



# Four new combinations in *Chomelia* and *Stenostomum* (*Rubiaceae*, *Guettardeae*) from Central America, the Guianas and the Amazon Basin

P.G. Delprete<sup>1</sup>, F. Achille<sup>2</sup>, A. Mouly<sup>3</sup>

## Key words

Amazon Basin  
*Chomelia*  
floristics  
French Guiana  
*Guettarda*  
*Guettardeae*  
Guyana  
*Rubiaceae*  
South America  
*Stenostomum*  
taxonomy

**Abstract** According to current generic delimitations, supported by wood anatomy, palynology, and recent molecular phylogenies, *Antirhea*, traditionally treated as a Pantropical genus, is instead restricted to the Paleotropics. At the same time, the Neotropical species traditionally positioned in *Antirhea* should be positioned in *Stenostomum*. Following these definitions, *Stenostomum* is a genus with most of the species present in the Caribbean Region, and two species present in the Guianas, namely *S. acreanum* and *S. guianensis*, distributed throughout the Amazon Basin. In addition, according to these new generic delimitations, two species previously positioned in *Guettarda* and *Antirhea* need to be transferred to *Chomelia*, as *C. triflora* and *C. ulei*.

**Published on** 17 August 2010

## INTRODUCTION

The generic delimitations within the tribe *Guettardeae* (subfamily *Cinchonoideae*) have been debated for more than two centuries. *Guettarda* has been traditionally recognized as a Pantropical genus of about 140 species, with the main centres of diversity in the South Pacific and in the Caribbean Region (c. 80 spp.), and about 50 species in South America.

Borhidi & Fernández (1995a, b), following the studies of Chaw & Darwin (1992, 1993) separated the Neotropical species usually included in *Antirhea* Juss., resurrecting the genus *Stenostomum* C.F.Gaertn., and reducing *Antirhea* as a genus restricted to the Paleotropics. According to Chaw & Darwin (1992), Borhidi & Fernández (1995b) and Borhidi (2006), *Stenostomum* is characterized by the 4- or 5-merous flowers, truncate or shallowly lobed calyx, corolla tube completely glabrous or sericeous outside, glabrous or pubescent at upper portion inside, and 3-colporate, tectate, and 'punctitegillate' pollen grains; however, according to Achille et al. (2006) the pollen of *Stenostomum lucidum* (Sw.) C.F.Gaertn. has reticulate tectum (not punctitegillate). In addition, Borhidi & Fernández (1995b) divided *Stenostomum* into three sections: 1) Sect. *Stenostomum*, with resinous leaves, free stipules and 2- or 3-branched stigma; 2) Sect. *Resinanthus* Borhidi, with scantily resinous leaves, free or shallowly connate stipules and 2- or 3-branched style; and 3) Sect. *Neolaugeria* (Nicolson) Borhidi, with resinous leaves,

connate stipules (forming a truncate ring) and 4- or 5-branched stigma. The last two sections were later demonstrated to be paraphyletic by recent molecular phylogenies by Moynihan & Watson (2001); based on their phylogenies, they returned the sect. *Neolaugeria* to the generic level, and only recognized three species restricted to the Antilles, corresponding to the same generic and specific delimitations proposed by Nicolson (1979). Achille et al. (2006) confirmed the distinctness of *Neolaugeria* from *Stenostomum* and further suggested that sections *Stenostomum* and *Resinanthus* together do not form a monophyletic group. Therefore, *Stenostomum* is here circumscribed corresponding to *Stenostomum* sect. *Stenostomum*; while sect. *Neolaugeria* is here maintained at the generic level (Moynihan & Watson 2001, Achille et al. 2006); and sect. *Resinanthus* is tentatively recognized as a possible separate genus (closely related to *Chomelia* Jacq.), pending future phylogenetic studies. *Stenostomum*, as here delimited, is a genus of about 30 species, mostly centred in the Caribbean Basin, and a few species in South America (see below). Some previous reports of occurrence in northern South America were published by Darwin (1979) and Gentry (1993); however, these reports might be referring to the genus *Pittoniotis* Griseb., treated by these authors as a synonym of *Stenostomum*. *Pittoniotis*, as delimited by Steyermark (1974: 863–867, f. 138), and the present authors, is a monotypic genus restricted to the Caribbean coast of Panama, Colombia and Venezuela, easily distinguishable from *Guettarda*, *Chomelia*, *Stenostomum* and *Neolaugeria* by the stamens well-exserted above the corolla, with filaments as long as the anthers (vs anthers sessile to subsessile), and the paniculate, many times branched inflorescence (vs 1–few-flowered or cymose).

*Chomelia*, as traditionally recognized, is a Neotropical genus of about 60 species of shrubs and trees, with the main centres of diversity in the Andean Cloud forests, the Guayana Highlands and the Brazilian Atlantic forest. In addition, *Chomelia* has been classically treated as the sister genus of *Guettarda* L., distin-

<sup>1</sup> Herbar de Guyane, Institut de Recherche pour le Développement (IRD), Boite Postale 165, 97323 Cayenne Cedex, French Guiana, France; corresponding author e-mail: piero.delprete@ird.fr.

<sup>2</sup> Muséum national d'Histoire naturelle, Département Systématique et Évolution, USM 602, 57 rue Cuvier, CP 39, 75231, Paris Cedex 5, France. Current address: Muséum national d'Histoire naturelle, Département des Jardins botaniques et zoologiques, 57 rue Cuvier, CP 45, 75231, Paris CEDEX 05, France; e-mail: achille@mnhn.fr.

<sup>3</sup> The Bergius Foundation at the Royal Swedish Academy of Sciences, Botany Department, Stockholm University, SE-106 91 Stockholm, Sweden; e-mail: arnaud@bergianska.se.

guished by the persistent, lobed calyx (vs caducous, truncate in *Guettarda*), corolla lobes valvate, valvate-induplicate or rarely narrowly imbricate (vs imbricate in *Guettarda*), and fruits usually 2-locular (vs (1–2) 3–9-locular in *Guettarda*; Hooker 1873, Müller Argoviensis 1881, Bremekamp 1934, Steyermark 1972, 1974). However, the molecular phylogenies produced by Achille et al. (2006), showed that *Chomelia* is more closely related to *Stenostomum* sect. *Resinanthus* (represented in the study only by *S. acutatum* DC. and *S. myrtifolium* Griseb.), than to *Guettarda*. Of the genus *Chomelia*, only *C. spinosa* Jacq. was included, which provided preliminary evidence that *Chomelia* and *Stenostomum* sect. *Resinanthus* are sister taxa; nevertheless, because only one species of *Chomelia* was investigated, the monophyly of the genus was not significantly tested. In the same phylogenetic study, *Guettarda* was shown to be polyphyletic, and represented by several separated clades in the Paleotropics and in the Neotropics. Following these results, most paleotropical species of *Guettarda* were transferred to other genera (Achille 2006, Achille & Mouly in prep.). Therefore, much work remains to be done in order to detect monophyletic groups in the tribe *Guettardeae*.

A set of diagnostic characters for the separation of *Chomelia*, *Guettarda*, *Stenostomum* and *Neolaugeria* is presented in Table 1. According to this set of characters, three species previously positioned in *Antirhea* or *Guettarda* and occurring in the Guianas (one of them extending throughout the Amazon Basin) need to be transferred to *Chomelia* or *Stenostomum*, and the necessary new combinations are presented below. These combinations are also needed for the ongoing *Rubiaceae* treatment for the Flora of the Guianas (Delprete submitted).

## SYSTEMATIC TREATMENT

### Chomelia

#### 1. *Chomelia triflora* (J.H.Kirkbr.) Delprete & Achille, *emend.* & *comb. nov.* — Fig. 1

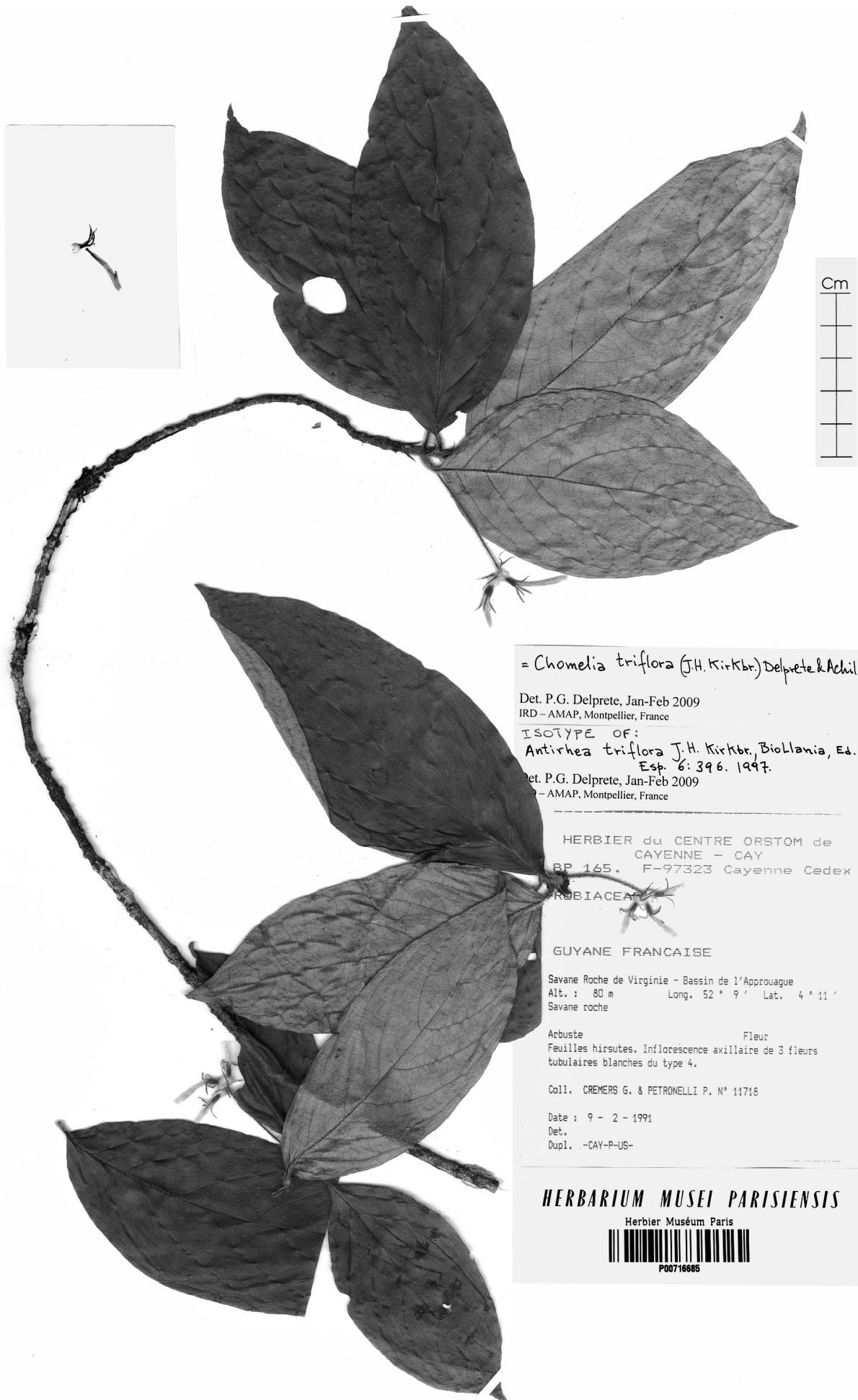
*Antirhea triflora* J.H.Kirkbr., BioLlania, Ed. Espec. 6 (1997) 396. — Type: *Cremers & Petronelli 11718* (holo US; iso CAY, P), French Guiana, Savane Roche de Virginie, Bassin de l'Approuague, 80 m, 4°11'N, 52°09'W, 9 Feb. 1991 (fl).

*Treelet* c. 1.4 m tall, with lianescent branches; branchlets brown, sparsely lenticellate; axillary thorns narrowly cylindrical, 1.3–1.4 cm long (absent in some branches, as in the type specimens). *Stipules* narrowly triangular, 5.5–7 by 3 mm, with two minute

asymmetrical teeth and a central seta at apex, with a longitudinal line of adpressed-pubescent hairs in the middle, the rest glabrous outside, yellowish, somewhat persistent. *Petioles* 5–13 mm long, spreading-pubescent below, adpressed-pubescent above; blades ovate to elliptic, 11–13.5 by 6–6.5 cm, round to obtuse at base, acute and acuminate at apex, acumen deltoid to narrowly triangular, 0.7–1.5 cm long, chartaceous to papyraceous, drying rust-brown, sparsely pubescent above and below; secondary veins 7 or 8 each side, densely adpressed-pubescent above and densely spreading pubescent below; domatia absent. *Inflorescences* axillary, long-pedunculate, condensed cymes, 1–3(–4)-flowered, peduncles 2.8–5 cm long, densely white-hirsute (hairs 1.2–1.5 mm long), the apex with 2 or 4 bracts, narrowly lanceolate, linear to subulate, 7–12 mm long, free at base. *Flowers* sessile, not subtended by bracteoles; hypanthium cylindrical, 2–3 by (0.3–)0.7–1.3 mm, densely velutinous or densely white-hirsute; calyx tube short-cupular, 3–4 mm long, lobes irregularly unequal or two longer and two shorter, narrowly oblong-lanceolate to narrowly spatulate, 4.5–10 by 0.7–1.3 mm long, obtuse to acute at apex, densely adpressed-pubescent; corolla hypocrateriform, yellowish white, 20–24.5 mm long, tube narrowly cylindrical, slightly wider at mouth, (12–)16–20 mm long (12 mm long in type specimens), 0.9–1 mm wide at base, 1.8–2 mm wide at mouth, densely adpressed-pubescent outside, glabrous inside, lobes basally conduplicate-valvate and distally imbricate in bud, two external and two internal, narrowly-ovate to narrowly lanceolate, 4–4.5 by 1.2–1.3 mm, acute at apex, densely adpressed-pubescent outside, corniculate just below the apex (or, according to Kirkbride “of 3 types, c. 5 mm long, the external lobe overlapping 2 other lobes, symmetrical, c. 1.5 mm wide, externally sericeous, the next lobe asymmetrical and underlapping the external lobe, c. 0.5 mm wide, with lateral 2/3s straight and overlapping one of the internal lobes, c. 1 mm wide, the 2 internal lobes symmetrical, ovate, obtuse at apex, c. 2 mm wide, with 1 margin underlapping an external lobe and the other margin conduplicate valvate with the other internal lobe”); anthers partially exerted (only tips exerted), subsessile (filaments very short), inserted just below the mouth, oblong, 4 by 0.4 mm, dorsifixed near the base, apiculate at apex, caudate at base (tails 1.2–1.3 mm long); ovary 2- or 4-locular; style included, 10.5–13 mm long, glabrous, style branches 2 or 4, narrowly elliptic to lanceolate, 1.5–2.3 mm long. *Drupe* oblong-ellipsoid, sometimes slightly curved, 12–18 by 6–7 mm when dry, laterally flattened or triangular in cross-section, 2-seeded (by abortion of 2 ovules), sparsely hirsute (hairs 1–2 mm long), passing from green to purple, calyx persistent, green.

**Table 1** Diagnostic characters for the distinction of *Guettarda*, *Chomelia*, *Stenostomum*, *Pittoniotis* and *Neolaugeria* in the Neotropics (according to Chaw & Darwin 1993, Moynihan & Watson 2001, Achille et al. 2006, and the present authors). The *Guettarda crispiflora* group is an informal group that appeared as a distinct monophyletic clade in Achille et al. (2006), and might deserve generic recognition.

	<i>Guettarda</i>	<i>Chomelia</i>	<i>Stenostomum</i>	<i>Guettarda crispiflora</i> group	<i>Pittoniotis</i>	<i>Neolaugeria</i>
Stipules	free	free or connate	free or shallowly connate	free	free	connate into a basal tube
Calyx	truncate or shallowly lobed	lobed (lobes usually slender and elongate)	shallowly lobed or short-lobed	lobed	lobed	truncate or shallowly lobed
Corolla aestivation	imbricate or quincuncial	valvate, valvate-induplicate, or narrowly imbricate (or distally imbricate)	imbricate or quincuncial	imbricate	imbricate	imbricate
Corolla lobes	5–9, rounded, not corniculate	4, usually narrow, often acute and/or corniculate	(4 or) 5, rounded to oblong, not corniculate	4 (or) 5, ovate, crisped or appendaged	5, narrow, rounded, not corniculate	4–5, rounded, not corniculate
Ovary	(1–)2–9-locular	2–4-locular	2–10-locular	(2–)3–4(–5)-locular	2-locular	4–5-locular
Style	undivided (capitate)	2–4-lobed	2–10-lobed	2-lobed	2-lobed	4–5-lobed
Inflorescence	dichasial, few- to many-flowered, rarely 1-flowered	few- to many-flowered, rarely 1-flowered	dichotomous, strongly scorpioid, or condensed 2–3-flowered	dichotomous, strongly scorpioid	many times branched panicle	dichotomous strongly scorpioid cyme, few-flowered



= *Chomelia triflora* (J.H. Kirkbr.) Delprete & Achille

Det. P.G. Delprete, Jan-Feb 2009  
IRD - AMAP, Montpellier, France

ISO TYPE OF:  
*Antirhea triflora* J.H. Kirkbr, Biollania, Ed.  
Esp. 6: 396. 1997.

Det. P.G. Delprete, Jan-Feb 2009  
IRD - AMAP, Montpellier, France

HERBIER du CENTRE ORSTOM de  
CAYENNE - CAY  
BP 165. F-97323 Cayenne Cedex

ROBIACEAE

GUYANE FRANCAISE

Savane Roche de Virginie - Bassin de l'Approuague  
Alt. : 80 m Long. 52° 9' Lat. 4° 11'  
Savane roche

Arbuste Fleur  
Feuilles hirsutes. Inflorescence axillaire de 3 fleurs  
tubulaires blanches du type 4.

Coll. CREMERS G. & PETRONELLI P. N° 11718

Date : 9 - 2 - 1991  
Det.  
Dupl. -CAY-P-US-

**HERBARIUM MUSEI PARISIENSIS**



Fig. 1 Isotype (P) of *Antirhea triflora* J.H.Kirkbr. (= *Chomelia triflora* (J.H.Kirkbr.) Delprete & Achille).

**Distribution & Ecology** — A species endemic to French Guiana, only known from the type specimens from Savane Roche de Virginie (inselberg), Approuague River, and two recent collections from the Nouragues Mountains. Growing in primary forest and gallery forest, at the base of an inselberg, at low altitude.

**Additional specimens studied.** FRENCH GUIANA, Station de Nouragues, 4°03'N, 52°42'W, 27 Mar. 1992 (fl), *Poncy 889* (CAY, NY, P); Bassin de l'Arataye, Nouragues Mts, 4°03'N, 52°42'W, June 1989 (fr), *Larpin 633* (CAY [2]).

The corolla lobes of this species are conduplicate-valvate at base and variably imbricate at distal portion (see description above). For example, the type specimen was described by Kirkbride (1997) to have one external lobe overlapping two other lobes, while the innermost lobe underlaps an external lobe on one side and is valvate-conduplicate with the contiguous internal lobe. On the other hand, the corolla lobes of *Poncy 889* are basally conduplicate and distally imbricate, with two external lobes, overlapping the two internal ones (folding as a mailing envelope).

Also, the vestiture of the hypanthium was described to be densely velutinous, but the hypanthium of *Poncy 889* is densely white-hirsute. This difference in vestiture is here interpreted as a simple morphological variation within the species, and an emended description is provided above.

## 2. *Chomelia ulei* (K.Krause) Achille & Delprete, *comb. nov.* — Fig. 2

*Guettarda ulei* K.Krause, Notizbl. Königl. Bot. Gart. Berlin 6 (1914) 203. — Type: *Ule 9860* p.p. (holo B?, destroyed; lecto K, here selected), Peru, Madre de Diós, Seringal Auristella, Rio Acre, Apr. 1911 (fl).

**Shrub or tree**, 6–18 m tall; branchlets terete, puberulent to short pubescent; axillary thorns absent (in the specimens studied). *Stipules* basally connate, narrowly lanceolate, 3–4 by 1–2 mm, pubescent outside, caducous. *Petioles* 3–5 mm long, short pubescent; blades broadly ovate to oblong-ovate, 3–5 by 2–3.5 cm, obtuse at base, obtuse to acute at apex, chartaceous to papyraceous, drying rust-brown, glabrous above, puberulous below; secondary veins 4 or 5 each side, sparsely pubescent below; domatia absent. **Inflorescences** axillary, sessile to subsessile, condensed cymes, (3–)5–7-flowered, peduncles (when present) to 1.5 mm long. **Flowers** sessile, subtended by bracteoles, these ovate-lanceolate, 2–3 mm long, acute, pubescent; hypanthium obovoid, c. 1 mm long, sparsely pubescent; calyx tube short-cupular, 4-lobed, lobes slightly unequal, linear, 0.5–0.8 mm long, acute at apex, sparsely pubescent; corolla hypocrateriform, white, 11–21 mm long, adpressed-pubescent outside, tube narrowly cylindrical, 8–18 mm long, lobes 4, valvate in bud, narrowly lanceolate, 3–3.5 mm long, glabrous; style included, 10.5–13 mm long, glabrous, style branches narrowly elliptic to lanceolate, 1.5–2.3 mm long. Anthers subsessile (filaments very short), inserted near the mouth, oblong, 1.5–2 mm long, dorsifixed near the base, glabrous. *Drupe* and seeds unknown.

There has been a considerable confusion regarding the identity of *Guettarda ulei* and *G. acreana* K.Krause, caused by either a mixed collection or a confusion of specimen labels. The holotype specimen of *G. ulei* was cited by Krause (1914) as *Ule 9860*, and probably existed at B. However, when Macbride took photos of the types preserved at B, the specimen labelled as the type of *G. ulei*, negative N. 388, was instead *Ule 9707*, which is the holotype of *G. acreana*. Standley (1936: 119) contributed to maintain this confusion by citing Macbride's negative N. 388 as "*Ule 9860*" and treating it as *G. ulei*, which is instead *Ule 9707* and is the holotype of *G. acreana*. In the same work

(p. 122) he cited *Ule 9860* as a specimen of *Chomelia sessilis*, but without specifying the herbarium (probably the US specimen), as "*Anisomeris sessilis* (Müll.Arg.) Standl." Because of this ongoing confusion, Standley (1936) and Steyermark (1984) treated *G. ulei* as closely related, and Taylor & Steyermark (2004) as a synonym of *G. acreana*.

After extensive search of type specimens of *G. ulei*, we were able to find two specimens labelled as *Ule 9860* at K and US. The specimen at K bears a label with the print "E. Ule. Herbarium Brasiliense, Amazonas-Expedition" and the handwriting "Peru. No. 9860. Guettarda Ulei Krause n. sp., Bl. weiss, Str. od. Bm. 6–18 m, Seringal Auristella. Rio Acre, April 1911." This specimen is here selected as the lectotype of *G. ulei*, because it corresponds almost entirely to Krause's original description of this taxon. On the other hand, *Ule 9860* at US, bearing the label "Peru, Madre de Diós, Seringal Auristella, Ule 9860" is instead a specimen of *G. acreana* [= *Stenostomum acreanum*].

In trying to clarify the identity of *G. ulei* (i.e., *Ule 9860* at K), we have first compared it with *Chomelia sessilis* Müll.Arg., Flora 58: 451, 456. 1875 (syntypes: Brazil, Mato Grosso, Cuiabá, *Riedel s.n.* (G-DC), *Pohl s.n.* (G-DC)), as suggested by Standley. The two taxa are very similar by having subsessile, subcapitate, cymose inflorescence, calyx minutely lobed, corolla pubescent outside, 11–12.5 mm long, glabrous inside, and anthers presented among the corolla lobes. Krause described *G. ulei* as with corollas 16–18 mm long, but the corollas of the sole type specimen available are only 11–12.5 mm long. The only clear difference among the two taxa is in the calyx lobes, which are round, 4 mm long and obtuse at apex in *C. sessilis*, while in *G. ulei* are linear, 0.5–0.8 mm long and acute at apex. A comparison of the fruits of the two taxa is impossible, as none are available in *G. ulei*.

Also, in the protologue of *G. ulei*, the stigma is described as capitate, but in the specimen *Ule 9860* (K) it has two flattened, oblong branches, as it is common in *Chomelia*. The most distinctive characters of this species are the sessile, condensed, several-flowered inflorescences, with many conspicuous bracts, that are also found in *C. recordii* Standl. (from Mesoamerica and Colombia), which are uncommon in *Chomelia*; however in *C. redordii* the calyx plus the hypanthium is 5–6 mm long, and the hypanthium is tubular-campanulate, densely pilose with long, adpressed, white hairs, while in *C. ulei* the hypanthium plus calyx is 1.5–1.8 mm long, and the hypanthium is obovoid and sparsely pubescent. For these reasons, we prefer to treat *C. ulei* as a separate species, pending future comparative studies with all Amazonian species of this genus.

## Stenostomum

Following the delimitation of *Stenostomum* sect. *Stenostomum* (here as *Stenostomum* s.s.) proposed by Chaw & Darwin (1992, 1993), adopted by Borhidi & Fernández (1995a, b), and supported by the molecular phylogenies of Achille et al. (2006), two new combinations of South American species are necessary.

### 1. *Stenostomum acreanum* (K.Krause) Achille & Delprete, *comb. nov.*

*Guettarda acreana* K.Krause, Notizbl. Königl. Bot. Gart. Berlin 6 (1914) 204. — Type: *Ule 9709* (holo B, destroyed; lecto U, here selected, isolecto K, L), Brazil, Acre, Seringal São Francisco, Sept. 1911 (fl).

*Antirhea panamensis* Standl. in N.L. Britton et al. (eds) N. Amer. Fl. 32 (1934) 264, syn. nov.; *Chomelia panamensis* (Standl.) Dwyer, Ann. Missouri Bot. Gard. 67 (1980) 100. — Type: *G.P. Cooper 238* (holo F; iso NY), Panama, San Blas Distr., Perme, 21–28 Apr. 1933 (fl).

*Antirhea surinamensis* Bremek., Acta Bot. Neerl. 8 (1959) 479. — Type: *Helstone 237* (holo U), Surinam, Reg. of Maratakka R., 6 June 1958 (fl, fr).



image  
ROYAL BOTANIC GARDENS KEW  
K000173095

Peru. 6 JUL 1914  
E. ULE. Herbarium Brasiliense.  
Amazonas-Expedition.  
No. 9860.  
*Guettarda Ulei* Krause n.sp.  
Bl. negra, Fl. od. Bm. 6-8m, Leringal Anistella.  
Rio Itare: April 1911.

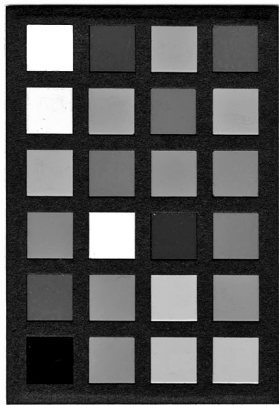


Fig. 2 Lectotype (K) of *Guettarda ulei* K.Krause (= *Chomelia ulei* (K.Krause) Achille & Delprete).

*Chomelia chambersii* Dwyer & M.V.Hayden, Ann. Missouri Bot. Gard. 54 (1967) 138, syn. nov. — Type: *Stern & Chambers 144* (holo MO; iso GH), Panama, Chiriquí, Comarca del Barú, area near Puerto Armuelles, between Cañazo and Cocos, 17 June 1957 (fl).

*Guettarda leiantha* Steyer., Ann. Missouri Bot. Gard. 71 (1984) 1175. — Type: *Steyermark et al. 122318* (holo VEN; iso MO), Venezuela, Amazonas, Depto. Atures, between Paso El Diablo and Caño de Culebra, 25–30 km SE of Puerto Ayacucho, 12 May 1980 (fl).

Tree to 20 m tall, to 25 cm at dbh; trunks fluted, with high, steep plank buttresses; young branchlets ones sparsely pubescent, becoming glabrate, brown, sparsely lenticellate; axillary thorns apparently absent. *Stipules* shallowly connate at base, narrowly ovate, 7–9 by 2–3 mm, acuminate at apex, glabrous, readily caducous. *Petioles* 6–18 mm long, sparsely adpressed-pubescent; blades elliptic, ovate-elliptic, oblong-elliptic, to narrowly-elliptic, 6.5–13 by 2.5–7.5 cm, obtuse to acute at base, obtuse to acute and acuminate at apex, acumen deltoid to narrowly triangular, 0.5–1.5 cm, chartaceous, drying olive-green to rust-brown, glabrous above, sparsely adpressed-pubescent below; secondary veins 5–8 each side; domatia tuft of pubescent hairs. *Inflorescences* long-pedunculate, with 2 or 3 main axes, forking to a total of 4–9 axes, terminal axes 4–11-flowered, peduncles 3–10 cm long, sparsely to densely adpressed-pubescent. *Flowers* sessile, subtended by one bracteole, this ovate-triangular, 0.3–0.5 mm long; hypanthium globose to urceolate, c. 1 mm long, sparsely adpressed-pubescent to glabrate; calyx cupular, c. 0.5 mm long, with 4 shallow lobes, these obtuse to round at apex, glabrous and ciliate at margins; corolla narrowly hypocrateriform, 8.5–9 mm long, greenish white or yellowish white, tube narrowly cylindrical, slightly wider at mouth, 7–7.5 mm long, 0.7 mm wide at base, 1.1 mm wide at mouth, densely strigose outside, with a ring of hairs near the base and the rest glabrous inside, lobes broadly-ovate to round, 1.5 by 1 mm, obtuse to round at apex, glabrous or sparsely adpressed-pubescent, stamens included (tips barely exerted), inserted near the mouth, filaments 0.5 mm long, anthers narrowly oblong, 1.5–2.2 by 0.3–0.4 mm, dorsifixed near the base, short-caudate; ovary 4-locular, style 6.5–7 mm long, glabrous; style branches 4 (only known from flower buds). *Drupe* broadly oblong to broadly turbinate, with 4 pyrenes, 7.5–9 by 5–7 mm, glabrous, deep purple to black.

Both specimens of *Ule 9709* at U and L, have the label “Guettarda Ulei Krause n. sp., Bl. grünlich gelb, Bm. ad Seringal S. Francisco, Rio Acre, September 1911” handwritten by Ernst Ule. Later, another hand (of unknown identity) struck out “ulei Krause n. sp.” and wrote “acreana Krause in Notizbl. Berlin VI, 56 (15.V.1914) p. 204.” This might explain the confusion between *G. acreana* and *G. ulei*. However, we prefer to choose the U specimen as the lectotype of *G. acreana* because it is a more complete specimen.

*Antirhea panamensis* Standl. (= *Chomelia panamensis* (Standl.) Dwyer) was treated by Burger & Taylor (1993), as a synonym of *Chomelia microloba* Donn.Sm. (Type: *A. Tonduz 9874*, Costa Rica, Santo Domingo de Golfo Dulce; Iso NY). Burger & Taylor (1993) already noticed the heterogeneity of the material, as they wrote: “the leaves of the type specimen [of *Chomelia microloba*] (*Tonduz 9874*) are quite small and they appear atypical for the material placed here”. Actually, most of the specimens cited by Burger & Taylor (1993) belongs to *Stenostomum acreanum*, which has larger, membranaceous leaves. *Chomelia microloba* is easily distinguished from *Stenostomum acreanum*, by its valvate corolla lobes and cymose (not strongly scorpioid) inflorescence, two characteristic features of *Chomelia*, as here delimited (Table 1).

This species has also been positioned in *Chomelia* by Dwyer & Hayden (1967), published as *C. chambersii*. Later, Dwyer (1980), noticed that his species is a later synonym of *A. pana-*

*mensis*, and synonymised it with his new combination *C. panamensis* (Standl.) Dwyer.

The position of *G. acreana* has been regarded as problematic by many authors. Standley (1934), who was familiar with the numerous *Antirhea* species from the Caribbean area, already suggested the positioning of this species within the genus when he described *A. panamensis*, here treated as one of the synonyms of this species. Similarly, Bremekamp (1959) re-described this species under the name *A. surinamensis*. In the same work, he also suggested that a worldwide study of *Antirhea* s.l. “will lead to a splitting of the genus,” which was supported by later studies.

The systematic position of *G. acreana* was questioned by Koek-Noorman (1969) in a paper on wood anatomy of South American *Rubiaceae*. Ter Welle et al. (1983), in a study on wood anatomy of the tribe *Guettardeae*, concluded that there is sufficient evidence for a removal of *G. acreana* from *Guettarda*, but without suggesting any alternative generic position. Molecular phylogenies (Achille et al. 2006) and evidence from pollen morphology (Achille, unpubl. data) support the position of this species in *Stenostomum*. Aside from the multidisciplinary evidence, this species has corolla lobes imbricate (two external and two internal; see Steyermark 1974: f. 125), a persistent (later disintegrating), lobed calyx (as in *Guettarda*), and slender, dichotomous, strongly scorpioid cymes, distinctive of *Stenostomum* sect. *Stenostomum* – the two most obvious diagnostic characters of *Stenostomum* – and therefore a new combination is here proposed.

**Distribution** — A tree to 20 m tall, distributed from Costa Rica, Panama and throughout the Amazon Basin, in Colombia, Venezuela, Guyana, Ecuador, Peru and northern Brazil (c. 130 collections studied).

**Selected specimens examined.** BRAZIL, Acre, Mun. Rio Branco, Universidade Federal do Acre, Parque Zoológico, 9°57'S, 67°52'W, *Delprete 7676* (NY, U, US); Acre, Mun. Porto Walter, R. Juruá Mirim, Comunidade Aldeota, 08°13'S, 73°01'W, 230 m, *Delprete et al. 7789* (NY, U, US); Acre, Mun. Sena Madureira, W of R. Caete, 12 km, *Prance et al. 7911* (NY, P, U); Roraima, SEMA Ecological Reserve, Ilha de Maracá, hill close to Furo de Santa Rosa, 03°25'N, 61°29'W, *Milliken et al. 593V* (U). — COSTA RICA, Puntarenas, Cantón Golfito, Península de Osa, P.N. Corcovado, Sirena, 08°28'N, 83°35'W, 1–20 m, *Maass 50* (BM); San José, Cantón de Acosta, Cuenca del Pirri-Damas, 9°40'N, 84°15'W, 200–300 m, *Morales & Abarca 6186* (BM). — ECUADOR, Prov. Francisco Orellana, Estación Científica Yasuní, R. Tiputini, NE of jct with R. Tivacuno, Sendero Napo, arbol N. 38, 00°38'S, 76°30'W, 200–300 m, *Villa & Avia 1105* (BM). — FRENCH GUIANA, Saül, La Fumée Oeste, 3°37'N, 53°12'W, 200–400 m, *Mori & Pipoly 15598* (CAY, NY, P); Approuague R., Arataye R., Saut Pararé, *Sastre 6331* (CAY, P). — GUYANA, Kanuku Mts, Rumpuruni R., Crabwood Cr., 03°10'N, 59°24'W, *Jansen-Jacobs et al. 4361* (NY, U, US); Cuyuni R., near Camaria, *Tutin 159* (BM, U). — PANAMA, Parque Nacional Darién, Serranía de Cerro Sapo, trocha limitrofe del parque hasta la cima, 07°58'N, 78°23'W, 400–800 m, *Herrera 777* (MO, U). — PERU, Madre de Diós, Seringal Auristella, *Ule 9860* p.p. (US). — SURINAME, Sipaliwini, near Blanche Marie Waterfalls, on Nicherie R., 04°45'N, 56°52'W, *Evans et al. 2402* (MO, NY, P); Area of Kabalebo dam project, distr. Nickerie, 4°–5°N, 57°30'–58°W, *Lindeman et al. 670* (U). — VENEZUELA, Delta Amacuro, E side of R. Cucyubini, *Steyermark 87585* (NY, P); N of R. Acha, 2 km SE of Los Patos, c. 15 km N of R. Supamo, 365 m, *Steyermark 86953* (NY, VEN).

## 2. *Stenostomum guianensis* (Bremek.) Delprete & Achille, comb. nov.

*Antirhea guianensis* Bremek., Kew Bull. 7, 2 (1952) 260. — Type: *Fanshawe s.n.* (*Forest Department 3991*) (holo K; iso NY), Guyana, Lower Essequibo R., Groete Cr., 21 Apr. 1943 (fl, fr).

*Guettarda fanshawei* Steyer., Mem. New York Bot Gard. 23 (1972) 359. — Type: *Fanshawe 1255* (*Forest Department 3991*) (holo NY; iso K), Guyana, Lower Essequibo R., Groete Cr., 21 Apr. 1943 (fl, fr).

Tree to 50 cm at dbh; branchlets glabrous; axillary thorns absent (in the specimens studied). *Stipules* narrowly triangular, 6–10

by 3 mm, glabrous outside, somewhat persistent. *Petioles* 5–15 mm long, glabrous; blades oblanceolate, 8–12.5 by 2.5–4.5 cm, acute to decurrent at base, obtuse to acute and acuminate at apex, acumen narrowly triangular, 0.6–1 cm long, chartaceous to papyraceous, drying rust-brown, glabrous above and below; secondary veins 8 or 9 each side, sparsely pubescent below; domatia absent. *Inflorescences* axillary, long-pedunculate, dichotomous cymes, 7–13-flowered, peduncles 3–5 cm long, glabrous. *Flowers* sessile, subtended by one bracteole each; hypanthium obovoid, 1.3–1.5 mm long, glabrous; calyx tube short-cupular, 5-lobed, 1.8–2.5 mm long, tube 2 mm long, lobes slightly unequal, triangular, 0.2–0.5 mm long, obtuse to acute at apex, glabrous; corolla hypocrateriform, milk-white, 35–38 mm long, glabrous, tube narrowly cylindrical, 31–33 mm long, 2–2.5 mm wide, lobes 5, imbricate in bud, 3 external and 2 internal, oblong, 4–5 mm long, glabrous; anthers 5, partially exerted (only tips exerted), subsessile (filaments very short), inserted just below the mouth, oblong, 2.5–3.5 mm long, dorsifixed near the base, apiculate at apex, caudate at base; ovary 7- or 8-locular; style included, 10.5–13 mm long, glabrous, style branches 2 or 4, narrowly elliptic to lanceolate, 1.5–2.3 mm long. *Drupe* ellipsoid, immature 8 by 3.5 mm when dry, round in cross-section, 2-seeded (by abortion of 2 ovules), glabrous, passing from green to purple, calyx persistent, green.

**Distribution & Ecology** — Only known from the type collection.

When Steyermark (1972) described *Guettarda fanshawei* Steyermark, apparently he was not aware that this species was already described by Bremekamp (1952), using a duplicate of the same collection, as *Antirhea guianensis* Bremek. Therefore, the two taxa are synonymous, and a new combination in *Stenostomum* is necessary, using Bremekamp's basionym. The specimen preserved at NY has a label handwritten by Borhidi with the new combination in *Stenostomum*, but apparently he did not publish it. In addition, Steyermark (1972) already suggested a close relationship of *G. fanshawei* with *G. acreana* K.Krause (= *Stenostomum acreanum*, see above).

**Acknowledgements** Funds for this work were provided to PD by a fellowship from the Netherlands Organization for Scientific Research NWO (grant B 85-368) and the Alberta Mennega Stichting for the treatment of the *Rubiaceae* for the Flora of the Guianas, with the coordination of Marion Jansen-Jacobs (U) and the collaboration of the staff of the Nationaal Herbarium Nederland, Utrecht University branch (U). This project was realized also through major loans (c. 3 000 specimens) from NY and US to U for the study of PD at Utrecht, for which the generous support of these institutions is here acknowledged. A portion of this work was realized by PD during a fellowship for Visiting Scientist from the National Counsel of Technological and Scientific Development of Brazil (Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq; grant 309885/2003-5), at the Federal University of Goiás, Goiânia, Brazil, with the coordination of Vera Lúcia Gomes-Klein (UFG). We are also grateful to Lisa Campbell (NY) for supplying information of NY specimens, and to the directors and curators of the following herbaria for loan of material and/or for providing working space during several visits: B, BBS, BM, CAY, F, G, HTO, IBGE, INPA, K, L, MBM, MG, MO, NY, P, R, RB, U, UB, US and VEN.

## REFERENCES

- Achille F. 2006. Tinadendron, nouveau genre de Rubiaceae, Guettardeae de Mélanésie orientale. *Adansonia* 28: 167–180.
- Achille F, Motley T, Lowry PP II, Jérémie J. 2006. Polyphyly in *Guettarda* L. (Rubiaceae, Guettardeae) based on ITS sequence data. *Annals of the Missouri Botanical Garden* 93: 106–124.
- Borhidi A. 2006. Rubiaceae de México. *Akademia Kiadó, Budapest*.
- Borhidi A, Fernández MZ. 1995a ('1993–1994'). Nuevas especies y revisión breve del género *Stenostomum* C.F. Gaertn. [sic!] (Rubiaceae) en Cuba. *Acta Botanica Hungarica* 38: 143–156.
- Borhidi A, Fernández MZ. 1995b ('1993–1994'). The genus *Stenostomum* C.F. Gaertn. (Rubiaceae) or the reconsideration of the New World *Antirhea* species. *Acta Botanica Hungarica* 38: 157–165.
- Bremekamp CEB. 1934. Rubiaceae. In: Pulle A (ed), *Flora of Surinam* vol. 4: 113–298. De Bussy Ltd., Amsterdam.
- Bremekamp CEB. 1952. Contribution to the Flora of tropical America LIV. *Kew Bulletin* 7, 2: 255–260.
- Bremekamp CEB. 1959. A species of *Antirhea* (Rubiaceae) from Suriname. *Acta botanica neerlandica* 8: 479–481.
- Burger WC, Taylor CM. 1993. Rubiaceae. In: Burger WC (ed), *Flora Costaricensis*. Fieldiana, Botany, New Series 33: 1–333.
- Chaw S-M, Darwin SP. 1992. A systematic study of the paleotropical genus *Antirhea* (Rubiaceae: Guettardeae). *Tulane Studies in Zoology and Botany* 28, 2: 25–118.
- Chaw S-M, Darwin SP. 1993. The delimitation and geographical origin of paleotropical *Antirhea* (Rubiaceae). Abstracts: 12–13. International Conference on the Systematics of the Rubiaceae (4–6 Oct. 1993), Missouri Botanical Garden, St. Louis, MO, USA.
- Darwin SP. 1979. Synopsis of the indigenous genera of Pacific Rubiaceae. *Allertonia* 2: 1–11.
- Delprete PG. Submitted. Rubiaceae, Part I. Introduction, key to genera, and genera from A to L. In: Jansen-Jacobs MJ (ed), *Flora of the Guianas*. Royal Botanic Gardens, Kew, Richmond, Surrey, UK.
- Delprete PG, Cortés-B R. 2007 ('2006'). A synopsis of the Rubiaceae of the states of Mato Grosso and Mato Grosso do Sul, central-western Brazil, with a key to genera, and a preliminary species list. *Revista de Biología Neotropical* 3: 13–96.
- Dwyer JD. 1980. Family 179. Rubiaceae. In: Woodson E. et al. (eds), *Flora of Panama*, part IX. *Annals of the Missouri Botanical Garden* 67: 1–522.
- Dwyer JD, Hayden MV. 1967. Notes on woody Rubiaceae of Tropical America. *Annals of the Missouri Botanical Garden* 54: 138–146.
- Gentry AH. 1993. A field guide of the families and genera of woody plants of northwest South America (Colombia, Ecuador, Peru) with supplementary notes on herbaceous taxa. Conservation International, Washington, DC.
- Hooker JD. 1873. Tribus XIII. Guettardeae (Rubiaceae). In: Bentham G, Hooker JD, *Genera Plantarum*, vol. 2: 20–21, 99–104. Reeve & Co., London.
- Kirkbride JH. 1997. *Manipulus rubiacearum* VII. *BioLlania*, Edición Esp. 6: 393–406.
- Koek-Noorman J. 1969. Contribution to the wood anatomy of the South American Rubiaceae. II. *Acta botanica neerlandica* 18: 377–395.
- Krause K. 1914. *Guettarda* L. In: Pilger R (ed), *Plantae Uleanae novae vel minus cognitae*. *Notizblatt des Königlichen botanischen Gartens und Museums zu Berlin* 6: 203–205.
- Moynihan J, Watson LE. 2001. Phylogeography, generic allies, and nomenclature of Caribbean endemic genus *Neolaugeria* (Rubiaceae) based on internal transcribed spacer sequences. *International Journal of Plant Sciences* 162: 393–401.
- Müller Argoviensis JJ. 1881. Tribus II. Guettardeae (Rubiaceae). In: Von Martius CFP, Eichler AG, Urban I (eds), *Flora Brasiliensis*, vol. 6, pars 5: 13–48, fig. 2–6. Fleisher, Leipzig.
- Nicolson DH. 1979. *Neolaugeria*, a new name for *Terebraria* (Rubiaceae) of the West Indies. *Brittonia* 31: 119–124.
- Standley PC. 1934. Rubiaceae. In: Britton NL et al. (eds), *North American Flora* 32: 214–277.
- Standley PC. 1936. Rubiaceae. In: Macbride JF (ed), *Flora of Peru*. *Field Museum of Natural History, Botanical Series* 13: 3–261.
- Steyermark JA. 1972. Guettardeae (Rubiaceae). In: Maguire B, Wurdack JJ et al., *Botany of the Guyana Highlands – Part IX*. *Memoirs of the New York Botanical Garden* 23: 356–372.
- Steyermark JA. 1974. Rubiaceae. In: Lasser T, Steyermark JA (eds), *Flora de Venezuela* 9: 1–2070. Instituto Botánico, Caracas.
- Steyermark JA. 1984. New Rubiaceae from Venezuela. *Annals of the Missouri Botanical Garden* 71: 1175–1179.
- Taylor CM, Steyermark JA. 2004. *Guettarda*. In: Steyermark JA, Berry PE, Yatskievych K, Holst BK (eds), *Flora of the Venezuelan Guayana* 8: 614–616.
- Ter Welle BJH, Loureiro AA, Lisboa PLB, Koek-Noorman J. 1983. Systematic wood anatomy of the tribe Guettardeae (Rubiaceae). *Botanical Journal of the Linnean Society* 87: 13–28.