



A new species of *Smythea* (Rhamnaceae) from New Guinea

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Abstract

A new species of the genus *Smythea* is described and illustrated from Papua New Guinea. This new taxon, *Smythea papuana*, is morphologically similar to *S. oblongifolia*, a species widespread in Malesia reaching the Lesser Sunda Islands and Maluku Islands. It is the first inland species of *Smythea* in New Guinea to be described – the only other species known to occur on the island is the widely distributed and coastal *S. lanceata*. An amendment to the key to the genus is provided.

Keywords: Rosales, Ventilagineae, Papuasia, Australasia, Malesia, taxonomy, tropical climbers, rainforest

Introduction

Smythea Seemann (1862: 69) is a genus of 11 species of mostly South-East Asian tropical climbers recently revised by Cahen & Utteridge (2018). *Smythea* is closely related to *Ventilago* Gaertner (1788: 223), the only other genus in the tribe Ventilagineae of Rhamnaceae—a strongly supported monophyletic group within the family (Hooker 1862; Richardson *et al.* 2000a); the tribe is unique in Rhamnaceae in having fruits with a pronounced apical appendage (Richardson *et al.* 2000b).

The delimitation of *Smythea* was expanded to include all species with a laterally compressed seed chamber and a twisted wing, with several species of *Ventilago* moving into a slightly enlarged *Smythea* (Cahen & Utteridge 2018). The genus has a predominantly Old World distribution, but the widespread species *S. lanceata* (Tul.) Summerhayes (1928: 389), with an inflated fruit and no distinct wing-like appendage, modified for sea/water dispersal, stretches from the Seychelles to the Fiji Islands. Except for the poorly known *Smythea poomae* Cahen & Utteridge (2018: 21; known from a single collection from Thailand), that also has an inflated fruit and no distinct wing-like appendage, all other species have a more restricted distribution and flattened wings adapted for wind dispersal. In New Guinea, there are eight genera of Rhamnaceae with 23 species (Cámara-Leret *et al.* 2020) and, currently, *Smythea* is only represented by the widespread species *S. lanceata* collected from coastal habitats. The related genus *Ventilago* has three species in New Guinea (Cahen & Utteridge 2017), but differs in the conspicuously globose seed chamber clearly differentiated from the wing, as opposed to *Smythea* fruits, which have a laterally compressed seed chamber graduating into the wing (see Cahen & Utteridge 2018: Fig. 1B, D and E for examples).

During a visit by the first author to the Australian National Herbarium (CANB), a unique specimen of *Smythea* was discovered with a flattened, hairy wing, and from an inland rain forest habitat (rather than a coastal area), representing an undescribed species from the island. This species is clearly a member of *Smythea*, as delimited by Cahen & Utteridge (2018), because of the combination of the following characters: asymmetric leaf base (*Ventilago* base usually symmetrical), leaf margins toothed (*Ventilago* margins often entire), flowers borne in fascicles in axils of persistent leaves (*Ventilago* mostly with flowers arranged in leafless inflorescences), conspicuous domatia in the leaf axils (rare in *Ventilago*), the fruit with a laterally compressed seed chamber graduating into the wing (*Ventilago* with a globose seed chamber) and the wing somewhat twisted at the base (*Ventilago* fruit wings not twisted).

New Guinea remains one of the most poorly collected tropical areas in the world (Middleton *et al.* 2019), and one of the largest remaining wilderness areas on the planet (Mittermeier *et al.* 2003). Although identified as having the world's richest island flora (with 13,634 species), Cámara-Leret *et al.* (2020), in their recent expert-verified checklist, show that collecting effort is still low and that at least 3,000 additional species remain to be described from New

Guinea. The Australian National Herbarium (CANB) is particularly important for understanding the plant diversity of New Guinea as it holds significant collections of New Guinea material, especially the ‘top set’ of specimens collected during land use surveys conducted during the 1950–1970s by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in the Territory of Papua and New Guinea (see Keig *et al.* 2019a, b), and some specimens were unicates not distributed outside CANB, including the specimen studied here (see also Utteridge & Lepschi 2020). Further collecting is needed throughout the island, even in the better collected regions of Papua New Guinea, and this collection is from the Sohe District in northern Oro Province with some of the lowest collecting densities in the region (with grid cell squares having only 25–100 specimens per 25 × 25 km, see Cámara-Leret *et al.* 2020: Fig. 1a).

Materials and methods

Identification of the new species was undertaken with the use of relevant literature including Banerjee & Mukherjee (1969, 1970), Cahen & Utteridge (2017, 2018) and Lauterbach (1922). Specimens of the genus from Malesia, including types of similar taxa, were studied at CANB and K, and specimen images were consulted from Global Plants JSTOR (<http://plants.jstor.org/> - coverage includes A, B, BM, BR, BRI, P, etc.) and the BioPortal of Naturalis Biodiversity Center (<http://bioportal.naturalis.nl/> - coverage includes L, U and WAG). All measurements were taken from dried specimens. Photographs were taken using a Leica MZ12 fitted with a TouPCam XCAM Full HD Camera. The preliminary conservation status is proposed in accordance with the IUCN Red List Category Criteria (IUCN 2012).

Taxonomic treatment

Smythea papuana Utteridge & Cahen *sp. nov.*

Most like *Smythea bombaiensis* (Dalzell) Banerjee & Mukherjee (1970: 214) in having leaves with conspicuous domatia in the secondary vein axils and fruits with a densely hairy wing but differs in the branchlets with a majority of hairs spreading (vs .majority of hairs appressed in *S. bombaiensis*), leaf margins obscurely serrulate appearing almost entire (vs conspicuously serrate) and 5–7 pairs of secondary veins (vs 3–5 [– 6] pairs). Also similar to the nearer occurring *S. oblongifolia* (Blume) Cahen & Utteridge (2018: 18) on account of the same characters (domatia and hairy fruits) but differs again in leaf margins obscurely serrulate appearing almost entire (vs conspicuously serrate) but also in having secondary veins diverging from the primary vein at usually 35–45° (vs c. 20–35°) and the flowers in the axils of persistent leaves (vs in leafless racemes and panicles in *S. oblongifolia*).

Type:—PAPUA NEW GUINEA. Northern Div. [Oro Province], ca 1 km N of Oitatandi village [8°36'S 147°57'E], alt. ca 25 m, 19 Aug. 1953 (fr.), *Hoogland 3685* (holotype: CANB acc. no. 74365!; isotype: LAE n.v.).

Climber in ‘ca 20 m high tree’. *Indumentum* dense on all parts except lamina; hairs spreading, short, fulvous on branchlets, inflorescence and fruits, hairs appressed, longer and pale yellow-brown on leaves and petioles. *Branches* smooth, dark grey, with narrow longitudinal cracks; branchlets slightly ridged. *Stipules* early caducous. *Leaves*: lamina elliptic, 8.8–10 cm × 3.8–4 cm, chartaceous-subcoriaceous, apex acute, mucronulate, base asymmetric, rounded to broadly cuneate, margins obscurely serrulate appearing almost entire, serrations topped by callosities; lamina glabrous on both surfaces; primary vein prominent abaxially, sparsely hairy abaxially, glabrous adaxially; secondary veins 5–7 pairs, prominent abaxially, remaining separate near margin or indistinctly connected by secondary vein branches and forming weak loops near leaf margin, angle of divergence from primary vein usually 35–45°, glabrous or very sparsely hairy abaxially, glabrous adaxially; tertiary veins slightly ascending from primary vein, spaced every c. 0.5 mm; reticulations distinct on either side of lamina; venation glabrous abaxially except for domatia and the primary vein, glabrous on the adaxial side; domatia conspicuous, in secondary vein axils, appearing as the abaxial lamina slightly pitted and densely covered by fulvous hairs on adjacent venation; petiole 3–4 mm long, sparsely appressed hairy. *Inflorescence* of fascicles in the axils of persistent leaves; flowers unknown. *Fruit* narrowly elliptic-oblong and wing-like, 6–7.2 × 1.2–1.4 cm, wing slightly twisted near base, apex obtuse-rounded; hairs dense, especially near base of wing, ginger-brown; persistent calyx at base of fruit longitudinally ridged, sparsely hairy. Figs. 1 & 2.



Australian National Herbarium (CANB)

Smythea sp. nov. "*papuana*"

DET. T.M.A. Uteridge (K) Oct. 2019

HERBARIUM AUSTRALIENSE
C.S.I.R.O., Canberra

Coll. R.D. Hoogland no. 3685
Date 19.8.1953

Botanical Name fam. Rhamnaceae.
Smythea

Local Name

Area Northern Div., Terr. of Papua.
Loc. ca 1 km N of Oitatandi village. 8°36'E-147°57'E

Hab. climber in ca 20 m high tree in partly filled rainforest; alt. ca 25 m.

Notes Fruits green.

Duplicates have been sent to: (1) LAE.

CANB LOAN 2020-002-40

FIGURE 1. *Smythea papuana*. Image of the holotype Hoogland 3685 (CANB 74365).

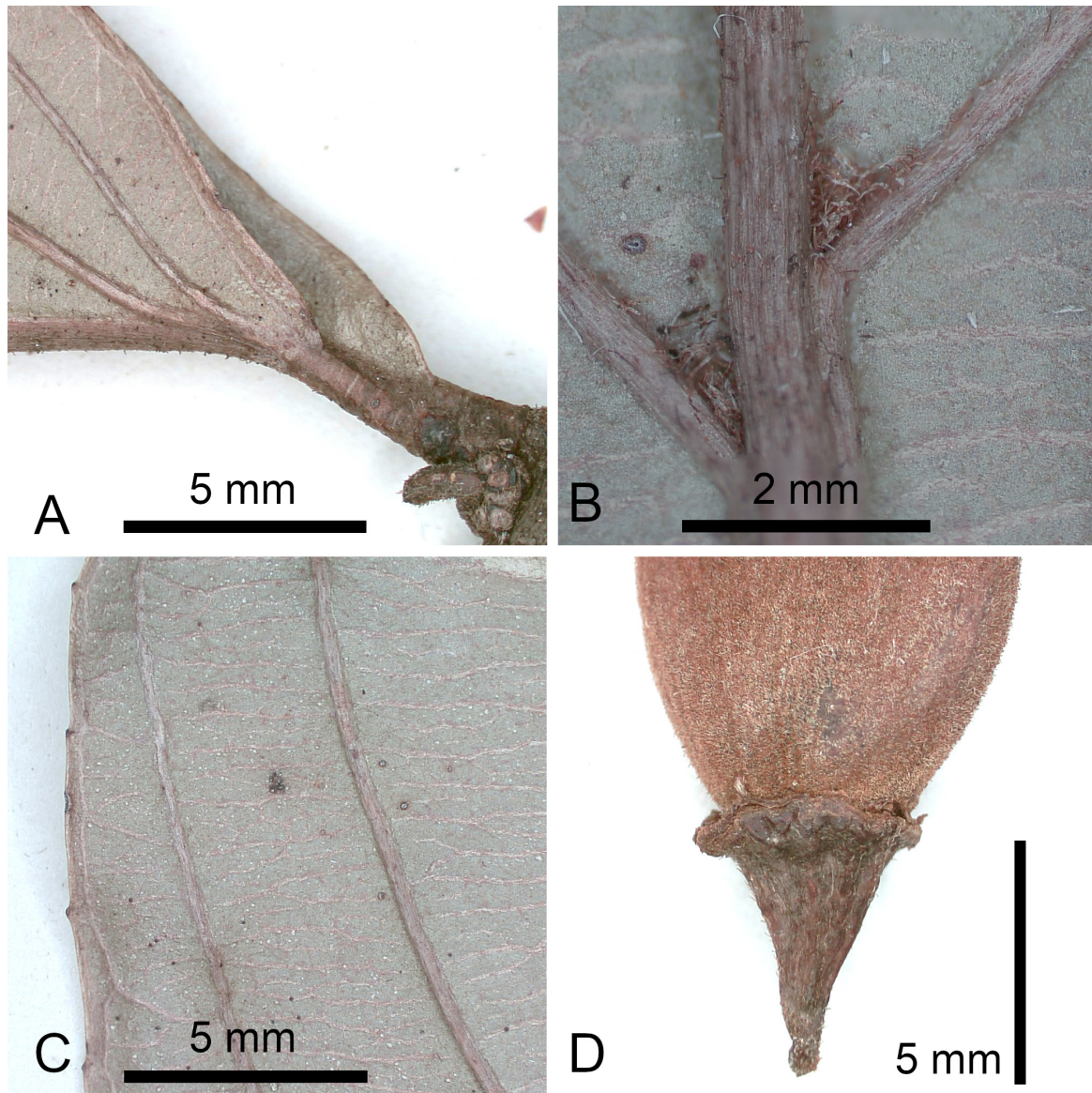


FIGURE 2. *Smythea papuana*, key diagnostic morphological characters. **A** unequal leaf base; **B** axillary domatia; **C** obscurely serrulate leaf margins (abaxial view); **D** base of fruit showing sparsely hairy persistent calyx and the densely hairy fruit wing, note the slight twist in the base of the fruit. All from *Hoogland 3685*. Photographs: Timothy Utteridge.

Distribution:—Only known from the type locality from Sohe District in northern Oro Province on the Papuan Peninsula (also known as the ‘Bird’s Tail Peninsula’).

Habitat:—Tropical wet evergreen rain forest within the South-Eastern Papuan rain forest ecoregion (Olson *et al.* 2001); ‘partly felled rain forest’ (*Hoogland 3685*).

Preliminary conservation status:—*Smythea papuana* is only known from the type with no additional data available to estimate range or population size, and the species is assigned as Data Deficient (DD) following the IUCN Red List Criteria (2012). The collection is from the lowlands in Oro Province, and the region around the collection locality is comprised of intact alluvial habitats along the Kumisi River but within a matrix of plantations nearer roads and villages and some remaining forest patches; immediately to the west are the still densely forested foothills of Mt Parkes in the Ajule Kajale Range within the larger Owen Stanley Range (Google Earth imagery from 2020). Further fieldwork is needed to assess population size and structure of this species, as well as habitat quality and threats.

Phenology:—Collected in fruit in August.

Etymology:—*Smythea papuana* is named for the Papuan Peninsula and Papua New Guinea.

Discussion:—*Smythea papuana* is unique in the genus on account of the combination of the leaf margins being obscurely serrulate appearing almost entire (Fig. 2C), the lamina being glabrous on both surfaces, the 5–7 pairs of secondary veins diverging from the primary vein at usually 35–45°, the flowers in the axils of persistent leaves and

the planar (not inflated) fruit with a densely hairy wing (Fig. 2D). The only other taxon of *Smythea* recorded from New Guinea is the widespread *S. lanceata*, a coastal species which is found near the seashore and has ovate, inflated fruits suited for water dispersal. *Smythea papuana* differs in having planar fruits with a distinct oblong wing-like apical appendage, domatia are tufts of hairs in the axils (Fig. 2B), rather than defined pockets as found in *S. lanceata*, and the habitat is different being found in lowland forests rather than littoral habitats. One of the most widespread species in Malesia with a planar wing is *S. oblongifolia*, distributed from India through to the Lesser Sunda Islands (Flores, Sumba, Sumbawa and Timor) and Maluku Islands (Halmahera), but that species differs from *S. papuana* in the more conspicuously serrate leaves with secondary veins that diverge from the primary vein at c. 20–35° (noted to be the narrowest angles of divergence in the genus), and the flower fascicles in leafless racemes or panicles. *Smythea papuana* is also morphologically similar to *S. beccarii* Cahen & Utteridge (2018: 8; Sulawesi) as both have leaf margins appearing almost entire, conspicuous domatia in the secondary vein axils and flowers in the axils of persistent leaves. However, *S. beccarii* has smaller leaves, 3.9–8.8 × 1.0–4.0 cm (vs 8.8–10 × 3.8–4 cm in *S. papuana*), 3–5 pairs of secondary veins (vs 5–7 pairs) and more sparsely hairy fruits.

In New Guinea, the species may be confused with *Ventilago* species vegetatively, but differs from *Ventilago crenata* Cahen & Utteridge (2017: 173) in the margins appearing almost entire (vs crenate) and from *V. microcarpa* K.Schum. in Schumann & Hollrung (1889: 72) and *V. papuana* Merrill & Perry (1941: 263) in the asymmetric leaf bases (see Fig. 2A), abaxially prominent secondary veins (vs almost flat), the presence of conspicuous domatia in the axils of secondary veins (Fig. 2B), and petioles 3–4 mm long (vs 5–13 mm). While the tertiary vein reticulations of *S. papuana* are distinct, they are more conspicuous in *Ventilago microcarpa* and *V. papuana*, especially adaxially. *Pullen 8188*, also collected on the Papuan Peninsula, 15 km NE of Cape Rodney, was identified as *V. crenata* by the authors who noted that it ‘differs from the type specimen and *Schodde 2418* in its narrower leaves with almost entire leaf margins and long and much-branched panicles’ (Cahen & Utteridge 2017). This specimen is vegetatively very similar to *S. papuana* but lacks the conspicuous domatia (a variable character in Ventilagineae). It was placed in *V. crenata* on account of the prominent secondary veins, short petioles and glabrous yellow nectary disks (hairy in *V. papuana*, not seen in *V. microcarpa*) but no fruits are available to determine whether it is a *Smythea* or a *Ventilago*. The long, much-branched panicles suggest the species may be distinct from *S. papuana* but more material is needed to confirm the identity of *Pullen 8188*.

The position of the leaves distally beyond the fruits on three of the shoots of the type specimen of *Smythea papuana* indicates that at least some of the flowers are in the axils of persistent leaves, rather than being in leafless racemes or panicles such as in *S. oblongifolia*. The new species is morphologically similar to those taxa with flowers in axils and chartaceous to planar fruits with the fruit wing densely hairy. All such taxa are from the Indian subcontinent or west Malesia, viz *S. bombaiensis* (western India), *S. calpicarpa* Kurz (1872: 301; Myanmar) and *S. velutina* (Ridl.) Banerjee & Mukherjee (1969: 251; southern Thailand and Peninsular Malaysia). The most similar of these taxa is *S. calpicarpa*, especially with similar indumentum and venation morphology having 5–7 pairs of abaxially conspicuously prominent, hairy secondary veins, but the new species described here differs in the longer petioles (less than 2 mm long in *S. calpicarpa*) and the conspicuous domatia (Fig. 2B; domatia absent in *S. calpicarpa*). Further differences in morphology within these taxa are given in the following amendment to the key to species given in Cahen & Utteridge (2018); inserting *S. papuana* would add a couplet following the leads of the flowers in axils of persistent leaves, the densely hairy fruit wing and the lamina glabrous on both surfaces:

[Continued from couplet 2 in Cahen & Utteridge 2018: 5]

3.	Flowers fascicles in axils of persistent leaves.....	4
-	Flower fascicles in leafless racemes or panicles.....	10
4.	Fruit wing surface densely hairy.....	5
-	Fruit wing surface very sparsely hairy except sometimes near base.....	7
5.	Abaxial surface of leaf densely hairy.....	<i>Smythea velutina</i>
-	Abaxial surface of leaf glabrous except along veins.....	6
6.	Domatia inconspicuous.....	<i>Smythea calpicarpa</i>
-	Domatia conspicuous.....	6.1
6.1.	Branchlets with majority of hairs spreading. Leaf margins obscurely serrulate appearing almost entire; secondary veins, 5–7 pairs.....	<i>Smythea papuana</i>
-	Branchlets with majority of hairs appressed. Leaf margins conspicuously serrate; secondary veins 3–5[–6] pairs.....	<i>Smythea bombaiensis</i>

[Continues to couplet 7 in Cahen & Utteridge 2018: 5]

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