

## Synopsis of the genus *Brachylaena* (Asteraceae) in southern Africa

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**Keywords:** Asteraceae, *Brachylaena*, southern Africa, synopsis, taxonomy

### ABSTRACT

A synopsis of the southern African representatives of the genus *Brachylaena* R. Br. (Asteraceae) is presented, in which seven species and two subspecies are recognized. *B. uniflora* Harv. is placed in synonymy with *B. discolor* subsp. *transvaalensis* (Phill. & Schweick.) J. Paiva and the division of subsp. *discolor* in two varieties is not accepted. Descriptions, synonymy, voucher specimens, distribution maps, line drawings and keys to the species and subspecies are given.

### UITTREKSEL

'n Sinopsis van die Suider-Afrikaanse verteenwoordigers van die genus *Brachylaena* R. Br. (Asteraceae) word aangebied waarin sewe spesies en twee subspesies erken word. *B. uniflora* Harv. is in sinonimie met *B. discolor* subsp. *transvaalensis* (Phill. & Schweick.) J. Paiva geplaas en die verdeling van subsp. *discolor* in twee variëteite, word nie aanvaar nie. Beskrywings, sinonimie, verwysingsekemplare, verspreidingskaarte, lyndiagramme en sleutels tot die spesies en subspesies word voorsien.

### INTRODUCTION

The latest taxonomic revision of all southern African species of *Brachylaena* was published by Phillips & Schweickerdt (1937). They recognized nine species in South Africa, including a new species, *B. transvaalensis* Phill. & Schweick., as well as *B. discolor* DC. and *B. uniflora* Harv.

According to Hilliard & Burt (1971) it is not always possible to distinguish between *B. discolor*, *B. uniflora* and *B. transvaalensis* on the basis of the characters described by Phillips & Schweickerdt (1937). These three species became known as the *B. discolor-uniflora* complex, which was regarded as the only remaining taxonomic problem in the genus.

In an effort to solve that problem, Paiva (1972) reduced *B. transvaalensis* to subspecific rank, under *B. discolor*. He also distinguished two varieties (var. *mossambicensis* and var. *discolor*) in *B. discolor* subsp. *discolor* on the basis of reproductive characteristics. Unfortunately he did not study *B. uniflora* because it does not occur in his study area, namely that of the *Flora zambesiaca*.

Hilliard (1977) did not agree with Paiva (1972) and speculated that *B. discolor* and *B. uniflora* represented merely the extremes in a wide range of head sizes within the *B. discolor-uniflora* complex. According to Hilliard (1977) the variation of the characteristics used by Paiva (1972) as diagnostic, is continuous. Hilliard also mentioned that the variation can be interpreted in two ways: a single species showing clinal variation in the number of flowers in a head loosely linked to an ecological cline, or two species which are hybridizing.

Gibbs Russell *et al.* (1987) followed the delimitation proposed by Paiva (1972), and recognized eight species and four infraspecific taxa in southern Africa, including *B. discolor* DC. subsp. *discolor* with the varieties *discolor* and *mossambicensis* J. Paiva; subsp. *transvaalensis* (Phill. & Schweick.) J. Paiva; as well as *B. uniflora* Harv.

The views presented here are supported by a detailed study of the vegetative and reproductive morphology and the anatomy of leaves and stems of the southern African representatives of *Brachylaena* (Cilliers 1990). Material was gathered during extensive field studies and loaned from all major South African and some overseas herbaria.

A brief review is given of the research on the morphology of the heads of the *B. discolor-uniflora* complex. The variation of certain quantitative characters was presented in the form of dice diagrams (Radford *et al.* 1974) as shown in Figure 1.

The diagrams in Figures 2 & 3 show the following:

- 1, on the basis of four parameters (Figures 2A–C; 3A) the four entities clearly fall into two groups with two members each: a, the varieties of *B. discolor* subsp. *discolor*; and b, *B. discolor* subsp. *transvaalensis* and *B. uniflora*;
- 2, the two varieties of *B. discolor* subsp. *discolor* cannot be separated on the basis of any of the eight parameters;
- 3, on the basis of six of the parameters shown, *B. discolor* subsp. *transvaalensis* and *B. uniflora* cannot be separated; the number of flowers both on male and female heads, however, indicate a discontinuity between the two entities;
- 4, the parameters of the male heads shown are taxonomically more useful than those of the female heads, which tend to show continuous variation; the length of the female involucre, however, clearly supports the recognition of the two groups mentioned under 1.

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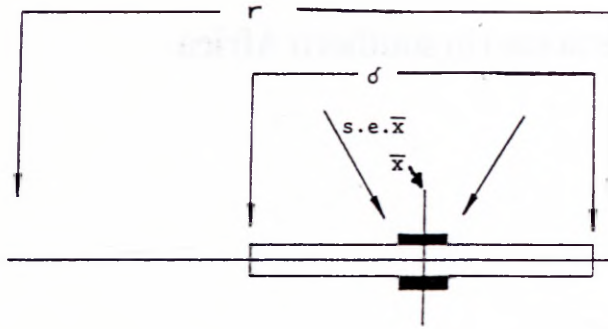


FIGURE 1.—Dice diagram to show variation in certain quantitative characters: where:  $\bar{x}$  = mean,  $s.e.\bar{x}$  = standard error,  $\sigma$  = standard deviation, and  $r$  = range (Radford *et al.* 1974).

On this evidence, backed by other findings by Cilliers (1990), I propose to sink *B. uniflora* under *B. discolor* subsp. *transvaalensis* and not to recognize varieties under *B. discolor* subsp. *discolor*.

TAXONOMIC TREATMENT

**Brachylaena** R. Br. in Transactions of the Linnean Society of London 12: 115 (1817); DC.: 430 (1836); Harv.: 116 (1865); Benth. & Hook.: 228 (1873); Engl. & Prantl: 174 (1890); Phill. & Schweick.: 206 (1937); Paiva:

368 (1972); Hilliard: 105, 106 (1977). Type species: *B. neriifolia* (L.) R. Br.

*Oligocarpha* Cass.: 22 (1817).

Trees or shrubs, dioecious. *Leaves* alternate, simple, petiolate or sessile, entire, toothed or crenate, sometimes 3-lobed at apex, mostly coriaceous, often white- or rusty-tomentose abaxially. *Heads* in open or dense axillary or terminal racemes or panicles, rarely solitary; unisexual, rarely with fertile hermaphrodite flowers; 1–30(–50) flowers per head; involucre oblong, ovoid or campanulate, bracts in 3–7 rows, free, dry, inner ones progressively longer. *Receptacle* epaleate, honeycombed. *Male flowers*: corolla tubular, 3–5-lobed; anthers tailed at base, exerted; style filiform, sometimes thickened above, simple or bifid, branches very short, flat, acute or obtuse; ovary usually abortive, pubescent; pappus poorly developed, of scabrid bristles, uniseriate. *Female flowers*: corolla tubular, 5-lobed; staminodes occasionally present; style filiform, bifid, branches very short, flat, acute or obtuse. *Achenes* 4–5-angled, pubescent or subglabrous, glandular.

The genus consists of twelve species, confined to Africa and the Mascarene Islands. Seven species are found in southern Africa.

KEY TO SPECIES

- 1a Leaves glabrous abaxially, if tomentose then rusty brown; male flowers with an abortive ovary (0.7–1.9 mm long); female flowers with staminodes (0.6–2.0 mm long):
  - 2a Leaf base decurrent into petiole, petiole often up to 8 mm (rarely up to 10 mm) long, not clearly distinct from leaf base; leaf lamina 5–10 (rarely 4) times as long as broad ..... 1. *B. neriifolia*
  - 2b Leaf base acute, petiole mostly longer than 10 mm, clearly distinct from leaf base; leaf lamina 1–4 times as long as broad ..... 2. *B. glabra*
- 1b Leaves white-tomentose abaxially, never glabrous; ovary in male flowers, if present, shorter than 0.6 mm; staminodes in female flowers, if present, shorter than 0.6 mm:
  - 3a Heads in dense axillary racemes or solitary; usually less than six heads per raceme; leaf apex usually mucronate; anthers usually shorter than 1.9 mm:
    - 4a Involucral bracts glabrous to white-tomentulose, in 5–8 series; leaves mostly oblong; petiole up to 3 mm, rarely up to 5 mm long; heads sometimes solitary ..... 3. *B. ilicifolia*
    - 4b Involucral bracts white-tomentose, never glabrous, in 3 or 4, rarely 5 series; leaves mostly obovate to oblanceolate, never oblong; petiole usually longer than 5 mm; heads never solitary ..... 4. *B. hullensis*
  - 3b Heads in open axillary or terminal racemes or panicles; usually more than eight heads per raceme or panicle; leaf apex rarely mucronate; anthers up to 3.7 mm long:
    - 5a Leaf apex 3-lobed or 3-toothed (leaves from coppice growth sometimes without lobes or teeth); involucral bracts in up to 5 series in male heads, in up to 6 series in female heads ..... 5. *B. elliptica*
    - 5b Leaf apex not 3-lobed or 3-toothed; involucral bracts in male heads in 4–10 series, in female heads in 5–10 series:
      - 6a Leaf base obtuse to rounded; leaves mostly elliptic; outer bark dark brown to black ..... 6. *B. rotundata*
      - 6b Leaf base decurrent into a petiole; leaves mostly oblanceolate to narrowly obovate; outer bark light grey or light brown ..... 7. *B. discolor*

1. **Brachylaena neriifolia** (L.) R. Br. in Transactions of the Linnean Society of London 12: 115 (1817); Less.: 208 (1832); DC.: 430 (1836); Drège: 169 (1843); Sch. Bip.: 671 (1844); Harv.: 116 (1865); Bolus & Wolley-Dod 14: 277 (1904); Sim: 246 (1907); Juel: 381 (1918); Sim: 44 (1921); Phill. & Schweick.: 207 (1937). Type: Aethiopia [South Africa], LINN 992.2, lecto.–PRE, photo.!

*Baccharis neriifolia* L.: 860 (1753); Willd.: 1904 (1804); Pers.: 423 (1807); Spreng.: 462 (1826); Steud.: 178 (1841). *Oligocarpha neriifolia* (L.) Cass.: 22 (1817). *Conyza neriifolia* (L.) L'Hérit. ex Steud.: 414 (1841).

*Tarhonanthus lanceolatus* Thunb.: 145 (1800); Willd.: 1793 (1804); Pers.: 405 (1807); Thunb.: 638 (1823); Spreng.: 456 (1826). Type: Cape, Thunberg s.n. (UPS, holo.–PRE (18917), photo.!).

Multistemmed shrubs or small trees (2–)4–6(–8) m high; bark dark grey to brown, longitudinally fissured; young branches with rusty brown down, glabrescent. *Leaves* petiolate, oblanceolate to narrowly oblanceolate, sometimes very narrowly elliptic or lorate, (20–)45–110 (–180) × (5–)10–20(–25) mm; coriaceous, glabrous adaxially, glabrous or rusty brown-tomentose abaxially; margins entire or serrated on coppice shoots, base decurrent in a short petiole, rarely acute; petiole (3–)5–8 (–10) mm long. *Heads* many, in open axillary or terminal racemes or panicles; peduncles of male heads 1.5–3.0(–5.0) mm, and of female heads 1.8–3.0 mm long. *Involucral bracts* in 4–7 series, 2.5–3.0(–5.0) × 2.0–3.5(–5.0) mm; individual bracts very narrowly to very broadly ovate, or narrowly to widely elliptic, rusty brown. *Flowers* 8–13 in



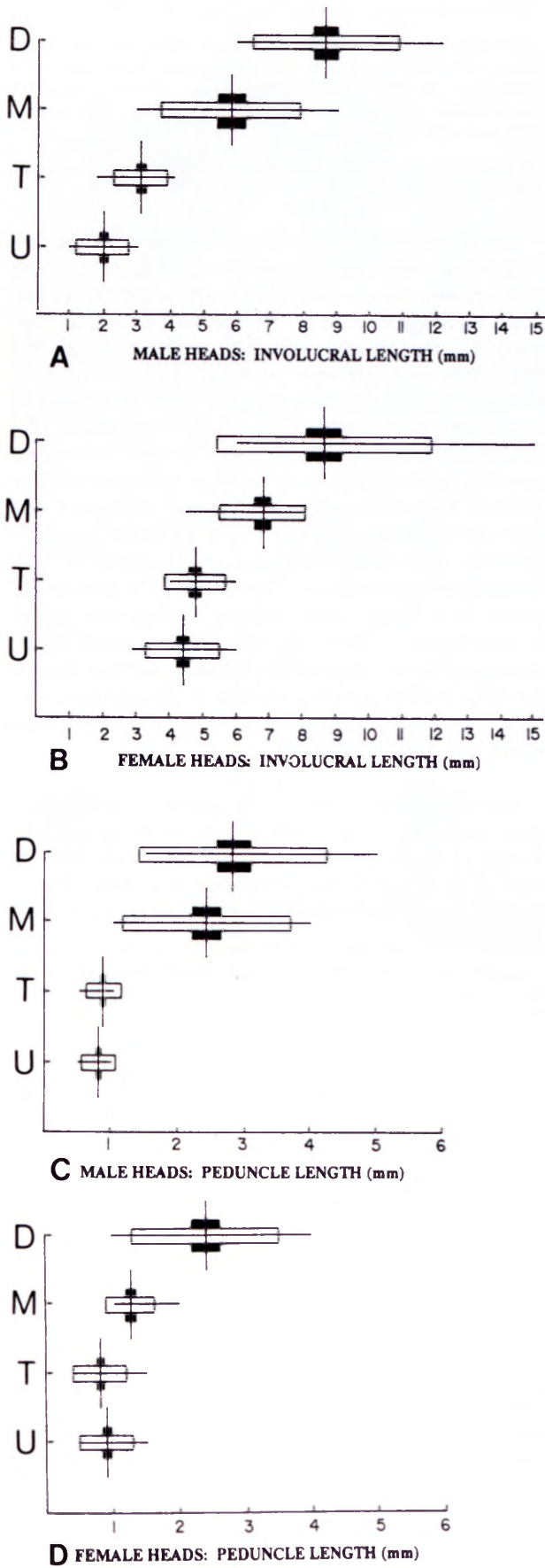


FIGURE 2.—Dice diagrams of all studied material of the *B. discolor-uniflora* complex. Variation in involucral length (mm): A, male, and B, female heads; variation in peduncle length (mm) of C, male and D, female heads. D = *B. discolor* subsp. *discolor* var. *discolor*; M = *B. discolor* subsp. *discolor* var. *mossambicensis*; T = *B. discolor* subsp. *transvaalensis*; and U = *B. uniflora*.

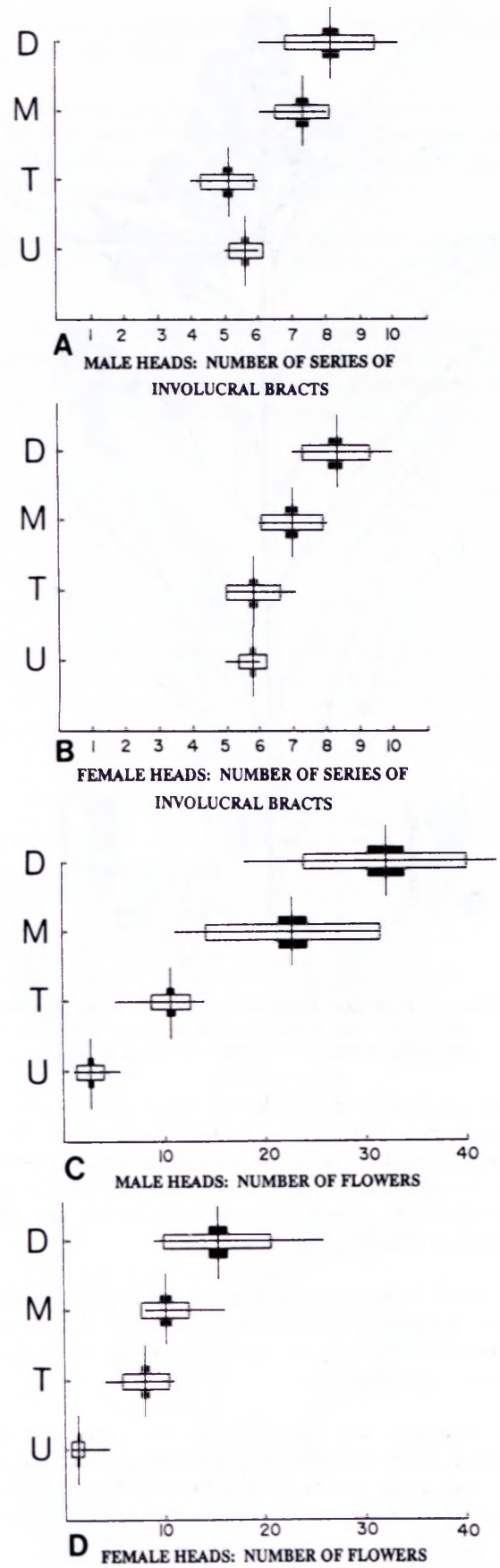


FIGURE 3.—Dice diagrams of all studied material of the *B. discolor-uniflora* complex. Variation in number of series of involucral bracts: A, male, and B, female heads; variation in number of flowers of C, male and D, female heads. D = *B. discolor* subsp. *discolor* var. *discolor*; M = *B. discolor* subsp. *discolor* var. *mossambicensis*; T = *B. discolor* subsp. *transvaalensis*; and U = *B. uniflora*.





FIGURE 4.—*Brachylaena neriifolia* (L.) R. Br. A, branch with leaves and female heads, Cilliers 69; B, male head, Cilliers 73; C, female head, Cilliers 65. Scale bars: 10 mm.

male and 7–11 in female heads. *Pappus* 3–5 mm long. *Ovary* in male flowers 0.7–1.1 mm long, pubescent, rarely absent, sometimes fertile. *Staminodes* in female flowers, 0.6–1.0 mm. *Achene* oblanceolate to narrowly elliptic, 1–2 × 0.5–1.0 mm, pubescent glandular. *Flowering time*: December to February. Figure 4.

Leaves from coppice growth of *B. neriifolia* may sometimes be confused with leaves of *B. glabra*. The species, however, can usually be distinguished by the features given in the species key.

*Distribution and habitat*: *B. neriifolia* occurs in the southern Cape, extending from Giftberg and Piketberg in the north to the Storms River in the east (Figure 5). It is common along streambanks on mountains and in forests.

Vouchers: Barker 2955 (NBG); Cilliers 72 (PUC); Orchard 543 (STE); Paterson 1267 (GRA); Jacot Guillarmod 8700 (GRA).

2. *Brachylaena glabra* (L.f.) Druce in Report of the Botanical Society and Exchange Club of the British Isles 1916: 611 (1917); Phill. & Schweick.: 209 (1937); Hilliard: 106 (1977). Type: Cape, Thunberg s.n. (UPS, holo.–PRE (microfiche 18914!).

*Tarchonanthus glaber* L.f.: 360 (1781); Thunb.: 638 (1823).

*T. dentatus* Thunb.: 145 (1800); Willd.: 1793 (1804); Pers.: 405 (1807); Thunb.: 638 (1823); Less.: 208 (1832). *B. dentata* (Thunb.) Harv.: 116 (1865); Sim: 246 (1907); Juel: 381 (1918); Sim: 44 (1921); Bews: 215 (1921); Henkel: 72 (1934); non DC. (1836). Type: Cape, Thunberg s.n. (UPS, holo.–PRE (18915), photo.).

*B. grandifolia* DC.: 430 (1836); Drège: 136 (1843). Type: Zuurbergen, Drège 2122 (G-DC, holo.!, K!).

Single-stemmed trees to multistemmed shrubs (2–) 5–20 m high; bark light grey to brown, not fissured; young branches with rusty brown down, glabrescent. *Leaves* petiolate, narrowly obovate to oblanceolate, sometimes narrowly elliptic, (30–)90–130(–225) × (12–) 20–60(–90) mm, coriaceous, glabrous adaxially, glabrous or rusty brown-tomentose abaxially, margins entire or serrated in upper half and on coppice shoots, base acute; petiole (8–) 10–15(–27) mm long. *Heads* many, in open axillary racemes or terminal panicles or racemes; peduncles of male heads (2.5–)4.0–6.0 mm, and of female heads 1–3 mm long. *Involucral bracts* in 4–7 series, 2.3–5.0(–7.0) × 0.6–4.0(–6.0) mm; individual bracts very narrowly to very broadly ovate, rusty brown. *Flowers* 13–24 in male heads, 3–10(–22) in female heads. *Pappus* 3–6 mm long. *Ovary* in male flowers 1.3–1.9 mm long, oblong, rarely absent, sometimes fertile. *Staminodes* in female flowers 0.8–2.0 mm long. *Achene* narrowly obovate to oblanceolate, 1.3–3.8 × 0.7–1.4 mm, pubescent glandular. *Flowering time*: March and April. Figure 6.

*Distribution and habitat*: *B. glabra* occurs mainly along the eastern Cape coast (Figure 5), in open spaces of high forest. At its northern limit in Natal (southeastern parts) (Figure 5) it forms a small tree or a shrub, mainly on south-facing sandstone outcrops and escarpment edges near the coast.

Vouchers: Abbott 1192 (NH); Cilliers 63, 133 (PUC); Fourcade 537 (BOL, GRA, PRE), 4499 (BOL); Ward 197 (NU); West 267 (BOL, GRA, PEU).

3. *Brachylaena ilicifolia* (Lam.) Phill. & Schweick. in Bothalia 3: 212 (1937); Hilliard: 108 (1977). Type: Cape, Sonnerat s.n. (K, iso!).

*Baccharis ilicifolia* Lam.: 345 (1783); Pers.: 423 (1807); Steud.: 177 (1841).

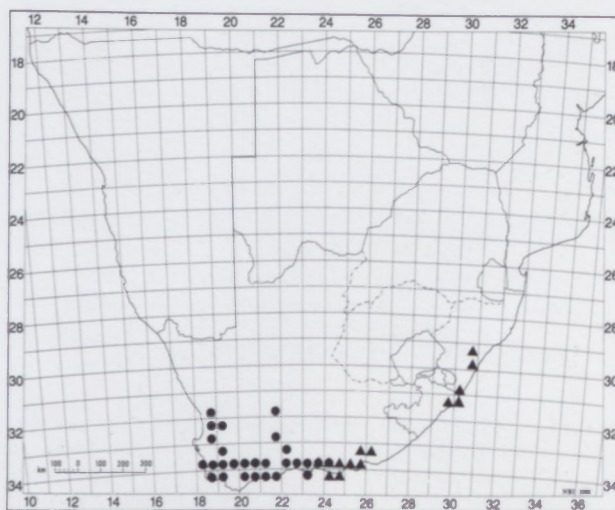


FIGURE 5.—Known geographic distribution of *Brachylaena neriifolia*, ●; and *B. glabra*, ▲.





FIGURE 6.—*Brachylaena glabra* (L.f.) Druce. A, branch with leaves and female heads, Thode A860; B, male head, Cilliers 133; C, female head, Cilliers 63. Scale bars: 10 mm.

*Tarchonanthus racemosus* Thunb.: 145 (1800); Thunb.: 638 (1823); Less.: 208 (1832). *Brachylaena racemosa* (Thunb.) DC.: 430 (1836); Harv.: 116 (1865); Sim: 246 (1907); Wood: 170 (1908); Juel: 381 (1918); Sim: 44 (1921); Bews: 215 (1921). Type: Cape, Thunberg s.n. (UPS, holo.-PRE (microfiche 18919!)).

*B. elliptica* auct., non (Thunb.) DC.: 430 (1836) quoad descr. et spec.

Multistemmed shrubs or small trees (1–)3–4(–6) m high; bark dark grey to brown, fissured; young branches with white down, glabrescent. *Leaves* short-petiolate to subsessile, oblong to narrowly oblong, sometimes narrowly elliptic to elliptic or lanceolate to narrowly ovate, (10–)25–45(–75) × (4–)10–15(–30) mm, chartaceous, glabrous adaxially, white-tomentose and glandular abaxially, apex acute or obtuse to rounded, usually mucronate, margin entire or dentate, base acute to obtuse, sometimes rounded; petiole (0.5–)1.0–3.0(–5.0) mm long. *Heads* few, in dense axillary racemes, sometimes solitary; peduncles of male heads 0.5–1.0(–2.0) mm and of female heads 0.8–1.5(–2.0) mm long. *Involucral bracts* in 5–8 series, 2.5–5.0(–9.0) × 1.5–3.0(–4.0) mm; individual bracts narrowly to very widely ovate, sometimes narrowly to widely elliptic, glabrous to white tomentulose. *Flowers* 9–11 (–18) in male and 8–12 in female heads. *Pappus* 2–5 mm long. *Ovary* in male flowers, if present, up to 0.6 mm long. *Staminodes* in female flowers, if present, up to 0.2 mm long. *Achene* oblanceolate or narrowly elliptic, 2.1–3.6 ×

0.5–1.3 mm, pubescent glandular. *Flowering time*: August and September. Figure 7.

*Distribution and habitat*: *B. ilicifolia* occurs in scrub in the drier parts of northeastern Transvaal, northern and central Natal, and in the eastern Cape (Figure 8). It grows in dry river valleys and on dry hillslopes.

Vouchers: Bayliss 5052 (GRA); Cilliers 53, 147 (PUC); Dahlstrand 1995 (GRA, PRE); Feely 62 (NH, PRE, UN); Van Wyk 5246 (PRE, PRU).

4. *Brachylaena huillensis* O. Hoffm. in *Botanische Jahrbücher* 32: 149 (1902); Phill. & Schweick.: 212 (1937); Wild: 124 (1969); Paiva: 369 (1972); Hilliard: 107 (1977). Type: Angola, Huilla, Antunes 121 (K, iso!).



FIGURE 7.—*Brachylaena ilicifolia* (Lam.) Phill. & Schweick. A, branch with leaves and male heads, Bayliss 5052; B, male head, Bayliss 5052; C, female head, Cilliers 53. Scale bars: 10 mm.



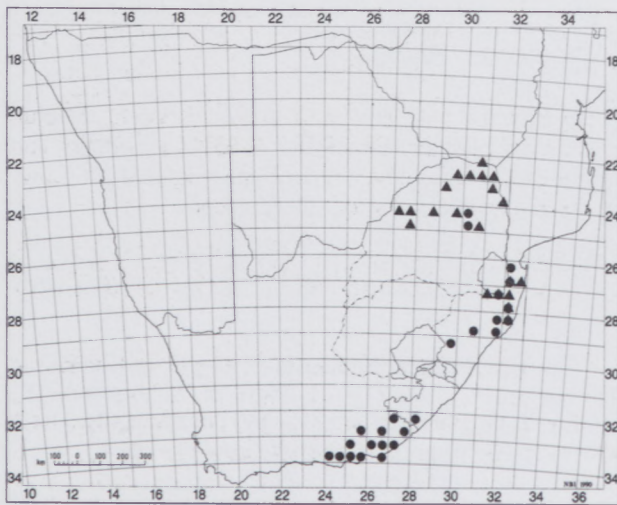


FIGURE 8.—Known geographic distribution of *Brachylaena ilicifolia*, ●; and *B. huillensis*, ▲, within southern Africa.

*Tarchonanthus camphoratus* auct. non L.: Hiern: 554 (1898); Gossw. & Mendonça: 121–123 (1939), *Welwitsch 6745* (could not be found).

*B. hutchinsii* Hutch.: 126 (1910); Brenan & Greenway: 149 (1949); Eggeling: 95 (1951); Dale & Greenway: 155 (1961); Cufod.: 1091 (1966). Type: Nairobi, *Hutchins s.n.* (K, holo.); Kenya, Nairobi, *Battiscombe 27 & 54* (K, para.).

Single-stemmed medium to large trees (5–)6–10(–15) m high; bark light grey to brown, deeply fissured; young branches with white down. *Leaves* petiolate, narrowly obovate to oblanceolate, sometimes narrowly elliptic to elliptic, (26–)45–75(–125) × (8–)16–30(–50) mm, coriaceous, glabrous adaxially, glandular and white-tomentose abaxially, apex acute, usually mucronate, margin entire, sometimes sinuate in front part or irregularly dentate, base acute, sometimes decurrent; petiole (3–)5–8 (–12) mm long. *Heads* few, in dense axillary racemes; peduncles of male heads 0.5–1.0(–2.0) mm and of female heads 0.5–1.0 mm long. *Involucral bracts* in 3–5 series, 2–4(–6) × 1.5–3.0(–5.0) mm, individual bracts ovate to very widely ovate, sometimes narrowly to widely elliptic, white-tomentose. *Flowers* 6–9(–10) in male and 5 in female heads. *Pappus* (1.5–)3.0–4.0(–6.0) mm long. *Ovary* in male flowers, if present, up to 0.3 mm long. *Staminodes* in female flowers, if present, up to 0.4 mm long. *Achene* oblanceolate or narrowly elliptic, 3.5–3.7(–4.0) × 1.0–1.3 mm, pubescent glandular. *Flowering time*: July. Figure 9.

*Distribution and habitat*: within southern Africa *B. huillensis* occurs in the northern parts of Transvaal, in Zululand and Natal (Figure 8). It is confined to short forest, woodland and bush, usually on sandy soils.

Vouchers: *Cilliers 79, 100, 104* (PUC); *Lang s.n.* (BOL, NBG); *Moll & Strey 3755* (NH); *Pooley 883* (UN); *Ward 7119* (NH).

5. *Brachylaena elliptica* (Thunb.) DC. in *Prodrromus systematis naturalis regni vegetabilis* 5: 430 (1836), quoad basionym excl. spec. et descr.; Harv.: 116 (1865); Sim: 92 (1907); Wood: 169 (1908); Juel: 381 (1918); Sim: 44 (1921); Bews: 215 (1921); Henkel: 72 (1934); Phill. & Schweick.: 216 (1937). Type: Cape, *Thunberg s.n.* (UPS, holo.–PRE (microfiche 18916!)).

*Tarchonanthus ellipticus* Thunb.: 145 (1800); Willd.: 1793 (1804); Pers.: 405 (1807); Thunb.: 638 (1823); Spreng.: 456 (1826) excl. syn.; Less.: 208 (1832).

*B. dentata* DC.: 430 (1836), non (Thunb.) Harv.; Type: Zuurbergen, *Drège 3659* (G-DC, lecto.!, here designated); Albany, *Burchell 3400* (G-DC!); Kaffraria, *Ecklon 791, 793* (G-DC!).

Multistemmed shrubs or small trees (2–)4–6(–8) m high; bark dark grey to brown, fissured; young branches with white down, glabrescent. *Leaves* petiolate, widely to narrowly obovate or narrowly oblanceolate, sometimes narrowly elliptic to oblong, (21–)40–70(–76) × (6–)15–30 (–62) mm, chartaceous, glabrous adaxially, glandular and white-tomentose abaxially, apex acute or obtuse, sometimes mucronate, usually 3-lobed, margins entire or dentate, base acute, rarely obtuse; petiole (1–)3–4(–6) mm long. *Heads* many, in open axillary or terminal racemes



FIGURE 9.—*Brachylaena huillensis* O. Hoffm. A, branch with leaves and male heads, *Cilliers 104*; B, male head, *Cilliers 104*; C, female head, *Ward 7119*. Scale bars: 10 mm.



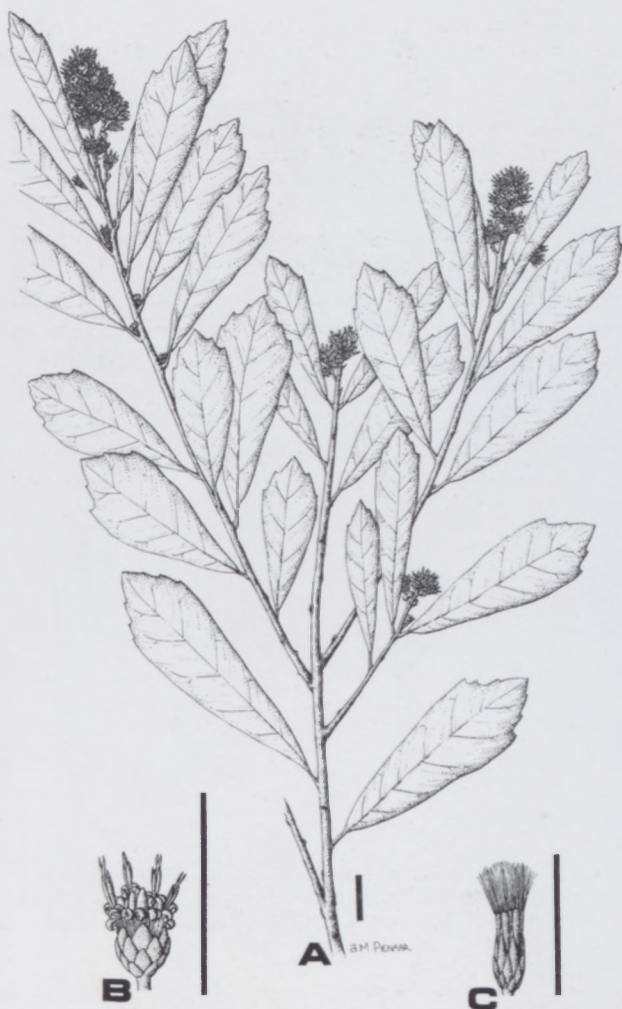


FIGURE 10.—*Brachylaena elliptica* (Thunb.) DC. A, branch with leaves and male heads, Bayliss 8747; B, male head, Bayliss 8747; C, female head, Cilliers 38. Scale bars: 10 mm.

or panicles; peduncles of male heads 0.5–1.0 mm and of female heads 0.5–1.5 mm long. *Involucral bracts* in 3–6 series, 1.5–3.0(–5.0) × 0.5–1.5(–2.0) mm; individual bracts narrowly to very widely ovate, sometimes lanceolate, white tomentulose. *Flowers* (4–)7–11(–15) in male and 4–10 in female heads. *Pappus* 1.5–2.5(–4.0) mm long. *Ovaries* in male flowers, if present, up to 0.4 mm long. *Staminodes* in female flowers, if present, up to 0.8 mm long. *Achene* narrowly obovate to narrowly oblanceolate, 2.1–3.2 × 0.5–1.0 mm, pubescent glandular. *Flowering time*: April, May and June. Figure 10.

The leaves of *B. elliptica* are very variable in their shape and often conspicuously 3-lobed or 3-toothed at the apex; they sometimes resemble those of *B. glabra*, but are shorter, not as wide and white-tomentose (never glabrous) abaxially.

*Distribution and habitat*: *B. elliptica* is widespread in the eastern Cape from Uitenhage eastwards through Transkei to Natal and Zululand (Figure 11). It can be found in coastal and river bush, valley bushveld, in scrub or on grassy slopes, often on rocky ridges.

Vouchers: Cilliers 27, 38, 50 (PUC); MacOwan 244 (NH); Olivier 2141 (PEU); Osborne 232 (GRA); Strey 6699 (NH, PRE).

6. *Brachylaena rotundata* S. Moore in Journal of Botany: 131 (1903); Burt Davy & Pott-Leend.: 168 (1912); Eyles: 508 (1916); Sim: 44 (1921); Phill. & Schweick.: 218 (1937); Wild: 123 (1969); Paiva: 372–375 (1972). Type: Transvaal, north escarpment of Witwatersrand series, *Rand 738* (BM, holo.!).

*B. rhodesiana* S. Moore 37: 448 (1906); S. Moore: 108 (1911); Eyles: 508 (1916). Type: Rhodesia, Matopo hills, *Gibbs 72* (BM, holo.!.; K, iso.!).

*B. discolor* auct. non DC.: Munro: 90 (1908); Eyles: 508 (1916).

Single-stemmed large shrubs or medium-large trees (3–)5–8(–15) m high; bark dark brown to black, deeply fissured; young branches white-tomentose, glabrescent. *Leaves* petiolate, narrowly to widely elliptic, sometimes narrowly obovate or oblong, (25–)50–100(–160) × (15–)30–50(–90) mm, coriaceous, glabrous to white-tomentose adaxially, white-tomentose abaxially, glandular, apex acute to obtuse, sometimes rounded, margins entire or crenate smoothly rounded, sometimes dentate in coppice shoots, base obtuse to rounded; petiole (1–)3–7(–10) mm long. *Heads* many, in open axillary or terminal racemes or panicles, peduncles of male heads 1.0–1.5(–2.0) mm and of female heads 0.5–3.0 mm long. *Involucral bracts* in 4–10 series, 3–6(–8) × 2–3(–5) mm; individual bracts ovate to very widely ovate, sometimes lanceolate, white-tomentulose. *Flowers* 13–28(–31) in male and 11–27 in female heads. *Pappus* 3.0–6.5 mm long. *Ovaries* absent in male flowers. *Staminodes* absent in female flowers. *Achene* narrowly elliptic, 1.6–3.8 × 0.5–1.0 mm, pubescent glandular. *Flowering time*: August and September. Figure 12.

*Distribution and habitat*: within southern Africa *B. rotundata* occurs in the northeastern, southern and western parts of Transvaal and occasionally on the Free State side of the Vaal River (Figure 11). It is common on rocky ridges and hills and the edges of dry kloof bush.

Vouchers: Adlam & Wood 5633 (NH); Botha & Ubbink 1556 (PUC, PRE); Cilliers 149, 151 (PUC); Leendertz 235 (GRA, KMG, NH); The-ron 1557 (PRE, PRU).

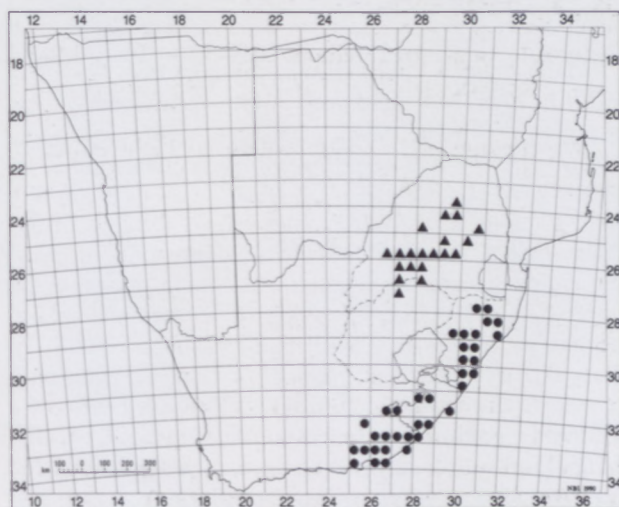


FIGURE 11.—Known geographic distribution of *Brachylaena elliptica*, ●, and *B. rotundata*, ▲, within southern Africa.





FIGURE 12.—*Brachylaena rotundata* S. Moore. A, branch with leaves and female heads, Cilliers 149; B, male head, Cilliers 151; C, female head, Cilliers 150. Scale bars: 10 mm.

7. *Brachylaena discolor* DC. Prodrromus systematis naturalis regni vegetabilis 5: 430 (1836); Drège: 155, 157 (1843); Harv.: 117 (1865); Wood & Evans: 23, 24 (1898); Sim: 247 (1907); Wood: 169 (1908); Sim: 44 (1921); Bews: 215 (1921); Henkel: 72 (1934); Phill. & Schweick.: 219 (1937); Macnae & Kalk: 154 (1958); Wild: 123 (1969); Hilliard & Burt: 3 (1971); Paiva: 369 (1972); Hilliard: 109 (1977). Type: Cape, Uitenhage District, *Burchell* 3751 (G-DC, lecto!, here designated); Uitenhage, *Ecklon* 1422 (G-DC!); between the Umzimkulu and Umtentu Rivers, *Drège* 5043 (G-DC!); Mozambique, Delagoa Bay, *Forbes s.n.* (G-DC!).

Multistemmed shrubs or small to large trees (2–6–10 (–20) m high; bark light grey to brown, fissured; young branches with white down, glabrescent. *Leaves* petiolate, oblanceolate to narrowly obovate, sometimes elliptic to narrowly elliptic; (50–)70–100(–190) × (15–) 25–45(–60) mm, glabrous adaxially, white-tomentose abaxially, glandular, apex acute, sometimes obtuse, rarely rounded, margin entire, sinuated or serrated over whole margin or in upper half and in coppice shoots, base decurrent into a petiole; petiole (3–)8–10(–12) mm long. *Heads* many, in open axillary or terminal racemes or panicles, peduncles of male heads 0.5–3.0(–5.0) mm and of female heads 0.4–4.0 mm long. *Involucral bracts* in 4–10 series, (1.5–)3.0–10.0(–15.0) × (0.5–)2.0–4.0 (–6.0) mm; individual bracts narrowly to very widely ovate, sometimes elliptic to narrowly elliptic, white-tomentulose to tomentose. *Flowers* 1–45 in male and 1–26 in female heads. *Pappus* 2.0–8.5 mm long. *Ovary* in male flowers, if present, up to 0.5



FIGURE 13.—*Brachylaena discolor* DC. subsp. *discolor*. A, branch with leaves and female heads, Harrison 29; B, male head, Cilliers 135; C, female head, Cilliers 109. Scale bars: 10 mm.

mm long. *Staminodes* in female flowers, if present, up to 0.7 mm long. *Achene* narrowly obovate to linear, 1.0–3.9 × 0.4–1.0 mm, pubescent glandular. *Flowering time*: July, August and September.

*B. discolor* can usually be distinguished from the other species by the leaf base which is mostly decurrent into the petiole.

*Distribution and habitat*: *B. discolor*, one of the most widely distributed species in the genus, occurs in northern and eastern Transvaal, through Swaziland and the eastern

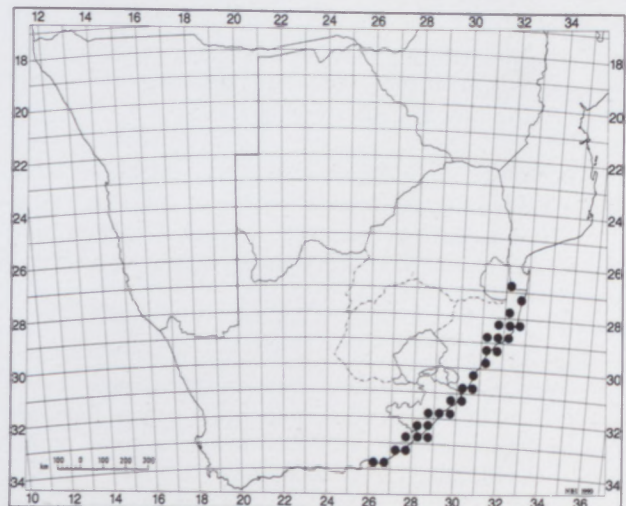


FIGURE 14.—Known geographic distribution of *Brachylaena discolor* subsp. *discolor* within southern Africa.





FIGURE 15.—*Brachylaena discolor* DC. subsp. *transvaalensis* (Phill. & Schweick.) J. Paiva. A, branch with leaves and female heads, Cilliers 134; B, male head, Cilliers 137; C, female head, Cilliers 144. Scale bars: 10 mm.

parts of Natal and Transkei up to the mouth of the Bushmans River in the eastern Cape. Its habitat varies from inland forests on valley slopes and plateaux to coastal forests, scrub and dune bush.

Key to subspecies

In 10–15% of the specimens investigated, the values of the characters used in this key overlapped.

1a Involucral bracts of male heads in 7–10 (rarely 6) series; peduncle of male heads up to 5 mm long; involucral bracts of female heads in 6–10 series; peduncle of female heads 1–4 mm long; involucral bracts up to 12 mm long in male heads and up to 15 mm long in female heads ..... 7a. subsp. *discolor*

1b Involucral bracts of male heads in 4–6 series; peduncle of male heads up to 1 mm long; involucral bracts of female heads in 5–7 series; peduncle of female heads 0.4–1.5 mm long; involucral bracts up to 4 mm long in male heads and up to 6 mm long in female heads ..... 7b. subsp. *transvaalensis*

7a. subsp. *discolor*

J. Paiva in Boletim da Sociedade Broteriana 46: 369 (1972).

*B. natalensis* Sch. Bip.: 972 (1843); Sch. Bip.: 671 (1844); Harv.: 117 (1865). Type: prope Natal-Bay [Durban], Krauss 243 (G, holo!).

*B. discolor* subsp. *discolor* var. *mossambicensis* J. Paiva 46: 369 (1972). Type: Nhacoongo, 90 km south of Inhambane, Gomes & Sousa 1667 (COI, holo!).

*B. rhodesiana* auct. non S. Moore: S. Moore: 108 (1911) quoad specim. Swynnerton 6515.

Multistemmed shrubs or small trees, usually not higher than 6–8 m. *Male heads* with involucral bracts in 7–10 series, involucre 3–10(–12) mm long; peduncles 1–5 mm long; 11–39 flowers per head. *Female heads* with involucral bracts in 6–10 series, involucre 6.0–13.5(–15.0) mm long; peduncles 1–4 mm long; 9–26 flowers per head. Figure 13.

*Distribution and habitat:* *B. discolor* subsp. *discolor* is a common coastal species (with an occasional inland occurrence, e.g. Hluhluwe Game Reserve) found from the mouth of the Bushmans River in the eastern Cape to Transkei, Natal and Zululand (Figure 14).

Vouchers: Cilliers 108, 109, 135 (PUC); Flanagan 861 (NMG); Muirhead K17 (RUH); Schweickerdt 1384 (NH, STE); Strey 8751, 8753, 8783, 8793, 8795, 8798 (NH).

7b. subsp. *transvaalensis* (Phill. & Schweick.) J. Paiva in Boletim da Sociedade Broteriana 46: 369 (1972).

*B. transvaalensis* Phill. & Schweick.: 214 (1937); Hilliard & Burt: 3 (1971). Type: South Africa, Transvaal, Pietersburg, between Houtbos and Haenertsburg, Hutchins s.n. (K, holo!).

*B. uniflora* Harv.: 117 (1865); Bews: 215 (1921); Phill. & Schweick.: 211 (1937); Hilliard & Burt: 3 (1971); Hilliard: 109 (1977). Type: Natal, on mountains, 30–60 miles from the sea, Sutherland s.n. (K, holo!).

Single-stemmed medium-large to large trees, not higher than 20 m. *Male heads* with involucral bracts in 4–6 series, involucre 1–4 mm long; peduncles 0.5–1.2 mm long; 1–14 flowers per head. *Female heads* with involucral bracts in 5–7 series, involucre 3–6 mm long; peduncles 0.4–1.5 mm long; 1–11 flowers per head. Figure 15.

*Distribution and habitat:* within southern Africa *B. discolor* subsp. *transvaalensis* occurs in the northern and eastern Transvaal and in Swaziland, as well as in the northeastern and southern parts of Natal and the Transkei (Figure 16). It can be found in inland and coastal forests, but not in dune bush or forests directly facing the sea.

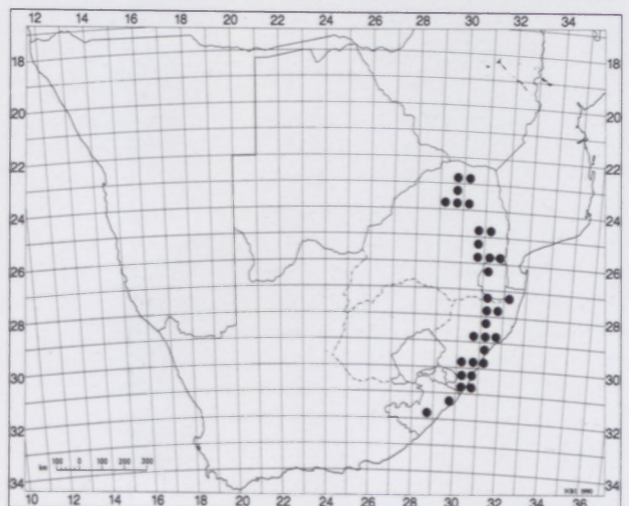


FIGURE 16.—Known geographic distribution of *Brachylaena discolor* subsp. *transvaalensis*.



Vouchers: Cilliers 120, 137, 144 (PUC); Compton 29073 (NBG); Keet 1130 (STE); Schrire, Van Wyk & Abbott 1782 (NH); Strey 8752, 8819, 8820 (NH).

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# Nomenclatural changes and additions to the genus *Ophioglossum* in Africa (Ophioglossaceae: Pteridophyta)

J.E. BURROWS\* and T.J. EDWARDS\*\*

**Keywords:** Africa, new combination, new species, *Ophioglossum*, Pteridophyta, taxonomy

## ABSTRACT

Recent research has necessitated a review of the nomenclature of the genus *Ophioglossum* in Africa. This paper establishes a new species, *O. caroticaule* J. E. Burrows, a new subspecies, *O. vulgatum* L. subsp. **africanum** Pocock ex J. E. Burrows, and a change in status, *O. latifolium* (Prantl) J.E. Burrows (basionym: *O. gomezianum* var. *latifolium* Prantl). Lectotypification is provided for *O. gracillimum* Welw. ex Hook. & Bak., *O. lusoáfricanum* Welw. ex Prantl, *O. latifolium* (Prantl) J.E. Burrows, and *O. rubellum* Welw. ex A. Braun. Nomenclatural problems in *O. lancifolium* Presl are discussed.

## UITTREKSEL

Onlangse navorsing het 'n hersiening van die nomenklatuur van die genus *Ophioglossum* in Afrika noodsaaklik gemaak. 'n Nuwe spesie, *O. caroticaule* J.E. Burrows, 'n nuwe subspesie, *O. vulgatum*, L. subsp. **africanum** Pocock ex J.E. Burrows, en 'n verandering in status, *O. latifolium* (Prantl) J.E. Burrows (basioniem: *O. gomezianum* var. *latifolium* Prantl), word in hierdie artikel beskryf. Lektotipifikasie word verskaf vir *O. gracillimum* Welw. ex Hook. & Bak., *O. lusoáfricanum* Welw. ex Prantl, *O. latifolium* (Prantl) J.E. Burrows, en *O. rubellum* Welw. ex A. Braun. Nomenklatoriese probleme in *O. lancifolium* word bespreek.

## INTRODUCTION

The genus *Ophioglossum* L. has received no taxonomic attention in Africa since Clausen's (1938) confusing monograph of the genus. The simple morphological structure of the plants together with apparently considerable intraspecific variation has caused compilers of African regional floras to either follow Clausen's nomenclature or assume a conservative stance by maintaining broadly circumscribed species which, in the light of recent studies, are often composed of two or more clearly distinct taxa.

The most important development since Clausen's work is the publication by Wagner & Wagner (1983) of their 'genus communities' concept, based upon work on the genus *Botrychium* Swartz (Ophioglossaceae) in North America. This concept made use of the fact that *Botrychium* (like *Ophioglossum*) frequently grows together in multiple species communities and, when this occurs, one is able to make rational comparisons between taxa occurring within a community, particularly if these differences are maintained in communities found elsewhere under different edaphic and climatic conditions. This concept has provided taxonomists with a valuable additional tool with which to distinguish between environmentally-induced variation and differences that are genetically controlled.

During recent studies, the senior author has discovered an unique area in northwestern Zimbabwe which supports 11 species of *Ophioglossum*. Additional genus communi-

ties have since been located in both Zimbabwe and South Africa which have made a better delimitation and definition of the southern African species of *Ophioglossum* possible. However, these studies have resulted in the need to revise the nomenclature of several of the taxa occurring on the African subcontinent.

## DISCUSSION

In 1983, the senior author collected nine species of *Ophioglossum* growing within an area of about six square kilometres in the Sengwa Wildlife Research Area of northwestern Zimbabwe. Subsequent collecting at Sengwa has yielded a further two species, bringing the total to eleven, a situation not recorded to date elsewhere in the world for the genus *Ophioglossum*. Additional genus communities have been discovered by the senior author on Ngomakurira, northeastern Zimbabwe (6 species), Elim Hospital, eastern Zimbabwe (4 species), Treur River, eastern Transvaal (5 species) and several communities composed of two or three species each. These localities occur on various substrates (sandstone, granite, quartzite and dolomite) and under varying climatic conditions, and the consistent differences displayed between members of these genus communities have allowed for clearer definitions to be established between taxa.

However, the specific concepts within the African members of *Ophioglossum* entrenched by Tardieu-Blot (1953, 1964) and Schelpe (1970, 1977) do not adequately cover the number of taxa that are evident from genus community studies. This was noted by Dr Mary Pocock of Grahamstown who spent much time studying the South African species of *Ophioglossum*. She recorded her concepts in a manuscript which unfortunately was never pub-

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lished. The author's studies corroborate some of Pocock's species concepts and one of her taxa is published below.

Spore morphology is a valuable taxonomic tool within the southern African species of *Ophioglossum* even though it cannot be readily employed for rapid determinations in herbaria.

### 1. The *Ophioglossum lancifolium* aggregate

#### Key to species

- 1a Trophophore linear with a length:width ratio >10:1; trophophore frequently falcate . . . . . *O. gracillimum*  
 1b Trophophore narrowly lanceolate to narrowly elliptic with a length:width ratio <10:1; trophophore not falcate:  
 2a Old rhizomes strongly linear, with a length:width ratio >6:1; spore wall lumina distinct, muri clearly reticulate . . . . . *O. lusoaffricanum*  
 2b Old rhizomes short or ellipsoid, with a length:width ratio <6:1; spore wall lumina reduced to conical pits:  
 3a Trophophore linear-elliptic, length:width ratio >6:1; rhizome ellipsoid . . . . . *O. caroticaule*  
 3b Trophophore elliptic, length:width ratio <6:1; rhizome linear . . . . . sp. aff. *O. lancifolium*

1.1. *Ophioglossum caroticaule* J.E. Burrows, sp. nov., ab *O. gracillimum* sporis aletis et trophophoris majoribus et latoribus differt; etiam *O. lusoafricano* similis sed rhizomate brevi et latiore, trophophoro apiculato et sporis lumina parva et conica ostendentibus differt.

TYPUS.—Zimbabwe: Gokwe Dist., Sengwa Wildlife Research Area, Leguaan Vlei, 880 m, 11-2-1991, J.E. & S.M. Burrows 5153 (K, holo.; PRE, SRGH, iso.). Figures 1; 2A, B.

*Rhizome* 4–14 × 2.0–3.5 mm (ratio 2.6:1), ellipsoid, with wiry, semi-descending roots which are rarely proliferous. *Stipe* 18–40 mm long, ± 0.5 of its length subterranean, dead stipes sometimes slightly persistent. *Trophophore* usually solitary, erect, 14–39 × 2.5–5.0 mm (ratio 7.2:1), very narrowly elliptic, sterile trophophore flat, fertile trophophore shallowly folded, apex sharply apiculate, venation linear, epidermal cell walls sinuous, stomata anomocytic. *Sporophore* 40–60 mm long, bearing (6–)12–15(–19) pairs of sporangia. *Spores* alete, 43–49 µm in equatorial diameter, muri thick, ± 3 µm wide, continuous and somewhat undulate, lumina conical, 1.5–2.3 µm wide, proximal surface concave, pitted (Figure 2A, B).

This taxon was included under *O. lancifolium* s.l. which comprises three or more species in Africa. It closely resembles *O. lusoaffricanum* but is clearly differentiated from it by the spores with their conical lumina, and the short, ellipsoid rhizome. The apex of the trophophore is generally sharply apiculate compared to the acute apex of *O. lusoaffricanum*. *O. gracillimum* is separated from *O. caroticaule* by its trilete and smaller spores, 27–38 µm in equatorial diameter (Figure 2D, E), and its much narrower and slightly falcate trophophore.

*Ophioglossum caroticaule* appears, from the few known collections, to be a species of shallow, sandy or humic loams which are seasonally moist or wet, growing among sparse, short grasses in subtropical deciduous

woodland or on open sheetrock on seasonally wet vegetation islands. It is a gregarious species and, in all populations so far seen in the field, grows with either *O. lusoaffricanum*, *O. gomezianum* Welw. ex A. Br., *O. rubellum* Welw. ex A. Br. or *O. costatum* R. Br.

#### Specimens examined

(Localities identified in terms of grid reference system—see Edwards & Leistner 1971.)

ETHIOPIA.—0539: Sidamo, Bitata, 20 km from Negele on road to Menghist, 1 450 m, 24-5-1983, Gilbert, Ensermu & Vollesen 7762 (K).

KENYA.—0237: K4 Machakos, Nairobi-Mombasa Road, 7.4 km towards Nairobi from Hunter's Lodge, 960 m, 6-1-1972, Faden & Faden 72/18 (K, MO).

ZAMBIA.—0831: Abercorn Dist., old road to Cascalawa, 16-2-1960, Richards 12480 (K).

ZIMBABWE.—1828 (Gokwe): Gokwe Dist., Sengwa Wildlife Research Area, Leguaan Vlei, 13-2-1983, Burrows 3016 (J.E.B. Herb.); 11-2-1991, Burrows & Burrows 5153 (K, holo., PRE, SRGH). 2027 (Plumtree): Matopo Hills, Bulalima-Mangwe, Embakwe, (–DD), 10-5-1942, Feiertag s.n. (BM, SRGH). 2028 (Bulawayo): Matopo Hills, Bulalima-Mangwe, Greystone, (–CA), 1-5-1939, Feiertag s.n. (BM, SRGH).

#### SOUTH AFRICA

TRANSVAAL.—2429 (Zebediela): Potgietersrus, Percy Fyfe Nature Reserve, (–AA), 1 500 m, 22-2-1971, Huntley 2013 (PRE). 2430 (Pilgrim's Rest): Bourke's Luck, Goedgeloof Plantations, Treur River, (–DB), 1 200 m, 27-12-1990, Burrows 5113 (J.E.B. Herb.).

1.2. *Ophioglossum gracillimum* Welw. ex Hook. & Bak., Synopsis filicum: 445 (1868); Burrows: 40 (1990); Johns: 8 (1991). Type: Angola, Pungo Andongo, near Catete, Jan. 1857, Welwitsch 36 (BM, lecto!; K!, LISU, iso.).



FIGURE 1.—*Ophioglossum caroticaule*, Burrows 3016, Sengwa Research Area, Zimbabwe.