

A revision of *Lebeckia* sect. *Lebeckia*: The *L. sepiaria* group

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Abstract

The type section of the genus *Lebeckia* (sect. *Lebeckia*) comprises 12 species with simple, acicular leaves, all endemic to the Cape Floristic Region. As a first step towards a revision of the section *Lebeckia*, a detailed study was made of the species with terete or subterete fruits (*L. sepiaria* and related species). Analyses of the vegetative and reproductive morphology showed that four species should be recognised: *L. sepiaria* (L.) Thunb., *L. ambigua* E. Mey., *L. gracilis* Eckl. and Zeyh. and *L. brevicarpa* M. M. le Roux and B.-E. van Wyk sp. nov. Last-mentioned has been confused with *L. sepiaria* (hitherto wrongly known as *L. simsiana* Eckl. and Zeyh.) but is easily distinguished by its ovoid, few-seeded pods and restricted distribution in the Cedarberg Mountains. The diagnostic characters, correct nomenclature and typification, as well as descriptions and distribution maps are presented.

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1. Introduction

The genus *Lebeckia* Thunb. (Fabaceae) is the last remaining genus of the predominantly African tribe Crotalariaeae that has not been revised in recent years. The genus comprises some 33 species that are all endemic to the western parts of southern Africa (see map in Van Wyk, 1988).

Harvey (1862) revised this genus and followed Bentham (1844) by dividing it into five sections, namely *Stiza* Benth., *Phyllodiastrum* Benth., *Eu-Lebeckia* Benth., *Calobota* Benth. and *Viborgioides* Harv. The distinction between the species was mainly based on leaf type (trifoliolate or unifoliolate), length of the leaf, inflorescence structure (terminal or ending in a naked, spiny point), length of the wing petals compared to the length of the keel and especially the legume shape (flat or terete).

The 12 species of section *Lebeckia* are easily distinguished from all other species of the genus by their acicular (needle-shaped) leaves (often articulated near the middle) but they are often confused with one another and are often misidentified.

As a first step towards a comprehensive taxonomic revision of *Lebeckia* section *Lebeckia* (syn. *Lebeckia* section *Phyllo-*

diastrum and *Lebeckia* section *Eu-Lebeckia*), a revision of the type species, *Lebeckia sepiaria* (L.) Thunb. and its three close relatives, is presented here. These four species differ from others of the section in their ± sessile, terete or semi-terete pods. One of them turned out to be a new species, here described as *Lebeckia brevicarpa* M.M. le Roux and B.-E. van Wyk.

2. Materials and methods

Herbarium specimens from the following herbaria were studied (abbreviations according to Holmgren et al., 1990): BOL, NBG, P, PRE, S and SAM. Regional variation in morphology was studied by sorting the material into several regional forms that served as operational taxonomic units. These were: *Lebeckia gracilis* Eckl. and Zeyh.: OTU 1 (Bredasdorp form), OTU 2 (Port Elizabeth form); *Lebeckia ambigua* E. Mey.: OTU 1 (Namaqualand form), OTU 2 (Nieuwoudtville form), OTU 3 (Clanwilliam form), OTU 4 (Saldanha Bay form); *L. brevicarpa*: OTU 1 (Pakhuis Pass form), OTU 2 (Algeria form); *L. sepiaria* (L.) Thunb.: OTU 1 (Clanwilliam form), OTU 2 (Worcester form), OTU 3 (Stellenbosch form), OTU 4 (Swellendam form). A dissection microscope (WILD M3Z) with a *camera lucida* attachment was used to examine and draw the reproductive and vegetative morphology (all drawings were done by the first author).

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3. Results and discussion

3.1. Morphology

Lebeckia section *Lebeckia* is characterised by glabrous, simple, unifoliolate and acicular leaves that are spirally arranged on the branches and are often articulated near the middle. Stipules are absent. Extreme reduction in stipule size is common in the *Crotalariaeae*, but in *Lebeckia* there is typically a total absence of stipules except in one species (*L. wrightii*).

All four species in the *L. sepiaria* complex are resprouting suffrutices with multiple, virgate stems and terminal racemes (Fig. 1). All four species may reach a height of 0.8 m, but the Bredasdorp form of *L. gracilis* is characteristically smaller (up to 0.3 m).

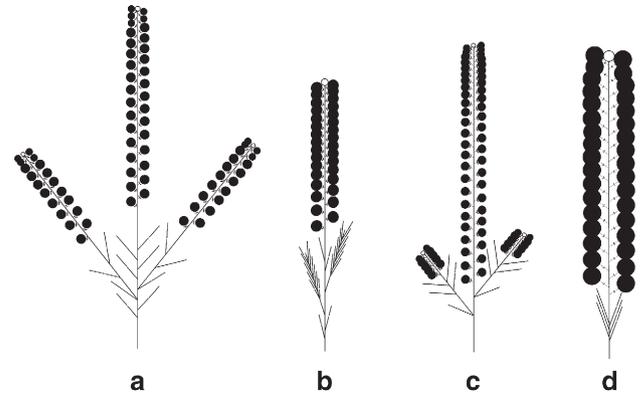


Fig. 2. Diagrams of inflorescence structure and relative flower size in the *Lebeckia sepiaria* group: (a) *L. ambigua*; (b) *L. brevicarpa*; (c) *L. gracilis*; (d) *L. sepiaria*. Scale bar: 10 mm.



Fig. 1. Growth form (habit) and fruit shape in the four species of the *Lebeckia sepiaria* group: (a) *L. ambigua* (Namaqualand form, photo taken at Klawer); (b) *L. brevicarpa* (Pakhuis Pass); (c) *L. gracilis* (Bredasdorp form, taken at Still Bay); (d) *L. sepiaria* (Clanwilliam form; photo taken at Elandskloof); (e) fruit and flowers of *L. ambigua* (Clanwilliam); (f) fruit of *L. brevicarpa* (Pakhuis Pass); (g) fruit of *L. gracilis* (Still Bay); (h) fruit of *L. sepiaria* (Clanwilliam form, photo taken at Citrusdal). All photos by B.-E. van Wyk.

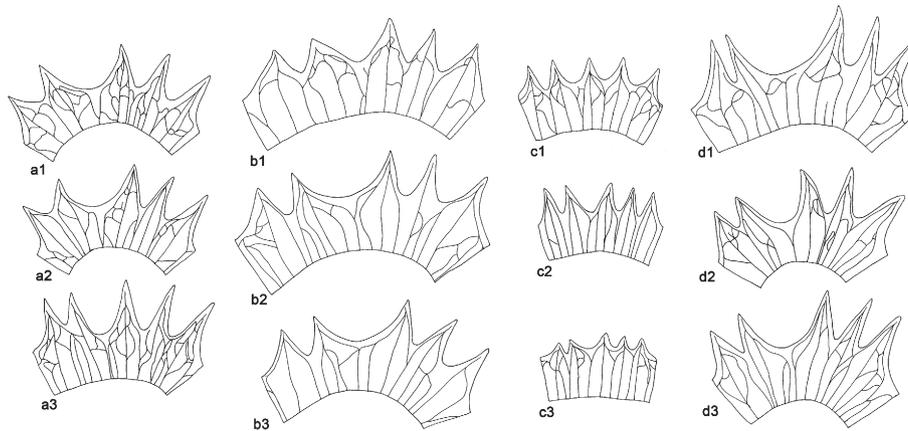


Fig. 3. Calyces of the *Lebeckia sepriaria* group showing variation in size and structure (calyces are opened out with the upper lobes to the left): (a) *L. ambigua*; (b) *L. brevicarpa*; (c) *L. gracilis*; (d) *L. sepriaria*. Vouchers: (a1) from Rossouw 18619 (NBG); (a2) from Barker 9781 (NBG); (a3) from Boucher 2946e (NBG); (b1) from Bolus 23854 (BOL); (b2) from Van Wyk 2550 (JRAU); (b3) from Schutte 261 (JRAU); (c1) from Bohnen 7617 (NBG); (c2) from Patterson 773 (BOL); (c3) from Esterhuysen 23259 (BOL); (d1) from Anon 252 (NBG); (d2) from Marloth 6240 (NBG); (d3) from Barker 6515 (NBG). Scale bar: 1 mm.

The length and density of leaves and the position of the articulation have been studied in detail (Le Roux, 2005) but are not of diagnostic value to distinguish between the species.

The inflorescence in the *L. sepriaria* group is invariably a terminal multi-flowered raceme but there are subtle differences between species as shown diagrammatically in Fig. 2. In *L. ambigua* (Fig. 2a), the stems are invariably branched, resulting in a few (2–3) lateral branches that also bear terminal (but shorter, fewer-flowered) racemes. The same pattern is observed in *L. gracilis* (Fig. 2c). The flowers in these two species are somewhat smaller than those of *L. brevicarpa* and *L. sepriaria*. The stems of the last-mentioned species are almost invariably unbranched (Fig. 2d), while those of *L. brevicarpa* (Fig. 2b) may have lateral branches (but these never form inflorescences). Differences in inflorescence structure are easily observed *in situ*, but herbarium material is sometimes inadequate for diagnostic purposes.

Bracts and bracteoles are invariably simple, sessile and glabrous. The bracts are deciduous, attached at the base of the pedicel and usually have a median vein. The bracts of *L. brevicarpa* are much longer (6–7 mm) than the bracts of the other three species (1.5–3 mm). A pair of narrowly trian-

gular, acuminate bracteoles is invariably present near the middle of the pedicel in all four species.

The calyx of *L. gracilis* tends to be equally lobed, while those of *L. ambigua*, *L. brevicarpa* and *L. sepriaria* are subequally lobed but the upper lateral sinuses much wider (not shallower) than the medial sinus and the lower lateral sinuses (Fig. 3). In all four species, the calyx teeth are as long as or shorter than the tube but diagnostically shorter in *L. gracilis* (Fig. 3). The lobes are deltoid, acute and the tips are minutely pubescent on the inside in all four species. The two upper lobes are often slightly shorter than the three lower lobes. The calyx morphology is therefore of some value in the identification of the species.

The standard petal has some diagnostic value to distinguish *L. gracilis* — much smaller, with a long claw, which is often almost as long as the (rather small) lamina. The wing petals of the four species are similar in shape — oblong with an obtuse apex. *L. gracilis* and *L. brevicarpa* always have the wings as long as or longer than the keel. The wings in *L. sepriaria* are invariably shorter than the keel. *L. ambigua* shows some regional variation in its wing petal length. Populations in the north (that have curled fruit) often have wings shorter than the keel, but in southern populations the wings are always as long as or longer than the

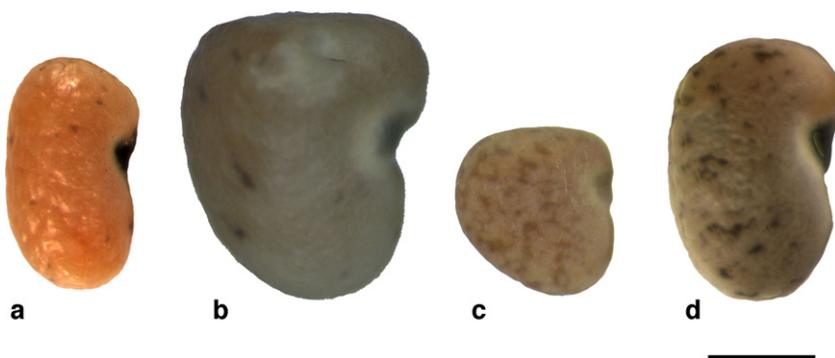


Fig. 4. Seeds of the *Lebeckia sepriaria* group showing the size, shape and colour: (a) *L. ambigua*; (b) *L. brevicarpa*; (c) *L. gracilis*; (d) *L. sepriaria*. Vouchers: (a) from Van Wyk 2900 (JRAU); (b) from Van Wyk 3123 (JRAU); (c) from Leighton 1894 (BOL); (d) from Campbell and Van Wyk s.n. (JRAU). Scale bar: 1 mm.

keel. The size and length of the wing relative to the keel therefore have some diagnostic value. There are no obvious differences in petal sculpturing. The keels of the four species are similar in shape — rostrate (beaked) in all but less so in *L. gracilis*. Pockets are usually present in *L. ambigua* and *L. sepiaria*, sometimes in *L. gracilis* but usually absent in *L. brevicarpa*. *L. gracilis* can be distinguished by its short (6 mm long), more obtuse keel.

The anthers of all four species are dimorphic and differentiated into five elongate, basifixed and five short, dorsifixed anthers (5+5 arrangement).

The gynoecium has some diagnostic value, especially since fruiting material is not always available. *L. brevicarpa* differs from the other three species in its shortly stipitate ovary with fewer (6–10) ovules (sessile or subsessile with about 14–18 ovules in the other three species). The style of *L. gracilis* is much shorter than the ovary (only slightly shorter in the other species).

The shape and size of fruits are known to be the most useful diagnostic characters to distinguish between *Lebeckia* species (Dahlgren, 1963; Polhill, 1976). This is also true for the *L. sepiaria* group (Fig. 1). The four species all have terete to semi-terete fruits (a diagnostic feature for the group — other groups in the sect. *Lebeckia* have laterally compressed fruits). *L. pauciflora* Eckl. and Zeyh. and *L. grandiflora* E. Mey. also have somewhat terete fruits but in these two species the fruits are markedly stipitate and longer than in all other species with stipes — typically more than 70 mm long. They are dehiscent and thin-walled in *L. gracilis* and *L. ambigua* but indehiscent and thick-walled (and spongy in texture) in *L. brevicarpa* and *L. sepiaria*. Fruits of *L. brevicarpa* differ markedly from those of the other three species in their ovoid shape and small number (1–3) of seeds. The fruits of *L. sepiaria* and *L. gracilis* are similar in size and shape but they are terete with inconspicuous sutures in the former and somewhat laterally compressed with distinct sutures in the latter. The fruits of *L. ambigua* vary from linear to strongly falcate and they are easily distinguished by the very narrow width (up to 2 mm wide).

Seeds are not always available but they seem to be diagnostically different in the four species (Fig. 4). The seeds are all slightly rugose but they differ markedly in shape, size and colour. Those of *L. ambigua* and *L. sepiaria* are oblong, while those of *L. gracilis* and *L. brevicarpa* are more rounded. The last-mentioned species have much larger seeds than the other three — up to 3×2.2 mm (Fig. 4). Geographical variation (especially in colour patterns) is unknown, but there is clearly a relationship between the size and shape of seeds and the size and shape of fruits.

Although superficially similar, the four species which are revised below can easily be distinguished by a combination of morphological characters even if their diagnostically different fruits are not available.

3.2. The section *Lebeckia*

Lebeckia Thunb. section *Lebeckia*. Type: *L. sepiaria* (L.) Thunb., chosen by Hutchinson in Gen. Flow. Pl.: 358 (1964).

Spartium L., Pl. Rar. Afr.: 91 (1760), Sp. Pl.: 995 (1764), Gmelin, Syst. Nat. 2 (2): 1088 (1792), *pro parte*.

Lebeckia Thunb., Prod. Pl. Cap.: 122 (1800), Fl. Cap.: 561 (1823), *pro parte majore*; Eckl. and Zeyh., Enum.: 192 (1836), *pro parte majore*; E. Mey. in Linnaea 7: 155 (1832), Comm. Pl. Afr. Austr. 1: 34 (1836), *pro parte majore*.

Sarcophyllum E. Mey. in Linnaea 7: 155 (1832), Comm. Pl. Afr. Austr. 1: 34 (1836).

Eu-Lebeckia Benth. in Hook., Lond. J. Bot. 3: 358 (1844), *synon. nov.*

Phyllodiastrum Benth. in Hook., Lond. J. Bot. 3: 358 (1844), *synon. nov.*

Erect to prostrate, slightly to markedly glaucous suffrutices. Leaves simple, acicular, glabrous, sparse or dense, spirally arranged, often articulated near the middle, mucronulate. Inflorescences terminal, short or elongate, laxly to densely many-flowered; rachis usually furrowed; flowers small or large (6–18 mm long), yellow; bracts ovate to lanceolate, acuminate, caducous; bracteoles narrowly triangular, acuminate. Calyx equally to subequally lobed, lobes deltoid, ± as long as the tube, tips minutely pubescent on the inside. Petals yellow, sometimes fading to orange or rarely purple (*L. longipes*), invariably totally glabrous. Standard lanceolate to orbicular; apex obtuse. Wings oblong; apex obtuse; sculpturing present or absent. Keel rostrate, pockets sometimes present. Stamens fused into an open sheath, upper third free; anthers 10, 5 oblong and basifixed, 5 short and dorsifixed (vexillary stamen only slightly shorter than long anthers). Pistil sessile to markedly stipitate; ovary oblong to linear; ovules ±6–20; style shorter than the ovary, curved upwards. Pods linear or ovoid, straight or slightly deflexed, up to 12 mm wide. Seeds reniform.

3.2.1. Diagnostic characters

Species of *Lebeckia* section *Lebeckia* differ from all other species in the genus by their needle-like leaves, which are terete (never flat).

3.2.2. Distribution

Lebeckia section *Lebeckia* (and also the *L. sepiaria* group) are endemic to the Cape Floristic Region, from Namaqualand to Port Elizabeth.

Key to the species of *Lebeckia* section *Lebeckia*

1a. Keel spirally twisted:	
2a. Fruit up to 50 mm long; short-lived fireweed; flowers 1–3 per inflorescence	<i>L. wrightii</i>
2b. Fruit 60–120 mm long; perennial herb; flowers more than 5 per inflorescence	<i>L. pauciflora</i>
1b. Keel not twisted:	
3a. Calyx teeth longer than the tube	<i>L. grandiflora</i>
3b. Calyx teeth shorter than the tube:	
4a. Leaves articulated near the middle:	
5a. Fruit long-stipitate (stipe 10–20 mm long); flowers very widely spaced on rachis	<i>L. carnosa</i>
5b. Fruit sessile or short-stipitate (stipe less than 5 mm long), flowers usually densely spaced on rachis (if somewhat widely spaced, then the fruit is flat):	
6a. Fruit ovoid (up to 13 mm long)	<i>L. brevicarpa</i>
6b. Fruit oblong to linear (more than 15 mm long):	

(continued on next page)

7a. Fruit oblong (up to 6x longer than wide), flat, upper suture with distinct margin or wing:	
8a. Flowers 6–11 mm long;	<i>L. meyeriana</i>
fruit 20–35 mm long	
8b. Flowers ca. 15 mm long;	<i>L. macowanii</i>
fruit ± 50 mm long	
7b. Fruit linear (more than 10x longer than wide), terete or semi-terete, upper suture without a margin or wing:	
9a. Flowers usually up to 8 mm long;	<i>L. gracilis</i>
upper lateral sinuses of calyx ± as wide as medial sinus and lower lateral sinuses; southern coastal distribution from Bredasdorp to Port Elizabeth	
9b. Flowers more than 9 mm long; upper lateral sinuses of calyx much wider than medial sinus and lower lateral sinuses; western coastal distribution from Namaqualand and inland to the Cedarberg and eastwards to Heidelberg:	
10a. Fruit dehiscent, not spongy, subterete, ± 2 mm wide, sometimes falcate	<i>L. ambigua</i>
10b. Fruit indehiscent, spongy, terete, more than 4 mm wide, straight, often somewhat torulose	<i>L. sepiaria</i>
4b. Leaves not articulated:	
11a. Fruit long-stipitate (stipe 15 mm or longer)	<i>L. longipes</i>
11b. Fruit sessile or short-stipitate (stipe up to 5 mm long)	<i>L. plukenetiana</i>

Within the section *Lebeckia*, there are four species groups:

- (1) the *L. sepiaria* group — four species with terete or semi-terete, ± sessile pods and a generally erect, virgate habit (Fig. 1).

- (2) the *L. plukenetiana* E. Mey. group — five species with stipitate, flat pods of up to 75 mm long.
 (3) the *L. wrightii* (Harv.) Bolus group — one species — a short-lived fireweed with stipules and flat pods.
 (4) the *L. pauciflora* group — two species with relatively long calyx lobes and linear, stipitate, semi-terete pods of more than 70 mm long.

4. Revision of the *L. sepiaria* group

4.1. *L. ambigua*

L. ambigua E. Mey., Comm. Pl. Afr. Austr. 1: 34 (1836), *pro parte majore*; Benth. in Hook., Lond. J. Bot. 3: 357 (1844); Harv. in Harv and Sond., Fl. Cap. 2: 86 (1862); Goldblatt and Manning, Cape Plants, Strelitzia 9: 493 (2000). Type: South Africa, “Uienvally” [near Clanwilliam, 3218 BB], Drège *s.n.* (“III, A, c”) (P!, the specimen on the right hand side of the sheet, lectotype designated here; S!, isosytype) and Saldanha Bay [3318 AA], Drège *s.n.* (“III, E, b”), (P! isosytype).

Erect, glaucous suffrutex, up to 0.8 m in height. *Leaves* simple, acicular, articulated near the middle; leaf density 2–5 per 10 mm length of stem. *Inflorescences* terminal, 90–350 mm long; rachis smooth; flowers numerous, relatively sparse (3–5 per 10 mm length of rachis), intermediate in size (7–10 mm long); pedicel 2–3 mm long; bract narrowly lanceolate, acuminate, 2.0–3.5 mm long; bracteoles narrowly triangular, acuminate, ± 1 mm long.

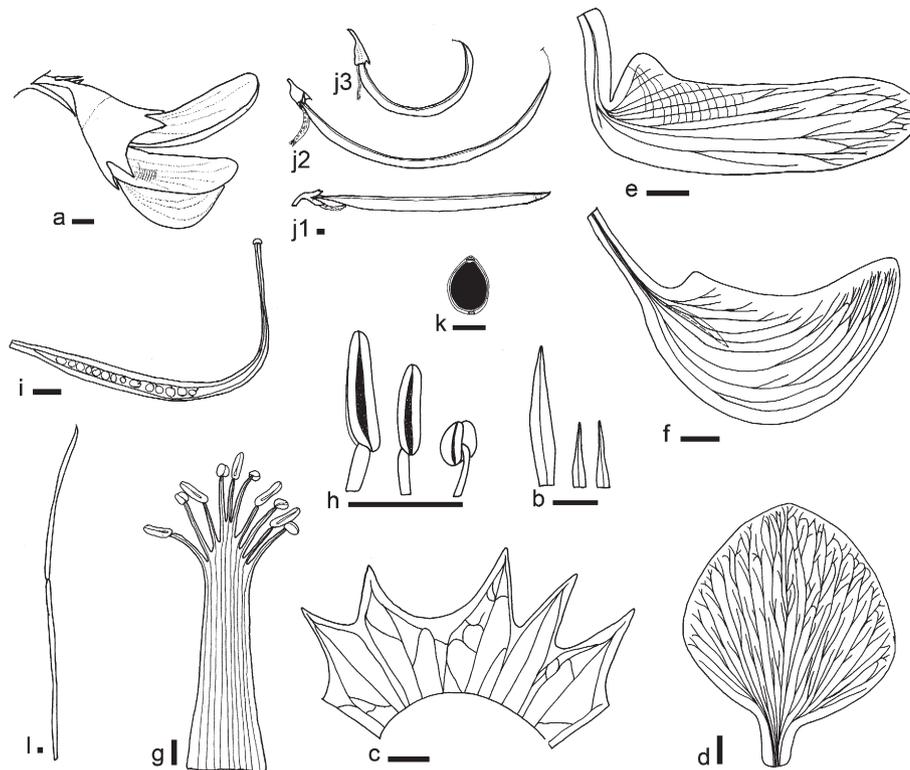


Fig. 5. Morphology of *Lebeckia ambigua*: (a) lateral view of flower; (b) abaxial view of bract and bracteoles; (c) abaxial view of calyx with the upper lobes to the left; (d) standard petal; (e) wing petal; (f) keel petal; (g) anthers; (h) long, basifixed anther, carinal (intermediate) anther and short, dorsifixed anther; (i) pistil; (j1–j3) lateral view of pods; (k) cross section of pod; (l) leaf. Vouchers: (a, l) from Barker 9781 (NBG); (b) from Rossouw 18619 (NBG); (c) from Barker 9781 (NBG); (d, i) from O’Callaghan, Van Wyk and Morley 90 (NBG); (e, f) from Boucher 2946e (NBG); (g, j3, h) from Le Roux 374 (NBG); (j1) from Heyns 1942 (NBG); (j2) from Niemand 11 (JRAU); (k) from Le Roux, Boatwright, Magee and Van Wyk 6 (JRAU). Scale bars: 1 mm.

Calyx 3.5–5 mm long, tube 1.5–2.5 mm long, lobes 1.5–2.5 mm long; subequally lobed but the upper lateral sinuses much wider than the medial sinus and the lower lateral sinuses; lobes deltoid, tips minutely pubescent inside. *Standard* widely ovate to orbicular, 8–10×4.5–8.0 mm; apex obtuse; claw 1–2 mm long. *Wings* oblong, as long as or usually longer than the keel, 7–9×2.0–3.5 mm, with 9–12 rows of sculpturing; apex obtuse; claws 1.5–2.5 mm long. *Keel* rostrate, 6.0–8.5×2.5–3.5 mm, usually with pockets; claws 1.5–3.0 mm long. *Pistil* subsessile; ovary 5.5–11.0×±0.5 mm long, linear; ovules many (14–18); style 2.5–3.5 mm long, curved upwards. *Pods* narrowly linear, straight or falcate, up to 75×2 mm; dehiscent; terete; fruit wall thin, membranous. *Seeds* oblong-reniform, 2.0×1.2 mm, rugose, light pink; hilum black (Fig. 5).

4.1.1. Diagnostic characters

L. ambigua is closely related to *L. sepiaria* but differs in the membranous, narrowly linear, straight or falcate, ±2 mm wide, dehiscent fruit (*L. sepiaria* has spongy, linear, straight, ±4 mm wide and indehiscent fruit) and smaller flowers (7–10 mm long) (12–18 mm long in *L. sepiaria*) (Fig. 5).

4.1.2. Distribution and habitat

L. ambigua occurs in the low-lying coastal region of the Northern and Western Cape Provinces, from Namaqualand southwards to a little north of Cape Town (Fig. 6). The altitude

is usually below 300 m but may be up to 900 m at some localities. Plants grow in deep sandy soil, usually in obviously disturbed areas such as riverbanks and roadsides.

4.1.3. Specimens examined

- 2917 (Namaqualand): Namaqualand (–CD), *Le Roux* 374 (NBG).
- 3017 (Kamieskroon): Kotzerus (–DD), *Acocks* 23398 (PRE).
- 3117 (Vredendal): Lepelfontein (–BB), *Helme* 2930 (NBG).
- 3118 (Van Rhynsdorp): 23 miles from Clanwilliam (–DA), *Grobbelaar* 1129 (PRE); Van Rhynsdorp (–DA), *Marloth* 2627 (PRE), *Rossouw* 18619 (NBG); near turn-off to Klaver on the N7 (–DA), *Van Wyk* 3120 (JRAU); foot of Gifberg (–DB), *Zietsman* 1180 (PRE); foot of Heereloge-mentsberg near Klaver (–DC), *Van Wyk* 3284 (JRAU); Klaver (–DC), *Barker* 3637 (NBG), *Lewis* 1309 (SAM); De Little Farm, Nardouwsberg (–DD), *Stirton* 9365 (PRE).
- 3119 (Calvinia): Arendskraal Farm, near Nieuwoudtville (–AC), *Barker* 9781 (NBG); Lokenburg House (–CA), *Acocks* 18568 (PRE); top of Botterkloof (–CD), *Barker* 6515 (NBG).
- 3218 (Clanwilliam): Wadrif, Soutpan, coastal side of the railway (–AB), *O’Callaghan, Van Wyk and Morley* 90 (PRE); Lambert’s Bay (–AB), *Henrici* 3297 (PRE); farm Wolfhuis (–AB), *Stirton* 9294, 9388 (PRE); Uitkomsberge, Bo-Voëlfontein Farm (–AB), *Stirton* 9351 (PRE);

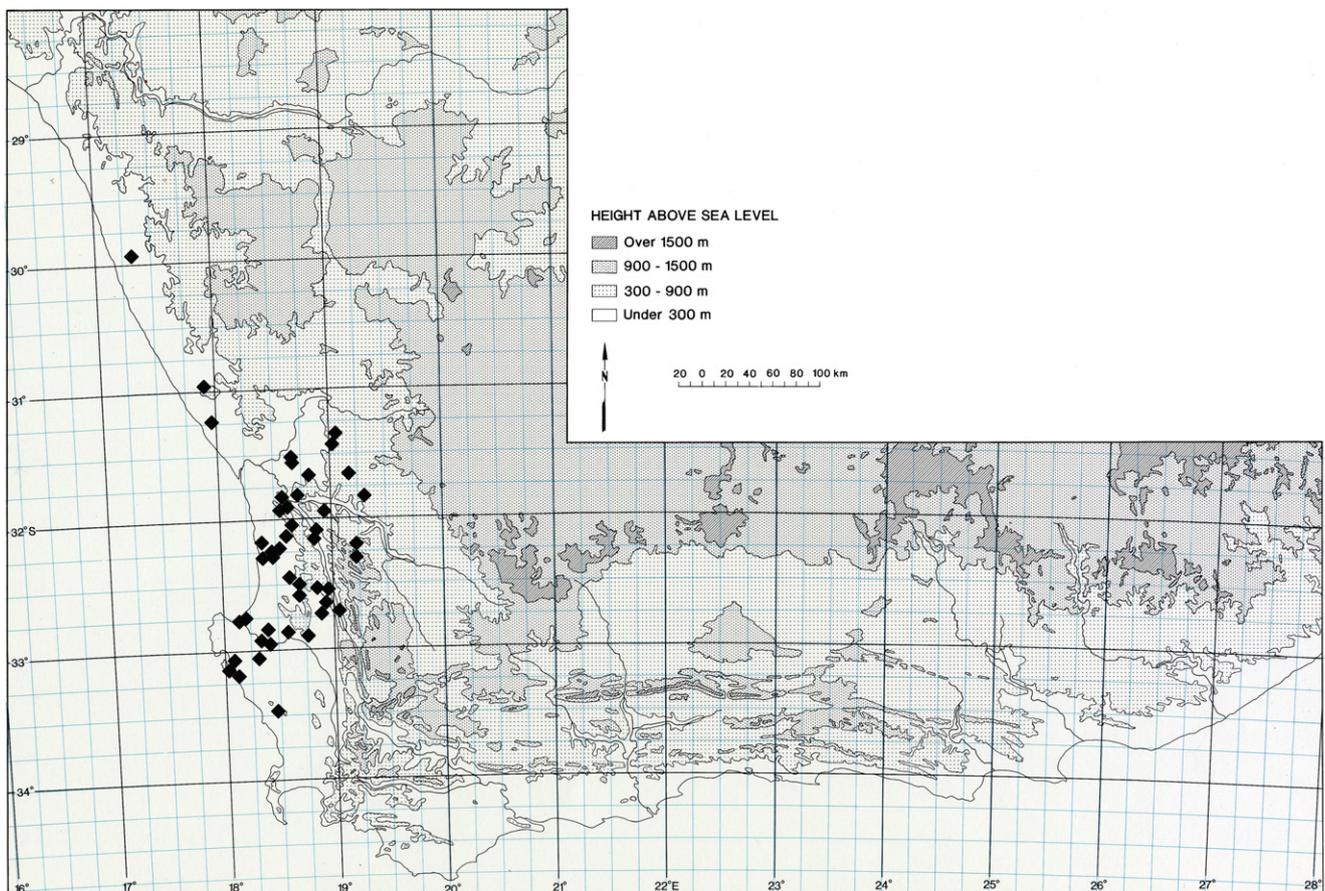


Fig. 6. Known distribution of *Lebeckia ambigua*.

Nortier station (–AB), *Van Breda 4460* (PRE); Verlore Vlei (–AD), *Stirton 6100* (PRE); between Elandsvlei and Redelinghuys (–AD), *Stirton 6117* (PRE); between Leipoldville and Elands Bay (–AD), *Zinn s.n.* (SAM); between Lambert's Bay and Clanwilliam (–BA), *Marsh 781* (NBG); Graaffwater (–BA), *Van Breda 4363* (PRE); Clanwilliam Park (–BB), *Acocks 15179* (PRE); Olifants River Bridge (–BB), *De Winter 9564* (PRE); Clanwilliam (–BB), *Leipoldt 349* (SAM), *Repton 7176* (PRE), *Van Wyk 2605* (PRE); between Clanwilliam and Springbok (–BB), *Le Roux 2625* (BOL); north of Clanwilliam (–BB), *Le Roux, Boatwright, Magee and Van Wyk 6* (JRAU); Redelinghuys, Piketberg (–BC), *Acocks 19795* (PRE), *Compton 15052* (NBG); Paleisheuvel (–BC), *Stirton 9294* (PRE); Berg River (–CC), *Ecklon and Zeyher 1334* (SAM); Berg River Station, Malmesbury (–CD), *Compton 15103* (NBG); Paleisheuvel (–CD), *Stirton 9294* (PRE); Berg River Valley (–DA), *Acock 2930* (S); Paleisheuvel Station, north of Het Kruis (–DA), *Wisura 3486* (NBG); 3 miles from Grey's Pass, Piketberg (–DB), *Barker 6406* (NBG); between Piketberg and Grey's Pass (–DB), *Lewis 3391* (SAM); between Piketberg and Citrusdal (–DB), *Parker 3588* (NBG); Citrusdal (–DB), *Niemand 11* (JRAU); between Pakhuis Pass and Piquetberg (–DB), *Parker 61* (BOL); between Citrusdal and Clanwilliam (–DB), *Van Wyk 2900* (JRAU); Pickenierskloof Pass

(–DB), *Van Wyk 3220* (JRAU); Olifantsrivier (–DC), *Grobbelaar 1129* (PRE); Piketberg (–DC), *Heyns 26146* (NBG); Sauer (–DC), *Acocks 24459* (PRE); Piketberg (–DD), *Van Breda 352* (PRE).

–3219 (Wuppertal): Cedarberg, Boesmanskloof, Wuppertal (–AA), *Van Rooyen, Steyn and De Villiers 499* (NBG); Cedarberg, Wuppertal (–AC), *Bolus 8972* (NBG); Warm Baths (–CA), *Le Roux, Boatwright, Magee and Van Wyk 9* (JRAU).

–3318 (Cape Town): Langebaan, Schrywershoek (–AA), *Boucher 2946e* (NBG); Langebaan (–AA), *Cupido 13* (NBG); Langebaan, behind the granite koppie (–AA), *Goldblatt 2704* (PRE); Saldanha Bay, Langebaan (–AA), *Taylor 3757* (NBG); Darling near Ysterfontein (–AA), *Van Rensburg 157* (NBG, PRE); 125 km north of Cape Town on the R27 (–AA), *Van Wyk 3290* (JRAU); Hopefield (–AB), *Acocks 20669* (PRE), *Bolus 12653* (PRE); Modderriver (–AD), *Le Roux, Boatwright, Magee and Van Wyk 14* (JRAU); in fields near Hopefield (–DC), *Letty 35* (PRE).

4.2. *L. brevicarpa*

L. brevicarpa M.M. le Roux and B.-E. van Wyk, sp. nov.
L. ambigua sepriariae similes sed leguminibus brevibus ovatis pauciseminalibus (in *L. ambigua* et *L. sepriaria*

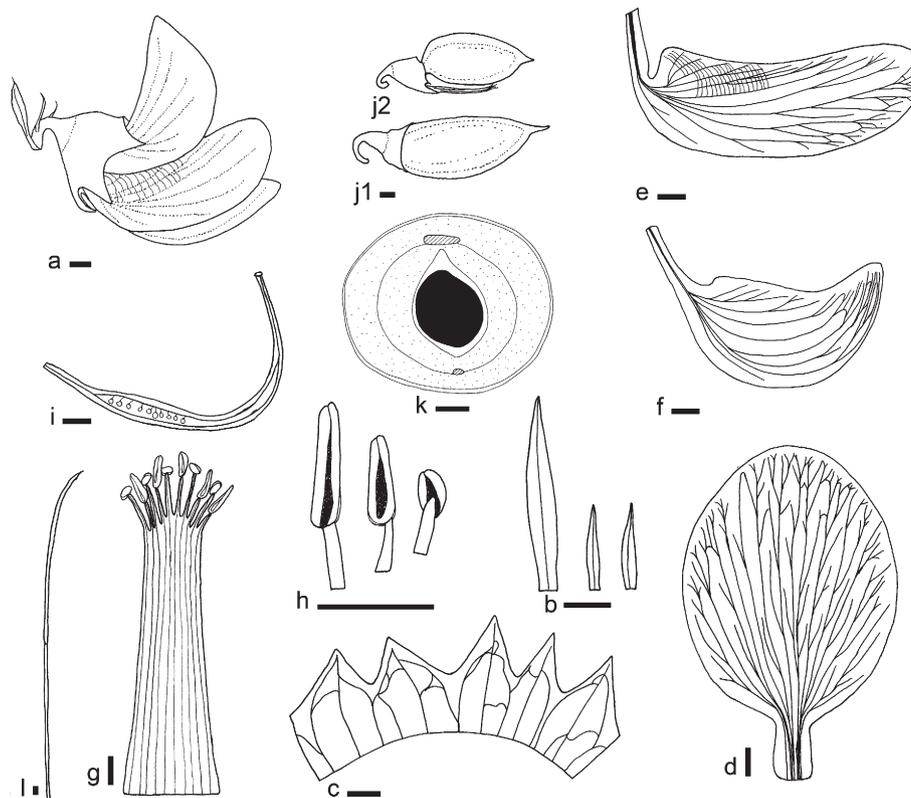


Fig. 7. Morphology of *Lebeckia brevicarpa*: (a) lateral view of flower; (b) abaxial view of bract and bracteoles; (c) abaxial view of calyx with the upper lobes to the right; (d) standard petal; (e) wing petal; (f) keel petal; (g) anthers; (h) long, basifixed anther, carinal (intermediate) anther and short, dorsifixed anther; (i) pistil; (j1 – j2) lateral view of pods; (k) cross section of pod; (l) leaf. Vouchers: (a, l) from *Schutte 261* (JRAU); (b, e, f, i) from *Van Wyk 2550* (JRAU); (c, g, h) from *Schutte 261* (JRAU); (d) from *Bolus 23854* (BOL); (j) from *Van Wyk 3123* (BOL); (k) from *Le Roux, Boatwright, Magee and Van Wyk 4* (JRAU). Scale bars: 1 mm.

lineares multiseminales) differt. Type: South Africa, Pakhuis Pass [3219 AA], *Le Roux and Van Wyk 5* (NBG, holotype; BOL, K, PRE, S, isotypes).

Erect, glaucous suffrutex, up to 0.8 m in height. *Leaves* simple, acicular, articulated near the middle; leaf density 3–6 per 10 mm length of stem. *Inflorescences* terminal, 220–280 mm long; rachis furrowed; flowers numerous, relatively dense (5–7 per 10 mm length of rachis), intermediate in size (8–11 mm long); pedicel 2–3 mm long; bract narrowly lanceolate, acuminate, 4–6 mm long; bracteoles narrowly triangular to lanceolate, acuminate, up to 2 mm long. *Calyx* 3.5–5.5 mm long, tube 2.5–3.0 mm long, lobes 1.5–2.5 mm long; subequally lobed but the upper lateral sinuses much wider than the medial sinus and lower lateral sinuses; lobes deltoid, tips minutely pubescent inside. *Standard* ovate to orbicular, 10–13 × 6.5–7.5 mm; apex obtuse; claw 2.0–2.5 mm long. *Wings* oblong, longer than the keel, 9–11 × 3.5–4.0 mm, with 14–18 rows of sculpturing; apex obtuse; claws ± 3 mm long. *Keel* rostrate, 8–9 × ± 4 mm, usually without pockets; claws 3.0–3.5 mm long. *Pistil* short-stipitate; ovary 8–10 × 0.7–0.9 mm long, oblong; ovules few (6–10); style 3–5 mm long, curved upwards. *Pods* ovoid, up to 13 × 5 mm; indehiscent; terete; fruit wall thick, spongy. *Seeds* reniform–orbicular, 3.0 × 2.2 mm, indistinctly rugose, pale brown, mottled dark brown to black; hilum dark brown (Fig. 7).

4.2.1. Diagnostic characters

L. brevicarpa is similar to *L. ambigua* and *L. sepiaria*, but differs markedly in its short, ovate, few-seeded pods (linear and many-seeded in *L. ambigua* and *L. sepiaria*). In *L. brevicarpa* the wings are longer than the keel and the bracts are less caducous than in *L. sepiaria* (which has wings that are shorter than the keel) (Fig. 7).

4.2.2. Distribution and habitat

L. brevicarpa has a localised distribution and is restricted to altitudes above 400 m in the Bokkeveld and Cedarberg Mountains (Fig. 8), where it is locally common in deep sandy soil on disturbed roadsides.

4.2.3. Specimens examined

–3119 (Calvinia): Between Nieuwoudtville and Oorlogskloof (–AC), *Leipoldt 3763* (BOL).

–3218 (Clanwilliam): Pakhuis Pass (–BB), *Acocks 15019, 15039* (PRE), *Bolus 8973* (PRE), *Grobbelaar 2002* (PRE), *Leach and Forrester 17424* (PRE), *Le Roux, Boatwright, Magee and Van Wyk 4, 5* (JRAU), *Marloth 9527* (PRE), *Sturton 5937* (PRE), *Story 2982* (PRE); Pakhuis Pass near Kleinkliphuis (–BB), *Emdon 118* (PRE); Pakhuis Pass, between Clanwilliam and Calvinia (–BB), *Schutte 261* (JRAU); Pakhuis Pass, Elandsfontein

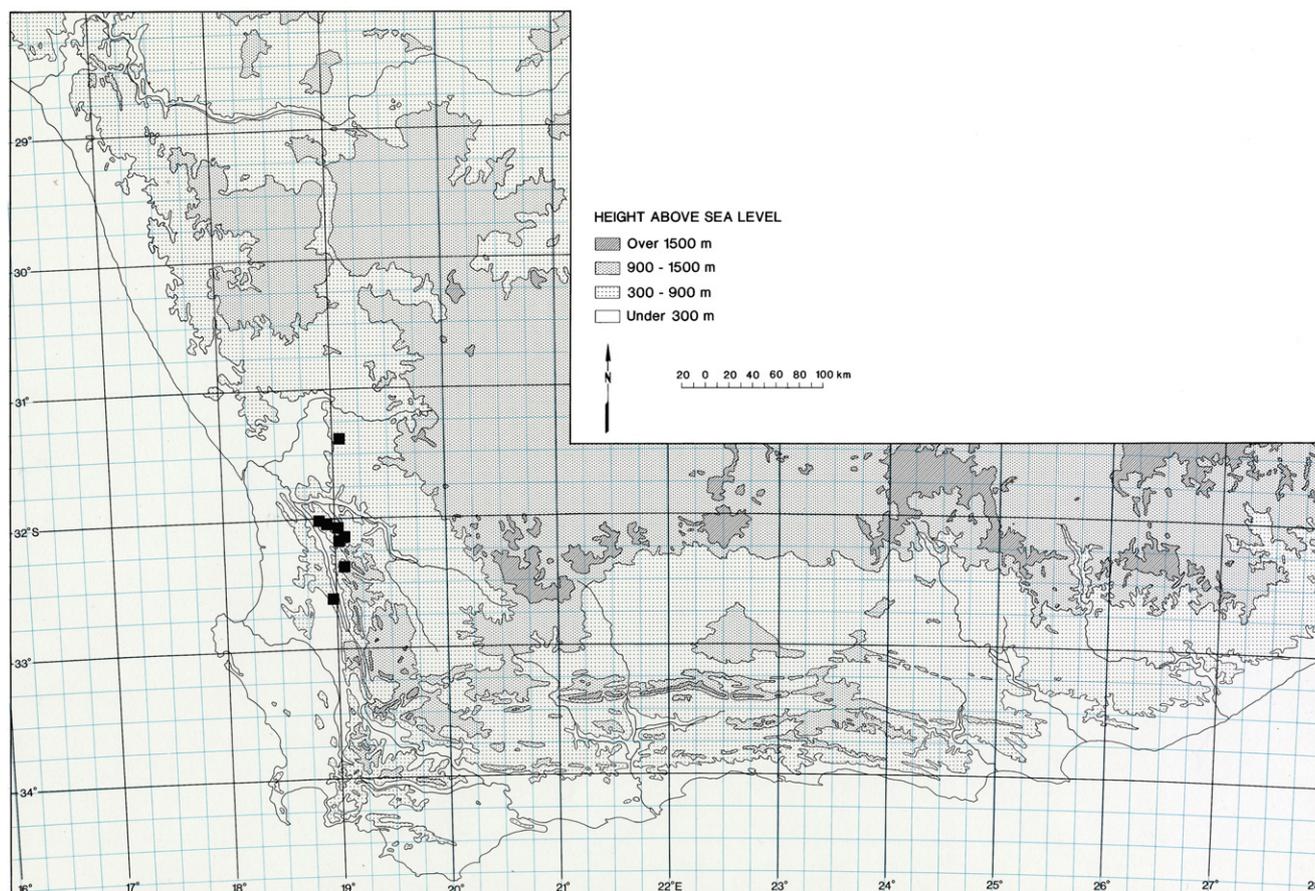


Fig. 8. Known distribution of *Lebeckia brevicarpa*.

Farm (–BB), *Stirton 9288* (PRE); Kleinkliphuis (–BB), *Taylor 11023* (PRE); Piekenierskloof Pass (–DB), *Le Roux, Boatwright, Magee and Van Wyk 8* (JRAU).

–3219 (Wuppertal): Pakhuis Pass (–AA), *Bolus 8973, 23854* (BOL), *Van Wyk 3123* (JRAU); Staatsbos, Cedarberg (–AC), *Andrag 141* (PRE); Kleinplaas, Citrusdal (–AC), *Hanekom 2896* (PRE); Algeria (–AC), *Stirton 5916* (PRE); Algeria Forest Station (–AC), *Stirton 5920* (PRE); Algeria, Grootberg (–AC), *Van Wyk 2550* (JRAU, PRE); Grootberg, Cedarberg (–AC), *Viviers 409* (PRE); Cedarberg Forest Reserve, Grootberg (–AC), *Viviers 489* (NBG).

4.3. *L. gracilis*

L. gracilis Eckl. and Zeyh., Enum.: 192 (1836); Benth. in Hook., Lond. J. Bot. 3: 358 (1844). Type: South Africa, “Zwartkopsrivier” [3322 CD], *Ecklon and Zeyher 1336* (SAM!), specimen in middle of the sheet, lectotype, designated here; P!, S!, isolectotypes).

L. sepiaria auct. non (L.) Thunb.: Eckl. and Zeyh., Enum.: 191 (1836); Harv. in Harv. and Sond., Fl. Cap. 2: 86 (1862); Goldblatt and Manning, Cape Plants, Strelitzia 9: 493 (2000).

[Harvey cited a Thunberg specimen (*Thunberg s.n. sub Herb. Thunberg 16422*) which is indeed this species. However, Thunberg based his description on a specimen from Cape Town “Leeuwenberg”, but he explicitly cited *Spartium sepiarium* of Linnaeus, *q.v.*]

L. ambigua E. Mey., Com.: 34 (1836), *pro parte minore*.

Erect, glaucous suffrutex, 0.15–0.8 m in height. Leaves simple, acicular, articulated near the middle; leaf density 3–6 per 10 mm length of stem. Inflorescences terminal, 44–172 mm long; rachis furrowed; flowers numerous, relatively dense (5–7 per 10 mm length of rachis), relatively small in size (6–8 mm long); pedicel 1.5–3.0 mm long; bract lanceolate, acute, ±2 mm long; bracteoles triangular, acuminate, ±1 mm long. Calyx 2.5–4.5 mm long, tube 1.5–3.5 mm long, lobes 0.7–1.5 mm long; ± equally lobed; lobes deltoid, tips minutely pubescent inside. Standard widely oblong to suborbicular or obovate, 4.0–6.5 × 2.0–3.5 mm; apex obtuse; claw 1.5–2.5 mm long. Wings oblong, longer than the keel, 4.0–6.5 × 1.0–2.5 mm, with 11–14 rows of sculpturing; apex obtuse; claws 1.5–2.0 mm long. Keel rostrate, 5–6 × 1.5–2.5 mm, sometimes with pockets; claws 1.5–2.5 mm long. Pistil subsessile; ovary 5.5–7.5 × 0.6–0.8 mm long, linear; ovules many (9–11); style 1.5–3.5 mm long, curved upwards. Pods linear, straight or very slightly falcate, up to

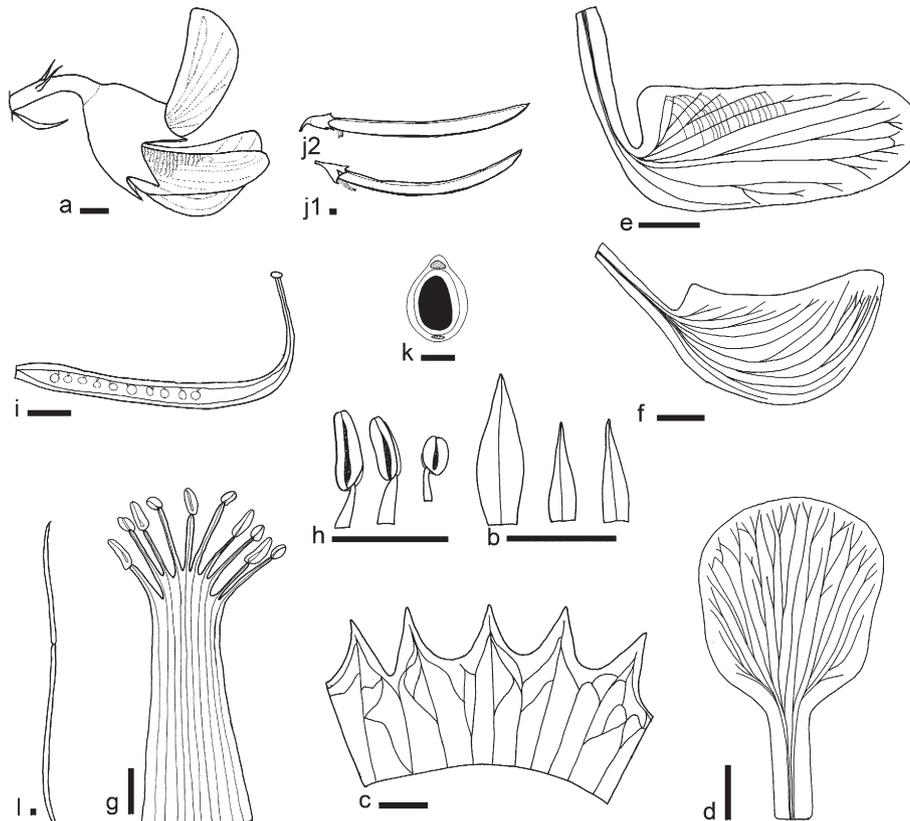


Fig. 9. Morphology of *Lebeckia gracilis*: (a) Lateral view of flower; (b) abaxial view of bract and bracteoles; (c) abaxial view of calyx with the upper lobes to the left; (d) standard petal; (e) wing petal; (f) keel petal; (g) anthers; (h) long, basifixed anther, carinal (intermediate) anther and short, dorsifixed anther; (i) pistil; (j1 – j2) lateral view of pods; (k) cross section of pod; (l) leaf. Vouchers: (a) from *Heginbotham 163* (NBG); (b, e) from *Esterhuysen 23529* (BOL); (c, f, g, h, i) from *Bohnen 7617* (NBG); (d) from *Leighton 1894* (BOL); (j1) from *Hutchinson 1478* (BOL); (j2) from *Ecklon and Zeyher 1336* (S); (k) from *Le Roux, Boatwright, Magee and Van Wyk 17* (JRAU); (l) from *Wurts 2234* (NBG). Scale bars: 1 mm.

37×2–3 mm; dehiscent; semi-terete; fruit wall thin, membranous. Seeds reniform-orbicular, ±1.8×1.5 mm, rugose, pale brown, mottled dark brown to black; hilum dark brown (Fig. 9).

4.3.1. Diagnostic characters

L. gracilis is similar to *L. ambigua* but differs in its calyx that is ±equally lobed and with the lobes shorter than the tube (calyx subequally lobed and the lobes as long as the tube in *L. ambigua*) (Fig. 9). *L. gracilis* also differs from *L. ambigua* in its shorter and more congested racemes. The two species are allopatric.

4.3.2. Distribution and habitat

L. gracilis has a distinctively coastal distribution, from Bredasdorp in the Western Cape Province eastwards to Port Elizabeth in the Eastern Cape Province (Fig. 10). All known localities are below 300 m altitude. Those in the west experience winter rainfall, while those in the east (around Port Elizabeth) have a higher proportion of summer rain. Plants grow in deep sandy soil.

4.3.3. Specimens examined.

–3322 (Oudtshoorn): Fairy Knowe (–DC), *Guillarmond* 8257 (PRE); Rondevlei (–DC), *Sachse* 670 (PRE); Wilderness (–DC), *Van Niekerk* 223 (BOL); Ruigtevlei at Zwart River (–DD), *Fourcade* 1534 (BOL, NBG, PRE).

–3324 (Steytlerville): Zwartkopsrivier (–DC), *Ecklon and Zeyher* 1336 (P, S, SAM), *Zeyher* 2293 (P, S); Gamtoos River (–DD), *Gillett* 2361 (NBG).

–3325 (Port Elizabeth): Humewood (–DC), *Paterson* 773 (BOL).

–3420 (Bredasdorp): De Hoop (–AD), *Morley* 139 (PRE); Melkbosheuwel (–BC), *Burgers* 2461 (NBG); Potberg area (–BC), *Derdejaarsekskursie* 84/C10 (NBG); Potberg (–BC), *Esterhuysen* 23259 (BOL); De Hoop (–BC), *Fellingham* 701 (PRE); The Poort (–CA), *Henderson* 1829 (NBG), *Morris* 268 (NBG); Bredasdorp Poort (–CA), *Heginbotham* 163 (NBG).

–3421 (Riversdale): Oude Tuin near Albertinia (–AB), *Muir* 1852 (BOL, PRE); Stilbaai (–AD), *Jordaan* 18607 (NBG); Stilbaaihoogte (–AD), *Bohnen* 7617 (NBG), *Le Roux, Boatwright, Magee and Van Wyk* 17 (JRAU).

–3422 (Mossel Bay): Brak River (–AA), *Young* 5514 (BOL); Belvedere (–BB), *Duthie* 510 (NBG); Goukamma (–BB), *Wurts* 2234 (NBG).

–3423 (Knysna): Between Knysna and Plettenberg Bay (–AA), *Pappe s.n.* (S, SAM); Plettenbergbaai (–AB), *Anon s.n. sub STEU* 13540 (NBG).

–3425 (Port Elizabeth): Schoenmakers Kop (–AB), *Story* 3654 (PRE).

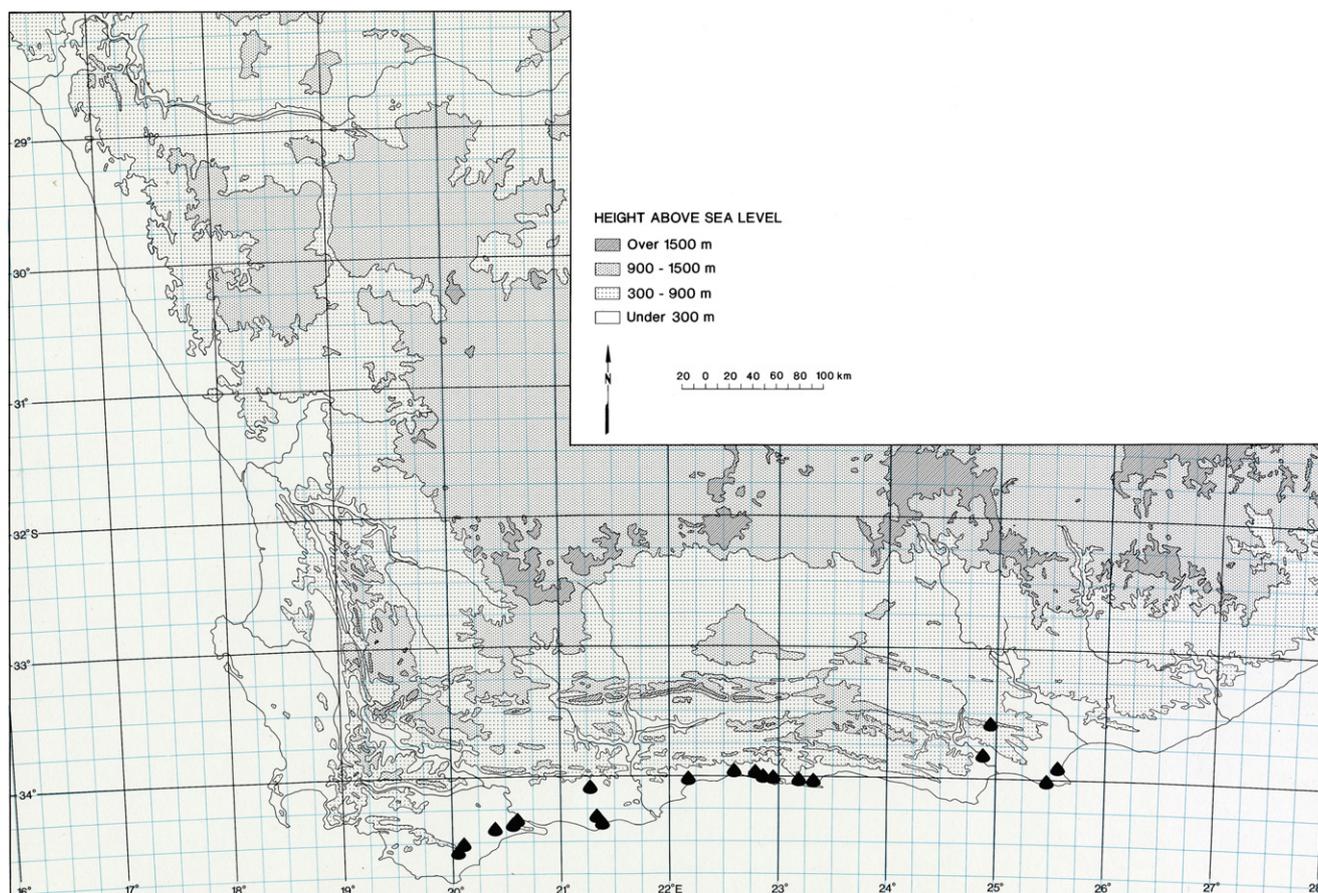


Fig. 10. Known distribution of *Lebeckia gracilis*.

4.4. *L. sepiaria*

L. sepiaria (L.) Thunb., Prod. Pl. Cap.: 122 (1800), Fl. Cap.: 561 (1823); Benth. in Hook., Lond. J. Bot. 3: 192 (1844) non Harv. (1862), nec Goldblatt and Manning (2000). Type: South Africa, LINN 891.4 (LINN!), lectotype, designated here).

S. sepiarium L., Sp. Pl.: 995 (1753) and Pl. Rar. Afr.: 91 (1760), Gmelin, Syst. Nat. 2 (2): 1088 (1792). Type as for *L. sepiaria*.

Sarcophyllum carnosum Sims, Bot. Mag.: 51, t. 2502 (1824). Iconotype: Sims, Bot. Mag.: 51, t. 2502 (1824). [Note: The illustration and description leaves no doubt about the identity of the species illustrated. The calyx is not equally lobed, with the lateral sinus wider than the upper and lower sinuses and the wing petals are shorter than the keel petal. The proliferation of the apical bud of the inflorescence is very unusual. The Ecklon specimen on which Meyer based his description of *L. sarcophylloides* [Ecklon and Zeyher 1338 (SAM!)] also agrees with this species.

L. sarcophylloides E. Mey. in Linnaea 7: 155 (1832), nom. nov. pro *S. carnosum* Sims non *L. carnosum* Thunb. Type as for *S. carnosum*.

L. simsiana Eckl. and Zeyh., Enum. 2: 192 (1836); Harv. in Harv. and Sond., Fl. Cap. 2: 86 (1862); Goldblatt and Manning, Cape Plants, Strelitzia 9: 493 (2000), *synon. nov.* Type as for *S. carnosum*.

L. contaminata (L.) E. Mey., Comm. Pl. Afr. Austr. 1: 34 (1836), non Thunb.

Erect, glaucous suffrutex, up to 0.8 m in height. Leaves simple, acicular, articulated near the middle; leaf density 4–11 per 10 mm length of stem. Inflorescences terminal, 50–300 mm long; rachis furrowed; flowers numerous, relatively sparse (2–5 per 10 mm length of rachis), relatively large in size (12–18 mm long); pedicel 4–7 mm long; bract lanceolate, acute, ± 3 mm long; bracteoles narrowly triangular, acuminate, 0.5–1.5 mm long. Calyx 4.5–6.5 mm long, tube 2.5–3.5 mm long, lobes 1.5–2.5 mm long; subequally lobed but the upper lateral sinuses much wider than the medial sinus and lower lateral sinuses; lobes deltoid, tips minutely pubescent inside. Standard widely ovate to orbicular, 9–15 \times 7.5–11.5 mm; apex obtuse; claw 1.0–3.5 mm long. Wings oblong, shorter than the keel, 7.5–12.5 \times 3.5–6.0 mm, with 13–16 rows of sculpturing; apex obtuse; claws 1.5–4.5 mm long. Keel rostrate, 7–14 \times 3.0–5.0 mm, usually with pockets; claws 2–5 mm long. Pistil subsessile; ovary 13.5–15.5 \times 0.6–0.9 mm long, linear; ovules many (15–19); style 4.0–5.5 mm long, curved upwards. Pods linear, straight, up to 40 \times 4 mm; indehiscent; terete; fruit wall thick, spongy. Seeds oblong-reniform, $\pm 2.5 \times 1.2$ mm, rugose, pale brown, mottled dark brown to black; hilum black (Fig. 11).

4.4.1. Diagnostic characters

L. sepiaria is one of the most well-known species in sect. *Lebeckia*. It differs markedly from *L. brevicarpa* in the long, linear fruits (up to 40 mm long) and wings that are shorter than

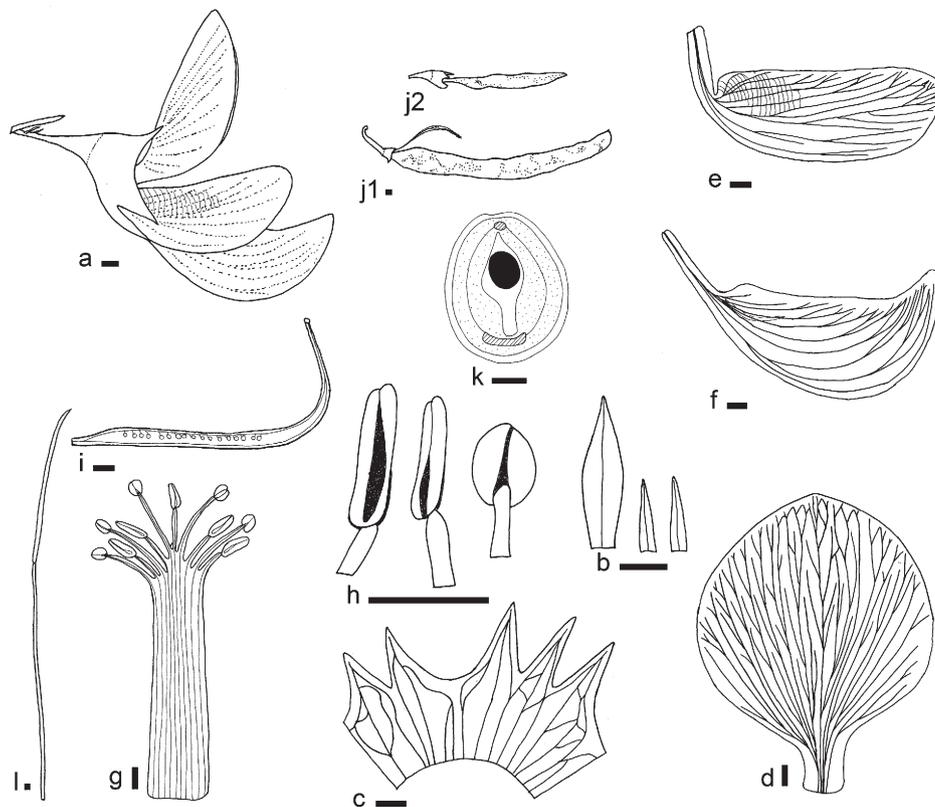


Fig. 11. Morphology of *Lebeckia sepiaria*: (a) lateral view of flower; (b) abaxial view of bract and bracteoles; (c) abaxial view of calyx with the upper lobes to the left; (d) standard petal; (e) wing petal; (f) keel petal; (g) anthers; (h) long, basifixed anther, carinal (intermediate) anther and short, dorsifixed anther; (i) pistil; (j1 – j2) lateral view of pods; (k) cross section of pod; (l) leaf. Vouchers: (a, l) from *Ruiters 28* (NBG); (b) from *Forrester 514* (NBG); (c, g, h, i) from *Barker 6515* (NBG); (d–f) from *Anon 252* (NBG); (j1) from *Grobler 513* (NBG); (j2) from *Hanekom 2851* (NBG); (k) from *Le Roux, Boatwright, Magee and Van Wyk 10* (JRAU). Scale bars: 1 mm.

the keel. In *L. brevicarpa*, the fruits are short and ovate (up to 13 mm long) and the wings are longer than the keel (Fig. 11).

4.4.2. Distribution and habitat

L. sepiaria occurs only in the Western Cape Province (Fig. 12). It differs markedly from *L. ambigua* and *L. gracilis* in occurring mainly at higher altitudes (300–1500 m, with only a few localities near Cape Town that are below 300 m). Plants grow in well-drained sandy soil.

4.4.3. Specimens examined

- 3218 (Clanwilliam): Piketberg, Redelinghuys (–BC), *Stephans 7013* (NBG); Paleisheuvel Station (–DA), *Wisura 3486* (NBG); Olifants Rivier Valley (–DB), *Barker 10336* (NBG); Warmbaths (–DB), *Edwards 251* (PRE); Citrusdal, Jansekraal (–DB), *Hanekom 1300* (NBG); Citrusdal (–DB), *Hanekom 2851* (NBG, PRE), *Parker 3588* (NBG); Citrusdal, Berg-en-Dal (–DB), *Hanekom 3209* (PRE); farm at the top of Zebrakop, Piketberg (–DB), *Taylor 5319* (PRE); Piketberg (–DC), *Goldblatt 2743* (PRE), *Van Breda 2005* (PRE); Piketberg (–DD), *Bodkin 13537* (PRE), *Bolus 13537* (PRE), *Gulline 2585* (NBG), *Marloth 11477* (PRE); on top of Piketberg mountain (–DD), *Bodkin and Bolus 13537* (PRE).
- 3219 (Wuppertal): Kleinplaas (–CA), *Hanekom 2896* (NBG, PRE); Middelberg Pass, Elandskloof (–CA), *Le Roux,*

Boatwright, Magee and Van Wyk 13 (JRAU); Olifants River Valley (–CA), *Stephans 7013* (BOL); 3.6 km N. of Warm Baths (–CA), *Le Roux, Boatwright, Magee and Van Wyk 10, 11* (JRAU); Cedarberg (–CB), *Thode 2151* (PRE); Wuppertal, Olifants River (–CC), *Thompson 1505* (NBG).

- 3318 (Cape Town): Above Riebeeek Kasteel (–BD), *Drège s.n.* (PRE, S); Riebeeek Kasteel (–BD), *Marsh 1053* (NBG); Langverwacht above Kuilsrivier (–DC), *Olivier 4753* (NBG); Stellenbosch (–DD), *Bolus 10722* (BOL), *Prior s.n.* (PRE); Jonkershoek (–DD), *Borchardt 417* (PRE); Jonkershoek (–DD), *Hubbard 285* (PRE); between Stellenbosch and Vlottenberg (–DD), *Marloth 8755* (NBG); Stellenbosch, Banhoek (–DD), *Martley 32 404* (BOL); Stellenbosch, Vredenburg (–DD), *Salter 7800* (NBG); Stellenbosch, Swartboskloof (–DD), *van Rensburg 2135* (NBG, PRE); Assegaibosch (–DD), *Van der Merwe 1224* (PRE).
- 3319 (Worcester): Breederivier, Paspasvalley, Vierentwintgrivier (–AA), *Ecklon and Zeyher 1338* (SAM); Tulbagh, Winterhoek (–AA), *Pappe s.n.* (SAM); Foothills of Witzenberg (–AC), *Schonken 317* (NBG, PRE); Boesmanskloof (–CA), *Taylor 6507* (PRE); Goudini road (–CB), *Middlemost and Creasy 2143* (NBG); Bastiaanskloof (–CB), *Taylor 6507* (PRE); Brandvlei Prison (–CD), *Forrester 514* (NBG); Villiersdorp (–CD),

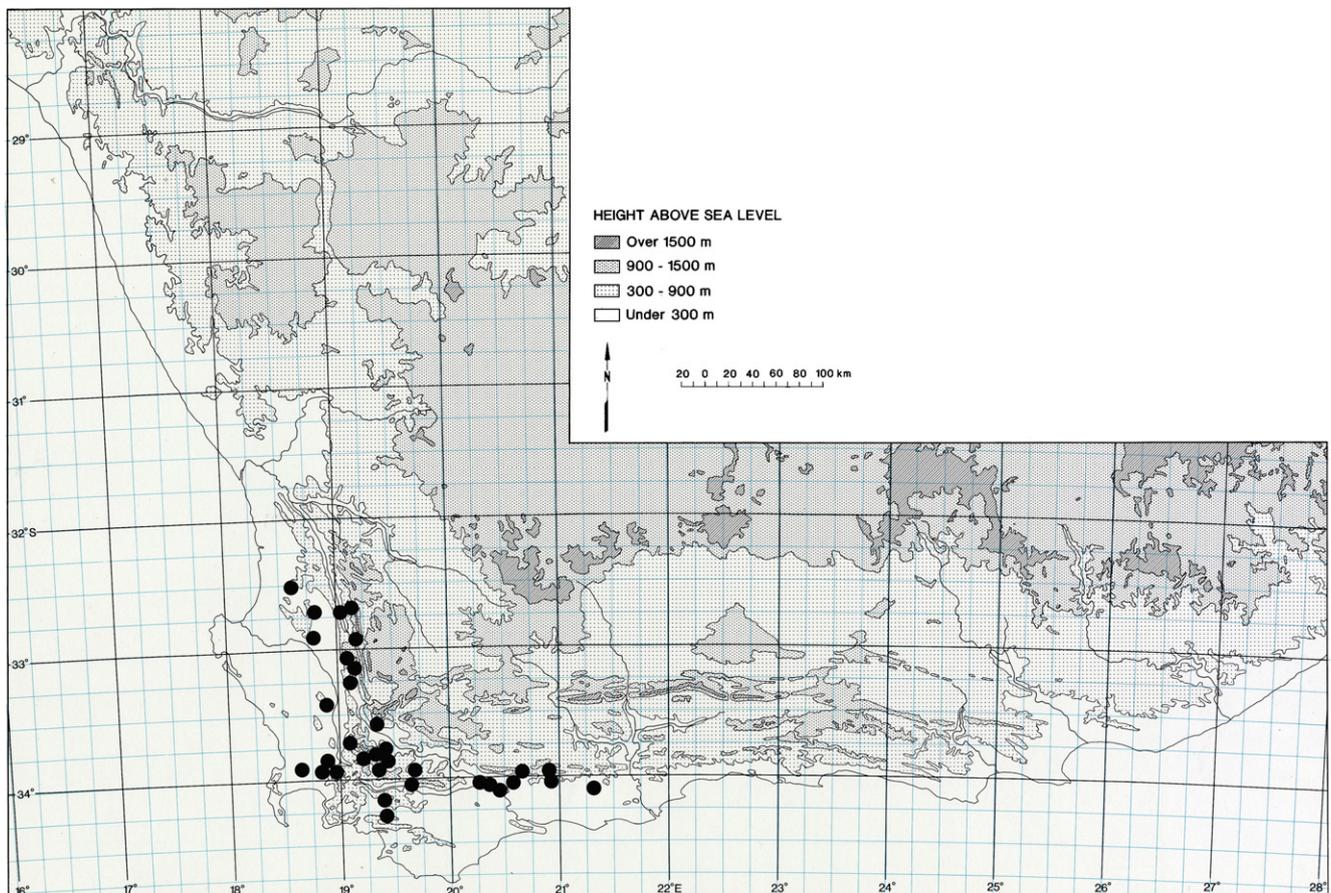


Fig. 12. Known distribution of *Lebeckia sepiaria*.

- Schlechter 140* (PRE); Louwshoek (–CD), *Stokoe s.n.* (SAM); Stettynskloof (–CD), *Walters 227, 1065* (NBG); between Worcester and Villiersdorp (–CD), *Walters 398* (NBG); Villiersdorp, Doornrivier (–CD), *Walters 1380* (NBG); 20 km from McGregor on the way to Greyton (–DC), *Grobbelaar 2209* (PRE); McGregor (–DC), *Grobbelaar 2856* (PRE).
- 3320** (Montagu): Foot of Tradouw Pass, Barrydale (–DC), *Marsh 864* (NBG); Langeberg between Lemoenshoek and Naauwkrantz, Strawberry Hill (–DD), *Stokoe s.n.* (NBG).
- 3419** (Worcester): Caledon (–AB), *Zeyher s.n.* (SAM); Steenboksberg (–AD), *Taylor 6507* (NBG); Robertson, Boesmanskloof Pass at McGregor (–BA), *Leipoldt 3153* (BOL).
- 3420** (Swellendam): Nasionale Bontebok Park (–AB), *Acocks 22894* (PRE), *Taylor 4262* (PRE); Bontebok Park (–AB), *Grobler 513* (NBG, PRE), *Liebenberg 6463* (NBG), *Taylor s.n., 4252* (NBG, PRE), *Van Wyk 2979* (JRAU); Swellendam (–AB), *Galpin 3721* (PRE), *Kennedy s.n.* (SAM); Robindale, Bredasdorp (–AB), *Viviers 1179* (NBG, PRE); Buffeljagsrivier (–BA), *Anon s.n.* (SAM), *Van der Merwe 2704* (PRE); Grootvadersbosch (–BB), *Meyer 1829* (S), *Ruiters 28* (NBG, PRE); Naauwpoort (–BB), *Thorne, s.n.* (SAM).
- 3421** (Riversdale): Aasvoëlbergnek (–AB), *Horn 649* (PRE).

Acknowledgements

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