



Guatteria darienensis (Annonaceae), a new species from Panama and Colombia

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Introduction

Guatteria Ruiz & Pavón (1794: 85) is the largest genus of Annonaceae with about 210 recognized species (Chatrou *et al.* 2012, Maas *et al.* 2011). It comprises small- to medium- sized trees, rarely canopy trees or shrubs, and only two species are lianas, *Guatteria scandens* Ducke (1925:10) and *G. fractiflexa* Maas & Westra (2008: 491; Erkens *et al.* 2008). It is widely distributed throughout Mesoamerica, the Caribbean, and tropical South America (Erkens & Maas 2008). Species of *Guatteria* are common members of Neotropical forests where they occupy a wide variety of habitats, such as lowland rain forests, gallery forests, semideciduous forests, coastal forests, inundated forests, savannas and montane forests (Erkens *et al.* 2007b). However, the highest species diversity is found in the Amazon Basin with approximately half of the species occurring there. Central America harbours ca. 30 species, mostly endemics (Erkens *et al.* 2008) of which ca. 20 species occur in Panama, a highly under-collected country with respect to *Guatteria* (Erkens *et al.* 2006). In the adjacent Colombian Chocó region, we found ca. ten endemic species, and to date, only two species, *Guatteria aberrans* Erkens & Maas (2006: 201) and the new species described in this paper, are restricted to Panama and northwestern Colombia.

Recent phylogenetic studies (Erkens *et al.* 2007a, b) have confirmed monophyly of the genus and the position of *Guatteria anomala* Fries (1939: 524–525) from Mexico, Guatemala and Honduras, as sister to the rest of the genus. *Guatteria anomala* is part of a grade consisting predominantly of species of Central America and the Chocó region in Colombia (west of the Andes). Within this grade, a large unsupported clade contains the majority of the species in the genus, the so-called South American clade. Most species in this clade have South American distributions, but some nested species are from Central America, e.g. *G. dolichopoda* Donnell Smith (1897: 2) (as “*G. tonduzii*” Diels (1931: 75)), *G. aberrans* and *Guatteria sessilicarpa* Maas & Setten (1988: 257–259).

In general, *Guatteria* is easily distinguished from other Neotropical Annonaceae genera by the combination of an impressed primary vein on the upper side of the leaves, mostly axillary flowers with a clear oblique suprabasal articulation on the pedicel (Maas *et al.* unpubl. data), valvate sepals, almost always imbricate petals, and numerous carpels with a single basal ovule (Erkens & Maas 2008). Moreover, the genus is characterized by unusual chromosome differentiation and cuticular folding patterns (Moratwez & Waha 1985) and a highly distinctive type of pollen unique within Annonaceae (Moratwez & Waha 1985; Doyle & Le Thomas 2012).

Although the genus is recognizable, species recognition in *Guatteria* can sometimes be problematic because of the uniformity of floral (van Heusden 1992) and fruit characters (van Setten & Koek-Noorman 1992) and the variability in some vegetative characters within species. Furthermore, most herbarium material has only immature flowers (“open flower buds”), which are morphologically different from mature flowers in petal size, proportion and orientation (Lobão *et al.* 2011), making delimitation of species difficult. As a result several species complexes exist (Erkens 2007).

In 1939, Fries published the only revision to date of the genus as a whole. In this revision, he described 106 new species and recognized 217 species in total. His descriptions were based on gross morphology and the relatively few collections available at that time (Chatrou 1998). Since Fries’ treatment, large amounts of unidentified material have accumulated in herbaria (Erkens 2007; Erkens *et al.* 2008). Unfortunately, identifying new material using Fries’ keys (1939) has become almost impossible (Scharf *et al.* 2006a). Due to recent taxonomic revisions dealing with different geographical areas within the distribution of the genus (Scharf *et al.* 2005, 2006a, b, 2008; Erkens *et al.* 2006, 2008; Lobão & Mello-Silva, 2007; Erkens & Maas 2008; Lobão *et al.* 2010, 2011; Maas & Westra 2010, 2011), much of the previously unidentified material has been named to species, many names were placed into synonymy, and new species

have been described. Therefore, current knowledge of the diversity of *Guatteria* has increased greatly, reducing the 303 mentioned species by Erkens *et al.* (2008) to ca. 210 valid names (Maas *et al.* 2011). A full revision of the genus is now on its way, and the number of accepted names will probably be ca. 175 (Maas, pers. comm.).

The new species described here was discovered during taxonomic work on the Central American species of *Guatteria* for a treatment in *Flora Mesoamericana* (Erkens *et al.* 2007c). At that time, little material of this species could be investigated, and the characters envisioned for species circumscription were not particularly discriminating. Therefore, at that time Erkens *et al.* refrained from naming it. However, during a recent revision of the species of *Guatteria* section *Chasmantha* from the Colombian Chocó region, more material could be studied, and the authors now feel that formal description is warranted.

In absence of direct field observations, we used herbarium collections from COL, HUA, JAUM, MEDEL, MO, PMA, U and VALLE as sources of data (Schatz 2002, Willis *et al.* 2003) for applying the IUCN Red List criterion B to determine the categories of threat to the species. The map was created using the software ArcGIS 10 (ESRI 2011). The Geospatial Conservation Assessment Tool (Bachman *et al.* 2011; GeoCAT- <http://geocat.kew.org>) was used to calculate the Extent of Occurrence (EOO) and Area of Occupancy (AOO). The cell size width was set to 2 km (as recommended by IUCN Standard and Petitions Subcommittee 2011) and 3 km, the largest permissible value allowed with GeoCAT which is under 10 km². Choosing a cell size width of 4 km or larger will not allow any taxa to be listed as Critically Endangered where the threshold AOO under criterion B is 10 km² (IUCN Standard and Petitions Subcommittee 2011).

Taxonomy

Guatteria darienensis Susana Arias & Maas, *sp. nov.* (Figs. 1, 2)

Guatteria sp. 2 Erkens (2007: 208).

Species most similar to *G. dolichopoda* Donn.Sm. but with relatively long and slender pedicels, small monocarps with thin wall and long slender stipes.

Type:—COLOMBIA. Antioquia: Turbo, Carretera Tapón del Darién, sector Río León-Lomas Aisladas, km 36, 07°40'N, 76°55'W, 20 m, 27 August 1983, (fl. and fr.), *Brand & Ascanio 439* (holotype HUA!, isotype JAUM!, MO!).

Tree, rarely a shrub, 3–16 m tall, 4–18 cm in dbh; young twigs rather densely to sparsely covered with appressed hairs, soon glabrous. Leaves with petiole 2–7 mm long, 1–3 mm diam.; lamina narrowly elliptic to narrowly obovate, rarely elliptic, 8.0–21.0 × 2.5–8.0 cm (leaf index 2.5–3.6), chartaceous, not verruculose, dull to shiny, greyish, dark green or brown above, dull, pale brown or brown below, glabrous above, sparsely covered with appressed hairs to almost glabrous below, base acute to attenuate, rarely obtuse, apex acuminate, (acumen 5–15 mm long), primary vein impressed above, secondary veins distinct, 10–14 on either side of primary vein, impressed to slightly raised above, smallest distance between loops and margin 3–5 mm, tertiary veins indistinct or distinct, slightly raised above, reticulate. Flowers in 1–2-flowered inflorescences in axils of leaves; pedicels 30–60 mm long, ca. 1 mm in diam., fruiting pedicels 1.0–1.5 mm in diam., densely to sparsely covered with appressed hairs and some erect hairs, articulated 0.2–0.3 from the base, bracts 3–7, soon falling, only one uppermost bract seen, elliptic, ca. 7 mm long; flower buds depressed ovoid; sepals basally connate to free, broadly ovate-triangular, 3–7 × 4–6 mm, reflexed, outer side densely covered with appressed hairs; petals green, maturing yellow in vivo, narrowly elliptic, 13–26 × 5–10 mm, outer side densely covered with appressed hairs; stamens 1.5–2 mm long, connective shield papillate. Monocarps 25–50, green or pinkish maturing red to purple in vivo, brown in dried specimens, ellipsoid or obovoid, 7–10 × 4–5 mm, sparsely covered with appressed hairs, apex apiculate (apiculum ca. 0.5 mm long), wall ca. 0.1 mm thick, stipes 7–15(–20) × 0.5–1 mm. Seed ellipsoid, 6–9 × ca. 4 mm, shiny, reddish brown, pitted, raphe not distinct from rest of seed.

Selected specimens examined:—COLOMBIA. Antioquia: 45 km S de Turbo en la via Turbo-Mutatá, Reserva Forestal Tulenapa (ICA), 7° 35' 36"N, 76° 35'W, 20 m, 31 August 1987, *Callejas 4848* (HUA, MO, NY, U); Mutatá, Carretera Mutatá-Pavarandocito, km 2, 7° 19'N, 76° 30'W, 150 m, 4 October 1986, *Betancurt, A. et al. 89* (HUA, U). Chocó: Cerca de Acanadí, desembocadura del Río Tolo, 8° 29' 43"N, 77° 15' 51"W, 29 March 1974, *Forero 1039* (COL, MO); Municipio Río Sucio, Parque Nacional los Katíos, camino de Sautatá a Tilupo, 7° 48' 43"N, 77° 11' 28"W, 12 July 1983, *Sánchez S. & Hoyos 536* (CUVC, MEDEL, U). Córdoba: Municipio Tierralta, Río Sinú, 8° 10' 24"N, 76° 3' 33"W, 120–200 m, 26 July 1988, *Cuadros 4169* (MO, U). PANAMA. Darién: Parque Nacional del

Darién, ridge between N and S branches of Río Pucuro, across river from old Kuna village of Tacarcuna, ca. 18 km E of Pucuro, 8° 3' 57"N, 77° 15' 57"W, 600-1000 m, 21 October 1987, *Hammel et al. 16335* (MO, U). Panamá: Parque Nacional Altos de Campana, Buena Vista, Bejuco, Chame, 8°41'50"N, 79°57'W, 24 February 1999, *FLORPAN 3413* (PMA, U). Veraguas: vicinity of Arizona-Tute hill, above Santa Fé and Altos de Piedra, along trail to summit, 8° 30'N, 81° 9' 59"W, 1000–1200 m, 28 July 1988, *McPherson 12812* (MO, U).

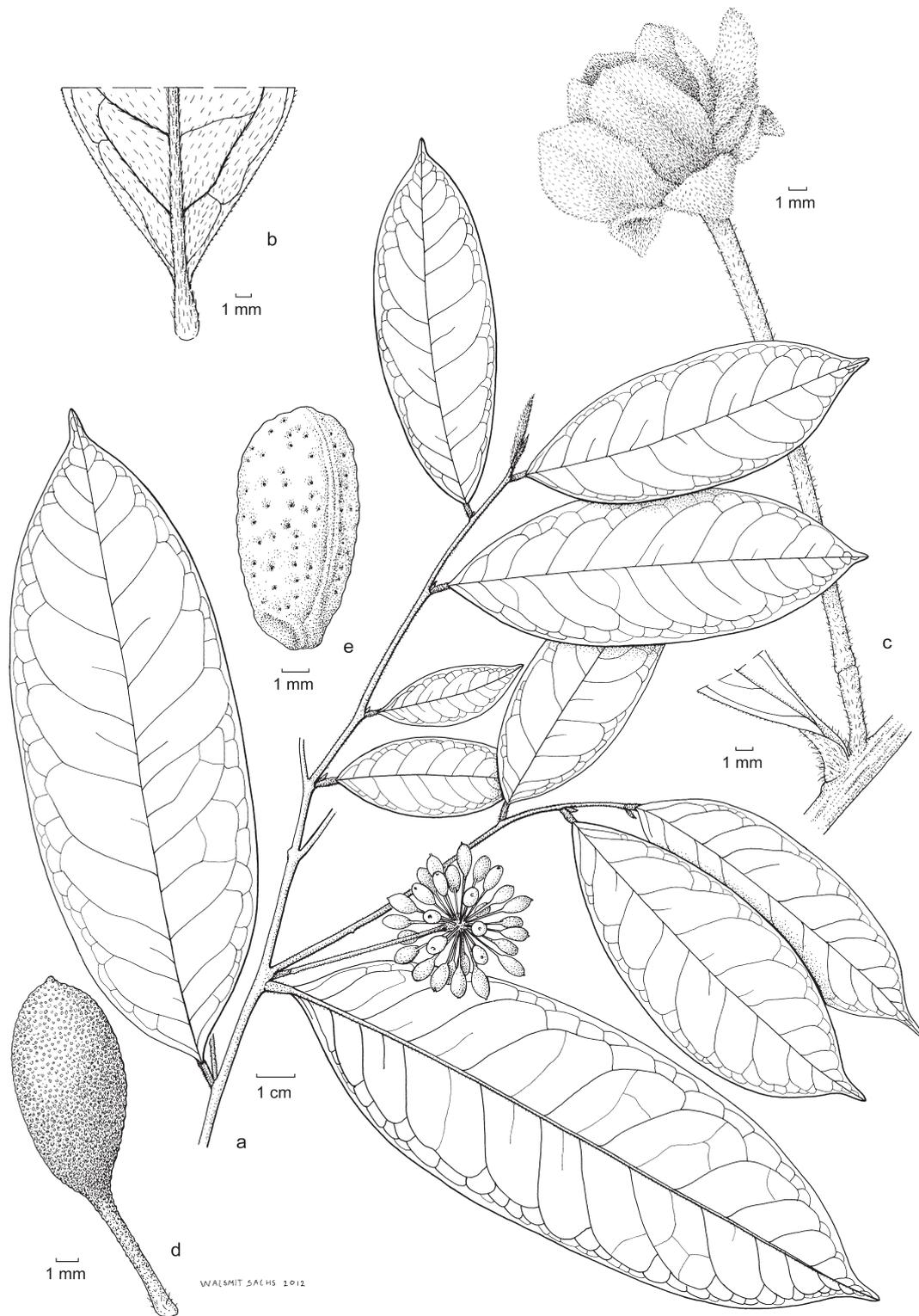


FIGURE 1. *Guatteria darienensis* (a, *Adriana Bentancurt et al. 89*; b, d, e, *Brand & González 843*; c, *Gentry & León 16860*). A. Fruiting branch. B. Detail of the indument on the Indument of lower side of the lamina. C. Close-up of a young flower showing its long pedicel and reflexed sepals. D. A single monocarp (fruitlet). E. Lateral view of a seed. Although the herbarium material of this species clearly shows 3–7 (soon falling) bracts (of which only one uppermost bract is often seen), this cannot be seen in this drawing.

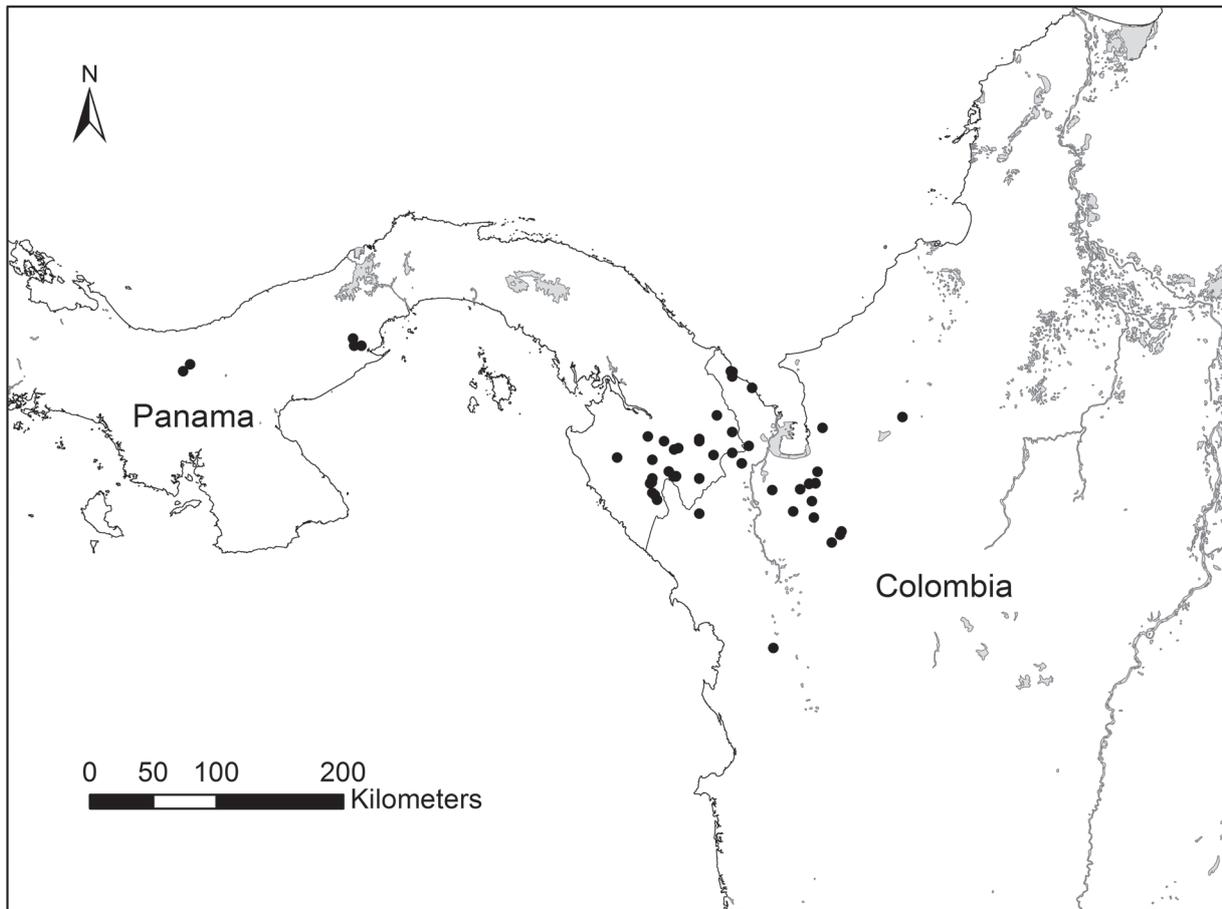


FIGURE 2. Distribution of *Guatteria darienensis*.

Distribution:—Found in the Panamanian provinces of Veraguas, Panamá, and Darién and the Colombian departments of Antioquia, Chocó and Córdoba (Fig. 2).

Habitat & Ecology:—In wet forests, along roads, rivers, creeks and on steep slopes at 20–800(–1200) m. Flowering and fruiting throughout the year.

Vernacular names:—Colombia: guanabanillo (*Zuluaga R. 1226*), yaya blanca (*Sánchez S. & Hoyos 536*).

Uses:—In Colombia the wood is used for building houses and the bark for lashing material and head straps (*Sánchez S. & Hoyos 536*). A decoction of any part of the plant has been used against malaria (*Fonnegra et al. 8877*).

Etymology:—The specific epithet refers to the Darién Gap (Tapón del Darién), the road-free area between Panama and the Colombian Chocó, where most collections were made.

IUCN Conservation Status:—Near Threatened. Even though the Area of Occupancy (AOO) is less than 500 km², *Guatteria darienensis* is well represented in herbaria. Most specimens seen were collected along the Panama-Colombia border (Darién Gap) in the 1980s and 1990s. This area remains poorly explored and difficult to access, and therefore we expect the value of AOO and the number of localities to increase in the future with additional collections. Furthermore, it was collected in five national parks: Santa Fé, Alto Campana and Darién (the largest protected tropical forest in Central America) in Panama and Los Katíos and Paramillo in Colombia. We thus consider the category ‘Near Threatened’ to be appropriate for now.

Notes:—*Guatteria darienensis* is easily recognised by an indument composed of appressed hairs on young twigs and lower side of the lamina (Fig. 1B), long pedicels (Fig. 1C), and relatively small monocarps with a thin wall (ca. 0.1 mm).

Some Panamanian material collected in Panama Province from Parque Nacional Altos Campana (*Espinosa et al. 720*, *FLORPAN 2962*, *Galdames et al. 3081, 4136* and *van der Werff et al. 6198, 6933*) and one collection from the province of Veraguas (*McPherson 12812*) are aberrant in having relatively smaller, thicker leaves (8.0–12.0 × 2.5–4.5 cm) with an acute to obtuse base. As all flowers, fruit and seed characters fall within the range of variability of *G. darienensis*, we refrained from giving this material status on its own.

Most material has previously been identified as *Guatteria tonduzii*, a synonym of *Guatteria dolichopoda* Donnell Smith (1897: 2), a common species restricted to Costa Rica and Panama. However, examination of numerous herbarium specimens of *G. dolichopoda* from Costa Rica and Panama (CR, MO, PMA and U) including the type specimen (Donnell Smith 6429 MO!) shows *G. darienensis* to be distinct (Table 1). According to Erkens (2007) *G. dolichopoda* is one of the Central American *Guatteria* species complexes because of its highly variable density of indument, leaf shape, and leaf base. However, the complex as a whole can easily be recognized by its young twigs covered with erect hairs ca. 0.5 mm long and the relatively long-pedicellate flowers. In the case of *G. darienensis*, the indument is invariably composed of appressed hairs on most of its vegetative parts (Fig. 1B). Ongoing taxonomic work in the genus has found that the presence of erect vs. appressed hairs is a reliable feature for species recognition in *Guatteria* (Maas *et al.* unpubl. data). For instance, the most problematic species complexes of the genus in Central America, *Guatteria amplifolia* Triana & Planchon (1862: 35) in southeastern Brazil, *Guatteria australis* Saint-Hilaire (1825: 37) and in Amazonian region *Guatteria punctata* (Aublet 1775: 614) Howard (1983: 260) are characterized by an indument composed of appressed hairs on the vegetative parts but are morphologically variable in terms of leaf shape and leaf base, as in the case of *G. dolichopoda*.

TABLE 1. Morphological differences between *G. darienensis* and *G. dolichopoda*.

Characters	<i>G. darienensis</i>	<i>G. dolichopoda</i>
Indument on young twigs	composed of appressed hairs	composed of erect hairs ca. 0.5 mm long
Lamina size	8.0–21.0 × 2.5–8.0 cm	11.0–14.0 × 2.0–5.0 cm
Leaf colour after drying	greyish, dark green or brown above	greyish black to greyish brown above
Primary vein	glabrous above	sparsely covered with erect hairs above
Smallest distance between loops and leaf margin	3–5 mm	2–3 mm
Lower side of lamina	composed of appressed hairs	composed of erect hairs
Flower bud shape	depressed ovoid	depressed ovoid, slightly pointed
Sepal shape	broadly ovate-triangular	ovate-triangular
Petal shape	narrowly elliptic	narrow oblong-elliptic to narrowly ovate
Monocarps	25–50	75–100
Monocarp colour	brown in sicco	black in sicco

Although *G. darienensis* shares with *G. dolichopoda* its long-pedicellate flowers with reflexed sepals (Fig. 1C) and relatively small monocarps, it also differs in various respects, e.g. in terms of leaf morphology (Table 1). Firstly, its leaves are relatively larger and dry greyish or brown instead of narrower and drying greyish black as in *G. dolichopoda*. Secondly, it has a glabrous primary vein on the upper side instead of one that is covered with erect hairs, and, thirdly, *G. darienensis* has a larger distance between the secondary vein loops and the leaf margin (3–5 mm vs. 2–3 mm). Moreover, *G. darienensis* is easily separated from *G. dolichopoda* by five flower and fruit characteristics. The ovoid flower buds are depressed in *G. darienensis* and not pointed slightly as in *G. dolichopoda*. It has broadly-ovate triangular sepals and narrowly elliptic petals, whereas those of *G. dolichopoda* are ovate-triangular and narrow oblong-elliptic to narrowly ovate, respectively. Furthermore, *G. darienensis* has many fewer monocarps (25–50 vs. 75–100) and, finally, the monocarps of *G. darienensis* are coloured brown instead of black.

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