



Two new species of *Justicia* (Acanthaceae) from northern Thailand

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Summary. Two new species, *Justicia flavescens* and *J. vasculosoides* are described and illustrated from northern Thailand. Both species have restricted distributions. The conservation status of each species is assessed.

Key Words. Asia, conservation status, morphology, pollen, taxonomy.

Introduction

Justicia L. is a large pantropical genus of Acanthaceae with c. 600 species (Graham 1988; Mabberley 2008). The genus is easily recognised by its zygomorphic, bilabiate corolla having a rugula (a stylar furrow which runs along the centre of the upper lip) (Kiel *et al.* 2017), bitheous anthers with appendages or a white tail (rarely absent), 2-porate pollen grains that are 2 – 3-colporate with aperture areas or 3-colporate with six pseudocolpi (Rueangsawang *et al.* 2013) and four seeds held on retinacula. A recent analysis of the nrITS and the cpDNA sequence data by Kiel *et al.* (2017) suggests that *Justicia* s.l. is highly paraphyletic, with New World and Old World clades, both of which have morphologically distinct lineages nested within them. In particular, it revealed that *Justicia* from the Old World is sister to subtribe Diclipterinae (*Dicliptera* (= *Peristrophe*) and *Hypoestes*). Members of Diclipterinae lack the rugula that is usually present in justicioid lineages. Keil *et al.*'s work also has implications for the infrageneric classification of Graham (1988), as several of her sections prove to be polyphyletic.

The first record of *Justicia* from Thailand was the newly described *J. bicalcarata* Craib (Craib 1912). Since then 19 new species have been found in the country (Imlay 1939). Further studies of the genus in Thailand were undertaken by Ridley (1922), Imlay (1938), Hansen (1985, 1987, 1989) and the Forest Herbarium (2014). In a recent treatment for Thailand (Rueangsawang 2012), 50 taxa (48 species and two varieties) were delimited. During recent fieldwork in northern Thailand, specimens were collected that did not match with any of the known taxa of *Justicia*. After detailed examination, it was concluded that they represent species new to science and are described below. A key that includes the new species will be

presented in the forthcoming *Flora of Thailand* account of the genus (Rueangsawang *et al.* in prep.).

Materials & Methods

Extensive fieldwork was undertaken in Tak, Kamphaeng Phet and Sukhothai provinces, northern Thailand in 2014 by the first author. Specimens collected during the fieldwork were pressed, dried and examined both directly and under a binocular microscope. Material in AAU, BK, BKF, BM, C, CMU, E, K, KKU, L, P, QBG and SING was also examined and compared to other Asian taxa in order to determine whether the specimens collected during fieldwork represented new taxa. Data were assembled into a Microsoft® Excel™ spreadsheet, from which the species descriptions were written. For the conservation assessments the IUCN Red List categories and criteria (IUCN 2012) were applied; extent of occurrence (EOO) and area of occupancy (AOO) were measured using Geocat software (<http://geocat.kew.org/>; Bachman *et al.* 2011). All specimens seen are indicated by '!'.

Taxonomy

***Justicia flavescens* Rueangs. & Chantar. sp. nov.** Type: Thailand, Sukhothai province, Si Satchanalai National Park, Tat Dao waterfall, 10 Nov. 2016, K. Rueangsawang 308 (holotype BKF!; isotypes K!, KKU!).

<http://www.ipni.org/urn:lsid:ipni.org:names:60479210-2>

Subshrubs up to 1.5 m tall. *Stems* woody, erect, quadrangular, with longitudinal green lines, pubescent when young, swollen at nodes. *Leaves* chartaceous, upper surface variegated when young, 14 – 21 × 3 – 8 cm, lanceolate or rarely ovate, base attenuate, margin entire, apex acuminate

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or caudate; cystoliths linear, conspicuous on lower surface; minutely pubescent along midrib; lower surface puberulent; lateral veins in 6–10 pairs; petioles 1.5–5 cm long, grooved above, pubescent. *Inflorescences* comprising terminal spikes, 8–15 cm long, unbranched or with a single branch; rachis pubescent; peduncles c. 1 cm long, pubescent. *Flowers* sessile, opposite at each inflorescence node, each flower subtended by 1 bract and 2 bracteoles; bract 4-ranked, imbricate, pale green, upper bract ovate or lanceolate, 8–13 × 4–6 mm, base obtuse or cuneate, margin ciliate, apex acute or acuminate, surfaces pubescent, lower bracts foliaceous and narrowly ovate, 20–25 × 3–4 mm, base cuneate, margin entire, apex caudate, glabrous, bracts longer than calyx; bracteoles 3–5 × c. 1 mm, lanceolate, margin ciliate, apex acuminate, surfaces minutely pubescent to glabrous, shorter than calyx. *Calyx* deeply 5-lobed, greenish, 4–6 × 0.5–0.7 mm, lobes linear-lanceolate, apex acuminate, margin ciliate, sparsely pubescent outside, glabrous inside. *Corolla* yellowish, without markings on palate of lower lip, 18–20 mm long, finely pubescent outside; tube cylindrical, 13–15 mm long, slightly enlarged in throat; upper lip 5–7 mm long, broadly triangular, slightly hooded, not emarginate; lower lip 5–10 × 7–8 mm, lateral lobes c. 1 × 1–1.3 mm, middle lobe c. 1 × 1.5–2 mm, three lobes spreading, palate with conspicuous venation. *Stamens* 4–5 mm long, glabrous, attached near upper part of corolla tube; filaments straight; anthers separate, 2-theous, c. 1.5 mm long, subequal, lower theca 1–1.3 mm long, with tail c. 0.1 mm long, upper theca c. 1 mm long. *Ovary* ovoid, glabrous; style 13–20 mm long, filiform, strigulose in lower half; stigma with 2, minute, unequal lobes. *Capsules* 1.5–2 cm long, obovoid, apex acute, densely pubescent. *Seeds* 4, 1.8 × 2 mm, suborbicular, dark brown, rugulose-tuberculate. Figs 1 & 2.

RECOGNITION. *Justicia flavescens* is morphologically similar to *J. cochinchinensis* Benoist in having flowers that are sessile and opposite at each inflorescence node, a long inflorescence and 4-ranked bracts, but can be distinguished by lanceolate or rarely ovate leaves (vs ovate throughout in *J. cochinchinensis*); bracts foliaceous towards base of inflorescence but rapidly narrowing to ovate or lanceolate upwards (vs not foliaceous towards base of inflorescence); pale green bract coloration (vs pale green with purple margin); yellowish corolla without markings on the lower lip (vs white to pale pink with reddish or purple markings on the lower lip) and corolla tube longer than the corolla lip (vs tube as long as corolla lip). A comparison between *J. flavescens* and *J. cochinchinensis* is presented in Table 1.

DISTRIBUTION. Endemic to Thailand and only known from Si Satchanalai National Park (Map 1).

SPECIMENS EXAMINED: THAILAND. Sukhothai: Si Satchanalai National Park, Tat Dao waterfall, 17°33'16.4"N, 99°29'00.8"E, 148 m alt., 18 Nov. 2014, M. Norsaeangri 1153 (QBG!); same locality, 17°33'17.6"N, 99°28'54.3"E, 203 m alt., 10 Nov. 2016,

K. Rueangsawang 305 (holotype BKF!; isotypes K!, KCU!).

HABITAT. Along streams in sandy soil, in open bamboo forest; alt. 148–203 m. Associated with *Adiantum philippense* L., *Barleria siamensis* Craib, *Eranthemum tetragonum* A.Dietr. ex Nees, *Lygodium polystachyum* Wall. ex Moore and *Thelypteris* sp. etc.

CONSERVATION STATUS. This species is known only from the type locality which lies within in a protected area. It is rare and there appears to be only one small population along a nature trail in an area frequently visited by tourists. Therefore, it should be considered as Vulnerable [VU D2] according to the IUCN (2012) criteria.

PHENOLOGY. Flowering and fruiting between November–January.

ETYMOLOGY. The name of this species is derived from the Latin for yellowish. This refers to the colour of the corolla which is unusual in *Justicia*.

NOTE. Both *Justicia flavescens* and *J. cochinchinensis* have characteristics of *Justicia* sect. *Vasica* (sensu Graham 1988), such as simple spicate inflorescence with ovate bracts.

***Justicia vasculosoides* Rueangs. & Chantar. sp. nov.** Type: Thailand, Tak province, Namtok Pha Charoen National Park, Pha Charoen waterfall, 15 Jan. 2014, K. Rueangsawang 285 (holotype BKF!; isotypes K!, KCU!).

<http://www.ipni.org/urn:lsid:ipni.org:names:77198949-1>

Subshrubs up to 1 m tall. *Stems* woody, erect, quadrangular, with longitudinal dark lines, sparsely pubescent when young, swollen at nodes. *Leaves* chartaceous, upper surface variegated when young, 6–14 × 3–6 cm, ovate, base attenuate, margin entire, apex acuminate or sometimes caudate; cystoliths linear, conspicuous on both surfaces; minutely pubescent along midrib; lower surface glabrous; lateral veins in 7–9 pairs; petioles 1–6 cm long, grooved above, minutely pubescent. *Inflorescences* terminal and in upper axils; spikes 2–6 cm long, unbranched or with up to 3 pairs of branches; rachis minutely pubescent; peduncles 1–3 cm long, sparsely pubescent or glabrous. *Flowers* sessile, opposite at each inflorescence node, each flower subtended by 1 bract and 2 bracteoles; bracts 3–7 × 1–3 mm, oblanceolate, base obtuse, margin ciliate or entire, apex acute, surfaces sparsely pubescent or glabrous, shorter than calyx; bracteoles 1–3.2 × 1–1.2 mm, lanceolate, margin ciliate, apex acute, surfaces pubescent to glabrous, shorter than calyx. *Calyx* deeply 5-lobed, greenish, 3.7–5 × 0.7–1 mm, lobes linear-lanceolate, apex acuminate, margin ciliate, pubescent with glandular hairs outside, glabrous inside. *Corolla* pink or white with pinkish markings on palate of lower lip, 14–17 mm long, finely pubescent outside; tube cylindrical, 5–8 mm long, slightly enlarged in throat; upper lip 6–8 mm long, broadly triangular, slightly hooded, not emarginate; lower lip 6–8 × 5–9 mm, lateral lobes 1–2 × 2–2.5 mm, middle lobe

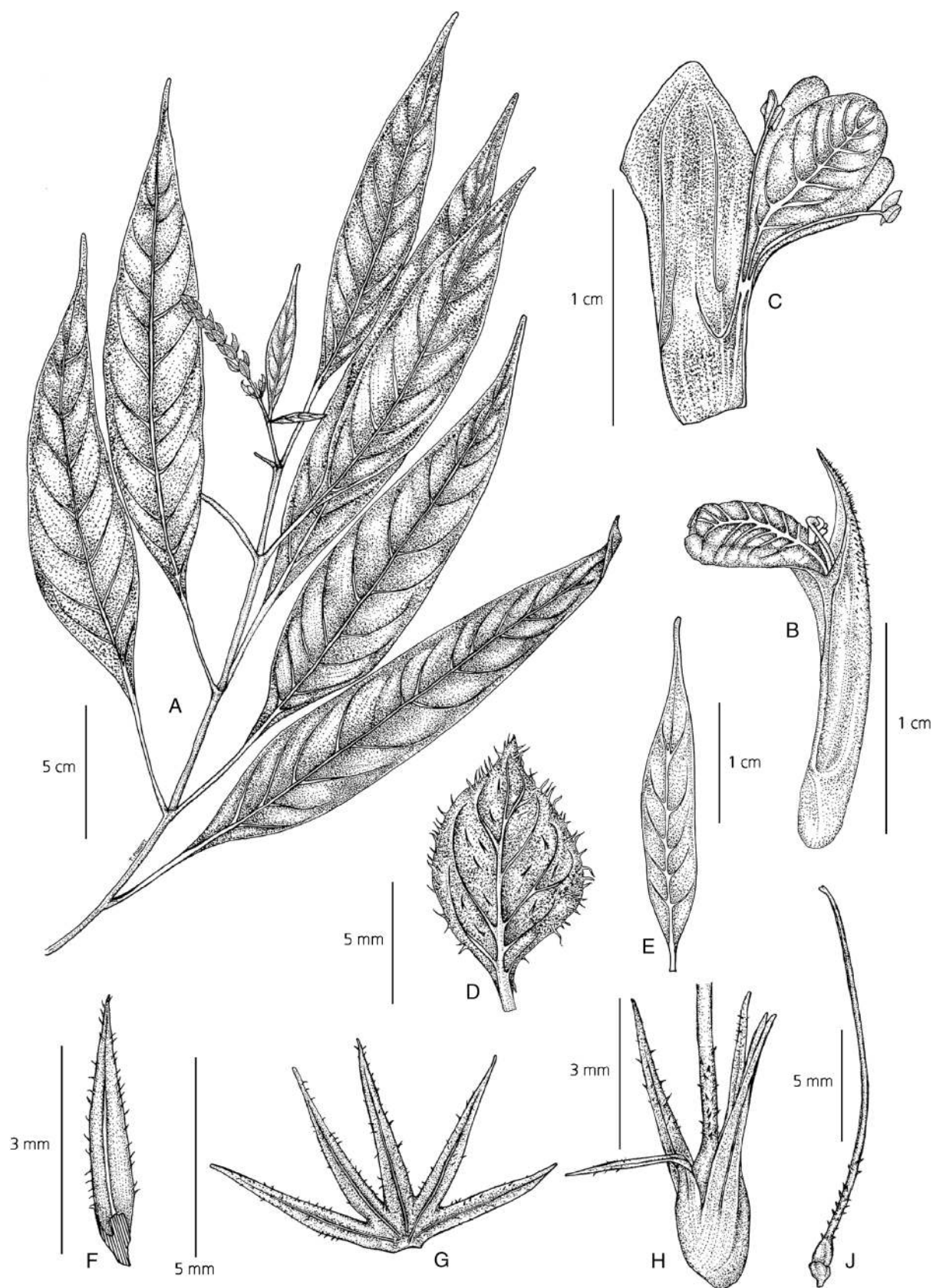


Fig. 1. *Justicia flavesces* A plant with inflorescence; B flower, lateral view; C dissected corolla, with stamens attached; D upper bract; E lower bract; F bracteole; G calyx; H calyx with ovary; J pistil. All from the type. DRAWN BY T. PINGYOT.



Fig. 2. *Justicia flavescens* A plant habit; B inflorescence; C variegated leaf surface when young; D flowers. PHOTOS: W. TANMING.

broader, $2 - 2.5 \times 2.5 - 2.8$ mm, the 3 lobes spreading, paler with conspicuous venation. *Stamens* 3 – 4 mm long, glabrous, attached near middle part of corolla tube; filaments straight; anthers separated, 2-theous, c. 1.8 mm long, subequal, lower theca 1 – 1.3 mm long, with tail c. 0.1 mm long, upper theca c. 1 mm long. *Ovary* ovoid, glabrous; style 13 – 15 mm long, filiform, strigulose in lower half; stigma with 2, minute, unequal lobes. *Capsules* 1 – 1.2 cm long, obovoid, apex acute, pubescent. *Seeds* 4, 2.6×1.8 mm, suborbicular, pale brown, rugulose-tuberculate. Figs 3 & 4.

RECOGNITION. *Justicia vasculosoides* is morphologically similar to *J. vasculosa* (Wall. ex Nees) T. Anderson in having ovate leaves and a lax inflorescence with a single flower subtended by one bract and two bracteoles, but can be distinguished by the glabrous leaf surface with an acuminate or caudate apex (vs sparsely pubescent with an acute or rounded apex in *J. vasculosa*); inflorescence 2 – 6 cm long, glabrous or with minute pubescence (vs inflorescence 7 – 19 cm long with dense glandular hairs) and a pink or purple corolla tube (vs cream-coloured or white). A compar-

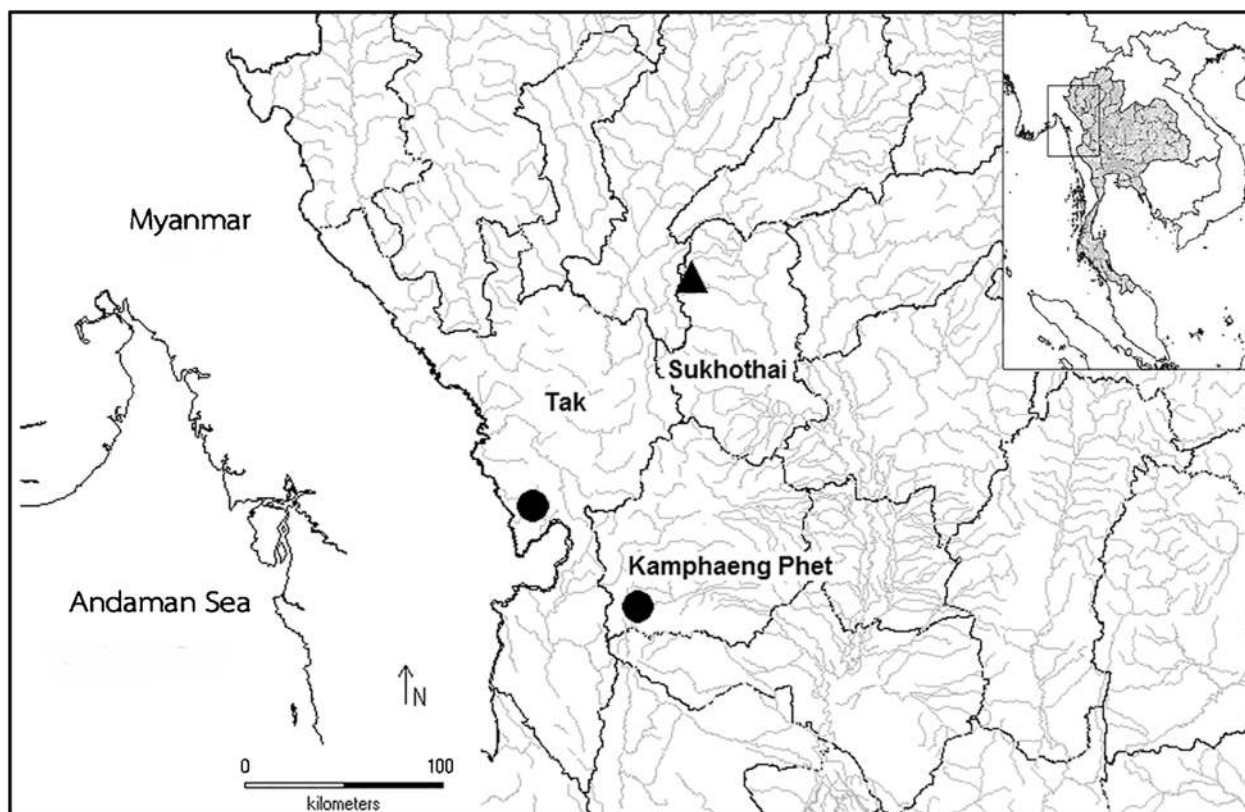
Table 1. Comparison of selected characters between *Justicia flavesces* and *J. cochinchinensis*.

Character	<i>J. flavesces</i>	<i>J. cochinchinensis</i>
Leaf		
texture	chartaceous	coriaceous
shape	lanceolate, ovate	ovate
apex	acuminate or caudate	acute or cuneate
base	attenuate	attenuate or obtuse, oblique
size (cm)	14 – 21 × 3 – 8	5.5 – 12 × 3 – 8.5
Bract		
arrangement	4-ranked, imbricate, longer than calyx	4-ranked, imbricate, longer than the calyx
colour	pale green with ciliate margin	pale green with purple margin
size (mm)	8 – 13 × 4 – 6	8 – 15 × 6 – 10
Calyx		
size (mm)	4 – 6 × 0.3 – 0.5	4 – 6 × 0.9 – 1
Corolla		
colour	yellowish, without markings	white to pale pink with reddish or purple markings on palate of lower lip
tube length (mm)	13 – 15	7 – 9.5
Capsule		
indumentum	densely pubescent	pubescent
length (cm)	1.5 – 2	0.8 – 1.2

ison between *J. vasculosoides* and *J. vasculosa* is presented in Table 2.

DISTRIBUTION. Northern Thailand (Map 1), near the Myanmar border and possibly occurring in Myanmar although no material from here has yet been collected.

SPECIMENS EXAMINED: THAILAND. Tak: Namtok Pha Charoen National Park, Pha Charoen waterfall, 16°30'07"N, 98°45'09"E, 600 m alt., 15 Jan. 2014, *K. Rueangsawang* 285 (holotype BKF!; isotypes K!, KKKU!); Kamphaeng Phet: Chong Yen, Chong Yen Mae Wong National Park, 16°02'22"N, 99°14'00"E,

**Map 1.** Distribution of *Justicia flavesces* (closed triangle) and *J. vasculosoides* (closed circles) in northern Thailand.

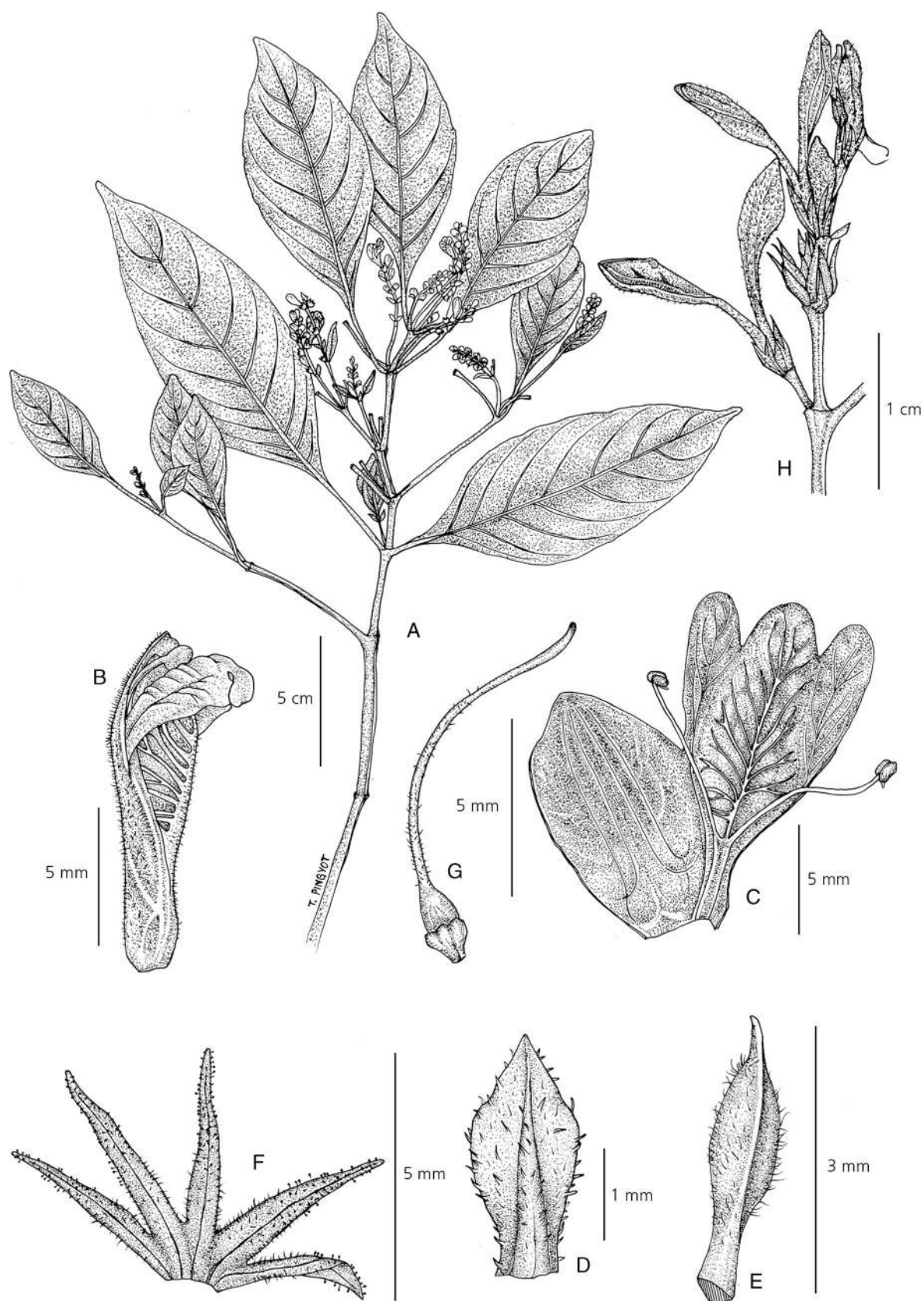


Fig. 3. *Justicia vasculosoides* A plant with inflorescences; B flower, lateral view; C dissected corolla, with stamens attached; D bract; E bracteole; F calyx; G pistil. All from the type. DRAWN BY T. PINGYOT.



Fig. 4. *Justicia vasculosoides* A plant habit; B inflorescence; C flower showing lower corolla lip; D flower showing upper corolla lip. PHOTOS: K. RUEANGSAWANG.

Table 2. Comparison of selected characters between *Justicia vasculosoides* and *J. vasculosa*.

Character	<i>J. vasculosoides</i>	<i>J. vasculosa</i>
Leaf		
texture	chartaceous	thinly chartaceous
shape	ovate or lanceolate to ovate	broadly ovate or elliptic
apex	acuminate or caudate	acute or rounded
base	attenuate	cuneate or obtuse
size (cm)	6 – 14 × 3 – 6	8 – 18 × 3.5 – 5.8
Inflorescence		
length (cm)	2 – 6	7 – 19
indumentum	glabrous to minutely pubescent	dense glandular hairs
Bract		
size (mm)	3 – 7 × 1 – 3	2 – 3.5 × 1 – 1.4
indumentum	shorter than calyx sparsely pubescent to glabrous	as long as or a little shorter than the calyx pubescent on both surfaces
Calyx		
size (mm)	3.7 – 5 × 0.7 – 1	2.5 – 3 × 0.5 – 0.8
Corolla		
colour	pink with pink or red markings on palate of lower lip, tube cylindrical, pink	creamy to white with pink markings on palate of lower lip, tube cylindrical, white
middle lobe size (mm)	2 – 2.5 × 2.5 – 2.8	1 – 1.8 × 1.8 – 2.2

1,340 m alt., 28 March 2015, *K. Rueangsawang* 305 (BKF!).

HABITAT. Open areas and along streams in evergreen forest; alt. 600 – 1340 m. Associated with *Ageratina adenophora* (Spreng.) R.M.King & H.Rob. and *Peristrophe lanceolaria* (Roxb.) Nees.

CONSERVATION STATUS. A preliminary conservation assessment of Endangered [EN B1ab(iii)+2ab(iii)] is appropriate. The extent of occurrence (EOO) is 60 km² and the population occurs in disturbed and fragmented habitats due to human activity (mainly agriculture and urban development that have resulted in the extensive loss of forest cover). The area of occupancy (AOO) is less than 5 km². Both collection localities are in protected areas.

PHENOLOGY. Flowering and fruiting between November – March.

ETYMOLOGY. The specific epithet “*vasculosoides*” refers to the new species’ superficial resemblance to *Justicia vasculosa*.

NOTE. *Justicia vasculosoides* most likely belongs to sect. *Tyloglossa* (sensu Graham 1988) and, in common with *J. vasculosa*, has characteristics of this section, such as the spiciform inflorescence with one flower per node and linear to lanceolate bracts.

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