

***Tetradenia* (Lamiaceae) in Africa: new species and new combinations**

Peter B. PHILLIPSON

Missouri Botanical Garden, P.O. Box 299, St Louis, MO 63166-0299 (USA)
and Muséum national d'Histoire naturelle,
Département Systématique et Évolution, USM 602,
case postale 39, 57 rue Cuvier, F-75231 Paris cedex 05 (France)
peter.phillipson@mobot.org

Catherine F. STEYN

SRK Consulting, Postnet Suite #206,
Private Bag X18, Rondebosch, 7701, Cape Town (South Africa)
ksteyn@srk.co.za

Phillipson P. B. & Steyn C. F. 2008. — *Tetradenia* (Lamiaceae) in Africa: new species and new combinations. *Adansonia*, sér. 3, 30 (1): 177-196.

ABSTRACT

The taxonomy of the African representatives of the Afro-Malagasy genus *Tetradenia* Benth. is reviewed. In a previous treatment of the genus, a single species, *T. riparia* (Hochst.) Codd, was taken to encompass almost all of the variation of the genus in tropical Africa: however, this interpretation has proved unsatisfactory. We recognise 10 species in Africa, of which two are described here as new, and we provide four new nomenclatural combinations for species originally described either in the genus *Moschosma* Rchb. or in *Iboza* N.E.Br. The two new species comprise: *T. discolor*, characterised by its discoloured leaves with woolly indument on the abaxial surface of densely matted, long white eglandular trichomes and shorter glandular trichomes, combined with relatively large flowers and hispid stems; and *T. tanganyikae*, characterised by its dense spikes of male flowers, relatively large flowers and short, generally sparse indument.

KEY WORDS

Lamiaceae,
Labiatae,
Tetradenia,
Africa,
new species,
new combinations.

RÉSUMÉ

Tetradenia (Lamiaceae) en Afrique: nouvelles espèces et nouvelles combinaisons. La taxonomie des représentants africains de *Tetradenia* Benth., genre afro-malgache, est passée en revue. Dans un traitement précédent du genre, une seule espèce, *T. riparia* (Hochst.) Codd, était supposée englober presque toute la variation du genre en Afrique tropicale; toutefois cette interprétation s'est révélée être non satisfaisante. Ici, nous reconnaissons 10 espèces africaines dont deux sont décrites pour la première fois, et nous proposons quatre nouvelles combinaisons nomenclaturales pour des espèces décrites à l'origine soit dans le genre *Moschosma* Rchb. soit dans *Iboza* N.E.Br. Les deux espèces nouvelles comprennent: *T. discolor*, caractérisé par ses feuilles discolorées avec un indument laineux sur la face abaxiale composé de poils densément emmêlés, longs non glandulaires, et de poils courts glandulaires, combiné avec ses fleurs relativement grandes et ses tiges hispides; et *T. tanganyikae*, caractérisé par ses épis de fleurs mâles denses, ses fleurs relativement grandes et son indument généralement épars et court.

MOTS CLÉS

Lamiaceae,
Labiées,
Tetradenia,
Afrique,
espèces nouvelles,
combinaisons nouvelles.

INTRODUCTION

The genus *Tetradenia* Benth. and its type species, *T. fruticosa* Benth. from the central highlands of Madagascar, were first described by Bentham in 1830. This genus of Lamiaceae was regarded as restricted to Madagascar for about 150 years, until Codd (1983) realised that the seven species of the genus *Iboza* N.E.Br., all from continental Africa, shared many distinctive features with the Malagasy plants, and concluded that the African and Malagasy plants are congeneric. However, he accepted only three of the seven species of *Iboza* recognised at the time, reducing the other four to synonymy. Thus new combinations were made for *T. barberae* (N.E.Br.) Codd – a local endemic from the Eastern Cape of South Africa, *T. brevispicata* (N.E.Br.) Codd – from Botswana, south-west Zimbabwe and neighbouring parts of South Africa, and *T. riparia* (Hochst.) Codd – interpreted as a widespread and highly variable species extending from South Africa to Ethiopia, and west to Angola and Namibia. The genus was treated for the *Flora of Southern Africa* by Codd (1985). A fourth African species, *T. kaokoensis* van Jaarsv. & A.E. van Wyk, endemic to the Otjhipa Mountains of northwestern Namibia, was recently described (Van Jaarsveld & Van Wyk 2003). *Tetradenia* was revised for Madagascar by Phillipson &

Hedge (1998), who formally recognised nine species of which six were newly described. Codd's enlarged concept of *Tetradenia* – with both Malagasy and African species included – has been widely accepted (for example by Harley *et al.* 2004).

In the field *Tetradenia* plants are often quite conspicuous in their preferred rocky habitats, and they are relatively well-represented in the relevant herbarium collections. They are distinctive plants with hundreds or thousands of minute flowers usually borne on a large panicle-like thyrses. However, the inflorescences in most species are produced during the dry season when the plants may be leafless, and the genus is unusual in Lamiaceae in that most species are dioecious (see Johnson & Phillipson 1999 for a discussion of the reproductive biology of *Tetradenia*). These characteristics make studies on *Tetradenia* rather challenging because herbarium specimens often lack leaves, and representative male and female plants have only rarely been collected together. Observations of wild populations of the plants are therefore particularly important. Our knowledge of *Tetradenia* in the field in many parts of Africa convinced us that Codd's (1983) broad concept of *T. riparia* does not account for the variation in a satisfactory way, and this was confirmed by examination of available herbarium material, therefore we set out to re-evaluate the taxonomy of *Tetradenia* in Africa.

Throughout Africa and Madagascar, species of *Tetradenia* are used medicinally in many ways owing to the presence of essential oils. A search on the internet will quickly reveal a number of studies on the biochemistry of these compounds, some of which show potential commercial value (see for example: Campbell *et al.* 1997). This fact gives further impetus to the need for an improved classification for the genus.

In this article, which is a precursor to treatments for the *Flora of Tropical East Africa* (FTEA) (Phillipson in press) and *Flora Zambesiaca* (FZ) (Phillipson in prep.), we recognise 10 species of *Tetradenia* in Africa. Two of these are described as new to science, and we give emended descriptions for *T. riparia* and another species whose circumscription has often been confused, and which occurs outside the FTEA and FZ regions. We also present four new nomenclatural combinations and brief remarks on the nomenclature, morphology, ecology or geography of each species. Detailed descriptions for the relevant species will also be provided in the floras, and descriptions for the remaining species are available elsewhere (Codd 1983; Van Jaarsveld & Van Wyk 2003).

Herbarium collections were studied from the most relevant institutions in Europe, in many African countries and at the Missouri Botanical Garden. Representative collections are cited in this paper, and more comprehensive lists and distribution maps are available online through the TROPICOS database (<http://www.tropicos.org>). Living plants have also been observed in many of the countries in which *Tetradenia* occurs. Some of the work reported here on *Tetradenia* in southern Africa was included in a BSc Honours dissertation (Steyn, *née* Johnson 1995) from Rhodes University, South Africa.

SYSTEMATICS

Genus *Tetradenia* Benth.

Edwards's Botanical Register 15: t. 1300 (1830), *non* Nees 1831. — Type: *Tetradenia fruticosa* Benth.

Iboza N.E.Br. in Thiselton-Dyer (ed.), *Flora Capensis* 5 (1): 298 (1910). — Type: *Iboza riparia* (Hochst.) N.E.Br.

IDENTIFICATION KEY TO *TETRADENIA* BENTH. IN AFRICA

1. Plants hermaphrodite, bearing bisexual flowers; inflorescence consisting of a long largely unbranched terminal spike; Eastern Cape Province of South Africa 2. *T. barberae*
- Plants dioecious, or in some species occasional hermaphrodite individuals bearing bisexual flowers may be present; inflorescence a branched terminal panicle-like thyrse; throughout much of tropical Africa, extending into KwaZulu-Natal and Northern provinces of South Africa 2
2. Calyx lobes subequal, the lobes all acute and with the upper lobe gradually spreading in fruit; inflorescence large but poorly branched; female with long lax spikes, the terminal usually > 8 cm long; highlands of Ethiopia 7. *T. multiflora*
- Calyx lobes unequal, the upper lobe large, rounded, abruptly bent upwards in fruit, the lateral and lower lobes small, acute, separated by a deep basal; inflorescence large and well-branched or highly reduced; female with short dense spikes, the terminal usually < 3 cm long; widespread (including Ethiopia) 3
3. Leaves strongly discoloured with the entire lower surface and the veins obscured by a dense white woolly indument; young stems and inflorescence branches sometimes with a dense brown woolly indument 4
- Leaves not or at most slightly discoloured, the lower surface and the veins variously pubescent, but the indument of fully expanded leaves never completely obscuring the surface or the veins; stems and inflorescence branches variously pubescent, but never with a dense brown woolly indument 5

4. Leaves triangular to ovate or cordiform usually with pointed marginal teeth; young stems and inflorescence branches with a dense brown woolly indument; both male and female spikes dense; corolla tube of the male flowers \pm 1.0 mm long; from the Ubombo Mountains in the extreme north of KwaZulu in South Africa, Swaziland, the northern provinces of South Africa, eastern Zimbabwe and adjacent parts of Mozambique 1. *T. bainesii*
- Leaves ovate to elliptic with rounded marginal teeth; stems finely hispid, somewhat glabrescent; inflorescence branches with a pale villous indument; male spikes lax, female spikes dense; corolla tube of the male flowers 1.5-2.0 mm; Malawi, Zambia, south-western Tanzania, southeastern Democratic Republic of the Congo, and Zimbabwe ..
..... 4. *T. discolor*
5. Plants compact (up to 0.6 m high), with thick succulent stems; flowering during the austral summer (November to February); confined to the Otjihipa Mountains in north-west Namibia 6. *T. kaokoensis*
- Plants generally large (mature individuals generally more than 1.5 m high, often much more), with woody or slightly succulent stems; flowering during the winter months or during the dry season in the equatorial zone; widespread, but not known from the Otjihipa Mountains in north-west Namibia 6
6. Small rather weak shrub (1-2 m tall) with small leaves (blades often $<$ 20 \times 15 mm); inflorescence a small rather irregular cylindrical panicle or somewhat reduced to separate lateral partial inflorescences or even solitary spikes; male and female spikes often $<$ 3 cm long; northern provinces of South Africa, eastern Botswana, central Namibia and the Matopo hills in southwestern Zimbabwe 3. *T. brevispicata*
- Large vigorous shrub (often over 2 m tall) with large leaves (blades usually $>$ 3 cm long); the longest male spikes $>$ 3 cm long (the female sometimes shorter); widespread, but not known from Botswana, Namibia or the Matopo hills in Zimbabwe 7
7. Flowers pedicellate, pedicels \geq 0.3 mm (male) or \pm 0.3 mm (female) long; male inflorescence lax (internodes generally $>$ 3 mm long); northern provinces of South Africa northwards to southern Tanzania 8
- Flowers subsessile or very shortly pedicellate, pedicels $<$ 0.3 mm long; male inflorescence dense, the axis often hardly visible (internodes generally $<$ 3 mm long); calices with pale yellow sessile glands or lacking sessile glands); Tanzania and adjacent parts of northern Malawi and north-east Zambia, north to Ethiopia and Sudan 9
8. Male flowers funnel to trumpet-shaped, corolla *c.* 2.7 mm long from the base of the tube to the tip of the bottom lip, the tube expanding gradually from the base, pedicels of male flowers \pm 0.3 mm long; stems hispid and \pm equal mixture of glandular and eglandular trichomes; petioles \pm 1/3 as long as the blades; widespread from Swaziland northwards to southern Tanzania, and west to Namibia and Angola 5. *T. galpinii*
- Male flowers broadly funnel-shaped, corolla *c.* 3.4 mm long from the base of the tube to the tip of the bottom lip, the tube expanding abruptly beyond the calyx mouth, pedicels of male flowers $>$ 0.7 mm long; stems hispid with mainly glandular trichomes; petioles \pm 1/2 as long as the blades; from KwaZulu-Natal in South Africa, through Swaziland, southern Mozambique and eastern Zimbabwe to southern Malawi 8. *T. riparia*
9. Stems with conspicuously raised leaf-abscission scars; leaves coarsely and deeply serrate, the primary teeth usually with conspicuous smaller marginal teeth; corolla tube very short: *c.* 0.8 (male) or 0.5 mm (female), lobes spreading; Burundi, Rwanda, Kenya, northern Tanzania, Uganda and adjacent parts of the Democratic Republic of the Congo, Ethiopia and Sudan 10. *T. urticifolia*

- Stems with only slightly raised leaf-abscission scars; leaves crenate-dentate, the primary teeth usually lacking (or sometimes with very small) marginal teeth; corolla tube \pm 1.2 (male) or 1.4 mm (female) long; south-west Tanzania, and adjacent parts of Zambia and Malawi 9. *T. tanganyikae*

1. *Tetradenia bainesii* (N.E.Br.)

Phillipson & C.Steyn, comb. nov.

Iboza bainesii N.E.Br., in Thiselton-Dyer (ed.), *Flora Capensis* v. I: 301 (1910). — Type: South Africa. South African Gold-field, 1870, *Baines s.n.* (holo-, K! [2 sheets: one male, one female]).

Tetradenia riparia (Hochst.) Codd *sensu* Codd, *Bothalia* 14 (2): 181 (1983); *Flora of Southern Africa* 28: 114 (1985) *pro parte*.

SELECTED REPRESENTATIVE MATERIAL. — **Mozambique.** Lower slopes of Mt. Zembe, 16.VI.1959, *Leach 9127* (K).

South Africa. KwaZulu-Natal, Pongola Port, 20 km E of Pongola town, 35 m, 27°20'45"S, 31°45'53"E, 21.II.2002, *Phillipson 5432* (GRA). — Pietersburg, Blau-berg, 29.IV.1961, *Strey & Schlieben 8616* (K, PRE).

Swaziland. Mbabane district, Spokasini, 20.V.1955, *Compton 25131* (NBG). — Mankaiana district, Ntondozi, 760 m, 3.V.1957, *Compton 26910* (PRE, NBG). — Palwane Hills, 19.IV.1956, *Compton 25899* (K, PRE). — Usutu Forest, 22.IV.1958, *Compton 27765* (K, NBG, PRE). — District Hlatikulu, Vondo Hill, 10.IV.1959, *Compton 28776* (K, NBG, PRE). — Mbabane district, Gobolo, *Dhlamini s.n.* (PRE). — Swaziland, Mbabane district, Mukusini Hills, 1220 m, *Karsten s.n.* (PRE). — Frequent along road from Stegi southwards, VII.1936, *Verdoorn 1677* (P, PRE).

Zimbabwe. Vumba Mountain, 3.VIII.1988, *Carter & Coates-Palgrave 2118* (K). — Umtali, on high granite hill Dora Farm, 12.VI.1949, *Chase 1625* (K). — Chimanimani, on mt. slope, V.1956, *Coates Palgrave s.n.* (K). — Marandellas, 1.VI.1924, *Eyles 4404* (K). — Umtali, 8.VII.1927, *Galpin 9248* (K). — Without locality, *Gilliland 310* (K). — Tarka Forest Reserve, Melsetter district, VIII.1968, *Goldsmith 120/68* (K, MO). — Stapleford district, 15.V.1941, *Hopkins s.n.* (K). — Environs d'Umtali, Vumba Mountains, 18-19.IV.1934, *Humbert 15557* (P). — Stapleford au N d'Umtali, 20.IV.1934, *Humbert 15731* (P). — Tokwe Riv. 5 mls E of Chibi, 16.VI.1957, *Leach 8084* (K). — Umtali, X.1957, *Leach 8184* (K). — Stapleford Forest Reserve, *Mullin 34/56* (K). — Odzani River Valley, district Monica, Div. Umtali, 28.III.1905, *Teague 143* (K). — Mpingi Pass, Great Dyke, *Wild 5785* (K, MO). — Melsetter, Pasture Research Station, 5.VI.1950, *Williams 91* (K).

REMARKS

Tetradenia bainesii occurs in the extreme north of KwaZulu in South Africa on the Ubombo Mountains and on the Lebombo Mountains in Swaziland, with scattered populations through the northern provinces of South Africa and northwards into eastern Zimbabwe and neighbouring parts of Mozambique. It has been recorded on moist stream banks, roadsides, forest margins, boggy areas and sandy areas, on serpentine or norite.

The species can be recognised by the dense white woolly indument on the lower side of the leaves and dense brown woolly indument on the young stems and inflorescence branches. Flowering is known to occur from May to July, and at this period of the year the leaves are usually still present. Both the male and female spikes are dense, and the male flowers are only slightly larger than the female ones. The male flowers are the smallest of any of the southern species, with both the corolla tube and the lower lobe \pm 1.0 mm long. *Tetradenia discolor* has a similar leaf indument to *T. bainesii*, but has a fine hispid indument on the stems and villous indument on the inflorescence; also it occurs further north than *T. bainesii*.

Tetradenia bainesii appears to share an unusual feature with the Malagasy species *T. goudotii*, in that at least some populations of both species comprise a mixture of male, female and hermaphrodite individuals. This type of breeding system appears to be very uncommon in the flowering plants as a whole, and unknown in other Lamiaceae (Johnson & Phillipson 1999).

2. *Tetradenia barberae* (N.E.Br.) Codd

Bothalia 14 (2): 178 (1983); Codd, *Flora of Southern Africa* 28: 113 (1985). — *Iboza barberae* N.E.Br., in Thiselton-Dyer (ed.), *Flora Capensis* v. I: 302 (1910). — Type: South Africa. Orange River Colony, *Barber 7* (holo-, K!).

SELECTED REPRESENTATIVE MATERIAL. — **South Africa.** E Cape Province, Ballinafas (Andries Vosloo Kudu Reserve) Ecce shale soil, 10.VIII.1952, *Archibald 4367* (GRA). — Gonubie River at horseshoe bend near Slippery Drift, edge of Krantz above river, among rocks, full sun, 32°48'00"S, 27°51'00"E, 300 m, 16.IV.1999, *Batten s.n.* (GRA). — Kaffir drift, 270 m, 26.III.1966, *Bayliss 3248* (GRA, PRE). — Andries Vosloo Kudu Reserve, 40 km NE of Grahamstown, 33°06'00"S, 26°42'00"E, 360 m, 23.VI.1981, *Burdett s.n.* (GRA). — Kaffir drift Outspan, Prudhoe, dense valley Bushveld along ridge above Fish River, 33°23'35"S, 27°01'50"E, 100 m, 12.VIII.1996, *Dold 2271* (GRA). — Kaffir Drift, Great Fish River, 100 m, 1.VII.1983, *Jacot Guillarmod 1* (GRA, K, MO, PRE). — Andries Vosloo Kudu Reserve, 40 km NE of Grahamstown, 33°06'00"S, 26°42'00"E, 360 m, 23.I.1980, *Palmer 1037* (GRA). — Andries Vosloo Kudu Reserve, 320 m, 3.II.1983, *Palmer 1071* (GRA, K, PRE, PRU). — Adam's Krantz, top of S facing slope, 33°02'00"S, 26°49'10"E, 340 m, 20.XI.1993, *Phillipson 4158* (GRA, MO, PRE). — Collywobbles, cliffs above Bashee River, 31°05'59"S, 29°24'05"E, 420 m, 30.VI.1994, *Phillipson 4263* (GRA, MO). — Cross-roads village between Peddie and Hamburg, 33°09'43"S, 27°17'29"E, 165 m, 19.VI.2002, *Phillipson 5504* (GRA, K, MO, P, PRE). — Kaffir drift, III.1966, *Tsuane A1126* (GRA, K, PRE). — Collywobbles, Transkei, 7.IV.1992, *van Jaarsveld 13134* (NBG, PRE).

REMARKS

The range of *Tetradenia barberae* extends from the Fish River in the south to the Mbashe River in the north of the Eastern Cape Province of South Africa. This distribution range is much further south than any other species of *Tetradenia*, and *T. barberae* is the only African species to occur entirely outside of the tropics. The species appears to be restricted to a few dry, rocky south-facing valley slopes above some of the major rivers, no more than about 50 km from the coast. The plants are abundant at the few sites where this species in known to occur.

Remarkable in several ways, *T. barberae* is smaller and more compact than any of the other African species, and is unique in being completely hermaphrodite. The flowers and nutlets are the largest in the genus and are borne on long, largely unbranched spikes of apparently indeterminate growth. There are certain differences between the typical plants from the Mbashe River Valley and those from other localities further to the south, which may merit taxonomic recognition, but further study is

required to confirm this. A full description of this species is provided by Codd (1983).

3. *Tetradenia brevispicata* (N.E.Br.) Codd

Bothalia 14 (2): 179 (1983); Codd, *Flora of Southern Africa* 28: 114 (1985). — *Iboza brevispicata* N.E.Br., in Thiselton-Dyer (ed.), *Flora Capensis v. I.*: 302 (1910). — Type: South Africa, Wonderboom Farm near Pretoria, 6.VIII.1904, *Burt Davy 1844* (holo-, K!).

SELECTED REPRESENTATIVE MATERIAL. — **Botswana.** South-east district, Ofse, hill E of main road, 18.VIII.1978, *Hansen 3435* (K, PRE, SRGH). — 5 miles SE of Gaborone, 10.VIII.1974, *Mott 320* (K).

Namibia. Brakwater 10 miles N of Windhoek on rd. to Okahandja, 25.IV.1955, *de Winter 3242* (K, P). — Stadtgebiet von Klein-Winhoek, Umlandstrasse, in Glimmerschieferspalten, 7.I.1964, *Geiss s.n.* (K). — Otjimbingwe, Farm Kaan dam, *Geiss 13523* (NBG). — Farm Khomas, 64 km NW of Windhoek, *Hardy 6554* (MO). — Windhoek district, Avis Dam, *Liebenburg 4497* (K PRE). — Windhoek region, *Schlieben 10416* (PRE). — Hindhuker Bergland, 27.IV.1958, *Seydel 1525* (K, MO, SRGH). — Avis, Windhoek, 4.VI.1961, *Seydel 2270* (K, MO). — Hindhuker Bergland, 25.III.1963, *Seydel 3465* (K, MO). — District Windhoek, 14.III.1965, *Tolken & Hardy 710* (K). — Rietfontein, Windhoek district, *Strey 1557* (PRE). — 8 miles S of Kapps arm, *Wilman 434* (PRE).

South Africa. Soutpansberg district, SE of Louis Trichardt, Ben Lavin Nature Reserve, Tabanjwane Hill, *Balkwill, Balkwill and Wits Biosoc 4091* (MO). — Lydenburg region, Sukuniland, *Barnard 223* (K, PRE). — Magaliesberg, c. 3 miles W of Wonderboompoort, *Bremerkamp 1280* (PRU). — Soutpansberg, near Punch Bowl Forest, *Codd 8339* (PRE). — Soutpansberg, near Entebent Forest Station, *Codd 8398* (PRE). — Rustenburg, below Dunningkamp Dam, *Coetzee 869* (PRE). — Rustenburg, *Collins 10522* (PRE, J). — Lebowa, Arabie, about 1 km SE of office complex, *Ellery 250* (PRE). — Matoks, 24.VIII.1930, *Hutchinson & Gillett 4468* (K). — Middelburg district, kloofs near Botsebelo Mission station, Little Olifants River, *Marloth 11754* (PRE). — Thabazimbi, Farm Zwarthoek, N slopes of Aasvoelkop, *McMurty 7214* (PRE). — Groblersdal district, about 4 miles N of the Lobethal service station, *Monnig 46* (PRE). — Rustenburg district, *Pegler 3008* (SAM). — Pietersburg, *Pole-Evans 3730(a)* (PRE). — Burgersfort, 6.VII.1963, *Repton 5942* (K). — Bankfontein district, Middelburg, *Rudatis 226* (PRE). — Bandolierkop, 12.XI.1955, *Schlieben 7585* (K). — Lekgalameetse Nature Reserve, Paris, *Stalmans 65* (PRE). — Rainhill, c. 5 miles SW of Rustenburg, 19.III.1946, *Story 990* (K, PRE). — Transvaal, Kruger

Nat. Park, Punda Maria, 11.VIII.1953, *v.d.Schuyff* 3151 (K). — Brits, Jacksonstun, Magaliesburg, *van Vuuren* 312 (PRE). — 18 miles E of Pietersburg, road to Tsaneen, 1.IX.1961, *v.Vuuren* 1266 (K, PRE). — Transvaal, Kruger National Park, 19.VIII.1952, *Van der Schiff* 658 (K). — Northern Province, Abel-Erasmus pass, 10 km S of Strydom tunnel, 10.XI.2000, *van Wyk* 125 (K). — C. 50 km N of Pietersburg on the road to Louis Trichardt, *van Wyk* 5193 (PRU, PRE); *van Wyk* 5216 (PRU). — Mmatlaka, Farm St Etienne, 3.VIII.1985, *Venter* 10788 (K).

Zimbabwe. Matopos National Park, 12.VIII.1980, *Best* 1416 (K, MO). — Near Bulawayo, *Eyles* 1234 (SRGH). — Matopo Hills, *Gibbs* 3 (K). — Fort Victoria, *Hall* 18 (NBG). — Zimbabwe, suburb of Bulawayo, *Howe s.n.* (GRA). — 12 miles N of Lundi Bridge on Fort Victoria-Beit Bridge road, 4.VI.1961, *Leach* 11103 (K, MO). — Matoppos, VIII.1911, *Mason s.n.* (K). — Matobo, Besner Kobila Farm, VII.1953, *Miller* 1837 (K, MO, SRGH). — Matopos, VIII.1951, *Plowes* 34036 (K, SRGH). — Bulawayo district, Khami ruins, *Sim* 19221 (PRE).

REMARKS

Tetradenia brevispicata is confined to scattered localities in the northern provinces of South Africa, eastern Botswana, central Namibia and the Matopo hills in southwestern Zimbabwe. It is known from rocky hills and ridges (granite and quartzite) from about 500-1600 m asl, and has been recorded in flower from June to September.

As its name suggests, *T. brevispicata* has inflorescences with short rather dense spikes (both male and female). The male flowers are considerably larger (tube \pm 1.5 mm long, lower lobe \pm 1.4 mm long) than those of *T. bainesii* with which it is partly sympatric. It is also distinguished by a short fine indument on the vegetative parts, unlike the long woolly indument of *T. bainesii*. A full description of this species is provided by Codd (1983).

We provisionally include material in this species from the highlands of Central Namibia that was referred by Codd (1983) to *T. riparia*. While these plants differ slightly from typical *T. brevispicata*, they cannot be accommodated satisfactorily in any other species. In our view, delimited in this way, the species remains a morphologically and eco-geographically coherent taxon. However, it is possible that the Namibian specimens represent a distinct taxon, and this merits further study.

4. *Tetradenia discolor* Phillipson, sp. nov.

(Fig. 1)

Frutex foliis discoloribus, differt a Tetradenia bainesii floribus majoribus et caulibus hispidis.

Moschosma myriostachyum Benth. & Hook.f. *Genera Plantarum* 2: 1173 (1876), *pro parte* excl. lectotype. The lectotype is included in *T. riparia*.

TYPUS. — **Malawi.** Chambe Plateau, Mlanje Mt., 1900 m, *Brass, L.J.* 16766 (holo-, K!; iso-, MO!, NY).

PARATYPES. — **Democratic Republic of the Congo.** N de Kolwezi, 10.IV.1971, *Lisowski* 15 (ETH, K).

Malawi. Michesi hill above Nalingura School, *Balaka & Kaunda* 1567 (MAL, P). — Beside Ngala Mountain on SW side, 23 km SE of Lilongwe, 28.IV.1970, *Brummitt* 10247 (K). — Msese Hill, 8 km N of Mlangeni on Ncheu-Dedza road, 30.IV.1970, *Brummitt* 10296 (K). — Mlanje district, Mlanje Mountain above Fort Lister Forestry Depot on path to Sombani, 8.VI.1970, *Brummitt* 11367 (K). — Side of Mlanje Mountain above Fort Lister Forestry Depot on path to Sombani, 8.VI.1970, *Brummitt* 11367 (K). — Mamule (Yao) at Zomba, 19.IX.1929, *Burt Davy* 21858 (K). — Nyankhava Mountain, Zomba *Humbert* 17013 (P). — 1 mile W of Chiradzulu Mtn, 21.VII.1958 *Leach* 8124 (K). — Zomba Plateau, 13.VIII.1960, *Leach* 10447 (K, P). — Mt Chiradzura, Manganja range, 1.IX.1861, *Mellor s.n.* (K). — 49 miles N of Lilongwe, 7.VI.1938, *Pole Evans & Erens* 605 (K, P, PRE). — Mt. Chiradzulu, 9.III.1905, *Whyte s.n.* (K).

Tanzania. Usafwa, *Goetze* 1058 (P). — Msanzi, on Mbala road SW of Sumbawanga, 2.VI.1980, *Hooper & Townsend* 1790 (K). — Sumbawanga road, roadside growing on big rocks, 16.V.1970, *Sanane* 1206 (K). **Zambia.** Northern Province, Kasama district, among rocks, on edge of escarpment with *Dissotis* sp. (shrub) *Diplorhynchus*, *Vitex* sp., *Maprounea* near the Forest of Kasama, 11.XI.1952, *Angus* (K, MO). — Abercorn, rocks near outflow from Lake Chila, 1949-1951, *Bullock* 1092 (K, P). — Lake Ishiku Ndola, 16.IV.1957, *Fanshawe* 3182 (K). — Nobola, 7.VII.1954, *Fanshawe* 1360 (K). — Shiwa Ngandu, 22.VII.1938, *Greenway* 5465 (K). — Solwezi, N. Monument, 24.V.1969, *Mutumushi* 3501 (K). — Solwezi district, gorge two miles below Boma on river, 14.VI.1930, *Milne-Redhead & Taylor* 499 (K). — Shiwa Ngandu, 1800 m, 4.VI.1956, *Robinson* 1586 (K). — Abercorn district, Gorge, Kalambo River, Kalambo Farm, Saisi Valley, 21.V.1952, *Richards* 1794 (K). — Rocky hill above Kawimbe, 2.VI.1957, *Richards* 9982 (K). — Juuna village edge of dambo, 9.VII.1970, *Sanane* 1244 (K, MO). — Serenje district, 57.0 km NW of Chisomo on the Chisomo-Serenje road, c. 30.0 km SE of junction with the Serenje-Mpika road, open miombo

woodlands, grasslands, and adjacent cultivated fields with large granitic outcropping of boulders, 8.V.1994, *Schmidt, Harder, Nkhoma & Louwiika, B. 1345* (K, MO). — Mutinondo Wilderness Area, 13.VI.1998, *Smith 1728* (K).

Zimbabwe. No locality, 28.IX.1920, *Hislop 103* (K). — No locality, 28.IX.1920, *Hislop Z. 97* (K, P).

DESCRIPTION

Aromatic dioecious shrub 1.5–3 m tall, with an indument of stout short (± 0.1 mm), medium-length (± 0.5 mm) and long, fine curly eglandular trichomes and fine short (± 0.1 mm) and medium-length (± 0.5 mm) glandular trichomes. Stems dark brown, with prominent raised scars of fallen leaves, finely hispid with mainly short and some medium-length glandular trichomes, somewhat glabrescent. Leaves elliptic to ovate; blades < 80 (130) \times 55 (130) mm, margins crenate, teeth rounded $< 5 \times 5$ mm, the edges of the teeth revolute, apex usually rounded, base usually rounded, pubescent with erect glandular and eglandular medium-length trichomes above; woolly with densely matted, long white eglandular trichomes and shorter glandular trichomes, and with yellow sessile glands beneath; petioles $< 1/4$ the length of leaf blade, indument like the stems. Inflorescence usually rather compact, branches moderately to densely villose with mainly medium-length eglandular and short glandular trichomes; bracts caducous, $c. 1.5 \times 2$ mm, moderately pubescent on outer surface and with pale yellow sessile glands, spikes dense, usually < 2 cm long (male and female), internodes ± 2 (male) or 1 mm (female) long, the axes somewhat or completely hidden by the flowers at anthesis. Flowers shortly (< 0.4 mm) pedicellate (male) or subsessile (female). Calyx $\pm 0.7 \times 0.6$ mm, moderately to densely hispid to woolly with short white eglandular trichomes and with scattered to many pale yellow sessile glands; fruiting calyx ellipsoidal, ± 1.4 mm long, lobes ± 0.4 mm long. Corolla funnel-shaped, bluish-mauve or white tinged lilac; tube pubescent in throat, glabrous outside, ± 1.5 – 2.0 mm (male) or 1.0 mm (female) long; lobes spreading widely, glabrous inside, eglandular pubescent outside (except along margins), lower lobe ± 1.1 mm (male) or 0.8 mm (female) long, lateral and upper lobes shorter. Stamens protruding ± 1.8 mm, anthers pale mauve or purple. Style protruding ± 0.5 mm (male)

or 2 mm (female), drying purple, lobes ± 0.1 mm (male) or 0.5 mm (female) long. Nutlets brown, ellipsoidal, $\pm 0.7 \times 0.3$ mm.

REMARKS

This new species is known from Malawi, Zambia, southwestern Tanzania, and Shaba Province in south-eastern Democratic Republic of the Congo, and two collections from unspecified localities in Zimbabwe. It has been found in open miombo woodland on rocky slopes, and at the edge of Dambos, usually among boulders between 1200 and 1800 m asl. It flowers mainly from April to July.

Tetradenia discolor can be recognized by its dense compact male and female inflorescences and its distinctive leaves which are strongly discolorous (the lower surfaces of which are covered in a dense white indument), and which have a rather even, deeply crenate margins, which are usually distinctly revolute. These characteristics are not seen in other specimens within its range. The flowers have a calyx that is moderately to densely hispid to conspicuously woolly with short white eglandular trichomes. One specimen, *Burt Davy 21858*, is rather atypical in having leaves with somewhat pointed rather than rounded apices and cordate rather than rounded bases.

Tetradenia discolor could be easily confused with *T. bainesii*, which has leaves of a similar shape and indument, but the latter has smaller male flowers and a different indument on its vegetative parts (see remarks on *T. bainesii*) and occurs further south. At some localities, *T. urticifolia* can have somewhat discolorous leaves, but the indument is never as dense as in *T. discolor*, it has other distinctive characteristics, and is not sympatric with *T. discolor* (see remarks on *T. urticifolia*).

One of the two syntypes of *Moschosma myriostachya* is a plant of *T. discolor*, while the other syntype is a plant of *T. riparia*. The selection of the latter as the lectotype is discussed in our remarks on *T. riparia*.

5. *Tetradenia galpinii*

(N.E.Br.) Phillipson & C. Steyn, comb. nov.

Iboza galpini N.E.Br., in Thiselton-Dyer (ed.), *Flora Capensis v. I.* 300 (1910). — Type: South Africa. Barberton, Dry hillsides, VI–VII.1890, *Galpin, E. 972*



FIG. 1. — *Tetradenia discolor* Phillipson, scanned image of holotype, Brass, L.J. 16766 (K), from Chambe Plateau on Mlanje Mountain at 1900 m in Malawi.

(holo-, K!; iso-, GRA [3 sheets]!, NBG!, PRE [2 sheets]!, SAM!, SRGH!).

Tetradenia riparia (Hochst.) Codd *sensu* Codd, *Bothalia* 14 (2): 181 (1983); *Flora of Southern Africa* 28: 114 (1985) *pro parte*.

SELECTED REPRESENTATIVE MATERIAL. — **Malawi.** Nchisi Mountain, 29.VII.1946, *Brass 17018* (K, MO). — Central Region, Ntchisi district, Ntchisi Forest Reserve, 19.VI.1970, *Brummitt 11556* (K). — Northern Region, Chitipa district, N end of Nyika Plateau and adjacent area, southern slopes of Kawozya, 10.VIII.1972, *Brummitt & Syngé WC188* (K). — Without locality, *Buchanan 221* (P). — Dedja Mt., 10.IX.1929, *Burt Davy 1561* (K). — Dedza district, 10.IX.1929, *Burt Davy 1546* (K). — Southern Region, Mt. Mulanje, foot Esperanza Estate, 21.VIII.1986, *Chapman 7994* (K, MO), without locality, 23.V.1919, *Johnson s.n.* (K). — Lilongwe district, 20.IX.1985, *Patel & Kwatha 2709* (K, MO). — N Prov., Rumpi district S Rukuru bridge, Njakwa gorge, 17.VII.1969, *Pawek 2557* (K). — Chikwawa escarpment, 20.VIII.1976, *Pawek 11637* (K, MO). — N Prov. Mzumba district Mzumba River, 31.VIII.1970, *Pawek 3713* (K). — N Prov., Chitipa district Sokora Rd. Misuku Hills 8 miles N of Kalenge drift, 14.IX.1977, *Pawek 13047* (K, MO). — 15 miles SW of Mzuzu, 17.X.1977, *Pawek 13130* (K, MO). — Mzimba district, Chikangawa, 9.X.1977, *Phillips 2991B* (K, MO). — 15.III.1905, *Sharpe 47* (K). — Without locality, X.1887, *unknown* (K). — Cultivated at NYBG, 29.IV.1905, *Vernay s.n.* (K). — Cultivated at NYBG, 29.IV.1905, *Vernay s.n.* (K [3 sheets]). — Tanganyika Plateau, *s.n.* (K), 19.VIII.1949, *Wiehe 225* (K). **Mozambique.** Maputo, Namaacha, Mt. Ponduni, 25.VII.1980, *Schafer 7207* (K, MO). — Lijamanji, Nyassa district, 1.IX.1931, *Sousas 747* (K). **Namibia.** Ruacana Falls, 23.VII.1976, *Leistner & Oliver 322* (K, MO). **South Africa.** Lowveld Botanic Garden, 30.VI.1970, *Buitendag 593* (PRE, NBG). — 7.VI.1974, *Buitendag 1047* (K, NBG, PRE). — Nelspruit district, Malelane at Kruger National Park, 2500 m, 25.II.1949, *Codd 5279* (PRE). — Soutpansberg, 20.VIII.1955, *Codd 8398* (K). — Transvaal, mountains near Barberton, 1220 m, 26.VII.1947, *Compton 19782* (NBG). — Farm Kaalbooi, Joubertspruitkloof, 1710 m, 23.III.1979, *Fourie 11712* (PRE). — Pietersburg district Duivels Kloof, 15.VII.1929, *Galpin 9724* (K). — Zoutpansberg, 14.VII.1935, *Galpin 14918* (K, PRE). — Environs de Louis Trichardt, Zoutpansberg, *Humbert 10635* (MO, P). — Bois de Marouvogne, *Junod 1275* (K). — No locality, VII.1899, *Junod 538* (K). — White River district, Lydenburg, Witklip plantation, 3400 m, 27.VII.1973, *Kluge 83* (PRU). — Pietersburg district near Boyene, *Leach s.n.* (K). — Barberton Region, *Liebenberg 2607* (P, PRE). — Berlin Forest Station,

Drakensberg, 24.IV.1944, *Mogg s.n.* (K, PRE). — Ritvlei Farm 12 miles N of Potgietersrus, *Mogg 21797* (J). — Waterval Boven, above the falls, *Norwood Young 1646* (J). — Erongo Mts, 28.VI.1916, *Pearson 9836* (K). — On hills between Nylstroom & Pietersburg, 12.IX.1934, *Pole-Evans 3730* (K [2 sheets]). — Transvaal, Barberton, *Rogers 22527* (K). — Letaba district, 6.VIII.1960, *Scheepers 993* (K). — Zoutpansberg, 19.VIII.1955, *Schlieben 7118* (K). — Schoemanskloof, VI.1932, *Smuts 322* (K). — Barberton, *Thorncroft 2840* (SAM, GRA, PRE). — Barberton, VIII.1932, *Williamson 73* (PRE). — Waterberg district, Rietspruit, on Driefontein road, N of Nylstroom, 22.XI.1966, *Vahrmeyer 1457* (PRE). — Lydenburg district, Waterval Boven 5 Arch Bridge, 15.V.1986, *Williams 3657* (NBG).

Swaziland. Swaziland, Mbabane, Mbeluzi Falls, 16.VII.1955, *Compton 25147* (NBG). — Swaziland, Malolotja Nature Reserve, cliff W of Malolotja Falls, 1219 m, 30.VI.1985, *Heath 272* (PRE). — Frequent along road from Stegi southwards, VII.1936, *Verdoorn 1677* (K [2 sheets]).

Tanzania. Ulugurus, Morogoro, Bahati river, 21.X.1935, *Bruce 2* (K). — S Highlands Prov., 13.IX.1932, *Geilinger s.n.* (K). — S Highlands Prov. N of Lake Nyasa, 25.IX.1932, *Geilinger 2619* (K). — Morogoro district, 3.IX.1930, *Greenway 2500* (K). — Mbagula, Kwirow b, Mahenge, *Mayer 542* (P). — *Mwangoka 2567* (MO, NHT). — Ipafu, 18.IX.1971, *Paget-Wilkes 963 A* (K, MO). — Mufindi district, 18.IX.1971, *Perdue & Kibuwa 11488* (K). — No locality, 12.X.1931, *Schlieben 1342* (K, P). — Njombe, Iringa Prov., X.1931, *Staples 195* (K). — Iringa district. N part of Gologolo Mts, 12.IX.1970, *Thulin & Mboro 926* (K). — Morogoro district, Miambo, *Vaughan 2905* (K). — Morogoro district, 16.X.1932, *Wallace 124* (K).

Zambia. Li district, S Province, 26.VII.1961, *Angus 3042* (K). — Sasami River Test Herd below Sasami River Gorge, 19.V.1964, *Bingham 1316* (K, MO). — Southern Province, Livingstone district, 29.IX.1947, *Brenan & Greenway 7777* (K). — Chilanga fish farm, 2.VI.1963, *Lusaka Natural History Club 277* (K). — Near Mumbwa, 25.III.1905, *Macaulay 780* (K). — Abercorn district. Lumi River flats (Dambo), 17.VIII.1956, *Richards 5853* (K). — Mapanza East, near R. Ngongo, 2.V.1953, *Robinson 217* (K). — Kafue Basin, 9.VI.1963, *van Rensburg 2288* (K). — Kafue Basin, Masabuka, 3.VI.1964, *van Rensburg 2932* (K).

Zimbabwe. Zambesi River, VIII.1909, *Allen 728* (K). — Edge of Gorge within reach of spray near the rain forest, Victoria Falls, 30.VIII.1947, *Brenan & Greenway 7787* (K). — Umtali district Zimunya's Reserve 18 miles from Umtali, 2 miles S of Hood's road, 15.VI.1956, *Chase 6145* (K [2 sheets]). — Near Salisbury, *Craster 202* (K). — Marandella, 1.VI.1924, *Eyles 4403* (K). — Urungwe, by Nyagugutu dam, Urungwe Native Reserve, 7.V.1957, *Goodier 241* (K). — Victoria Falls, 8.VII.1930,

Hutchinson & Gillett 3448 (K [2 sheets]). — Zambesi banks and islands near Falls, 20.III.1905, *Kolbe 3142* (K). — Chibakwe River, Mrewa district, 16.VI.1957, *Leach 8047* (K [2 sheets]). — Inyanga district, Gaeresi River, Inyanga Downs, IX, 1956, *Leach 8144* (K). — Martin Forest Reserve, 10 m. N of Melsetter, 31.VIII.1961, *Lord Methuen 165* (K). — Kasipiti district Melsetter, 1.VI.1966, *Loveridge 1567* (K, MO). — Victoria Falls, district Wankie, 9.VII.1979, *Mshasha 212* (K, MO). — Chibi district, Iuyani Hills, 17.VI.1956, *Noel 9004* (K). — At Timarn, Rusape district, V.1961, *Plowes 2179* (K). — Mberengwa district, Mt Buhwa, lower NW slope, 23.VII.1973, *Pope 1115* (K). — Near Sinoia, 21.IV.1948, *Rodin 4371* (K). — S bank of river Zambesi near Victoria Falls, VII.1908, *Rogers 5133* (K). — Lundi Drift, VII.1929, *Smuts J.C. s.n.* (K).

REMARKS

Tetradenia galpinii has the most extensive distribution range of all species of the genus, extending from Swaziland and the northeastern parts of South Africa, through Zimbabwe, Zambia, Malawi and into southern Tanzania, with a few records from Mozambique and an outlying population known from the Ruacana Falls in the Cunene River Valley on the Namibia-Angola border. Not surprisingly, there is considerable variation within this large range. Plants from Zambia, Malawi and Tanzania have much denser and longer indument on their stems and leaves. Specimens from around the Victoria Falls on the Zambia-Zimbabwe border are often recorded as occurring “in the spray zone”, these together with the specimen from the Ruacana Falls, are rather atypical in that the bracts are somewhat persistent. We presume that the unusual habitat is responsible for this characteristic, although further study may indicate that these specimens represent a distinct taxon.

Most species of *Tetradenia* can be recognised quite easily by one or two particularly distinctive features, however this is not the case with *T. galpinii*, which lacks clear-cut diagnostic characters. However, it can be distinguished from other members of the genus by the combination of the rather hispid indument of the leaves, which are not markedly discoloured; the shortly pedicellate flowers (male pedicels 0.5-1 mm long and the female \pm 0.3 mm long); the lax male inflorescence (internodes > 4 mm long); and the calices and the lower surface of the leaves which are

usually with honey-coloured or red-brown sessile glands. *Tetradenia galpinii* is most easily be confused with *T. riparia*, and critical differences between the two are discussed further under the latter.

6. *Tetradenia kaokoensis* van Jaarsv. & A.E. van Wyk

Bothalia 33 (1): 107 (2003). — Type: Namibia. Northern Kaokaland, Otjihipa Mountains, near Koakora Spring, sheer dolomite cliffs, *Van Jaarsveld et al. 16617* (holo-, WIND; iso-, NBG, PRE).

OTHER MATERIAL. — Namibia. Otjihipa Berge. Post Velho, 1850 m, III.1975, *Vahrmeijer and du Preez 2562* (PRE).

REMARKS

This recently described species is only known from the extreme northwestern corner of Namibia within the Kaokaland Centre of Floristic Endemism (Van Wyk & Smith 2001), where it is said to be “not common” (Van Jaarsveld & Van Wyk 2003). Found on inaccessible cliff faces in the Otjihipa Mountains, which reach an elevation of about 2000 m, *T. kaokoensis* is adapted to what are undoubtedly the most arid conditions (\pm 200 mm rainfall p.a.) tolerated by any member of the genus. Its morphology reflects this: the compact habit, thick succulent roots and stems serve to distinguish the species easily from other African species. In this respect, Van Jaarsveld & Van Wyk (2003) liken *T. kaokoensis* to certain Malagasy species, but this may be due to convergence rather than being a reflection of close relationship. *Tetradenia kaokoensis* is also unlike all other species of the genus in that it flowers in the austral summer, from November to February.

7. *Tetradenia multiflora* (Benth.) Phillipson, comb. nov. (Fig. 2)

Moschosma multiflorum Benth. in DC., *Prodromus* xii: 49 (1848). — *Basilicum multiflorum* (Benth.) Kuntze, *Revisio Generum Plantarum*: 512 (1891). — *Iboza multiflora* (Benth.) E.A. Bruce, *Kew Bulletin* 1940 (2): 66 (1940). — Type: Ethiopia, in *aupidus prope Djeladjeranne*

versus fluvium Tacaza, 29.VIII.1840, *Schimper 1688* (lecto-, K!; isolecto-, K!, MO!, P [3 sheets]!), selected here).

Plectranthus multiflorus Hochst. *Nom inval. in sched.*

Tetradenia riparia (Hochst.) Codd *sensu* Codd in *Bothalia* 14 (2): 181 (1983); *Flora of Southern Africa* 28: 114 (1985) *pro parte*.

SELECTED MATERIAL EXAMINED. — **Ethiopia.** Mai-Tecklit (Asi-Arkai), 13°31'00"N, 38°36'00"E, 1860 m, 2.IX.1973, *Aweke 949*, (K). — Begemder Prov., Simian Mountain, Wolkefit Pass, 1650 m, 26.IX.1969, *De Wilde 262* (K). — No locality, 1861, *Parkyns s.n.* (K). — Chiré, *Quartin-Dillon & Petit 18* (K, MO, P [multiple sheets]). — Aaosa, entre 5000 et 6000 ft, 9.IX.1852, *Schimper 686* (K, P). — Inter Sana et Ferrefera, dans le Tigré, 5.X.1838, *Schimper 776* (paralecto-, K!; isoparalecto-, P!).

EMENDED DESCRIPTION

Dioecious or possibly gynodioecious shrub up to 1.5 m tall, with a pale yellowish indument of fine, short to medium-length (up to 0.3 mm) eglandular trichomes. Stems densely pubescent, the trichomes rather matted, with scattered to dense red sessile glands. Leaves elliptic to ovate; blades < 160 × 110 mm, margins dentate along their entire length, the teeth triangular ± 5 × 6 mm, rounded, occasionally with smaller teeth on their margins, apex rounded, base cordate to rounded, finely pubescent with scattered red sessile glands above, indument similar beneath but denser along the veins, and with copious red sessile glands between the veins; petioles < 1/4 the length of the leaf blade, pubescent like the stems, but generally lacking sessile glands. Inflorescence a large pyramidal panicle with few main branches and these lacking spikes on the lowest 1/3 and poorly-branched in the upper 2/3, with few reduced leaf-like bracts; branches densely pubescent like the stems; bracts caducous, ± 2 × 2.5 mm, densely covered with red sessile glands on the outer surface and with a ciliate margin, spikes relatively lax, the terminal spikes (on well-developed inflorescences) > 4 cm (male) or > 8 cm (female) long, internodes 3-6 mm long (male and female). Flowers subsessile. Calyx ± 0.7 mm long, villous and with copious red sessile glands; deeply lobed (to ± 1/2 way), the lobes subequal and acute, fruiting calyx broadly ellipsoid to 1.8 mm long, the lobes

± 0.7 mm long, all gradually curved outwards. Corolla white; tube ± 0.8 (male) or ± 0.5 mm (female) long, glabrous outside pubescent in throat; lobes spreading widely, pubescent like calyx outside (except at margins) and with red sessile glands, glabrous inside; lower lobe ± 1.3 (male) or ± 1.0 mm (female) long, lateral lobes ± 1.0 mm long. Stamens protruding ± 1.8 mm, anthers ± 0.3 mm diameter. Style protruding ± 1.5 mm, lobes ± 0.2 mm (male and female). Nutlets pale brown, ovoid, slightly flattened with apiculate apex ± 0.9 × 0.7 mm.

REMARKS

Tetradenia multiflora is endemic to the highlands of Ethiopia. It is known from rocky places, often growing near rivers at elevations of between 1600 and 1900 m, and is known in flower from September to February.

This species is unique in having a lax female inflorescence with long female spikes (the terminal usually > 8 mm long), and a calyx with subequal lobes – all five lobes are acute and the upper lobe is gradually spreading in fruit. This contrasts with the upper calyx lobes of all other African species of *Tetradenia* which are rounded, substantially larger than the other lobes, and become bent abruptly upwards in fruit. The flowers are small with the male and female of a similar size and the style of male flowers as long as those of the female – suggesting that a gynodioecious condition may prevail, although this has not been confirmed. The overall yellowish indument and the apparent lack of any glandular trichomes are distinctive in this species, and the copious gland dots on many of its parts are notable. These characters serve to distinguish *T. multiflora* from *T. urticifolia*, which is the only other species of *Tetradenia* known from Ethiopia. The latter, which is widespread through east and central Africa, is only known in Ethiopia from the southwestern mountains, a region in which *T. multiflora* is not known to occur.

The collection *Schimper 1688* is represented by excellent specimens seen by Bentham at Kew, with multiple sheets at the Paris Herbarium, and a sheet at Missouri, it is therefore selected as the lectotype. The printed labels of this collection and *Schimper 776* (the paralectotype) bear the name *Plectranthus*

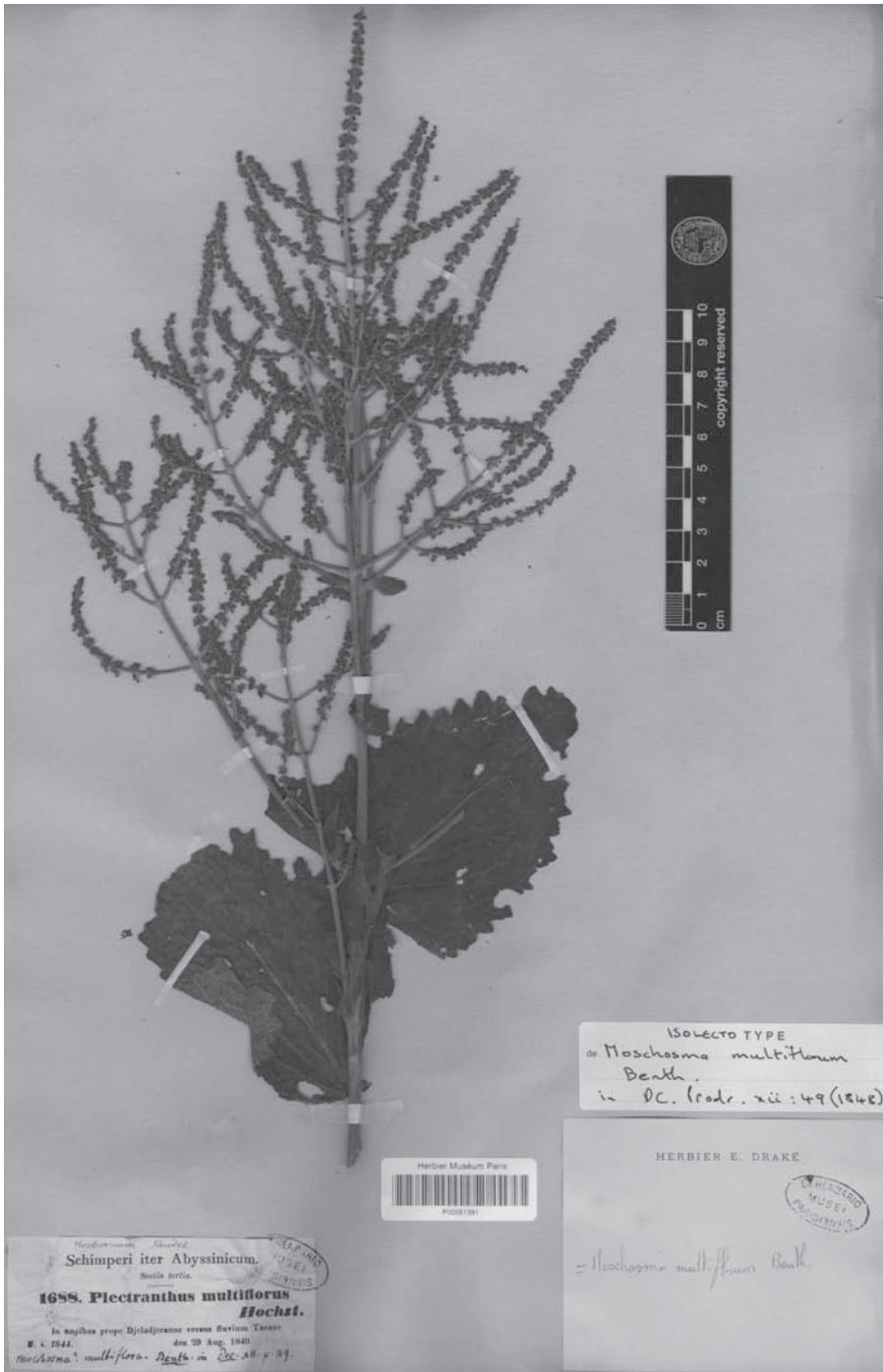


FIG. 2. — *Tetradenia multiflora* (Benth.) Phillipson, scanned image of isolectotype, Schimper 1688 (P), from Djeladjeranne towards the Tacaza River in Ethiopia.

multiflorus Hochst., but this species name was never formally published. The original description of this species was brief, and could easily have referred to a number of the species we currently recognise, and subsequently Bruce (1940) adopted a broad concept of the species. As a result, the name *Iboza multiflora* has been applied widely in East Africa to plants belonging to other species, most commonly to specimens of *T. urticifolia*. However, we regard *Tetradenia multiflora* to be a very distinctive species with a rather restricted distribution, and we have therefore provided a full emended description of it that reflects our current interpretation.

8. *Tetradenia riparia* (Hochst.) Codd

Bothalia 14 (2): 181 (1983); Codd, *Flora of Southern Africa* 28: 114 (1985). — *Moschosma riparium* Hochst., *Flora oder Allgemeine botanische Zeitung* xxviii: 67 (1845). — *Iboza riparia* (Hochst.) N.E. Brown, in Thiselton-Dyer (ed.), *Flora Capensis* v. I. 300 (1910). — Type: South Africa. KwaZulu-Natal, VII.1839, *Krauss 331* (holo-, K!; iso-, M!; MO [2 sheets]!).

Moschosma myriostachyum Benth. & Hook.f., *Genera Plantarum* 2: 1173 (1876). — Type: Malawi, Murchison (Kholombidzo) Falls, VII.1861, *Meller s.n.* (lecto-, K [2 sheets]!), selected here.

SELECTED REPRESENTATIVE MATERIAL. — **Malawi.** Shire Highlands, 6.IV.1906, *Adamson 81* (K, P). — Michiru Hills, Balantyre district, 14.VII.1988, *Banda & Tawakali 3332* (K). — Balantyre, Shiri Highlands, 6.VII.1879, *Buchanan 159* (K). — No locality, 21.X.1905, *Cameron 112* (K, P). — Eldorado Estate, Mlanje, 23.VIII.1960, *Chapman 884* (K). — Southern Region, Mt Mulanje, foot Esperanza Estate, 25.VIII.1986, *Chapman 7995* (K, MO). — Southern Region, Mt Mulanje massif low down the Likhubula Valley, 13.VIII.1987, *Chapman 8780* (K, MO). — Mlanje, Close to Mozambique border, 26.IX.1948, *Faulkner 302* (K 2 sheets). — Nr. Blantyre, Shire Highlands, *Last s.n.* (K). — Murchison Falls, VIII.1861, *Meller s.n.* (K). — Livingston's Zambesi Expedition, VIII.1861, *Meller s.n.* (K). — Mozamballa, Zambesi Expedition, *Waller s.n.* (K). — Mt Chiradzulu, *Whyte s.n.* (K).

Mozambique. No locality, 17.VI.1911, *Dawe 384* (K). — No locality, *Dawe s.n.* (K). — Amalongas, *Honey 742* (K [2 sheets]). — Manica, E. Sofala, foot of Mt Zambe, S of Vila Peru, 15.VI.1959, *Leach 9116* (K). — Manica Sofala, near Vila de Manica, 7.VII.1969, *Leach & Cannell 14250* (K). — Vallée du Muza, 8.VIII.1904, *Vasse*

4 (P). — Vallée du Muza, *Vasse 52* (P).

South Africa. Insuzi Valley between Nkandhla and Ntingwe, 13.VI.1946, *Acocks 12721* (K). — Stanger, 5 miles from Doornkop Sugar Mill, *Archibald 14* (PRE). — 9 km W of Nkandhla nr. Nsuzi river, 13.VI.1946, *Codd 1407* (K). — Transvaal, Soutpansberg, 20.VIII.1955, *Codd 8398* (K). — Prov. Natal, district Umzinta, 9.VII.1955, *Codd 8576* (K). — Natal, Kranskop, between Kranskop and Tugela Bridge, *Compton 19756* (NBG). — Northern Transvaal, Lake Funduzi, mountainside, *Crocker s.n.* (J). — Natal, Nkandla district, Insuzi River valley, *Edwards 1472* (PRE). — Natal, Oribi mountainside near Hell's Gate, *Glen 407* (J). — Natal, Pinetown district, 22.VI.1970, *Hilliard 5060* (K). — Transvaal, Barberton, Plaston, granite outcrops, *Holt 310* (PRE). — Zoutpansberg, near Entabeni, 20.VIII.1930, *Hutchinson & Gillett 4319* (K [2 sheets]). — Bothas Hill, Natal, 3.IX.1930, *Hutchinson 4686* (K). — Natal, Pietermaritzburg, Cato Ridge district, Craigle, *Jacobsen 3334* (49) (PRE). — Transvaal, Pilgrims Rest district, Mala Mala near Skukuza, *Johnson 448* (NBG). — Natal, Port Shepstone, Oribi Gorge, *Johnson 934* (NBG). — Natal, Eshowe, Umhlatuzi Swamp, *Kotze 41* (PRE). — Natal, 27.VI.1957, *Leach 8112* (K, PRE). — Natal, Ifafa, moist ground river bank, *Moss 19003* (J). — Swaziland, Mvungatini, *Murdoch 82* (PRE). — Natal, Echanga, *Noel s.n.* (GRA). — Natal, Weenen district, *Pentz 348* (K, PRE). — Transvaal, Phalaborwa Water Board, 16 km S of Phalaborwa, *Retief 465* (PRE). — Natal, Station Dumisa, 20.VI.1909, *Rudatis 657* (K, P). — Ellesmere, 30.IX.1909, *Rudatis 723* (P). — Natal, Alexandra district, 1.VII.1910, *Rudatis 1048* (K, PRE). — Transvaal, Letaba, Central Hill, Westfalia, *Scheepers 993* (SRGH, PRU). — Inanda Location, 13.VII.1969, *Strey 8758* (K). — Inanda Location, 13.VII.1969, *Strey 8759* (K, PRE, SRGH). — Gibraltar cliffs, 20.VI.1972, *Strey 10967* (K, PRE, SRGH). — Inanda Location, 13.VII.1969, *Strey Dec-23* (K). — Natal, Port Shepstone, Oribi Gorge Nature Reserve, *Vassilatos and Mantell 543* (J). — Natal, Eshowe, *Venter 1675* (PRE). — Natal, Ngotshe district, Lebombo Mountains, Majozini, *Ward 4193* (PRE). — Prov. Zululand, Bartlow Combine, 8.VII.1960, *Ward Jun-09* (K). — Inanda, Natal, *Wood 141* (K). — Natal, VIII.1886, *Wood 1001* (K, P). — Natal, 1.VII.1908, *Wood s.n.* (P). — Natal, Durban, *Wood 43198* (SAM).

Swaziland. Manzini, Bulunga Point, forest margin, *Compton 32116* (PRE). — Utondozi, 11.VII.1957, *Compton 26962* (K). — Hlatikulu, Mamitu River, *Compton 27950* (PRE). — Mankaiana, Filmeront, riverside bush, *Compton 28920* (PRE). — Ingwavuma Poort, 18.VII.1960, *Compton 30095* (K). — Mankaiana, Ntondozi, 27.VI.1963, *Compton 31652* (K, PRE). — Hlatikulu, *Pierce 53* (PRE).

Zimbabwe. No locality, IX.1930, [*van Sow*] 28924 (K). — Salisbury district, 15.VII.1974, *Biegel 4514* (K). — Salisbury, 22.IX.1974, *Biegel 4629* (K). — Salisbury district,

15.VII.1974, *Biegel 4805* (K). — Chimanmani Mountains, 22.VIII.1966, *Bisset CH3* (K). — Above Mutare on road to Vumba Mountain, 3.VIII.1988, *Carter & Coates-Palgrave 2131* (K). — Inyanga, Hondi Valley, *Chase 1595* (K). — Umtali, Christmas Pass, 17.IX.1948, *Chase 1624* (K). — Inyanga district, 4.VIII.1950, *Chase 2854* (K). — Umtali district, 18.VIII.1953, *Chase 5055* (K, MO). — Wuton Farm, Odzi River, Umtali district, 29.VII.1970, *Chase 8616* (K, MO). — Driespanberg Pass between Chipinga and Birchenough Bridge, 17.IX.1975, *Plowes 7149* (K). — Melsetter district, Bridal Veil Falls, near Melsetter village, 21.IX.1960, *Rutherford-Smith 132* (K). — Chirinda Rhodesia, 24.XI.1905, *Swynnerton 244* (K). — No locality, IX.1930, *Van Sow 28924* (K).

EMENDED DESCRIPTION

Dioecious shrub 2(-3) m tall, with indument of long (0.8-1.5 mm) eglandular and short to medium (0.1-0.5 mm) glandular trichomes. Stems sparsely hispid with mainly glandular and scattered eglandular trichomes; longer eglandular trichomes present at the nodes. Leaves triangular to ovate; blade up to 100 × 75 mm, serrate to the base, teeth oblique triangular, ± 5 × 6 mm, apex acute, base cordate to truncate, hispid at first, but becoming sparsely hispid or nearly glabrous with short glandular and long eglandular trichomes above, similar beneath, but denser along the midrib, veins and margins and sometimes with sparse honey-coloured sessile glands; petioles *c.* 1/2 as long as the leaf blade; hispid like the stems. Inflorescence often very large, especially the male, branches sparsely hispid like the stems; bracts somewhat persistent, *c.* 2 × 1 mm, finely and sparsely glandular hispid on the outer surface and the margins, spikes very lax (male) or dense (female), the terminal spikes (on well-developed inflorescences) usually > 8 (male) or *c.* 1.5 cm (female) long, internodes > 4 (male) or ± 1 mm (female) long. Male flowers long pedicellate (> 0.7 mm); female flowers short pedicellate (0.3 mm). Calyx *c.* 0.7 (male) or 0.6 mm (female) long, sparsely and finely hispid, sometimes with scattered pale yellow or honey-coloured sessile glands, the lobes often tinged white to purple; fruiting calyx to 2.2 mm, lobes 0.7 mm long. Corolla broadly funnel-shaped, usually pale lilac, mauve or occasionally white, sparsely and finely pubescent outside; corolla tube narrow at the base and expanding abruptly beyond the calyx mouth, ± 1.6 (male) or 1.1 mm (female)

long, with a ring of long hairs in the throat; lobes slightly spreading, glabrous inside and sparsely pubescent outside, sometimes with scattered sessile glands; lower lobe 1.8 (male) or 0.8 mm (female) long; lateral lobes shorter. Stamens with purple anthers. Style branched purple. Nutlets ellipsoidal ± 0.75 × 0.35 mm.

REMARKS

Tetradenia riparia occurs from the eastern parts of South Africa as far south as the KwaZulu-Natal South Coast, northwards through Swaziland, southern Mozambique and eastern Zimbabwe as far north as southern Malawi, from near sea-level in the south of its range to about 1500 m asl further north. Flowering is recorded mainly from May to September. The range of *T. riparia* overlaps with those of a number of other species (*T. bainesii*, *T. brevispicata* and *T. galpinii*), but it generally occurs at lower elevations or in more humid habitats. Within the genus, it represents the extreme in dimorphism between the male and female flowers and inflorescences.

Male plants in flower are easy to distinguish from those of any other species because of the relatively large flowers on long pedicels borne in large, lax inflorescences. The corolla of the male flowers is also a distinctive shape: it is broadly funnel-shaped, with the tube expanding abruptly beyond the calyx mouth from the narrow base, whereas in other species the corolla tube expands much more gradually from the base. Specimens lacking male flowers are sometimes difficult to place with certainty, but the species does have a unique suite of vegetative characters. *Tetradenia riparia* is most similar to *T. galpinii*, and apart from the characteristics of the male inflorescences mentioned above, the two taxa can be distinguished by their stem indument, comprised of mainly glandular trichomes in *T. riparia* and a more equal mixture of glandular and eglandular trichomes in *T. galpinii*, and by the petioles being generally ± 1/2 as long as the leaf blades in *T. riparia* as compared with ± 1/3 as long in *T. galpinii*.

The relatively narrow concept of *T. riparia* adopted here contrasts with that of Codd (1983). He interpreted this species as highly variable and widespread

in distribution – extending from South Africa to Ethiopia, and he placed most of the previously described taxa from Africa into synonymy under this species. Codd (1985) noted that his concept of *T. riparia* “includes a good deal of variation in leaf size, shape and pubescence but no pattern emerges and so infraspecific taxa are not upheld”. We disagree with this view, and believe that patterns of variability do exist, and that these are correlated with eco-geographical distribution. Furthermore, coherent entities can be defined on this basis, which are appropriately placed at the species level. Consequently we have redefined *T. riparia*, and we segregate six additional species. Four of these already have available epithets: *T. bainesii*, *T. galpinii*, *T. multiflora* and *T. urticifolia*, and two others are described as new species: *T. discolor* and *T. tanganyikae*.

The name *Moschosma myriostachya* Benth. has generally been equated with *T. riparia* in the literature. It is based on two syntypes, both collected in Malawi by C. J. Meller during Livingstone’s Zambezi Expedition. The first, collected in August 1861 at Murchison (Kholombidzo) Falls, is a male specimen of *T. riparia*; the second, collected in September 1861 at Mount Chiradzulu (Zomba Peak), is a female specimen of *T. discolor*. We select the former as the lectotype of *M. myriostachya* because it is well-preserved and copious (it is mounted on two separate sheets at Kew), and so that the name will continue to fall into synonymy under *T. riparia*. Selecting the other syntype would make the name *M. myriostachya* available for the new species described here as *T. discolor*, but this could lead to confusion.

Plants of *T. riparia*, most commonly males, are cultivated as garden ornamentals in many tropical and subtropical countries, including in a number of African countries outside of its natural range.

9. *Tetradenia tanganyikae* Phillipson, sp. nov.
(Fig. 3)

Frutex indumento sparso, inflorescentiis-masculis densis, differt a Tetradenia urticifolia floribus majoribus et indumento brevi.

TYPUS. — Zambia. Abercorn district, Ndundu, 1740 m, Richards 12917 (holo-, K!).

PARATYPES. — Malawi. *Brachystegia* woodland, 24.VII.1946, Brass 16909 (K, MO). — Kabumba River, 22 km S of Engucwini in road from Rumpi to Kafukule, 6.VII.1970, Brummitt 11838 (K). — North end of Nyika Plateau and adjacent area, 10.VIII.1972, Brummitt & Synge WC190 (K). — No locality, Pawek 3629 (K). — Nkhata Bay at Chikale Beach, 13.VIII.1972, Pawek 5640B (K). — Masuku Plateau, Whyte, 300 (K).

Tanzania. No locality, 1.VIII.1965, Beecher 50 (K). — Rungwe district Tukuyu, 20.VII.1932, Davies (K). — Dept. of Agriculture, 10.IX.1932, Davies D.222 (K). — 1.V.1935, Emson 393 (K). — S Highlands Province, 11.XII.1932, Geilinger 2162 (K). — Iringa Prov.-Mbozi, 30.VIII.1933, Greenway 3642 (K). — Kwirowi, 1.VII.1960, Haerdi 565/0 (K). — Nr. Pasagulu 10 m N of Kasogi, 6.VIII.1959, Harley 9173 (K). — Nr. Pasagulu, 10 m N of Kasogi, 7.VIII.1959, Harley 9197 (K). — Kabesi, 4.IX.1958, Jefford T.G. & Newbould 2328 (K). — Mpanda district, Mahali Mts Nr Kasangazi, 24.VII.1958, Juniper & Jefford 226 (K). — Mbeya Mountain Range, 16.VI.1999, Kayombo 2381 (K, MO). — Loweau plateau (?) N of Lake Leyessa [? illegible notes, just a guess], Lawson, Oct-80 (K). — Ufipa, on escarpment, near Muburu River, Ruhwa Rift valley, growing next to river, 3.XII.1936, Lee L.V.10 (K). — Iringa Region, Nr. Milo, 3.IX.1986, Linder 3860 (K). — Pungaluma Hills above Mshewe Village, 20.XII.1989, Lovett & Kayombo 3390 (K, MO). — Kasangazi, Kigoma district, 30.VII.1958, Mahinde 186 (K). — Mahali Mountains, Ujamba, 23.VIII.1958, Newbould & Jefford 1734 (K). — Kasieha Valley, Mahali Mountains, 20.VII.1959, Newbould & Harley 4504 (K). — Kungwe Mountain Selimweguru, 24.VII.1959, Newbould & Harley 4611 (K). — Ruhudje, 26.VIII.1931, Schlieben 1142 A (K, P). — Bergwesene, 24.IX.1910, Stolz 295 (K).

Zambia. Fort Jameson, 1.VI.1958, Fanshawe 4560 (K). — Abercorn-Tunduma Road, 70 miles towards Tunduma, 5.VIII.1949, Greenaway 8377 (K). — Nr Abercorn, on the slopes of Sunzu, 1.VI.1955, Lawton 215 (K). — Ndcondu, 12.IX.1969, Sanane 946 (K, P). — Without locality, Modesty Sanane 947 (K [2 sheets]; P).

DESCRIPTION

Dioecious aromatic (citronella-scented) shrub 1.5–5 m tall; with white or colourless indument of mainly short (± 0.1 mm) and long (± 1 mm) eglandular and medium (± 0.3 mm) glandular trichomes. Stems brown, the scars of fallen leaves hardly raised, hispid with patent medium-length glandular and also usually long eglandular trichomes, and a ring of longer (± 1.5 mm) eglandular trichomes at the node. Leaves ovate; blades $< 150 \times 110$ mm, margins shallowly serrate to crenate along their entire length, the teeth



FIG. 3. — *Tetradenia tanganyikae* Phillipson, scanned image of holotype, Richards 12917 (K), from Ndundu in Mbala (Abercorn) district at 1740 m in Zambia.

broadly triangular $\pm 4 \times 8$ mm, shortly rounded or pointed, occasionally with smaller teeth on their margins, apex acute, base rounded, sparsely pubescent with medium-length glandular and eglandular trichomes above, sparsely woolly with matted long fine eglandular trichomes present mainly near the veins, and with scattered pale honey-coloured sessile glands beneath; petioles $\pm 1/2$ the length of the leaf blade, hispid like the stems. Inflorescence often very large, branches moderately to densely villous with mainly medium-length glandular trichomes; bracts caducous, $\pm 1 \times 1.5$ mm, moderately and rather evenly pubescent with short eglandular trichomes on the outer surface and the margins, spikes dense, the terminal spikes (on well-developed inflorescences) usually > 3 (male) or > 1.5 cm (female) long, internodes $\pm 2-3$ (male) or 1 mm (female) long, the axes somewhat or completely hidden by the flowers at anthesis. Flowers subsessile to shortly (< 0.3 mm) pedicellate. Calyx $\pm 0.5 \times 0.6$ mm (male) or 0.8×0.7 mm (female), pubescent with short trichomes and with copious pale yellow sessile glands, lateral sepal-pairs shortly divided, fruiting calyx ellipsoid ± 2 mm long, lobes ± 0.3 mm long. Corolla white, or (less commonly) pink; tube glabrous in throat, pubescent outside, ± 1.2 (male) or 1.4 mm (female) long; lobes slightly spreading, glabrous inside and pubescent outside (except at margins), lower lobe ± 1.2 (male) or ± 0.6 mm (female) long, lateral lobes shorter. Stamens protruding ± 2 mm, anthers ± 0.3 mm diameter, pink. Style ± 2.2 mm long, purple, drying honey-coloured, lobes ± 0.7 (female) or 0.2 mm (male) long. Nutlets yellow-brown, narrowly ellipsoidal, $\pm 0.8 \times 0.3$ mm.

REMARKS

Tetradenia tanganyikae is confined to the mountains of southwestern Tanzania, northern Malawi and adjacent parts of Zambia, with many of the known specimens collected in Tanzania near to Lake Tanganyika. The species is known from forest, woodland and bushland, mainly along streams and rivers between 1200-2000 m asl, and it is sometimes cultivated locally as a hedge. It has been recorded in flower from May to November. Label data on several collections report that the plant has a scent of "citronella", but at least one reports "unscented leaves".

This new species can be distinguished from all other members of the genus by the combination of dense male and female inflorescences, relatively short sparse indument on its stems and leaves, and medium-sized flowers, larger than those of *T. urticifolia*, a species that also occurs in Tanzania and with which it could be confused.

10. *Tetradenia urticifolia* (Baker) Phillipson, comb. nov.

Moschosma urticifolium Baker in Thiselton-Dyer (ed.), *Flora of Tropical Africa* v: 353 (1900). — *Iboza urticifolia* (Baker) E.A. Bruce *Kew Bulletin* 1940 (2): 66 (1940). — Type: Tanzania. Kilimanjaro, 1800 m, *H.H. Johnson s.n.* (holo-, K!).

Tetradenia riparia (Hochst.) Codd *sensu* Codd, *Bothalia* 14 (2): 181 (1983); *Flora of Southern Africa* 28: 114 (1985) *pro parte*.

SELECTED REPRESENTATIVE MATERIAL. — **Burundi.** Muramvya, Teza, 2100 m, 14.VI.1981, *Reekmans 10699* (ETH, K).

Democratic Republic of the Congo. Haut-Zaire, Ituri, env. de Nduye, Mont Mukonza, rochers, 5.I.1970, *Lisowski 41567* (ETH, K). — Entre Bukeye et Musemerse, 25.V.1926, *Robyns 2326* (ETH, K). — Massif du Ruwenzori, versant ouest, 1.VII.1929, *Humbert 8877bis* (K, P).

Ethiopia. About 15 km, from Jimma Gebessa, 18.VIII.1967, *Ebba 546* (K). — Kaffa prov. SE of Folla, some 15 km N of Ghibe-bridge, 2.XII.1970, *Friis et al. 541* (ETH, K). — 47 km N of Mega on road to Agere Mariam and Dilla, 9.VI.1988, *Gilbert & Sebsebe 8827* (ETH, K).

Kenya. Olchoro Onyore, in valley by river rocky grassland, *Leakey 188* (K). — W of Lake Nakuru at the cliffs. Growing in the middle of rocks in a poor soil, *Mwangangi 143* (EA, K). — District around Nyeri, Leikipia Plateau and Aberdare Range, *Scoresby-Routledge s.n.* (K). — NW of the Ngong Hills on a track to the Kedong Valley and Suswa Mtn, *Greenway 13096* (EA, K). — Naivasha district, lava crags, c. 1 km S of Gilgil-Elmenteita Rd, open bushland, *Gillett 20069* (K).

Rwanda. Loba, Terr. Astrida, VII.1933, *Becquet 704* (ETH, K).

Sudan. Kinyeti Valley, above Katire, 24.III.1982, *Friis & Volleson 1302* (ETH, K). Gebel Kacha 10 miles S of Yei, 2.XII.1937, *Myers 7959* (ETH, K).

Tanzania. Coast of Speke Gulf, Lake Victoria, Nr Mwanza, 31.V.1931, *Burt 2499* (EA, K). — E Usambara Mountains, Kisiwani Village, 30.VI.1997, *Rajabu Hizza 27* (K, MO, NHT). — Arusha town (cultivated), *Phillipson*

5017 (GRA, K, MO, NHT, P). — Kymbila district, North of Lake Nyasa, 24.IX.1910, *Stolz* 295 (K).
Uganda. Kisoro, Kigezi, VI.1939, *Purseglove* 749 (K). — Ruwenzori, 7.III.1905, *Scott-Elliot* 7879 (K). — Victoria, Nyanza region, 14.VII.1914, *Maitland s.n.* (K). — Sukulu Hills, Budama, VIII.1939, *Dale* 34 (K). — About 14 miles S of Kotido, on southern summit of Toror, near survey beacon, 14.IX.1950, *Dawkins* 634 (K).

REMARKS

Tetradenia urticifolia occurs in an area of East and Central Africa centered on Uganda. It has also been recorded from Burundi, Rwanda, eastern Democratic Republic of the Congo, northern Tanzania, Kenya, southeastern Sudan and southwestern Ethiopia. The species is known from forest margins, woodland and bushland, mainly on rock outcrops and among large granitic, quartzitic or volcanic boulders, also from near human habitation and cultivated land where it is sometimes cultivated locally as a hedge, from between 1200 and 2150 m asl. *Tetradenia urticifolia* has been recorded in flower in all months from May to January. It does not appear to be sympatric with any other species of *Tetradenia*, and it is the only species currently known from Kenya, Rwanda, Burundi, Uganda and Sudan.

Tetradenia urticifolia can be recognised by its large coarsely-toothed leaves and long dense racemes in both male and female plants of tiny white or pale mauve-pink flowers, which largely hide the inflorescence axes. There is variation in this species with regard to the density of the indument, especially that of the inflorescence and the lower surface of the leaves. Plants from exposed rocky sites have a denser indument and have more numerous sessile glands on the calyx than those from shadier, more protected sites and from vigorous cultivated plants. Some specimens from Uganda have occasional branched trichomes, a character not noted in any other African species, but characteristic for several Malagasy species.

INDEX TO SPECIES

Accepted names in bold print.

Basilicum multiflorum (Benth.) = ***Tetradenia multiflora*** (Benth.) Phillipson
Iboza bainesii N.E.Br. = ***Tetradenia bainesii*** (N.E.Br.) Phillipson & C.Steyn

Iboza barberae N.E.Br. = ***Tetradenia barberae*** (N.E.Br.) Codd
Iboza brevispicata N.E.Br. = ***Tetradenia brevispicata*** (N.E.Br.) Codd
Iboza galpini N.E.Br. = ***Tetradenia galpinii*** (N.E.Br.) Phillipson & C.Steyn
Iboza multiflora (Benth.) E.A.Bruce = ***Tetradenia multiflora*** (Benth.) Phillipson
Iboza riparia (Hochst.) N.E.Br. = ***Tetradenia riparia*** (Hochst.) Codd
Iboza urticifolia (Baker) E.A.Bruce = ***Tetradenia urticifolia*** (Baker) Phillipson
Moschosma multiflorum Benth. in DC. = ***Tetradenia multiflora*** (Benth.) Phillipson
Moschosma myriostachyum Benth. & Hook.f. = ***Tetradenia riparia*** (Hochst.) Codd
Moschosma riparium Hochst. = ***Tetradenia riparia*** (Hochst.) Codd
Moschosma urticifolium Baker = ***Tetradenia urticifolia*** (Baker) Phillipson
Plectranthus multiflorus Hochst. = ***Tetradenia multiflora*** (Benth.) Phillipson
Tetradenia bainesii (N.E.Br.) Phillipson & C.Steyn
Tetradenia barberae (N.E.Br.) Codd
Tetradenia brevispicata (N.E.Br.) Codd
Tetradenia discolor Phillipson
Tetradenia galpinii (N.E.Br.) Phillipson & C.Steyn
Tetradenia kaokoensis van Jaarsv. & A.E.van Wyk
Tetradenia multiflora (Benth.) Phillipson
Tetradenia riparia (Hochst.) Codd
Tetradenia tanganyikae Phillipson
Tetradenia urticifolia (Baker) Phillipson

Acknowledgements

We wish to acknowledge the work of the many botanists who have collected specimens of *Tetradenia* in Africa, without whom our research would not have been possible. We also thank the directors and curators of the following herbaria for access to their collections: DSM, EA, ETH, GRA, J, K, KEI, MAL, MO, NBG/SAM, NHT, P, PRE, PRU, SRGH and TFD, and to the Royal Botanic Gardens Kew and the Muséum national d'Histoire naturelle, Paris for permission to reproduce images of certain type specimens. We are grateful to the Botany Department, Rhodes University, for the opportunity to conduct part of this research while we were both based there, and to our present employers. Thanks go also to Pete Lowry and Alan Paton for their helpful suggestions and corrections to an earlier version of this paper.

REFERENCES

- BENTHAM G. 1830. — *Edward's Botanical Register* 15: 270 p., pls 1217-1305 (dated 1829, published 1830).
- BRUCE E. A. 1940. — Labiatae, in ANONYMOUS, Tropical African Plants: XVIII. *Kew Bulletin* 1940 (2): 65-66.
- CAMPBELL W. E., GAMMON D. W., SMITH P., ABRAHAMS M. & PURVES T. D. 1997. — Composition and anti-malarial activity *in vitro* of the essential oil of *Tetradenia riparia*. *Planta Medica* 63 (3): 270-272.
- CODD L. E. 1983. — The genus *Tetradenia* Benth. (Lamiaceae). I. African species. *Bothalia* 14 (2): 177-183.
- CODD L. E. 1984. — The genus *Tetradenia* Benth. (Lamiaceae). II. Malagasy Republic. *Bothalia* 15 (1-2): 1-6.
- CODD L. E. 1985. — *Tetradenia* (Lamiaceae), in LEISTNER O. A. (ed.), *Flora of Southern Africa*. Botanical Research Institute, Pretoria: 113-116.
- HARLEY R. M., ATKINS S., BUDANTSEV A., CANTINO P. D., CONN B., GRAYER R. J., HARLEY M. M., DE KOK R., KRESTOVSKAJA T., MORALES A., PATON A. J., RYDING O. & UPSON T. 2004. — Labiatae, in KADEREIT J. W. (ed.), *The Families and Genera of Vascular Plants*, VII (*Lamiales*). Springer, Berlin: 1-478.
- JOHNSON C. F. 1995. — *A Taxonomic Revision of the Genus Tetradenia in Southern Africa*. Unpublished BSc Honours Dissertation, Rhodes University, South Africa, 44 p.
- JOHNSON C. F. & PHILLIPSON P. B. 1999. — Reproductive biology of *Tetradenia* Benth. (Lamiaceae), in TIMBERLAKE J. & KATIVU S. (eds), *African Plants: Biodiversity, Taxonomy and Uses*. Royal Botanic Gardens, Kew: 97-104.
- PHILLIPSON P. B. in press. — *Tetradenia* (Labiatae), in BEENTJE H. J. & GHAZANFAR S. A. (eds), *Flora of Tropical East Africa*. Royal Botanic Gardens, Kew.
- PHILLIPSON P. B. & HEDGE I. 1998. — *Tetradenia* Benth., in HEDGE I., CLEMENT R. A., PATON A. J. & PHILLIPSON P. B. (eds), *Lamiacées. Flore de Madagascar et des Comores* 175. Muséum national d'Histoire naturelle, Paris: 70-94.
- VAN JAARSVELD E. J. & VAN WYK A. E. 2003. — Lamiaceae: *Tetradenia kaokoensis*, a new species from Kaokoland, Namibia. *Bothalia* 33 (1): 107-108.
- VAN WYK A. E. & SMITH G. F. 2001. — *Regions of Floristic Endemism in Southern Africa. A Review with Emphasis on Succulents*. Umdaus Press, Pretoria, 199 p.

Submitted on 31 January 2007;
accepted on 9 November 2007.