

Revision of the African genus *Uvariastrum* (Annonaceae)

Thomas L.P. Couvreur^{1,2,3}

1 Institut de Recherche pour le Développement, UMR-DIADE, BP 64501, F-34394 Montpellier cedex 5, France **2** Université de Yaoundé I, Ecole Normale Supérieure, Département des Sciences Biologiques, Laboratoire de Botanique systématique et d'Ecologie, B.P. 047, Yaoundé, Cameroon **3** Naturalis Biodiversity Center (section NHN), Wageningen University, Generaal Foulkesweg 37, 6703 BL, Wageningen, The Netherlands

Corresponding author: Thomas L.P. Couvreur (thomas.couvreur@ird.fr)

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Abstract

The genus *Uvariastrum* (Annonaceae) is restricted to continental Africa and is characterized by sepals with folded margins, few carpels and numerous stamens. The genus is mainly found in the tropical lowland rain forests of Africa, with one species growing in a drier woodland habitat. The species name *U. pynaertii* De Wild is reduced into synonymy with *U. zenkeri* Engl. & Diels. *Uvariastrum neglectum* Paiva and *U. modestum* Diels are transferred to the genus *Uvaria* leading to two new combinations: *Uvaria modesta* (Diels) Couvreur, **comb. nov.** and *Uvaria paivana* Couvreur, **nom. nov.** Five species are currently recognized in *Uvariastrum*. The present revision, the first of the genus for over 100 years, provides an overview of previously published information and discussions on morphology, taxonomy and palynology. Preliminary conservation status assessments are provided for each species, as well as diagnostic keys for fruiting and flowering material as well as detailed species descriptions. Furthermore, all species are illustrated by line drawings and all species are mapped.

Keywords

Taxonomy, IUCN conservation, Monodoreae, *Uvaria*

Introduction

Annonaceae (Magnoliales) is a pan tropical family of trees, shrubs and lianas and represent an important component of tropical rain forest ecosystems worldwide (Chatrou et al. 2012). Africa contains 42 genera and around 400 species (Couvreur 2011; Couvreur et al. 2012). Recently, a series of publications have contributed to a better understanding of African Annonaceae (Botermans et al. 2011; Couvreur 2009; Kenfack et al. 2003; Luke and Derooin 2005; Versteegh and Sosef 2007) as well as a dedicated scratchpad page (afroannons.myspecies.info). *Uvariastrum* Engl. & Diels belongs to the sub family Annonoideae Raf. and tribe Monodoreae Baill. (Chatrou et al. 2012). This tribe contains ten other African genera whose phylogenetic relationships were elucidated by Couvreur et al. (2008b). *Uvariastrum* was recovered with strong support as sister to another African genus *Hexalobus* A.DC., these in turn sister to the East African genus *Asteranthe* Engl. & Diels (Chatrou et al. 2012; Couvreur et al. 2008b).

Uvariastrum is a genus of five species restricted to lowland tropical rain forests across Africa except for *Uvariastrum hexaloboides* (R.E.Fr.) R.E.Fr. that is found in drier woodlands of southern Democratic Republic of Congo (Katanga region) and northern Zambia. Gabon appears as a center of diversity with four of the five species occurring there.

Uvariastrum are medium sized trees or shrubs as most of the members of the tribe Monodoreae. The trunks of *Uvariastrum* never present buttresses, can be fluted when old, but are generally straight and cylindrical. The phyllotaxis is distichous as usual for Annonaceae. The leaves show the typical Annonaceae pattern: they are simple, entire, distinctly petiolate, and exstipulate. Interestingly, leaves alone can be very useful for species identification (see key below and Fig. 1). Two species, *U. insculptum* Sprague & Hutch. and *U. hexaloboides*, have pubescent leaves, even in older individuals, especially along the upper side of the midrib. Besides their geographical disjunction, the former has clearly impressed venation above (Fig. 1C) and the latter has an emarginated leaf apex (Fig. 1E). The three other species of *Uvariastrum* can be distinguished by the size and shape of the leaves, the length of the petiole and the insertion of the lamina on the petiole. *Uvariastrum zenkeri* Engl. & Diels (Fig. 1A) has large leathery leaves and the lamina is inserted on top with a petiole length 2–4 mm long. Both *U. germainii* Boutique and *U. pierreanum* Engl. have the lamina inserted on the side and forming a groove, but the former (Fig. 1D) has characteristic small, long-apiculate leaves with long petioles (4–7 mm) whereas *U. pierreanum* (Fig. 1B) has slightly longer leaves with a short apiculate apex and shorter petioles (2–4 mm). The midrib is sunken to flat on the upper side which is the common state for African Annonaceae. Only a few African genera (*Isolona* Engler, *Monodora* Dunal and *Ophrypetalum* Diels) have raised midribs which provides a useful taxonomical indication in sterile material (Couvreur 2009). The midrib is always prominent on the lower side. Secondary venation is brochidodromous, i.e. secondary veins joined together at the margins in a series of arches (loop-forming). On the upper side the venation is either raised (*U. germainii*,

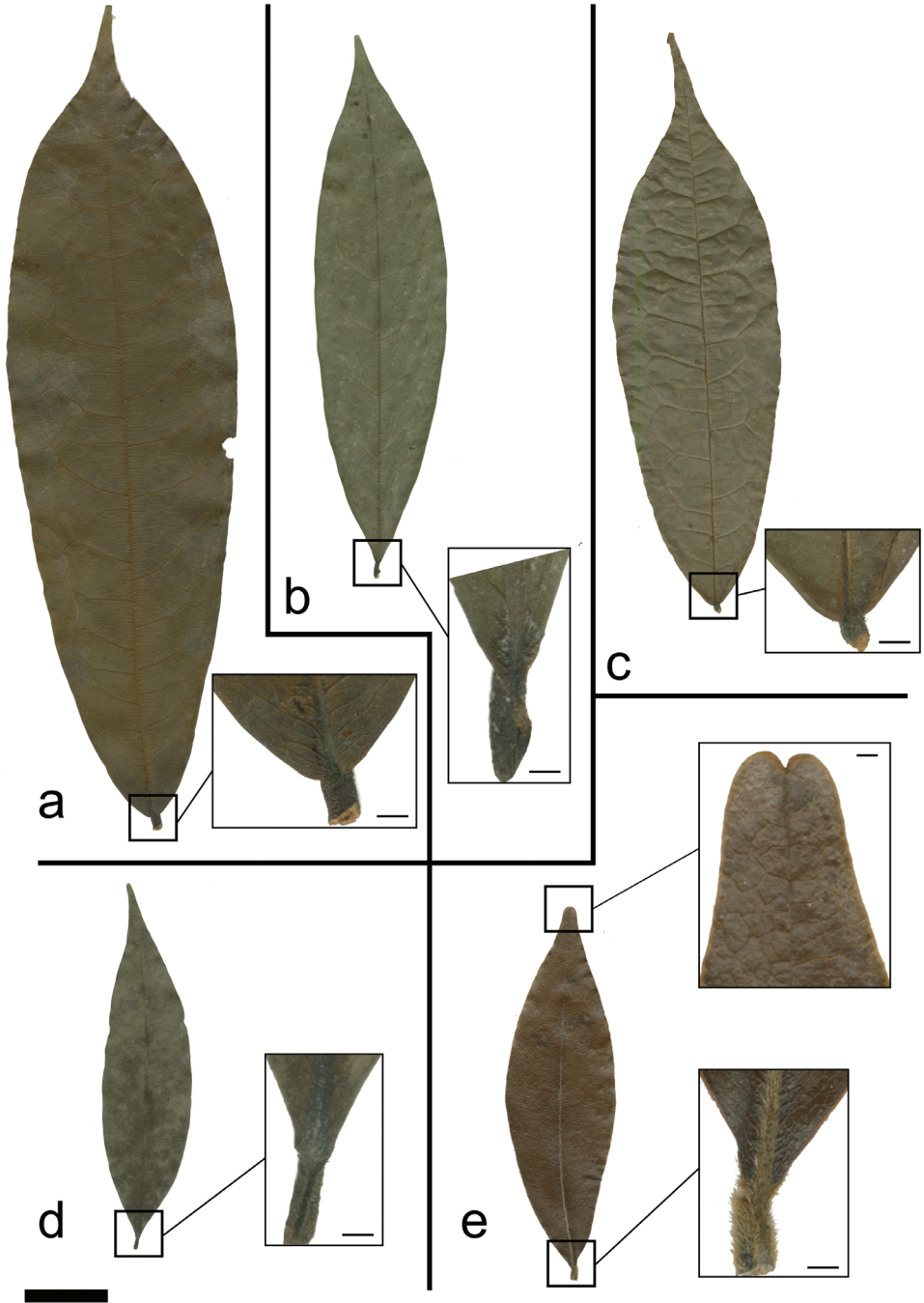


Figure 1. Leaf and petiole morphology in *Uvariastrum*. **a** *U. zenkeri* (Bergen 335, WAG) **b** *U. pierreanum* (Jongkind 7318, WAG) **c** *U. insculptum* (Staudt 740, M) **d** *U. germainii* (Ndolo Ebika 311, WAG) **e** *U. hexaloboides* (Schmitz 12046, WAG).

U. pierreanum), clearly impressed (*U. insculptum*) or not very prominent (*U. hexaloboides*, *U. zenkeri*). The tertiary venation is always reticulate.

The basic inflorescence type in Annonaceae is a thyrsoid (Weberling and Hoppe 1996): a cymosely branched partial inflorescence on a multinodate main axis, ending in a terminal flower (determinate). This sort of inflorescence is also called a rhipidium. In *Uvariastrum*, the inflorescences are defined as a single-flowered rhipidium developing from the axillary meristem similar in structure to those of *Isolona* (Couvreur 2009). Sometimes additional single flowered rhipidia develop from extra-axillary meristems. In *U. zenkeri*, *U. pierreanum*, and to a lesser extent in *U. hexaloboides*, cauliflory has been observed in which case there are numerous clustered flowers on main stems (Fig. 2d). The bracts vary from 1–3 being semi-amplectent on the petiole and caducous. They are generally small varying from 1–10 mm in length. Large leaf-like bracts, like for example those in *Isolona cauliflora* Verdc., have not been recorded in the genus.

Flowers in *Uvariastrum* are actinomorphic, cyclic, trimerous with one whorl of three free sepals and two whorls of three free petals each (referred to as outer and inner), and bisexual, conforming to the general pattern found within Annonaceae (van Heusden 1992). The pedicel is generally long varying from 0.5–5 cm, and is glabrous to densely pubescent. The bracts are inserted at the base of the pedicel, ranging from 1–3, short, 1–7 mm long, generally falling off early and leaving a scar, pubescent outside and glabrous inside.

The sepals are large varying in shape and qualified as reduplicate-valvate (van Heusden 1992) in bud meaning the margins are curved outwards (Fig. 2 e). Reduplicate-valvate sepals are found in several other genera and have been linked to large flower buds (van Heusden 1992). Within the tribe Monodoreae this character is also found in the genus *Mischogyne* Exell (see below) and has been observed to a slighter degree in *Asteranthe* Engl. & Diels (Couvreur, pers. obs.). The sepals enclosing the rest of the flower until anthesis is a character shared with the sister genus of *Uvariastrum*, *Hexalobus* (Botermans et al. 2011). The inner and outer petals are sub-equal in length, the inner ones slightly shorter, with a valvate aestivation. The petals of *Uvariastrum* are not fused in sharp contrast to *Hexalobus* and several other genera from the tribe (e.g. *Isolona*, *Monodora*, *Asteranthe*, *Sanraphaelia* Verdc.) (Couvreur et al. 2008b).

The androecium has numerous exstrose stamens conforming to the typical Annonaceae configuration (Fig. 2g). The disposition of anthers in Annonaceae flowers is still poorly known and more data is needed to better understand this (Endress and Armstrong 2011). The filaments are generally very short and wide. The connective is discoid, glabrous to densely pubescent; e.g., *U. insculptum* (Fig. 3a). In *U. germainii* the center of the connective is adorned by a protuberance termed umbonate (Maas et al. 2003) or tongue shaped, a character also found in other species like *Uvaria angolensis* Welw. ex Oliv. (Le Thomas 1969) and species of *Annickia* Setten & Maas (Versteegh and Sosef 2007) or *Greenwayodendron* Verdc. (Couvreur et al. 2009). Carpels are free, varying from 1–15 and are densely pubescent. The stigma is bilobed, or capitate in *U. pierreanum*, and can be glabrous or pubescent. Ovules vary from 15 to numerous and are biseriate with a parietal placentation.



Figure 2. Species of *Uvariastrum*. **a** *U. insculptum*, Ivory Coast (photo O. Lachenaud, no specimen) **b** *U. pierreanum*, fruit, Gabon (photo: TLP Couvreur, (Sosef 2034)) **c** *U. pierreanum*, Cameroon (photo: TLP Couvreur; Couvreur 454) **d** *U. zenkeri*; cauliflorous flowers; Cameroon (photo: XM van der Burgt (van der Burgt 590)) **e** *U. zenkeri*, flower bud; Cameroon (photo Sonneck, no specimen) **f** *U. zenkeri*, mature flower; Cameroon (photo Sonneck, no specimen) **g** *U. zenkeri*, detail of receptacle; Cameroon (photo Sonneck, no specimen).

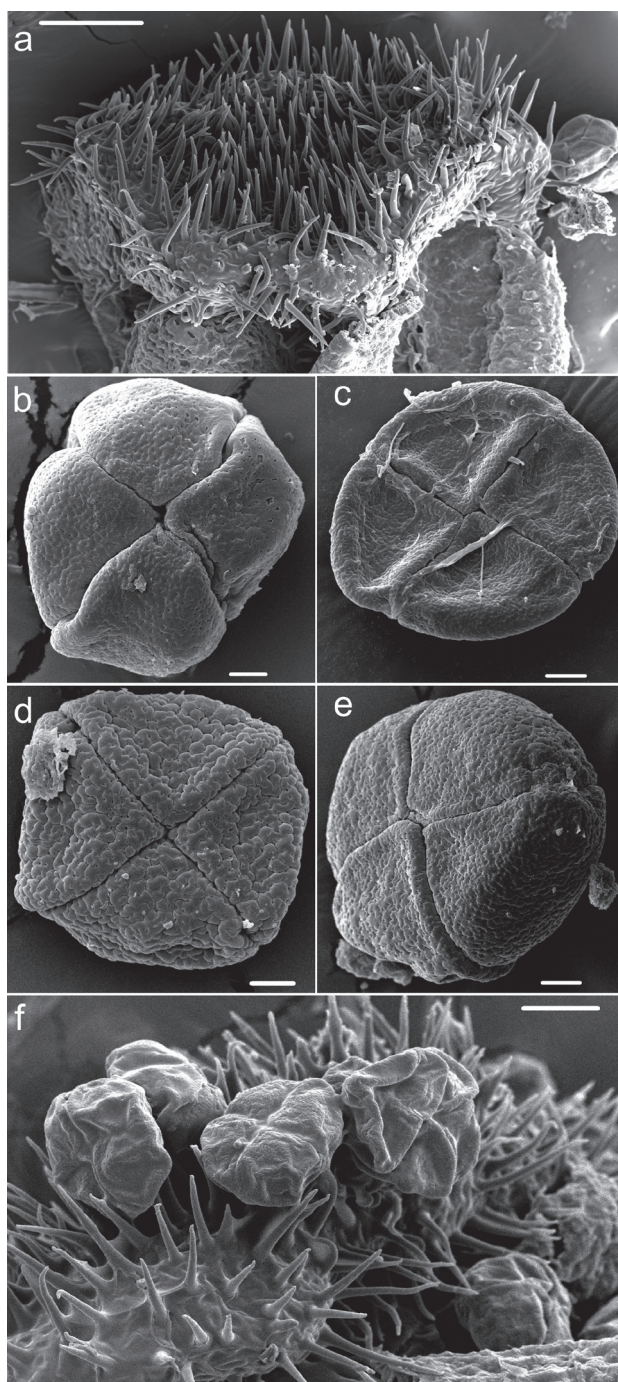


Figure 3. Stamen and pollen morphology in *Uvariastrium*. **a** detail of connective shield in *U. insculptum* (Breteler 5811) **b** pollen grain of *U. insculptum* (Breteler 5811) **c** pollen grain of *U. germainii* (Lebrun 5977) **d** pollen grain of *U. hexaloboides* (Breteler 11894) **e** pollen grain of *U. zenkeri* (Bos 6266) **f** Pollen grains of *U. zenkeri* in connective shield (Bos 6266).

Couvreur et al. (2008a) undertook a palynological analysis of five genera from the Monodoreae tribe: *Asteranthe*, *Hexalobus*, *Isolona*, *Monodora* and *Uvariastrum*. A short overview is provided here (Fig. 3). *Uvariastrum* has pollen in acalymmate, tetragonal tetrads with constituent monads inaperturate. The size of the tetrads ranged from 52–107 µm in diameter. Based on the exine ornamentation a single pollen type was recognized being regulate or psilate resulting in a very homogenous genus. This contrasts to the closely related genus *Hexalobus* with a similar number of species (Botermans et al. 2011) but with three different types of pollen ornamentation (granular to gemmate; areolate-verrucate to/or regulate; or psilate with perforations).

Taxonomic history

The first species name later to be accommodated into *Uvariastrum* was *Uvaria insculpta* Engl. & Diels (1899). Two years later in their “*Monographien afrikanischer Pflanzenfamilien und –Gattungen Anonaceae*” (Engler and Diels 1901) Engler described the genus *Uvariastrum* which included one species: *Uvariastrum pierreanum*. *Uvariastrum zenkeri* was described a few years later (1907) followed by *U. pynaertii* De Wild. that is now considered a synonym of it. *Uvaria insculpta* was later transferred into *Uvariastrum* by Sprague and Hutchinson (1916). *Uvariastrum* was distinguished from *Uvaria* by its tree or shrub habitat (*Uvaria* species are lianas), simple hairs (*Uvaria* having generally stellate hairs), valvate petals and few carpels (less than 6), even though *Uvariastrum pierreanum* can have up to 10 carpels. Sprague and Hutchinson (1916) transferred the species name *Uvaria elliotianum* Engl. & Diels into *Uvariastrum* based on its valvate sepals and petals with an indumentum of simple hairs. In 1953, Robert E. Fries (Fries 1953) transferred *Uvariastrum elliotianum* into the genus *Mischogyne*, described a few years earlier based on the stamens inserted along the receptacle and the lack of a flat discoid connective appendage on the stamens. This was also followed by several authors (Hawthorne and Jongkind 2005; Le Thomas 1969) and confirmed based on molecular data (Chatrou et al. 2012; Couvreur et al. 2008b). Fries (1953) also described *Uvaria hexaloboides* R.E.Fr. which he later transferred to *Uvariastrum* and was accepted by subsequent authors including here (Robson 1960; Verdcourt 1971).

As is evident from the above there has been some confusion between the genera *Uvaria* and *Uvariastrum*. Thus some species were initially described as *Uvaria* then transferred into *Uvariastrum*. Besides the species discussed above, Engler and Diels (1901) described *Uvaria dependens* Engl. & Diels which was then transferred into *Uvariastrum* in 1907 by Diels. I agree with Verdcourt (1971) that this species belongs to *Uvaria*. I collected it in Tanzania, and besides the fact that it was a liana, it had stellate hairs and a terminal inflorescence, the monocarps were long-stalked (also described in Verdcourt 1971, Fig. 4), a character never found within the tribe Monodoreae (Couvreur et al. 2008b). The last two names that are linked to *Uvariastrum* are *Uvariastrum neglectum* Paiva and *Uvariastrum modestum* Diels both from Angola. For both names we only have the type material (which includes flowers but no fruits) and I think these names are better excluded from *Uvarias-*

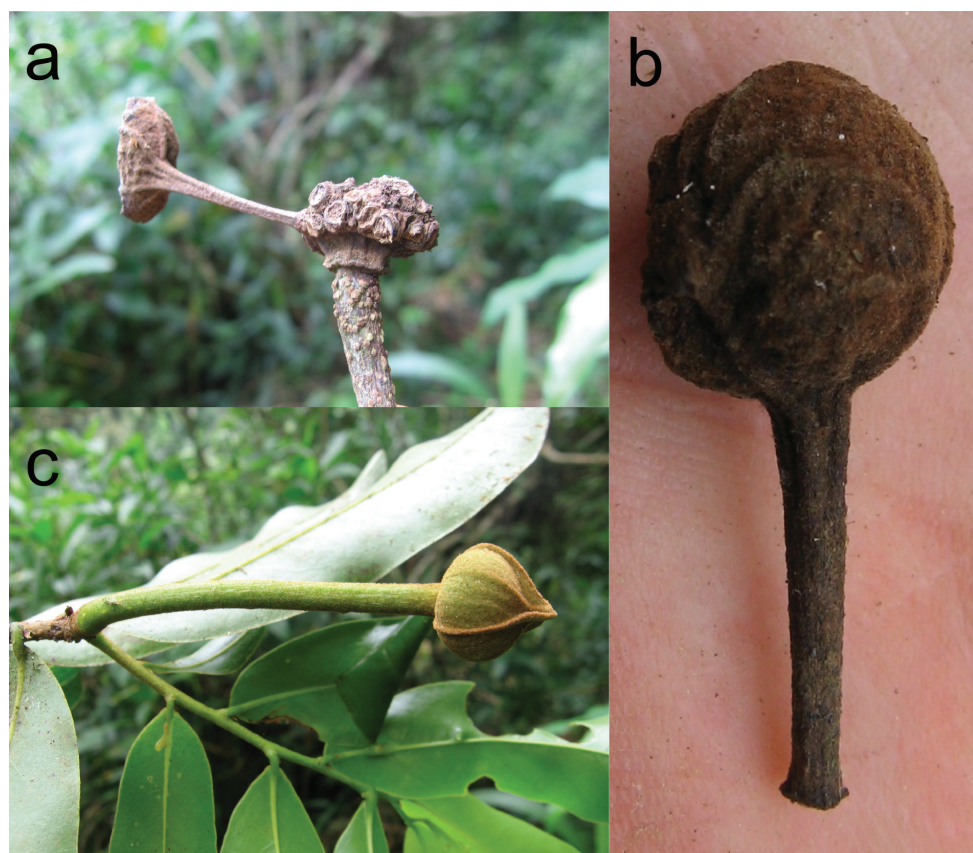


Figure 4. *Uvaria dependens* (Couvreur 96). **a** Detail of old fruiting receptacle **b** Detail of stipitate monocarp **c** Flower, note reduplicate margins. Photos: TLP Couvreur.

trum and placed for now in *Uvaria* because of their terminal inflorescences and pollen that shed in monads at least for *U. modestum* (Le Thomas, unpublished data).

Materials and methods

Measurements were made on dried herbarium specimens, although certain characters such as shape were observed on alcohol-preserved flowers or fruits, as well as field notes and photos. All specimens cited in this paper have been seen by the author (see acknowledgments for list of herbaria). I also used online databases for type specimens in order to provide a complete overview of type distribution (e.g., Global Plants, <http://plants.jstor.org>). In cases where the type collection was composed of more than a single sheet without any clear indication that these were part of a series (sheet 1, 2, etc.), a lectotypification or secondary lectotypification was done to designate a single sheet following recommendation of Article 19.7 of the International Code of Nomenclature for algae, fungi, and plants (Melbourne Code) (McNeill et al. 2012).

Preliminary conservation assessments for each species followed the IUCN recommendations (IUCN 2012) and were based on the distribution of herbarium specimens (Schatz 2002) by calculating the Extent Of Occurrence (EOO) and the Area Of Occupancy (AOO) based on category B (Geographic range). I used the on-line tool GeoCAT (Bachman et al. 2011) (<http://geocat.kew.org/>). The cell area was always set to the largest permissible value which is just under 10 km² (cell diameter = 3.16 km). Setting a cell size diameter at 3.2 km or larger will not allow any taxon to be listed as Critically Endangered where the threshold AOO under criterion B is 10 km² (IUCN 2012). Maps were generated with ArcMap 10.0 (ESRI).

Taxonomic treatment

Keys to the species of *Uvariastrum*

Sterile and flowering material:

- 1 Upper side of midrib glabrous, or sometimes very sparsely pubescent in young leaves **2**
- Upper side of midrib conspicuously pubescent, especially in younger leaves.... **4**
- 2 Lamina inserted on top, pinched, not forming a groove above on the petiole; flowering pedicels and sepals drying black..... ***U. zenkeri***
- Lamina inserted on the sides, not pinched, forming a groove; flowering pedicels and sepals drying light brown..... **3**
- 3 Young branches pubescent; leaf apex shortly acuminate; stamen connectives discoid ***U. pierreanum***
- Young branches very sparsely pubescent to glabrous; leaf apex long acuminate; stamen connectives tongue shaped ***U. germainii***
- 4 Leaf apex emarginate, secondary veins not clearly visible on both sides, upper side ones slightly raised (southeastern Democratic Republic of Congo, Zambia) ***U. hexaloboides***
- Leaf apex not emarginate, secondary veins clearly visible, upper ones clearly impressed (West Africa) ***U. insculptum***

Fruiting material:

- 1 Fruits clearly ribbed **2**
- Fruits not ribbed..... **4**
- 2 Fruits densely pubescent, young branches pubescent with erect hairs..... ***U. insculptum***
- Fruits sparsely pubescent to glabrous, young branches glabrous to sparsely pubescent with appressed hairs. **3**
- 3 Leaves 6–10 cm long, apex long acuminate; mature fruits glabrous; seeds 3–5, not flattened, raphe clearly raised..... ***U. germainii***

- Leaves 15–22 cm long, apex short acuminate; mature fruits sparsely pubescent; seeds 20–25, flattened, raphe very slightly raised *U. zenkeri*
- 4 Fruits tomentose brown, light green in vivo, not rostrate, leaf apex not emarginate..... *U. pierreanum*
- Fruits glabrous black, rostrate, leaf apex emarginate..... *U. hexaloboides*

***Uvariastrum* Engl., Monogr. Afrik. Pflanzen.-Fam. 6: 31. 1901.**

<http://species-id.net/wiki/Uvariastrum>

Type species. *Uvariastrum pierreanum* Engl. & Diels

Description. Trees or shrubs, up to 30 m tall, 15–45 cm in diameter. Trunk straight, sometimes fluted, cylindrical. Phyllotaxis distichous. Petioles 1–7 mm long, glabrous or densely pubescent. Leaves simple, entire, petiolate and exstipulate, 6–22 cm long, 2–5 cm wide, narrowly elliptic to obovate, glabrous to pubescent. Midrib impressed on the upper side, raised on the lower side; secondary venation brochidodromous, impressed or flat on upper side, tertiary venation reticulate. Inflorescence 1–3 flowered, on young or old branches, sometimes cauliflorous then with numerous flowers (more than 10). Bracts, 1–3, semi-amplexant, basal, caducous. Sepals 3, free, reduplicate-valvate, enclosing the receptacle until anthesis, 0.7–2.5 cm long, 0.5–1.8 cm wide, very broadly ovate to ovate, pubescent to glabrous on outer side, pubescent on inner side. Petals in two whorls of three each, valvate, free, subequal to outer longer than inner, outer petals 1–3.5 cm long, 0.5–1.5 cm wide, elliptic to ovate, pubescent; inner petals 1–2.8 cm long, 0.5–1.5 cm wide, elliptic to ovate, pubescent. Receptacle pyramidal to convex with a flat apex. Stamens numerous, spirally arranged, 2–6 mm long, extorse, basifixed, filament short and wide, connective present, discoid or tongue-shaped, glabrous to pubescent. Pollen grains as tetrads, inaperturate. Carpels (1)5–15, 2–6 mm long, densely pubescent, style absent, stigma capitate, Ovules numerous, lateral, biseriate, placentation parietal. Monocarps 1–8, 2.5–10 cm long, 1–5 cm in diameter, ellipsoid, oblong to globose, pubescent to glabrous, longitudinally ribbed to smooth, constricted or not around the seeds, shortly stipitate to sessile, stipe 1–9 mm long. Seeds 3–27 to numerous, 0.7–2.5 cm long, 0.7–1.5 cm wide, flat to transversely ellipsoid, raphe raised to flat.

1. *Uvariastrum germainii* Boutique, Bull. Jard. Bot. État Bruxelles 21: 120. 1951.

http://species-id.net/wiki/Uvariastrum_germainii

Figure 5

Type. DEMOCRATIC REPUBLIC OF CONGO. Orientale: Yangambi, 29 Feb 1910, *R.G.A. Germain* 213 (lectotype, designated here: BR! [BR8824400]; isolectotypes: BR! [BR8824417], FT! [FT001090], K! [K000198809], P! [P00315823, P00315825], US! [accession number US00104141]).

Description. Tree, up to 25 m tall, up to 50 cm in diameter, stem cylindrical; old branches glabrous; young branches glabrous to sparsely pubescent quickly becoming glabrous, hairs ca. 0.1 mm long, erect to appressed, brown. Petioles 4–7 mm long, ca. 1 mm in diameter, glabrous or sparsely pubescent, quickly becoming glabrous, leaf lamina inserted on top, weakly grooved adaxially. Leaf lamina 6–10 cm long, 2–3 cm wide, length:width ratio 2.5–4, narrowly elliptic to elliptic, coriaceous, glabrous on both sides, base cuneate, apex cuneate to acuminate, acumen ca. 1 cm long; midrib glabrous on both sides; secondary veins 10–12, glabrous, hardly visible adaxially, slightly raised abaxially, curving upwards and anastomizing near margin; margins wavy. Raphidia 1(–2), on leafy or older branches, no report of cauliflory. Flower buds up to 1 cm long, 1 cm in diameter, margins clearly folded outwards. Bracts soon falling, not seen. Flowering pedicel 0.7–1.5 cm long, ca. 1 mm in diameter, densely pubescent, hairs ca. 0.5 mm long, appressed, light brown. Sepals 1–1.5 cm long, 0.5–1 cm wide, length:width ratio 1–1.5, very broadly ovate to broadly ovate, base truncate, apex acute, densely pubescent outside, same as on pedicel, tomentose inside, glabrous towards the center; outside light brown, inside light brown along margins, black in center in herbarium material. Outer petals 1.3–3 cm long, 0.5–1.2 cm wide, length:width ratio 1.8–3, elliptic to broadly elliptic, base truncate, apex acute, densely pubescent outside, more so along central vein, hairs ca. 0.3 mm long, appressed, light brown, tomentose inside. Inner petals 1–2 cm long, 0.5–1 cm wide, length:width ratio 1.7–2, elliptic, base truncate, apex acute, pubescence same as outer petals; petals light brown in herbarium material, yellow on fresh material. Stamens ca. 4 mm long, connective ca. 0.6 mm long, tongue shaped. Carpels ca. 9, 4 mm long, 1 mm in diameter, densely pubescent, hairs ca. 0.7 mm long, appressed upwards, stigma bilobed, ca. 1 mm in diameter, glabrous. Fruiting pedicel 1–4 cm long, 3–4 mm in diameter, glabrous, woody. Monocarps 3–8, 2.5–7 cm long, 1.5–2 cm in diameter, ellipsoid, straight to curving, glabrous or very sparsely pubescent, many to few irregularly longitudinal ribs, resembling a peanut; stipe 3–8 mm long, ca. 5 mm in diameter; rostre ca. 5 mm long. Seeds 3–5 per monocarp, 0.7–1.4 cm long, ca. 1 cm in diameter, broadly ellipsoid, not flattened, testa bark brown on herbarium material, raphe raised, hilum ca. 4 mm long, ca. 1 mm wide, narrowly elliptic.

Distribution. Gabon, Central African Republic, Republic of Congo and Democratic Republic of Congo, mainly in the Congo basin. (Figure 6).

Habitat and ecology. This species is found in *Gilbertiodendron* J.Léonard forests as well as in semi-deciduous forests. One collection indicates a habitat on white sand on a river bank (*Germain 412*); 400–900 m.

Phenology. Mature flowers collected from Feb to Mar, Jun, Aug and Oct. Mature fruits collected in Jan, May to Jun and Oct.

Preliminary IUCN conservation status. VUB2ab(iii): *Uvariastrum germainii* is moderately represented in herbaria, and has an Area of Occupancy less than 60 km² with just nine localities. Although it is found in several protected areas (Dzanga-Sangha, Central African Republic; Nouablé-Ndoki National Park, Republic of Congo) it is highly fragmented in distribution (although this might be linked to collecting effort). The vulnerable category thus seems applicable.

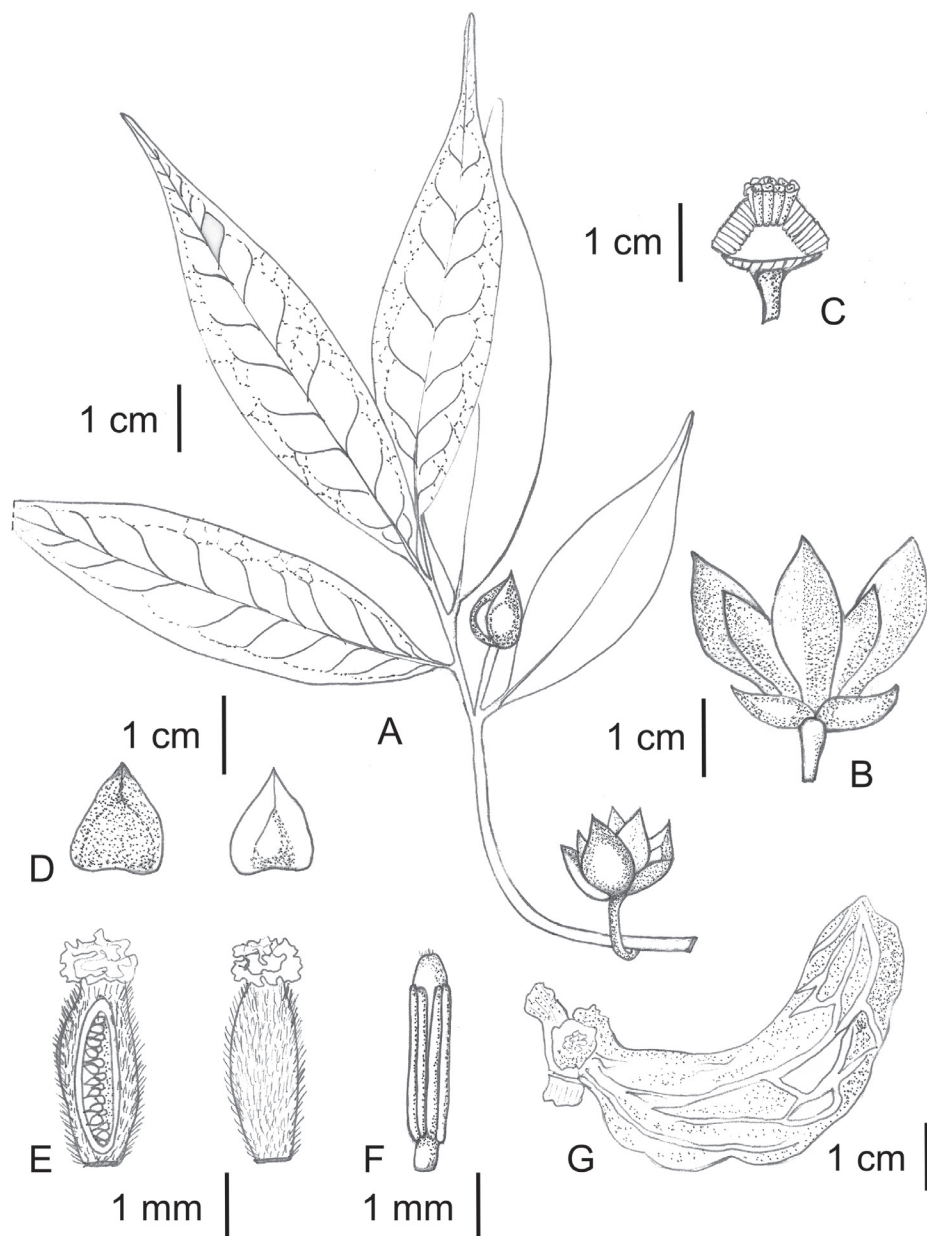


Figure 5. *Uvariastrum germainii*. **A** Flowering branch **B** Flower **C** Transversal cut of flower showing carpels and stamens **D** detail of sepals **E** detail of carpels and ovule placentation **F** stamen **G** detail of a monocarp. Drawings by Fadia, EPHE in MNHN-Palynothèque (Paris).

Vernacular names. Democratic Republic of Congo: Loopa lo nénu (Turumbu people Lombo language, *Germain* 213, 412); Mosangui (Gambé language, *Leontovitch* 113).

Uses. None recorded.

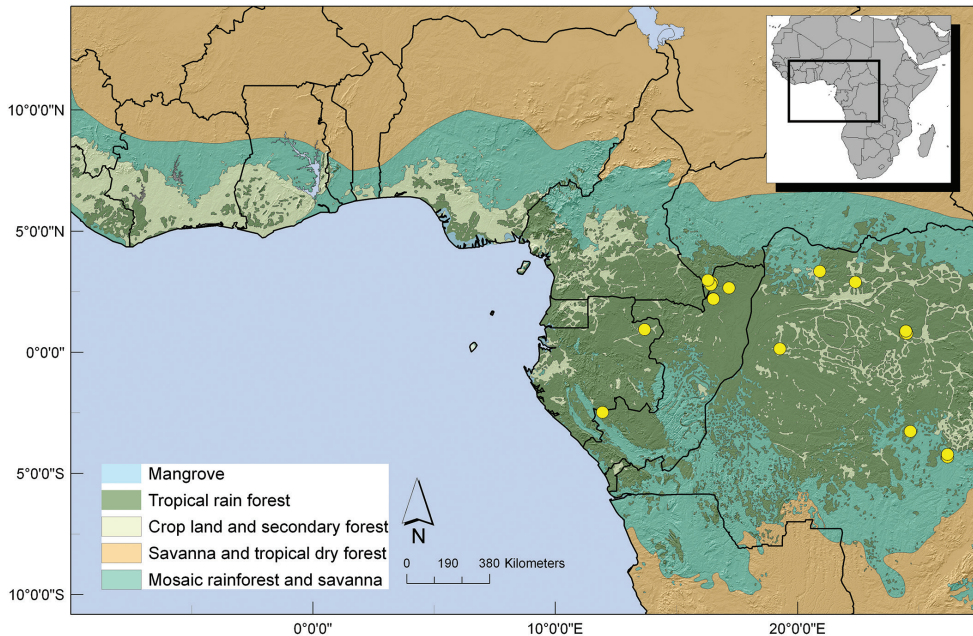


Figure 6. Distribution of *U. germainii*.

Notes. This species somewhat resembles *U. pierreanum* in the small size of its leaves, but can be distinguished by the longer petioles (4–7 mm vs 2–4 mm), long acuminate leaf apex and tongue-shaped connectives of the stamens. In addition, the fruits of *U. germainii* are clearly ribbed and glabrous, compared to the smooth and pubescent fruits of *U. pierreanum*.

Specimens examined. **CENTRAL AFRICAN REPUBLIC.** **Sangha-Mbaere:** Kongana research camp, 25 km SE of Bayanga. 31 May 1994, *Harris, D.J.* 5002 (E); Kongana research camp, 25 km SE of Bayanga. 7 Feb 1994, *Harris, D.J.* 4505 (E); Madibwé, close to St. Francois road, c. 12 km NE of Bayanga. 3 May 2001, *Harris, D.J.* 7526 (E); Bai Hoku, 25 km E of Bayanga. 17 Aug 1995, *Remis, M.* 101-95 (E).

DEMOCRATIC REPUBLIC OF CONGO. **Equateur:** Djoa, 17 Oct 1958, *Evrard, C.M.* 5064 (BR); Dua-Ebola, 28 Aug 1938, *Leontovitch, C.* 113 (BR); Dundusana, Feb 1913, *Reygaert, F.J.* 53 (BR); Bokome/Tushuapa, 22 Jan 1959, *Evrard, C.M.* 5594 (K); **Kasai-Oriental:** lotissement de Shinga II, Jun 1952, *Germain, R.G.A.* 7648 (BR, EA); **Manie-ma:** entre Nyangwe-Malela, Aug 1932, *Lebrun, J.-P.A.* 5977 (BR, K, P); **Oriental:** Yangambi, Réserve forestière, vallée de la Luweo, 29 Feb 1940, *Germain, R.G.A.* 213 (BR, FT, K, P, US); Yangambi, 1948, *Gilbert, G.C.C.* 9375 (P); 1 May 1948, *Germain, R.G.A.* 936 (P); Yangambi, RFI, vallée de Luweo, 1 Mar 1943, *Germain, R.G.A.* 412 (BR, P); Yangambi, 2 Oct 1952, *Madoux, E.* 453 (BR); 1950, *Gilbert, G.C.C.* 9347 (BR, S); Yangambi, vallée de la Luweo, May 1952, *Toussaint, L.* 929 (BR).

GABON. **Ogooué-Ivindo:** Boka-Boka, piste menant au Mt Bengoué, 4 Mar 1979, *Florence, J.* 1723 (P).

REPUBLIC OF CONGO. Niari: chantier à 4 km de Moukoudi, sur route de Mougala, 27 Oct 1975, *Sita*, *P.* 3939 (BR, P); **Sangha:** Nouablé-Ndoki National Park, Goualougo Study Site, 36.62 km E de Bomassa, 375m, 27 Mar 2008, *Ndolo Ebika*, *S.T.* 311 (E, IEC, WAG); Nouablé-Ndoki National Park, Goualougo Study Site, 38.33 km E-SE de Bomassa, 391m, 15 Sep 2008, *Ndolo Ebika*, *S.T.* 387 (E, IEC, WAG); **Likouala:** North side of Sombo stream, 8 km N of Makao, 150 km NW of Impfondo. 22 Apr 1995 *Harris*, *D.J.* 5268 (E).

2. *Uvariastrum hexaloboides* (R.E.Fr.) R.E.Fr., *Ark. Bot. ser.* 2, 3: 42. 1953.

http://species-id.net/wiki/Uvariastrum_hexaloboides

Figure 7

Uvaria hexaloboides R.E.Fr., *Wiss. Ergebn. Schwed. Rhodesia-Kongo-Exped.* 1911–1912 i. 44. 1914.

Type. ZAMBIA. Northern: Abercorn (Mbala), 19 Nov 1911, *R.E. Fries 1260* (lectotype, designated here: UPS! [accession number V-043384]; isotypes: USP! [accession number V-061951]), Z! [Z-000000874]).

Type. Based on *Uvaria hexaloboides* R.E.Fr.

Description. Tree up to 15 m high, d.b.h. up to 45 cm; old branches, glabrous, bark brown, striate; young branches densely pubescent, hairs ca. 0.5 mm long, appressed, brown; leaf buds elongated, pubescent, hairs ca. 1 mm long, appressed, light brown. Petioles 2–7 mm long, 1–2 mm in diameter; densely pubescent, hairs ca. 0.1–0.3 mm long, erect and appressed, red-brown, persisting in older leaves; leaf lamina inserted on the side, grooved adaxially. Leaf lamina 6–13 cm long, 2.4–5 cm wide, length:width ratio 2.4–4.4, narrowly elliptic to elliptic or narrowly obovate to obovate, coriaceous, glabrous adaxially, sparsely pubescent abaxially, hairs ca. 0.5 mm long, appressed, light brown; leaf dark green adaxially; lighter green abaxially; base cuneate to rounded, apex acuminate, acumen 1–2 cm long, emarginate; midrib densely pubescent adaxially persisting in older leaves, hairs ca. 0.1 mm long, appressed, brown; densely to sparsely pubescent abaxially, hairs ca. 0.3 mm long, appressed, brown; secondary veins 9–14, curving upwards and not fusing towards margins, glabrous, hardly visible adaxially; glabrous, slightly raised abaxially, sparsely pubescent. Raphidia 1–2, on young and old branches, sometimes cauliflorous. Flowering pedicel 0.5–1.8(–6) cm long, 1–2 mm in diameter, densely pubescent, hairs 0.3–0.5 mm long, appressed, light brown; bracts 1–2, basal, 2–7 mm long, 3–6 mm wide, length:width ratio 0.8–1, very broadly ovoid, densely pubescent, hairs ca. 0.3 mm long, appressed, light brown. Flower buds ca. 5–8 mm long, 5–8 mm in diameter, deltoid to globose. Sepals 0.9–1.5 cm long, 0.7–1.8 cm wide, length:width 0.6–1.1, very broadly to depressed ovate, base truncate, apex acute, margins very slightly folded, densely pubescent outside, hairs ca. 0.3 mm long appressed, light brown; densely pubescent inside, hairs 0.1 mm long, appressed, very light brown, more densely pubescent towards the margins. Outer petals

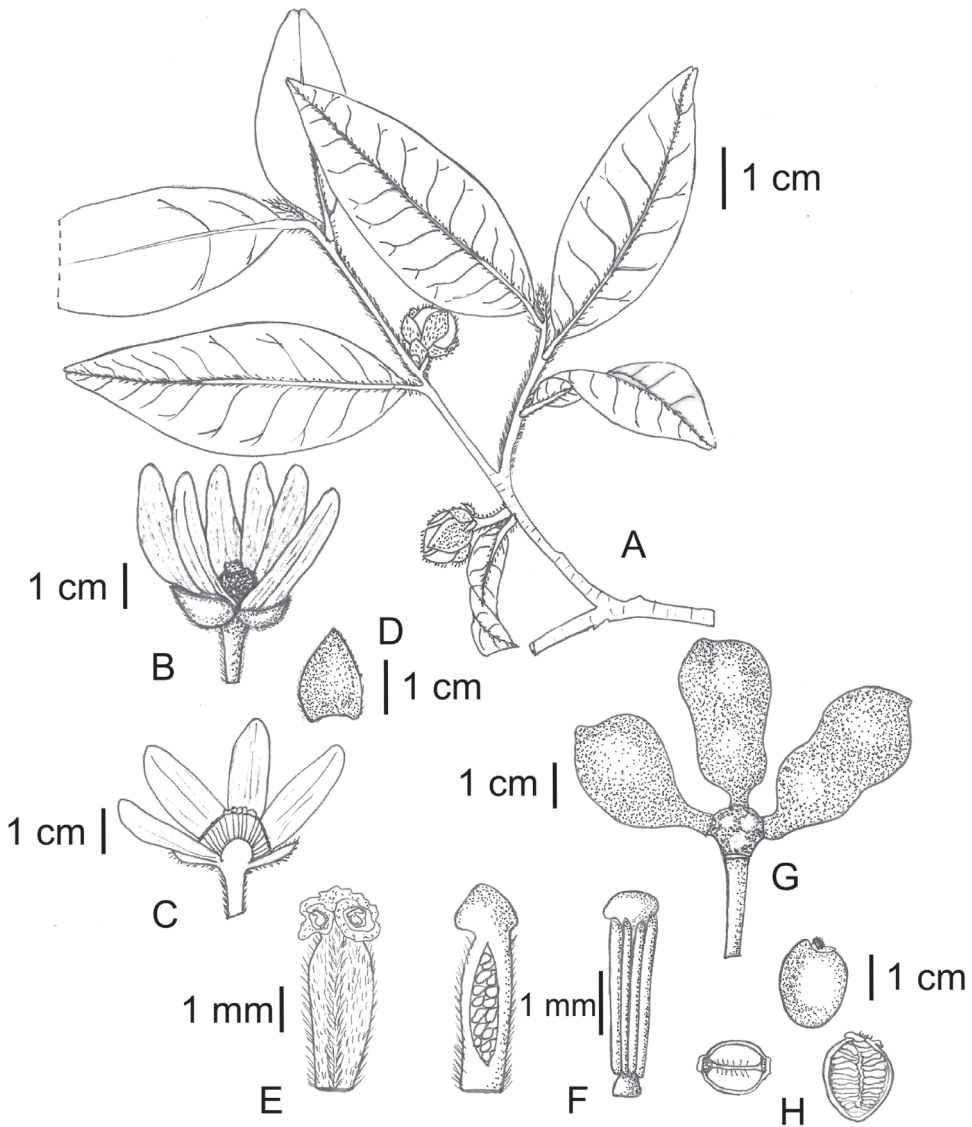


Figure 7. *Uvariastrum hexaloboides*. **A** Flowering branch **B** Flower **C** Transversal cut of flower showing carpels and stamens **D** detail of sepals **E** detail of carpels and ovule placentation **F** stamen **G** fruit **H** detail of seeds. Drawings by Fadia, EPHE in MNHN-Palynothèque (Paris).

2–3.5 cm long, 1–1.4 cm wide, length:width 2–3, elliptic to narrowly elliptic, densely pubescent and slightly shiny outside, hairs ca. 0.3 mm long, appressed, light brown, more densely pubescent on central vein and towards the base, densely pubescent inside, hairs shorter, ca. 0.1 mm, appressed, a paler brown. Inner petals shorter, 1–2.5 cm long, 0.8–1.5 cm wide, length:width 2–2.5, ovate, pubescence inside and outside same as outer petals; inner and outer petals yellow to green-yellow in color. Stamens ca. 3

mm long, connective discoid, ca. 0.5 mm in diameter. Carpels 10–14, ca. 3 mm long, densely pubescent, hairs ca. 0.5 mm long, appressed, light brown; stigma bilobed, ca. 1 mm in diameter, drying black, glabrous. Fruiting pedicels 0.5–2 cm long, 2–5 cm in diameter, densely to sparsely pubescent, sometimes glabrous, hairs ca. 0.2 mm long, erect or appressed, light brown. Monocarps 1–5, 2.5–6 cm long, 2–2.5 cm wide, broadly oblong to oblong, not ribbed, glabrous, red at maturity; stipes 5–9 mm long, 2–9 mm in diameter; rostre 1–2 mm long, slightly displaced to the side. Seeds 6–10 per monocarp, 1.5–2 cm long, 0.8–1.2 cm wide, transversely ellipsoid, 6–8 mm in depth, testa dark brown; raphe flat; hilum 2–3 mm long, 1–1.3 mm wide, narrowly elliptic to narrowly ovate.

Distribution. Southern Democratic Republic of Congo, Katanga region (Lubumbashi), northern Zambia and one collection from the Rukwa region in Tanzania. (Figure 8).

Habitat and ecology. Common in woodland, especially in *Brachystegia* Benth. and *Isoberlinia* Craib & Stapf woodlands, on rocky soil, sometimes associated with bright red sandy loam; 1000–1600 m.

Phenology. Mature flowers found between Oct and Jan, but mainly in Nov to Jan, sometimes flowering in May. Mature flowers found in Jul, Sep and from Nov till Dec.

Preliminary IUCN conservation status. LC: *Uvariastrum hexaloboides* is quite well represented in herbaria but the last collection was made in 1985. The area of extent is 128 km² however there are more than 10 localities. The species occurs in three protected Forest Reserves in Zambia (Ichimpi, Dome and Luano Forest Reserves) thus the least concern category seems appropriate, although more recent observations will be important to confirm this assessment.

Vernacular names. Zambia: Mukonderonde (Martin, J.D. 38/924; 880); La-ombo Holmes, W.D.H. 482); Mukonde mpanga (means “banana of the bush”, Holmes, W.D.H. 672).

Uses. The wood is sometimes used to make arcs (Gilbert 172)

Notes. This species is easily differentiated from all other species of the genus by its densely pubescent leaves (petioles and midribs) combined with emarginate leaf apices (Fig. 1e).

In the protologue of *Uvaria hexaloboides*, Fries cited two syntypes: 1260 and 1260a, and I select here the former as the lectotype as it was located in several herbaria (UPS and Z).

In the Flore du Gabon, Le Thomas (1969) suggested that *U. hexaloboides* should be better placed in the genus *Uvaria* because of the imbricate inner petals and “very numerous” carpels. Based on the examination of numerous herbaria specimens I did not find any indication that this species should be transferred. Indeed, carpel number varies between 10 and 15, and the inner petals were only slightly imbricate to valvate. Moreover, the pollen in this species appears as tetrads (Couvreur et al. 2008a) confirming its position in *Uvariastrum*.

Specimens examined. DEMOCRATIC REPUBLIC OF CONGO. **Katanga (Shaba):** Kasapa, 1245m, 14 Jun 1979, *Malaisse, F. 9806* (BR, WAG); Luiswishi, 1208 m, 28 Nov 1985, *Malaisse, F. 13699* (BR, WAG); 19 Dec 1984, *Malaisse, F. 13408* (BR, K, P, WAG); Parc

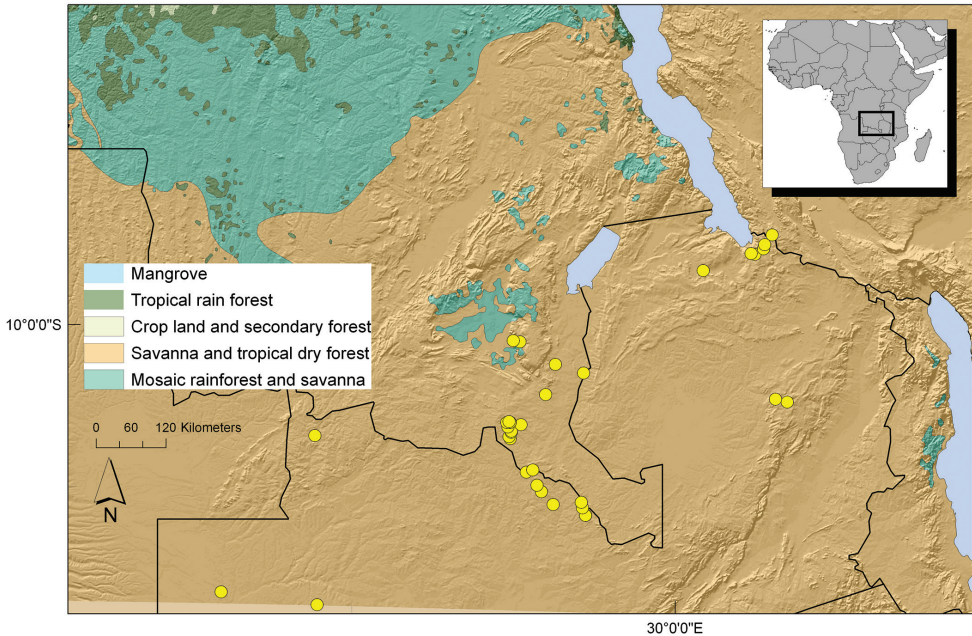


Figure 8. Distribution of *U. hexaloboides*.

Kundelungu (Chutes de Kaloba), 25 May 1984, *Breyne, H.* 4862 (BR); S.E. de la route Sakania-N'Dola, à 12km au Sud de Sakania, 25 Apr 1962, *Schmitz, A.* 9431 (M, P); no locality info, 18 Jul 1950, *Schmitz, A. s.n.* (BR); around Lubumbashi, 12 Dec 1947, *Schmitz, A.* 1118 -1 (BR, EA); Kasunumi, Nieuwdorp, 4 May 1912, *Bequaert, J.C.C.* 412 (BR); Nieuwdorp, 5 May 1912, *Bequaert, J.C.C.* 573 (BR); route Elisabethville, Kasenga. ±80 km Elisabethville, 7 May 1952, *Delvaux, J.* 248 (BR); au S.E. de Kipilingu, crête Zaire-Zambèze, 1 May 1971, *Lisowski, S.* 11941 (BR); Haut Shaba, 21 km NW de Lubumbashi, Lukuni, 22 Dec 1968, *Lisowski, S.* 11926 (BR, K); Plateau des Kundelungu, Katanga. Au bord de la rivière Lofoi, 27 May 1969, *Lisowski, S.* 7584 (BR); env. 20 km au NNW de Kasomeno, 12 Sep 1970, *Malaisse, F.* 6765 (BR); Luiswishi, 18 Jul 1950, *Schmitz, A.* 2883 (BR); Arboretum Etoile, 5km NE d'Elisabethville, 13 Dec 1949, *Schmitz, A.* 2701 (BR); Station de Keyberg (=Kisanga), 8 kms S.O. d'Elisabethville, 28 Jul 1947, *Schmitz, A.* 789 (BR); Muken, 12 km S.SO d'Elisabethville, 12 Apr 1947, *Schmitz, A.* 506 (BR, COI); Kasapa, 1245m, 16 Dec 1976, *Malaisse, F.* 9144 (BR); à 92 km au Sud de Kolwezi, en bordure de la vallée formant tête de source de la Musinga, 24 Nov 1982, *Schaijes, M.* 1636 (BR); à 14 km d'Elisabethville, 13 Jan 1966, *Schmitz, A.* 12046 (M); Luiswishi, 24 May 1979, *Malaisse, F.* 9889 (BR); à 12 km au N.W. d'Elisabethville (Katanga), 22 Oct 1958, *Gathy, A.L.* 2285 (BR).

TANZANIA. Rukwa: Ufipa district, 20 miles from Abercorn on new Sumbawanga-Abercorn Road, 25 Nov 1960, *Richards, M.A.E.* 13630 (K).

ZAMBIA. Central: Luwondo Forest (site 3), 30 Jun 1998, *Smith, P.P.* 1783 (K); **Copperbelt:** Ndola, 8 Dec 1953, *Fanshawe, D.B.* 555 (EA, K, WAG); edge of Ndola

golf course, 8 Dec 1952, *Angus, T.A.* 919 (BR, COI, EA, FHO, NY); Ndola, no date, *Greenway, P.J.* 5676 (BR, EA, FHO); 24 Jul 1935, *Duff, C.E.* 35/ 300 (A, BR, FHO, NY, P, S); 16 May 1933, *Duff, C.E.* 33/ 83 (BR, FHO); Luano forest reserve, 10 Jul 1951, *Holmes, W.D.H.* 481 (FHO); Dome forest Reserve, 13 Jun 1952, *Holmes, W.D.H.* 479 (FHO); Nchanga, 16 Aug 1927, *Bourne, R.* 80 (FHO); Luano Forest district, 9 Jul 1951, *Holmes, W.D.H.* 482 (FHO); Ichimpi Forest Reserve, west of Chati, 1 Jun 1951, *Holmes, W.D.H.* 672 (FHO); Ndola, 20 Nov 1959, *Angus, T.A.* 2061 (FHO); 24 Dec 1935, *Miller, R.G.* 290 (FHO); **Luapula**: 70 km from Manza, along road to Mwense, 19 Nov 1992, *Breteler, F.J.* 11894 (MO, UZL, WAG); **North-Western**: Mwinilunga district. Close to the Kabompo, Sep 1934, *Trapnell, C.G.* 1618 (BR, K); c. 1 mile N of Mwinilunga, 26 Nov 1937, *Milne-Redhead, E.W.B.H.* 3413 (BR); **Northern**: Shiwa Ng'andu, Mansha River. Collections at Chusa Falls, 25 Nov 1993, *Harder, D.K.* 2133 (MO, WAG); top of path escarpment. Chilongowelo, 1524m, 13 Jan 1955, *Richards, M.A.E.* 4055 (BR); 24 km west of Mbala along Mbala-Mpulungu Road to Power Station Road (D549). By stream 3 km along road D549, 1 Dec 1993, *Nkhoma, C.N.* 80 (BR, MO); ad flumen Mukunashi, 26 Oct 1911, *Fries, R.E.* *Centr. Afr.* 1119 (UPS); Shiwa Ngandy, Chinsali, 1463m, 24 Sep 1938, *Greenway, P.J.* 5771 (EA, FHO); Chianga stream, N.E. of Abercron, 11 Dec 1934, *Michelmores, A.P.G.* 1048 (EA); Lungua valley, Abercorn, 14 Jan 1958, *Lawton, R.M.* 335 (FHO); Abercorn, 1 Aug 1962, *Lawton, R.M.* 955 (FHO); **Western Province**: Lialui district, near Shombo plain, between Lukulu and Kabompo Reserves, 30 Dec 1938, *Martin, J.D.* 38/924 (FHO); Luampa-Kafue traverse, Mutundwa, 16 Oct 1938, *Martin, J.D.* 880 (FHO); **Unknown**: locality unknown, no date, *Miller, R.G.* 307 (BR, FHO, NY).

3. *Uvariastrum insculptum* (Engler & Diels) Sprague & Hutch., *Bull. Misc. Inform. Kew* 159. 1916.

http://species-id.net/wiki/Uvariastrum_insculptum

Figure 9

Uvaria insculpta Engl. & Diels, *Notizbl. Königl. Bot. Gart. Berlin* 2: 295. 1899.

Type. CAMEROON. South-West Province: Johann-Albrechtshöhe [Kumba], 1896, *A. Staudt* 740 (lectotype, designated here: B! [B100153111]; isolectotypes: COI!, EA!, G! 2-sheets [G00011729], K! 3-sheets [K000105338, K000105339, K000105340], P! 2-sheets [P00315828, P00315829], S!).

Type. Based on *Uvaria insculpta* Engl. & Diels.

Description. Tree or shrub to 4–7 (15) m high, d.b.h. 2.5–5 cm; old branches spreading, glabrous, bark brown-grey; young branches pubescent, hairs ca. 0.5–1 mm long, erect, brown; leaf buds elongated, pubescent, hairs ca. 1 mm long, appressed, light brown. Petioles 1–2(4) mm long, 1 mm in diameter; pubescent, hairs ca. 0.4–0.8 mm long, erect, red brown, persisting in older leaves; leaf lamina inserted on top, weakly grooved adaxially. Leaf lamina 6–14 cm long, 2–4 cm wide, length:width ratio

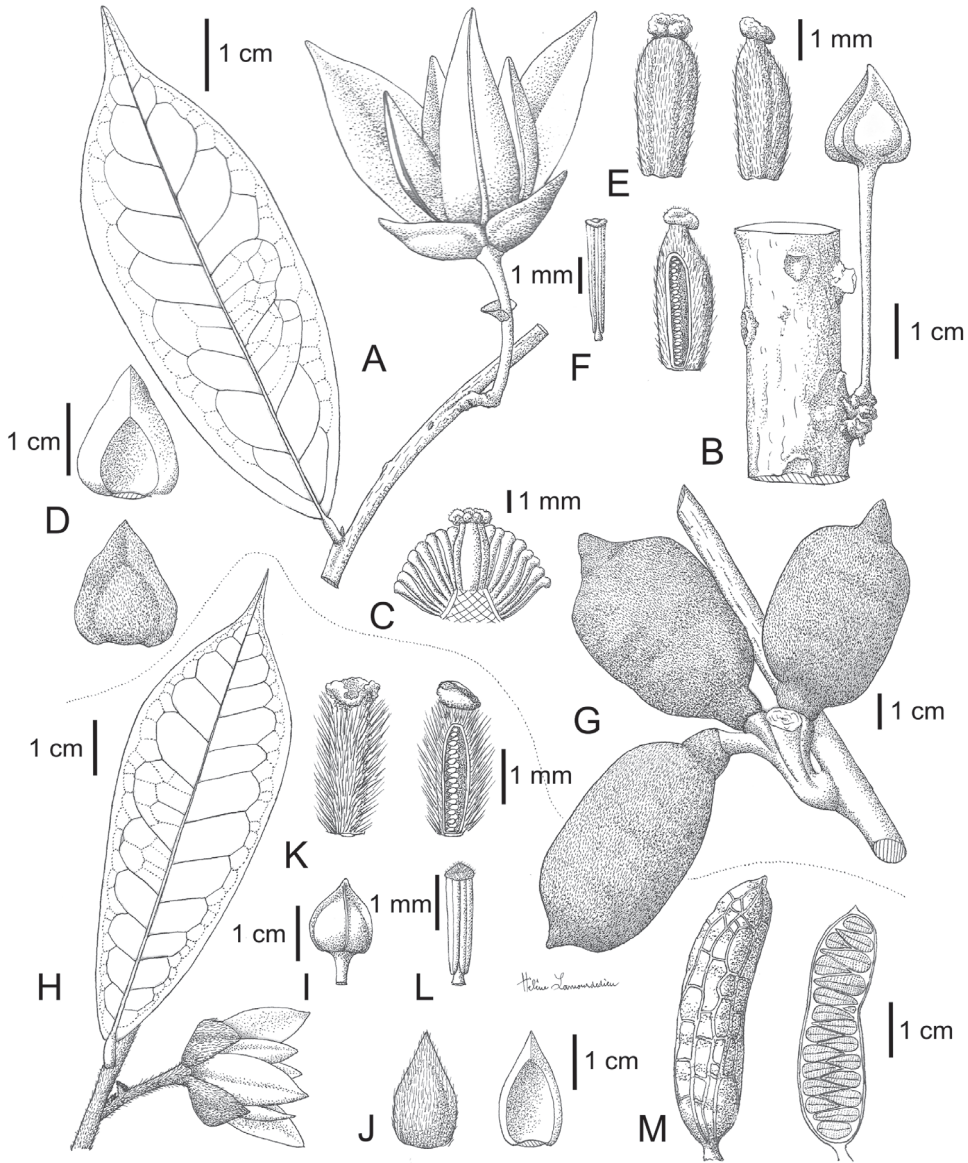


Figure 9. *Uvariastrum pierreanum*. **A** Flowering branch **B** cauliflorous flower **C** Transversal cut of flower showing carpels and stamens **D** detail of sepals **E** detail of carpels and ovule placentation; stamen **G** fruit. *Uvariastrum insculptum* **H** Flowering branch **I** flower bud **J** sepals **K** carpel **L** stamen **M** fruits. Drawing Helène Lamourdedieu, modified from *La Flore du Gabon*, Fig. 53. 1969.

2.5–4, narrowly elliptic to elliptic or narrowly obovate to obovate, papyraceous to sub coriaceous, glabrous to very sparsely pubescent adaxially, sparsely pubescent quickly becoming glabrous abaxially; dark green adaxially; lighter green abaxially; base rounded to subcordate, apex acuminate, acumen 1–2 cm long; midrib pubescent in young

leaves quickly becoming glabrous adaxially, hairs ca. 0.1 mm long, appressed, brown; densely to sparsely pubescent abaxially, hairs ca. 0.3 mm long, appressed, brown; secondary veins 8–12, straight to curving upwards, clearly anatomizing towards margins, glabrous, imprinted adaxially; sparsely pubescent, hairs ca. 0.3 mm long, appressed, brown, clearly visible abaxially. Rhipidia 1–2, on leafy branches, and one report of cauliflory. Flowering pedicels 0.8–1.5 cm long, 1–2 mm in diameter, densely pubescent, hairs 0.2–0.5 mm long, appressed, light brown. Bracts up to 3, ca. 4 mm long, 3–4 mm wide, basal, densely pubescent outside, hairs ca. 0.5 mm long, light to darker brown, glabrous inside. Sepals 0.7–1.5 cm long, 5–8 mm wide, length:width ratio 1.4–2.5, ovate to broadly ovate, base truncate, apex acute, margins slightly folded; densely pubescent, hairs ca. 0.5 mm long, appressed, light brown when dried; horizontally spreading in mature flowers, falling when in fruit, green to light green or pale yellow with darker margins in fresh flowers. Outer petals 2.3–3.5 cm long, 0.5–1 cm wide, length:width ratio 2–4, ovate to narrowly ovate, base narrowing, apex acute, densely pubescent to tomentose outside, hairs ca. 0.1 mm long, appressed, light brown, more densely pubescent along central vein, sparsely pubescent to tomentose inside, hairs ca. 0.1 mm long, appressed, light brown; pale yellow to white in fresh flowers. Inner petals smaller than outer ones, 1–2 cm long, 0.6–1 cm wide, length:width ratio 2–4, ovate to narrowly ovate, base narrowing, apex acute, pubescence and color same as outer petals; pale yellow to white in fresh flowers. Stamens 2–2.5 mm long, connective discoid, ca. 0.5 mm in diameter, densely pubescent; bright red. Carpels 6–7, falling off before stamens, 2–3 mm long, ca. 1 mm in diameter, densely pubescent, hairs 0.7–1 mm long, appressed upwards, light brown; stigma ca. 1.5 mm in diameter, bilobed, glabrous, yellow to creamy; ovules 19–26, biseriate. Fruiting pedicels 1–2 cm long, 2–5 mm in diameter, woody, densely to sparsely pubescent, hairs ca. 0.5 mm long, appressed, light brown. Monocarps 2–8, 3–6 cm long, 1–2 cm in diameter, oblong to narrowly oblong, straight or bending, longitudinally ribbed, ribs ca. 4–6, resembling that of a peanut, densely pubescent all over, more so along ribs, hairs ca. 0.2 mm long, light brown; stipe 2–6 mm long, 2–5 mm in diameter; rostre 2–4 mm long. Seeds, ca. 20 per monocarp, 1–1.5 cm long, 0.7–0.9 cm wide, ellipsoid flat, 3–5 mm in depth, testa dark brown; raphe raised, slightly darker brown; hilum 2–4 mm long, 1–1.5 mm wide, narrowly elliptic to narrowly ovate.

Distribution. Mainly a West African species, found in Liberia and Ivory Coast, two collections in Cameroon and two in Gabon; Figure 10.

Habitat and ecology. Found in lowland primary and secondary rain forest 0–400 m.

Phenology. Mature flowers found between Oct and Feb. Mature fruits found in Feb and from Apr till May and in Jul.

Preliminary IUCN conservation status. LC: *Uvariastrum insculptum* is well represented in herbaria and has a large distribution across West Africa, and a few specimens from Central Africa. It is also present in several protected areas such as national parks or protected areas (Taï National Park, Banco National Park, Monogaga Forest Reserve (Ivory Coast); Stubbs Creek Forest Reserve (Nigeria)). The Least Concern category thus seems appropriate.

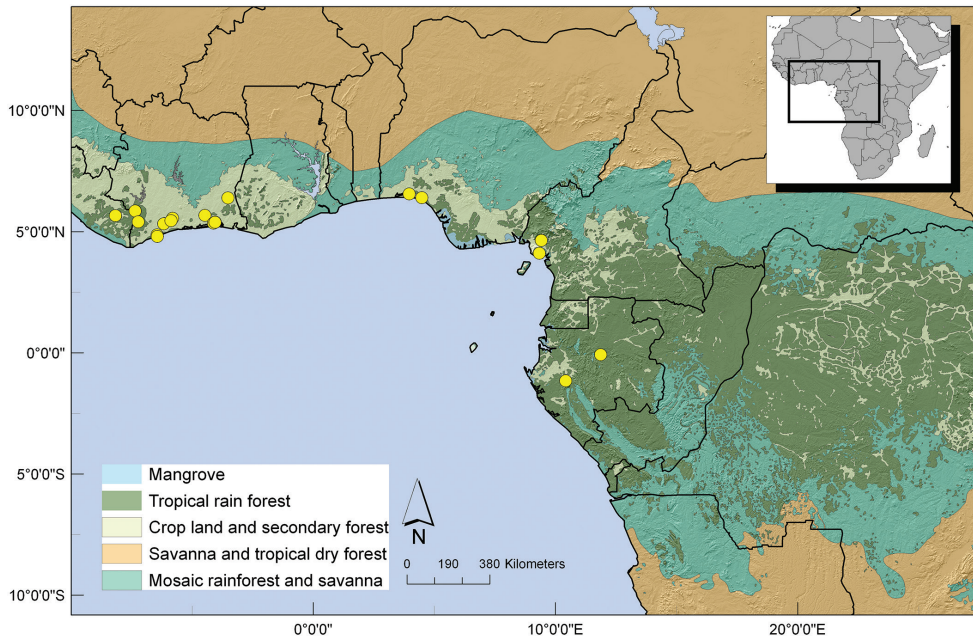


Figure 10. Distribution of *U. insculptum*.

Vernacular names. None known.

Uses. None known.

Notes. This is the only largely West African species of the genus, although it occurs in the South-West region of Cameroon. It is easily distinguishable by its densely pubescent leaves and midrib and its impressed venation of the upper side of the leaves.

Two Staudt collections were cited in the protologue of *Uvaria insculpta*: n. 740 and n. 900. Although it would appear as if the former was already considered as the lectotype I found no publication formalizing this (e.g., Global Plants), so I have lectotypified it here using because it has several sheets compared to one located for #900.

Specimens examined. CAMEROON. South-West Province: Johann-Albrechtshöhe Kumba, *Staudt, A. 900* (G); Likomba Pflanzung, 15–35 km NE von Victoria, Dec 1928, *Mildbraed, G.W.J. 10795* (A, K).

GABON. Ngounié: along a forestry road of chantier EFT (Exploitation Forestière de Tsamba) starting at Ndjemba village on Fougamou-Lambaréné road, 29 Oct 2009, *Bissiengou, P. 644* (LBV, WAG); CFAD de Rimbunan Hijau, au Sud-Ouest du Parc National de la Lopé, 448m, 31 Jan 2009, *Dauby, G.V. 1510* (BRLU); **Ogooué-Ivindo:** 5km Sud du Petit Okano, 20 Mar 1979, *Florence, J. 1853* (P).

GHANA. Western Region: Asientiem, 11 Jul 1912, *Chipp, T.F. 291* (K).

IVORY COAST. Abidjan: km 52 new road Abidjan-Ndouci, c. 10 km E of Sikensi, 19 Jul 1979, *Kruif, A.P.M. de 207* (FHO, WAG); Banco arboretum near Abidjan, 9 Oct 1961, *Wilde, J.J.F.E. de 3126* (K, WAG); Banco Forest Reserve, near Arboretum, along Banco River, 26 Feb 1975, *Koning, J. de 5412* (BR, C, E, G, MA, MO, WAG); Abid-

jan, Banco Forest Reserve, Botanic Garden, 26 Feb 1976, *Koning, J. de 6583* (AAU, BR, C, EA, FR, G, GC, K, LMU, MA, MO, P, PRE, SL, WAG); Adiopodoumé, 5 Feb 1961, *Wit, H.C.D. de 9110* (WAG); forêt du Banco, 20 Apr 1973, *Aké Assi, L. 12030* (G); Arboretum du Banco, 19 Dec 1973, *Aké Assi, L. 12295* (G); forêt du Banco, 26 Mar 1980, *Aké Assi, L. 15146* (G); forêt du Banco, 1 Jun 1981, *Aké Assi, L. 15900* (G); Arboretum du Banco, 5 Nov 1984, *Aké Assi, L. 16772* (B, G); Banco, 10 Mar 1932, *Aubréville, A. SF 1331* (P); Le Banco, Jun 1932, *Aubréville, A. SF 1341* (P); **Adzopé**: On border of Comoé river, c. 15 km NW of Mbasso, c. 60 km NE of Adzopé, 27 Jul 1963, *Wilde, W.J.J.O. de 570* (BR, K, P, WAG, Z); **San-Pédro**: Forêt Classée Monogaga, just north of Sassandra - San Pedro road, 24 Mar 2000, *Jongkind, C.C.H. 4707* (MO, U, WAG); Classified forest of Monogaga, 26 Apr 1997, *Breteler, F.J. 13761* (WAG); **Sassandra**: 79 km NNE of Sassandra, Lagako-Tokpeko, 7 May 1975, *Burg, W.J. van der 131* (WAG); 61 km N of Sassandra, W of Niapidou, 19 Jan 1959, *Leeuwenberg, A.J.M. 2492* (P, WAG); 61 km N of Sassandra, W of Niapidou, 21 Feb 1959, *Leeuwenberg, A.J.M. 2785* (P, WAG); 44 km Lakota-Sassandra, 28 Oct 1968, *Breteler, F.J. 5811* (BR, EA, HBG, K, LG, LISC, MA, MO, P, PRE, SRGH, U, WAG); **Tabou**: P.N. Taï, environ 0.5 Km à l'Est de la Station CRE, 5°51'N, 7°21'W, Feb 1999, *Menzies, A. 107* (G); Entre Djiroutou et le mont Niénoukoué. Guiroutou, 50m au Sud du layon 'Hana'; à 3.5 Km du campement écotouristique, Mar 1999, *Menzies, A. 459* (G); P.N. Taï, station d'écologie, 12 Jul 1996, *Chatelain, C. 1358* (CSRS).

LIBERIA. Grand Gedeh: Putu Hills, E ridge, Mt. Jideh, 254m, 2 Dec 2010, *Putu Botanic Team EP 1307* (WAG).

NIGERIA. Cross River State: Calabar, Eket Distr, Stubbs Greek F.R. near Unyene, 10 Jan 1959, *Keay, R.W.J. 37719* (K); **Lagos State**: Lagos Botanical Station, Atigere, Feb 1893, *Millen, H. 15* (K); Eba, 1931, *Kennedy, J.D. 1711* (FHO); road leading Murtala Muhamed botanical gardens, 26 Nov 1994, *Daramola, B.O. 94/ 581* (F, MO).

4. *Uvariastrum pierreanum* Engl., *Monogr. Afrik. Pflanzen.-Fam. 6: 32. 1901.*

http://species-id.net/wiki/Uvariastrum_pierreanum

Figure 9

Type. Gabon. Estuaire: Libreville, Oct 1897, *T.-J. Klaine 1091* (lectotype, designated by Le Thomas 1969, p. 294: P! [P00315822]; isolectotype: B! [B1001153112]).

Description. Tree to 20–25 m high, d.b.h. up to 40 cm; bole cylindrical, old branches spreading, glabrous, truck fluted when old, bark brown-grey; first year branches sparsely pubescent to glabrous, hairs ca. 0.5–1 mm long, appressed, light brown; leaf buds elongated, pubescent, hairs ca. 1 mm long, appressed, light brown. Petioles 2–4 mm long, 1–1.5 mm in diameter; glabrous, sometimes sparsely pubescent in first year leaves, hairs ca. 0.5 mm long, appressed; leaf lamina inserted on top, weakly grooved adaxially. Leaf lamina 6–12(–16) cm long, 2–4.5 cm wide, length:width ratio 2.5–4.2, narrowly elliptic to elliptic or narrowly obovate to obovate, sometimes narrowly oblong to oblong, papyraceous to sub coriaceous in older leaves, glabrous to sparsely pubes-

cent, hairs ca. 0.3 mm long, appressed, light brown; lamina dark green adaxially; light green abaxially; base cuneate to decurrent, apex acuminate, acumen 0.7–2 cm long, lamina margins wavy; midribglabrous on both sides; secondary veins 7–12, curving upwards, arching towards margins, glabrous, slightly raised adaxially; clearly visible abaxially. Raphidia 1–3 on young to old branches, numerous when cauliflorous. Flowering pedicel 1.5–5 cm long, 1–1.5 mm in diameter, sparsely pubescent to densely pubescent, hairs 0.3 mm long, appressed, light brown. Bracts 1, basal to sub basal, ca. 6 mm long and wide, length:width ratio ca. 1, very broadly ovate, apex acuminate, base truncate, pubescent outside, hairs ca. 0.2 mm long, appressed, light brown, glabrous inside. Flower buds up to 3 cm long, up to 1.5 cm in diameter, pyramidal, margins strongly reflexed. Sepals 1.5–2.5 cm long, 1–2 cm wide, length:width ratio 1.2–1.4, broadly ovate, tomentose brown, and sparsely pubescent inside, hairs 0.2 mm long, appressed, light brown; tomentose light brown outside, glabrous towards center. Sepals grey-green in fresh material, light brown to yellowish outside, yellowish inside along margins, black at center inside. Outer petals 2.5–4 cm long, 0.8–1.5 cm wide, length:width ratio 2–3, narrowly elliptic to elliptic, base narrowed, apex acute; densely pubescent outside, more so along central vein, hairs ca. 0.1 mm long, appressed, light brown; sparsely pubescent inside, hairs 0.1 mm long, appressed, light brown. Inner petals 1.5–2.8 cm long, 0.6–1.5 cm wide, length:width ratio 1.6–2.6, narrowly elliptic to elliptic, base narrowed, apex acute, pubescence similar to outer petals. Petals yellow to grayish-yellow in fresh material; dark brown to grey outside, black inside in herbarium material. Stamens 4–6 mm long, connective discoid, pubescent, ca. 1 mm in diameter, pinkish red. Carpels 5–10, 4–6 mm long, 1.5–2 mm in diameter, stigma weakly bilobed, ca. 2 mm in diameter, drying back, densely pubescent, hairs ca. 0.5 mm long, appressed upwards, light brown; ovules 24–35. Fruiting pedicels 1.5–5 cm long, 4–6 mm in diameter, woody, glabrous to sparsely pubescent. Monocarps 3–5, up to 9–10 cm long, 4–5 cm wide, globose to ellipsoid, generally straight; not ribbed, smooth, densely tomentose brown, light green in vivo, all over giving a velvety aspect; pale bluish green turning brown at maturity on fresh material; apex rounded, stipe 0–4 mm long, 3–5 mm wide; not rostrate. Seeds numerous per monocarp, 1.5–2.5 cm long, 1–1.5 cm wide, ellipsoid flat, 5–9 mm in depth; testa black to brown, smooth, easily falling off revealing the ruminate endosperm; raphe raised; hilum 0.7–1 cm long, 3–5 mm wide, narrowly ellipsoid.

Distribution. A widespread species across West and Central Africa. Found in Guinea, Liberia, Ivory Coast and Ghana, as well as in Nigeria, Cameroon, Gabon, Equatorial Guinea, Central African Republic, Republic of Congo and two specimens in Democratic Republic of Congo. Figure 11.

Habitat and ecology. Found in primary or secondary lowland rain forest. On *tierra firme*, or along rivers, occurring on sandy or rocky soils. Also found in gallery forests near savannas. 0–600m.

Phenology. Flowering and fruiting have been recorded across its distribution all year round.

Preliminary IUCN conservation status. LC. This species is the most widespread of all *Uvariastrum* species occurring in numerous national parks and other protected

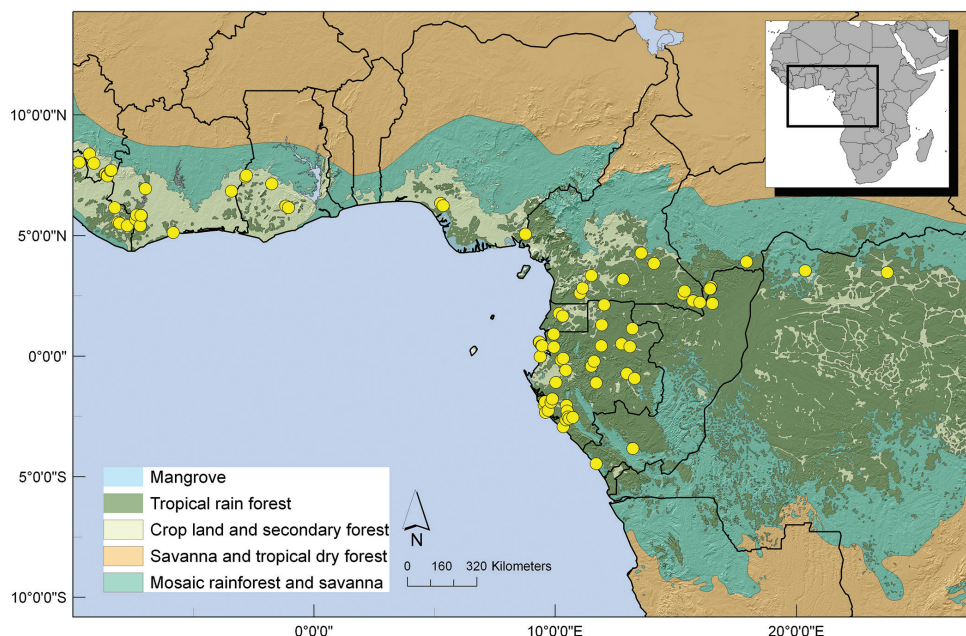


Figure 11. Distribution of *U. pierreanum*.

areas in both Central and West Africa, as well as being a common understory tree and is often collected. The Least Concerned category is recommended.

Vernacular names. Central African Republic: Mosooso (*Tisserant (Équipe) C.* 57); Mosome (Lissongo, *Tisserant (Équipe) C.* 582); Democratic Republic of Congo: Niyegbabe (Ngwaka, *Evrard C.M.* 587); Equatorial Guinea: Nvuma (Fang, *Lejoly J.* 95T/3193); Ghana: Ochwe-chi (Ashanti, *Vigne, C.* 3132); Ankuma-baka (Wum, *Vigne, C.* 1860).

Uses. The wood is hard and sometimes used for making guns in West Africa (Burkill 1985; Irvine 1961).

Notes. *Uvariastrum pierreanum* is characterized by a combination of light brown sepals and glabrous leaves. The leaves resemble those of *U. germainii* but the petioles are notably shorter and the apex shortly acuminate. The fruits are large smooth and pubescent with a green tinge when fresh in contrast to *U. germainii* that has smaller ribbed fruits.

Selected specimens examined. CAMEROON. **Central Province:** C. 30 km South of M'Balmayo, 13 Feb 1964, *Wilde, W.J.J.O. de 1904* (B, BR, EA, FHI, K, MO, P, PRE, WAG, YA, Z). **East Province:** 3 km west of Djembe road head. Lobeke Reserve. 16 Oct 1998, *Harris, D.J.* 5889 (E); East Lobeke Reserve. Small Bai and surrounding forest, 1 Nov 1998, *Harris, D.J.* 6135 (E); 10 km N of Welele, between Yokadouma and Molundu, along road, 18 Mar 1987, *Manning, S.D.* 1586 (MO,P,YA); a 25 km à WSW de Kinsassa, ville situé à 6 km au NWN de Noloundou sur route de Yokadouma, 9 Mar 1971, *Letouzey, R.* 10533 (HBG, P); 13 km SSW de Koso (village situé à

60km SSW de Batouri), 29 Jul 1963, *Letouzey, R. 5529* (P); Forêt au sud de Dimako, rive droite de la Rivière Mbonda, 18 Jan 1960, *Letouzey, R. 2670* (P); Réserve de Biosphère du Dja, vers 1175m sur la piste reliant la station de Bouamir et l'inselberg de Mbasakok, 19 May 2001, *Senterre, B. 1370* (BR); Réserve de Biosphère du Dja, vers 1175m sur la piste reliant la station de Bouamir et l'inselberg de Mbasakok, 18 May 2001, *Senterre, B. 1283* (BR). **South Province:** Station du Cacaoyer de N'koemvone, S. of Ebolowa, 14 km on the road to Ambam, 18 Feb 1975, *Wilde, J.J.F.E. de 7972* (B, BR, EA, K, LG, MA, MO, P, PRE, SRGH, U, WAG, YA); près de Meyo Centre, 40 km SSW d'Ebolowa, 24 Mar 1970, *Letouzey, R. 10225* (P); Campo Ma'an National Park, 5 km after main entrance, 15 Feb 2012, *Couvreux, T.L.P. 385* (WAG, YA); 20 km west from Lélé village, 7 Sep 2013, *Couvreux T.L.P. 454* (WAG, YAO); Bitya nr. river Ja (Dja), Sep 1922, *Bates, G.L. 1764* (K). **South-West Province:** Forest and second growth around Erat village in the southwest corner of the Korup National Park., 10 Jun 1988, *Thomas, D.W. 8094* (L, WAG).

CENTRAL AFRICAN REPUBLIC. Lobaye: Station de Boukoko, 3 Mar 1948, *Tisserant (Équipe), C. 739* (HBG, P, WAG); Boukoko, 15 Jun 1950, *Tisserant (Équipe), C. 57* (P); à Boukoko, 31 Dec 1947, *Tisserant (Équipe), C. 582* (MO, P). **Sangha-Mbaere:** Bai Hoku, 25 km E of Bayanga. 26 Jan 1995, *Goldsmith, M. 205* (E); Bai Hoku Camp, 25 km E of Bayanga, 14 Aug 1995, *Remis, M. 100-95* (E); Kongana camp, 22 km SE of Bayanga, 1 Apr 1996, *Fangounda, J. 503* (E); 25 km SE of Bayanga, Kongana research camp, 16 Feb 1994, *Harris, D.J. 4641* (E).

DEMOCRATIC REPUBLIC OF CONGO. Equateur: rivière Kangada, Boyazube, 23 Mar 1955, *Evrard, C.M. 587* (BR). **Orientale:** La Kulu, 11 Apr 1931, *Brande, J.F. van den 538* (BR); EQUATORIAL GUINEA. **Rio Muni, Centro Sur:** Parc National de la Lonte Alen, transect de Monte Chocolate, 14 Jul 1995, *Lejoly, J. 95T/L 3193* (BR).

GABON. Estuaire: S of Ekouk, 3 Nov 1983, *Louis, A.M. 336* (C, K, LBV, U, WAG); Malibé à 3 km Nord-Ouest. Sur la route de Libreville/Cap Estérias, 1 Nov 1984, *Louis, A.M. 1632* (LBV, MO, W AG); Andem, à 70 km sur la route de Libreville - Kango, 2 km NE, 26 Sep 1985, *Louis, A.M. 1817* (BR, K, LBV, LISC, MO, WAG); Brigade forestière de Ekouk (nouvelles parcelles), 28 Sep 1983, *Floret, J.J. 1532* (LBV, P, WAG); Nyonyie survey, transect F2. Forêt exploitée, 5 Jul 1990, *Wilks, C.M. 2123* (MO, WAG); Off logging road near Ekorodo Village, alongside small stream, 30 Apr 2001, *Stone, J.R. 3236* (L, LBV, MO, WAG); Forêt de la Mondah. CADDE Botanical trail; 1 km SE of the Passel de Conservateur, 21 Nov 2002, *Stone, J.R. 3456* (LBV, MO); Environs de Libreville, 1896, *Klaine, T.-J. 99* (P); 12 Jan 1898, *Klaine, T.-J. 200 a* (A, P, WAG); 2 Oct 1900, *Klaine, T.-J. 1963* (P); 22 Nov 1901, *Klaine, T.-J. 2520* (P); 8 Jan 1902, *Klaine, T.-J. 2606* (P); 12 Feb 1902, *Klaine, T.-J. 2720* (MPU, P); 15 Oct 1902, *Klaine, T.-J. 3112* (P); Nyonyie. Transect F2, 15 Jul 1990, *Wilks, C.M. 2259* (LBV, WAG); N of Libreville, Forêt de la Mondah, 14 Feb 2003, *Sosef, M.S.M. 2014* (LBV, MO, WAG); N of Libreville, Forêt de la Mondah. Just after the parcelle des conservateurs, 26 Oct 2005, *Sosef, M.S.M. 2034* (BR, K, LBV, MO, WAG). **Moyen-Ogooué:** 26 km ENE of Lambaréné, 6 km ENE of Bellevue, 2 Apr 1994, *Wieringa, J.J. 2620* (LBV, MO, 2-sheets U, WAG); Oguemoué, 19 Oct 1953,

Guillery S.R.F.G. 1189 (LBV, WAG). **Ngounié**: Concession CBG, ± 20km à l'Ouest de Mandji, 31 Jul 2008, *Dauby, G.V. 1108* (BR); forêt au Nord de Lambaréné, à environ 5 km au nord de la rivière Niambo-Kamba, 15 Aug 2008, *Dauby, G.V. 1378* (BRLU). **Nyanga**: along Nyanga river stream upwards from Mayonami, 16 Mar 1994, *Wieringa, J.J. 2499* (LBV, U, WAG); Chantier CEB, Inventory, ca 50 km SW of Doussala, primary rain forest, 14 Jun 1985, *Reitsma, J.M. 1152* (LBV, WAG); Inventory; chantier CEB, ca 50 km SW of Doussala, 24 Aug 1985, *Reitsma, J.M. 1384* (LBV, WAG); 30 km S.S.W. of Doussala, Game Reserve Moukalaba, 14 Mar 1988, *Wilde, J.J.F.E. de 9342* (LBV, MO, WAG); Monts Doudou, à 2km au Nord de Mourindi, 18 Apr 2000, *Sosef, M.S.M. 1332* (LBV, WAG); Doudou Mountains, Chantier SFN-Bakker, 22 Nov 2003, *Jongkind, C.C.H. 5743* (LBV, WAG). **Ogooué-Ivindo**: Near village Ekobakoba, 50 km SE of Makokou; inventory, 21 May 1987, *Reitsma, J.M. 3558* (LBV, WAG); South of Ayem; western border of Lopé-Okanda Reserve; along roads south of SEEF chantier, 28 Dec 1991, *McPherson, G.D. 15696* (LBV, MO, P, WAG); near Booué-Makokou road, north of Koumameyong, along SHM lumber roads, 1 Feb 1993, *McPherson, G.D. 16128* (LBV, MO, P, WAG); Reserve de Lopé-Okanda, SEGC, 6 Oct 1990, *White, L.J.T. 163* (LBV, MO); Reserve de Lopé-Okanda, SEGC, CNSS/PENTADESMA, 28 Jun 1990, *White, L.J.T. 4* (LBV, MO); M'passa, 24 Feb 1979, *Florence, J. 1677* (P); Bélinga, mines de fer, 1966, *Hallé, N. & Le Thomas, A. 604* (P). **Ogooué-Lolo**: Tsamba, Yao, 20 Sep 1926, *Le Testu, G.M.P.C. 6083* (EA,P); c. 25 km E of Lastoursville, Chantier forestier CEB Bambidie, on Sentier Forestier, 28 Oct 2005, *Sosef, M.S.M. 2055* (BR,LBV,MO,WAG); Chantier Bambidie, c. 43 km on the road to Okondja - Lelama, 31 Oct 2005, *Sosef, M.S.M. 2158* (BR, LBV, MO, WAG). **Ogooué-Maritime**: Rabi, 29 Mar 1990, *Breteler, F.J. 9626* (BR, C, G, LBV, MA, MO, P, PRE, WAG); ± 17 km sur la route à partir de Doussala dans une direction Nord-Ouest, 23 Mar 2000, *Sosef, M.S.M. 1391* (LBV, WAG); Monts Doudou, à ± 15km à O-S.O de Doussala autour du campement 5, 31 May 2000, *Azizet Issembé, Y. 387* (LBV, WAG); Toucan, 1 Jun 2002, *Bourobou, H.P. 661* (LBV, WAG); 13 Jun 2002, *Bourobou, H.P. 735* (LBV, WAG); Petit Loango, 25 Sep 2002, *Bourobou, H.P. 892* (LBV, WAG); Parc National Loango, 19m, 17 Jun 2004, *Mouandza Mbembo, J.-C. 197* (K, LBV, MO, P, WAG); Doudou Mountains National Park, c. 5 km S of Camp Peny (CBG), 14 Nov 2005, *Sosef, M.S.M. 2285* (BR, K, LBV, MO, WAG); Loango National Park, Rembo Rabi River, upstream from Rabi village, 5m, 6 May 2005, *Harris, D.J. 8388* (E, IG, LBV, WAG); Loango National Park, Rembo Rabi River, upstream from Rabi village, 5m, 6 May 2005, *Harris, D.J. 8391* (E, LBV, WAG); Loango National Park, c. 1 km south of Rabi village, 15m, 8 May 2005, *Harris, D.J. 8458* (E, LBV, WAG); Loango National Park, east side of Rembo Nyoungou river, c. 2 km upstream from Akaka camp, 14 May 2005, *Harris, D.J. 8644* (E, LBV, WAG). **Woleu-Ntem**: Evorombil, 11 Apr 1934, *Le Testu, G.M.P.C. 9539* (EA, P); forestry concession Bordamur, c. 70 km NE of Mitzic, 7 Feb 2003, *Sosef, M.S.M. 1915* (BR, LBV, MO, WAG).

GHANA. Ashanti Region: Abofaw (=Abofuo), Nov 1933, *Vigne, C. FH 3132* (FHO). **Brong-Ahafo Region:** Atuna, N.W. Ashanti, Dec 1934, *Vigne, C. FH 3511* (P); Pamu Berekun F.R., Sep 1932, *Vigne, C. FH 2486* (FHO). **Central Region:** Akokosasu, 25 Aug 1934, *Hughes, F.E. 102* (FHO). **Eastern Region:** Amantia, 152m, Mar 1930, *Vigne, C. FH 1860* (FHO); Kade Agricultural Research Station, 26 Mar 1968, *Hossain, M. 38223* (K).

GUINEA. Macenta: Sérédou, 1969, *Adam, J.-G. 26906* (MO). **Nzérékoré:** Nimba Mountains, just north of Camp 1 (Mifergui), 28 Nov 2006, *Jongkind, C.C.H. 7318* (WAG); Nimba Mountains, plot JRFL11, 611m, 9 Dec 2007, *Nimba Botanic Team JR 1756* (WAG); Forêt Classée de Mt Yonon, not far from the Diane River, 11 May 2011, *Jongkind, C.C.H. 10728* (WAG); Mont Yonon, East slope, 768m, 4 Feb 2012, *Yonon Botanic Team 111* (WAG).

IVORY COAST. Abengourou: 30 km NE of Abengourou, along the road from Sankadiakro to Manzanonan, 1 Aug 1969, *Versteegh, C. 623* (U, WAG). **Daloa:** F.C. du Haut-Sassandra, Sud. forêt peu dégradée, layon 28, Est CTFT, 19 Jul 1995, *Kouamé, F.N. 1525* (CSRS). **Divo:** 15 km on the road to Fresco from road Sassandra-Lakota, 8 May 1975, *Burg, W.J. van der 156* (WAG). **Guiglo:** forêt près de Sakré, 28 Feb 1969, *Aké Assi, L. 10499* (FHO). **Tabou:** P.N. Taï, 26 Feb 1992, *Téré, H.G. 2207* (CSRS); P.N. Taï, station d'écologie. Taï, environ 0.5 Km à l'Est de la Station CRE, Feb 1999, *Menzies, A. 92* (G).

LIBERIA. Grand Gedeh: Mimtimber exploitation, 10 miles NW of Chien, 22 Jan 1969, *Jansen, J.W.A. 1261* (U, WAG); Eastern Province, Putu District. New road from Chiehn (Zwedru village) to Cape Palmas. About 10 km N. of Kamweake, a small village situated c. 70 km S. of Chiehn, 27 Mar 1962, *Wilde, J.J.F.E. de 3667* (WAG); Grebo Forest, 8 Dec 2005, *Jongkind, C.C.H. 7190* (BR, WAG). **Lofa:** North Lorma National Forest, 21 Nov 2005, *Jongkind, C.C.H. 6783* (WAG). **Nimba:** Yéképa. Mt Nimba - Mt Gangra, 6 Oct 1971, *Adam, J.-G. 26222* (MO, P, WAG); Jéképa. Grassfield, 4 Oct 1969, *Adam, J.-G. 24016* (WAG); Nimba area, 10 Apr 1962, *Voorhoeve, A.G. 1092* (WAG); between Bonpla village and Mt Beeton, 565m, 11 Apr 2010, *Jongkind, C.C.H. 9657* (WAG).

NIGERIA. Edo State: Ugwega (Beni), Compt. 86, 16 Jan 1948, *Brenan, J.P.M. 8827* (COI, FHI, FHO); Okomu Forest reserve, Compartment no. 86, 26 Jan 1948, *Brenan, J.P.M. 8901* (COI, FHO, K, P); Okomu Forest Reserve, Mar 1948, *Akpabla, G.K. 1121* (P). **Ondo State:** N'Krowa, 13m, Feb 1935, *Kennedy, J.D. 2571* (A, F, FHO).

REPUBLIC OF CONGO. Kouilou: Bas-Kouillou, 5 Jan 1988, *Foresta, H. de 1536* (P). **Lékoumou:** forets entre Loudima et Libiti, Feb 1957, *Koechlin, J. 7758* (P). **Sangha:** Nouablé-Ndoki National Park, Goulougo Study Site, 37.29 km E-SE de Bomassa, 11 Apr 2008, *Ndolo Ebika, S.T. 344* (E, WAG).

SIERRA LEONE. Eastern Province: Wanje Valley, Kambui Hills Forest Reserve, in block 9, near motor road, 19 Apr 1967, *Samai, S.K. 529* (K).

5. *Uvariastrum zenkeri* Engl. & Diels, Bot. Jahrb. Syst. 39: 473. 1907.

http://species-id.net/wiki/Uvariastrum_zenkeri

Figure 12

Uvariastrum zenkeri Engl. & Diels var. *nigritanum* Baker f., Cat. Talbot's Plants 3. 1913.

Type. NIGERIA. Cross River State: Oban district, recd. at Paris 21 Feb 1912, *P.A. Talbot 1341* (lectotype, here designated: K!; isotypes: FHO! [accession number 15560, barcode 3586], P! [P01983332]).

Uvariastrum pynaertii De Wild., Ann. Mus. Congo Belge, Bot. sér. 5, 3[1]: 74. 1909.

Type. DEMOCRATIC REPUBLIC OF CONGO. Equateur: Eala, Mar 1907 *L.A. Pynaert 1234* (lectotype designated by Le Thomas (1969) pp. 292, sheet designated here: BR! [BR0000008824288]; isolectotypes: BR! [BR0000008824295, BR0000008824301], S!) **syn. nov.**

Type. CAMEROON. South Province: Bipindi, 1904, *G.A. Zenker 2935* (lectotype, here designated: B! [B100153114]; isolectotypes: B! [B100190283], BM!, [BM000554069], BR!, 2 sheets COI!, GOET! [GOET005731], G! 2-sheets [G00011742, G00011744], HBG!, K! [K000198808], L! [L0191076], M! [M0089220], MA! [MA215566-3], P! [P00315826], S!, WAG! [WAG0057973], WU! [WU0025789], Z! 2-sheets [Z000034578, Z000034577]).

Description. Tree or shrub to 20 m high, d.b.h. up to 30 cm; old branches spreading, glabrous, bark brown-grey; young branches glabrous to very sparsely pubescent, hairs ca. 0.1 mm long, appressed, light brown soon disappearing; leaf buds elongated, pubescent, hairs ca. 0.2 mm long, appressed, light brown. Petioles 2–3 mm long, 1.5–2 mm in diameter; glabrous, or rarely very sparsely pubescent, hairs tiny, light brown, soon falling off; leaf lamina inserted on top, not grooved adaxially. Leaf lamina (12–)15–22 cm long, 3–5 cm wide, length:width ratio 2–4.7, narrowly elliptic to elliptic or narrowly obovate to obovate, coriaceous, glabrous adaxially, sparsely pubescent, hairs tiny, light brown, becoming quickly glabrous abaxially; lamina dark green adaxially; slightly lighter green abaxially; base rounded to cuneate, apex acuminate, acumen 1–2 cm long; midrib glabrous on both sides; secondary veins 11–17, curving upwards, anastomizing near margins, glabrous, slightly raised adaxially; clearly visible abaxially. Raphidia 1–2 on young and old braches, cauliflorous with numerous flowers. Flowering pedicels 1.3–3 cm long, 1–2 mm wide, glabrous to very sparsely pubescent, hairs ca. 0.1 mm long, appressed, light brown, drying black or brown, brown to dark green in fresh material. Bracts up to 3, basal, up to 5 mm long, 3 mm wide, length:width ratio 1.6, ovate, sparsely pubescent outside, glabrous inside. Flower buds pyramidal, up to 2.5 cm long, up to 1.5 cm in diameter, margins weakly to strongly folded. Sepals 1.5–2.5 cm long, 0.8–1.5 cm wide, length:width ratio 1.2–2, ovate to broadly ovate, base truncate, apex acute, margins clearly recurved, glabrous or sparsely pubescent outside, hairs 0.1–0.2 mm long, appressed, light brown, tomentose light brown inside along the margins, glabrous towards the center; sepals conspicuously black outside, light brown

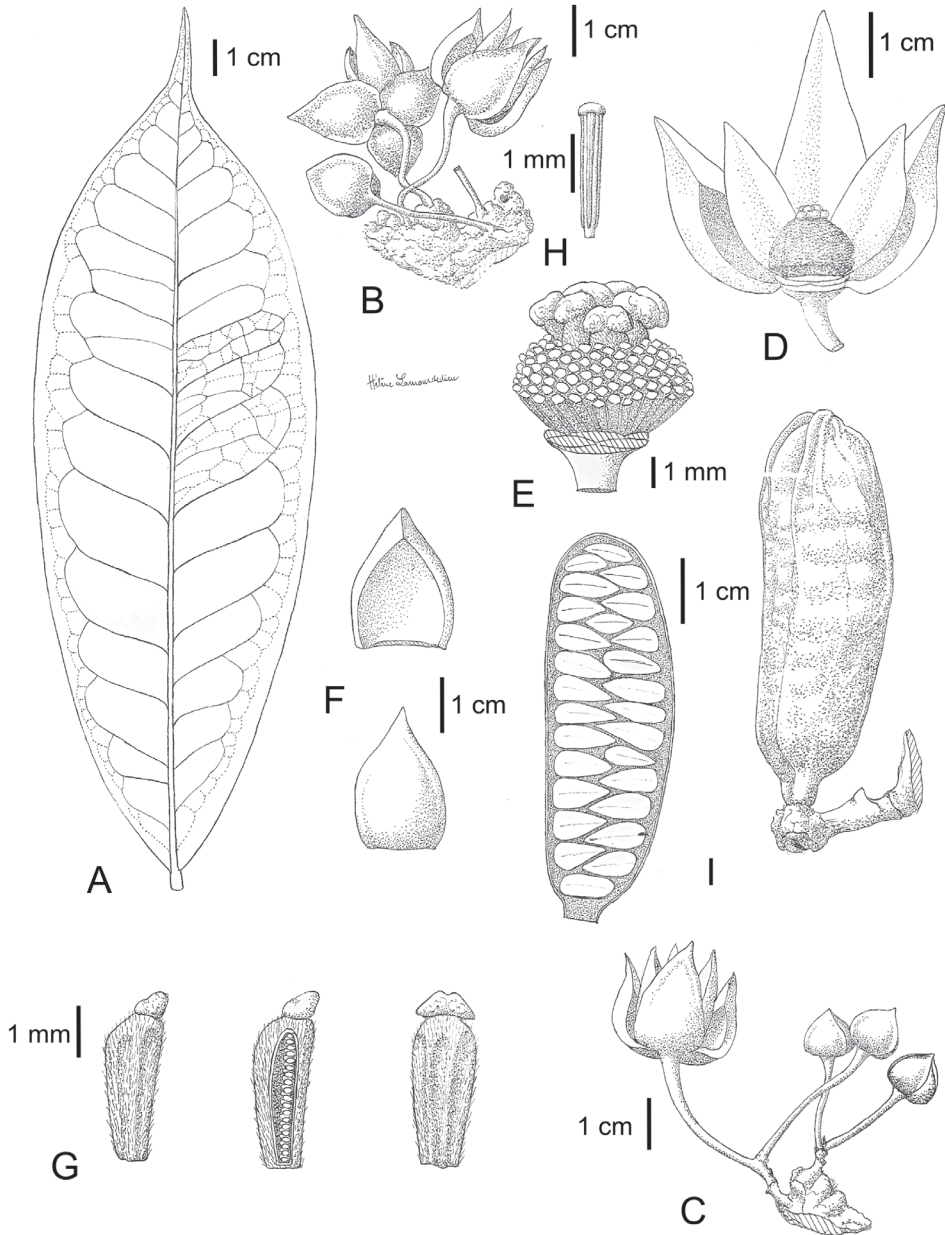


Figure 12. *Uvariastrum zenkeri*. **A** leaf **B**, **C** cauliflorous flowers **D** detail of flower with three petals removed **E** detail of receptacle **F** sepals **G** carpels **H** stamens **I** detail of monocarp. Drawing Hélène Lamourdedieux, EPHE in MNHN-Palynothèque (Paris).

inside but black at the centre on dry material; same color as flowering pedicels on fresh material, spreading horizontally at anthesis. Outer petals 2–3.5 cm long, 0.8–1.5 cm wide, length:width ratio 2–3.5, ovate to narrowly ovate or elliptic to narrowly elliptic,

base truncate, apex acute, densely pubescent outside more so along the main vein, hairs ca. 0.1–0.2 mm long, appressed, light brown shiny, pubescent along the margins to glabrous at the center inside, hairs ca. 0.1 mm long, appressed, light brown; petals light brown outside, light brown to black inside in herbarium material, white turning bright yellow to orange in fresh material, light grey when old; spreading horizontally at anthesis. Inner petals 1.5–2.5 cm long, 0.7–1 cm wide, length:width ratio 1.5–3.5, ovate to narrowly ovate, base truncate, apex acute, pubescence same as outer petals, color same as outer petals, connivent to appressed by the margins, the top open. Receptacle pyramidal with a flat apex. Stamens 2–4 mm long, connective discoid, pubescent, ca. 0.2 mm in diameter, red in fresh material. Carpels (1–3-)5–15, 3–5 mm long, ca. 1 mm in diameter, stigma capitate, ca. 0.7 mm in diameter, glabrous or sometimes very sparsely pubescent, drying black; ovules numerous. Fruiting pedicels 1.5–3 cm long, 2–5 mm in diameter, woody, glabrous. Monocarps 2–5, up to 8 cm long, up to 2.5 cm in diameter, oblong to narrowly oblong, straight to slightly bending, apex acute, longitudinally ribbed, main ribs 5–6, sometimes with smaller latitudinal ribs, glabrous to sparsely pubescent, hairs ca. 0.1 mm long, appressed, light brown; stipe 2–5 mm long, ca. 5 mm in diameter; monocarps. Seeds 20–27 per monocarp, 1.5–2 cm long, 1–1.5 cm wide, ellipsoid flat, ca. 5 mm in depth, testa light brown in herbarium material, raphe very slightly raised, hilum 3–4 mm long, 2–3 mm wide, narrowly elliptic.

Distribution. This species has a strict Central African distribution occurring from extreme east Nigeria and South East Cameroon till Democratic Republic of Congo; 0–600 m. Figure 13.

Habitat and ecology. Occurring in primary or secondary lowland rain forest, on *tierra firme* with well drained soils, but also on marshy or sandy soils; 0–400 m.

Phenology. Flowering and fruiting all year round across its distribution range.

Preliminary IUCN conservation status. LC. This species has a wide distribution across the Congo basin. It occurs in numerous national parks (Korup National Park (Cameroon); Loango National Park (Gabon) and other protected areas, and it is often collected. The least concern category is appropriate. Onana et al. (2005) gave the Near Threatened (NT) status to *U. zenkeri*, but this was before *U. pynaertii* was sunken into synonymy and thus based on a smaller distribution.

Vernacular names. Democratic Republic of Congo : Bolésé na mai (Kunau, *Coû-teaux*, G. 337); Etunduluku (*Corbisier-Baland*, A. 942) Moukassa (*Corbisier-Baland*, A. 1386); Bokako (*Corbisier-Baland*, A. 2051); Mukobakoba mufike (Tshiluba; *De-champs*, R. 80); Inaolo a Loopa (Turumbu; *Germain*, R.G.A. 4562)

Uses. None recorded.

Notes. This species is easily distinguished by the sepals that dry black and the large leaves with the leaf lamina inserted on top of the petiole. The black color of the dried sepals is related to the glabrous or sparsely pubescent outer side of the sepals, whereas it is pubescent in the other species.

Carpel number in this species appears very variable. The higher number of carpels compared to the other species (*U. zenkeri* and *U. pierreanum*) was one of the reasons why De Wildeman (1909) described the species *U. pynaertii*. I have counted

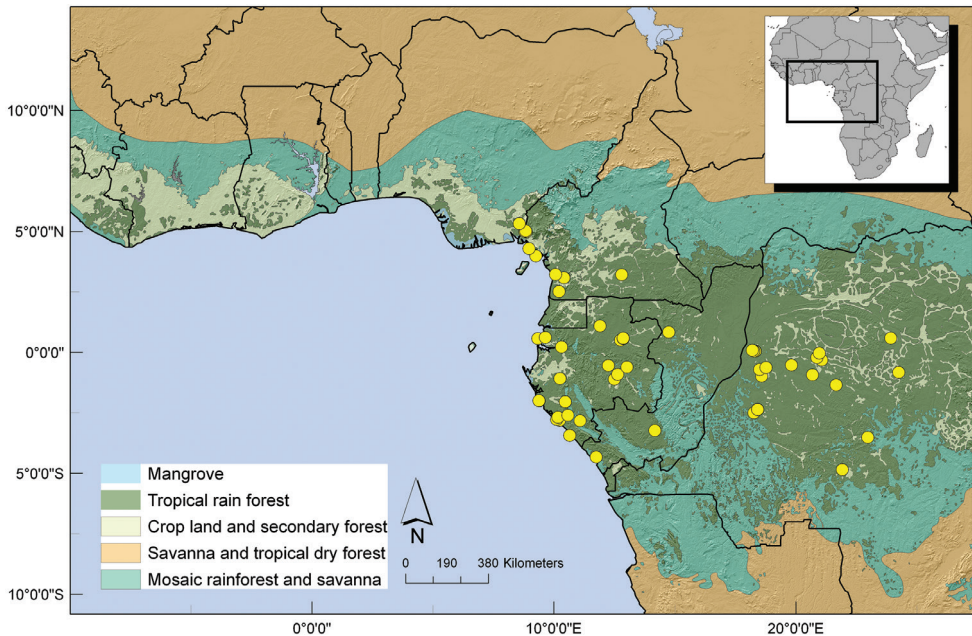


Figure 13. Distribution of *U. zenkeri*.

the carpels for several specimens from DRC to Nigeria and there is a clear continuous variation from 1 to 15. The specimen with a single carpel is intriguing and has been described as a variety *U. zenkeri* var. *nigritanum* (Talbot 1314). However, all other aspects of its morphology lead me to not accept it as distinct even at the rank of variety. What I can see is an increase in carpel number from Nigeria/Cameroon (3-5-10) to DRC (9-15), but this variation has yet to be properly explored. For these reasons I will keep this variation under a single species name.

The lectotype of *U. zenkeri* designated here followed the unpublished flora of Cameroon (Annonaceae) by Le Thomas (1969) that is archived at the Museum National d'Histoire Naturelle in Paris, kindly made available by Dr. Thierry Deroin. Le Thomas selected *Zenker 2935* as the lectotype over *Zenker 2438*, the other syntype cited in the protologue. Because the former is more widely distributed I agree with her choice and select the B sheet designated here.

In the “Catalogue of the plants collected by Mr. and Mrs. P.A. Talbot” (Rendle et al. 1913) Baker indicates two collection numbers for var. *nigritanum* (pp 120): *Talbot 3* and *1341*. The protologue clearly indicates that *Talbot 1341* is the type. Of the 4 specimens I have located, the BM sheet has no indication of either the name or the collection number and with a 1911 date (indicated via a small stamp). The other sheets (FHO, K, P) all have the name, the collection number and the date (1912, see below). This leads me to suspect that the BM sheet is in fact *Talbot 3* and thus isn't a type specimen. I here select the K! sheet as the holotype as this would have been seen by Baker (based in BM or K) and I do not consider the BM sheet as being a type specimen.

Selected specimens examined. CAMEROON. East Province: department Haut-Nyong. Dja Reserve. Bouamir Research area. 90km Southeast of Akonolinga. Study plot 12, Ind: 12W12, 4 Nov 1994, *Fogiel, M.K. 1039* (MO, P). **South Province:** 40 km N. of Kribi, 5 km E. of Edea road, forest track Fifinda-Bella, 6 Feb 1970, *Bos, J.J. 6266* (BR, C, K, LD, LISC, LMA, MO, P, PRE, UPS, WAG, YA); Bipindi, Jan 1914, *Zenker, G.A. 481* (B, BR, C, F, G, GH, M, NY, P, S, U, US, WAG, Z); Kamerun. Bipinde, 1902, *Zenker, G.A. 2438* (B, COI, G, K, L, MO, P, S, WAG, Z); Bipinde, 1912, *Zenker, G.A. 4473* (B, COI, FHO, G, HBG, L, M, P, S); 1907, *Zenker, G.A. 3409* (COI, G, HBG, L, M, MO, P, S, US, WRSL, Z); Bipinde, 1907, *Zenker, G.A. 3289* (B, L, S, WU, Z); entre 15 et 25 km au SW de Zingui. Soit à 45km au SSE de Kribi, 22 Mar 1968, Letouzey, R. 9121 (P); Bipinde, Mar 1907, *Zenker, G.A. s.n.* (P); Bipindi, May 1904, *Zenker, G.A. s.n.* (F); Bipinde, 1906, *Zenker, G.A. 3248* (K). **South-West Province:** Korup National Park, P transect, plot 22U, 4 Feb 2000, *Burgt, X.M. van der 590* (G, SCA, WAG); Korup National Park, P transect, near P plot, subplot 19Y, 19 Mar 2004, *Burgt, X.M. van der 674* (BR, G, K, MO, P, SCA, WAG, YA); Korup Forest Dynamics Plot, Korup National Park, 12 Jan 1998, *Kenfack, D. 1008* (MO, WAG); Korup national park, forest along footpath from Ndiian River at PAMOL fields 69 and transect P, 24 Jan 1985, *Thomas, D.W. 4334* (K, MO, P, US); Ideano, West bank of the Onge River, seasonally exposed cobble in river bed, large rocks (shaded and exposed) riparian forest with Oubanguita alata, 7 Nov 1993, *Thomas, D.W. 9772* (K, MO, P, SCA, WAG, YA); Mabeta/Moliwe, 2 Apr 1992, Bongyu, J. 42 (K,P); Korup reserve, transect P, 12 Jan 1979, *Thomas, D.W. 604* (K).

DEMOCRATIC REPUBLIC OF CONGO. Bandundu: Bankaie, 29 Jun 1953, Gilbert, G.C.C. 14329 (BR); 5 Jul 1953, *Gilbert, G.C.C. 14552* (BR); Ipeke, 29 Jul 1953, *Gilbert, G.C.C. 14560* (BR); Bankaie, 10 Jun 1953, *Gilbert, G.C.C. 14045* (BR, WAG); Bankai, 7 Jul 1953, *Gilbert, G.C.C. 14362* (BR, WAG). **Equateur:** Equateur, Bikoro, route Weti-Iboko, Apr 1959, *Evrard, C.M. 6190* (L); entre Bokatola et Bikoro, 7 Sep 1930, *Lebrun, J.-P.A. 1406* (A, BR, P 2 sheets); Eala, Oct 1930, Staner, P.J. 1274 (K, P); Coquilhatville, 1930, *Lebrun, J.-P.A. 1199* (A, B, G, K, NY, P); Eala, 27 Sep 1933, *Corbisier-Baland, A. 2051* (BR, MO, NY, P, WAG); 1936, *Leemans, J. 346* (BR, P); environs d'Eala, 11 May 1905, *Laurent, M.D.J. 664* (S, US, Z); Bongoy, 6 Jan 1958, *Evrard, C.M. 3235* (F); Watsi, 9 Feb 1959, *Evrard, C.M. 5635* (Z); Eala, 9 Mar 1931, *Corbisier-Baland, A. 942* (BR); 14 Apr 1932, *Corbisier-Baland, A. 1386* (BR); 28 Sep 1937, *Coûteaux, G. 337* (BR); Coquitaville, 2 Jan 1896, *Dewèvre, A.P. 591* (BR); rivière Salonga, rive gauche, 3 km en amont de la Yenge. Monkoto Parc National, 5 Aug 1958, *Evrard, C.M. 4500* (BR); piste Nkinki-Pomandjoku. Monkoto Parc National, 12 Aug 1858, *Evrard, C.M. 4616* (BR); piste Eungu-Imbonga, 11 Apr 1959, *Evrard, C.M. 6073* (BR); route ITIPO-IBOKO, 15 Apr 1959, *Evrard, C.M. 6150* (BR); Eala, 1936, *Leemans, J. 443* (BR); Bandaka, N'Koli, 25 Jun 1907, *Vanderwegen, C. s.n.* (BR); Eala, Dec 1906, *Pynaert, L.A. 725* (BR); Jun 1907, *Pynaert, L.A. 1560* (BR); 22 Jan 1907, *Pynaert, L.A. 982* (BR); 30 Apr 1908, *Seret, F. 806* (BR). **Kasai-Occidental:** Kakenge, 575m, 20 Nov 1958, *Dechamps, R. 80* (BR, WAG). **Kasai-Oriental:**

entre Lodga et Kole, Sep 1932, *Lebrun, J.-P.A.* 6266 (K, P). **Orientale:** entre Yafela et Yandjali, Dec 1948, *Germain, R.G.A.* 4562 (BR).

GABON. Estuaire: Ndombo oil-concession area of CONOCO; ca 3 km SW of No Ayong, 28 Feb 1991, *Reitsma, J.M.* 3711 (LBV, WAG); forêt classée de la Mondah: site combat 2, 16 Oct 2009, *Bissiengou, P.* 288 (LBV, WAG); Agonenzorck, sur le Haut-Komo, 7 Oct 1912, *Chevalier, A.J.B.* 26973 (P). **Moyen-Ogooué:** Ezanga. Layon D ouest, 1991, *Wilks, C.M.* 2465 (LBV, WAG). **Nyanga:** Gamba area, 32 km on road to Bouda (NE of Gamba), 28 Dec 1995, *Bergen, M.A. van* 200 (LBV, WAG); Inventory; chantier CEB, c. 50 km SW of Doussala; primary rain-forest, 17 Oct 1985, *Reitsma, J.M.* 1640 (LBV, WAG); Tchibanga area, Mindounga, Oct 1910, *Le Testu, G.M.P.C.* 1638 (P); Mayumba, 30 Jan 1904, *Chevalier, A.J.B.* 11303 (P); région du Mayumbe, à l'ouest du village de Biboura situé sur la route menant à la république du Congo, 22 Mar 2012, *Dauby, G.V.* 2553 (BRLU). **Ogooué-Ivindo:** M'passa, 7 Apr 1978, *Florence, J.* 860 (P); Makokou. Station d'IPASSA, 10 km S of Makokou, 29 Jun 1978, *Florence, J.* 1472 (P); Makokou. Transect 8, 9 Jul 1981, *Gentry, A.H.* 33253 (MO); Makokou. Transect 17, no date, *Gentry, A.H.* 33443 (MO); Makokou, bord de l'Ivindo, 16 Mar 1961, *Hallé, N.* 1491 (P). **Ogooué-Lo-lo:** Chantier forestier de vouboué à 10 Km du Campement à l'ouest dans les abatages, 30 Aug 1983, *Sita, P.* 5195 (LBV); région de Koulamoutou, Koulamoutou, Mar 1930, *Le Testu, G.M.P.C.* 7996 B (P); région de Lastoursville, Koulamotou, 21 Oct 1930, *Le Testu, G.M.P.C.* 8462 (P); région de Lastoursville, Malendé, 24 Jan 1930, *Le Testu, G.M.P.C.* 8473 (P, WAG); c.40 km ENE of Lastoursville, 20 km on forestry road from Bambidie heading N, 25 Jan 2008, *Wieringa, J.J.* 6157 (LBV, WAG). **Ogooué-Maritime:** Gamba-E, road from Gamba airport to the north, new laterite road direction 'plaines' (only for services), 11 Nov 1990, *Nek, F.I. van* 262 (LBV, WAG); Vera plains, transect II, forest plot, 13 Mar 1996, *Bergen, M.A. van* 335 (WAG); Doudou Mountains National Parc, c. 5 km S of Camp Peny (CBG), 14 Nov 2005, *Sosef, M.S.M.* 2277 (BR, LBV, MO, WAG); Doudou Mountains National Parc, c. 5 km S of Camp Peny (CBG), 14 Nov 2005, *Sosef, M.S.M.* 2282 (BR, E, HUJ, K, LBV, MO, WAG); Loango National Park, Nick's camp, by Louri lagoon, c. 12 km south of Iguela, 2 May 2005, *Harris, D.J.* 8300 (E, LBV, WAG); Loango National Park, Nick's camp, by Louri lagoon, c. 12 km south of Iguela, 3 May 2005, *Harris, D.J.* 8337 (E, IG, LBV, WAG); Parc National de Loango, near Tassi, 22m, 7 Nov 2011, *Maas, P.J.M.* 10143 (LBV, MO, UC, WAG). **Woleu-Ntem:** forestry concession Bordamur, c. 50 km NE of Mitzi, 11 Feb 2003, *Sosef, M.S.M.* 1992 (LBV, WAG).

NIGERIA. Cross River State: Oban district, 1911, Talbot, P.A. 1341 (FHO, P); Oban, 1912, *Talbot, P.A. s.n.* (K).

REPUBLIC OF CONGO. Cuvette: Park National d'Odzala, Forêt d'Andzoyi, entre Mboko et Mbomo, Jan 1994, *Dowsett-Lemaire, F.* 1736 (BR). **Kouilou:** Koubotchi (Kayis), 1 Sep 1990, *Moutsamboté, J.M.* 80 (BR). **Pool:** Région de Kimba, à 21 km de Kimba, 15 Dec 1971, *Sita, P.* 3248 (P).

Excluded names

Uvariastrum neglectum Paiva, Mem. Soc. Brot. 19: 55.1966 = *Uvaria paivana* Couvreur, **nom. nov.** urn:lsid:ipni.org:names:77135539-1 (not *Uvaria neglecta* A.Rich., Hist. Phys. Cuba, Pl. Vasc. 44. 1846)

Type. Angola. Cabinda: Dinje, 26 Oct 1957, *Brigada de Estúdio Florestais ao Maiombe 115* (lectotype, designated here: LISC! [LISC000305]; isotype LISC! [LISC000306]).

Uvariastrum modestum Diels, Notizbl. Bot. Gart. Berlin-Dahlem 15: 790. 1942

= *Uvaria modesta* (Diels) Couvreur **comb. nov.** urn:lsid:ipni.org:names:77135540-1

Type. Angola. Melange: Quela, Oct 1907, *I. v. Nolde* 265 (holotype: B! [B100153113]).

Uvariastrum elliotanum (Engler & Diels) Sprague & Hutch, Kew Bull. 159. 1916.

Uvaria elliotianum Engler & Diels, Monogr. Afrik. Pflanzen.-Fam 6: 28. 1901 =

Mischogyne elliotanum (Engl. & Diels) R.E. Fries, Ark. Bot. 3: 37. 1955.

Uvariastrum elliotianum (Engler & Diels) Sprague & Hutch var *glabrum* Keay, Kew

Bull. 151. 1952. = *Mischogyne elliotanum* (Engl. & Diels) R.E. Fries var. *glabrum*

Keay, Ark. Bot. 3: 37. 1955.

Uvariastrum elliotianum (Engler & Diels) Sprague & Hutch var *sericeum* Keay, Kew

Bull. 151. 1952 = *Mischogyne elliotanum* (Engl. & Diels) R.E. Fries var. *sericeum*

Keay, Ark. Bot. 3: 37. 1955.

Uvariastrum elliotianum (Engler & Diels) Sprague & Hutch var. *gabonensis* Pellegrin.

Bull. Soc. Bot., Mém. 31: 62. 1949. Nom. Nud.

= *Mischogyne elliotanum* (Engl. & Diels) R.E. Fries var. *gabonensis* Pellegrin ex Le Thomas, Fl. Gabon, 285. 1969.

Uvariastrum depedens Engl. & Diels, Bot. Jahrb. Syst. XXXIX: 474. 1907.

= *Uvaria dependens* Engl. & Diels, Monogr. Afrik. Pflanzen.-Fam. 6: 28. 1901.

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LBV, LISC, M, MO, P, UPS, US, UC, WAG, and Z. Finally, I am grateful to two anonymous reviewers and Sandra Knapp for improving the manuscript thanks to their detailed comments on an earlier version. Access to ArcMAP 10.0 was provided via the IUCN Palm Specialist Group.

References

- Bachman S, Moat J, Hill AW, de la Torre J, Scott B (2011) Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. In: Smith V, Penev L (Eds) e-Infrastructures for data publishing in biodiversity science. *ZooKeys* 150: 117–126. doi: 10.3897/zookeys.150.2109
- Botermans M, Sosef MSM, Chatrou LW, Couvreur TLP (2011) A revision of the African genus *Hexalobus* (Annonaceae). *Systematic Botany* 36: 33–48. doi: 10.1600/036364411X553108
- Burkill HM (1985) The useful plants of West tropical Africa. Royal Botanic Gardens Kew, Kew, 98–135 pp.
- Chatrou LW, Pirie MD, Erkens RHJ, Couvreur TLP, Neubig KM, Abbott JR, Mols JB, Maas JW, Saunders RMK, Chase MW (2012) A new subfamilial and tribal classification of the pantropical flowering plant family Annonaceae informed by molecular phylogenetics. *Botanical Journal of the Linnean Society* 169: 5–40. doi: 10.1111/j.1095-8339.2012.01235.x
- Couvreur TLP (2009) Monograph of the syncarpous African genera *Isolona* and *Monodora* (Annonaceae). *Systematic Botany Monographs* 87: 1–150.
- Couvreur TLP AfroAnnon: The Annonaceae of Africa. <http://afroannons.myspecies.info/> [accessed 30 August 2013]
- Couvreur TLP, Botermans M, van Heuven BJ, Van der Ham RWJM (2008a) Pollen morphology within the *Monodora* clade, a diverse group of five African Annonaceae genera. *Grana* 47: 185–210. doi: 10.1080/00173130802256913
- Couvreur TLP, Maas PJM, Meinke S, Johnson DM, Keßler PJA (2012) Keys to the genera of Annonaceae. *Botanical Journal of the Linnean Society* 169: 74–83. doi: 10.1111/j.1095-8339.2012.01230.x
- Couvreur TLP, Richardson JE, Sosef MSM, Erkens RHJ, Chatrou LW (2008b) Evolution of syncarpy and other morphological characters in African Annonaceae: a posterior mapping approach. *Molecular Phylogenetics and Evolution* 47: 302–318. doi: 10.1016/j.ympev.2008.01.018
- Couvreur TLP, Van der Ham RWJM, Mbele YM, Mbago FM, Johnson DM (2009) Molecular and morphological characterization of a new monotypic genus of Annonaceae, *Mwasumbia*, from Tanzania. *Systematic Botany* 34: 266–276. doi: 10.1600/036364409788606398
- De Wildeman E (1909) Etudes de la systématique et de la géographie botaniques sur la flore du bas- et moyen-Congo: Annonaceae. *Annales du Musée du Congo* 3: 73–87.
- Endress PK, Armstrong JE (2011) Floral development and floral phyllotaxis in *Anaxagorea* (Annonaceae). *Annals of Botany* 108: 835–845. doi: 10.1093/aob/mcr201
- Engler A, Diels L (1899) Diagnosen neuer afrikanischer Pflanzenarten: 4: Annonaceae. *Notizblatt des Botanischen Gartens und Museums Berlin-Dahlem* 2: 292–302.

- Engler A, Diels L (1901) Anonaceae. In: Engler A (Ed) Monographien afrikanischer Pflanzen-Familien und -Gattungen. Engelmann, Leipzig, 1–96.
- Fries RE (1953) Verstreute Beobachtungen hinsichtlich der Familie Annonaceae. *Arkiv för Botanik* 3: 35–42.
- Hawthorne W, Jongkind C (2005) Woody Plants of Western African Forests: A Guide to the Forest Trees, Shrubs and Lianes from Senegal to Ghana. Royal Botanic Gardens, Kew, 1040 pp.
- Irvine FR (1961) Woody Plants of Ghana with special reference to their uses. Oxford University Press, London, 868 pp.
- IUCN (2012) IUCN Red List Categories and Criteria: Version 3.1. Second edition. IUCN, Gland, Switzerland and Cambridge, UK, 32 pp.
- Kenfack D, Goseline G, Gereau RE, Schatz GE (2003) The genus *Uvariopsis* (Annonaceae) in tropical Africa with a recombination and one new species from Cameroon. *Novon* 13: 443–449. doi: 10.2307/3393377
- Le Thomas A (1969) Annonacées. In: Aubréville A (Ed) Flore du Gabon. Muséum National d'Histoire Naturelle, Paris, 1–371.
- Luke Q, Derooin T (2005) A new *Toussaintia* (Annonaceae) from Tanzania. *Journal of East African Natural History* 94: 165–174. doi: 10.2982/0012-8317(2005)94[165:ANTAFT]2.0.CO;2
- Maas PJM, Westra LYT, Chatrou LW (2003) *Duguetia*. Flora Neotropica Monograph 88. New York Botanical Garden, New York, 1–275 pp.
- McNeill J, Barrie F, Buck W, Demoulin V, Greuter W, Hawksworth D, Herendeen P, Knapp S, Marhold K, Prado J (2012) International Code of Nomenclature for algae, fungi, and plants (Melbourne Code). Koeltz Scientific Books, 208 pp.
- Rendle AB, Baker EG, Wernham HF, Moore S (1913) Catalogue of the Plants Collected by Mr. & Mrs. P.A. Talbot In the Oban District, South Nigeria. Trustees of the British Museum, London, UK, 157 pp.
- Robson NKB (1960) Annonaceae. In: Exell AW, Wild H (Eds) Flora Zambesiaca. Kew Publishing and Flora Zambesiaca Managing Committee, London, U.K., 104–149.
- Schatz GE (2002) Taxonomy and herbaria in service of plant conservation: Lessons from Madagascar's endemic families. *Annals of the Missouri Botanical Garden* 89: 145–152. doi: 10.2307/3298559
- Sprague T, Hutchinson J (1916) African Anonaceae. *Bulletin of Miscellaneous Information* (Royal Gardens, Kew) 1916: 145–161.
- van Heusden ECH (1992) Flowers of Annonaceae: morphology, classification, and evolution. *Blumea Supplement* 7: 1–218.
- Verdcourt B (1971) Annonaceae. In: Milne-Redhead E, Polhill RM (Eds) Flora of Tropical East Africa. Crown Agents for Oversea Governments and Administrations, London, 1–131.
- Versteegh PC, Sosef MSM (2007) Revision of the African genus *Annickia* (Annonaceae). *Systematics and Geography of Plants* 77: 91–118.
- Weberling F, Hoppe JR (1996) Comparative morphology evaluation of inflorescence characters in Annonaceae. In: Morawetz W, Winkler H (Eds) Reproductive morphology in Annonaceae. Österreichische Akademie der Wissenschaften, Vienna, 29–53.

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 Micheltore, A.P.G. 1048 (*hexaloboides*).
 Mildbraed, G.W.J. 10795 (*insculptum*).
 Millen, H. 15 (*insculptum*).
 Miller, R.G. 290, 307 (*hexaloboides*).
 Milne-Redhead, E.W.B.H. 3413 (*hexaloboides*).
 Mouandza Mbembo, J.-C. 197 (*pierreanum*); 323 (*Uvariastrum* sp.).
 Moutsamboté, J.-M. 80 (*zenkeri*).
 Ndolo Ebika, S.T. 311 (*germainii*); 344 (*pierreanum*); 387 (*germainii*).
 Nek, F.I. van 262 (*zenkeri*).
 Niangadouma, R. 90, 272 (*Uvariastrum* sp.).
 Nimba Botanic Team JR1756 (*pierreanum*).
 Nkhoma, C.N. 80 (*hexaloboides*).
 Putu Botanic Team EP1307 (*insculptum*).
 Pynaert, L.A. 725, 982, 1234, 1560 (*zenkeri*).
 Reitsma, J.M. 1152, 1384 (*pierreanum*); 1640 (*zenkeri*); 3558 (*pierreanum*); 3711 (*zenkeri*).
 Reygaert, F.J. 53 (*germainii*).
 Richards, M.A.E. 4055, 13630 (*hexaloboides*).
 Samai, S.K. 529 (*pierreanum*).
 Schaijes, M. 1636 (*hexaloboides*).
 Schmitz, A. s.n, 506, 789, 1118-1, 2701, 2883, 9431, 12046 (*hexaloboides*).
 Senterre, B. 1283, 1370 (*pierreanum*).
 Seret, F. 806 (*zenkeri*).
 Sita, P. 3248 (*zenkeri*); 3939 (*germainii*); 5195 (*zenkeri*).
 Smith, P.P. 1783 (*hexaloboides*).
 Sosef, M.S.M. 1332, 1391, 1915 (*pierreanum*); 1992 (*zenkeri*); 2014, 2034, 2055, 2158 (*pierreanum*); 2277, 2282 (*zenkeri*); 2285 (*pierreanum*).
 Staner, P.J. 1274 (*zenkeri*).
 Staudt, A. 740, 900 (*insculptum*).
 Stone, J.R. 3236, 3456 (*pierreanum*).
 Talbot, P.A. s.n, 1341 (*zenkeri*).
 Téré, H.G. 2207 (*pierreanum*).
 Thomas, D.W. 604, 4334 (*zenkeri*); 8094 (*pierreanum*); 9772 (*zenkeri*).
 Tisserant (Équipe), C. 57, 582, 739 (*pierreanum*).
 Toussaint, L. 929 (*germainii*).
 Trapnell, C.G. 1618 (*hexaloboides*).
 Vanderwegen, C. s.n. (*zenkeri*).
 Versteegh, C. 623 (*pierreanum*).
 Vigne, C. FH1860, FH2486, FH3132, FH3511 (*pierreanum*).
 Voorhoeve, A.G. 1092 (*pierreanum*).

White, L.J.T. 4, 163 (*pierreanum*).

Wieringa, J.J. 2499, 2620 (*pierreanum*); 6157 (*zenkeri*).

Wilde, J.J.F.E. de 3126 (*insculptum*); 3667, 7972, 9342 (*pierreanum*).

Wilde, W.J.J.O. de 570 (*insculptum*); 1904 (*pierreanum*).

Wilks, C.M. 2123, 2259 (*pierreanum*); 2465 (*zenkeri*).

Wit, H.C.D. de 9110 (*insculptum*).

Yonon Botanic Team 111 (*pierreanum*).

A new species and a new combination in *Phaeostemma* (Apocynaceae, Asclepiadoideae, Gonolobinae)

Gilberto Morillo¹, Alexander Krings²

1 Departamento de Botánica, Facultad de Ciencias Forestales y Ambientales, Universidad de Los Andes, Mérida 5101-A, Venezuela **2** Herbarium, Department of Plant and Microbial Biology, North Carolina State University, Raleigh, NC 27695-7612, U.S.A.

Corresponding author: Gilberto Morillo (gilberto12-10@hotmail.com)

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Abstract

Phaeostemma surinamensis Morillo & Krings, **sp. nov.**, a new species of Apocynaceae (Asclepiadoideae, Gonolobinae) is described and illustrated, and the new combination *Phaeostemma fucata* (Woodson) Morillo & Krings, **comb. nov.**, is made. The new species, known only from a lowland wet forest of Suriname, seems to be closely related to *P. fucata*, which is an endemic to Ptari-tepui, a sandstone mountain in the southeastern edge of the Venezuelan Guayana.

Keywords

Climbing milkweeds, *Matelea*, Suriname, Venezuela

Introduction

Phaeostemma E. Fourn. (Apocynaceae, Asclepiadoideae, Gonolobinae) is a South American genus of twining vines, distributed from southeastern Venezuela to Argentina. Heretofore, five names have been published in the genus—*P. brandonianum* Silveira, *P. glaziovii* E. Fourn., *P. grandifolia* Rusby, *P. riedelii* E. Fourn. and *P. tigrina* Woodson—however, based on morphology, neither *P. grandifolia* [syn. *Matelea*

dasytricha (Schltr.) Woodson] nor *P. tigrina* appear to belong to *Phaeostemma*. The latter species appear to belong to the Andean lineage *Lachnostoma* Kunth (Morillo 2012). Members of *Phaeostemma* s.l. are recognized by stems, leaves and inflorescences densely pubescent, with brown to yellowish-red medium to long (0.9–3 mm) eglandular trichomes, mixed with some shorter (0.5–1 mm) eglandular, multiseptate trichomes, and in some species short (0.15–0.4 mm) glandular trichomes, leaves membranous to coriaceous, often broadly ovate, ovate-elliptic, elliptic or widely oblong, medium to large in size (8–19.5 × 3.8–12 cm), bases shortly cordate, flowers large and broadly campanulate (corolla 23–37 mm in diameter; Fig. 1), corollas green to greenish-yellow, lobes ovate to deltate, sometimes reticulate, spreading, not ocellate, gynostegium stipitate, nectar chambers present, anthers subtriangular almost horizontal, radially prominent, pollinia narrowly or triangular pearshaped, and staminal corona fleshy, of 5 digitate lobes, partly adnate to the stipe and to the corolla tube. *Phaeostemma* is somewhat similar to *Lachnostoma*, but in *Lachnostoma*, the pubescence is usually shorter, with short to long (0.12–1.60 mm) eglandular trichomes, and rarely short (0.10–0.25 mm) glandular trichomes, and corollas usually smaller (12–20 mm in diameter; 26–34 mm in *Lachnostoma uribei* (Morillo) Morillo, inedit.), with lobes in natural position ovate-oblong to narrowly ovate-elliptic, longer than wide, partly due to recurved margins, in few species as long as wide, and bases narrowly campanulate or subtubular (Fig. 2). Species of *Lachnostoma* are known only from wet mountain forests (usually above 1400 m) from the Andes of Peru, Ecuador and Colombia to the Coastal Range of northern Venezuela, whereas species of *Phaeostemma* are known mainly from Tropical Rain Forests or in Austral Forests with araucarias (mostly below 1000 m), from southeastern Guayana to northern Argentina.

Lachnostoma and *Phaeostemma* have been treated as nomenclatural synonyms of *Matelea* Aubl. sensu lato (Spellman and Morillo 1976; Morillo 1984; Fontella-Pereira et al. 1985), however, recent morphological studies (Morillo 2012), indicate that these genera differ from *Matelea* by the combination of dense, ubiquitous, long brown or yellowish-red pubescence in stems, leaves and inflorescences, corollas medium to large (12–37 mm in diameter), narrowly to broadly tubular, campanulate to subcampanulate, staminal corona segments (Cs) well-developed, connate to the base of the anthers, apically bifid or digitate, nectar chambers conspicuous, anthers radially prominent, with a concave outer face, retinacula broadly sagittate, and follicles (mature follicles unknown for *Phaeostemma*) ovate-oblong, with 5 wings and several conical projections. Members of *Matelea* s.s., in contrast, are recognized by stems glabrous to variously pubescent, pubescence in one or two lines, rarely ubiquitous, eglandular trichomes white or translucent, glandular capitate trichomes white, translucent, or with blackish capitula, corollas small to medium-size (less than 15 mm in diameter), usually rotate to subcampanulate, staminal corona segments (Cs) not distinct, usually appearing as ridges emanating from the central stipe, nectar chambers absent, retinacula narrowly sagittate or ovate-sagittate, and follicles narrowly ovate or fusiform, unwinged, costate, or 5-winged, conical projects absent.

On-going work for various regional projects, including the *Flora of the Guianas* and the Biological Diversity of the Guiana Shield, has resulted in the discovery of a new species of *Phaeostemma*: *P. surinamensis* Morillo & Krings [initially misidentified as *Matelea glaziovii* (E. Fourn.) Morillo = *Phaeostemma glaziovii* E. Fourn (Morillo 1997)]. A more careful study of the known species of the genus resulted in the present recognition of its distinctness. The new species is morphologically similar to *P. fucata* (Woodson) Morillo & Krings, an endemic to Ptari-tepui, a sandstone mountain in the Venezuelan Guayana. The new species is described and distinguished below, and the requisite new combination made.

Taxonomic treatment

Key to *Phaeostemma*

- 1a Adaxial corolla lobe surface glabrous **2**
- 1b Adaxial corolla lobe surface pubescent **4**
- 2a Trichomes of stems, midveins, and inflorescences eglandular; corolla lobes longer than wide, adaxially obscurely reticulate when dry, leaf blades membranous; southeastern Brazil..... ***P. riedelii***
- 2b Trichomes of stems, midveins, and inflorescences both eglandular and glandular; corolla lobes as long as wide or wider than long, adaxially conspicuously reticulate when dry, leaf blades membranous or coriaceous; Guayana and Suriname..... **3**
- 3a Leaf blades coriaceous, broadly ovate to ovate-elliptic, marginally revolute, calyx lobes 8.5 mm long; Guayana (Venezuela)..... ***P. fucata***
- 3b Leaf blades membranous, narrowly elliptic to oblanceolate-elliptic, marginally spreading; calyx lobes 5.5–6 mm long; Suriname..... ***P. surinamensis***
- 4a Leaves subcoriaceous, veins on adaxial surface distinctly impressed, blades mostly broadly elliptic to ovate ***P. brandonianum***
- 4b Leaves membranous, veins on adaxial surface not or only slightly impressed, blades mostly narrowly elliptic to slightly obovate..... ***P. glaziovii***

***Phaeostemma fucata* (Woodson) Morillo & Krings, comb. nov.**

urn:lsid:ipni.org:names:77135536-1

http://species-id.net/wiki/Phaeostemma_fucata

Figure 1

Matelea fucata Woodson, Fieldiana, Bot. ser. 28(3): 510. 1953.

Type. VENEZUELA. Bolivar, Ptari-tepui, densely forested slopes overlying sandstone, alt. 1800 m, 8 Nov 1944, *J. Steyermark* 59963 (Holotype: MO!; Isotypes: F!, NY!, VEN!).



Figure 1. Flower of *Phaeostemma fucata* (from Steyermark 59963, MO).

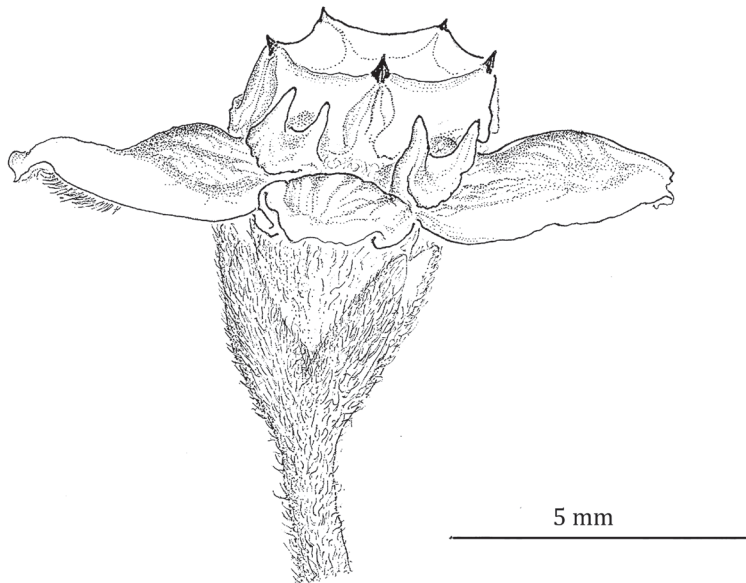


Figure 2. Flower of *Lachnostoma ecuadorensis* Morillo (*Homeier et al.* 1174, QCNE).

***Phaeostemma surinamensis* Morillo & Krings, sp. nov.**

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http://species-id.net/wiki/Phaeostemma_surinamensis

Figures 3–6

A new species of *Phaeostemma* E. Fourn., morphologically similar to *P. fucata* (Woodson) Morillo & Krings, but differing from the latter among other characters, by leaf blades thinner, membranous, narrowly elliptic to oblanceolate-elliptic, marginally spreading (vs. coriaceous, broadly ovate to ovate-elliptic, marginally revolute in *P. fucata*), calyx lobes 5.5–6 mm long (vs. 8.5 mm long in *P. fucata*), staminal corona lobes (Cs) 3–3.2 mm wide, narrower at lateral extremes (vs. 2.3 mm wide at apex, somewhat obtuse at lateral extremes [projections] in *P. fucata*), and pollinia longer, 1–1.15 mm (vs. ca. 0.8 mm long in *P. fucata*).

Type. SURINAME. Lely Mts., SW plateaus covered by ferrobauxite, in secondary vegetation, at end of airstrip, alt. 550–710 m, 1 Oct 1975, *J.C. Lindeman, A.L. Stoffers, A.R.A. Górts-van Rijn & M.J. Jansen-Jacobs 654* (Holotype: U!; Isotype: MO!).

Description. *Vine*, woody, slender. *Stems* densely pubescent, pubescence mixed eglandular and glandular trichomes, eglandular trichomes ubiquitous reddish-brown, stiff, usually spreading, multiseptate, 1.2–2.3 mm long, glandular trichomes spreading, scarce in mature stems, 0.2–0.3 mm long. *Leaf* blades membranous, narrowly elliptic to oblanceolate-elliptic, 10.2–15.0 × 3.8–5.8 cm (1.6–1.8 cm wide at base), apex short acute, base narrowly and shortly cordate, trichomes of surfaces, veins, and margins mixed, yellowish-red, adaxial surface strigose, eglandular multicelled trichomes antrorse, curved to subappressed 0.7–1.3 mm long, glandular trichomes 3–4-celled, spreading, 0.15–0.2 mm long, present mainly on midvein, abaxial surface hispid or hispidulous, eglandular multicelled trichomes erect, 0.25–0.7 mm long, glandular trichomes spreading on the midvein, 0.1–0.2 mm long, midvein adaxially sulcate, abaxially prominent, lateral veins in 6–7 pairs, slightly to strongly prominent; colleters 2, digitate-cylindric, 2.8–3.3 mm long; petioles 1.1–1.7 cm long, densely pubescent, pubescence ubiquitous, eglandular multicelled trichomes spreading, 2.8–3.3 mm long, glandular trichomes 3–4-celled, spreading, 0.1–0.2 mm long. *Inflorescence* racemiform, 2–4-flowered, 1(–2) flowers open at a time; peduncles 3–5 mm long, sparsely to moderately pubescent, pubescence ubiquitous, eglandular trichomes spreading, 1.2–2 mm long, glandular trichomes 3–4-celled, scarce, spreading, 0.2–0.3 mm long, rachis with scars, 3–4 mm long, bracts oblong, 1.8–2 mm long, abaxially pubescent, eglandular trichomes multicelled, 0.3–0.4 mm long, pedicels 24–33 mm long, densely pubescent, pubescence ubiquitous, eglandular trichomes spreading, 0.9–2.5 mm long, glandular trichomes 3–4-celled, spreading, 0.15–0.3 mm long. *Calyx* 8.5 mm long, lobes green, dark red at apex, oblong-elliptic, 5.5–6 × 2.4–2.6 mm, apex obtuse, margins entire, adaxial surface mostly glabrous, except few trichomes at apex, abaxial surface densely pubescent, eglandular multicelled trichomes spreading or antrorse, 0.9–1.5 mm long, glandular trichomes

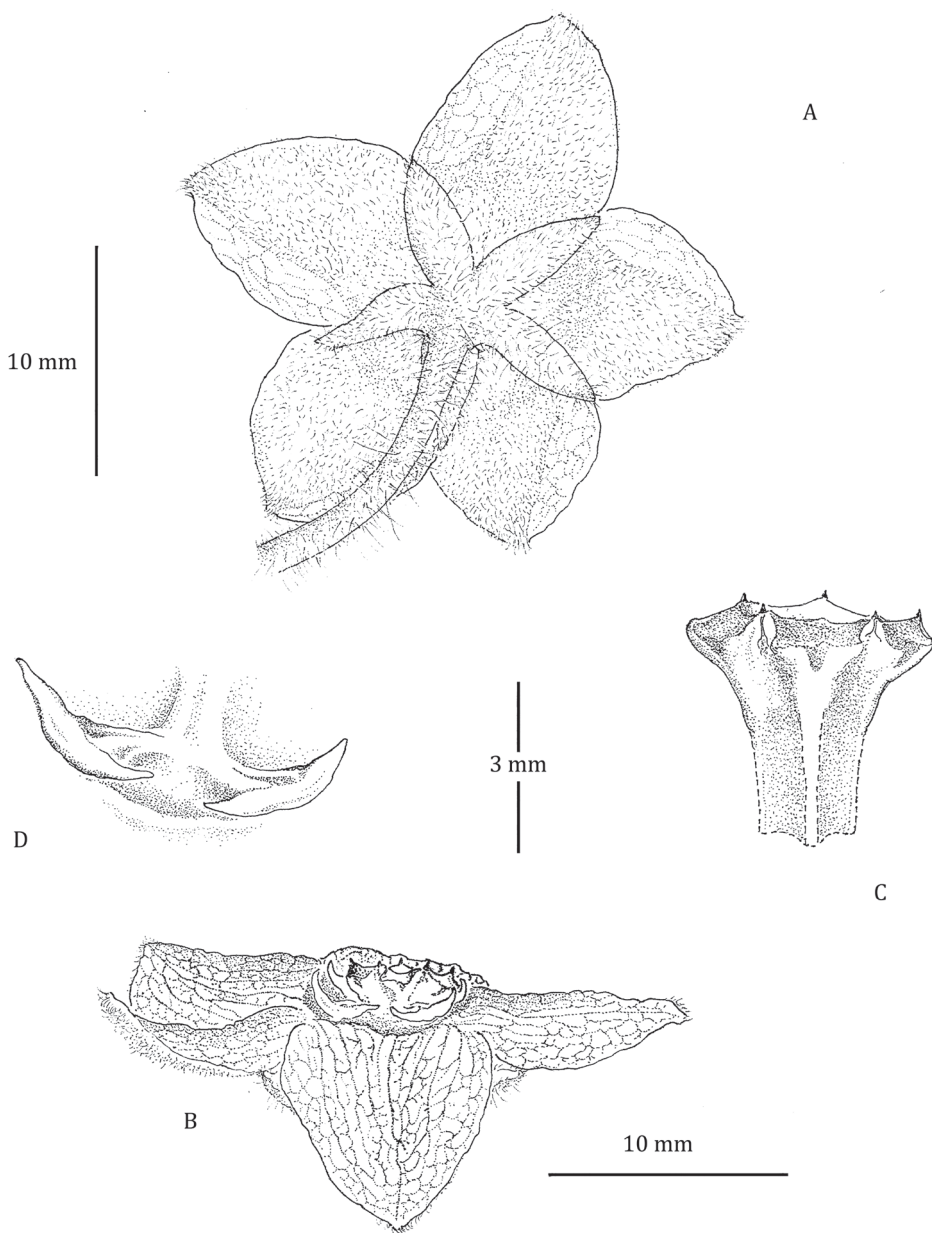


Figure 3. Flower of *Phaeostemma surinamensis*. **A** Abaxial view showing calyx and abaxial corolla lobes **B** Side view showing adaxial corolla surface and gynostegial corona **C** Style-head **D** Staminal corona (Cs). Based on Lindeman *et al.* 654 (U).

2–3-celled, spreading, 0.1–0.3 mm long, colleter 1 per sinus. *Corolla* pale green, with green vein network (fide collectoris), broadly subcampanulate, tube 5.5–5.8 mm long, up to 7 mm wide, sparsely short pubescent on the abaxial side, lobes imbricate



Figure 4. Holotype of *Phaeostemma surinamensis* (Lindeman et al. 654, U).



Figure 5. Detail of flower (side view) of *Phaeostemma surinamensis* from holotype (Lindeman et al. 654, U).



Figure 6. Detail of flower (adaxial view) of *Phaeostemma surinamensis* from holotype (Lindeman et al. 654, U).

in bud, deltoid, spreading, 8–9 × 9–10 mm, adaxial surface glabrous, abaxial surface densely pubescent, eglandular trichomes reddish-brown curved, antrorse, 0.5–1.5 mm long, glandular trichomes 3–4-celled, scarce, 0.15–0.25 mm long, apices obtuse-emarginate, margins entire. *Gynostegium* stipitate, style-head green yellow, somewhat concave, 4.3–4.5 mm in diameter, stipe 2.5 mm long, terminal style-head appendage absent. *Corona* gynostegial, fleshy, of 5 staminal (Cs) apically bifid segments fused to the corolla tube for most of its length, free in the upper 1.5–1.6 mm, apical area bifurcate, dorsally flattened, 3–3.2 mm wide at apex; anthers subtriangular, 1.9–2.1 mm wide between wings; nectar chambers ca. 2.5 × 2.6 mm. *Pollinarium*: corpuscula narrowly obovate-sagittate, ca. 0.5 × 0.33 mm long, caudicles ca. 0.22 mm long, pollinia triangular-pyriform, 1.0–1.15 × 0.6 mm. *Follicles* in very immature state, ca. 2 cm long, apparently 5-costate, densely glandular-pubescent, eglandular trichomes not seen, glandular trichomes 2–3-celled, 0.1–0.15 mm long. *Seeds* unknown.

Distribution and ecology. Growing on a plateau covered with ferrobauxite rock. Endemic to Suriname, in tropical rain forests 500 to 710 m.

Phenology. Collected in flower in October.

Conservation status. Currently, very little is known regarding the status of this species.

Excluded names

Phaeostemma grandifolia Rusby, Descr. S. Am. Pl. 101. 1920. = *Matelea dasytricha* (Schltr.) Fontella, Bradea 4 (9): 55. 1984 (syn. *Gonolobus dasytrichus* Schltr., Notizbl. Königl. Bot. Gart. Berlin 6(55): 177. 1914.)

Phaeostemma tigrina Woodson, Ann. Missouri Bot. Gard. 18: 560. 1931. = *Lachnostoma tigrinum* Kunth, Nov. Gen. Sp. (quarto ed.) 3: 199, t. 232. 1818[1819] (syn. *Matelea humboldtiana* Spellman & Morillo, Phytologia 34(2): 152. 1976.)

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References

- Fontella Pereira J, Hatschbach G, Hartmann RW (1985) Contribuição aos estudos das Asclepiadaceae do Paraná, 3. Boletim do Museu Botânico Municipal, Curitiba 64: 1–47.
- Morillo G (1984) Nuevas especies, nuevos nombres y nuevas combinaciones en *Matelea* Aubl. Ernstia 24: 35–40.

- Morillo G (1997) Asclepiadaceae. In: Boggan J, Funk V, Kelloff C, Hoff M, Cremers G, Feuillet C (Eds) Checklist of the Plants of the Guianas, 2nd ed, 57–58.
- Morillo G (2012) Aportes al conocimiento de las Gonolobinae II. *Pittieria* 37: 141–180.
- Spellman DL, Morillo G (1976) New names and new combinations in Asclepiadaceae. *Phytologia* 34(2): 152.

Aristolochia quangbinhensis (Aristolochiaceae), a new species from Central Vietnam

Truong Van Do^{1,2}, Trong Duc Nghiem³, Stefan Wanke¹, Christoph Neinhuis¹

1 Institut für Botanik, Technische Universität Dresden, Zellescher Weg 20b, D–01062 Dresden, Germany

2 Vietnam National Museum of Nature, Vietnam Academy of Science & Technology, 18 Hoang Quoc Viet, Hanoi, Vietnam **3** Department of Botany, Hanoi University of Pharmacy, 13–15 Le Thanh Tong, Hanoi, Vietnam

Corresponding author: Truong Van Do (dovantruong_btrn@yahoo.com)

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Abstract

Aristolochia quangbinhensis T.V. Do, a new species from Central Vietnam, is described and illustrated. According to morphology, the species belongs to *Aristolochia* subgenus *Isotrema*. A detailed description, along with line drawings, photographs, ecology, distribution, conservation status as well as a comparison to morphologically similar species is provided.

Keywords

Aristolochia, *Aristolochia quangbinhensis*, Aristolochiaceae, *Isotrema*, new species, Vietnam

Introduction

Aristolochia comprises about 500 species and is the largest genus of Aristolochiaceae (Wagner et al. 2012). Recent phylogenetic studies of the genus based on morphological and molecular data suggested a subdivision of *Aristolochia* into three subgenera: *Aristolochia*, *Isotrema* and *Pararistolochia* (Wanke et al. 2006). *Aristolochia* subgenus *Aristolochia* occurs from the Mediterranean zone to subtropical and tropical areas of America, Africa and Asia, *Aristolochia* subgenus *Pararistolochia* is present in tropical Africa and Australasia, whereas *Aristolochia* subgenus *Isotrema* shows a disjunct Asian and Central- and North American distribution (Wanke et al. 2006, Ohi-Toma et al. 2006, González et al. 2013, Buchwalder et al. in press). *Aristolochia* subgenus *Isotrema* (hereafter shortened to *Isotrema*) comprises

about 70 species, 50 of which occur in Asia (González et al. 2013). In Vietnam two subgenera occur, namely *Aristolochia* and *Isotrema*.

Isotrema is well known for its U- or horseshoe-shaped perianth, the utricle and the tube are not sharply delimited, a strongly folded or curved tube, a 3-lobed limb, sometimes with fused lobes, and a gynostemium consisting of three segments, each of them carrying two anthers on the outer surface. In contrast, subgenus *Aristolochia* can be recognized by its slightly curved or rectilinear tube, the utricle and the tube are sharply distinct, a one- to three-lobed perianth limb, a gynostemium with more than three lobes, each of them carrying a single anther on the outer surface. Based on these characters, the new species can be easily assigned to subgenus *Isotrema*.

In an illustrated Flora of Vietnam, Ho (2000) reported 11 species of *Aristolochia*, including four belonging to *Isotrema*. Hwang et al. (2003) listed 45 species of *Aristolochia* for the Flora of China, 33 of which are restricted to this country. In the latter study, 29 Chinese species belong to *Isotrema*, and only one of them (*A. petelotii* O.C. Schmidt) was mentioned to occur also in Vietnam, although the floras of southern China and northern Vietnam have many angiosperm species in common. Ban (2003) recorded 13 species and one variety for Vietnam, and listed the same species of *Isotrema* as those mentioned by Ho (2000), plus *A. kwangsiensis* W.Y. Chun & F.C. How ex C.F. Liang. In preparation of a taxonomic revision of *Aristolochia* for Vietnam, a new *Aristolochia* species belonging to *Isotrema* was found in Central Vietnam and is described here.

Methods

Based on morphological characters, a first overview of the genus *Aristolochia* from Vietnam and adjacent areas (southern China, Laos, Cambodia & Thailand) was prepared. All available specimens of *Aristolochia* housed in Vietnamese herbaria (CPNP, HN, HNU, IMM, VNM VNMN), relevant collections from institutions abroad (DR, HITBC, IBK, IBSC, K, KUN, L, MO, P, SING) and material from recent fieldwork were examined. All morphological characters were studied under dissecting microscopes, and are described using the terminology presented by Harris (2001) & Hwang et al. (2003).

Taxonomy

***Aristolochia quangbinhensis* T. V. Do, sp. nov.**

urn:lsid:ipni.org:names:77135668-1

http://species-id.net/wiki/Aristolochia_quangbinhensis

Figure 1, 2

Note. This new species is morphologically similar to *A. championii* Merrill & W.Y. Chun, *A. vallisicola* T.L. Yao, *A. petelotii* O.C. Schmidt and *A. versicolor* S.M. Hwang, but is distinguishable from these species by the following diagnostic characters: petiole

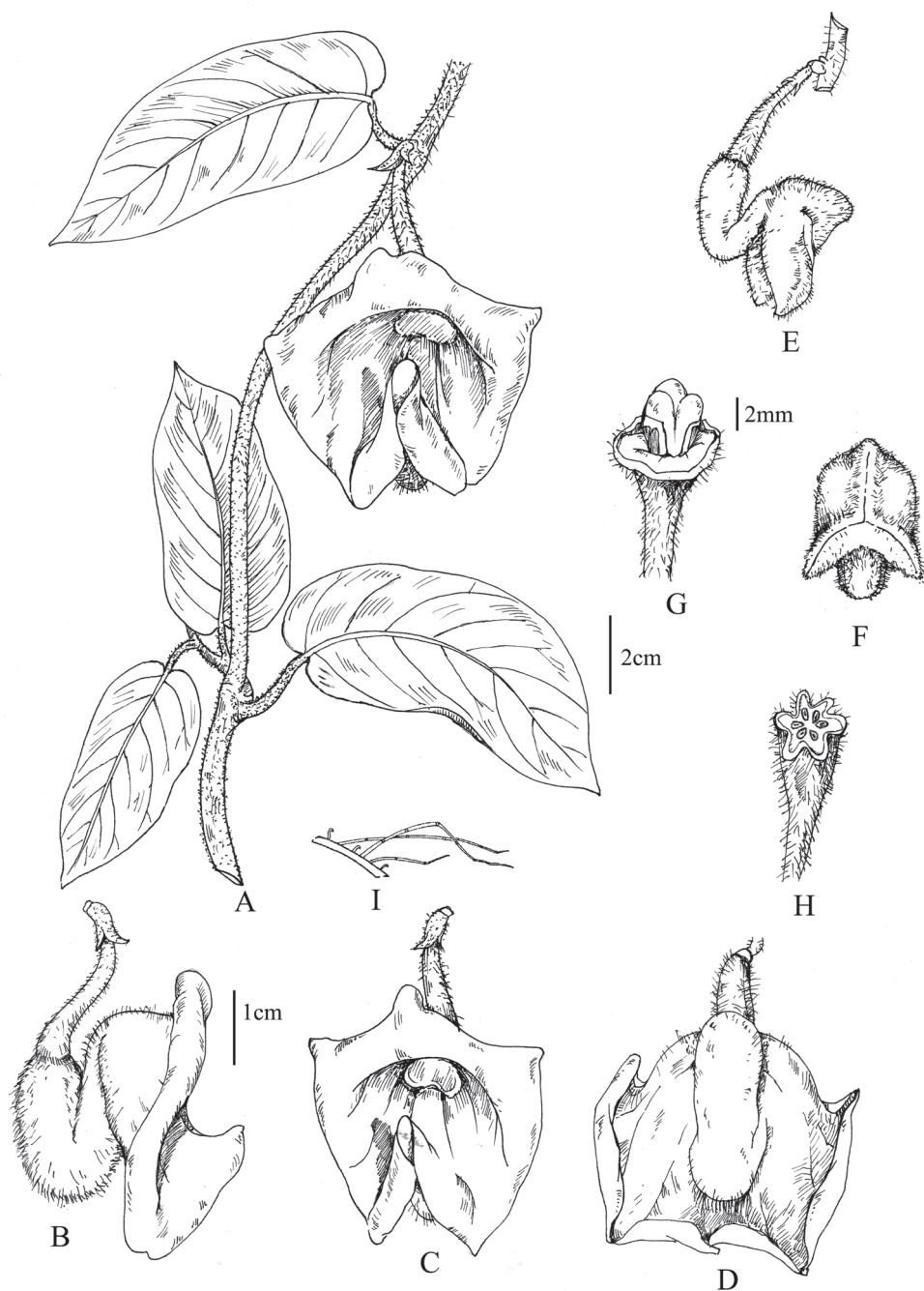


Figure 1. Line drawing of *Aristolochia quangbinhensis* T.V. Do. **A** Flowering branch **B–D** Lateral (**B**) frontal (**C**) and dorsal (**D**) views of a flower at anthesis **E–F** Lateral (**E**) and frontal (**F**) views of a pre-anthetic flower **G** Gynostemium and ovary **H** Transverse section of ovary **I** Multicellular trichomes on the surface of the petiole. Drawing by N.V. Quyet from the holotype.

1.5–2.5(–3) cm long; lamina elliptic to oblong-elliptic; peduncle 1.5–2 cm long, covered with yellow-brown trichomes; perianth limb bell-shaped, 2–2.5(–3) cm wide, exclusively purplish-pink on both sides, no blotches or veins are visible; perianth margins recurved; flower tube mouth slightly darker than the remaining perianth limb; perianth tube pale yellow to whitish and the entire back of the perianth limb and tube covered with yellow-brown trichomes.

Type. VIETNAM. Quang Binh province: Minh Hoa district, Hoa Luong community, 17°47'5.00"N, 105°52'20.05"E, elev. 380 m, 3 April 2013, *T.V. Do* 39 (holotype: VNMN; isotype: DR).

Description. Perennial woody lianas. Roots numerous, fasciculate and cylindrical. Stems terete, densely yellow-brown villous when young, older stems with corky bark, glabrous. Petiole 1.5–2.5(–3) cm long, straight, densely covered with yellow-brown trichomes; lamina elliptic to oblong-elliptic, (6–)8–13(–14) cm long, 3–5(–6) cm wide, subcoriaceous, base subcordate to auriculate, with a shallow sinus 3–4 mm deep, (1–)1.5–2 mm wide, apex acute, adaxially glabrous, dark green, abaxially densely yellow-brown villous, basal veins 3, palmate, secondary veins 7–8 pairs, pinnate, venation densely reticulate and prominent on both sides. Flowers terminal, solitary, but accompanied by a lanceolate scale-like bracteole, (2–)3 mm long, (1.5–)2 mm wide, sessile, inserted near base of the peduncle, conspicuous, persistent. Peduncles 1.5–2 cm long, pendulous, purple, densely hirsute. Peduncles, bracts and perianth densely covered by yellow-brown pluricellular hairs. Perianth S-shaped, (3–)3.2–3.5 cm long, outside densely yellow-brown hirsute with obscure, parallel veins, inside smooth. Ovary oblong, (0.8–)1–1.2 cm long, 0.3–0.4 cm diam., yellowish-green, densely hirsute, 6-locular, ovules numerous, usually in one series. Utricle ovoid, (1.2–)1.5–1.8 cm long, 0.5–0.6(–0.8) cm diam., externally white, inner surface basally with a dark-purple patch and distally with a white patch; tube strongly curved at its base, parallel and in close contact with the utricle, narrower than the utricle, cylindrical, 0.9–1.0 cm long, 0.4–0.5 cm diam.; limb three-lobed, bell-shaped, 2–2.5(–3) cm diam., purplish-pink on both sides, without any blotches or veins visible, outer surface densely hirsute, inner surface smooth, the three unequal lobes valvate in preanthetic flowers, the lateral lobes broadly deltoid with acute apex, the lower (median) lobe semicircular, during anthesis bell-shaped and with the margins recurved; throat circular, dark-purple, densely papillose; annulus present, formed by an ellipsoid flange, dark-violet; gynostemium three-lobed, lobes with obtuse apices, smooth, (3–)4–5 mm high, 2–3 mm diam., white; stamens six in one series of three pairs; anthers oblong, (2–)2.5–3 mm long, yellow, tetralocular, longitudinally dehiscent. Capsules not seen.

Vernacular name. Phòng Kỳ Quảng Bình (in Vietnamese).

Distribution. *Aristolochia quangbinhensis* is known from a single population found on the north-eastern slope of a mountain range bordering the buffer zone of Phong Nha-Ke Bang National Park in the Hoa Luong community, Minh Hoa district, Quang Binh province (Fig. 3). It might also be present in Laos P.D.R., because of the proximity of the Khammouan province with Central Laos.

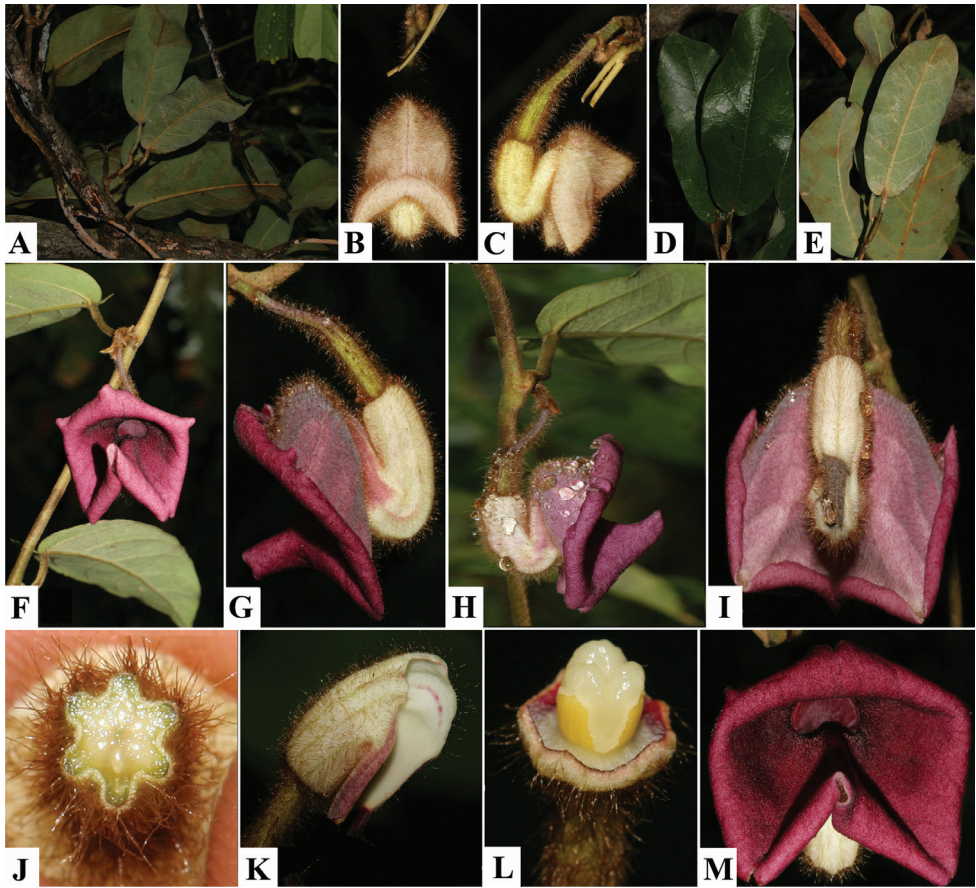


Figure 2. Photographs of *Aristolochia quangbinhensis* T.V. Do. **A** Habit **B–C** Frontal (**B**) and lateral (**C**) views of a preanthetic flower **D–E** Leaf in adaxial (**D**) and abaxial (**E**) views **F** Flowering branch **G–I** Lateral (**G–H**) and dorsal (**I**) views of flowers at anthesis **J** Transverse section of the ovary **K** Inner surface of perianth **L** Gynostemium and ovary **M** Frontal view of an anthetic flower. Photographs taken on the holotype locality in Hoa Luong community, Minh Hoa district, Quang Binh province, Central Vietnam.

Ecology. *Aristolochia quangbinhensis* occurs in humid mountain sites, in the understory of disturbed lowland evergreen broad-leaved forest and mainly evergreen scrubs. Dominant plants at the type locality are Annonaceae (*Desmos* spp.), Apocynaceae (*Marsdenia* spp., *Wrightia* spp.), Fabaceae (*Millettia* spp.), Lauraceae (*Machilus* spp., *Litsea* spp.), Malvaceae (*Sterculia* spp.), Pandaceae (*Microdesmis* spp.), Phyllanthaceae (*Antidesma* spp., *Aporosa* spp., *Glochidion* spp.), and Rubiaceae (*Randia* spp.).

Phenology. Flowering specimens have been collected in April and May but it is possible that blooming already begins in March.

Etymology. The specific epithet refers to the type locality.

Conservation status. In the past, large areas of primary, broad-leaved, evergreen forest covered the Hoa Luong community. Excessive logging, however, resulted in

Table 1. Comparison between *A. quangbinhensis* and its four morphologically closest relatives.

Characters	<i>A. quangbinhensis</i>	<i>A. vallsicola</i>	<i>A. championii</i>	<i>A. versicolor</i>	<i>A. petelotii</i>
Petiole	1.5–2.5(–3) cm long, densely yellow-brown villous	2.5–7 cm long, puberulent	1–2.0 cm long, densely villous	1–2.0 cm long, sparsely pilose	2–4 cm long, densely yellow-brown villous
Lamina	elliptic to oblong-elliptic, (6–)8–13(–14) cm long, 3–5(–6) cm wide	lanceolate, oblanceolate to broadly oblanceolate, 6.5–11 cm long, 1.7–3.9 cm wide	elliptic- lanceolate to linear-lanceolate, 15–30 cm long, 2–5 cm wide	narrowly elliptic to lanceolate-elliptic, 7.5–33 cm long, 4–12 cm wide	narrowly ovate to lanceolate ovate blade lamina, 12–20(–22) cm long, 5–11(–13) cm wide
Leaf base	narrowly auriculate; 3–4 mm deep	cordate; 2–3 mm deep	rounded to shallowly cordate; 2 mm deep	narrowly auriculate; 5–7 mm deep	shallowly cordate, sinus 6–10 mm deep
Leaf apex	acute	acute	acuminate	acute to acuminate	acuminate
Adaxial surface of the leaf	glabrous	glabrescent	glabrous but villous along veins	glabrous	glabrous
Abaxial surface of the leaf	densely yellow-brown villous	puberulent	densely brown villous	sparsely villous along veins, glaucous	pubescent
Inflorescences	ramiflorous, flower solitary	cauliflorous, flower solitary	cauliflorous, cluster of 2–5 flowers	ramiflorous, solitary or flower pair	cauliflorous, cluster of 2–3 flowers
Peduncle	1.5–2 cm long; densely hirsute, unbranched	15.5–17 cm long; puberulent, branched	3–4 cm long; brown villous, unbranched	2–3 cm long; brown villous, unbranched	10–12 cm long, densely brown villous, unbranched
Perianth	yellowish-white; (3–)3.2–3.5 cm long; without blotches	purple; 6–6.5 cm long; with obscure veins	greenish-yellow; 10–12 cm long; with purple veins and blotches	yellow-green; 7–9 cm long; with purple veins	yellow-purple, 8–10 cm long; with purple veins and blotches
Limb	purplish-pink; bell-shaped; 2–3 cm wide; unequal 3-lobed, margin of lobes recurved, acute apex	yellow; disc-shaped; 5.8–6.5 cm wide; equal 3-lobed, margin of lobes expanded, rounded apex	yellow; funnel-shaped; 4–6 cm wide; unequal 3-lobed, lower one spreading spatulate-like, margin of lobes erect, rounded apex	purple; disc-shaped; 4–6 cm wide; equal 3-lobed, margin of lobes expansive, rounded apex	yellow; bell-shaped; 4–5 cm wide; unequal 3-lobed, margin of lobes rolled downwards, acute apex
Throat	annulus present, throat dark-violet	annulus present, throat coloration unknown	annulus present, throat yellow	annulus absent, throat coloration unknown	annulus present, throat dark-purple
Distribution	Central Vietnam	Peninsular Malaysia	Southern China	Southern China, North Eastern Thailand	Southern China, Northern Vietnam



Figure 3. Distribution (dot) of *Aristolochia quangbinhensis* T.V. Do in Central Vietnam.

the loss of large extensions of primary forest. Although logging was prohibited in the 1990s, local farmers continued to impose strong pressure on the remaining forest patches converting it mostly into corn and soybean fields. As a result, the flora of the area should be regarded as threatened by extinction. Within the area, *A. quangbinhensis* is known from a single population; in fact, during the present study, only two healthy individuals were located growing about 50 m apart from each other. Therefore, the new species is assigned a preliminary status of vulnerable (VU D2) according to IUCN Red List criteria (IUCN 2013), indicating a population with a very restricted area of occupancy (typically less than 20 km²) or the number of locations (typically five or fewer) being both at hand for *A. quangbinhensis*. The lack of data currently does not allow a final risk evaluation, but the species might also be regarded as endangered (EN).

Discussion

Aristolochia quangbinhensis is morphologically similar to *A. vallisicola* T.L. Yao (reported from Pahang, Peninsular Malaysia), *A. championii* Merr. et Chun (known from Guangdong, Guangxi, China), *A. versicolor* S.M. Hwang (reported from China and Thailand) and *A. petelotii* O.C. Schmidt (reported from Vietnam and China). However, the new species differs from the aforementioned species by several important veg-

etative and reproductive characters (summarized in Table 1). This new discovery, along with several new species recently described from Thailand (González and Poncy 1999, Phuphathanaphong 2006), Hainan Island, China (Han Xu et al. 2011), and Peninsular Malaysia (Yao 2012), provide evidence that the genus *Aristolochia* and in particular *Aristolochia* subgenus *Isotrema* is very diverse in South-East Asia. A detailed investigation of the different flower phenotypes and inflorescence between Asian, North and Central American *Isotrema* species is needed to reconstruct the evolution of floral forms between the biogeographic areas.

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References

- Ban NT (2003) Checklist of plant species of Vietnam. Agriculture Publishing House, Hanoi, 2: 123–126.
- Buchwalder K, Samain M-S, Sankowsky G, Neinhuis C, Wanke S (in press) Nomenclatural updates of *Aristolochia* subgenus *Pararistolochia* (Aristolochiaceae). Australian Systematic Botany.
- González F, Poncy O (1999) A new species of *Aristolochia* (Aristolochiaceae) from Thailand. *Brittonia* 51: 452–456. doi: 10.2307/2666529
- González F, Stevenson DW (2002) A phylogenetic analysis of the subfamily Aristolochioideae (Aristolochiaceae). *Revista de la Academia Colombiana de Ciencias* 26: 25–60.
- González F, Wagner ST, Salomo K, Symmank L, Samain MS, Isnard S, Rowe NK, Neinhuis C, Wanke S (2013) Present trans-Pacific disjunct distribution of *Aristolochia* subgenus *Isotrema* (Aristolochiaceae) was shaped by dispersal, vicariance and extinction. *Journal of Biogeography*. doi: 10.1111/jbi.12198
- Harris JG (2001) Plant Identification Terminology: An Illustrated Glossary, Spring Lake Publishing, Utah, USA. 2nd edit. 216 pp.
- Ho PH (2000) An Illustrated Flora of Vietnam. Young publishing house, Tp. Ho Chi Minh 3: 302–305.
- Hou D (1984) Aristolochiaceae. *Flora Malesiana*, ser. I, 10: 53–108.

- Huber H (1993) Aristolochiaceae. In: Kubitzki K, Rohwer JG, Bittrich V (Eds) The families and genera of vascular plants, Springer, Berlin, 129–137.
- Hwang SM (1987) Aristolochiaceae. In: Chen FH, Wu TL (Eds) Flora of Guangdong, Guangdong Science and Technology Press, Guangzhou, 47–62.
- Hwang SM (1988) Aristolochiaceae. In: Kiu HS, Ling YR (Eds) Flora Reipublicae Popularis Sinicae, Science Press Beijing, vol. 24.
- Hwang SM, Kelly LM, Gilbert MG (2003) Aristolochiaceae. In: Wu ZY, Peter HR (Eds) Flora of China, Science Press Beijing, and Missouri Botanical Garden Press, St. Louis, vol. 5: 246–269.
- IUCN (2013) Red List of Threatened Species, Version 2013.1. www.iucnredlist.org [accessed on 26 September 2013]
- Lecomte H (1910) Aristolochiaceae. In: Lecomte H (Ed) Flore Général de l'Indo-Chine 4: 57.
- Liang CF (1975) The Aristolochiaceae of Kwangsi flora. Acta Phytotaxonomica Sinica. Paris 13 (2): 15.
- Ma JS (1989) A revision of *Aristolochia* Linn. from E. & S. Asia. Acta Phytotaxonomica Sinica 27(5): 321–364.
- Neinhuis C, Wanke S, Hilu KW, Müller K, Borsch T (2005) Phylogeny of Aristolochiaceae base on parsimony, likelihood, and Bayesian analyses of trnL-trnF sequences. Plant Systematics and Evolution 250: 7–26. doi: 10.1007/s00606-004-0217-0
- Ohi-Toma T, Sugawara T, Murata H, Wanke S, Neinhuis C, Murata J (2006) Molecular phylogeny of *Aristolochia* sensu lato (Aristolochiaceae) based on sequences of rbcL, matK, and phyA genes, with special reference to differentiation of chromosome numbers. Systematic Botany 31: 481–492. doi: 10.1600/036364406778388656
- Phuphathanaphong L (2006) New taxa of *Aristolochia* (Aristolochiaceae) from Thailand. Thai Forest Bulletin (Botany) 34: 179–194.
- Wagner ST, Isnard S, Rowe NP, Samain MS, Neinhuis C, Wanke S (2012) Escaping the lianoid habit: evolution of shrub-like growth forms in *Aristolochia* subgenus *Isotrema* (Aristolochiaceae). American Journal of Botany 99(10): 1609–1629. doi: 10.3732/ajb.1200244
- Wanke S, González F, Neinhuis C (2006) Systematics of pipevines: combining morphological and fast-evolving molecular characters to investigate the relationships within subfamily Aristolochioideae (Aristolochiaceae). International Journal of Plant Sciences 167 (6): 1215–1227. doi: 10.1086/508024
- Xu Han, Li YD, Yang HJ, Chen HQ (2011) Two new species of *Aristolochia* (Aristolochiaceae) from Hainan Island, China. Novon 21: 285–289. doi: 10.3417/2009116
- Yao TL (2012) *Aristolochia vallisicola* (Aristolochiaceae), a new species from Peninsular Malaysia. Phytokeys 14: 15–22. doi: 10.3897/phytokeys.14.3354

***Miconia bullotricha* and *M. hirtistyla*, two new species of *Miconia* sect. *Lima* (Miconieae, Melastomataceae) from eastern Cuba**

Lucas C. Majure^{1,2}, Eldis R. Bécquer³, Walter S. Judd^{1,2}

1 Department of Biology, University of Florida, Gainesville, Florida 32611–8525 U. S. A. **2** Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611–0575 U. S. A. **3** Jardín Botánico Nacional, Universidad de La Habana, La Habana, Cuba

Corresponding author: Lucas C. Majure (lmajure@ufl.edu)

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Abstract

We describe two new species in *Miconia* sect. *Lima*, *Miconia bullotricha* Bécquer & Majure and *Miconia hirtistyla* Majure & Judd, from eastern, Cuba. We also provide illustrations and distribution maps for the two species, as well as a key to members of the *Lima* clade on Cuba.

Resumen

Describimos dos nuevas especies de *Miconia* sect. *Lima*, *Miconia bullotricha* Bécquer & Majure y *Miconia hirtistyla* Majure & Judd, del este de Cuba. También, proveemos ilustraciones y mapas de distribución para las dos especies, y una clave para distinguir los miembros del clado *Lima* en Cuba.

Keywords

Cuba, Greater Antilles, *Leandra*, *Ossaea*, Sierra Maestra

Introduction

Miconia sect. *Lima* Majure & Judd (2013a), i.e., the *Lima* clade, is a small group of 18 species, including the two species described here. The clade occurs throughout the Greater Antilles, with the exception of Puerto Rico. Ten species are endemic to Cuba, seven are endemic to Hispaniola and one species occurs only on Jamaica. This clade is characterized by the production of bulla-based hairs on virtually all surfaces of the plant, including stems, petioles, leaf surfaces, inflorescence axes, bracts, hypanthia, and even the petal abaxial surfaces. The bulla-based hairs on the adaxial leaf surfaces often are very well developed and more or less cover the areoles. Long stemmed, clavate-dendritic hairs also are common on the adaxial leaf surface, especially toward the base of the blade, along the primary, secondary, and tertiary veins. Certain species within the clade also produce acarodomatia composed of tufts of multicellular hairs. Species within the clade have terminal inflorescences and typically flowers with ovate to elliptic petals with acute apices (Majure and Judd 2013a, b), which led the majority of species to be described (e.g., Alain 1955, Britton and Wilson 1920, Urban 1923, 1927, 1929, 1931) or recognized as either *Ossaea* or *Leandra* in previous treatments (Alain 1956, Liogier 2000, Judd and Skee 1991, Michelangeli and Bécquer 2012). The production of anthers with one dorso-basal appendage, and a single, dorsally-oriented pore, also is common in this clade (Majure and Judd 2013a), although not all species possess these features (Majure and Judd 2013b).

While working on a taxonomic revision of the *Lima* clade, two previously undescribed species from eastern Cuba were discovered, *M. bullotricha* Bécquer & Majure and *M. hirtistyla* Majure & Judd. We describe these two species herein and provide distribution maps, illustrations, and comparisons with other putative close relatives. We also provide a key to the species of *Miconia* sect. *Lima* on Cuba.

It is noteworthy that most members of the *Lima* clade are local endemics and this is especially true for numerous species from eastern Cuba, which are either found in the Sierra Maestra region (*M. hirtistyla*, *M. norlindii* (Urb.) Majure & Judd, *M. tentaculicapitata* Majure & Judd) or the mountains of the Baracoa and Moa regions (*M. bullotricha*, *M. cubacinerea* Majure & Judd, *M. granulata* (Urb.) Majure & Judd, *M. jashaferi* Majure & Judd). *Miconia argentimuricata* Majure & Judd is restricted to both the Sierra Maestra and Moa-Baracoa regions, and *M. ottoeschmidtii* (Urb.) Majure & Judd is the only widespread species across the island. *Miconia cubana* (Alain) Majure & Judd is the only species endemic to western Cuba. Eastern Cuba is known for high endemism with 53.4 % of endemics to the island known only from the former Oriente Province (Borhidi 1991), which is now composed of the provinces of Granma, Guantánamo, Holguín, Las Tunas, and Santiago de Cuba. The cause for such high endemism in this region has been suggested to be the result of dramatic elevational diversity, as well as the diversity of soil types and other ecological and geographic factors (Borhidi 1991, López Almirall 2013). In fact, the highest number of endemics on Cuba is found in areas of the Nipe Mountains, Sierra de Cristal and Moa region, all of which are composed of serpentine soils. Approximately 31.2 % of all Cuban endemic

plant species are found on serpentine soils (Borhidi 1991). Thus, it appears that specific soil types are certainly a direct driver of local endemism, along with topological relief, as well as other ecological factors, such as regional climate patterns. Such combined factors likely resulted in the high number of local endemics in the *Lima* clade of eastern Cuba. Numerous other groups show local endemism in these areas as well (e.g., *Lyonia* Nutt. sect. *Lyonia*, Judd 1981; *Heptanthus* Griseb., *Neobraccia* Britt., *Oplonia* Raf., *Platygyne* Muell., Borhidi 1991; *Exostema* (Pers.) Bonpl., McDowell et al. 2003; *Miconia* sect. *Chaenopleura* (L.C. Rich. ex DC.) Hook., Judd 2007; the *Calycopteris* clade of *Miconia*, Judd & Majure 2013, Judd et al. in press).

Key to the species of *Miconia* sect. *Lima* on Cuba

- 1 Adaxial leaf surfaces appearing velvety or soft, covered in narrowly dilated (i.e., poorly developed bulla-based) hairs with long, attenuate apices, and hairs mostly of one size, usually not covering leaf areoles **2**
- Adaxial leaf surfaces appearing as a rasp or file, lizard or toad skin, covered in broadly dilated (i.e., well developed bulla-based hairs), with acute, attenuate to truncate apices, and hairs of several sizes, mostly covering the leaf areoles **5**
- 2 Inflorescence an expanded, open, compound cyme, very delicate (inflorescence axis and branches 0.2–0.6 mm wide), with proximal inflorescence branches 8–25 mm long, bracteoles linear, 0.5–0.6 × 0.15–0.3 mm, calyx lobes and teeth 4, ovary 4-locular and 4 lobed, Pinar del Río ***M. cubana***
- Inflorescence a dense cluster of sessile flowers (i.e., glomerulate), robust (inflorescence axis and branches 0.8–1.5 mm wide), proximal inflorescence branches 0–5.5 mm long, bracteoles foliose, ovate, obovate or orbicular, 2.8–4.3 × 1–2.4 mm, calyx lobes and teeth 4–7, ovary 3-locular and unlobed, Granma, Guantánamo, Holguín, Santiago de Cuba **3**
- 3 Leaf apices narrowly acute to acuminate, leaf margins composed of large and small bulla-based hairs (appearing jagged), inflorescences pendant, anther pores dorsally oriented, Baracoa, Moa, Sierra de Cristal ***M. jashaferi***
- Leaf apices broadly acute, leaf margins with one size of bulla-based hairs (appearing smooth), inflorescences erect, anther pores apically oriented, Baracoa and western Sierra Maestra **4**
- 4 Abaxial leaf surface deeply pitted (to 0.5 mm deep) from the bulla-based hairs produced on the adaxial surface, styles pubescent, calyx teeth 4.5–4.6 × 0.2–0.4 mm, Sierra Maestra ***M. hirtistyla***
- Abaxial leaf surface shallowly pitted (pits to <0.1 mm deep), styles glabrous, calyx teeth 5.7–6.2 × 0.6–0.7 mm, Baracoa ***M. cubacinerea***
- 5 Bulla-based hairs on adaxial leaf surface truncate, the larger hairs broadly spaced from one another, not meeting at the bases, and surrounded by smaller hairs, the smaller hairs forming a ring around the larger hairs, tertiary veins inconspicuous on the adaxial surface, stem hairs granulate **6**

- Bulla-based hairs on adaxial leaf surface with attenuate, acute or truncate apices, the larger hairs not appearing broadly spaced from one another and oftentimes nearly meeting at the bases, the smaller hairs not forming a ring around the larger hairs, tertiary veins conspicuous on adaxial surface, stem hairs long and shaggy or granulate7
- 6 Leaves 3-veined, domatia absent, basal inflorescence branches sometime pendant, ovaries strongly 4-lobed, leaves narrowly ovate to narrowly elliptic, leaf length/width quotient (1.38–6.25), apices acute to acuminate, Sierra de Moa and Baracoa regions..... ***M. granulata***
- Leaves 5-veined, domatia present at least at the junction of primary and secondary veins, basal inflorescence branches consistently erect, ovaries not strongly 4-lobed, leaves elliptic or narrowly elliptic, leaf length/width quotient (1.38–4.85), apices acute to obtuse, Sierra Maestra.....***M. norlindii***
- 7 Adaxial leaf surface drying dark brown, bronze or silver colored, stem and hypanthia clothed in long, shaggy ascending hairs 0.9–4 mm long, mountains of eastern Cuba..... **8**
- Adaxial leaf surface drying light brown, green or yellow, stem and hypanthia clothed in short, spreading, slightly ascending or descending hairs 0.1–0.5 mm long, Guantánamo or otherwise widespread in Cuba..... **9**
- 8 Leaves mostly elliptic, apices broadly acute to obtuse, abaxial leaf surface covered in short, appressed to slightly erect bulla-based hairs, the epidermis mostly obscured, inflorescence a 3–5 flowered condensed cyme, proximal inflorescence branches absent, bracts and bracteoles broad and foliaceous, Sierra Maestra.....***M. tentaculicapitata***
- Leaves mostly ovate, apices narrowly acute to acuminate, abaxial leaf surface covered in long, erect to spreading narrowly bulla-based hairs, the epidermis clearly seen, inflorescence a 3–42 flowered, open, compound cyme, proximal inflorescence branches 8–26 mm long, bracts and bracteoles oblong or ovate with attenuate apices, not foliaceous, Sierra Maestra and Sierra de Moa region***M. argentimuricata***
- 9 Entire inflorescence usually pendant, floral buds globose, calyx teeth 1.75–2.2 mm long, abaxial leaf surface hairs erect throughout the lamina and along veins, stem indumentum generally with apices attenuate and strongly recurved upwards, innermost pair of secondary veins produced 2–6 mm from the leaf base, mountains of Guantánamo province..... ***M. bullotricha***
- Inflorescence erect or occasionally with basal most branches pendant, floral buds quadrangular, calyx teeth 0.4–0.8 mm long, abaxial leaf surface hairs erect, spreading or appressed throughout the lamina, appressed to spreading along the veins, stem indumentum generally granulate with apices truncate or only short attenuate and recurved upwards or not, innermost pair of secondary veins produced 0.8–25 mm from the leaf base, widespread on Cuba
.....***M. ottoschmidtii***

Systematics

Miconia bullotricha Bécquer & Majure, sp. nov.

urn:lsid:ipni.org:names:77135720-1

http://species-id.net/wiki/Miconia_bullotricha

Figs 1, 2

Diagnosis. Species differing from *Miconia ottoschmidtii* in its stem indumentum generally with apices attenuate and strongly recurved upwards, (vs. more frequently granulate stem indumentum with apices truncate) more frequently ovate leaf shape (vs. mostly elliptic leaves), innermost pair of secondary veins produced 2–6 mm from leaf base (vs. 0.8–25 mm from leaf base), erect bulla-based hairs on lamina and tertiary veins of leaf abaxial surface (vs. mostly spreading to appressed bulla-based hairs), entire inflorescences pendant (vs. mostly erect inflorescences except for sometimes pendant basal inflorescence branches), globose floral buds (vs. quadrangular floral buds), and calyx teeth length (1.75–2.2 vs. 0.4–0.8 mm).

Type. CUBA. Guantánamo: Palenque. Bernardo. Sierra del Frijol, Loma Bernardo, 800–900 m, 21 May 1983, *Bisse J., Beurton C., Dietrich H., Gutiérrez J., Lepper L., Dolmus R., Köhler E., Rankin R., Arias I.* HFC-49930 (holotype: HAJB!; isotypes: B 100362845!, HAJB!, JE!, NY!; Fig. 1).

Description. Evergreen shrub (height unknown); stems round in cross section, not ridged, the internodes 1.1–2.4 cm long; stems densely covered in bulla-based hairs with strongly to narrowly dilated bases, to 0.3 mm long, the hairs spreading to descending with apices recurved upwards, young stem hairs often dark purple in color; nodal line present, inconspicuous. Leaves opposite, decussate, elliptic to ovate-elliptic, often slightly falcate, 4.2–6 × 1–2.2 cm, often slightly anisophyllous, yellowish when dried; apex narrowly acute; base rounded to broadly cuneate or abruptly cuneate; margin revolute, dentate, the dentations obscure, each covered in one large, bulla-based hair, venation acrodromous, 3 (–5) veined, 1 primary vein and 1 (rarely 2) pairs of suprabasal secondary veins, often asymmetrical at union with midvein, produced 2–6 mm from the leaf base, positioned 0.7–3 mm in from margin at widest part of blade, the tertiary veins percurrent, ± perpendicular to midvein, 2–3 mm apart at mid-leaf, intertertiary veins present, often joined by quaternary veins; adaxial leaf surface with primary and secondary veins impressed, tertiary veins flat to slightly impressed, remaining veins flat, abaxial surface with primary, secondary and tertiary veins raised, the higher order veins ± flat to slightly raised (i.e., clearly visible to more or less obscure); adaxial leaf surface completely covered in erect bulla-based hairs, these fully expanded at the base, thus the lamina obscured, widest hair bases to 1.5 mm wide, hair apices acute to truncate, sometimes slightly recurved toward the leaf margin, sessile, glandular hairs occurring between the bases of bulla-based hairs; abaxial leaf surface nearly completely covered with bulla-based hairs with strongly to narrowly dilated bases, the lamina areoles not completely filled, the hairs along the epidermis erect with apices recurved or not, veins completely covered by spreading to

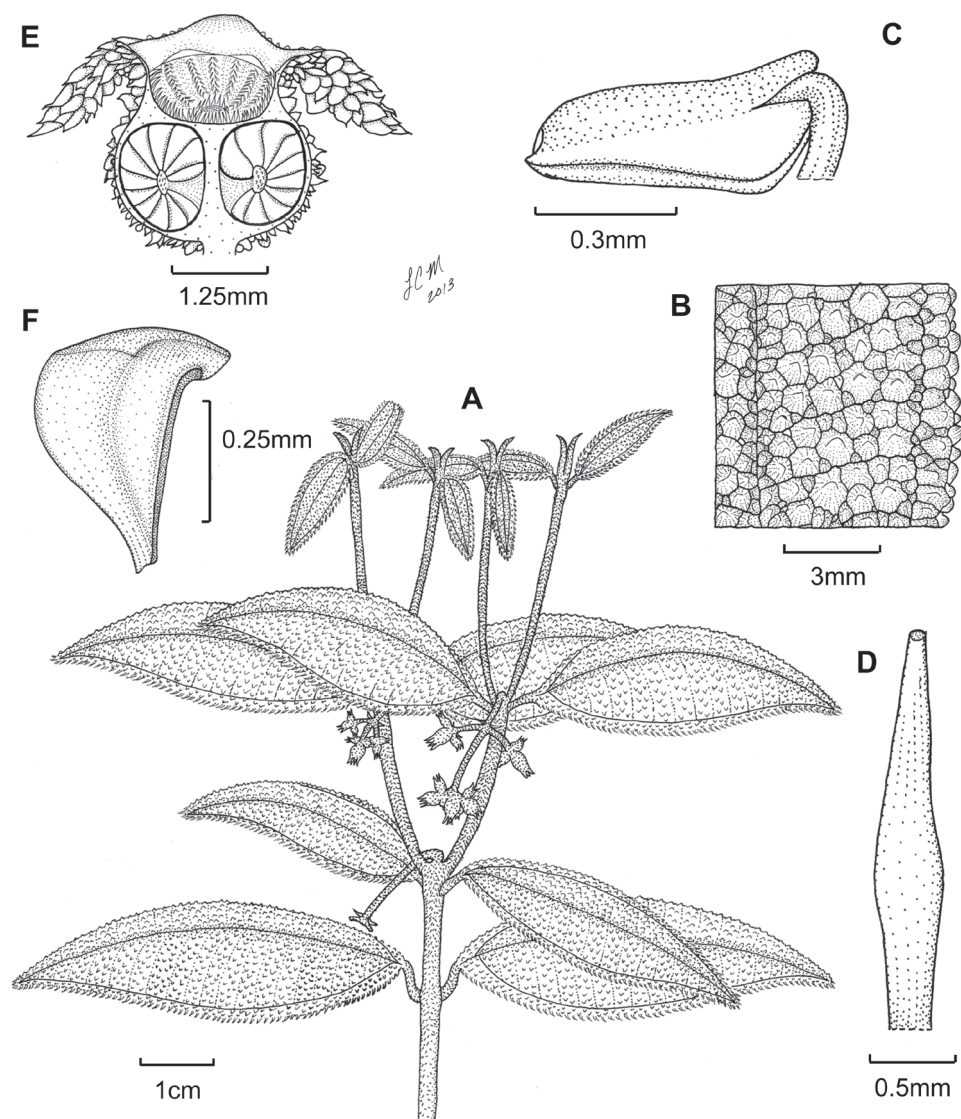


Figure 1. Illustration of *Miconia bullotricha*. **A** habit **B** close-up of leaf adaxial surface **C** immature stamen **D** style **E** fruit longitudinal section **F** seed (all from Bisse et al. HFC-49930).

erect hairs mostly with narrowly dilated bases and recurved apices, sessile, glandular hairs occurring throughout the lamina, as well as along veins; domatia inconspicuous, of multicellular, tufts of linear hairs present in the axils of the primary and secondary, as well as primary and tertiary veins; petiole 5–8 mm long, covered in spreading bulla-based hairs, those of the adaxial surface slightly longer and narrower than those of the abaxial surface and recurved towards to the leaf blade. Inflorescences terminal, well-developed to reduced cymes of 3–13 flowers, 2–3.5 × 1.8–3.4 cm, the flowers produced in 3–7 flowered

dichasia, the peduncle 0.7–1.4 cm long, usually conspicuously reflexed at base, thus the entire inflorescence pendant, the proximal inflorescence branches 0.5–1 cm long; bracts oblong to narrowly ovate, 1.1–2 mm long; bracteoles narrowly ovate, ca. $0.5\text{--}0.7 \times 0.2\text{--}0.3$ mm, glabrous or with small bulla-based hairs at base, bracteoles generally resembling one large, bulla-based hair. Flowers perfect, actinomorphic, 4-merous, with pedicels 0–1 mm long. Hypanthium ca. 1.6×2.8 mm, \pm globose, slightly constricted below torus, abaxial surface covered in granulate, bulla-based hairs with dilated bases and attenuate to truncate apices, to 0.5 mm long, and sessile, glandular hairs, the free portion of hypanthium 0.5–0.7 mm long, adaxial surface longitudinally ridged and covered by bulla-based hairs; calyx teeth $1.75\text{--}2.2 \times 0.5$ mm, linear and terete, recurved upon maturation, covered in bulla-based hairs; calyx lobes \pm triangular, apex acute, ca. 1×1.3 mm, with bulla-based hairs abaxially and sessile, glandular hairs produced adaxially; calyx tube not tearing, ca. 0.4 mm long, with bulla-based hairs abaxially, sessile, glandular hairs adaxially and clavate-dendritic hairs produced at the apex; petals 4, (i.e., only seen in bud), ovate to elliptic with acute apices, apices with one, slightly bulla-based hair produced subapically, hair to 0.5 mm long; stamens 8 (immature), filaments glabrous, anthers ovate, with a well-developed dorso-basal appendage and one apically-oriented pore (the pore position could be an artifact of level of maturity); style (immature) dilated in the middle, subtended by a short crown of multicellular hairs, these only slightly longer than the surrounding bulla-based hairs on the ovary apex; stigma punctate; ovary ca. 1.4×2.4 mm, apex flat, with bulla-based hairs, 4 locular, with axillary placentation, the placenta deeply intruded into locule; berries (immature) globose, ca. $3\text{--}3.4 \times 3$ mm; seeds (immature) 0.2–0.6 mm long, obpyramidal, testa smooth, light brown, raphe extending the length of the seed, dark brown.

Distribution and habitat. *Miconia bullotricha* is endemic to eastern Cuba (province of Guantánamo; Fig. 2), where it occurs in semi-dry, montane and elfin forest on serpentine soils at elevations of 500–1000 m. Associated melastomes include *Calycogonium grisebachii* Triana, *Miconia baracoensis* Urb. and *Ossaea pauciflora* (Naudin) Urb.

Phenology. Plants with buds and young fruits have been collected in May.

Etymology. The specific epithet “*bullotricha*” refers to the well-developed bulla-based hairs on the adaxial leaf surface. Although *bulla* is Latin in origin, we base formation of our compound epithet on the Greek rules for connecting vowels. Thus, we use “o” here instead of “i”, as we find “*bullotricha*” to be more euphonious than “*bullitricha*.” The connecting vowel “o” has had widespread usage in classical Latin based on the large influence of Greek (Stearn 1966).

Conservation status. We do not have extensive knowledge of population level numbers of individuals or the reproductive biology of this species, so the conservation status of *M. bullotricha* cannot be critically evaluated at this time. More fieldwork is imperative to assess the status of this species. However, deforestation has occurred in the surrounding areas from where *M. bullotricha* is known, and thus, the species most likely should be considered threatened by habitat loss and other anthropogenic disturbances.

Specimens examined. **Cuba. Guantánamo:** Baracoa. Imías, Sierra de Imías, loma Jubal (al sur de Los Lechugos), 900–1000 m, 19 Aug 1975, A. Álvarez de Zayas & al.

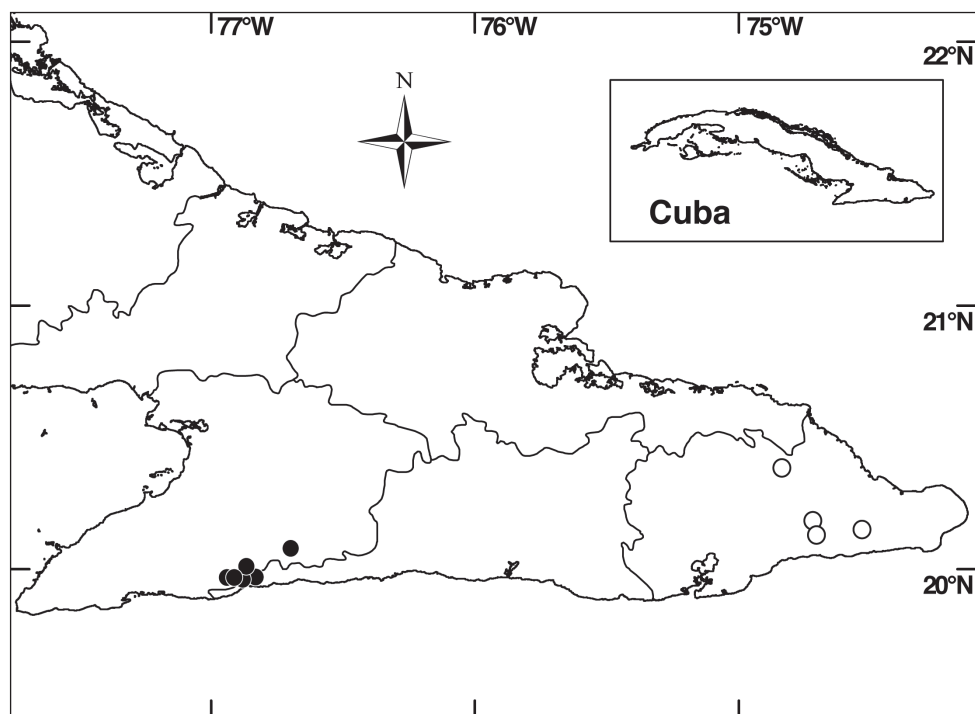


Figure 2. Distribution of *M. hirtistyla* in Granma and Santiago de Cuba provinces (closed circles) and *M. bullotricha* in Guantánamo Province (open circles).

HFC-27626 (B, HAC, HAJB, JE); Baracoa. Sierra de Purial, La Gurbia, 700 m, May 1968, *J. Bisse & L. Rojas* HFC-8562 (HAJB); IBID, HFC-9389 (HAJB); Baracoa. falda suroeste de la loma del Mirador, 500 m, 9 Aug 1975, *J. Bisse & F. K. Meyer* HFC-27230 (B, HAC, HAJB, JE); Yateras Palenque. Sierra del Frijol, cerca de Bernardo, 800 m, 17 May 1983, *J. Bisse & al.* HFC-49721 (B, JE); IBID, HFC-49731 (HAJB).

Discussion. *Miconia bullotricha* likely belongs to a subclade within the *Lima* clade that contains the phenetically similar, Cuban endemic, *M. otoschmidtii*, as well as other members of the *M. lima* complex (Majure et al. 2013b, Majure et al. unpubl. data). These species are recognized by their very well developed bulla-based hairs on the upper leaf surface (which mostly cover the leaf areoles; Fig. 1), as well as expanded, pyramidal inflorescences consisting of cymose clusters of flowers subtended by highly reduced bracts. The only exception to this is *M. pedunculata* Majure & Judd of the Cordillera Central, Dominican Republic that has widely spaced bulla-based hairs on the adaxial leaf surface, which do not completely fill the leaf areoles, and flowers that are subtended by foliaceous bracts.

As mentioned above, *Miconia bullotricha* is phenetically most similar to *M. otoschmidtii*. However, the two species can be easily distinguished by stem and leaf indumentum, where *M. bullotricha* has the stem indumentum generally with apices attenuate and strongly recurved upwards, (as opposed to granulate with the apices

truncate or short attenuate in *M. ottoschmidtii*; although it should be noted that central and northern Cuban populations of *M. ottoschmidtii* have a tendency towards stem hairs with longer, attenuate apices that may be recurved upwards), and erect bulla-based hairs throughout the lamina and along the tertiary veins on the leaf abaxial surface (while *M. ottoschmidtii* has spreading to appressed bulla-based hairs throughout the lamina and along the tertiary veins of the leaf abaxial surface). *Miconia bullotricha* usually produces entirely pendant inflorescences (Fig. 1), in contrast to the erect inflorescences of *M. ottoschmidtii* and the rest of the members of the subclade (however, several species often produce pendant basal inflorescence branches, including *M. ottoschmidtii*), and has longer calyx teeth than *M. ottoschmidtii* (1.75–2.2 vs. 0.4–0.8 mm). Also, *M. bullotricha* has globose floral buds, while *M. ottoschmidtii* exhibits quadrangular floral buds.

Miconia bullotricha adheres to the morphological/phenetic and diagnostic species concepts (Judd 2007, Wheeler and Platnick 2000), and considering the putative autapomorphy of entirely pendant inflorescences, is likely a cladospecies (Donoghue 1985).

***Miconia hirtistyla* Majure & Judd, sp. nov.**

urn:lsid:ipni.org:names:77135721-1

http://species-id.net/wiki/Miconia_hirtistyla

Figs 2, 3

Diagnosis. Species differing from *Miconia jashaferi* in having erect inflorescences, clawed petals, apically oriented anther pores and pubescent styles. Species differing from *Miconia cubacinerea* in having pubescent styles, clawed petals, and shorter calyx teeth (4.5–4.6 mm in *M. hirtistyla* vs. 5.7–6.2 mm in *M. cubacinerea*).

Type. CUBA. Santiago de Cuba: Southern Oriente and Pico Turquino, high [Sierra] Maestra, July 1922, *Fre. León LS-10923* (holotype: NY!; isotype: GH!, HAC!; Fig. 3).

Description. Evergreen shrub (height unknown); stems round in cross section, not ridged, the internodes 0.4–3.3 cm long, stem indumentum of bulla-based hairs to 1.6 mm long, these shaggy, spreading to slightly descending; nodal line absent. Leaves opposite, decussate, ovate to elliptic, not falcate, 1.6–8.2 × 1.4–3.9 cm, slightly to strongly anisophyllous (larger leaves at a node to twice as large as the smaller leaf), dark brown when dried, apex broadly acute, base broadly acute to rounded, margin dentate, dentations obscure, each covered in one large bulla-based hair, venation acrodromous, 7 veined, the midvein and 3 pairs of arching secondary veins, secondary veins mostly basal, the innermost pair, suprabasal, produced 3–9 mm from leaf base, positioned 2.5–11 mm in from margin at widest point of blade, tertiary veins percurrent, ± perpendicular to midvein, 1.5–4.1 mm apart at midleaf, intertertiary veins present, tertiary veins often joined by quaternary veins; adaxial leaf surface with primary, secondary and tertiary veins impressed, quaternary veins obscure, abaxial surface with all veins conspicuously raised; adaxial leaf surface covered in well developed but narrow bulla-based hairs mostly but not entirely covering the leaf areoles, widest hair bases to 0.8 mm, apices of bulla-based

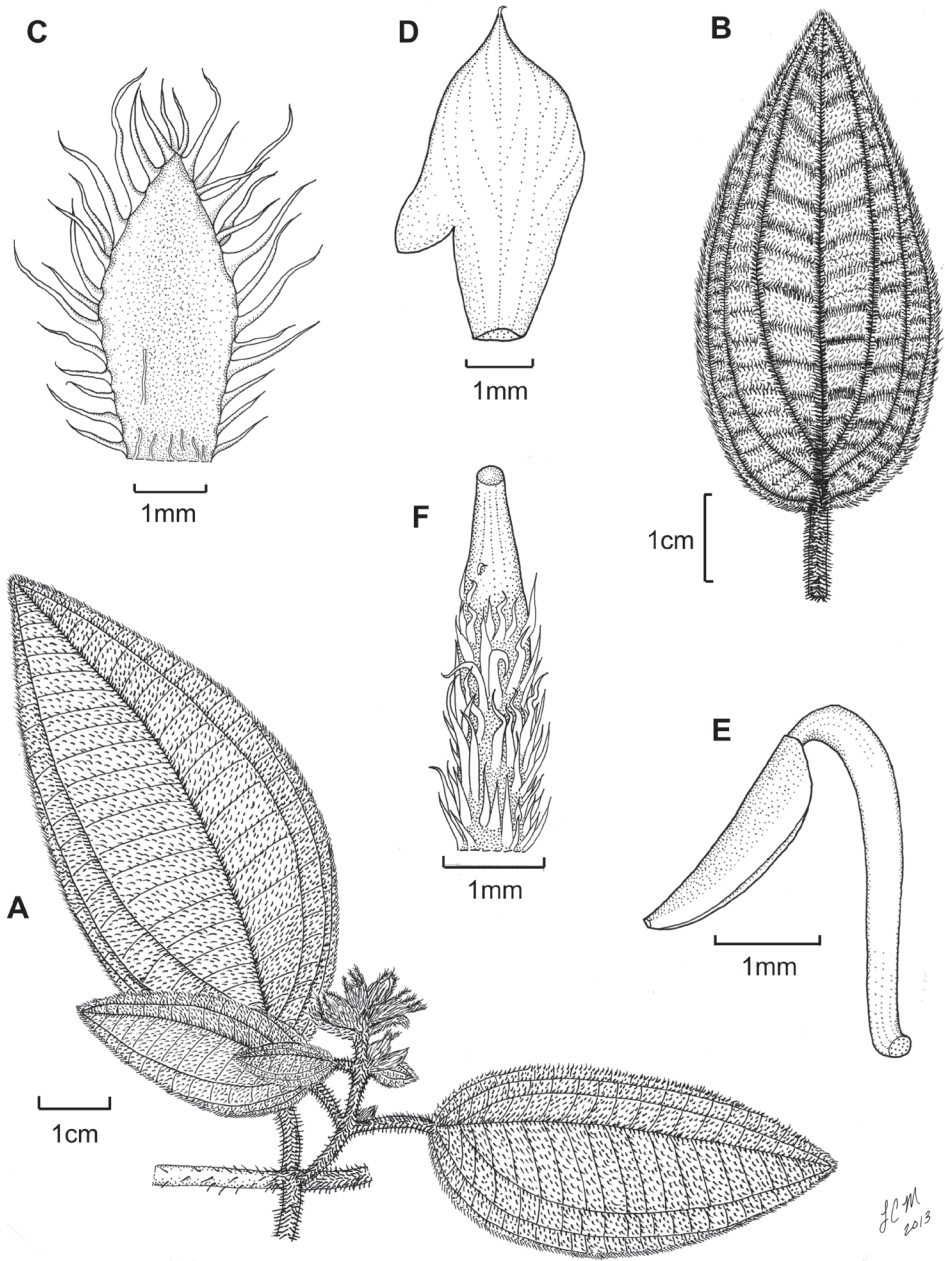


Figure 3. Illustration of *Miconia hirtistyla*. **A** habit (Ekman 14617) **B** leaf abaxial surface (León LS-10923) **C** bracteole (León LS-10923) **D** petal (Ekman 14617) **E** stamen (Ekman 14617) **F** style (Ekman 14617).

hairs mostly erect to recurved, sessile, glandular, hairs produced along the primary, secondary, tertiary, and quaternary veins between the bulla-based hairs; abaxial leaf surface covered in bulla-based hairs, these mostly erect with undulate apices, those along the

primary, secondary, and tertiary veins spreading and larger than hairs produced throughout the lamina, lamina appearing as a series of pits from depressions of the bulla-based hairs produced from the upper leaf surface (i.e., foveolate), sessile, black, glandular hairs produced along all major and minor veins, domatia of tufts of multicellular, linear hairs abundant in axils of primary and secondary veins, as well as the axils of the primary and secondary with tertiary veins; petioles 0.4–1.8 cm long, covered in spreading, bulla-based hairs on both surfaces. Inflorescences terminal, cymose, 2–5 flowered, 1.3–2.4 × 1.2–3.8 cm, the flowers mostly produced in glomerulate clusters, the peduncle 0.6–1.3 cm long, proximal inflorescence branches 0.8–1.1 mm long, pedicels absent; bracts ovate to elliptic, foliaceous, 5–17 mm long; bracteoles foliaceous, elliptic, 2.8–4.3 × 1.7–2.1 mm, covered in bulla-based hairs marginally and abaxially and glabrous abaxially or with filiform hairs towards the base. Flowers perfect, actinomorphic, 6-merous, sessile. Hypanthium 2.6–3.2 mm long, short-oblong to globose, unlobed, slightly constricted below the torus, free portion of the hypanthium 1–1.4 mm long, abaxial surface covered in bulla-based hairs to 2.3 mm long, and occasional, sessile, glandular hairs near the bases of the bulla-based hairs; adaxial surface (i.e., free portion) covered in small, bulla-based hairs; calyx teeth 6, 4.5–4.6 × 0.2–0.4 mm, ascending or spreading, covered in bulla-based hairs; calyx lobes 6, ± triangular, apices acute, 1–1.4 × 1–1.5 mm, covered in bulla-based hairs abaxially and gland-headed, filiform hairs adaxially; calyx tube not tearing, 0.3–0.5 mm long with bulla-based hairs abaxially and sessile, glandular hairs, as well as filiform, gland-headed hairs adaxially and along the apex of the tube; petals 6, most likely white, elliptic to obovate, 5.7–6.6 × 2.7–3.1 mm, with an acuminate apex, only slightly to conspicuously clawed, with one slightly bulla-based hair produced abaxially, subapically, or in some cases, marginally, to 0.1 mm long; stamens 12; filaments 3.8–4.1 mm long, glabrous, anthers 2.2–2.6 mm long, ovate, with one apically oriented pore, anther thecae 2–2.5 mm long, anthers without a dorso-basal appendage; style 3.8–4.4 mm long, pubescent (i.e., with scattered, slightly bulla-based hairs), oblong to only slightly dilated in the middle, collar absent, style subtended by multicellular, linear to elongate-triangular (needle-like) hairs, which grade into the surrounding bulla-based hairs of the ovary apex, stigma punctate; ovary 1.2–2.8 × 1.5–2.5 mm, apex convex, with bulla-based hairs, placentation axile, placenta apparently not deeply intruded, 3-locular; berries not seen, mature seeds not seen.

Distribution and habitat. *Miconia hirtistyla* is only known from the western Sierra Maestra, Cuba (Fig. 2), where it occurs in montane rainforest, pine forest and elfin forest on rocky soils at elevations of 700–1800 m. Associated melastomes include *Miconia argentimuricata*, *Miconia norlindii* and *Miconia nystroemii* Urb.

Phenology. *Miconia hirtistyla* was collected in bud, at anthesis, and in immature fruit in March and July.

Etymology. The specific epithet “*hirtistyla*” refers to the pubescent style of this species (Fig. 3). Within the *Lima* clade, *M. hirtistyla* is the only species that demonstrates this character.

Conservation status. *Miconia hirtistyla* is mostly known from the very well protected forests of Turquino National Park. Although the species has not been collected

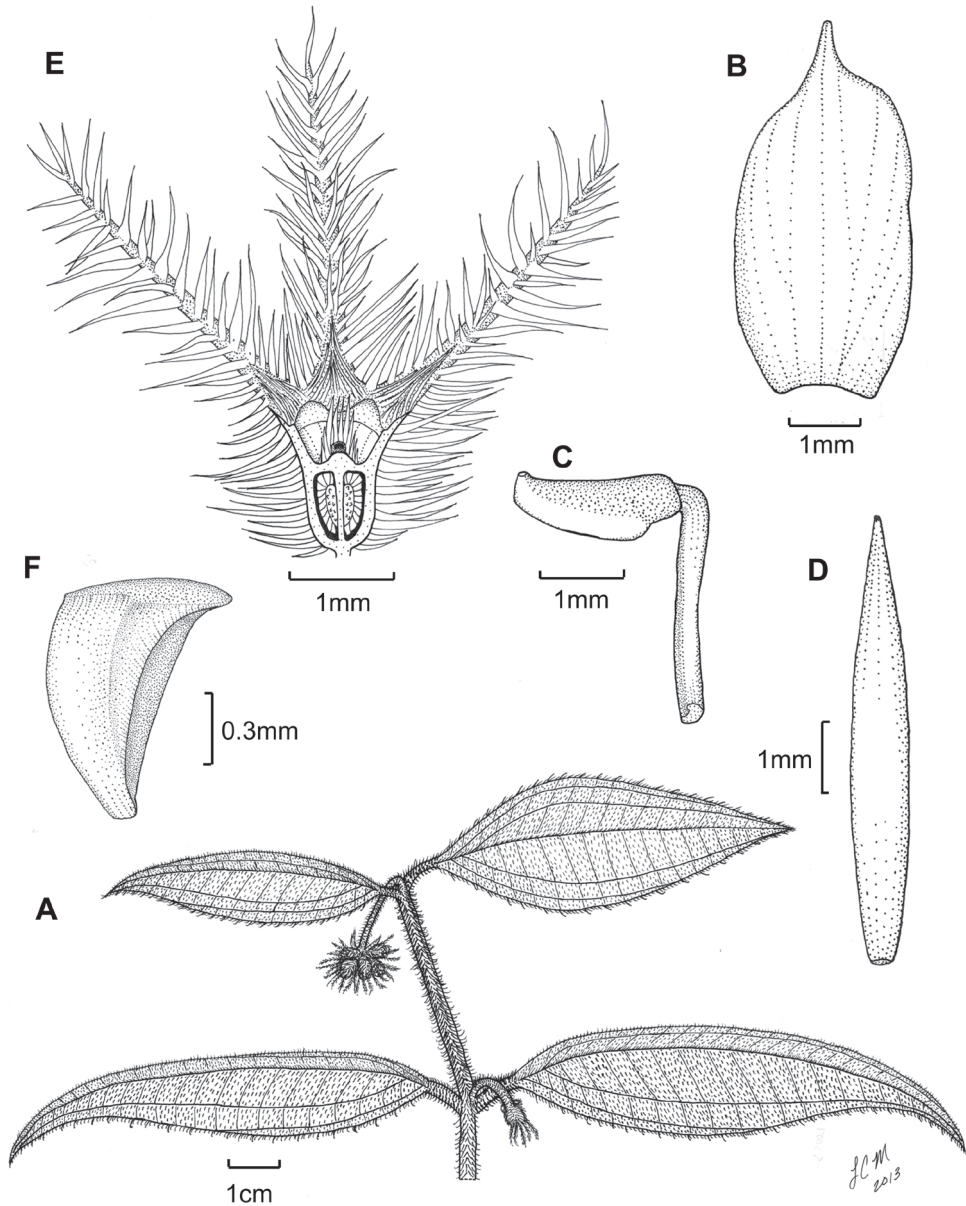


Figure 4. Illustration of *Miconia jashaferi*. **A** habit (Ekman 3849) **B** petal (Alain 871) **C** stamen (Alain 871) **D** style (Alain 871) **E** immature fruit longitudinal section (Alain 871), seed (Acuña SV-13275).

since 1978, and we know nothing regarding its reproductive biology or population numbers, it is most likely not threatened by anthropogenic disturbance and habitat loss, at least in the areas immediately surrounding the park. Fieldwork will be necessary to appropriately assess the conservation status of this species.

Specimens examined. Cuba. Granma: A lo largo del camino de Minas del Frio a Montpie, 23 Apr 1978, *J. Bisse et al.* HFC-37347 (HAJB); Valle del arroyo Escondido, 700–1000 msm, 26 Apr 1978, *J. Bisse et al.* HFC-37628 (HAJB); Bartolomé Masó. Estribo del Pico Turquino, 20 Apr 1979, *J. Bisse et al.* HFC-40517 (HAJB); Manguito, pinares de la loma La Botella, 1200–1400 msm, 22 Mar 1970, *H. Lippold* HFC-16283 (HAJB). **Santiago de Cuba:** Oriente, Pico Turquino, 12–26 Jul 1936, *J. Acuña* SV-10189 (HAC); Oriente, Sierra Maestra, Cima del Pico Turquino, 10 July 1936, *J. Acuña* SV-22705 (HAC); Oriente, Sierra Maestra, steep rocks of Loma Regino, 25 Jul 1922, *E.L. Ekman* 14617 (S); southern Oriente and Pico Turquino, high [Sierra] Maestra, Jul 1922, *Fre. León* LS-10927 (GH, NY).

Discussion. *Miconia hirtistyla* is the only species in the *Lima* clade known to possess pubescent styles and it is one of two species that exhibits clawed petals (e.g., *M. phrynosomaderma* Majure & Judd; Majure and Judd 2013a, a putatively distantly related species). Both characters are likely autapomorphies of *M. hirtistyla*, because morphology suggests that *M. phrynosomaderma* is more closely related to *M. limoides* and relatives (e.g., well-developed bulla-based hairs on leaf adaxial surface, open, expanded, cymose inflorescences, presence of anther dorso-basal appendages; see Majure and Judd 2013). *Miconia hirtistyla* is most likely closely related to *M. jashaferi* (Fig. 4), with which it had been confused, as well as *M. cubacinerea* and *M. tentaculicapitata*. All of these species have condensed inflorescences, leaf-like bracts and bracteoles, broad, oblong to obovate petals, a crown of long, needle-like hairs on the ovary apex and surrounding the style or merely needle-like hairs produced throughout the ovary apex, long, filiform, eglandular or gland-headed hairs along the calyx lobe adaxial surface and apex of calyx tube, long calyx teeth, as well as “shallowly” intruded placenta (versus deeply intruded placenta as in most other species of the *Lima* clade). All four species also lack a dorso-basal anther appendage, the presence of which otherwise is a common feature in the clade (Majure and Judd 2013a). *Miconia hirtistyla* differs from all three of these species by the presence of pubescent styles and clawed petals and from *M. jashaferi* and *M. cubacinerea* by hypanthium shape (short oblong to globose in *M. hirtistyla* vs. narrowly oblong to cylindrical in the latter two species). The species also differs from *M. jashaferi* in inflorescence structure (erect vs. pendant inflorescences; Figs 3, 4), leaf shape (elliptic to ovate with broadly to narrowly acute apices rather than mostly ovate with acuminate apices), anther size (2.2–2.6 mm long in *M. hirtistyla* vs. 1.8–2 mm long in *M. jashaferi*; Figs 3, 4) and shape (ovate with anther thecae continuous with sterile portion of anther vs. elliptic with anther thecae discontinuous with sterile portion of anther; Figs 3, 4), as well as having apically oriented anther pores instead of dorsally oriented pores. *Miconia hirtistyla* differs from *M. cubacinerea* in the pubescence of the abaxial leaf surface, in that *M. cubacinerea* has a clearly visible epidermis as a result of a sparser indumentum, while the epidermis of *M. hirtistyla* is mostly concealed by dense bulla-based hairs. Likewise, the primary, secondary, tertiary, and quaternary veins of *M. hirtistyla* are densely clothed in spreading bulla-based hairs, however, in *M. cubacinerea* the veins are easily seen, as the bulla-based hairs are less dense. The abaxial leaf surface of *M. cubacinerea* also is densely covered in sessile, glandular hairs, while that of *M. hirtistyla* has sparse,

glandular hairs. The lamina of the abaxial leaf surface of *M. hirtistyla* is conspicuously, deeply pitted (as a result of the bulla-based hairs on the upper leaf surface to 0.5 mm deep), while that of *M. cubacinerea* is not deeply pitted (i.e., the pits are only superficial to <0.1 mm deep). The two species also differ in calyx teeth length (4.5–4.6 mm in *M. hirtistyla* vs. 5.7–6.2 mm in *M. cubacinerea*), and by the lack of clavate-dendritic hairs on the leaf adaxial surface and calyx teeth in *M. hirtistyla*.

Lastly, *M. hirtistyla* differs from *M. tentaculicapitata* by the less well-developed bulla-based hairs on the leaf adaxial surface, spreading to descending stem hairs, and lack of clavate-dendritic hairs on the leaf adaxial surface, as opposed to the well developed bulla-based hairs covering the leaf adaxial surface areoles, the ascending-appressed stem hairs, and presence of clavate-dendritic hairs on the leaf adaxial surface of *M. tentaculicapitata*.

Miconia hirtistyla, and the less phenetically similar, *M. tentaculicapitata*, are found in the western Sierra Maestra, while those species that are more phenetically similar to *M. hirtistyla*, i.e., *M. cubacinera* and *M. jashaferi*, are found in northeastern Cuba in the Sierra de Baracoa and Sierra de Moa regions; *M. jashaferi* also is found in the southern part of Sierra de Cristal.

Miconia hirtistyla is most likely a cladospecies (Donoghue 1985), as indicated by the putative autapomorphies of pubescent styles and clawed petals. The species also adheres to the morphological/phenetic species (Judd 2007) and diagnostic species concepts (Wheeler and Platnick 2000).

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References

- Alain Hno (1955) Novedades de la Flora de Cuba, V. Contribuciones Ocasionales del Museo de Historia Natural del Colegio "De La Salle." 14: 1–14.
- Alain Hno (1956) Flora de Cuba. Vol. 4. Dicotiledóneas: Melastomataceae a Plantaginaceae. Contribuciones Ocasionales del Museo de Historia Natural del Colegio "De La Salle." Havana, Cuba.
- Borhidi A (1991) Phytogeography and vegetation ecology of Cuba. Akaémiai Kiadó, Budapest.
- Britton NL, Wilson P (1920) *Ossaea shaferi*. In: Descriptions of Cuban plants new to science. Memoirs of the Torrey Botanical Club 16: 92–93.

- Donoghue MJ (1985) A critique of the biological species concept and recommendations for a phylogenetic alternative. *The Bryologist* 88: 172–181. doi: 10.2307/3243026
- Judd WS (1981) A monograph of *Lyonia* (Ericaceae). *Journal of the Arnold Arboretum* 62: 63–209, 315–436.
- Judd WS (2007) Revision of *Miconia* sect. *Chaenopleura* (Miconieae, Melastomataceae) in the Greater Antilles. *Systematic Botany Monographs* 81: 1–235.
- Judd WS, Majure LC (2013) *Miconia becqueri*, a new species of *Miconia* with strongly four-lobed ovaries from the Sierra Maestra, Cuba. *Brittonia* doi: 10.1007/s12228-013-9312-2
- Judd WS, Slean JD (1991) Taxonomic studies in the Miconieae (Melastomataceae). IV. Generic realignments among terminal-flowered taxa. *Bulletin of the Florida Museum of Natural History, Biological Sciences* 36: 25–84.
- Judd WS, Bécquer ER, Majure LC (in press) Taxonomic studies in the Miconieae (Melastomataceae). XI. A revision of *Miconia* sect. *Calycopteris* on Hispaniola. *Brittonia*.
- León Hno (1923) Una excursión al Pico Turquino. *Memorias de la Sociedad Cubana de Historia Natural* 6: 127–140.
- Liogier AH (2000) La flora de la Española. Vol. IX. Jardín Nacional Dr. Rafael Ma. Moscoso, Instituto Tecnológico de Santo Domingo, Santo Domingo. 151 pp.
- López Almirall A (2013) Contribución al catálogo de flora cubana: endemismos de suelos derivados de ofiolitas. *Botanica Complutensis* 37: 135–152.
- Majure LC, Judd WS (2013a) *Miconia phrynosomaderma* (Melastomataceae: Miconieae), a new species of *Miconia* from the Massif du Nord, Haiti, and sixteen new names and combinations. *Journal of the Botanical Research Institute of Texas* 7: 265–274. http://brit.org/webfm_send/382
- Majure LC, Judd WS (2013b) *Miconia paralimoides* (Miconieae: Melastomataceae), a new species from the Cordillera Central, Dominican Republic. *Phytotaxa* 131: 9–16. doi: 10.11646/phytotaxa.131.1.2
- McDowell T, Volovsek M, Manos P (2003) Biogeography of *Exostema* (Rubiaceae) in the Caribbean region in light of molecular phylogenetic analyses. *Systematic Botany* 28: 431–441.
- Michelangeli FA, Bécquer ER (2012) Melastomataceae. In: Acevedo RP, Strong MT (Eds) *Catalogue of seed plants of the West Indies*. *Smithsonian Contr. Bot.* 98: 531–562.
- Stearn WT (1966) *Botanical Latin: history, grammar, syntax, terminology and vocabulary*. David & Charles Limited Brunel House, Newton Abbot.
- Urban I (1923) *Plantae Cubenses* Ekman I. Melastomataceae. *Symbolae Antillanae: seu fundamenta florum indiae occidentalis* 9: 111–127.
- Urban I (1927) *Plantae Haitienses novae vel rariores* IV. a cl. E.L. Ekman 1924–1927 lectae *Arkiv für Botanik* 21A: 1–97.
- Urban I (1929) *Plantae Haitienses et Domingenses* VII. a cl. E.L. Ekman 1924–1928 lectae. *Arkiv für Botanik* 22A: 1–115.
- Urban I (1931) *Plantae Haitienses et Domingenses* IX. a cl. E.L. Ekman 1924–1930 lectae. *Arkiv für Botanik* 23A: 1–103.
- Wheeler QD, Platnick NI (2000) The phylogenetic species concept (sensu Wheeler and Platnick). In: Wheeler QD, Meier R (Eds) *Species concepts and phylogenetic theory: a debate*. Columbia University Press, New York, 55–69.

