

Three new species of *Centella* series *Glabratae* (Apiaceae)

Mahalia T. R. Schubert and Ben-Erik van Wyk

Schubert, M. T. R. & Van Wyk, B.-E. 1998. Three new species of *Centella* series *Glabratae*. – Nord. J. Bot. 18: 461-469. Copenhagen. ISSN 0107-055X.

Three new species of *Centella* series *Glabratae* are described in this paper: *C. brachycarpa*, *C. dolichocarpa* and *C. pilosa*. These species are similar to *C. difformis*, and in order to clarify species limits the latter is also described and illustrated. The fruit shape and the bulging commissure of the new species show that the sectional limits of the series *Glabratae* will have to be revised to include *C. difformis* and related species, previously associated with the series *Montanae*.

M. T. R. Schubert & B.-E. van Wyk, Department of Botany, Rand Afrikaans University, P. O. Box 524, Auckland Park 2006, Johannesburg, Republic of South Africa.

Introduction

Centella (L.) Domin is a genus of the subfamily Hydrocotyloideae of the Apiaceae. The genus comprises some 50 species and is largely restricted to southern Africa. A notable exception is the medicinally important *C. asiatica* (L.) Urban, which has a pantropical distribution. In the last revision by Adamson (1951), the genus was subdivided into two subgenera, namely *Trisanthus* Lour. and *Solandra* L. Seven series, based mainly on leaf characters, were recognised within subgenus *Solandra*. These included, amongst others, the series *Montanae* Adamson (7 species) and series *Glabratae* Adamson (15 species). It is interesting to note that these two taxa were not mutually exclusive, since *C. glabrata* L. was included in both of them! It has also become evident that the series *Montanae* is not monophyletic. We investigated the value of fruit characters to devise a more satisfactory classification system for one of the natural groups within the series *Montanae*, namely *C. difformis* (Eckl. & Zeyh.) Adamson and related species. A detailed discussion of the taxonomic value of the fruit in *Centella* is in preparation.

Fruit morphology

A study of transverse sections of the fruit of all the species of *Centella* revealed an interesting modification of the commissure in several species. This character is here reported for the first time. In transverse view, the commissural area is much thickened, externally visible as a bulging of the mericarps on both sides of the commissure (Fig. 1). The bulging commissure (clearly visible in Fig. 1b-d) is an important diagnostic character in the genus *Centella* and is associated with *C. glabrata* and related species of the series *Glabratae*. Three new species with bulging commissures are described in this paper. *Centella difformis* is also described and included in the illustrations, to enable comparisons with the other species, of which two were previously confused with *C. difformis*. Although two of the new species (*C. brachycarpa* and *C. dolichocarpa*) are superficially very similar to *C. difformis*, there are important differences between them: *C. difformis* (Fig. 1a) has fruit with distinct ribs and no bulging of the commissure, while *C. dolichocarpa* and *C. brachycarpa* both have fruit without prominent ribs and with a distinct bulging of the commissure (Fig. 1b & 1c). The bulging commissure and the absence of ribs are found in the third new species (*C. pilosa*) as well. Although the bulging of the

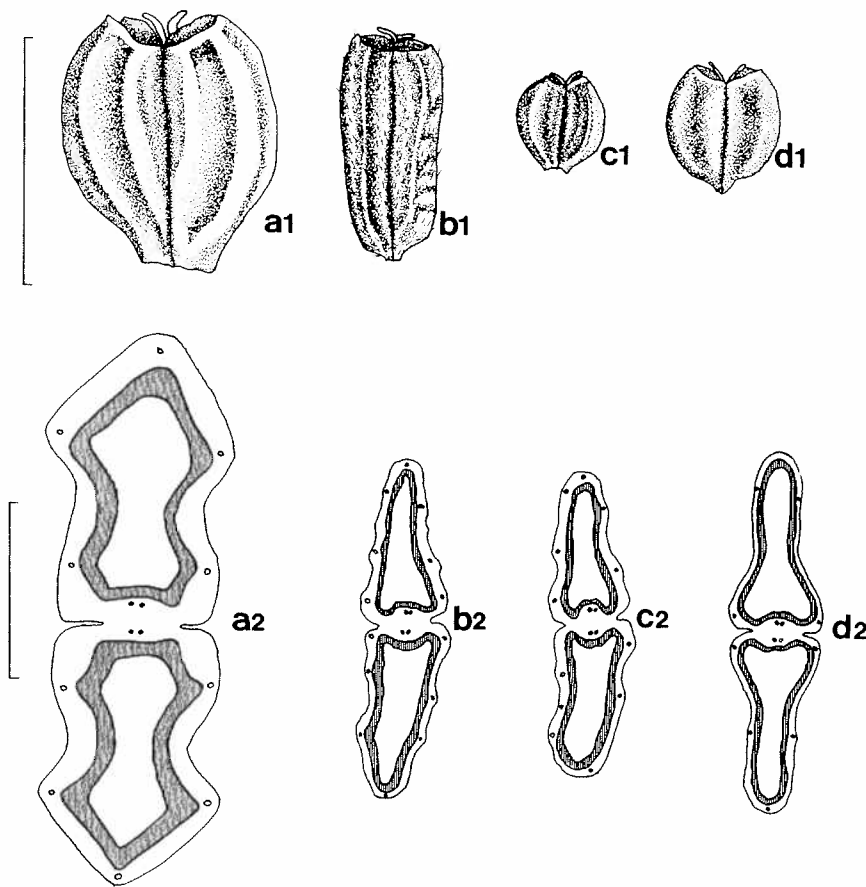


Fig 1. Schematic illustration of fruit characters of *Centella difformis*, *C. dolichocarpa*, *C. brachycarpa* and *C. pilosa*. – Top row: fruits in commissural view. a1, *C. difformis*: large ribbed fruit with no prominent bulging of the commissure; b1, *C. dolichocarpa*: elongated, ribbed, villose fruit with distinct bulging of the commissure; c1, *C. brachycarpa*: small, ribbed fruit with distinct bulging of the commissure; d1, *C. pilosa*: small smooth fruit with distinct bulging of the commissure. Bottom row: transverse sections of fruits. a2, *C. difformis*: distinctly ribbed fruit with no prominent bulging of the commissure; b2, *C. dolichocarpa*: ribbed fruit with bulging commissure; c2, *C. brachycarpa*: ribbed fruit with bulging commissure; d2, *C. pilosa*: smooth fruit with prominent bulging commissure. – (a from Schubert & Van Wyk 23, b from Bean & Trinder-Smith 2723, c from Schubert 85, d from Winkler 5). (Scales: 5 mm and 1 mm).

commissure of *C. difformis* is not as prominent as it is in the other species described in this paper, observation of other fruit characters led us to question Adamson's (1951) placement of *C. difformis* in the series *Montanae* and we propose a transfer to the series *Glabratae*. The fruit of *C. difformis* is often ribbed, a character found only in the series *Glabratae* and *Virgatae* Adamson and not in *Montanae*. Species of the series *Glabratae* can also be distinguished by their fruit shape; the fruits are longer than wide, with a length:width ratio of more than one. The series was poorly defined by Adamson (1951) and we suggest that the two fruit characters mentioned here (bulging commissure, fruit shape) are more reliable than leaf characters and that they will lead to a more natural subdivision within the series *Glabratae* and *Montanae*.

Leaves

As shown in Fig. 2, the leaves of *Centella difformis* (Fig. 2a) are very similar to those of *C. dolichocarpa* (Fig. 2b) and *C. brachycarpa* (Fig. 2c). In his key to the

series Adamson includes the series *Montanae* in the definition 'basal or all leaves toothed' while he includes the series *Glabratae* in the definition 'leaves or most of them entire'. We have observed that both dentate and entire leaves co-occur within the species of our study group. As a result, Adamson's (1951) distinction between series *Montanae* and *Glabratae* is entirely artificial. As discussed under the fruit characters, we propose that *C. difformis* be placed in the series *Glabratae* rather than *Montanae*. This is supported by the intermediacy of the general morphology (leaves, habit and fruit) of *C. dolichocarpa* between *C. difformis* and *C. glabrata*.

Habit

The prostrate or procumbent habit of *Centella difformis* and related species is very similar to that of various species of the series *Glabratae*. Distinct differences in habit (and more specifically the relation between vegetative and flowering branches) between *C. difformis* and the three new species are shown in Fig. 3. Fig. 3a shows the dimorphic leaves of *C. difformis*. Note the

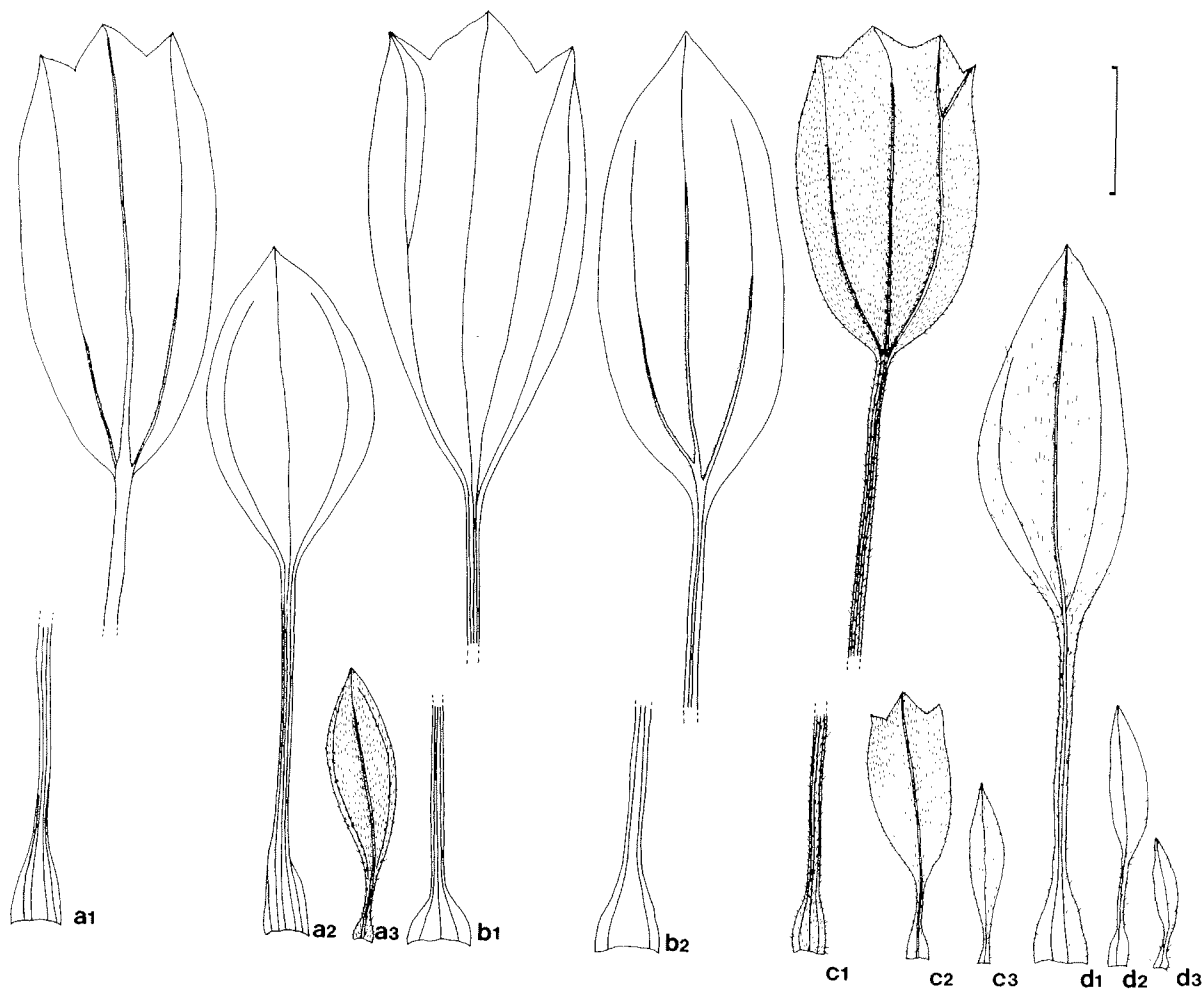


Fig. 2. Basal and upper leaves of *Centella difformis*, *C. dolichocarpa*, *C. brachycarpa* and *C. pilosa*. – a, *C. difformis*: a1, basal leaf, dorsal view; a2, basal leaf, ventral view; a3, upper leaf, ventral view; b, *C. dolichocarpa*: b1, basal leaf, ventral view; b2, upper leaf, ventral view; c, *C. brachycarpa*: c1, basal leaf, dorsal view; c2, basal leaf, dorsal view; c3, upper leaf, dorsal view; d, *C. pilosa*: d1, basal leaf, dorsal view; d2, upper leaf, dorsal view; d3, upper leaf, dorsal view. – (a1-3 from Schubert & Van Wyk 23, b1-2 from Bean & Trinder-Smith 2723, c1-3 from Schubert 85, d1-3 from Winkler 5). (Scale: 10 mm).

distinct difference between the basal (vegetative leaves) and the upper ones (i.e. those on the flowering branches). This difference is particularly striking in *C. brachycarpa* (Fig. 3b), where there is an abrupt transition from the basal, trilobed leaves to the much smaller, entire upper leaves. In *C. pilosa* there is a gradual transition from large basal leaves to minute upper leaves (Fig. 3d) while there is virtually no distinction between vegetative and flowering branches in *C. dolichocarpa* (Fig. 3c).

Inflorance

One of the most remarkable features found in this small group of related species is the widely different inflorescence structures (Fig. 4). In *Centella difformis* (Fig. 4a) and *C. dolichocarpa* (Fig. 4c) the plants are andromonoecious (a1, c1) or androdioecious (a2, a3, and c2 - c4), while the other two species (*C. dolichocarpa*, Fig. 4b and *C. pilosa*, Fig. 4d) are invariably andromonoecious. As far as we know, *C. pilosa* is unique within the genus *Centella* because of the co-occurrence of homosexual and heterosexual inflorescences, all on the same plant (Fig. 4d). The homosexual inflorescences

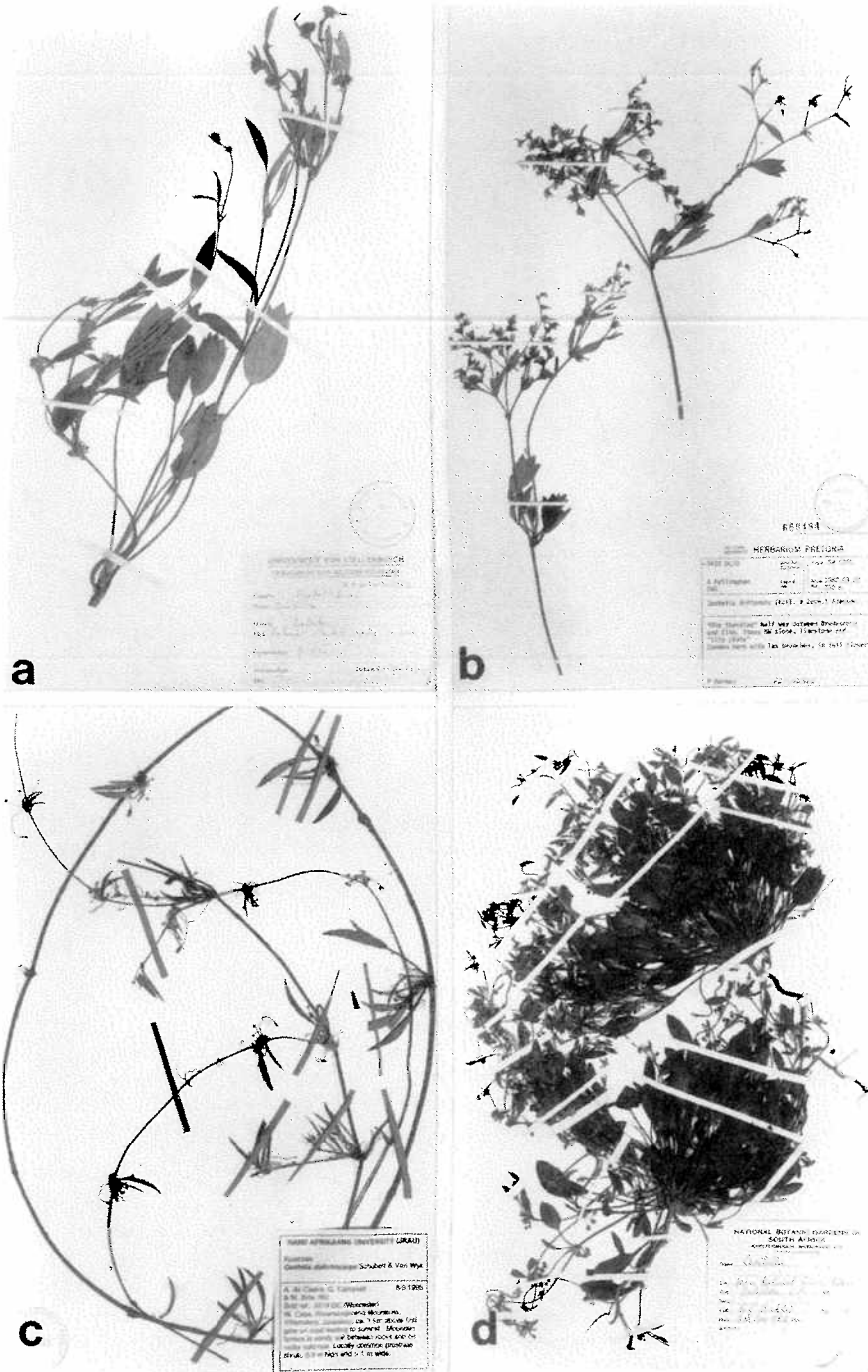


Fig. 3. Photographic plates of herbarium specimens to illustrate differences in habit and the degree of leaf dimorphism. a, *Centella difformis*; b, *C. brachycarpa*; c, *C. dolichocarpa*; d, *C. pilosa*.

are either male or hermaphroditic. In all other species, only one type of inflorescence is present on any given plant. In *C. difformis* for example, there are andromonoecious plants (with inflorescences as in Fig. 4a1), male plants (with inflorescences as in Fig. 4a2) or hermaphroditic plants (with inflorescences as in Fig. 4a3).

Geographical distribution

All of the species referred to in this paper are localized fynbos endemics. Their known distribution areas are concentrated in the Western Cape Province of South Africa as shown in Fig. 5.

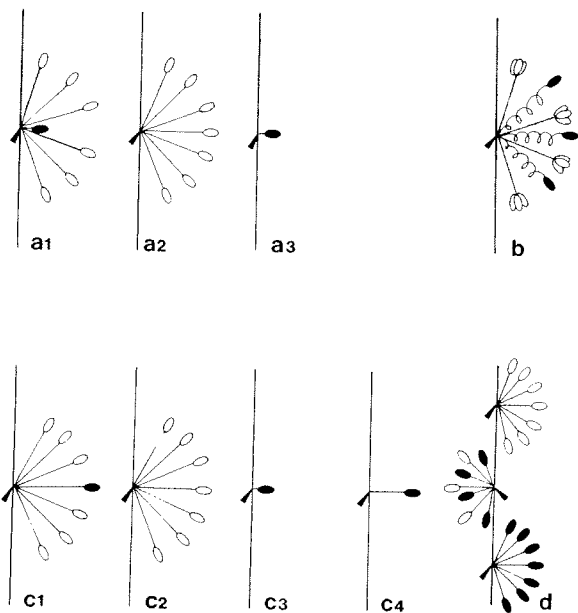


Fig. 4. Schematic overview of inflorescences of *Centella difformis*, *C. dolichocarpa*, *C. brachycarpa* and *C. pilosa*. (Single-flowered male umbellule shown as an open ellipse; 5- to 7-flowered male umbellule shown as multiple open ellipse and single-flowered bisexual umbellule shown as filled ellipse). – a, *C. difformis*: a1, inflorescence from andromonoecious plant, with male and bisexual umbellules; a2, inflorescence from male plant, with male umbellules only; a3, inflorescence from bisexual plant, with single bisexual umbellule. b, *C. dolichocarpa*, inflorescence with many-flowered male umbellules and bisexual umbellules with peculiar coiled rays. c, *C. brachycarpa*: c1, inflorescence from andromonoecious plant, with male and bisexual umbellules; c2, inflorescence from male plant, with male umbellules; c3, inflorescence from bisexual plant, with subsessile bisexual umbellule; c4, inflorescence as in c3, but with a ray. d, *C. pilosa*, inflorescences with male umbellules only (above), with both male and bisexual umbellules (middle) and with bisexual umbellules only (below), all on the same plant.

Centella difformis (Eckl. & Zeyh.) Adamson

in J. S. Afr. Bot. 15: 94 (1949) pro parte; Adamson & Salter, Fl. Cap. Penin.: 614 (1950) pro parte; Adamson in J. S. Afr. Bot. 17: 19 (1951) pro parte; Eichler in Feddes Repert. 98: 15 (1987) pro parte; Burt in Edinb. J. Bot. 48 (2): 200 (1991) pro parte. – Type: South Africa, Stellenbosch Mountains near ‘Grietjesgat’ [3418BB] Ecklon & Zeyher 2165 (SAM!, lectotype, designated here).

≡ *Hydrocotyle difformis* Eckl. & Zeyh., Enum.: 333 (1837). – Type as above.

≡ *Hydrocotyle montana* auct., non Cham. & Schlecht.; Sonder in Fl. Cap. 2: 531 (1862). (Sonder cited Ecklon & Zeyher 2165).

≡ *H. difformis* Eckl. & Zeyh. var. *approximata* Eckl. & Zeyh., Enum.: 333 (1837). – Type: South Africa, Western Cape, Hottentottsholland Mountains near ‘Palmietrivier’ [3418BB], Ecklon & Zeyher 2165b (SAM!, upper specimen, lectotype, here designated).

≡ *H. difformis* Eckl. & Zeyh. var. *intermedia* Eckl. & Zeyh., Enum.: 333 (1837). – Type: South Africa, Western Cape, between ‘Zwarteberg’ [3419AB] and ‘Gnadenhal’ [3419BA], Ecklon & Zeyher 2165c (SAM!, lectotype, here designated; GRA!, isolectotype).

≡ *H. difformis* Eckl. & Zeyh. var. *divaricata* Eckl. & Zeyh., Enum.: 333 (1837). – Type: South Africa, Western Cape, ‘Klynriviersberge’ and ‘Klynrivier’ [3419AD], Ecklon & Zeyher 2165d (SAM!, lectotype, here designated).

Erect andromonoecious or androdioecious perennial, up to 0.3 m tall, 0.5 m wide, with ascending flowering branches spreading from a central tuft of basal leaves. Leaves (Fig. 2a) dimorphic, elliptic to narrowly elliptic, the base attenuate, main veins abaxially raised and adaxially sunken, surface on both sides puberulent to glabrescent, grey-green to red-green, concolorous, the margin dentate in upper third and entire lower down; basal leaves with petiole (10-) 40-60 (-160) mm long, pubescent to glabrous along entire length, lamina (15-) 30-40 (-50) mm long, (10-) 15-20 (-30) mm wide; margin occasionally entire or with two to five acuminate teeth in upper third; apex acuminate; upper leaves (on flowering shoots) petiolate or more often sessile, petiole 5-10 (-40) mm long, pubescent to glabrous along entire length, lamina (10-) 15-20 (-45) mm long, (2-) 4-10 (-17) mm wide; margin entire or occasionally with two to three acuminate teeth in upper third; apex acuminate. Inflorescence with a central single sessile bisexual umbellule mostly surrounded by many lateral, rayed male umbellules (or sometimes with many rayed male umbellules only); rarely with many rayed bisexual umbellules without a central bisexual umbellule. Male umbellules 3-5 mm long, with a single male flower each. Bisexual umbellules with a single flower each (Fig. 4a1, a3); borne in axils of flowering shoots; bracts of male umbellules two or rarely three, up to 1.5 mm long, not foliaceous, glabrous; bracts of central bisexual umbellule paired, 1-2 mm long, 1-1.5 mm wide, lanceolate, glabrous. Flowers with cream coloured petals; petals abaxially pubescent. Fruit widely elliptic, 4-5 mm long, 3-4 mm wide in commissural view, bulging of commissure not prominent; ribs prominent, the surface between ribs smooth, glabrous; stylopodium not prominent.

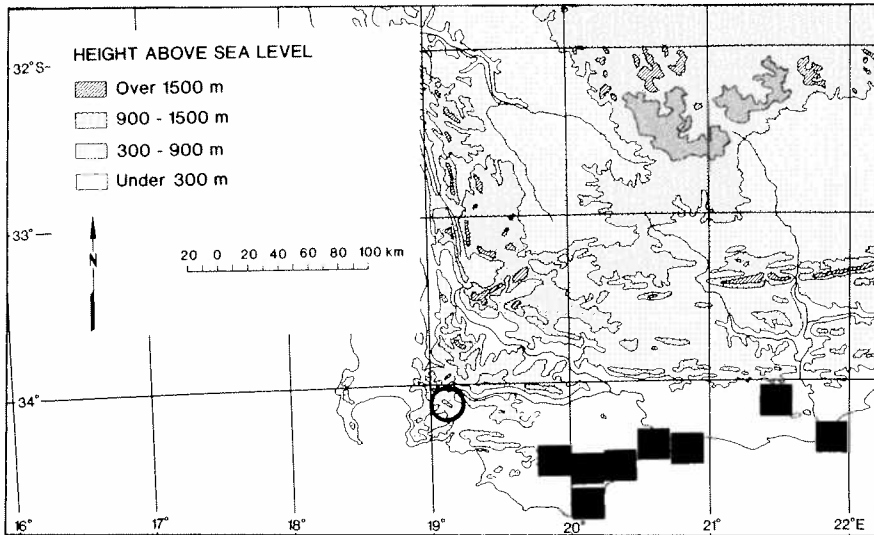
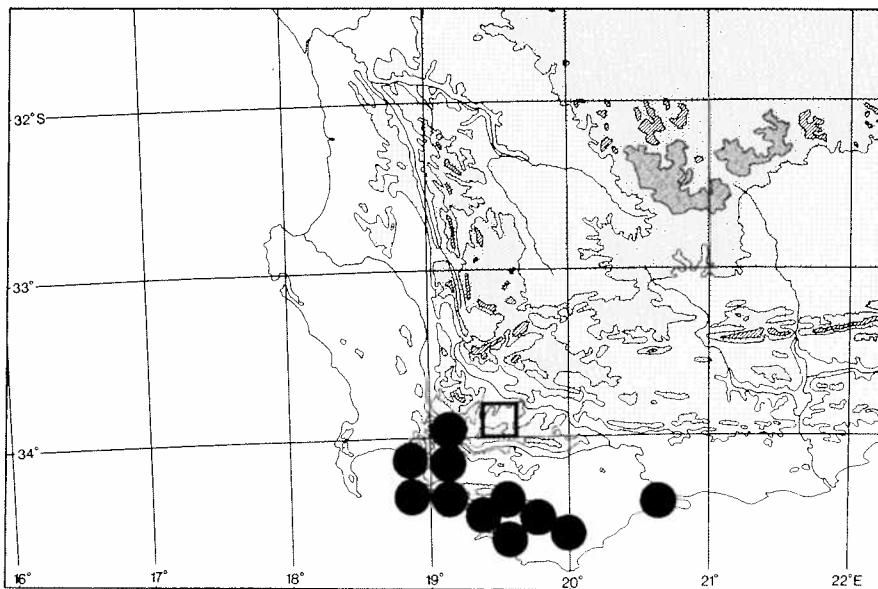


Fig. 5. The known geographical distribution of *Centella difformis* (●), *C. dolichocarpa* (□), *C. brachycarpa* (■) and *C. pilosa* (○).



Notes. *Centella difformis* is superficially very similar to *C. brachycarpa* and *C. dolichocarpa* and previously they have been regarded as a single species. All three species have dimorphic leaves (Fig. 2a-c): the basal leaves are mostly tridentate in the upper half while the upper leaves, which are borne on long shoots, are entire. However, there are important differences between them: *C. difformis* has fruit with distinct ribs and no distinct bulging of the commissure (Fig. 1, a1, a2), while *C. dolichocarpa* (Fig. 1, b1, b2) and *C. brachycarpa* (Fig. 1, c1, c2) both have fruit without prominent ribs and with a distinct bulging of the commissure. We

question Adamson's (1951) placement of *C. difformis* in the series *Montanae* and here propose a transfer to the series *Glabratae*. The fruit of *C. difformis* is often ribbed, a character found only in the series *Glabratae* and *Virgatae* and not in *Montanae*.

Distribution. *Centella difformis* occurs in mountainous habitats in the Western Cape Province, from the Hottentottsholland Mountains to the Potberg Nature Reserve (Fig. 5). It is an exceptionally variable species, but no distinct discontinuities could be found to justify infraspecific taxa. In the Fernkloof Nature Reserve at

Hermanus, several seemingly distinct forms have been found, such as an erect virgate plant (Schubert & Van Wyk 59a, JRAU) but this merges gradually (through Schubert & Van Wyk 59b, JRAU) with small forms (such as Schubert & Van Wyk 24, JRAU). An interesting variant has been collected on the Swartberg near Caledon (Esterhuysen 18938, BOL). It has broadly triangular leaves and a somewhat hispid vestiture, but similar leaves occur in the Kogelberg Nature Reserve, such as Kruger 791 (STE).

Material examined. 3319 (Worcester): Franschhoek Pass (-CC), Pillans 7012 (BOL). 3418 (Simonstown): Hottentots Holland Mountains (-BB), Bolus 4139 (BOL), Esterhuysen 16726 (NBG); Grietjiesgat (-BB), Ecklon & Zeyher 2165 (SAM); Somerset Sneeuwkop (-BB), Esterhuysen 2596 (PRE); Steenbras Dam (-BB), Van Wyk 962 (PRE, STE); Palmiet River (-BB), Adamson 4184, 4214 (BOL), Levyns 3837 (BOL); Kogelberg (-BB), Kruger 791, 807 (STE), Stirton & Zantovska 11316 (NBG); Palmiet River mouth (-BD), Adamson 4184 (BOL), 4215 (SAM), 4216 (BOL), Compton 12352 (NBG), Ecklon & Zeyher 2165b (SAM), Grobler 590 (STE), Esterhuysen 12613 (BOL), Stokoe s.n. (SAM); Rooiels (-BD), Adamson 4272, 4273 (BOL), Levyns 9389 (BOL); Hangklip (-BD), Adamson 4099 (BOL), Barker 6092 (NBG, STE), Boucher 604 (STE), Compton 13509, 17588 (NBG), Rodin 3161 (BOL); Kogelberg Nature Reserve (-BD), Boucher 127 (BOL), Vlok & Schutte 291 (JRAU); Betty's Bay (-BD), Ebersohn s.n. (NBG), Goldblatt 1601 (NBG, PRE), Schubert & Van Wyk 23 (JRAU), Van Wyk et al. 3504 (JRAU), Vogts s.n. (PRE). 3419 (Caledon): Franschhoek Mountains (-AA), Stokoe s.n. (SAM), Viviers 992 (STE); Lebanon State Forest (-AA), Haynes 7784 (STE), Kruger 519 (STE), 577 (PRE); Elgin (-AA), Levyns 3383 (BOL); Houhoek Mountains (-AA), Schlechter 7428 (BOL); Highlands (-AA), Compton 7467, 12261 (NBG), Winkler 6 (NBG); Swartberg & Gnadendal (-AB), Ecklon & Zeyher 2165c (GRA, SAM), Esterhuysen 18938 (BOL); Palmiet River (-AC), Barker 6090 (NBG, STE), De Vos 1363 (STE), Stokoe s.n. (SAM); Kleinmond (-AC), De Vos 800 (STE), Kleinriviersberge (-AC) Ecklon & Zeyher 2165d (SAM), Esterhuysen s.n. (PRE), Vlok & Schutte 303 (JRAU), Zeyher 2666 (SAM); Bot River (-AC), Adamson 4099 (BOL); Hawston (-AC), Bond 753 (NBG); Onrus (-AC), Compton 3963 (BOL); Hermanus (-AC), Esterhuysen 4233 (PRE), Galpin 12901 (PRE), Heginbotham 180 (NBG), Johnson 320 (NBG), Schubert & Van Wyk 24, 59a, b (JRAU), Stokoe s.n. (SAM); Vogelgat (-AD), Williams 2510 (NBG), 2946 (NBG, PRE), 3258 (NBG); Shaws Pass (-AD), Lewis 134 (SAM); Flouhoogte (-BC), Thompson 3877 (PRE, STE); Elandskloof Mountains

(-BD), Adamson 4322, 4324 (PRE); Pearly Beach (-DA), Lewis s.n. (PRE, SAM), Maguire 40 (NBG); Elim (-DB), Bolus s.n. (BOL). 3420 (Bredasdorp): Potberg Nature Reserve (-BC), Schubert 83 (JRAU). Without precise locality: Ecklon & Zeyher s.n. (SAM).

Centella brachycarpa M. Schub. & B.-E. van Wyk sp. nov.

A *C. difformi* ramis valde dimorphis, ramis supernis floriferis valde a ramis basalis divergentibus (in *C. difformi* rami non valde dimorphi), etiam fructu egregie pusilli (usque ad 2 mm longo et 2.5 mm lato), rugoso, cum commissura tumescenti (fructus *C. difformi* valde maior est, ultra 4 mm longus et 3 mm latus, costatus, sine commissura distincta tumescenti), differt.

Typus: South Africa, Western Cape Province, Bredasdorp district, De Hoop Nature Reserve, ca. 1 km from office to Koppie Alleen [3420AD], Schubert 78 (PRE, holotype; NBG, isotype).

Erect andromonoecious or androdioecious perennial, up to 0.3 m tall, with ascending flowering branches extending upwards beyond a central tuft of basal leaves. Leaves (Fig. 2b) dimorphic, elliptic to narrowly elliptic, the base attenuate, main veins abaxially raised and adaxially sunken, surface on both sides puberulent to glabrescent, grey-green to red-green, concolorous, the margin dentate in upper third and entire lower down; basal leaves with petiole (10-) 40-80 (-130) mm long, pubescent to glabrous along entire length, lamina (15-) 30 (-45) mm long, (7-) 10-15 (-25) mm wide; margin occasionally entire or with two to five acuminate teeth in upper third; apex acuminate; upper leaves (on flowering shoots) often sessile or petiolate, petiole (0-) 10 (-15) mm long, pubescent to glabrous along entire length, lamina (7-) 10 (-25) mm long, (1-) 2-3 (-8) mm wide; margin entire or occasionally with two to three acuminate teeth in upper third; apex acuminate. Inflorescence with a central single sessile bisexual umbellule mostly surrounded by five to seven lateral rayed male umbellules (or sometimes with many lateral, rayed male umbellules only). Male umbellules 1-2 mm long, with a single male flower each. Bisexual umbellules with a single flower each (Fig. 4c1, c3, c4); borne in axils of flowering shoots; bracts of male umbellules paired, up to 1 mm long, not foliaceous, glabrous; bracts of the central bisexual umbellule paired, 1-2.5 mm long, 1-2 mm wide, lanceolate, glabrous. Flowers with cream coloured petals; petals glabrous. Fruit widely elliptic, 1.5-2 mm long, 2-2.5 mm wide in commissural view, with bulging commissure, ribs not prominent, the surface wrinkled, glabrous; stylopodium not prominent.

Notes. *Centella brachycarpa* differs from *C. difformis* in the highly dimorphic branches with the upper flowering branches differing markedly from the basal branches (in *C. difformis* and *C. dolichocarpa* the dimorphism is not as pronounced as in *C. brachycarpa*), as well as in the exceptionally small (up to 2 mm long and 2.5 mm wide), wrinkled fruit with a bulging commissure (the fruit of *C. difformis* is large, 4-5 mm long and 3-4 mm wide, ribbed, not wrinkled and the bulging commissure is not clearly evident) - compare Fig. 1a (*C. difformis*) with Fig. 1c (*C. brachycarpa*). The bulging commissure, as well as the presence of ribs, both verify the placement of this species in the series *Glabratae*.

Distribution. *Centella brachycarpa* is found in the Western Cape Province between Die Skeiding (near Napier in the Caledon district) in the west and the Gouritz River mouth in the east (Fig. 5). Even though there is an overlap of the geographical distribution of *C. brachycarpa* and *C. difformis*, they are ecologically separated as *C. difformis* is particularly concentrated along the mountain ranges while *C. brachycarpa* is restricted to limestone areas along the coast.

Material examined. 3419 (Caledon): Die Skeiding (-BD), Fellingham 248 (PRE, STE); Heuningrug (-DB), Albertyn 690 (NBG), Cowling 3064 (STE). 3420 (Bredasdorp): De Hoop Nature Reserve (-AD), Barker 8688 (NBG), Burgers 3071 (PRE, STE), Fellingham 540 (PRE, STE), Schubert 78 (JRAU), Oliver 8530 (PRE, STE); Potberg Estate (-BC), Schubert 85 (JRAU), Taylor 8467 (NBG, STE), Thompson 3777 (PRE, STE); Stilbaai (-BD), Barker 7746 (NBG, STE), Esterhuysen 19533 (BOL); Die Poort (-CA), Barker 7767 (NBG, STE), Compton 14734 (NBG), Esterhuysen 3621 (BOL), Taylor 8956 (STE); Arniston (-CA), Martin 52 (GRA), Taylor 3810 (PRE, STE); Moerasfontein (-CB), Thompson 3429 (STE); Cape Agulhas (-CC), Salter 4115 (BOL), Schelpe 6436 (BOL). 3421 (Riversdale): Brandfontein (-AB), Esterhuysen 19095 (BOL); Gouritz River mouth (-BD), Schubert 69, 72 (JRAU).

***Centella dolichocarpa* M. Schub. & B.-E. van Wyk sp. nov.**

A *C. difformis* plantis semper monoeciis (interdum dioeciis in *C. difformis*) et in plantis maximis (usque ad 2.5 m latis in *C. dolichocarpa*; ad 0.5 m latis in *C. difformis*) differt. *C. dolichocarpa* differt etiam radii umbellularum bisexualium longioribus tortis (in *C. difformis* breves, non torti). Radii umbellulae masculae sunt breviores illis umbellularum bisexualium (longiores in *C. difformis*). Umbellulae masculae *C.*

dolichocarpae sunt e quinque floribus sessilibus compositae (semper uno in *C. difformis*), et fructus est anguste oblongus cum commissura tumescenti (late ellipticus sine commissura tumescenti in *C. difformis*).

Typus: South Africa, Western Cape, Worcester district, Riviersondereinde Mountains, Jonaskop, 1 km above first gate [3319DC], De Castro, Campbell & Brits 362 (PRE, holotype; BOL, K, NBG isotypes).

Prostrate andromonoecious perennial, up to 2.5 m wide, with flowering branches spreading horizontally from a central tuft of basal leaves. Leaves (Fig. 2c) dimorphic, elliptic to narrowly elliptic, the base attenuate, main veins abaxially raised and adaxially sunken, surface on both sides pubescent to glabrescent, grey-green to red-green, concolorous, margin dentate in upper third and entire lower down; basal leaves with petiole 30-155 mm long, pubescent to glabrous along entire length, lamina (30-) 35 (-60) mm long, (3-) 15 (-30) mm wide; margin occasionally entire or with two to five acuminate teeth in upper third; apex acuminate; upper leaves (on flowering shoots) sessile or sometimes petiolate, petiole 2-60 mm long, pubescent to glabrous along entire length, lamina 5-35 mm long, 5-22 mm wide; margin entire or occasionally with two to three acuminate teeth in upper third; apex acuminate. Inflorescence with a single bisexual umbellule and three male umbellules. Male umbellules 10-25 mm long, with five male flowers each. Bisexual umbellules 15-40 mm long, with a single flower each (Fig. 4b); borne in axils of flowering shoots; bracts of male umbellules paired, up to 1.5 mm long, not foliaceous, glabrous; bracts of the bisexual umbellule paired, 1-2 mm long, 1 mm wide, narrowly lanceolate, glabrous. Flowers with cream coloured petals; petals pubescent to glabrous. Fruit narrowly oblong, 4-5 mm long, 2 mm wide in commissural view, with bulging commissure, ribs prominent, the surface between the ribs wrinkled, pubescent or glabrous; stylopodium not prominent.

Notes. *Centella dolichocarpa* differs from *C. difformis* in the plants being invariably andromonoecious (sometimes androdioecious in *C. difformis*) and in the exceptionally large size of the plant (up to 2.5 m wide in *C. dolichocarpa* and up to 0.5 m wide in *C. difformis*). *C. dolichocarpa* also differs in the much longer, spirally twisted rays of the bisexual umbellules (short and not twisted in *C. difformis*). The rays of the male umbellules are shorter than the rays of the bisexual umbellules (longer in *C. difformis*). The male umbellules of *C. dolichocarpa* are composed of five flowers (always one flower in *C. difformis*) and the fruit is narrowly oblong with a bulging commissure (widely elliptic without a bulging commissure in *C. difformis*).

C. dolichocarpa clearly shows the link between *C. difformis* and *C. glabrata* as it shares characters with both species. The bulging commissure, as well as the decreasing dimorphism of the leaves and lesser degree of dentation of the leaves of *C. dolichocarpa*, are characters which link the species with *C. glabrata*.

Distribution. *Centella dolichocarpa* is endemic to the Riviersondereinde Mountains (Fig. 5).

Material examined. 3319 (Worcester): Riviersondereinde Mountains, Boesmans Pass (-DC), Bean & Trinder-Smith 2723 (BOL); Jonaskop (-DC), De Castro et al. 362 (BOL, JRAU, K, PRE), Schubert & Van Wyk 35 (JRAU); Poesjenels River (-DC), Levyns 5501 (BOL).

Centella pilosa M. Schub. & B.-E. van Wyk sp. nov.

Specie distincta sine affinitatibus manifestis ullis. A speciebus omnibus aliis inflorescentiis masculis, femineis et mixtis in eadem planta. Similis est *C. montanae* sed inflorescentiis differt, atque in *C. pilosa* habet fructus commissuram tumescentem. Etiam aliquantum similis est *C. difformi* sed foliis uniformibus pilosis et floribus bisexualibus radiatis (folia dimorpha et flores bisexuales sessiles vel subsessiles in *C. difformi*)

Typus: South Africa, Western Cape Province, Caledon, Palmiet River, Elgin [3419AA], Winkler 5 (NBG, holotype, BOL, isotype).

Prostrate andromonoecious annual?, with flowering branches spreading horizontally from a central tuft of basal leaves. Leaves (Fig. 2d) slightly dimorphic, elliptic to narrowly elliptic, the base attenuate, main veins abaxially raised and adaxially sunken, surface on both sides pilose to glabrescent, red-green, concolourous, margin entire; basal leaves with petiole (30-) 38-45 (-50) mm long, pilose along entire length, lamina (15-) 20-25 (-35) mm long, (7-) 10-11 (-15) mm wide, margin entire or occasionally with two to three acuminate teeth in upper third; apex acuminate; upper leaves petiolate, petiole (3-) 4-5 (-15) mm long, pilose along entire length, lamina (7-) 11 (-15) mm long, (2-) 3-4 (-7) mm wide, margin entire; apex acuminate. Inflorescences of three types (Fig. 4d): with four to six bisexual umbellules and mostly four to five male umbellules; with four to six bisexual umbellules only; with four to six male umbellules only. Male umbellules 2-3 mm

long, with a single flower each. Bisexual umbellules 2-6 mm long, with a single flower each (Fig. 4d); borne in axils of flowering shoots; cauline bracts (those below the inflorescence) resembling leaves of flowering shoots; bracts of male umbels paired, up to 1.5 mm long, not foliaceous, pilose; bracts of the bisexual umbellules paired, 1-2 mm long, 1 mm wide, lanceolate, glabrous. Flowers with cream coloured petals; petals glabrous. Fruit oblong, 2-2.5 mm long, 2.5 mm wide in commissural view, with bulging commissure; ribs not prominent, glabrous; stylopodium not prominent.

Notes. *Centella pilosa* is a distinct species with no obvious affinities. It differs from all other species in the co-occurrence of male, bisexual and heterosexual inflorescences. There is a similarity with *C. montana* but in the latter the inflorescences are all heterosexual and the commissure of the fruit is not bulging. It is also somewhat similar to *C. difformis* but differs in the uniformly pilose leaves and the rayed bisexual flowers (leaves dimorphic and pubescent, and bisexual flowers subsessile in *C. difformis*). The fruit of *C. pilosa* is smooth, with a distinctly bulging commissure, while those of *C. difformis* are ribbed and do not have a distinctly bulging commissure. *C. pilosa* is an annual or short-lived fireweed, while *C. difformis* is a perennial. *C. pilosa* furthermore is similar to *C. glabrata* from which it can be distinguished by the single-flowered male umbellules (male umbellules of *C. glabrata* with three to five flowers), the smaller fruit and the pilose indumentum (*C. glabrata* glabrous or rarely slightly villos). Thus *C. pilosa* is another species which clearly shows a link between *C. difformis* and *C. glabrata*.

Distribution. *Centella pilosa* is known only from a single collection from Elgin in the Caledon district (Fig. 5).

Material examined. (3419) Caledon: Palmiet River, Elgin (-AA), Winkler 5 (BOL, NBG).

Acknowledgements – We thank the directors and staff of the listed herbaria for allowing us to study their material. Thank you very much to Dr H. F. Glen of the NBI in Pretoria for translating the diagnoses. Financial support from the Rand Afrikaans University and the Foundation for Research Development is acknowledged.

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