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A synopsis of *Rungia* (Acanthaceae) in Thailand

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ABSTRACT

A synopsis of the genus *Rungia* in Thailand is presented. The 14 species are listed together with a synoptic account of each species and an identification key is provided. *Rungia repens* is selected as the type of *Rungia*. One species, *Rungia brandisii* is a new record for Thailand. Lectotypes are selected for *Rungia adnata*, *R. brandisii*, *R. diversibracteata*, *R. maculata*, *R. rivicola*, *R. subtilifolia* and *R. tenuissima*. A new combination, *Rungia polyneura* is made for *Justicia polyneura* which is found to belong within *Rungia* based on morphological characters.

KEYWORDS: key, lectotype, new combination, taxonomy.

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INTRODUCTION

The genus *Rungia* Nees is mainly distributed in the Old World tropics, with approximately 50 species (Mabberley, 2017). The placenta of the mature fruit is typically separate from the capsule wall but remains attached apically. These 'rising placentas' are also found in subtribes Ruellieae and Justicieae (Wood, 2014). *Rungia* is closely related to *Justicia* L. as both have anthers with superposed thecae, nearly always with a conspicuous appendage on the lower theca, and also share bilabiate, internally rugulate corollas. In some accounts, e.g., Darbyshire *et al.* (2010) and Wood (2014), *Rungia* has been placed in *Justicia* on the basis of several morphological characters, including floral shape, androecium and fruit structure. However, Nees von Esenbeck (1847), Anderson (1867), Clarke (1885), Benoist (1935), Wood (2001) and Hu *et al.* (2011) all treated *Rungia* as a separate genus. A recent phylogenetic study by Kiel *et al.* (2017) revealed that the *Rungia* clade (including *Metarungia galpinii* (Baden) Baden, *M. longistrobus* Baden, *Justicia gendarussa* Burm.f., *J. pseudorungia* Lindau and *Rungia klossii* S.Moore) is monophyletic, with all the taxa having elastic placentae.

In Thailand, seven species of *Rungia* were enumerated by Imlay (1938) based on the presence or absence of hyaline margins on the bracts and bracteoles, and on various inflorescence characters including flattened spikes with 1- or 2-sided spikes and bracts 2- or 4-ranked. The separation of *Rungia* and *Justicia* was recognised by Hansen (1989a), who distinguished *Rungia* by having 1-sided spikes with one sterile and one fertile bract at each inflorescence node, whereas in *Justicia*, both bracts are fertile. Hansen (1989b) transferred four species of Thai *Justicia* to *Rungia*, namely *R. adnata* (J.B.Imlay) B.Hansen, *R. oligoneura* (J.B.Imlay) B.Hansen, *R. purpurascens* (Ridl.) B.Hansen and *R. subtilifolia* (J.B.Imlay) B.Hansen.

In the present work, delimitation of the Thai species is revised, and a synoptic account is presented for each species, with notes on ecology, distribution and herbarium specimen citations. This work will form the basis for the treatment of *Rungia* in the Flora of Thailand.

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MATERIALS AND METHODS

Specimens were collected during fieldwork throughout Thailand and material was studied from AAU, ABD, BK, BKF, BM, CMU, E, K, KKU, L, P, PSU and QBG (abbreviations follow Thiers, 2019). Flowers were dissected, measured from dry specimens and examined under a binocular microscope. Floral shape and colour were studied from living material. Distribution, ecology and phenology were recorded from specimen labels. All specimens seen are indicated with an exclamation mark '!'. Specimens seen as digital images are indicated with '*'. Types not been seen are indicated with '*n.v.*'.

TAXONOMIC TREATMENT

RUNGIA

Nees in Wallich, Pl. Asiat. Rar. 3: 77, 109. 1832; Nees in DC., Prodr. 11: 469. 1847; T.Anderson, J. Linn. Soc. Bot. 9: 517. 1867; Benth. in Benth. & Hook.f., Gen. Pl. 2: 1120. 1876; C.B.Clarke in Hook.f., Fl. Brit. India 4(12): 545. 1885; Lindau in Engl. & Prantl, Nat. Pflanzanfam. 4(3b): 331. 1895; Trimen, Handb. Fl. Ceylon 3: 341. 1895; C.B.Clarke, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74: 697. 1908; Ridl., Fl. Malay Penins. 2: 602. 1923; Benoist in Lecomte *et al.*, Fl. Indo-Chine 4: 756. 1935; Backer & Bakh.f., Fl. Java 2: 591. 1965; L.H.Cramer in Dassan. & Clayton, Revis. Handb. Fl. Ceylon 12: 102. 1998; J.R.I.Wood in A.J.C. Grierson & D.G.Long, Fl. Bhutan 2: 1290. 2001; J.Q.Hu *et al.* in C.Y.Wu *et al.*, Fl. China 19: 443. 2011. Type: *Rungia repens* (L.) Nees (lectotype, designated here).

Herbs or subshrubs, erect or procumbent. *Stems* with swollen nodes, rooting at lower nodes. *Leaves* petiolate or rarely sessile, simple, opposite decussate; cystoliths conspicuous or inconspicuous. *Inflorescences* formed of terminal spikes or spikes arising from the upper leaf axils. *Flowers* solitary at each fertile node, sessile; each flower subtended by 2 bracts (one sterile bract longitudinally adnate to the rachis and one fertile bract) and 2 bracteoles. *Calyx* deeply 5-lobed, lobes equal in size. *Corolla* tubular and bilabiate; upper lip erect, internally rugulate (stylar furrow which runs along the centre of the upper lip); lower lip spreading, 3-lobed, usually with coloured markings on lower lip. *Stamens* 2, inserted near middle of corolla tube; anthers 2-thecous, thecae equal or unequal in length or superposed, 1 or both with a basal appendage (tail), staminodes absent. *Disk* cupular. *Ovary* superior with 2 ovules per locule; style terminal, exserted; stigma 2-lobed, minute, lobes unequal. *Capsules* 2-valved, loculicidal; capsule with placenta tearing from the capsule wall at dehiscence and rising elastically. *Seeds* 4, supported by retinacula.

Rungia was described by Nees von Esenbeck (1832) comprising seven species, *Rungia linifolia* Nees, *R. origanoides* Nees, *R. parviflora* (Retz.) Nees, *R. polygonoides*, *R. punduana* Nees, *R. repens* (L.) Nees and *R. wightiana* Nees. The genus has not previously been typified and here we select *Rungia repens* as the lectotype of the genus because it is the accepted name for a species with a widespread distribution.

The genus comprises ca 50 species and is distributed throughout tropical and subtropical Africa and Asia. Fourteen species are present in Thailand, of which eight are endemic to the country.

In Thailand, *Rungia* comprises herbs or subshrubs, typically growing in evergreen forest, mixed mountainous forest or in open areas on limestone. The highest number of species (nine) is recorded in peninsular Thailand. This might be related to the humid conditions in this region, as they are always found in moist, shaded, habitats or along streams and waterfalls. Five endemic species have very restricted distribution in Thailand, each being found only at a single locality. Of these, four species have been found only during the humid season in moist evergreen forest; one species is restricted to a limestone habitat, Pha Hong cave in Nam Nao National park, Thailand and was collected in the cool, dry season.

Morphologically, the genus can be distinguished by the combination of flat or narrowly cylindrical spikes; secund (rarely 4-ranked) bracts comprising one sterile and one fertile bract with or without hyaline margins; bracteoles that are similar to the bracts; a calyx with five subequal lobes; a bilabiate corolla which is internally rugulate; anther thecae with basal appendages (tails); and a capsule with the placentas tearing from the capsule wall at dehiscence. This combination of characters is unique to the genus.

The species may be distinguished using the following key:

KEY TO THE SPECIES

1. Corolla tube 2–5 mm long; bracts up to 8 mm long
  2. Spikes flat; bracts imbricate
    3. Leaves with cystoliths visible on upper surface only; capsules strigulose with glandular hairs **2. R. brandisii**
    3. Leaves with cystoliths visible on both surfaces; capsules glabrous **8. R. pectinata**
  2. Spikes narrowly cylindrical; bracts not imbricate **5. R. minutiflora**
1. Corolla tube 7–15 mm long; bracts more than 8 mm long
  4. Bracts without hyaline margin
    5. Leaves ovate or lanceolate, apex acuminate or acute **3. R. diversibracteata**
    5. Leaves oblanceolate or oblong-lanceolate, apex obtuse **4. R. maculata**
  4. Bracts with hyaline margin
    6. Bracts with purple hyaline margin
      7. Bracts elliptic or ovate, 3–5 mm wide, apex apiculate or acuminate
        8. Peduncles wiry or very slender; spikes dense or compact; apex of bract apiculate **14. R. tenuissima**
        8. Peduncles stout; spikes lax; apex of bract acuminate **11. R. rivicola**
      7. Bracts broadly ovate, obovate-orbicular or rhomboid, 7–20 mm wide, apex acute, obtuse or rounded
        9. Plant slightly pubescent or almost glabrous throughout; stems terete or subquadrangular; leaves with cystoliths visible on both surfaces, base cuneate
          10. Leaves elliptic or lanceolate-elliptic, lateral veins 11–13 pairs; bracts obovate-orbicular, apex rounded **13. R. subtilifolia**
          10. Leaves oblanceolate or lanceolate, lateral veins 5–7 pairs; bracts broadly ovate, apex acute or obtuse **7. R. oligoneura**
        9. Plant tomentose throughout; stems quadrangular; leaves without cystoliths on both surfaces, base truncate, rounded or subcordate
          11. Leaves dark purple, base rounded or subcordate; bracts rhomboid; calyx lobes ca 0.5 mm long, glabrous **10. R. purpurascens**
          11. Leaves green, base truncate; bracts obovate; calyx lobes ca 1 mm long, pubescent **9. R. polyneura**
    6. Bracts with white hyaline margin
      12. Leaves oblanceolate, base attenuate; sterile bracts lanceolate, base obtuse **1. R. adnata**
      12. Leaves ovate or elliptic, base cuneate; sterile bracts ovate, base oblique
        13. Bracts obovate-elliptic, margin broadly hyaline, crispate, tawny-coloured **12. R. sinothailandica**
        13. Bracts broadly ovate, margin narrowly hyaline not crispate or tawny-coloured **6. R. naoensis**

1. Rungia adnata (J.B.Imlay) B.Hansen, Nordic J. Bot. 9(2): 211. 1989.— *Justicia adnata* J.B.Imlay, Bull. Misc. Inform. Kew 1939(3): 143. 1939. Type: Thailand, Nakhon Si Thammarat, Khao Luang, 1,740 m alt., Apr. 1922, *Smith 736* (lectotype **ABD***, designated here; isolectotype **BK** [BK257609!]). Fig. 1A–B.

Thailand.— PENINSULAR: Nakhon Si Thammarat [Khao Luang, 1,500 m alt., 30 Apr. 1928, *Kerr 15462* (**BK**, **BM**, **K**); ibid., 26 Jan. 1966, *Sutheesorn 859* (**BK**); ibid., 1,000 m alt, 2 Feb. 1966, *Hennipmam 3883* (**BKF**); ibid., *Smith 736* (**ABD**, **BK**); ibid., Apr. 1922, *Smith 735* (**BM**); ibid., 11 Nov. 2009, *Rueangsawang 290* (**KKU**)].

Distribution.— Endemic to Thailand.

Ecology.— In evergreen forest, 1,000–1,740 m alt.

Note.— *Rungia adnata* is restricted to Khao Luang, Nakhon Si Thammarat, at high altitude and is found in moist evergreen forest. This species is unique among *Rungia* species in having oblanceolate leaves with 10–15 pairs of lateral veins that are glabrous above and pubescent below, a large corolla (1.5–2 cm long) and the narrowly white-hyaline margins of the fertile bracts. There are two duplicates of the type and the specimen in ABD is designated here as the lectotype because it is a perfect match to the line drawing in the protologue.

2. Rungia brandisii C.B.Clarke in Hook.f, Fl. Brit. India 4: 549. 1885.— *Diapedium brandisii* (C.B. Clarke) Kuntze, Revis. Gen. Pl. 2: 484. 1891. Type: Myanmar, Pandau, Salween, Mar. 1862, *Brandis 838* (lectotype **K** [K000884077!], designated here).

Thailand.— SOUTH-WESTERN: Kanchanaburi [Thay Banhau, 800 m alt., 8 Nov. 1971, *van Beusekom et al. 3515* (**BKF**, **K**, **L**)].

Distribution.— Myanmar.

Ecology.— Mixed deciduous forest on limestone hill, ca 800 m alt.

Note.— *Rungia brandisii* is newly recorded for Thailand. This species is similar to *R. pectinata* in the length of inflorescences and bracts. However, *R. brandisii* can be recognised by its herbaceous,

suberect habit, ovate or elliptic leaves with an acuminate or acute apex, almost glabrous leaf surfaces, a corolla 7–8 mm long and both strigulose and glandular hairs on the mature capsules. Clark described *R. brandisii* based on three collections, namely *Brandis 838*, *Beddome* and *Parish*. We have designated *Brandis 838* (**K**) as the lectotype because it is the most complete of the original material.

3. Rungia diversibracteata J.B.Imlay, Bull. Misc. Inform. Kew 1939(3): 148. 1939. Type: Thailand, Ranwang [Ranong], Khao Pawta Luang Keo, 1,000–1,200 m alt., 1 Feb. 1929, *Kerr 16941* (lectotype **K** [K000884138!], designated here; isolectotypes **ABD***, **BK** [BK257634!], **BM** [BM000950083!], **C** [C10005144!], **K** [K000884137!]).

Thailand.— PENINSULAR: Ranong [Khao Pawta Luang Keo, *Kerr 16941* (**ABD**, **BK**, **BM**, **C**, **K**)].

Distribution.— Endemic to Thailand.

Ecology.— In evergreen forest, 1,000–1,200 m alt.

Note.— *Rungia diversibracteata* is only known from Ranong. It is recognised by the combination of ovate or lanceolate leaves and glabrous, imbricate bracts which are broadly ovate with an acute apex and without hyaline margins. There are six known duplicates of the type collection. The specimen at **K** [K000884138] is designated as the lectotype because it is a perfect match with the line drawing in the protologue.

4. Rungia maculata Craib, Bull. Misc. Inform. Kew 1914(1): 9. 1914; Benoist in Lecomte, Fl. Indo-Chine 4: 760. 1935. Type: Thailand, Pre [Phrae], Hue Kamin [Huai Khamin], near stream, 240 m alt., 10 Feb. 1912, *Kerr 2348* (lectotype **K** [K00884245!], designated here; isolectotypes **BM** [BM000950082!], **E** [E00284083!], **K** [K000884244!]).

Thailand.— NORTHERN: Phrae [Huai Khamin, *Kerr 2348* (**BM**, **E**, **K**-2 sheets); ibid., 10 Feb. 1912, *Kerr 2340* (**K**)]; Sukhothai [Si Satchanalai, 800 m alt., 23 June 1974, *Maxwell 74-80* (**AAU**)].

Distribution.— Endemic to Thailand.

Ecology.— In evergreen forest, 240–800 m alt.

Note.— *Rungia maculata* is endemic to Phrae and Sukhothai. The inflorescences are similar to *R. diversibracteata*, but *R. maculata* can be recognised by the oblanceolate or oblong-lanceolate leaves with an obtuse apex and oblanceolate, chartaceous bracts up to 1 cm long. Craib (1914) did not designate a holotype, therefore **K** [K000884245] is designated here as lectotype. This specimen is chosen as it is the best-preserved, with complete inflorescences and several leaves.

5. Rungia minutiflora C.B.Clarke, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74: 698. 1908; Ridl., Fl. Malay Penins. 2: 602. 1923. Type: Malaysia, Kedah, Lankawi [Langkawi] Island, Nov. 1901, *Curtis 3689* (holotype **K** [K000884154!]). Fig. 1C–E.

Thailand.— NORTH-EASTERN: Loei [Nong Hin, 7 Nov. 2010, *Rueangsawang 284* (**KKU**)]; Khon Kaen [Phu Pha Man National Park, 300–450 m alt., 9 Dec. 2005, *Sarawichit 13* (**KKU**); Phothiyan Cave, Chum Phae, 390 m alt., 21 Dec. 1982, *Koyama et al. T-31517* (**C**, **L**)]; PENINSULAR: Surat Thani [Chong Lom, Khao Sok National Park, 100–150 m alt., 12 Dec. 1979, *Shimizu et al. T-27126* (**L**)]; Satun [Tarutao National Park, 100 m alt., 12 Oct. 1979, *Congdon 18* (**AAU**)].

Distribution.— Peninsular Malaysia.

Ecology.— In shade of limestone outcrops and mixed deciduous forest on limestone hills, 100–800 m alt.

Note.— *Rungia minutiflora* is close to *R. brandisii*, but differs in having a lax inflorescence with glabrous, narrowly cylindrical spikes up to 15 cm long (vs up to 4 cm long in *R. brandsii*), obovate or elliptic bracts (vs ovate or elliptic bracts) and the absence of hyaline margins on the sterile bracts (vs presence of hyaline margins).

6. Rungia naoensis B.Hansen, Nordic J. Bot. 9(2): 211. 1989. Type: Thailand, Phetchabun, Nam Nao National Park, Pha Hong cave, 900 m alt., 27 Dec. 1982, *Koyama et al. T-31797* (holotype **KYO** *n.v.*; isotypes **BKF** [BKF001109!], **C!**, **K** [K001327004!, K001327003!], **L** [L0029800470!, L00298084847!]).

Thailand.— NORTH-EASTERN: Phetchabun [Nam Nao National Park, 900 m alt., 27 Dec. 1982, *Koyama et al. T-31797* (**KYO**, **BKF**, **C**, **K**-2 sheets, **L**-2 sheets].

Figure 1. *Rungia adnata* (J.B.Imlay) B.Hansen: A. habit and inflorescence, B. inflorescence; *R. minutiflora* C.B.Clarke: C. habit, D. inflorescence, E. dehiscing capsules. Photos by K. Rueangsawang.

Distribution.— Endemic to Thailand.

Ecology.— In bamboo forest, on limestone, ca 900 m alt.

Note.— *Rungia naoensis* is only known from Pha Hong cave, Phetchabun. This species is similar to *R. sinothailandica* in having ovate or elliptic leaves but differs in the leaves being broader with an acute or apiculate apex and an oblique base, and fertile bracts with narrowly hyaline margins.

7. Rungia oligoneura (J.B.Imlay) B.Hansen, Nordic J. Bot. 9(2): 212. 1989.— *Justicia oligoneura* J.B.Imlay, Bull. Misc. Inform. Kew 1939(3): 142. 1939. Type: Thailand, Chumphon, Langsuan, Khao Nom Sao, 300 m alt., 20 Feb. 1927, *Kerr 12014* (lectotype **ABD***, designated by Hansen, 1989b; isolectotypes **K** [K000884257!, K00884256!], **BK** [BK257616!], **BM!**).

Thailand.— PENINSULAR: Chumphon [Langsuan, Khao Nom Sao, *Kerr 12014* (**ABD**, **BM**, **BK**, **K**-2 sheets); Hot Spring Forest Park, Mueang, 100 m alt., 26 Feb. 1983, *Koyama et al. T-33730* (**BKF**, **C**, **K**, **L**)]; Ranong [Ngao Waterfall, 8 Apr. 2017, *Rueangsawang 301* (**KKU**), Khlong Nakha Wildlife Sanctuary, 150 m alt., 1 Mar. 1983, *Koyama et al. T-33893* (**BKF**, **C**, **K**, **L**); ibid., 50–100 m alt., 24 Dec. 1983, *Fukuoka & Ito T-35466* (**BKF**); ibid., 1,000 m alt., 8 Jan. 1990, *Hoover et al. 5490* (**E**); Khao Chong, 5 m alt., 1 Jan. 1929, *Kerr 16560* (**BK**, **BM**, **C**, **K**); ibid., 5 m alt., 3 Jan. 1929, *Kerr 16511* (**BK**, **BM**, **K**); NW of Phato, 200–300 m alt., 2 May 1974, *Larsen & Larsen 33579* (**AAU**, **BKF**, **K**); Kraburi, Bok Krai Falls, 75 m alt., 17 Jan. 1987, *Maxwell 87-77* (**AAU**)]; Phangnga [Khura Buri, foothills of Khao Phra Mi, 100 m alt., 7 Jan. 1966, *Hansen & Smitinand 11804* (**C**, **K**); Laemson National Park, Kampuan substation, 50–100 m alt., 22 Feb. 1994, *Barfod et al. 45241* (**AAU**, **BKF**)].

Distribution.— Endemic to Thailand.

Ecology.— In evergreen forests, 100–300 m alt.

Note.— *Rungia oligoneura* is most closely related to *R. subtilifolia*, but differs in having terete stems and slightly pubescent, oblanceolate or lanceolate leaves up to 14 cm long (vs up to 22 cm long in *R. subtilifolia*), 1.4–1.5 cm long corolla (vs ca 2 cm long), and obovoid, pubescent capsules up to 0.7 cm long (vs glabrous capsules up to 1.2 cm long).

8. Rungia pectinata (L.) Nees in DC., Prodr. 11: 470. 1847; Anderson, J. Linn. Soc. Bot. 9: 517. 1867; Ridl., Fl. Malay Penins. 2: 603. 1923; Backer & Bakh.f., Fl. Java 2: 593. 1965; L.H.Cramer in Dassan. & Clayton, Revis. Handb. Fl. Ceylon 12: 105. 1998; J.Q.Hu *et al.* in C.Y.Wu *et al.*, Fl. China 19: 445. 2011.— *Justicia pectinata* L., Amoen. Acad. 4: 299. 1760.— *Rungia parviflora* var. *pectinata* (L.) C.B.Clarke in Hook.f., Fl. Brit. India 4: 550. 1885; H.Trimen, Handb. Fl. Ceylon. 3: 343. 1974.— *Rungia parviflora* subsp. *pectinata* (L.) L.H.Cramer., Revis. Handb. Fl. Ceylon 12: 105. 1998. Type: India, *Anon. s.n.* (lectotype **LINN** [Herb. Linn. No. 28–17], designated by Cramer, 1998).

— *Rungia pectinata* var. *clarkeana* Hand.-Mazz., Symb. Sin. 7(4): 898. 1936. Type: China, Guizhou, *Cavalerie 8156* (holotype **WU** *n.v.*).

— *Rungia angustifolia* Bremek, Dansk. Bot. Ark. 23: 278. 1966. Type: Thailand, Chiang Mai, west of Bo Luang, 30 Jan. 1964, *Hansen et al. 11004* (holotype **C** [C10005148!]).

— *Rungia parviflora* var. *ciliata* Bremek, Dansk. Bot. Ark. 20: 88. 1961. Type: Thailand, Chiang Mai, Doi Sutep, 26 Oct. 1958, *Sørensen et al. 850* (holotype **C** [C10005147!]).

— *Justicia parviflora* Retz., Obs. 5: 9. 1789.— *Rungia parviflora* (Retz.) Nees in Wallich, Pl. Asiat. Rar. 3: 110. 1832; Nees in DC., Prodr. 11: 469. 1847; C.B.Clarke in Hook.f., Fl. Brit. India 4(12): 550. 1885; Benoist in Lecomte, Fl. Indo-Chine 4: 757. 1935; Backer & Bakh.f, Fl. Java 2: 593. 1965; H.Trimen, Handb. Fl. Ceylon. 3: 342. 1974; L.H. Cramer in Dassan. & Clayton, Revis. Handb. Fl. Ceylon. 12: 104. 1998. Type: Myanmar, *Wallich 2458 K* (lectotype **K-W** [K001116093!], designated here).

— *Rungia repens* T.Anderson, J. Linn. Soc. Bot. 9: 518. 1867, non Nees, 1832.

— *Rungia longifolia* Bedd., Icon. Pl. Ind. Or.: t. 266. 1874, non Nees, 1832. Fig. 2A–B.

Thailand.— NORTHERN: Mae Hong Son [Khun Yuam, alt. 600 m, 6 Sept. 1974, *Larsen & Larsen 34192* (**AAU**, **BKF**, **L**); ibid., 600–700 m alt., 4 Sept. 1974, *Larsen & Larsen 34093* (**AAU**, **BKF**, **K**, **L**); Doi Pui, SE of Mae Hong Son, 1,100 m alt., 23 Sept. 1995, *Larsen et al. 46825* (**AAU**); ibid., 800 m alt., 23 Sept. 1995, *Larsen et al. 46864* (**AAU**); Doi Chong, 240 m alt., 22 Feb. 1968, *Hansen &*

Smitinand 12699 (**E**, **K**); Mae Sariang, Papae, 800 m alt., 3 Feb. 1969, *Smitinand & Saphasi 10681* (**BKF**, **K**)]; Chiang Mai [Doi Pui, 7 Oct. 1973, *Bunkird 26* (**BK**); Omkoi, 900 m alt., 20 Jan. 1964, *TDBS 10832* (**BK**, **BKF**); ibid., 11 Nov. 1911, *Kerr 2214* (**AAU**); Pong Dueat National Park, 600 m alt., 26 Nov. 1993, *Larsen et al. 44888* (**AAU**); Mok Fa waterfall 40 km of Chiang Mai, 800 m alt., 23 Sept. 1995, *Larsen et al. 44763* (**AAU**); ibid., 500 m alt., 24 Nov. 1993, *Larsen et al. 46864* (**AAU**); Doi Inthanon, 1,100–1,200 m alt., 15 Sept. 1995, *Larsen et al. 46457* (**AAU**); Doi Suthep, 1,000 m alt., 14 Dec. 1965, *Fukuoka T-2173* (**BKF**, **K**); ibid., 2,000 m alt., 25 Sept. 1910, *Kerr 1426* (**BM**, **K**); ibid., 2,000 m alt., 23 Dec. 1911, *Kerr 160013/B* (**BK**, **K**); ibid., 2,200 m alt., 27 Nov. 1910, *Kerr 1600* (**BM**); ibid., 2,000 m alt., 11 Nov. 1911, *Kerr 2217* (**K**); ibid, 200 m alt., 11 Dec. 1911, *Kerr 2177* (**K**); Doi Chiang Dao, 600–1,300 m alt., 25 Sept. 1871, *Murata et al. T-14935* (**BKF**, **K**); ibid., 600 m alt., 8 Dec. 1951, *Garrett 1368* (**K**); ibid., 20 Nov. 1963, *Bunchuai 1343* (**K**); ibid., 800 m alt., 1 Dec. 1955, *Suvarnakoses 916* (**K**); ibid., 500–600 m alt., 12 Sept. 1967, *Tagawa et al. T-9858* (**E**); ibid., Tham Chiang Dao, 350 m alt., 18 Feb. 1958, *Sørensen et al. 1323* (**E**); ibid., 12 Oct. 1926, *Put 303* (**BM**, **E**, **K**); Northern Botanic Garden, 8 Oct. 1990, *Chantaranothai et al. 90/666* (**K**); Pang Tawa, 4 May 1981, *Put 3906* (**BM**, **K**); ibid., 575 m alt., 11 Nov. 1989, *Maxwell 89-1404* (**E**); Mae Taeng, Mok Fa Falls, 550 m alt., 9 Oct. 1989, *Maxwell 89-1195* (**E**); Doi Chiang Dao, Mae Na to Den Ya Kad Rd., 800 m alt., 8 Feb. 1999, *Larsen & Larsen 47302* (**AAU**)]; Chiang Rai [Doi Thung, 1,400–1,500 m alt., 15 Jan. 1975, *Geesink et al. 8292* (**K**)]; Nan [Chiang Klang, Ban Pang Kae, 100 m alt., 28 Nov. 1986, *Paisooksantivathana 1883-86* (**BK**); 50 km W of Ban Luang, 600 m alt., 22 Nov. 1993, *Larsen et al. 44730* (**AAU**); Sapan (Spun) Waterfall, 600 m alt., 17 Nov. 1993, *Larsen et al. 44468* (**AAU**); Tham Pa Tok near Nan, 350 m alt., 14 Dec. 1990, *Larsen et al. 41985* (**AAU**)]; Lampang [Doi Khun Tan, Mae Tha, 700–800 m alt., 28 Dec. 1984, *Koyama & Phengklai T-39185* (**AAU**, **L**); Doi Din Deng, 1,800 m alt., 3 Feb. 1912, *Kerr 2316* (**K**)]; Phitsanulok [Thung Salaeng Luang National Park, 300–600 m alt, 11 Dec. 1965, *Tagawa et al. T-2374* (**K**)]; Kamphaeng Phet [Doi Tung Cha, 300–750 m alt., 18 Nov. 1970, *Kerr 4593* (**BM**, **K**)]; NORTH-EASTERN: Phetchabun [900 m alt., 17 Nov. 1973, *Maxwell 73-622* (**AAU**)]; Sakon Nakhon [Phu Phan National Park, 250 m alt., 25 Feb. 1993, *Chantaranothai et al. 936* (**K**)]; Loei [route from Nam Thop to Ban Na Luang, eastern foot of Phu Luang, 300–400 m alt., 8 Dec. 1965, *Tagawa et al. T-1964* (**BKF**, **K**)]; EASTERN: Nakhon Ratchasima [Pak Thong Chai, Khao Yai National Park, 1,000 m alt., 11 Aug. 1968, *Larsen et al. 3035* (**AAU**, **E**, **K**); Dong Paya Yen Forest Area, 100 m alt., 17 Dec. 1923, *Kerr 8020* (**BM**, **K**)]; SOUTH-WESTERN: Kanchanaburi [Wangka, 200 m alt., 28 Jan. 1926, *Kerr 10321* (**BM**, **K**); Tham Than Lod National Park, 1,100 m alt., 30 Nov.1982, *Koyama et al. T-30509* (**L**)]; Uthai Thani [near Ban Mai, Bo Rai District, 400 m alt., 2 Feb. 1976, *Maxwell 76-53* (**AAU**); Hin Dang, Huai Kha Khang Reserve, 200 m alt., 10 Feb. 1976, *Maxell 76-96* (**AAU**); Kroengkawia Non-hunting Area, Thongphaphum, 420 m alt., 27 Nov. 1982, *Koyama et al. T-30398* (**BKF**, **K**); ibid., 9 Feb. 1960, *Bunchary 22* (**K**)]; Phetchaburi [100 m alt., 2 Jan. 1921, *Marcan 549* (**BM**, **K**); Kaeng Krachan National Park, 130 m alt, 26 Jan. 2005, *Williams 1092* (**E**, **K**)]; Prachuap Khiri Khan [Bang Sapan, 24 Dec. 1927, *Put 1349* (**BM**, **K**)]; CENTRAL: Saraburi [Sam Lan Forest, Mueang, 125 m alt., 21 Sept. 1974, *Maxwell 74-911* (**AAU**); ibid., 250 m alt., 16 Nov. 1973, *Maxwell 73-766* (**AAU**); 125 m alt., 5 Jan. 1974, *Maxwell 74-2* (**AAU**)]; Bangkok [14 Jan. 1923, *Marcan 1129* (**BM**, **K**); 25 Jan. 1920, *Kerr 3949* (**BM**, **BK**, **K**); 25 Jan. 1920, Marcan 14 (**BM**)]; SOUTH-EASTERN: Chanthaburi [Khlong Narai Falls, 21 Jan. 1973, *Maxwell 73-23* (**AAU**); Khao Sa Bap Foothill, 100 m alt., 7 Nov. 1993, *Larsen et al. 44281* (**AAU**); Khao Plori Nen, 50 m alt., 10 Jan. 1930, *Kerr 18057* (**K**); Pong Rad, 30 Nov. 1964, *Sakol 271* (**BK**)]; Trat [Mueang, 4 Jan. 1971, *Sutheesorn 1954* (**BK**)]; PENINSULAR: Chumphon [Khlong Wa, 10 m alt, 20 Dec. 1928, *Kerr 16236* (**K**); Sawi, 23 Feb. 1968, *Vocharapong 114* (**BK**); Tha sae, 50 m alt., 16 Jan. 1987, *Maxwell 87-71* (**K**)]; Ranong [Ban Kampuam, 100 m alt., 4 Feb. 1914, *Kerr 17003* (**K**), Khlong Nakha, 25 Apr. 1973, *Geesink & Santisuk 4867* (**AAU**, **BKF**, **E**); ibid., 7 Jan. 1990, *Hoover et al. 5053* (**E**); ibid., 300–1,000 m alt., 3 Feb. 1979, *Koyama et al. 15209* (**AAU**, **BKF**); ibid., 150 m alt, 1 Mar. 1983, *Koyama et al. T-33898* (**BKF**, **K**); South of Ranong, 100 m alt., 30 Jan. 1958, *Sørensen et al. 839* (**E**); Khao Chang, 10 Jan. 1929, *Kerr 16597* (**BK**, **BM**, **E**, **K**); Khao Cha Mao National Park, 50–650 m alt., 24 Nov. 1979, *Shimizu et at. T-23454* (**K**)]; Phangnga [Tap Put,100 m alt.,

5 Mar. 1930, *Kerr 18371* (**BM**, **K**); Khura Buri, 60 m alt., 18 Feb. 2005, *Williams & Pooma 1589* (**E**); ibid., 100–600 m alt., 8 Jan. 1990, *Hoover et al. 6255* (**E**)]; Nakhon Si Thammarat [Thung Song, 12 Feb. 1929, *Put 2341* (**BK**, **BM**, **E**, **K**)]; Trang [Khao Pap Pa, 300 m alt., 11 Mar. 1974, *Larsen & Larsen 33178* (**AAU**, **BKF**, **L**)]; Satun [Kuan Po, 20 m alt., 30 Dec. 1927, *Kerr 13772* (**BM**, **K**)]; Pattani [Khok Pho, 24 Mar. 1939, *Umpai s.n.* (**BK**)].

Distribution.— India, Sri Lanka, Myanmar, China, Laos, Cambodia, Vietnam, Peninsular Malaysia, Indonesia.

Ecology.— Evergreen forest along rivers and slopes with large limestone outcrops, deciduous forest mixed with bamboo, dry ground in light shade, mixed montane forest, 20–1,000 m alt.

Vernacular.— San phra (สันพร้า)(General).

Note.— *Rungia pectinata* is widespread and found in different habitat types. Leaf shape is extremely variable in this species. Collections from north-eastern Thailand are usually almost erect plants with brown stems, lanceolate or rarely ovate leaves and a white corolla, but those from other parts of Thailand are usually almost scandent with straggling branches, ovate to lanceolate leaves and a blue corolla. Distinguishing features are elliptic, oblong or narrowly obovate in bract shape, mucronate or apiculate at the apex, fertile bracts with undulate margins and small capsules (2–2.5 mm long).

9. Rungia polyneura (J.B.Imlay) Rueangs. **comb. nov.**— *Justicia polyneura* J.B.Imlay, Bull. Misc. Inform. Kew 1939(3): 143. 1939. Type: Thailand, Ranawng [Ranong], La-un, 50 m alt., 3 Jan. 1929, *Kerr 17512* (holotype **ABD***). Fig. 2C–D.

Thailand.— PENINSULAR: Ranong [Kra Buri, 8 Apr. 2017, *Rueangsawang 306* (**KKU**), La-un, *Kerr 17512* (**ABD**)]; Phangnga [Khao Bangto, 900 m alt., 23 Jan. 1929, *Kerr 17211* (**BK**, **BM**, **K**)].

Distribution.— Endemic to Thailand.

Ecology.— In evergreen forest along stream, ca 900 m alt.

Note.— *Justicia polyneura* was first described by Imlay (1939), based on *Kerr 17512*. However, we make a new combination here as the plant has all the characters typical of *Rungia*. This species is most similar to *R. purpurascens* but differs in the truncate leaf bases (vs rounded in *R. purpurascens*), obovate bracts (vs rhomboid) and the longer calyx (up to 1 mm long vs up to 0.5 mm long).

10. Rungia purpurascens (Ridl.) B.Hansen, Nordic J. Bot. 9(2): 212. 1989.— *Justicia purpurascens* Ridl., J. Fed. Malay States Mus. 10: 107. 1920. Type: Thailand, Chumphon, Tasan, 5 Nov. 1919, *Kloss 6919* (lectotype **K** [K000884247!], designated by Hansen, 1989b). Fig. 2E–F.

Thailand.— PENINSULAR: Chumphon [Tasan, *Kloss 6919* (**K**); ibid., 5 Nov. 1919, *Kloss 6954* (**K**); ibid., 5 Nov. 1919, *Kloss 6983* (**K**); ibid., 50 m alt., 22 Dec. 1928, *Kerr 16278* (**BK**, **BM**, **K**)]; Ranong [Kapoe, 48 m alt., 28 Jan. 1924, *Kerr 11676* (**BK**, **BM**, **K**); Kra Buri, 8 Apr. 2017, *Rueangsawang 302* (**KKU**)].

Distribution.— Peninsular Malaysia.

Ecology.— In evergreen forest, ca 50 m alt.

Note.— In the herbarium, *Rungia purpurascens* may be confused with *R. polyneura*, a creeping and ascending herb with a similar habit. This species is characterised by the dark purple colour of the dry specimens, bracts that are 1–1.5 by 0.8–1 cm (vs 0.8–1 by 0.4–0.5 cm in *R. polyneura*) and corolla up to 15 mm long (vs up to 10 mm long).

11. Rungia rivicola Craib, Bull. Misc. Inform. Kew 1914(1): 10. 1914; Benoist in Lecomte, Fl. Indo-Chine 4: 760. 1935. Type: Thailand, Lampang, Doi Wao, by stream, 720 m alt., *Kerr 2443* (lectotype **K** [K000884241!], designated here; isolectotypes **BM** [BM000950081!]), **E** [E00284084!], **K** [K000884242!, K000884243!].

Thailand.— NORTHERN: Chiang Mai [South of Pang Faen, 5 km along road 1252, a side-road to 118 (formerly 1019), 1,000 m alt., 25 Nov. 1993, *Larsen et al. 44810* (**AAU**)]; Chiang Rai [Mae Sai, 1,325 m alt., 16 Feb. 2005, *Maxwell 05-124* (**BKF**); Khun Kon waterfall, 15 Mar. 2017, *Rueangsawang 303* (**KKU**)]; Lampang [Doi Wao, *Kerr 2443* (**BM**, **E**, **K**-3 sheets)].

Distribution.— Endemic to Thailand.

Ecology.— In deciduous forest mixed with bamboo, dry ground in light shade and along stream, ca 1,500 m alt.

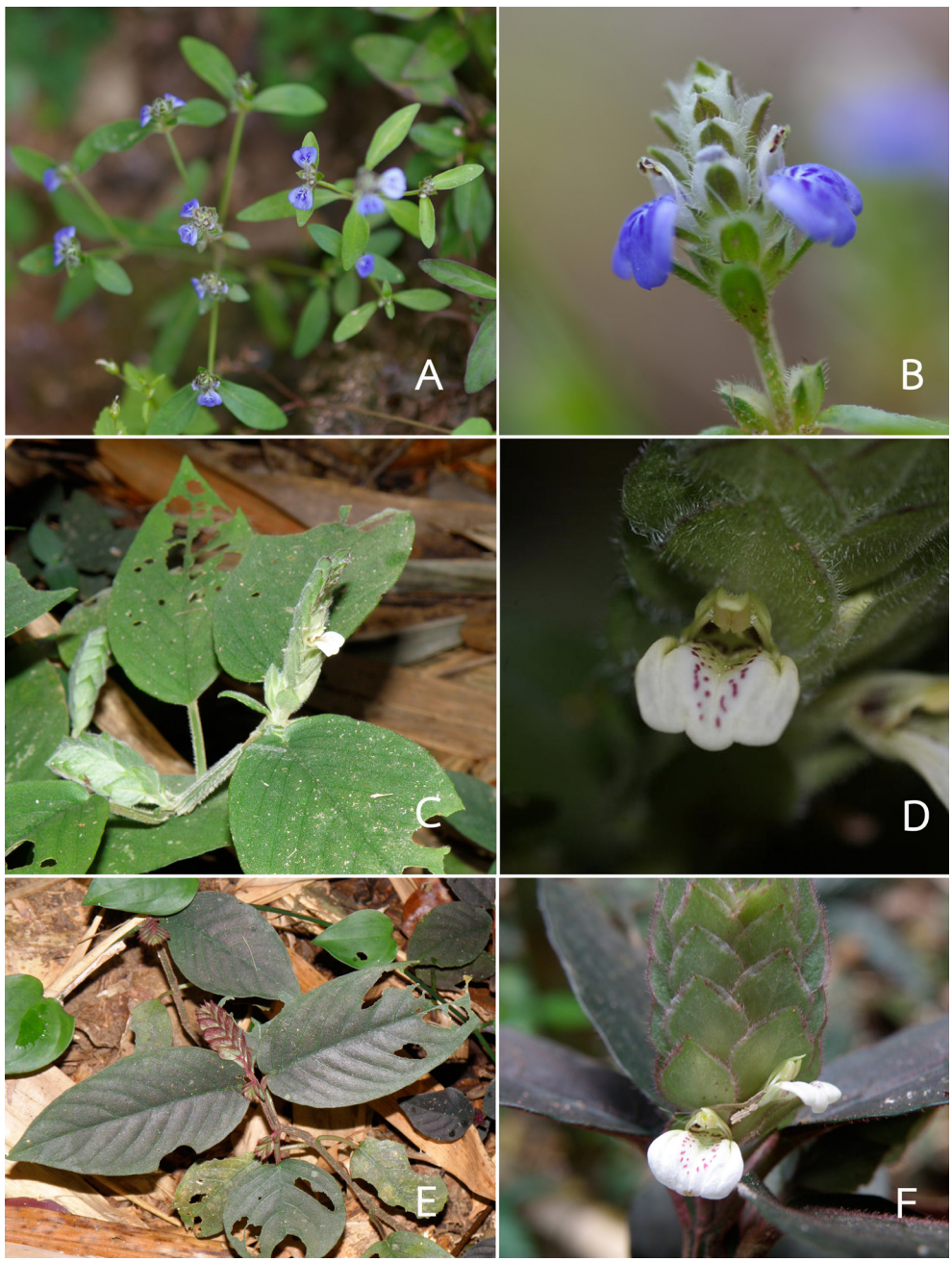

Figure 2. *Rungia pectinata* (L.) Nees: A. habit and inflorescence, B. inflorescence; *R. polyneura* (J.B.Imlay) Rueangs.: C. habit and inflorescence, D. inflorescence; *R. purpurascens* (Ridl.) B.Hansen: E. habit, F. inflorescence; Photos by C. Suwanphakdee.

Note.— *Rungia rivicola* is distinguishable in having lax or elongate spikes that are, at most, 0.5 cm wide and bracts acuminate at the apices and with purple-tinged margins. Craib (1914) did not indicate a holotype, therefore a well-preserved specimen, **K** [K000884241], is designated here as the lectotype.

12. Rungia sinothailandica Z.L.Lin & Y.F.Deng, Nordic. J. Bot. 35: 488. 2017. Type: China, Yunnan, Xishuangbanna Daizu Zizhizhou, Jinghong Shi, Menglong Zhen, Mengsong Cun, 1,700 m alt. 29 Mar. 2014, *Z.L.Lin & X.E.Ye 14032910* (holotype **IBSC***; isotype **IBSC***).

Thailand.— NORTHERN: Chiang Rai [Mae Sai, Tham Luang Khun Nam Nang Non National Park, Doi Jong, 819 m alt., 14 Feb. 2012, *Norsaengsri & Tathana 8978* (**BKF**, **QBG**)].

Distribution.— China.

Ecology.— In evergreen forest along stream, ca 800 m alt.

Note.— *Rungia sinothailandica* is a distinctive species, characterised by ovate or elliptic leaves and obovate-elliptic fertile bracts with crispate and tawny-coloured margins.

13. Rungia subtilifolia (J.B.Imlay) B.Hansen, Nordic J. Bot. 9(2): 213. 1989.— *Justicia subtilifolia* J.B.Imlay, Bull. Misc. Inform. Kew 1939(3): 144. 1939. Type: Thailand, Satul [Satun], Khao Keo Range, 700 m alt., 12 Mar. 1928, *Kerr 14529* (lectotype **ABD***, designated here; isolectotypes **BK** [BK257619!], **BM!**).

Thailand.— PENINSULAR: Satun [Khao Keo Range, *Kerr 14529* (**ABD**, **BK**, **BM**)].

Distribution.— Endemic to Thailand.

Ecology.— In evergreen forest, ca 700 m alt.

Note.— *Rungia subtilifolia* is distinct in its large size (up to 1 m tall), glabrous leaves up to 22 cm long and flattened spikes up to 2.8 cm wide. This species is only known from the Khao Keo Range, Satun. There are three duplicates of the type and the one in ABD is designated here as the lectotype because it is the best preserved specimen.

14. Rungia tenuissima J.B.Imlay, Bull. Misc. Inform. Kew 1939(3): 148. 1939. Type: Thailand, Kanburi [Kanchanaburi], Ta Kanun, 400 m alt., 21 Jan. 1926, *Kerr 10285* (lectotype **K** [K000884146!], designated here; isolectotypes **K** [K000884145!], **BK** [BK257635!], **BM** [BM000950084!]).

Thailand.— NORTHERN: Tak [Khao Phra Wo, Mae Sot, 700–850 m alt., 12 Oct. 1979, *Shimizu T-18508* (**AAU**, **BKF**, **C**, **K**, **L**); Mae Sot, Doi Dinki, 9 Nov. 1988, *Paisooksantivatana y2288-88* (**BK**); Mae Sot, Wat Tham Inthanin, 660 m alt., 18 Oct. 2014, *Middleton et al. 5776* (**BKF**, **E**)]; SOUTH-WESTERN: Kanchanaburi [Ta Kanun, *Kerr 10285* (**BK**, **BM**, **K**-2 sheets); Wangka, 200 m alt., 7 Feb. 1926, *Kerr 10464* (**BK**, **BM**, **K**); Sai Yok, 100 m alt., 21 Jan. 1962, *Larsen 9227* (**BKF**)].

Distribution.— Endemic to Thailand.

Ecology.— In mixed deciduous forest and bamboo forest, 200–850 m alt.

Note.— *Rungia tenuissima* is closely related to *R. rivicola* but is separated by the slender or wiry peduncles (vs stout peduncles in *R. rivicola*), shorter and narrower leaves 3–6 by 1.5–2.5 cm (vs 8–15 by 2.5–6 cm) and bracts with broadly deeply hyaline margins. There are four duplicates of the type, and **K** [K000884146] is designated here as the lectotype because it is a perfect match with line drawing in the protologue.

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