
New Species of *Xylopia* and *Uvaria* (Annonaceae) from Tanzania

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ABSTRACT. Two new species of Annonaceae from the threatened lowland coastal forests of Tanzania are described and illustrated. *Xylopia mwasumbii* D. M. Johnson has distinctive flattened monocarps, unique among its African congeners. *Uvaria puguensis* D. M. Johnson is a small-flowered species belonging to a complex including, in East Africa, *U. angolensis*, *U. lucida*, and *U. tanzaniae*. A key to the taxa of the *U. angolensis* group in East Africa is provided.

Annonaceae are especially diverse in the lowland coastal forests of Tanzania and Kenya, with six genera and 35 species endemic to these forests (Verdcourt, 1971, 1986; Verdcourt & Mwasumbi, 1988; Vollesen, 1980). At the same time that the biological diversity of these coastal forests is being recognized, this rare forest formation is disappearing due to pressure from land development and charcoal production (Burgess et al., 1992; Mwasumbi et al., 1994).

Pugu Forest Reserve near Dar es Salaam, Tanzania, is the best-studied coastal forest in Tanzania (Burgess et al., 1992), yet we have just recently gathered sufficient material to describe two new species of Annonaceae, one in *Xylopia* and one in *Uvaria*, from this small reserve and nearby areas. Both species occur in forested uplands with a distinctive suite of associated species, including *Baphia puguensis* Brummitt, *Hugonia castaneifolia* Engler, *Hymenaea verrucosa* Gaertner, *Hymenocardia ulmoides* Oliver, *Landolphia kirkii* Dyer, *Lasiodiscus holtzii* Engler, *Manilkara sulcata* (Engler) Dubard, *Monanthotaxis fornicata* (Baillon) Verdcourt, *Nesogordonia holtzii* (Engler) Capuron, *Scorodophloeus fischeri* (Taubert) J. Leon, *Suregada zanzibariensis* Baillon, and *Uvaria pandensis* Verdcourt, as well as species of *Croton*, *Haplocoelopsis*, *Ochna*, *Megalochlamys*, *Rinorea*, and *Tessmannia*.

Verdcourt (1971), in his treatment of *Xylopia* for the *Flora of Tropical East Africa*, first drew attention to the specimen *Semsei* 3704 from the Pugu Forest Reserve, identifying it as *Xylopia* "Species

B" and commenting, "The material is scarcely adequate for description and only one of the two specimens seen bears flowers; both bear globose artichoke-like galls covered with conical tubercles which appear to be derived from the flowers." The name *Xylopia* "Species B" has, in the meantime, crept into East African floristic literature (e.g., Hawthorne, 1993), but it is now possible to name and describe this species in detail.

Xylopia mwasumbii D. M. Johnson, sp. nov.

TYPE: Tanzania. Coast Region: Kisarawe District, Pugu Forest Reserve, along N road 0.5 km E of brick factory, 6°52'S, 39°06'E, 200 m, 16 Feb. 1996, *Johnson & Ndangalasi 1884* (holotype, OWU; isotypes, DSM, K, MO). Figure 1A–H.

Inter africanas *Xylopiæ* species petalis lanceolatis olivaceis, staminibus non-capitatis, staminodiis nullis, carpellis duobus vel tribus, stigmatibus glabris oblongo-falcatis, toro leviter tantum concavo, et monocarpiis foliiformibus falcatis venosis compressis distincta.

Tree 4–9 m tall, DBH up to 8 cm, often with multiple trunks, the principal trunk often arching rather than erect; bark white with gray and orange mottling, exfoliating in places; slash brown on yellow (*ex* Hawthorne). Nodes occasionally with two or more axillary branches. Twigs 0.7–2.1 mm diam., gray, longitudinally wrinkled, with epidermis soon exfoliating, sparsely lenticellate, sparsely appressed-pubescent to glabrate, the simple hairs 0.2–0.4 mm long. Lamina of larger leaves 4.6–7.7 cm long, 2.4–4.3 cm wide, paler abaxially, subcoriaceous, broadly elliptic to elliptic, occasionally ovate, elliptic-ovate, or obovate-elliptic; base cuneate, decurrent on petiole; apex 4–8 mm long, blunt-acuminate, or occasionally obtuse and emarginate; lamina with adaxial surface glabrous, abaxial surface sparsely sericeous; midrib impressed to plane adaxially, abaxially raised and keeled; secondary veins 9–11 per side, departing at 50–60° from the midrib, weakly brochidodromous, anastomosing 1–2 mm from margin; secondary and high-

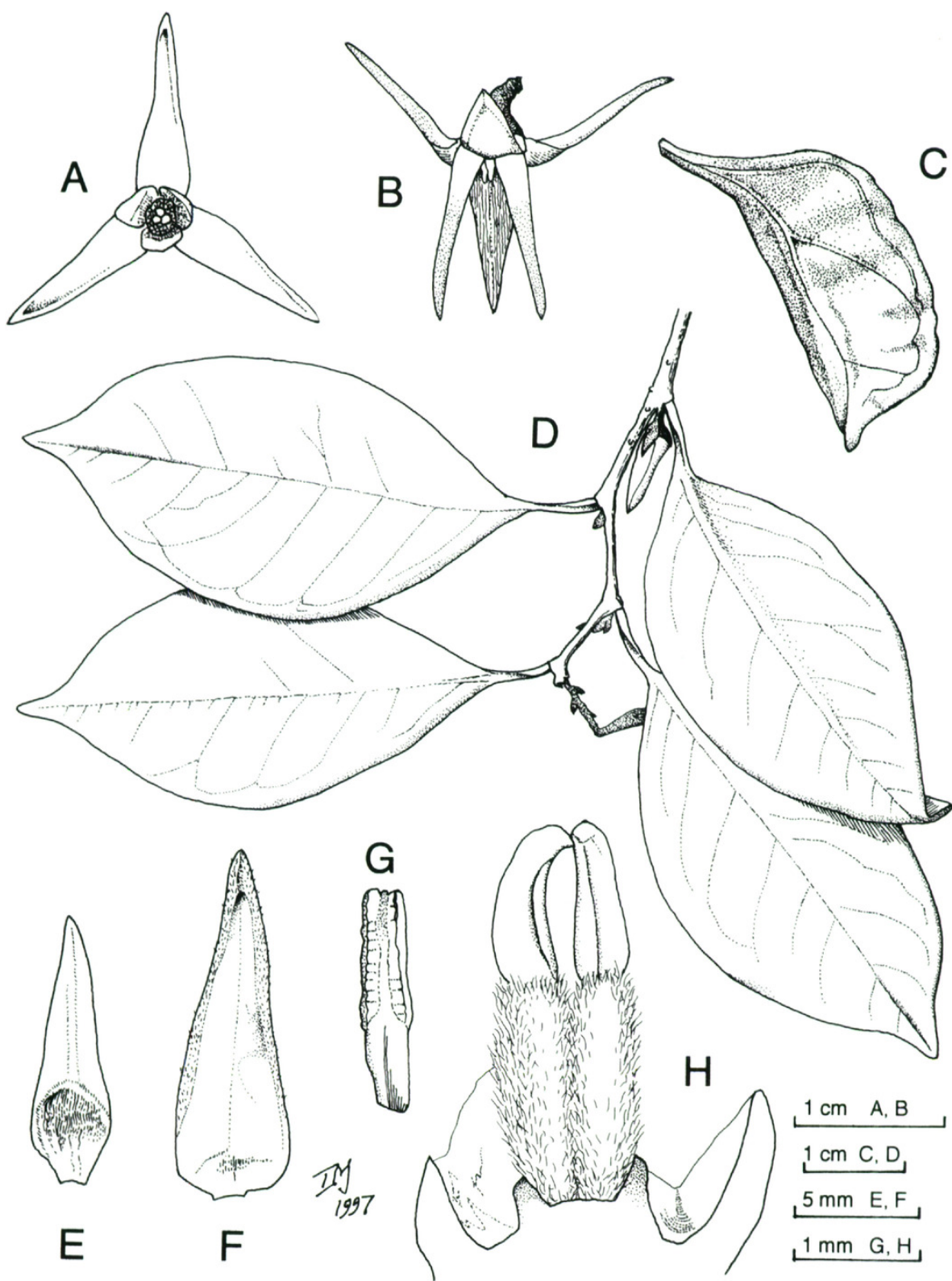


Figure 1. *Xylopia mwasumbii*. —A. Flower at anthesis, face view. —B. Flower at anthesis, lateral view. —C. Mono-carp, lateral view. —D. Habit, with flower bud. —E. Inner petal, adaxial view. —F. Outer petal, adaxial view. —G. Stamen, abaxial view. —H. Longitudinal section of flower, with petals and stamens removed, showing two carpels seated in concavity of torus. C, D from Johnson & Ndangalasi 1884 (OWU); A–B, E–H from Johnson 1928A (OWU). Note: A–C and E–H were drawn from fluid-preserved material and their dimensions are consequently ca. 20% greater than those given in the species description.

er-order veins indistinct, raised adaxially, slightly raised abaxially. Petiole 4.5–8 mm long, 0.9–1.2 mm wide, semiterete, flattened to canaliculate adaxially, glabrous to sparsely appressed-pubescent. Inflorescences of 1–3 flowers, the pedicels arising either from the axils of leaves or from the axils of bracts on a common peduncle 3–4 mm long; pedicels articulate at base, 2.5–4.6 mm long, 0.8–0.9 mm thick, bibracteate, sparsely pubescent to glabrate; bracts 0.8–1.1 mm long, quadrate, semicircular, or deltate, occasionally tearing down the center as the inflorescence enlarges. Buds linear-lanceolate, apex obtuse. Calyx 1.4–2.2 mm long, 2.5–3.3 mm diam., cup-shaped, coriaceous, sparsely sericeous abaxially; lobes 0.6–1.5 mm long, 1.5–2.2 mm wide, broadly triangular, obtuse to acute at apex. Corolla olive-yellow *in vivo*, coriaceous to slightly fleshy; outer petals spreading at anthesis, 8–10 mm long, 2–3 mm wide, linear-lanceolate to narrowly triangular, acute at apex, cuneate at base, appressed-pubescent adaxially, sericeous abaxially; inner petals erect at anthesis, 5.7–7.5 mm long, 1.8–2.2 mm wide, linear-lanceolate, basal $\frac{1}{3}$ concave adaxially, keeled abaxially, glabrous except for a few hairs along abaxial keel. Stamens pale orange-yellow *in vivo*, ca. 40, 1.5–1.8 mm long, narrowly oblong, glabrous; anthers septate at anthesis; apex of connective rudimentary, not exceeding anther thecae, coriaceous to fleshy; filament ca. 0.7 mm long; staminodes absent. Carpels 2–3; ovaries 1.5–1.6 mm long, narrowly oblong, sericeous; ovules 4 in a single row; stigmas white *in vivo*, 0.7–1.1 mm long, lanceolate-falcate, acute, longitudinally grooved ventrally, glabrous. Torus 1.5 mm diam., elevated above the calyx with a shallow central concavity in which the ovaries are seated, glabrous. Fruit of 1–3 monocarps borne on a pedicel 4.5–6 mm long, 1.1–1.4 mm thick, sparsely pubescent to glabrate, with bracts and sepals persistent; torus of fruit ca. 2 mm diam.; monocarps near maturity yellow-green with green stipe and venation *in vivo*, probably dehiscent, 2–2.7 cm long, 1.1 cm wide, oblong, compressed laterally, venation of pericarp raised and distinct, finely verrucose, sparsely pubescent to glabrate; stipe 5–6.5 mm long, 1.5–1.6 mm wide; apex truncate, with an oblique mucro 1.7–2 mm long; wall ca. 0.5 mm thick. Seeds 2–4, at 60–90° to long axis of monocarp, 9 mm long, 6 mm wide, ellipsoid, elliptic in cross section, smooth; micropyle circular, flat, 2.2–2.4 mm diam.; aril cupular and forming a complete ring around micropyle, 5 mm diam., 2.2 mm deep, white, fleshy, readily detached from seed.

Distribution and phenology. Known only from dry evergreen forest on several small ridgetops and

plateaus near the coast of east-central Tanzania, at elevations of 0–300 m. Specimens with flowers have been collected from February through May, and those with fruits from February through June. No definable peak of flowering was observed, but rather a few flowers at anthesis were present at any one time on a given tree. Similarly, only a very few fruits could be found on an individual tree at any one time. Vegetative growth seems to have been stimulated by the short rains of November–December, with production of flower buds following shortly thereafter.

Vernacular names and uses. *Mgwaza*, *mgwaza dume* (Zaramo). Used locally for tool handles and building poles.

I am pleased to name this distinctive species for my co-author, Leonard Mwasumbi, authority on the flora of Tanzania and herbarium superintendent at the University of Dar es Salaam, who taught me much about the flora of East Africa and guided me to localities for this species.

In Verdcourt's (1971) key to East African species of *Xylopia*, *X. mwasumbii* will key to *Xylopia odoratissima*, a species of the dry interior with pronounced pubescence on twigs, leaves, pedicels, and fruits, longer and more narrow petals, and monocarps that are irregularly oblong and not compressed. *Xylopia mwasumbii* does not, however, closely resemble this or any other East African species of *Xylopia*, with its subcoriaceous elliptic leaves, olive-yellow flowers, absence of prolonged anther connectives, lack of staminodes, small number of carpels, and flattened monocarps. It is sympatric with two other species of *Xylopia*, *X. parviflora* (A. Richard) Benth and *X. arenaria* Engler. The former differs in being a large tree, the flowers of which have linear petals that flare into a saccate base. *Xylopia arenaria* is a small tree, more similar in habit, but its flowers are pale orange-yellow and the leaves are rounded at the base and chartaceous. Petal orientation at anthesis is distinctive in each of the three species: in *X. mwasumbii* the inner petals are erect and the outer petals are wide-spreading, in *X. parviflora* all six petals curve outward from the base and then inward at the apices, and in *X. arenaria* both series of petals are also erect, but the apex of each squarrose inner petal emerges through a gap between two outer petals.

The dry evergreen coastal forests where *X. mwasumbii* grows are both poorly known and very limited in extent. Within this rare forest formation the species may be commoner than is currently recognized: its green-tinted flowers and fruits are inconspicuous, and its principal flowering and fruiting occur during the long wet season. Also, it has a strong resemblance to species of *Diospyros* and,

in herbarium material, to other Annonaceae genera such as *Sphaerocoryne* and may thus be misidentified in collections. The flower-galls described by Verdcourt seem to be a frequent feature of the trees, and similar galls are found in other African species of *Xylopia* as well.

Paratypes. TANZANIA. **Coast Region:** Pande, *Hawthorne 1360* (K), *Hawthorne 1714* (K, *fide* B. Verdcourt); Pande, W edge, *Hawthorne 1469* (K); Kisiju, by the sea, *Hawthorne 1790* (DSM); Kisarawe District, Pugu Forest Reserve, ridges along N road between Pugu railway station and brick works, 6°52'30"S, 39°06'E, *Johnson & Mwasumbi 1899* (DSM, OWU); Kisarawe District, Pugu Forest Reserve, along N road 0.5 km E of brick factory, 6°52'S, 39°06'E, *Johnson 1920* (DSM, OWU), *Johnson 1928A* (OWU, spirit collection only); Kisarawe District, Pugu Forest Reserve, ridgetop over road tunnel, 6°52'30"S, 39°05'30"E, *Johnson & Mwasumbi 1936* (DSM, OWU); Kisarawe District, Pugu Forest Reserve, S of Dar-Kisarawe road, ridgetop near Mwakanga railway station, 6°55'S, 39°06'E, *Johnson & Ndangalasi 1948* (DSM, OWU); Bagamoyo District, Zaraninge Forest Reserve, 54 km E of Hwy., 6°04–13'S, 38°35–42'E, *Johnson & Mbago 1963* (DSM, OWU); Kisarawe District, Pugu Forest Reserve, bus roundabout area ca. 4 km E of Kisarawe, 06°53'30" S, 39°06'E, *Johnson 1964B* (DSM, OWU); Kisarawe District, Kazimzumbwi Ruvu South [sic], *Magogo 618* (NHT, TFD); Kisarawe District, Banda Forest Reserve near Mfyozza village, *Ruffo 301* (EA, K, NHT, TFD); Kisarawe District, Pugu Forest Reserve, *Semsei 3704* (EA, K, TFD); Kisarawe District, Banda Forest Reserve, *Shabani 471* (EA, K, TFD); Pande Forest Reserve, 25 km WNW of Dar [es Salaam], *Wingfield 3311* (DSM, EA, K).

Uvaria L. is the largest genus of Annonaceae in the tropical East African flora, and many of its species groups are taxonomically difficult. Still, it is clear that there are undescribed species among the taxa represented. One of these came to the notice of L. Mwasumbi in the course of collaborative work with the research group studying Annonaceae secondary compounds in the Dept. of Chemistry at the University of Dar es Salaam under the leadership of M. H. H. Nkunya. Almost all of the collections of this species come from the Pugu Forest Reserve, where the plant is fairly common in the same habitats in which *Xylopia mwasumbii* occurs, but the plant has also been reported from the Pande and Kiono Forest Reserves as "*Uvaria* sp. nov." (Burgess et al., 1992; Mwasumbi et al., 1994).

***Uvaria puguensis* D. M. Johnson, sp. nov.** TYPE: Tanzania. Coast Region: Kisarawe District, Pugu Forest Reserve, ridge trail from N road, 6°52'S, 39°06'E, 200 m, 24 Apr. 1996, *Johnson 1928* (holotype, OWU; isotypes, DSM, MO). Figures 2A, C–E, G, I, J.

Uvariae lucidae affinis, sed lamina basi distincte subcordata, pedicellis 3–5 mm longis, calyce 3–4 mm longo,

petalis ovatis, 5–6 mm longis, flavo-viridibus vel pallide aurantiaco-flavis, staminibus 2.2–2.7 mm longis diversis.

Woody liana climbing to 6 m. Twigs 0.9–2 mm diam., longitudinally wrinkled, gray to black, at first ferruginous-pubescent, the stellate hairs 0.1–0.6 mm diam. with the tips of the stellae erect or appressed, at length glabrate. Lamina of larger leaves 8.8–12.4 cm long, 4.3–6.6 cm wide, shiny and gray-green adaxially, dull and greenish yellow abaxially, subcoriaceous, elliptic, obovate, or oblanceolate; base distinctly subcordate, occasionally rounded; apex 6–10 mm long, acuminate; expanded lamina with adaxial surface glabrous except for a few hairs on the midrib, abaxial surface with scattered stellate hairs; midrib impressed adaxially, raised abaxially; secondary veins 9–11 per side, departing at 50–70° from the midrib, weakly brochidodromous, slightly impressed adaxially, slightly raised abaxially; higher-order veins indistinct on both surfaces. Petiole 6–10 mm long, 1.5–2 mm wide, terete, pubescent. Inflorescences internodal, usually closer to the distal nodes, 1–2-flowered. Inflorescence axis 3–5 mm long, 1.3–1.8 mm thick, covered by yellowish rusty stellate pubescence, with two clasping bracts ca. 2 mm long; buds globose. Calyx connate, tearing longitudinally as flower opens, 3–4 mm long, 5 mm diam., cup-shaped, coriaceous, pubescent abaxially. Corolla slightly fleshy; petals light green *in vivo* and erect in pistillate phase of anthesis, yellow-green to pale orange-yellow *in vivo* and strongly recurved in staminate phase; inner and outer petals subequal, 5–6 mm long, 3.6–4 mm wide, ovate, glabrous and somewhat verrucose adaxially, pubescent abaxially and on margins. Stamens mustard-yellow at anthesis *in vivo*, 30–40, 2.2–2.7 mm long, narrowly oblong, glabrous except for the puberulous connective apex, which is 0.3–0.5 mm long and quadrate to ovate; anthers latrorse; filament short or lacking. Carpels 6–8; ovaries 3.4–4.1 mm long, oblong, longitudinally sulcate on ventral surface, pubescent; ovules 8–9 in a single row; stigmas 0.7–0.8 mm long, obconic to quadrate, pubescent on sides. Torus 3 mm diam., flat, umbonate in center, with a few scattered hairs. Fruit of 5–8 monocarps borne on a pedicel 5 mm long, 1.9 mm thick, covered with dense appressed yellowish gray stellate pubescence; bracts persistent; torus of fruit 3 mm diam.; monocarps (immature) 1.7 cm long, 0.7–0.8 cm wide, oblong, slightly constricted between the seeds, subsessile, pubescent; apex rounded, with a small beak 1.2 mm long; wall ca. 0.5 mm thick. Seeds 1–4, at 90° to long axis of monocarp.

Distribution and phenology. Known from ridgetops and slopes in several areas of dry evergreen

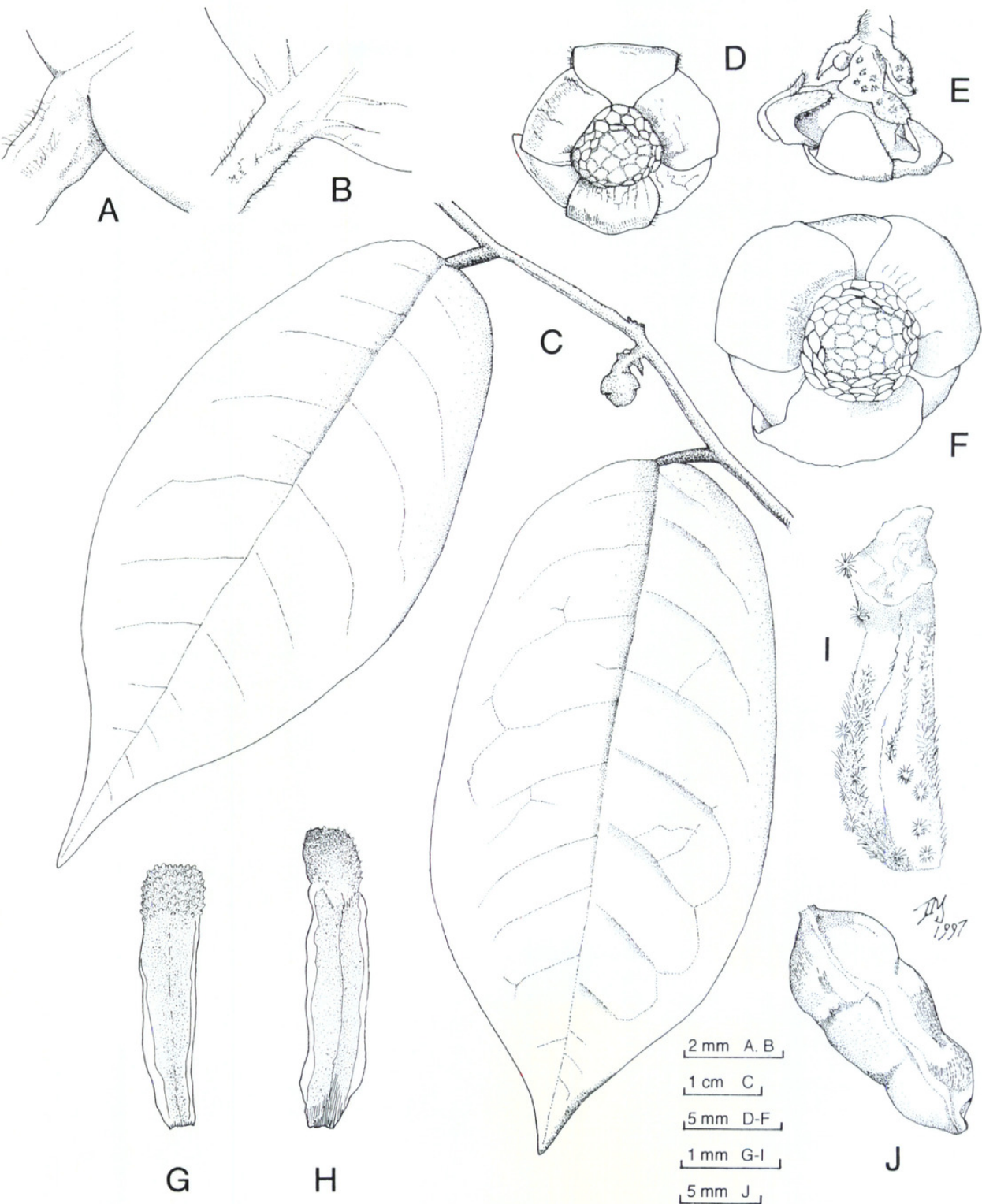


Figure 2. *Uvaria puguensis* and *Uvaria lucida*. A, C–E, G, I–J: *Uvaria puguensis*. —A. Detail of leaf lamina base. —C. Habit with flower bud. —D. Flower in staminate phase of anthesis, face view. —E. Flower in staminate phase of anthesis, lateral view. —G. Stamen, abaxial view. —I. Carpel. —J. Monocarp, lateral view. B, F, H: *Uvaria lucida*. —B. Detail of leaf lamina base. —F. Flower in staminate phase of anthesis, face view. —H. Stamen, abaxial view. D & E from Johnson & Ndangalasi 1949 (OWU), A, C, G, I, & J from Johnson 1928 (OWU), B, F, & H all from Johnson & Murray 1887 (OWU). Note: D–F and G–I were drawn from fluid-preserved material and their dimensions are consequently ca. 20% greater than those given in the species description.

coastal forest in east-central Tanzania, at elevations up to 300 m, where it has been found in flower from February through June, and fruiting in April.

Uvaria puguensis belongs to a group of species that includes, in East Africa, *U. angolensis*, *U. lucida*, and *U. tanzaniae*. The group is characterized by connate sepals, which form a cup that is torn open by the developing corolla, and by petals that become completely revolute during anthesis. Distinctions among these taxa are presented in the key below. The only one of these species known to be sympatric with *U. puguensis* is *U. lucida*.

KEY TO THE EAST AFRICAN TAXA OF THE *UVARIA ANGOLENSIS* GROUP (ADAPTED FROM VERDCOURT, 1971, 1986; THE ALPHANUMERIC CODES FOLLOWING EACH SPECIES NAME REFER TO THE FLORA OF TROPICAL EAST AFRICA FLORISTIC DIVISIONS, AS CITED IN VERDCOURT, 1971)

- 1a. Petals 12–25 mm long, uniformly tomentose on both surfaces; carpels/monocarps typically 20–35.
 - 2a. Leaf bases distinctly cordate; leaf strongly hirsute beneath *U. tanzaniae* Verdcourt (T3, T6)
 - 2b. Leaf bases broadly cuneate, rounded, or slightly cordate; leaf sparsely pubescent beneath *U. angolensis* Oliver (U1–4; T1, 4, 7; Sierra Leone to Cameroon, Congo, Sudan, Zambia, Angola)
- 1b. Petals 5–13 mm long, glabrous or with hairs sparse toward the apex adaxially, pubescent abaxially; carpels/monocarps 5–20.
 - 3a. Leaf base cuneate or rounded (Fig. 2B), rarely subcordate; inflorescence axis 5–10 mm long; petals 7–13(–20) mm long, green or grayish brown, oblong-ovate or rounded-ovate; stamens 2.5–4 mm long *U. lucida* Benth
 - 4a. Leaves mostly relatively broad, obtuse to shortly acuminate at the apex, drying pale green; indumentum of calyx and monocarps mostly pale brown or orange-brown; calyx, petals, stamens, and monocarps with dimensions toward the lower of the limits given *U. lucida* Benth subsp. *lucida* (K4, 7; T3, 6, 8; Z;? P)
 - 4b. Leaves relatively narrower, obtuse to acuminate (acuminate in East African material), drying a darker green; indumentum of calyx and monocarps mostly dark brown; calyx, petals, stamens, and monocarps with dimensions toward the upper of the limits given *U. lucida* Benth subsp. *virens* (N. E. Brown) Verdcourt (T6, Malawi, Mozambique, Zimbabwe, South Africa)
 - 3b. Leaf base distinctly subcordate; inflorescence axis 3–5 mm long; petals 5–6 mm long, yellow-green to pale orange-yellow, ovate; stamens 2.2–2.7 mm long *U. puguensis* D. M. Johnson (T6)

This species is a locally common component of the forest flora in the Pugu Hills, more common there than its close relative *U. lucida*. In our experience, the flower buds frequently showed insect feeding damage, so that few flowers reached anthesis; fruits were consequently scarce.

Paratypes. TANZANIA. **Coast Region:** Kisarawe District, Pugu Forest Reserve, ridges along N road between Pugu Railway Station and brick works, 6°52'30"S, 39°06'30"E, *Johnson & Mwasumbi 1898* (DSM, OWU); Kisarawe District, Pugu Forest Reserve, along N road between Pugu railway station and brick works, 6°52'30"S, 39°06'E, *Johnson 1916* (DSM, OWU); Kisarawe District, Pugu Forest Reserve, S of Dar–Kisarawe road, ridgetop near Mwakanga railway station, 6°55'S, 39°06'E, *Johnson & Ndangalasi 1949* (DSM, OWU); Pande Forest Reserve, *Mwasumbi 14705* (DSM); Pugu Forest Reserve, *Mwasumbi 12532* (DSM).

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