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# Revision of *Carapichea* (Rubiaceae–Psychotrieae) in the Guianas, with two new combinations and transfer of three species to *Notopleura*

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## Abstract

**Background and aims** – The genus *Carapichea* (Rubiaceae), recently resurrected and separated from *Psychotria*, currently includes 24 Neotropical species and is morphologically heterogeneous. A revision of the genus in the Guianas is presented here, as part of the authors' work on the Rubiaceae treatment in the Flora of the Guianas series.

**Material and methods** – This paper is based on a study of herbarium specimens from BBS, BM, BR, BRB, CAY, INPA, K, P, P-JJR, and U; type specimens from other herbaria were consulted online. Some of the species were also studied in the field by the authors. Normal practices of herbarium taxonomy have been applied.

**Results** – Three species previously included in *Carapichea* (*C. altsonii*, *C. nivea*, and *C. sandwithiana*) show aberrant characters for the genus and are transferred to *Notopleura*; new combinations are published for the former two (*N. altsonii* and *N. nivea*). Eight species of *Carapichea*, one of them still imperfectly known, are recorded from the Guianas; a ninth species, *C. araguariensis*, is included in this revision as it is expected to occur in the region. New combinations are published for two species: *Carapichea galbaoensis* and *C. squamelligera*, based on *Psychotria galbaoensis* and *P. squamelligera*, respectively; the former species was previously included in synonymy of *C. guianensis*, which is here redefined in a narrower sense. The delimitation of *C. ligularis* is expanded to include *C. pacimonica* as a synonym. The first records of *C. adinantha* in French Guiana – and the Guiana Shield – are documented. The taxonomy of the two remaining species, *C. tillettii* and *C. urniformis*, is left unchanged. For every species a complete description is presented, as well as data on distribution, ecology, phenology, local names (when known), and a list of collections studied.

## Keywords

*Carapichea*, *Psychotria*, *Uragoga*, *Stachyococcus*, Guiana Shield, French Guiana, Suriname, Guyana, Neotropics

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## INTRODUCTION

The genus *Carapichea* Aubl. (Rubiaceae) was described by Aublet (1775) with a single species from French Guiana, *C. guianensis*. For the following two centuries, most authors, with the exception of Candolle (1830), did not accept the genus as distinct and included it successively in the synonymy of *Cephaelis* Sw. (Willdenow 1798), *Tapogomea* Aubl. (Poiret 1806; Baillon 1880, 1881), *Uragoga* Baill. (Pulle 1906), *Cephaelis* again (Standley 1929; Bremekamp

1934), and finally *Psychotria* L. (Steiermark 1972). Based on molecular studies, Andersson (2002) resurrected and expanded the genus *Carapichea*, which, according to him, “differs from *Psychotria* (sensu Petit 1964) and most other members of the *Psychotria* complex in having the combination of non-caducous stipules, pyrenes with distinct germination slits on abaxial ridges (rather than marginally), and testa without ethanol-soluble pigment”. Jardim and Zappi (2008) described a new species from north-eastern Brazil, *C. lucida*, which is unusual in its

deeply bifid stipules and pyrenes with a basal-ventral germination slit.

Taylor and Gereau (2013) further expanded the delimitation of *Carapichea* and published a synopsis of the genus. They described the generic diagnostic characters as follows “a characteristic marcescent stipule form, inflorescences that are capitate or branched to one or two orders with the flowers sessile to shortly pedicellate, lack of ethanol-soluble pigments in the testa, and aperturate pollen of a generalized form” (Taylor and Gereau 2013: 107). Based on these characters, they transferred numerous species to *Carapichea*, most of them from *Psychotria* subg. *Heteropsychotria* Steyererm. and the monospecific genus *Stachyococcus* Standl., and also described a new species. They recognized 23 species, all Neotropical, and divided the genus into seven informal groups: I. *Ipecacuanha* group; II. *Carapichea* group; III. *Pacimonica* group; IV. *Altsonii* group; V. *Panurensis* group; VI. *Stachyococcus* group; and VII. Bahia group. One new species, *Carapichea cardenasiana*, was later published (Taylor and Bruniera 2018), bringing the total to 24.

Since then, field and herbarium work by the authors – partly in the context of the Rubiaceae treatment for the Flora of the Guianas – allowed to critically compare our data with the literature. This has led us to reevaluate the infrageneric classification of Taylor and Gereau (2013), the generic position of some species, and the delimitation of others, while significant range extensions have also been recorded. This paper presents new findings in the framework of a revision of *Carapichea* in the Guianas, providing two new combinations in *Carapichea* and two in *Notopleura*. A key to the Guianan species of *Carapichea* is presented, and synonymy, description, distribution, and specimens studied are provided for the species.

## MATERIAL AND METHODS

This paper is based on a study of herbarium specimens from BBS, BM, BR, BRB, CAY, INPA, K, P, P-JJR, and U, as well as images of type specimens from B, F, G, K, MPU, NY, US, and VEN available at JSTOR Global Plants (<https://plants.jstor.org/>) and images from COL (<http://www.biovirtual.unal.edu.co/en/collections/search/plants/>). We also consulted images available at speciesLink (<https://specieslink.net/>) and REFLOA Virtual Herbarium (<http://reflora.jbrj.gov.br/reflora/herbarioVirtual/>). *Carapichea adinantha*, *C. galbaensis*, *C. guianensis*, and *C. ligularis* were also studied in the field in French Guiana and Brazil. Descriptions are based on herbarium specimens, alcohol-preserved material, and field observations. All specimens cited have been examined, unless indicated by “n.v.”. For accurate citation of type specimens, the barcode number is cited between square brackets, or, when not available, the accession number is cited, preceded by “No.”

## RESULTS AND DISCUSSION

### The delimitation of *Carapichea* and transfer of three species to *Notopleura*

The revision of the genus *Carapichea* in the Guianas led us to reevaluate the delimitation of the genus, and in particular the position of the species included by Taylor and Gereau (2013) in their *Altsonii* group (Group IV). This group included four species from western Guyana and eastern Venezuela: *C. altsonii* (Sandwith) C.M.Taylor, *C. nivea* (Sandwith) C.M.Taylor, *C. sandwithiana* (Steyererm.) C.M.Taylor, and *C. urniformis*.

These four species have always been regarded as closely related. Steyermark (1972) placed them in an infrageneric group of their own, *Psychotria* sect. *Notopleura* Benth. ser. *Altsonii* Steyererm., characterised by 1) terminal capitate inflorescences with conspicuous involucre bracts, 2) pedicellate flowers lacking bracts or bracteoles but subtended by glandular projections from the receptacle, and 3) stipules forming a truncate sheath (which is actually not the case in *C. urniformis*). Taylor and Gereau (2013) noted some differences between *C. urniformis* and the other three species, and the similarity of the latter with *Notopleura*, but opted to place all four species in *Carapichea* due to their terminal inflorescences, and “interpetiolar rather than sheathing stipules that lack glandular appendages” (Taylor and Gereau 2013: 107) as opposed to lateral inflorescences and stipules often sheathing, bearing glandular appendages, in *Notopleura*.

After a reexamination of herbarium material, we agree with Taylor and Gereau (2013) in positioning *C. urniformis* in *Carapichea*. This species has free stipules without appendages (actually not glandular), coriaceous leaves with conspicuous secondary and tertiary venation, and semi-circular pyrenes in cross-section; all these characters are shared with the type species *C. guianensis*. Therefore, *C. urniformis* appears to be correctly placed in this genus, in spite of its unique lyrate involucre.

The remaining three species of Taylor and Gereau’s (2013) Group IV, on the other hand, show several characters aberrant in *Carapichea*: 1) very fleshy stems and leaves, the latter with secondary venation not or hardly distinct (i.e. embedded within the lamina), 2) pyrenes dorso-ventrally flattened, and 3) stipules with basal interpetiolar tufts of appendages (early caducous, leaving distinct scars). These stipules are further unusual in being remarkably dimorphic: those of vegetative nodes consist of a truncate sheath with interpetiolar tufts of appendages, while those of flower-bearing nodes consist only of tufts of appendages, without a sheath. This very peculiar stipular dimorphism, which seems not to have been previously documented in Rubiaceae, also exists in *Notopleura tapajozensis* (Standl.) Bremek. (Fig. 1).

All above discussed characters of *C. altsonii*, *C. nivea*, and *C. sandwithiana* point to an affinity with *Notopleura*, a genus where interpetiolar stipular appendages are

usually present, as well as fleshy leaves and dorso-ventrally flattened pyrenes. The leaves of the *Altsonii* group closely resemble those of three *Notopleura* species, *N. aneurophylla* (Standl.) C.M.Taylor, *N. aneurophyloides* (Steierm.) C.M.Taylor, and *N. tapajozensis*, in their obsolete or barely visible secondary venation (i.e. embedded within the lamina). *Notopleura tapajozensis* further resembles *C. altsonii* and similar species in its remarkable stipular dimorphism and in having terminal inflorescences and a bipartite disk (the latter was not checked in *N. aneurophylla* and *N. aneurophyloides*). These characters are unusual in *Notopleura*, which has the disk usually entire and lateral inflorescences, although some epiphytic species may have terminal inflorescences. The generic placement of *N. tapajozensis* has been confirmed by a phylogenetic study (Bruniera 2015: figures 1, 2), where it was found in a basal position in *Notopleura* (although the species sampling is very incomplete). The difference between the paniculate inflorescences with minute bracts of *N. tapajozensis* and the involucrate heads of *C. altsonii*, *C. nivea*, and *C. sandwithiana* is great, but in other characters their resemblance is so clear that a close affinity of these taxa leaves little doubt. Furthermore, *N. aneurophylla* and *N. aneurophyloides* show an intermediate condition between *N. tapajozensis* and the three species with involucrate solitary heads, in having a tricapitate inflorescence with large bracts.

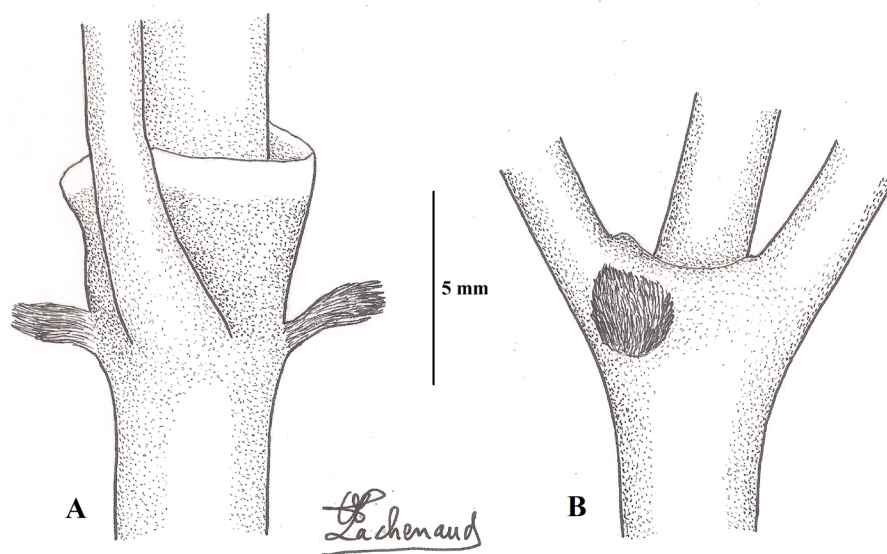
We therefore transfer *Carapichea altsonii*, *C. nivea*, and *C. sandwithiana* to *Notopleura*. New combinations are necessary for the first two names, while *N. sandwithiana* (Steierm.) C.M.Taylor is already available. These three species are placed in *Notopleura* subg. *Notopleura*, where the terrestrial species are grouped, while the epiphytic species are included in *N.* subg. *Viscagoga* (Baill.) C.M.Taylor (Taylor 2001).

## Revision of *Carapichea* in the Guianas

In the generic revision of Taylor and Gereau (2013), six species of *Carapichea* were recorded from the Guianas: *C. altsonii*, *C. guianensis*, *C. ligularis*, *C. nivea*, *C. tillettii*, and *C. urniformis*. As a result of our work, and despite the exclusion of *C. altsonii* and *C. nivea*, the number of *Carapichea* species in the Guianas has increased to eight. A ninth species, *C. araguariensis*, though not recorded from the Guianas to date, is expected to occur there and is consequently included in this revision.

New combinations are made for two species, *C. galbaoensis* and *C. squamelligera*, based on *Psychotria galbaoensis* Steierm. and *P. squamelligera* Steierm., respectively. The former species was so far treated as a synonym of *C. guianensis* (Delprete 2001, 2003; Taylor and Gereau 2013), which is here circumscribed in a narrower sense. The affinities of *P. squamelligera* were so far unclear and it is transferred to *Carapichea* due to its similarities with *C. galbaoensis* and *C. guianensis*. The first records of *C. adinantha* in French Guiana, which is a major range extension westwards, are documented. One species from Guyana is still imperfectly known and is treated here under the provisional name *C. sp. A*. Finally, the delimitation of *C. ligularis* is expanded to include *C. pacimonica* (Müll.Arg.) C.M.Taylor as a synonym.

The genus *Carapichea* now includes 22 species, plus an imperfectly known one. A closer study of *Carapichea* species in the Amazon basin, which is outside the scope of this paper, is likely to result in further taxonomic changes and novelties. In particular, it is likely that *C. franquevilleana* and *C. klugii* are synonymous; Taylor and Gereau (2013) already suggested this but provisionally kept them as distinct.



**Figure 1.** Stipular dimorphism in *Notopleura tapajozensis*. **A.** Vegetative node with a stipular sheath and a tuft of appendages on each side. **B.** Flower-bearing node with a tuft of appendages but no sheath. From Delprete & Benjamin 12849. Drawing by Olivier Lachenaud.

## TAXONOMIC TREATMENT

***Carapichea*** Aubl. (Aublet 1775: 167) [nom. rej. versus *Cephaelis* Sw. (Swartz 1788)]

*Chesnea* Scop. (Scopoli 1777: 119), nom. superfl. illeg. – Type species: *Carapichea guianensis* Aubl.

*Ipecacuanha* Arruda (in Koster 1816: 497), nom. nud. – Type species: *Ipecacuanha officinalis* Arruda, nom. illeg. [= *Carapichea ipecacuanha* (Brot.) L.Andersson]

*Nettlera* Raf. (Rafinesque 1838: 147), nom. superfl. illeg. – Type species: *Nettlera guianensis* (Aubl.) Raf. [= *Carapichea guianensis* Aubl.]

*Ipecacuana* Raf. (Rafinesque 1838: 147), orth. var. – Type species: *Ipecacuanha fusca* Raf. [= *Carapichea ipecacuanha* (Brot.) L.Andersson]

*Uragoga* L. ex Baill. (Baillon 1879: 324), nom. superfl. illeg. – Lectotype species (designated by Petit 1964: 16): *U. ipecacuanha* (Brot.) Baill. [= *Carapichea ipecacuanha* (Brot.) L.Andersson]

*Stachyococcus* Standl. (Standley 1936: 144) – Type species: *Stachyococcus adinanthus* (Standl.) Standl. [= *Carapichea adinantha* (Standl.) C.M.Taylor]

**Type species.** *Carapichea guianensis* Aubl.

**Description of the genus.** Subshrubs, shrubs, or small trees. Raphides present. Stipules interpetiolar, free or shortly connate at base, entire to bifid at apex, rarely multifid (*C. ipecacuanha*), lacking dorsal appendages, persistent on distal nodes, marcescent, and eventually falling off through fragmentation, leaving a well-developed scar or a persistent hardened basal portion. Leaves opposite, rarely ternate (*C. tillettii*), short- to long-petiolate; blades ovate, elliptic, obovate, oblong or narrowly elliptic, papyraceous to coriaceous; secondary veins strongly to weakly prominent; tertiary veins reticulate or subparallel; domatia absent, or present as a continuous line of pubescence along midrib. Inflorescence terminal, rarely pseudoaxillary, few- to many-flowered, variously capitate, subcapitate, spiciform, or thyrsoid and branched to 1 or 2 orders; bracts reduced to very large, free to variously connate, sometimes forming an involucre. Flowers bisexual, usually heterodistylous, protandrous, (4)5-merous. Hypanthium ovoid to obovoid. Calyx tube extremely reduced or cup-shaped, truncate, undulate or lobed, persistent, lobes (when present) small, broadly to narrowly triangular. Corolla tubular, funnellform to hypocrateriform, actinomorphic, white, yellow, orange, or salmon-pink, tube glabrous or pubescent inside; lobes valvate, oblong-ovate, margin entire, acute at apex, thickened or sometimes with horn-like extensions (*C. araguariensis*). Stamens included, partially exerted or well exerted beyond corolla mouth; filaments inserted at the basal (*C. urniformis*), median, or distal portion of the corolla tube, short, equal, glabrous; anthers narrowly elliptic or narrowly oblong or linear, round at base, round or apiculate at apex, dorsifixed near middle. Pollen

**Table 1.** Infrageneric groups in *Carapichea*. Species occurring in the Guianas are in **bold**.

Group	Species included
<i>Ipecacuanha</i> group	
	<i>C. ipecacuanha</i> (Brot.) L.Andersson
<i>Carapichea</i> group	
	<i>C. affinis</i> (Standl.) L.Andersson
	<i>C. dolichophylla</i> (Standl.) C.M.Taylor
	<i>C. fimbriiflora</i> (Steyerm.) C.M.Taylor
	<i>C. franquevilleana</i> (Müll.Arg.) C.M.Taylor
	<b><i>C. galbaoensis</i></b> (Steyerm.) O.Lachenaud & Delprete
	<b><i>C. guianensis</i></b> Aubl.
	<i>C. klugii</i> (Standl.) C.M.Taylor
	<i>C. maturacensis</i> (Steyerm.) C.M.Taylor
	<b><i>C. squamelligera</i></b> (Steyerm.) O.Lachenaud & Delprete
	<b><i>C. tillettii</i></b> (Steyerm.) C.M.Taylor
	<b><i>C. urniformis</i></b> (Steyerm.) C.M.Taylor
	<i>C. vasivensis</i> (Müll.Arg.) C.M.Taylor
<i>Ligularis</i> group	
	<i>C. araguariensis</i> (Steyerm.) C.M.Taylor
	<i>C. crebrinervia</i> (Standl.) C.M.Taylor
	<b><i>C. ligularis</i></b> (Rudge) Delprete (incl. <i>C. pacimonica</i> )
	<i>C. necopinata</i> (Standl.) C.M.Taylor
	<b><i>C. sp. A</i></b>
<i>Panurensis</i> group	
	<i>C. panurensis</i> (Müll.Arg.) C.M.Taylor
<i>Stachyococcus</i> group	
	<b><i>C. adinantha</i></b> (Standl.) C.M.Taylor
	<i>C. cardenasiana</i> C.M.Taylor
	<i>C. verrucosa</i> C.M.Taylor
Bahia group	
	<i>C. lucida</i> J.G.Jardim & Zappi

aperturate. Ovary 2-locular, placenta reduced. Ovules 1 per locule, basally inserted, erect. Disk usually bilobed to the base, sometimes undivided and cylindrical or laterally 5-sulcate (*C. adinantha*). Style included or partially exerted, glabrous; branches 2, oblong or linear. Fruits drupaceous, fleshy, variable in colour (yellow, orange-red, red, purple, maroon, blue, white or cream-white, or black at maturity) with 2 fibrous to woody pyrenes. Pyrenes vertical, plano-convex, ovate to elliptic in outline, dorsal side multi-costate, ventral side longitudinally sulcate or rarely flat.

**Morphological characters.** The main diagnostic characters of *Carapichea* are the marcescent stipules lacking dorsal appendages, lack of ethanol-soluble pigment in the seed testa, and aperturate pollen of a generalized form, corresponding to Types XIV and XVI of Johansson (1992). The genus is rather variable in inflorescence and pyrene characters, as described by

Taylor and Gereau (2013). Most species of *Carapichea* have a bipartite disk. This character was not emphasized by previous authors and is often not even mentioned in their descriptions, though it is well depicted on illustrations of *C. tillettii* (Steyermark 1972: 496, figure 70), *C. urniformis* (Steyermark 1972: 557, figure 74), and *C. vasivensis* and *C. pacimonica* (Steyermark 1974, figures 234, 240). Among species investigated for this character, the only exceptions are *C. cardenasiana*, *C. ipecacuanha*, and *C. panurensis*, which have an entire disk, and *C. adinantha*, which has an undivided, laterally 5-sulcate disk. We were not able to verify the shape of the disk in *C. fimbriiflora*, *C. lucida*, *C. maturacensis*, and *C. verrucosa*. Among related genera, bipartite disks also occur in some species of *Notopleura* (see above) and in two recently described species of *Rudgea* Salisb.: *R. glomerulata* Zappi & O.Lachenaud and *R. itoupensis* O.Lachenaud (Lachenaud et al. 2022).

#### Position within the tribe and delimitation of *Carapichea*.

*Carapichea* has been included in the *Palicourea* complex of the tribe Psychotrieae s.l. by Andersson (2002) and Lachenaud (2019). This complex has been treated as the tribe Palicoureeae by Robbrecht and Manen (2006), Razafimandimbison et al. (2014), and Taylor and Bruniera (2018), and includes *Carapichea*, *Chassalia* Comm. ex Poir., *Eumachia* DC. [= *Chazaliella* E.M.A.Petit & Verdc., *Margaritopsis* C.H.Wright], *Geophila* D.Don, *Hymenocoleus* Robbr., *Notopleura*, *Palicourea* Aubl. s.l., *Puffia* Razafim. & B.Bremer, and *Rudgea*. Phylogenetic studies strongly support the monophyly of *Carapichea*, albeit with limited sampling (Andersson 2002; Razafimandimbison et al. 2014; Bruniera 2015). The genus appears either as sister to *Eumachia* (Andersson 2002; Bruniera 2015; as *Margaritopsis*) or as sister to a

clade including *Eumachia*, *Chassalia*, *Geophila*, *Puffia*, and *Hymenocoleus* (Razafimandimbison et al. 2014) with low support in all cases.

**Distribution and ecology.** According to the present circumscription, *Carapichea* includes at least 22 species that are found mostly in the Amazon basin and the Guianas, with two species (*C. affinis* and *C. ipecacuanha*) extending to Central America, one (*C. ipecacuanha*) extending to the Cerrado Biome of Central Brazil, and a single species (*C. lucida*) endemic to the Atlantic Forest of Brazil. The species occur in lowland or lower montane forest habitats (up to 1570 m but mostly below 1000 m), either on drained or seasonally flooded soils. Eight species occur in the Guianas; a ninth one, *C. araguariensis*, is to be expected there and has been included in the treatment below.

**Infrageneric classification.** No infrageneric taxa are formally recognised in *Carapichea*, but the species may be arranged in six groups (Table 1), separable by characters in the key below, and largely based on those proposed by Taylor and Gereau (2013). We have usually kept the group names used by these authors, although their *Pacimonica* group is better called the *Ligularis* group now that *C. pacimonica* is a synonym of *C. ligularis*. Their *Altsonii* group is not maintained here, since, as discussed above, three of its species are transferred to *Notopleura*, while the last one, *C. urniformis*, is included in the *Carapichea* group of which it has all the key characters. Also transferred to the *Carapichea* group are *C. tillettii* (see Notes under this species) and *C. fimbriiflora*. The latter species, from Brazil, is very poorly known, but its leaf venation matches the *Carapichea* group, rather than the *Ligularis* group in which it was placed by Taylor and Gereau (2013).

#### Key to infrageneric groups in *Carapichea* (the Roman numerals in parentheses refer to the numbering of the groups by Taylor and Gereau 2013)

1. Stipules multifid, with 3–8 linear lobes; rhizomatous undershrubs; pyrenes longitudinally twisted; inflorescence capitate and involucrate ..... ***Ipecacuanha* group (I)**
- Stipules entire or bilobed (rarely minutely fimbriate at apex in *C. tillettii*); erect shrubs; pyrenes straight; inflorescence variable .. 2
2. Leaves with secondary and tertiary veins ± parallel and hardly distinct from each other ..... ***Ligularis* group (III)**
- Leaves with secondary veins much stronger than tertiaries, the latter either reticulate or invisible ..... 3
3. Secondary leaf veins forming conspicuous loops well before the margin; disk (when known) entire or crenate laterally, not bipartite; inflorescence glomerulate or spiciform (the ramifications < 5 mm long if present), with minute bracts ..... 4
- Secondary leaf veins curved towards the margin and almost reaching it; disk (when known) bipartite; inflorescence either broadly thyrsoid or capitate, the bracts usually well-developed ..... 5
4. Stipules keeled dorsally; inflorescence glabrous; corolla glabrous outside; fruits pedicellate, crowned with persistent calyx tube; pyrenes strongly costate dorsally; leaves acute to obtuse at apex, secondary veins rather weak ..... ***Panurensis* group (V)**
- Stipules not keeled; inflorescence puberulous; corolla (when known) puberulous outside; fruits sessile, not conspicuously crowned by the calyx; pyrenes smooth to verrucose dorsally, not ridged; leaves acuminate at apex, secondary veins very strong ..... ***Stachyococcus* group (VI)**
5. Stipules bifid with linear lobes; inflorescence capitate, surrounded with two large green bracts ..... ***Bahia* group (VII)**
- Stipules entire or bilobed, the lobes if present rather broad; inflorescence thyrsoid to capitate ..... ***Carapichea* group (II)**

Key to species of *Carapichea* in the Guianas

1. Leaves with secondary and intersecondary veins  $\pm$  parallel and hardly distinct from each other (Fig. 6B); corolla lobes often corniculate dorsally ..... 2
- Leaves with secondary veins thicker than tertiary veins; intersecondary veins absent; tertiary veins reticulate (Figs 3A, 5B); corolla lobes not corniculate (but sometimes with an internal appendage) ..... 4
2. Inflorescence with basal bracts inserted at the end of the peduncle; secondary branches absent or very short; corolla tube 6–9 mm long ..... *C. ligularis*
- Inflorescence basal bracts inserted at the end of the secondary branches, these always distinct; corolla tube 11–12 mm long (unknown in *C. sp. A*) ..... 3
3. Inflorescence with 3 glomerules; secondary branches 0.4–0.6 cm long ..... *C. sp. A*
- Inflorescence with 5–9(–13) glomerules (or shortly branched cymules); secondary branches 0.7–3.0 cm long ..... *C. araguariensis*
4. Inflorescence spiciform, with minute bracts; corolla puberulous outside, the lobes internally appendiculate (Fig. 2A); pyrenes ventrally flat and dorsally smooth; disk almost entire, 5-sulcate laterally; secondary veins arching far from the leaf margin ..... *C. adinantha*
- Inflorescence capitate or thyrsoid; corolla (unknown in *C. squamelligera*) glabrous outside, the lobes not appendiculate; pyrenes ventrally sulcate, usually costate dorsally; disk bipartite; secondary veins arching near the leaf margin (almost reaching it) ..... 5
5. Inflorescence thyrsoid, with reduced bracts 1–4 mm long; corolla tube 6.0–6.5 mm long ..... *C. tillettii*
- Inflorescence capitate, with bracts 12–90 mm long, forming an involucre; corolla tube 5–30 mm long (unknown in *C. squamelligera*) ..... 6
6. Bracts fused for most of their length into an urn-shaped involucre ..... *C. urniformis*
- Bracts free or shortly connate at base ..... 7
7. Bracts orange,  $\pm$  erect and not markedly unguiculate at base, the external pair 12–17 mm long; peduncle 4–6 cm long; pyrenes 11–14  $\times$  4–7 mm ..... *C. squamelligera*
- Bracts mostly green, obviously unguiculate at base, the external pair 19–44 mm long; peduncle 1–3 cm long; pyrenes 8–9  $\times$  3–4 mm ..... 8
8. Corolla tube 5–8 mm long, conspicuously widening in upper part; involucre bracts in two very unequal pairs, the external one 19–42  $\times$  3–10 mm, the internal one 5–20  $\times$  2–6 mm, both unguiculate at basal 4–6 mm; stipules 5–9 mm long ..... *C. guianensis*
- Corolla tube (15–)16–19 mm long, almost cylindrical; involucre bracts in two nearly equal pairs, the external one 27–44  $\times$  9–25 mm, the internal one 24–36  $\times$  5–15 mm, both unguiculate at basal 9–10 mm; stipules 2–5 mm long ..... *C. galbaensis*

1. *Carapichea adinantha* (Standl.) C.M. Taylor (Taylor and Gereau 2013: 123)

Fig. 2

*Retiniphyllum adinanthum* Standl. (Standley 1931: 355)

*Stachyococcus adinanthus* (Standl.) Standl. (Standley 1936: 144)

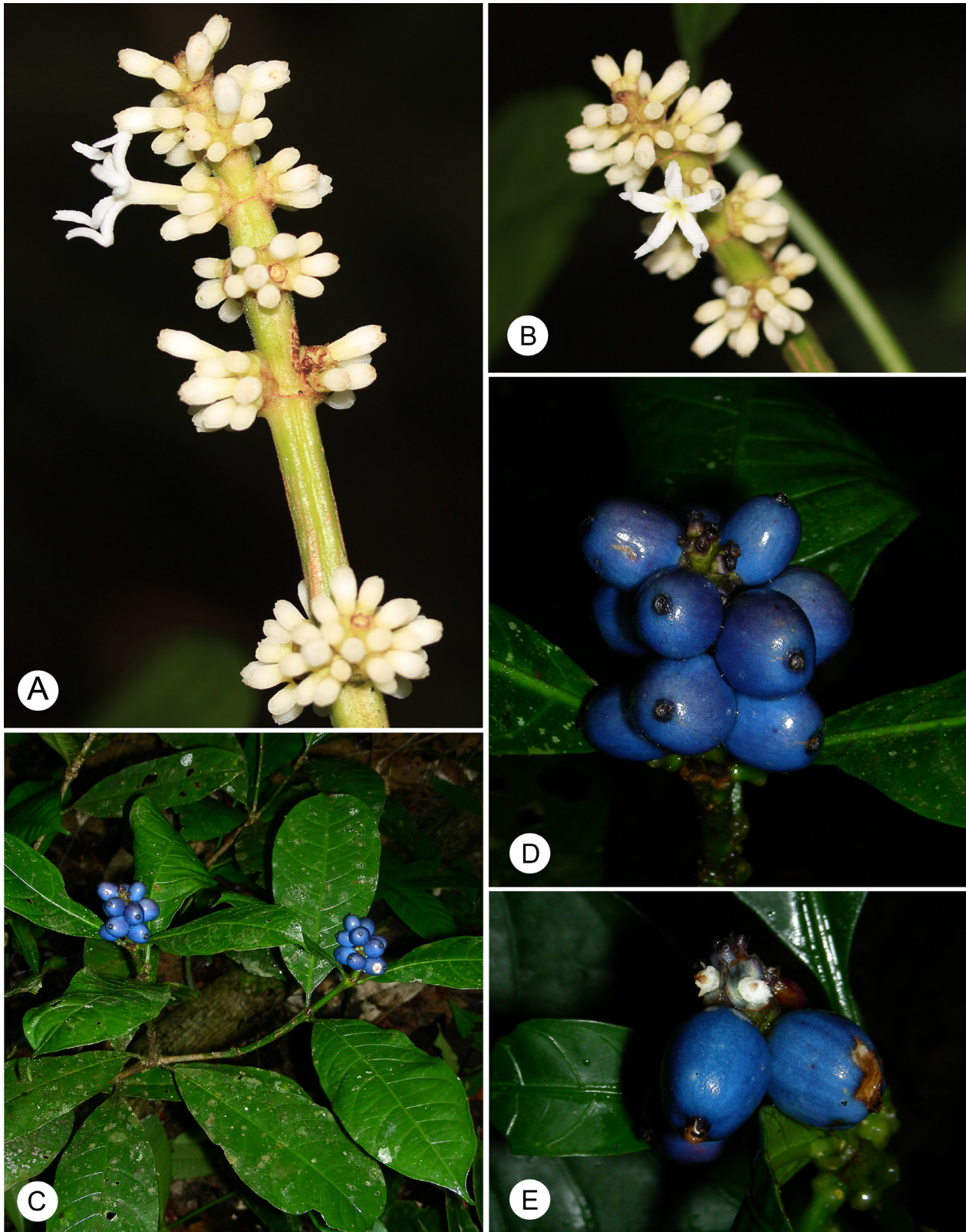
**Type.** PERU – Loreto • near Iquitos, Mishayacu; 100 m; Feb.–Mar. 1930; fl.; Klug 988; holotype: F [No. 612612]; isotypes: NY [00133128], US [0013820].

**Description.** Shrub or small tree up to 4 m tall, sparsely branched; terminal branchlets terete or slightly laterally compressed, 2.5–3.0 mm in diam., glabrous, soon covered with a greyish-beige thin bark. Stipules free, interpetiolar, 2–5 mm long, bifid at apex, each lobe deltoid to lanceolate, 1–2 mm wide at base, acute to acuminate, glabrous. Leaves with petioles 1.5–3.0 cm long, glabrous; blades elliptic, oblong-elliptic oblong-lanceolate, 19–34  $\times$  5.5–15 cm, acute at base, acuminate at apex, chartaceous to papyraceous when dry, entirely glabrous, drying olive-green; midrib and secondary veins slightly prominent on the upper side; secondary veins 9–12 on each side of the midrib, ascending and forming loops away from the margin; intersecondary veins 2–3 between each couple of secondary veins, terminating far from the margin; tertiary veins reticulate, sparse. Inflorescences terminal, erect, spiciform, 7–20 cm long, with (6–)7–9 multiflorous

glomerules, rachis minutely puberulous; peduncle 1.0–8.7 cm long; bracts subtending each glomerule shallowly ovate to broadly deltoid, 1–2 mm long. Flowers 5-merous, sessile (heterostylous?). Hypanthium glabrous or sparsely puberulous. Disk 5-sulcate laterally. Calyx cupuliform, 1.0–2.2 mm long, minutely puberulous, margin truncate, undulate or shallowly denticulate, ciliate. Corolla hypocrateriform, white; tube cylindrical, 4.5–7.0 mm long, 1.5–1.7 mm wide, granular-puberulous outside, glabrous inside; lobes imbricate, 3.5–4.5  $\times$  1.4–1.7 mm, reflexed at anthesis, internally appendiculate, granular-puberulous outside, glabrous inside; appendages linear, 1.5–2.0 mm long. Stamens inserted at 1.0–1.5 mm from base of corolla tube, included; filaments 1.1–1.3 mm long; anthers linear, 2.3–2.5  $\times$  0.2–0.3 mm. Style as long as corolla tube (branch tips barely exerted), ca 4.5–7.0 mm long, style branches linear, 1.3–1.5 mm long. Fruits drupaceous, fleshy, red to pink when immature (one collection reported as “white”), turning dark blue to black at maturity, interior spongy-white, ellipsoid to subglobose, 13–14  $\times$  9–10 mm when fresh, 7–16  $\times$  5–12 mm when dry, glabrous, sessile. Pyrenes 2, thin-walled, plano-convex, elliptic to narrowly elliptic in outline, 9–10  $\times$  7–8 mm, dorsal side smooth (i.e. without ridges), ventral side flat (without longitudinal furrow), with a pore with a raphal plug, sometimes with short basal marginal

slits. Seeds with a deep T-shaped ventral groove in cross-section.

**Distribution.** This species occurs sporadically in Amazonian Peru, Colombia, Brazil (Acre, Amapá, Amazonas, Pará, Rondônia), and French Guiana.



**Figure 2.** *Carapichea adinantha*. A–B. Detail of inflorescence with buds and one open flower. C. Fruiting plant. D. Inflorescence with mature fruits. E. Inflorescence with mature fruits, some eaten by birds. A–B from Gonzalez *et al.* 3281; C–E from Gonzalez 1368. Photographs by Sophie Gonzalez.



**Ecology.** In undercanopy of terra firme primary and secondary forest, often at river margins, on clay soil, at 100–200(–300) m in elevation.

**Specimens examined.** FRENCH GUIANA • Approuague River Basin, Rivière Kourouaï; 4°15'N, 52°01'W; 120 m; 9 Jul. 2008; fr.; *Gonzalez 1368*; BR, CAY, L, MO, NY, P, US • Monts Tumuc-Humac, Sommet en Cloche; 2°13'40"N, 54°28'10"W; 12 Mar. 2015; fl.; *Gonzalez 3281*; BR, CAY.

BRAZIL – **Acre** • Mun. Cruzeiro do Sul, Rio Branco, ca 25 km from Rio Juruá, secondary forest with canopy 30–35 m tall; 7°45'S, 72°17'W; 240 m; 22 Nov. 2001; fl.; *Delprete et al. 8045*; NY, UFACPZ, additional duplicates at UFACPZ to be distributed • Mun. Cruzeiro do Sul, road Cruzeiro do Sul–Rio Branco, road to Canela Fina, ca 7 km from 3-way junction at 5 km N of Cruzeiro do Sul; 7°32'44"S, 72°44'31"W; 220 m; 23 Nov. 2001; fl.; *Delprete et al. 8078*; NY, UFACPZ, additional duplicates at UFACPZ to be distributed. – **Amapá** • Parque Nacional Montanhas do Tumucumaque, cabeceiras do Rio Amapari, margem esquerdo do Rio Anacuí, trilha 1, floresta de terra firme; 6 Mar. 2006; fl.; *Hamada et al. 139*; INPA, MO n.v. – **Amazonas** • Distrito Agropecuário, Fazenda Porto Alegre, Reserva 3402 (Cabo Frio) of the WWF/INPA MCS project; 2°25'25"S, 59°54'38"W; 50–125 m; 1 Apr. 1989; fr.; *Aquino et al. 3*; INPA • Basin of Rio Juruá, near mouth of Rio Embira (tributary of Rio Tarauacá); 7°30'S, 70°15'W; 6 Jun. 1933; fr.; *Krukoff 4682*; K, M, MO • Basin of Rio Juruá, near mouth of Rio Embira; 17 Jun. 1933; fr.; *Krukoff 4900*; M, MO, NY, US. – **Pará** • Igarapé das Pedras, Cataractam Furnas, Rio Tapajóz; 30 Dec. 1917; fl.; *Ducke s.n. (MG 16859, RB 23125)*; B destroyed (photo at F), RB. – **Rondônia** • ca 4 km ENE along rd to São Sebastião off BR-364, terra firme forest; 24 May 1984; fr.; *Frame 160*; INPA, MO n.v., NY • Estrada Porto Velho–Cuiabá, BR-364, km 171, mata de terra firme; 6 Feb. 1983; fr.; *Freitas et al. 13*; INPA • Itapuã do Oeste, Floresta Nacional do Jamari, parcela convenio NYBG-RON; 9°15'6"S, 62°54'38"W; 23 Apr. 2015; fr.; *Medeiros et al. 1692*; MO n.v., NY, RON.

COLOMBIA – **Caquetá** • Araracuara, trocha Yari; 0°25'S, 72°20'W; 200 m; 23 Jan. 1989; fl.; *Gentry & Sánchez 65001*; COL, MO n.v.

PERU – **Loreto** • Maynas Prov., Dtto. Amazonas, Explornapo Camp, cerca de Sucusari, a lo largo del Río Napo; 3°20'S, 72°55'W; 100–140 m; 15 Feb. 1991; fl.; *Pipoly et al. 12979*; MO • Chacra Canamá, Requena; 7 Dec. 1962; fl.; *Schunke Vigo 6243*; K • Prov. Requena, Jenaro Herrera; 4°50'S, 73°45'W; 170 m; 5 Jul. 1981; fr.; *Vásquez et al. 2192*; MO • carretera Nauta–Iquitos km 5; 4°29'S, 73°35'W; 28 Mar. 1987; fr.; *Vásquez & Arevalo 8984*; P • Iquitos, Asociación Agraria Paujil; 4°10'S, 73°20'W; 2 Jul. 1988; fr.; *Vásquez & Jaramillo 10837*; P • Allpahuayo, Estación Experimental del Instituto de Investigaciones de la Amazonia Peruana; 2 Jun. 1990; fr.; *Vásquez & Jaramillo 14029*; P.

**Notes.** This species has recently been collected in French Guiana and the adjacent Brazilian state of Amapá, which represents a major eastern range extension. Although this

species is known from numerous specimens, most of them are fruiting and we were able to dissect only a few flowers. In these flowers, the stamens are inserted at 1.0–1.5 mm from base of corolla tube and are included, while the style is as long as the corolla tube, with the branch tips barely exerted. Though we have not seen a short-styled form, we suspect the species may be heterostylous, as many of its congeners.

2. *Carapichea araguariensis* (Steyerm.) C.M.Taylor (Taylor and Gereau 2013: 120)

*Psychotria araguariensis* Steyerm. (Steyermark 1972: 588)

**Type.** BRAZIL – **Amapá** • Araguari River, Camp 12; 1°11'N, 52°08'W; 30 Sep. 1961; fl.; *Murça Pires et al. 51371*; holotype: NY [00132598].

**Description.** Shrub, 0.5–1.0 m tall, or treelet 2–5 m tall, glabrous; terminal branchlets terete, 2–4 mm in diam., soon covered with a greyish bark. Stipules shortly sheathing, truncate to very broadly ovate, 1–4 × 4.0–5.5 mm, entire and obtuse at apex, glabrous, soon corky and fragmenting. Leaves with petioles 0.7–2.5 cm long, glabrous; blades elliptic, to oblong-oblancoelate, 11–25 × 3.5–7.5 cm, acute-decurrent at base, acute and acuminate at apex, acumen narrowly triangular, 0.5–1.5 cm long, subcoriaceous to coriaceous when fresh, drying papyraceous to subcoriaceous, grey-green to olive brown, glabrous throughout; secondary veins 13–25 on each side of midrib, weakly ascending and hardly more prominent than the intersecondary veins, arching at 0.5–1.0 mm from the margin; intersecondary veins (1–)2–3 between each couple of secondary veins, terminating far from the margin; tertiary veins obsolete; domatia absent. Inflorescence compact-paniculate at early stage, expanding and becoming obviously paniculate at later stage, many-flowered, pedunculate; peduncles 4.5–9.5 cm long, glabrous or with distal portion puberulous, drying olive green to pale brown; secondary branches verticillate, 2–4 per node, 0.7–3.0 cm long, glabrous to puberulous, terminating into cymules; outer branches of cymules with bracts; bracts 2–5 in each cymule, subequal to unequal, narrowly elliptic to linear, longer ones 7–17 × 1–2 mm, shorter ones 4.0–4.5 × 0.7–1.2 mm, persistent or tardily caducous, drying olive green to brown, glabrous. Flowers 5-merous, (heterostylous?), sessile or with pedicel < 0.5 mm long during anthesis, elongating to 1–5 mm long at fruiting stage. Hypanthium narrowly obovoid, 0.7–1.0 mm long, glabrous. Disk bilobed to the base, 0.5 mm long, glabrous. Calyx cupular, 0.7–1.3 mm long, truncate or minutely denticulate, glabrous. Corolla infundibuliform, 14.5–16 mm long, glabrous, white (“orange” according to *Pires et al. 51371*), tube narrowly obconical, 11–12 mm long, 1.5 mm wide at base, 3.5–4.0 mm wide at mouth, glabrous outside and inside; lobes lanceolate, 3.0–3.5 × 1.2–1.3 mm, acute at apex, glabrous, bearing dorsal linear cornicula 0.3–0.7 mm long. Stamens inserted just below the corolla mouth, filaments 0.5 mm long, anthers subsessile, half-exserted, narrowly oblong, 2.3–3.0 × 0.3–0.6 mm. Style glabrous, barely exerted, 14.5–16.5 mm

long. **Fruits** elliptic to ovoid, 6.5–10 × 5.5–8.5 mm, slightly costate when dry, green when young, orange or yellow at maturity. **Pyrenes** plano-convex, ellipsoid in outline, 6–9 × 4.5–5.5 mm, dorsal side with 3 prominent longitudinal ridges, ventral side with a shallow longitudinal groove. **Seeds** with a deep T-shaped ventral furrow.

**Distribution.** Only known from northern Brazil (Amapá, Pará, and Amazonas states); to be expected in French Guiana.

**Ecology.** In understory of moist, non-flooded forest, at 50–125 m elevation.

**Phenology.** The flowering type specimen from Amapá state was collected in September; in Amazonas state, flowering specimens were collected in February and March, and fruiting specimens in February and August.

**Selected specimens examined.** BRAZIL – Amazonas • Reserva Florestal Ducke, Estrada Manaus–Itacoatiara, km 26, floresta de campinarana; 2°53'S, 59°58'W; 13 Feb. 1996; fl., fr.; *Campos et al.* 481; INPA, MO, NY • Mun. Manaus, Distrito Agropecuário da SUFRAMA, Rod. BR-174, km 72, depois 6 km W da BR, Fazenda Dimona, mata de terra firme sobre latosolo amarelo; 2°19'S, 60°5'W; 50–125 m; 25 Mar. 1992; fl.; *Dick* 62; INPA • estrada Manaus–Caracará, km 125, igarapé da Lage, terra firme; 13 Feb. 1974; fr.; *Loureiro et al. s.n. (INPA 47925)*; INPA • *ibid.*, 14 Feb. 1974; fl.; *Loureiro et al. s.n. (INPA 47947)*; INPA • Distrito Agropecuário, Reserve 1501 (km 41) of the Smithsonian/INPA Biological Dynamics of Forest Fragments Project; 2°24'–2°25'S, 59°43'–59°45'W; 15 Jul. 1990; fr.; *Mori & Costa Lima Assunção* 21383; K • Reserva Florestal Ducke, Manaus–Itacoatiara km 26; 2°53'S, 9°58'W; 16 Jun. 1994; fr.; *Ribeiro & Assunção* 1325; K • Manaus, km 68 da Estrada Manaus–Itacoatiara, sub-bosque de terra firme; 19 Mar. 1963; fl.; *Rodrigues* 4985; INPA • Reserva Florestal Ducke, Estrada Manaus–Itacoatiara, km 26, floresta de baixo, solo arenoso; 2°53'S, 59°58'W; 3 Feb. 1995; fl.; *Vicentini et al.* 840; INPA, K, MG, MO, NY, U • *ibid.*, 31 May 1995; fr.; *Vicentini et al.* 984; K. – Pará • Mun. Anajas, opposite to town of Anajas, on Rio Anajas; 31 Oct. 1984; fl.; *Sobel et al.* 4943; MG, MO n.v.

**Notes.** No records of this species are known from the Guianas to date, but due to its occurrence in the Brazilian state of Amapá, it may well be found in adjacent French Guiana, and is therefore included in this treatment. *Carapichea araguariensis* resembles *C. ligularis* but has laxer inflorescences with the basal bracts inserted at the end of the secondary branches (vs at the end of the peduncle). The bracts are also usually smaller and more distinctly unequal than in *C. ligularis*, and the corolla tube is longer. This species also resembles *C. necopinata* from Brazil (Amazonas state), but the latter has an inflorescence with only three glomerules and outer bracts 20–25 mm long, while in *C. araguariensis* the inflorescence has at least five glomerules and outer bracts 7–17 mm long. See also the notes under *C. sp. A* below. Due to the rarity of flowering specimens, it is not known whether the flowers are heterostylous. In the few flowers that we analyzed, the stamens are included

and the style is barely exerted, which is consistent with a long-styled form.

3. *Carapichea galbaoensis* (Steyerm.) O.Lachenaud & Delprete, **comb. nov.**

urn:lsid:ipni.org:names:77302852-1

Figs 3, 4

*Psychotria galbaoensis* Steyerm., Brittonia 33: 387 (Steyermark 1981)

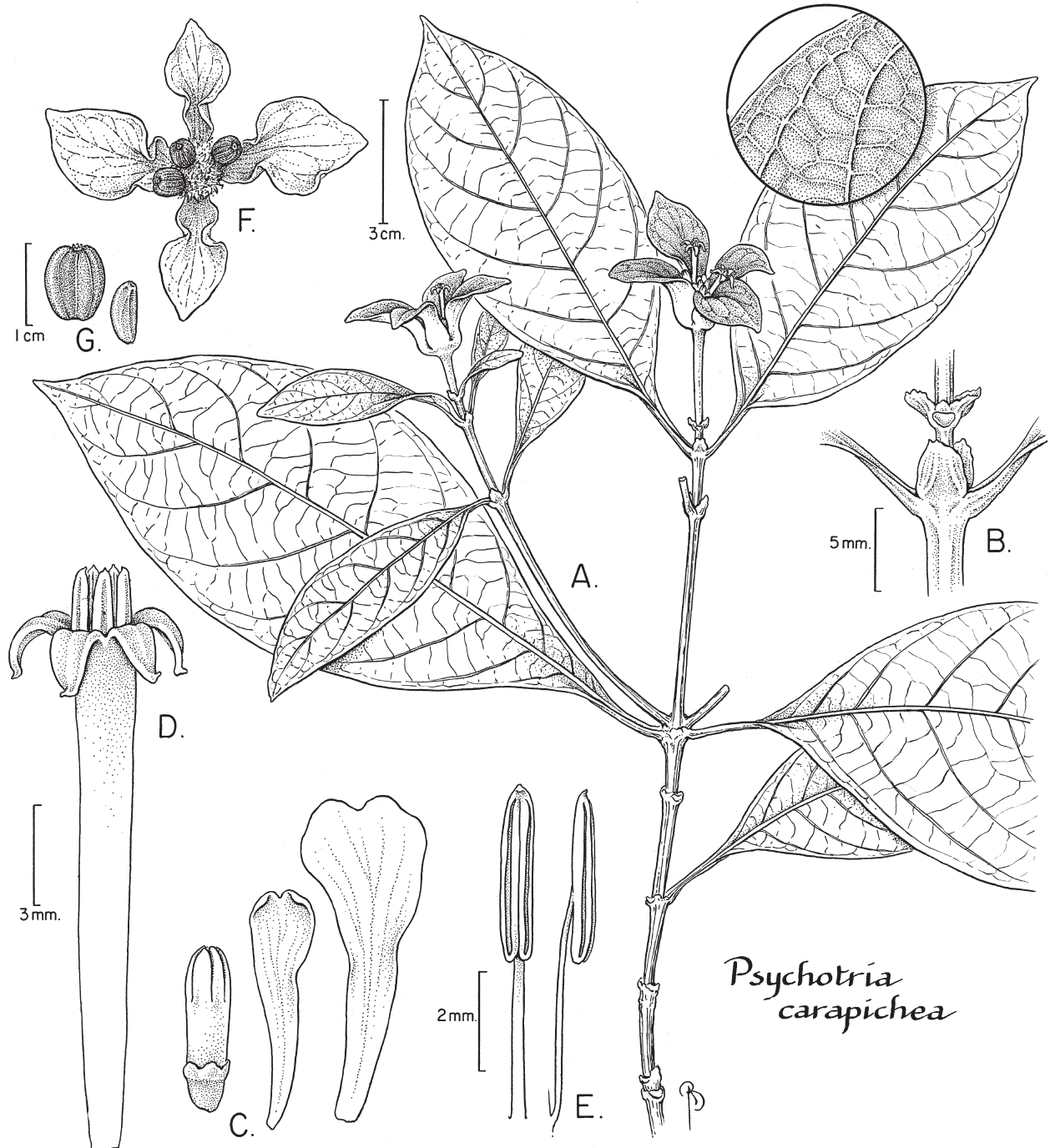
**Type.** FRENCH GUIANA • pente NE des Monts Galbao, à 10 km au SW de Saül; 500–600 m; 11 Mar. 1975; fl.; *Granville* 2383; holotype: VEN n.v.; isotype: CAY [CAY024926, CAY024927].

**Description.** **Shrub** 0.5–3.0 m tall, sparsely branched; **terminal branchlets** terete, 2.0–2.5 mm in diam., glabrous, soon covered with a pale grey corky bark. **Stipules** triangular, 2–5 × 1.2–4.5 mm, free, entire or shortly bilobed for < 0.5(–1) mm, glabrous outside, villose at the base inside, becoming corky and soon damaged. **Leaves** with petioles 0.6–2.5 cm, glabrous; blades elliptic or slightly oblanceolate, 11–22.5 × 3.5–7.2 cm, long-attenuate and decurrent on the petiole at base, acuminate at apex, subcoriaceous when fresh, papyraceous when dry, entirely glabrous, drying blackish or dark grey; midrib and secondary veins prominent on the upper side; secondary veins 7–10 on each side of the midrib, strongly ascending, arching near the margin (almost reaching it); with 2–3 subsecondary veins between each pair of secondary veins; tertiary veins reticulate, barely visible when fresh, prominent when dry. **Inflorescences** terminal, involucre heads, 14–20-flowered; peduncle 1–3 cm long, erect, glabrous; involucre whitish outside and dark green inside, very shortly connate basally, with two decussate pairs of bracts, both pairs with a basal stalk 8–11 × 7–10 mm; the outer pair 27–44 × 9–25 mm, with the medio-distal portion broadly ovate to ovate; the inner pair slightly smaller than the outer bracts, 24–36 × 5–15 mm, with the medio-distal portion broadly to narrowly ovate to lanceolate, acute to obtuse at apex; both pairs entirely glabrous, persistent at fruiting stage. **Interfloral bracts** much smaller than the involucral ones, narrowly elliptic, obovate to narrowly spatulate, obtuse at apex, gradually decreasing in size towards the center of the inflorescence, the largest ones 10–12 × 1.5–5 mm, glabrous, caducous or sometimes persistent at fruiting stage. **Flowers** 5-merous, heterostylous, sessile. **Hypanthium** obovoid, 1.0–1.3 × 0.7–0.8 mm, glabrous. **Disk** bilobed to the base, cylindrical, 0.7–1.0 mm long. **Calyx** shortly cupuliform, 0.3–0.4 mm long, truncate or shallowly denticulate, glabrous. **Corolla** hypocateriform, white; tube narrowly cylindrical, slightly wider at mouth, (15–)16–19 × 2.0–2.5 mm, glabrous outside, shortly pubescent at stamens insertion inside; lobes oblong-lanceolate, 2.0–3.5 × 1.0–1.2 mm, reflexed, acute at apex, glabrous throughout. **Short-styled flowers:** stamens inserted at distal 1/4<sup>th</sup> from the base of the tube; filaments ca 3 mm long; anthers with only the tips exerted, ca 3 × 0.3 mm; style included, ca 13

mm long; style branches 2, linear, ca 2 mm long. **Long-styled flowers:** stamens inserted just above the middle of the tube; anthers subsessile, fully included,  $2.0\text{--}2.4 \times 0.2$  mm; style just reaching the corolla mouth or exerted beyond the mouth, 16–17 mm long; style branches linear, 1.0–1.2 mm long. **Fruits** ellipsoid,  $8\text{--}10 \times 5.5\text{--}6.0$  mm when dry, orange to red, turning black at full maturity, glabrous, sessile. **Pyrenes** planoconvex, narrowly elliptic in outline,  $8\text{--}9 \times 3.5\text{--}4.0$  mm, dorsal side with 3–4 faint ridges, ventral side with a deep narrow excavation for the

whole length,  $\pm$  C-shaped in cross-section, opening by 4 dorso-basal slits running along the ridges. **Seeds** entire, C-shaped in cross-section.

**Distribution.** This species is found mostly in French Guiana, where it is locally frequent in the interior (occurring in most ranges of the Inini-Camopi chain, and in the Approuague basin north of the Nouragues Mountains) with a single record from the adjacent Brazilian state of Amapá.



**Figure 3.** *Carapichea galbaensis*. A. Stem with leaves, stipules, and inflorescences. B. Nodes with stipules. C. Flower bud and two floral bracts. D. Corolla at anthesis with partially exerted anthers, lateral view. E. Stamens, adaxial and lateral view. F. Infructescence surrounded by bracts, top view. G. Fruit (left) and seed (right). A–E from Mori & Pipoly 15511; F–G from Marshall & Rombold 102. Drawn by Bobbi Angell. Reproduced from Mori et al. (2002: figure 279) with permission.

**Ecology.** This species is locally frequent in the understory of terra firme rainforest, at 100–800 m elevation.

**Phenology.** This species flowers during the small dry season (March–early April) and produces fruits from mid-April to September.

**Specimens examined.** FRENCH GUIANA • Saül, layon blanc vers Limonade; 3°37'N, 53°12'E; 3 Aug. 1987; *Allorge 311*; P • Mont Bakra; 3°18'N, 52°57'W; 475 m; 16 Apr. 1993; fr.; *Cremers 13141*; CAY [2 sheets], U • Mont Chauve; 3°49'N, 52°44'W; 150 m; 16 Apr. 1997; *Cremers & Crozier 15010*; CAY • *ibid.*; 120 m; 21 Apr. 1997; fl.; *Cremers & Crozier 15134*; CAY • Saül, sur le layon vers La Fumée, 500 m avant le plateau La Douane; 3 Feb. 1981; imm. fr.; *Fournet 62*; CAY, P • Monts Galbao, à 10 km WNW de Saül; 10 May 1973; *Granville 1584*; CAY, COL, U • Saül, 1 km environ au S des Monts La Fumée; 6 Mar. 1975; fl.; *Granville 2354*; CAY • Saül, layon ORSTOM du plateau La Douane aux Monts La Fumée; 16 Jan. 1976; fl.; *Granville 2664*; CAY [2 sheets], P • Saül, antenne est La Fumée/Nouvelle France, pk 1.2; 5 Mar. 1977; fl.; *Granville 2806*; CAY • Sommet Tabulaire, versant sud;

500 m; 24 Aug. 1980; fr.; *Granville 3596*; CAY [2 sheets], P • Massif des Emerillons, zone sud; 250 m; 8 Sep. 1980; fr.; *Granville 3773*; CAY • tracé ORSTOM La Fumée, à 1,2 km environ au N du Plateau La Douane; 3 Apr. 1982; fl.; *Granville 5050*; CAY • env. 13 km SSW Saül, 2–3 km W of Crique Limonade, Montagne Périnette; 31 Mar. 1983; fl.; *Granville 5435*; CAY [2 sheets], P • Montagne Bellevue de l'Inini, zone centrale; 750–800 m; 23 Aug. 1985; fl., fr.; *Granville 7761*; CAY, INPA, MG, MO n.v., P, U • Station des Nouragues; 4°03'N, 52°42'W; 100 m; 6 Aug. 1989; fr.; *Granville et al. 11071*; CAY • Pic Coudreau, Monts Bakra; 3°18'N, 52°57'W; 710 m; 18 Apr. 1993; fl.; *Granville & Cremers 11788*; CAY • Monts Bakra, 1,5 km à l'ouest du Pic Coudreau; 3°18'N, 52°57'W; 520 m; 16 Jun. 2002; fr.; *Granville et al. 14804*; CAY • Saül, Monts La Fumée; 3°40'N, 53°10'W; 200–300 m; 26 Jul. 1987; fr.; *Hahn 3634*; CAY, U • Piste Sophie, Saül; 11 Sep. 1962; F. *Hallé 818*; P, U • Station des Nouragues; 4°03'N, 52°42'W; Jul. 1996; fr.; *Hequet 222*; CAY • Saül, Les Eaux Claires; 3°39'N, 53°12'W; 200–400 m; 5 Sep. 2000; fr.; *Junikka & Nieminen 3031*; CAY • Saül, Monts La Fumée; 17 Mar. 2014;



**Figure 4.** *Carapichea galbaoensis*. A. Inflorescence with open flowers, top view. B. Inflorescence with open flowers, side view. C. Flowering branch. D. Habit. A from plant not collected, Monts La Fumée, French Guiana; B–C from plant not collected, Mont Galbao, French Guiana; D from *Lachenaud 1689*. Photographs by Sébastien Sant (A–C) and Olivier Lachenaud (D).

Lachenaud 1689; BR, CAY • Montagne des Nouragues; 4°03'N, 52°42'W; Jun. 1989; fr.; *Larpin* 539; CAY [2 sheets] • Commune de Saül; 13 Jul. 1977; fr.; *Moretti* 752; CAY [2 sheets] • Saül, Monts La Fumée; 3°37'N 53°12'W; 200–400 m; 30 Aug. 1982; fr.; *Mori & Boom* 14803; CAY, NY • Saül, La Fumée Oeste; 3°37'N, 53°12'W; 200–400 m; 5 Apr. 1983; fl.; *Mori & Pipoly* 15511; CAY, NY • Saül, La Fumée Mountain; 3°37'N, 53°12'W; 200–350 m; 22 May 1986; fr.; *Mori & Pennington* 18097; CAY, P, U • Station des Nouragues; 4°03'N, 52°42'W; 20 Jul. 1989; fr.; *Sabatier & Prévost* 2547; CAY, U • Station des Nouragues, chemin ouest; 9 Mar. 1996; fl.; *Solano* K 282; CAY.

BRAZIL – Amapá • Near Cachoeira Macacoara; 0°53'N, 53°21'W; 27 Aug. 1961; fr.; *Egler & Irwin* 46695 [Irwin's collection number]; U, US.

**Notes.** *Carapichea galbaoensis* is closely related to *C. guianensis* and has been considered a synonym of the latter (Delprete 2001, 2003; Boom and Delprete 2002; Taylor and Gereau 2013) but is here reinstated as a distinct species. The two taxa are almost identical in vegetative characters (although *C. galbaoensis* has usually shorter stipules), fruits, pyrenes, and inflorescence structure, but the shape and dimensions of the involucre bracts differ, as well as the position of the stamens and style, and especially the length of the corolla tube, which is much longer in *C. galbaoensis*. Differences between them are summarised in Table 2 and illustrated in Figs 3, 5.

#### 4. *Carapichea guianensis* Aubl. (Aublet 1775: 168)

Fig. 5

*Callicocca guianensis* (Aubl.) J.F.Gmel. (Gmelin 1791: 372)

*Cephaelis involucreta* Willd. (Willdenow 1798: 979), nom. superfl.

*Tapogomea carapichea* Poir. (Poiret 1806: 587), nom. superfl.

*Carapichea aubletii* DC. (Candolle 1830: 536), nom. superfl.

*Uragoga guianensis* (Aubl.) Pulle (Pulle 1906: 446)

*Cephaelis guianensis* (Aubl.) Standl. (Standley 1929: 335)

*Psychotria ligularis* var. *carapichea* Steyermark (Steyermark 1972: 676)

*Psychotria carapichea* (Steyermark) Delprete (Delprete 2001: 401)

**Type.** FRENCH GUIANA • “ad ripam amnis Galibiensis” [margin of the Galibi Creek]; s.d. [Apr.–May 1763]; *Aublet* s.n.; lectotype: P-JJR [8:266], designated by Lanjouw and Uittien (1940: 149); isolectotype: BM [BM001009105]; see Delprete (2015).

**Description.** *Shrub* 0.4–1.5 m tall, sparsely branched; terminal branchlets terete, 1–2 mm in diam., glabrous, soon covered with a buff to pale grey corky bark. Stipules 5–9 × 1.5–3.0 mm, free, triangular to lanceolate, entire or shortly bifid for up to 3 mm, glabrous outside, villose at the base inside, becoming corky and soon damaged. Leaves with petioles 0.8–3.0 cm long, glabrous; blade elliptic,

10–18 × 3.3–7.5 cm, attenuate and decurrent on the petiole at base, narrowly acuminate at apex, rather thick when fresh (becoming papyraceous when dry), entirely glabrous, drying dark grey-green to blackish; midrib and secondary veins prominent on the upper side; secondary veins 6–9 on each side of the midrib, strongly ascending, curving towards the margin and almost reaching it; with 2–3 intersecondary veins between each pair of secondary veins; tertiary veins reticulate, rather inconspicuous in the fresh state, prominent when dry. Inflorescences in terminal involucre heads, few-flowered; peduncle 1–3 cm long, erect to patent, glabrous; involucre green on both sides, sometimes with a reddish-brown basal part, consisting of two very unequal decussate pairs of bracts shallowly connate at base, the outer pair 19–42 × 3–10 mm, the inner pair 5–20 × 2–6 mm, both pairs with a basal stalk 4–6 mm long (that of the inner pair much narrower) and the medio-distal portion narrowly ovate to lanceolate, acute to round at apex, glabrous, persistent at fruiting stage; interfloral bracts much smaller than the involucre ones, elliptic, obovate to spatulate, 4–6 × 0.8–3.0 mm, obtuse to truncate at apex, glabrous, persistent in the fruiting stage. Flowers 5-merous, heterostylous, sessile. Hypanthium obovoid, 1.0–1.2 × 0.7 mm, glabrous. Disk bilobed to the base, 0.5–0.6 mm long. Calyx shortly cupuliform, truncate or undulate, 0.2 mm long, glabrous. Corolla hypocrateriform, white; tube infundibuliform, 5–8 mm long, 0.8–1.0 mm wide at base, 2.6–3.7 mm at mouth, glabrous outside, shortly pubescent inside around the insertion of the stamens; lobes ovate to deltoid, 2–3 × 1.5–2 mm, reflexed, glabrous throughout. Short-styled flowers: stamens inserted at distal 1/3<sup>rd</sup> of the tube, exerted beyond corolla mouth; filaments ca 3 mm long; anthers 1.3–2.3 × 0.3–0.5 mm; style included, 5–6 mm long; style branches linear, 1.5–1.7 mm long. Long-styled flowers: stamens inserted at distal 1/3<sup>rd</sup> of the tube, included; anthers subsessile, oblong-elliptic 1.5–1.8 × 0.3–0.4 mm; style exerted well beyond the mouth, 8.5–10 mm long, style branches obovate, 0.7–1.3 mm long. Fruits ellipsoid, 7–9 × 5–7 mm when dry (8–10 × 5–8 mm when fresh), vermilion, turning black at maturity, glabrous, sessile. Pyrenes plano-convex, narrowly elliptic in outline, 9 × 3.0–3.5 mm, dorsal side with 4 hardly distinct ridges, ventral side with a deep narrow excavation for the whole length, ± C-shaped in cross-section, opening by 4 dorso-basal slits running along the ridges. Seeds entire, C-shaped in cross-section.

**Distribution.** Endemic to the Guiana Shield, occurring in French Guiana, Suriname, Guyana, and the contiguous Brazilian states of Amapá and Pará; locally common, but apparently absent from the range of *C. galbaoensis* (except on the Montagne Bellevue de l'Inini).

**Ecology.** Commonly encountered in mature terra firme rainforest, or sometimes in seasonally flooded forest, from near sea level to 600 m elevation.

**Phenology.** Flowering collections were made in January (once), March to early May (main flowering season), and



**Figure 5.** *Carapichea guianensis*. A. Habit. B. Detail of lower leaf surface. C. Inflorescence with long-styled flowers. D. Inflorescence with short-styled flowers. E. Inflorescence. A from plant not collected, Mont Itoupé, French Guiana; B–C from *Lachenaud 1725*; D from plant not collected, Camopi, French Guiana; E from plant not collected, Bellevue de Papaïchton, French Guiana. Photographs by Sébastien Sant (A, D–E) and Olivier Lachenaud (B–C).

**Table 2.** Diagnostic characters of *Carapichea galbaoensis*, *C. guianensis*, and *C. squamelligera*.

	<i>C. galbaoensis</i>	<i>C. guianensis</i>	<i>C. squamelligera</i>
<b>Stipules</b>	2–5 mm long	5–9 mm long	6–8 mm long
<b>Peduncle</b>	1–3 cm long, erect	1–3 cm long, erect to patent	4–5 cm long, apparently erect
<b>Involucre</b>	Two pairs of subequal bracts	Two pairs of very unequal bracts	Two pairs of unequal bracts
<b>Involucral bracts size</b>	Outer bracts 27–44 × 9–25 mm, inner bracts 24–36 × 5–15 mm	Outer bracts 19–42 × 3–10 mm, inner bracts 5–20 × 2–6 mm	Outer bracts 12–14 × 9–11 mm, inner bracts 11 × 2.5–4.0 mm
<b>Stalk of involucral bracts</b>	Stalk 8–10 mm long	Stalk 4–6 long	Not markedly stalked
<b>Bracts colour</b>	Green to white	Green (the base sometimes reddish-brown)	Orange
<b>Corolla tube length and shape</b>	17–19 mm long, almost cylindrical (slightly wider towards the mouth)	5–8 mm long, conspicuously wider towards the mouth	Flowers unknown
<b>Anthers position in short-styled flowers (style always included)</b>	Only tips exerted	Fully exerted	-
<b>Style position in long-styled flowers (anthers always included)</b>	Just reaching corolla mouth	Well exerted	-
<b>Pyrene dimensions</b>	8–9 × 3.5–4.0 mm	9 × 3.0–3.5 mm	11–14 × 4–7 mm

August (once). Fruiting specimens were collected from April to November.

**Local names.** This species is called *carapiche* (hence the generic name) by the Karipuna (“Garipons”; Aublet 1775) and *tapiiwapaà* by the Wayampi (Grenand 270).

**Specimens examined.** GUYANA • Rupununi District, Kuyuwini landing, Kuyuwini River; 2°05'N, 59°15'W; 10 Oct. 1992; fr.; Jansen-Jacobs *et al.* 2844; CAY, U.

SURINAME • Tumuc Humac Mountains, Talouakem, Litani River; 2°31'N, 54°45'W; 6 Aug. 1993; fr.; Acevedo-Rodriguez *et al.* 5924; CAY, U, US • Upper Litany River; 2°27'N, 54°48'W; 30 Jul. 1993; fr.; Granville *et al.* 11895; B n.v., BBS, CAY, MO n.v., P, U, US • Sipaliwini, vicinity of airstrip along Ulemari River, 71 km up Ulemari River from its confluence with Litani River; 3°6'17"N, 54°32'28"W; 150 m; 29 Apr. 1998; fr.; Hammel *et al.* 21736; MO n.v., U • Sipaliwini, 99 km up Ulemari River from its confluence with Litani River; 2°58'18"N, 54°33'14"W; 150 m; 8 Apr. 1998; fr.; Hammel *et al.* 21391; MO n.v., U • Lely Mts, SW Plateau; 27 Sep. 1975; fr.; Lindeman *et al.* 472; CAY, K, U • road Afobaka–Brownsweg, N of Brokopondo Lake; 10 Nov. 1974; Maas *et al.* 2335; U • flum. Saramacca sup.; Mar. 1903; Pulle 212; U • between Saramacca R. and Goliath Mt.; 9 Jun. 1956; J.P. Schulz 7702; U • opposite Gansee, right bank of Suriname R.; 12 May 1964; van Donselaar 1310; U • W bank of Marowijne Creek (= Gran Creek) near Gran Dam; 20 May 1966; van Donselaar 3435; U • Brokopondo District, W. of Brokobaka; 2 Nov. 1966; van Donselaar 3830; U • ad rivulum Palaime, flum. Sipaliwinin trib.; 2°8'N 56°12'W; 23 Feb. 1963; Wessels Boer 719; U • S of Tafelberg at the margin of Kappelsavanna; 10 Jun. 1963; Wessels Boer 1532; K, U.

FRENCH GUIANA • Crique Grand Laussat; 5°25'N, 53°37'W; 11 Jul. 2004; fr.; Barrabé 77; CAY, NY, P • RN2,

pk 50; 11 Jun. 1984; fr.; Feuillet 1405; B n.v., CAY, MO, P, U, US • Rivière Itany × Koulé-Koulé; 20 Jul. 1985; fr.; Feuillet 2480; CAY • *ibid.*; 21 Jul. 1985; fr.; Feuillet 2504; CAY, P • Montagne de l'Inini; 3°30'N 53°30'E; 9 Apr. 1986; fr.; Feuillet 3730; CAY, MO n.v., P • *ibid.*; 11 Apr. 1986; fr.; Feuillet 3843; CAY • Eastern Plateau of Montagne Tortue; 13 Jun. 1988; Feuillet 9974; K, U • Rivière Kourouaï, Bassin de l'Approuague; 4°15'N, 52°1'W; 120 m; 8 Jul. 2008; fr.; Gonzalez 1361; CAY • Mont Itupé-sommet tabulaire – 15, versant W, layon D; 3°1'45"N, 53°5'28"W; 600 m; 15 Mar. 2010; fr.; Gonzalez 2158; CAY, MO, P, US • forêt à 1 km du saut “S” sur la rive droite du [fleuve] Grand Inini; 18 Aug. 1970; fr.; Granville C-1; CAY, COL, P, U • Monts Atachi Bacca; 5 Mar. 1971; fl.; Granville C-125; CAY, P • rive gauche du [Fleuve] Yaroupi, un peu au-dessus de Saut Ouaimicouaré; 12 Apr. 1970; fl.; Granville 333; CAY [3 sheets], P, U • Crête des Monts Atachi Bacca; 5 Mar. 1971; fallen fl.; Granville 789; CAY, P • Route de Cacao à proximité de la Crique Boulanger; Mar. 1981; fl.; Granville 4428; CAY [2 sheets], P • Haute [Fleuve] Mana, lieu dit “Bellevue”, rive gauche; 18 Aug. 1981; fr.; Granville 4920; CAY • Sud de la Crique Martin, RN2, pk 22 environ; Apr. 1983; Granville 5559; fr. ; BR, CAY, P • Sud de la Crique Martin, RN2, pk 22 environ; Apr. 1983; Granville 5560; fl.; BR, CAY, P • Montagne de Kaw, versant nord à 2–3 km N de Camp Caïman; 1 Apr. 1984; fallen fl.; Granville 6710; BR, CAY, P, U • route de l'Est, à proximité de l'embranchement de la route de Cacao; 8 Apr. 1985; fl.; Granville 7256; CAY, P, U • Crique Gabaret, bassin de l'Oyapock, Saut Mérignan; 3°55'N, 51°48'W; 13 Apr. 1988; fl.; Granville 10279; CAY, P, U • Monts Atachi Bacca; 3°33'N, 53°55'W; 9 Jan. 1989; fl.; Granville *et al.* 10485; CAY, P, U • Camp Caïman, Montagne de Kaw; 4°32'N, 52°13'W; 11 Mar. 2004; fallen fl.; Granville &

*Bordenave* 15828; CAY, P • Trois-Sauts en face du village Zidock; 21 May 1974; fr.; *Grenand* 270; CAY • savane-roche [inselberg] Virginie; 6 Apr. 2014; *Lachenaud* 1725; BR, CAY, MO • route de Cacao juste avant la scierie; 4 May 2014; *Lachenaud* 1792; BR, CAY, MO • Relais de Patawa, on the Montagne de Kaw road; 9 May 2001; fl., fr.; *Mori et al.* 25351; CAY, NY • Fleuve Oyapock, chemin Maripa, layon ORSTOM du km 1 au km 2; 8 Jun. 1970; fr.; *Oldeman T-850*; CAY • Oyapock, rive française face à Mariaflor, station de jaugeage hydrologique ORSTOM; 19 May 1965; fr.; *Oldeman* 1290; CAY, COL, P, U • rive gauche du [Fleuve] Yaroupi, Saut Ouaimicouaré; 15 Apr. 1970; fl.; *Oldeman B-3082*; CAY • Rivière Grand Inini, au Saut Equerre; 18 Aug. 1970; fl.; *Oldeman B-3508*; CAY, P • Route de l'Est, km 53; 25 Aug. 1986; fr.; *Prévost* 2163; CAY [2 sheets], U • s.loc.; s.d. [1781–1785]; *L.C.M. Richard s.n.*; P • Abattis Cotica, sur le Maroni; 26 Aug. 1961; *Schnell* 11468; U.

BRAZIL – Amapá • Serra do Navio, Orebody slopes and trail to Serra do Viado; 16 Nov. 1954; fl.; *Cowan* 38335; K, NY, U, US • *ibid.*; 17 Nov. 1954; fl.; *Cowan* 38384; U • *ibid.*; fl.; *Cowan* 38416; U • immediately east of Colonia Agricola do Oiapoque, about 4 km N of mouth of Cricu River; 3°43'N, 51°55'W; 14 Aug. 1960; fl., imm. fr.; *Irwin et al.* 47516; F, IAN, K, NY [2 sheets]. – Pará • Rio Trombetas, 4 km S of Cachoeira Porteira; 6 Jun. 1974; fr.; *Campbell et al.* P22528 [Prance's collection number]; INPA, NY, U, US.

**Notes.** The chaotic taxonomic history of this species has been summarized in Delprete (2003). It has often been confused with *C. ligularis*. Steyermark (1972), in particular, reduced it to a variety of the latter (as *Psychotria ligularis* var. *carapichea*). It is very strange that he arrived to this conclusion, since *C. guianensis* and *C. ligularis* are quite different in leaf venation (reticulate in the former and parallel in the latter) and bract shape (narrower and lacking an unguiculate basal part in *C. ligularis*) (Figs 5, 6). Delprete (2001) showed that they represent separate species. Taylor and Gereau (2013), in their revision of the genus, also recognized the two species as distinct, and even placed them in different groups, chiefly on account of their strikingly different leaf venation. On the other hand, *C. guianensis* closely resembles *C. galbaoensis*, which was until now considered a synonym (Delprete 2001, 2003; Taylor and Gereau 2013) and is here re-established as a distinct species, and *C. squamelligera*. The three species are almost identical in vegetative characters, and their differences are summarised in Table 2 (see also Figs 3, 4). The dimensions of the involucre bracts are rather variable in *C. guianensis*. Two collections from French Guiana (*Feuillet* 3730 and 3843) have the bracts unusually broad, resembling *C. galbaoensis*, but their basal stalk is shorter than in the latter species, and the corolla is typical for *C. guianensis*. At the other extreme, *Wessels Boer* 719 from Suriname and *Schnell* 11468 from French Guiana have exceptionally narrow bracts, and also differ from the rest of the material in their shortly corniculate corolla lobes; they are provisionally referred to *C. guianensis* but might prove to be distinct.

5. *Carapichea ligularis* (Rudge) Delprete (Delprete 2003: 89)

Fig. 6

*Schradera ligularis* Rudge (Rudge 1806: 29, plate 45) – Type: same as for *Carapichea ligularis*.

*Cephaelis ligularis* (Rudge) A.Rich. ex DC. (Candolle 1830: 533) – Type: same as for *Carapichea ligularis*.

*Psychotria ligularis* (Rudge) Steyermark. (Steyermark 1972: 675) – Type: same as for *Carapichea ligularis*.

*Psychotria pacimonica* Müll.Arg., **syn. nov.** (Müller 1881: 337) – Type: VENEZUELA – Amazonas • “in regione superiore Rio Negro ad flumen Pacimoni”; Feb. 1854; fl.; *Spruce* 3445; lectotype (**designated here**): P [P00837131]; isolectotypes: G [G00300288], K [K000432842], W [1889-0014290].

*Uragoga pacimonica* (Müll.Arg.) Kuntze (Kuntze 1891: 961) – Type: same as for *Psychotria pacimonica*.

*Carapichea pacimonica* (Müll.Arg.) C.M.Taylor (Taylor and Gereau 2013: 120) – Type: same as for *Psychotria pacimonica*.

**Type.** FRENCH GUIANA [as “Guiana”] • s.loc.; s.d.; fl.; *Martin s.n.*; holotype: BM [BM001009103].

**Description.** Subshrub or shrub, 0.2–2(–4) m tall, single-stemmed or weakly branched (or rarely trees 7–10 m tall in the Brazilian and Venezuelan Amazon); terminal internodes terete, 2–3(–4) mm in diam., glabrous. Stipules shallowly sheathing, glabrous; sheath truncate to shallowly elliptic; lobes broadly triangular to broadly ovate, 2–5 mm long, persistent. Leaves with petioles 0.3–3.3 cm long, glabrous; blades elliptic, oblanceolate to narrowly oblong-elliptic, (4–)8.5–21 × (1.5–)2–6.5 cm, acute-decurrent at base, acute and long-acuminate at apex, acumen narrowly triangular, 0.5–2.5 cm long, sometimes falcate, papyraceous to coriaceous, drying pale olive-green to dark grey-green, glabrous throughout (except sometimes the domatia); secondary veins 14–26 on each side of the midrib; intersecondary veins 2–3(–4) between each couple of secondary veins, terminating far from the margin; tertiary veins barely visible or obsolete; domatia absent, or present as a row of hairs on each side of the midrib below. Inflorescence capitate to subcapitate (shortly branched, ramifications ≤ 0.5 cm when present); peduncle 1.5–7.0 cm long, glabrous to shortly pubescent; bracts inserted at distal end of peduncle and sometimes also on inflorescence axes, shallowly connate or free at base, (2–)4–8, usually decussate, narrowly lanceolate to linear, (7–)12–30 × (1–)2–4 mm, pale green or pale orange-green, glabrous, persistent. Flowers 5-merous, heterostylous, sessile to subsessile, the pedicels elongating to 2–5 mm long at fruiting stage. Hypanthium obovoid, 0.6–1.0 mm long, glabrous. Disk bilobed to the base, 0.5 mm long, shorter than or as long as the calyx. Calyx cupular, glabrous, tube 0.5–1.0 mm long, truncate or with short triangular lobes < 0.5 mm long. Corolla hypocrateriform, orange to salmon colored, 7.5–13(–14) mm long, glabrous; tube subcylindrical, gradually wider towards the mouth, 6–10.4(–11) mm long, 0.8–1.0 mm



wide at base, 1.5–1.6 mm wide at mouth, glabrous outside and inside; lobes oblong-ovate,  $2-4 \times 0.8-0.9$  mm, acute at apex, not corniculate, glabrous. **Short-styled flowers:** Stamens inserted at distal  $1/3^{\text{rd}}$  of the tube, anthers partially exerted beyond corolla mouth; filaments ca 0.3 mm long; anthers  $2.3-2.5 \times 0.5$  mm; style included, 3.5–4.0 mm

long; style branches narrowly oblong, 1.5 mm long. **Long-styled flowers:** stamens inserted at about the middle of the corolla tube, included; filaments 1.5 mm long, glabrous; anthers narrowly oblong,  $2.5 \times 0.3-0.4$  mm, acute at both ends; style exerted just beyond the corolla mouth, 12.5 mm long (corolla tube 10.5 mm long), style branches



**Figure 6.** *Carapichea ligularis*. A. Habit, with two inflorescences. B. Detail of lower leaf surface. C. Inflorescence with open flowers. D. Infructescence with immature fruits. A from plant not collected, Montagne des Gouffres, French Guiana; B from Lachenaud 1793; C–D from plants not collected, Saül region, French Guiana. Photographs by Sébastien Sant (A, C–D) and Olivier Lachenaud (B).

obovate, ca 1 mm long. **Fruits** ellipsoid to oblong-ovoid, 6–12 × 4–9 mm, smooth (slightly costate when dry), orange to orange-red. **Pyrenes** plano-convex, elliptic in outline, 7–9 × 3–5 mm, dorsal side with 3 ridges, ventral side with a very shallow longitudinal groove. **Seeds** with a deep T-shaped ventral furrow.

**Distribution.** This species occurs in southeastern Venezuela (state of Amazonas), French Guiana, and eastern Amazonian Brazil (states of Amapá, Pará, Roraima, and Amazonas). It is locally common, at least in French Guiana. It could be expected in Suriname and Guyana, but we have seen no collections of the species from these countries; the type specimen, reported to be from Guyana (Delprete 2001: 399; Taylor and Gereau 2013: 120) was actually collected in French Guiana (see Notes below).

**Ecology.** In understory of non-flooded forest, usually on superficial soils (e.g. lateritic crusts, granitic boulders) at 100–800 m elevation.

**Phenology.** Flowering specimens were collected from August to January; and fruiting specimens throughout the year.

**Selected specimens examined.** VENEZUELA – Amazonas • Cerro da Neblina, Río Yatua, along Upper Río Yatua between mouth of Río Yacibo and Piedra Araucaua; 1 Feb. 1954; fl.; *Maguire et al. 37411*; F, US. FRENCH GUIANA • Route de l'Est, ca 25 km NW of Régina; 4°23'N, 52°19'W; 16 Mar. 1994; fr.; *Andersson et al. 1989*; BR, CAY • Cacao; 27 Oct. 1983; fl.; *Billiet & Jadin 1877*; BR • Route RN2 Cayenne-Régina, pk 67, Crique Tibourou; 4°29'N, 52°19'W; 10 Feb. 1993; fr.; *Billiet & Jadin 5733*; BR • Extension Nord-Ouest des Petites Montagnes Tortue; 4°20'29"N, 52°16'16"W; 30 m; 29 Sep. 2010; fl., fr.; *Bordenave & Le Hir 9068*; CAY, K, P, MO • Montagne Tortue, Plateau Est; 4°17'N, 52°21'W; 460 m; 5 Oct. 2010; fl.; *Bordenave & Le Hir 9233*; CAY • Upper Maroni River, layon de chasse au NE d'Antecume Pata, confluent de l'Itany et du Marouini; 19 Nov. 1977; fl.; *Cremers 5077*; CAY • Saül, piste du carbet; 31 Oct. 1984; fl.; *Foresta 705*; CAY • Monts Atachi Bacca, autour du Camp 3, entre les sommets 525 et 782 m; ca 400 m; 5 Mar. 1971; fr.; *Granville C-128*; CAY [2 sheets], P • Monts Atachi Bacca; 3 Mar. 1971; fr.; *Granville 752*; P • Rivière Petite Ouaiqui, rive droite, au niveau de l'ancien village Hubert; 20 Jul. 1973; fr.; *Granville 1872*; CAY, P • Sommet Tabulaire, zone nord; 2 Sep. 1980; fr.; *Granville 3710*; P • Monts Bakra, 2,5 km à l'ouest du Pic Coudreau; 2 Oct. 1980; fr.; *Granville 4065*; CAY, P • Mont Bellevue de l'Inini, central zone, slope near the summit; 23 Aug. 1985; fr.; *Granville 7762*; CAY, F, INPA, MG, MO, NY, P, U • Région de l'Inini, Mount Atachi Bacca, NW summit, 6 km E of Gobaya Soula, near Camp 2; 10 Jan. 1989; fl.; *Granville et al. 10541*; CAY, MO n.v., P, U • Montagne de la Trinité, Bassin de la Mana, partie supérieure de la pente N du plateau tabulaire; 13 Mar. 1997; fr.; *Granville 13318*; CAY, K, MO, P, U, US • Montagne Lucifer, SW du plateau sommital; 4°46'30", 53°56'30"W; 520 m; 18 Nov. 1999; fr.; *Granville & Crozier 13869*; CAY, MO • Monts Bakra, 1.5 km W du

Pic Coudreau; 3°18'N, 52°57'W; 600 m; 18 Jun. 2002; fr.; *Granville et al. 14864*; B, CAY, MO, P • Monts Kotika, plateau latéritique sommital; 3°55'10"N, 54°11'10"W; 730 m; 23 Feb. 2005; fr.; *Granville et al. 16922*; B, CAY, MO, NY, P, U • Route Cayenne-Régina, km 52; 4°34.638'N, 52°23.873'W; 9 Jan. 2011; fr.; *Lachenaud 1074*; BR, CAY • route de Cacao; 4 May 2014; fr.; *Lachenaud 1793*; BR, CAY • Mont Itoupé, Sommet Tabulaire, Layon D, 2me sommet; 3°02'35"N, 53°05'18"W; 760 m; 31 Mar. 2010; fr.; *Molino & Sabatier 2843*; BR, CAY, MO • Montagnes de la Trinité; 4°36'30"N, 53°21'30"W; 12 July 2001; fl. buds, fr.; *Poncy & Crozier 1458*; CAY, NY, P, U, US • RN2 – Cayenne-Régina, km 85.5; 4°20'N, 52°18'W; 26 Jun. 2003; fl., fr.; *Prévost & Sabatier 4742*; CAY, MO • Rivière Itany, Crique Petit Marouini, près de son embouchure; 2 Sep. 1972; fr.; *Sastre 1814*; P.

BRAZIL – Amapá • Upper Jari River, forêt primaire humide; 2°28'N, 54°46'W; 420 m; 20 Aug. 1993; fl.; *Granville et al. 12387*; BBS, CAY [2 sheets], US. – Amazonas • Rio Curicuriari, afl. do Rio Negro; 21 Dec. 1931; fl.; *Ducke s.n.*; INPA [No. 16533] • Nova Prainha, Rio Aripuanã, RADAM/BRASIL, SB-20-ZD, Ponto 10; 9 Jul. 1976; fr.; *C.D.A. Mota s.n.*; INPA [No. 60607] • Mun. Nova Olinda, Rio Paca, tributari of the Rio Mari Mari, terra firme forest, tree to 7 m tall; 2 Jul. 1983; fr.; *Todzia et al. 2299*; INPA, MO, NY, US • Mun. Axinim, basin of Rio Abacaxis, lower Rio Paca, ca 1 km from its confluence with Rio Mari Mari, forest on terra firme, shrub 2 m tall; 4°07'S, 58°58'W; 1 Jul 1983; fr.; *Zarucchi et al. 2917*; INPA, MO, NY. – Pará • Ilha de Marajó, Rio Jipurú, aflente do Rio Anajas; 20 Oct. 1987; fl.; *A. Tavares & J. Cardoso 227*; INPA, NY. – Roraima • Mun. Rorainópolis, Reserva Popular Xixuaú-Xiparina, ilha subindo o Rio Xipariná; 0°55'41"S, 61°50'26"W; 25 Aug. 2010; fl, young fr.; *Zappi et al. 2902*; INPA, MIRR.

**Notes.** This species has often been confused with *C. guianensis* (see Notes under that name) but is very different in leaf venation and bract shape (Delprete 2001; Figs 5, 6). It is much more similar to *C. araguariensis* and *C. sp. A*, from which it differs by the characters mentioned in the key.

Delprete (2001: 401) separated *Carapichea ligularis* from *C. pacimonica* by the lower habit, being a small, single-stemmed shrub 0.5–1.5 m tall (vs shrub up to 2 m tall or tree up to 10 m tall), the presence of corniculate appendages on the abaxial side of the corolla lobes (vs appendages absent), the subcapitate to sparsely cymose inflorescences (vs capitate), and the larger ovoid fruits (vs smaller, subspherical fruits). None of these characters proves to be reliable: the variation in habit and fruit seems to be continuous, the corolla appendages are commonly present in flower buds and usually fall off during or shortly after anthesis or during the preparation of herbarium specimens (Piero Delprete pers. obs.) and the inflorescences are usually capitate or nearly so at anthesis and often develop short ramifications in the fruiting stage. Taylor and Gereau (2013: 114) also kept the two species separate, based on other characters:

“outermost inflorescence bracts at base straight-sided and not sheathing; plants often drying with a gray cast” in *C. ligularis* vs “outermost inflorescence bracts at base widened and shortly sheathing; plants often drying yellowish brown” in *C. pacimonica*. After a detailed study of numerous specimens throughout the geographic range, we observed that the inflorescence bracts can be shallowly sheathing or free at base in duplicate specimens of the same collection, and the colour of the dry plants may vary from greyish to olive green to pale brown to dark brown (possibly depending on the drying method). Taking into account all the above observations, we treat these two names as synonyms.

Steyermark (1972: 589) regarded *Psychotria necopinata* Standl. as a synonym of *P. pacimonica*, but we follow Taylor and Gereau (2013) in recognizing the former as a distinct species, *Carapichea necopinata*, which is only known from the type and not recorded from the Guianas to date.

The typification of *C. ligularis* has been a source of confusion. In his original description, Rudge (1806: 29, pl. 45) did not cite any gathering. Delprete (2001: 399) designated the lectotype as “Guyana, Rudge s.n. (P)”, which was followed by Taylor and Gereau (2013: 120). However, this lectotypification is erroneous since no such specimen exists at P, and Rudge never travelled to South America; the material that he used to describe the taxa in his *Plantarum Guianae Rariorum Icones et Descriptiones* was in fact collected by Joseph Martin in French Guiana. The fate of Martin’s specimens was described by Stearn and Williams (1957), and summarized by Stafleu and Cowan (1983: 971–972). Succinctly, in 1803, France and England were at war, and the specimens collected by Joseph Martin in French Guiana, originally intended for the Museum of Natural History of Paris, were confiscated by two British privateers and brought to London. About 400 of these specimens were bought by the British Museum (BM), and 772 were bought by Rudge and included in his own herbarium (Stafleu and Cowan 1983: 971–972). Also, Rudge gave a partial set of these specimens to Banks, whose herbarium became the founding collection of BM. After Rudge’s death, his widow donated his herbarium to BM in 1847. Therefore, most of Martin’s collections converged at BM, although some of his specimens are also reported to be at FI or FI-Webb (Stafleu and Cowan 1983: 971–972). These specimens have the penciled information “Guiana. Martin”, which may give the false impression that they were collected in modern day Guyana, while they actually came from French Guiana. After an exhaustive search for original material of *S. ligularis*, we were unable to find any specimen at FI and FI-Webb. However, a specimen with the indication “Guiana, Martin” penciled on the upper corner of the sheet, exists at BM [BM001009103], and being the sole original material, should be regarded as the holotype.

Müller (1881: 338), in the original description of *Psychotria pacimonica*, cited a single gathering, *Spruce 3445*, but he did not indicate the herbarium of deposit. Taylor and Gereau (2013: 120) assumed that the holotype

is in M, but no specimen of *Spruce 3445* was found there after an exhaustive search (Andreas Fleischmann pers. comm.). Specimens with this collection number are found in G, K, P, and W; the P sheet, which is the only one with open flowers, and has a label handwritten by Müller, is here designated as lectotype.

The photograph of the fruits published by Campos and Brito (1999: 627) as *Psychotria pacimonica* appears to represent another species, probably not a *Carapichea*.

## 6. *Carapichea* sp. A.

**Description.** Shrub, up to 1 m tall, glabrous; terminal internodes terete, 3–4 mm in diam. Stipular sheath truncate to shallowly ovate, 2–4.5 mm long, glabrous, persistent. Leaves with petioles 1.6–2.7 cm long, glabrous; blades narrowly oblong-elliptic, oblong-lanceolate to oblong-ob lanceolate, 15–25 × 3.5–6.5 cm, acute-decurrent at base, acute and acuminate at apex, acumen narrowly triangular, 1.2–1.3 cm long, drying papery and brown, glabrous throughout; secondary veins 17–22 on each side of midrib, with 2–3 intersecondary veins between each pair of secondary veins; tertiary venation reticulate; domatia absent. Inflorescence terminal, long-pedunculate, distally short-trichotomous, peduncle 8.2–8.5 cm long, glabrous, drying brown; branches 4–6 mm long, thick-fleshy, puberulous, terminating into cymules; each cymule subtended by 1–2 bracts; bracts unequal within each cymule, narrowly lanceolate to narrowly oblong-lanceolate, the longer ones 14 × 5.2 mm, the shorter ones 4.0 × 2.6 mm, persistent, drying brown. Hypanthium narrowly obovoid, 2.5 mm long. Calyx cupular, 0.7 mm long, undulate, glabrous. Corolla unknown (fallen off). Style 4 mm long, lobes narrowly elliptic (after corolla has fallen off). Fruits unknown.

**Distribution.** Only known by two gatherings from the Kamoia Mountains, Guyana.

**Ecology.** Understorey of dense forest on brown sand with rocky outcrops, at 240–400 m elevation.

**Phenology.** The two flowering collections were collected in November.

**Specimens examined.** GUYANA • Upper Takutu-Upper Essequibo Region, Kamoia Mountains, 0–2 km N of camp on Kamoia River; 1°31’N, 58°49’W; 240 m; 11 Nov. 1996; fl.; *Clarke 3081*; MO, US • Upper Takutu-Upper Essequibo Region, Kamoia Mountains, 1.5 km S of Kamoia River; 1°31’N, 58°49’W; 400 m; 12 Nov. 1996; fl.; *Clarke 3136*; MO, US.

**Notes.** This probably new taxon is only known from two gatherings, both of which have inflorescences but no corollas left (one specimen still has a fully elongated style) and no fruits. It closely resembles *C. araguariensis* and *C. necopinata*, both of which are so far only known from Brazil. The differences with the former species are indicated in the key. From the latter species, which is still only known from the type (Taylor and Gereau 2013: 120), it may be separated by its smaller bracts (the largest ones up to 14 mm long vs 20–25 mm long in *C. necopinata*),

longer inflorescence peduncle (8.2–8.5 cm long vs 5.0–5.5 cm long), shorter calyx (0.7 mm long vs 1.5–2.0 mm long) and leaves with 17–22 (vs 22–24) secondary veins on each side of the midrib. With so little material, it is difficult to assess the significance of these characters, and better collections are required to establish the identity of this taxon.

7. *Carapichea squamelligera* (Steyerm.) O.Lachenaud & Delprete, **comb. nov.**

urn:lsid:ipni.org:names:77302853-1

*Psychotria squamelligera* Steyerm., Brittonia 36: 156 (Steyermark 1984)

**Type.** FRENCH GUIANA • sur la rivière Comté, en forêt sur la Montagne Soufflet; 12 Jun. 1975; fr.; *Granville B-5288*; holotype: VEN [No. 289722]; isotypes: CAY n.v., P [P06800571]

**Description.** Shrub up to 1.5 m tall, branched; terminal branchlets terete, 1.5–2.5 mm in diam., glabrous, soon covered with a greyish-brown corky bark. Stipules free, narrowly triangular to lanceolate, 6–8 × 1.5–4.0 mm, entire, glabrous outside, villose at the base inside, becoming corky and soon damaged. Leaves with petioles 0.5–1.4 cm, glabrous; lamina elliptic, 8–18.5 × 1.8–6.7 cm, attenuate and decurrent on the petiole at base, acuminate at apex, slightly coriaceous when dry, entirely glabrous, drying dark brown or dark olive-green; midrib and secondary veins prominent on the upper side; secondary veins 6–9 on each side of the midrib, strongly ascending, curving towards the margin and almost reaching it; 2–3 intersecondary veins between each pair of secondary veins; tertiary veins reticulate, dense and conspicuous in the dry state. Inflorescences terminal, apparently erect, in involucre heads, few-flowered; peduncle 4–5 cm long, glabrous; involucre orange, consisting of two unequal, decussate pairs of almost free bracts, the outer pair broadly obovate, 12–17 × 9–12 mm, the inner pair narrowly elliptic, 11 × 2.5–4.0 mm, both pairs erect, obtuse at apex, entirely glabrous, persistent in the fruiting stage; interfloral bracts numerous and much narrower than the involucre ones, linear, acute, ca 9 × 0.5 mm, glabrous, persistent in the fruiting stage. Flowers unknown. Calyx (in fruit) shortly cupuliform, truncate, ca 1 mm long, glabrous, persistent on fruit. Disk bilobed to the base, ca 1 mm long. Fruits narrowly ovoid, 12 × 5 mm when dry, glabrous, sessile. Pyrenes plano-convex, narrowly elliptic to oblong in outline, 11–14 × 4–7 mm, acute at apex, dorsal side nearly smooth with 3 very vague indications of ridges, ventral side with a deep longitudinal narrow excavation, ± C-shaped in cross-section, opening by 3 dorso-basal slits running along the ridges. Seeds entire, C-shaped in cross-section.

**Distribution.** Endemic to northeastern French Guiana, only known from the type specimen collected on Montagne Soufflet.

**Ecology.** The type label only reports that the specimen was collected in forest, without indicating the elevation.

**Phenology.** The only known specimen, with fruits, was collected in June.

**Notes.** This species is only known from the fruiting type specimen. Presumably due to the incompleteness of the material, Steyermark (1984) noted that its immediate relationships were not evident. However, it closely resembles *C. guianensis* and *C. galbaensis* in the marcescent stipules and in the shape, texture, and venation of the leaves – the three species being virtually indistinguishable in vegetative state – as well as in the shape and mode of opening of the pyrenes. The three species also share inflorescences with two pairs of involucre bracts – although Steyermark (1984) described and illustrated only one pair of involucre bracts in *C. squamelligera*, two pairs are actually present – and the flowers are surrounded by numerous bracteoles. They can be separated by the characters summarized in Table 2. The above description is mostly based on the P isotype; the holotype in VEN was seen as a photograph only, and an isotype from CAY cited in the original description was sent on loan to VEN in 1981 but has not been returned.

8. *Carapichea tillettii* (Steyerm.) C.M.Taylor (Taylor and Gereau 2013: 123)

*Psychotria tillettii* Steyerm. (Steyermark 1972: 496, figure 70)

**Type.** GUYANA • Upper Mazaruni River basin, Partang River, ridge of Merumé Mountains; 1140 m; 1 Jul. 1960; fr.; S.S. Tillett *et al.* 43946; holotype: NY [0013844], isotypes: COL [COL000004671], F [No. 1704833, 1704834], K [K000432817, K000432818], NY [0013845], P [P02428007], US [00131318, 00146632], VEN [No. 82283].

**Description.** Shrub or treelet 1–3 m tall; terminal branchlets terete to slightly quadrangular, 4.0–5.5 mm in diam., glabrous, soon covered with a buff corky bark. Stipules shallowly sheathing at base, 3.5–8.0 × 5 mm, broadly ovate, glabrous, bilobed or irregularly fimbriate at apex, with lobes 1–5 mm long, soon corky and marcescent. Leaves opposite or ternate; petioles 1.5–3.0 cm long, glabrous; blades narrowly elliptic or oblong-elliptic, 14–25 × 5–10 cm, acute to decurrent at base, acute and long-acuminate at apex, acumen narrowly triangular to linear, 1.0–2.5 cm long, coriaceous, drying olive green above and yellowish green below, glabrous throughout; primary and secondary veins prominent on both sides; secondary veins 8–12 on each side of midrib, curving towards the margin and almost reaching it; tertiary venation densely and prominently reticulate in the dry state; domatia absent. Inflorescence thyrsoid, rather narrowly pyramidal, long-pedunculate (expanded at fruiting stage); peduncles 7.5–12.5 cm long, glabrous, drying brown; secondary branches whorled, 3–5 per node, spreading, 0.4–2.0 cm long (0.8–4.0 cm at fruiting stage), glabrous except fringes of hairs at nodes, terminating into cymules; cymules with 15–22 flowers; bracts 4–5 around each cymule, ovate to triangular, 1–4 × 0.7–2.0 mm, obtuse to rounded at apex, slightly concave, persistent, drying brown, glabrous except a row of

hairs at the base inside. **Flowers** 5-merous, heterostylous, sessile. **Hypanthium** narrowly obovoid, 0.5–1.0 mm long, glabrous. **Disk** bilobed to the base, ca 1 mm long. **Calyx** cupular, 0.7–1.0 mm long, truncate or minutely denticulate, glabrous. **Corolla** hypocrateriform, 8–10 mm long, white, greenish-white or brownish-white; tube narrowly obconical to almost cylindrical, 6.0–6.5 mm long, 1.0–1.5 mm wide at base, 1.5–4.0 mm wide at mouth, glabrous outside, pubescent in distal portion inside; lobes lanceolate to triangular, 1.5–3.5 × 1.0–1.3 mm, acute at apex, glabrous. **Short-styled flowers**: stamens exerted, filaments 2.5 mm long, anthers narrowly oblong, 1.8 mm long; style included, 2.5 mm long, glabrous. **Long-styled flowers**: stamens included; style exerted, 8 mm long, shortly bifid, glabrous. **Fruits** ellipsoid to ovoid or subglobose, 7–10 × 5–8 mm, costate when dry, dark red or maroon (probably when immature) to purplish-black. **Pyrenes** plano-convex, elliptic to oblong in outline, 6–9 × 4.5–6.0 mm, dorsal side 3–4-costate, ventral side longitudinally sulcate. **Seeds** entire, C-shaped in cross-section.

**Distribution.** Endemic to western Guyana, Potaro-Siparuni and Cuyuni-Mazaruni Regions, on Merume Mountains, Mount Ayanganna, and Mount Wokomung, which are the easternmost extensions of the Pakaraima Mountains.

**Ecology.** Growing in dense scrub forest on tepui sandstone, at 1070–1570 m elevation.

**Phenology.** Flowering specimens were collected in June and July, and fruiting specimens in February, March, June, and July.

**Selected specimens examined.** GUYANA • Potaro-Siparuni Region, Ayanganna Slope; 2 Mar. 1960; fr.; R. Browne 118 (*Forest Department of British Guiana* No. 7942); NY • Potaro-Siparuni Region, Mount Ayanganna, E face, camp above first of four escarpments; 5°20'19"N, 59°56'46"W; 1070 m; 12 Jun. 2001; fl., fr.; Clarke *et al.* 9062; MO n.v., US; *ibid.*, Clarke *et al.* 9063; MO n.v., US • Potaro-Siparuni Region, Mount Ayanganna, E face, plateau above third of four escarpments; 5°23'12"N, 59°58'36"W; 1570 m; 19 Jun. 2001; fr.; Clarke *et al.* 9350; MO n.v., US • Potaro-Siparuni Region, Mount Ayanganna, E face; 5°23'05"N, 59°58'33"W; 1545 m; 26 Jun. 2001; fl., fr.; Clarke *et al.* 9565; MO n.v., NY, US • Potaro-Siparuni Region, Mount Wokomung, easternmost pinnacle of massif; 5°05'34"N, 59°50'13"W; 1524 m; 30 Jun. 2003; fl. buds; Clarke *et al.* 10341; MO n.v., NY, US • Potaro-Siparuni Region, Mount Wokomung, base of fourth escarpment; 5°05'39"N, 59°50'36"W; 1375 m; 4 Jul. 2003; fr.; Clarke *et al.* 10508; MO n.v., NY, US • Potaro-Siparuni Region, Mount Wokomung, Little Ayanganna, summit of highest point of Mount Wokomung massif; 5°04'53"N, 59°50'26"W; 1660 m; 6 Jul. 2003; fl.; Clarke *et al.* 10588; MO n.v., NY, US • Potaro-Siparuni Region, Mount Wokomung, summit; 5°04'3"N, 59°51'42"W; 1560 m; 10 Jul. 2003; fl. buds; Clarke *et al.* 10713; MO n.v., US • Potaro-Siparuni Region, Mount Wokomung, summit; 5°04'03"N, 59°51'42"W; 1560 m; 10 Jul. 2003; fl. buds; Clarke *et al.* 10757; MO n.v., US • Potaro-Siparuni Region,

Pakaraima Mountains, Mount Wokomung, summit plateau, from central plateau 1–2 km to escarpment; 5°04'N, 59°52'W; 1500–1530 m; 19 Feb. 1993; fr.; Henkel & Chin 1483; MO n.v., NY, US, Mount Ayanganna, east slope; 13 Mar. 2014; fr.; Radosavljevic *et al.* 146; P.

**Notes.** This species was placed by Taylor and Gereau (2013) in their *Panurensis* group, together with *C. panurensis* from Brazilian and Colombian Amazon, but the two differ in so many characters that a close relationship between them seems unlikely. In fact, *C. panurensis* has several aberrant characters within the genus: almost spiciform inflorescences (the lateral branches being extremely reduced), an entire disk, large mitriform stipules usually with a prominent midrib, and secondary leaf veins forming conspicuous loops far from the margin. On the other hand, *C. tillettii* has thyrsoid inflorescences, a bipartite disk, stipules smaller than those of *C. panurensis* and without prominent midrib, and secondary leaf veins looping near the margin. All these characters fit very well with Taylor and Gereau's (2013) *Carapichea* group, where *C. tillettii* most closely resembles *C. franquevilleana* and *C. klugii*. It differs from these species (which are probably not distinct from each other) by its pyramidal inflorescence with ramifications shorter than rachis (vs not or hardly so), smaller and coriaceous bracts, corolla tube 6.0–6.5 mm long (vs 3 mm long), and sessile fruits (vs shortly pedicellate). As noted by Taylor and Gereau (2013), the leaves of *C. tillettii* may be opposite or verticillate, sometimes with both conditions on the same branch, and the stipules can be bilobed or irregularly 3–5-fid at apex. The locality, altitude, collection date, and field notes of the type collection have been wrongly cited both in the protologue (Steyermark 1972: 498) and in Taylor and Gereau (2013: 123). The type label actually reads "Tree to 3 m; flowers white; fruit dark red; occasional in wet forest along trail, ridge of Merume Mountain, elev. 1140 m.". This species is not to be confused with *Rudgea tillettii* Steyermark. (Steyermark 1976: 416), which is a synonym of *R. coussareoides* (Standl.) C.M.Taylor, Bruniera & Zappi (Taylor *et al.* 2015). The latter somewhat resembles *C. tillettii* in general appearance, but its stipules are basally connate into a truncate sheath and bearing dorsal appendages (these soon caducous), its flowers are sparsely arranged (not densely crowded at the apex of inflorescence ramifications) and its disk is entire.

9. *Carapichea urniformis* (Steyermark) C.M.Taylor (Taylor and Gereau 2013: 122)

*Psychotria urniformis* Steyermark. (Steyermark 1972: 556, figure 74)

**Type.** GUYANA • Upper Mazaruni River Basin, Mount Ayanganna, along NE side; 800–900 m; 2 Aug. 1960; fr.; S.S. Tillett *et al.* 45008; holotype: NY [NY00132855]; isotypes: F [No. 1704839], COL [COL000004672], K [K000432825], NY [00146649], US [00146649], VEN [No. 82281].

**Description.** *Shrub* or *small tree*, up to 4 m tall, much branched; *terminal branchlets* terete or slightly quadrangular, 3–7 mm in diam., somewhat succulent, glabrous, soon covered with a buff corky bark. *Stipules* free, oblong-ovate, 7–12 × 7–9 mm, obtuse and entire when young (apical and distal nodes), later splitting into two lobes at older nodes, each lobe oblong-ovate, 4–9 mm long, shortly apiculate, soon corky, persistent or fragmenting. *Leaves* with petioles 1.0–3.5 cm long, glabrous; blades elliptic to oblong-elliptic, 12–22 × 5.5–10 cm, acute at base, acute at base, acuminate at apex, acumen narrowly triangular, 0.7–1.2 cm long, papyraceous to subcoriaceous, drying dark brown above and pale brown below, glabrous throughout; secondary veins 10–13 on each side of midrib, curving towards the margin and almost reaching it; tertiary veins rather densely and prominently reticulate in the dry state; domatia absent. *Inflorescence* capitate, short-pedunculate; peduncle 0.5–1.7 cm long, glabrous; head included in a large involucre structure, 5.5–9.0 cm long, green at base and pinkish-red at apex, formed by the basally fused bracts, glabrous; involucre basal portion urceolate, 2.5–5.7 × 2.3–3.5 cm, thick and fleshy, distal portion flaring, funnel-shaped, 2- to 4-lobed, lobes ovate to broadly ovate, 2.5–3.5 × 3.5–4.0 cm, membranaceous; internal bracts (when present) ligulate, orbicular to round, 1.7–2.5 × 1.0–1.7 cm; bracteoles ligulate to linear, 0.7–1.5 mm, glabrous. *Flowers* 5-merous, (heterostylous?), pedicellate; pedicels 1.0–3.5 mm long (5–7 mm long in mature fruits), glabrous. *Hypanthium* narrowly cylindrical, ca 1 mm long, glabrous. *Disk* bilobed to the base, ca 1 mm long. *Calyx* cupular, dentate, 1.0–1.7 mm long, glabrous; tube 0.7–1.0 mm long; teeth deltoid to narrowly triangular, 0.3–0.7 mm long. *Corolla* narrowly tubular, 18–31.5 mm long, glabrous, white; tube narrowly cylindrical, 17–30 mm long, 1.5–2.5 mm wide, glabrous outside, with a sericeous ring just above the base and glabrous above inside; lobes narrowly ovate, 1.0–1.5 × 0.7 mm, acute at apex, glabrous outside. *Stamens* inserted near the base of the corolla tube, included; anthers subsessile, linear, 3–4 × 0.2 mm, glabrous. *Style* barely exerted among the corolla lobes, 17–34 mm long, glabrous, branches oblong, 0.7–0.8 mm long. *Fruits* ovoid, 6–12 × 4.5–8.0 mm when dry (“20 × 15 mm” when fresh, fide *Henkel & Hoffman 187*), costate when dry, bright blue to bluish-purple. *Pyrenes* plano-convex, elliptic to ovate in outline, 5–10 × 3.0–6.5 mm, dorsal side 5-costate, ventral side longitudinally sulcate. *Seeds* with a deep ventral furrow, ± T-shaped in cross-section.

**Distribution.** Endemic to Mount Ayanganna in western Guyana.

**Ecology.** In understory of tall wet evergreen forest, on brown sandy lateritic soil, at 712–1100 m elevation.

**Phenology.** One flowering specimen was collected in June, one specimen with flowers and young fruits was collected in November, and two specimens with mature fruits were collected in March and August.

**Specimens examined.** GUYANA • Potaro-Siparuni Region, Mount Ayanganna, E face; 5°20′04″N, 59°55′30″W; 712 m; 4 Jun. 2001; fl., fr.; *Clarke et al. 8963*;

MO n.v., NY, US • Cuyuni-Mazaruni Region, Pakaraima Mountains, toe slope on NW side of Mt. Ayanganna; 5°24′N, 59°57′W; 1000–1100 m; 8 Nov. 1992; fl.; *Henkel & Hoffman 187*; K, MO n.v., NY, U, US • Mount Ayanganna, E slope, vicinity of new airstrip; 5°18′08″N, 59°50′10″W; 689 m; 9 Mar. 2014; fr.; *Radosavljevic et al. 103*; MO n.v., US.

**Notes.** This species is remarkable by its large, urn-shaped involucre, varying from bilobed to unequally 4-lobed, which is formed by the fusion of the external bracts. The involucre is reported to be red (Taylor and Gereau 2013) although on the type label it is more precisely described as “green at base, shading through brown to pinkish-red at tips”. *Carapichea urniformis* was placed by Taylor and Gereau (2013) in their *Altsonii* group, together with *C. altsonii*, *C. nivea*, and *C. sandwithiana*. However, as discussed above, it is quite different from these three species (which are here transferred to the genus *Notopleura*) in characters of the stipules, leaf venation, and pyrenes, and is better placed in Taylor and Gereau’s (2013) *Carapichea* group, alongside with *C. guianensis* and *C. galbaoensis*, which are quite similar in vegetative characters. Due to the small number of collections, it is not known whether the flowers of this species are heterostylous. In the few flowers that we analyzed, the stamens are included and the style is barely exerted, which is consistent with a long-styled form.

### Species excluded from the genus *Carapichea*

*Palicourea hoffmannseggiana* (Schult.) Borhidi (Borhidi 2011: 245)

*Carapichea patrisii* DC. (Candolle 1830: 536) – Type: FRENCH GUIANA • s.loc.; s.d.; *Patris s.n.*; lectotype: G-DC [sheet N. 4], designated by Delprete and Kirkbride (2016: 422); possible isolectotype: G-DC [sheets N. 1, 2, and 3].

*Cephaelis patrisii* (DC.) D.Dietr. (Dietrich 1839: 773) – Type: same as for *Carapichea patrisii*.

*Uragoga carapichea* Kuntze (Kuntze 1891: 955), non *Uragoga patrisii* (DC.) Kuntze (Kuntze 1891) – Type: same as for *Carapichea patrisii*.

**Type.** BRAZIL – Pará • s.loc.; s.d.; *Sieber s.n.* [dedit J.C. Hoffmannsegg]; holotype: B [B-W4155]; photograph: NY.

### Species transferred to *Notopleura*

*Notopleura altsonii* (Sandwith) O.Lachenaud & Delprete, **comb. nov.**  
urn:lsid:ipni.org:names:77302854-1

*Cephaelis altsonii* Sandwith, Bulletin of Miscellaneous Information, Royal Gardens, Kew 1931: 475 (Sandwith 1931)

*Psychotria altsonii* (Sandwith) Steyererm. (Steyermark 1972: 555)

*Carapichea altsonii* (Sandwith) C.M.Taylor (Taylor and Gereau 2013: 121)

**Type.** GUYANA – Cuyuni-Mazaruni Region • Macreba Falls, Kurupung River; Aug. 1925; fl. & fr. imm.; *Altson* 322; lectotype: K [K000174497], designated by Taylor and Gereau (2013: 121); isolectotypes: K [K000174398], NY [00131011]; photo-K at NY.

**Description.** Shrub, 1.5–3 m tall, single-stemmed, glabrous; distal internodes terete, 4.5–8.0 mm in diam., somewhat succulent, glabrous. Stipules consisting of a persistent, truncate sheath (absent in flower-bearing nodes), 2.5–3.5 × 6.5–14 mm, glabrous, and a dense mass of basal linear appendages 1.0–2.5 mm long, very early caducous, leaving a scar. Leaves with petioles 1.0–5.5 cm long, glabrous; blades elliptic to oblanceolate, 14–35 × 4.5–10 cm, acute-decurrent at base, acute and long-acuminate at apex, acumen narrowly triangular, 1–2 cm long, somewhat succulent to fleshy when fresh, drying papyraceous, dark brown above and pale brown to pinkish-brown below, glabrous throughout; secondary veins 18–21 on each side of midrib; embedded in the lamina, barely visible above and obsolete below in dried specimens; intersecondary veins 1–3 between each couple of secondary veins, terminating far from the margin; tertiary veins invisible, embedded within the lamina; domatia absent. Inflorescence terminal, long-pedunculate, capitate; peduncles 7.5–17 cm long, glabrous, drying brownish-black; head multiflorous, subtended by a cup-shaped structure 3–5 mm long made by 4 bracts connate at base; free portion of bracts in two decussate pairs, unequal to subequal, obovate to broadly ovate, 1.5–2.7 × 0.9–3.2 cm, pale greenish-white, white or pale violet, often tinged with pink or purple, persistent, drying dark brown, glabrous; bracteoles subulate to lanceolate, 5–10 × 0.5–3.0 mm. Flowers 5-merous, subsessile to shortly pedicellate; pedicels to 2 mm long at flowering stage (to 3 mm long in fruiting stage). Hypanthium narrowly obovoid, 1.5–2.0 mm long, glabrous. Disk bilobed to the base, 0.5–0.8 mm long, glabrous. Calyx cupular, 0.7–1.2 mm long, truncate, slightly undulate or with minute teeth < 0.2 mm long, glabrous. Corolla hypocrateriform, 10.5–15 mm long, glabrous, white with lobes yellow inside; tube subcylindrical, 9–12 mm long, 1–2 mm wide, glabrous outside and inside; lobes triangular to ovate, 1.5–3.0 × 1–2 mm, acute at apex, glabrous outside, papillose inside. Stamens inserted 3–4 mm from corolla base, anthers subsessile, included, narrowly oblong, 2–3 × 0.4 mm. Style glabrous, 10 mm long, barely exerted; stigmas linear, 1 mm long. Fruits (slightly immature) ovoid to ellipsoid, 4–6 × 2.0–3.5 mm, slightly costate when dry, white to pale violet. Pyrenes plano-convex, elliptic in outline, 4–6 × 2.0–3.5 mm, strongly compressed dorso-ventrally, dorsal side with 3 or 4 ridges, ventral side with 2 very shallow depressions separated by a longitudinal median crest. Seeds unknown.

**Distribution.** Only known from the foothills and higher elevations of the Pakaraima Mountains, Guyana.

**Ecology.** In understory of moist, non-flooded forest, commonly on boulders of sandstone or conglomerates; 85–1000 m elevation.

**Phenology.** Specimens with flowers were collected from July to November, and with immature fruits in August.

**Local names.** The two following vernacular names are reported in Akawai (Guyana): *duma-ek* (*Altson* 522) and *wagak-wa-eba* (*Forest Department* 2773).

**Specimens examined.** GUYANA • near summit of Kurupung Mts on trail from Macreba Falls to Kamarang; 13 Sep. 1938; fl.; *Forest Department* 2773; K • Pakaraima Mountains, Membaru-Kurupung trail, Dicyembe pole forest; 1000 m; 29 Oct.–4 Nov. 1951; fl.; *Maguire & Fanshawe* 32353; NY • Upper Mazaruni River, Kurupung River, Makreba Falls, on Kamarung trail; Sep. 1938–Feb. 1939; fl.; *Pinkus* 5; NY • Pakaraima Mountains, Kurupung River, Makreba Falls; 17 Jul. 1992; fl.; *Hoffman et al.* 2050; MO, US.

**Notes.** This species closely resembles *N. nivea* and *N. sandwithiana*; differences between them are summarized in Table 3.

*Notopleura nivea* (Sandwith) O.Lachenaud & Delprete, **comb. nov.**

urn:lsid:ipni.org:names:77302855-1

*Cephaelis nivea* Sandwith, Bulletin of Miscellaneous Information, Royal Gardens, Kew 1939: 551 (Sandwith 1939)

*Psychotria nivea* (Sandwith) Steyererm. (Steyermark 1972: 556)

*Carapichea nivea* (Sandwith) C.M.Taylor (Taylor and Gereau 2013: 121)

**Type.** GUYANA – Potaro-Siparuni Region • Potaro River, Amatuk portage; 31 Aug. 1937; fl., fr.; *Sandwith* 1249; lectotype: K [2 sheets, K000174488, K000174489], designated here; isolectotypes: K [K000662774], K spirit collection n.v., NY [00131025].

**Description.** Perennial herb or subshrub, 18–30 cm tall (maybe more?), single-stemmed; distal internodes terete, 4–7 mm in diam., somewhat succulent, glabrous. Stipules consisting of a truncate sheath (absent at flower-bearing nodes) 3–9 × 7–10 mm, glabrous, persistent, and numerous basal linear appendages ca 2 mm long, aggregated into a dense mass, very early caducous, leaving a scar. Leaves with petioles 1.0–2.5 cm long, glabrous, drying black; blades elliptic to oblanceolate, 18–29 × 5.7–11.6 cm, acute-decurrent at base, obtuse to acute and acuminate at apex, acumen deltoid to narrowly triangular, 0.5–1.0 cm long, coriaceous to somewhat succulent when fresh, papyraceous when dry, drying greyish olive-green to brown above and pinkish to greyish pale brown or pale olive green below, glabrous throughout; secondary veins 12–19 on each side of midrib, embedded within the lamina, barely visible above and below in dried specimens; intersecondary veins (1)–2–3 between each couple of

**Table 3.** Diagnostic characters of *Notopleura altsonii*, *N. nivea*, and *N. sandwithiana*.

	<i>N. altsonii</i>	<i>N. nivea</i>	<i>N. sandwithiana</i>
<b>Number of involucre bracts</b>	Four	Four	Two
<b>Bracts</b>	Connate at base for 0.3–0.5 cm	Connate at base into an urn 1.0–1.8 cm deep	Connate at base for 0.3 cm
<b>Peduncle length</b>	7.5–17 cm	2.5–5.3 cm	4.5 cm
<b>Pedicels</b>	0–3 mm	1.8–2.5 mm	7–8 mm
<b>Corolla tube</b>	9–11 mm long	16–19 mm long	9–11 mm long
<b>Distribution</b>	Guyana	Guyana	Venezuela

secondary veins, terminating far from the margin; tertiary veins invisible, embedded within the lamina; domatia absent. **Inflorescence** terminal, pedunculate, capitate; peduncles 2.5–5.3 cm long, glabrous, drying dark brown; head multiflorous, subtended by a cupular structure 1.0–2.5 cm long, made of 4 bracts connate at base; free portion of bracts decussate, unequal to subequal, broadly ovate, 1.5–2.6 × 1.5–2.5 cm, acute to obtuse at apex, fleshy, pure white, persistent, drying brown, with 3–5 ascending veins; bracteoles triangular-ovate, 0.7–2.0 × 0.2–0.5 mm. **Flowers** 5-merous, pedicellate; pedicels 1.8–2.5 mm long, fleshy. **Hypanthium** truncate-obconical, 0.6–0.7 mm long, glabrous. **Disk** bilobed to the base, 0.5–1.0 mm long, bipartite. **Calyx** 0.7–1.3 mm long, shallowly denticulate, glabrous; teeth broadly to shallowly triangular, 0.4–0.5 mm long. **Corolla** hypocrateriform, 17.7–21.5 mm long, glabrous, white with lobes yellow inside; tube narrowly cylindrical, 16–19 mm long, 1.3–1.5 mm wide, glabrous outside and inside; lobes ovate to triangular, 1–2.6 × 1–2.3 mm, acute at apex, glabrous outside, papillose inside. **Stamens** inserted at 9.5–12 mm from the base; filaments extremely short; anthers included, narrowly oblong, 3 × 0.3–0.4 mm. **Style** glabrous, included, 8 mm long; branches oblong, ca 0.6 mm long. **Fruits** oblong-ovoid, 5–6 × 3–3.75 mm, smooth (slightly costate when dry), colour unknown (pale olive-green when dry). **Pyrenes** semi-ellipsoid, 5–6 × 2 mm, strongly compressed dorso-ventrally, dorsal side with 4 prominent ridges, ventral side with 2 longitudinal grooves separated by an irregular median crest prolonged at apex into a short spine. **Seeds** unknown.

**Distribution.** Endemic to Guyana and reported from the Potaro River Basin (Kaieteur Savanna, Amatuk Portage, and Hoit Mountain), the Upper Mazaruni River Basin (Ayanganna Plateau), and the Cuyuni-Mazaruni Region (W branch of Eping River).

**Ecology.** Growing in understory of primary and secondary forests, sometimes on sandstone or white sands, on lowland and mountain slopes, at 274–610 m elevation.

**Phenology.** Flowering specimens were collected in February, April–May, and July–August; and specimens with fruits only once in August.

**Specimens examined.** GUYANA • Kaieteur Savanna; 1936; fl.; *Hollister s.n.*; NY • Upper Mazaruni River Basin, Ayanganna Plateau, between Pong River (686 m) and G.S. Camp 13, in *Dicymbe* forest, on trail to Ayanganna; 25 Jul. 1960; fl.; *Tillett et al. 44925*; NY • Potaro River Gorge,

Amatuk Portage; 27 Apr. 1944; fl.; *Maguire & Fanshawe 23018*; K, NY • Cuyuni-Mazaruni Region, W branch of Eping River; 7 Feb. 1991; fl.; *McDowell & Stobey 3924*; MO n.v., US • Potaro-Siparuni Region, black water creek near Camp NW along ravine, rocky ravine, mixed premontane wet forest; 5°12'N, 59°10'W; 274–610 m; 23 May 1991; fl.; *McDowell et al. 4901*; MO n.v., US • “Amutu” [Amatuk] Portage path; 20 Feb. 1879; fl.; *im Thurn s.n.*; K • Amatuk Falls, Potaro River; 26 Aug. 1933; fl.; *Tutin 600*; BM • Potaro district, Hoit Mountain; 2 Aug. 1959; fl.; *Whitton 63*; K.

**Notes.** Sandwith (1939: 551–552), in the original description of *Cephaelis nivea*, cited the gathering *Sandwith 1249* as the type, with no indication of the herbarium of deposit. Four sheets of this gathering have been found, three in K and one in NY, as well as one spirit collection (not seen by us) in K. According to the Code (Turland et al. 2018), all these samples represent original material. One of the K sheets, barcode K000174488, which has complete label data and bears the annotation “Typus” in Sandwith’s handwriting, was cited as holotype by Taylor and Gereau (2013: 121–122). Being posterior to 2001, and not accompanied by the statement “here designated” or a similar expression, their citation cannot be treated as an inadvertent lectotypification (ICBN, Art. 7.11 & 9.10). Two sheets of *Sandwith 1249* at K are labeled “Sheet I/II” (K000174488) and “Sheet II/II” (K000174489), and are physically kept together. Therefore, according Art. 8.3 of the Code (Turland et al., 2018), they should be treated as a single specimen with multiple preparations. This specimen, composed of two sheets, is here designated as the lectotype of *Cephaelis nivea*.

*Notopleura nivea* differs from *N. altsonii* and *N. sandwithiana* by the characters summarized in Table 3, the most obvious of which – not mentioned by Taylor and Gereau (2013) – is that the involucre bracts form a much longer basal cup than in the other two species. Taylor and Gereau (2013: 122) also reported differences in the colour of the bracts, which are apparently not constant, and in the colour of the corolla (supposedly purple in *N. altsonii* and yellow in *N. nivea*) but in both species the corolla is actually white outside and yellow inside.



*Notopleura sandwithiana* (Steयरम.) C.M.Taylor (Taylor 2004: 663)

*Cephaelis sandwithiana* Steयरम. (Steयरम 1967: 428, figure 42)

*Psychotria sandwithiana* (Steयरम.) Steयरम. (Steयरम 1972: 555)

*Carapichea sandwithiana* (Steयरम.) C.M.Taylor (Taylor and Gereau 2013: 122)

**Type.** VENEZUELA – Bolívar • Along Río Framela, Cerro Pitón, Cordillera Epicara; 400 m; 3 Sep. 1962; fr.; B. Maguire, J.A. Steयरम & C.K. Maguire 53562; holotype: VEN [No. 63029].

**Description.** Shrub 2.0–2.5 m tall, single-stemmed, glabrous; distal internodes terete, 10–12 mm in diam., somewhat succulent, glabrous. Stipules basally sheathing, truncate to shallowly elliptic, 2–3 × 10–12 mm, glabrous. Leaves with petioles 2.0–2.5 cm long, glabrous; blades elliptic to elliptic-obovate, 26–37 × 10–12 cm, acute at base, abruptly acuminate at apex, acumen narrowly triangular, 2.0–2.5 cm long, somewhat succulent to coriaceous when fresh, drying brownish-olive green above and pale olive green below (“silvery beneath” when fresh, fide Maguire et al. 53562), glabrous throughout; secondary veins 38–40 on each side [Steयरम wrote “lateral veins 40–45 on each side” without distinguishing secondary and intersecondary veins], barely visible in dry specimens; tertiary veins barely visible in dry specimens; domatia absent. Inflorescence terminal, long-pedunculate, capitate; peduncles 4.5 cm long, gradually wider towards the head, ca 3 mm wide just below the head, glabrous, drying dark brown; head multiflorous, subtended by cup-shaped structure made by 2 bracts connate at base, the cup-shaped base 3 mm long and 1.7 cm wide; the free portion of bracts subequal, broadly ovate, 1.8 × 2.6 cm, cream-white when fresh, pale brown when dry, persistent, drying pale brown, glabrous; internal bracts subtending fascicles of ca 3 flowers falcate-sublanceolate to oblong-lanceolate, 3.5–4.0 × 1.0–1.5 mm, entire of with a lateral tooth at base, glabrous; bracteoles absent [fide Steयरम]. Flowers 5-merous, pedicellate; pedicels 7–8 mm long, 1.5–2.0 mm thick, fleshy, angular. Hypanthium narrowly oblong-turbinate, size unknown, glabrous. Calyx cupular, 1.5–2.0 mm long, 5-toothed, teeth deltoid to triangular-subulate, 0.2–0.6 mm long, glabrous. Corolla hypocrateriform, 12–13 mm long, glabrous, white; tube narrowly cylindrical, 9–11 mm long, 1 mm wide, glabrous outside and inside; lobes ovate, 2 × 1.5 mm, subacute at apex, glabrous outside, papillose inside. Stamens inserted below the middle of the corolla base; anthers subsessile, included, narrowly oblong, 2 mm long. Disk and style unknown. Fruits ellipsoid, 4 × 2.5–3 mm. Pyrenes (seen through dried fruits) dorsally costate.

**Distribution.** Only known from the holotype specimen, collected on Cordillera Epicara, state of Bolívar, southern Venezuela.

**Ecology.** Evergreen forest, at ca 400 m elevation.

**Phenology.** The only collection, with both flowers and fruits, was made in September.

**Notes.** The only collection of this species was seen on photograph, and as the high-resolution image available at JSTOR Global Plants (<https://plants.jstor.org/>). The above description is largely based on Steयरम (1967, 1974). Although Steयरम (1967: 428–430, figure 42) described and illustrated flowers, the holotype, which is evidently the specimen on which the drawing was based, has only fruits and no flower is left. Steयरम (1967: 430) separated *Notopleura sandwithiana* from *N. altsonii* by the “shorter peduncle, longer pedicels, absence of bracteoles, more conspicuously and unequally dentate calyx-lobes, and acute, ovate calyx-lobes”. These two species are in fact quite similar. *Notopleura sandwithiana* apparently has only two involucral bracts (while there are four in *N. altsonii*) and also has a shorter peduncle and longer pedicels than those of *N. altsonii*. The taxonomic value of these characters is difficult to assess with so little material available. The length of the pedicels is of doubtful taxonomic value, since they most likely elongate during fruit ripening. Steयरम (1967) mentioned, as additional differences, the shape of the calyx lobes, which is not a reliable character, and the absence of bracteoles subtending the individual flowers of *N. sandwithiana*, a feature that we could not check. For a morphological comparison of these two species see Table 3.

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