Novitates neocaledonicae XI: A new endemic species of Garcinia L. (Clusiaceae), with an emended description of G. virgata Vieill. ex Guillaumin

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Novitats neocaledonicæ XI:
A new endemic species of *Garcinia* L. (Clusiaceae),
with an emended description
of *G. virgata* Vieill. ex Guillaumin

Jérôme MUNZINGER, David BRUY & Marc PIGNAL
Novitates neocaledonicae XI:
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**ABSTRACT**

A new species, *Garcinia urceolata* Munzinger, Bruy & M.Pignal, sp. nov. (Clusiaceae), is described from New Caledonia. It is restricted to North Province, from the Tchamba valley in the south to Mandjélia in the north of the main island of Grande-Terre, occurring in dense humid rainforests on non-ultramafic substrate. Material of this small tree species was first collected more than fifty years ago but was confused with *G. virgata* Vieill. ex Guillaumin as both taxa have small leaves. *Garcinia urceolata*, sp. nov. differs from *G. virgata* in a number of features of the leaves, flowers and fruits. *Garcinia urceolata*, sp. nov. also grows at higher elevation and in wetter conditions than *G. virgata*. Both species are purported to have dehiscent fruit, along with other New Caledonian members of the genus, a distinctive character that was used to justify the description of the genus *Septogarcinia* Kosterm., which is no longer regarded as distinct from *Garcinia* L. Line drawings and colour photos are provided for both the new species and for *G. virgata* for comparison, along with a preliminary risk of extinction assessment for each of them, which indicates that *G. urceolata*, sp. nov. is Vulnerable (VU) while *G. virgata* is Near Threatened (NT).

**KEY WORDS**

Clusiaceae,
*Garcinia*,
New Caledonia,
conservation,
lectotypification,
novel species.
INTRODUCTION

Garcinia L. contains approximately 260 species, which are mainly confined to the tropics (Jones 1980; Stevens 2007), and is usually regarded as a taxonomically difficult genus (Sosef & Dauby 2012). Since Linnaeus’ description, Garcinia has been divided into many sections, which were reduced to 14 in an unpublished thesis by Jones (1980), most of which are supported by molecular work (Sweeney 2008). Only two of these sections (Mungotia and Discostigma) occur in New Caledonia (Jones 1980; Sweeney 2008).

Observations made in 2007 by one of us (JM) at the herbarium of New Caledonia (NOU, acronyms follow Thiébaut et al. 2018) showed that the material identified as Garcinia virgata appeared to be very heterogeneous. Observations of fruiting material in the field confirmed that there appeared to be two taxa, one with a large fleshy fruit with a thick pericarp, and another with smaller fruit with a thin pericarp, but whose leaves were very similar. It was not until an expedition to Mount Katapupaik, organized by the program “Our Planet Reviewed/La Planète Revisitée” (http://www.laplaneterevisitee.org/fr), that we had the chance to see both species in bloom. The fruit of most species of Garcinia is an indehiscent drupe or berry (Stevens 2007), and for this reason, Kostermans (1962) described the genus Septogarcinia for a species from Sumbawa that has a capsular fruit (Septogarcinia sambawensis Kosterm.). Corner (1976) disagreed with the generic delimitation of Kostermans, and Jones (1980) in her dissertation thesis, synonymized Septogarcinia with Garcinia sect. Brindonia, indicating that she planned to transfer Kostermans’s species to Garcinia (using a replacement name as a nomen novae because the name Garcinia sambawensis Lauterb. already existed), but she failed to make a valid combination. No material of this species was included by Sweeney (2008) in his molecular phylogenetic study, but its characters were coded for the morphological phylogenetic work of Ruhfel et al. (2013). Finally, the combination was later made in Garcinia (Medellín-Zabala & Marinho 2015), but these authors created a later homonym. Kostermans was obviously unaware that several species of New Caledonian Garcinia, viz. G. virgata Vieill. ex Guillaumin, G. neglecta Vieill., and G. compionii Baker f. all have capsular fruits, and should therefore also have been placed in Septogarcinia as he conceived it. Jones (1980) likewise did not cite any of these species, otherwise she probably would have assigned them to G. sect. Brindonia. All these species, including the new species described in the present paper, are currently included in a phylogenetic study to test the taxonomic value of fruit dehiscence in relation with sections delimitation.

We have long been certain that there must be two species currently confused under G. virgata, mainly because of the fruit. The male and female flowers remained to be observed in the field. Their recent observation now allows us to characterize the two entities morphologically well, to emend the description of G. virgata, which is so far known only from the short diagnosis of Guillaumin (1942), and to describe the second species which is new to science, which we call Munzinger, Bruy & M. Pignal, sp. nov. Each species is illustrated, along with a plate of photographs in the field and a distribution map is provided. A preliminary conservation status following IUCN (2012) criteria is also given.

MATERIAL AND METHODS

All material of Garcinia collected in New Caledonia from NOU, MPU and P was studied. Scans of specimens at K and Z have been seen through their websites, respectively.
A new *Garcinia* L. from New Caledonia

**FIG. 1.** — *Garcinia urceolata* Munzinger, Bruy & M.Pignal, sp. nov.: **A**, flowering branch; **B**, abaxial surface of leaf; **C**, male flower (fresh); **D**, male flower (in herb.); **E**, adaxial (left) and abaxial (right) surfaces of external sepals; **F**, adaxial (left) and abaxial (right) surfaces of internal sepals; **G**, petals; **H**, androecium; **I**, fruiting branch with globose fruits; **J**, pyroid fruit; **K**, seeds. **A**, **B**, **D-H**, McPherson 4065 (NOU); **B**, from Munzinger et al. 4708 (NOU); **I**, from photo by P. Lowry, not vouchered; **J**, from photo by D. Létocart, not vouchered; **K**, Munzinger et al. 3554 (P). Drawings by Laurence Ramon. Scale bars: **A**, **B**, **I-K**, 1 cm; **C-H**, 1 mm.
Garcinia urceolata Munzinger, Bruy & M.Pignal, sp. nov. (Figs 1; 2; 3)

**Phenology.** — Buds were observed in August, flowers in October-November, green fruit in November and January-February, and mature fruits in March-April.

**Conservation Status.** — *Garcinia urceolata*, sp. nov. is known from eight subpopulations, three of which occupy two adjacent 2 × 2 km grid cells giving an EOO of 1185 km² and an AOO of 48 km². Two of the subpopulations occur in North Province in the “Rezerve de nature sauvage du mont Panié,” the other six subpopulations falling outside protected areas. The species can be locally abundant (Roches Ouaïme) but is threatened by bushfires and invasive browsers in at least some localities (respectively Tchamba, Roches Ouaïme, Atéou and Panié). These threats are responsible for an estimated decline in habitat quality and the number of mature individuals of this species. In Tchamba and Roches Ouaïme, the species was observed both in burnt edge and catchment forests (unlikely bushfires). Fire being the main threat to this species, the number of locations (sensu IUCN 2012) is therefore 10. We consequently assign a preliminary conservation status of Vulnerable (VU Bl ab(iii,iv)+2ab(iii,iv)) to *G. urceolata*, sp. nov. using the IUCN Red List criteria (IUCN 2012).

**Vernacular Name.** — Unknown.


**Distribution.** — *Garcinia urceolata*, sp. nov. ranges from the Tchamba River valley at its southern limit to Mandjélia in the north, and occurs from 520 to 950 m elevation (Fig. 3).

**Habitat and Ecology.** — The species is restricted to dense humid forest on non-ultramafic substrate.
Fig. 2. — *Garcinia urceolata* Munzinger, Bruy & M.Pignal, sp. nov.: A, habit; B, aspect of bark and sapwood; C, leaves; D, latex (cross section of a leafy branch); E, female flowers and young fruit; F, pyroid fruit; G, globose fruit; H, cross and longitudinal section of globose fruit and seed; A, B, Munzinger et al. 8162; C-E, G, Munzinger et al. 8115; F, H, not voucher. A-E, G, Photos by J. Munzinger; C, photo D. Létocart; H, photo P. Lowry.

DESCRIPTION

Dense shrub, 2-3 m tall or tree to 5-8 m, 7-15 cm DBH, bark grey; sapwood cream; young branchlets opposite decussate, quadrangular in section, becoming terete; latex yellow in trunk and twigs; all parts glabrous. Leaf blade obovate to widely obovate, (17-)43-60-(89) × (11-)16-21-(34) mm, chartaceous to slightly coriaceous, longitudinal black lines on both surfaces sometimes present in sicco.; base attenuate, forming an acute angle of (19-)33-45-76 degrees; margin slightly to strongly revolute, sometimes with a thin hyaline fringe; apex rounded, rarely slightly obtuse and forming an angle of (69-92-113-124) degrees; midvein slightly prominent adaxially, strongly prominent abaxially; lateral veins more or less visible on both surfaces in herb., 8-12 pairs, the basal veins ascending to c. half of the blade length; petiole slightly canaliculate, (4.1-)6.1-8-(9.1) × (0.8-)1.0-1.2-(3.8) mm. Flowers solitary or grouped in axillary fascicles, usually borne just under the leafy part of the twigs, corolla urceolate, pale green in both sexes. Flower bracts ovate-triangular, 2 mm long × 1.7 mm wide, membranous, brownish, quickly caducous. Male flowers 1-4 per inflorescence; pedicel 2-4 × 2-2.5 mm. Sepals 4, glabrous, two external ones obvate, 4 × 4 mm, two internal ones widely-elliptic to oblong, 5-6 × 3-3.5 mm, 2 mm thick, margin not or only slightly membranous. Petals 4,
TABLE 1.—Comparison of morphological characters between Garcinia urceolata, sp. nov. and G. virgata. Leaf characters indicated by * are based on c. 500 measurements and are presented as (min-) quartile 1–quartile 3 (max). **, as the fruit is crushed into a herbarium, these values are approximate.

<table>
<thead>
<tr>
<th>Characters</th>
<th>G. urceolata, sp. nov.</th>
<th>G. virgata</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habit</td>
<td>shrub or tree</td>
<td>tree</td>
</tr>
<tr>
<td>Sapwood colour</td>
<td>cream (Fig. 2B)</td>
<td>pinkish (Fig. 5D)</td>
</tr>
<tr>
<td>Leaf blade form</td>
<td>mostly obovate or widely obovate</td>
<td>mostly elliptic</td>
</tr>
<tr>
<td>Leaf blade size (mm)*</td>
<td>(17-) **43-60 (-89) × (11-) **16-21 (-34)</td>
<td>(33-) **39-62 (-75) × (5-) **13-19 (-34)</td>
</tr>
<tr>
<td>Leaf apex</td>
<td>rounded, obnubate to sub-oblance</td>
<td>acute to rounded</td>
</tr>
<tr>
<td>Leaf apex angle *</td>
<td>(69-) **92-113 (-124)</td>
<td>(49-) **66-79 (-106)</td>
</tr>
<tr>
<td>Leaf base</td>
<td>attenuate</td>
<td>cuneate to attenuate</td>
</tr>
<tr>
<td>Leaf angle base *</td>
<td>(19-) **33-45 (-76)</td>
<td>(19-) **39-50 (-71)</td>
</tr>
<tr>
<td>Leaf angle between primary and secondary veins*</td>
<td>(26-) **33-43 (-54)</td>
<td>(16-) **25-32 (-41)</td>
</tr>
<tr>
<td>Corolla shape and colour (male &amp; female)</td>
<td>urceolate, pale green</td>
<td>cup-like, yellowish</td>
</tr>
<tr>
<td>Number of stamens (male flowers)</td>
<td>20 stamens with filaments fused into a distinct column</td>
<td>30 stamens, distinct column absent</td>
</tr>
<tr>
<td>Ovary shape and size, stigma shape (female flowers)</td>
<td>ovary oblate, c. 1.5 × 3 mm, stigmata widely elliptic</td>
<td>ovary globose, c. 2 × 2 mm, stigmata 4-angle star-like</td>
</tr>
<tr>
<td>Fruit width (on dry material) (mm)</td>
<td>35-123**</td>
<td>8-12</td>
</tr>
<tr>
<td>Fruit height (on dry material) (mm)</td>
<td>19-53**</td>
<td>11-18</td>
</tr>
<tr>
<td>Pericarp texture</td>
<td>fleshy</td>
<td>coriaceous</td>
</tr>
<tr>
<td>Pericarp thickness</td>
<td>&gt; 3 mm</td>
<td>≤1 mm</td>
</tr>
<tr>
<td>Seed size (mm)</td>
<td>c. 18 × 6-7</td>
<td>8-11 × 3-5</td>
</tr>
</tbody>
</table>

elliptic, 4.5×3.5-3.5 mm, fleshy, apex obtuse and truncate. Stamens 20, filaments fused into a distinct column 1 mm high, anthers c. 0.5 mm wide; rudimentary pistil conical, c. 1×1 mm, truncate at summit. Female flowers solitary, pedicel 1.5-2 mm long, 2.2-5 mm in diameter. Sepals 4, pale green, two external ones widely ovate, c. 3×3-4 mm, two internal ovate, 3×2.5 mm, margin not or only slightly membranous. Petals ovate, 4×2.5-3 mm, fleshy, connate in basal quarter. Staminodes 0. Ovary oblate, c. 1.5×3 mm, glabrous, 4-locular, vertically grooved; stigma widely elliptic, warty, pale yellow. Fruit globose-pyroid, 23×15-21 mm in fresh material (crushed in herb. 35-123×19-53 mm), dehiscence not observed (but expected), the pericarp 3.5-6 mm thick, smooth, fleshy, probably green when mature, yellow inside. Calyx persistent. Peduncle c. 2 mm × 3 mm. Seeds 1-4, ellipsoid, sometimes slightly compressed laterally, c. 18×6-7 mm, surface with irregular longitudinal lines, brown-blackish, tegument thin, fleshy and orangish.

**Taxonomic Note**

*Garcinia urceolata*, sp. nov. probably belongs to Sect. *Brindonia* (Thouars) Choisy, but further studies, including phylogenetic ones, are needed.

**Species Recognition**

With its small leaves and its general architecture, *Garcinia urceolata*, sp. nov. could only be confused with *G. virgata* Vieill. ex Guillaumin. Table 1 compares the main morphological characteristics of these two species. Herbarium specimens without reproductive organs can be difficult to identify. Leaf shape in *G. urceolata*, sp. nov. is usually obovate or broadly obovate, with an apex rounded, obtuse to sub-obtuse, whereas the leaves of *G. virgata* are elliptic with an acute apex, but individuals of *G. virgata* have only flowers or fruits, never both. Variation in the shape of the fruit (globose to pyriform) might be related to the maturity of the fruit, but this remains to be verified.

**ETYMOLOGY**

At the time of its description, *Garcinia virgata* was the New Caledonian member of the genus with the smallest leaves and twigs, and it may have been named based on this aspect, one meaning of virgate being “with long, slender twigs” (Short & George 2013). Alternatively, the author may have noticed the black lines often present on the leaf-blade (especially on the type) and used virgate in its other sense, i.e. “streaked or striped” (Short & George 2013).

**DISTRIBUTION**

*Garcinia virgata* is known from Haute-Ouenghi in the south to Forêt Frouin in the north of Grande-Terre (Fig. 3).
FIG. 4. — *Garcinia virgata* Vieill. ex Guillaumin: A, flowering branch; B1, B2, adaxial surface of leaves; C, abaxial surface of leaf; D, flower and aspect of twig; E, male flower (in herb.); F, inner and outer surfaces of sepals; G, pistillode; H, stamen; I, androecium; J, fruit opening by four valves; K, dorsal and lateral surfaces of the seed. A-I, McPherson 6122 (NOU); K, Munzinger et al. 7258 (P, MPU). Drawings by Laurence Ramon. Scale bars: A-C, 1 cm; D, J, K, 2 mm; E, F, I, 1 mm; G, H, 0.5 mm.
A new *Garcinia* L. from New Caledonia

**Habitat and ecology.** — This species can be locally quite common in dense humid forest, especially along forest edges, but it also grows in drier conditions, in what some authors call “mesic forest” (Munzinger & Gatebé 2017), currently included within dense humid forests sensu (Munzinger et al. 2012). It is known that the number of locations — Garcinia virgata — occurs in 50 to c. 650 m in elevation, on non-ultramafic substrate, and is probably under-collected.

**Phenology.** — Buds were collected in October-November, and flowers in (end of October-) November and December, while the end of fruiting was observed in March-April.

**Conservation status.** — *Garcinia virgata* is known from 12 subpopulations, three of which occupy two adjacent 2 x 2 km grid cells, and one of which occupy three adjacent grids. The calculated EOO is 2604 km² and the AOO is 68 km². In North Province, one subpopulation occurs in the “Reserve de nature sauvege du mont de l’Aoupinié” and another one is found in the “Reserve de nature sauvege du mont Panié”. In South Province, one subpopulation occurs in “Parc des Grandes Fougères” reserve. The other 9 sub-populations fall outside protected areas. The plant can be locally very abundant (Mandjélia, Katalupaik, Farino) and, although some sub-populations may be threatened by bushfires and/or introduced browsers, we consider the number of locations from 5 to more than 10 and the species is threatened in some sites, which still need to be more clearly characterized (Jaffré et al. 2008). *Garcinia virgata* occurs from 50 to c. 650 m in elevation, on non-ultramafic substrate, and is probably under-collected.

**Vernacular name.** — Unknown.

**Additional material examined.** — *New Caledonia*. Koinédé-Cabasse, 21°36'S, 165°58'E, 600 m, 24.XI.77, buds, P. Bambo (NOU[NOU018088]); Mandjélia, 20°24'16.71''S, 164°31'1.26''E, 545 m, 24.IX.2007, buds, P. Bambo (P04667134, P04667135, and P04667138), are annotated by the choice of Vieillard’s epithet, as all duplicates of the type material, “Vieillard 2362” (viz. K000677836, P04667133, P04667134, P04667135, and P04667138), are annotated by Vieillard’s hand as “Garcinia virgata, Vieill.”. Moreover, in this paper, Guillaumin (1942) lists many species in different families, spelling out the genus name in full for the first species listed and then abbreviating it with its initial for all subsequent species, including for new species or combinations. Thus, it is clear that the “C.” in Guillaumin’s protologue is nothing more than a typographical error that is to be corrected (as per Article 60.1. of the Shenzhen Code; T-urland et al. 2018). As a consequence, the new combination published by Govaerts (2018) is superfluous.

As the material is heterogeneous, we have selected a lectotype, choosing P04667134 which includes a hand drawing of a dissected flower. Preynlated xanthones and tococtriens were isolated from the stem bark of *Garcinia virgata* (Merza et al. 2004). The voucher for this analysis is Dumontet 151, wrongly cited as collected in the forest of Frouin in Mandjélia by Merza et al. (2004), whereas the specimen label indicates Aoupinié. We were able to verify the specimen and confirm that it was correctly assigned to this species.

**AMPLIFIED DESCRIPTION**

As the species newly described in this paper was previously included in the little-known *G. virgata*, we propose to emend the description of the latter, in order to clearly distinguish between the two species.

Trees up to 8 m tall, bark pale brown to grey, sapwood pinkish, young branchlets flattened to quadrangular, slightly

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**Note**

Guillaumin’s mention of “*C. virgata* Vieill. ex Guillaumin” (Guillaumin 1942: 149) was interpreted as *Clusia virgata* by Govaerts, who recently published the combination *Garcinia virgata* (Vieill. ex Guillaumin) Govaerts (2018). But Guillaumin clearly used the delimitation of the species and the choice of Vieillard’s epithet, as all duplicates of the type material, “Vieillard 2362” (viz. K000677836, P04667133, P04667134, P04667135, and P04667138), are annotated by Vieillard’s hand as “Garcinia virgata, Vieill.”. Moreover, in this paper, Guillaumin (1942) lists many species in different families, spelling out the genus name in full for the first species listed and then abbreviating it with its initial for all subsequent species, including for new species or combinations. Thus, it is clear that the “C.” in Guillaumin’s protologue is nothing more than a typographical error that is to be corrected (as per Article 60.1. of the Shenzhen Code; T-urland et al. 2018). As a consequence, the new combination published by Govaerts (2018) is superfluous.

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channeled, pruinose; latex yellow in trunk and twigs; all parts glabrous. Leaf blade obovate, narrowly obovate or elliptic, (33-)-39-62(-75) × (5)-13-19(-34) mm, chartaceous to slightly coriaceous, dots or longitudinal black lines (up to 3 mm long) usually present in sicco.; base cuneate to attenuate, forming an angle of (19-)-39-50(-71) degrees; margin flat to slightly revolute; apex acute to rounded, forming an angle of (49-)-66-79(-106) degrees; midvein flat above, prominent below, lateral veins obvious on both surfaces in sicco., 8-10 pairs, the basal veins strongly ascending (to half or more of the blade length); petioles flat above, rounded below, (1.9-)-3.1-4.3(-7.6) × (0.6-)-0.9-1.3(1.8) mm. Flowers solitary or grouped in axillary fascicles, mostly just under the leafy part of the twigs, corolla cup-like, yellowish on both sexes. Flower bracts round to narrowly elliptic, 1 × 0.5-1 mm. Male flowers 1-7 per inflorescence; pedicel 2-2.5 × 1 mm. Sepals 4, glabrous, two external ones slightly oblate, 2.5-3 × 3.5-3.5 mm, margin membranous, two internal ones elliptic, c. 2.5 × 2 mm. Petals 4, elliptic, 2.2-2.5 × 1.8-2 mm, fleshy, apex obtuse. Stamens c. 30, not forming a distinct column, anthers c. 0.5 mm wide; rudimentary pistil conical, c. 1 × 0.5 mm. Female flowers 1-3 per inflorescence, sessile or pedicel up to 2 mm long, 1 mm in diameter. Sepals 4, pale green, two external ones orbicular, c. 3.5-3.5 × 3.5-3.5 mm, two internal ones elliptic, c. 3 × 2 mm, margin membranous. Petals 4, 3 × 2 mm, fleshy, connate in basal half. Stamens 0-2, slender, sagittate, filament to 1.5 mm. Ovary globose, c. 2 × 2 mm, glabrous, 4-locular, vertically grooved; stigma 4-angled, lobes warty, pale yellow. Fruit narrowly obovoid, 11-18 × 8-12 mm, smooth, dehiscent apically by four valves, pale brown when opening, the pericarp 0.5-1 mm thick. Calyx persistent. Peduncle c. 2-4 × 3 mm. Seeds 1-4, ellipsoid, sometimes slightly compressed laterally, 8-11 × 3.5 mm, surface ruminate, brown-blackish.

Acknowledgments

We thank Pete Lowry and Daniel Létocart for allowing us to use their photos. Thanks are given to the staff of MPU, NOU and P for access to and loans of specimens. IRD and MNHN provided access to their collections through of the RECOLNAT national Research Infrastructure (ANR-11-INBS-0004). We also thank Jacques Florence for the correction of the Latin diagnosis. Our Planet Reviewed/Planète Revisitée is a global initiative founded in 2007 by the Muséum national d’Histoire naturelle (MNHN) and Pro- nature International (PNI). The New Caledonia expedition (2016-2019) was a project in partnership with the Conservatoire d’ Espaces Naturels (CEN) de Nouvelle-Calédonie. The 2017 Katalupaik expedition was funded mainly by the Gouvernement de la Nouvelle-Calédonie, Province Nord, and Office des Postes et Télécommunications (OPT), with in-kind support from Air Calin and Avis Nouvelle-Calédonie. The expedition operated under permit number 60912-2001-2017/JJC issued by Direction du Développement Économique et de l’Environnement (DDEE) of Province Nord. Special thanks to Olivier Pascal for organizing the logistics of the 2017 expedition to Katalupaik.

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