

A synopsis of the genus *Argostemma* Wall. (Rubiaceae) in Thailand

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ABSTRACT. A synopsis of the 31 taxa of *Argostemma* in Thailand is presented. A key to taxa is provided, together with illustrations, distributional and ecological data.

INTRODUCTION

Argostemma Wall. is a genus of perennial herbs in Rubiaceae subfamily Rubioideae tribe Argostemmatae. The tribe includes one other genus, *Neurocalyx* Hook. (Robbrecht, 1988). *Argostemma*, comprising ca. 100 species (Mabberley, 1987), is confined to the paleotropics, and apart from two tropical West African species, all the other taxa occur in Asia (details in Sridith & Puff, 1999).

The type species of the genus, *A. sarmentosum* Wall., originates from India. Following Wallich's original description (in Roxburgh, 1824), many new Asiatic species were described, and also two Asiatic genera, *Pomangium* Reinw. (1828) and *Argostemmella* Ridl. (1927), which were believed to be closely allied to *Argostemma*. However, it is now generally accepted that their generic status cannot be upheld; they are thus considered to be synonyms of *Argostemma*.

There have been various attempts to further subdivide the genus into sections (Schumann, 1981; Ridley 1927; Bakhuizen van den Brink, Jr. 1953), based primarily on vegetative (growth form) characters and floral features. None of these infrageneric classifications seem satisfactory, and all of them appear to be highly artificial. For this reason, and also in view of the fact that the present account, being a regional treatment, does not cover all species of the genus, they are adopted in the current revision.

Apart from Bremer's (1989) "The genus *Argostemma* (Rubiaceae-Argostemmatae) in Borneo" (28 species, including six new ones, most of which are endemic to the island), there is no other recent regional revision. The most recent overall treatment is that of Ridley (1927). The most recent publication dealing with the genus in Thailand is more than 65 years old (Craib, 1932). Therefore, it was considered worthwhile undertaking an up-to-date study. Thirty species (31 taxa) of *Argostemma* are now recognized from Thailand.

The current work is based on an investigation of herbarium specimens from AAU, BCU, BK, BKF, C, E, G, K, KEP, L, P, PSU, S, W, and WU, on field observations, and on spirit-preserved material. Material from adjacent regions has been examined and is cited where appropriate.

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TAXONOMIC ACCOUNT

ARGOSTEMMA

Wall. in Roxb., Fl. Ind. (ed. Carey & Wall.) 2: 324. 1824; DC. in Prodr. 4: 417. 1830; Rich. in Mémoire sur la famille des Rubiacées: 169. 1830; Korth., Ned. Kruidk. Arch. 2: 119. 1851; Miq., Ann. Mus. Bot. Ludg.-Bat. 4(18): 278. 1869; Hook.f. in Benth. & Hook.f., Gen. Pl. 2: 54. 1873; in Fl. Br. Ind. 3: 42. 1882; King & Gamble, J. As. Soc. Beng. 72(2): 191. 1903; Pit. in Lecomte, Fl. Gén. I.-C. 3(1): 81. 1922; Ridl. in Fl. Mal. Pen. 2: 21. 1923; J. Bot. 65: 25. 1927; Backer & Bakh.f. in Fl. Java 2: 292. 1965; M.R. Hend. in Malayan Wild Flowers: 196. 1974; B. Bremer, Ann. Missouri Bot. Gard. 76(1): 11. 1989.— *Pomangium* Reinw., Syll. Pl. Rar. 2: 10. 1828.— *Argostemella* Ridl., J. Bot. 65: 41. 1927. Type species: *A. sarmentosum* Wall.

About 100 species, the majority widely distributed throughout tropical and subtropical Asia, with two species in Tropical West Africa (Fig. 26).

KEY TO THE SPECIES

- | | |
|---|--------------------------|
| 1. Flower with star-shaped corolla | 2 |
| 2. Flower 4-merous | 17. <i>A. khasianum</i> |
| 2. Flower 5-merous | 3 |
| 3. Leaves scattered along the stem, not pseudovercillate, always strongly anisophyllous | 4 |
| 4. Filaments free; anthers fused and forming an anther cone, opening by means of longitudinal slits | 5 |
| 5. Calyx, corolla and ovary entirely glabrous | 6 |
| 6. Leaves distichous | 7 |
| 7. Leaf pairs per plant less than 10, the biggest leaves near shoot apex larger than the basal ones; flowers usually 2–5 per inflorescence | 7. <i>A. laeve</i> |
| 7. Leaf pairs per plant more than 10, the biggest leaves ± equal in size; flower 1 per inflorescence | 8. <i>A. condensum</i> |
| 6. Leaves not distichous | 8 |
| 8. Stem ± succulent, glabrous; leaves glabrous | 3. <i>A. subcrassum</i> |
| 8. Stem not succulent, pubescent; leaves pubescent | 9 |
| 9. Corolla slightly reflexed or spreading, corolla lobes lanceolate; style shortly exerted from anther cone (< 1 mm); flower buds ellipsoid | 1. <i>A. spinulosum</i> |
| 9. Corolla suberect, corolla lobes ovate; style long-exserted from anther cone (> 1 mm); flower buds ovoid | 6. <i>A. ophirens</i> |
| 5. Calyx, corolla and ovary o pubescent outside | 10 |
| 10. All pubescent parts covered with long hairs (≥ 1 mm long); leaf upper surface densely pubescent; not more than 5 flowers per inflorescence; corolla also densely pubescent | 5. <i>A. dispar</i> |
| 10. All pubescent parts, except flowers, very densely covered with short fine hairs (< 0.5 mm long); leaf upper surface sparsely pubescent or glabrous; 5–12 flowers per inflorescence; corolla sparsely pubescent | 11 |
| 11. Stem suberect, without adventitious roots; leaves not distichous; corolla reflexed and tips inrolled; anthers with relatively long apical appendages (2–3 mm long) | 2. <i>A. propinquum</i> |
| 11. Stem creeping, with adventitious roots at nodes on lower part of stem; leaves distichous, corolla only slightly reflexed and tips not recurved; anthers with relatively shorter apical appendages (< 1 mm long) | 4. <i>A. elatostemma</i> |
| 4. Filaments fused basally; anthers free, opening by means of apical pores | 21. <i>A. lobbii</i> |
| 3. Leaves clustered, pseudovercillate on the upper part of the stem, ± isophyllous to strongly anisophyllous | 12 |

- 12. Leaves in 1 or 2 pair(s), always unequal (strongly anisophyllous) 13
- 13. Leaves broadly ovate; stamens basifixed; style as long as or slightly longer than anther cone (exserted for < 0.5 mm) (Peninsular Thailand) 9. *A. unifolioides*
- 13. Leaves $\pm$ elliptic; stamens semi-medifixed; style much longer than anther cone (exserted for ca. 1 mm) (North-eastern, Eastern, South-eastern and Central Thailand) 10. *A. monophyllum*
- 12. Leaves in 1 or more pair(s), o isophyllous or anisophyllous, always more than 1 large leaf 14
- 14. Stamens free, not forming a cone-like structure 15
- 15. Pedicels glabrous; calyx lobes ca. 1 mm long, triangular; stamens straight (Northern Thailand) 22. *A. laxum*
- 15. Pedicels pubescent; calyx lobes > 5 mm long, ovate; stamens curved in an "S" shape (Peninsular Thailand) 18. *A. diversifolium*
- 14. Stamens united, forming a cone-like structure 16
- 16. Anthers only connivent, no parts of stamens fused; filaments broad and thick, merging into large connective 19. *A. pictum*
- 16. Either filaments or anthers fused, forming a cone-like structure; filaments not as above 17
- 17. Filaments fused; anthers free, but in a cone-like arrangement, opening by oblique elongated pores 20. *A. verticillatum*
- 17. Filaments free; anthers fused, forming an anther cone, anthers opening by longitudinal slits 18
- 18. Apical connective appendages $\pm$ longer than pollen sacs and curved; calyx lobes rounded, ca. $\leq$ 0.5 mm long (Peninsular Thailand) 11. *A. rotundicalyx*
- 18. Apical connective appendages shorter than pollen sacs, not curved; calyx lobes triangular, ca. $\geq$ 1 mm long (not in Peninsular Thailand) 19
- 19. Corolla lobes narrowly triangular; corolla tube without distinct rotate part 20
- 20. Calyx lobes reflexed; corolla lobes slightly curved upward, margins folded downwards, without green patches at the base 12. *A. fragile*
- 20. Calyx lobes not reflexed; corolla lobes not curved or folded, with green patches at the base 21
- 21. Leaves obovate, glabrous or sometimes only margins pubescent, venation inconspicuous; anther cone stout and straight 13. *A. stellatum*
- 21. Leaves elliptic or linear, pubescent, venation conspicuous; anther cone slender and often slightly curved 14. *A. concinnum*
- 19. Corolla lobes broadly triangular, elliptic or slightly lanceolate; corolla tube with distinct rotate part 22
- 22. Leaves falcate or lanceolate, always oriented in one direction, pedicels glabrous; corolla lobes broadly triangular 15. *A. parvum*
- 22. Leaves obovate, oblanceolate, elliptic or occasionally rounded, not oriented in one direction, pedicels densely covered with short hairs; corolla lobes elliptic or slightly lanceolate 16. *A. pulchellum*
- 1. Flower with bell-shaped corolla 23
- 23. Flower 4-merous 24
- 24. Peduncle pubescent; bracts free, 2 or 4 25
- 25. Corolla broadly bell-shaped, width to length ratio 1:0.75–1:0.4; stem (0.5) 1–6(10) cm, with only one pair of large leaves; leaf apex rounded or occasionally emarginate (Northern Thailand) 25. *A. plumbeum*
- 25. Corolla narrowly bell-shaped, width to length ratio 1:2–1:1; stem 5–20 cm with more than one pair of large leaves; leaf apex acute (Peninsular Thailand) 29. *A. neurosepalum*
- 24. Peduncle glabrous; bracts fused basally 26
- 26. Leaf blade elliptic or ovate with rounded or acute base and acute apex 28. *A. neurocalyx*
- 26. Leaf blade broadly ovate with truncate or cordate base and pointed acute apex 30. *A. tavoyanum*
- 23. Flower 5-merous 27
- 27. Stamens opening by apical pores 28
- 28. Stem glabrous; leaf glabrous or sparsely pubescent; bracts persistent; corolla entirely glabrous; on limestone 23. *A. thaithongae*

28. Stem, leaf and inflorescence densely hairy; bracts absent; corolla densely hairy outside; not on limestone 24. *A. ebracteolatum*
29
 27. Stamens opening by longitudinal slits
 29. Leaves scattered along the upper part of the stem, elliptic; upper leaf surface densely hairy; anthers with distinctly 3-lobed connective tips 26. *A. puffii*
 29. Leaves pseudovericillate; lanceolate, oblanceolate, obovate, obovate or slightly falcate; upper leaf surface sparsely pubescent; anthers without distinctly 3-lobed connective tips 27. *A. lobulatum*

1. *Argostemma spinulosum* C.B. Clarke ex Hook.f. in Hook.f., Fl. Br. Ind. 3: 46. 1880. Type: Singapore, *Lobb* s.n. (holotype K!). Fig. 1.

T h a i l a n d.—PENINSULAR: Yala [Ban-nang Sta, Khao Pok Yok, *Larsen et al.* 42283 (AAU), 42930 (AAU)], Narathiwat [Sungai Kolok, Waeng, *Larsen & Larsen* 32844 (AAU, K)]. Malaysia. (Pahang: Fraser's Hill, *Corner* 33231 (BM). Singapore. *Lobb* s.n. (holotype K).

D i s t r i b u t i o n.—Singapore.

E c o l o g y.—On moist rocks in evergreen forest, ca. 950–1050 m. Flowering February–June. Fruiting October.

N o t e.—*Argostemma spinulosum* exhibits a shrub-like habit, which is very characteristic for this species. Its vegetative characters may resemble *A. propinquum* in some aspects, e.g. the pubescent stem, the o long oblanceolate pubescent leaves and the o long peduncle with a compound cyme inflorescence. However, the two species differ from each other in many reproductive characters; for example, *A. spinulosum* has an entirely glabrous inflorescence, a glabrous calyx and corolla, and a slightly reflexed or spreading corolla lobe. Like many other *Argostemma* species in Thailand, *A. spinulosum* has been rarely collected. New material and field observations in Peninsular Thailand and Peninsular Malaysia are needed.

2. *Argostemma propinquum* Ridl., J. Str. Br. Roy. Asiat. Soc. 57: 53. 1911; in Fl. Mal. Pen. 2: 29. 1911; Craib in Fl. Siam. En. 2: 31. 1932. Type: Peninsular Malaysia, *Ridley* s.n. (holotype K!; isotype BM!).—*A. stipulaceum* Ridl., J. Fed. Malay States Mus. 10: 139. 1920. Type: Peninsular Malaysia, *Ridley* s.n. (holotype K!).—*A. fuscum* Craib, Kew Bull. 1931: 213. 1931; in Fl. Siam. En. 2: 29. 1932. Type. Thailand, *Kerr* 15413 (holotype K!; isotype BM!). Fig. 2.

T h a i l a n d.—PENINSULAR: Nakhon Si Thammarat: Khao Luang, *Kerr* 15413 (K, BM), *P. Suvarnakoses* 134 (BKF), *S. Phengnaren* 1026 (BKF); Ronpiboon Hill, *Smith* 441 (BM), *Sirirugsa* 1009 (BCU, PSU, WU); Surat Thani: Khao Nang, *Kerr* 13242 (BM), 13242a (BM); Yala: Betong, *Kerr* 10085 (BM, K); Toh Moh, Khao Re Chao, *Lashanakara* 724 (BM, E, K), 725 (BM, L, P); Narathiwat: Waeng, *Phusomsaeng* 404 (BKF). Malaysia. Kalantan: Kuala Lebir, *Ridley* s.n. (K); Perak: Tomengoh, *Ridley* s.n. (holotype K; isotype BM).

D i s t r i b u t i o n.—Peninsular Thailand, Peninsular Malaysia.

E c o l o g y.—On moist rocks by streams in evergreen forest, ca. 480–1400 m. Flowering February–August. Fruiting August.

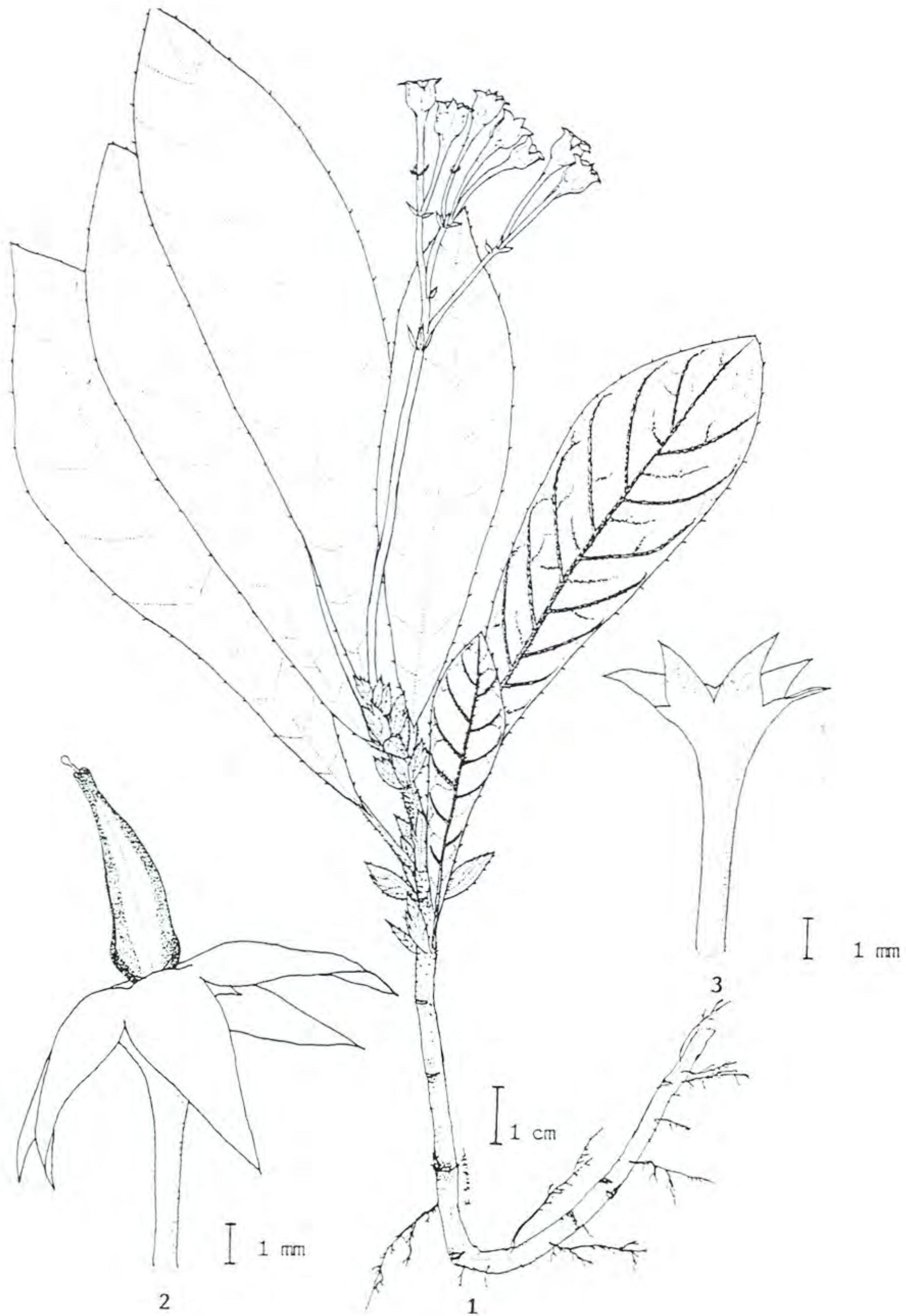


Figure 1. *Argostemma spinulosum* C.B. Clarke ex Hook.f.; 1. habit; 2. flower; 3. calyx. (Larsen & Larsen 32844, AAU).

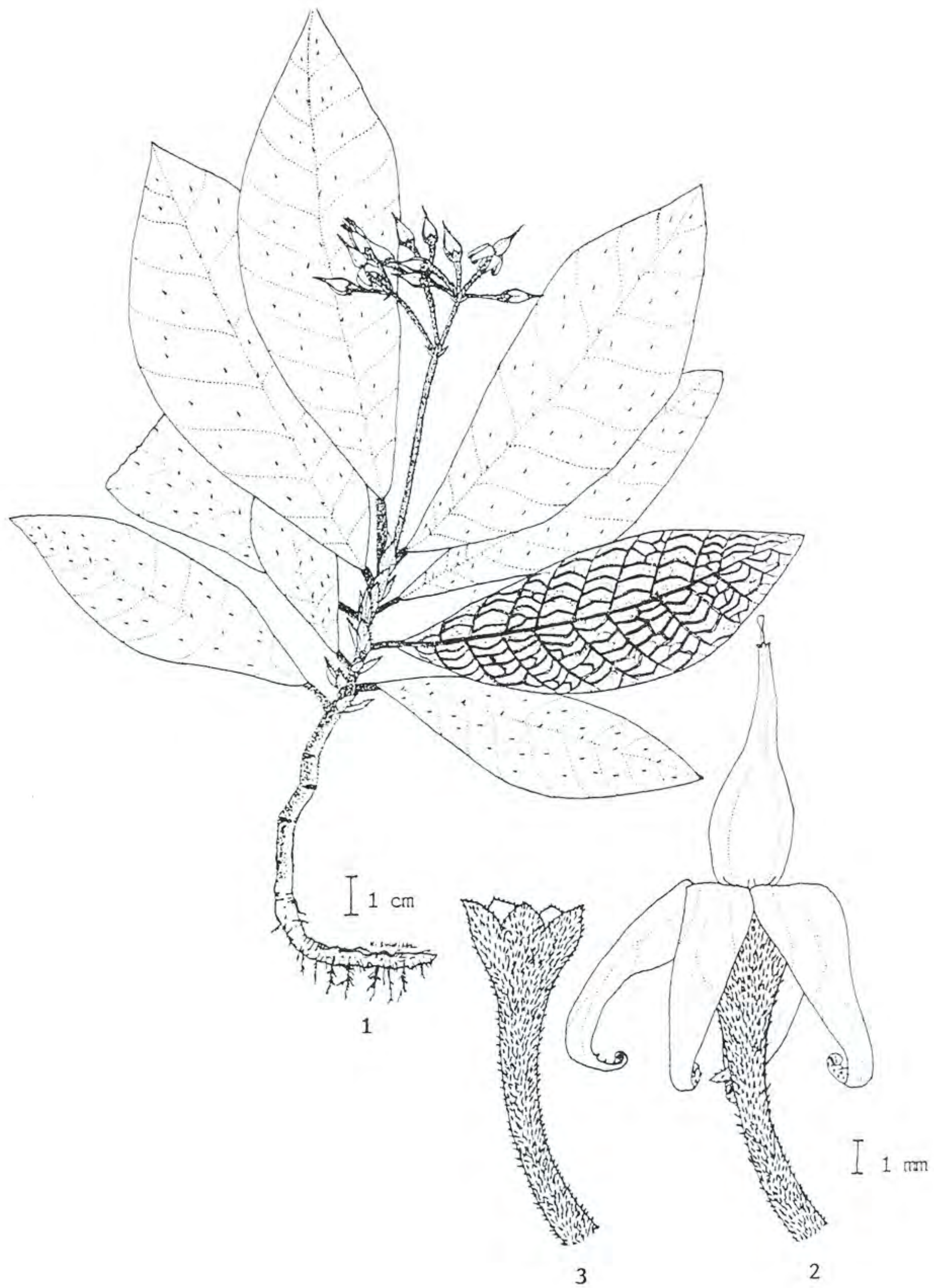


Figure 2. *Argostemma propinquum* Ridl.: 1. habit; 2. flower; 3. calyx. (Suvanakoses 134, BKF).

Note.— In the original description of *Argostemma stipulaceum* (Ridley 1920) no comparison was made with *A. propinquum*. As the two species show similar characters (apart from a more obtuse leaf apex in *A. stipulaceum*), *A. stipulaceum* is considered here a synonym. Similarly, Craib (1931) treated *A. fuscum* together with *A. spinulosum* C.B. Clarke and *A. stipulaceum*, but not with *A. propinquum*. Since *A. fuscum* also has similar characters to *A. propinquum*, it is again regarded a synonym (*A. fuscum* has somewhat narrower leaves than *A. propinquum*, but this is considered as part of the range of variation of *A. propinquum*).

The nearest ally of *Argostemma propinquum* appears to be *A. elatostemma* Hook.f.. The former differs in having suberect stems without adventitious roots, reflexed corollas with lobes inrolled at the tip and anthers with relatively long apical appendages (2–3 mm long). *A. elatostemma* has a creeping stem with adventitious roots at the nodes on lower part of the stem, a slightly reflexed corolla (but with the tips of the lobes straight) and anthers with relatively shorter appendages (< 1 mm long).

3. *Argostemma subcrassum* King, J. As. Soc. Beng. 72: 152 1903; Craib in Fl. Siam. En. 2: 34. 1932. Type: Peninsular Malaysia, *Scortechini* 1203 (lectotype K!, selected here). Fig. 3.

Thailand.— PENINSULAR: Yala [Betong, *Kerr* 7525 (BM, K)]. Malaysia. Perak: *Scortechini* 1912 (G), *Scortechini* 1203 (lectotype K; isolectotype BM).

Distribution.— Peninsular Malaysia.

Ecology.— On moist rocks in evergreen forest, ca. 200 m. Flowering August. Fruiting August.

Note.— *Argostemma subcrassum* differs from the other species of the group by its ? succulent, glabrous stem and glabrous leaves. The flower bud is sometimes slightly curved with a rather large anther cone, which in open flowers looks longer than the corolla lobes because the corolla lobes are inrolled. The apical connective appendages are longer than half the length of the anthers. It has been collected only once from Thailand, on the border with Malaysia (*Kerr* 7525). Additional collections and field observations along the Thai/Malay border are needed.

4. *Argostemma elatostemma* Hook.f. in Fl. Br. Ind. 3: 45 1880; Craib in Fl. Siam. En. 2: 28. 1932. Type: Peninsular Malaysia, *Griffith* s.n. (lectotype K!). Fig. 4.

var. *elatostemma*

Thailand.— PENINSULAR: Phatthalung [Tha Mot, *Larsen et al.* 42686 (AAU)]; Trang [Khao Sung, *Kerr* 15218 (BM, K); Khao Soi Dao, *Kerr* 19148 (BM, E, K, L)]; Satun [Klong Ton, *Kerr* 14442 (BM, K), *Lakshanakara* 332 (AAU)]. Malaysia. Penang: Penang Hill, *Griffith* s.n. (lectotype K); West Hill, *Ridley* 962 (K); Richmond Pond, *Ridley* s.n. (BM); Trengganu: Bukit Besi, Sri Bangun, *Sinclair* 7592 (BM, E). Singapore. *Lobb* 295 (BM, E, K, W).

Distribution.— Peninsular Malaysia, Singapore, Borneo.

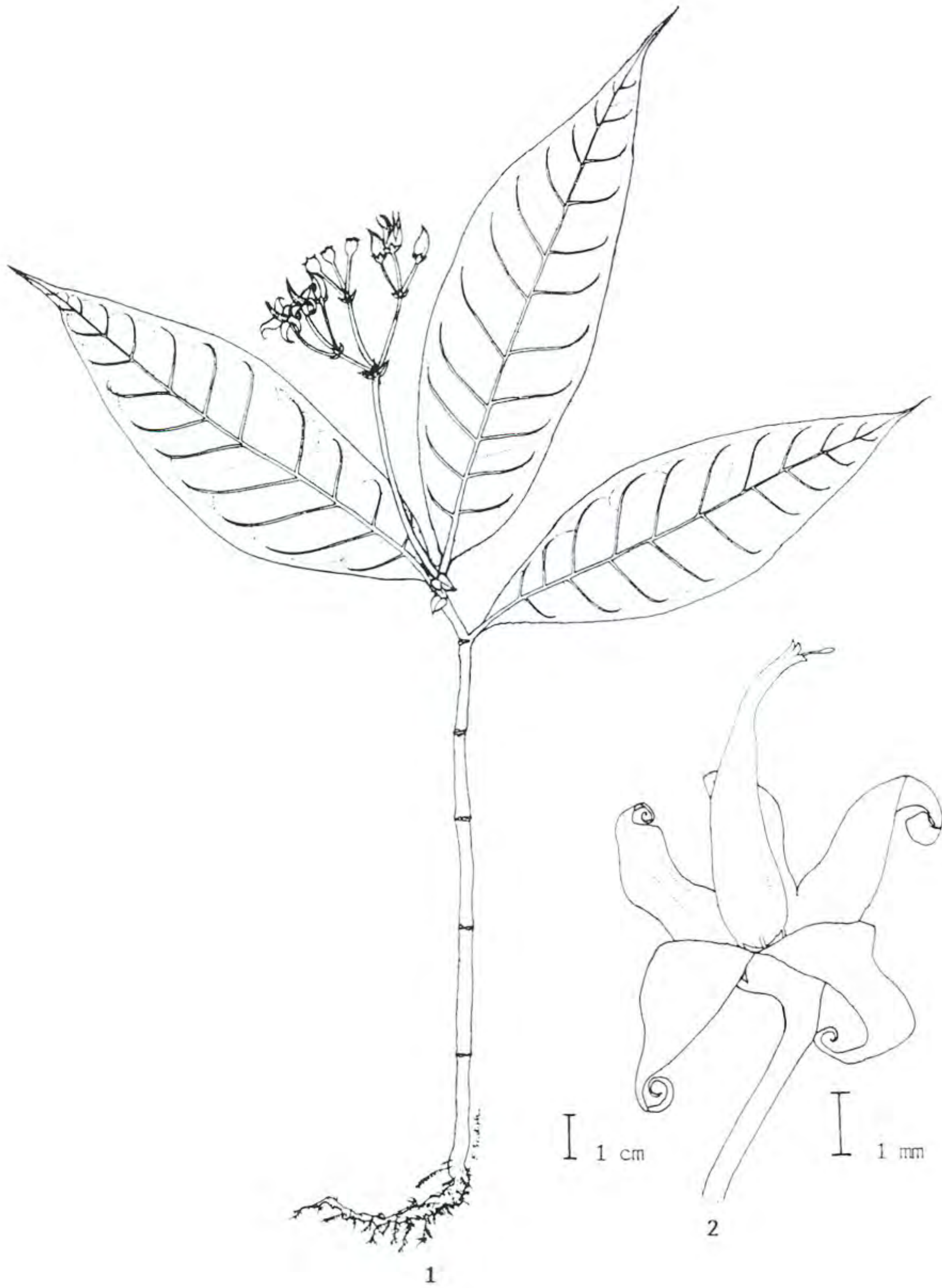


Figure 3. *Argostemma subcrassum* King: 1. habit; 2. flower. (Scortechini 1203, BM).



Figure 4. *Argostemma elatostemma* Hook.f.: 1. habit; 2. flower. (Larsen et al. 32686, AAU).

E c o l o g y.— On wet soil in evergreen forest, ca. 75–1400 m. Flowering March–June. Fruiting unknown.

N o t e.— *Argostemma elatostemma* differs from *A. propinquum* Ridl. in several characters (see under *A. propinquum* for differences). In the original publication, Hooker described *A. elatostemma* based on two specimens (*Griffith* s.n. and *Lobb* 295). Bakhuizen van den Brink selected *Griffith* s.n. as the lectotype (as indicated on the herbarium sheet) but this was not published. Bremer (1989) followed his choice when she revised *Argostemma* in Borneo.

King (1903) proposed var. *obovata* King, which differs from the typical variety in having smaller leaves with a minutely apiculate apex. However, all Thai material observed belongs the typical variety.

5. *Argostemma dispar* Craib, Kew Bull. 1931: 213. 1931; in Fl. Siam. En. 2: 27. 1932. Type: Thailand, *Kerr* 18720 (holotype K!; isotype BM!).— *A. septatum* Craib, Kew Bull. 1931: 215. 1931; in Fl. Siam. En. 2: 33. 1932. Type: Thailand, *Kerr* 15261 (holotype K!; isotype BM!).— *A. septatum* var. *flaccidum* Craib in Fl. Siam. En. 2: 33. 1932. Type: Thailand, *Kerr* 18687 (holotype K!; isotype BM!).— *A. septatum* var. *minus* Craib in Fl. Siam. En. 2: 33. 1932. Type: Thailand, *Kerr* 14958 (holotype K!; isotype BM!). Fig. 5.

T h a i l a n d.— PENINSULAR: Krabi [Panom Bencha, *Kerr* 18687 (BM, K), *Kerr* 18720 (holotype K, isotype BM)]; Trang [Khao Sung, *Kerr* 15261 (BM, K), *Kerr* 15225 (BM, K, S)]; Pattani [Khao Kalakiri, *Kerr* 14958 (BM, K)]; Yala [Betong, *Kerr* 7534 (BM, K), *Kerr* 7579 (K)]; without locality: *Kerr* 8723 (K), *Kerr* s.n. (K).

D i s t r i b u t i o n.— Endemic to Peninsular Thailand.

E c o l o g y.— On moist rocks in evergreen forest, ca. 700–1300 m. Flowering March–April. Fruiting April–May.

N o t e.— *Argostemma dispar* differs from other *Argostemma* species by the denser and longer indumentum on almost all parts and the slightly oblique leaf base. The corolla is characteristically hairy outside. *Argostemma septatum* vars. *septatum*, *flaccidum* and *minus* differ from each other and from *A. dispar* only in the length of the calyx lobes, leaf shape and the numbers of lateral nerves on leaves. The variation in these characters is regarded here as part of the normal range of variation within *A. dispar*, and all three varieties are treated as synonyms.

Malaysian material was identified by Bakhuizen van den Brink (1953) as *Argostemma parvifolium* var. *involucratum*. *Argostemma dispar* differs from this taxon by its shorter calyx lobes, but in other characters seems to be similar. However, since the type specimen of *A. parvifolium* is not available and, in the original publication, Bakhuizen van den Brink did not mention how var. *involucratum* differs from the var. *parvifolium*, I refrain from placing Thai material under *A. parvifolium*, at least for the present.

6. *Argostemma ophirens* Maingay ex Hook.f. in Hook.f., Fl. Br. Ind. 3: 45. 1880. Type: Malaysia, *Maingay* 897 (holotype K!; isotype L!). Fig. 6.



Figure 5. *Argostemma dispar* Craib: 1. habit; 2. flower; 3. ovary and calyx. (Kerr 15225. K).



Figure 6. *Argostemma ophirenses* Maingay ex Hook.f.: 1. habit; 2. flower. (Larsen & Larsen 33415, AAU).

T h a i l a n d.— PENINSULAR: Ranong 30–70 km south of Ranong, *Larsen & Larsen* 33415 (AAU, BKF, K, L), Klong Kam Puang, *Geesink & Santisuk* 4946 (AAU, BKF, L, P); Phangnga [Khao Kata Kwam, *Kerr* 19366 (K); hill along new road, 30 km east of Takuapa, *Beusekom & Phengklai* 685 (AAU, BKF, C, E, K, L, P)]. Malaysia. Melaka: Mount Ophir, *Maingay* 897 (holotype K; isotype L); Pahang: Lubok Temang, *Henderson* 10913 (K); Robinsonos Falls, *Maxwell* 78-192 (AAU); Selangor: Ulu Gombak, *Burt & Wood* B1065 (E); Trengganu: Ulu Setui, Kg Buloh, Besut, *Lewis* 74 (K).

D i s t r i b u t i o n.— Peninsular Malaysia.

E c o l o g y.— On moist rocks near streams or in wet places in evergreen rain forest, ca. 0–400 m. Flowering March–May. Fruiting May.

N o t e.— Craib (1932) did not refer to *Argostemma ophirens*, because at that time there was only one Thai collection (*Kerr* 19366), which was misidentified as *A. subcrassum*.

The ovoid flowering buds, spreading calyx lobes and the suberect corolla lobes are characteristic of *A. ophirens* when compared to other *Argostemma* species with star-shaped flowers, an anther cone and an elongated stem with leaves scattered on it.

7. ***Argostemma laeve*** Benn., Pl. Jav. Rar. 1: 96. 1838. Type: Indonesia, Sumatra, *Horsfield* s.n. (isotype BM!).— *A. curtisii* King, J. As. Soc. Beng. 72: 151. 1903. Types: Peninsular Malaysia, *Curtis* 3332 (syntype K!), *Scortechini* 1890 (syntype BM!).

subsp. ***setosum*** (Geddes) Sridith, Nordic J. Bot. 19(2): 178. 1999.— *A. setosum* Geddes, Kew Bull. 1927: 169. 1927; Craib in Fl. Siam. En. 2: 34. 1932. Type: Thailand, *Smith* 449 (holotype K!; isotype BM!).— *A. setosum* var. *hirsutum* Craib in Fl. Siam. En. 2: 34. 1932. Type: Thailand, *Kerr* 15759 (holotype K!). Fig. 7.

T h a i l a n d.— PENINSULAR: Surat Thani [Khao Nang, *Kerr* 13244 (BM)]; Nakhon Si Thammarat [Lan Saka, Kiriwong, Khao Kai Chang *Suvarnakoses* 518 (BKF, K, L, P), *Sangkhachand* 740 (BKF), *Beusekom & Phengklai* 766a (K, L); Tap Chang, *Suvarnakoses* 232, 816 (BKF); Khao Luang, *Phengnaren* 1069 (BKF), *Kerr* 15402 (BM, C, E, K), *Smitinand* 707, 864 (BKF), *Hansen & Smitinand* 12047 (BKF, C, L, S), *Henipman* 3903 (BKF, C, K, L, P), *Iwatsuki et al.* T-14609 (BKF), *Tagawa et al.* T-5326 (BKF); Ronphiboon, *Smith* 449 (holotype K; isotype BM)]; Phatthalung [Khao Rom, *Smith* 561 (BM); Khao Ban Tat, Priwan Falls, *Puff & Sridith* 930725-1/1 (WU)]; Trang [Khao Chong, *Geesink et al.* 7170 (AAU, BKF, C, K, L, P), *Charoenpol et al.* 3688 (AAU, BKF, P), *Put* 243 (BKF); Khao Sung, *Kerr* 15240 (BM, K); Khao Soi Dao, *Kerr* 19156 (BM, E, K, L); Chawang, *Kerr* 15759 (K)].

D i s t r i b u t i o n.— Endemic to Thailand.

E c o l o g y.— On moist rocks by streams in evergreen forest, ca. 200–1400 m. Flowering January–December. Fruiting January–December.

N o t e.— See Sridith (1998) for further details about this subspecies.

8. ***Argostemma condensum*** Craib, Kew Bull. 1931: 212. 1931; in Fl. Siam. En. 2: 27. 1932. Type: Thailand, *Kerr* 14440 (holotype K!; isotype BM!). Fig. 8.



Figure 7. *Argostemma laeve* Benn. subsp. *setosum* (Geddes) Sridith: 1. habit; 2. flower. (Charoenpol et al. 3688, AAU).

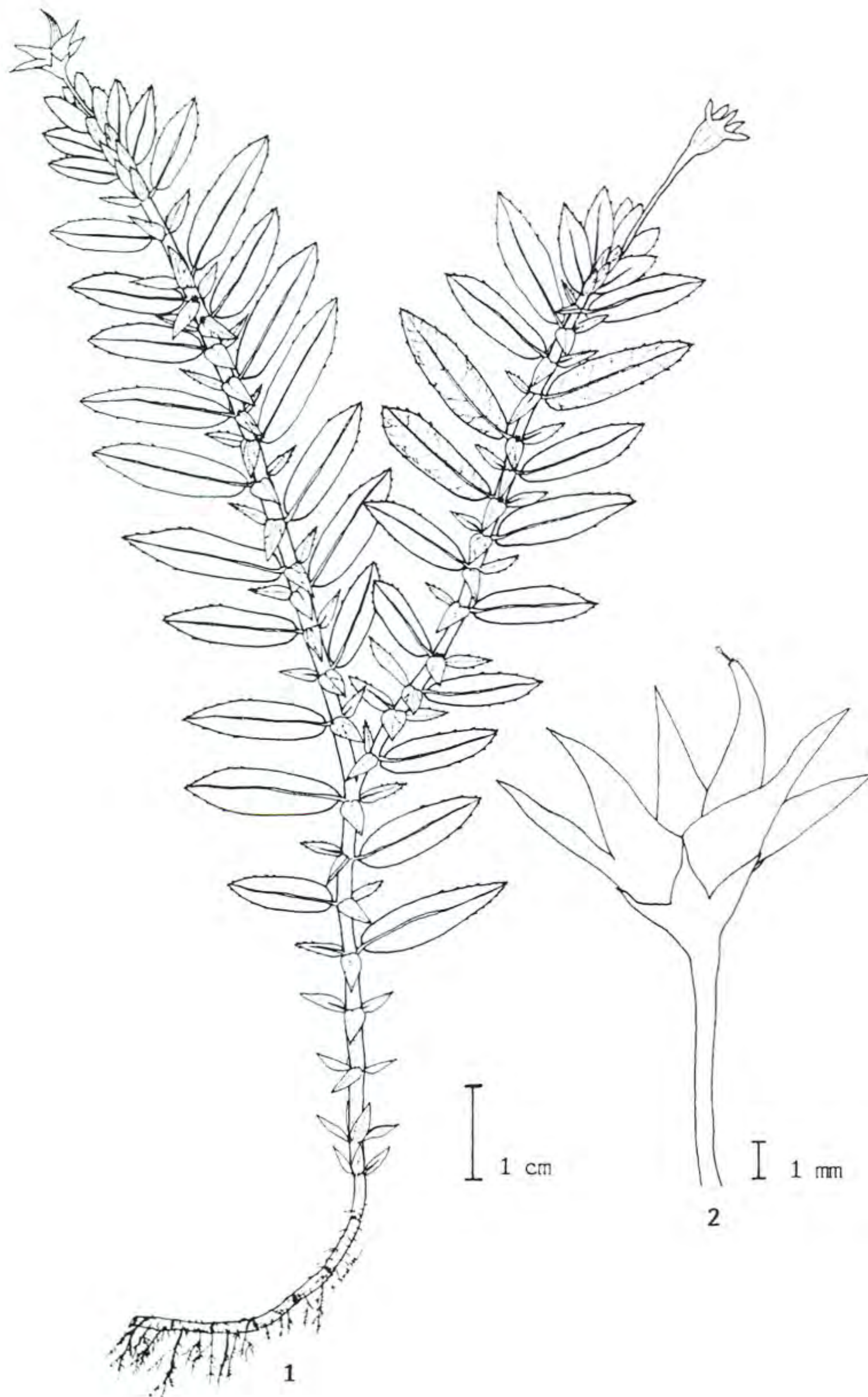


Figure 8. *Argostemma condensum* Craib: 1. habit; 2. flower. (Larsen et al. 42284, AAU).

Thailand.—PENINSULAR: Satun [Klong Ton, *Kerr* 14440 (holotype K; isotype BM)]; Yala [Ban-nang Sta, Khao Pok Yok, *Larsen et al.* 42284 (AAU), 42934 (AAU)].

Distribution.—Endemic to Thailand.

Ecology.—On moist rocks by streams in evergreen forest, ca. 200–1050 m. Flowering March. Fruiting June.

Note.—*Argostemma condensum* has condensed, elliptic to oblong "big leaves", which are, in general, smaller than in any other species of the same group. Moreover its linear "small leaves" are smaller than the ovate stipule; the leaves are distichously arranged. Flowers are only known from the type specimen, and more collections are needed from Peninsular Thailand and Peninsular Malaysia, where it could also be expected.

9. *Argostemma unifolioides* King, J. As. Soc. Beng. 72(2): 148. 1903. Types: Malaysia *Scortechini* 282 (syntype, not seen), 384 (syntype, not seen), *Wray* 410 (syntype, not seen).

var. **glabra** King, J. As. Soc. Beng. 72(2): 148. 1903. Type: Malaysia, *Wray* 2814 (lectotype K!, selected here). Fig. 9.

Thailand.—PENINSULAR: Satun [Boriphat Falls, *Larsen et al.* 42382 (AAU), *Maxwell* 84-227 (BKF); Thale Ban National Park, *Larsen et al.* 42104 (AAU)]; Pattani [Khao Kalakiri, *Kerr* 7760 (BM, K, S)]; Narathiwat [Bacho, *Kerr* 7178; Su-ngai Padi, Chatwarin Falls, *Charoenpol et al.* 3978 (AAU, K, P); Waeng, Sirindhon Falls, *Suddee* s.n. (WU)]. Malaysia. Perak: Maxwelllos Hill, *Wray* 2814 (lectotype K), *Scortechini* 412 (BM, G, K), *Sinclair & Kiah* 6160 (E), 6169 (E), *Sinclair* 38629 (BM); Terengganu: Gunung Batu, *Chew* 1204 (AAU).

Distribution.—Peninsular Malaysia.

Ecology.—On moist rocks by stream in evergreen forest, ca. 100–500 m. Flowering July–September. Fruiting August–October.

Note.—In the original description of *Argostemma unifolioides*, King stated that this species differs from its close ally, *A. unifolium* Benn. (found only in Peninsular Malaysia), in having a broadly ovate corolla in bud, ovate, boldly 1-nerved corolla lobes and almost sessile anthers with very long apical appendages. The former has also larger leaves with more lateral nerves than the latter and sometimes a short indumentum on both upper and lower surfaces. The inflorescence of *A. unifolioides* seems to have more branches than these of *A. unifolium*. However, it is rather difficult to distinguish *A. unifolioides* from *A. unifolium*, since their flower characters are very much alike. Nevertheless, all *Argostemma* collections from Peninsular Thailand with only a solitary large foliage leaf fit very well with *A. unifolioides*. The other Thai *Argostemma* species with a well-developed foliage leaf (*A. monophyllum*) has smaller leaves than *A. unifolioides*, and its leaf shape is more elliptic than ovate, since it has a rather acute leaf base instead of a rounded or cordate leaf base as in *A. unifolioides*. The flowers of this species also differ from both *A. unifolioides* and *A. unifolium*. In particular, *A. monophyllum* has semi-medifixed stamens and slightly sagittate anthers, in contrast to the basifixed stamens of *A. unifolioides* and *A. unifolium*.



Figure 9. *Argostemma unifolioides* King var. *glabra* King: 1. habit; 2. flower. (Larsen et al. 42382, AAU).

10. *Argostemma monophyllum* Sridith, Nordic J. Bot. 19(2): 171. 1999. Type: Thailand, *Phusomsaeng & Bunchuai* 8 (holotype BKF!; isotype K!). Fig. 10.

T h a i l a n d.— NORTH-EASTERN: Loei [Phu Luang, *Phusomsaeng & Bunchuai* 8 (holotype BKF; isotype K), *Bunchuai* 1683 (BKF, L)]; EASTERN: Nakhon Ratchasima [Pak Thong Chai, Khao Lutong, *Larsen et al.* 3173 (AAU, BKF, E, L)]; CENTRAL: Nakhon Nayok (*Phengkklai et al.* 3721 (BKF)); SOUTH-EASTERN: Chon Buri, Si Racha [Chanta Taen Falls, *Maxwell* 74–815 (AAU, L), Ban Bueng, Ang Chang Nam, *Maxwell* 75–971 (AAU, L)], Rayong [Ban Phe, *Larsen et al.* 32483 (AAU); Khao Chamao National Park, *Puff* 890812–1/1 (WU)], Trat [Tasen Falls, *Larsen et al.* 32388 (AAU)].

D i s t r i b u t i o n.— Endemic to Thailand.

E c o l o g y.— On moist granitic rocks in evergreen forest, ca. 20–50 m. Flowering July–August. Fruiting July–August.

N o t e.— Two fruiting *Argostemma* collections from Doi Phra Kao in Chiang Mai Province (N2) (*Garrett* 676 (K) and 707 (BKF, K, L)) resemble *A. monophyllum*, *A. unifolioides* and *A. unifolium* in having a solitary large foliage leaf. However, they do not fit the descriptions of these species, since their persistent calyx lobes on the fruit are distinctly longer (3–4 mm versus 0.5 mm of *A. unifolioides*, *A. unifolium* and *A. monophyllum*). In the adjacent region of Myanmar, there is only one *Argostemma* species (*A. kurzii* C.B. Clarke) with a solitary well-developed foliage leaf. However, in this case the persistent calyx on the fruit is significantly shorter than that seen in the Garrett collections. The latter collections may represent a new species but as no flowers are available, I refrain from describing it at this stage. It would be necessary to recollect at the same locality, although the plants could be extinct there as the area has been deforested for many years.

11. *Argostemma rotundicalyx* Sridith, Nordic J. Bot. 19(2): 173. 1999. Type: Thailand, *Larsen, Larsen, Nielsen & Santisuk* 30944 (holotype AAU!; isotypes C, K, P). Fig. 11.

T h a i l a n d.— PENINSULAR: Surat Thani [Klong Sok, *Prapat* 5 (K, mixed collection with *A. lobulatum* var. *variabilis*)], Phangnga [Takuapa-Surat Thani road, 20–60 km. from Takuapa, *Larsen et al.* 30944 (holotype AAU, isotypes C, K, P)].

D i s t r i b u t i o n.— Endemic to Peninsular Thailand.

E c o l o g y.— On wet rocks in evergreen forest, ca. 100–250 m. Flowering July. Fruiting July.

12. *Argostemma fragile* Geddes, Kew Bull. 1927: 166. 1927; in Fl. Siam. En. 2: 29. 1932. Type: Thailand, *Kerr* 6179 (holotype K!; isotype BM!). Fig. 12.

T h a i l a n d.— NORTHERN: Mae Hong Son [Doi Popo, *Kerr* 6179 (holotype K; isotype BM)].

D i s t r i b u t i o n.— Endemic to northern Thailand.

E c o l o g y.— On tree trunks in hill-evergreen forest, ca. 900–1000 m. Flowering June. Fruiting June–July.

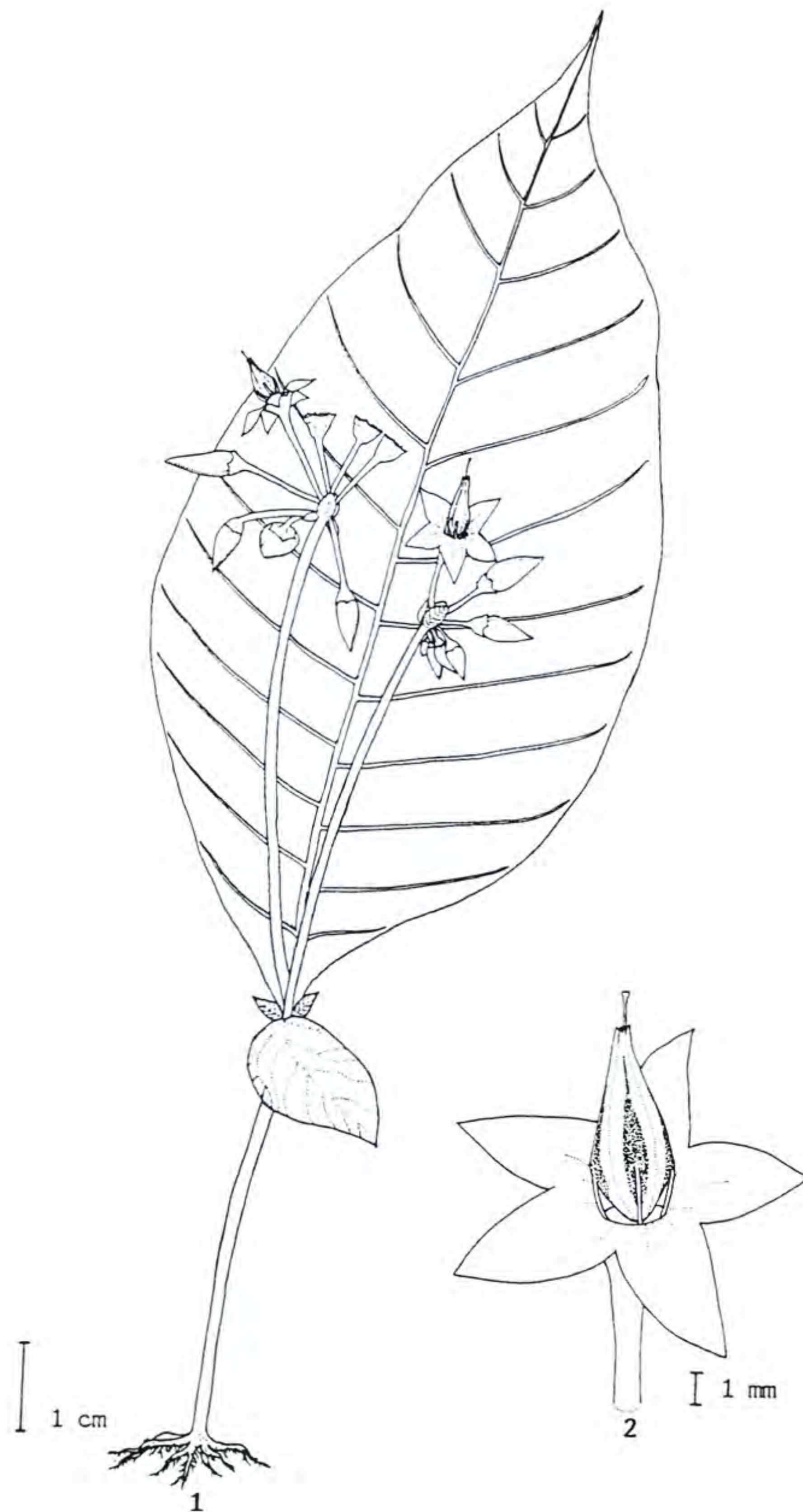


Figure 10. *Argostemma monophyllum* Sridith: 1. habit; 2. flower. (Phusomsaeng & Bunchuai 8, BKF).



Figure 11. *Argostemma rotundicalyx* Sridith: 1. habit (Larsen et al. 30944, AAU); 2. flower; 3. calyx and ovary from below (Prapat 5, K).

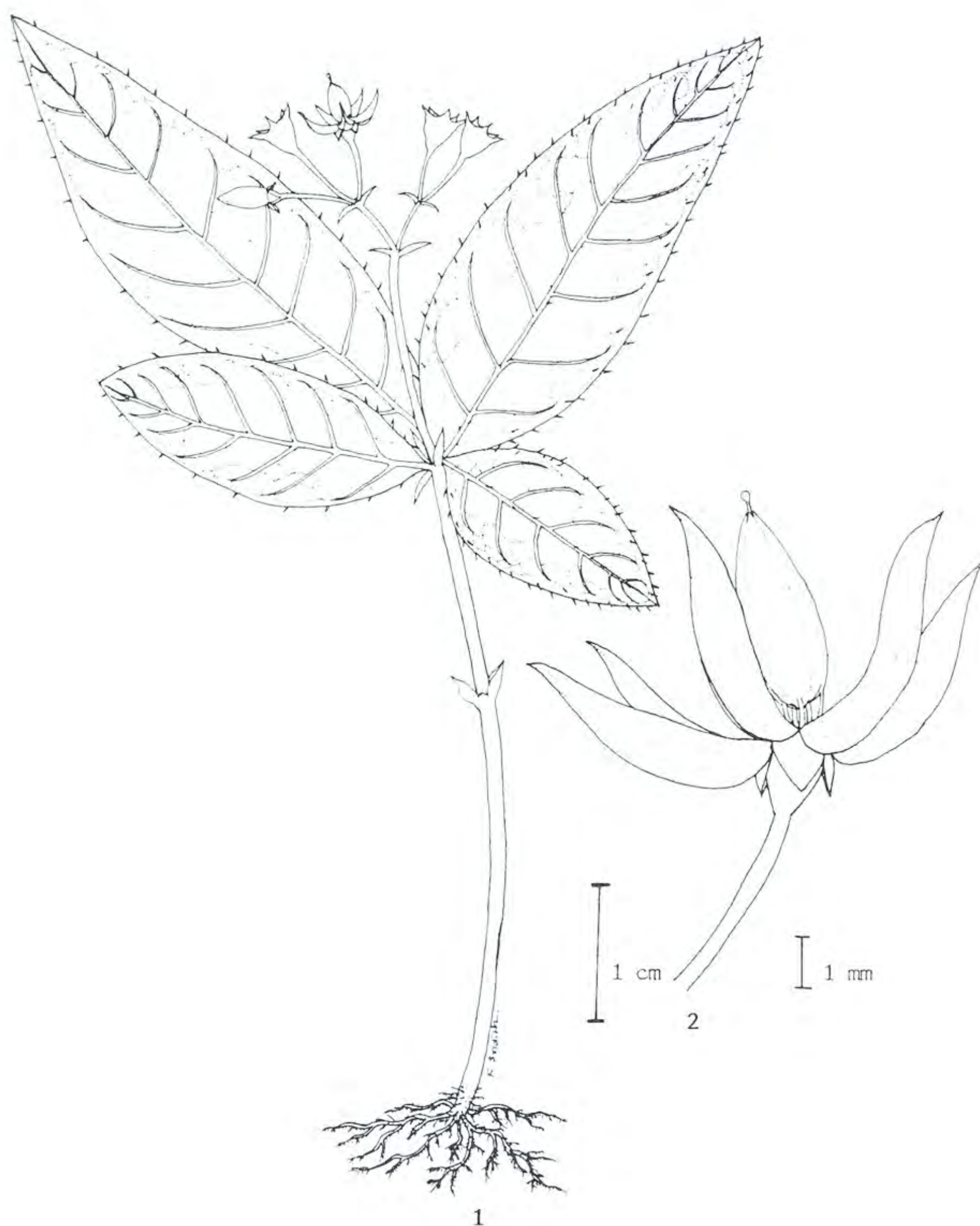


Figure 12. *Argostemma fragile* Geddes: 1. habit; 2. flower. (Kerr 6179, K).

Note.— *Argostemma fragile* resembles *A. verticillatum*, but can be distinguished from the latter by its androecium characters (free versus partially fused filaments; stamens straight versus curved; anthers fused into a cone versus anthers free, although cone-like). *Argostemma fragile* may also resemble *A. concinnum* and *A. stellatum* in some respects, e.g. all usually have four pseudoverticillate leaves and stout anther cones. However, *A. fragile* differs in having a much shorter anther cone (2.5–3 mm versus 5 and 5–5.6 mm in *A. stellatum* and *A. concinnum*), distinctly reflexed calyx lobes and corolla lobes that are slightly curved upward but with the margins folded downward. So far, this apparently rare species is only known from the type.

13. *Argostemma stellatum* Craib, Kew Bull. 1911: 387. 1911; in Fl. Siam. En. 2: 34. 1932. Type: Thailand, *Kerr* 1413 (holotype K!; isotype BM!). Fig. 13.

Thailand.—NORTHERN: Chiang Mai [*Winit* 1132 (BKF), Doi Suthep, Mae Hea, *Kerr* 1413 (holotype K; isotype BM), Doi Inthanon, Mae Wang, *Kerr* 6357 (BM)].

Distribution.—Endemic to northern Thailand.

Ecology.—On moist rocks by streams in evergreen forest, ca. 300–400 m. Flowering July. Fruiting July–September.

Note.—The flowers of *Argostemma stellatum* resemble those of *A. concinnum*, but in the latter, the anther cone is relatively longer, slender and slightly curved. Its obovate pubescent leaves resemble those of *A. pulchellum* Geddes (restricted to south-eastern Thailand) but the latter has pubescence on both surfaces. Moreover, the leaves of the former are yellowish when dry, while those of the latter are dark. *Argostemma pulchellum* appears to be endemic to Doi Inthanon and Doi Suthep. However, additional collections and population studies of this species are needed to clarify its distribution and the variation within species.

14. *Argostemma concinnum* Hemsl. in Hook., Icon. Pl. 24: t. 2830. 1895; Kew Bull. 1895: 105. 1895. Type: Thailand, *Smiles* s.n. (holotype K!). Fig. 14.

Thailand.—NORTHERN: Phitsanulok [Khao Mok, Phu Kaw, *Smiles* s.n. (holotype K), Nakhon Thai, Phu Hin Rongkla National Park, *Thaithong* 650 (BCU, WU); So Pa Falls, *Larsen et al.* 720 (BKF); EASTERN: Nakhon Ratchasima [Khao Yai National Park, Khao Laem, *Beusekom et al.* 1755, *Murata et al.* T-16406 (BKF)]; SOUTH-EASTERN: Prachin Buri [Khao Yai National Park, Khao Khiao, *Larsen* 10174 (AAU, BKF, C), *Phengklai* 1055 (BKF), *Puff* 950803-1/1 (WU)].

Distribution.—Endemic to Thailand.

Ecology.—On wet rocks along streams in evergreen forest, ca. 330–1200 m. Flowering July–September. Fruiting July–October.

Note.—This species was apparently overlooked by Craib (1932). It varies considerably in leaf size. In the type specimen (*Smiles* s.n.) and in a specimen from Phu Hin Rongkla near the type locality (*Thaithong* 650), the leaves are tiny and linear-shaped, whereas the leaves of the specimens from Khao Yai National Park are much bigger (Fig. 55.1 and 55.2). Leaf indumentum and floral characters are, however, uniform.

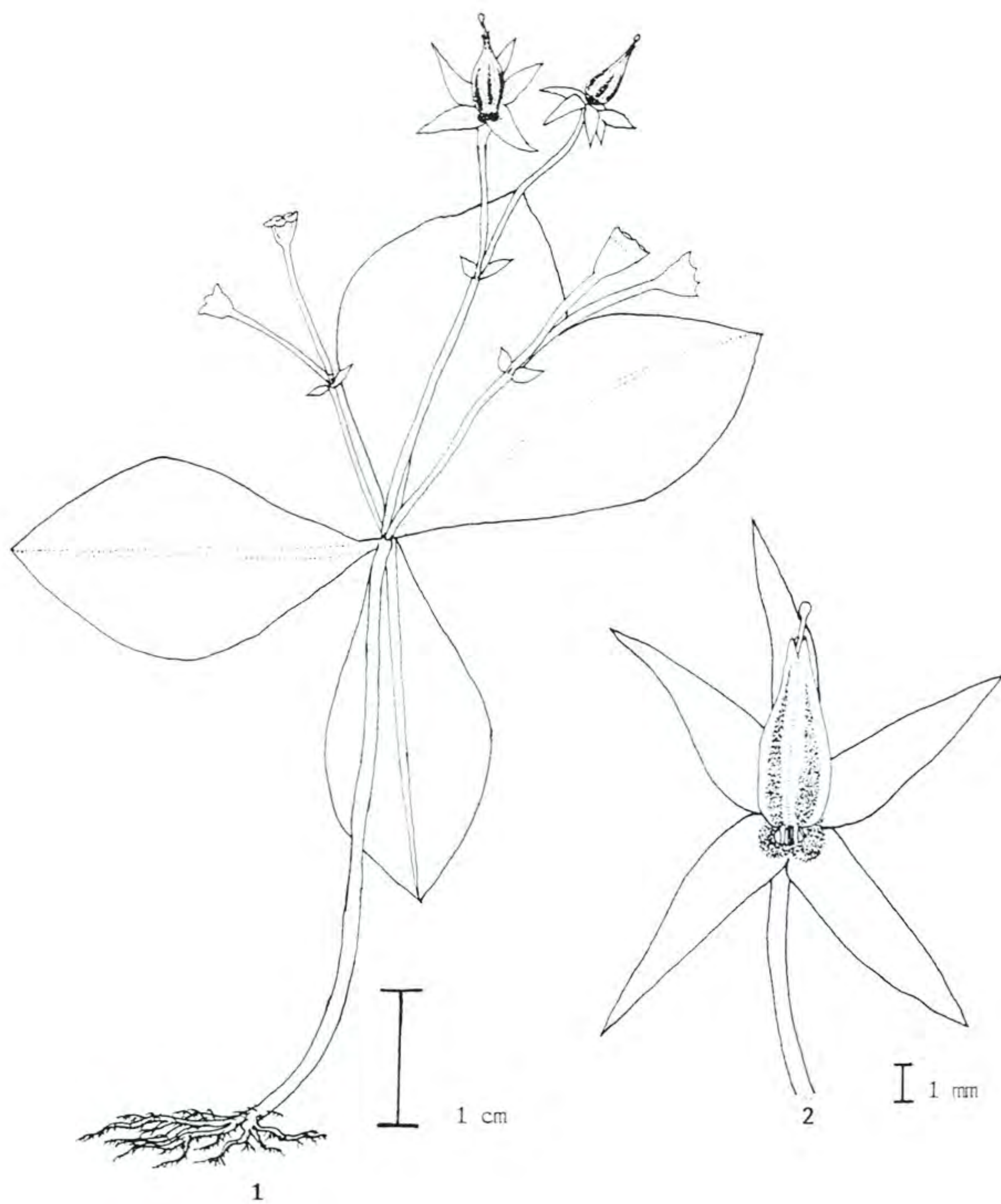


Figure 13. *Argostemma stellatum* Craib: 1. habit; 2. flower. (Kerr 1413, K).

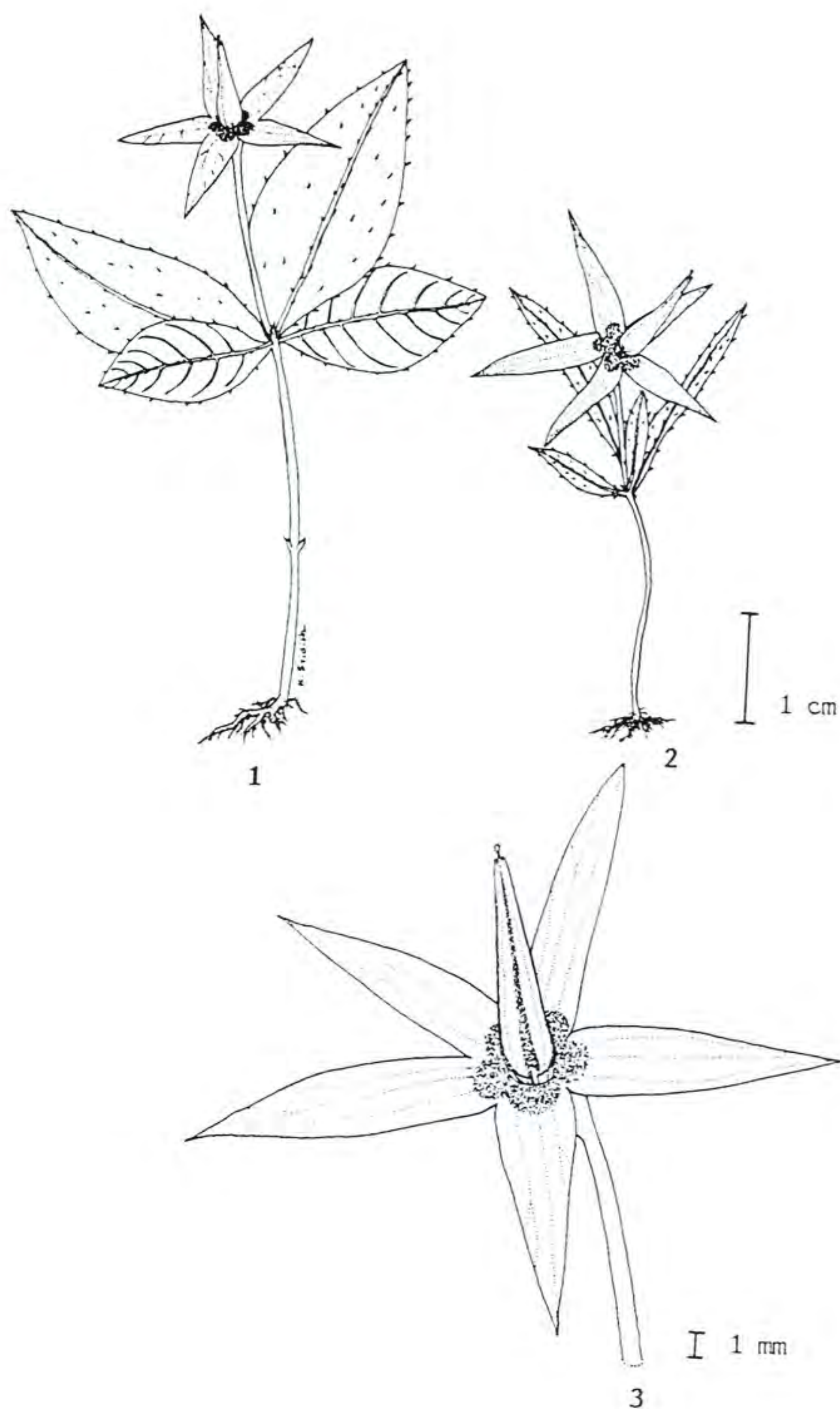


Figure 14. *Argostemma concinnum* Hemsl.: 1-2. habit (1: Larsen 10174, AAU, 2: Smiles s.n., K); 3. flower (Larsen 10174, AAU).

Argostemma concinnum differs from *A. stellatum*, presumably its closest ally, in the leaf characters and anther cone. *Argostemma concinnum* has an elliptic or linear leaf, while *A. stellatum* has an obovate leaf. The anther cone of the former is slender and often oblique, while that of the latter is stout and straight.

15. *Argostemma parvum* Geddes, Kew Bull. 1927: 167. 1927; Craib in Fl. Siam. En. 2: 30. 1932. Type: Thailand, *Kerr* 9230 (holotype K!; isotype BM!). Fig. 15.

T h a i l a n d.— EASTERN: Si Sa Ket [Kantharalak, Dongrak Range, *Maxwell* 76-499 (AAU, L)]; SOUTH-EASTERN: Rayong [Khao Chamao, *Larsen et al.* 32474 (AAU, BKF, K, P)], Chanthaburi *Phengkhlai* 1079 (BKF), Makham forest station, *Larsen et al.* 1844 (AAU, L, P), Khao Sabab, *Put* 899 (BM, C, E, K, L), *Smitinand* 1825 (BKF); *Pliu Falls*, *Maxwell* s.n. (AAU, L), Trat [Ko Chang, *Kerr* 9230 (holotype K; isotype BM), Tapan Hin, *Geesink & Phengkhlai* 6296 (AAU, BKF, C, E, L, P), *Larsen et al.* 44298 (AAU), Klong Sappao, *Maxwell* 73-383 (AAU)].

D i s t r i b u t i o n.— Endemic to Thailand.

E c o l o g y.— On moist rocks along streams in evergreen forest, ca. 10–450 m. Flowering August–September. Fruiting September–November.

N o t e.— *Argostemma parvum* may resemble *A. pulchellum* in floral characters. However, the latter is easily distinguished by its hairy pedicels. *Argostemma parvum* has 3–4 falcate leaf-pairs which are characteristically oriented in one direction, while *A. pulchellum* has obovate, elliptic or rounded leaves with a normal arrangement. Its 3-colpate pollen differs from that of *A. pulchellum* which is 3-porate. *Maxwell* 76-449, *Geesink & Phengkhlai* 6296 and *Larsen et al.* 44298 differ from other specimens in having less hairy leaves. They may represent another variety but more material is needed to confirm this.

16. *Argostemma pulchellum* Geddes, Kew Bull. 1927: 167. 1927. Craib in Fl. Siam. En. 1: 32. 1932. Type: Thailand, *Rabil* 35 (holotype K!; isotype BM!). Fig. 16.

T h a i l a n d.— SOUTH-EASTERN: Rayong [Khao Chamao National Park, *Larsen et al.* 32484 (AAU)], Trat [Ko Chang, *Rabil* 35 (holotype K, isotype BM), *Sangkhachand* 437 (BKF), *Maxwell* 73-324, 74-398 (BM), *Murata et al.* t17401 (AAU, BKF, L), *Schmidt* 502 (C), Taphan Hin, *Geesink et al.* 6485 (AAU, BKF, K, L), Khao Ban Tat, *Suvanakoses* s.n. (BKF)].

D i s t r i b u t i o n.— Endemic to south-eastern Thailand.

E c o l o g y.— On rocks in evergreen forest, ca. 0–30 m. Flowering August. Fruiting August–October.

N o t e.— *Argostemma pulchellum* seems to be closely related to *A. parvum*, and both have a similar distribution. However, they differ from each other in many other respects (see under *A. parvum*).

17. *Argostemma khasianum* C.B. Clarke in Hook.f., Fl. Br. Ind. 3: 43. 1880. Type: India, *De Silva* s.n. (isotype L!). Fig. 17.

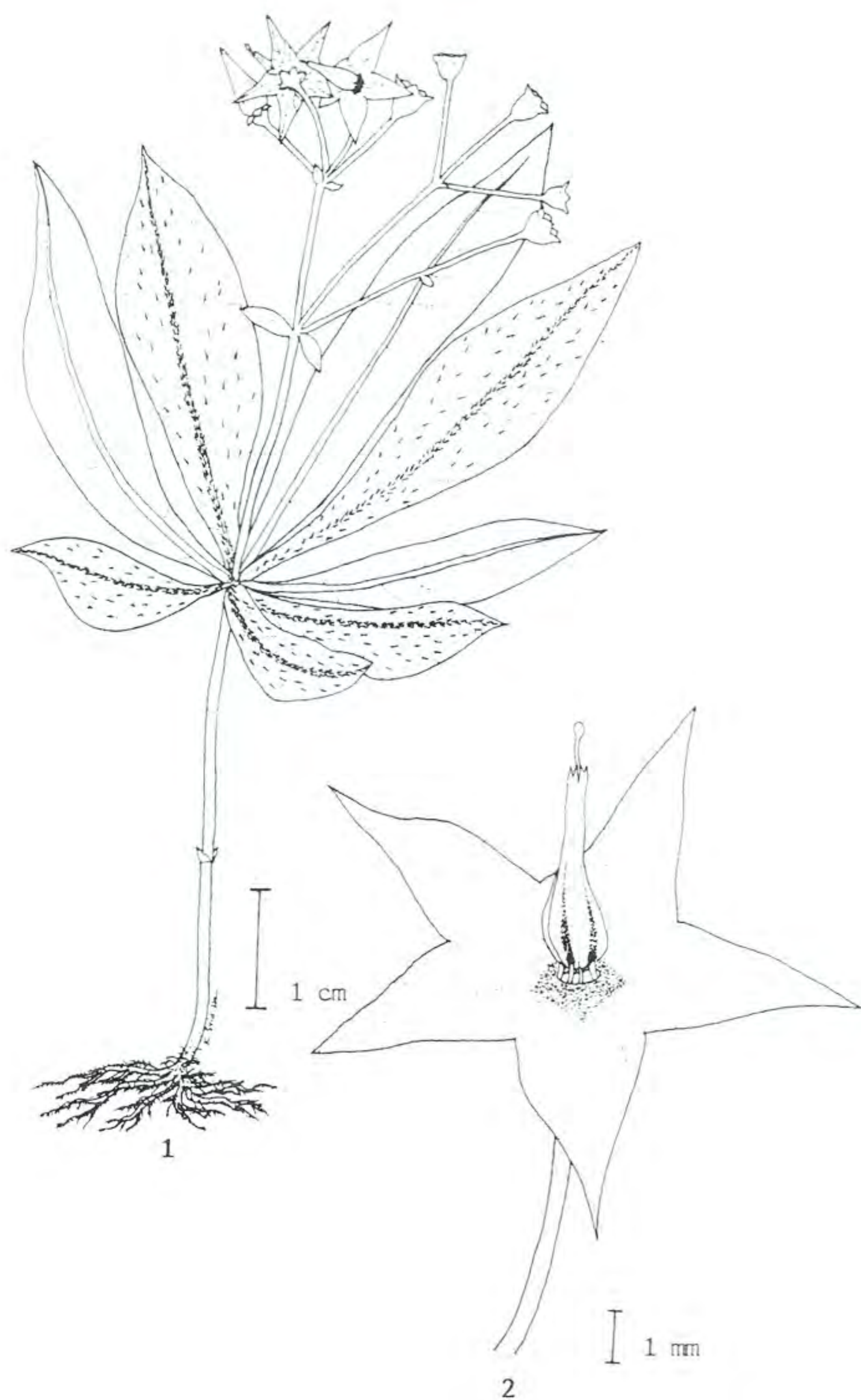


Figure 15. *Argostemma parvum* Geddes: 1. habit; 2. flower. (Larsen et al. 32474, AAU).

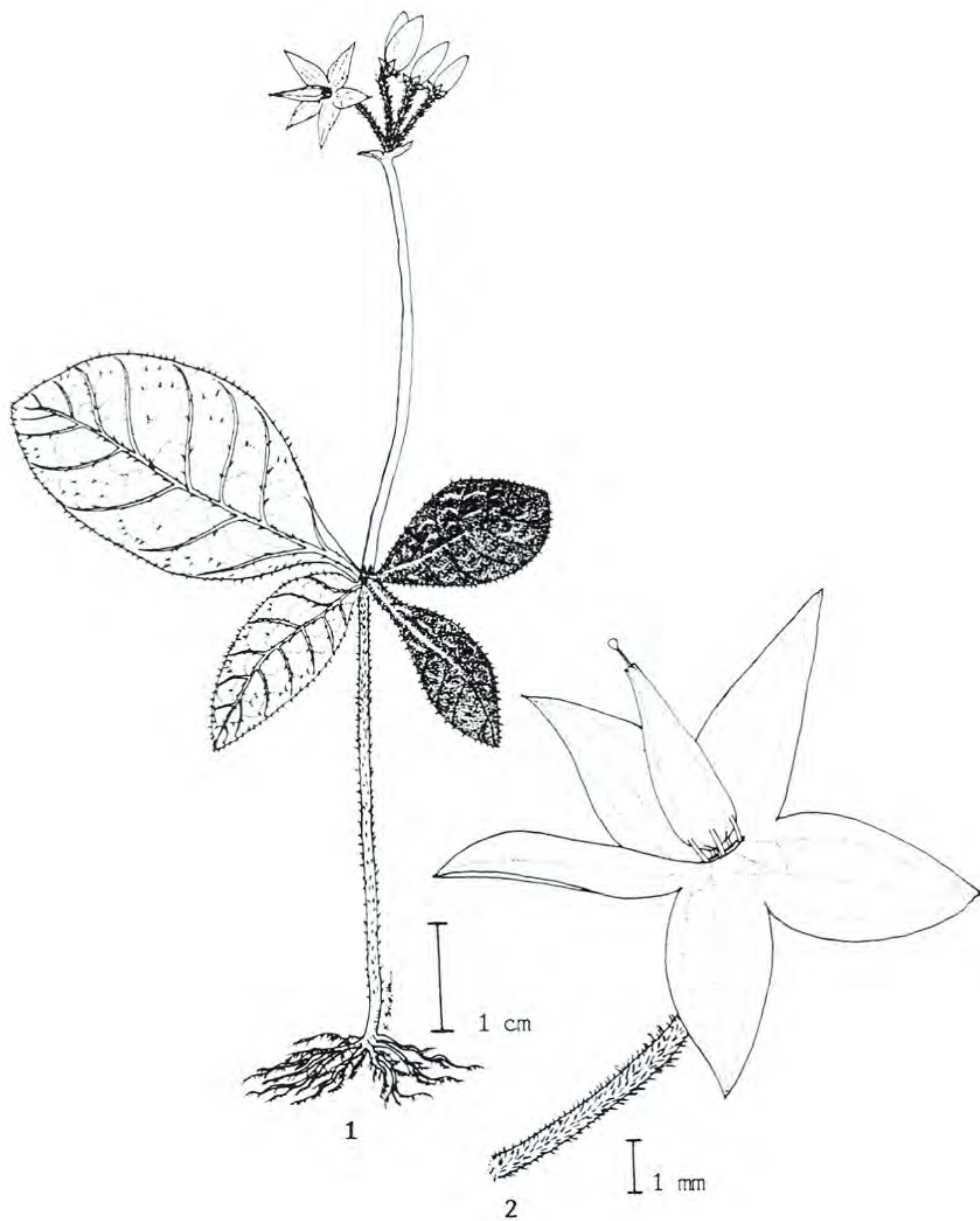


Figure 16. *Argostemma pulchellum* Geddes: 1. habit; 2. flower. (Geesink & Phengklai 6376, AAU).

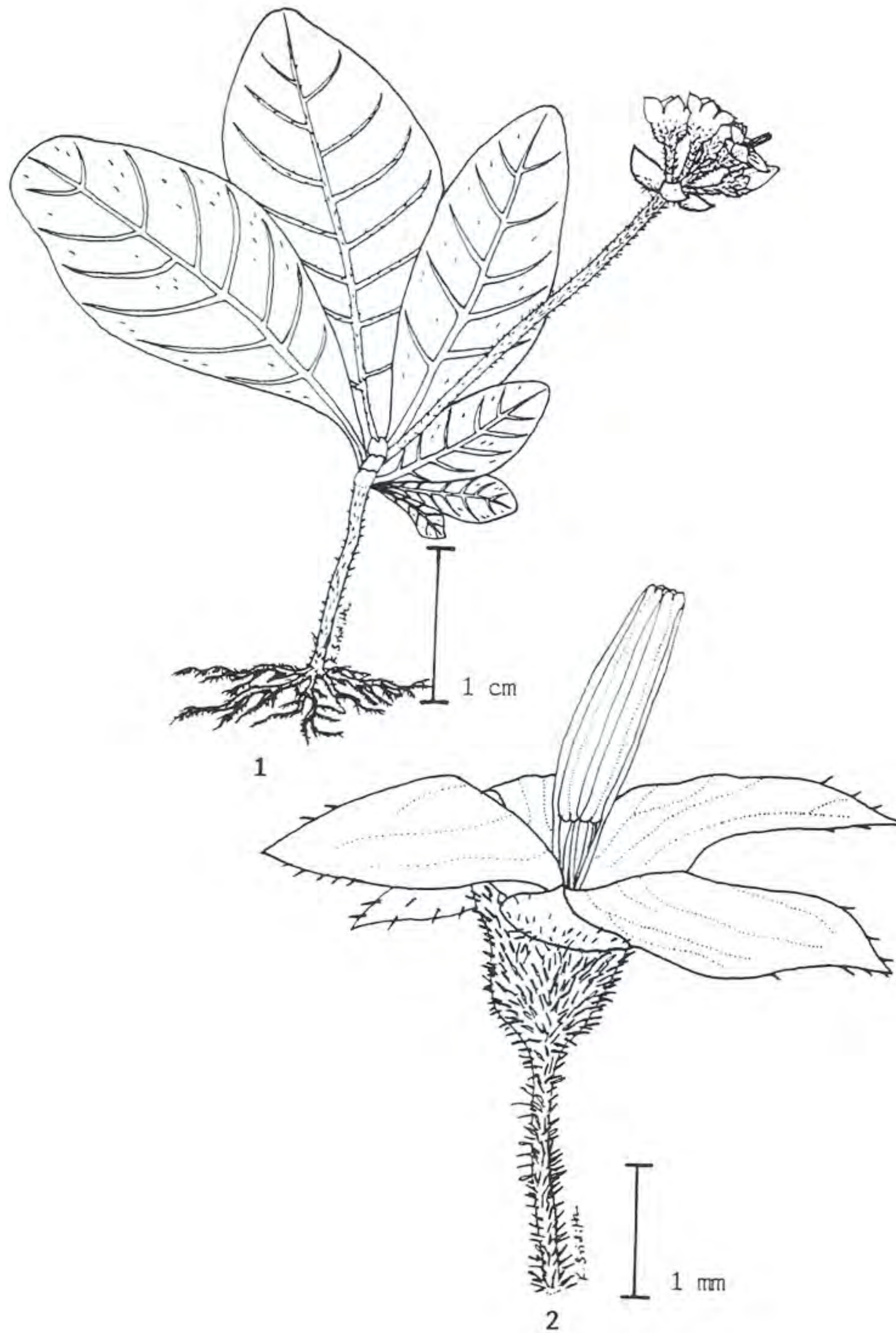


Figure 17. *Argostemma khasianum* C.B. Clarke: 1. habit; 2. flower. (Larsen et al. 2484, AAU).

T h a i l a n d.— NORTHERN: Chiang Mai [Mae Rim, 15 km N of Chiang Mai, *Larsen et al.* 2484 (AAU)]. Myanmar. Maymyo Plateau, *English* s.n. (E); North Shan: Goktick gorge, *Lace* s.n. (E), *English* s.n. (E).

D i s t r i b u t i o n.— Myanmar, India.

E c o l o g y.— In gallery forest along streams, ca. 450 m. Flowering July. Fruiting July.

N o t e.— *Argostemma khasianum* differs from other *Argostemma* species in having 4-merous flowers and a style included in the anther cone. Its leaves are sparsely pubescent on both sides, although Clarke originally described them as glabrous. Clarke also mentioned that *A. khasianum* has free anthers, opening by apical pores. However, it is possible that the anther cone was separated when the type specimen was prepared. *A. khasianum* has only once been collected in Thailand and more material is needed.

18. *Argostemma diversifolium* Ridl., J. Str. Br. Roy. Asiat. Soc. 57: 52, 1911; Craib in Fl. Siam. En. 2: 28, 1932. Type: Malaysia, *Ridley* 14470 (holotype K!; isotype BM!).— *A. diversifolium* var. *montanum* Craib in Fl. Siam. En. 2: 28, 1932. Type: Thailand, *Kerr* 10855 (holotype K!; isotype BM!). Fig. 18.

T h a i l a n d.— SOUTH-WESTERN: Prachuap Khiri Khan: Khao Luang, *Kerr* 10855 (BM, K); PENINSULAR: Ranong [near the hot spring, *Larsen et al.* 43118 (AAU), Khao Phra Mi, *Larsen et al.* 30867 (AAU, K), *Larsen et al.* 30671 (AAU, BKF, K, P), Klong Naka, *Na Nakorn* 725 (BKF), Ngao Falls, *Fukuoka & Na Nakorn* t-35883 (BKF, L), Ban Racha Krude, *Larsen et al.* 43191 (AAU), 43192 (AAU)], Surat Thani [Khao Sok National Park, *Larsen et al.* 40841 (AAU), *Puff & Sridith* 930705-1/1 (WU)], Phangnga [Klong Saeng Wildlife Sanctuary, *Fukuoka & Na Nakorn* t-36072 (BKF, L), *Na Nakorn* 724 (BKF), Kuraburi, Song Pi Nong Falls, *Santisuk* 1161 (BKF)], Nakhon Si Thammarat [Khao Luang National Park, *Maxwell* 85-686 (BKF, L), *Puff* 960904-1/1 (WU)], Phatthalung [Khao Pu Khao Ya National Park, Riang Thong Falls, *Puff & Sridith* 930711-1/2 (WU)], Trang [Khao Chong, *Saephu* 18 (C), *Rabil* 286 (BM, E, K), *Charoenpol et al.* 3468 (AAU, BKF, K, P), *Put* 190 (BKF), 240 (BKF), *Maxwell* 85-712 (BKF, L), 84-363 (BKF), 75-768 (AAU, L), *Suvarnakoses* 2137 (BKF), 2146 (BKF); Chawang, *Smitinand* 2983 (BKF, L)], Satun [Thale Ban National Park, *Maxwell* 85-665 (AAU, BKF, L)]. Myanmar. Upper Chindwin: opposite Kindar, *Lace* 4300 (E). Malaysia. Perak: Lenggong, *Ridley* 14470 (holotype K; isotype BM).

D i s t r i b u t i o n.— Myanmar, Peninsular Malaysia.

E c o l o g y.— On moist rocks along and in streams in evergreen forest, ca. 50–1100 m. Flowering July–August. Fruiting October.

N o t e.— *Argostemma diversifolium* is closely allied to *A. laxum*. Both have star-shaped corollas and free stamens with relatively long anthers that open by means of apical pores. However, *A. diversifolium* differs from the latter in several characters (see under *A. laxum*). The leaves in *A. diversifolium* vary from broadly ovate to lanceolate and, vegetatively, this species sometimes resembles *A. neurosepalum*. However, it can be distinguished from the latter by its star-shaped corollas and the larger, lanceolate calyx lobes (versus bell-shaped corollas and small, triangular calyx lobes in *A. neurosepalum*).

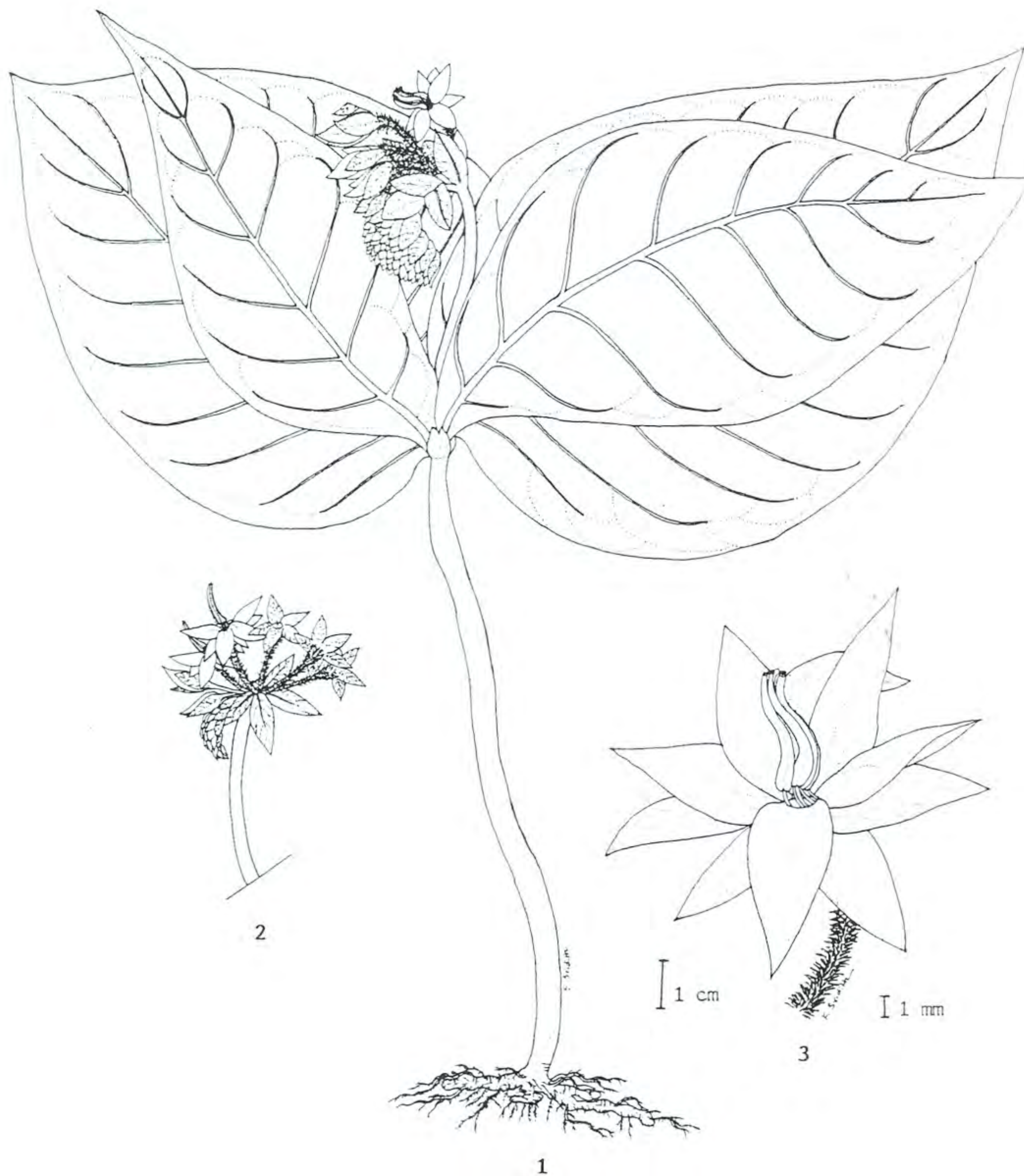


Figure 18. *Argostemma diversifolium* Ridl.: 1. habit plant with young inflorescence; 2. older inflorescence; 3. flower. (Puff & Sridith 930727-1/1, WU). Drawn from specimen preserved in alcohol.

The young inflorescences of *A. diversifolium* can be highly condensed with many bracts (e.g. *Puff & Sridith* 930727-1/1), becoming looser when they mature. Its anthers are held in a tube-like arrangement, but without any fusion or agglutination. The arrangement of the androecium is often slightly zygomorphic because all five filaments have a distinct, S-like curvature and, therefore, the anthers themselves are also curved. In contrast to other *Argostemma* species with longitudinally dehiscent anthers, the anther sac walls of *A. diversifolium* lack endothelial thickenings (*Puff et al.* 1995).

19. *Argostemma pictum* Wall. in Roxb., Fl. Ind. (ed. Carey & Wall.) 2: 327. 1824; in Benn., Pl. Jav. Rar. 1: 94. 1838; Hook.f. in Fl. Br. Ind. 3: 43. 1880; Craib in Fl. Siam. En. 1: 30. 1932. Type: Malaysia, *Wallich* 8392 (holotype K!).— *A. bifolium* Ridl., J. Bot. 65: 27. 1927. Type: Malaysia, *Ridley* s.n. (holotype K!).— *A. rotundifolium* Geddes, Kew Bull. 1927: 168. 1927; Craib in Fl. Siam. En. 1: 33. 1932. Type: Thailand, *Kerr* 7470 (holotype K!). Fig. 19.

T h a i l a n d.— PENINSULAR: Ranong [Klong Naka, *Geesink et al.* 7372 (AAU, BKF, K, P), Khao Phra Mi, *Larsen et al.* 30726 (AAU, BKF, L, P), Kapoe, Klong Bang Man, *Niyomdham et al.* 313 (AAU, C, K, L)], Phangnga [Kuraburi, Song Pi Nong Falls, *Santisuk* 1162 (BKF); Kuraburi, Klong Saeng Wildlife Sanctuary, *Na Nakorn* 646 (BKF)], Phuket [Phra Taao, *Niyomdham et al.* 292 (AAU, C, E, L, P)], Phatthalung [Ta Mot Forest Reserve Area, *Maxwell* 86-755 (L)], Trang [Yan Ta Khao, Sai Rung Falls, *Puff & Sridith* 930729-1/6 (WU)], Songkhla [Hat Yai, Ton Nga Chang Falls, *Puff & Sridith* 930804-1/6 (AAU, PSU, WU); Rattaphum, Boriphat Falls, *Maxwell* 84-65 (BKF), *Puff & Sridith* 930805-1/1 (WU)], Yala [Betong, *Kerr* 7470 (K, BM)]. Myanmar. Tavoy: E of Paungdaw Power Station, *Keenan et al.* 833 (E)]. Malaysia. Acheh Forest, *Burkill* 6143 (K); Johor: Gunung Panti, *Smith* 125 (K), *Maxwell* 81-137 (AAU, L); Kedah: Langkawi I., *Kerr* 21836 (K, KEP); Kelantan: Gunung Ayam, *Saw & Kamarudin* 37603 (KEP); Gunung Stong Lata, Sungai Geri, *Symington* 37836 (KEP); Melaka: *Maingay* 896 (K, L); Penang: *Wallich* 8392 (holotype K); Tilok Bahang, *Wong* 35258 (KEP); Perak: *Scortechini* 310 (G); Maxwell's Hill, *Ridley* s.n. (K), *King's collector* 10585 (E); Cameron Highland, *Jeomat* 28101 (KEP); Selangor: Bukit Batu Berdinding, *Nur* 34336 (BM, K, L), Sungai Loh, *Symington* 37400 (KEP), *Whitmore* 8942 (K).

D i s t r i b u t i o n.— Myanmar, Peninsular Malaysia.

E c o l o g y.— In coarse sand or on moist (sandstone) rocks in evergreen forest, ca. 100–400 m. Flowering June–August. Fruiting August–October.

N o t e.— *Argostemma pictum* resembles *A. neurocalyx* Miq. in vegetative characters. However, the former often has white streaks along veins and veinlets through the reticulation system while the latter has patches or streaks only at the junctions of veins and/or veinlets. *Argostemma pictum* can also be distinguished from *A. neurocalyx* by its star-shaped flowers with anthers connivent into an anther cone. *Argostemma pictum* has the shortest corolla tube among *Argostemma* species with star-shaped flowers. Characteristic for the choripetalous-looking flowers are the downward folding corolla lobes, anthers with short apical appendages connivent into an anther cone and a distinct capitate stigma.

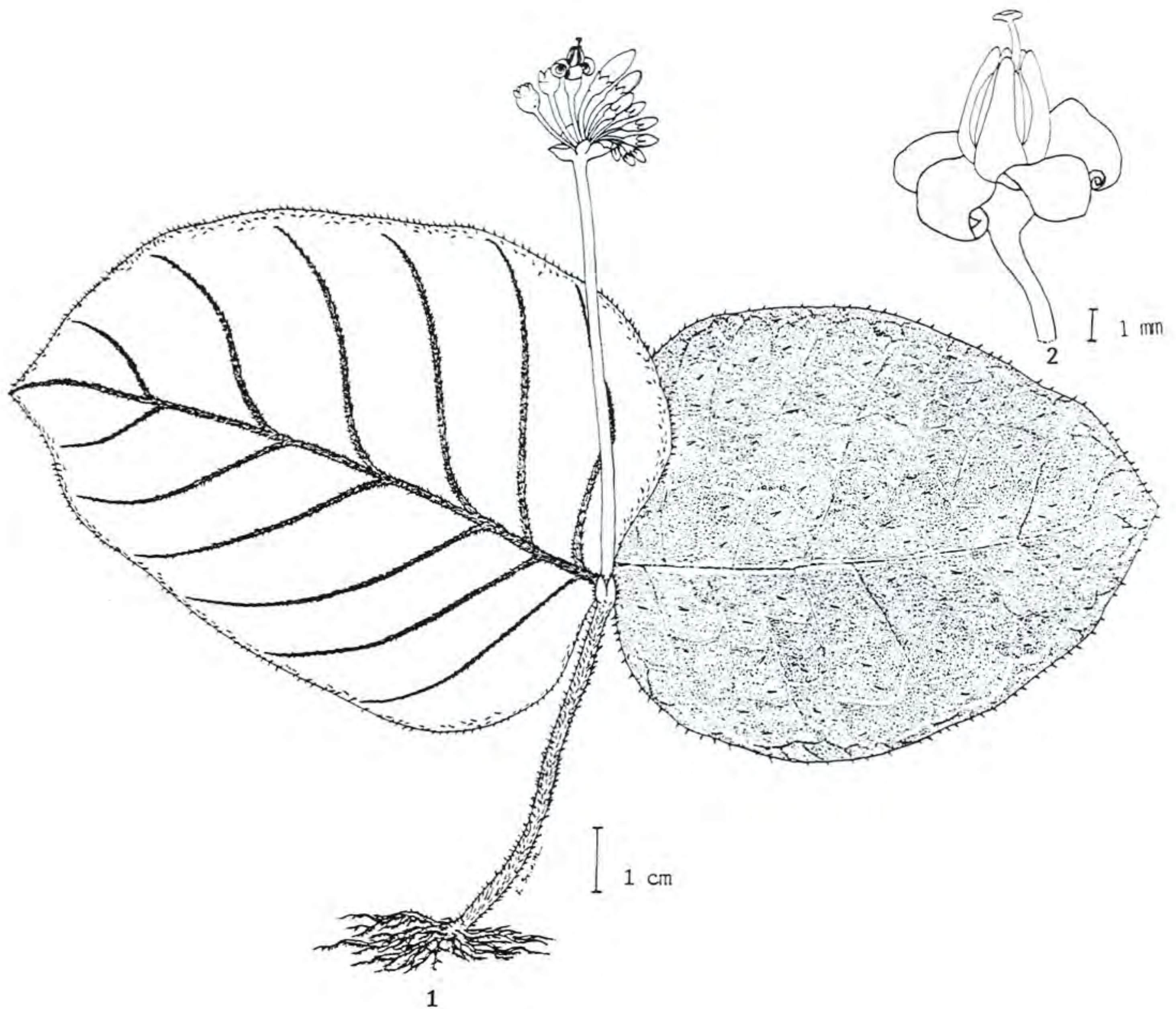


Figure 19. *Argostemma pictum* Wall.: 1. habit; 2. flower. (Niyomdham et al. 292, AAU).

20. *Argostemma verticillatum* Wall. in Roxb., Fl. Ind. (ed. Carey & Wall.) 2: 3244. 1824; in Benn., Pl. jav. rar. 1: 94. 1833; Hook.f. in Fl. Br. Ind. 3: 43. 1880; Craib in Fl. Siam. En. 1: 35. 1932; Kanjilal in Fl. Assam 3: 36. 1939. Type: not indicated.—*A. glaberrimum* Hook.f., Kew Journ. 3: 345. 1851. Type: India, *Stocks* s.n. (holotype K!). Fig. 20.

T h a i l a n d.—NORTHERN: Chiang Mai [Doi Suthep, *Kerr* 728 (BM, K, L), *F.H.W. Kerr* 186 (K), *Winit* 1142 (BKF, K), *Maxwell* 87-733 (BKF, L)], Lampang [Chae Son National Park, *Puff* 950729-1/1 (WU)]. Myanmar. Katha: *Lace* 5333 (K). China. Yunnan: *Henry* 13122a (K).

D i s t r i b u t i o n.—India, Myanmar, China (Yunnan).

E c o l o g y.—On moist rocks along streams in hill-evergreen forest, ca. 700–2200 m. Flowering July–August. Fruiting August.

N o t e.—*Argostemma verticillatum* differs from other *Argostemma* species by (a) the filaments fused around the middle and forming a short filament tube and (b) anthers opening by oblique elongated pores (unique in *Argostemma* spp). *Argostemma lobbii* Hook.f. also has fused filaments. However, it has many pairs of leaves scattered on the stem, which markedly differs from the clustered and pseudoverticillate leaves of *A. verticillatum*. Moreover, its anthers open by means of apical pores.

21. *Argostemma lobbii* Hook.f. in Fl. Br. Ind. 3: 44. 1880. Type: Myanmar, *Lobb* 369 (lectotype K!).—*A. saxicolum* Craib, Kew Bull. 1931: 215. 1931; in Fl. Siam. En. 2: 1932. Type: Thailand, *Put* 217 (holotype K!). Fig. 21.

T h a i l a n d.—NORTHERN: Chiang Rai [Doi Tung, *Iwatsuki et al.* T-11157 (BKF)], Lampang [Tham Pha Thai cave, *Hambananda* 229 (BKF)], Phitsanulok [Thung Salaeng Luang National Park, *Larsen et al.* 586 (AAU), *Tagawa et al.* T-11255 (BKF)], Tak [Khao Phra Wo, *Murata et al.* 16919 (BKF, L)]; SOUTH-WESTERN: Kanchanaburi [Bo Re, *Put* 217; Dong Yai, *Phengklai et al.* 2929 (BKF), Huai Ban Kao, *Maxwell* 73-273 (AAU)]; CENTRAL: Nakhon Nayok [Nang Rong Falls, *Maxwell* 75-706 (AAU, L), *Larsen et al.* 3349 (BKF, E, L), *Larsen et al.* 43769 (AAU)]. Myanmar. Moulmein: *Lobb* 369 (lectotype K), *Parish* 60 (K).

D i s t r i b u t i o n.—Myanmar.

E c o l o g y.—On limestone rocks in evergreen forest, ca. 100–900 m. Flowering July–September. Fruiting July–September.

22. *Argostemma laxum* Geddes, Kew Bull. 1927: 166. 1927; Craib in Fl. Siam. En. 2: 29. 1932. Type: Thailand, *Kerr* 6334 (holotype K!; isotype BM!). Fig. 22.

T h a i l a n d.—NORTHERN: Chiang Mai [Doi Inthanon] *Kerr* 6334 (holotype K; isotype BM), *Garrett* 398 (C, E, L), *Phengklai et al.* 7074 (BKF), 7190 (BKF)].

D i s t r i b u t i o n.—Endemic to northern Thailand.

E c o l o g y.—On mossy trunks in hill-evergreen forest, ca. 1500–1800 m. Flowering June–July. Fruiting July.

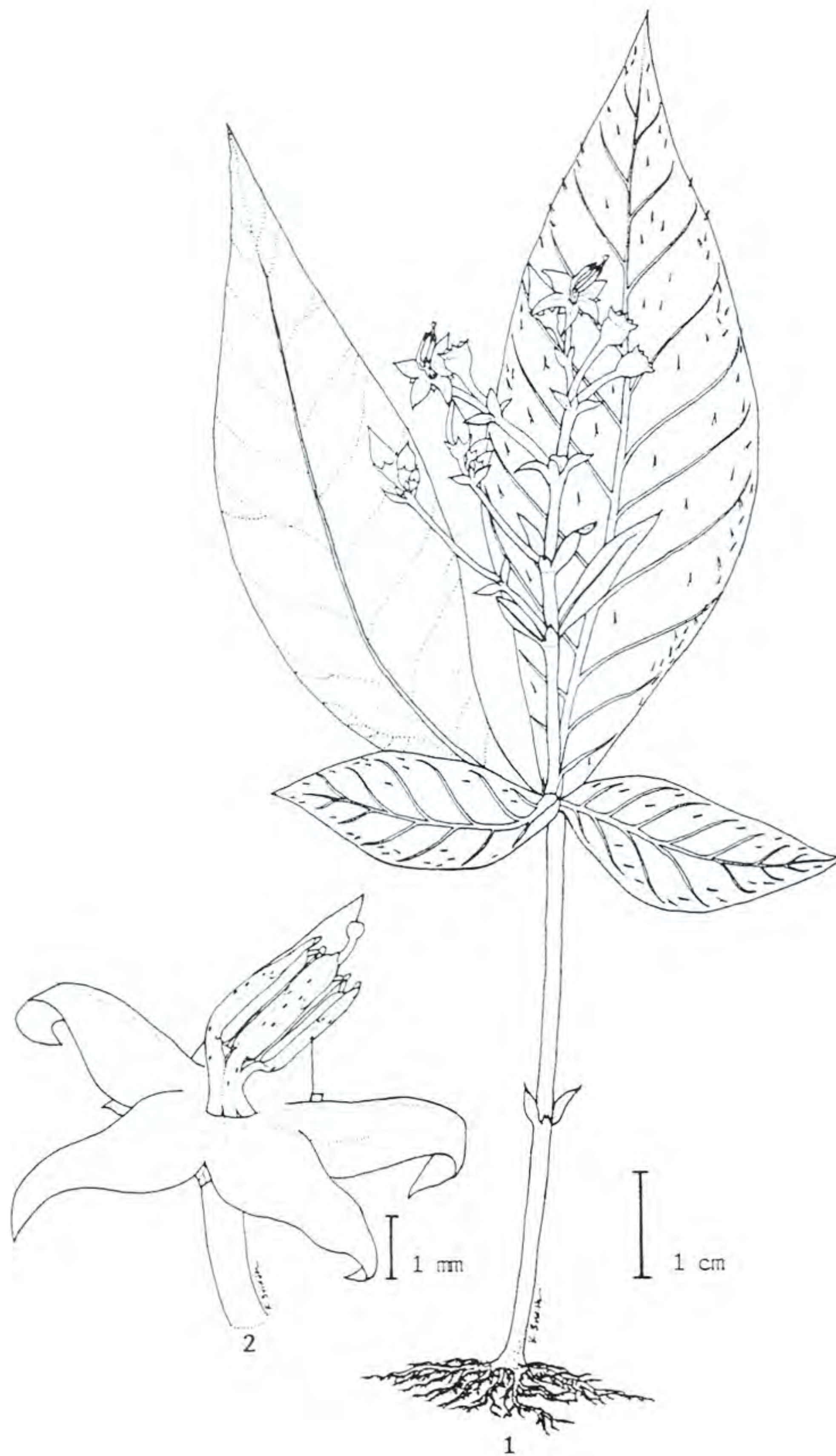


Figure 20. *Argostemma verticillatum* Wall.: 1. habit; 2. flower. (Puff 950729-1/1, WU). Drawn from specimen preserved in alcohol.

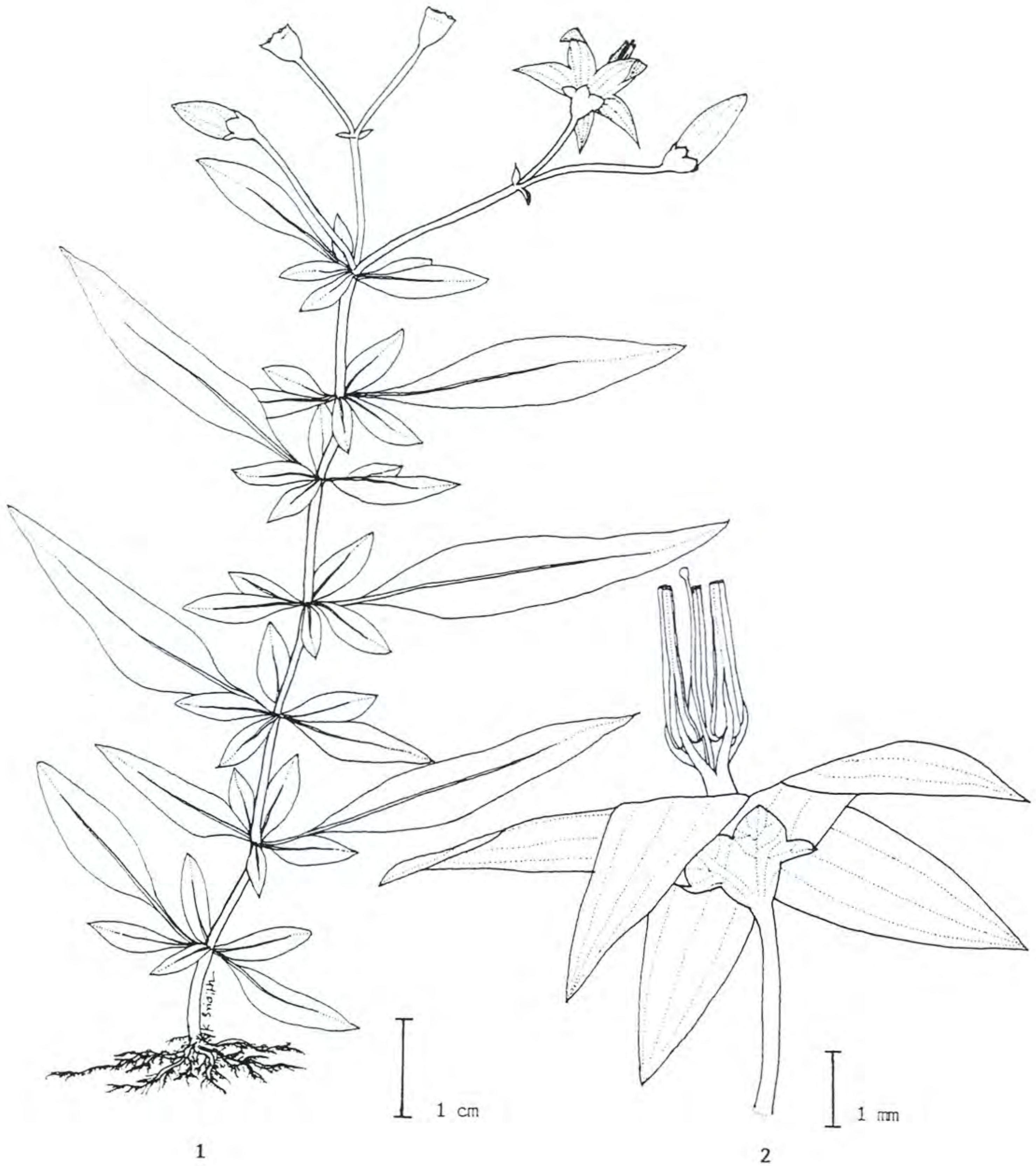


Figure 21. *Argostemma lobbii* Hook.f.: 1. habit; 2. flower. (Larsen et al. 586, AAU).

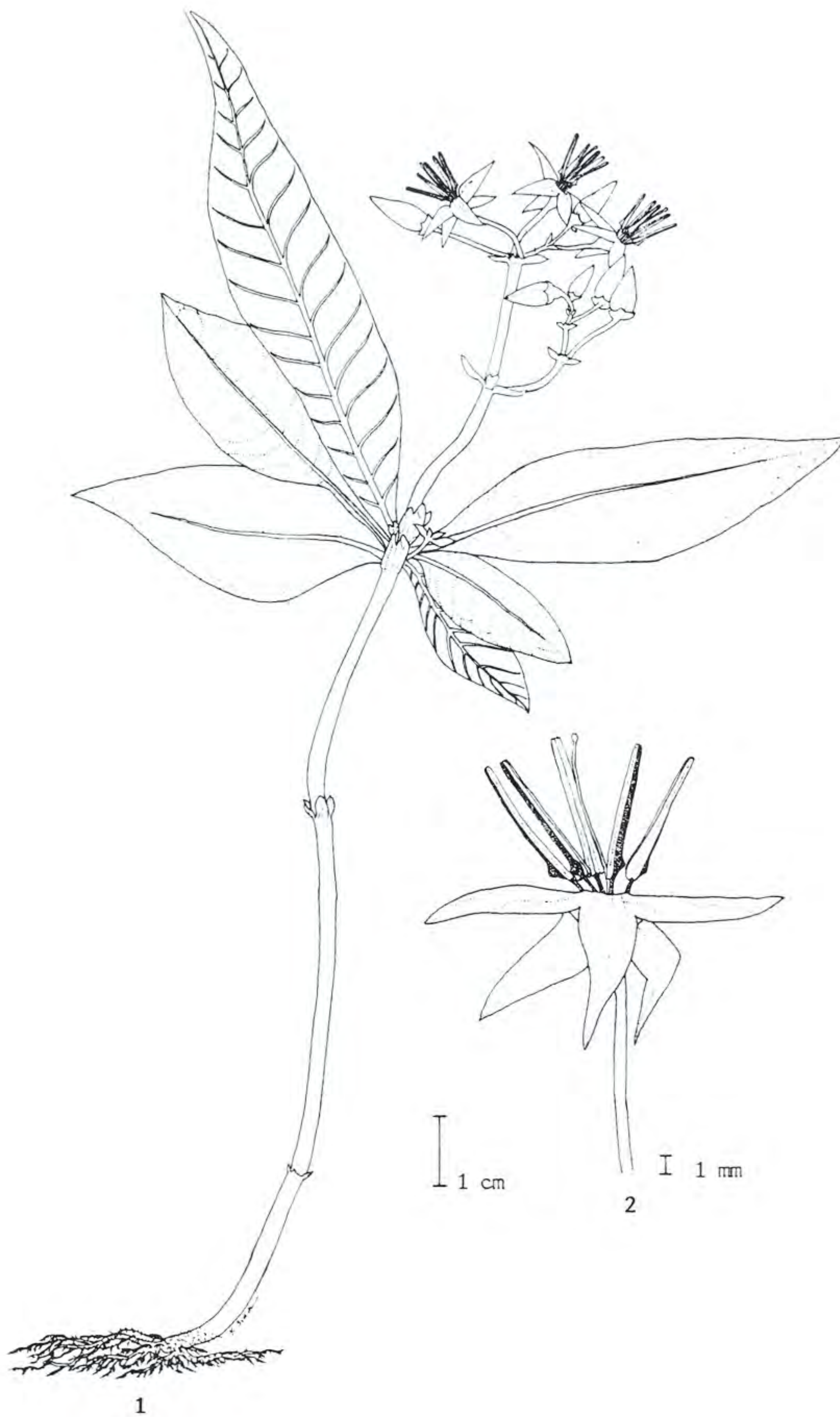


Figure 22. *Argostemma laxum* Geddes: 1. habit (Kerr 6334, K); 2. flower. (Phengklai et al. 7074, BKF).

Note.— *Argostemma laxum*, although belonging to the group of *Argostemma* species with star-shaped corollas, has stamens which are not coherent into an anther cone. Moreover, it has the longest and most free anthers among Thai *Argostemma* species. Its 3-colpate pollen grains are larger than those of any other species. *Argostemma laxum* considerably differs from *A. diversifolium*, the other *Argostemma* with star-shaped corolla and anthers opening by apical pores. The former has more slender leaves than the latter. The inflorescence of the latter is much denser with pubescent pedicels, while the former has a normal compound cyme with glabrous pedicels. *Argostemma laxum* has a much smaller calyx than *A. diversifolium* and it also has straight stamens, while *A. diversifolium* has stamens with "S" shaped curvature. Finally, *A. laxum* is endemic to Doi Inthanon, while *A. diversifolium* occurs only in Peninsular Thailand and Peninsular Malaysia. *Argostemma laxum* may resemble *A. verticillatum* (when the former has four leaves), but the latter has smaller flowers, fused filaments and shorter anthers opening by oblique elongated pores.

23. *Argostemma thaithongae* Sridith, Nord. J. Bot. 19(2): 174. 1999. Type: Thailand, Garrett 965 (holotype BKF!). Fig. 23.

Thailand.—NORTHERN: Chiang Mai [Doi Chiang Dao, Garrett 965 (holotype K, isotype BKF), Sørensen *et al.* 4075 (C), P. Suvanakes 931 (BKF), 4697 (BKF), Smitinand & Sleumer 1065 (BKF), Beusekom *et al.* (BKF, E, K, P), Doi Ang Khang, P.S. 1011 (BCU, BKF)].

Distribution.—Endemic to northern Thailand.

Ecology.—On limestone hills in shaded and moist areas, ca. 630–2000 m. Flowering July–August. Fruiting September.

24. *Argostemma ebracteolatum* Geddes, Kew Bull. 1927: 165. 1927; Craib in Fl. Siam. En. 2: 58. 1932. Type: Thailand, Kerr 6276a (holotype K!; isotype BM!).—*A. pubescens* Geddes, Kew Bull. 1927: 167. 1927; Craib in Fl. Siam. En. 2: 32. 1932. Type: Thailand Kerr 3298 (holotype K!).—*A. repens* Geddes, Kew Bull. 1927: 168. 1927; Craib in Fl. Siam. En. 2: 33. 1932. Type: Thailand, Kerr 6068 (holotype K!; isotype BM!). Fig. 24.

Thailand.—NORTHERN: Chiang Mai [Mae Chaem, Kerr 6276a (holotype K; isotype BM), Doi Suthep, Kerr 3298 (BM, K), Smitinand 4669 (BKF)], Chiang Rai [Phu Wat Tha, Smitinand 1759 (BKF)], Nakhon Sawan [Khao Pado, Kerr 6068a (BM, K)].

Distribution.—Endemic to northern Thailand.

Ecology.—On damp rocks along streams in dry evergreen and deciduous forest, ca. 500–1110 m. Flowering June–July. Fruiting unknown.

Note.—Bracts were not observed on any of the herbarium material studied. As bracts are always present in other *Argostemma* species, it is suggested that, in *A. ebracteolatum*, they fall exceptionally early. *Argostemma ebracteolatum* belongs to the group of *Argostemma* with bell-shaped, 5-merous flowers. It differs from related species by its hairy corolla. Its corolla tube is broadly bell-shaped, similar to *A. plumbeum*.

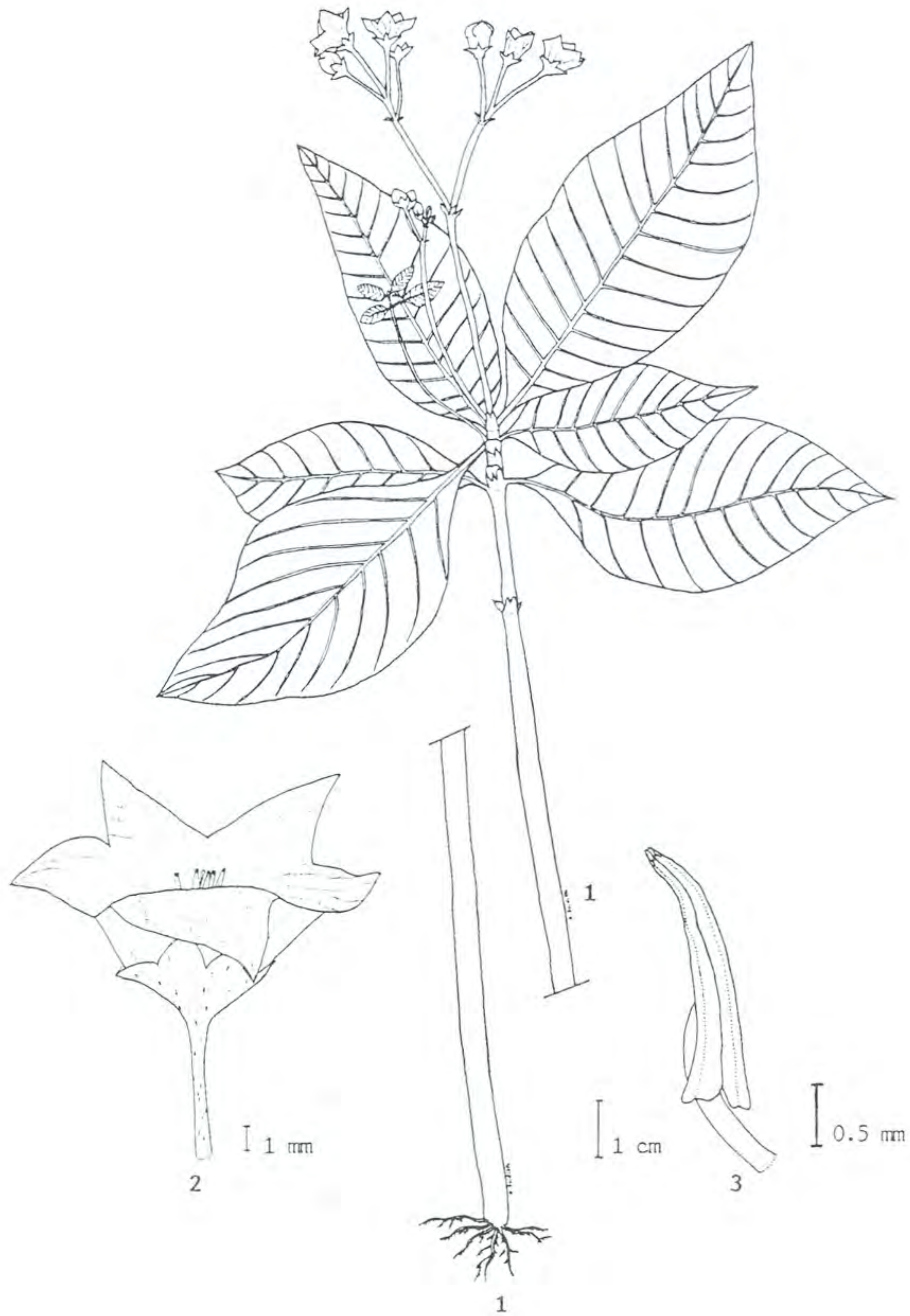


Figure 23. *Argostemma thaithongae* Sridith: 1. habit; 2. flower; 3. stamen. (Sørensen et al. 4075, C).

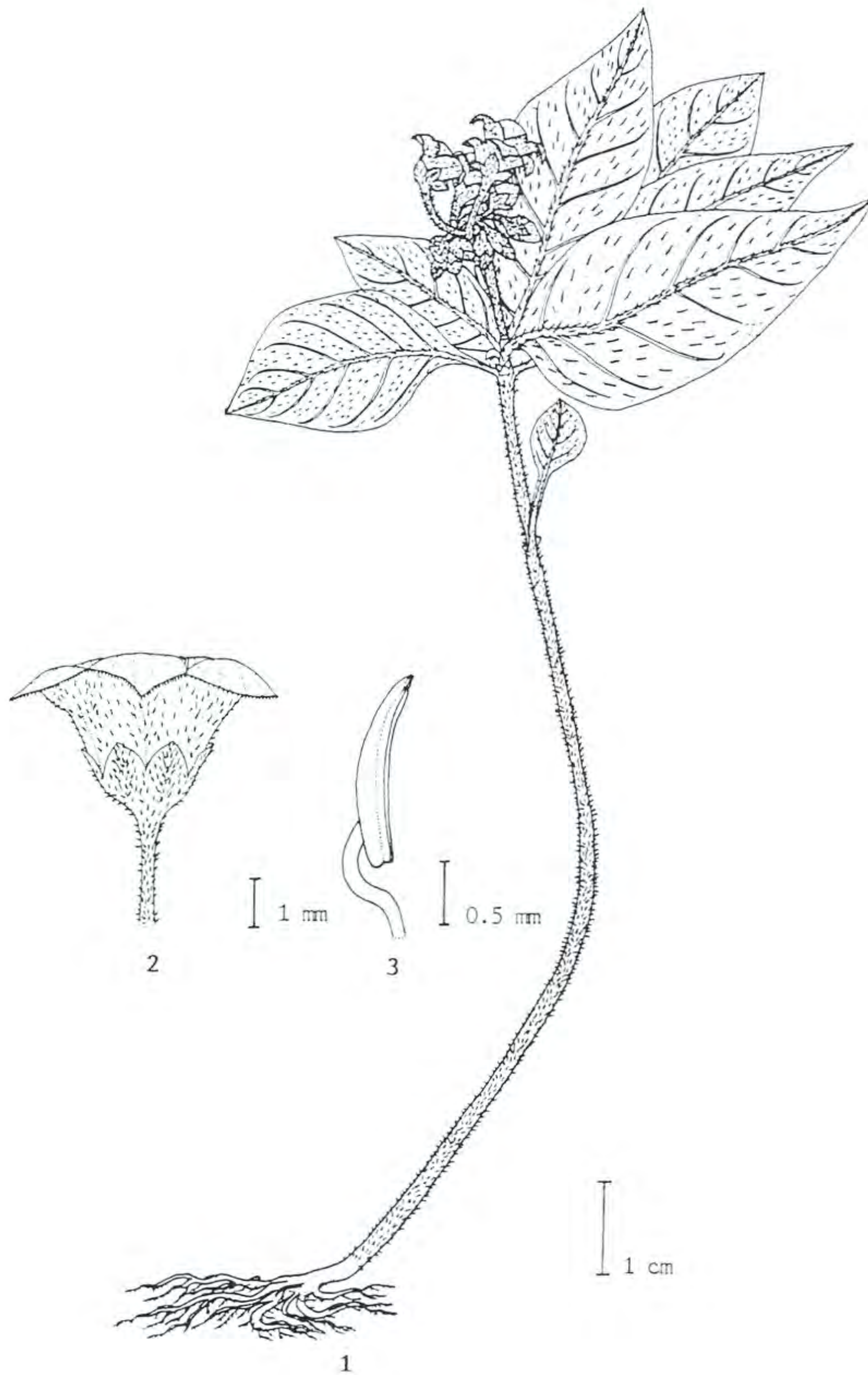


Figure 24. *Argostemma ebracteolatum* Geddes: 1. habit; 2. flower; 3. stamen, side view. (Kerr 6276a).

25. *Argostemma plumbeum* Craib, Kew Bull. 1916: 263. 1916; Craib in Fl. Siam. En. 2: 31. 1932. Type: Thailand, *Kerr* 2197 (holotype K!; isotype E). Fig. 25.

T h a i l a n d.—NORTHERN: Mae Hong Son [S of Mae Sariang, *Geesink et al.* 5900 (AAU, C, E, P), *P. Sangkachand* 402 (BK), 15 km NW of Mae Hong Son, *Geesink et al.* 5931 (AAU, BKF, E, C, P)], Chiang Mai [Ban Hat Kuak, *Kerr* s.n. (BM, K), Mae Chaem, *Kerr* s.n. (BM), gorge below Ban Kao, *Kerr* 2197 (holotype K; isotype E)].

D i s t r i b u t i o n.—Endemic to northern Thailand.

E c o l o g y.—In moist places in bamboo forest, deciduous forest or in open disturbed forest, ca. 200–600 m. Flowering June–December. Fruiting unknown.

N o t e.—*Argostemma plumbeum* differs from its close allies *A. neurocalyx* and *A. tavoyanum* by the rather round leaves with a rounded or emarginate apex, the free bracts and a broadly bell-shaped corolla (see also *A. neurocalyx*). Its flower is also larger than that of *A. neurocalyx* and *A. tavoyanum*. Its corolla lobes are mostly suberect, occasionally spreading, while the corolla lobes of the *A. neurocalyx* and *A. tavoyanum* are mostly reflexed. *Argostemma plumbeum* grows in moist places in dry vegetation such as bamboo forest, deciduous forest etc, whereas most other *Argostemma* species occur in moister vegetation such as evergreen forest.

26. *Argostemma puffii* Sridith, Nord. J. Bot. 19(2): 175. 1999. Type: Thailand, Satun, *Puff* 960907–1/1 (holotype WU!). Fig. 26.

T h a i l a n d.—PENINSULAR: Satun [Petra National Park, *Puff*, 950805-3/1 (WU), 960907–1/1 (holotype WU)].

D i s t r i b u t i o n.—Endemic to peninsular Thailand.

E c o l o g y.—On limestone, ca. 30 m. Flowering August. Fruiting unknown.

27. *Argostemma lobulatum* Craib, Kew Bull. 1931: 214. 1931; Craib in Fl. Siam. En. 2: 29. 1932. Type: Thailand, *Kerr* 10822 (holotype K!; isotype BM!).

KEY TO THE VARIETIES

Peduncle, pedicel and calyx pubescent; calyx lobes ovate; leaves dark green when dry	var. lobulatum
Peduncle, pedicel and calyx glabrous; calyx lobes shortly rounded; leaves yellowish when dry	var. variabile

var. **lobulatum** Fig. 27.

T h a i l a n d.—SOUTH-WESTERN: Prachaup Khiri Khan [Khao Luang, *Kerr* 10822 (holotype K; isotype BM)].

D i s t r i b u t i o n.—Endemic to peninsular Thailand.

E c o l o g y.—On rocks in evergreen forest, ca. 1000 m. Flowering July. Fruiting unknown.

var. **variabile** Sridith, Nord. J. Bot. 19(2): 177. 1999. Type: Thailand, *Put* 242 (holotype BKF!). Fig. 28.

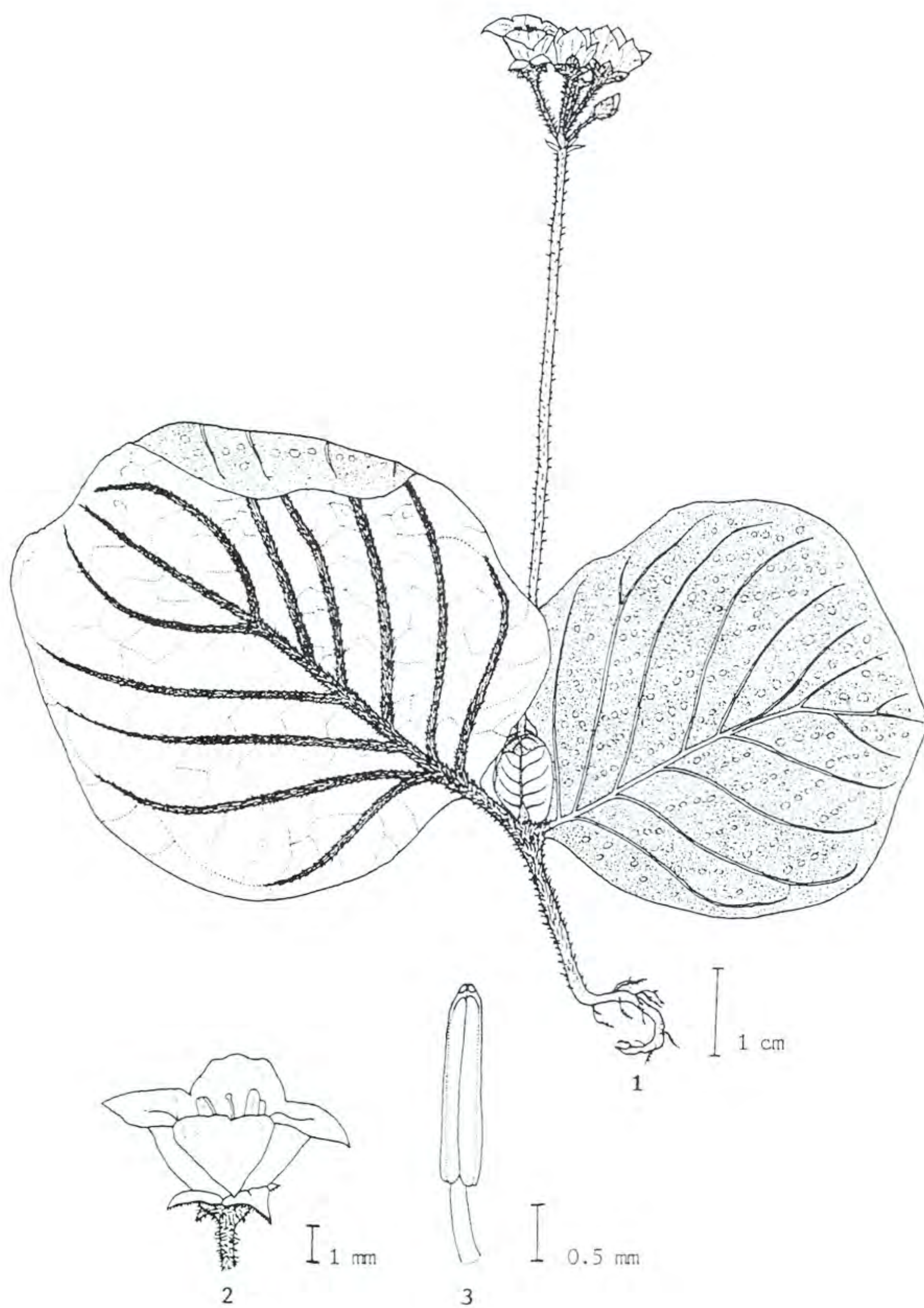


Figure 25. *Argostemma plumbeum* Craib: 1. habit; 2. flower; 3. stamen. (Larsen et al. 2248, AAU).



Figure 26. *Argostemma puffii* Sridith: 1. habit; 2. flower; 3–4. stamens, showing 3-lobed connective outgrowths, 3. abaxial side, 4. side view. (Puff 950805-3/1, WU). Drawn from specimen preserved in alcohol.



Figure 27. *Argostemma lobulatum* Craib var. *lobulatum*: 1. habit; 2. flower; 3–4. stamens, showing connective outgrowths, 3. abaxial side, 4. side view. (Kerr 10822, K).

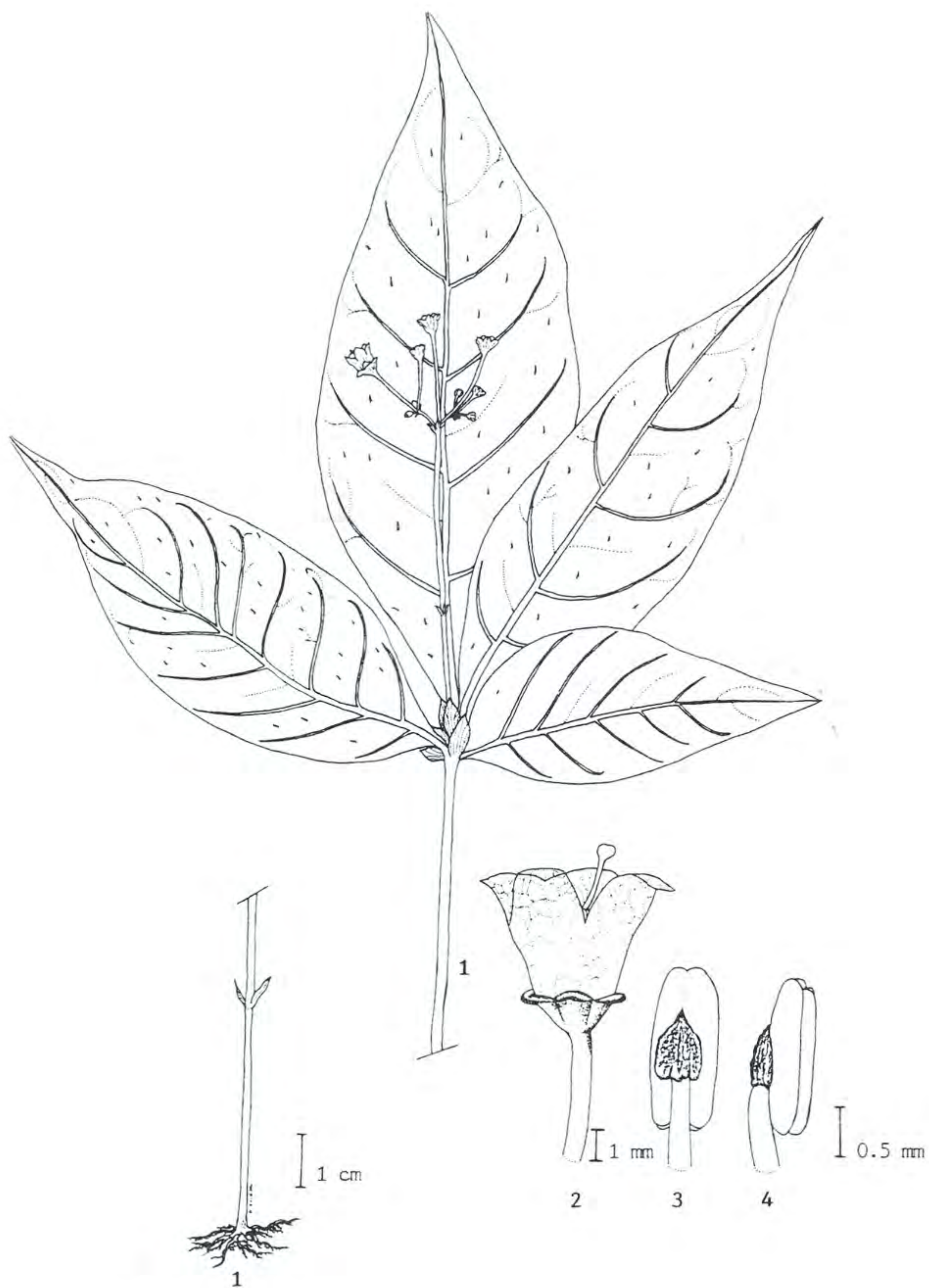


Figure 28. *Argostemma lobulatum* Craib var. *variable* Sridith: 1. habit; 2. flower; 3–4. stamens, showing connective outgrowths, 3. abaxial side, 4. side view. (Put 242, BKF).

T h a i l a n d.—NORTHERN: Phitsanulok [Thung Salaeng Luang, *Larsen et al.* 584 (L)], PENINSULAR: Ranong [Khao Phra Mi, *Larsen et al.* 30867 (AAU)], Surat Thani [Klong Sok, *Prapat* 5 (BKF, C, K, L)], Krabi [Au Luek, *Larsen et al.* 31267 (AAU, BKF), *Charoenpol et al.* 3455 (AAU, BKF, K, P)], Trang [Khao Chong, *Charoenpol et al.* 3689 (BKF, E, L), *Puff* 900910-1/7 (WU), *Put* 242 (holotype BKF)].

D i s t r i b u t i o n.—Endemic to Thailand.

E c o l o g y.—On limestone in evergreen forest, ca. 50–800 m. Flowering July–August. Fruiting October.

N o t e.—*Argostemma lobulatum* var. *lobulatum* differs from var. *variabile* in its often longer stem, the almost glabrous, long, narrowly lanceolate and slightly anisophyllous leaves, the pubescent inflorescences and the hairy ovate calyx lobes. It was only once collected from peninsular Thailand and more collections are needed. *Larsen et al.* 584 from Phitsanulok is tentatively included under var. *variabile* although it was collected much further north than other material of this variety.

28. *Argostemma neurocalyx* Miq., Ann. Mus. Ludg.-Bat. 4(8): 229. 1869; Bremer, Ann. Missouri Bot. Gard. 76: 47. 1989. Type: Indonesia, Sumatra, *Junghuhn* s.n. (holotype U).—*A. cambodianum* Pitard in Lecomte, Fl. Gén. I.-C. 3: 78. 1922. Type: Cambodia, *Geoffray* 423 (holotype P!).—*A. albovenatum* Geddes, Kew Bull. 1927: 164. 1927. Type: Thailand, *Kerr* 7117 (holotype K!; isotype BM!).—*A. craibianum* Geddes, Kew Bull. 1927: 165. 1927. Type: Thailand, *Kerr* 7932 (holotype K!; isotype BM!).—*A. umbellatum* Geddes, Kew Bull. 1927: 169. 1927; Craib in Fl. Siam. En. 2: 33. 1932. Type: Thailand, *Winit* 746 (holotype K!).—*A. umbellatum* var. *australe* Craib in Fl. Siam. En. 2: 33. 1932. Type: Thailand, *Kerr* 13166 (holotype K!; isotypes BK, BM).—*A. platyphyllum* Merr., Univ. Calif. Publ. Bot. 15: 275. 1929. Type: Malaysia, Sabah, *Elmer* 21138 (lectotype BO; isoelectotypes BR, G!).—*A. plumbeum* var. *obtusum* Craib in Fl. Siam. En. 2: 31. 1932. Type: Thailand, *Rabil* 120 (holotype K!; isotype BM!). Fig. 29.

T h a i l a n d.—NORTHERN: Nan [Khun Mo Tom, *Larsen et al.* 43596 (AAU)], Lampang [Mae Ngao, *Winit* 746 (holotype K)], Phrae [Mae Ban, *Frank* 471 (C, P)]; CENTRAL: Saraburi [Sam Lan National Park, *Maxwell* 74-703 (AAU)], Nakhon Nayok [Nang Rong Falls, *Larsen et al.* 43755 (AAU), 43755 (AAU), 43768 (AAU), *Puudjaa* 72 (BKF)]; SOUTH-EASTERN: Rayong [Khao Chamao, *Larsen et al.* 32485 (AAU), *Puff* 890812-1/1 (WU)], Chanthaburi [Khao Sa Bap, *Put* 918 (BK, BM), 928 (BK, BM), *Maxwell* s.n. (AAU)], Sa Kaeo [Khao Ta-krup Wildlife Sanctuary, *Thaithong* 1528 (BCU, WU)]; PENINSULAR: Ranong [near the hot springs, *Larsen et al.* 43126 (AAU); Khao Klong Yang, Khao Phra Mi, *Larsen et al.* 30671 (AAU, BKF, K, P); Klong Naka Wildlife Sanctuary, *Geesink et al.* 7371 (BKF, K); Ban Racha Krude, *Larsen et al.* 43195 (AAU)], Surat Thani [Khao Sok National Park, *Larsen et al.* 40870 (AAU), *Puff & Sridith* 930703-1/7 (AAU, PSU, WU), 930731-1/2 (AAU, PSU, WU), Ban Kaup Kep, *Kerr* 13166 (BK, BM, K)], Krabi [Klong Chilat, 6 km from Krabi, *Larsen et al.* 43342 (AAU), 43346 (AAU); Klong Chawang, *Chermsirivathana* 52 (BK)], Phuket [Pra Tao, *Niyomdham et al.* 292 (AAU, C, E, P)], Nakhon Si Thammarat [Kiriwong, Tap Chang, *Smitinand* 706 (P); Khuan Chum, *Rabil* 120 (BM); Thung Song, Wang Kram,

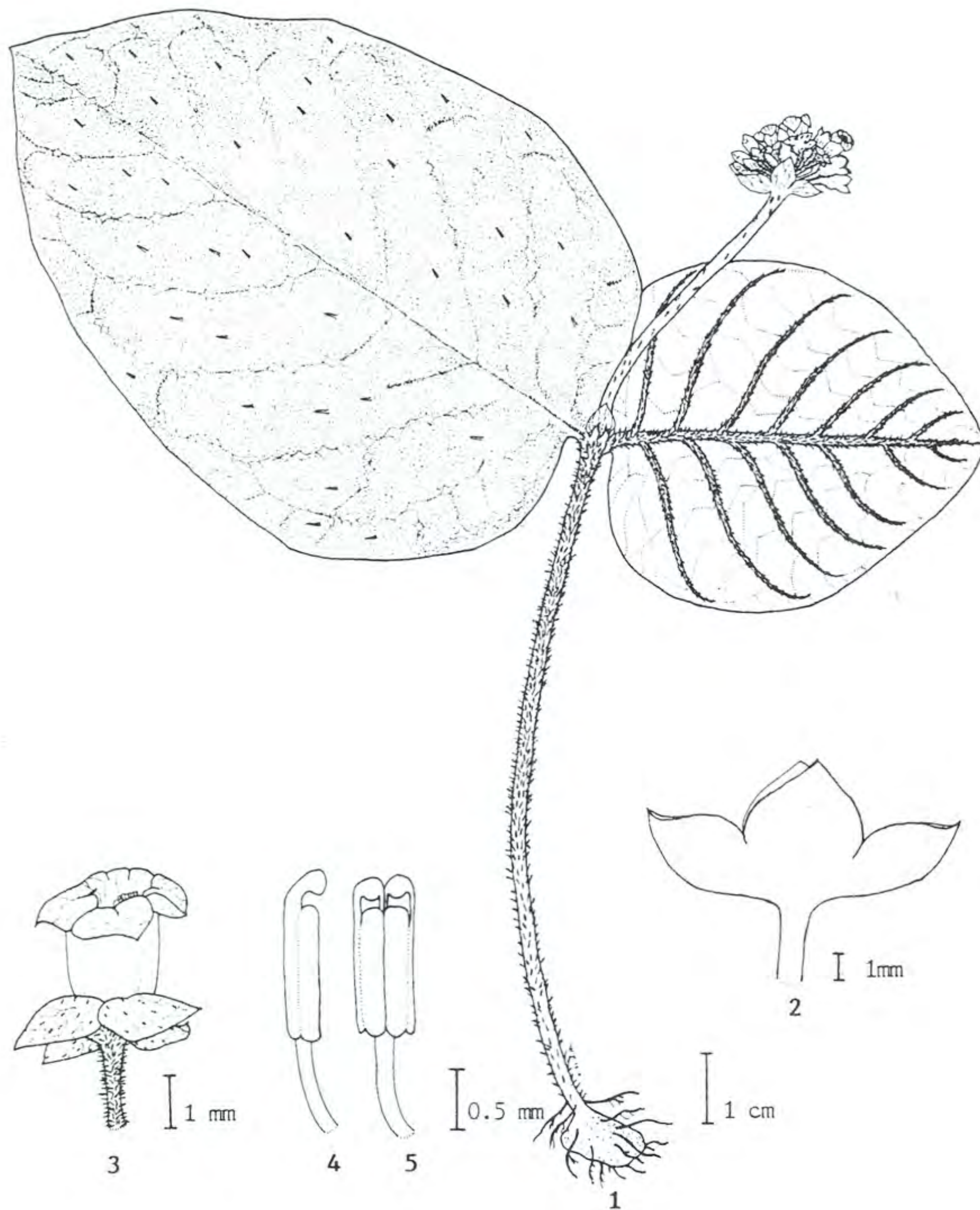


Figure 29. *Argostemma neurocalyx* Miq.: 1. habit; 2. cupula-like involucre (4 bracts fused basally); 3. flower; 4–5. stamen, 4. side view, 5. adaxial side. (Larsen et al. 43346, AAU).

Rabil 201 (BM, K)], Satun [Thale Ban National Park, *Maxwell* 85-666 (BKF), *Puff & Sridith* 930727-1/2 (AAU, PSU, WU)], Pattani [Bukit, *Kerr* 7117 (BM, K)], Yala [Ban-nang Sta, *Kerr* 7392 (BM, K)], Narathiwat [Waeng, *Prayad* 438 (BK)]. Cambodia. Kamchay: *Geoffray* 423 (P holo of *A. cambodiana* Pitard). Peninsular Malaysia. Kedah: Langkawi, *Kerr* 21692 (BM, K), *Curtis* s.n. (BM), *Henderson* 29063 (K). Sabah. Tawao, *Elmer* 21138 (G).

D i s t r i b u t i o n.— Cambodia, Peninsular Malaysia, Sumatra, Borneo.

E c o l o g y.— On moist rocks or wet ground along streams in evergreen forest, ca. 0–500 m. Flowering June–September. Fruiting August–January.

N o t e.— *Argostemma neurocalyx* differs from its closest allies (*A. courtallense*, *A. tavoyanum* and *A. plumbeum*) in leaf and/or flower morphology. The ovate leaves with truncate or cordate base and pointed apex in *A. tavoyanum*, the relatively shorter corolla tube (< corolla lobe length) in *A. courtallense* and the ovate, obovate or rounded leaves with rounded apex and a broad, relatively shorter corolla tube (= corolla lobe length) in *A. plumbeum* are in contrast to the more-or-less elliptic or ovate leaves with acute apex, fused bracts and a narrow, relatively longer corolla tube (= corolla lobe length) in *A. neurocalyx* (see note under *A. tavoyanum*). The 4-merous flowers in *A. neurocalyx* are characterised by a slightly zygomorphic, bell-shaped corolla and the zygomorphic arrangement of the free anthers which are all held near the two basal corolla lobes and in close proximity to each other. The ab- and adaxial pollen sacs of each theca are of unequal length, whereby the former are notably longer than the adaxial ones and form a spoon-like structure because their apical parts are slightly upturned (see Puff et al. 1995 for more details on androecium structure).

29. *Argostemma neurosepalum* Bakh.f., Blumea 7: 331. 1953. Type: Malaysia, Lenggong, Ridley 14479 (holotype K!). Fig. 30.

T h a i l a n d.— SOUTH-WESTERN: Kanchanaburi [Erawan Falls, *Suvanakoses* 1896 (BKF), *Larsen & Larsen* 33966 (AAU, BKF, K)]; PENINSULAR: Ranong [near the hot spring, *Larsen et al.* 43121 (AAU)], Phangnga [Limestone cave near Phangnga, *Dawson* 15 (K)], Krabi [Tham Soe, *Larsen et al.* 43255 (AAU), Than Bok Korani, *Larsen et al.* 43444 (AAU)]. Malaysia. Perak: Lenggong, *Ridley* 14479 (holotype K; isotype BM).

D i s t r i b u t i o n.— Peninsular Malaysia.

E c o l o g y.— Wet rocks in evergreen forest, ca. 100–300 m. Flowering June–July. Fruiting July.

N o t e.— *Argostemma neurosepalum* is apparently closely allied to *A. neurocalyx* and *A. tavoyanum*. The leaves of *A. neurosepalum* are slightly anisophyllous and stem is relatively long, while *A. neurocalyx* has strongly anisophyllous leaves and a shorter stem. Its corolla shape is more-or-less like that of *A. neurocalyx* and *A. tavoyanum*. However, the width:length ratio of the corolla tube in *A. neurosepalum* is usually closer to 0.5 than 1, while the corresponding width:length ratio in *A. neurocalyx* is mostly closer to 1 than 0.5. Hence, the corolla of *A. neurosepalum* is broadly bell-shaped, while that of *A. neurocalyx* is narrowly bell-shaped. However, variation from narrowly

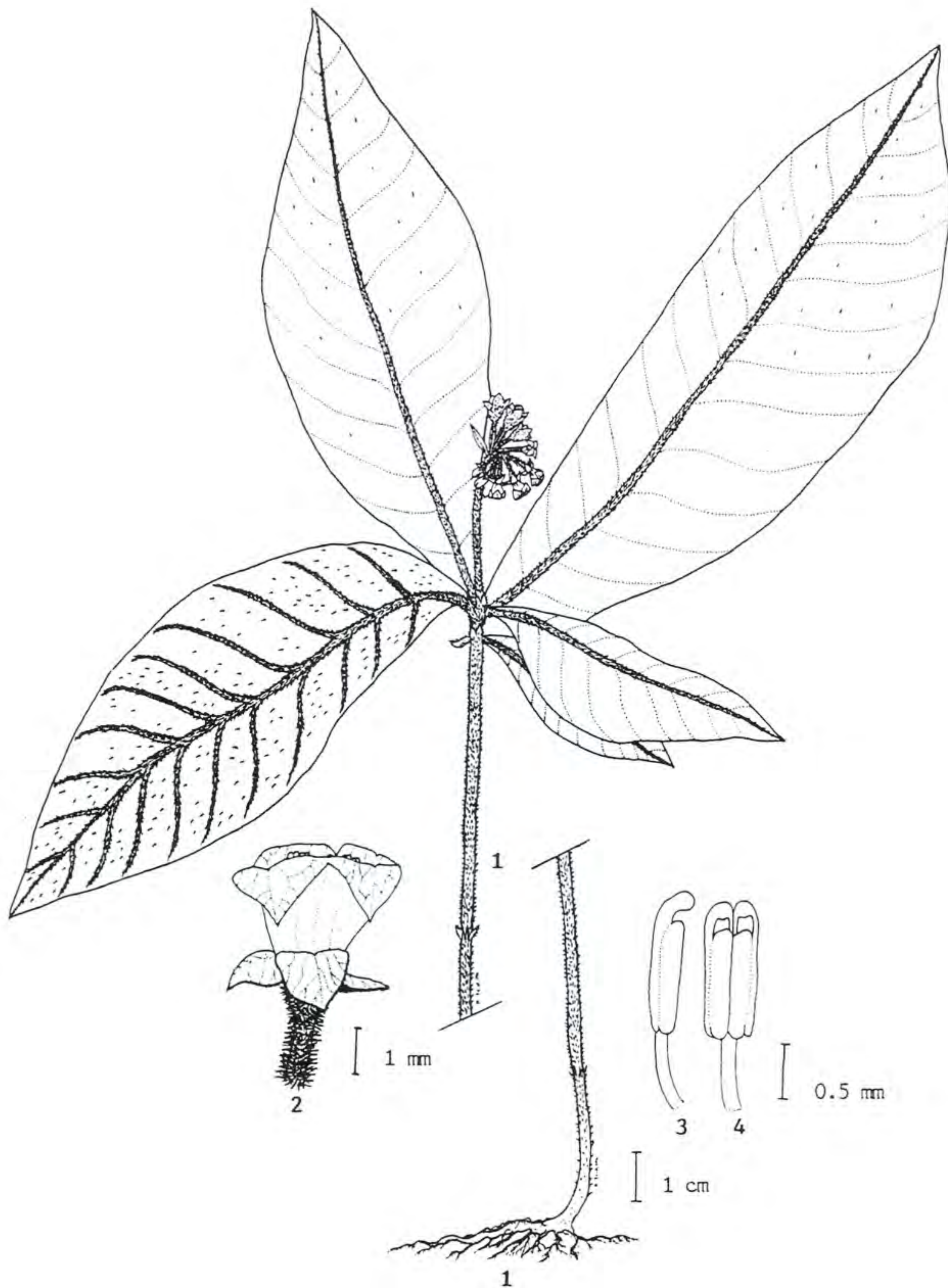


Figure 30. *Argostemma neurosepalum* Bakh.f.: 1. habit; 2. flower; 3–4. stamens, 3 side view, 4. abaxial side. (Larsen et al. 43444, AAU).

bell-shaped to broadly bell-shaped was found in both species. In *A. tavoyanum*, the width:length ratio is always more than 1 (1.33–2.5); the flowers are always broadly bell-shaped. *Argostemma neurosepalum* has pubescent peduncle, while *A. neurocalyx* and *A. tavoyanum* have glabrous peduncles. Moreover, *A. neurosepalum* has free bracts, while *A. neurocalyx* and *A. tavoyanum* have fused bracts. A denser indumentum on the peduncle and lower leaf surface is seen in collections from Erawan Falls (*Ploenchit* 1896, *Larsen & Larsen* 33966).

30. *Argostemma tavoyanum* Wall. in Benn., *Pl. jav. rar.* 1: 94. 1838; Hook.f. in *Fl. Br. Ind.* 3: 43. 1880. Type: Myanmar, *Wallich* 60 (holotype CAL; isotype BM!).—*A. soneriloides* Kurz. *J. As. Soc. Beng. Nat. Hist.* 41(2): 310. 1872. Type: Andaman Is, *Kurz* s.n. (holotype K!). Fig. 31.

T h a i l a n d.— SOUTH-WESTERN: Kanchanaburi [*Thongphapoom*, *Maxwell* 73-101 (AAU)]; PENINSULAR: Ranong [*Ngao Falls*, *Larsen et al.* 43189 (AAU), 43244 (AAU), *Fukuoka & Na Nakorn* T-36032 (BKF), *W.N.* 642 (BKF)], Phangnga [*Klong Saeng Wildlife Sanctuary*, *W.N.* 714 (BKF)]. Myanmar. Chindwin: *Lace* 79 (E); Tavoy: *Pungdaw Power Station*, *Keenan et al.* 786 (E, K), 833 (E, K), 1230 (E, K), *Wallich* 60 holotype CAL; isotype BM); Tenasserim: *Kerr* 21596 (BM, K). Andaman Islands. South Andaman: *Kurz* s.n.

D i s t r i b u t i o n.— Myanmar, Andaman Islands.

E c o l o g y.— On wet rocks along streams and on wet ground or moist places in evergreen forest, ca. 100–200 m. Flowering June–August. Fruiting August–September.

N o t e.— *Argostemma tavoyanum* was treated by Deb & Basu (1990) as a synonym of *A. courtallense* Arn. However, the name *A. tavoyanum* (1838), anteceded *A. courtallense* (1839). *A. courtallense* and *A. tavoyanum* are, indeed, closely allied but not conspecific (Table 1). *A. courtallense* does not occur in Thailand. Hooker (1880) mentioned that *A. tavoyanum* may prove to be a variety of *A. courtallense*. Differences in the characters shown in Table 1 lead to the conclusion that *A. tavoyanum* and *A. courtallense* are two distinct species.

Table 1. Comparison of selected character states in *Argostemma tavoyanum*, *A. neurocalyx* and *A. courtallense*.

Character	<i>A. tavoyanum</i>	<i>A. neurocalyx</i>	<i>A. courtallense</i>
bracts	fused basally	fused basally	free
leaf shape	broadly ovate	ovate or elliptic	ovate or elliptic
leaf base	truncate, cordate or rounded	acute or attenuate	acute
leaf apex	pointed acute	acute	acute
patches, dots or streaks	absent	present	absent?
corolla lobe shape	triangular	triangular	narrowly triangular
corolla lobe length	ca. 1–1.5 mm	ca. 0.5–1.5 mm	ca. 3.5–4 mm
corolla tube length	ca. 2.5–3 mm	ca. 0.4–2.5 mm	ca. 1.5–2 mm
corolla tube width to length ratio	1:1.25	1:2–1:1	1:1

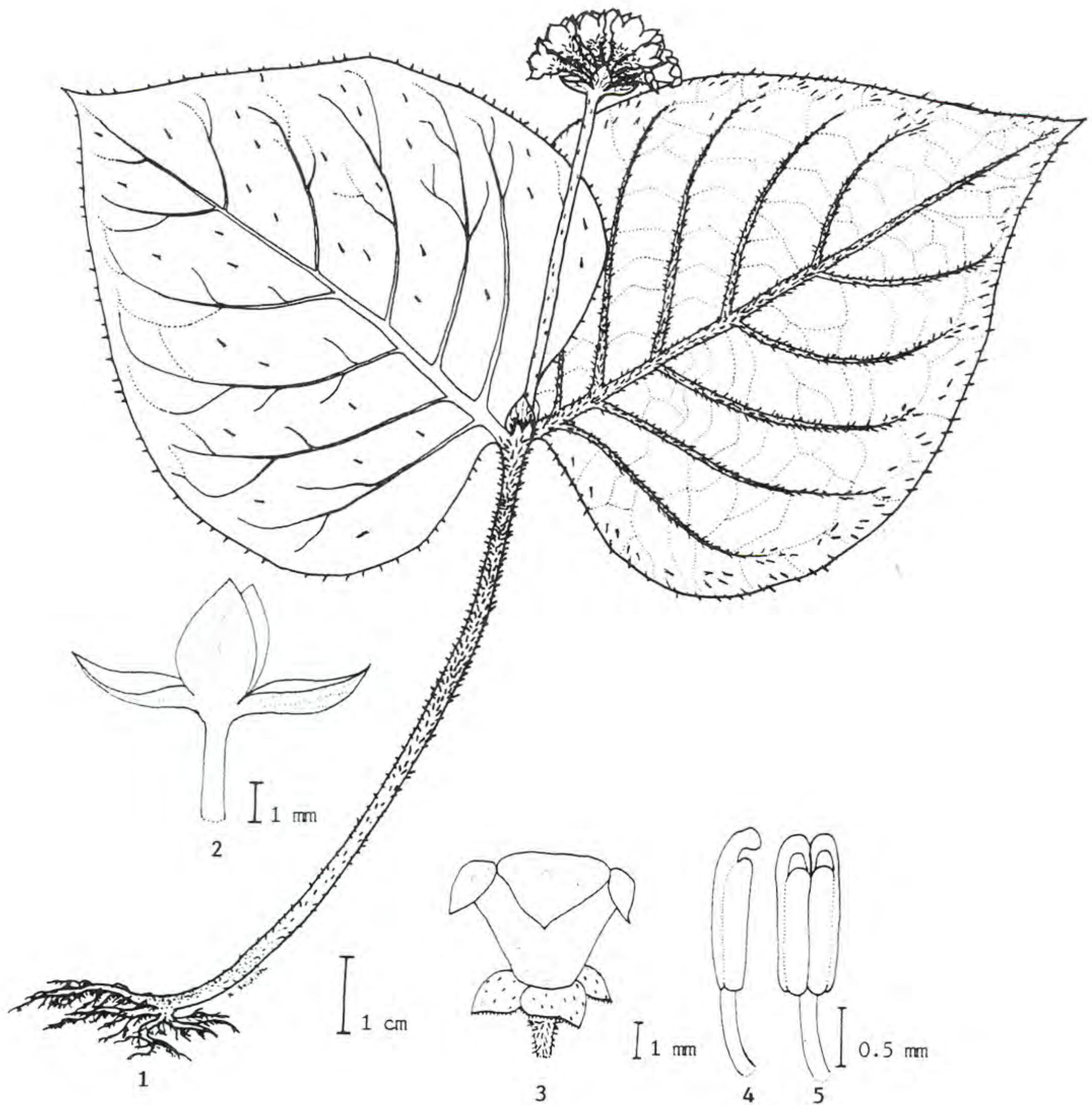


Figure 31. *Argostemma tavoyanum* Wall.: 1. habit; 2. cupula-like involucre (4 bracts fused basally); 3. flower; 4–5. stamen, 4. side view, 5. adaxial side. (Larsen et al. 43244, AAU).

ACKNOWLEDGEMENTS

I would like to thank my supervisor Prof. Christian Puff for guidance and critical reading of the manuscript. A Scholarship from the ÖAD (Österreichischer Akademikeraustauschdienst), allowing me to carry out the present studies at the Institute of Botany, University of Vienna, Austria is gratefully acknowledged.

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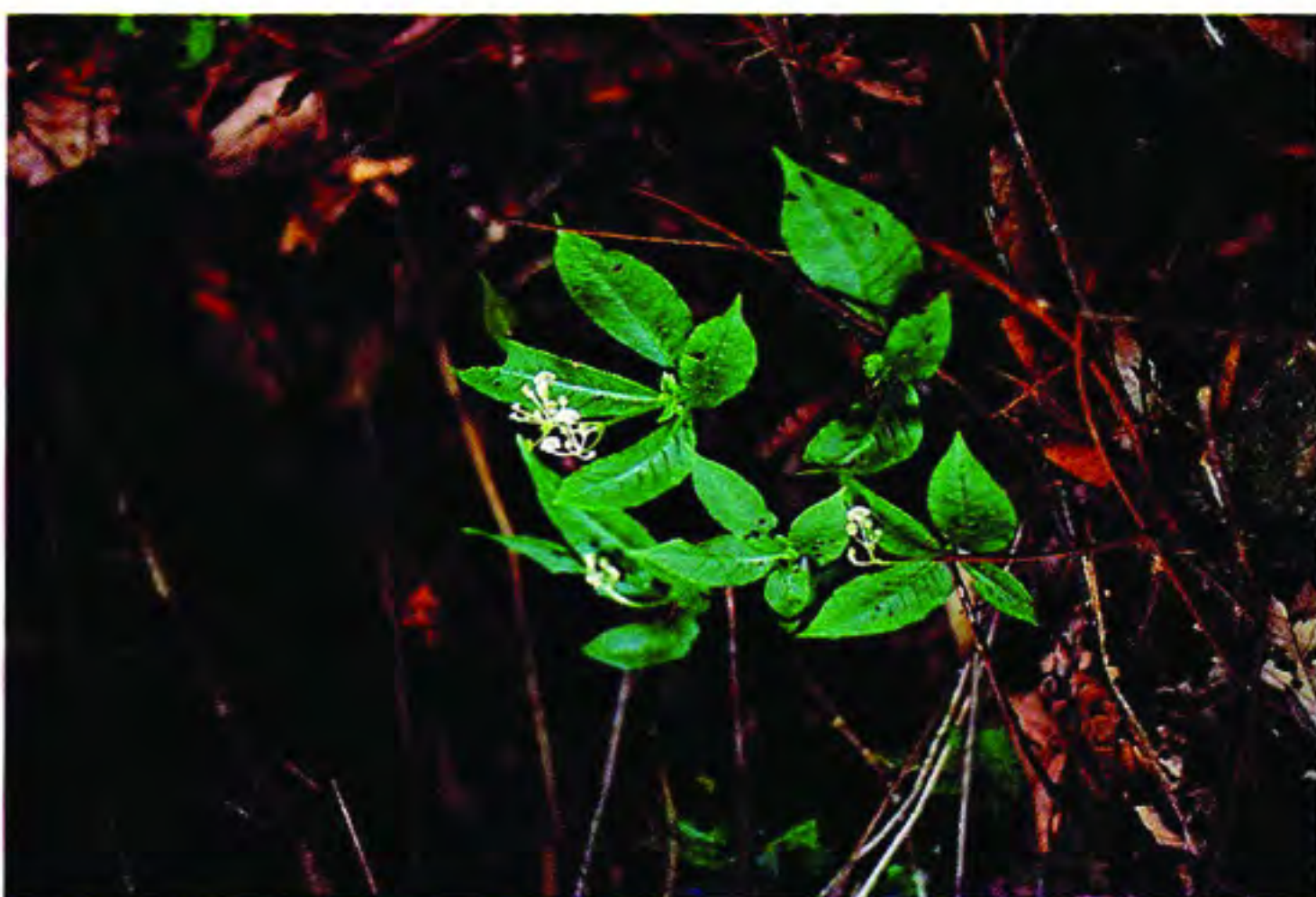
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A



B



C



D



E

Figure 32. A, B: *Argostemma parvum* Geddes; C, D: *Argostemma lobulatum* Craib var. *variable* Sridith; E: *Argostemma neurocalyx* Miq.