



Warneckea albiflora, a new species of *W.* subgenus *Carnosae* (Melastomataceae—*Olisbeoideae*) from coastal dry forest in northern Mozambique

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Abstract

Described and illustrated is *Warneckea albiflora* R.D. Stone & N.P. Tenza, another localized endemic of coastal dry forest near Quiterajo in Mozambique's Cabo Delgado Province. In *Flora Zambesiaca* the new species would key to *Memecylon sansibaricum* Taub. [= *Warneckea sansibarica* (Taub.) Jacq.-Fél.], but is distinguished by its elliptic-lanceolate, attenuate-acuminate leaves and white flowers borne on pedicels 3.5–4 mm long (versus leaves elliptic and rounded to shortly and obtusely acuminate, pedicels 6–15 mm long, and flowers pale blue to deep blue in *Warneckea sansibarica*). Because of its evidently very limited occurrence as well as on-going anthropogenic threats, *Warneckea albiflora* is provisionally assessed as Critically Endangered (CR) B1ab(iii) according to IUCN criteria. A key is provided to the Mozambican species of *Warneckea*.

Introduction

The woody African-Madagascan genus *Warneckea* Gilg (1904: 100) is closely allied and has been previously united with *Memecylon* Linnaeus (1753: 349), but is morphologically and phylogenetically distinct (Jacques-Félix 1978, Stone 2006a, Stone & Andreasen 2010). *Warneckea* currently holds about 50 species and has been the subject of renewed taxonomic work over the past several years (Stone 2006b, Stone & Luke 2009, Stone *et al.* 2009, Stone & Andreasen 2010, Stone 2013, Stone & Ntetha 2013).

In the treatment of *Memecylon* sensu lato for the *Flora Zambesiaca* (R. Fernandes & A. Fernandes 1978), the species with strongly trinervate to multinervate leaves are properly placed in *Warneckea*, except for *M. zambeziense* A. Fernandes & R. Fernandes (1969: 304) which belongs to *Lijndenia* Zoll. & Moritz in Moritz (1846: 10) and was treated in the *Flore du Cameroun* (Jacques-Félix 1983: 156) as a taxonomic synonym of *L. barteri* (Hooker 1871: 462) K. Bremer (1982: 124). *Warneckea* has been further subdivided into subgenus *Warneckea* (with three sections) and subgenus *Carnosae* (Jacques-Félix 1985b: 45) R.D. Stone in Stone & Andreasen (2010: 89), the latter group characterized by sessile inflorescences with long-pedicellate flowers subtended by persistent, imbricate-decussate bracts; hypanthium with free limb and calyx lobes obsolete; and embryo with two fleshy but unequal cotyledons (Jacques-Félix 1985a, 1985b, Stone and Andreasen 2010).

Previous authors (Wickens 1975, R. Fernandes & A. Fernandes 1978, 1980, Jacques-Félix 1985a, 1985b, Borhidi 1993) have treated *Warneckea* subgenus *Carnosae* as comprising a single polymorphic species, *W. sansibarica* (Tauber 1895: 296) Jacques-Félix (1978: 234), distributed mainly in the coastal dry forests of East Africa and Mozambique but with outlying populations in the African interior (Malawi and Zambia) and northwestern Madagascar. However, recent investigations have revealed that *W. sansibarica* sensu lato includes several distinct morphotypes, some of which have been treated as separate species. For example, in the Arabuko-Sokoke forest of coastal Kenya, typical *W. sansibarica* with arboreal stature and relatively large leaves is sympatric with the small-leaved, shrubby *W. melindensis* (A. Fernandes and R. Fernandes 1955: 62) R.D. Stone and Q. Luke (2009: 142). Another very distinctive species is *W. cordiformis* R.D. Stone (2013: 113), known only from the Namacubi (Banana) Forest near Quiterajo in Cabo Delgado province, northern Mozambique. Most recently, Tenza (2015) conducted a careful morphometric study of *W. sansibarica* sensu lato and found several characters of taxonomic importance. Molecular analyses with increased sampling further indicate that treating this group as a single species would under-represent its genetic diversity (R.D. Stone, unpublished data).

Here we describe another distinctive new species of *W.* subgenus *Carnosae* from the Namacubi Forest (northern Mozambique), discovered through recent field-work together with comparative studies of herbarium material (see the Acknowledgements for a list of the herbaria consulted). While it would have been desirable to publish this name as part of a comprehensive revision, it is being proposed here to make it available for a forthcoming book on the *Trees and Shrubs of Mozambique* (Burrows *et al.*, in press). The extent of occurrence (EOO) and area of occupancy (AOO) were estimated using GeoCAT (Bachman *et al.* 2011), and the conservation status has been provisionally assessed according to the IUCN Red List Categories and Criteria (IUCN 2012). We also provide a key to the currently recognized species of *Warneckea* in Mozambique.

Warneckea albiflora R.D. Stone & N.P. Tenza, *sp. nov.* (Figs. 1, 2)

Type:—MOZAMBIQUE. Cabo Delgado: Quiterajo, track through middle of Namacubi (Banana) Forest, 11°45'46"S, 40°20'19"E, elev. 125 m, 27 Nov 2008, *J.E. Burrows & S.M. Burrows 10833* (holotype BNRH!, isotype K[K000738569]!).

Evergreen tree 2.5–8 m high; bark smooth, pale grey mottled with patches of pale brown; young branchlets subquadrangular, soon becoming terete with age; internodes 1.4–2.8 (–3.2) cm long. Leaves thinly coriaceous, 3-nerved from the base and with an additional pair of weaker submarginal nerves, dark green above, somewhat paler below; petioles 2–3 mm long; blades elliptic-lanceolate, (3.2–) 4.5–6.5 (–7.3) × 1.8–3 cm, narrowly cuneate at base, attenuate then acuminate towards the apex, acumen mostly 6–12 (–15) mm long, apex narrowly obtuse to ± pointed; midnerve impressed on the upper surface, prominent on the lower, often extending past the leaf apex as a short mucro; lateral nerves prominent on both surfaces (in dried material), curvilinear toward the base of the blade, forming shallow arches and becoming progressively weaker toward the leaf apex; lower surface of blade finely reticulate-areolate owing to a conspicuous network of purplish veinlets. Cymules sessile, clustered at the recently defoliated nodes just below the current leaves (rarely in the leaf axils); pedicels 3.5–4 mm long, subtended by several pairs of imbricate-decussate bracts; bracts ca. 1 mm long, ± rhombic in outline, cucullate and ± keeled toward apex on the abaxial side. Flowers white; hypantho-calyx obconic, 2 mm high × 3 mm wide; petals spatulate, 3 mm long × 2 mm wide; staminal filaments 4–5 mm long; anthers ca. 0.8 mm long, the connective strongly incurved by the ellipsoid, dorsal gland occupying the middle 1/3 on the dorsal side; style filiform, 6 mm long. Fruits unknown.

Additional specimens examined (paratypes):—MOZAMBIQUE. Cabo Delgado: Namacubi Forest, west of Quiterajo, 11°45'46.5"S, 40°21'18.1"E, elev. 90 m, 27 Nov 2008, *F. Crawford 259* (BNRH!, K!, P!); Quiterajo, 11°47'42"S, 40°20' 23"E, elev. 120 m, 24 Nov 2009, *Q. Luke & P. Luke 13898* (EA, K!, LMA, P!); Namacubi Forest, ca. 10 km west of Quiterajo village, 11°45'47.2"S, 40°21'42.8"E, elev. 99 m, 25 Nov 2009, *D.J. Goyder et al. 6151* (K!, LMA, P!); Namacubi Forest near Quiterajo, 11°45'23"S, 40°24'00"E, elev. 90 m, 08 Sep 2014, *J. Timberlake & A. Massingue s.n.* (NU!).

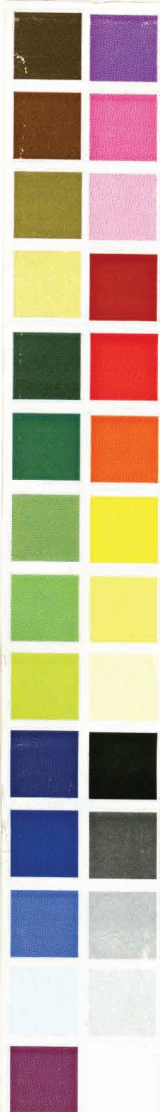
Distribution and habitat:—Known only from the Namacubi (Banana) Forest west of Quiterajo, Cabo Delgado province, northern Mozambique (for maps see Fig. 2 in Timberlake *et al.* 2011 and Fig. 2 in Stone 2013). According to data provided on specimen labels, the habitat is in dry, semi-deciduous coastal forest dominated by *Guibourtia schliebenii* (Harms) J. Léonard and *Pteleopsis myrtifolia* (M.A. Lawson) Engl. & Diels, on sandy soil at elevations of 90–120 m.

Phenology:—Flowers in late November. Fruiting period unknown.

Conservation status:—*Warneckea albiflora* is known from a single location that is not in a protected area. The EOO is estimated as 12 km² and the AOO as 16 km² (assuming a 4 km² grid-cell size). Ongoing threats include continued clearing for subsistence agriculture, cutting of poles, uncontrolled fires, and possible road construction for oil-and-gas development which would increase access to and clearance of the forest (Timberlake *et al.* 2011; Cheek & Darbyshire 2014). Accordingly, *W. albiflora* is provisionally assessed as Critically Endangered, CR B1ab(iii).

Etymology:—The epithet *albiflora* is an adjective referring to the white flowers of this species, this being the main diagnostic feature separating it from the closely related *W. sansibarica*.

Discussion:—*Warneckea albiflora* is placed in *W.* subgenus *Carnosae* on account of its combination of leaf blades with conspicuous network of purplish veinlets on the lower surface; sessile inflorescences agglomerated at the recently defoliated nodes; pedicels subtended by persistent, imbricate-decussate bracts; patelliform calyx limb with lobes obsolete; and anther connectives bearing a minute, dorsal oil-gland (Stone and Andreasen 2010). The new species would key to *Memecylon sansibaricum* Taub. [≡ *Warneckea sansibarica*] in the *Flora Zambesiaca* and the *Flora de Moçambique* (R. Fernandes and A. Fernandes 1978, 1980), but is readily distinguished from *W. sansibarica* by its narrowly elliptic, attenuate–acuminate leaves (acumen mostly 6–12 mm long) and white flowers borne on relatively short pedicels (3.5–4 mm long). In contrast, the leaves of *W. sansibarica* are elliptic with apices rounded to ± shortly



(*Warneckea sansibarica*)
 vel. sp. aff
 Det./Conf.: R.D. Stone 2/10/2009

Warneckea sansibarica (Taub.)
 10833 Jacq.-f. & G.
 DET. D. J. Goude (L) May 2009
 19

The Buffelskloof Herbarium		451/15.0	
Regio	Cabo Delgado, Mozambique	Legit	Burrows, J.E. & Burrows, S.M.
Grid ref.	11° 45' 46" S 40° 20' 19" E [1140CD]		
Alt.	125 m		
Asp.	Level	& no.	10833 Date 27/11/2008
Warneckea sp.			
Quiterajo, track through middle of Namacubi (Banana) Forest, northern edge of forest.			
Point data correct to 0-10m. Small evergreen tree to 5 m tall, in mixed semi-deciduous forest on sandy soils on edge of low escarpment. Bark thin, smooth mottled grey; wood dense and hard. Flowers white with yellow anthers, sweetly-scented.			
Genspec no. 5788020 0			

HOLO-TYPE
 BNRH

Burrows 10833 (BNRH)
Warneckea albiflora R.D. Stone & Tenza, sp. nov. ined.
 det. R.D. Stone, 02.III.2016



FIGURE 1. Image of the holotype of *Warneckea albiflora* (J.E. Burrows & S.M. Burrows 10833, BNRH). Source: Buffelskloof Nature Reserve Herbarium.

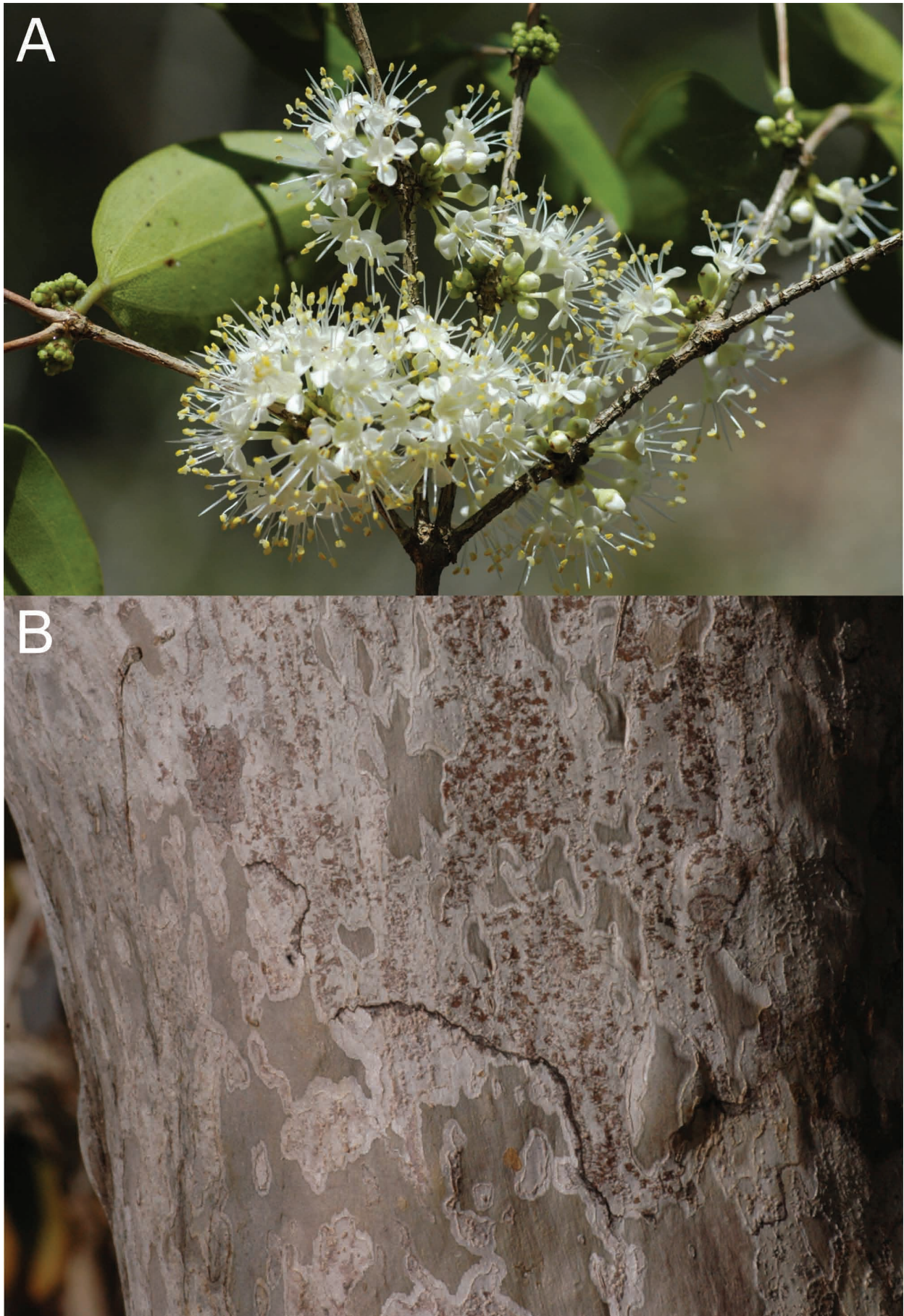


FIGURE 2. Living material of *Warneckea albiflora* (same individual as the type collection). **A.** Flowering branchlet; **B.** Trunk showing mottled character of the bark. Photographs by John E. Burrows.

and obtusely acuminate (acumen absent or if present then mostly 3–8 mm long); the flowers are generally pale blue to deep blue, and the pedicels are generally longer (6–15 mm). In the Namacubi Forest, *W. sansibarica* is represented by the collections *J. Burrows & S. Burrows 10753* and *10765* (BNRH, K), *Crawford et al. 266* (K) and *Timberlake et al. 5486* and *5505* (K).

Also occurring in the same Namacubi Forest near Quiterajo is *W. cordiformis*, another close relative of *W. sansibarica* except being of smaller stature (a shrub or small tree 2–3 m vs. a larger tree 5–8 m) with young branchlets distinctly quadrangular and narrowly 4-winged (vs. terete to subquadrangular), leaves smaller and differently shaped (mostly 1.5–3 × 1.2–2.2 cm and ovate to cordiform vs. mostly 4–6.5 × 2.3–4 cm and elliptic with base cuneate), pedicels relatively short (1.5–3 vs. 6–15 mm), and flowers white (vs. pale to deep blue). *Warneckea cordiformis* is locally endemic in the Namacubi Forest, and is represented by the collections *J. Burrows & S. Burrows 10773* and *10837* (BNRH, K), *Goyder et al. 6095* (holotype K; isotypes LMA, NU, P), *Luke 13887* (EA, K, P), and *Timberlake et al. 5499* (K).

Remarkably, the Namacubi Forest is the only locality where three different species of *W.* subgenus *Carnosae* are known to occur together. Further study is needed to address questions of how the boundaries between these sympatric species originated and are maintained. For now, we can only confirm that the observed differences between them are consistent, i.e., the three distinct morphotypes do not appear to represent extremes in a continuous range of variation.

Key to the species of *Warneckea* in Mozambique

1. Outer bark of trunk and older branches pale reddish brown, exfoliating in patches to reveal whitish inner bark; leaves with purplish veinlets forming a fine, reticulate-areolate network on the lower surface; flowers distinctly pedicellate; hypantho-calyx patelliform with calyx lobes short or obsolete; anther connectives with a dorsal oil-gland; embryo with two fleshy but unequal cotyledons (*Warneckea* subg. *Carnosae*).....2
- Outer bark of trunk and older branches grey, finely longitudinally fissured; venation pattern on lower leaf surface as above or with reticulations not so close; flowers sessile or short-pedicellate; hypantho-calyx obconic to campanulate with calyx lobes generally well-developed and concealing the corolla in bud, the bases of the outer pair of lobes often auriculate-amplexate; anther connective-gland absent; embryo with just one fleshy cotyledon, the second obsolete (*Warneckea* sect. *Warneckea*).....4
2. Shrub or tree to 10 m high; young branchlets subquadrangular to terete; leaves narrowly to broadly elliptic, mostly 4–6.5 × 1.8–4 cm, bases cuneate, apices ± distinctly acuminate; flowers blue or white, on pedicels 3.5–15 mm long.....3
- Shrub or small tree 2–3 m high; young branchlets distinctly quadrangular and narrowly 4-winged; leaves ovate to cordiform, 1.5–3 (–4) × 1.2–2.2 (–3) cm, bases broadly cuneate to rounded or strongly cordate, apices shortly and obtusely acuminate; flowers white, on pedicels 1.5–3 mm long..... *W. cordiformis*
3. Leaves elliptic, mostly 4–6.5 × 2.3–4 cm (1.5–2× as long as broad), the apex ± broadly obtuse-acuminate (acumen if present mostly 3–8 mm long); flowers pale to deep blue; pedicels 6–15 mm long..... *W. sansibarica*
- Leaves narrowly elliptic, (3.2–) 4.5–6.5 (–7.3) × 1.8–3 cm (mostly 2–2.6× as long as broad), attenuate-acuminate at apex (acumen mostly 6–12 mm long); flowers white; pedicels 3.5–4 mm long..... *W. albiflora*
4. Internodes 1.0–4.5 (–6.0) cm long; petioles 2–5 mm long; leaf-blades 3–9 × 1.5–6.5 cm; reticulate veinlets of lower leaf surface not close; pedicels ca. 4 mm long.....
- Internodes mostly 0.5–2.5 cm long; petioles 1–1.5 (–2) mm long; leaf-blades mostly 1.5–3.5 (–5.3) × 0.8–2.5 (–3.6) cm; reticulate veinlets as above or very close; pedicels absent or up to 3 mm long.....5
5. Reticulate veinlets of lower leaf surface not close; pedicels in bud concealed by the bracts, becoming 0.5–1 mm long at anthesis and 1–2.2 (–3) mm long after anthesis..... *W. parvifolia* R.D. Stone & Ntetha (2013: 320)
- Reticulate veinlets of lower leaf surface very close; pedicels absent (flowers and fruits sessile)..... *W. sessilicarpa* (A. Fernandes & R. Fernandes 1974: 55) Jacques-Félix (1978: 234)

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