Title: The Identity of Lessertia rigida (Thunb.) DC. (Galegeae, Fabaceae) and a New Species From the Greater Cape Region of South Africa
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Lessertia DC. comprises ca. 53 species (Nkonki 2003) that, together with the genus *Sutherlandia* R. Br., represent the only genera of the Galegeae endemic to southern Africa (Lock and Schrire 2005). The last detailed study of the genus was that of Harvey (1862) in *Flora Capensis* with subsequent authors only treating selected species (Bolus 1915; Balkwill and Balkwill 1999). The genera of the Astragalean clade of the Galegeae are known to be morphologically cryptic, and defining apomorphies for genera are few. Molecular data suggest that *Oxytropis* DC. and the genera of the Coluteoid clade (which includes *Lessertia* and *Sutherlandia*) are not nested within *Astragalus* L. (Wojciechowski et al. 1999), and given the geographical isolation of *Lessertia* it may be regarded as distinct from the former. This study furthermore suggests that *Sutherlandia* is nested within *Lessertia* , which needs to be evaluated with a larger sample of both genera. During ongoing taxonomic studies of the genus *Lessertia* the correct identity of *L. rigida* (Thunb.) DC. has been clarified.

Thunberg (1800) described *Colutea rigida* Thunb., which was subsequently transferred to *Lessertia* by De Candolle (1825) as *L. rigida* (Thunb.) DC. In his 1836 treatment of the genus, however, Meyer used De Candolle's name and while including Thunberg's *Colutea rigida* in his concept of this species, created a broadened concept by also including other elements under the name *Lessertia rigida* . It is now clear that the taxon of Thunberg and the one added by Meyer represent two different species. Thunberg's *Colutea rigida* is restricted to the Northern Cape Province, while the species of Meyer (1836) [added as two varieties] is allopatric to Thunberg's species, occurring in the Northern and Western Cape Provinces of South Africa. The morphological and distributional differences between these two taxa are highlighted in Table 1

Table 1.: Comparative diagnostic characters between *Lessertia meyeri* and *L. rigida.*

. Currently, herbarium collections of *L. rigida* include only Meyer's taxon (erroneously cited as *L. rigida* E. Mey.), while specimens of Thunberg's species have remained either unidentified or misidentified. Harvey (1862) clearly also considered the two taxa to be separate by including Meyer's *L. rigida* under *L. fruticosa* Lindl. and Thunberg's *Colutea rigida* as a variety of *L. flexuosa* E. Mey. (var. *rigida* Harv.). The new species *L. meyeri* is thus described here and a detailed description of the revised concept of *L. rigida* provided. Illustrations and distribution maps of both species are also provided.

Materials and Methods

Morphological data were obtained through the study of herbarium specimens from BOL, JRAU, NBG (including SAM and STE), and PRE as well as field investigations. Selected specimens from UPS and P were also studied (abbreviations according to Holmgren et al. 1990). Measurements and observations of vegetative and reproductive characters were made from among several geographically isolated populations by arranging the material according to geographical distribution. At least three measurements per specimen were made of three or more specimens per population where possible. Drawings of vegetative and reproductive structures were prepared using a stereoscope (WILD M3Z) with a camera lucida attachment. All the drawings were done by the first author.

Distribution data, gathered from the study of herbarium material of the species are presented as maps. The quarter degree reference system (Edwards and Leistner 1971; also outlined in Leistner and Morris 1976) was used to record the distribution data for each species. The basic unit in this system is the one-degree square of latitude and longitude, which is 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.

Taxonomic Treatment

1. LESSERTIA RIGIDA (Thunb.) DC., Prod. Syst. Nat. 2: 272. 1825; E. Mey., Comm. Pl. Afr. Austr. 1: 115. Feb. 1836, pro parte. *Colutea rigida* Thunb., Prod. Pl. Cap.: 134. 1800, Fl. Cap. 603. 1823. *Lessertia flexuosa* E. Mey. var. *rigida* Harv. in Harv. and Sond., Fl. Cap. 2: 215. 1862.--TYPE: SOUTH AFRICA. Cape, *Thunberg s. n. sub*

THUNB-UPS17092 (lectotype: UPS!, designated here).

Erect shrub up to [+ or -] 1.5 m in height. Branches green to brown, pilose to glabrescent. Stipules triangular to narrowly triangular, 2-4 mm long, 1-2 mm wide, pilose on adaxial surface, often with black hairs. Leaves imparipinnate, 30-80 mm long, 5-8 jugate; petiole 5-20 mm long; leaflets lanceolate to elliptic, subsessile, 6-20 mm long, 1-5 mm wide, apex markedly acuminate, base cuneate, pilose on abaxial surface, glabrous on adaxial. Inflorescence lax, axillary racemes, longer than the leaves, up to [+ or -] 250 mm long, with 6-13 flowers, rarely spine-tipped; pedicels 5-12 mm long; bracts narrowly ovate, 3-4 mm long, pubescent, often with black hairs, persistent; bracteoles present at base of calyx, 1.0-1.5 mm long, pubescent, often with black hairs, persistent. Flowers 8-14 mm long, pink or purple. Calyx [+ or -] 5-6 mm long, pubescent, often with black hairs, subequally 5-lobed, tube [+ or -] 3-4 mm long; lobes deltoid, [+ or -] 1.5-2.5 mm long, upper two shorter than the lower three, tips pubescent on inner surface. Standard 10-13 mm long, claw linear, 2-3 mm long; lamina broadly obovate, 8-10 mm long, 11-13 mm wide, emarginate, glabrous. Wings 10-12 mm long, claw 2-3 mm long; lamina oblong, [+ or -] as long as keel, 8-11 mm long, 3-4 mm wide, obtuse, glabrous, without sculpturing. Keel 10-12 mm long, claw 3-4 mm long; lamina boat-shaped, 7-9 mm long, 5-7 mm wide, obtuse, glabrous, pocket absent. Anthers monomorphic, basifixed, nine stamens fused for two-thirds of their length, vexillary stamen free but fused at the base with the other stamens. Pistil stipitate, glabrous, ovary narrowly elliptic, 7-9 mm long, [+ or -] 1 mm wide with [+ or -] 12-15 ovules; style [+ or -] 4-6 mm long, curved upwards, bearded along the upper surface of the style. Pods stipitate with stipe 4-10 mm long, obliquely elliptic to obliquely obovate, laterally compressed, 20-35 mm long, 8-11 mm wide, glabrous, [+ or -] 3-6-seeded, indehiscent. Seeds not seen, no mature seed available for study (Fig. 1

Fig. 1.: Morphology of *Lessertia rigida* . A. Standard petal. B. Pistil. C. Leaflets in abaxial view. D. Wing petal. E. Androecium. F. Flower in lateral view. G. Outer surface of the calyx (upper lobes to the left). H. Keel petal. I1. Bract. I2. Bracteole. J. Pod in lateral view. Voucher specimens: (A, F) *Steiner 2857* (NBG); (B) *Goldblatt 4392* (NBG); (C) *Rosch 582* (NBG); (D, G-I) *Rosch 616* (NBG); (E) *Maguire 1954* (NBG); (J) *Steiner 515* (NBG). Scale bars: 1 mm.

). Flowering time: July-October.

Diagnostic Characters and Relationships--

This species is similar to *Lessertia flexuosa* , *L. meyeri* , *L. perennans* DC., and *L. spinescens* E. Mey. in that all these shrubby species generally have long pedicels (more than 5 mm), elongate inflorescences longer than the leaves (with the exception of *L. spinescens*) and laterally compressed, glabrous pods. It differs from these species in the lax, fewer flowered inflorescences or length of the inflorescence compared to leaf length (*L. flexuosa* , *L. meyeri* and *L. perennans* have dense, many-flowered inflorescences while *L. spinescens* has inflorescences that are shorter than the leaves), lanceolate to elliptic leaflets with markedly acuminate apices (the other species have elliptic to oblong, obovate, lanceolate, linear-lanceolate or linear leaflets with obtuse or mucronate apices) and long-stipitate pods with a stipe length of 4-10 mm (short-stipitate in the other species with stipes no longer than 2 mm). It also differs from *L. spinescens* in the generally unarmed habit and wing petals that are equal in length to the keel petals (*L. spinescens* is a spinescent shrub with wing petals that are longer than the keel petals). Furthermore, *L. rigida* is geographically isolated from the previously mentioned species.

Distribution and Habitat--

Lessertia rigida appears to be endemic to the Trans Escarpment Succulent Karoo Bioregion where it occurs in both Hantam Karoo and Roggeveld Karoo vegetation (Mucina et al. 2006). It occurs from the Calvinia area south-east as far as Sutherland on sandy, stony shale or clay or on dolerite hills up to ca. 1,400 m (Fig. 2

Fig. 2.: Known geographical distribution of *Lessertia rigida* (circles) and *L. meyeri* (triangles).

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Additional Specimens Examined--

SOUTH AFRICA. 3019 (Loeriesfontein): Calvinia district, Spioenberg (-BC), *Acocks 19042* (PRE). 3119 (Calvinia): Soetwater 17 miles [27.35 km] west of Calvinia (-AD), *Lewis s. n. sub SAM66063* (NBG, PRE); Soetwater, 21 miles [33.79 km] west of Calvinia (-AD), *Maguire 1934* (NBG, 3 sheets); road to Farm Toren, 4.9 km north of Calvinia to Loeriesfontein road (-BC), *Steiner 2857* (NBG); Plaas Groot Toren [+ or -] 40 km noord

van Calvinia (-BC), *Van Wyk 6615* (PRE); Akkerdam (-BD), *Lewis 5800* (NBG); Wilgebosch Farm (-DA), *Barker 9399* (NBG); Klein Platberg south-west of the town and north-west of Klipbak (-DA), *Oliver 9598* (NBG); Dolerite hill top south of Farm Keisie, 31[degrees]39'23"S 19[degrees]53'47"E (-DB), *Goldblatt et al. 13373* (NBG); Perdefontein (-DD), *Acocks 17308* (PRE). 3120 (Williston): between Calvinia and Middelpos on Blomfontein road ca. 64 km SE Calvinia (-CC), *Goldblatt 4392* (NBG); Droëkloof, next to dam, 31[degrees] 55'01.5"S 20[degrees]03'25.2"E, (-CC), *Rosch 616* (NBG); Farm Blomfontein, on Rooiwal road between Middelpos and Calvinia (-CC), *Steiner 515* (NBG, PRE); Roggeveld Escarpment on side of road on farm Blomfontein (-CC), *Whitehead s. n.* (NBG). 3220 (Sutherland): Tankwa National Park, Gannaga Pass near middle, 32[degrees]07'28.7"S 20[degrees]06'38.1"E (-AA), *Rosch 582* (NBG); Gannaga Pass (-AA), *Van Wyk et al. 4400* (JRAU); Sutherland (-BC), *Bayer s. n.* (PRE). Precise locality unknown: renosterveld, *Marloth 9879* (NBG).

2. **Lessertia meyeri** Boatwr., T. Nkonki & B.-E. van Wyk, sp. nov.--TYPE: SOUTH AFRICA. Western Cape: near Mamre, Malmesbury division [3318 CB], *Bolus 20406* (holotype: K; isotype: BOL, fragment).

Lessertia rigida (Thunb.) DC., sensu E. Mey., Comm. Pl. Afr. Austr. 1 (1): 115 (1836) pro parte excl. type (sometimes erroneously cited as *L. rigida* E. Mey.); L. Bolus in Ann. Bol. Herb. 1: 89 (1915).

L. rigida (Thunb.) DC. var. *leucomelaena* E. Mey., Comm. Pl. Afr. Austr. 1 (1): 115 (1836).--TYPE: SOUTH AFRICA. Western Cape: "Lauwskloof [grid unknown], in argillosis, alt. 2,400 ped.", *Drège s. n. [alpha]* (P!).

L. rigida (Thunb.) DC. var. *marina* E.Mey., Comm. Pl. Afr. Austr. 1 (1): 115 (1836).--TYPE: SOUTH AFRICA. Western Cape: "in arenosis inter Groenekloof [3318 CB] et Saldanhabaai [3317 BB], alt. 200 ped.", *Drège s. n. β* (P!).

L. fruticosa Lindl. sensu Harv. in Harv. & Sond., Fl. Cap. 2: 215 (1862).

Lessertia spinescenti E. Mey. similis pedicellis longis (ultra 5 mm) et leguminibus glaberis circum margines compressis et prope medium inflatis sed foliolis liniaribus ad liniarilanceolata obtusis ad emarginata, inflorescentiis foliis longioribus et petalis alae longitudine petalorum carinae (in *L. spinescenti* folioli elliptici ad oblonga apicibus obtusis ad acutos, inflorescentiae foliis breviores et petala alae petalis carinae longior) differt.

Erect shrub up to [+ or -] 1.5 m in height. Branches brown, pilose to glabrescent, young stems often sericeous. Stipules triangular to narrowly triangular, 2-5 mm long, 1.5-2.0 mm wide, glabrous or pilose on adaxial surface. Leaves imparipinnate, 30-80 mm long, 4-11 jugate; petiole up to [+ or -] 5-10 mm long; leaflets linear to linear-lanceolate, subsessile, 6-16 mm long, 2-3 mm wide, apex obtuse to emarginate, base cuneate, pubescent to pilose or glabrous on abaxial surface, glabrous on adaxial. Inflorescence dense axillary racemes, longer than the leaves, often spine-tipped, up to [+ or -]130 mm long, with (3-)6-24 flowers; pedicels 5-10 mm long; bracts linear to narrowly ovate, 1.5-2.0 mm long, pubescent, often with black hairs, persistent; bracteoles present at base of calyx, 0.5-1.0 mm long, pubescent, often with black hairs, persistent. Flowers 5-10 mm long, pink to purple. Calyx [+ or -] 3-5 mm long, pubescent, mostly with black hairs, subequally 5-lobed; tube [+ or -] 3-4 mm long; lobes deltoid, [+ or -] 1-2 mm long, upper two slightly shorter than the lower three, tips pubescent on inner surface. Standard 6-8 mm long, claw linear, 1-2 mm long; lamina broadly obovate, 5-7 mm long, 6-9 mm wide, emarginate, glabrous. Wings 6-8 mm long, claw 2-3 mm long; lamina oblong, [+ or -] as long as keel, 4-6 mm long, 2-4 mm wide, obtuse, glabrous, without sculpturing. Keel 6-8 mm long, claw 2-3 mm long; lamina boat-shaped, 4-6 mm long, 3-4 mm wide, obtuse, glabrous, pocket absent. Anthers monomorphic, basifixed, nine stamens fused for two-thirds of their length, vexillary stamen free but fused at the base with the other stamens. Pistil shortly stipitate, glabrous, ovary narrowly elliptic, 4-7 mm long, [+ or -] 1 mm wide with 3-6 ovules; style [+ or -] 2-3 mm long, curved upwards, bearded only around stigma. Pods shortly stipitate with stipe 1-2 mm long, obliquely elliptic to orbicular or falcate, compressed around margins and inflated near middle, 20-35 mm long, 10-16 mm wide, glabrous, [+ or -] 2-3-seeded, indehiscent. Seeds suborbicular to reniform, brown, 3-4 x 3-4 mm, smooth (Fig. 3

Fig. 3.: Morphology of *Lessertia meyeri* . A. Standard petal. B. Pistil. C. Leaflets in abaxial view. D. Wing petal. E. Androecium. F. Flower in lateral view. G. Outer surface of the calyx (upper lobes to the left). H. Keel petal. I1. Bract. I2. Bracteole. J1-J2. Pods in lateral view. Voucher specimens: (A, F) *Strid & Strid 38066* (NBG); (B) *Perry & Snijman 2338* (NBG); (C) *Hanekom 3312* (NBG); (D-E, G-H) *Helme 4423* (NBG); (I1, I2) *Compton 20695* (NBG); (J1) *Compton 14945* (NBG); (J2) *Thomas & Van Jaarsveld 8937* (NBG). Scale bars: 1 mm.

). Flowering time: July-November.

Diagnostic Characters and Relationships--

This species is similar to *Lessertia rigida* , *L. spinescens* and *L. perennans* in the shrubby habit, long pedicels (more than 5 mm), elongate inflorescences longer than the leaves (shorter than the leaves in *L. spinescens*) and laterally compressed, glabrous pods. It differs in the linear to linear-lanceolate leaflets that have distinctly obtuse to emarginate apices. The other species have elliptic to oblong, obovate or lanceolate leaflets with acuminate apices (or if obtuse, then the leaflets not linear). It further differs from *L. rigida* and *L. perennans* in the pods that are compressed around the margins and inflated near the middle, as opposed to being laterally compressed. *Lessertia spinescens* has similar pods to *L. meyeri* , but these two species differ in the inflorescences that are longer than the leaves and the wing petals as long as the keel petals in *L. meyeri* (inflorescences shorter than the leaves and wing petals longer than the keel petals in *L. spinescens*).

Distribution and Habitat--

Lessertia meyeri occurs from Namaqua National Park south along the west coast of South Africa to the Cape Peninsula with an outlier population at Montagu (Fig. 2). It is found mainly in Namaqualand Strandveld, Lambert's Bay Strandveld, sandstone fynbos and sand fynbos (Rebelo et al. 2006) on sandy or rocky soil, granite, limestone, and tillite up to ca. 700 m.

Etymology--

This species is named in honor of Ernst H. F. Meyer (1791-1858) for his monumental contribution to South African Botany. The species concept proposed here is based on the varieties of *Lessertia rigida* (var. *leucomelaena* and var. *marina*) proposed by Meyer (1836), excluding the Thunberg type specimen of *Colutea rigida* .

Additional Specimens Examined--

SOUTH AFRICA. 2917 (Springbok): Namaqua National Park, north-western corner of Park 29[degrees]59'29"S 17 [degrees]24'31"E (-CD), *Bester 7987* (NBG). 3017 (Hondeklipbaai): Hondeklipbaai, 16 km north of Kotzesrus and 2 km west of Hardevlei, Farm Hardekoppie (-DC), *Perold 1710* (BOL, PRE). 3118 (Vanrhynsdorp): Farm Komandokraal, Koekenaap to Graafwater, 31[degrees]30'10"S 18[degrees]12'15"E (-CA), *Goldblatt & Porter 13106* (NBG); Vanrhynsdorp, Bergopklip (-CD), *Stirton 6084* (PRE); Clanwilliam district, Flats, Heerenlogement (-DC), *Bond 1064* (NBG); *Esterhuysen 5570* (BOL, PRE); near Klawer (-DC), *Compton 20695* (NBG). 3119 (Calvinia): Nieuwoudtville Reserve (-AC), *Perry & Snijman 2338, 2427* (NBG). 3217 (Vredenburg): Vredenburg (-DD), *Compton 15905* (NBG). 3218 (Clanwilliam): Lambert's Bay (-AB), *Marsh 784* (NBG), *Van Breda 345* (PRE); Lambert's Bay, Nortier Expt. Farm (-AB), *Bayer 5792* (PRE); Langdam, Groendam (-AB), *Stirton 9347* (PRE); west of Graafwater, Bestershof (-AB), *Bayer 5821* (PRE); Elandsbaai, Koopmansdrift, 2 km east of homestead (-AD), *Hanekom 3312* (NBG); Clanwilliam, 5 km from Elands Bay on road to Lambert's Bay (-AD), *Stirton & Zantovska 11431* (NBG, PRE); Verloren Vlei (-BC), *Barker 2615* (NBG); Farm Drooge Rivier about 5 km south of Sandberg (-BC), *Steiner 1568* (NBG); north-west of Olifantsrivier Mountains, just north of Elandsfontein, 32[degrees]17'42.1"S 18[degrees]48'12.9"E (-BD), *Helme 4423* (NBG); Keurbos north of Algeria (-BD), *Thomas & Van Jaarsveld 8937* (NBG); Rocher Pan Nature Reserve, between Velddrif and Elands Bay (-CB), *Ellis s. n.* (PRE); Vredenburg, Saldanha Yskor Smelting Plant Site, Spioenkop (-CC), *Rode 268* (NBG); Langebaanweg to Fossil Park, south of turnoff below low hill, 32 [degrees]57'44"S 18[degrees]07'32"E (-CC), *Goldblatt & Porter 13290* (NBG); 15 km from Hopefield to Vredenburg (-CC), *Grobbelaar 2557* (PRE); Piquetberg, Berg River (-CD), *Bond 523* (NBG). 3317 (Saldanha): Saldanha, Hoetjies Bay (-BB), *Bolus 12672, 12673* (BOL). 3318 (Cape Town): west slopes of Postberg (-AA), *Barker 10467* (NBG), *Pamphlett 120* (NBG); Langebaan Country Estate, upper south slopes of Bontheuwel north of road to Langebaan town and north-east of golf course extension (-AA), *Boucher 6980* (NBG); Saldanha Bay, hillside (-AA), *Galpin 10707* (PRE); peninsula west of Langebaan (-AA), *Pillans 6987* (BOL); Elandsfontein West, second ridge west of farmhouse (-AA), *Thompson 3532* (NBG); Malmesbury, Geelbek road (-AA), *Compton 24387* (NBG); 11 km north north-east of Yzerfontein (-AC), *Strid & Strid 38066* (NBG); Malmesbury division between Mamre and Darling (-AD), *Bolus s. n.* (BOL), *Leighton 2123* (PRE); near Mamre (-AD), *Bolus 20406* (BOL); Malmesbury, Darling (-AD), *Compton 15959* (NBG); Malmesbury, Mamre Hills (-AD), *Compton 14945* (NBG); north of Modder River, near bridge (-AD), *O'Callaghan 1312* (NBG, PRE); Darling (-AD), *Liebenberg 4238* (PRE); Malmesbury, Modder River (-AD), *Stirton 9355* (PRE); Malmesbury division, near Groot Post (-BC), *Salter 6807* (BOL); Malmesbury, Bok Point (-CB), *Esterhuysen s. n.* (NBG);

Malmesbury, Mamre (-CB), *Compton 6773* (NBG); Malmesbury, Bokbaai (-CB), *Esterhuysen 3806* (BOL); Milnerton Golf Course, near the sea in sand (-CD), *Leighton 673* (BOL); Milnerton dunes (-CD), *Compton 16324* (NBG); Mowbray (-CD), *Guthrie 905* (BOL); Raapenberg, Mowbray (-CD), *Guthrie 7076* (BOL). 3320 (Montagu): Cabidu (-AB), *Compton 12099* (NBG). 3418 (Simonstown): Kuilsriver (-AB), *Pappe s. n. sub SAM 15509* (SAM, 2 sheets).

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