A TAXONOMIC REVISION OF

Calobota
(FABACEAE, CROTALARIEAE)

James Stephen Boatwright, Patricia May Tilney and Ben-Erik van Wyk
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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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A taxonomic revision of the genus *Calobota* Eckl. & Zeyh. (Fabaceae, Crotalarieae) 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 Crotalarieae. 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.

The authors thank the curators and staff of the listed herbaria for making their specimens available for study or on loan. Financial support from the National Research Foundation of South Africa and the University of Johannesburg are gratefully acknowledged. We are grateful to Drs Sarah K. Gess and Friedrich W. Gess for supplying reprints of their publications on pollinators of the Crotalarieae. Michelle Smith is thanked for making the distribution maps. Collecting permits (permit numbers AAA005-00018-0028, 1362/2009) were provided by the conservation authorities of the Northern and Western Cape, and Namibia.

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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 Crotalarieae (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 Crotalarieae, 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 Crotalarieae 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

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 & Smolenisky 1981; Kinghorn et al. 1982; Hegnauer & Grayer-Barkmeier 1993; Southon 1994; Hegnauer & Hegnauer 1992–2001).

Alkaloids

Detailed studies of alkaloids in the Crotalarieae 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 Crotalarieae differ from all other gentiods 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 Crotalarieae, 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).


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 Crotalarieae 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 Crotalarieae 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 Crotalarieae, 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 Crotalarieae and Genisteae as these are the only tribes that have genera bearing pyrrolizidine alkaloids (Van Wyk 2003).

**Flavonoids**

Flavonoids in legumes and within the Crotalarieae 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 Crotalarieae 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 Crotalarieae. *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 cytisoides* 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.
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.
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 fresh 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.
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 (Metcalfe & Chalk 1950). Although green stems are also found in other genera of the Crotalarieae, 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 tanniniferous 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
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

![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.](image-url)
& Baas (1989) speculate that these cells are usually associated with plants that occur in Mediterranean climates, and consistent with this, C. saharae 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.
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 Crotalarieae (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 Crotalarieae, 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*.
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 lamina 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 upcurved 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 Crotalarieae 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 membraneous 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. *Synclistus* (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 Crotalarieae 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. loto-noides*, which has rugose seeds (Boatwright & Van Wyk 2007).
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 unifoliolate or digitately trifoliolate (rarely 5-foliolate), 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

**Taxonomic treatment**


[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.]
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 semi-terete 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 *CALOBO_TA*

1a. Plants strongly spinescent shrubs; pods laterally compressed, often falcate ................................. 2

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

2a. Plants leafless shrubs, if leaves present then widely separated ................................................. 3

2b. Plants shrubs with leaves present, leaves fasciculate ........................................................................ 5

3a. Petals glabrous; ovary glabrous; pods glabrous ................................................................................. 4

3b. Petals glabrous; ovary pubescent; pods densely pubescent ............................................................. 13. *C. pungens*

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*

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*

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*

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
......................................................................................................................................................... 2. *C. lotononoides*

11a. Leaves trifoliolate and petiolate ........................................................................................................ 12

11b. Leaves simple and sessile ................................................................................................................. 14

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 gla-
brous 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*

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*
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 angulate. 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 9.5–11.0 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 linear, 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 sub-sessile 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.
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): Kovisberge (–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), *Gies & 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 (Wuppertal): Oudekraal farm between Ramkraal and Ouskraal, Cederberg (–AD), *Koekemoer 2467* (PRE). Precise locality unknown: Nautilus, *Kinges 2580* (PRE); Summit of Kortderm, *Williamson 3376* (BOL).


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 trifoliolate, 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, Oranjemund 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 Rabomond 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 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 mibi’. 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 decuins 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 1.5–2.0 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, calcite 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 Boegoebberg, Bogenfels, Pomona, Chamaids 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. **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 4.5–5.5 × 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 (–DB), Seely & Ward 54 (WIND); Spencer Bay (–DB), Gies & 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), Aocks 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 & Pbleman 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); Völk 12825 (WIND); Wall s.n. (S); 13 mls [20.92 km] east of Lüderitz, road to Aus, Grasplatz (–CA), Anger Pequena (–CA), Marloth 4663 (NBG, PRE); Schenk 9 (PRE); Lüderitz lagoon (–CA), Merxmüller & Giess 3133 (WIND); Lüderitz, just outside township (–CA), Müller & Jankowitz 275 (WIND); Essy Bay (–CA), Strohbach 151 (WIND); Lüderitz Bay, Halbinsel (–CA), Walter 56 (WIND); Wondt s.n. (WIND 2 sheets); Aus (–CB), Regius 23 (WIND); Grasplatz (–CA), Merxmüller & Giess 3052 (PRE, WIND); Venter 9160 (PRE). 2715 (Bogenfels): Pomona (–AB), Dinter 6336 (BM, BOL, K, NBG 2 sheets, PRE); Kelle 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), Gies & Giess 97/98/68 (J, WIND); Oranjemund (–CB), Merxmüller & Giess 2267 (BM, K, WIND); sandy area near mouth of Orange River at Oranjemund (–CB), Metekerkamp 290 (BOL); Schenk 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.
SOUTHERN AFRICA. 2816 (Oranjemund): Witbank (= DC), Pillans 5636 (BOL, K); 40 km from Port Nolloth on road to Alexander Bay (=DD), Germisbuitzen 4770 (PRE, WIND); Germisbuitzen 4771 (PRE); 32 km from Port Nolloth on road to Alexander Bay (=DD), Germisbuitzen 4813 (PRE). 2817 (Vioolsdrif): ‘ad ostia from Port Nolloth on road to Alexander Bay (=DD), 32 km (PRE, WIND); Germishuizen 4771 (PRE); Germishuizen 4770 (K, PRE); on road to Alexander Bay (=DD), Pillans 4884 (WIND); 1 km south of McDougall Bay (–BD), Cock 3428 (K); Farm Oubees 339, 1.2 km east of Elands Bay (–AB), Compton 22071 (BOL, NBG), 3018 (Hondeklipbai): 6 mls [9.65 km] southeast of Hondeklipbai (=AD), Hall 899 (BOL, NBG); Farm Oubes 339, 1.2 km east of Oues/Wildepaardehoek boundary fence and 4.7 km east of Springbok, Soebatsfontein road (–BA), Le Roux & Lloyd 670 (NBG); between Brakwater and Komaggas (=BC), Acocks 14933 (K, PRE 2 sheets); 5 mls [8.05 km] north-east of Wallekraal (=BC), 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] north-west of Wallekraal (=BC), Hall 895 (NBG 2 sheets); Wallekraal, near Hondeklipbai (=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 (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 Redelings huys (=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); Heerenloge (=DC), Esterhsy 5547 (BOL), Vanhynsdorp, foot of Nardousberge below Witbakenkop on old Clanwilliam, Vanhynsdorp road (=DC), Hilton-Taylor 1613 (NBG); western aspect of koppie on Vanhynsdorp 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 (Vredenburg): Stompneus Point (=DB), Taylor 1515 (NBG); Brittania Bay (=DB), Taylor 5216 (NBG, K, PRE); Farm Trekkoskraal (=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 Lapike to Elands Bay (=AB), Bosenberg & Rutherford 394 (NBG); Lamberts Bay (=AB), Acocks 14182 (K, PRE), Clarke 633 (K, PRE); Heenri 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); Wadrifsoorpunt (=AB), Stirton 9340 (PRE); Farm Middelpos (=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 Redelingshuys 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 Leipoldtville 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 (PB); 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 Veldrif (–CC), Boatwright et al. 138 (JRAU); road from Veldrif to Saldanha Bay (–CC), Boatwright et al. 139 (JRAU); Veldrif (–CC), Compton 15940 (NBG); Goldblatt 6016 (PRE); Lewis 899 (NBG); Mauve 5356 (K, PRE); 1 km from road between Veldrif and Vredenburg on road to Stompneusbaai (–CC), Grobbelaar 2546 (PRE); Veldrif, next to road before the bridge 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 Veldrif, on banks of Berg River (–CC), Marisch 1265 (K, NBG, PRE); ca. 6 km east of Veldrif, 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); Kaptein skloof (–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), Axelson 445 (NBG); roadside south of Langebaan village (–AA), 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).
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 Raymondo 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 trifoliolate and obovate to elliptic or oblanceolate as opposed to the simple linear to oblanceolate or spatulate 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): Kojisberge (–BB), Wall 2 (S). 2615 (Lüderitz): Angra Pequena (–BA), Marloth 4809 (PRE); Marloth 14109 (K); Kojisberge (–CB), Dinter 6292 (BM, BOL, K, NBG); Halenberg (–CB), Merxmüller & Giess 3089 (WIND). 2616 (Aus): near Aris on the Gariep (–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): 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): Klinhardt 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 (NBG); on road to Port Nolloth from Steinkopf (–AC), Boatwright et al. 150 (JRAU); sandy

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Figure 10.—Distribution of *Calobota cinerea*.
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 Vanrhynsdorp (–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 Vanrhynsdorp (–DA), Stirton 5944 (K, PRE); Farm Spes Bona, Inedendahl (–DC), Department of Agriculture 29 (PRE); Klawer (–DC), Henri 3344 (PRE); western aspect of koppie, Vanrhynsdorp road near Klawer (–DC), Lavis 20235 (BOL). 3218 (Clanwilliam): 8 km from Clanwilliam on road to Vanrhynsdorp (–BB), Boatwright et al. 136, 210 (JRAU); 5 km north of Clanwilliam (–BB), Grobbelaar 2004 (PRE); 10 km before Clanwilliam from Vanrhynsdorp (–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).
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, deltoid. 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, ±4–6-seeded, glabrous, 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 winter (April to May).

Distribution and habitat

Calobota cuspidosa occurs in the Northern 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, basifixied anther; I2, intermediate carinal anther; I3, short, dorsifixied 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 doorns (–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.

*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), Peeters, Gercke & 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 Khosie (–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): Blesmanpost (–CA), Burtt-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 Voelwag, 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.
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); Burcell 1697, Pole-Evans 22 (K, PRE); 1 ml [1.6 km] east of Griquatown (–CC), Leister 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), Leister & 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 Abrahmsdam (–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).
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 trifoliolate to rarely 5-foliolate, 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, basifixed anther; I2, intermediate carinal anther; I3, short, dorsifixed 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.
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 roadides. 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); Vlei, east of Klawer (–DA), Walters 178 (K, NBG); 17.2 km from caravan park, Clanwilliam on old road to Citrusdal (–DC), Ges 91/92/1 (GRA); 23.9 km from Clanwilliam (–DC), Ges 91/92/10 (GRA); Klawer (–DC), Lavis 29233 (BOL); 29 km from Clanwilliam to Vanrhynsdorp (–DC), Sterton 5943 (K, PRE). 3119 (Calvinia): Vanrhyns Pass (–AC), Acocks 14717 (K, PRE 2 sheets); Bond 1147 (NBG); Esterhuyzen 5312 (BOL); Schutte 286 (JRAU 2 sheets); Van Wyk 3117 (JRAU); Skuinoshoote Pass (–AC), Niemand 1 (JRAU); Nieuwoudtville, Oorstegkloof Nature Reserve (–AC), Pretorius 105 (NBG, PRE, WIND); Nieuwoudtville (–AC), Schmidt 636 (K); Meulsteenleij near Nieuwoudtville (–AC), Taylor 3942 (NBG); Lochenville, Stinkfontein Hills (–CA), Leistner 451 (NBG, PRE). 3217 (Vredenburg): Vredenburg (–DB), Grobbelaar 2549 (PRE); above Stompneus (–DB), Boosen 141 (NBG); 1 ml [1.61 km] east of Paternoster (–DD), Barker 9694 (NBG 2 sheets); Kasteelbergh (–DD), Strid & Strid 38078 (NBG). 3218 (Clanwilliam): Graaffwater (–BA), Compton 24209 (NBG); Bulshoek Barrage, Olifants River Valley (–BB), Barker 6426 (NBG 2 sheets); Clanwilliam (–BB), Bayliss BR1593 (GRA, K, PRE, S); Davidson s. n. (J); Ecklon & Zeyher 17 (NBG); Eliason 161 (J); Henrici 2105 (PRE); Leyens 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). Bakhooete next to Clanwilliam (–BB), Sterton 1995 (PRE); Nardouwskloof Farm (–BB), Sterton 9364 (PRE); Boschkloof (–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); Rondeagt River, 10 km from Algeria to Clanwilliam (–BD), Sterton 5926a (K, PRE); road-side 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 Klauer and Citrusdal (–BD), Wilman 828 (BOL); St Helena Bay, Steenberg Cove (–CA), Wisard 1710 (NBG); on road between Misverstand Dam and Velddrift (–CC), Le Roux 2 (JRAU 2 sheets); 9 mls [14.48 km] from Velddrift 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 Piqueberg Mountain complex (–DA), Goldblatt 797 (NBG, PRE, S); base of north slopes below nek at head of Kapteinskloof, Piqueberg (–DA), Pillans 7701 (BOL); Het Kruis (–DA), Stephenson & Glover 8686 (BM, NBG 2 sheets, K, PRE); Kapteinskloof (–DA), Sterton 6133a (K, PRE); near Warmbad (–DB), Hutchinson 1132 (BM, BOL, K, PRE); Olifants River Valley (–DB), Marloth 7121 (PRE); Piekeneierskloof Pass (–DB), Van Wyk 3219 (JRAU); 3 km south of Piqueberg (–DC), Ibbenfeldt 1023 (PRE); 3 mls [4.83 km] from Piqueberg up Versfeld Pass (–DC), Thompson 762 (K, NBG, PRE); outside Piqueberg (–DC), Thorne s. n. (NBG); Piqueberg (–DD), Bolus 13536 (BOL, PRE 2 sheets); Grant 4714 (PRE); Guttrie 2584 (NBG); Schlechter 5233 (BM, BOL, K); Schlechter s. n. sub TRV 3377 (PRE); roadside near Piqueberg (–DD), Hafstrom & Acocks 3212 (PRE 2 sheets, S); 3 km south of Piqueberg (–DD), Ibbenfeldt 1023 (PRE); 2 mls [3.22 km] along Piqueberg to Velddrift road (–DD), Marsch 795 (NBG, PRE). 3219 (Wuppertal): pass into Biedouw Valley, 6.2 mls [9.98 km] from turnoff from Clanwilliam–Calvinia road (–AA), Marsch 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); Cedarberg State Forest, Grootskloof (–AC), Andrag 272 (NBG, PRE); Nieuwoudt Pass (–AC), Barnes s. n. (BOL); Olifants
River near Algeria (–AC), Boatterwright 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), Vivers 510 (NBG, PRE); Brakfontein (–AD), Ecklon & Zeyher 1332 (K, PRE, S); south of Trekkoel Pass (–AD), Louw 2942 (NBG); Wuppertal (–AD), Thode A1987 (K, PRE); Tboone 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):** Riebeek Wes (–BD), Coffer s.n. (NBG); Riebeek Castle (–BD), Droge s.n. ‘III, D, a’ (BM, K, S); Pillans 9788 (BOL); Stark & Co. s.n. (BOL).

**3319 (Worcester):** Farm Welbedacht, Biedouw Valley (–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), Mane & Oliver 136 (NBG, PRE); Hex River Pass (–BD), Elvion 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), Cipodo 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 & Benson 7 (NBG 2 sheets, PRE); Olivier 101 (NBG); Van Reda & Joubert 2177 (K); Farm Vrolkhied, 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); Dobre 52 (NBG); Niemand 14 (JRAU); Van Wyk 1408a (JRAU); Fairy Glen, lower slopes of Brandwag Mountains (–CB), Stirton 9143 (PRE); Brandwag, 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), Mass 6798 (BM, J), Schmidt s.n. (NBG); Stettyns (–CD), Van Rensburg 386 (K, NBG 2 sheets, PRE); Farm Doringkloof, southern foothills of Voetpadberg (–DA), Morley 506 (NBG); Hex River Kloof (–DA), Sidey 1878 (PRE, S 2 sheets); Farm Doringkloof, foothills of Voetpadberg (–DA), Van Wyk 66 (NBG, PRE, UPS); Jo-naskop (–DC), Baylis 839/228 (K, PRE); on plains between Assegai Kloof and Breede River (–DC), Bowie s.n. (BM); Robertson (–DD), Levens 2812 (BOL); Vrolkhied Nature Reserve (–DD), Van der Merwe 2949a (K, PRE).

**3320 (Montagu):** Kogmanskloof (–CC), Court 399 (GRA), Gillett 421 (BOL); Mundt s.n. (K); Bonnievale, hills of Boekeveld beds (–CC), Marloth 11811 (NBG 2 sheets, PRE); 5 km before Montagu (–CC), Van Wyk 544 (NBG, PRE); Goudmyn, between Bonnieville and Robertson (–CC), Van Wyk 2705 (JRAU); Olifantsberg (–CC), Vivers 422 (NBG 2 sheets, PRE); Scheepersrus (–CD), Johnson 147 (NBG 2 sheets, PRE); 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), Hafstrom & Asocks 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 Nierek 582 (K); top of Wildehondskloof Pass (–DC), Van Wyk 2651b (JRAU).

**3321 (Ladismith):** Gamka Mountain Reserve, alongside road to Paardebon (–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), Beselaar s.n. (NBG); along roadside from Oudtshoorn to De Rust (–CA), Boatterwright et al.
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).


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.
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**

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, sub sessile, 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, sub sessile 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 south wards 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 river beds 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 Har develd (SKn 4 Namaqualand Heuweltjieveld)
Figure 17.—Morphology of Calobota halenbergensis. 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), Strohbach 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 Bay (–AB), Poirie 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); Namib-Naukluft, 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), Wendl 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), Giss 14639 (WIND); Wiss 2059 (WIND 3 sheets); Zebrafontein (–DD), Merxmüller & Giss 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), Giesca 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 Grootdern (–BC), Venter 81759 (PRE); Numees (–BD), Jürgens 22149 (PRE); McDonald 739 (NBG, PRE); Annisvlakte (–BD), Jürgens 22322 (PRE); Oranjemund (–CB), Merxmüller & Gies 2266 (BM, K, PRE, WIND); 70 km north of Oranjemund (–CB), Williamson 4900 (WIND); 38 mls [61.14 km] north of Port Nolloth, on road to Alexander Bay (–DA), Wörger 5318 (K); Goarief-Passage (–DB), Jürgens 22485 (PRE); Goariefvlakte (–DB), Jürgens 23119 (PRE); near Doringbank, between Lekkerfontein and Kuboes (–DB), Van Wyk 2836 (JRAU, 4 sheets); Holgat River (–DB), Wisnur 2499 (NBG); Sukkel (–DD), Jürgens 22739 (PRE); between Port Nolloth and Holgat (–DD), Pillans 5713 (K). 2817 (Vioolsdrift): 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 Wildepaardenrandt (–CA), Thompson & Le Roux 288 (K, NBG); Eksteenfontein (–CA), Venter 8053 (PRE); 5 mls [8.05 km] west of Stinkfontein (–CC), Leister 3549 (K, WIND); Lekkerfontein (–CC), Thorne s.n. (NBG); 7 mls [11.26 km] beyond Stinkfontein on way to Kuboos, near Skouerfontein (–CC), Wörger 431 (K, PRE, WIND); Blomhoek, 5 km from Eksteenfontein on road to Kubus (–DD), Germiswissen 4723 (PRE).

2916 (Port Nolloth): 16 km north of Port Nolloth on road to Alexander Bay (–BB), Germiswissen 5315 (BOL, PRE); 38 mls [61.14 km] east by south of Port Nolloth (–BD), Acocks 14236 (K, PRE 2 sheets); Port Nolloth (–BD), Bulas 427 (BM, BOL, K, NBG, PRE, UPS); 2 mls [3.22 km] east of Port Nolloth (–BD), Marlborough 1216 (NBG, PRE); between Port Nolloth road and Stinkfontein (–BD), Middlemost 2129 (NBG 2 sheets, S); 25 mls [40.23 km] after Anenous Pass (–BD), Schledter 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 Eksteenfontein (–AB), Goldblatt & Manning 9284 (NBG); on road to Port Nolloth from Steinkopf (–AC), Boatwright et al. 149, 190 (JRAU); Anenous Pass (–BA), Germiswissen 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), Compont 22796 (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 (–CA), Grobbelaar 1962 (PRE); Farm Langhoogte on Port Nolloth turn-off from Springbok–Kleinsee road just north of waterpipe (–CB), Le Roux 3959 (NBG); Spektakel (–DA), Compont 11508 (NBG, PRE); Esterhuyzen s.n. sub PRE 32706 (PRE); bottom of Wildepaardehoek Pass (–DC), Van Jaarsveld 192 (PRE). 2918 (Gamopo): Karuchab [Arragaab], Richtersveld (–BB), Herre s.n. sub STE 11887 (NBG); Karuchabpoort, Lekkerlag (–BB), Oliver, Tölken & Venter 142 (PRE). 3017 (Hondelklipbaai): Farm Koingnaas 475 on road from Hondelklipbaai to Koingnaas (–AB), Le Roux & Lloyd 535 (NBG); ca. 6 km north of Koingnaas 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 Hondelklipbaai (–BC), Boatwright et al. 146 (JRAU); Wallekraal, between Garies and Hondelklipbaai (–BC), Compont 5485 (BOL, NBG); Wallekraal (–BC), Pillans 15790 (BOL); 5 km from Wallekraal to Garies (–BC), Storiton 6053 (K); Horres, ca. 30 mls southwest of Kamieskroon (–BC), Van Breda 4058 (PRE); Farm Sandkraal, 40 km west of Garies (–DA), Hilton-Taylor 1371 (NBG, PRE); 12.9 km from Garies–Hondelklipbaai road on road to Soutfontein, Farm Sandkraal (–DA), Steiner 2172 (NBG, PRE); in red sand near Garies (–DB), Esterhuyzen s.n. (K, NBG 2 sheets, PRE). Precise locality unknown: between Port Nolloth and Augrabies Poort, Bulas 6457 (K); Doornpoort, Compont 20633 (NBG 3 sheets); Kalkfontein, near river, Marlborough 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).


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 spathulate, 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**

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).

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 trifoliolate 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, conuplicate, 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 sub sessile 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*. 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 ± 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*.

**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 Roodeheuwel, 9 km west of Nariep (–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).

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

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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!).

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

2318 (Leonardville): Farm Rietfontein (–CA), Leipert 4537 (WIND). 2516 (Helmeringhausen): Farm Arub 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).
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 unifoliolate or rarely trifoliolate, deciduous; petiole short, 0.5–1.0 mm long (up to 5 mm long when trifoliolate); 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 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.
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 & Zeyber 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), *Burtt-Davy 9665* (PRE). 3225 (Somerset East): Cradock (–BA), *Botany Honours Students 320* (PRE, PRU); Somerset East, farm Koboega (–DA), *Bayliss 6897* (K, S). 3324 (Steyterville): 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); Perdepoort (–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), *Brynard 445* (K, PRE); 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), *MaxOwen 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).
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 unifoliolate or rarely trifoliolate, deciduous; petiole short, 0.5–2.0 mm long (up to 5 mm long when leaves are trifoliolate); 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, membraneous, 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, 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, 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 spathulate. In both these species the ovary and pods are glabrous).

The specimen *Thunberg s.n. sub THUNBERGUPS 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 erioluta* 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 (Ladyshmith): Farm Withoek (–AC), Van Wyk 2154 (JRAU); road from Seweweeks Poort (–AD), Levyns 2334 (BOL); Touwsberg, farm Rietfontein (–CA), Germishuizen 6956 (PRE); Touwsberg, farm Wolwefontein (–CA), Van Wyk et al. 3447 (JRAU, PRE). 3322 (Outshoorn): 14 mls [22.5 km] east of Prince Albert (–AA), Sidey 1906 (PRE, S); Swartberg Pass (–AC), Bond 1537 (NBG, 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 Ew0151 (K); Meiringspoort (–BC), Boatwright et al. 106 (JRAU), Levyns 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 mls [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); Piet-se-laagte on road to Uniondale (–CA), *Van Wyk 3180* (JRAU); dirt road between De Rust and Uniondale (–CA), *Van Wyk 3252* (JRAU).
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 spatulate 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 saharae*. 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: Keith 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 Seffisifa, Cosson *s.n. sub K 000227005* (K); Oran Province, Abiod-Sisi-Cheikh, 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-Rhnem, Davis 49544 (K); Jebel, north of Jefren, Keith 181 (K).


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 trifoliolate; 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.
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. *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): Kodaspiek (–AA), *Oliver et al.* 451 (K, NBG); Vandersterrberg northeast of Khubsus north and southeast of the top of Helskloof and southeast of Paradyseberg western slopes to summit (–AC), *Oliver et al.* 151 (NBG, K, PRE); Vioolsdrif, Ridge above Koeskop, summit of Vandersterrberg, Richterveld National Park (–AC), *Williamson & Williamson* 5764 (NBG); Cornellsberg (–CA), *Bean* 1258 (BOL); *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 STE 9068 (NBG); Aenous Pass (–BA), Germishuizen 4839 (PRE, WIND); Schutte 591 (JRAU 2 sheets); Van Wyk 6266 (PRE); Spitskop, 6 ml [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), Eliason 37 (NBG); 25 km from Springbok towards Spektakelberg Pass (–DA), Glen 1463 (BOL, PRE); Spektakel Pass (–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 ml [14.81 km] southeast by east of Springbok (–DB), Acocks 19237 (K, PRE); 8.5 ml [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 ml [3.22 km] northeast of Springbok (–DB), Compton 22012 (NBG); Concordia, near Springbok (–DB), Clarke 687 (PRE); Thorn s.n. (NBG); just outside Nababeep on road to O’kiep (–DB), Germishuizen 4515 (PRE); Nababeep (–DB), Gass & Gass 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 ml [3.22 km] north of Springbok (–DB), Lewis 3392 (NBG); Schelphe 240 (BM, BOL); 4 ml [6.44 km] west of Springbok (–DB), Macquarie 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 ml [24.14 km] north of Springbok (–DB), Schleben 9059 (BM, K, PRE); Springbok T’Karoepe, 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 ml [8.05 km] north of O’kiep (–DB), Van der Schijff & Schweickerd 5744 (K, PRE); 2 ml [3.22 km] north of Springbok (–DB), Van Nickerk 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 Komagga (–DC), Eliason 69 (J); north slopes of Rooiberg above Buffels River on eastern approach to the Messelpad (–DC), Hilton-Taylor 2140 (NBG, PRE), ca. 11 km from Springbok on sand road to Hondeklopbai (–DC), Joffe 96 (NBG, PRE); on road to Hondeklopbai, 18 ml [28.96 km] from turn-off from national road to Springbok (–DC), Van der Merwe 215 (NBG); 29 ml [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), Powrie 652 (NBG 2 sheets, PRE); 30 ml [48.27 km] south of Springbok (–DD), Rynolds 5440 (K); 20 ml [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 (Hondeklopbai): Diknek (–AD), Van Breda 4073 (PRE); Farm Doornfontein 464, Portion 1, Steenkamp Kral (–BA), Le Roux 4555 (NBG); on road to Leliofontein from Kamieskroon (–BB), Boatwright et al. 219 (JRAU); Grootvlei, hillsides, Kamieskroon (–BB), Compton 6839 (NBG); Skilpad Wild Flower Reserve, 100m from house (–BB), Cruze 85 (NBG); Studer Pass (–BB), Evard 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), Wisun 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), Leeuws 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 Lellefontein (–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 Kopp 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), Selpele 131 (BM, BOL, K); Nuwerus (–AB), Steyn 472 (NBG); Vanhynsdorp (–DA), Van der Byl s.n. sub STE 17419 (NBG); top of Klein Kobee Pass (–DB), Manning s.n. (K, NBG 2 sheets); Klipmuts (–DD), Schlechter 375 (BOL). 3119 (Calvinia): Bottom of Vanrhyns 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); Zeyer 400 (K 2 sheets, S); north of Darters Grave, Maguire 296 (NBG); Namaqualand, Scully 7 (BM).
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 trifoliolate; 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 suborbicular 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: Koekemoer 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 pubescence of the ovary and fruit:

**FORM A** (typical or hairy-fruit 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; 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 calcareous 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), Wilmann 383 (BOL, NBG, PRE). 2516 (Helmeringhausen): Grootfontein MAL 91 (–BB), Volk 12875b (WIND). 2618 (Keetmanshoop): west of Gellap-Ost 15 km northwest of Keetmanshoop (–CA), Maggi 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 (Chamaites): south of Lowen River, at Gawachab (–BB), Pearson 4098 (BM, K); Wegdraai, Hottentots Plateau (–CB), Helary & Batault 202 (WIND). 2719 (Tränental): Farm Blinkoog (–CA), Walters & Wiltu 2403 (WIND); Farm Nuwerus (–CB), Giess et al. 7125 (WIND); Farm Goedemoed (–DD), Strobach et al. 3000 (WIND). 2818 (Warmbad): Ramandrift (–CD), Pearson 4046 (BM). 2819 (Arimsvlei): 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 (Olifantschoek): 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), Davide 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).
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Strelitzia


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A taxonomic revision of the genus *Callobota* Eckl. & Zeyh. (Fabaceae, Crotalariaceae) is presented. Sixteen species are recognised in the genus. Among these, *Callobota 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 *Callobota* from other genera of the tribe Crotalariaceae. 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*. *Callobota* 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. psylopha* (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.