



The *Rhynchosia totta* complex (Phaseoleae, Fabaceae) in Southern Africa, including the description of a new variety and new species

**Authors:**

Annah N. Moteetee¹ 
M. Marianne le Roux^{1,2} 

Affiliations:

¹Department of Botany and Plant Biotechnology, University of Johannesburg, South Africa

²South African National Biodiversity Institute (SANBI), South Africa

Corresponding author:

Annah Moteetee,
amoteetee@uj.ac.za

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Background: The *Rhynchosia totta* complex is one of three taxonomically complicated African groups in the genus *Rhynchosia*. Numerous southern African species and infraspecific taxa (at least 19 names, 17 species and 2 varieties) have been described by various authors in the past, but were later reduced into synonymy with *R. totta*. Currently, only the typical variety is recognised in Southern Africa.

Objectives: To investigate and update the circumscription of the taxa within the *R. totta* complex in southern Africa and to update their synonymies and distribution ranges.

Methods: Specimens of *R. totta* at GRA, JRAU, K, NH and PRE were studied and compared, and measurements of characters recorded. Populations were also observed during field studies.

Results: The examination of numerous specimens, as well as field investigations, has prompted the recognition of four varieties (one described here as new: *R. totta* var. *longicalyx*) and a new species (*R. pedunculata*) in southern Africa.

Conclusions: A great variation in leaf structure and vestiture occurs within the *R. totta* complex, with the extreme forms easily recognisable. However, the total number of varieties are limited to four [*R. totta* vars. *totta*, *longicalyx*, *rigidula* and *venulosa*] and a new species described to accommodate specimens with a distinctly prostrate habit and upwardly directed leaves.

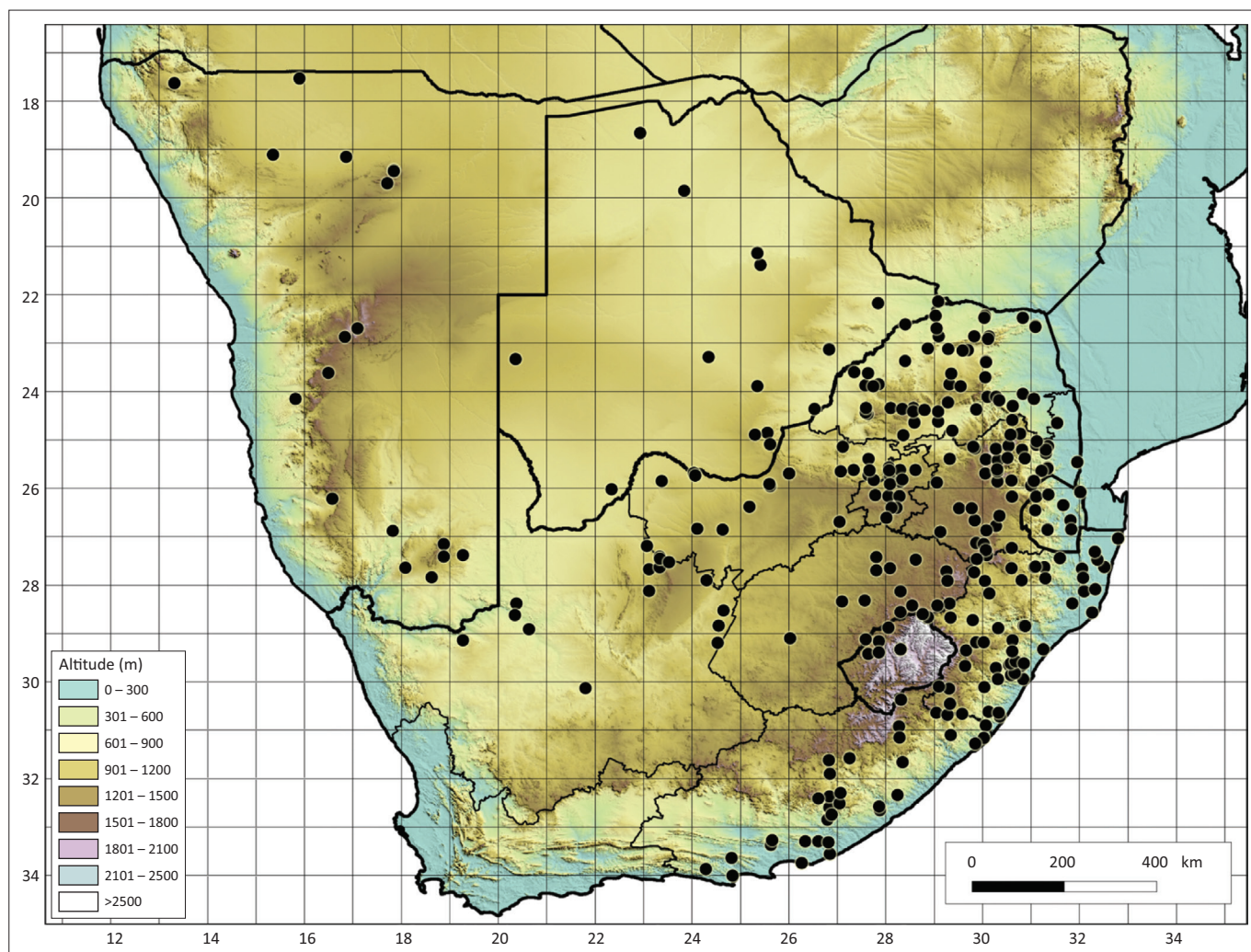
Introduction

Rhynchosia Lour. is a member of the Fabaceae (Leguminosae) subfamily Papilionoideae (Faboideae) tribe Phaseoleae (Lackey 1981). Within the tribe Phaseoleae, taxonomic studies have been completed for a number of southern African genera, for example, *Dipogon* Liebm. (Stirton 1981a), *Macrotyloma* (Wight & Arn.) Verdc. (Verdcourt, Hooker & Halliday 1982), *Bolusafra* Kuntze (Moteetee & Van Wyk 2006), *Dolichos* L. (Moteetee & Van Wyk 2012a), *Sphenostylis* E.Mey. (Moteetee & Van Wyk 2012b), *Ophrestia* H.M.L.Forbes (Moteetee & Van Wyk 2012c), and *Canavalia* DC. (Moteetee 2016), while studies on other genera are ongoing. Of particular interest is the genus *Rhynchosia* in which taxonomic research is ongoing and several new species have already been described (Boatwright & Moteetee 2014; Germishuizen 1998, 2006, 2011; Moteetee, Boatwright & Jaca 2012, 2014). With approximately 230 species (Schrire 2005), *Rhynchosia* is the largest genus in the subtribe Cajaninae with the majority of species widely distributed across Africa. Some of the species are also found in warm temperate and tropical regions of Asia, Australia and America. It is closely related to *Eriosema* (DC.) Desv. within the Phaseoleae. Cajaninae is characterised by the presence of vesicular glands and bulbous-based hairs (Lackey 1981). It comprises eight genera, of which only four occur in southern Africa; that is, *Bolusafra*, *Cajanus* DC. (write out cultivated species), *Eriosema* and *Rhynchosia*. Comprehensive taxonomic studies of the South African species of the genus *Eriosema* are yet to be published; however, a number of studies have been published by Stirton (1977, 1981b, 1981c, 1994).

Rhynchosia totta (Thunb.) DC. was first described by Thunberg (1800) in his *Prodromus Plantarum Capensium* as *Glycine totta* Thunb. (1800). De Candolle (1825) later transferred it to *Rhynchosia*. This species is commonly known as the yellow carpet bean and is widely distributed from South Africa northwards to Somalia (Verdcourt 1971). Its place of origin has been suggested to be South Africa. However, molecular studies are needed to prove this. Thunberg (1800) described this species as having trifoliolate leaves with reticulate, ovate and ciliate leaflets. More detailed descriptions of *R. totta* are given by De Candolle (1825), Harvey (1862), and Verdcourt, Pope & Polhill (2001), who

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Source: Compiled by M.M. le Roux, original map based on GTOPO30 global digital elevation model

FIGURE 1: Combined distribution of *Rhynchosia totta* and its four varieties in southern Africa.

have described it as a climbing, twining, ascending perennial herb with a tuberous rootstock and slender stems, with glabrescent to densely pubescent trifoliolate leaves, oblong-lanceolate leaflets acute at the apex, glabrescent to silky pubescent with prominent, reticulate venation, and flowers flushed reddish that are either solitary or a few arranged in very lax inflorescences.

Baker (1923) divided the species into seven variants mainly based on leaf shape and structure, as well as stem and/or leaf vestiture, but other characters such as petiole length and flower size were applied inconsistently. These are *Rhynchosia totta* var. *brevipetiolata* Baker f. (stem pilose or tomentose, petioles short), *R. totta* var. *fenchelii* Schinz (stem grey puberulous, leaves trifoliolate), *R. totta* var. *graciliflora* Harms ex Baker f. (*R. graciliflora* Harms) (leaves trifoliolate, linear-lanceolate, pubescent or nearly glabrous), *R. totta* var. *namaensis* Schinz (leaves trifoliolate, leaflets lanceolate or ovate-lanceolate, grey puberulous), *R. totta* var. *pilosa* Harv. (stem patently pilose, leaves trifoliolate, leaflets of the lower ovate-oblong, upper linear) and *R. totta* var. *unifoliolata* Burt Davy (leaves unifoliolate or trifoliolate, leaflets ovate, petiole short).

Having studied *Rhynchosia* species occurring in East Africa, Verdcourt (1971) remarked that 'three groups stand out for their difficulty, so far as Africa is concerned'. The three groups in question are: 1) the *Rhynchosia minima* (L.) DC. group, 2) the *R. viscosa* (Roth) DC. group, and 3) the *R. totta* (Thunb.) DC group. The *R. viscosa* group does not occur in South Africa, while the other two are more widely distributed in southern and tropical Africa. The *R. totta* group is centred in South Africa but extends through most of southern Africa (Figure 1) and north-eastwards through East Africa as far as Somalia. Numerous South African species and infraspecific taxa in this group (herein referred to as a complex) have been described giving 'the impression that work on the group has been uninspired and that every small variant has been given a name, as the simplest way out of the particular author's immediate difficulty' (Verdcourt 1971). There are at least 17 specific and 2 varietal names that have been reduced into synonymy with *R. totta* over the years, possibly due to the immense variation in leaf shape and vestiture encountered across a wide distribution area. According to Verdcourt (1971), there are two extremes in East Africa (which also extend to southern Africa): there are variants with slender stems and glabrescent leaflets on the one hand (which he

TABLE 1: Historical overview of the development of the concept of the *Rhynchosia totta* complex.

Baker (1923)	Verdcourt (1971, 2001)	Current study
[Series 25]		
<i>Rhynchosia totta</i> (Thunb.) DC.	<i>R. totta</i>	<i>R. totta</i>
var. <i>totta</i>	var. <i>totta</i>	var. <i>totta</i> (synonyms as in Verdcourt (1971) and Verdcourt, Pope, & Polhill (2001)), excluding <i>R. rigidula</i> but including those listed below)
var. <i>brevipetiolata</i> Baker f.	[= <i>R. humilis</i> Eckl. & Zeyh.]	[=var. <i>unifoliolata</i>]
var. <i>fenchelii</i> Schinz	[= <i>R. rigidula</i>]	[=var. <i>graciliflora</i>]
var. <i>graciliflora</i> Harms ex Baker f.	[= <i>Copisma paniculatum</i> E.Mey.]	
var. <i>namaensis</i> Schinz	[= <i>R. paniculata</i> (E.Mey) Steud.]	var. <i>longicalyx</i> A.Moteetee & M.M.le Roux
var. <i>pilosa</i> (E.Mey) Baker f	[= <i>C. pilosum</i> E.Mey.]	
var. <i>unifoliolata</i> Burt Davy	[= <i>R. pilosa</i> (E.Mey.) Steud.]	var. <i>rigidula</i> (DC.) Moteetee & M.M.le Roux
<i>R. longiflora</i> Schinz	[= var. <i>pilosa</i>]	[=var. <i>namaensis</i>] [=var. <i>longiflora</i>]
[Series 26]		
	[= <i>R. nervosa</i> Benth. ex Harv. & Sond. var. <i>petiolata</i> Burt Davy]	var. <i>venulosa</i> (synonyms as in Verdcourt (1971), and Verdcourt, Pope, & Polhill (2001)) and those listed below)
<i>R. elegantissima</i> Schinz	var. <i>venulosa</i> (Hiern) Verdc.	[=var. <i>fenchelii</i>]
[Series 27]		
	[= <i>R. filicaulis</i> Bak.]	var. <i>elongatifolia</i> Verdc.
<i>R. venulosa</i> (Hiern) K. Schum.	[= <i>R. hirsuta</i> Schinz, <i>non illegit.</i>]	<i>R. pedunculata</i> M.M.le Roux & A. Moteetee
[Series 29]		
	[= <i>R. venulosa</i>]	
<i>R. rigidula</i> DC.	[= <i>R. elegantissima</i>]	
	[= <i>R. cinnamomea</i> Schinz]	
	[= <i>R. remota</i> Conrath]	
	[= <i>R. mollis</i> Burt Davy, <i>nom illegit.</i>]	
	var. <i>elongatifolia</i> Verdc.	

attributes to the typical variant) and those with thicker stems and pubescent to densely velvety leaflets on the other [*R. totta* var. *venulosa* (Hiern) Verdc. – which was recognised as a species by Baker (1923)], with several intermediates between these two. He further recognised *R. totta* var. *elongatifolia* Verdc. (Verdcourt 1971; Verdcourt *et al.* 2001). The development of the concept of the *R. totta* complex is summarised in Table 1. According to the latest checklist of southern African plants (Germishuizen and Meyer 2003), only the typical variant is currently recognised.

Here, we present results of a taxonomic study of the *R. totta* complex, including correct synonymy and distribution ranges of the taxa of southern Africa. We further describe a new species and a new variety.

Research method and design

Plant material representative of both *R. totta* and *R. capensis* (Burm.f.) Schinz was studied from herbarium specimens housed at GRA, JRAU, K, NH and PRE, and during field excursions. *Rhynchosia capensis* is the closest relative to *R. totta* (see the discussion under ‘Diagnostic characters and relationships’ of *R. totta*). Herbarium acronyms are listed according to Thiers (2011). Both Baker (1923) and Verdcourt (1971) mentioned the variation in leaf structure (number and shape of leaflets) and vestiture; therefore, these were examined as well as other characters such as habit, petiole length, floral and fruit morphology. Flowers were rehydrated in boiling water and dissected under a binocular stereomicroscope.

Representative specimens examined are arranged according to the quarter-degree grid reference system (Edwards & Leistner 1971; Leistner & Morris 1976). This system is used to map distribution data of each taxon, whereby the basic unit is the one-degree square of latitude and longitude, designated

by a degree reference number (i.e. degrees of latitude and longitude of the north-west corner) and the district name of that square. Some types of specimens were examined online in the JSTOR (2015) database.

Results

The examination of 562 specimens labelled as *R. totta* at the National Herbarium in Pretoria (PRE), and those housed in GRA, JRAU, K and NH, as well as observations made during field trips, have revealed great morphological variation. *Rhynchosia totta* is a scrambling perennial herb, although some of the varieties tend to be woody, particularly those occurring farther north in southern Africa. The herbaceous nature can potentially be the result of stems dying back (or burning down) during winter, corresponding to typical environmental circumstances found in grasslands (fire and frost during the winter season) but with the underground, robust tuber remaining undamaged, giving rise to new stems and foliage in spring. Leaves are usually leathery with distinct reticulate venation.

We here recognise four varieties (*R. totta* vars. *totta*, *longicalyx* Moteetee & M.M.le Roux, *rigidula* (DC.) Moteetee & M.M.le Roux and *venulosa* (Hiern) Verdc.) in southern Africa. The newly described *R. totta* var. *longicalyx* is distinguished by the larger flowers (12 mm – 14 mm long) and elongate, narrowly linear calyx lobes. We also recognise a new species, *R. pedunculata* M.M.le Roux & Moteetee, characterised by its elongated peduncles and prostrate habit.

Key to the *Rhynchosia totta* complex and related species

- 1A. Habit distinctly prostrate, stems never twining; leaflets directed upwards ... *R. pedunculata*

1B. Habit trailing, semi-erect, spreading or decumbent, stems sometimes twining; leaflets not distinctly directed upwards:

2A. Plants glabrous or minutely downy; leaflet margins slightly revolute; legume glabrous or downy ... *R. capensis*

2B. Plants hispidulous-pubescent or villous to glabrescent; leaflet margins not revolute; legume pubescent ... *R. totta*

3A. Lateral leaflets symmetrical; leaflets usually small and linear-lanceolate or elliptic-ovate [16–40(45) mm long, 3–11(20) mm wide] (if leaflets slightly asymmetrical, then inflorescences up to 16 mm long):

4A. Stems herbaceous; leaves leathery and pubescent; inflorescences 10–40 mm long ... *R. totta* var. *totta*

4B. Stems woody; leaves soft-textured, densely pubescent; inflorescences 13–16 mm long ... *R. totta* var. *rigidula*

3B. Lateral leaflets asymmetrical; leaflets usually large and lanceolate-elliptic [26–100 mm long, 3–30 mm wide]:

5A. Leaflets lanceolate; calyx usually up to half the length of the flower with the lobes equal to the tube and not long and slender ... *R. totta* var. *venulosa*

5B. Leaflets more or less ovate; calyx approximately as long as flowers with the lobes longer than the tube and distinctly slender ... *R. totta* var. *longicalyx*

Taxonomic treatment

1. *Rhynchosia totta* (Thunb.) DC., Prodr. 2: 388 (1825); Eckl. & Zeyh., Enum. 2: 253 (1836); Harv. in Fl. Cap. 2: 255 (1862); Baker f. in Bothalia 1: 130 (1923). *Glycine totta* Thunb., Prodr. Pl. Cap.: 131 (1800), 591 (1823). *Copisma tottum* (Thunb.) E.Mey., Comm. Pl. Trop. Afr.: 133 (1836). *Dolicholus totta* (Thunb.) Kuntze, Revis. Gen. Pl. 3(3): 62 (1898). Type: South Africa, Eastern Cape, 3325 (Port Elizabeth), 'prope Gagebosch ad Cap. b. Spei [near Gagebosch]', (–CC), without date, *Thunberg s.n. THUNB-UPS 16820* (UPS-microfiche, holo!).

Rhynchosia humilis Eckl. & Zeyh., Enum. 2: 253 (1836). Type: South Africa, Eastern Cape, 3326 (Grahamstown), 'inter frutices hiatuum prope Grahamstown [near Grahamstown]', (–BC), without date, *Zeyher 1669* (S, holo!).

Copisma paniculatum E.Mey., Comm. Pl. Afr. Austr.: 134 (1836). *Rhynchosia paniculata* (E.Mey.) Steud., Nom. Bot.: 454 (1840). Type: South Africa, Eastern Cape, 3226 (Fort Beaufort), 'Katriviervoorpoort', (–DC), without date, *Drège s.n.* (S, lecto!), designated here; HAL, K, isolecto!). [Syntype: South Africa, Eastern Cape, 3225 (Somerset East), 'Klein Vischrivier', (–DB), without date, *Drège s.n.* (specimen not seen, see taxonomic note (i))].

Copisma pilosum E.Mey., Comm. Pl. Afr. Austr.: 133 (1836). *Rhynchosia pilosa* (E.Mey.) Steud., Nom. Bot.: 454 (1840). *Rhynchosia pilosa* (E.Mey.) Harv. in Fl. Cap. 2: 256 (1862). *Rhynchosia totta* var. *pilosa* (E.Mey.) Baker f. in Bothalia 1: 131 (1923). Type: South Africa, Eastern Cape, 3325 (Port Elizabeth), 'Zuurebergen [Zuurberg]', (–AD), without date, *Drège s.n.* (specimen not seen).

Rhynchosia nervosa var. *petiolata* Burt Davy, Man. Flow. Pl. Transvaal: 411 (1932). Type: South Africa, Gauteng, 2627 (Potchefstroom), 'Buttholm, Vereeniging', (–AD), Apr 1922, *Burt Davy 17655* (K, lecto!), designated here; PRE, isolecto!, see taxonomic note (ii)).

Rhynchosia unifoliolata Burt Davy, Man. Flow. Pl. Transvaal: 49 (1932), *syn. nov.* *Rhynchosia totta* var. *unifoliolata* (Burt Davy) Baker f. in Bothalia 1: 131 (1923). Type: South Africa, Mpumalanga, 2629 (Bethal), 'Ermelo', (–DB), without date, *Burt Davy 17403* (K, lecto!), designated here, see taxonomic note (iii)). [Syntype: South Africa, Mpumalanga, 2729 (Volksrust), 'Hoogeveld near Paardekopberg' (–BA), without date, *Rehmann 6836* (specimen not seen)]

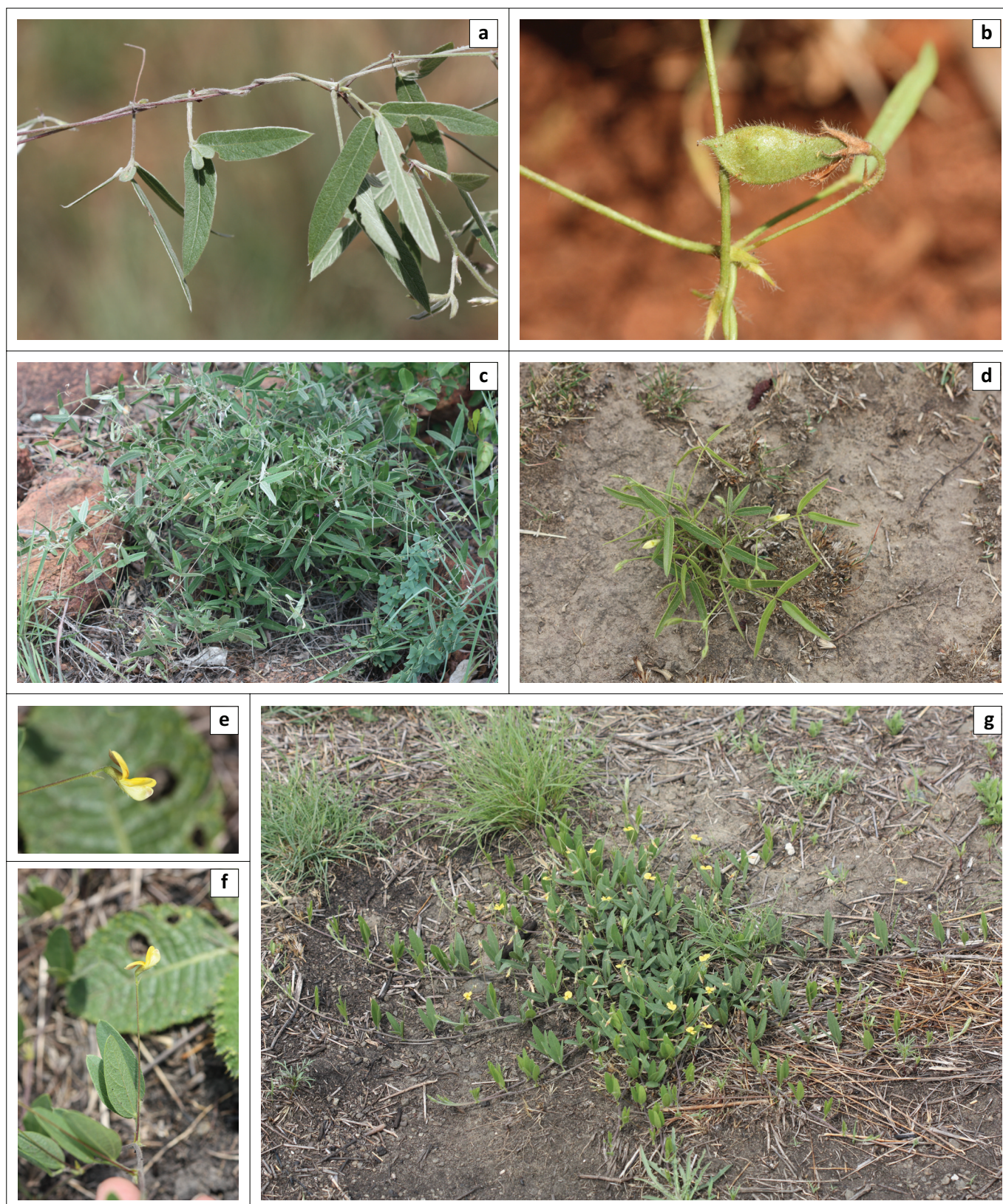
Rhynchosia totta var. *graciliflora* Harms ex Baker f. in Bothalia 1: 131 (1923), *syn. nov.* Type: South Africa, Mpumalanga, 2530 (Lydenburg), 'Lydenburg', (–AB), Nov 1895, *Wilms 367* (Z, lecto!), designated here; K, isolecto!, see taxonomic note (iv)).

Description

Vigorous, slender, spreading, twining or climbing herb arising from a woody rootstock. *Stems*: densely puberulous with short, brownish or grey hairs when young, often glabrescent. *Leaves*: pinnately trifoliolate or unifoliolate, leaflets linear, narrowly to broadly elliptic or ovate, sometimes asymmetrical, 15–80(100) × (3)6–25(30) mm, glandular, hispidulous-pubescent or villous to glabrescent above, sparsely- to densely-pubescent below, emarginate or mucronate; stipules small, ovate-lanceolate, 3–6 × 0.5–2.0 mm, striated; petiole (3)6–40 mm long. *Inflorescences*: mostly 1–4-flowered (rarely 5-flowered) in axillary racemes or sessile, 15–125 mm long, sometimes occurring in pairs. *Flowers*: 5–18 mm long, yellow; bracts lanceolate, 1.5–3.0 × 0.2–1.0 mm; bracteoles absent. *Calyx*: bilabiate, usually half the length of the corolla to almost as long as the corolla, vexillary lobes connate for 0.2–0.8(–1.5) mm above the calyx tube, those of the lower lip unequal, oblong-elliptic, carinal lobe longer than lateral lobes, 5–12 mm long, lateral lobes 3–10 mm long. *Corolla*: persistent; standard yellow or yellow and veined red, suborbicular, reflexed backwards, 5–15 × 4–7 mm, slightly emarginate, glabrous, with two callosities on claws; wings oblong, sometimes slightly narrower and shorter than keel, 4–8 × 1–2 mm, spurred at base, without sculpturing; keel obtuse, 4–10 × 2–4 mm, pocketed. *Androecium*: diadelphous with nine filaments fused, vexillary stamen free to the base; anthers monomorphic, dorsifixed. *Ovary*: narrowly oblong-elliptic, stipitate, pubescent, 2-ovuled; style curved upwards, glabrous. *Fruit*: narrowly oblong, laterally compressed, 15–20(25) × 4–8 mm, densely pilose, glandular, 2-seeded. *Seeds*: depressed-globular, 3–5 × 1–3 mm, brown, black or mottled brown (Figures 2, 3). Flowering time: (Aug) Sep to Apr (May).

Distribution and ecology

Rhynchosia totta is widespread in southern Africa, but is centred mainly in South Africa, from which it extends north through Botswana, Zimbabwe and Mozambique, westwards to Namibia and Angola, eastwards through Zambia, and

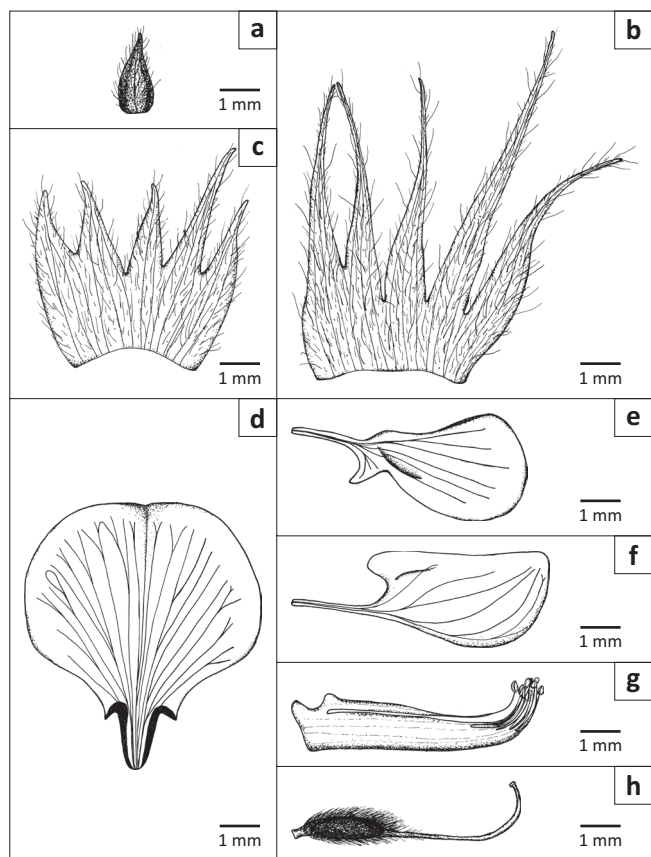


Source: M.M. le Roux

(a), Twining branch with pinnately trifoliolate, greyish-pubescent leaves; (b), Typical fruit; (c–d), Trailing, spreading habit; (e), Flower with wings almost equal in length to the keel; (f), Pinnately trifoliolate leaf with inflorescence, showing the long length of the peduncle in comparison to the leaves; (g), Prostrate, trailing habit with leaves notably upright.

a–c, *Rhynchosia totta* var. *venulosa*. d, *Rhynchosia totta* var. *totta*. e–g, *Rhynchosia pedunculata*.

FIGURE 2: Diagnostic features of *Rhynchosia totta* vars. *venulosa* and *totta* and *R. pedunculata*.



Source: M.M. le Roux

(a), Bract; (b), Calyx of *R. totta* var. *longicalyx*; note the long, slender calyx lobes with the carinal lobe longer than the other lobes; (c), Calyx of *R. totta* var. *totta*; note the longer, carinal lobe; (d), Standard with callosities (black shading); (e), Wing, (f), Keel; (g), Diadelphous androecium with 10 dorsifixed anthers; (h), Gynoecium.

Scale bar: 1 mm. Vouchers: (a, c, d-h) M.M. le Roux 177 (PRE); (b) S. Venter 11883 (PRE).

FIGURE 3: Floral structure of *Rhynchosia totta*.

across East Africa as far as Somalia (Verdcourt, Pope & Polhill 2001). In South Africa, it occurs widely in all provinces, except in the Western Cape province and is only sparsely distributed in the Northern Cape province (Figure 1). It grows in sandy soil in grasslands, burnt hillsides, rocky outcrops, near streams, and on roadside embankments.

Taxonomic notes

(i) Some of Drège's syntypes of *Copisma tottum*, *C. paniculatum*, and *C. pilosum* could not be found in any of the probable herbaria (B, P, UPS, W). If they were ever deposited in B, they were most probably destroyed during World War II. (ii) The K specimen of *R. nervosa* var. *petiolata* is selected because it is a better-looking specimen with multiple fruits. (iii) The K specimen of *R. totta* var. *unifoliolata* is chosen as lectotype because it is the only one available. (iv) The Z specimen of *R. totta* var. *graciliflora* is chosen as lectotype because it has both flowers and a fruit and it represents best the twining nature of the taxon.

Diagnostic characters and relationships

Rhynchosia totta resembles *R. capensis* in its growth form (spreading, twining or climbing herb arising from a woody

rootstock), but tends to be more hairy (*R. capensis* tends to be glabrous or minutely downy), has leaflet margins that are not revolute (leaf margins slightly revolute in *R. capensis*), and peduncles that are usually laxly 1–4-flowered or sometimes 5-flowered (1–6-flowered, flowers concentrated at the tips of peduncles in *R. capensis*). According to Harvey (1862), *R. capensis* also differs from *R. totta* in having large resinous glands. However, glands do occur in *R. totta*, but they are much denser in *R. capensis*.

R. totta var. *totta*

Description

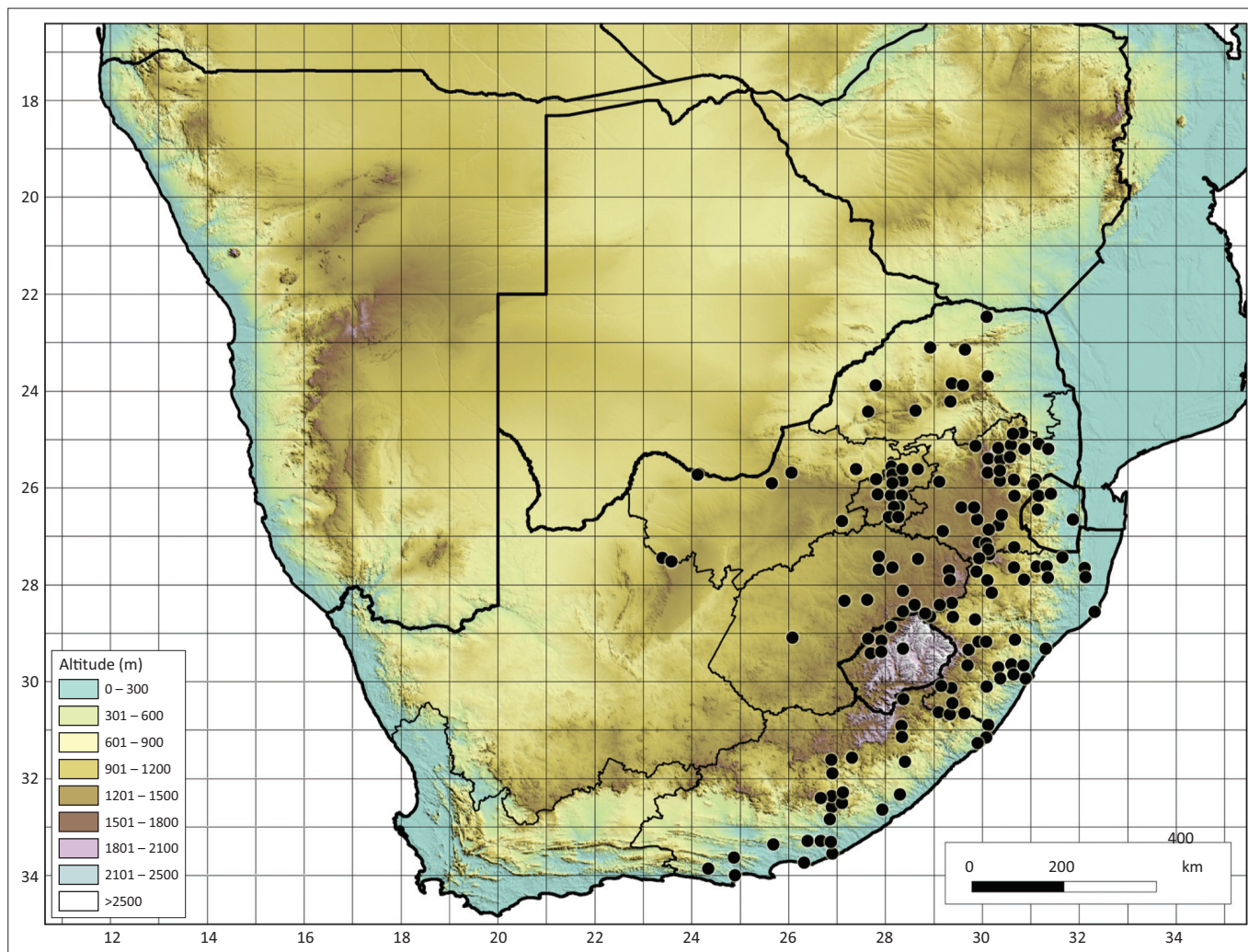
Leaves: unifoliolate or trifoliolate, leaflets linear-lanceolate, lanceolate, elliptic or ovate, 16–35(45) × 3–11(20) mm, sparsely pubescent above, densely pubescent below; stipules lanceolate, 3–6(8) × 1–2 mm; petiole (6)10–25 mm long. *Inflorescences:* 1–3-flowered axillary racemes, occasionally branched, 10–40 mm long, pubescent-glabrescent. *Flowers:* yellow, 6–10 mm long; bracts 1.0–1.5 × ± 0.2 mm. *Calyx:* tube 2–3 mm long, upper lobes 3–5 mm long, lateral lobes 2–4 mm long, carinal lobe 5–6 mm. *Standard:* 6–8 × 4–5 mm; wings 4–5 × 1–2 mm; keel 5–6 × 2–3 mm. *Fruits:* 15–20 × 5–6 mm, pubescent. *Seeds:* brown or black, 2–4 × 1–3 mm (Figure 2d and Figure 3).

Distribution and ecology

This variety is widely distributed in South Africa (across the Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga and North-West provinces), Swaziland and Lesotho (Figure 4), with two specimens found on the border of the Northern Cape province. Specimens from the latter province are sterile and could not be identified with confidence as they share similarities in appearance with *R. totta* var. *rigidula*. It grows on sandy soil in grasslands, rocky outcrops, open woodlands and forest margins.

Diagnostic characters and relationships

Rhynchosia totta var. *totta* differs from var. *rigidula* in the herbaceous habit, long rachises and leathery, glabrescent leaves (woody with short rachises and often slightly silver-felted leaves that are not leathery are found in *R. totta* var. *rigidula*). This variety also resembles the new species, *R. pedunculata*, but differs in the trailing, twining or spreading habit and inflorescences that are not distinctly longer than the leaves or leaves orientated horizontally (prostrate habit with inflorescences much longer than the leaves and invariably standing upright in *R. pedunculata*). The typical variety includes those taxa with a woody base and herbaceous stems, and unifoliolate or trifoliolate leaves with leaflets that are ovate to lanceolate in shape. There are some specimens with long petioles and linear-lanceolate leaflets (formerly *R. totta* var. *graciliflora*), but, given the lack of any other morphological features to distinguish these collections from the typical form, the variant is included in *R. totta* var. *totta*.



Source: Compiled by M.M. le Roux, original map based on GTOPO30 global digital elevation model

FIGURE 4: Distribution of *Rhynchosia totta* var. *totta* in Southern Africa.

Additional specimens seen

SOUTH AFRICA. LIMPOPO.—**2230** (Messina): Messina, (–AC), Mar 1918, *F.A. Rogers 20807* (PRE). **2327** (Ellisras): Mogol Nature Reserve, wooded slope, (–DD), 1040 m, Feb 1981, *S.P. Fourie M 211* (PRE). **2328** (Baltimore): Blouberg, Buffelshoek Farm 261, (–BB), 7 Dec 1990, *P.P.J. Herman 1307* (PRE). **2329** (Pietersburg): 42 km from Louis Trichardt on Southern Vivo road en route to Lesheba Farm, (–BA), 25 Mar 1994, *H. Joffe 1068* (PRE); Pietersburg Nature Reserve, near gate, (–CD), 7 Feb 1980, *G.J. Bredenkamp 364* (PRE); 27.3 mi from Pietersburg on road to Tzaneen, (–DC), 2 Apr 1972, *B. Clarke 380* (K, PRE). **2330** (Tzaneen): Letaba, Westfalia Estate, firebreak near road-rail bridge en route to Duiwelskloof, (–CA), 3100 ft, 18 Nov 1960, *J.C. Scheepers 1049* (K, PRE). **2427** (Thabazimbi): Farm Groothoek 1246, Western entrance of Waterberg Mountain, (–BC), 7 Apr 1948, *L.E. Codd 3985* (PRE). **2428** (Nylstroom): Sterkrivier Dam Nature Reserve, (–BC), 9 Feb 1972, *N.H.G. Jacobsen 2053* (PRE). **2429** (Zebediela): between Pietersburg and Chunies Poort, (–AB), 4 Oct 1938, *A.H.F. Hafstrom & J.P.H. Acocks 715* (PRE).

NORTH-WEST.—**2524** (Vergeleë): Corowa Farm on the Molopo River, (–CA), 21 Mar 2001, *J.J. Meyer 3514* (PRE); **2525**

(Mafikeng): along Mafikeng-Zeerust road, (–DC), 21 Dec 1982, *S.D. Phalatse 103* (PRE). **2526** (Zeerust): Zeerust, (–CA), Jan 1928, *Thode A 1399* (NH, PRE). **2527** (Rustenburg): Waagfontein Farm, 20 km from Rustenburg on the road to Pretoria on the mountain's side of the road, (–CB), 1367 m, 5 Nov 1971, *L.A. Coetzer 90* (PRE); Pelindaba, Uitkomst 499 JQ, (–DD), 5000 ft, 5 Jan 1969, *B.J. Coetzee 86* (PRE). **2627** (Potchefstroom): Potchefstroom School of Agriculture, on veld preservation experimental plot 2, (–CA), 12 Oct 1927, *E.P. Phillips & R.W. Liebenberg 968* (PRE); 16 mi [25.7 km] E of Rustenburg, (–CA), 11 May 1975, *A.O.D. Mogg & K.M. Cunliffe 36523* (JRAU); Sterkfontein Caves & Zwartkrans 67, (–DD), 12 Dec 1970, *A.O.D. Mogg 35622* (JRAU).

GAUTENG.—**2528** (Pretoria): Bon Accord, Pyramid Hills, (–CA), 23 Nov 1944, *E. Wasserfall & L.R. van Niekerk 91* (PRE); Drylands Experimental Station, 3 mi S of Pretoria, (–CA), 4500 ft, 29 Sep 1946, *L.E.W. Codd 1739* (PRE); Pretoria, Fountains Valley, (–CA), 8 Feb 1929, *I.C. Verdoorn 683* (PRE); Pretoria, Groenkloof, (–CA), 30 Sep 1914, *A.O.D. Mogg s.n. 10575* (PRE); Pretoria, Meintjieskop, Union Buildings, (–CA), 18 Mar 1925, *C.A. Smith 103* (PRE); Pretoria, Muckleneuk, (–CA), 11 Sep 1930, *A.P.G. Goossens 71* (PRE); Prinshof,

Pretoria, (-CA), 4400 ft, Nov 1934, L.C.C. Liebenberg 3205 (K); Suidefronhelling in Magaliesberg, (-CA), 14 Nov 1969, B.J. Coetzee 17 (PRE); veld opposite Dutch Reformed Church in Doornpoort, (-CA), 3 Oct 2003, S.P. Bester 4236 (PRE); 24 mi buite Pretoria op Hartebeespoortdam pad [24 mi outside Pretoria on the Hartebeespoort Dam road], (-CA), Feb 1961, H.P. van der Schijff 5297 (PRE); between Pienaars River Dam and entrance to Roodeplaat Research Station, (-CB), 3 Oct 1971, B. Clarke 228 (PRE); Pretoria, Doornpoort, new extension, (-CB), 9 Jan 2004, S.P. Bester 4615 (PRE); Pretoria National Botanical Gardens, (-CB), Nov 1974, P. Drijfhout 940 (PRE); Roodeplaatdam Natuurreservaat hek S [Roodeplaat Nature Reserve, gate S], (-CB), 13 Nov 1979, N. van Rooyen 2094 (PRE); Pretoria, Doornkloof, (-CC), Dec 1935, M.C. Gillett 1082 (PRE); Pretoria, Faerie Glen, langs Morelettaspruit [Pretoria, Faerie Glen, next to Moreletta stream], (-CD), 26 Aug 1978, A.E. van Wyk 2378 (PRE); Van Riebeecknatuurreservaat [Van Riebeeck Nature Reserve], (-CD), 5000 ft, 17 Oct 1968, P.D.F. Kok 270 (JRAU, PRE); Premier Mine, Pretoria, (-DA), 5000 ft, 1919, F.A. Rogers 23506 (K). **2627** (Potchefstroom): Northcliff, vacant plot between Weltevreden Road and Amanda Avenue, (-BB), 1600 m, 12 Sep 1998, R.A. Reddy, K.B. Reddy & P. Reddy 1371 (PRE); op kaal erwe h/v Monkor- en Jukskeiweg en omgewing in Kelland, Johannesburg [on empty yards c/o Monkor and Jukskei drives and in area of Kelland, Johannesburg], (-BB), Oct 1976, L.C.C. Liebenberg 8391 (K); Sasol Game Park, The Star 387, SW of Sasolburg, (-DD), 1440 m, 11 Oct 1997, N.V. Kroon 15387A (PRE). **2628** (Johannesburg): Johannesburg E, Kensington, (-AA), 20 Aug 1920, Unknown (PRE 56300) (PRE); in veld near Brakpan, (-AB), Oct 1925, D.P. Murray s.n. (PRE 56311) (PRE); ca. 14.5 km S of Johannesburg, Klipriviersberg Nature Reserve, (-AC), 7 Mar 1992, R.J. Bruyns 8 (PRE); Suikerbosrand Nature Reserve, (-AD), 18 Oct 1893, F.R.R. Schlechter 3482 (K, PRE); Suikerbosrand Nature Reserve, Schoongezicht 64 Farm, (-CA), 7 Feb 1960, J.E. Repton 5300 (PRE); Klipkraal, Vaal Dam, (-CB), 1628 m, 15 Feb 2015, M.M. le Roux 177 (PRE).

MPUMALANGA.—**2430** (Pilgrim's Rest): Ohrigstad Dam Nature Reserve, (-DC), 5800 ft, 16 Feb 1972, N.H.G. Jacobsen 2287 (PRE); 3 km from Graskop on road from Sabie, (-DD), Mar 1973, T.H. Arnold 342 (PRE). **2529** (Witbank): Mapoch Cave, Roosenekal, ca. 7 km NE of Roosenekal, (-BB), 1587 m, 18 Jan 2005, M.K. Maserumule 214 (PRE); Middelburg, Tantesberg, (-BB), 9 Nov 1933, R.G.N. Young A 184 (PRE); ca. 16 km W of Witbank, next to the N4, (-CC), 18 Dec 2003, T. Nkonki 79 (PRE). **2530** (Lydenburg): 16 mi SE of Lydenburg, (-AB), 11 Aug 1966, G.D. Morris 35 (PRE); Dullstroom Caravan Park, in cut grass W of centre of ablution blocks, (-AC), 6 Apr 1994, P.M. Burgoyne 2389 (PRE); Dullstroom, Farm Tonteldoos, (-AC), 2090 m, 8 Mar 1988, P.M. Burgoyne 177 (PRE); Schoemanskloof, Belfast, (-AD), 14 Nov 1933, R.G.N. Young A349 (PRE); Schoemanskloof, W end, (-AD), 14 Nov 1933, R.G.N. Young A 340 (PRE); De Kuilen Farm, ca. 9 mi SE of Lydenburg, (-BA), 5500 ft, 2 Nov 1975, P.J. Anderson A 58 (PRE); Sabie, Relevé no. GBD 81089, (-BB), 14 Dec 1981, G.B. Deall 1327 (PRE 18357) (PRE); Weltevrede Farm 268 JT,

opposite Weltevrede school, (-BC), 5 Feb 1979, S.P. Fourie 3189 (PRE 58090) (PRE); Dullstroom on the road to Machadodorp, Elands Valley Farm, (-CA), 5 Nov 2001, A.J. Hankey 1346 (PRE); Mac-Mac Nature Reserve, (-CA), 7 Mar 1979, J.P. Kluge 1787 (PRE); 10 km from Machadodorp on road to Badplaas, (-CB), 7 Mar 1989, G. Germishuizen 5011 (PRE); Uitkomst Farm, 18 km from Machadodorp on road to Badplaas, (-CD), 5 Mar 1986, G. Germishuizen 3805 (PRE); 8 km from Badplaas on road to Barberton, (-DC), 5 Mar 1986, G. Germishuizen 3833 (PRE). **2531** (Komatipoort): Kruger National Park, Shabin, (-AA), 20 Nov 1952, H.P. van der Schijff 1384 (PRE); Kruger Nationale Park, Msahalong spruit [Kruger National Park, Msahalong stream], (-AB), 11 Nov 1952, H.P. van der Schijff 1265 (PRE); Kangwane, Songimvelo Game Reserve, near camp for training field wardens, (-CC), 10 Dec 1992, G. Germishuizen 5841 (PRE); lower slopes on Saddleback Hill, (-CC), Oct 1890, E.E. Galpin 1108 (K), 1108a (K, PRE); 4 km from Barberton on road to Kaapmuiden, (-CC), 10 Mar 1989, G. Germishuizen 5118 (PRE); 4 km from Barberton on road to Nelspruit, (-CC), 13 Aug 1985, G. Germishuizen 3223 (PRE). **2629** (Bethal): Ca. 0.5 km before 'Schuwekop' turn-off on Bethal- Hendrina road, (-AD), 21 Feb 1986, B.-E. van Wyk 1819 (JRAU); Davel, Leeuwkuil, (-BC), 2 Dec 1911, W. Wayland s.n. (PRE 6745) (PRE); Ermelo, Spitskop, (-BD), Dec 1915, R. Pott-Leendertz 5276 (PRE 15069) (PRE); Standerton, (-CC), Jan 1912, R. Leendertz s.n. (PRE 11108) (PRE); Nooitgedacht 10, (-DB), 21 Dec 1927, P.E. Potter 1740 (PRE); Nooitgedacht 10, Ermelo, (-DB), 28 Jan 1928, M. Henrici 1757 (PRE). **2630** (Carolina): 25 km from Carolina, (-AA), 12 Feb 1986, B.-E. van Wyk 1833 (JRAU); 13 km from Jessievale on road to Oshoek, (-BA), 9 Mar 1989, G. Germishuizen 5071 (PRE); 50 km from Chrissiesmeer on road to Lochiel, (-BA), 6 Mar 1986, G. Germishuizen 3892 (PRE); Ermelo, Athole Pasture Reserve street, (-CB), 8 Apr 1938, J.H. Preller 137 (PRE); Amersfoort area, Kalkoenkranz, Elandsberg Farm, (-CC), 6 Nov 1984, B.J. Turner 333 (PRE); S of Panbult at Jagdrift Farm, (-CD), 1550 m, 9 Mar 1993, J.P. Coetzee 2204 (PRE); 21 km from Panbult to Amersfoort, (-CD), 12 Jan 1984, G. Germishuizen 2982 (PRE). **2729** (Volksrust): Koppieskraal Farm, Amersfoort area, (-BB), 7 Mar 1986, B.J. Turner 1066 (PRE). **2730** (Vryheid): Amersfoort area, Latemanek, Langberg Farm, (-AA), 1951 m, 18 Feb 1986, B.J. Turner 874 (PRE); Zommershoek Farm, Latemanek, (-AA), 17 Feb 1986, B.J. Turner 858 (PRE); Wakkerstroom, (-AC), 1829 m, 5 Feb 1994, P.P. Swartz 51/94W (PRE).

FREE STATE.—**2727** (Kroonstad): Just outside Heilbron on road to Kroonstad, (-BD), 13 Mar 1987, G. Germishuizen 4482 (PRE); Bultfontein, Viljoensdrieff, (-DB), 4 May 1912, D. Odendaal s.n. (PRE 56343) (PRE). **2728** (Frankfort): 20 km from Frankfort on road to Vrede near slow-moving stream, (-BC), 9 Mar 1987, G. Germishuizen 4343 (PRE); Farm Modus Vivendi, E of Petrus Steyn, (-CA), 25 Jan 1988, M. Crosby 472 (PRE); 38 km N van Bethlehem of R26 route, kop links van pad [38 km N of Bethlehem on route R26, hill left of road], (-CC), 14 Dec 1985, B.-E. van Wyk 1549 (JRAU). **2729** (Volksrust): 42 km SE of Vrede, Farm Driekop, area between Spitzkop and Aasvoëlkop, (-CB), 2000 m, 4 Feb 1987, L. Smook 6413 (PRE); 13 km from Verkykerskop on road to Memel, (-CD),

10 Mar 1987, *G. Germishuizen* 4393 (PRE). **2827** (Senekal): Willem Pretorius Wildtuin [Willem Pretorius Game Reserve], (–AC), 21 Mar 1966, *O.B. Kok s.n.* PRE 160 (PRE); top of Senekal Koppie, overlooking town, (–BC), 12 Mar 1987, *G. Germishuizen* 4445 (PRE). **2828** (Bethlehem): 4 mi SE of Bethlehem on Kestell Drive near boundary of Vosges and Benadia Farms, (–AB), 5500 ft, 17 Mar 1967, *J.C. Scheepers* 1565 (PRE); Bethlehem, QwaQwa National Park, Avondrust, (–BC), 4 Dec 1995, *P.C. Zietsman* 3201 (PRE); Clarens, (–CB), Dec 1934, *Unknown* 375 (PRE); Witzieshoek, (–DB), Feb 1917, *H.A. Junod s.n.* (17338) (PRE). **2829** (Harrismith): Harrismith, Sterkfontein Dam, (–AC), 1700 m, 28 Nov 1974, *M.L. Jacobsz* 1840 (PRE). **2926** (Bloemfontein): Bloemfontein, Grant's Hill, (–AA), 13 Apr 1917, *G. Potts* 2915 (PRE), 21 Oct 1967, *W.J. Hanekom* 974 (K); *Bultfontein/Winburg kruising* [Bultfontein/Winburg crossing], (–AA), 3 May 1988, *M. du Toit* 124 (PRE). **2927** (Bethlehem): *Op N1 by afdraai na Van Stadensrus* [on the N1 at the turnoff to Van Stadensrus], (–AA), 15 Dec 1985, *B.-E. van Wyk* 1584 (JRAU).

KWAZULU-NATAL.—**2729** (Volksrust): Amersfoort area, Majuba Power Station, (–BD), 1753 m, 1 Nov 1986, *B.J. Turner* 1177 (PRE); Farm Dassieklip, 20 km NW of Volksrust, (–BD), 27 Dec 1986, *B.-E. van Wyk* 1986 (JRAU); just past Laingsnek, 28.3 mi from New Castle, (–DA), 25 Oct 1966, *J.A. Marsh* 70 (PRE); 6 km from Newcastle on road to Memel, (–DB), 24 Oct 1982, *C.N. Buthelezi* 258 (NH). **2730** (Vryheid): Oshoek, (–AC), 30 Oct 1963, *N.J. Devenish* 1056 (PRE); Hans Village, ca. 500 m from Osizweni/Dannhauser Road, (–CC), 1375 m, 19 Oct 2006, *A.M. Ngwenya* 3014 (NH); 13 km from Utrecht turnoff on Paulpietersburg-Vryheid road, (–DA), 23 Oct 1982, *G. Germishuizen* 2390 (PRE); Vryheid, at the turnoff to Nongoma from Vryheid-Louwsburg road, (–DD), 20 Oct 1982, *G. Germishuizen* 2306 (PRE). **2731** (Louwsburg): Pongola Bushveld Farm, (–BC), Jan 1972, *M.D.S. Nel* 196 (PRE); 18 km from Kongolwane on road to Louwsburg, (–CA), 18 Oct 1982, *G. Germishuizen* 2208 (PRE); Itala Nature Reserve, (–CB), 2200 ft, 1 Jan 1976, *Brown & Shapiro* 319 (K), 19 Oct 1982, *G. Germishuizen* 2242 (K); Abaqulusi Municipality area, Tygerskloof Plantation adjacent to the Ngome State Forest, (–CD), 7 Nov 2011, *A.M. Ngwenya & D.G.A. Styles* 4115 (NH). **2732** (Ubombo): turnoff at top of Jozini Pass on gravel road to Ubombo, (–CA), 680 m, 11 Mar 2004, *S.P. Bester* 4901 (PRE); Ngweni, along the N2 road NW of Hluhluwe, (–CC), 2 Feb 1982, *J. Lambinon & M. Reekmans* 82/191 (PRE); 36 km from Mkuze to Mtubatuba, (–CC), 12 May 1981, *C.H. Stirton* 8842 (NH). **2828** (Bethlehem): Royal Natal National Park, Mont-aux-Sources, (–DB), 5300 ft, 8 Mar 1964, *W.R. Trauseld* 234 (PRE). **2829** (Harrismith): *Plaas Nolens Volens, O van Van Reenen* [Farm Nolens Volens, E of Van Reenen], (–AD), 1700 m, 2 Mar 1976, *M.L. Jacobsz* 1591 (PRE); Bergville, Natal, (–CB), 14 Nov 1928, *E.E. Galpin* 9548 (PRE); Royal Natal National Park, Mont-aux-Sources, (–CB), 5000 ft, 10 Mar 1964, *W.R. Trauseld* 235 (PRE); Pieter's Hill near Ladysmith, (–DB), 3300 ft, 27 Nov 1900, *Medley Wood s.n.* (K); 8 km N of Colenso, (–DB), 20 Apr 1988, *B.J. Pienaar* 1063 (PRE); **2830** (Dundee): Dundee, Impati Hill, ca. 50 m from Vodacom telecommunications tower at top of hill, (–AA), 1400 m, 15

Mar 1996, *C.A. Prentice* 32 (NH, PRE); **2832** (Mtubatuba): N Coast, Lake Nhlabane area, eastern side of N Lake, (–CB), 6 m, 23 Jan 1992, *C.J. Ward & G.W. Begg* 11745 (NH, PRE). **2929** (Underberg): Estcourt, (–BB), 5 Nov 1943, *J.P.H. Acocks* 9858 (PRE); 1 km beyond aerodrome on road to Mooi River, (–BB), 1 Sep 1974, *C.H. Stirton* 1052 (PRE); 10 km E of Estcourt at Rensburgspruit, (–BB), 3200 ft, 15 Mar 1988, *D. Green* 519 (NH); Underberg, (–BC), 7000 ft, 7 Mar 1970, *B. Clarke* 29 (PRE); 10 km from Himeville on road to Nottinham Road, (–DA), 1 Oct 1974, *C.H. Stirton* 1148 (PRE); **2930** (Pietermaritzburg): Middle Rest, (–AA), 1400 m, 10 Mar 1991, *D. Green* 750 (NH); *ongeveer 10 mi S van Mooirivier, Natal* [ca. 10 mi S of Mooi River, Natal], (–AA), 11 Feb 1966, *N. Grobbelaar* 533 (PRE); 9 km from Greytown at Rietvlei turnoff on road from New Hanover, (–BA), 22 Jan 1985, *B.J. Pienaar* 397 (PRE); Bishopstowe, (–CB), 23 Oct 1975, *C.H. Stirton* 5523 (PRE); Bisley Valley Housing Scheme behind Oribi Airport, Pietermaritzburg, (–CB), 2200 ft, 23 Oct 1973, *C.H. Stirton* 355 (K); Boulder Hill Game Farm, Pietermaritzburg, (–CB), 27 Oct 1973, *C.H. Stirton* 378 (PRE); Pietermaritzburg, open field in suburb Hayfields, (–CB), 27 Sep 1984, *A. Nicholas* 2009 (NH); Oribi Aerodrome, (–CB), 17 Aug 1965, *E.J. Moll* 1852 (PRE); 11 km from Thornville to Eston, (–CD), 19 Oct 1975, *C.H. Stirton* 5442 (PRE); Camperdown, (–DA), 15 Apr 1911, *J.M. Wood* 11826 (PRE), 2000 ft, 15 Apr 1901, *M. Franks* 13009 (NH); on banks of Loteni River, (–DA), 5400 ft, 17 Jan 1968, *D.J.B. Killick* 3860 (K); Phoenix, (–DB), 4 Aug 1893, *F.R.R. Schlechter* 3027 (NH, PRE); Nkozo State Forest, Kwa-yili forest, (–DC), 4600 ft, 20 Feb 1984, *A. Nicholas & N. Van den Berg* 1848 (NH); 3 km to Eston from Pietermaritzburg, (–DC), 24 Sep 1974, *C.H. Stirton* 1111 (PRE); Bulwer, (–DD), 5000 ft, Jan 1931, *A.W. Bayer* 326 (NH); Durban, Wentworth Bluff, (–DD), 300 ft, 8 Mar 1967, *C.J. Ward* 6137 (K, PRE). **2931** (Stanger): Groutville, Lower Tugela, (–AD), 300 ft, 14 Oct 1965, *E.J. Moll* 2525 (PRE). **3029** (Kokstad): Vielsalm, new Amalfi, (–AA), Mar 1933, *H.M. Forbes* 1122 (NH); 36 km from Underberg to Swartberg, (–AB), 9 Nov 1980, *C.H. Stirton* 8158 (PRE); 14 km from Kokstad to Umzimkulu, (–AD), 9 Nov 1980, *C.H. Stirton* 8140 (PRE); Kokstad, (–CB), 4300 ft, Feb 1883, *W. Tyson* 1336 (K); Farm Thornham, Kokstad, (–DA), 6000 ft, 30 Apr 1973, *T.A. Coleman* 667 (NH); Weza, (–DA), 8 Nov 1980, *C.H. Stirton* 8108 (PRE). **3030** (Port Shepstone): Ixopo; 11 km from Ixopo to Umzimkulu, (–AA), 24 Oct 1975, *C.H. Stirton* 5583 (PRE); 3 km from Ixopo to Highflats, (–AA), 11 Nov 1980, *C.H. Stirton* 8195 (PRE); Izingolweni, Horseshoe Dam, (–CC), 5 Mar 1974, *H.B. Nicholson* 1412 (PRE). **3130** (Port Edward): Umtamvuna Nature Reserve, Clearwater, (–AA), 5 Mar 1983, *A. Abbott* 919 (NH).

EASTERN CAPE.—**3028** (Matatiele): Marshall Clarke, (–AD), 9 Dec 1982, *J.E. Granger* 3658 (PRE); Herbert Farm, 20 km NE from Maclear on the road to Halcyon Drift, (–CD), 1380 m, 31 Oct 1994, *S.P. Bester* 3062 (PRE). **3029** (Kokstad): Transkei, 22 km S of Cedarville, Kakas Hill, Nungi Mountains, (–CA), 1870 m, 3 Jan 1987, *F.A. Brusse* 4980 (PRE); Kokstad, (–CB), 8 Jan 1987, *F.A. Brusse* 4049 (PRE). **3126** (Queenstown): 19 km from Dordrecht on road to Queenstown, (–DB), 13 Jan 1997, *G. Germishuizen* 8924 (PRE); 50 km from Queenstown to

Dordrecht, 19 km from Dordrecht on road from Queenstown, (–DB), 1311 m, 13 Jan 1997, *A.M. Makwarela 139* (PRE); mountain side, Queenstown, (–DD), 3700–4000 ft, 1893, *E.E. Galpin 1547* (K, PRE), *1547a* (K). **3127** (Lady Frere): 29 km from Indwe on road to Lady Frere on R396, (–CB), 11 Jan 1997, *G. Germishuizen 8788* (PRE). **3128** (Umtata): Drakensberg, Maclear, Farm Rockwater, foothills and higher slopes on SW part of farm, (–AB), 1400 m, 11 Feb 1993, *S.P. Bester 64* (PRE); plateau above Mhlahlane Forest Station, (–BC), 25 Jan 1986, *B.-E. van Wyk 1750* (JRAU); on the summit of Baziya Mountain, summit of grassy plateau, (–CB), 1670 m, 11 Feb 1988, *T. Strever 850* (PRE). **3129** (Port St. Johns): Transkei Coast, Mkambati Nature Reserve, ca. 2 km from Mkambati Waterfall, near road leading to falls, (–BD), 11 Dec 1986, *A. Nicholas & L. Smook 2360* (NH, PRE). **3130** (Port Edward): 1.5 mi N of Port Edward post office, (–AA), ca. 500 ft, 22 Feb 1947, *J.P.H. Acocks 13346* (PRE). **3225** (Somerset East): Top of Swaerhoek Pass, Cradock District, (–BC), 17 Dec 1985, *B.-E. van Wyk 1617* (JRAU). **3226** (Fort Beaufort): Winterberg Mountain Range, top of Katberg Pass, side of mountain on very steep S-facing slope, (–BC), 1740 m, 25 Apr 1995, *J.E. Victor 1101* (PRE); ca. 5 km above Nico Malan Pass, (–BD), 1350 m, 7 Feb 1995, *J.E. Victor & D.B. Hoare 300* (PRE); Hogsback region, below Gaika's Kop N of pine plantations, (–DB), 22 Dec 1995, *J.E. Victor 846* (PRE); Victoria E, Sandile's Kop near monument, (–DD), 2100 ft, 6 Sep 1935, *M.H. Giffen 330* (PRE). **3227** (Stutterheim): Toise River to Cathcart road, about 8 km from Cathcart, (–AC), 22 Mar 1995, *J.E. Victor 965* (PRE); Ailsa Farm, near Thomas River, (–CA), 23 Mar 1996, *J.E. Victor 1924* (PRE); near Komgha, (–DB), 1891, *H.G. Flanagan 131* (PRE); near the Kei bridge, (–DB), 1800 ft, Jan, *H.G. Flanagan 1140*, (GRA). **3228** (Butterworth): *Ngqaqini administratiewe gebied* [Ngqaqini administrative area], (–AD), 370 m, 1983, *Anon 61764 B 316* (PRE). **3324** (Steytlerville): Assegaibos, (–CD), Apr 1921, *H.G. Breijer s.n.* (PRE 23321) (PRE); Diepkloof, Mandaryn Boerdery, (–DB), 26 Jan 2003, *C.L. Bredenkamp 1633* (PRE). **3325** (Port Elizabeth): Zuurberg National Park, along Brandrug, (–BC), 6 Jan 1986, *B.-E. van Wyk & C.M. van Wyk 1061* (JRAU, PRE). **3326** (Grahamstown): Albany, (–AD), Apr 1903, *A. Prior s.n.* (K); Grahamstown, Atherstone, (–AD), 17 Feb 1955, *R.S. Adamson D 288* (PRE); Grahamstown, (–BC), Nov 1867, *P. Macowan 462* (K); *Grahamstown, 26.8 km van Grahamstown oppad na Kingwilliamstown* [Grahamstown, 26.8 km from Grahamstown on the way to King Williams Town], (–BC), 1 Feb 1979, *N. Grobbelaar 2293* (PRE); Fraser's Camp, (–BD), 14 Apr 1947, *R. Story 2285* (PRE); Thorn Kloof, on Alexandria-Port Elizabeth road, (–CD), 10 Aug 1953, *S.M. Johnson 697* (K, GRA, PRE); Kariega Park, ca. 16 km N of Kenton-on-Sea, (–DA), 150 m, 6 Mar 1995, *H.H. Burrows 4311* (GRA); Grahamstown, 6 mi from Kowie on Grahamstown road, (–DB), 13 Mar 1970, *M.J. Wells 4235* (PRE). **3424** (Humansdorp): Humansdorp, The Glen, (–BB), 12 Jan 1912, *J. Burttt Davy 12088* (PRE).

SWAZILAND.—**2631** (Mbabane): Malolotja Nature Reserve, track to Timbileni from upper Malolotja Valley near bottom track, (–AA), 6 Mar 1989, *K.P. Braun 815* (PRE); 20 km from Piggs Peak, at New Bridge over Nkomati River, (–AA), 4 Mar

1993, *G. Germishuizen 6071* (PRE); Nyokane, 14 km from Piggs Peak/Mbabane turnoff, on road to Maphalaleni, Malandzela area, (–AB), 25 Jan 1994, *G. Germishuizen 7052* (PRE); hill E of Mbabane, (–AC), 4500 ft, 20 Mar 1962, *R.H. Compton 31386* (PRE); Mzimpopu River, (–DB), 31 Oct 1961, *R.H. Compton 30949* (PRE).

LESOTHO.—**2828** (Bethlehem): Leribe, (–CC), 5000–6000 ft, Dec 1912, *A. Dieterlen 6839* (PRE). **2927** (Maseru): Teyateyaneng, (–BA), 29 Dec 1964, *A. Jacot-Guillarmod 4755* (GRA, PRE); Maseru, Ha Khotso, near NW corner of fence line, (–BB), 19 Nov 1971, *K. Gormley & H. Barber 36* (PRE); Monethi's, Berea district, (–BB), 1 Jan 1957, *A. Jacot-Guillarmod 3072* (PRE); Korokoro, 15 km from Roma, (–BC), Jul 1980, *M.O. Schmitz 9145* (PRE); Maseru Experimental Station, Lesotho, (–BC), 5000 ft, 27 Oct 1969, *C. Williams 202* (K); Bushmen's Pass, foot of pass, (–BD), 10 Dec 1980, *M.O. Schmitz 9096* (PRE). **2928** (Marakabei): Bokong, Katse, slope above stream E of Katse Village, SE of Katse Lodge, W side of stream, (–AD), 5 Dec 1995, *K.P. Braun 2099* (PRE).

R. totta var. *longicalyx*

Moteetee & M.M.le Roux, *var. nov.* Type: South Africa, Limpopo, 2328 (Baltimore), 'Morgenzon Farm 138 LR. Ga-Mathula Hill', (–AD), 13 May 1986, *S. Venter 11883* (PRE, holo.!).

Description

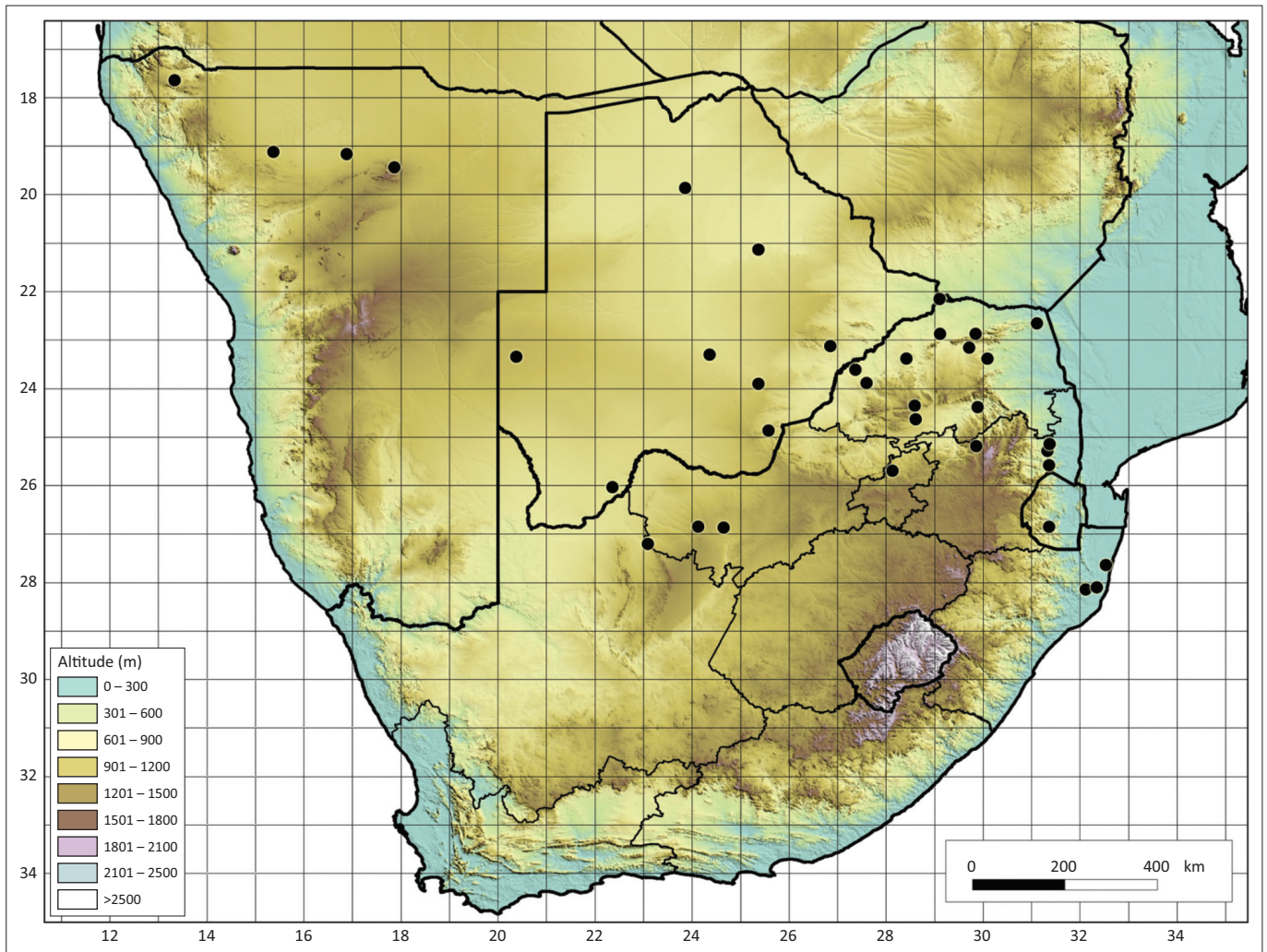
Leaves: trifoliate, leaflets ovate to lanceolate, 35 – 50 mm × 12 – 25 mm, pubescent-villous above and below; stipules narrowly lanceolate, 3–5 × 0.5–1.0 mm; petiole 12–25 mm long. *Inflorescences*: 2–5-flowered axillary racemes, 18–55 mm long, villous to pubescent. *Flowers*: light yellow with red veins, 12–14 mm long; bracts ca. 2 × 1 mm. *Calyx*: tube 3–4 mm long, upper lobes 5–8 mm long, lateral lobes 5–10 mm long, carinal lobe 10–12 mm long. *Standard*: 8–15 × 5–6 mm; wings 4–6 × 1–2 mm; keel 5–10 × 3–4 mm. *Fruits*: 18–25 × 5–8 mm, pubescent. *Seeds*: brown or black, 3–4 × ca. 2 (Figure 3).

Distribution and ecology

In southern Africa, this variety mostly has a northern distribution occurring from KwaZulu-Natal province north and westwards to the Northern Cape province, Botswana and Namibia (Figure 5). The distribution may stretch into Mozambique and Zimbabwe, but no specimens in PRE were found for these areas. It is common in sandveld and brown sandy loam.

Diagnostic characters and relationships

This variety is close to *R. totta* var. *venulosa*, but differs in having relatively large flowers (12–14 mm long), elongated, linear and narrow calyx lobes and often strongly asymmetrical lanceolate-ovate leaves. In *R. totta* var. *venulosa*, the flowers are 6–10 mm long, the calyx lobes are narrowly deltoid and the leaves are less strongly asymmetrical and lanceolate in shape.



Source: Compiled by M.M. le Roux, original map based on GTOPO30 global digital elevation model

FIGURE 5: Distribution of *Rhynchosia totta* var. *longicalyx* in southern Africa.

Additional specimens seen

BOTSWANA.—**1923** (Maun): Shorobe, 38 km NE of Maun, (–DD), 19 Mar 1965, *H. Wild & R.B. Drummond* 7182 (PRE). **2125** (Tlala Mabeli): Orapa Game Park, (–AB), 962 m, 13 Apr 2005, *P.P. Smith, K. Kemoreile, D. Mafokate, K. Mathibidi, E. Mosimanyana & S. Dickson* 147 (K). **2320** (Urwu): 5 km NNW of Dondong borehole, (–AD), 12 Feb 1977, *C. Skarpe S-141* (PRE). **2324** (Kuchwe Pan): A4 Khotse, (–AD), 3000 ft, 25 Apr 1972, *M. Coleman* 98 (PRE). **2325** (Lephepe): Kweneng, Matlolakgang Ranch, (–CD), 28 Mar 1977, *O.J. Hansen* 3098 (PRE). **2425** (Mahikeng/Mafikeng): between Manyana and Ramotswa along road, (–DC), 31 Mar 1977, *O.J. Hansen* 3109 (PRE). **2622** (Tsabong): Kgalagadi, 10 mi NW of Tsabong, (–AB), 25 Feb 1963, *O.A. Leistner* 3149 (PRE).

NAMIBIA.—**1713** (Swartbooisdrif): 3 mi W of Etanga, (–CB), 7 Apr 1957, *B. de Winter & O. Leistner* 5417 (K, PRE). **1915** (Okaukuejo): Etosha Pan Nature Park, S boundary, 8 km E of Safarihoek, (–AB), 3 May 1973, *Le Roux* 533 (PRE). **1916** (Gobaub): Gobaub, about 2 km S of Dunfaries waterhole, on firebreak, (–BB), 12 Feb 1985, *S.R. Brown & H.H. Kolberg* 294 (PRE). **1917** (Tsumeb): 16.8 mi SE of Tsumeb on road to Grootfontein, (–BD), 23 Mar 1955, *B. de Winter* 2909 (K, PRE).

SOUTH AFRICA. LIMPOPO.—**2229** (Waterpoort): ca. 5 km from Pontdrif on road to Alldays, at picnic spot, (–AA), 22 Mar 2003, *M. Jordaan* 4057 (PRE); Langjan Nature Reserve, (–CC), 2600 ft, Dec 1974, *S. Zwanziger* 410 (PRE); Wyllies Poort, Kidsgrove, 739 MS, (–DD), 3600 ft, 11 Jan 1986, *P. Raal & G. Raal* 739 (PRE). **2231** (Pafuri): Zoutpansberg, Kruger National Park, Punda Maria, (–CA), Nov 1932, *H. Lang s.n.* (PRE 32347) (PRE). **2327** (Ellisras): 50 km to Swartwater from Ellisras, (–CB), 21 Mar 2003, *M. Jordaan* 4054 (PRE); 9 mi from Ellisras on road to Thabazimbi, (–DC), 24 Apr 1971, *B. Clarke* 199 (PRE). **2328** (Baltimore): Morgenzon Farm 138 LR, Ga-Mathula Hill, (–AD), 13 May 1986, *S. Venter* 11883 (PRE). **2329** (Pietersburg): 40 km from Louis Trichardt on southern Vivo road en route to Lesheba Farm, (–BA), 25 Mar 1994, *H. Joffe* 1067 (PRE). **2428** (Nylstroom): Naboomfontein [Naboomspruit], (–BC), 1290 m, 23 Jan 1894, *F.R.R. Schlechter* 4299 (PRE); Naboomspruit, Waterberg, (–DA), 8 Feb 1919, *E.E Galpin* M 95 (PRE). **2429** (Zebediela): Pietersburg area, Atok Mine, ca. 22 km SE of Atok near Matsatsana school, (–BD), 1007 m, 15 Nov 1999, *P.M. Burgoyne* 7643 (PRE).

NORTH-WEST.—**2624** (Vryburg): Vryburg, (–CC), 1 Apr 1921, *A.O.A. Mogg* 8264B (PRE); Armoedsvlakte, Vryburg, (–DC), 3960 m, 4 Mar 1921, *A.O.D. Mogg* 8264 A (PRE).

MPUMALANGA.—**2529** (Witbank): *Langs besproeiingskanaal, naby hoewe H71 tussen Groblersdal en Marble Hall* [next to irrigation channel, near smallholding H71 between Groblersdal and Marble Hall], (–AB), 26 Oct 1963, N. Grobbelaar 33 (PRE). **2531** (Komatipoort): Kruger National Park, Pretoriusskop, (–AB), 16 Nov 1954, H.P. van der Schijff 4050 (PRE); Kruger National Park, Klokwene, (–AD), 26 Aug 1952, H.P. van der Schijff 770 (PRE); Kaapmuiden, (–CB), Dec, 1921, F.A. Rogers 25091 (PRE).

KWAZULU-NATAL.—**2732** (Ubombo): *66 km vanaf Mnkuzi op pad na Sodwana Baai, Makatinivlakte* [66 km from Mnkuzi on the way to Sodwana Bay, Makatini Flats], (–DA), 28 Dec 1973, N. Grobbelaar 1834 (K, PRE). **2832** (Mtubatuba): Hluhluwe Game Reserve, (–AA), 900 ft, 16 Oct 1953, C.J. Ward 1549 (PRE); 7 km from main road on turnoff to Fanie's Island, (–AB), 31 Jul 1973, B. Clarke 530 (PRE).

NORTHERN CAPE.—**2723** (Kuruman): 2 mi S of bed of Kuruman River, 78 mi NW of Kuruman, (–AA), 3400 ft, 5 Apr 1961, O.A. Leistner 2217 (K, PRE).

R. totta var. *rigidula*

(DC.) Moteetee & M.M.le Roux, *stat. nov. Rhynchosia rigidula* DC., Prodr. 2: 388 (1825); Eckl. & Zeyh., Enum. 2: 255 (1836); Baker f. in *Bothalia* 1: 133 (1923). Type: South Africa, Western Cape, 'ad Cap. B-Spei', without date, *Burchell* 2587 (G-DC-microfiche, holo.!).

Rhynchosia longiflora Schinz in *Vierteljahrsschr. Nat. Ges. Zurich*: 168 (1889); Baker f. in *Bothalia* 1: 131 (1923). Type: Namibia, 'Gross Namaland [Great Namaqualand]', 2 Apr 1885, *Schinz* 793 (Z, holo.!).

Rhynchosia namaensis Schinz in *Vierteljahrsschr. Nat. Ges. Zurich*: 427 (1907). *Rhynchosia totta* var. *namaensis* (Schinz) Baker f. in *Bothalia*: 130 (1923). Type: Namibia, 2317 (Rehoboth), 'an Flussrinnen im Gebirge südlin von Rehoboth [channels in mountains S of Rehoboth]', (–AB), 1895, *Fleck* 698 (Z, holo.!).

Description

Leaflets: trifoliolate, leaflets lanceolate to elliptic, 22–40 × 3–7 mm, sparsely pubescent above, densely pubescent below; stipules lanceolate, 2–3 × 0.5–1.0 mm; petiole 3–8 mm long. *Inflorescences*: 1–3-flowered axillary racemes, sometimes in pairs, 13–16 mm long, reddish brown pubescent. *Flowers*: yellow, 9–18 mm long; bracts 1.5–3.0 × 0.5–1.0 mm. *Calyx*: tube 3–5 mm long, upper lobes 2–4 mm long, lateral lobes 3–4 mm long, carinal lobe 4–6 mm long. *Standard*: 9–12 × 4–7 mm, wings 5–8 × 1–2 mm; keel 6–10 × 3–4 mm. *Fruits*: 20–25 × 5–8 mm, villous-pubescent. *Seeds*: brown mottled black, ca. 5 × 3 mm.

Distribution and ecology

This variety has a northern distribution extending from the central parts of the Northern Cape into KwaZulu-Natal

province as well as Swaziland into Botswana, Namibia and farther northwards (Figure 6). It grows in stony hills, well-drained, red-brown sand and banded ironstone rock.

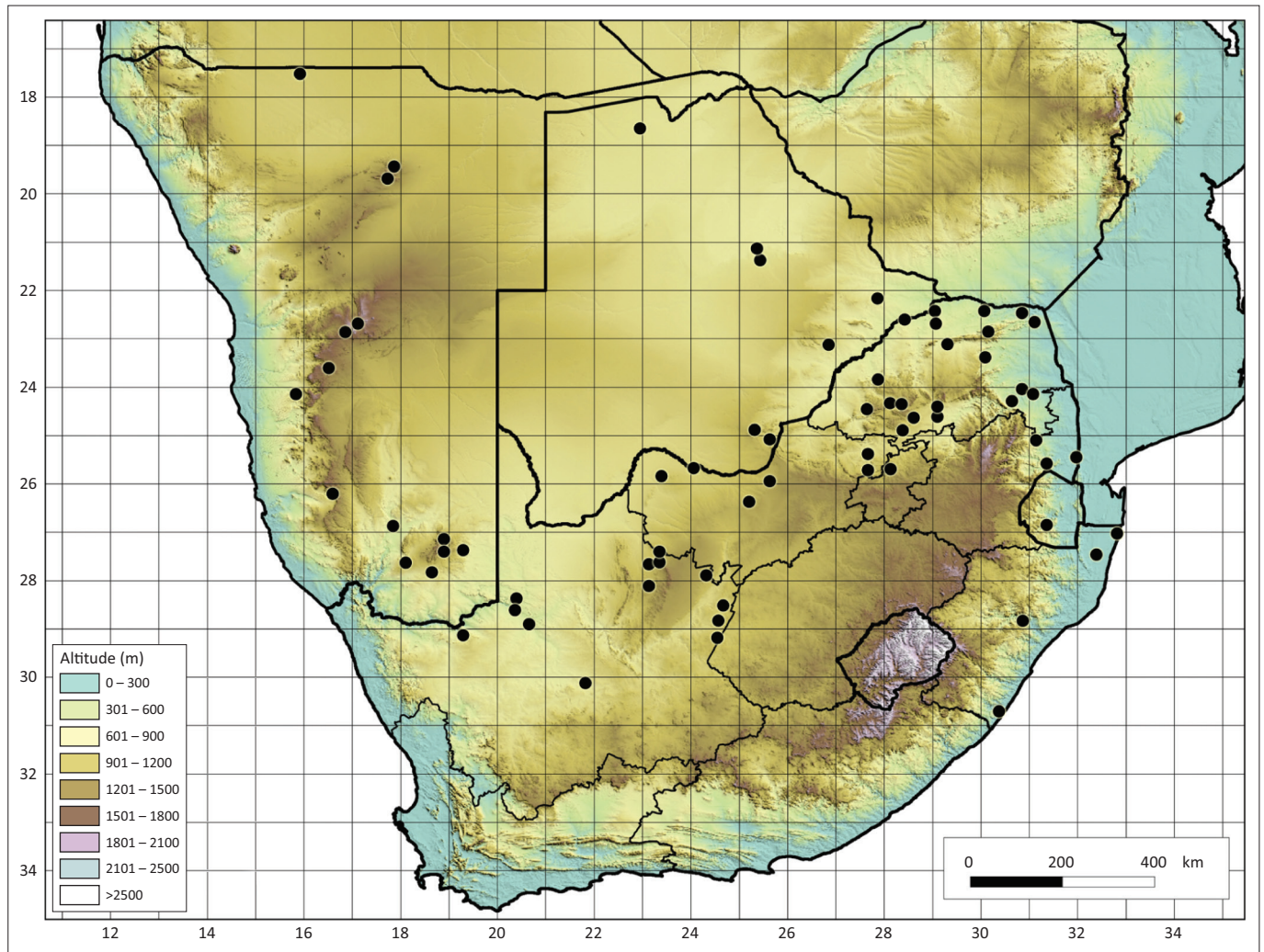
Diagnostic characters and relationships

Rhynchosia totta var. *rigidula* closely resembles *R. totta* var. *venulosa*, but differs in its symmetrical lateral leaflet bases (versus leaflet bases strongly asymmetrical in the latter), shorter peduncles (versus up to 16 mm long, opposed to 125 mm long), the relatively larger flowers (up to 18 mm long versus up to 10 mm long), and calyx that is half the length of the flower (versus calyx sometimes as long as the flower). *Rhynchosia totta* var. *rigidula* is also similar to the typical variety, but differs in its woody habit, greyish-felted, soft-textured leaves and brown mottled black seeds (versus herbaceous habit, glabrescent, leathery leaves and brown seeds in *R. totta* var. *totta*).

Additional specimens seen

BOTSWANA.—**2125** (Tlala Mabeli): Orapa, NE fence, (–AD), 3 Jan 1976, A.M. Allen 379 (PRE). **2227** (Palapye): Selebi-Pikwe, (–BB), 900 m, Dec 1977, *Kerfoot & Falconer* 83 (PRE). **2326** (Mahalapye): 25 mi W of Mahalapye near Phutselerengura, (–BB), 27 May 1970, H.J. van Rensburg B 4085 (PRE). **2425** (Mafeking): Kanye, Makgodumo Dam, (–CD), 26 Feb 1995, R. Candales & E. Vega 1 (PRE). **2525** (Mafikeng): Ootse Mountains, (–BA), 1350–1450 m, 9 Oct 1977, O.J. Hansen 3217 (PRE).

NAMIBIA.—**1715** (Ondangua): Ovamboland, Oshikango, (–BD), Jul 1936, G. Boss s.n. (PRE 36279) (PRE). **1813** (Ohopoho): 1.6 mi NE of Kaoko Otavi on road to Ohopoho, (–BC), 17 Apr 1957, B. de Winter & O.A. Leistner 5534 (K). **1917** (Tsumeb): at Farm Gaub on road to Grootfontein, (–BD), 3 Mar 1995, G. Germishuizen 7427 (PRE); at junction of tar road between Otavi and Grootfontein, (–BD), 1524 m, 3 Mar 1995, G. Germishuizen 7437 (PRE); just N of Kombat on Farm Gauss, 4 km from campsite, (–DA), 2 Mar 1995, G. Germishuizen 7379 (PRE). **2216** (Otjimbingwe): Farm Claratal, 27 mi SW of Windhoek, (–DD), 2 Mar 1955, B. de Winter 2574 (K, PRE). **2217** (Windhoek): Avis Dam, Windhoek, (–CA), Jan 1967, L. Smook 132 (GRA); Farm Regenstein, W32, (–CA), 19 Mar 1972, J.W.H. Giess & B. Giess 11656 (PRE). **2415** (Sossusvlei): Abendruhe, NE of Sossusvlei, (–BB), 11 May 1976, E.G.H. Oliver, M.A.N. Müller & P. Steenkamp 6566 (K, PRE). **2616** (Aus): Tiras, on road between Aus and Helmeringhausen, (–BA), 8 May 1976, E.G.H. Oliver & M.A.N. Müller 6454 (PRE). **2617** (Bethanie): Great Namaqualand, Seeheim, (–DD), 4000 ft, 9 Feb 1909, H.H.W. Pearson 3741 (K, PRE). **2718** (Grünau): Great Karas Mountains, western foothills near Holoog, (–AC), 19 Jan 1916, Pearson 9744 (K); Kochena Kee 74 Farm, N of farmhouse on the other side of the river, Grünau, (–BB), 12 May 1972, J.W.H. Giess & M.A.N. Müller 11872 (PRE); Warmbad, Sandmund WAR 270 Farm, Gaiabtal, (–BD), 21 May 1963, J.W.H. Giess, O.H. Volk & B. Bleissner 7181 (PRE); Klein Karas, (–CA), 20 Aug 1923, M.K. Dinter 4918 (K, PRE); 30 mi S of Narubis on road to Grünau, Great Karas Mountains, (–DC), 29 Apr 1955, B. de Winter 3303 (K, PRE).



Source: Compiled by M.M. le Roux, original map based on GTOPO30 global digital elevation model

FIGURE 6: Distribution of *Rhynchosia totta* var. *rigidula* in southern Africa.

2719 (Tranental): At Karasberg, Krai Klufft River bed, (–AD), 23 Dec 1912, *Pearson 8286* (K); Karasberg, Numdis, (–AD), Jan 1974, *W.P. Auret 5597* (PRE). **2818** (Warmbad): Kopie near curving of the Kalkfontein railway track, (–BB), 3300–3600 ft, 2 Feb 1909, *H.H.W. Pearson s.n.* (K).

SOUTHAFRICA. LIMPOPO.—**2228** (Maasstroom): Maasstroom, (–CB), 1 May 1961, *R.G. Strey & H.-J.E. Schlieben 8663* (PRE). **2229** (Waterpoort): Breslau 2 mi S of farm, (–AC), 1800 ft, 24 May 2001, *C.C. Straub 929* (PRE); Breslau 2 mi S of farm (near Pontdrift), (–AC), 26 Jul 2000, *C.C. Straub 855* (PRE); Waterpoort, ongeveer 10 km NO van Alldays op plaas Ceon [Waterpoort, ca. 10 km NE from Alldays on Ceon Farm], (–CA), 25 Mar 1978, *N. Grobbelaar 2438* (PRE). **2230** (Messina): Messina, near the town, (–AC), 29 May 1927, *R.G.N. Young 26490* (PRE); 12.1 mi from Tshipise on road to Messina, (–AC), 21 Apr 1971, *B. Clarke 178* (PRE); Vandaland, ca. 5 km S vanaf Matatani [Venda, ca. 5 km S of Matatani], (–BD), May 1977, *J.N. Pienaar 1112* (PRE); locality uncertain, Zoutpansberg, (–CC), 2 Feb 1919, *F.A. Rogers 22555* (K, PRE). **2231** (Pafuri): Kruger National Park, Punda Maria, (–CA), 15 Oct 1952, *H.P. van der Schijff 944* (PRE), 1700 ft, 16 May 1949, *L.E.W. Codd & B. de Winter 5523* (PRE). **2327** (Ellisras): Ellisras, Mokolo River,

Zwarthoek 597 LQ Farm, (–DD), 900 m, 1979, *S.P. Fourie 203* (PRE). **2329** (Pietersburg): Soutpansberg, Llewellyn 35 Farm, (–AB), 1640 m, 4 Jul 1985, *S. Venter 10734* (PRE). **2330** (Tzaneen): Zoutpansberg, 2 mi from Mashangani, (–AC), Jul 1916, *H.G. Breijer s.n.* (PRE 16021) (PRE). **2427** (Thabazimbi): Geelhoutbos Farm of Mr Van Heerden, (–BC), 10 May 1977, *G. Germishuizen 298* (K); Thabazimbi, Kransberg, lower plateau, (–BC), 1275 m, 12 Mar 1980, *R.H. Westfall 966* (PRE). **2428** (Nylstroom): Waterberg near Visgat, (–AA), 1 May 1961, *R.G. Strey & H.-J.E. Schlieben 8667* (K); Vaalwater, Buffelsfontein, Welgevonden, (–AC), 17 May 2000, *G.J. Bredenkamp & S.J. Siebert 1649* (PRE); Heuningfontein, Ratelhoek Farm, (–AD), 1480 m, 9 Dec 1985, *R.H. Westfall 2065* (PRE); sowat 10 mi N van Warmbad op pad na Nylstroom [ca. 10 mi N of Warmbad on road to Nylstroom], (–CD), Feb 1968, *N. Grobbelaar 811* (PRE); Nylstroom, Nylsvley Nature Reserve, on top of Maroelakop, (–DA), 29 Apr 1975, *N. Grobbelaar 2409* (PRE). **2429** (Zebediela): Zebediela, 9 km from Zebediela on road to Immerpan, (–AC), 2 Apr 1972, *B. Clarke 384* (PRE); between grass valley and Stavoren Tin Mine, (–CA), 19 Jan 1955, *B. de Winter 2301* (K, PRE); Lebowa, Arabie, Camp A2, ca. 300 m S of primary school, (–CD), 16 Nov 1981, *W.N. Ellery 327* (PRE). **2430** (Pilgrim's Rest): tussen Mica en Phalaborwa [between Mica and

Phalaborwa], (–BB), 14 Apr 1964, *N. Grobbelaar* 338 (PRE); 4 km from Gravelotte on road to Mica, (–BB), 7 Nov 1985, *G. Germishuizen* 3471 (PRE); Hoedspruit, Lissataba Private Nature Reserve, (–BC), 500 m, 1 Jan 1987, *F. van Heerden* 711 (PRE); Simoari, Ga-mabins, (–BC), 630 m, 27 Nov 1981, *S. Venter* 7270 (PRE). **2431** (Acornhoek): Sheila 10 KU, 14 km S of Phalaborwa, (–AA), 19 Sep 1984, *I.M. Retief* 194 (K, PRE).

NORTH-WEST.—**2523** (Pomfret): Hatherley Farm, Relevé 122, (–CD), 28 Apr 1980, *A.A. Gubb* 122/54 (PRE). **2524** (Vergeleë): Corowa Farm on the Molopo River (Botswana border), (–CA), 22 Mar 2001, *J.J. Meyer* 3558 (PRE). **2525** (Mafikeng): along Mafikeng-Vryheid road, (–DC), 16 Dec 1982, *S. Phalatse* 75 (PRE). **2527** (Rustenburg): Brits, Beestekraal Game Reserve (PPC Lime), approximately 40 km N of Brits near Atlanta Station, (–BC), 1000 m, 28 May 1989, *N.P. Barker* 640 (PRE); Bokfontein Farm 647, *Jacksonstuin* [Jackson's Garden], (–DA), 8 Mar 1934, *A.O.D. Mogg* 14989 (PRE). **2624** (Vryburg): 32 km from Stella on road to Mafeking, (–DB), 21 Oct 1966, *J.B. Gillett* 17501 (K).

GAUTENG.—**2528** (Pretoria): Moloto, 10 mi from Moloto on road to Groblersdal, (–BC), 21 Apr 1969, *N. Grobbelaar* 1334 (PRE); Pretoria, Wonderboom Poort, (–CA), 17 Aug 1935, *A.O.D. Mogg & R.A. Dyer s.n.* (PRE 56318) (PRE).

MPUMALANGA.—**2531** (Komatipoort): 6 km from Malelane on road to Kaapmuiden, (–CB), 11 Mar 1989, *G. Germishuizen* 5131 (PRE).

FREE STATE.—**2825** (Boshof): Leeuhoogte, Relevé 428, (–AC), 11 May 1996, *J.H.L. Smit* 1107 (PRE).

KWAZULU-NATAL.—**2732** (Ubombo): Kosi Bay, coastal forest reserve between Lalanek and Manzenzwenya, (–BB), 31 Oct 1994, *R.A. Lubbe* 390 (NH). **2929** (Underberg): Rockleigh, Estcourt, (–BB), 12 Nov 1987, *D.M. Green* 452 (NH).

NORTHERN CAPE.—**2721** (Tellery Pan): Postmasburg, 1 mi S of Lang Pan (ca. 30 mi W of Korannaberg Mountain), (–DB), ca. 3300 ft, 9 Dec 1960, *O.A. Leistner* 2077 (K). **2723** (Kuruman): near Kuruman, (–AD), *Burchell* 2433 (PRE); 3 mi NE of Kuruman, (–AD), 4500 ft, 30 Nov 1957, *O.A. Leistner* 986 (PRE); 3 mi E of Kuruman, (–AD), 14 Oct 1970, *N. Grobbelaar* 1113 (PRE); Bophuthatswana, Kuruman, Harvard Farm, (–BC), 27 Feb 1982, *A.A. Gubb* 259/59 (PRE); Bestwood Farm, Relevé 145, (–CA), 9 Feb 1981, *A.A. Gubb* 145/77 (PRE); Newstead Farm, gentle slope of hill, (–CB), 14 Mar 1981, *A.A. Gubb* 185–65 (PRE); Newstead Farm, on level plain at top of hill, (–CB), 14 Mar 1981, *A.A. Gubb* 184–74 (PRE). **2724** (Taung): Knockbarragh, (–CD), 15 Mar 1945, *A.E. Brueckner* 240 (PRE). **2820** (Kakamas): Riemvasmaak, edge of Molopo Gorge, Gordonina, (–AD), 2000 ft, 21 May 1952, *J.P.H. Acocks* 16386 (PRE); Augrabies Falls National Park, Rooipad, (–CB), ca. 2000 ft, 7 May 1969, *O.A. Leistner* 3343 (K); Augrabies National Park, S side along Rooipad, (–CB), ca. 700 m, 7 May 1969, *M.J.A. Weger* 347 (PRE); 11 mi W of Augrabies Hotel on Coetzeeputs Road, (–CB), ca. 2400 ft, 21 Feb 1954, *D.M.*

Comins 651 (K); (11 km E of Kakamas on road to Keimoes, (–DC), 31 Jan 1974, *G. Davidse* 6148 (PRE). **2822** (Glen Lyon): Slopes of the Langebergen, Hay, Dummarry, (–DD), 27 Sep 1939, *C. Vigue s.n.* (K, NH). **2823** (Griekwastad): Lohatla, army ground, N and S-facing steep slopes and on top of hill, (–AA), 11 May 1981, *A.A. Gubb* 229–48 (PRE). **2824** (Kimberley): Magersfontein, Relevé 127, (–DC), 17 Dec 1980, *A.A. Gubb* 127–65 (PRE). **2919** (Pofadder): Pofadder, Boomrivier Farm, Slangberg, (–AB), 952 m, 8 Jun 2005, *J.J.J. Mnengwane* 107 (PRE). **2924** (Hopetown): *Honeynest Kloof* [Honeynest Valley], (–BA), Mar 1920, *M. Wilman s.n.* (PRE 56346) (PRE). **3021** (Vanwyksvlei): Jasper Hills at Buisvlei, (–BB), 10 Nov 1937, *J.P.H. Acocks* 2558 (PRE).

SWAZILAND.—**2631** (Mbabane): St. Philips, (–CD), 6 May 1964, *R.H. Compton* 32092 (PRE).

R. totta var. *venulosa*

(Hiern) Verdc. in *Kew Bull.* 25: 99 (1971). *Dolicholus venulosus* Hiern, *Cat. Afr. Pl. i.*: 271 (1896). *Rhynchosia venulosa* (Hiern) K. Schum. in *Just's Jahresb.* xxvii. I: 496 (1901). Type: Angola 'Huila, between Catumba and Ohay, date unknown', *Welwitsch* 4072 (COI, holo.!; BM, K, LISU, P, iso!).

Rhynchosia elegantissima Schinz in *Vierteljahrsschr. Nat. Ges. Zurich*: 428 (1907); Baker f. in *Bothalia* 1: 132 (1923). Type: South Africa, Limpopo, 2429 (Nylstroom), 'Makapansberge [Makapaansberg], Streydpoort', (–AA), date unknown, *Rehmann* 5545 (Z, holo!).

Rhynchosia cinnamomea Schinz in *Vierteljahrsschr. Nat. Ges. Zurich*: 428 (1907). Type: South Africa, Gauteng, 2528 (Pretoria), 'im Gebüsch auf dem Magallisberg bei Aapiesrivieri [Magaliesberg, near Apies River]', (–AD), 14 Jan 1894, *Schlechter* 4162 (Z, holo.!; MPU, NSW, iso!).

Rhynchosia totta var. *fenchelii* Schinz in *Vierteljahrsschr. Nat. Ges. Zurich*: 426 (1907), *syn. nov.* Type: Namibia, 2618 (Keetmanshoop), 'Keetmanshoop', (–CA), 1890, *Fenchel* 195 (Z, holo.!; K, iso!).

Rhynchosia remota Conrath in *Bull. Misc. Inform. Kew* 1908: 224 (1908). Type: South Africa, Gauteng, 2628 (Johannesburg), 'Witpoortjie, near Johannesburg', (–DC), 3 Apr 1981, *Conrath* 262 (GZU, holo!).

R. mollis Burt Davy, *Man. Flow. Pl. Transvaal*: 411 (1932), *nom. illegit. non R. mollis* DC., *Prodr.* 2: 388 (1825). Type: South Africa, Limpopo, 2229 (Waterpoort), 'Waterpoort', (–DC), Sep 1918, *F.A. Rodgers* 21543 (K, lecto.!, designated here, see taxonomic note (v)).

Description

Leaves: trifoliolate, leaflets lanceolate, 26–100 × (3)9–30 mm, pubescent above, pubescent to densely velvety below, giving a greyish appearance; stipules lanceolate, 4–6 × 0.5–1.0 mm; petiole 23–40 mm long. *Inflorescences*: 2–4-flowered axillary

racemes, 30–125 mm long, villous-pubescent. *Flowers*: yellow with red veins, 6–10 mm long; bracts ca. 3×0.2 mm. *Calyx*: tube 2–3 mm long, upper lobes 2–4 mm long, lateral lobes 3–4 mm long, carinal lobe 4–6 mm long. *Standard*: 5–8 \times 4–6 mm; wings 4–5 \times 1–2 mm; keel 4–6 \times 2–3 mm. *Fruits*: pubescent, 18–25 \times 5–8 mm. *Seeds*: brown or black, 3–4 \times ca. 2 mm (Figure 2a–c).

Distribution and ecology

Rhynchosia totta var. *venulosa* is widely distributed throughout southern and East Africa up to Ethiopia. In South Africa, it occurs in Limpopo, North-West, Gauteng, Mpumalanga, KwaZulu-Natal, and Eastern Cape provinces (Figure 7). It grows on heavy alluvium and sandy soils in floodplain grasslands, *Acacia* thickets and wooded grasslands.

Taxonomic notes

(v) The specimen in K is chosen as lectotype because it is the only one available. It is also possible that Burt Davy based the description of this species on this specimen since he was based there at the time of writing his book.

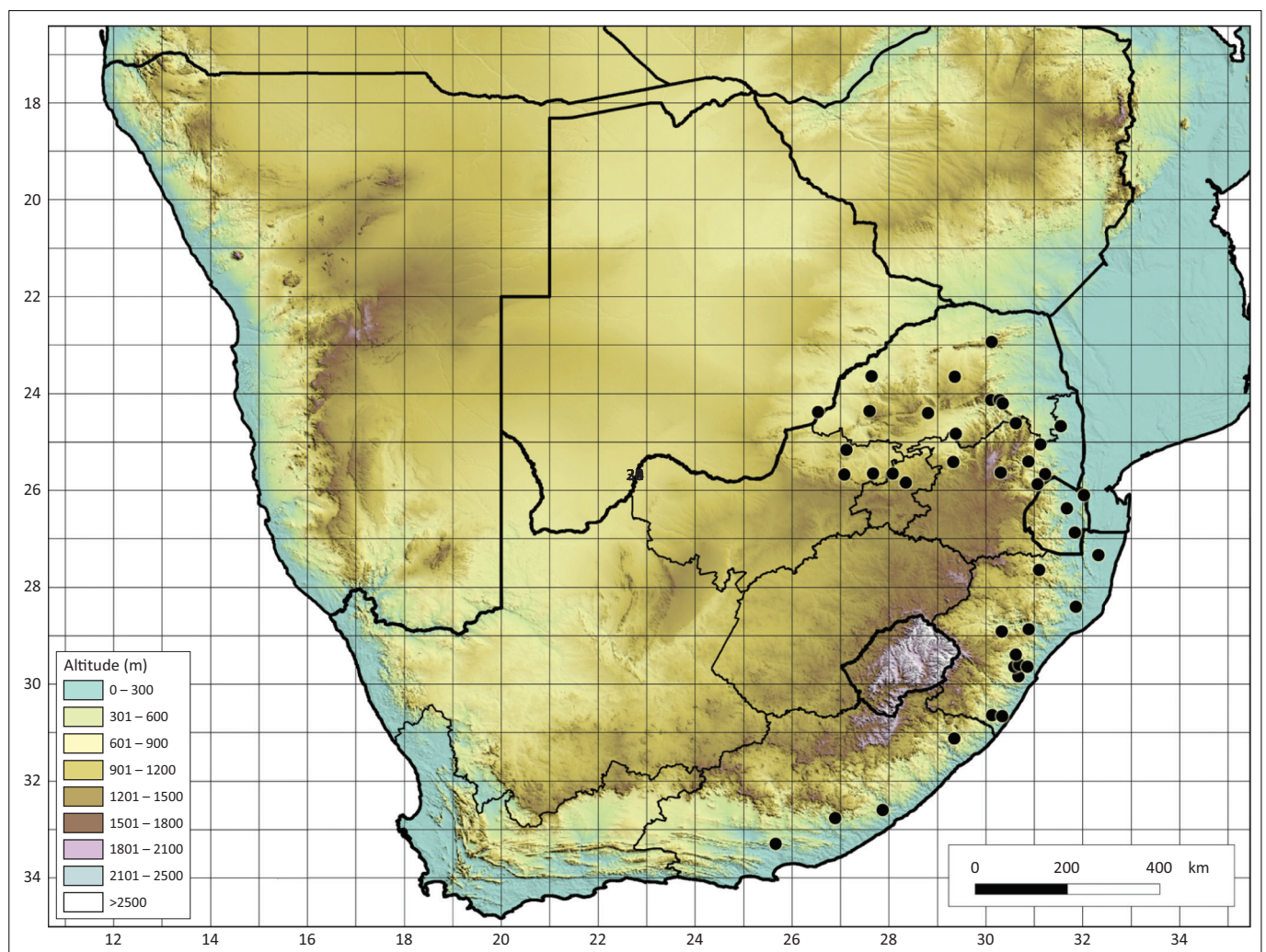
Diagnostic characters and relationships

This variety differs from the typical variety in having thicker, hairier stems with a tendency of becoming woody, with pubescent to densely velvety leaflets that often have very prominent venation, and the strongly asymmetrical lateral leaflets.

Additional specimens seen

BOTSWANA.—2426 (Mochudi): Sikwane, (–BC), Mar 1955, J.L. Reyneke 237 (PRE).

SOUTH AFRICA. LIMPOPO.—2230 (Messina): Louis Trichard, *Plaas Vreemdeling, westerlike deel van plaas, bo-op heuwel, S-westelike rigting van plaashuis* [Louis Trichard, Farm Vreemdeling, western part of farm, on top of hill, SW direction from farm house], (–CC), 1400 m, 26 Mar 1994, G.L. Rossouw 237 (PRE). 2327 (Ellisras): Moorddrift, (–DA), Oct 1909, R. Leendertz s.n. (PRE 7324) (PRE). 2329 (Pietersburg): Klipdam, (–CB), 14 Feb 1894, F.R.R. Schlechter 4495 (K, PRE). 2427 (Thabazimbi): Kransberg area in kloof, (–BC), 8 May 1977, G. Germishuizen 246 (K, PRE). 2428 (Nylstroom): Sterkriver Dam Nature Reserve, (–BD), 4000 ft, 14 Mar 1973,



Source: Compiled by M.M. le Roux, original map based on GTOPO30 global digital elevation model

FIGURE 7: Distribution of *Rhynchosia totta* var. *venulosa* in southern Africa.

N.H.G. Jacobsen 2814 (PRE). **2429** (Zebediela): Arabie, ca. 150 mi NW of Boaparankwe, (–CD), 2890 ft, 18 Jan 1982, *W.N. Ellery 377* (PRE). **2430** (Pilgrim's Rest): Serala Forestry, Klipdraai Farm 3 KT, (–AA), 1538 m, 20 Nov 1985, *S. Venter 11248* (PRE); Lekgalameetse Nature Reserve, Makutswi Valley near house terrace, (–AB), 740 m, 13 Jan 1986, *M. Stalmans 947* (PRE); Shiluvane, (–AB), Mar to May 1905, *H.A. Junod 2367* (PRE).

NORTH-WEST.—2527 (Rustenburg): Bophuthatswana, Pilanesberg Game Reserve, near Saulspoort End, (–AA), 5 Jan 1989, *G. Germishuizen 4979* (PRE); kopie, near Rustenburg, (–CA), 6 Feb 1929, *J. Hutchinson 2936* (K, PRE); Tierkloof, below waterfall, entrance to Rustenburg Nature Reserve, (–CA), 14 Mar 1976, *Crawford 522* (K, PRE); Magaliesberg, Jacksontuin, (–DA), 19 Sep 1957, *D.R.J. van Vuuren 291* (PRE).

GAUTENG.—2528 (Pretoria): Soutpan, (–CA), 15 Mar 1956, *L. Vari 1750* (PRE); 38 km NE of Pretoria on road past Roodeplaats Dam, (–CD), May 1975, *T.H. Arnold 900* (PRE).

MPUMALANGA.—2430 (Pilgrim's Rest): Ca. 6 km from Ohrigstad on road to Tzaneen, along road, (–DA), 31 Jan 1996, *M. Jordaan 3107* (PRE). **2431** (Acornhoek): Manyeketi Game Reserve, Sarabank, (–DA), 1250 ft, 8 Jan 1976, *G.J. Bredenkamp 1414* (PRE). **2529** (Witbank): *kloof O van Loskopdam op pad na Middelburg* [valley E of Loskop Dam on the way to Middelburg], (–AD), 26 Nov 1963, *N. Grobbelaar 16* (PRE); *Loskopdam, hek na Weltevrede* [Loskop Dam, gate to Weltevrede], (–AD), 28 Sep 1968, *G.K. Theron 1829* (PRE); Loskop Dam, hill on left-hand side after gate, Renosterhoek, (–AD), 13 Jul 1967, *G.K. Theron 1459* (PRE). **2530** (Lydenburg): Lowveld Botanic Garden, Nelspruit, (–BD), 6 Oct 1969, *E. Buitendag 136* (PRE), 17 Nov 1969, *E. Buitendag 309* (PRE); Nelspruit, (–BD), Feb 1918, *H.G. Breijer s.n.* (PRE 17845) (PRE); 10 km from Lowveld Botanic Garden on road to Witrivier, (–BD), 23 Nov 1993, *G. Germishuizen 6985* (PRE); Waterval-Boven, picnic spot at entrance of tunnel, (–CB), 1402 m, 10 May 1995, *M. Jordaan 2887* (PRE). **2531** (Komatipoort): Hazyview holiday resort, (–AA), 28 Oct 1981, *B.D. Schrire 654* (NH); 5 km from Kaapmuiden on road to Nelspruit via Kanyamazane, (–CB), 12 Mar 1989, *G. Germishuizen 5154* (PRE); Kangwane, Songimvelo Game Reserve, Grootboom Farm, (–CC), 11 Dec 1992, *G. Germishuizen 5855* (PRE); *Rimers Creek digby Barberton* [Rimers Creek near Barberton], (–CC), 21 Feb 1969, *N. Grobbelaar 1397* (PRE).

KWAZULU-NATAL.—2731 (Louwsburg): Coronation, Dipka 590 Farm, ca. 23 km N of Coronation on Bivane River, (–CA), 730 m, 27 Nov 1996, *N.H.G. Jacobsen 5402* (PRE). **2732** (Ubombo): Ca. 2 km from the turnoff on Mbazwane road at rice project site Muzi swamp area, (–AD), 27 Mar 1985, *G. Germishuizen 3125* (K). **2830** (Dundee): Near Muden to W, (–CD), 2700 ft, 15 Mar 1947, *J.P.H. Acocks 13478* (PRE); Mtunjambili, Kranskop, (–DD), 24 Mar 1963, *O.M. Hilliard* (NH). **2831** (Nkandla): Nkandla, roadside in Umfolozi Game Reserve, (–BD), 6 Jan 1986, *B.J. Pienaar 862* (PRE). **2930** (Pietermaritzburg): Mkhabela near Ekuthuleni; Windy Hill area, (–BC), 10 Oct 1989, *A.M. Ngwenya 629*

(NH, PRE); greater Durban Metropolitan Area, outer W substructure, Harrison, Condor Farm, (–DA), 750 m, 20 Mar 1997, *C.J. Ward 13963* (NH, PRE); Nagle Dam, (–DA), 1 Feb 1957, *M.J. Wells 1149* (PRE); N Coast, Inanda area, Mzinyathi River Valley, vicinity of confluence of Mzinyathi and Khusane rivers, (–DB), 324 m, 5 Mar 1992, *C.J. Ward 11880* (PRE); Camperdown, Shongweni Dam, (–DC), 1500 ft, 21 Feb 1966, *J.W. Morris 724* (PRE). **3030** (Port Shepstone): Oribi Gorge Nature Reserve, (–CA), Jan 1979, *D. Mantell & A.V. Vassilatou 672* (PRE); Gibraltar Rock, (–CB), 400 m, 29 Mar 1977, *H.B. Nicholson 1725* (PRE), 3 Jan 1981, *B.D. Schrire 455* (NH); Gibraltar Rock, Umzimkulu River, (–CB), 23 Mar 1972, *H.B. Nicholson 1208* (PRE); Oribi Gorge, Hell's Gate, (–CB), 12 Jan 1979, *K. Balkwill & G.V. Cron 42* (PRE); Oribi Nature Reserve along roadside down into the gorge, (–CB), 280 m, 16 Oct 1971, *L.A. Coetzer 79* (K, PRE).

EASTERN CAPE.—3129 (Port St. Johns): On road from Tabankulu to Lusikisiki near the Horseshoe, (–AB), 420 m, 22 Jun 1995, *P.B. Phillipson, T. Dold & E. Cloete 4314* (GRA). **3226** (Fort Beaufort): Alice, Fort Hare, Farm Honeydale section WSW Trollope's burn-browse plots, (–DD), 31 Mar 1977, *G.E. Gibbs Russell 3713* (PRE). **3227** (Stutterheim): Komga, (–DB), Dec 1891, *H.G. Flanagan 1140* (PRE). **3325** (Port Elizabeth): Zuurburg National Park, (–BC), 7 Jan 1986, *B.-E. van Wyk & C.M. van Wyk 1130* (PRE).

SWAZILAND.—2631 (Mbabane): Mpsi, (–BC), ca. 1500 ft, 17 Oct 1961, *R.H. Compton 31073* (PRE); Big Bend hillside, (–DD), ca. 500 ft, 30 Oct 1961, *R.H. Compton 30911* (PRE). **2632** (Bella Vista): Lebombo Mountains, Umbuluzi Gorge, Blue Jay Ranch S bank ca. 3 mi W upstream of Mozambique border, (–AA), 4 Dec 1977, *J. Culverwell 1222* (PRE).

Rhynchosia pedunculata

M.M.le Roux & Moteetee, *sp. nov.* Type: South Africa, Gauteng, 2628, (Johannesburg), 'next to road S of Villiers, between Villiers and R54', (–DC), 29 Oct 2014, *M.M. Le Roux & S.P. Bester 155* (PRE, holo.!, JRAU, iso.!).

Description

Prostrate herb arising from a woody rootstock. *Stems*: pubescent-glabrescent. *Leaves*: pinnately trifoliolate, leaflets lanceolate-elliptic, slightly asymmetrical, mucronate, 26–100 × (3)9–30 mm, pubescent to glabrescent above and beneath, mucronate; stipules small, lanceolate, 2–6(7) × 0.5–1.0 mm, striated; petiole (5)10–25(34) mm long. *Inflorescences*: (1)2–4-flowered axillary racemes, (30)45–125 mm long, pubescent-glabrescent, rarely occurring in pairs. *Flowers*: 6–10 mm long, yellow with red veins, 6–10 mm long; bracts lanceolate, ca. 3 × 0.5 mm, bracteoles absent. *Calyx*: bilabiate, usually half the length of the corolla, lobes of upper lip connate almost to half the length of the lobes, those of the lower lip approximately equal, oblong-acuminate, carinal lobe longer than lateral lobes, tube 13.5–36.0 mm long, upper lobes 2–3 mm long, lower lobe 3–6 mm long, lateral lobes

2–3 mm long. *Corolla*: persistent, standard yellow, ovate-oblong, reflexed backwards, 7–9 × 4–5 mm, slightly emarginate, glabrous, with no callosities on the claws; wings oblong-obovate, narrower and approximately as long as keel, 7–8 × 2–3 mm, spurred at base, without sculpturing; keel somewhat rostrate, 7–8 × 2–3 mm, pocketed. *Androecium*: diadelphous with nine filaments fused, vexillary stamen free to the base; anthers monomorphic, dorsifixed. *Ovary*: narrowly oblong-elliptic, subsessile, pubescent, 2-ovuled; style strongly curved upwards, glabrous. *Fruit*: narrowly oblong-elliptic, laterally compressed, 14–23 × 4–6 mm, pubescent, glandular, (1)2-seeded. *Seeds*: smooth, ca. 1.5 × 0.5 mm, uniformly brown (Figures 2e–g and Figure 8). *Flowering time*: Oct to Mar (Apr).

Distribution and ecology

A South African endemic, with populations found in the Free State, Gauteng, KwaZulu-Natal, Mpumalanga and North-West provinces (Figure 9). It grows in grassland areas on black turf or loamy soil on dolorite or quartzite.

Diagnostic characters and relationships

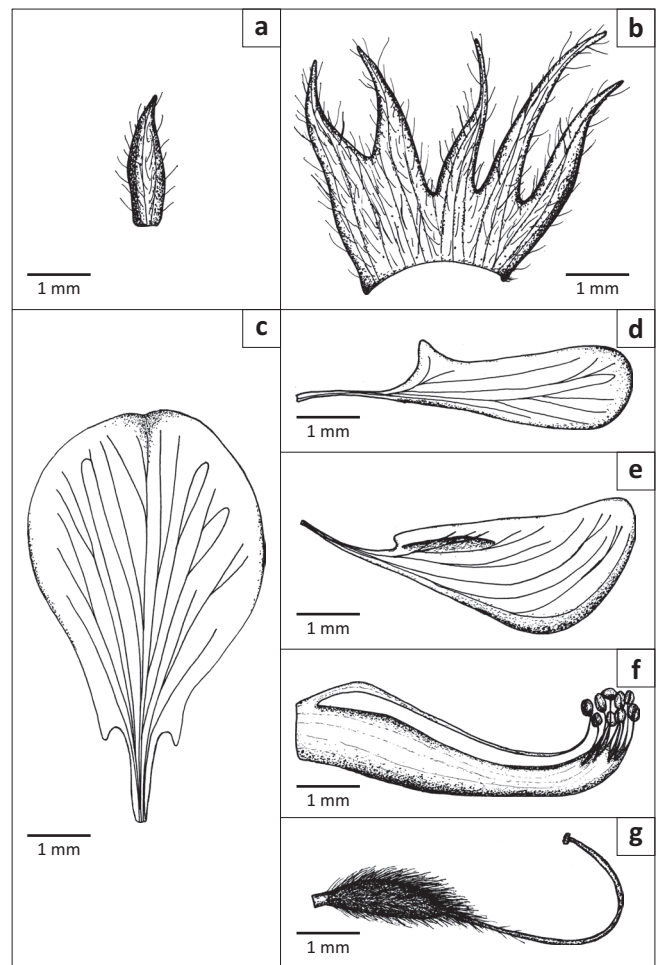
Rhynchosia pedunculata is closely related to *R. totta*, but differs in the prostrate habit (never twining), upright leaves, long peduncles that extend beyond the leaves, and wing petals approximately equal in length to the keel. *Rhynchosia totta* is a trailing, climbing and twining species with leaves not distinctly erect and the peduncles not distinctly longer than the leaves (peduncles might be longer when multi-flowered), and wing petals slightly shorter and narrower than the keel. The specific epithet was chosen to honour the strikingly long peduncles by which it is differentiated from *R. totta*.

Additional specimens seen

SOUTH AFRICA. NORTH-WEST.—2527 (Rustenburg): Rustenburg Nature Reserve, (–CA), 5000 ft, 5 Nov 1970, *N.H.G. Jacobsen 1121* (PRE). 2627 (Potchefstroom): Carletonville, A. Bailey Nature Reserve, (–AD), Apr 1983, *S. van Wyk 326* (PRE); Klipdrift, Potchefstroom, (–CB), 7 Jan 1935, *J.J. Theron 1164* (PRE).

GAUTENG.—2528 (Pretoria): Brummeria Botanical Gardens (Pretoria Botanical Gardens), (–CA), 4 Jan 1967, *J.A. Marsh 150* (PRE); Onderstepoort, (–CA), 17 Oct 1912, *A.C. Theiler 9304* (PRE); Pretoria, Erasmusdrift, (–CA), 7 Nov 1915, *A.O.D. Mogg 11677* (PRE); Willow Glen, (–CA), 11 Nov 1961, *R.G. Strey 3932* (K, PRE); near 1.9 milestone along road from Tygerpoort to Rayton, (–CD), 30 Jan 1971, *B. Clarke 134* (PRE). 2628 (Johannesburg): N of Rosebank near Johannesburg, (–AA), 23 Feb 1927, *R.G.N. Young s.n. (PRE 26489)* (PRE); *Suikerbosrand Natuurreseeroot, Valsfontein 311* [Suikerbosrand Nature Reserve, Valsfontein 311], (–AC), 20 Feb 1974, *S. Wolff 7* (PRE).

MPUMALANGA.—2629 (Bethal): Ermelo, (–DB), 10 Feb 1910, *R. Leendertz s.n. (TRV 7811)* (PRE); Amersfoort area, Uitspanning, Rolfontein Farm, (–DD), 1640 m, 13 Mar 1986, *B.J. Turner 978* (PRE).



Source: M.M. le Roux

(a), Bract; (b), Calyx; note the longer carinal lobe; (c), Standard with callosities; (d), Wing; (e), Keel; (f), Diadelphous androecium with 10 dorsifixed anthers; (g), Gynoecium.

Scale bar: 1 mm. Vouchers: (a, b, d–f) *R.G. Strey 3932* (PRE); (c, g) *M.M. le Roux & S.P. Bester 155* (PRE).

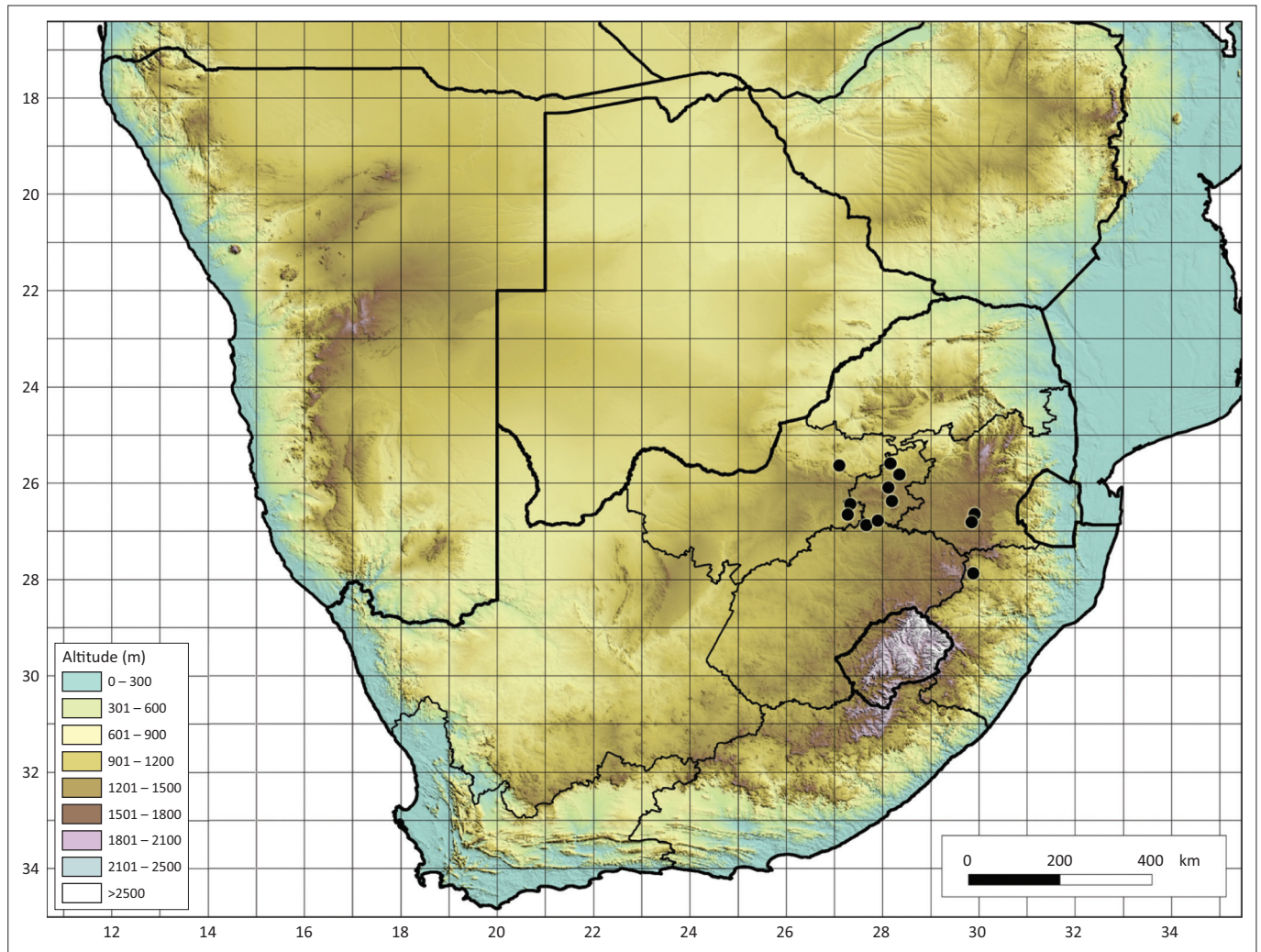
FIGURE 8: Floral structure of *Rhynchosia pedunculata*.

FREE STATE.—2627 (Potchefstroom): Uitkomst Farm 413, as crow flies, 5–6 km WNW of Sasolburg, (–DC), 1430 m, 18 Dec 1996, *N.V. Kroon 14058* (PRE); Uitkomst Farm 413, 5–6 km WNW of Sasolburg, (–DC), 24 Oct 1996, *N.V. Kroon 12060* (PRE); Wonderwater Section 1B, adjacent to Section 1, (–DD), 1430 m, 14 Apr 1997, *N.V. Kroon 15223A* (PRE).

KWAZULU-NATAL.—2729 (Volksrust): Ingogo, Newcastle, Rotsvas, (–DD), 16 Dec 2002, *S.J. Siebert & F. Siebert 2051* (PRE).

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Source: Compiled by M.M. le Roux, original map based on GTOPO30 global digital elevation model

FIGURE 9: Distribution of *Rhynchosia pedunculata*.

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

A.N.M. and M.M.L.R. contributed equally to this article in conceptualisation and execution of the study. A.N.M. compiled the initial manuscript, while M.M.L.R. contributed the specimens examined sections and figures. Both authors were equally involved in the editing process.

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