

## CARAIPA ANDINA (CLUSIACEAE), A NEW SPECIES FROM THE VENEZUELAN ANDES, AND ITS BIOGEOGRAPHICAL IMPLICATIONS

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### ABSTRACT

(*Caraipa andina* (Clusiaceae), a new species from the Venezuelan Andes, and its biogeographical implications) *Caraipa andina* from La Fundación, in the western Andes of Venezuela (Táchira State) is described, illustrated, and its morphological relationship with an allied species is discussed. This new species is morphologically related to *C. heterocarpa* Ducke, but it differs by the leaf blade shape, size, and dense abaxial papillae; fewer-flowered inflorescence; and shorter pedicel, flower buds, petals, and filaments. Phytogeographical information about the La Fundación area is presented. This species represents the first report of this genus in the Venezuelan Andes.

**Key words:** Amazonia, Estado Táchira, Guayana, Guttiferae, sandstone outcrops.

### RESUMO

(*Caraipa andina* (Clusiaceae), uma nova espécie para os Andes da Venezuela e suas implicações biogeográficas) *Caraipa andina* foi descoberta em La Fundación, nos Andes Ocidentais da Venezuela (Estado de Táchira) e é aqui descrita e ilustrada, discutindo-se suas afinidades morfológicas com as espécies próximas. Morfologicamente relacionada com *C. heterocarpa* Ducke, a nova espécie diferencia-se pelo tamanho, forma da lâmina foliar e face abaxial densamente papilosa; inflorescência paucifloras; pedicelos, botões florais, pétalas e filamentos mais curtos. Informações sobre a fitogeografia do local são apresentadas. Esta espécie representa o primeiro registro deste gênero nos Andes Venezuelanos.

**Palavras-chave:** Amazônia, Estado Táchira, Guayana, Guttiferae, afloramentos de arenito.

*Caraipa* Aublet comprises about 30 species of small to large trees or shrubs, distributed in tropical South America (Gustafsson *et al.* 2002; Stevens 2007). The genus has been variously treated as Bonnetiaceae, Theaceae, and is presently included in Clusiaceae (Kubitzki 2007). The genus is characterized by an indumentum of usually stellate hairs; alternate leaves with tertiary veins perpendicular to the secondary veins; stamens with free filaments and bearing an apical gland; and capsular fruits.

Species occur in moist forest formations (lowland, montane slopes, gallery, flooded, and Amazonian caatinga) and shrubby savannas, with the largest number of species in the Amazon Basin and on the Guiana Shield. However, a few taxa occur outside of this region, such as the two subspecies of *C. densifolia* Martius in southeastern and central Brazil. Three species (*C. densifolia* Martius subsp.

*densifolia*, *C. punctulata* Ducke and *C. richardiana* Cambess.) are found in the wet and gallery forests in the Venezuelan Llanos (Aymard 2003; Aymard & González 2006). *Caraipa llanorum* Cuatr. subsp. *llanorum* and *C. savannarum* Kub. form ecologically interesting communities of dense trees called *saladillales*. These communities are very common in the vast eolic, seasonally flooded savannas (the Llanos) that extend from northeastern Colombia through western Venezuela (Schargel & Aymard 1992; Huber *et al.* 2006). The genus is rare in the Andes, and currently is known only by several collections of *C. punctulata* Ducke from Colombia (Antioquia and Norte de Santander departments), and reported herein for Venezuela. A revision of the genus was published by Kubitzki (1978; as Bonnetiaceae), who reconized 21 species and three morphological groups; however, these groups did not

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accommodate all of the species. Kubitzki (1978) pointed out two taxonomically useful leaf characters to separate the species: phyllotaxy spiral vs. distichous, and the cells of the abaxial surface bullate or clavate, with the cuticle minutely wrinkled and scaly vs. cells of the abaxial surface not protruding, and the cuticle mostly smooth. Since then, five new species have been described (Kubitzki 1987; Vásquez-Martínez, 1991) and others suggested (Kubitzki & Holst 1998; see also Stevens 2007). Additionally, the genus has been treated for the *Flora of the Venezuelan Guayana* (Kubitzki & Holst 1998), and two local florulas in the Amazonian region of Colombia and Peru (Vásquez-Martínez 1997; Rudas & Prieto 2005).

This contribution increases to fifteen the number of *Caraipa* species known from Venezuela. This new species represents the first record of this genus in the Venezuelan Andes, and was discovered during herbarium work for a phytogeographic study being conducted in the area in which it was collected.

***Caraipa andina*** Aymard & L. M. Campb.  
*sp. nov.* Fig. 1

**Type:** VENEZUELA. TÁCHIRA: Dtto. Uribante, empresa Las Cuevas, near La Fundación, 08°50'N, 71°47'W, ca. 900 m, 7.VII.1983, H. van der Werff & A. González 5013 (Holotype: PORT; Isotype: MO, *n.v.*; NY; VEN).

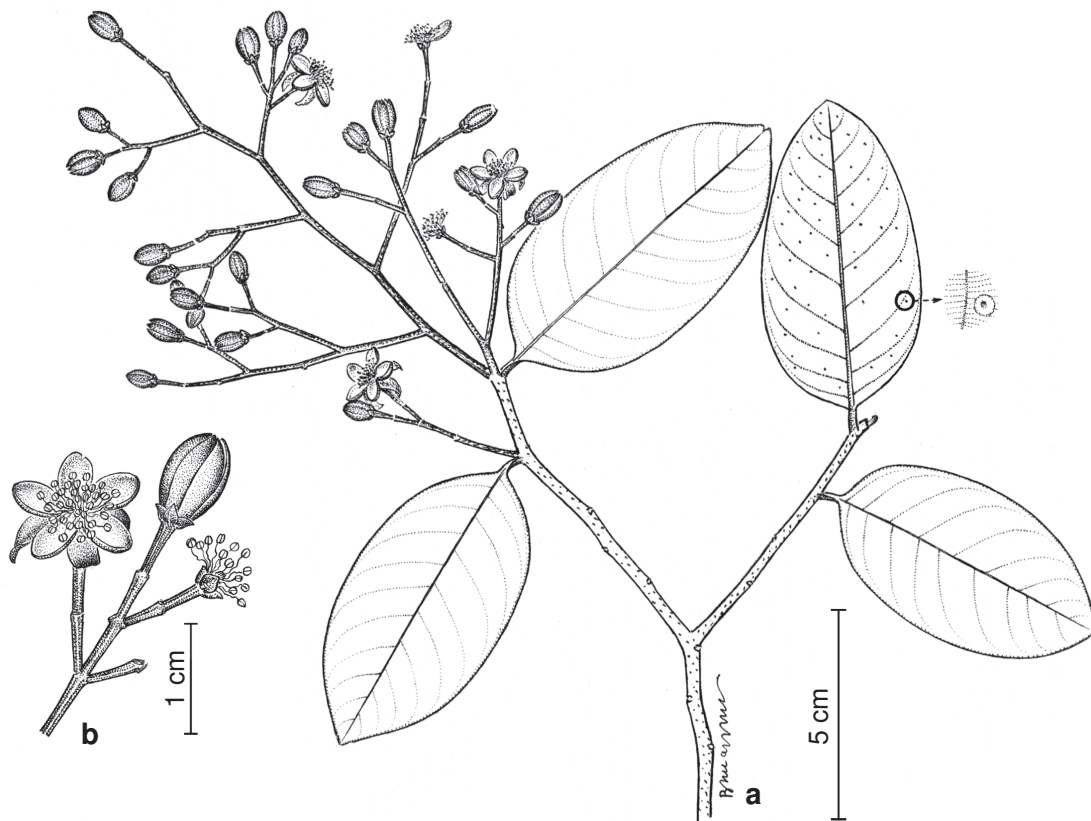
*Species* *Caraipa heterocarphae* Ducke *proxima*, *sed differt: foliis oblongis, 6–9 cm longis, subtus dense papillatis, inflorescencia 12–16-flora, pedicellis 5–10 mm longis, gemmis floralibus 4–6 longis, sepalis ovatis, ca. 2 mm longis, intus adpress luteo-pubescentibus, petalis 6–8 longis, filamentis 5–6 longis, ovario dense luteo-glandulosis trichomatibus obtecto.*

**Tree**, 20 m tall. Young branches and branchlets smooth, glabrous. **Leaves** distichous, petiole 6–8 mm long, stout, glabrous; blades coriaceous, 6–9 cm long, 3–5 cm wide, base rounded, apex acute to rounded, margins slightly revolute, glabrous on both surfaces with sparse translucent dots, abaxial epidermal cells papillate,

with microscopic epicuticular wax, secondary veins in 8–10 pairs, impressed adaxially, prominent abaxially. **Inflorescence** axillary, lax panicles, 10–15 cm long, 12–16-flowered; the rachis and pedicels covered by simple and stellate trichomes; pedicels 5–10 mm long, bracts and bracteoles not seen. **Flower** buds globose, 4–6 cm long before anthesis; sepals ovate, ca. 2 mm long, ca. 2 mm wide, stellate pubescent and covered with translucent dots abaxially, adpressed yellow pubescent adaxially, margins ciliate; petals oblong, 6–8 mm long, 3–5 mm wide, puberulent abaxially, glabrous adaxially; stamens 80–100, filaments 5–6 mm long, anthers ca. 0.5 mm long, oblong, introrse, connective distally widened and topped by a gland; ovary ca. 2 mm long, tomentose, trichomes yellow; style ca. 3 mm long, glabrous, stigma trilobed. **Fruits** not seen. **Distribution and habitat:** *Caraipa andina* appears to be restricted to the moist montane forests near La Fundación, Táchira state, Venezuela.

**Phenology:** Collected with flowers in July.

The ranked phyllotaxis, with leaves glabrous on both surfaces, cells of their lower surface not protruding, and with a smooth cuticle, and lax panicles more 4 cm long, relate this new species morphologically to *Caraipa heterocarpha*, a species known from a few specimens, with restricted distribution in low elevation flooded forests in the Amazon basin of Brazil and Venezuela (Kubitzki 1978; Kubitzki & Holst 1998). However, *C. andina* differs from that species by its leaf blades oblong, 6–9 cm long, densely papillate on the abaxial surface (*vs.* leaf blades lanceolate-ovate or lanceolate, 10–17 cm long, not papillate on the abaxial surface), inflorescence with 12–16 flowers, pedicels 5–10 mm long (*vs.* inflorescence with 20–40 flowers, pedicels 12–16 mm long), flower buds 4–6 cm long; sepals ovate, ca. 2 mm long, adpressed yellow pubescent adaxially, petals 6–8 mm long, and filaments 5–6 mm long (*vs.* flower buds 7–8 cm long; sepals obtuse, 3–4 mm long, slightly strigose adaxially, petals ca. 10 mm long, and filaments 10–12 mm long).



**Figure 1** – *Caraipa andina* – a. branch showing the inflorescence and flowers; b. detail of an inflorescence branch. (van der Werff 5013).

**Phytogeography:** Species of *Caraipa* are distributed almost exclusively in the Guayana region and Amazon Basin, and are rarely encountered in the tropical Andes. The first report of the genus in this region was *C. colombiana* Ewan, a species described from a collection from forests on the slopes of the Cordillera Central in Colombia (Ewan 1951). Kubitzki (1978) treated this species as a synonym of *C. punctulata* Ducke, a mostly lowland wet forest species, that he considered to also be distributed on mountain slopes in Venezuela and Colombia; notably, he did not mention that this collection (*J. Cuatrecasas 13335*, F, US) would have represented the only known occurrence of *Caraipa* in the Andes. Intensive botanical exploration in the Colombian Andes during the last twenty-five years revealed that the distribution of *Caraipa* extends to the Central Cordillera in Antioquia department.

The only known locality of *Caraipa andina*, La Fundación, is located in the western portion of the Cordillera Mérida, on sandstone outcrops belonging to the Formación Aguardiente (Notestein *et al.* 1944; Salvador 1961a, b). The vegetation of this area is relatively well known because of the extensive collections made by R. Liesner, J. A. Steyermark and H. van der Werff. Liesner (pers. comm.) observed that the floristic composition of the vegetation associated with these sandstone outcrops includes several species that are known from the Guiana Shield, and the Amazon Basin floras, such as *Philodendron atabapoense* G. S. Bunting (Araceae), *Bonnetia paniculata* Spruce *ex* Benth. (Bonnetiaceae), *Vriesia duidae* (L. B. Sm.) Gouda (Bromeliaceae), *Licania latifolia* Benth. (Chrysobalanaceae), *Elaphoglossum horridulum* (Kaulf.) J. Sm., *E. raywaense* (Jenman) Alston (Dryopteridaceae), and *Pleurothallis erebatensis* Carnevali & Romero (Orchidaceae). Additionally, the flora

includes many endemic species (e.g., *Licania tachirensis* Prance (Chrysobalanaceae), *Piper fundacionense* Steyerm. (Piperaceae), *Clidemia steyermarkii* Wurdack, *Miconia liesneri* Wurdack (Melastomataceae), and *Securidaca fundacionensis* Aymard & L. M. Campb. (Polygalaceae; see Aymard & Campbell 2007).

The entire Tertiary is characterized by tectonic events and changes in climate and sea-level (Hooghiemstra & van der Hammen 2004). These continuously affected the present-day Venezuelan Andes, which then were a lowland contiguous with the Guayana and Amazonia regions (van der Hammen & Hooghiemstra 2000; Hooghiemstra *et al.* 2006). The Western Cordillera is the most recently uprised (Kroonenberg *et al.* 1990) of the northern Andes complex, and paleobotanical and geomorphological data indicate that its final uplift was completed around 4–3 MYA (Gregory-Wodzicki 2000; H. Hooghiesmstra, pers. com.). The progressive physical separation of the Andes from the ancient Guayana region resulted in the present Andean flora: a mosaic of endemics, and elements from the Guayana, Amazonia, south-temperate, and north-temperate floras (van der Hammen & Cleef 1984; van der Hammen & Hooghiemstra 2000; Hooghiemtra *et al.* 2006).

No descriptive analysis of vegetation types from the sandstone rocks and sand substrates of the Venezuelan Andes has been undertaken thus far. Furthermore, few studies have examined whether taxa occurring in the Andes considered to be Amazonia-Guayana relicts do indeed have a lowland origin, and whether present disjunctions are a result of vicariance or dispersal. Studies on two families with high species diversity in both the Guayana region and the Andes (Bromeliaceae [Givnish *et al.* 2004] and Gentianaceae: Helieae [Gould & Struwe 2004]) suggest different histories leading to the modern distribution: evolution of the group in the lowlands and dispersal to the Andes (Givnish *et al.* 2004), or Andean origins with subsequent radiation (Gould & Struwe 2004). Lacking rigorous hypotheses of relationship, it would be premature to speculate

if either of these scenerios applies to *Caraipa*. The description of this interesting new species re-enforces Kubitzki's (1978) observation that the genus is still in need of study.

A broader biogeographic question remains regarding the affinities of floras occurring on vicariant sandstone habitats. In future research we will make comparative surveys of the floras occupying habitats on sandstone from both the Guayana and Amazon regions (G. A. Aymard C., L. M. Campbell, and G. Romero-González, in prep.).

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