagas, *Drège s.n. 'III, B'* (BM, K, P); sandveld, Richtersveld, *Herre s.n. sub STE 11868* (NBG 2 sheets, PRE); without locality, *Drège s.n. sub PRE 9367* (PRE).

8. ***Calobota linearifolia*** (E.Mey.) Boatwr. & B.-E.van Wyk, S. African J. Bot. 75: 553. 2009. Basionym: *Lebeckia linearifolia* E.Mey., Comm. Pl. Afr. Austral. [Meyer] 1: 33. Feb. 1836. TYPE: SOUTH AFRICA, Northern Cape Province, on the Gariep, near Verleptpraam [2817 AA], 300 ped., *Drège s.n.* 'III, B' (lectotype, designated here, P!; isolectotypes, K!, P!, S!, Z photo!).

Lebeckia dinteri Harms, Repert. Spec. Nov. Regni Veg. 16: 360. 1920. TYPE: NAMIBIA, Garub [2616 CA], *Dinter 1057* (lectotype, designated here, NBG!).

Erect or virgate, multi-stemmed, unarmed shrub up to 3 m in height. *Branches* green; young branches sericeous or silky; older branches sericeous or silky with light brown bark. *Leaves* simple, persistent; petiole absent; leaflets linear to oblanceolate or spatulate, sericeous, sessile, leaflets 11–45 × 1.0–2.5 mm; apex acute; base cuneate. *Inflorescence* 38–170 mm long, with 5 to 9 flowers; pedicel 1–2(–8) mm long; bract 1.5–2.5 mm long, linear to narrowly ovate, pubescent; bracteoles 1.0–1.5 mm long, linear to narrowly ovate, pubescent. *Flowers* 13–17 mm long, bright yellow. *Calyx* 5.5–7.5 mm long, sericeous; tube 4–6 mm long; lobes 1.0–2.5 mm long, deltoid. *Standard* 11.5–15.0 mm long; claw linear, 2.5–3.5 mm long; lamina ovate, 8.5–12.0 × 8.5–10.5 mm, dorsal surface pubescent; apex acute. *Wings* 8.0–11.5 mm long, claw 3.0–4.5 mm long, lamina oblong, shorter than keel, 5–7 × 2.5–4.0 mm, pilose, with 4–8 rows of sculpturing. *Keel* 12–15 mm long, claw 3.5–6.0 mm long, lamina boat-shaped, 7.5–10.0 × 4.0–5.5 mm, pubescent. *Pistil* subsessile to shortly stipitate, pubescent; ovary linear, 9–11 × 0.8–1.5 mm with 12 to 18 ovules; style shorter than ovary, 4.8–7.8 mm long. *Pods* linear, sometimes

somewhat clavate, terete, sericeous, subsessile to shortly stipitate, 25–40 × 2–3 mm, ±4- to 8-seeded, dehiscent; endocarp hairy. *Seeds* oblong-reniform, 2.5–3.5 × 1.5–2.5 mm, mature seeds light brown or grey, surface smooth (Figure 19). *Flowering time*: mainly between September and November, but flowering and fruiting specimens have been collected in January, April, May and August.

Distribution and habitat

Calobota linearifolia is widely distributed in the Northern Cape Province of South Africa and southern Namibia, with outlier populations around the Unjab River, Sima Hill and the Sanitatas area in northwestern Namibia (Figure 20). Polhill (2003) mentioned that this species also occurs in Botswana in the Kgalagadi district, but no specimens from this region were found in the herbarium collections studied. *Calobota linearifolia* occurs in dune sand, red sand or brackish soil often along rivers or in dry watercourses, washes and gulleys. It occurs at altitudes of between ca. 300 and 1 350 m. It is suspected of poisoning livestock (according to specimen label information).

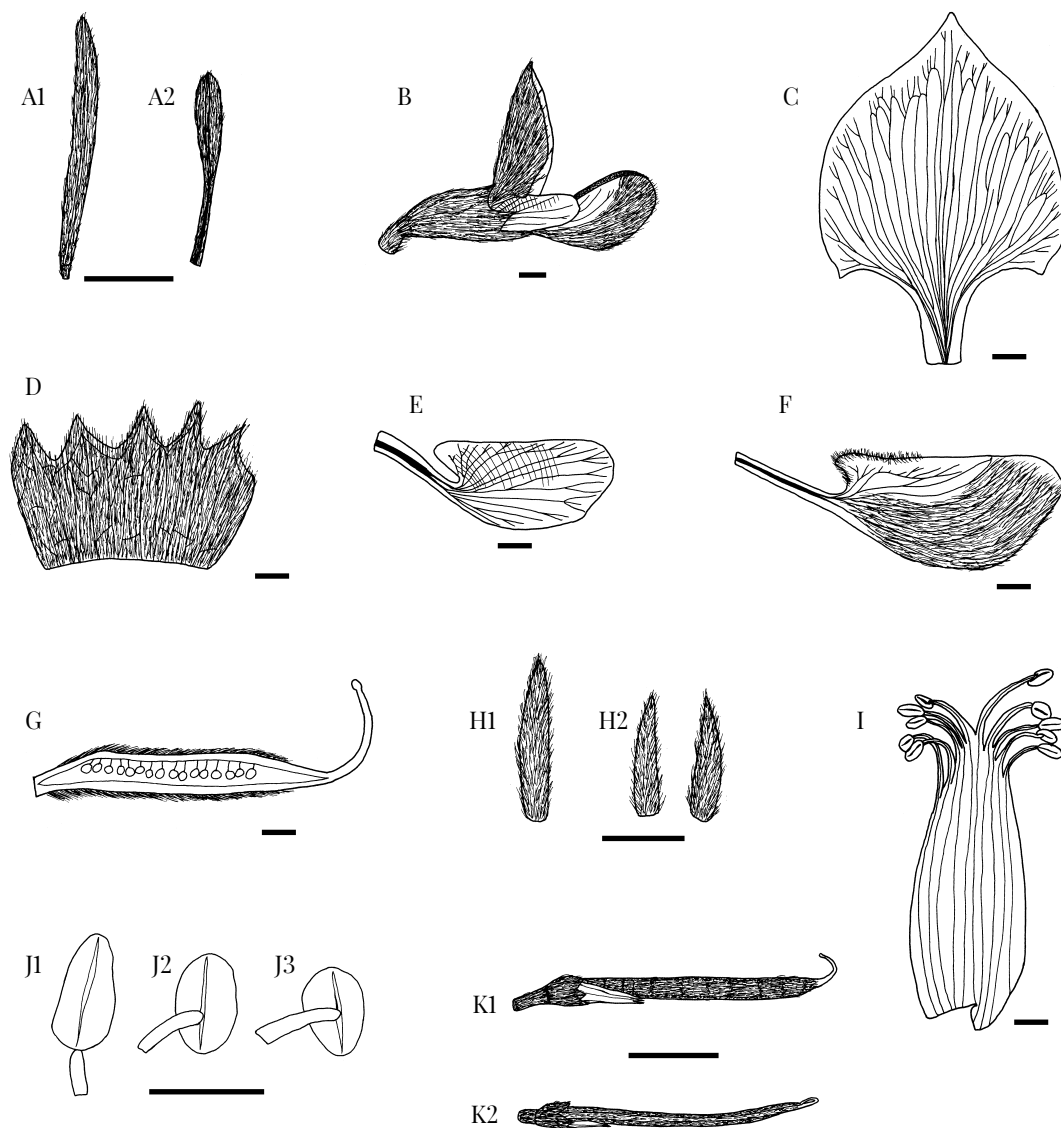


Figure 19.—Morphology of *Calobota linearifolia*. A1, A2, leaves in abaxial view; B, flower in lateral view; C, standard petal; D, outer surface of the calyx (upper lobes to the left); E, wing petal; F, keel petal; G, pistil; H1, bract; H2, bracteoles; I, androecium; J1, long, basifixed anther; J2, intermediate carinal anther; J3, short, dorsifixed anther; K1, pod in lateral view; K2, pod in dorsal view. A1, B: *Acocks 13195*, PRE; A2: *Giess & Van Vuuren 821*, BOL; C: *Giess 13803*, WIND; D–G, J: *Dean 673*, JRAU; H, I: *Evrard 9285*, PRE; K: *Keet 1668*, WIND. Scale bars: A & K, 10 mm; B–J, 1 mm.

IUCN Red List category

Considered of Least Concern (LC) by Raimondo et al. (2009).

Discussion

Calobota linearifolia is similar to *C. cinerea*, but differs in its virgate to erect habit, simple, linear leaves, fewer flowered inflorescences, sericeous pods that are constricted between the seeds and the light brown to grey seeds. *Calobota cinerea* has a low, spreading habit, obovate, elliptic or oblanceolate and trifoliolate leaves and the inflorescences more densely flowered. The latter species also has tomentose pods that are not constricted between the seeds and the seeds are light brown to orange and often mottled.

The P specimen of *Drège s.n.* 'III, B' bears the type locality and was annotated by Meyer himself and is therefore chosen as lectotype of *Calobota linearifolia*. No other specimens except the one in NBG could be traced of the collection *Dinter 1057* (it is not present in either B or Z). Both *Dinter 1056* and *Dinter 1058* were found in Z, but it is likely that all specimens of *Dinter 1057*, except the NBG specimen chosen as lectotype, have been destroyed.

Additional specimens examined

NAMIBIA. **1812** (Sanitatas): 20 mls [32.18 km] south of Orupembe (–CD), *Giess & Leippert 7435* (WIND). **1913** (Sesfontein): 2 km north of Sima Hill, Kaokoland (–AA), *Braine 68* (WIND); near Sima Hill, northeast of Möwe Bay (–AA), *Moss & Jacobsen K316* (PRE, WIND); between Hoamib and Unjab Rivers

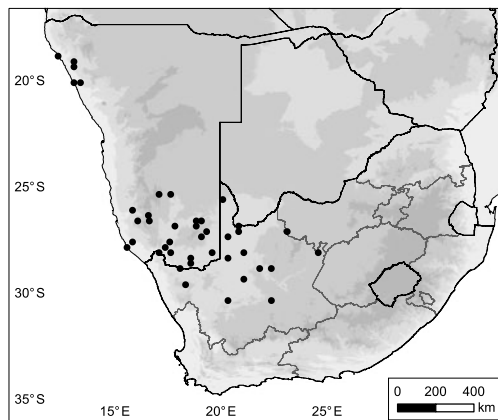


Figure 20.—Distribution of *Calobota linearifolia*.

(–AC), *Tinley 1625* (WIND). **2013** (Unjab Mouth): 8 mls [12.87 km] east of Torrabay (–AA), *Giess et al. 6180* (PRE, WIND); Unjab River (–AB), *Kers 1875* (S). **2517** (Gibeon): Orion, Varsfontein (–AC), *Giess et al. 7190* (K); between Achterfontein and Gelwater (–BC), *Pearson 9233* (K). **2520** (Mata Mata): Kalahari Gemsbok National Park (–CA), *Schlieben 10433* (PRE). **2615** (Luderitz): Farm Gawachab KEE 114 (–BB), *De Winter & Giess 6424* (BOL, K, WIND). **2616** (Aus): between Neisip and Eureka (–BC), *Merxmüller & Giess 2986* (WIND); 13 mls [20.92 km] west of Aus (–CA), *Giess & Van Vuuren 821* (BOL, K, WIND); Kuibis (–DA), *Bayliss BRL.B.365* (K, PRE 2 sheets). **2617** (Bethanie): Felshang, near Seeheim (–DD), *Merxmüller & Giess 3615* (PRE, WIND); Seeheim (–DD), *Dinter 1205* (NBG). **2618** (Keetmanshoop): 7 mls [11.26 km] south by east of Naute Station (–DB), *Acocks 15659* (K, PRE); Sandmodder 73 (–DD), *Lensing A87/75* (WIND). **2619** (Aroab): east of Groot Karas Mountains (–CA), *Mannheimer et al. CM771* (WIND). **2715** (Bogenfels): Sperrgebiet South, 38 km east of Kakaoberg escarpment (–DB), *Jürgens 28176* (PRE); Chameis Valley (–DC), *Williamson 2647* (BOL). **2717** (Chamaïtes): Mara, Letterklip area in Konkiep River bed (–CD), *Craven 2634* (WIND); bed of Vis River, near Seeheim (–DA), *Keet*

1663 (WIND, 2 sheets). **2719** (Tränental): Warmfontein 280 (–AB), *Lensing J14/76* (WIND); *Müller 87* (WIND); Farm Blaufontein WAR 276 (–AC), *Giess et al. 7131* (WIND).

SOUTH AFRICA. **2620** (Twee Rivieren): Ashkam (–DD), *Evrard 9285* (PRE). **2720** (Noenieput): 20 mls [32.18 km] north of Noenieput on way to Kalahari Gemsbok Park (–AD), *Werger 1489* (NBG, PRE); Askam area, 120 km from Van Zylsrus (–BB), *Dlamini et al. EvW568* (K). **2723** (Kuruman): 10 mls [16.09 km] southwest of confluence of the Kuruman and Molopo Rivers (–AA), *Leistner 2255* (K). **2817** (Vioolsdrif): 5 km west of Nuob River (–AA), *Giess 13803* (K, PRE, WIND); Garip (–AA), *Wyley s.n.* (S); Richtersveld (–BA), *Venter 8069* (PRE). **2818** (Warmbad): a little south of Dabegabis (–BC), *Pearson 4390* (BM 2 sheets, K); near Dabegabis (–BC), *Pearson 4896* (K); mountains between Wolftoon and Henkriesfontein (–CC), *Pearson 3105* (BM 2 sheets, BOL, K 2

sheets); Farm Aluriesfontein 308 (–DA), *Owen-Smith 1252* (WIND). **2819** (Ariamsvlei): Nababis, Guigatsis (–BA), *Evrard 9220* (PRE). **2820** (Kakamas): below Riemvastmaak, Upington (–AD), *Barnard s.n.* (NBG). **2821** (Upington): Swartpan, northwest of Upington (–AA), *Snijman 214* (NBG); 24 mls [38.62 km] southeast of Groblershoop (–DD), *Leistner & Joynt 2861* (K, PRE). **2822** (Glen Lyon): 9 mls [14.48 km] west south-west of Volop (–CD), *Leistner 1742* (K). **2824** (Kimberley): Gordonias (–BA), *Webb 16* (K, PRE). **2918** (Gamoep): Karasberg (–CB), *Van Schauroff s.n.* (K). **2921** (Kenhardt): 40 mls [64.36 km] north northeast of Kenhardt (–AC), *Acocks 18803* (K). **3020** (Brandvlei): sand dunes along Sak River near Brandvlei (–AD), *Acocks 13195* (BOL, K, PRE). **3022** (Carnarvon): Van Wyksvlei, Beesdam (–AD), *Dean 673* (JRAU 2 sheets). **Precise locality unknown:** without locality, *Bolus 1935* (BOL), *Flanagan s.n. sub PRE 53667* (PRE), *Range 1935* (BOL, NBG).

9. ***Calobota lotononoides*** (Schltr.) Boatwr. & B.-E. van Wyk, S. African J. Bot. 75: 553. 2009. Basionym: *Lebeckia lotononoides* Schltr., Bot. Jahrb. Syst. 27: 143. 1900, as '*L. lotonoides*'; Germishuizen & Meyer, Plants of Southern Africa: an annotated checklist, Strelitzia 14: 523. 2003, p.p., Boatwr. & B.-E. van Wyk, in S. African J. Bot. 73 (4): 664–666. 2007, as '*L. lotononoides*', non Goldblatt & Manning. 2000. TYPE: SOUTH AFRICA, 'In regione namaquensi: In sabulosis montium Karree-Bergen, alt. C. 4500 ped.' [3118 AB], *Schlechter* 8214 (lectotype, designated here, K!; isoelectotypes, BM!, BOL!, MO, photo!, PRE!, S!, Z, photo!).

Small, decumbent, multi-stemmed, unarmed shrublet up to 0.5 m in height. *Branches* green; young branches sericeous, older branches pilose to glabrous with light brown bark, often buried. *Leaves* digitately trifoliate or rarely 5-digitate with two additional leaflets, persistent; petiole 10–23 mm long, longer than leaflets; leaflets elliptic to narrowly oblanceolate, secund, alternate, sericeous, conduplicate, subsessile, terminal leaflet 10–17 × 1.5–3.0 mm, lateral leaflets 8–14 × 1.5–3.0 mm, mucronate, base narrowly cuneate. *Inflorescence* (15–)24–54 mm long, with (3–)4 to 14 flowers; pedicel 1–3 mm long; bract 0.7–1.5 mm long, linear, pubescent; bracteoles 0.3–0.6 mm long, linear, pubescent. *Flowers* 12–15 mm long, yellow. *Calyx* 5.0–6.5 mm long, pubescent; tube 3.0–3.5 mm long; lobes 2–3 mm long, subulate. *Standard* 13–16 mm long; claw linear, 4–7 mm long; lamina widely ovate to transversely oblong, 8–9 × 9.0–12.5 mm, pilose along dorsal midrib; emarginate. *Wings* 14–15 mm long; claw 3.0–4.5 mm long; lamina narrowly oblong, subfalcate, twice as long as the keel, 11.5–15.0 × 2–4 mm, glabrous, with 7–8 rows of sculpturing. *Keel* 9–11 mm long; claw 3–4 mm long; lamina boat-shaped,

5.5–7.0 × 3.0–4.5 mm, glabrous. *Pistil* subsessile to shortly stipitate, pubescent, ovary linear, 6.5–7.5 × 0.7–0.9 mm with 15 to 19 ovules; style shorter than ovary, 3.0–3.5 mm long. *Pods* narrowly oblong, sometimes somewhat clavate, sericeous, terete, subsessile to shortly stipitate, 18–37(–40) × 3–4 mm, 7- to 12-seeded, dehiscent; endocarp hairy. *Seeds* suborbicular, 2.0–2.5 × 1.5–2.0 mm, mature seeds brown with beige spots, hilum brown, surface rugose (Figure 21). *Flowering time*: July to October, late winter to late spring.

Distribution and habitat

Calobota lotononoides occurs on the West Coast of South Africa around Hondeklipbaai and Brand-se-baai (Figure 22). The type collection was made by Schlechter at Karree-Bergen, close to Nuwerus in the Vanrhynsdorp district according to Leistner and Morris (1976). The species occurs on well-drained, sandy soils with the main stems becoming covered with sand (Boatwright & Van Wyk 2007). The multi-stemmed, decumbent habit appears to be an adaptation to moving sand dunes, as extensive underground branches enable the plant to emerge above the sand after being covered.

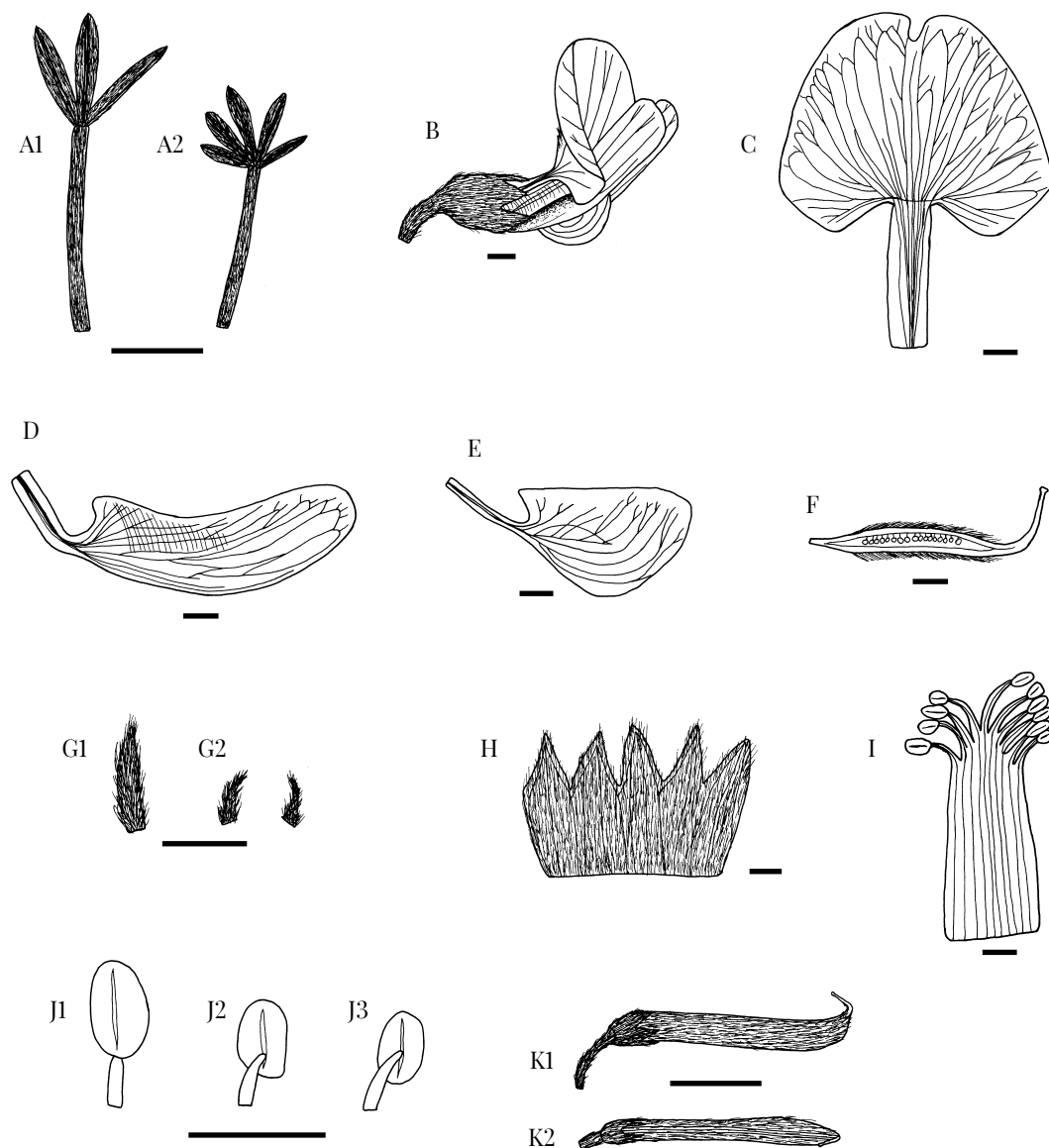


Figure 21.—Morphology of *Calobota lotononoides*. A1, A2, leaves in abaxial view; B, flower in lateral view; C, standard petal; D, wing petal; E, keel petal; F, pistil; G1, bract; G2, bracteoles; H, outer surface of the calyx (upper lobes to the left); I, androecium; J1, long, basifixed anther; J2, intermediate carinal anther; J3, short, dorsifixed anther; K1, pod in lateral view; K2, pod in dorsal view. A–K: *Boatwright et al.* 142, JRAU. Scale bars: A & K, 10 mm; B–J, 1 mm.

IUCN Red List category

According to Raimondo et al. (2009) the status of this species is Near Threatened (NT B1ab(iii)). Although only a 5% habitat loss has been observed due to heavy mineral sand mining, the loss is still ongoing and could later become problematic.

Discussion

Calobota lotononoides superficially resembles *C. angustifolia*, notably the broad-leaved form on the West Coast and around Clanwilliam. In this form the leaflets are broad and sericeous, much like those of *C. lotononoides*. However, *C. lotononoides* differs in its smaller, decumbent habit with buried stems and especially in the exceptionally long lamina of the wing petals, which is $\pm$ twice as long as those of the glabrous keel petals. The inflorescences are unarmed, and the sericeous pods contain spotted, rugose seeds. *Calobota angustifolia* can reach heights of up to 2 m and the wing petals are only slightly longer than the pilose keel petals.

A large number of Schlechter's African collections are housed at K (Stafleu & Cowan 1985) and we therefore select the K specimen as lectotype of *Calobota lotononoides*.

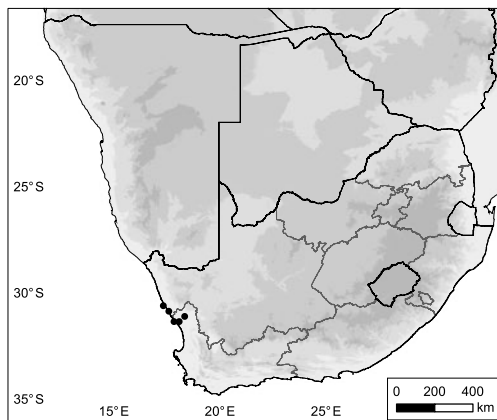


Figure 22.—Distribution of *C. lotononoides*.

Additional specimens examined

SOUTH AFRICA. **3017** (Hondeklipbaai): from Sandkraal, north of Bitter River, 25 km west of Garies (–CB), *Helme et al.* 4720 (NBG); Farm Rootheuwel, 9 km west of Nariëp (–DC), *Boatwright et al.* 142 (JRAU); *Perold* 1646 (PRE). **3117** (Lepelfontein): Vredendal, southeast of Brand-se-baai, on Farm Hartebeestekom (–BD), *Helme* 2931 (NBG); Vanrhynsdorp/Vredendal, Brand-se-baai (–BD), *Van Rooyen* 2235 (PRE). **3118** (Vanrhynsdorp): Karree-Bergen (–AB), *Schlechter s.n. sub TRV* 1059 (PRE); from Skaapvlei, some 10 km northeast of Olifants River mouth (–AC), *Helme* 4684 (NBG).

10. **Calobota namibensis** Boatwr. & B.-E.van Wyk, sp. nov. TYPE: NAMIBIA, 25 mls [40.23 km] east of Lüderitz on road to Aus [2615 CA], *De Winter & Hardy 7919* (holotype, WIND!, specimen on the right; isotypes, K!, PRE!).

Lebeckia dinteri auct. non Harms, Repert. Spec. Nov. Regni Veg. 16: 360. 1920.: A.Schreib., FSWA 60: 67. 1970.

Virgate, multi-stemmed shrubs up to 1.2 m tall. *Branches* green; young branches sericeous; older branches sericeous or glabrous with light brown bark. *Leaves* simple, deciduous; petiole absent; elliptic to ovate, upper and lower surfaces sericeous, alternate, 6–12 × 1–2 mm; apex acute; base cuneate. *Inflorescences* 70–110 mm long, with 3 to 8 flowers; pedicel 1–2 mm long; bract 2.5–3.5 mm long, linear, sericeous; bracteoles 1.5–3.0 mm long, linear, sericeous. *Flowers* 10–11 mm long, bright yellow. *Calyx* 6–8 mm long, densely pubescent on the outer surface; tube 3–4 mm long; lobes 3.0–4.5 mm long, subulate. *Standard* 9.5–12.0 mm long; claw linear, 2–3 mm long; lamina ovate, 7.5–9.0 × 5–6 mm, densely pubescent on dorsal surface; apex acute. *Wings* 8.0–8.5 mm long; claw 2–3 mm long; lamina oblong, shorter than the keel, 5.5–6.5 × 2.5–3.0 mm, with 6–8 rows sculpturing, glabrous. *Keel* 8.0–11.5 mm long; claw 2.5–3.5 mm long; lamina boat-shaped, 5.5–8.0 × 3.5–4.5 mm, pubescent. *Pistil* shortly stipitate, pubescent; ovary linear, 4–5 × 0.9–1.0 mm with about 5 ovules; style longer than the ovary, 5.0–9.5 mm long. *Pods* linear, terete, 15–17 × 2 mm, 3- to 4-seeded, tomentose, ?dehiscent, endocarp glabrous. *Seeds* not seen (Figure 23). *Flowering time*:

flowering specimens have been collected in March, August and October.

Distribution and habitat

Calobota namibensis is endemic to Namibia and occurs in the Lüderitz and Aus areas (Figure 24). It grows on dunes in red sand or gravelly sandy soil along roadside up to 1 800 m above sea-level.

IUCN Red List category

The status of this species has been assessed as Vulnerable (VU D2) by Golding (2002; included as *Lebeckia dinteri*) and as Least Concern (LC) recently by Loots (2005; included as *Lebeckia dinteri*).

Discussion

Calobota namibensis is a very poorly known and collected species. It is similar to *C. linearifolia* and *C. saharae*, but differs in the elliptic to ovate leaves, densely pubescent petals and the short, tomentose pods. In both *C. linearifolia* and *C. saharae* the leaves are linear. The petals are also pubescent in *C. linearifolia* while in *C. saharae* only the standard petal is pilose. The pods of *C. linearifolia* are sericeous, while

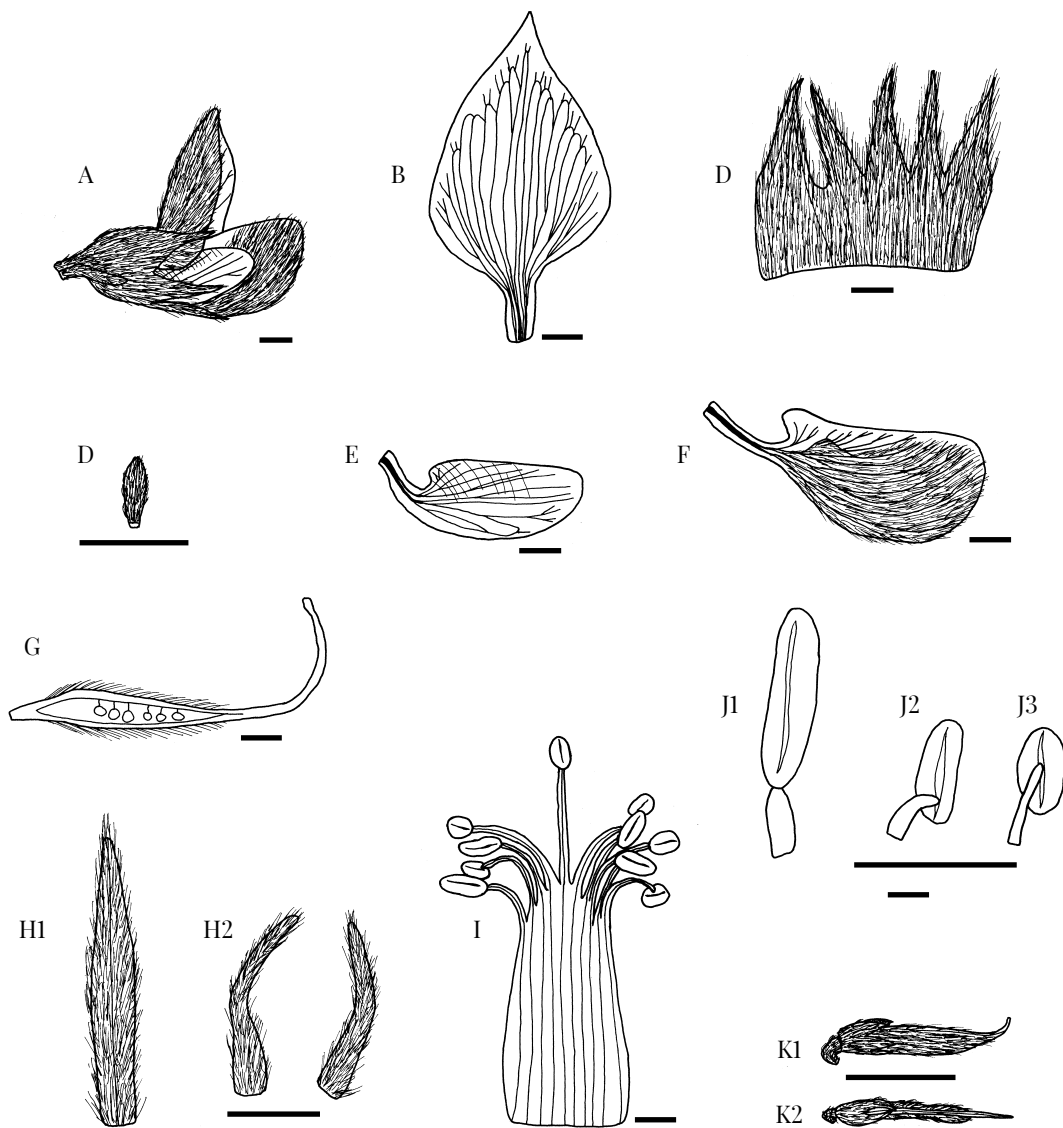


Figure 23.—Morphology of *Calobota namibensis*. A, flower in lateral view; B, standard petal; C, outer surface of the calyx (upper lobes to the left); D, leaf in abaxial view; E, wing petal; F, keel petal; G, pistil; H1, bract; H2, bracteoles; I, androecium; J1, long, basifixed anther; J2, intermediate carinal anther; J3, short, dorsifixed anther; K1, pod in lateral view; K2, pod in dorsal view. A–C, E, F, H, J: *Owen-Smith 1268*, WIND; D: *Kolberg & Maggs 212*, WIND; G, I: *Owen-Smith 117*, WIND; K: *De Winter & Hardy 7919*, WIND. Scale bars: A & K, 10 mm; B–J, 1 mm.

those of *C. saharae* are glabrous and in both species they are longer than those of *C. namibensis*.

Harms (1920) described *Lebeckia dinteri* from a specimen that is actually *Calobota linearifolia*. Subsequent authors, however, referred to the species here described as new as *Lebeckia dinteri*. The species is quite distinct from *Calobota linearifolia*, but is here formally described for the first time.

Additional specimens examined

NAMIBIA. **2615** (Lüderitz): dunes south of Koichab pump station (–AD), *Seely 2005* (WIND); Koichab State Land (–BC), *Owen-Smith 117, 1268* (WIND); Halenberg (–CB), *Merxmüller & Giess 3088* (WIND); Rotkop, Lüderitz (–CB), *Dinter 1032* (NBG); *Merxmüller & Giess 3141* (WIND). **2616** (Aus): 13 mls [20.92 km] west of Aus (–CB), *Giess & Van*

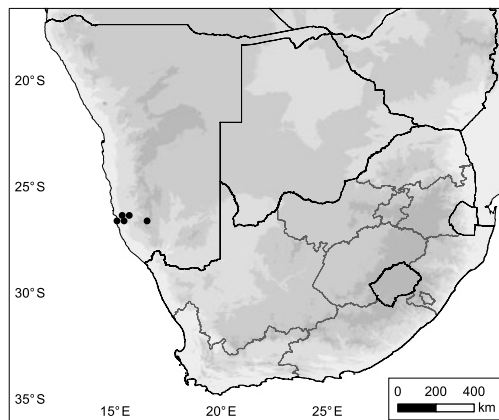


Figure 24.—Distribution of *Calobota namibensis*.

Vuuren 821 (PRE, WIND); koppie southwest of Rotkop Station, next to power-line track (–CB), *Kolberg & Maggs 212* (PRE, WIND).

- 11. *Calobota obovata*** (Schinz) Boatwr. & B.-E.van Wyk, S. African J. Bot. 75: 553. 2009. Basionym: *Lebeckia obovata* Schinz, Mem. Herb. Boissier 1: 126. 1900. TYPE: NAMIBIA, Gansberg [grid unknown], *Fleck* 75 (lectotype, Z-000022914, photo!, specimen on the left, designated here; isoelectotype, Z-000022915, photo!).

Sericeous, multi-stemmed shrub up to 1.5 m in height. *Branches* green; young branches velvety, older branches velvety or glabrous with light brown bark. *Leaves* unifoliate or rarely trifoliate, persistent; petiole shorter than leaflets, 5–24 mm long; leaflets widely obovate to orbicular, rarely ovate, alternate, velvety, subsessile, 12–36 × 10–25 mm, apex obtuse or rarely acute, base cuneate. *Inflorescence* 24–85 mm long, with 7 to 16 flowers; pedicel 4–5 mm long; bract 3–5 mm long, ovate, pubescent; bracteoles 3–5 mm long, ovate to linear, pubescent. *Flowers* 13–16 mm long, bright yellow. *Calyx* 8.0–8.5 mm long, densely pubescent; tube 4.5–5.5 mm long; lobes 3–4 mm long, subulate. *Standard* 14.5–15.5 mm long, claw linear, 3.5–4.5 mm long, lamina widely ovate, 10.0–11.5 × 12.5–14.5 mm, dorsal surface pubescent; apex obtuse. *Wings* 14.5–15.5 mm long, claw 3.0–3.5 mm long, lamina oblong, shorter than keel, 11–12 × 5.5–6.0 mm, pilose, with 4–5 rows of sculpturing. *Keel* 14.5–16.5 mm long, claw 4–5 mm long, lamina boat-shaped, 10.0–11.5 × 5.5–6.5 mm, pubescent. *Pistil* subsessile to shortly stipitate, pubescent, ovary linear, 11.5–12.5 × 1.5–2.0 mm with ±15 ovules; style shorter than ovary, 6–7 mm long. *Pods* linear, terete, subsessile to shortly stipitate, 30–40 × 4–5 mm, 5- to 7-seeded, velvety, dehiscent; endocarp hairy. *Seeds* not seen (Figure 25). *Flowering time*: flowering

specimens have been collected in May, June, July, November and December suggesting that flowering occurs in spring and summer.

Distribution and habitat

Calobota obovata is endemic to Namibia and occurs from Windhoek southwards as far as Aus (Figure 26). It grows on rocky outcrops or granite at altitudes of ca. 1 600 to 2 230 m.

IUCN Red List category

The status of this species has been assessed as Data Deficient (DD) by Golding (2002) and Loots (2005).

Discussion

The species is superficially similar to *Calobota elongata*, but differs in the unifoliate leaves, few-flowered racemose inflorescences, pedicellate flowers, obovate bracts and bracteoles, widely ovate standard petal, pubescent wing petals that are shorter than the keel petals and the linear, sericeous pods (*C. elongata* differs in the trifoliate leaves, dense, spicate inflorescences with much smaller, sessile flowers, long, narrow bracts and bracteoles, ovate to elliptic standard petal with a pilose midrib, wing petals that are longer than keel and shorter, tomentose pods with less seeds). The

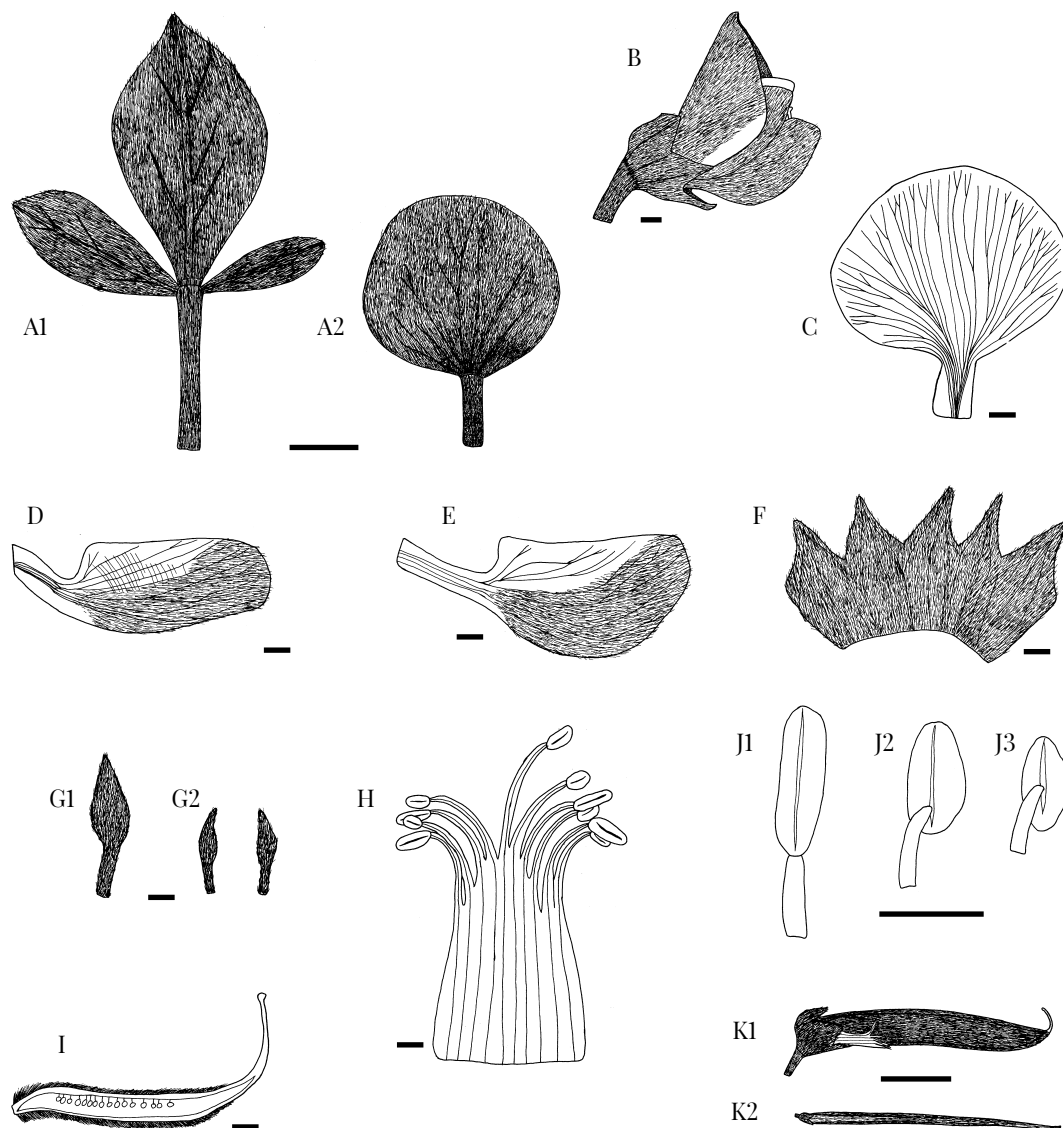


Figure 25.—Morphology of *Calobota obovata*. A1, A2, leaves in abaxial view; B, flower in lateral view; C, standard petal; D, wing petal; E, keel petal; F, outer surface of the calyx (upper lobes to the left); G1, bract; G2, bracteoles; H, androecium; I, pistil; J1, long, basifixed anther; J2, intermediate carinal anther; J3, short, dorsifixed anther; K1, pod in lateral view; K2, pod in dorsal view. A1: *Schweidfezer 4315*, WIND; A2, K: *Dinter 1094*, NBG; B, F, I: *Pearson 8036*, BOL; C–E, G, H, J: *Kers 152*, WIND. Scale bars: A & K, 10 mm; B–J, 1 mm.

growth forms of the two species are also very different. *Calobota obovata* is an erect, much-branched, shrub, while *C. elongata* has a virgate habit, with slender, mostly unbranched flowering stems arising from a woody base at ground level.

According to Stafleu and Cowan (1985), Hans Schinz's main collection is in Z and we therefore designate one of the Z specimens as lectotype.

Additional specimens examined

NAMIBIA. **2217** (Windhoek): Farm Regenstein (–CA), *Giess & Giess 11765* (NBG, PRE, S, WIND); *Merxmüller & Giess 28010* (WIND); Ruschberg (–CA), *Rusch 4379* (S). **2316** (Nauchas): Road to Hakos, just off the C26 to Walvis Bay, Gamsberg (–AC), *Boatwright et al. 241* (NBG, WIND); Gamsberg (–AD), *Kers 152* (WIND); *Kers 154* (S); *Merxmüller & Giess 957* (BM, K, PRE, WIND); *Kolberg & Tholkes NAM2960-HK1418* (K); *Meyer 1016* (WIND); *Schweidfezer 4315* (WIND); Farm Hopefield (–AD), *Merxmüller & Giess 893* (WIND); Farm Weipenfels (–AD), *Walter & Walter 1686* (WIND).

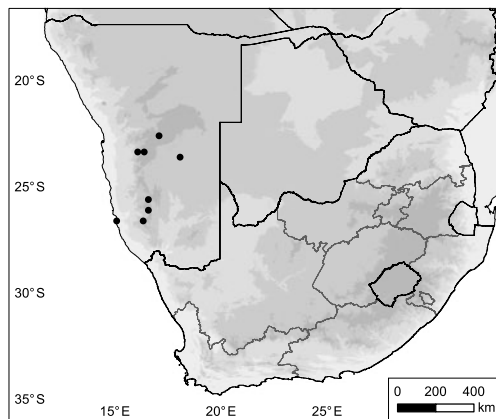


Figure 26.—Distribution of *Calobota obovata*.

2318 (Leonardville): Farm Rietfontein (–CA), *Leipert 4537* (WIND). **2516** (Helmeringhausen): Farm Aruab 23 on top edge of Great Escarpment (–DA), *Miller Mil1/036* (WIND). **2615** (Lüderitz): Lüderitz (–CA), *Rogers 2959* (K). **2616** (Aus): Urus Plateau, Lüderitz (–BA), *Logan & Seely 301* (WIND); Aus (–CB), *Dinter 1094* (NBG); Aus, rocks east of railway station (–CB), *Pearson 8036* (BM, BOL 2 sheets, K, NBG, PRE).

- 12. *Calobota psiloloba*** (E.Mey.) Boatwr. & B.-E. van Wyk, S. African J. Bot. 75: 554. 2009. Basionym: *Stiza psiloloba* E.Mey. Comm. Pl. Afr. Austral. [Meyer] 1: 32. Feb. 1836. *Lebeckia psiloloba* (E.Mey.) Walp., Linnaea 13: 478. 1839. TYPE: SOUTH AFRICA, s. loc., Drège 6470 (lectotype, designated here, P!; isolectotype, K!, S!).

Acanthobotrya pungens sensu Eckl. & Zeyh., Enum. 2: 193. Jan 1836 [non *Lebeckia pungens* Thunb., Nov. Gen. Pl. [Thunberg]: 141. 1800]. TYPE: SOUTH AFRICA, 'Zwartkops- et Zondagsrivier', Ecklon & Zeyher 1340 (lectotype, designated here, NBG!; isolectotypes, P!, K!, S!).

Erect, multi-stemmed, spinescent shrub up to 1.2 m tall. *Branches* green; young branches glabrous to very sparsely pubescent, older branches glabrous with brown bark. *Leaves* unifoliate or rarely trifoliate, deciduous; petiole short, 0.5–1.0 mm long (up to 5 mm long when trifoliate); leaflets slightly obovate to spatulate, alternate, upper and lower surfaces thinly pilose, 5–7(–11) × 1.5–3.0(–4.0) mm; base attenuate; apex obtuse. *Inflorescences* 40–50(–65) mm long, with 8 to 10(–12) flowers; pedicel relatively long, (3–)4–5(–6) mm long; bract 0.3–0.4(–0.6) mm long, triangular; bracteoles 0.1–0.3 mm long, linear to slightly ovate. *Flowers* 8–11 mm long; bright yellow. *Calyx* 2.2–2.6 mm long, slightly pubescent on the outer surface; tube 1.5–2.0 mm long; lobes widely triangular, 0.5–0.8 mm long; apices broadly acute. *Standard* 7–9 mm long; claw 2.5–3.0(–4.0) mm long; lamina oblong to slightly ovate, 4–5(–6) × 3.0–4.5 mm, glabrous; apex emarginate. *Wings* 7.0–8.5 mm long; claw 2.5–3.0(–3.5) mm long; lamina oblong, shorter than the keel, 4.0–4.5(–5.0) × 2–3 mm, with 4–5 rows sculpturing, glabrous. *Keel* 8.5–11.0 mm long; claw 3.5–4.0(–4.5) mm long; lamina boat-shaped, 5–6(–7) × 3–4 mm,

glabrous. *Pistil* stipitate, glabrous; ovary linear to elliptic, 5.5–7.5 × 0.8–1.1 mm; ovules 6 to 8; style shorter than ovary, 3.5–5.0 mm long. Pods oblong, laterally compressed, membranous, 14–17(–33) × 4–5 mm, glabrous; stipe up to 4 mm long, 2- to 6-seeded, indehiscent; endocarp glabrous. *Seeds* reniform, 2.5–3.0 × 2.0–2.5 mm, light brown, surface smooth (Figure 27). *Flowering time*: the main flowering time is between March and June, but flowering also sometimes occurs in spring and summer (October to January).

Distribution and habitat

Calobota psiloloba is restricted to the Eastern Cape Province and occurs mainly around Port Elizabeth, Grahamstown and Addo, but has outlier populations around Cradock and Middelburg at altitudes between 30 and 520 m (Figure 28). It is normally found in open grasslands on sandy soils and is eaten by elephants (according to specimen label information).

IUCN Red List category

Considered to be of Least Concern (LC) by Raimondo et al. (2009).

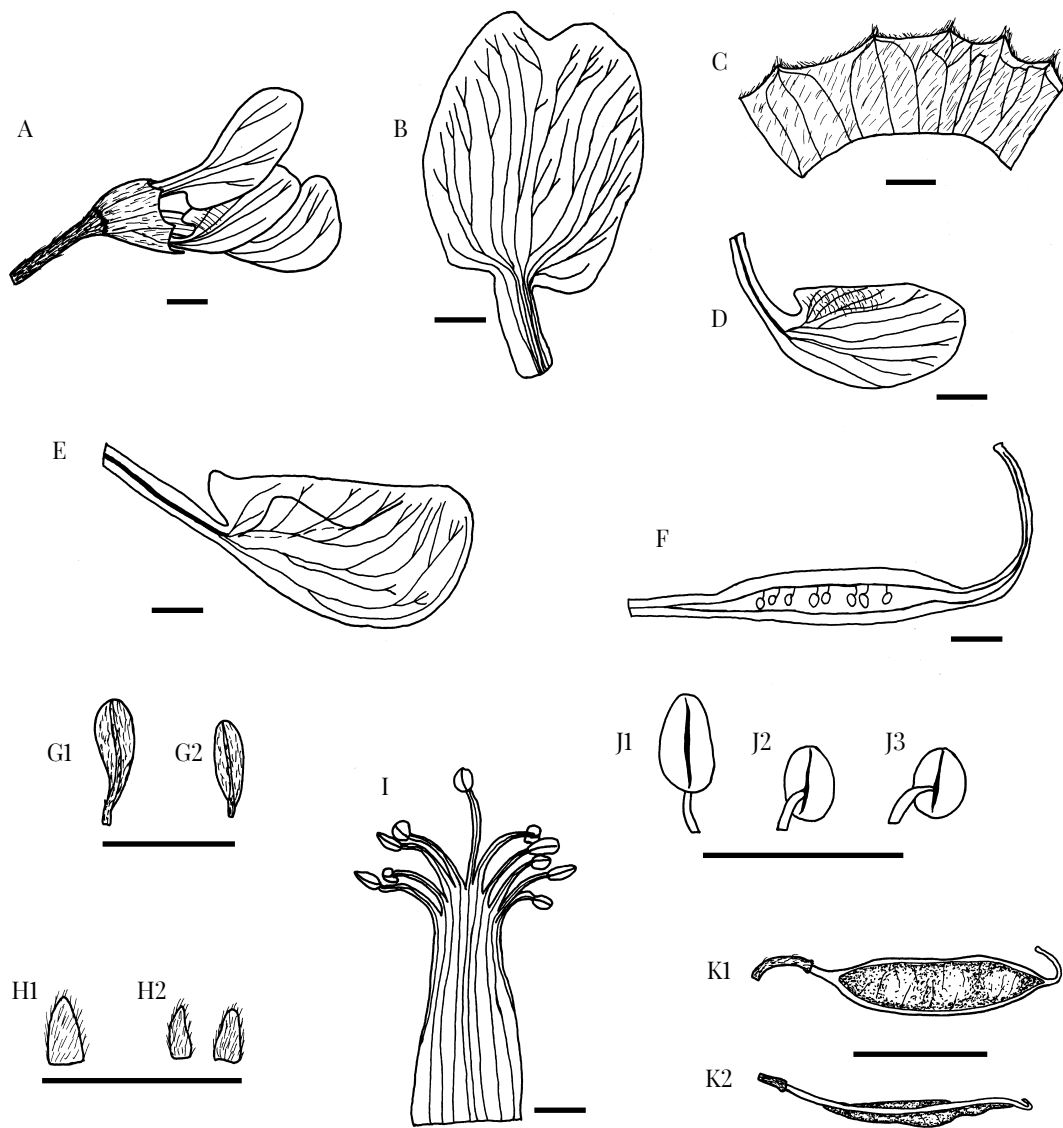


Figure 27.—Morphology of *Calobota psiloloba*. A, flower in lateral view; B, standard petal; C, outer surface of the calyx (upper lobes to the left); D, wing petal; E, keel petal; F, pistil; G1, G2, leaves in abaxial view; H1, bract; H2, bracteoles; I, androecium; J1, long, basifixed anther; J2, intermediate carinal anther; J3, short, dorsifixed anther; K1, pod in lateral view; K2, pod in dorsal view. A: *Story 3353*, PRE; B–F, G1, H–J: *Van Wyk s.n.*, JRAU; G2: *Zeyher 2317*, NBG; K: *Le Roux et al. 20*, JRAU. Scale bars: G & K, 10 mm; A–F, I, J, 1 mm.

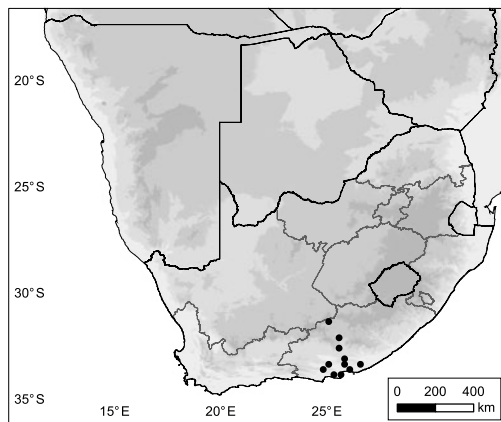


Figure 28.—Distribution of *Calobota psiloloba*.

Discussion

Calobota psiloloba is similar to *C. cuspidosa*, but differs in that this species only reaches heights of up to 1.2 m and has small flowers that are borne on long (3–6 mm long), thin pedicels (*C. cuspidosa* reaches heights of up to 4 m and has much larger flowers on relatively short pedicels). The older stems are almost completely glabrous and the standard petal notched, while in *C. cuspidosa* the older stems are pubescent and the standard petal is obtuse. The pods and seeds are also smaller than those of *C. cuspidosa*.

The specimen of Drège 6470 at P bears a label with the words '*Stiza psiloloba mihi*' in Meyer's handwriting, and is therefore chosen as lectotype of *C. psiloloba*. The relatively thin, glabrous twigs and small, leathery pods (in an envelope on the specimen) are characteristic

of this species. The specimen of Ecklon & Zeyher 1340 in NBG displays the type locality as the Enumeratio label and is therefore chosen as lectotype of *Acanthobotrya pungens*.

Additional specimens examined

SOUTH AFRICA. 3125 (Steynsburg): Grootfontein, Middelburg district (–AC), Burt-Davy 9665 (PRE). **3225** (Somerset East): Cradock (–BA), Botany Honours Students 320 (PRE, PRU); Somerset East, farm Ka-boega (–DA), Bayliss 6897 (K, S). **3324** (Steytlerville): on plains near Zondags River (–DB), Bowie s.n. (BM). **3325** (Port Elizabeth): in the valleys of the Zuurberg Mountains at Paarde Poort (–AC), Bolus 2667 (BOL, K); Wilson 422 (BM); Perdepoot (–AC), Theron 685 (PRE); Bassons Kloof, Annes Villa (–BB), Bayliss 3923 (NBG); Addo Elephant Park (–BD), Archibald 3848 (GRA, K, PRE); Brynard 445 (K, PRE); Repton 5715 (PRE); 15th mile [24.1 km] on the road from Port Elizabeth to Addo (–BD), Long 612 (GRA, K); along road from Grahamstown to Paterson (–BD), Van Wyk s.n. (JRAU); Uitenhage (–CD), Alexander-Prior s.n. (BM, K 3 sheets); Cradock Place, Port Elizabeth (–DC), Galpin 6430 (GRA, PRE); district Uitenhage, Zwartkops River (–DC), Ecklon & Zeyher 737 (BM, BOL 2 sheets, K 2 sheets, NBG, PRE 4 sheets); Ecklon & Zeyher 1340 (K, NBG, P 3 sheets, PRE, S); New Brighton near Port Elizabeth (–DC), Ethel West 395 (BOL); Coega (–DC), Long 945 (GRA, K); Redhouse, near cemetery (–DC), Troughton 425 (PRE 2 sheets); Redhouse (–DC), Boatwright et al. 107 (JRAU); Le Roux et al. 20 (JRAU); Wells 3697 (PRE); Zwartkops River (–DC), Zeyher 2317 (PRE 2 sheets, NBG, S). **3326** (Grahamstown): Table farm near Grahamstown (–BC), Atherstone 24, 50 (K); Grahamstown (–BC), MacOwen 1102 (K); Bushman's River bridge, main road from Grahamstown to Port Elizabeth (–CA), Archibald 3958 (PRE); Story 3353 (K, PRE). **Precise locality unknown:** without locality, Barber s.n. (K); Bowie s.n. (K); Zeyher 3317 (PRE).

- 13. *Calobota pungens*** (Thunb.) Boatwr. & B.-E. van Wyk, S. African J. Bot. 75: 554. 2009. Basionym: *Lebeckia pungens* Thunb., Nov. Gen. Pl. [Thunberg]: 141. 1800. TYPE: SOUTH AFRICA, Western Cape Province, near Olifant's River [close to Oudtshoorn] at Cannaland [now Little Karoo], *Thunberg s.n. sub THUNB-UPS 16417* (lectotype, designated here, UPS!).

Stiza erioloba E. Mey., Comm. Pl. Afr. Austral. [Meyer] 1: 31. Feb. 1836. TYPE: SOUTH AFRICA, Western Cape Province, near Klaarstroom [close to Prince Albert, 3322BC], near the foot of the 'Groote Zwartebergen' [Great Swartberg], *Drège s.n.* (lectotype, designated here, P!, specimen on the right; isolectotypes, K!, P!, S!).

Erect, multi-stemmed woody spinescent shrub up to 2.5 m tall. *Branches* green; young branches densely sericeous; older branches sericeous with brown bark. *Leaves* unifoliate or rarely trifoliate, deciduous; petiole short, 0.5–2.0 mm long (up to 5 mm long when leaves are trifoliate); leaflets obovate to broadly obovate, upper and lower surfaces sericeous, alternate, 3–13(–18) × 2–5(–8) mm; base attenuate; apex retuse. *Inflorescences* (22–)25–40(–55) mm long, with (4–)6–10 flowers; pedicel 2–4 mm long; bract 0.6–1.1 mm long, triangular; bracteoles 0.4–0.6 mm long, narrowly ovate. *Flowers* 10–13(–14) mm long, bright yellow. *Calyx* 2.5–3.7 mm long, pubescent on the outer surface; lobes triangular, 0.4–1.0 mm long; tube 2–3 mm long, apices acute. *Standard* 9.5–12.0 mm long; claw 3–4 mm long; lamina widely ovate, 6–7(–8) × 4–6(–9) mm, pilose along the dorsal midrib; apex broadly acute. *Wings* 7–12 mm long; claw (2.0–)3.5–5.0 mm long; lamina oblong, shorter than the keel, 4–6(–7) × 2–3(–4) mm with 4–5 rows of sculpturing, pilose. *Keel* 10–14 mm long; claw 4.0–5.5 mm long; lamina oblong, 6.0–8.5 × (3.0–)4.0–5.5 mm, pilose.

Pistil subsessile to shortly stipitate, pubescent; ovary linear, 6.0–8.5 × 0.8–1.0 mm; ovules 6 to 9; style shorter than ovary, 4.0–5.5 mm long. *Pods* oblong to slightly falcate, laterally compressed, membranous, 11–21(–28) × (2.5–)3.0–4.0(–6.0) mm, densely tomentose; stipe very short (less than 1 mm long), ±4- to 6-seeded, indehiscent; endocarp glabrous. *Seeds* reniform, 2.0–2.5 × 1.5–2.0 mm, surface smooth (Figure 29). *Flowering time*: flowering occurs from spring to summer (September to December).

Distribution and habitat

Calobota pungens occurs from Laingsburg through Ladysmith and Oudtshoorn to Bavianskloof and Willowmore in the east at altitudes of between 790 and 1 100 m (Figure 30). It is typically a fynbos species and occurs on rocky, loamy or quartzitic soils.

IUCN Red List category

Considered to be of Least Concern (LC) by Raimondo et al. (2009).

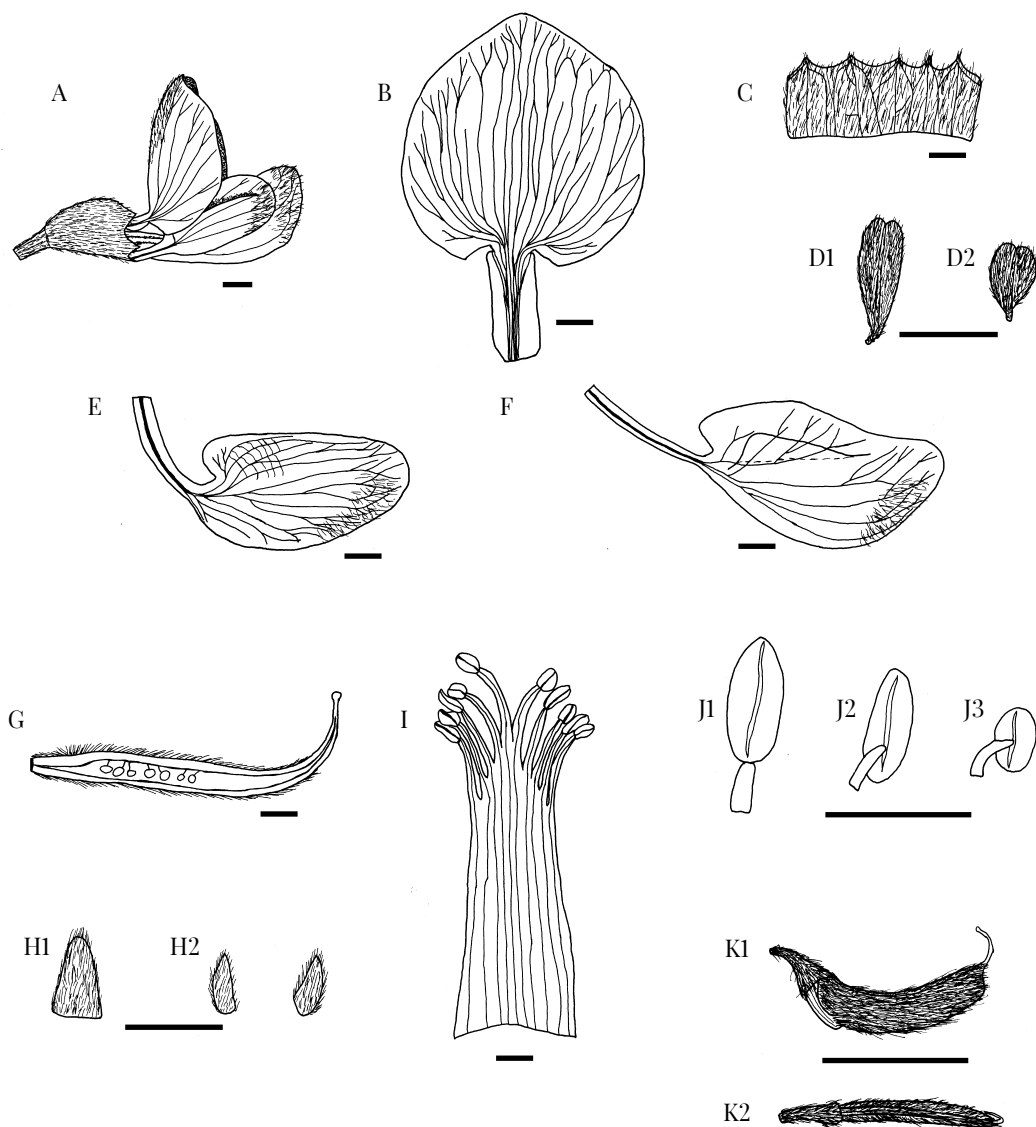


Figure 29.—Morphology of *Calobota pungens*. A, flower in lateral view; B, standard petal; C, outer surface of the calyx (upper lobes to the left); D1, D2, leaves in abaxial view; E, wing petal; F, keel petal; G, pistil; H1, bract; H2, bracteole; I, androecium; J1, long, basifixed anther; J2, intermediate carinal anther; J3, short, dorsifixed anther; K1, pod in lateral view; K2, pod in dorsal view. A, B, D1, E–G, H2, I, K: *Boatwright et al.* 106, JRAU; C: *Taylor* 9386, NBG; D2: *Barker* 9948, NBG; H1: *Acocks* 15547, PRE; J: *Van Wyk* 3252, JRAU. Scale bars: D & K, 10 mm; A–C, E–J, 1 mm.

Discussion

Calobota pungens is similar to *C. cuspidosa* and *C. psiloloba*, but differs from both in the sericeous stems, sericeous obovate leaves, pilose petals, pubescent ovary and tomentose pods (in *C. cuspidosa* the stems are pubescent and the leaves linear to slightly obovate, while in *C. psiloloba* the stems are glabrous or slightly pilose and the leaves slightly obovate to spatulate. In both these species the ovary and pods are glabrous).

The specimen *Thunberg s.n. sub* THUNB-UPS 16417 is chosen as lectotype of *C. pungens* as it is the only specimen in Thunberg's Herbarium and the type locality is written on the back of the sheets in Thunberg's handwriting. The Drège specimen of *Stiza erioloba* in P is chosen as lectotype because it displays the type locality as well as the characteristic tomentose pods from which Meyer denominated this species.

Additional specimens examined

SOUTH AFRICA. **3320** (Montagu): Cabidu (–AB), *Bond* 12112 (BOL, NBG); Matjiesfontein (–BA), *Compton* 2714, 3315 (BOL, K); *Compton* 22233 (NBG 2 sheets); *Foley* 58 (PRE); *Marloth* 10764 (NBG 2 sheets, PRE); top of Koppie near Matjiesfontein (–BA), *Thoday & Delf* (NBG); Rooikloof (–BD), *Van Wyk* 2147 (JRAU). **3321** (Ladysmith): Farm Withoek (–AC), *Van Wyk* 2154 (JRAU); road from Seweweeks Poort (–AD), *Levy* 2334 (BOL); Touwsberg, farm Rietfontein (–CA), *Germishuizen* 6956 (PRE); Touwsberg, farm Wolwefontein (–CA), *Van Wyk et al.* 3447 (JRAU, PRE). **3322** (Oudtshoorn): 14 mls [22.5 km] east of Prince Albert (–AA), *Sidey* 1906 (PRE, S); Swartberg Pass (–AC), *Bond* 1537 (NBG,

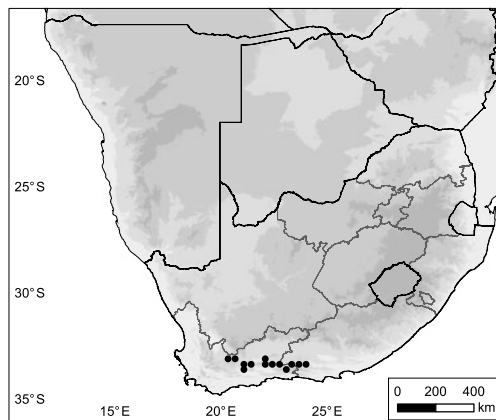


Figure 30.—Distribution of *Calobota pungens*.

PRE); *Markotter* 9951 (NBG); Congo Valley close to Oudtshoorn (–AC), *Dreyer* 18618 (NBG); northern foothills of Swartberg above farm Rietfontein (–AC), *Vlok* 1152 (K, PRE); Venterskloof near Klaarstroom (–AD), *Taylor* 9386 (K, NBG); 20 mls [32.2 km] west of Klaarstroom (–AD), *Acocks* 15547 (K, PRE); on road between Prins Albert and Klaarstroom (–AD), *Van Wyk EvW0151* (K); Meiringspoort (–BC), *Boatwright et al.* 106 (JRAU); *Levy* 6619 (BOL); *Stokoe* 61389 (NBG); outside Meiringspoort, past Klaarstroom turn-off along roadsides (–BC), *Boatwright et al.* 111 (JRAU); foot of Swartberg Mountains, near Klaarstroom (–BC), *Drège s.n.* (S, K); Klaarstroom, Prince Albert (–BC), *Barker* 9948 (NBG 2 sheets). **3323** (Willowmore): Hot Springs (–AC), *Fourcade* 5841 (NBG); *Fourcade* 6086 (BOL, NBG); flats between Hot Springs and Toorwater (–AC), *Thompson* 1398 (PRE); lower slopes of Zuurberg at Georgida (–AD), *Fourcade* 4410 (BOL, K); 7 mls [11.26 km] south-west of Willowmore (–AD), *Horn s.n.* (PRE); 6–8 mls [9.6–12.8 km] south-east of Willowmore on Baviaanskloof road (–AD), *Wells* 2606 (PRE); 7 mls [11.2 km] on Baviaanspoort road from Willowmore (–AD), *Wells* 2838 (GRA, PRE); 18 ml [28.8 km] from Uniondale on Willowmore road (–AD), *Wells* 3699 A & B (GRA, PRE); along road from Willowmore

to Baviaanskloof near Uniondale turnoff (–BC), *Snijman* 353 (NBG, PRE); Kammanassie hill sides 7 mls [11.3 km] from Uniondale (–CA), *Fourcade* 3594 (BOL 2 sheets, K); Vet Vlei, 8 mls [12.8 km] from

Uniondale (–CA), *Fourcade* 6255 (BOL); Pietse-laagte on road to Uniondale (–CA), *Van Wyk* 3180 (JRAU); dirt road between De Rust and Uniondale (–CA), *Van Wyk* 3252 (JRAU).

- 14. *Calobota saharae*** (Coss. & Durieu) Boatwr. & B.-E. van Wyk, S. African J. Bot. 75: 554. 2009. *Genista saharae* Coss. & Durieu in Coss. Bull. Soc. Bot. France 2: 247. 1855. *Spartidium saharae* (Coss. & Durieu) Pomel, Nouv. Mat. Fl. Atl.: 173. 1874. TYPE: ALGERIA, D'Oran Province, *Cosson s.n.* (type P-COS, not seen).

Erect or virgate, multi-stemmed, unarmed shrub up to 2 m in height. *Branches* green; young branches densely pilose or glabrous; older branches pilose or glabrous with light brown bark. *Leaves* simple, deciduous; petiole absent; linear, alternate, pilose on both surfaces, sessile, 6–10 × 1–2 mm, apex acute, base cuneate. *Inflorescence* 75–150 mm long, with 5 to 12 flowers; pedicel 1–2 mm long; bract 1.5–2.0 mm long, linear, pubescent; bracteoles 0.5–1.0 mm long, linear, pubescent. *Flowers* 13–17 mm long, yellow. *Calyx* 4.5–7.0 mm long, pilose; tube 3–4 mm long; lobes 1.5–3.0 mm long, subulate. *Standard* 13–15 mm long, claw linear, 3.5–4.0 mm long, lamina ovate, 9.5–11.0 × 7.5–8.0 mm, dorsal surface pubescent; apex obtuse. *Wings* 11.5–14.0 mm long, claw 4.0–4.5 mm long, lamina oblong, longer than keel, 7–9 × 3–4 mm, glabrous, with 4 rows of sculpturing. *Keel* 12.5–13.0 mm long, claw 4–5 mm long, lamina boat-shaped, 8.0–8.5 × 4.5–5.0 mm, glabrous. *Pistil* subsessile to shortly stipitate, glabrous; ovary linear, 9.0–11.5 × 1.0–1.3 mm with 7 to 8 ovules; style shorter than ovary, 4.5–5.5 mm long. *Pods* oblong-linear, laterally compressed, membranous, subsessile to shortly stipitate, 30–40 × 6–10 mm, 4- to 6-seeded, indehiscent; endocarp glabrous. *Seeds* reniform to oblong-reniform, 2.5–3.0 × 1.5–2.0 mm, mature seeds light brown, surface smooth (Figure 31). *Flowering time*: flowering occurs from March to May.

Distribution and habitat

Calobota saharae is endemic to North Africa and occurs in Morocco, Algeria, Libya and Tunisia. It is found on desert hills or dunes at altitudes of ca. 200 m (Figure 32). The disjunct distribution is remarkable, but a careful consideration of morphological and molecular evidence leaves no doubt that the species is best accommodated within the genus *Calobota* (see Boatwright et al. 2009).

IUCN Red List category

Unknown.

Discussion

Calobota saharae is similar to *Calobota cuspidosa* and *C. psiloloba* in the laterally compressed, membranous pods, but differs in the unarmed habit, linear leaves and pubescent standard petal (in *C. cuspidosa* and *C. psiloloba* the branches are strongly spinescent, the leaves slightly obovate to elliptic or spathulate and the petals pubescent). *Calobota saharae* is also similar to *C. namibensis*, but differs in the linear leaves, the glabrous keel petals and the membranous pods (in *C. namibensis* the leaves are elliptic to ovate, the keel petals densely pubescent and the pods thick-walled and tomentose).

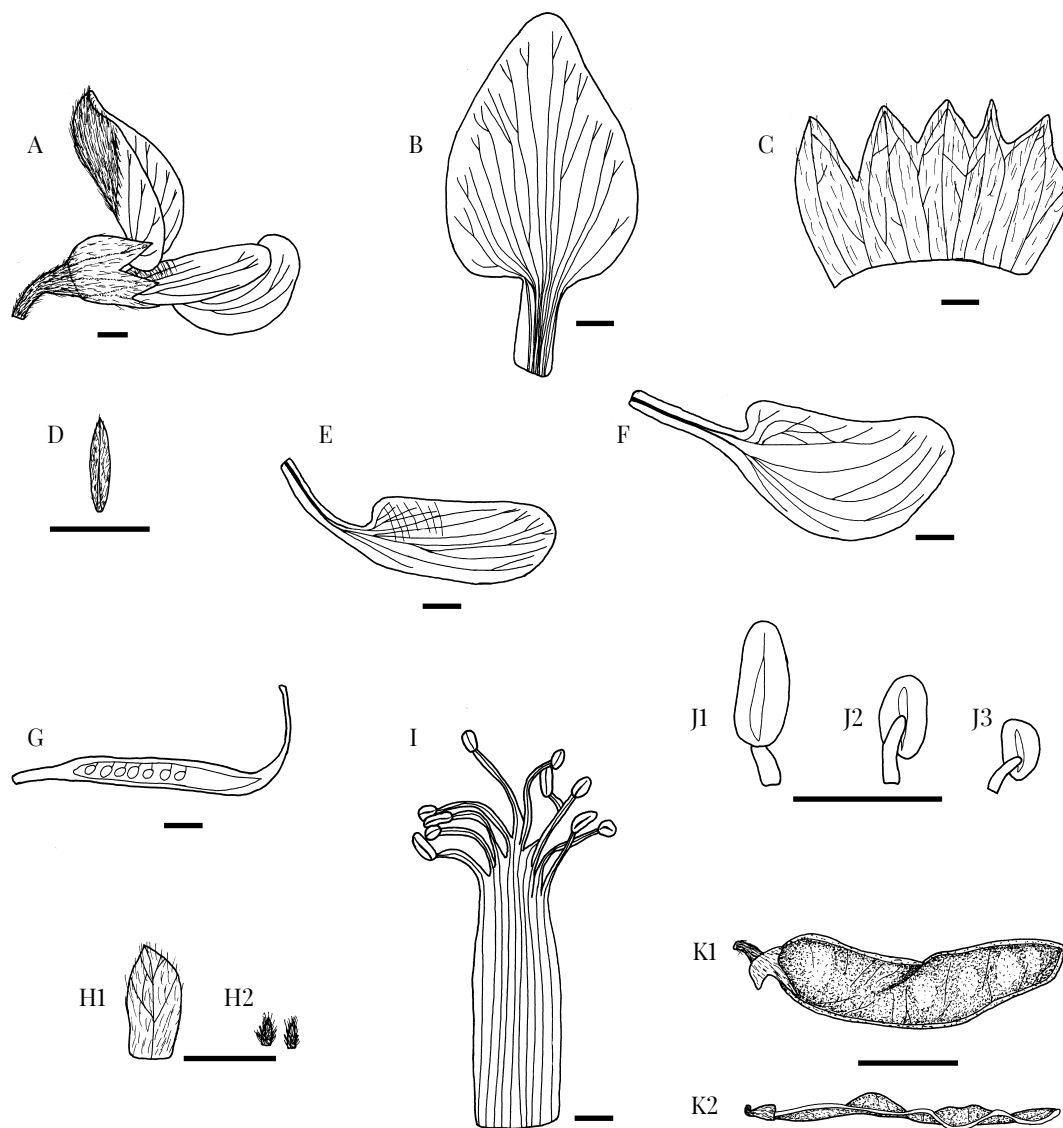


Figure 31.—Morphology of *Calobota saharac*. A, flower in lateral view; B, standard petal; C, outer surface of the calyx (upper lobes to the left); D, leaf in abaxial view; E, wing petal; F, keel petal; G, pistil; H1, bract; H2, bracteoles; I, androecium; J1, long, basifixed anther; J2, intermediate carinal anther; J3, short, dorsifixed anther; K1, pod in lateral view; K2, pod in dorsal view. A, E, G: *Kcith 181*, K; B, C, F, H–J: *Hill s.n.*, K; D: *Pitard 3276*, K; K: *Alleizette s.n. sub K 2007/014804*, K. Scale bars: D & K, 10 mm; A–C, E–J, 1 mm.

There are several Cosson specimens from various localities in the D'Oran Province in the K collection but it is unclear to us which of these are types.

Additional specimens examined

NORTH AFRICA. **Algeria:** Aïn Sefra, *Alleizette s.n. sub K 2007/014804* (K); *Cosson s.n. sub K 000227004* (K); *Hill s.n.* (K); *Bourgeau 210* (K 2 sheets); *Le Cesve 5429* (BM); *Rothschild & Hartert s.n.* (BM); *Samuelsson 6994* (K); Constantine Province, Oued Souf, *Cosson s.n. sub K 000227008* (BM, K); Djebel Milogh, *Cosson s.n. sub K 000227003* (K); Oran Province, Aïn Sefifsifa, *Cosson s.n. sub K 000227005* (K); Oran Province, Abiod-Sisi-Cheihk, *Cosson s.n. sub K 000227006* (K); Wadi Rummel, above Sidi Benour, *Guichard KG/Lib/289* (K); El Ardja, *Pitard 3275* (K); Oued el Khezoua/El Oued, *Pitard 3276* (K). **Tunisia:** Nefta, *Cosson s.n. sub K 000227007* (K). **Libya:** Aïn Zara, near Pripoli, *Brown s.n.* (K); Jebel Nefoussa, Azizia-Rhnm, *Davis 49544* (K); Jebel, north of Jefren, *Keith 181* (K).



Figure 32.—Approximate distribution of *Calobota saharae*.

- 15. *Calobota sericea*** (Thunb.) Boatwr. & B.-E. van Wyk, S. African J. Bot. 75: 554. 2009. Basionym: *Lebeckia sericea* Thunb., Nov. Gen. Pl. [Thunberg]: 143. 1800. TYPE: SOUTH AFRICA, 'e Cap. b. Spei' [grid unknown], *Thunberg s.n. sub THUNB-UPS 16423* (lectotype, designated here, UPS!).

Lebeckia flexuosa E. Mey., Comm. Pl. Afr. Austral. [Meyer] 1: 34. Feb. 1836; Walpers in Linnaea 13: 478. 1839. TYPE: SOUTH AFRICA, 'In rupestribus prope Kwekri-vier' [grid unknown], altit. 700 ped., *Drège s.n. 'III, C'* (lectotype, designated here, P!; isoelectotypes, K!, P!).

Lebeckia decipiens E. Mey., Comm. Pl. Afr. Austral. [Meyer] 1: 35. Feb. 1836. TYPE: SOUTH AFRICA, Karroo prope Mierenkasteel [grid unknown], *Drège s.n. 'III, C'* (lectotype, designated here, P!; isoelectotypes, BM!, K!, NBG!, P!, PRE!, S!).

Sericeous, multi-stemmed unarmed shrub up to 2 m in height. *Branches* green; young branches sericeous; older branches sericeous or glabrous with brown bark. *Leaves* digitately trifoliate; persistent; petiole longer or shorter than leaflets, 13–55 mm long; leaflets elliptic to narrowly oblanceolate, alternate, sericeous, subsessile, terminal leaflet (15–)17–50 × (1–)2–8 mm, lateral leaflets 10–45 × (1–)2–5 mm, apex acute, base angustate. *Inflorescence* 70–220 mm long, with 10 to 28 flowers; pedicel 2–4 mm long; bract 2–7 mm long, linear, pubescent; bracteoles 1–5 mm long, linear, pubescent. *Flowers* 13–24 mm long, pale or bright yellow. *Calyx* 6.0–9.5 mm long, sericeous; tube 4.0–6.5 mm long; lobes 1–4 mm long, subulate. *Standard* (11.5–)13.0–19.0 mm long; claw linear, 3–5 mm long; lamina widely ovate, 8.0–14.5 × 9.5–17.0 mm, pilose along dorsal midrib; apex obtuse. *Wings* 12.0–17.5 mm long; claw 3.0–5.5 mm long; lamina oblong, as long as or shorter than keel, 8–12 × 4.0–6.5 mm, glabrous, with (5–)8–14 rows of

sculpturing. *Keel* 12.5–19.5 mm long, claw 3.5–7.0 mm long, lamina boat-shaped, 8.5–13.0 × 4.5–6.5 mm, pilose on terminal parts. *Pistil* subsessile to shortly stipitate, sericeous; ovary linear, 8.5–15.0 × 0.8–1.5 mm with 19 to 28 ovules; style shorter than ovary, 3.5–8.5 mm long. *Pods* linear, terete, subsessile to shortly stipitate, 30–50 × 3–4 mm, 7- to 14-seeded, sericeous, dehiscent; endocarp hairy. *Seeds* oblong-reniform, 2.3–3.5 × 1.7–2.5 mm, mature seeds light brown to light pink, surface smooth (Figure 33). *Flowering time*: flowers mainly from May to October; one specimen collected in March was in flower.

Distribution and habitat

Calobota sericea is widely distributed from Wupperthal in the south, as far north as the Oranjemund area (Figure 34). It grows in well-drained sandy loam, granite, rocky sand, sandy dunes, in riverbeds or along disturbed roadsides at altitudes of between 300 and

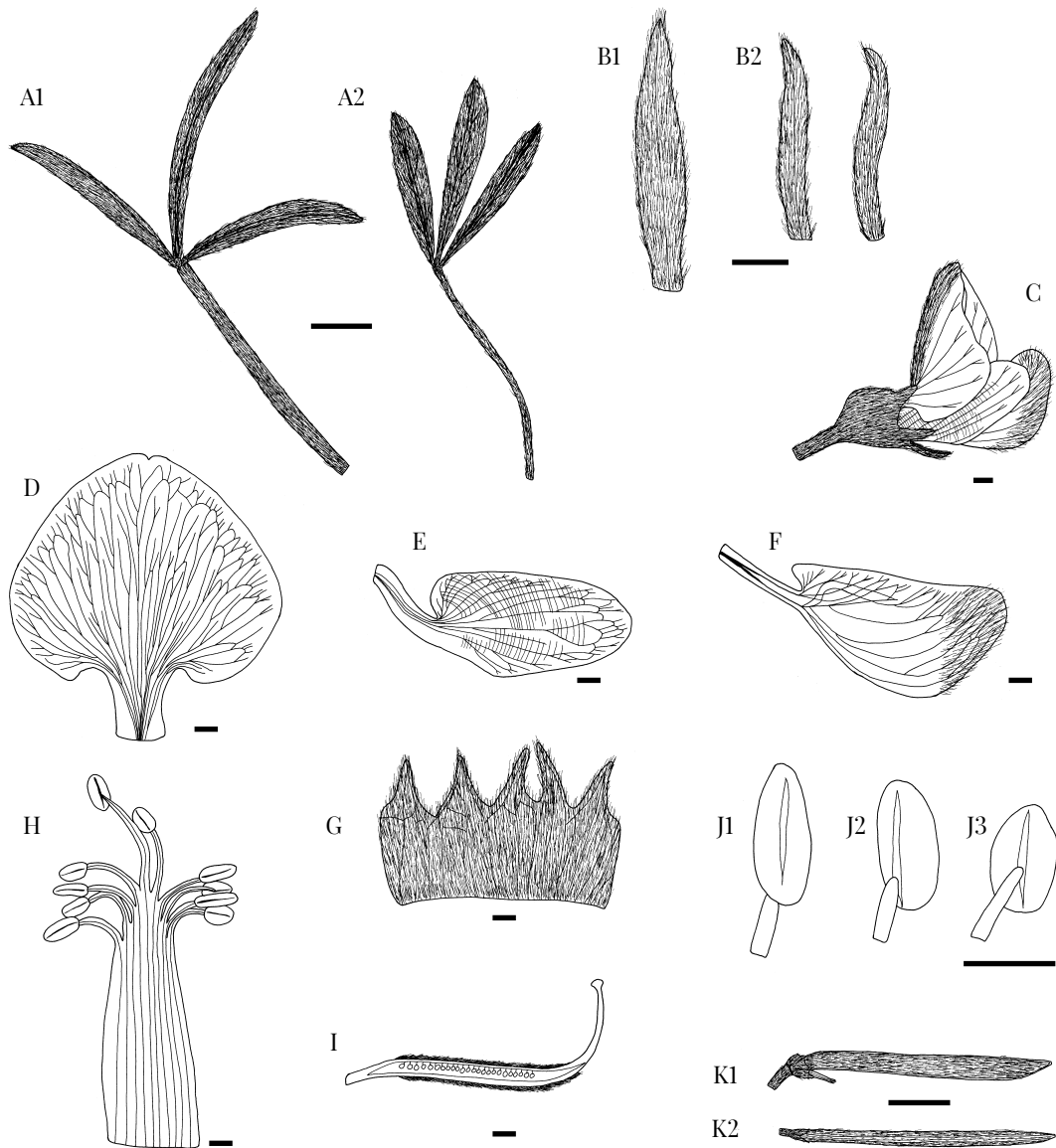


Figure 33.—Morphology of *Calobota sericea*. A1, A2, leaves in abaxial view; B1, bract; B2, bracteoles; C, flower in lateral view; D, standard petal; E, wing petal; F, keel petal; G, outer surface of the calyx (upper lobes to the left); H, androecium; I, pistil; J1, long, basifixed anther; J2, intermediate carinal anther; J3, short, dorsifixed anther; K1, pod in lateral view; K2, pod in dorsal view. A1, B–J: *Boatwright et al. 151*, JRAU; A2, K: *Van Wyk 3119*, JRAU. Scale bars: A & K, 10 mm; B–J, 1 mm.

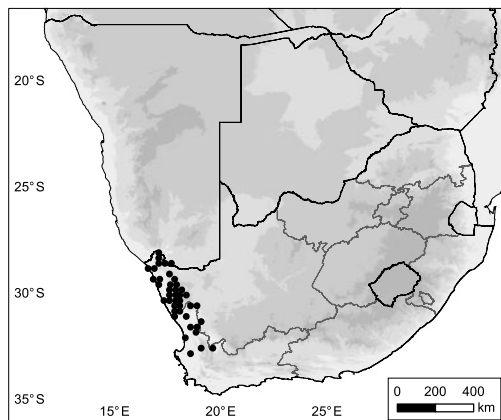


Figure 34.—Distribution of *Calobota sericea*.

1 200 m. This species, according to Mucina et al. (2006) and Jürgens (2006), is an important component of Richtersveld (SKr 14 Southern Richtersveld Inselberg Shrubland), Namaqualand Hardeveld (SKn 1 Namaqualand Klipkoppe Shrubland, SKn 2 Namaqualand Shale Shrubland, SKn 6 Kamiesberg Mountains Shrubland), Namaqualand Sandveld (SKs 9 Namaqualand Inland Duneveld) and Southern Namib Desert (Dn 1 Alexander Bay Coastal Duneveld).

IUCN Red List category

Considered to be of Least Concern (LC) by Raimondo et al. (2009).

Discussion

Calobota sericea is similar to *C. cytisoides*, but differs in the acute apices of the leaflets, short pedicels and smaller flowers, linear bracts and bracteoles, sericeous calyx and sericeous pistil

and pods (in *C. cytisoides* the apices of the leaflets are mucronulate, the pedicels longer and the flowers larger, the bracts and bracteoles are often ovate, the calyx glabrous and the pistil and pods glabrous).

Thunberg s.n. sub THUNB-UPS 16423 is here chosen as lectotype of *Calobota sericea* as it is the only specimen in Thunberg's Herbarium. The specimen of *Drège s.n. 'III, C'* in P has the diagnostic features of *Lebeckia flexuosa* described by Meyer and a label with the type locality, so that it is here chosen as lectotype. The specimen of *Drège s.n. 'III, C'* at P is chosen as lectotype of *Lebeckia decipiens* as it bears the type locality and was annotated by Meyer himself.

Additional specimens examined

SOUTH AFRICA. **2816** (Oranjemund): sand drifts on Witbank (–DC), *Pillans 5542* (BOL); sandy coast belt between Port Nolloth and Holgat River (–DD), *Pillans 5627* (BOL, K). **2817** (Vioolsdrif): Kodaapiek (–AA), *Oliver et al. 451* (K, NBG); Vandersterberg northeast of Khubus north and southeast of the top of Helskloof and southeast of Paradysberg western slopes to summit (–AC), *Oliver et al. 151* (NBG, K, PRE); Vioolsdrif, Ridge above Koeskop, summit of Vandersterberg, Richtersveld National Park (–AC), *Williamson & Williamson 5764* (NBG); Cornellsberg (–CA), *Bean 1258* (BOL); *Bean 1328* (S); *Van Jaarsveld 11977* (PRE); *Viviers 2046* (NBG); Jenkins Hill, 20 km from Eksteenfontein on road to Mount Stewart (–CB), *Germishuizen 4679a* (PRE 2 sheets); Spektakel Hill (–DA), *Johnson 216* (NBG). **2916** (Port Nolloth): sandy plain 2 mls [3.22 km] east of Port Nolloth (–BD), *Marloth 12660* (NBG, PRE). **2917** (Springbok): along roadside on road from Port Nolloth to Steinkopf (–AC), *Boatwright et al. 151* (JRAU); Klipfontein (–BA), *Bolus 429* (BM, BOL, K, NBG, PRE), *Bolus 6549* (K); *Hutchinson 904* (BM, BOL, K, PRE); Steinkopf

(-BA), *Herre s.n. sub STE 11889* (NBG); *Meyer s.n. sub STE9068* (NBG); Anenous Pass (-BA), *Germishuizen 4839* (PRE, WIND); *Schutte 591* (JRAU 2 sheets); *Van Wyk 6266* (PRE); Spitskop, 6 mls [9.65 km] south of Steinkopf (-BD), *Lewis 5487* (NBG 2 sheets); Klipfontein Koppie (-CA), *Compton 5486* (BOL, NBG); Stinkfontein Mountains southwest of Van Zylsrus (-CA), *Oliver et al. 625* (NBG, PRE); Spektakel (-DA), *Compton 11524* (NBG); Spektakel Pass (-DA), *Eliovson 37* (NBG); 25 km from Springbok towards Spektakelberg Pass (-DA), *Glen 1463* (BOL, PRE); Spektakel Pass, 26 km west of Springbok (-DA), *Goldblatt 3651* (PRE); top of Spektakelberg Pass (-DA), *Grobbelaar 2584* (PRE); Farm Ezelfontein 214, 2 km north of Naries farmstead (-DA), *Le Roux 3233* (NBG); 21.7 km from Springbok to Spektakel (-DA), *Stirton 6019* (K); 24 km from Springbok to Kleinsee (-DA), *Stirton 10149* (NBG); 9 mls [14.81 km] southeast by east of Springbok (-DB), *Acocks 19237* (K, PRE); 8.5 mls [13.68 km] west by south of Springbok (-DB), *Acocks 19550* (BOL, K, PRE); near O'kiep (-DB), *Barker 6244* (NBG 3 sheets); 1ml [1.61 km] south of Springbok (-DB), *Barker 8389* (NBG 2 sheets); 2 km east of Springbok (-DB), *Bellamy 12* (PRE); Springbok (-DB), *Bester & Pretorius 8* (JRAU); *Crosby 20* (PRE); *Salter 895* (BM, K); *Small et al. 82* (PRE); *Van Blerk 7* (PRE); *Van Hille 8* (BOL); *Venter 8820* (PRE); Nababeep, road to O'kiep (-DB), *Burrows 2950* (GRA); ±8 km northeast of Nababeep on gravel road to junction with tar road (-DB), *Botha 3170* (PRE); 2 mls [3.22 km] northeast of Springbok (-DB), *Compton 22012* (NBG); Concordia, near Springbok (-DB), *Clarke 687* (PRE); *Thorns s.n.* (NBG); just outside Nababeep on road to O'kiep (-DB), *Germishuizen 4515* (PRE); Nababeep (-DB), *Gess & Gess 89/90/67* (GRA); Hester Malan Wild Flower Reserve north of Oxaliskoppie (-DB), *Le Roux 918, 1231* (PRE); Nababeep, near golf course (-DB), *Le Roux 2674* (BOL); 2 mls [3.22 km] north of Springbok (-DB), *Lewis 3392* (NBG); *Schelp 240* (BM, BOL); 4 mls [6.44 km] west of Springbok (-DB), *Macquie 369* (BOL, NBG 2 sheets); Springbok, weather station hill on west of town (-DB), *Manning 2774* (NBG); Okiep (-DB), *Dümmel s.n.* (K); *Marloth 6712* (NBG 3 sheets, PRE); *Morris 5623* (BM, BOL, NBG); 15 mls [24.14 km] north of Springbok (-DB), *Schlieben 9059* (BM, K, PRE); Springbok T'Karoep, on road between Nababeep and

O'kiep (-DB), *Scholtz 20* (NBG, PRE); Hester Malan Nature Reserve (-DB), *Stirton 6004* (PRE); *Struck 113* (NBG); *Van Wyk 5728* (PRE); 5 mls [8.05 km] north of O'kiep (-DB), *Van der Schijff & Schweickerd 5744* (K, PRE); 2 mls [3.22 km] north of Springbok (-DB), *Van Niekerk 240* (PRE, 2 sheets); 11 km from Springbok to Pofadder (-DB), *Van Wyk 3078* (JRAU 2 sheets); Modderfontein (-DB), *Whitehead s.n.* (S); 3 km east of Springbok (-DB), *Zietsman & Zietsman 667* (PRE); Messelpad between Springbok and Wallekraal (-DC), *Compton 20664* (NBG 2 sheets); near Komaggas (-DC), *Eliovson 69* (J); north slopes of Rooiberg above Buffels River on eastern approach to the Meselpad (-DC), *Hilton-Taylor 2140* (NBG, PRE); ca. 11 km from Springbok on sand road to Hondeklipbaai (-DC), *Joffe 96* (NBG, PRE); on road to Hondeklipbaai, 18 mls [28.96 km] from turn-off from national road to Springbok (-DC), *Van der Merwe 215* (NBG); 29 mls [46.66 km] from Springbok on road to Garies (-DD), *Grobbelaar 1119* (PRE); near Mesklip (-DD), *Leighton 1156* (BOL); on roadside of N7 highway 13 km south of Springbok, opposite 33.4 marker (-DD), *Pourie 652* (NBG 2 sheets, PRE); 30 mls [48.27 km] south of Springbok (-DD), *Rynolds 5440* (K); 20 mls [32.18 km] southwest of Springbok (-DD), *Verdoorn & Dyer 1791* (BOL, K 2 sheets). **2918** (Gamoep): Zilverfontein (-CC), *Drège s.n.* (BM, K, P, S). **3017** (Hondeklipbaai): Diknek (-AD), *Van Breda 4073* (PRE); Farm Doornfontein 464, Portion 1, Steenkamp Kraal (-BA), *Le Roux 4555* (NBG); on road to Leliefontein from Kamieskroon (-BB), *Boatwright et al. 219* (JRAU); Grootvlei, hillsides, Kamieskroon (-BB), *Compton 6839* (NBG); Skilpad Wild Flower Reserve, 100m from house (-BB), *Cruz 85* (NBG); Studer Pass (-BB), *Evrard 8960* (PRE); Kamieskroon (-BB), *Hutchinson 841* (BM, K 2 sheets, PRE); *Salter 863* (BM); *Salter 865* (K); *Thorne s.n.* (NBG); *Van Rooyen 2416* (PRE); portion of Wolwepoort 459, Skilpad Farm, northwest of Kamieskroon (-BB), *Johannesburg Botanical Garden 3877* (PRE); between Kamieskroon and Soebatfontein (-BB), *Meyer 7331* (PRE); ± 4 km from Kamieskroon (-BB), *Meyer 7349* (PRE); Kamiesberg Pass (-BB), *Schutte 593* (JRAU); *Stirton 5993* (PRE); *Strid & Strid 37780* (NBG); *Van Wyk 2540, 3094* (JRAU); Farm Olienfontein (-BB), *Zietsman & Zietsman 1017* (PRE); 2.3 km from start of Kamiesberg Pass (-BB), *Van Wyk 2352* (JRAU 2 sheets); 5 km

from Wallekraal to Garies (–BC), *Stirton 6054d* (K); Garies (–BD), *Compton 17180* (NBG); *Kruger K5* (K, NBG, PRE); *Lynes 1944* (BM); Brakdam (–BD), *Johnson 200* (NBG 2 sheets); 5 mls [8.05 km] north of Garies, top of pass (–BD), *Lewis 1308* (NBG); between Nuwerus and Karkams (–BD), *Pearson 6500* (K); Brakdam (–BD), *Schlechter 11150* (BM, BOL, K, PRE); 20 km from Kamieskroon to Garies (–BD), *Stirton 5982* (K); 16 km north of Garies (–BD), *Wisura 2924* (NBG); between Garies and Kamieskroon (–DB), *Jordaan 1225* (NBG); *Van der Schijff 6994* (PRE); 4 km north of Garies on road to Springbok (–DB), *Le Roux 2630* (BOL); 6 mls [9.65 km] north of Garies (–DB), *Leighton 1127* (BOL); near Garies (–DB), *Levy's 6984* (BOL); *Markotter s.n.* (NBG); *Stirton 5978* (K, PRE); 2.1 km from Garies to Bitterfontein (–DB), *Marsch 343* (NBG, PRE); 3 km north of Garies on the main road to Springbok, Garieshoogte (–DB), *McDonald 1329* (NBG, PRE, UPS); 5 km from Kotzerus turn-off from Wallekraal to Garies (–DB), *Stirton 6055* (K); 6 mls [9.65 km] from Garies to Kamiesberg (–DB), *Thompson 415* (NBG, PRE); 23 km north of Garies beside N7 (–DB), *Van Wyk 2339* (JRAU); 24 km from Garies on main road to Springbok (–DB), *Van Wyk 2424* (JRAU); between Garies and Springbok (–DB), *Werdermann & Oberdieck 598* (K); Kotzerus (–DD), *Stirton 6058* (K); road between Kotzerus and Bitterfontein (–DD), *Van Wyk 3115* (JRAU). **3018** (Kamiesberg): Farm Pedroskloof, 18 km east of Kamieskroon (–AA), *Hilton-Taylor 2122* (NBG); north of Liefontein (–AB), *Liede & Herre s.n.* (JRAU); near Eselsfontein (–AC), *Van der Schijff & Schweikerd 5780* (PRE); on farm near Garies (–AC), *Van Der Walt 159* (NBG); slopes of hills near Garies (–CA), *Thorne s.n.* (NBG); on N7 towards Garies 30 km from town (–CC), *Boatwright et al. 140* (JRAU); 10 km from Garies on N7 (–CC), *Boatwright et al. 141* (JRAU); along N7 to Springbok 20 km from Garies (–CC), *Boatwright et al.*

183 (JRAU); 35 mls [56.32 km] south of Garies (–CC), *Thompson 1014* (NBG, PRE); along main road 5 mls [8.05 km] from Garies to Springbok (–CC), *Van Breda 1283* (K, PRE); Kliprand (–DA), *Hall 891* (BOL, NBG); *Van Breda 1607* (K); 5.6 mls [9.01 km] from Bitterfontein to Pofadder (–DB), *Marsch 444* (NBG). **3117** (Lepelfontein): Lepelfontein (–BB), *Kolbe s.n. sub BOL 14269* (BOL). **3118** (Vanhynsdorp): Nuwerus, Elandsfontein (–AB), *Barnard 307* (NBG); Bitterfontein (–AB), *Bond 1093* (NBG); Farm Quaggas Kop 125. 6 km west of Nuwerus (–AB), *Le Roux 2278* (NBG); slopes of Spitsberg southeast of Nuwerus (–AB), *Oliver 5930* (NBG, PRE); Karreebergen (–AB), *Schlechter s.n. sub TRV 1057* (PRE); *Schlechter 8182* (BM, BOL, K, PRE); 3 mls [4.83 km] north of Bitterfontein (–AB), *Schelp 131* (BM, BOL, K); Nuwerus (–AB), *Steyn 472* (NBG); Vanhynsdorp (–DA), *Van der Byl s.n. sub STE 17419* (NBG); top of Klein Kobbie Pass (–DB), *Manning s.n.* (K, NBG 2 sheets); Klapmuts (–DD), *Schlechter 375* (BOL). **3119** (Calvinia): Bottom of Vanhyns Pass (–AC), *Marsch et al. 312* (NBG, PRE); Nieuwoudtville (–AC), *Pearson 3468* (K); Vanhyns Pass before Nieuwoudtville (–AC), *Schutte 285* (JRAU); *Van Wyk 3119* (JRAU); Vanhyns Pass between Nieuwoudtville and Vanhynsdorp (–AC), *Van der Schijff 7183* (PRE); *Van Wyk 2584* (JRAU 2 sheets, NBG, PRE). **3218** (Clanwilliam): Nortier Experimental Station near Lamberts Bay (–AB), *Van Breda 4435* (PRE); near Nuwerus (–DC), *Acocks 14188* (K, PRE); few miles north of Nuwerus (–DC), *Wilman 702* (BOL). **3219** (Wuppertal): Citrusdal (–CA), *Thorns s.n.* (NBG); Doorn River (–DA), *Herre s.n. sub STE 11890* (NBG); Doorn River bridge (–DA), *Pillans 6305* (BOL, K). **Precise locality unknown:** Platberg, *Drège s.n. III, A, b' (P)*; without locality, *Leipoldt 739* (NBG); *Marloth 11143* (NBG); *Zeyher 400* (K 2 sheets, S); north of Darters Grave, *Maguire 296* (NBG); Namaqualand, *Scully 7* (BM).

- 16. *Calobota spinescens*** (Harv.) Boatwr. & B.-E. van Wyk, S. African J. Bot. 75: 554. 2009. Basionym: *Lebeckia spinescens* Harv. in Harv. & Sond., Fl. Cap. [Harvey] 2: 88. 1862. TYPE: SOUTH AFRICA, Dwaka River, *Burke s.n.* (lectotype, designated here, K!; isoelectotypes, BM! 2 sheets).

Lebeckia armata auct. non Thunb.: E. Mey., Comm. Pl. Afr. Austral. [Meyer] 1: 35. Feb. 1836.

Lebeckia elongata Hutch., Ann. Bolus Herb. 3: 2. 1923. TYPE: NAMIBIA, s. loc., Pearson 9899 (holotype, BOL!, isotype, K!).

Erect to spreading, multi-stemmed, spinescent shrub up to 1 m in height. *Branches* green; young branches sericeous; older branches sericeous or glabrous with light brown bark. *Leaves* digitately trifoliate; persistent or deciduous; petiole longer than leaflets, 6–25 mm long; leaflets linear to oblanceolate or spatulate, alternate, sericeous, subsessile, terminal leaflet 3–12 × 0.5–2.0 mm, lateral leaflets 2–11 × 0.5–2.0 mm; apex acute; base cuneate. *Inflorescence* 25–105 mm long, with 3 to 10 flowers; pedicel 1–3 mm long; bract 1–2 mm long, linear, pubescent, caducous; bracteoles 0.5–1.5 mm long, linear, pubescent, caducous. *Flowers* 10–16 mm long, bright yellow. *Calyx* 4.5–7.0 mm long, pubescent; tube 3–5 mm long; lobes 1.0–2.5 mm long, subulate. *Standard* 10.0–15.5 mm long; claw linear, 2–4 mm long; lamina ovate, 8.5–12.0 × 7.5–11.0 mm, dorsal surface sericeous; apex acute. *Wings* 10.5–14.0 mm long; claw 2.5–4.0 mm long; lamina oblong, as long as or shorter than keel, 7.5–10.0 × 2–4 mm, glabrous or rarely pilose, with 4–6 rows of sculpturing. *Keel* 11–15 mm long; claw 3.5–5.0 mm long; lamina boat-shaped, 7–10 × 3.5–6.0 mm, glabrous or rarely pilose.

Pistil subsessile to shortly stipitate, pubescent or glabrous with pilose hairs on margins; ovary linear, 7.5–11.5 × 1.0–1.5 mm with 10 to 16 ovules; style shorter than ovary, 3.5–6.0 mm long. *Pods* linear, somewhat falcate, laterally compressed, subsessile to shortly stipitate, 20–40 × 3–4 mm, ±4- to 6-seeded, either sericeous or glabrous and pilose along upper suture, dehiscent; endocarp glabrous. *Seeds* sub-orbicular to reniform, 2.4–2.5 × 2.1–2.2 mm (only one specimen available for measurement), mature seeds light brown, surface smooth (Figure 35). *Flowering time*: flowering occurs from February to May and September to October; one flowering specimen collected in December (summer and spring flowering).

Distribution and habitat

Calobota spinescens is widespread throughout the Cape and southern Namibia (Figure 36). According to Mucina et al. (2006) it is an important component of Namaqualand Sandveld (SKs 7 Namaqualand Strandveld) and Trans-Escarpment Succulent Karoo (SKt 1 Western Bushmanland Klipveld).

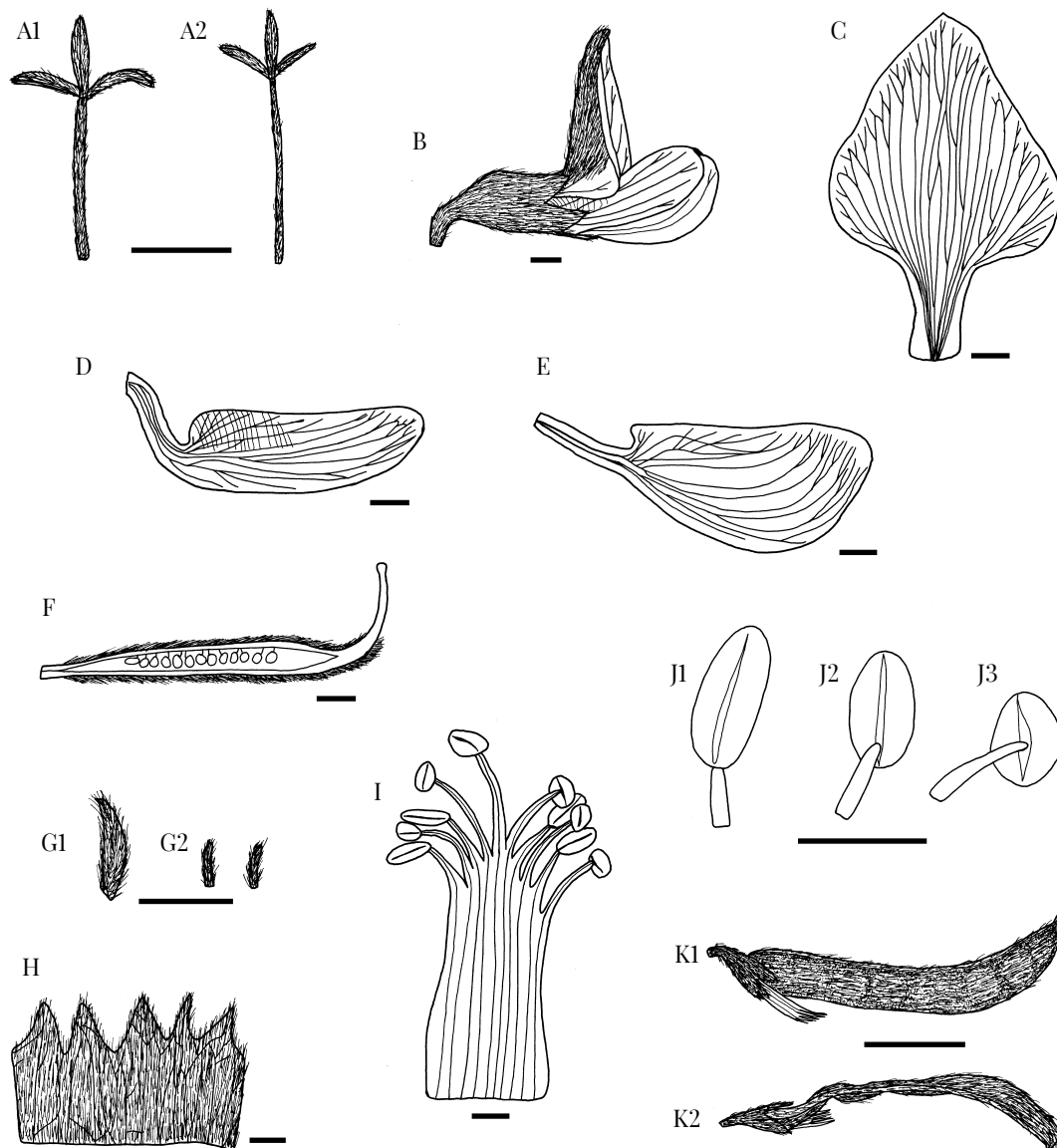


Figure 35.—Morphology of *Calobota spinescens*. A1, A2, leaves in abaxial view; B, flower in lateral view; C, standard petal; D, wing petal; E, keel petal; F, pistil; G1, bract; G2, bracteoles; H, outer surface of the calyx (upper lobes to the left); I, androecium; J1, long, basifixed anther; J2, intermediate carinal anther; J3, short, dorsifixed anther; K1, pod in lateral view; K2, pod in dorsal view. A1, B–E, G–K: *Boatwright et al.* 158, JRAU; A2: *Kockemoer* 248, JRAU; F: *Zietsman* 3489, PRE. Scale bars: A & K, 10 mm; B–J, 1 mm.

IUCN Red List category

Considered to be of Least Concern (LC) by Raimondo et al. (2009).

Discussion

This species is similar to *Calobota acanthoclada*, but differs in the green young branches, trifoliolate leaves, larger flowers, short calyx lobes and pods that are constricted between the seeds (in *C. acanthoclada* the young branches are brown, the leaves simple, the flowers smaller and the calyx lobes longer than in *C. spinescens*, and the pods not constricted between the seeds).

The Burke specimen in Kew was determined by Harvey himself as *Lebeckia spinescens* Harv. and is here chosen as lectotype of *Calobota spinescens*. Specimens have been misidentified as *Lebeckia armata* Thunb., but this species is a synonym of *Wiborgia mucronata* (L.f) Druce (Dahlgren 1975).

Regional variation

Two forms can be distinguished based on the pubescens of the ovary and fruit:

FORM A (typical or hairy-fruited form)

Leaves with petiole 6–25 mm long; leaflets with terminal 3–12 × 0.5–2.0 mm, lateral 2–11 × 0.5–2.0 mm. *Inflorescence* 25–105 mm long; with 3 to 10 flowers. *Flowers* 11–15 mm long. *Calyx* 5.5–6.5 mm long, pubescent or sericeous; tube 3.5–5.0 mm long; lobes 1.5–2.5 mm long. *Standard* 12.5–15.5 mm long;

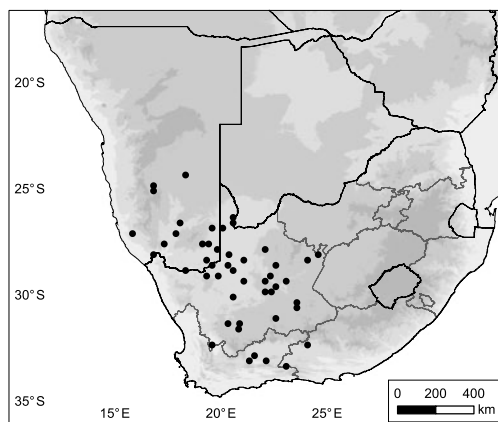


Figure 36.—Distribution of *Calobota spinescens*.

claw 3–4 mm long; lamina 9.5–12.0 × 7.5–9.5 mm. *Wings* 10.5–14.0 mm long; claw 2.5–4.0 mm long; lamina 7.5–10.0 × 2.5–3.5 mm, with 4–5 rows of sculpturing, glabrous or rarely pilose. *Keel* 11–15 mm long; claw 4–5 mm long; lamina 7–10 × 3.5–5.0 mm, glabrous or rarely pilose. *Pistil* pubescent; ovary 7.5–11.5 × 1.0–1.5 mm with 10 to 16 ovules; style 3.5–5.5 mm long. *Pods* sericeous, 20–40 × 3–4 mm.

Distribution and habitat

The typical form of *Calobota spinescens* is widely distributed in southern Namibia and the Northern Cape Province of South Africa, with some populations in the Western and Eastern Cape. It occurs on sandy soils along roadsides, in riverbeds or on sand dunes. It also grows on sand overlying limestone or granite koppies or calcareous sand at altitudes of between 600 and 1 100 m and is heavily grazed livestock.

Diagnostic characters

The ovary and pods of this form are densely sericeous.

FORM B (smooth-fruited form)

Leaves with petiole 6–14 mm long; leaflets with terminal 3–10 × 0.5–1.5 mm, lateral 2–10 × 0.5–1.0 mm. *Inflorescence* 30–70 mm long; with 5 to 7 flowers. *Flowers* 10–16 mm long. *Calyx* 4.5–7.0 mm long, glabrescent or pilose; tube 3–5 mm long; lobes 1.0–2.5 mm long. *Standard* 10–15 mm long; claw 2–4 mm long; lamina 8.5–11.5 × 7.5–11.0 mm. *Wings* 10.5–13.0 mm long; claw 2.5–4.0 mm long; lamina 7.5–10.0 × 2–4 mm, with 4–6 rows of sculpturing, glabrous. *Keel* 11–14 mm long; claw 3.5–5.0 mm long; lamina 7.5–10.0 × 3.5–6.0 mm, glabrous. *Pistil* glabrous with pilose hairs along margins; ovary 9.5–11.0 × 1.0–1.5 mm with 12–16 ovules; style 4.5–6.0 mm long. *Pods* glabrous and pilose along upper suture, 25–35 × 3–4 mm.

Distribution and habitat

This form occurs in the central parts of South Africa (Prieska, Brandvlei, Britstown, Aberdeen and Willowmore) with an outlier population around Klinghardt. It grows on red-brown, well-drained, sandy soil, limestone, deep aeolitic sand banks, on calcretic flats or sand on dolerite rock at altitudes of between 250 and 1 100 m. It is heavily grazed by livestock.

Diagnostic characters

In the smooth-fruited form the ovary and pods are largely glabrous with only some hairs along the upper suture.

Additional specimens examined

NAMIBIA. **2416** (Maltahöhe): Farm Grootplaas MAL 95 (–DD), *Giess et al.* 5204 (PRE, WIND). **2418** (Stampriet): between Hofmeyr and Stamprietfontein, 1 ml [1.61 km] from the latter (–AD), *Wilman* 383 (BOL, NBG, PRE). **2516** (Helmeringhausen): Grootfontein MAL 91 (–BB), *Volk* 12875b (WIND). **2618** (Keetmanshoop): west of Gellap-Ost 15 km north-west of Keetmanshoop (–CA), *Maggs* 111 (WIND). **2619** (Aroab): 20.5 mls. [32.98 km] southeast of Aroab on Klipdam road (–DC), *De Winter* 3440 (K, PRE, WIND); 3.6 mls [5.79 km] from Aroab on road to Koes (–DC), *De Winter* 3458 (K, PRE, WIND). **2715** (Bogenfels): Klinghardt Mountain, Diamond Area no. 1 (–BB), *Ward & Seely* 10223 (WIND). **2717** (Chamaite): south of Lowen River, at Gawachab (–BB), *Pearson* 4098 (BM, K); Wegdraai, Hottentots Plateau (–CB), *Helary & Batault* 202 (WIND). **2719** (Träental): Farm Blinkoog (–CA), *Waltu & Waltu* 2403 (WIND); Farm Nuwerus (–CB), *Giess et al.* 7125 (WIND); Farm Goedemoed (–DD), *Strobach et al.* 3000 (WIND). **2818** (Warmbad): Ramansdrift (–CD), *Pearson* 4046 (BM). **2819** (Ariamsvlei): Farm Udabis (–AD), *Giess et al.* 7107 (WIND); Farm Skroef, near hot spring on bank of Orange River (–DA), *Van Hoepen* 1942 (BOL, PRE).

SOUTH AFRICA. **2620** (Twee Rivieren): Twee Rivieren in bed of Nossob River (–BC), *Leistner* 1497 (BOL, K, PRE); Kalahari-Gemsbok National Park (–BC), *Van Rooyen & Bredenkamp* 76 (PRE); 40 mls [64.36 km] from Aroab (–CC), *Grobbelaar* 1862 (K); 50 km south of the Kalahari Gemsbok National Park (–DA), *Koekemoer* 248 (JRAU 6 sheets). **2722** (Olifantshoek): 4 mls [6.44 km] north of Gamotep Pan (–CC), *Leistner* 1706 (K). **2816** (Oranjemund): Sendelingsdrif (–BB), *Metelerkamp* 59 (BOL). **2820** (Kakamas): approximately 70 km from Ariamsvlei on road to Upington (–AB), *Grobbelaar* 1926 (K, PRE); Augrabies Waterfall National Park (–CB), *Werger* 345 (K, WIND); *Zietsman* 3489, 3920 (PRE); 31 km west of Kakamas along road to Pofadder and Onseepkans (–DC), *Davidse* 6161 (K); 6 mls [9.65 km] south of Kakamas (–DC), *Leistner & Joynt* 2828 (K, PRE); north bank of Orange River near Kakamas (–DC), *Lewis* 198 (NBG);

20 mls [32.18 km] southeast of Kakamas (–DC), *Theron 1943* (BOL, K); between Kakamas and Kenhardt (–DC), *Thorne s.n.* (NBG). **2821** (Upington): Karakul Research Station near Upington (–AC), *Labuschange s.n.* (NBG). **2822** (Glen Lyon): 8 mls [12.87 km] west-northwest of west entrance of Padkloof (–DA), *Leistner 1750* (K, PRE). **2824** (Kimberley): 60 mls [96.54 km] from Upington (–AC), *Pole-Evans 2160* (PRE); 21.5 mls [34.59 km] north of Witkop (–BA), *Pole-Evans 2132* (PRE). **2919** (Pofadder): Pofadder (–AB), *Conradie 25* (NBG); on N14 highway 25 km from Pofadder from Springbok (–BB), *Boatwright et al. 158* (JRAU). **2921** (Kenhardt): Kenhardt (–AC), *Wabberfall 1114* (K). **2922** (Prieska): Kwakwas (–AB), *Acocks 1759* (PRE); on sandy waste behind Draghoender hotel (–AC), *Acocks & Hafström H1343* (K, PRE 2 sheets); Boesmanland, Farm Mames-Pan 107, 0.5 km north of Kielder farmhouse (–CC), *Le Roux & Lloyd 173* (K, PRE); Boesmanland, Farm Doonies-Pan 106, 13.3 km north northwest of Copperton (–CD), *Le Roux & Lloyd 138* (PRE); Prieska (–DA), *Bryant J263* (K); North bank of Orange River (–DA), *Bryant 5404* (BOL). **2923** (Douglas): Lanyon-Vale (–AC), *Acocks 1982* (BOL, K). **3020** (Brandvlei): Boesmanland, Farm Bastiaans Kolk 331, on stabilized sand dunes in Groot Vloer (–BA), *Le Roux & Lloyd 111* (PRE). **3023** (Britstown): at Vissershoek turn-off 39 km north

of Britstown (–BC), *Van Wyk 2849* (JRAU 2 sheets); 36.3 km from Britstown to Vissershoek turn-off, at Farm Fonteintjies 8 km from house (–BC), *Van Wyk 3081* (JRAU); 10 km south on Deelfontein road, Farm Witfontein (–DA), *Le Roux 236* (PRE). **3120** (Williston): Great Fish River and Zout River, Beaufort (–AD), *Zeyher 397* (BM, K, NBG); Williston Station (–BD), *Smith 2443* (K); Rietpoort (–DB), *Shearing 81* (K). **3122** (Loxton): Pampoenpoort (–BA), *Henrici 4750* (PRE). **3219** (Wuppertal): Grasberg South, Tanqua National Park (–BC), *Bayer 6244* (PRE); Sandkop (–BC), *Henrici 3333* (PRE). **3221** (Merweville): rocks at Driekoppe (–DC), *Drège s.n. II, f* (P). **3224** (Graaff-Reinet): 40 mls [64.36 km] from Aberdeen (–AC), *Hutchinson 3135* (BM, K 2 sheets); southwest of Aberdeen (–AC), *Maguire 742* (NBG). **3321** (Ladismith): near Grootfontein, 30 mls [48.27 km] north east of Laingsburg (–AB), *Wilman 1048* (BOL). **3322** (Oudtshoorn): Prince Albert (–AA), *Bolus 11774* (K, PRE), *Thoday & Dolf 66* (NBG). **3323** (Willowmore): Willowmore, near station Vondeling on banks of Olifantsriver (–AC), *Vlok 1932* (JRAU, PRE). **Precise locality unknown**: without locality, *Acocks 1701* (PRE); Griqualand West, *Burchell 1965* (K); between Dweka River and Zwartbulletjie, *Drège s.n.* (S); Bushmanland, *Pearson 3633* (K).

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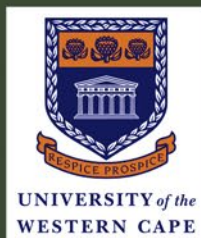
A taxonomic revision of the genus *Calobota* Eckl. & Zeyh. (Fabaceae, Crotalariaeae) is presented. Sixteen species are recognised in the genus. Among these, *Calobota namibensis* Boatwr. & B.-E.van Wyk is described as new from southwestern Namibia. The anatomy of the leaves, stems and fruit walls was studied and revealed important characters to distinguish *Calobota* from other genera of the tribe Crotalariaeae. These include isobilateral leaves (palisade parenchyma both adaxially and abaxially) as opposed to dorsiventral leaves (e.g. in *Wiborgia* Thunb. and *Wiborgiella* Boatwr. & B.-E.van Wyk), and thick-walled fruit with gelatinous fibres in some species. The absence of mucilage cells in the epidermis of the leaves is also an important distinguishing character for the genus with respect to *Aspalathus* L., *Lebeckia* Thunb., *Rafnia* Thunb., *Wiborgia* and *Wiborgiella*. *Calobota* differs from other closely related genera in the tribe in the following combination of characters: late bark formation, uni- or trifoliolate to simple, laminar leaves, hairy petals (*C. cuspidosa* (Burch.) Boatwr. & B.-E.van Wyk and *C. psiloloba* (E.Mey.) Boatwr. & B.-E.van Wyk are exceptions), anther configuration of 4+5+1 and laterally compressed or terete, usually pubescent pods. A detailed taxonomic study of the genus is presented here, including a key to the species, descriptions, typifications, distributions, phylogenetic relationships and illustrations.



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