

## *Lotononis brevicaulis* (Fabaceae — Crotalariaeae): A new species from the south-western Cape Province

B – E. van Wyk

Department of Botany, Rand Afrikaans University, Johannesburg, 2001 Republic of South Africa

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*Lotononis brevicaulis* B – E. van Wyk, an unusual new species, is described. It is not closely related to any known species and shows a unique combination of character states not previously recorded in *Lotononis*: a remarkable habit, with branch dimorphism and corresponding leaf dimorphism, a common occurrence of 6- and 7-foliolate leaves and large, tubular flowers. The known geographical distribution and morphological variation are described and illustrated. Based on available evidence, the new species is tentatively placed in *Lotononis* section *Lipozygis* (E. Mey.) Benth. near the *L. pentaphylla* (E. Mey.) Benth. group.

*Lotononis brevicaulis* B – E. van Wyk, 'n ongewone nuwe spesie, word beskryf. Dit is nie naverwant aan enige bekende spesie nie en toon 'n unieke kombinasie van kenmerke wat nog nie voorheen in *Lotononis* waargeneem is nie: 'n merkwaardige groeivorm, met stingeldimorfisme en ooreenstemmende blaardimorfisme, 'n algemene voorkoms van 6- en 7-gefolioleerde blare en groot, buisvormige blomme. Die bekende geografiese verspreiding en morfologiese variasie word beskryf en geïllustreer. Aan die hand van beskikbare inligting, word die nuwe spesie voorlopig in *Lotononis* seksie *Lipozygis* (E. Mey.) Benth. naby die *L. pentaphylla* (E. Mey.) Benth.-groep, geplaas.

**Keywords:** Crotalariaeae, dimorphism, Fabaceae, *Lotononis*, taxonomy

### Introduction

The genus *Lotononis* (DC.) Eckl. & Zeyh. is the third largest genus of the Fabaceae in southern Africa and comprises a variable assemblage of some 110 species.

Bentham (1843) had the greatest influence on the generic concept of *Lotononis* by reducing various genera of Ecklon & Zeyher (1836) and Meyer (1836) to sectional status within it. This treatment (with minor modifications) was followed by Harvey (1862) and Dümmer (1913). Many characters, the combinations of which are used as diagnostic features for related genera, are also present in *Lotononis*. Marked similarities exist between *Lebeckia* Thunb. and *Lotononis* section *Aulacanthus* (E. Mey.) Benth., *Buchenroedera* Eckl. & Zeyh. and *Lotononis* section *Krebsia* (Eckl. & Zeyh.) Benth., *Crotalaria* L. and *Lotononis* section *Oxydium* Benth. and also *Pearsonia* Dümmer and some species of *Lotononis*. The critical question is whether these similarities indicate evolutionary relationship or merely reflect similar adaptations in unrelated groups.

The significance of the new species described below is that it adds yet another unique combination of characters (branch dimorphism with corresponding leaf dimorphism and 6- and 7-foliolate leaves) to an already diverse and complex genus.

### *Lotononis brevicaulis* B – E. van Wyk, sp. nov.

*Caulis* perennis erectus, simplex vel dichotome furcatus, (15–)30–40 (–60) mm longus, apicem versus valde incrassatus propter molem densam fundorum petiolorum persistentium atque residuorum surculorum annuorum superiorum. *Ramuli floriferi* procumbentes (20–)40–60(–120) mm longi, post fructificationem emorientes. *Folia* digitate (5–)6–7(–8)-foliolata, valde dimorpha; folia caulina longipetiolata, petiolis (10–)30–40(–60) mm longis, parte tertia ima valde dilatata, dense lanata; parte superiore filiforme, terete, pilis sparsis brevibus; foliolis (5–)10–15(–18) mm longis, 2–5 mm latis, conduplicatis, ellipticis vel anguste oblanceolatis; folia surculis annuis insidentia breviora et minor, petiolis basin versus non dilatatis. *Stipulae* binatae. *Inflorescentiae* terminales, laxae (1–)2–4(–6) floratae. *Flores* magni flavi tubulares; bractae magnae, foliiformes. *Calyx* 10–14 mm longus, lobo imo aegre angustiore. *Vexillum* 14–29 mm longum, late ovatum, longe unguiculatum. *Alae* longiores quam carina. *Androecium* monadelphum, antheris dimorphis. *Pistillum* 14–19 mm longum, stylo curvato. *Fructus* inflatus, suturam superiorem secus eminentiis.

Species omnino distinctus, haud arcte ullae speciei cognitae affinis. *L. anthylloidi* Harv., *L. pentaphyllae* (E. Mey.) Benth. et *L. polycephalae* (E. Mey.) Benth. habitu et forma foliolorum similis, sed foliis 6- vel 7-foliolatis et petiolis foliorum caulinum basin versus planatis, dilatatis, dense pilosis differt. Valde etiam racemo laxo pauciflorifero (non capitulis densis), stipulis binatis, floribus valde maioribus, calyce, corolla et vestitura a speciebus illis differt. Similis est speciebus sicut *L. involucratae* (E. Mey.) Benth. et *L. azureae* (Eckl. & Zeyh.) Benth. fructui margine superiore dentato.

TYPUS — Cape Province: Tweedside, Laingsburg. 27/12/1951, *Compton 22867 charta 1* (NBG, holotypus!)

Perennial dwarf shrublet with a distinctly dimorphic branch system consisting of a short, erect, persistent stem from which lax, horizontally divergent flowering shoots develop annually. *Perennial stem* (caudex) erect, single or dichotomously forked in older specimens, (15–)30–40(–60) mm long, much thickened apically due to a dense mass of persistent petiole bases and the remains of annual shoots of previous seasons. *Flowering branchlets* procumbent, (20–)40–60(–120) mm long, dying back after fruiting, the basal part remaining on the caudex for some years. *Leaves* digitately (5–)6–7(–8)-foliolate, markedly dimorphic; cauline leaves long-petiolate; petioles (10–)30–40(–60) mm long, the basal third much dilated, thin, chartaceous, distinctly 3-veined, densely covered with long reddish-brown woolly hairs, upper part filiform, terete, with sparse, short hairs; leaflets (5–)10–15(–18) mm long, 2–5 mm wide, equal in size and shape, conduplicate, elliptic to narrowly oblanceolate, base narrowly cuneate, apex rounded, obtuse, acute or acuminate, densely strigose-hirsute; leaves on annual shoots shorter and smaller; petioles (3–)5–12(–22) mm long, not dilated basally; leaflets (2–)5–10(–14) mm long, 1–4 mm wide, oblanceolate to obovate, base cuneate to narrowly cuneate, apex rounded or obtuse, less hairy than the cauline leaflets, often sparsely strigose and glabrescent abaxially. *Stipules* in pairs, (1–)2–4(–10) mm long, up to 2 mm wide, narrowly lanceolate to narrowly elliptic, occasionally falcate. *Inflorescences* terminal on annual shoots, laxly (1–)2–4(–6)-flowered, the flowers mostly in pairs, opening ± simultaneously. *Flowers* very large, 15–30 mm long, yellow, tubular; pedicel 2–7 mm long; bracts large, 7–15 mm long, broadly lanceolate to

ovate, leaf-like; bracteoles absent or very rarely present on the terminal pedicel only, 3–4 mm long, up to 0,5 mm wide. *Calyx* 10–14 mm long, tubular, slightly inflated, shorter than the corolla; lobes triangular,  $\pm$  equal in length; lateral lobes fused a little higher in pairs; lower lobe not much narrower, densely hirsute or patently hirsute with reddish-brown hairs, glabrous inside. *Standard* large, 14–29 mm long, only the upper half of the blade slightly reflexed at anthesis; claw narrow, up to 10 mm long; blade up to 20 mm long, broadly ovate, dorsally densely hirsute on a well-defined triangular zone along the middle of the blade. *Wing petals* 15–22 mm long; claw 6–10 mm long, curved; blade 4–7 mm wide, only slightly auricled and pocketed; sculpturing exposed, upper basal and upper central, lamellate and lunate-lamellate, in 4–7 rows of 20–30 irregular reclined transcostal lunae, fading upper right central into a few intercostal lunae, a few transcostal lamellae occasionally present on the apex of the claw. *Keel petals* up to 20 mm long, shorter than wing petals; claw up to 10 mm long, curved; blade up to 10 mm long, 5 mm wide, semicircular, pointed, auriculate and pocketed near the base. *Androecium* as long as the keel, in a curved sheath open on the upper side; filaments flattened, ribbon-like; anthers dimorphic, alternately elongate, pointed, basifixed, 1,4–1,5 mm long and short, ovate, dorsifixed, 0,9 mm

long, dorsifixed anthers on longer filaments at anthesis, carinal anther intermediate, on a yet longer filament. *Pistil* 14–19 mm long; ovary 6–9 mm long, lower side  $\pm$  straight, upper side rounded, terete, sessile, densely hirsute; style merging gradually with ovary, basal half curving gently downwards, distal half curving gently upwards; stigma terminal, ovules *ca.* 25, funicles short, as long as the ovules. *Fruits* 17 mm long, 9 mm wide, longer than and partly covered by the persistent calyx, broadly elliptic, much inflated laterally, dark brown to black, densely hairy but glabrescent with age, with small peg-like projections and irregular narrow warty protuberances along the upper suture. Seed and chromosome number not known (Figures 1, 2, 3 & 4).

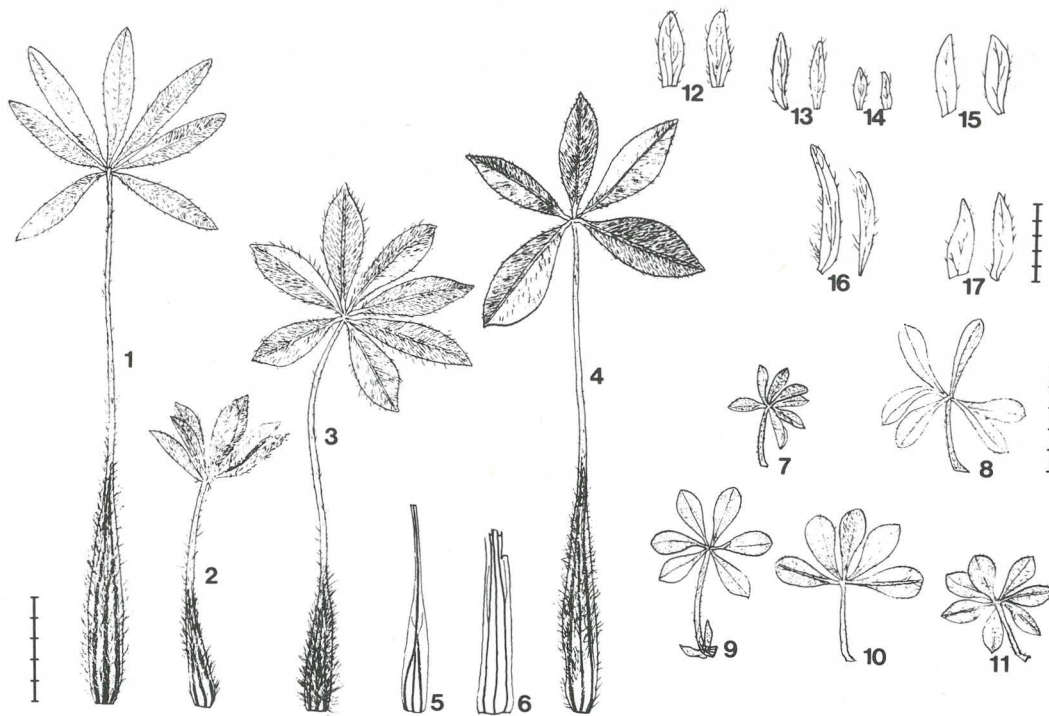
#### Geographical distribution and habitat

The species occurs in a relatively large area between the towns of Ceres, Worcester, Laingsburg and Swellendam in the southwestern Cape Province (Figure 5). It is represented in South African herbaria by only 7 collections, made sporadically between 1926 and 1971. The known distribution corresponds closely to the Witteberg and Bokkeveld Group of the Cape Supergroup. Judged by information on herbarium labels, the species seems to favour sandy soils.

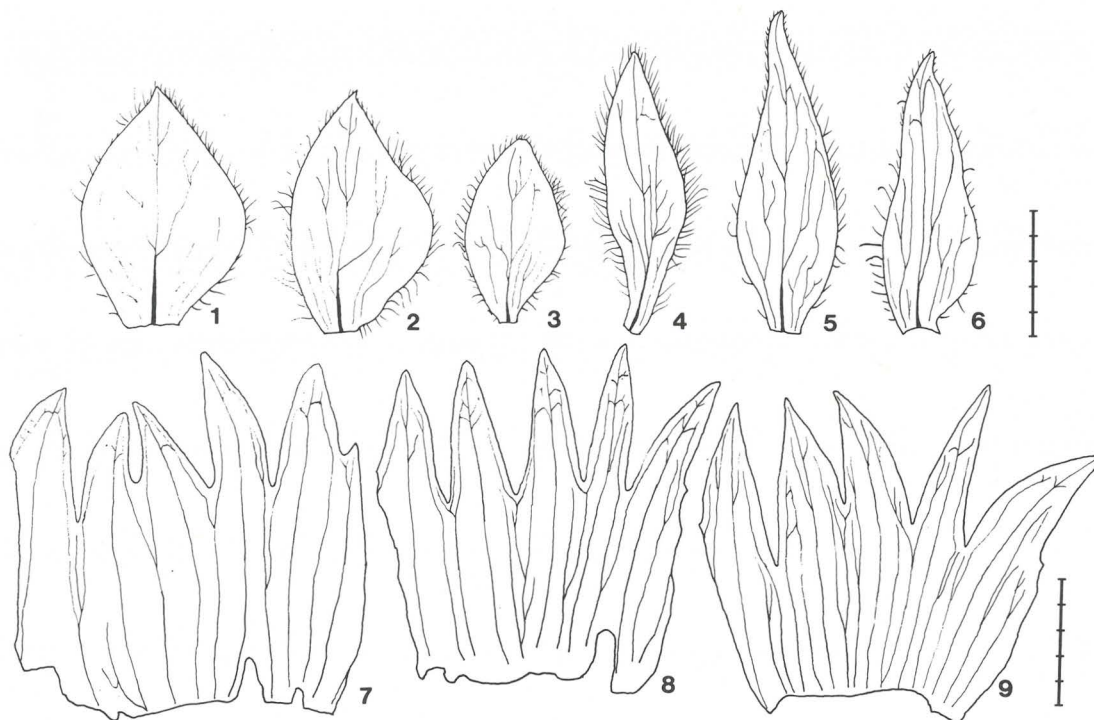
All known localities are situated in the dry transitional area



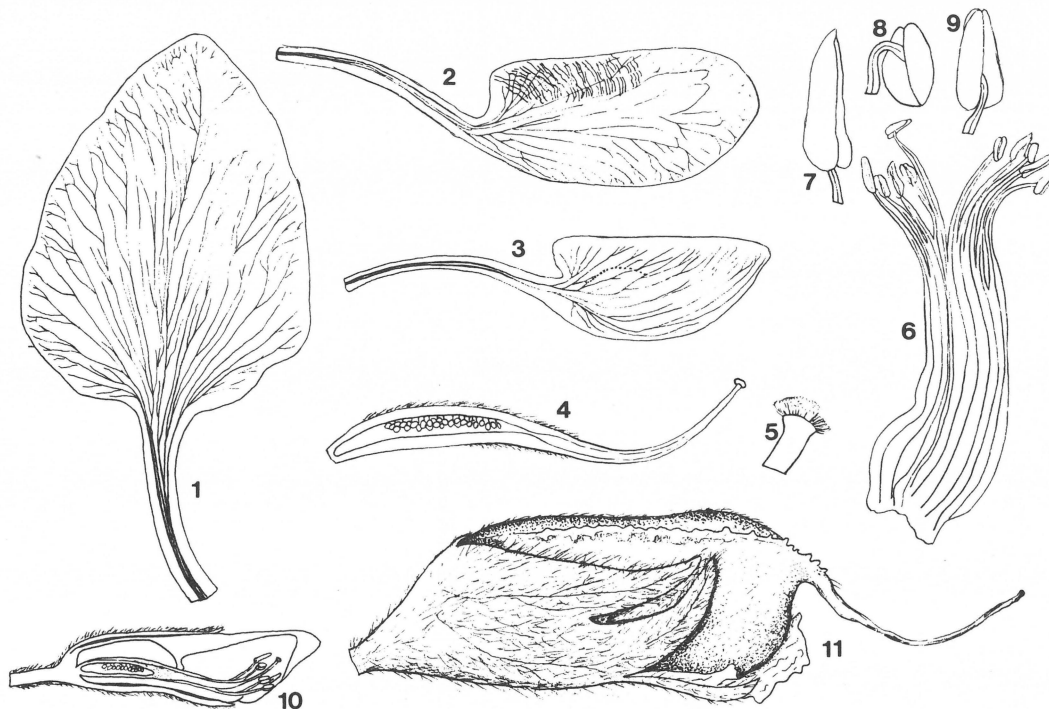
**Figure 1** The peculiar habit of *Lotononis brevicaulis*, showing the short caudex densely covered with persistent leaf bases, the procumbent annual flowering shoots and the large tubular flowers (*Compton 22867*). Life size.



**Figure 2** Variation in cauline leaves (1–6), leaves from annual shoots (7–11) and stipules (12–17) of *Lotononis brevicaulis*. 1, cauline leaf with leaflets opened out, showing the dilated petiole base (Compton 22867); 2, young cauline leaf showing the conduplicate leaflets (Compton 22867); 3, cauline leaf with leaflets opened out (Barker 3025); 4, cauline leaf with leaflets opened out (Oliver 3496); 5, petiole base of a young cauline leaf with the vestiture removed to show the venation (Compton 22867); 6, old petiole base, the vestiture removed (Compton 22867); 7, leaf from annual shoot showing the short petiole and conduplicate leaflets (Compton 22867); 8, unusual leaf with some leaflets only partially divided (Compton 22867); 9, leaf with stipules drawn in and leaflets opened out (Compton 22867); 10, quinquefoliolate leaf with leaflets opened out (Barker 3025); 11, 7-foliolate leaf with leaflets opened out (Oliver 3496); 12 & 13, stipule pairs (Oliver 3496); 14 & 15, stipule pairs (Barker 3025); 16 & 17, stipule pairs (Compton 22867). Scale in mm.



**Figure 3** Variation in the bracts (1–6) and calyx structure (7–9) of *Lotononis brevicaulis*. 1 & 2, ovate bracts (Barker 3025); 3 & 4, ovate and elliptic bracts (Compton 22867); 5 & 6, lanceolate bracts (Oliver 3496); 7–9, calyx opened out with the upper lobes to the left, vestiture not shown: 7, upper lobes fused higher up in pairs, lower lobe slightly longer (Barker 3025); 8, lobes nearly equal in length and shape (Compton 22867); 9, upper lobes fused higher up in pairs, lower lobe narrowest (Oliver 3496). Scale in mm.



**Figure 4** Detail of the flower and fruit of *Lotononis brevicaulis* (Compton 22867). 1, vexillum  $\times 3$ ; 2, wing petal, showing sculpturing  $\times 3$ ; 3, keel petal, showing auricle and pocket  $\times 3$ ; 4, longitudinal section of the pistil, showing the numerous ovules and the curvature of ovary and style  $\times 3$ ; 5, stigma  $\times 12$ ; 6, androecium at anthesis, showing the dimorphic anthers  $\times 3$ ; 7, basifixed anther, elongated and pointed  $\times 12$ ; 8, dorsifixed ovate anther  $\times 12$ ; 9, intermediate anther  $\times 12$ ; 10, longitudinal section of flower just before anthesis, showing the position and curvature of the pistil  $\times 1,5$ ; 11, fruit, showing the persistent calyx and protuberances along the upper suture  $\times 3$ .

between fynbos and karroid vegetation with a recorded rainfall of 75 to 100 mm per annum. The peculiar habit of the plant (Figure 1) may be an adaptation to this low and highly seasonal rainfall.

#### Diagnostic features and systematic position

*Lotononis brevicaulis* is a very distinct species and its affinities are not obvious. *L. anthylloides* Harv., *L. pentaphylla* (E. Mey.) Benth. and *L. polycephala* (E. Mey.) Benth. are similar in habit and the shape of the leaflets. Apical dominance of the primary stem is not maintained as in *L. brevicaulis* however. A slight differentiation between stem and side shoots is only evident in young plants of these species. The stipules are paired in the new species (Figure 2), not solitary as in the abovementioned species.

*L. brevicaulis* appears to be unique in having a well-developed, erect, perennial caudex (covered with persistent petiole bases) which is clearly differentiated from the seasonal, short-lived flowering branches (Figure 1). This differentiation is extended to the leaves (Figure 2), where the long-petioled cauline leaves with dilated, clasping petiole bases differ markedly from the shorter and smaller leaves of the flowering shoots.

The quinquefoliolate condition is relatively common in *Lotononis*. It also occurs in the *L. pentaphylla* group and perhaps significantly, often unstably so, with 3, 4 and 5 leaflets on the same plant. In all the specimens of *L. brevicaulis* examined, 6- and 7-foliolate leaves predominate, although at least some 5-foliolate leaves are usually present (Figure 2). This is a new character state for *Lotononis*, not recorded in any other known species.

The inflorescences and flowers of the species referred to above differ markedly from those of *L. brevicaulis*, being arranged in dense, small-flowered heads rather than the lax,

few- and large-flowered racemes of the latter. The flowers are amongst the largest in the genus and superficially resemble those of the genus *Pearsonia* Dümmer, where a 'gullet type' pollination mechanism occurs (Polhill 1973). Even the calyx (Figure 3) seems similar. As seen in Figure 4, however, the style is curved, the anthers are clearly dimorphic and the stamens remain within the keel. These characters would exclude the species from *Pearsonia* as presently circumscribed (Polhill 1973).

The large vexillum, pointed keel petals and turgid fruit (Figure 4) indicate an affinity with *Lotononis azurea* (Eckl. & Zeyh.) Benth. and its allies. Peg-like and warty projections are present along the upper suture of the fruit, such as are present in the section *Telina* (E. Mey.) Benth. and also elsewhere.

Even the vestiture does not provide a clear answer. The medifixed hairs of *L. brevicaulis*, with one arm short and the other similar or mostly very much longer, occur commonly in *Lotononis*. Medifixed hairs are found in *L. azurea* and its allies, but not in the *L. pentaphylla* group of species, which has ordinary uniseriate hairs. The longitudinally striated hair surface sculpturing, devoid of the round wart-like structures found on the hairs of most species of *Lotononis*, is present in both these groups.

A more definite decision on the systematic position of *L. brevicaulis* can only be taken once the full range of variation in the genus has been studied. Based on available evidence, the most appropriate position seems to be in the section *Lipozygis* (E. Mey.) Benth. near the *L. pentaphylla* group, where it is tentatively placed.

#### Specimens examined

—3319 (Worcester): Gydouw (—AB), 3/10/1942, *Leipoldt* 4025 (BOL); Jakhalsnest, Ceres [probably Jakkalsnek] (—AD), 27/9/1944, *Barker*

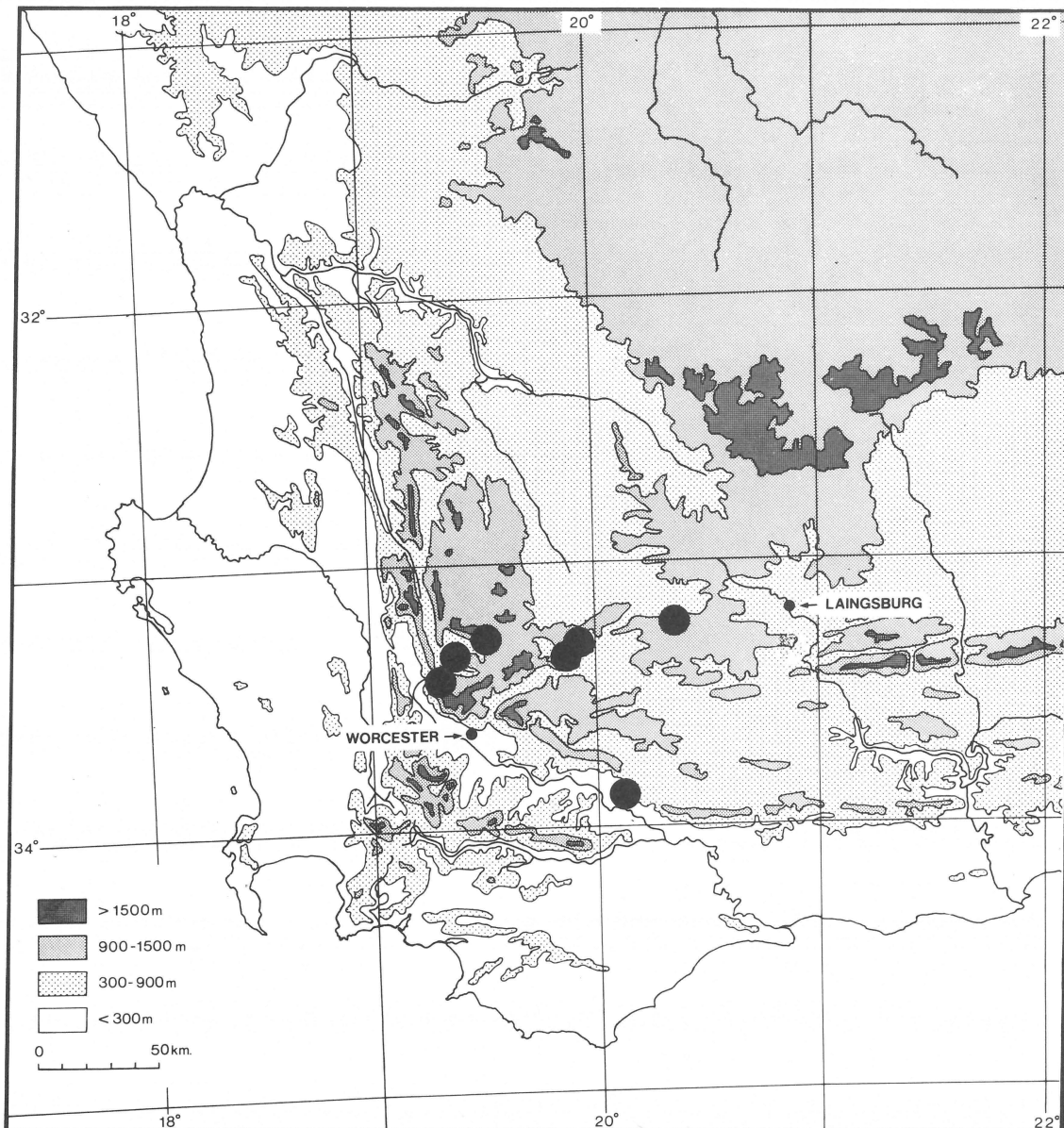


Figure 5 The known geographical distribution of *Lotononis brevicaulis*.

3025 (NBG, STE); Top of Theron's Berg Pass (–BC), 1/9/1926, *Levyns 1502* (BOL, K); Near Verkeerde Vlei (–BD), 9/1933, *Levyns 4610* (BOL); Bonteberg on farm Karrona, flats at base of mountain (–BD), 15/9/1971, *Oliver 3496* (PRE, STE).

—3320 (Montagu): Tweedside, Laingsburg (–AB), 27/12/1951, *Compton 22867 sheet 1* (NBG), *22867 sheet 2* (NBG); Near Bonnievale (–CC), 9/1933, *Leighton 21160* (BOL).

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