



Three new species of *Craterispermum* (Rubiaceae) from Madagascar[#]

PETRA DE BLOCK¹ & TIANJANAHARY RANDRIAMBOAVONJY²

¹Botanic Garden Meise, Nieuwelaan 38, BE-1860 Meise, Belgium. E-mail: petra.deblock@br.fgov.be

²Royal Botanic Gardens, Kew, Lot II J 131 B, Ambodivoanjo, Ivandry, 101 Antananarivo, Madagascar.
E-mail: trandria.rbgkew@moov.mg

[#]In: Delprete, P.G. & Dessein, S. (Editors), Festschrift volume dedicated to Timothy Motley (1966–2013). *Phytotaxa* 206: 1–132. (2015)

Abstract

The Afro-Madagascan genus *Craterispermum* (Craterispermeae, Rubiaceae) is taxonomically badly known. Hitherto, no species were described from Madagascar, although several taxa occur in the humid lowland forests in the eastern and northern regions of the island. In this contribution three new Madagascan *Craterispermum* species are described, *C. motleyanum*, *C. puffianum* and *C. cervicorne*. All are illustrated and their distribution is discussed. An identification key for the three new species is given.

Introduction

The genus *Craterispermum* Benth. in Hooker (1849: 411) occurs in tropical Africa, Madagascar and the Seychelles. The genus is badly known taxonomically and no monograph exists. Recently, taxonomic studies on the continental African species were started. Hitherto, five species have been newly described (Taedoumg *et al.* 2011; Taedoumg & Hamon 2013). In tandem, a study of the Madagascan material of *Craterispermum* was launched, the first results of which are reported here.

Craterispermum is easily recognized at genus level by the combination of the following characters: glabrous plants with raphides; leaves subcoriaceous or coriaceous and breaking easily when fresh, drying pale green or yellowish/golden, higher order venation often prominent; inflorescences axillary or supra-axillary and paired at the nodes, pedunculate, and often compact; flowers heterostylous; aestivation valvate; ovary 2-locular with a single pendulous ovule per locule; small, drupaceous, often somewhat assymmetrical fruits containing a single bowl-shaped seed (Robbrecht 1988; Igersheim 1992).

Craterispermum has several interesting characters that set it apart from most other Rubiaceae. The placentas are inserted very high up in the ovary, making the latter \pm semi-superior (Igersheim 1992). Also, the exotesta is discontinuous, consisting of irregular, isolated cells with ring-like thickenings around the entire circumference of the cells (Igersheim 1992). Furthermore, *Craterispermum* species are known as aluminium accumulators (Jansen *et al.* 2000); the pale or yellowish colour of the dried leaves is typical for aluminium accumulating plants. The genus was traditionally associated with the tribe Vanguerieae (Bentham 1849, Robbrecht 1988) which belongs to subfamily Ixoroideae, but currently *Craterispermum* is placed in a tribe of its own, Craterispermeae, in the Psychotrieae alliance in subfamily Rubioideae (Robbrecht & Manen 2006; Razafimandimbison *et al.* 2008; Bremer & Eriksson 2009).

In continental Africa, nineteen *Craterispermum* species are currently known (Taedoumg & Hamon 2013). While new species are still being discovered in hotspot areas, the genus is generally well-collected and numerous herbarium specimens are available. For Madagascar, a survey of existing herbarium material resulted in less than 160 specimens, representing more than ten undescribed species. This low specimen number indicates that the genus is only present at low densities in Madagascar, a fact that was corroborated during our fieldwork. Low densities were also recorded for *C. microdon* Baker (1877: 145), the only species known from the Seychelles (Ismail *et al.* 2011). The low number of collected specimens can in part also be explained by the fact that *Craterispermum* species usually have a restricted distribution in Madagascar. Furthermore, most of them occur in lowland humid forest, a vegetation type strongly under human pressure and considerably reduced in area during the last fifty years (Du Puy & Moat 1996; World Wildlife Fund 2006).

Hitherto, specimens belonging to different Madagascan species have been labeled as *Craterispermum laurinum* (Poir.) Benth. in Hooker (1849: 411) as was also the case for many Central and East African specimens. However, Verdcourt (1973) already showed that *C. laurinum*, the type species of the genus, is restricted to tropical West Africa and has lax, relatively large inflorescences and leathery, golden leaves with prominent venation. Several Madagascan species do indeed have leaf characters reminiscent of *C. laurinum*, but the inflorescence characters are very different. Therefore, the name *C. laurinum* cannot be used for any Madagascan *Craterispermum* species.

Though *Craterispermum* in Madagascar is easily identified to genus level, a taxonomic treatment at species level is rendered difficult by the low numbers of herbarium specimens available. Furthermore, herbarium material is often very poor, since flowers are short-lived and, because of the often compact inflorescences, both flowers and fruits fall easily during collecting and drying, leaving only residual inflorescences/infructescences. Matters are further complicated by the fact that the flowers are heterostylous.

In this paper, three new Madagascan species of *Craterispermum*, *C. motleyanum* De Block & Randriamb., *C. puffianum* De Block & Randriamb. and *C. cervicorne* De Block & Randriamb., are described. A dichotomous key, detailed descriptions, distribution maps and IUCN status are given.

Material and methods

Herbarium material was studied from the BR, G, K, MO, P, TAN and TEF herbaria [institute abbreviations follow Holmgren *et al.* (1990)]. Terminology generally follows Robbrecht (1988); leaf terminology is according to Anonymous (1962). The methods used followed normal practice of herbarium taxonomy (De Vogel 1987). Colors given are for dried material except for flower parts. Specimens are cited per province and alphabetically by collector. Coordinates of localities were determined using the online Gazetteer to Malagasy Botanical Collecting Localities (Schatz *et al.* 2003) in conjunction with 1:500,000 maps from the Malagasy Institut National de Géodésie et Cartographie. Distribution maps were drawn using Arcmap 9.2. The conservation status was assessed by applying the IUCN Red List Category criteria (IUCN 2001) using GeoCAT (Geospatial Conservation Assessment tool; Bachman *et al.* 2011).

Taxonomic treatment

Key to the three new *Craterispermum* species

- 1a. Leaf blades narrowly obovate, 3–7 x 0.8–2 cm, higher order venation obscure to invisible on both surfaces; peduncles 1–2 mm long; inflorescences usually 3-flowered *C. puffianum*
- 1b. Leaf blades elliptic or broadly elliptic, obovate or broadly obovate, 1.8–14 x 1–5.5 cm; higher order venation prominent on both surfaces; peduncles 2–30 mm long; inflorescences (3–)4–9-flowered or with numerous flowers 2
- 2a. Inflorescences compact, with (3–)4–9 flowers; inflorescence axes 0–1 mm long *C. motleyanum*
- 2b. Inflorescences lax, with numerous flowers; lateral inflorescence axes 1–5 cm long, central inflorescence axis usually ca. 0.5 cm long, rarely up to 5 cm long *C. cervicorne*

Craterispermum motleyanum De Block & Randriamb., *sp. nov.* Fig. 1.

Type:—MADAGASCAR. Province Toamasina: near Andasibe, forest of Mantadia, beyond graphite mine, 900 m, 18° 55' S, 48° 25' E, 6 November 1994, McPherson & Van der Werff 16525 (holotype MO, isotypes BR, K, TAN).

Resembling *C. schweinfurthii* Hiern in Oliver (1877: 161) from Continental Africa in inflorescence size and structure (compact cyme) but differing from it by the smaller, more coriaceous, obovate or broadly obovate leaves (1.8–12 x 1–5 cm vs. 5.5–22.3 x 2–7.7 cm) with more prominent higher order venation on both leaf surfaces, a shorter acumen (1–5 mm long vs. 5–12.5 mm long) and a yellowish or golden colour (vs. greenish in *C. schweinfurthii*).

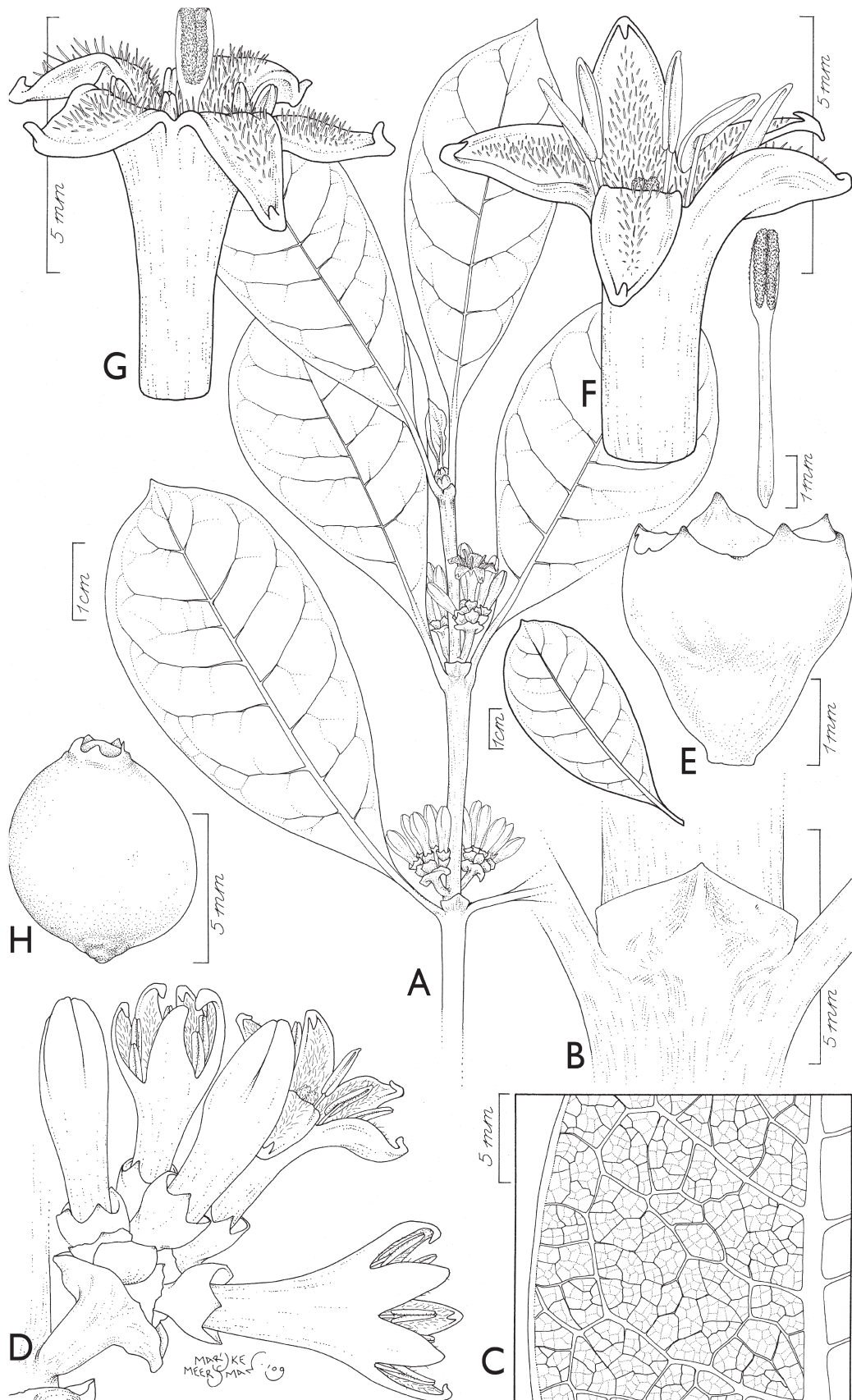


FIGURE 1. *Craterispermum motleyanum* A. Flowering branch. B. Stipules. C. Detail of higher order venation. D. Inflorescence. E. Ovary and calyx. F. Brevistylous flower with separate style and stigma. G. Longistylous flower. H. Fruit. Drawn by Marijke Meersman. Based on Lam & Meeuse 5327 (A–F), Capuron 22070-SF (E, G) and De Block *et al.* 880 (H).

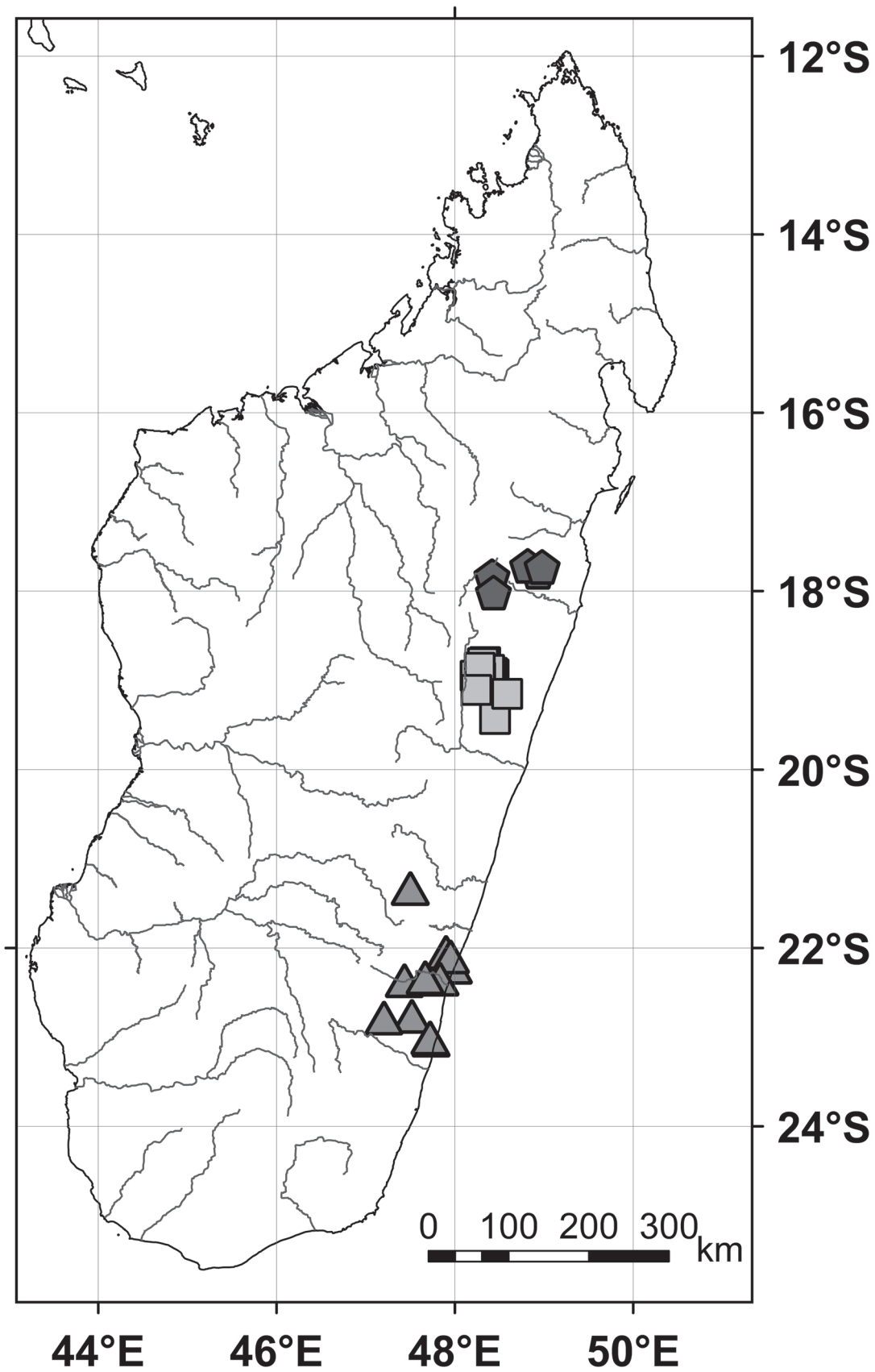


FIGURE 4. Distribution map of *Craterispermum motleyanum* (pentagon), *C. puffianum* (square) and *C. cervicorne* (triangle).

Tree, (3–)5–15 m tall, dbh up to 25(–50) cm, or rarely shrub, 2–4 m tall; vegetative and generative parts glabrous; branches dark brown or brown, somewhat corky; younger branches pale or greenish brown, often with weak decurrent ridge. Stipules 1.5–2.5(–4) mm long, keeled, persistent, awn 0.1–0.3(–0.5) mm long. Leaves petiolate; petioles 0.6–1.8 cm long, canaliculate; leaf blades obovate or broadly obovate, 1.8–12 x 1–5 cm, coriaceous, drying yellowish green or golden brown, often somewhat discolourous with lower surface paler; apex acuminate, acumen 1–5 mm long; base decurrent; margin revolute; midrib prominent on both leaf surfaces, raised below, impressed above; secondary nerves prominent on both surfaces, raised below and above, 6–9 on each side of the midrib; higher order venation prominent on both surfaces, raised below, raised or not raised above, usually paler than leaf blade below (when dry). Inflorescences supra-axillary, attached ca. 1–5 mm above node, or rarely axillary, (3–)4–9-flowered, pedunculate, compact cymes; peduncle stout, laterally compressed, widened distally, 2–14 mm long; inflorescence axes 0–1 mm long; bracts broadly triangular and vaulted, ca. 1.5 mm long, tip acuminate, margin sometimes sparsely beset with colleters. Flowers sessile or subsessile, 5-merous, flower bud rounded; bracteoles broadly ovate or broadly triangular, ca. 1–1.2 x 1.5 mm, tip obtuse to acute or acuminate, margin often sparsely beset with colleters; calyx tube 0.7–1 mm long, inner surface glabrous but groups of colleters present below the sinuses of the calyx lobes; calyx lobes broadly triangular, 0.2–0.8 mm long, inner surface glabrous, tip acute and tipped by colleter, margin often sparsely beset with colleters; corolla white; corolla tube narrowly cylindrical but widening somewhat at the throat, 4–6 mm long, inner surface densely pubescent in upper half and throat; corolla lobes 2.5–4 x 1.2–1.5 mm, inner surface pubescent with long erect hairs at the base, pubescence continuing sparsely along the midrib higher up, tip acute with short adaxial subapical spike-like protuberance, margin somewhat thickened; anthers 1.5–2 mm long; stigmatic lobes 1–1.5 mm long; ovary cup-shaped, 0.7–1 mm long, 2-locular, each locule containing a solitary pendulous ovule. Longistylous flowers: stamens only partly exerted, filaments 0.5–0.7 mm long; style and stigma 7.5–9 mm long, exerted for 2–3 mm from corolla tube. Brevistylous flowers: stamens exerted, filaments 1.5–2 mm long; style and stigma 4–5.5 mm long, included in corolla tube. Fruits sessile or subsessile, subglobose and somewhat asymmetrical, 5–6.5 x 5–6.5 mm, green turning white and then purplish black at maturity, one-seeded; calyx persistent; seed ca. 4–5 x 4 mm.

Etymology:—The species is named in memory of Timothy Motley, whose Pacific-based research led him to study diverse Rubiaceae groups such as Spermaceae, Retiniphyllae, Guettardeae and Chiococceae.

Distribution:—Only known from the Alaotra-Mangoro and Atsinanana Regions in Eastern Madagascar, mostly near Moramanga. Fig. 4.

Habitat:—Mid-altitudinal humid forest, sometimes on river banks or near marsh, on sandy soil. Elev.: 850–1050 m.

Phenology:—Flowering: September–December (buds from May onwards); Fruiting: October–May.

Vernacular names:—belavenona, hazomamy, hazomanga, hazombavy, hazondomohina.

Uses: Wood is used for construction, for charcoal and as fire wood.

IUCN status:—Endangered: EN B1ab(i); B2ab (ii,iii). The extend of occurrence (EOO) of *C. motleyanum* is 1384.38 km², and its area of occupancy (AOO) is 52 km² using a cell width of 2 km. The species is distributed in five subpopulations, two of which are located in protected areas: Analamazaotra and Zahamena Ankeniheny. Habitat loss outside the protected areas is a serious threat for *C. motleyanum*. The mining in the Zahamena protected area may affect the subpopulation located in this site.

Additional specimens examined (paratypes):—MADAGASCAR. Province Toamasina: Alaotra-Mangoro, Ambatovy, 1017 m, 18° 47' 46" S, 48° 20' 21" E, 26 November 2006, Andriatiana 404 (BR, MO, P, TAN, TEF); Phelps Dodge project site, ca. 15 air-km NE of Moramanga, ca. 11 km E of Antanambao, Ambatovy-South, wetland south (north-east branch), 975 m, 18° 52' 6" E, 48° 18' 23" S, 15 February 1997, Andriatsiferana *et al.* 2149 (MO); environs d'Andasibe (Périnet), 18° 56' S, 48° 26' E, 2–5 November 1984, Barnett & Dorr 145 (K, MO, P, TAN); Alaotra-Mangoro, Ambatovy, 978 m, 18° 48' 30" S, 48° 18' 51" E, 26 October 2007, Bernard 703 (BR, MO, P, TAN); Périnet, 18° 56' S, 48° 26' E, 1 November 1951, Bosser 2039 (TAN); Périnet, 18° 56' S, 48° 26' E, October 1951, Bosser 2056 (P); forêt d'Analamazaotra, Périnet, 18° 56' S, 48° 26' E, 2 November 1962, Capuron 22070-SF (P, TEF); vestige de forêt au pk 102 de la route Tananarive-Moramanga, près d'Ankarahara, rive gauche du Mangoro, 18° 57' S, 48° 14' E, 22 October 1965, Capuron 24169-SF (P, TEF); Analamazaotra, 18° 56' S, 48° 26' E, 24 October 1937, coll. ignot 3055 (P); Sahamaloto, Périnet, 18° 56' S, 48° 26' E, 13 October 1951, coll. ignot. 4390-SF (P, TEF); Périnet, pk 17, 18° 55' S, 48° 25' E, 10 October 1952, coll. ignot. 5780-SF (P, TEF); Moramanga, Antsahatsaka, 18° 58' S, 48° 17' E, 27 October 1952, coll. ignot. 6034-SF (P, TEF); Sahamaloto, Périnet, 18° 56' S, 48° 26' E, 15 October 1952, coll. ignot. 6055-SF (P, TEF); canton Périnet, district Moramanga, Analamazaotra, station 4LZ, presqu'île de la station, 18° 56' S, 48° 26' E, November 1963, coll. ignot. 21543-SF (P, TEF); canton Anosibe Anala, sous-préfecture Anosibe, Analabevakoana, sur la rive droite de la Mahamavo, pk 39 sur route d'Anosibe, 900 m, 19° 26' S, 48° 27' E, 5 May 1956, coll. ignot. 25185-SF (P, TEF); canton Anosibe, sous prefecture Anosibe, pk 39 sur route d'Anosibe,

900 m, 19° 26' S, 48° 27' E, 4 May 1965, coll. ignot. 25216-SF (P, TEF); canton Anosibe, sous prefecture Anosibe, Bevakoana, Toby, pk 39 sur route d'Anosibe, 900 m, 19° 26' S, 48° 27' E, 4 May 1965, coll. ignot. 25280-SF (TAN); Sandrangato, Moramanga, 19° 6' 30" S, 48° 14' 30" E, s. dat., Saint-Pierre 354 (as 354-R-212) (TEF); forest ca. 4 km W of Ampitambe, ca. 10 km N of Moramanga, 1050 m, 18° 51' 34" S, 48° 16' 42" E, 20 November 1998, Davis, Rakotonasolo & De Block 2198 (BR, G, K, MO, P, TAN); parc à orchidées, Analamazaotra, 890 m, 18° 56' 11" S, 48° 24' 47" E, 24 February 1999, De Block & Rakotonasolo 880 (BR, G, MO, P, TAN); Analamazaotra Special Reserve, 18° 56' S, 48° 26' E, 20 January 2006, De Block, Tosh & Rakotonasolo 1869 (BR, MO, P, TAN); station forestière d'Andasibe (Périnet), 900 m, 18° 55' S, 48° 25' E, 8 December 1989, Evrard 11241 (BR, P, TAN); Andasibe National park, Périnet-Analamazaotra Special Reserve, along trail in the Indri area, 900–950 m, 18° 56' S, 48° 26' E, 28 November 2003, Kårehed, Razafimandimbison & H. Bremer 303 (MO); Analamazaotra, 18° 56' S, 48° 26' E, August 1925, Louvel 59 (P); forêt d'Analamazaotra, 18° 56' S, 48° 26' E, s. dat., Perrier de la Bâthie 6910 (P); Analamazaotra, 18° 56' S, 48° 26' E, October 1932, Perrier de la Bâthie 18899 (P); Ambotrapanga, Périnet, 18° 56' S, 48° 26' E, 7 March 1952, Ratovoarison 100 (as 100-R-172) (P, TEF); Moramanga, Périnet, Menalamba, 18° 53' S, 48° 23' E, 10 April 1952, Ratovoarison 125 (as 125-R-172) (P, TAN); Périnet, Moramanga, 18° 56' S, 48° 26' E, 1 December 1947, Ratovoarison 1231-RN (P, TAN); Vatomaniry, Ambalabe, Ambinanindrano II, direction du NE de Toby Foara, 19° 9' 10" S, 48° 35' 12" E, 22 September 2006, Razanatsima 174 (BR, K, MO); Analamazaotra, 19° 9' 10" S, 48° 35' 12" E, s. dat., Thouvenot 26 (K, P, TAN); forêt d'Analamazaotra, 18° 56' S, 48° 26' E, 3 December 1934, Ursch 37 (P); near Andasibe, forest of Mantadia, beyond graphite mine, 900 m, 18° 55' S, 48° 25' E, 2 November 1994, Van der Werff, McPherson & Rapanarivo 13599 (BR, MO); Andovoranto, district Moramanga, forêt d'Analamazaotra, 18° 56' S, 48° 26' E, 17 October 1912, Viguier & Humbert 770 (P).—Locality unknown: s. loc., 1938, Lam & Meeuse 5327 (P).

Craterispermum puffianum De Block & Randriamb., *sp. nov.* Fig. 2.

Type.—MADAGASCAR. Province Toamasina: partie Sud-Est de la Réserve Naturelle Intégrale de Zahamena, bord de la rivière Namarafana, Miarinarivo, Vavatenina, 420 m, 17° 43' 47" S, 48° 58' 45" E, 22 October 1994, *Randrianjanaka & Zafy* 228 (holotype MO, isotypes K, P).

Differs from *C. motleyanum* by its narrowly obovate leaves (vs. obovate or broadly obovate) with mucronate apices (versus apex acuminate with acumen 1–5 mm long), obscure higher order venation on both leaf surfaces (vs. prominent on both surfaces) and shorter peduncles (1–2 mm long vs. 2–14 mm long).

Shrub, 1.5–3 m tall; vegetative and generative parts glabrous; internodes short; older branches brown, corky; younger branches brown or pale brown, often with weak decurrent ridge. Stipules 1.3–2.5 mm long, keeled, persistent, awn 0.1–0.2 mm long. Leaves petiolate; petioles 0.4–1 cm long, canaliculate; leaf blades narrowly obovate, 3–7 x 0.8–2 cm, coriaceous, drying golden, yellowish or yellowish brown; apex mucronate; base decurrent; margin revolute; midrib prominent on both leaf surfaces, raised below, impressed above; secondary nerves subprominent on both surfaces, somewhat raised below, impressed above, 4–7 on each side of the midrib; higher order venation obscure to invisible on both surfaces. Inflorescences axillary or somewhat supra-axillary (then inserted ca. 1 mm above node), usually 3-flowered (rarely 5-flowered), pedunculate, compact cyme; peduncle stout, laterally compressed, widened distally, 1–2 mm long; bracts broadly triangular and vaulted, ca. 1.5 mm long, tip acute to shortly acuminate, margin sometimes sparsely beset with colleters. Flowers sessile, 5-merous, flower bud rounded; bracteoles broadly ovate, ca. 1 x 1.5 mm, tip acute to acuminate, margin often sparsely beset with colleters; calyx tube 0.5–1 mm long, inner surface glabrous but groups of colleters present below the sinuses of the calyx lobes; calyx lobes triangular, 0.5–0.8 mm long, inner surface glabrous, tip acute and tipped by colleter, margin often sparsely beset with colleters; corolla white; corolla tube narrowly cylindrical but widening somewhat at the throat, 6.5–8 mm long, inner surface densely pubescent in upper half and throat; corolla lobes 3–3.5 x 1.5–2 mm, pubescent with long erect hairs, tip acute with short adaxial subapical spike-like protuberance, margin somewhat thickened; anthers ca. 2 mm long; stigmatic lobes 1–1.5 mm long; ovary cup-shaped, 2-locular, each locule containing a solitary pendulous ovule. Longistylous flowers: inner surface of corolla lobes densely pubescent all over; stamens completely included in corolla tube, filaments < 0.5 mm long; style and stigma 10–11 mm long, exserted for 2–3 mm from corolla tube; ovary ca. 1 mm long. Brevistylous flowers: inner surface of corolla lobes densely pubescent in lower half, sparsely pubescent in upper half; stamens exserted, filaments ca. 1.5 mm long; style and stigma 5–6 mm long, included in corolla tube; ovary ca. 0.5 mm long. Fruits subsessile, subglobose and somewhat asymmetrical, ca. 5 x 4 mm, green turning violet at maturity, one-seeded; calyx persistent; seed ca. 4 x 3.5 mm.

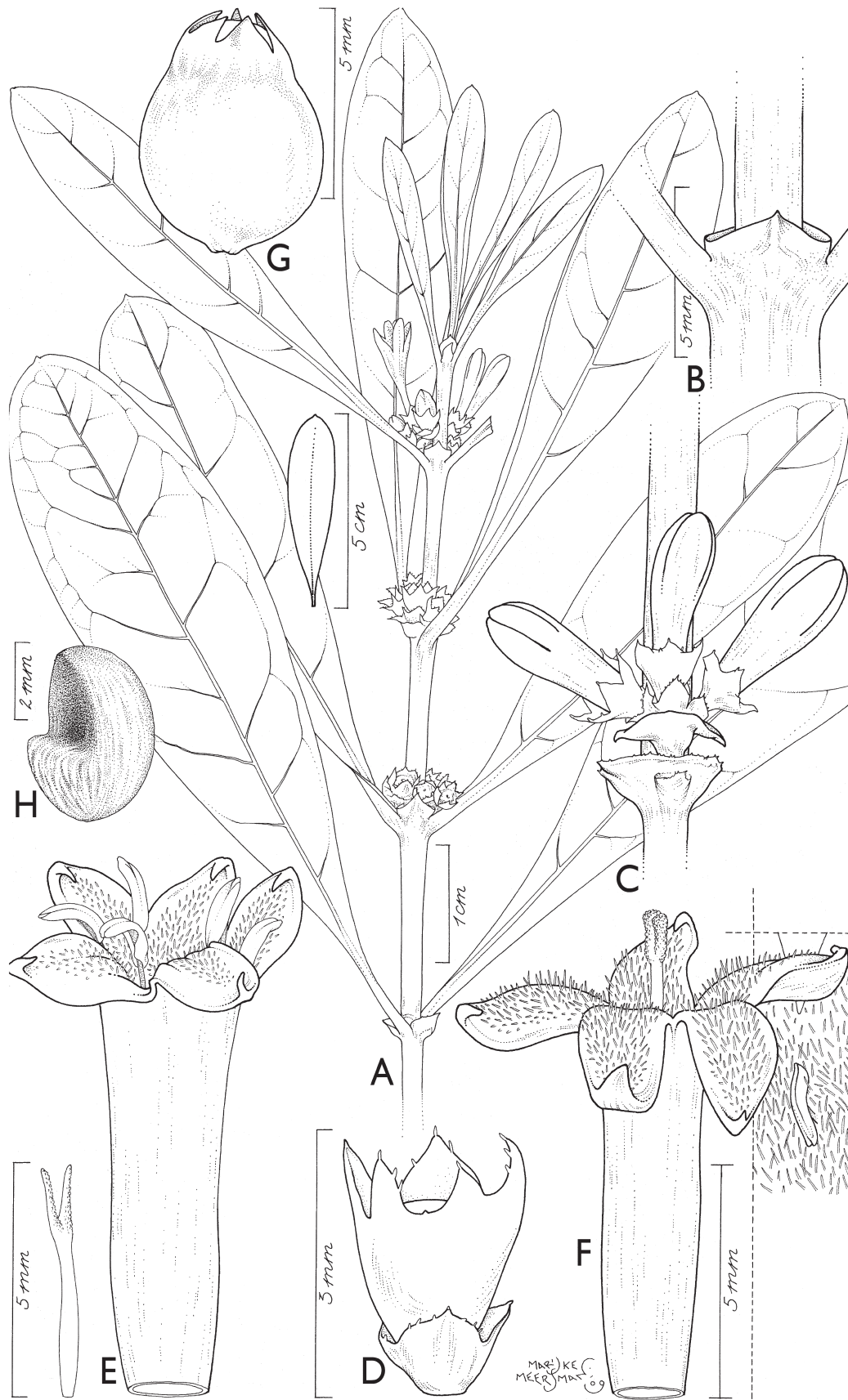


FIGURE 2. *Craterispermum puffianum*. A. flowering branch. B. Stipules. C. Inflorescence. D. Bracteoles, ovary and calyx. E. Brevistylous flower with separate style and stigma. F. Longistylous flower with indication of anther position and pubescence of inner surface of corolla tube. G. Fruit. H. Seed. Drawn by Marijke Meersman. Based on *Randrianjanaka & Zafy 228* (A–D, F), *coll. ignot. 20160-SF* (E) and *Cours 2471* (G–H).

Etymology:—The species is named in memory of Christian Puff, a great Rubiaceae researcher, who worked both in Africa and Asia, and who revised several genera of Madagascan Rubiaceae, such as *Alberta* Meyer (1838: 258), *Anthospermum* Linnaeus. (1753: 1058), *Paederia* Linnaeus (1767: 52).

Distribution:—Only known from the Alaotra-Mangoro Region in Eastern Madagascar, notably from Zahamena National Park and its close surroundings. Fig. 4.

Habitat:—Forest, often on river banks, on alluvial soil. Elev.: 400–1200 m.

Phenology:—Flowering: October; Fruiting: January.

Vernacular names:—masindranonandroana (Betsimisaraka).

Uses:—Wood is used as fire wood.

IUCN status:—Endangered: EN B1ab(i); B2ab(ii,iii,iv). The extend of occurrence (EOO) of *C. puffianum* is 856.60 km² and its area of occupancy (AOO) is 20 km² using a cell width of 2 km. The species is distributed in five subpopulations, three of which are conserved by a single protected area, Zahamena Ankeniheny. The major threat for this species is habitat loss, not only outside Zahamena but also inside this park, which is subject to traditional mining. In addition, this humid forest species has a low density: only seven herbarium collections were collected over a period of 68 years. Only one specimen dates from after 1990.

Additional specimens examined (paratypes):—MADAGASCAR. Province Toamasina: Canton Manakambahiny Est, district Ambatondrazaka, Ambinanisatandrazana, Sahamalaza, bas fond au bord de rivière, 18° 1' S, 48° 26' E, 20 October 1966, Capuron 26160-SF (P, TEF); Ampitanonoka à Fotsialalana, sentier plus loin que le chute, 1200 m, 17° 47' S, 48° 56' E, 19 January 1945, Cours 2471 (P, TAN); sentier au N de Sahamalaza pénétrant dans la RN III jusqu'à l'enclave, S/P d'Ambatondrazaka, 17° 50' S, 48° 25' E, 20 October 1966, Jacquemin H189J (P); sentier au N de Sahamalaza pénétrant dans la RN III jusqu'à l'enclave, au bord du fleuve Onibe, S/P d'Ambatondrazaka, 17° 50' S, 48° 25' E, 20 October 1966, Jacquemin H193J (P); canton Manakambahiny-Est, district Ambatondrazaka, Mitanonoka, 18° 1' S, 48° 26' E, 21 January 1963, Laibozaka 12607-RN (TEF); Sahamalaza, long du fleuve d'Onibe, 17° 43' S, 48° 49' E, 20 October 1966, Rakotozafy 716 (TAN).

Craterispermum cervicorne De Block & Randriamb., *sp. nov.* Fig. 3.

Type:—MADAGASCAR. Province Fianarantsoa: Karianga, district Farafangana, 22° 22' S, 47° 26' E, 7 October 1926, *Decary 5495* (holotype P, isotypes BR, G, K, MO, UPS).

Differs from all other Madagascan *Craterispermum* species by the large, lax, antler-shaped inflorescences, the lateral inflorescence axes of which are 1–5 cm long, with the central inflorescence axis usually ca. 0.5 cm long or rarely up to 5 cm long

Tree, 3–15 m tall, dbh 6–30 cm, more rarely shrub, 4–6 m tall; vegetative and generative parts glabrous; older branches greyish brown, somewhat corky; younger branches greenish or greenish brown, smooth. Stipules ca. 3 mm long, keeled, not persistent on older branches, awn ca. 0.5 mm long. Leaves petiolate; petioles 0.5–2.5 cm long, canaliculate; leaf blades elliptic or obovate, rarely broadly elliptic, 5–14 x 2.7–5.5 cm, coriaceous, drying golden, yellowish or greenish brown, often somewhat discolourous with lower surface paler; apex acuminate, acumen 2–8 mm long; base decurrent; margin revolute; midrib prominent on both leaf surfaces, raised below, impressed above; secondary nerves prominent on both surfaces, raised below, impressed above, 7–12 on each side of the midrib; higher order venation prominent on both surfaces, raised or not raised below, impressed above, usually paler than blade below (when dry). Inflorescences supra-axillary, attached 3–5 mm above node, many-flowered, pedunculate, lax double scorpioid cyme; peduncle laterally compressed, widened distally, 1–3 cm long; lateral inflorescence axes 1–5 cm long, usually monochasial (2 flowers and 1 axis per node) or rarely dichasial; central inflorescence axis usually reduced (ca. 0.5 cm long), more rarely as long as the lateral axes (e.g. in *I3585-SF*); bracts broadly triangular and vaulted, 1–2 mm long, tip acute to shortly acuminate, margin sometimes sparsely beset with colleters. Flowers sessile to shortly pedicellate with pedicels 0–5 mm long, 5-merous, flower bud rounded; bracteoles broadly triangular or broadly ovate, ca. 1 x 1.5 mm, tip acute or rounded, margin often sparsely beset with colleters; calyx tube 1–1.5 mm long, inner surface glabrous but sometimes with small groups of colleters below the sinuses of the calyx lobes; calyx lobes triangular, 0.5–0.8 mm long, inner surface glabrous, tip acute and tipped by colleter; corolla white; corolla tube narrowly cylindrical but widening somewhat at the throat, 4–7 mm long, inner surface densely pubescent in upper half and throat; corolla lobes 2.5–4 x 1.5–2 mm, inner surface pubescent with long erect hairs at the base, pubescence continuing sparsely along the midrib higher up, tip acute with short adaxial subapical spike-like protuberance, margin somewhat thickened; anthers

1.5–2 mm long; stigmatic lobes 0.5–1.5 mm long; ovary cup-shaped, 0.7–1 mm long, 2-locular, each locule containing a solitary pendulous ovule. Longistylous flowers: stamens only partly exerted, sessile; style and stigma 5.5–10 mm long, exerted for 1.5–5 mm from corolla tube. Brevistylous flowers: stamens exerted, filaments 1.5–2 mm long; style and stigma 4.5–7 mm long, included in corolla tube. Mature fruits unknown.

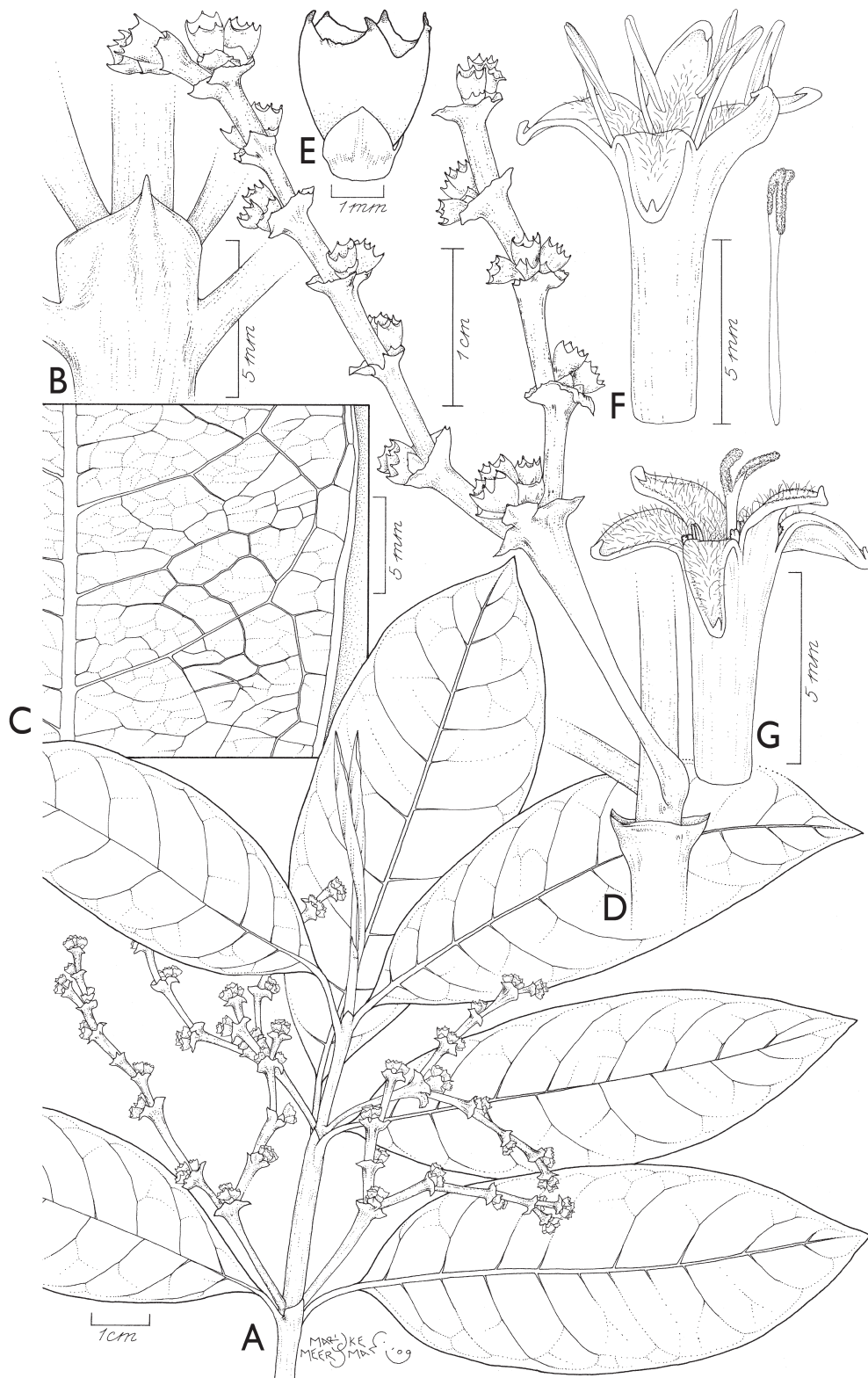


FIGURE 3. *Craterispermum cervicorne*. **A.** Flowering branch. **B.** Stipules. **C.** Detail of higher order venation. **D.** Inflorescence (corollas fallen). **E.** Bracteole, ovary and calyx. **F.** Brevistylous flower with separate style and stigma. **G.** longistylous flower. Drawn by Marijke Meersman. Based on Decary 5495 (A–F) and Ranarivelo et al. 353 (G).

Etymology:—The species is named for the large inflorescences that resemble the antlers of a stag.

Distribution:—Only known from the Vatovavy-Fitovinany, Atsimo-Atsinanana and Haute Matsiatra Regions in southeastern Madagascar. Fig. 4.

Habitat:—Humid lowland forest. Elev.: 20–900 m.

Phenology:—Flowering: October–November; Fruiting: immature fruits in October–November.

Vernacular Names:—hazomamy.

Uses:—Wood is used for construction and as fire wood.

IUCN status:—Vulnerable: VU B1ab(i); B2ab(ii,iii). The extend of occurrence (EOO) of *C. cervicorne* is 8,494.83 km², and its area of occupancy (AOO) is 839,00 km² using a cell width of 7 km. The species occupies 10 cells and AOO indicates that it is distributed in nine subpopulations. It occurs in two protected areas, Manombo and Ivohibe, and one protected forest located in Manakara. The subpopulations outside the protected areas occur in remnant forests, which are severely threatened by destruction. In addition, the species has a low density: over a period of one hundred years only thirteen specimens were collected: ten specimens were collected before 1960, only three after 1990.

Additional specimens examined (paratypes):—MADAGASCAR. Province Fianarantsoa: district Vohipeno, Labolakevo, Ambolonondry, 40 m, 22° 21' S, 47° 50' E, 18 October 1952, *coll. ignot. 6370-SF* (BR, P, TEF); canton et district Manakara, forêt de Manakara, N du terrain d'aviation, 22° 13' S, 47° 59' E, 17 November 1952, *coll. ignot. 6575-SF* (P, TEF); canton et district Manakara, forêt d'Ivakoany, 22° 3' S, 47° 54' E, 22 October 1954, *coll. ignot. 13573-SF* (BR, P, TEF); canton Manakara, district Manakara, Analamitily, 22° 13' S, 47° 59' E, 27 November 1954, *coll. ignot. 13585-SF* (BR, P, TEF); canton et district Manakara, Belambo, 22° 46' S, 47° 31' E, 14 February 1955, *coll. ignot. 13602-SF* (K P, TEF); canton et district Farafangana, lieu JB n° 16, village le plus proche Manombo, 23° 2' S, 47° 44' E, 17 November 1955, *coll. ignot. 16158-SF* (BR, P, TEF); canton et district Manakara, Belambo, village plus proche Marohala, 22° 46' S, 47° 31' E, 29 October 1955, *coll. ignot. 16234-SF* (P, TEF); réserve spéciale de Manombo, parcelle 1, 20–50 m, 23° 0' 35" S, 47° 43' 15" E, 26 October 2000, *Hoffmann, Ranaivojaona, Ralimanana, Richard & Ramaharitra 318* (BR, K, TAN); Bas Matatana, 22° 20' S, 47° 40' E, August 1911, *Perrier de la Bâthie 3975* (P); commune Farafangana, district Vondrozo, Ampasipotsy, 6 km from Madiorano to Vohibe (RN27), 589 m, 22° 47' 9" S, 47° 12' 17" E, 23 October 2006, *Ranarivelo, Ranaivojaona, Rakotoarinivo & Rajaonarison 353* (BR, K, MO); Tanjongato, canton et district Manakara, 22° 6' S, 47° 57' E, 20 October 1952, *Razafimamonjy 52* (as 52-R-118) (P, TEF); trail S of Morafeno, starting ca. 5 km E of Ranomafana on RN 25, between Morafeno and Ambinanindranofotaka and forest N of Ambinanifotaka, along bank of Faraony river, 600–900 m, 21° 20' S, 47° 30' E, 4 October 1996, *Turk, Randrianasolo, Randrianjatovo, Marolahy & Welton 654* (K, MO, TAN).—Locality unknown: *s. loc, s. dat. Baron 2590* (K, P).

Acknowledgements

We thank the herbarium curators of BR, G, K, MO, P, TAN, TEF and WAG for providing plant material and for help extended during study visits. Ms. Marijke Meersman is gratefully acknowledged for making the line drawings, Dr. Henry Engledow for making the distribution map. Fieldwork was conducted with the help of the Madagascar local teams from both Missouri Botanical Garden and Royal Botanic Gardens, Kew. We thank Dr. Pete Lowry and Mr. Stuart Cable for providing access to respectively the MBG and K facilities in Madagascar. Both the MBG and K offices and field staff are gratefully acknowledged for their hospitality and help. We extend special thanks to Dr. Franck Rakotonasolo, who provided help during the fieldwork. We are grateful to Madagascar National Parks (previously known as Association Nationale pour la Gestion des Aires Protégées, ANGAP), the Ministère des Eaux et Forêts and the Parc Botanique et Zoologique de Tsimbazaza (PBZT) for permission to collect in protected areas. The fieldwork was financially supported by the Fund for Scientific Research-Flanders (research project G.0250.05) and the Percy Sladen Memorial Fund.

References

- Anonymous (1962) Systematics Association committee for descriptive biological terminology. II. Terminology of simple symmetrical plane shapes (chart 1). *Taxon* 11: 145–156.
<http://dx.doi.org/10.2307/1216718>

- Bachman, S., Moat, J., Hill, A.W., de la Torre, J. & Scott, B. (2011) Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. *ZooKeys* 150: 117–126.
<http://dx.doi.org/10.3897/zookeys.150.2109>
- Baker, J.G. (1877) *Flora of Mauritius and the Seychelles: A Description of the Flowering Plants of those Islands*. L. Reeve & Co., London, 557 pp.
- Bremer, B. & Eriksson, T. (2009) Time tree of Rubiaceae: phylogeny and dating the family, subfamilies and tribes. *International Journal of Plant Sciences* 170: 766–793.
<http://dx.doi.org/10.1086/599077>
- Du Puy, D.J. & Moat, J. (1996) A refined classification of the primary vegetation of Madagascar based on the underlying geology: using GIS to map its distribution and to assess its conservation status. In: Lourenço, W.R. (Ed.) *Biogéographie de Madagascar*. Editions de l'ORSTOM, Paris, pp. 205–218.
- Holmgren, P.K., Holmgren, N.H. & Barnett, L.C. (1990) Index Herbariorum. Part I. The herbaria of the world. *Regnum Vegetabile* 120: 1–693.
- Hooker, W.J. (1849) *Niger Flora*. H. Bailliere, London, xv + 587 pp.
<http://dx.doi.org/10.5962/bhl.title.594>
- Igersheim, A. (1992) The ovary, fruit and seed development of *Craterispermum*. *Belgian Journal of Botany* 125: 101–113.
- Ismail, S., Huber, M.J. & Mougai, J. (2011) *Craterispermum microdon*. In: IUCN 2013. *IUCN Red List of Threatened Species*. Version 2013.2. Available from: <http://www.iucnredlist.org> (accessed November 27, 2013).
- IUCN (2001) *IUCN Red List Categories: Version 3.1*. IUCN Species Survival Commission, IUCN, Gland, Switzerland and Cambridge, UK, 32 pp.
- Jansen, S., Robbrecht, E., Beeckman, H. & Smets, E. (2000) Aluminium accumulation in leaves of Rubiaceae: systematic and phylogenetic implications. *International Association of Wood Anatomists Journal* 95: 91–101.
<http://dx.doi.org/10.1006/anbo.1999.1000>
- Linnaeus, C. (1753) *Species Plantarum*. Stockholm, L. Salvius, 560 pp.
- Linnaeus, C. (1767) *Mantissa Plantarum*. Part 1. Stockholm, L. Salvius, 144 pp.
- Meyer, E. (1838) Alberta magna, eine neue Pflanzengattung. *Linnaea* 12: 257–259.
- Oliver, D. (1877) *Flora of Tropical Africa* 3. L. Reeve & Co., London, viii + 544 pp.
<http://dx.doi.org/10.5962/bhl.title.48808>
- Razafimandimbison, S.G., Rydin, C. & Bremer, B. (2008) Evolution and trends in the Psychotriaceae alliance (Rubiaceae)—A rarely reported evolutionary change of many-seeded carpels from one-seeded carpels. *Molecular Phylogenetics and Evolution* 48: 207–223.
<http://dx.doi.org/10.1016/j.ympev.2008.03.034>
- Robbrecht, E. (1988) Tropical woody Rubiaceae: Characteristic features and progressions. Contributions to a new subfamilial classification. *Opera Botanica Belgica* 1: 1–271.
- Robbrecht, E. & 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. *Systematics and Geography of Plants* 76: 85–146.
- Schatz, G.E., Lescot, M., Rogers, Z., Sikes, K., Andriambololona, S., Raharimampionona, J. & Wolf, A.-E. (2003) *Gazetteer to Malagasy Botanical Collecting Localities*. Available from: <http://www.mobot.org/MOBOT/Research/madagascar/gazetteer/> (accessed November 2013).
- Taedoung, H. & Hamon, P. (2013) Three new species of *Craterispermum* (Rubiaceae) from the Lower Guinea Domain. *Blumea* 57: 236–242.
<http://dx.doi.org/10.3767/000651913X663776>
- Taedoung, H., De Block, P., Hamon, P. & Sonke, B. (2011) *Craterispermum parvifolium* and *C. robbrechtianum* spp. nov. (Rubiaceae) from west central Africa. *Nordic Journal of Botany* 29: 700–707.
<http://dx.doi.org/10.1111/j.1756-1051.2011.01297.x>
- Verdcourt, B. (1973) The identity of the common East African species of *Craterispermum* Benth. (Rubiaceae) with some other notes on the genus. *Kew Bulletin* 28: 433–431.
<http://dx.doi.org/10.2307/4108887>
- Vogel, E.F. de (1987) *Manual of herbarium taxonomy: theory and practice*. UNESCO, Indonesia, 164 pp.
- World Wild Life Fund (2006) Madagascar lowland forests. In: Cleveland, C.J. (Ed.) *Encyclopedia of Earth*. Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment (Published: October 27, 2006; Updated: March 3, 2013). Available from: <http://www.eoearth.org/view/article/154343/> (accessed 14 January 2014).