Nordic Journal of Botany 27: 305–312, 2009
doi: 10.1111/j.1756-1051.2009.00415.x,

Subject Editor: Ib Friis. Accepted 6 March 2009

Synopsis of the genus *Mitriostigma* (Rubiaceae) with a new monocaulous species from south Cameroon

Bonaventure Sonké, Murielle Simo and Steven Dessein

B. Sonké and M. Simo, Plant Systematic and Ecology Laboratory, Higher Teacher's Training College, Univ. of Yaounde I, PO Box 047 Yaounde, Cameroon. – S. Dessein (dessein@br.fgov.be), National Botanic Garden of Belgium, Domein van Bouchout, BE–1860 Meise, Belgium.

Mitriostigma monocaule Sonké & Dessein sp. nov., a new Rubiaceae species from south Cameroon is described and illustrated. The novelty is easily separated from the other four *Mitriostigma* species by its monocaulous growth form, the other species being shrubs, sub-shrubs, or occasionally trees. Another typical character for the species is its supra-axillary inflorescences paired at the nodes. The novelty is related to *M. barteri*, from which it further differs in the somewhat larger leaves with a more pronounced acumen and a higher number of secondary veins. A first conservation status for the species is given. A synopsis of the genus *Mitriostigma* with a taxonomic key is also provided.

Mitriostigma Hochst. is an exclusively African genus of the family Rubiaceae comprising four species. *Mitriostigma axillare* Hochst., the type species of the genus, ranges from south Africa to Mozambique and probably also occurs in Tanzania. *Mitriostigma usambarense* Verdc. and *M. greenwayi* Bridson are endemic to Tanzania and Kenya, respectively, and *M. barteri* Hook. f. ex Hiern occurs in Equatorial Guinea (Bioko) and Cameroon (Verdcourt 1987).

Mitriostigma was established by Hochstetter in 1842 and its name refers to the mitre-shaped stigma observed in *M. axillare*. Traditionally, the genus has been included in the tribe Gardenieae (Keay 1958, 1963, Robbrecht 1988), position confirmed by recent molecular studies (Andreasen and Bremer 1996, 2000, Robbrecht and Manen 2006). *Mitriostigma* is closely related to *Oxyanthus* from which it mainly differs in the shorter corolla tubes, the apiculate anthers, and the winged stigmatic clubs (though presumably absent in *M. usambarense*) (Bridson 1979, Verdcourt 1987).

During recent botanical inventory work in south Cameroon the first two authors encountered an unusual *Mitriostigma*: a monocaul, i.e. single-stemmed, dwarf with supra-axillary inflorescences paired at the nodes, and with pinkish ovaries and calyces. This collection did not match any of the species known in the genus (Keay 1963, Verdcourt 1987, Bridson 1988), or any other specimen of *Mitriostigma* stored in herbaria. Our specimens resemble *M. barteri* in having campanulate corollas and ovoid to sub-fusiform fruits. However, it differs from all species known in the genus by its monocaul growth form and the supra-axillary inflorescences paired at the nodes. We therefore here propose a new species, i.e. *Mitriostigma monocaule*. In addition, as there is no document dealing with all the *Mitriostigma* species, we include a synopsis of the genus.

Material and methods

Mitriostigma monocaule sp. nov. was collected by B. Sonké and M. Simo in March 2008. Herbarium material of *M. axillare*, *M. barteri*, *M. greenwayi* and *M. usambarense* was consulted at BR, BRLU, K, SCA, WAG and YA. The distribution maps are based on the specimens of the above herbaria complemented with localities listed in Tropicos (<www.tropicos.org>, accessed 30 Jan 2009). Measurements, colours and other details given in the descriptions are based on living material, spirit and herbarium specimens, and data derived from field notes.

Phytogeographical considerations follow White (1979, 1983). Descriptive terminology for simple symmetrical plane shapes follows Anonymous (1962).

Mitriostigma monocaule Sonké & Dessein sp. nov. (Fig. 1–4)

Mitriostigmati barteri Hook. f. ex Hiern affinis sed ab illa habitu monocauli (versus frutescenti et ramoso), nervorum secundariorum numero ab utroque latere 8–12 (versus 6–9) atque inflorescentiis supra-axillaribus in paribus oppositis (versus pseudo-axillaribus) differt.

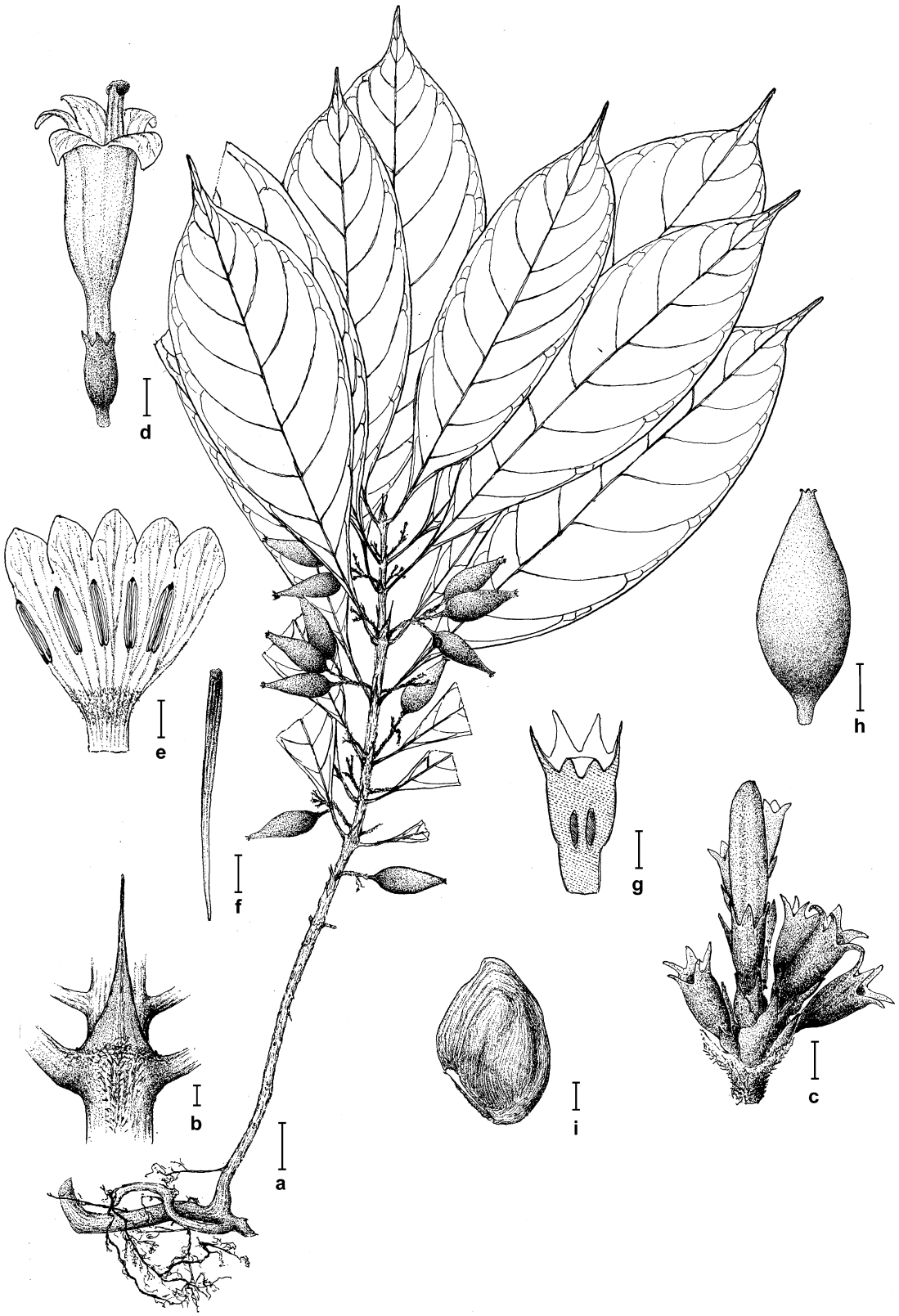

Figure 1. *Mitriostigma monocaule* Sonké & Dessein sp. nov. (a) fruiting stem with supra-axillary infrutescences, scale bar = 1 cm, (b) stipule and part of the stem showing the supra-axillary position of the inflorescence, scale bar = 1 mm, (c) detail of inflorescence, scale bar = 2 mm, (d) calyx, corolla and exserted stigma, scale bar = 2 mm, (e) corolla opened out, scale bar = 2 mm, (f) style, scale bar = 2 mm, (g) longitudinal section of ovary, scale bar = 1 mm, (h) fruit, scale bar = 5 mm, (i) seed, scale bar = 1 mm.

Figure 2. (a) fruiting stem with supra-axillary infrutescences of *Mitriostigma monocaule* Sonké & Dessein sp. nov., (b) side view of open flower and successive fruiting nodes, (c) side view of floral bud and fruit.

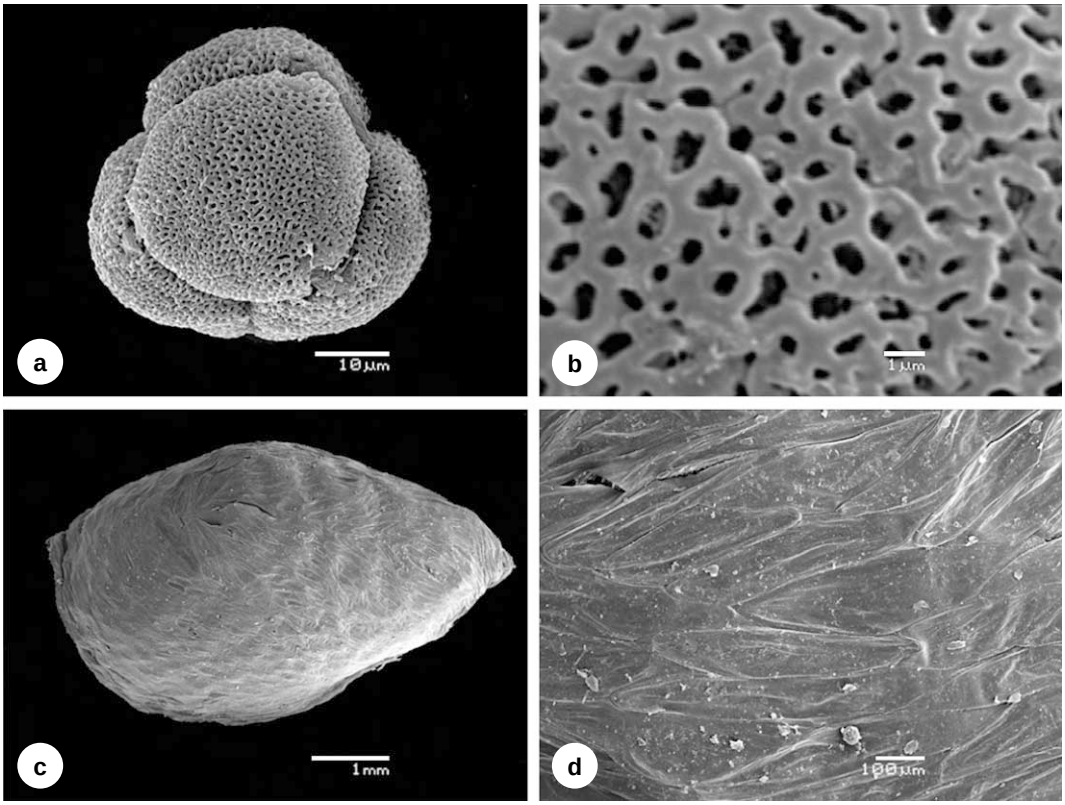

Figure 3. Pollen and seed morphology of *Mitriostigma monocaule* Sonké & Dessein sp. nov. (a) polar view of triporate pollen grain in tetrad, (b) detail of apocolpium showing (micro)reticulate sexine, (c) overview of seed, (d) detail of exotesta cells.

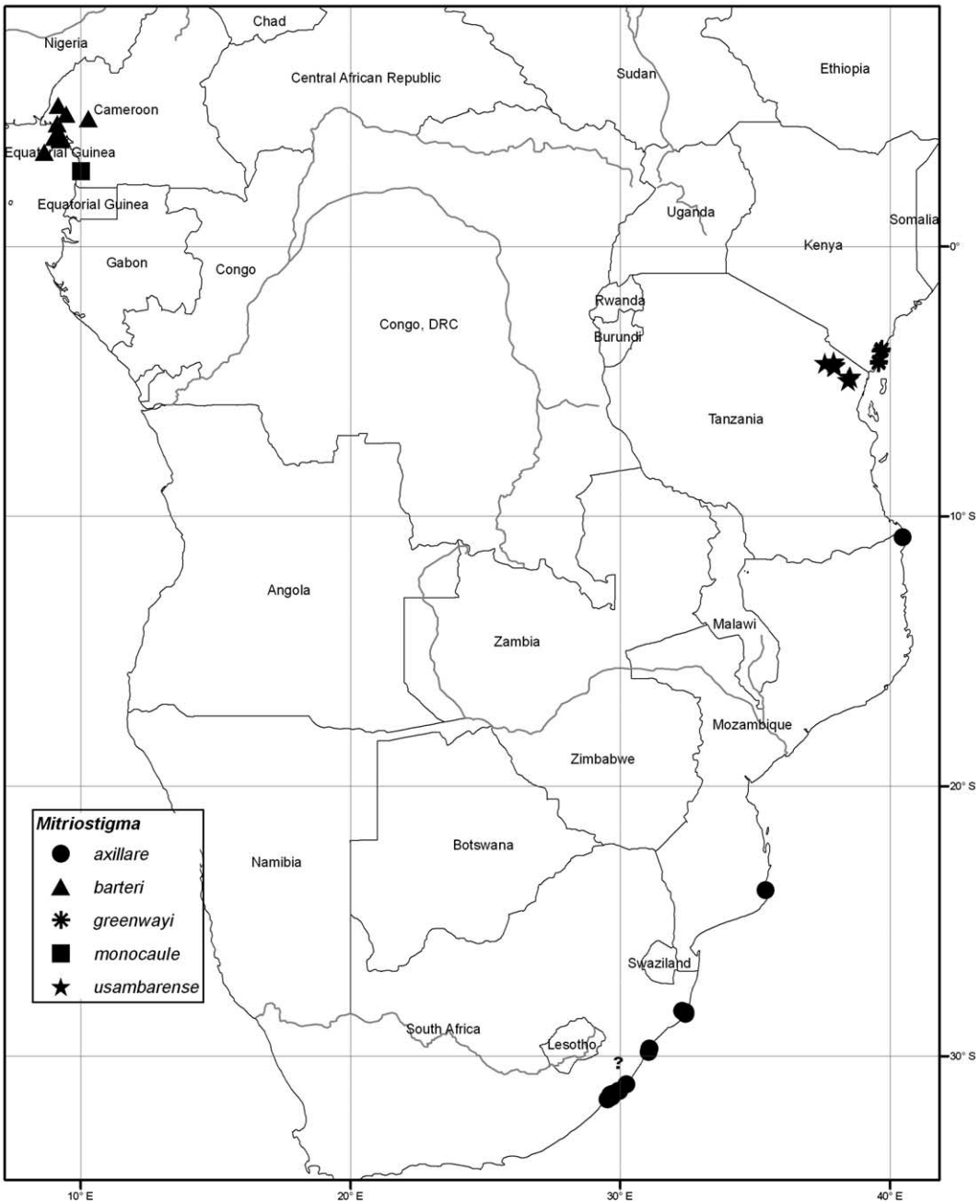

Figure 4. Distribution of *Mitriostigma* species (? = uncertain locality for *M. axillare* based on Bisset s. n. (K): Umzumkulu (? = Umzimkulu)).

Type: Cameroon, south province, Elephant Mountains, 18 Mar 2008 (fl., fr.), Sonké and Simo 4742 (holotype: BR, isotypes: BR, BRLU, K, MO, P, WAG, YA).

Woody monocaul dwarf, 20–30 cm tall, internodes very short. Stems 3–6 mm in diameter; bark brown, sparsely hairy when young, becoming glabrous with age. Stipules persistent, ovate–triangular, at the base protruded into an awn, 6.5–12 mm long (including 4–6 mm long awn), 3–4 mm wide at the base, puberulous outside. Leaves decussate; petiole 13–18 mm long, sparsely hairy when young; leaf blades obovate, 11–19 × 3.5–6.5 cm; apex acuminate with acumen (10–) 13–17 (–20) mm long; base attenuate; leaf surface glabrous above and underneath; mid-vein prominent below, slightly prominent above; secondary veins brochidodromous, prominent below, 8–12 on each side of the midrib, ascending, straight to slightly curved at the base, strongly curved at the margin to join with the adjacent vein; intersecondary veins forming a dense reticulate network; domatia absent. Inflorescences supra-axillary and paired at the nodes, shifted ca 2 mm above the nodes, 2–10-flowered, peduncle sparsely pubescent. Flowers 5-merous, pedicels often pink, 2.5 mm long; bracts and bracteoles often pink, triangular to narrowly triangular, sparsely pubescent particularly at the margin. Corolla buds pink with contorted aestivation to the left. Calyx pink; calyx tube ca 0.3 mm; calyx lobes subequal, triangular, 0.6–1.2 mm long, very sparsely pubescent

or glabrous. Corolla campanulate, cream–white with pink stripes and dots; corolla tube 10.5–12.0 mm long, glabrous outside, with a zone of hairs of ca 2 mm just below the enlarged part of the tube inside; corolla lobes ± elliptic, 3.5 × 2.9 mm. Anthers entirely included, basifixed, attached ca 7 mm from the base of the corolla tube, ca 4.5 mm long including a 0.1–0.2 mm long sterile appendix. Pollen 3-porate, dispersed as tetrads; sexine (micro-)reticulate. Ovary 2-locular, glabrous or sparsely pubescent; disc cylindrical, surrounding the base of the style. Style exserted, ca 15 mm long; stigma lobes ca 0.6 mm long. Fruits ovoid to sub-fusiform, crowned by persistent calyx lobes, 19–28 × 5–9 mm, orange at maturity, glabrous. Seeds 4–9 per fruit, 5.3–7.3 × 3.2–5 mm; seed-coat with fine narrow reticulations.

Distribution, habitat and ecology

Mitriostigma monocaule occurs in the Lower Guinean subcentre of endemism (White 1979), and is restricted to the region of south Cameroon (Fig. 4). The area from which *M. monocaule* is known, supports a closed-canopy evergreen forest with many epiphytes and a rich herb layer, which can be classified as Biafran evergreen forests, rich in Caesalpiniaceae (Letouzey 1985).

Phenology

Flowering and fruiting in March.

Conservation status

Data sparse. On the evidence available, *M. monocaule* is highly localized, being known only from the southern edge of the Elephant Mountains. So far, it is known from just one site and one single population. This is despite the fact that the species is highly conspicuous in flower and fruit and the fact that two of us have made several lengthy visits to the Elephant Mountains over recent years. We hope that more populations and new sites for *M. monocaule* will be located in the future. Given its apparent rarity, *M. monocaule* may be a suitable subject for a propagation and reintroduction scheme.

Etymology

The epithet '*monocaule*' refers to the monocaulous life-form of the plant (below).

Diagnostic characters and relationships

Floral and seed morphology clearly place the novelty within *Mitriostigma*. As in the other *Mitriostigma* species, the corolla is relatively short and ± campanulate or cylindrical and widened at the apex, and the seeds are rounded to angular but not strongly compressed. This is in contrast with the species of the sister genus *Oxyanthus*, which are characterized by long cylindrical corollas and strongly compressed seeds. *Mitriostigma monocaule* takes a rather isolated position within the genus as it has a unique combination of character states (Table 1). With *M. usambarense*, the new species shares the supra-axillary position of the inflorescences, the relatively short corolla lobes compared to the length of the corolla tube, and the included anthers. However, the leaves of *M. usambarense* are much smaller, the inflorescences are solitary at the nodes, the corolla tube is longer and only widened at the throat, and the fruits are ellipsoid not ovoid to sub-fusiform.

With *M. greenwayi* it shares the large leaves and the axillary inflorescences paired at the nodes. The corolla of *M. monocaule*, however, is much shorter, the stipules are narrower, the anthers are included, and the inflorescences are supra-axillary (although we occasionally observed supra-axillary inflorescences in *M. greenwayi*, De Block et al. 431).

With *M. barteri*, to which we think *M. monocaule* is most closely related, the novelty shares the included anthers and the very similar flowers and fruits. The habit of the two species is different, however. *Mitriostigma barteri* is a branched shrub up to 2 m tall, whereas the novelty is a small unbranched woody plant up to 30 cm tall.

Robbrecht (1988) has tentatively proposed the term 'monocaul dwarfs' for this kind of life-form, and the term has since then been used regularly in Rubiaceae systematics. In older literature this life-form has been reported under vague terms such as sub-shrub, treelet, or by means of intricate circumscriptions, e.g. ''small pachycaul treelet'' (Ridsdale et al. 1972) or ''unbranched understorey treelet'' (Ridsdale 1975). Apart from the monocaulous growth form and the supra-axillary inflorescences paired at the nodes, *M. monocaule* differs from *M. barteri* in the somewhat larger leaves with more numerous secondary veins and a more pronounced acumen (Table 1).

The finding of *M. monocaule* confirms that the genus *Mitriostigma* is morphologically heterogeneous, which might support the suggestion of Bridson (1979) that several subgenera could be recognized.

Key to the species of *Mitriostigma*

1. Monocaulous (i.e. single-stemmed) dwarf; inflorescences supra-axillary and paired at the nodes (Cameroon) .... *M. monocaule*
1. Trees, shrubs or sub-shrubs; inflorescences placed unilaterally at successive nodes on alternate sides, sometimes axillary at the nodes (Africa, also Cameroon) 2
2. Length of corolla lobes 1/3–1/2 of length of corolla tube 3
2. Length of corolla lobes less than 1/3 of length of corolla tube 4
3. Leaves elliptic to ovate; inflorescences placed unilaterally at successive nodes on alternate sides ..... *M. axillare*
3. Leaves obovate; inflorescences usually paired at the nodes ..... *M. greenwayi*
4. Inflorescences supra-axillary; corolla tube ca 24 mm long; fruits 22–25 × 14–16 mm, ellipsoid (Tanzania) .... *M. usambarense*
4. Inflorescences axillary; corolla tube 9–14 mm long; fruits 25–40 × 8–15 mm, sub-fusiform (Cameroon, Bioko) ... . *M. barteri*

Table 1. Morphological comparison of the *Mitriostigma* species, geographic distribution, altitudinal range and habitat. The characters distinguishing *M. monocaule* (sp. nov.) from the other species are indicated in boldface.

	M. axillare	*M. barteri*	*M. greenwayi*	*M. monocaule*	*M. usambarense*
Habit	shrub or small tree	shrub	shrub or sub-shrub	**monocaulous dwarf**	shrub
Indumentum on young twigs and petioles	glabrous	glabrous	glabrous	**sparsely hairy when young**	glabrous
Height (m)	0.3–2 (–8)	(0.3–) 0.5–2	0.3–1.0	**0.2–0.3**	2.0–4.5
Petiole (mm)	(2–) 6–15	5–12	3–10	13–18	5–12
Leaf base	cuneate to rounded	narrowly cuneate to attenuate	cuneate to obtuse	attenuate	narrowly cuneate to attenuate
Leaf shape	elliptic to ovate	narrowly elliptic	obovate	obovate	elliptic to obovate–elliptic
Leaf length (cm)	3–17	10–17	6.5–22	11–19	4.5–12
Leaf width (cm)	1–9	3–5	3.0–10.5	3.5–6.5	2.5–5.5
Secondary nerves	4–9	6–9	7–9	**8–12**	6–9
Domatia	tuft domatia	absent	absent, sometimes tuft domatia	absent	tuft domatia
Stipules (mm)	5–10	4–10	7–15	6.5–12	6–9
Inflorescences	axillary at alternate successive axils	axillary at alternate successive axils	(supra)axillary and paired (sometimes solitary) at the nodes	**supra-axillary and paired at the nodes**	slightly supra-axillary, at alternate successive axils
Number of flowers	3–10-flowered	few flowered	few–15-flowered	2–10-flowered	1–3-flowered
Corolla tube length (mm)	12–18	9–14	ca 20	10.5–12	ca 24
Corolla lobe/corolla tube ratio	>1/3	<1/3	>1/3	<1/3	<1/3
Anthers	tips exserted	included	partially exserted	included	included
Style	winged	winged	winged	winged	not winged
Fruit colour	orange	orange to red	green	orange	orange to red
Fruit shape	ellipsoid to sub-globose	sub-fusiform	? globose or pyriform	ovoid to sub-fusiform	ellipsoid
Fruit size (mm)	10–20 ×8–15	25–40 ×8–15	19–25 ×10–15	19–28 ×5–9	22–25 ×14–16
Distribution	Mozambique to northeast Cape Province	Bioko, Cameroon	southeast Kenya	Cameroon	northeast Tanzania
Altitudinal range (m)	0–450	20–300	5–160	265	1500–2160
Habitat	coastal or riverine forest, usually close to the sea	tropical rainforest	coastal forest, on coral rock or limestone outcrops	tropical rainforest	tropical mountain forest

Synopsis of other *Mitriostigma* species

Mitriostigma Hochst. (1842, p. 235–236)

– Keay (1958, p. 41–42); Dyer (1975, p. 612); Bridson (1979, p. 113–130); Verdcourt (1987, p. 245–250).

Type species: *Mitriostigma axillare* Hochst.

Mitriostigma axillare Hochst. (1842, p. 235–236)

Lectotype (designated here): South Africa, Kwazulu Natal Province, Port Natal (=Durban), Krauss 144 (holotype: B†, lectotype: K000419875 in K, isolectotypes: BM, BOL, K, TCD).

Taxonomic synonym: *Gardenia citriodora* Hook. (1857, Table 4987).

Lectotype (designated here): South Africa, Kwazulu Natal Province, Port Natal (=Durban), Gueinzius, s. n. (lectotype: K000419871 in K, isolectotypes: K, TCD).

Distribution

Zanzibar–Inhambane regional mosaic and Tongaland–Pondoland regional mosaic: Mozambique to northeast Cape Province (Fig. 4).

Additional specimens examined

Mozambique

Cabo Delgado Province: Palma District, andados 4 km do Cabo Delgado para palma, Torre and Paiva 12113 (LISC). Inhambane Province: Inhambane, Sim 20871 (K, LISC photo, PRE).

South Africa

Kwazulu-Natal Province: ''Natal'', Gerrard 383 (K); ibid., Sutherland s. n. (K); Dukuduku forest, Forest Dept 12 (K); St. Lucia Bay, Evans 3613 (K); Umzumkulu (? = Umzimkulu), Bisset s. n. (K); Inanda, 3 miles north of Umhlanga Rocks, Moll 2994 (K); St Lucia Estuary, Pooley 1730 (K); Umzinto, along road Undoni park, Strey 5972 (K); Durban, Marloth 4186 (K); St Lucia, Lansdell 14 (K); Mapelane (=Maphelane), du Toit 1266 (K); Stanger, Hawaan forest, northwest of Umhlanga Rocks, du Toit 1309 (K); Port Shepstone district, Port Edward, Strey 4924 (K).
Eastern Cape Province: Port St Johns, Manteku, Dakane location, Strey 10202 (K); Port Saint Johns, Theron 1577 (K); Lusikisiki, Umsikaba (river) mouth, Codd 9724 (K); near Lusikisiki, on the property of Magwa Tea Corporation, Egoso forest above Magwa falls, Balwkill et al. 1916 (K); Lusikisiki, Magwa falls, Strey 6721 (K); Port St Johns, Ntsubane forest, Strey 8597 (K); south bank Msikaba river, 1.5 miles from the coast, Pondoland, Miller 2588 (K); Ntsubane, Fraser falls vallee, Venter 858 (K); Msikaba river mouth, Venter 974 (K); Port St Johns district, Mount Thesiger, Balkwill et al. 1758 (K).
Cultivated at NBGB: Robbrecht 841 (BR); Robbrecht 941 (BR); De Block 1408 (BR).

Mitriostigma barteri Hook. f. ex Hiern (1877, p. 111)

Based on the same type: *Randia barteri* (Hook. f. ex Hiern) K. Schum. (1891, p. 75).

Lectotype (designated here): Equatorial Guinea, Bioko, Mann 234 (lectotype: K000419877 in K, isolectotypes: BR (photo), K, P).

Distribution

Lower Guinean regional subcentre of endemism: Bioko, Cameroon (Fig. 4).

Additional specimens examined

Cameroon

Southwest Province: Bakingili, Akogo 150 (SCA); Upper Boando, Cable 265 (K, SCA); Etinde, Etuge 1242 (K); lower slopes of Mount Etinde (Small Mount Cameroon), ca 10 km west of Limbe, above the village of Batoke, Maurin et al. 6 (K); Moliwe, Hunt 95 (SCA); Dikulu, Jaff 87 (SCA); between Upper Boando and Etome, Kwangue 136 (K, SCA); Mabeta–Moliwe, Watts 174 (SCA); ibid., Sunderland 1469 (K), ibid., Tchouto 181 (K, SCA, WAG, YA); Moliwe, Watts 202 (SCA); ibid., Watts 420 (SCA); Mbonge village, Mambo and Thomas 150 (BR, MO, WAG); Etome, Nning 127 (SCA); Mabeta, Etome, Tchouto 1628 (SCA); Bolo forest on Kumba–Mamfe road, 50 km north of Kumba, Thomas and Nemba 5897 (K, MO, YA); mature (old secondary) forest in northeastern corner of Korup National Park, near Baro village, Thomas 3360 (K, MO, YA).
Littoral Province: near Ndoktiba, Bafang-Yabassi road, 15 km southsoutheast Nkondjok, Letouzey 11168 (K, P, WAG, YA).

Equatorial Guinea

Bioko, Carvalho and Casas 3000-2 (K); ibid. Barter s. n. (K, syntype).

Mitriostigma greenwayi Bridson (1979, p. 127)

Type: Kenya, Kwale District, Jadini, Greenway 9639 (holotype: K, isotypes: EA, PRE).

Distribution

Zanzibar–Inhambane regional mosaic: southeast Kenya (Fig. 4).

Additional specimens examined

Kenya

Coast Province: Mwarakaya, Brenan, Gillett, Kanuri and Chamba 14669 (BR, K, WAG); ibid., Luke and Robertson

2628 (EA, K); Kaya forest, Hawthorne 205, 247 (K); Kambe Kaya near Maereni village, Hawthorne 114 (K); Pangani, crossing of Lwandani stream on Chonyi-Ribe road, R. B. Faden, A. J. Faden, Gillett and Gachathi 77/531 (BR, K, MO, WAG); Monbassa, Kaya Diani, De Block, Muasya, Stieperaere and Bytebier 431 (BR, EA, MO); Kilifi District, Ribe Kaya Forest on Chonyi-Ribe road, R. B. Faden, A. J. Faden, Gillett and Gachathi 77/542 (K); Mleji river, Luke 4702 (K); Kaya Kambe, Robertson and Luke 4788 (EA, K); Kaya Diani, Robertson and Luke 5888 (EA, K); ibid., Robertson and Luke 5935 (EA); ibid., W. R. Q. Luke and P. A. Luke 9019 (EA, UPS).

Mitriostigma usambarense Verdc. (1987, p. 245)

Type: Tanzania, west Usambara Mountains, Mazumbai, Lovett, J. C. and Lovett, I. M. 171 (holotype: K, isotypes: BR, DSM, MO).

Distribution

Afromontane regional centre of endemism: mountain ranges of northeast Tanzania (Fig. 4).

Additional specimens examined

Tanzania

Kilimanjaro region: same district, south Pare Mountains, Chome forest reserve, Festo, Gereau and Umila 94 (BR, MO); ibid., Kindeketa, Mwasumbi and Mlangwa 1302, 1302A, 1295 (BR, MO); ibid., Mwangoka, Mwasumbi and Umila 1085 (BR, MO); ibid., Mwangoka and Mwangulango 1104 (BR, K, MO).

Tanga region: Balangai West Forest Reserve, southeast slope of Kilimandege, Borhidi, Demissew, Hedren and Iversen 84298 (K, VBI); ibid., Borhidi, Demissew, Hedrén and Iversen 84299 (NHT); west Usambara Mountains, Kwamshunde, Tanner 261 (K); Lushoto, Usambara Mountains, Balslev 302 (MO).

Acknowledgements – The Board of Trustees of RBG Kew as well as the curators of BR, BRLU, SCA, WAG, and YA are acknowledged for providing herbarium material. Fieldwork leading to the discovery of *Mitriostigma monocaule* received the support of National Geographic, through its Committee for Research and Exploration (grant no. 8377-07). We would also like to acknowledge the 'Sud Expert Plantes' project under French Ministry of Foreign Affairs, for providing the opportunity for B. Sonké to work with S. Dessein. Professor E. Robbrecht is acknowledged for useful comments and checking the Latin diagnosis. A. Fernandez is acknowledged for preparing the drawing of *Mitriostigma monocaule*. F. Van Caekenberghe is thanked for operating the SEM. B. Sonké would also like to thank Dr P. Pete Lowry II and other staff at Missouri Botanical Garden for their assistance in Cameroon.

References

Andreasen, K. and Bremer, B. 1996. Phylogeny of the subfamily Ixoroideae (Rubiaceae). – Opera Bot. Belg. 7: 119–138.

Andreasen, K. and Bremer, B. 2000. Combined phylogenetic analysis in the Rubiaceae–Ixoroideae: morphology, nuclear and chloroplast DNA data. – Am. J. Bot. 87: 1731–1748.

Anonymous, 1962. Systematics Association Committee for descriptive biological terminology II. Terminology of simple symmetric plane shapes (chart 1). – Taxon 11: 145–156.

Bridson, D. M. 1979. Studies in *Oxyanthus* and *Mitriostigma* (Rubiaceae subfam. Cinchonoideae) for part 2 of 'Flora of tropical east Africa': Rubiaceae. – Kew Bull. 34: 113–130.

Bridson, D. M. 1988. Rubiaceae (part 2), *Mitriostigma*. – In: Pohill, R. M. (ed.), Flora of tropical east Africa. Balkema, pp. 638–640.

Dyer, R. A. 1975. The genera of southern African flowering plants. Vol. 1. Dicotyledons: 612. – Dept Agricult. Techn. Serv., Pretoria.

Hiern, W. P. 1877. Umbelliferae to Ebenaceae, *Mitriostigma*. – In: Oliver, D. (ed.), Flora of tropical Africa. Vol. III. L. Reeve and Co, p. 111.

Hochstetter, Ch. F. 1842. Rubiaceae. – Flora 25: 235–236.

Hooker, W. J. 1857. *Gardenia citriodora*. – Curtis's Bot. Mag. Vol. 13, ser. 3, table 4987.

Keay, R. W. J. 1958. *Randia* and *Gardenia* in west Africa. – Bull. Jard. Bot. Nat. Belg. 28: 41.

Keay, R. W. J. 1963. Rubiaceae, *Mitriostigma*. – In: Hepper, F. N. (ed.), Flora of west tropical Africa (2nd ed.). Crown Agents for Overseas Governments, p. 130.

Letouzey, R. 1985. Notice de la carte phytogéographique du Cameroun au 1: 500 000. 4. Domaine de la forêt dense humide toujours verte: 95–142. – Inst. de la Recherche Agronomique (Herbier Natl), Yaoundé, et Inst. de la Carte Int. de la Végétation.

Ridsdale, C. E. 1975. Notes on New Guinea Rubiaceae. *Chaetostachydium*. – Blumea 22: 267–269.

Ridsdale, C. E. et al. 1972. Notes on New Guinea Rubiaceae. *Versteegia* and *Maschalodesme*. – Blumea 20: 339–348.

Robbrecht, E. 1988. Tropical woody Rubiaceae. Characteristic features and progressions. Contributions to a new subfamilial classification. – Opera Bot. Belg. 1: 1–272.

Robbrecht, E. and Manen, J.-F. 2006. The major evolutionary lineages of the coffee family (Rubiaceae, angiosperms). Combined analysis (nDNA and cpDNA) to infer the position of *Coptosapelta* and *Luculia*, and supertree construction based on *rbcL*, *rps16*, *trnL-trnF* and *atpB-rbcL* data. A new classification in two subfamilies, Cinchonoideae and Rubioideae. – Syst. Geogr. Pl. 76: 85–146.

Schumann, K. 1891. Rubiaceae, *Randia*. – In: Engler, H. G. A. and Prantl, K. A. E. (eds), Die Natürlichen Pflanzenfamilien 4. Engelmann, pp. 75–76.

Verdcourt, B. 1987. A new species of *Mitriostigma* (Rubiaceae–Gardenieae) from Tanzania. – Kew Bull. 42: 245–250.

White, F. 1979. The Guineo–Congolian region and its relationship to other phytochoria. – Bull. Jard. Bot. Nat. Belg. 49: 11–55.

White, F. 1983. The vegetation of Africa. A descriptive memoir to accompany the Unesco/AETFAT/UNSO vegetation map of Africa. – Nat. Resour. Res. 20: 1–356.