

Notes on tribe Streptoliriae and genus *Dictyospermum* (Commelinaceae)

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ABSTRACT. Three genera, *Aetheolirion* Forman, *Spatholirion* Ridl. and *Streptolirion* Edgew. with four species, are recognised in Commelinaceae, tribe Streptoliriae for Thailand. *Aetheolirion stenlobium* Forman is an endemic species to Thailand. Distribution maps, photos and some information are presented. Lectotypes for two names *viz.* *Dictyospermum ovatum* (Wall.) Hassk. and a synonym *Aneilema subovatum* Ridl. are also selected and treated. *Spatholirion calcicola* K. Larsen & S.S. Larsen is newly recorded from Laos.

KEYWORDS: Commelinaceae, distribution, Laos, lectotype, new record, Thailand

INTRODUCTION

The classification of Commelinaceae was proposed by Faden & Hunt (1991) based on morphological, cytological and palynological characters, recognising two subfamilies, Cartonematoideae (with two tribes Cartonemateae and Triceratelleae) and Commelinoideae (with two tribes Commelineae and Tradescantieae). In recent

years, the phylogenetic relationship of Commelinaceae has been studied by several authors *viz.* Evans *et al.* (2000), Evans *et al.* (2003) and Burns *et al.* (2011). The most recent one, Lee *et al.* (2022), proposed a new classification of the family based on the phylogenetic relationships of the infrafamilial taxa. The result showed that the family is

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divided into two subfamilies as the work of Faden & Hunt (1991). Faden & Hunt (1991) recognised seven subtribes under tribe Tradescantieae *viz.* Coleotrypinae, Cyanotinae, Dichorisandrinae, Palisotinae, Streptoliriinae, Thyrsantheminae and Tradescantiinae but Lee *et al.* (2022) accepted three tribes including Tradescantieae and also raised the last two subtribes of Faden & Hunt (1991) into tribes Palisoteae and Streptoliriae. The Streptoliriae is one of the basal tribes in the Commelinaceae phylogeny and sister to the Tradescantieae.

The Streptoliriae are characterised by thyrses inflorescence, the lower-most 1–2 cincinni subtended by spathaceous bracts, flower usually bisexual, sepals wider than the petals and both are the same colour, stomata with four lateral and two terminal subsidiary cells and exine ornamentation of pollen grains without spines (Faden & Hunt, 1991; Evans *et al.*, 2000; Lee *et al.*, 2022). This tribe is composed of approximately eight species in three genera, and are distributed in India, mainly Southeast Asia and the Far East. *Aetheolirion* Forman

is a monotypic genus in Thailand. *Spatholirion* Ridl. is distributed in Malaysia, Thailand, Vietnam and China but *Streptolirion* is more widespread from India to the Far East.

As the taxonomic account of the Commelinaceae is now about to be published for Flora of Thailand, it is necessary to revise and notes on the tribe Streptoliriae including the typification of an accepted name, *Dictyospermum ovatum* (Wall.) Hassk. and a synonym, *Aneilema subovatum* Ridl. In addition, *Spatholirion calcicola* K. Larsen & S.S. Larsen is a new record from Laos.

MATERIALS AND METHODS

This work consulted material based on field collections and herbarium specimens from AAU, BK, BM, BKF, E, K, KKU, KYO, L, P, PSU, QBG and SING (Theirs, 2022). Type specimens cited here have been seen with an exclamation mark ‘!’, those that have not been seen are indicated with ‘*n.v.*’. Distribution map, photographs, herbarium specimen citations and ecological data are provided.

TAXONOMIC TREATMENT

KEY TO THE GENERA OF TRIBE STREPTOLIRIAE FOR THAILAND

1. Plants twining
 2. All cincinni bracteate; stamens 6, equal; all filaments bearded; seed wingless
 - 3. Streptolirion**
 2. Upper cincinni ebracteate; stamens 5, unequal; three filaments bearded; seed winged
 - 1. Aetheolirion**
 - 2. Spatholirion**
1. Plants erect or decumbent herbs

1. AETHEOLIRION

Forman, Kew Bull. 16(2): 209. 1962. Type species: *Aetheolirion stenolobium* Forman.

Twining herbs. *Leaves* spirally arranged, petiolate. *Inflorescences* leaf-opposed thyrse, upper cincinni ebracteate. *Flowers* actinomorphic, subsessile, bisexual in the lower cincinni and male flowers in the upper one. *Sepals* 3, free. *Petals* 3, free, not clawed. *Stamens* 5, dimorphic; fertile stamens 2, larger, antesealous, anterior; filaments glabrous; anthers dorsifixed, longitudinally dehiscent; staminodes 3, smaller, posterior; filaments bearded. *Ovary* 3-loculed. *Capsules* 3-valved. *Seeds* biseriate, winged.

Monotypic genus endemic to Thailand.

Aetheolirion stenolobium Forman, Kew Bull. 16(2): 209. 1962. Type: Thailand, Saraburi, Muak Lek, 4 Sept. 1924, *Kerr 9150* (holotype K [K000854192!]; isotypes BK [BK257804!], BM, K [K000854193!]). Figs. 1A–B & 2.

Thailand.— NORTHERN: Lampang [Ngao, 28 Aug. 1922, *Winit 753* (BKF, K-2 sheets); *ibid.*, 17 Jul. 1931, *Put 4026* (BK, K); *ibid.*, Ban On, 8 Sept. 2015, *La-ongsri et al. 4262* (QBG); *ibid.*, Doi Pha Phueng, 2 Jul. 2015, *La-ongsri et al. 4211* (QBG); *ibid.*, Kio Lom forest, 26 Jul. 2016, *La-ongsri et al. 4916* (QBG); Mae Pu, 18 Oct. 1926, *Winit 1802* (BK, BKF, K)]; Phrae [Doi Pha Klong NP, 19 Sept. 1999, *Srisanga & Puff 1115* (QBG); Long, 26 Oct. 2005, *Maxwell 05–602* (BKF)]; NORTH-EASTERN: Loei [Pha Khao, Tham Pha Sawan temple, 23 Jul. 2014, *Prommanut et al. 491* (BK-3 sheets)];

Khon Kaen [Phu Phan Man NP, 11 Jul. 2000, *Thitimetharoch 385a & 385b* (KKU); *ibid.*, 24 Aug. 2011, *Norsaengsri et al. 8084* (QBG); *ibid.*, Pha Phuang cave, 14 Aug. 2012, *Norsaengsri et al. 9877* (QBG); *ibid.*, Pha Nang Non, 23 Jun. 2008, *Norsaengsri & Lakoet 3885* (QBG); *ibid.*, Pha Nok Khao, 9 Sept. 1963, *Smitinand & Sleumer 1125* (BKF, K)]; CENTRAL: Saraburi [Hin Lap, 18 Aug. 1929, *Put 2403* (BK, BM); Muak Lek, 3 Sept. 1928, *Put 1905* (BK, BM, K); *ibid.*, 4 Sept. 1924, *Kerr 9150* (BK, BM, K-2 sheets); *ibid.*, Phutthanimit temple, 30 Aug. 2001, *Pooma et al. 3032* (BKF-2 sheets); Thap Kwang, 3 Oct. 1963, *Smitinand 1337* (BKF, K)]; SOUTH-EASTERN: Chon Buri [Bo Thong, Khao Kamphaeng, 14 Jul. 1999, *Puudjaa 607* (BKF-2 sheets)]; no exact locality, *Winit 923* (BKF-2 sheets).

Distribution.— Endemic to Thailand.

Ecology and Phenology.— Exposed areas in limestone forest, 230–700 m alt. Flowering and fruiting: July–September.

Notes.— *Aetheolirion stenolobium* is distinguished by having pod-like capsules and winged seeds. Forman (1962) reported that the plant had three stamens in the male flowers and five in the bisexual flowers, glabrous sepals and fruits with 6–8 seeds per locule. After careful study, we found both flowers having five stamens, pubescent sepals and the capsule had up to 10 seeds in each locule. This species is distributed in Thailand except in south-western and peninsular floristic regions.

2. SPATHOLIRION

Ridl., J. Bot. 34: 329. 1896. Type species: *Spatholirion ornatum* Ridl.

Perennial erect or decumbent herbs. *Leaves* ovate-cordate or lanceolate, spirally arranged, petiolate. *Inflorescences* leaf-opposed thyrse; cincinni with few flowers; upper cincinni ebracteate, smaller male flowers, larger flowers bisexual on bracteate cincinni. *Flowers* actinomorphic, subsessile. *Sepals* 3, free, petal-like. *Petals* 3, free,

not clawed. *Stamens* 6, all fertile, free, equal; filaments bearded; anthers basifixed, longitudinally dehiscent. *Ovary* 3-loculed, with undeveloped pistillode in male flowers; stigma simple. *Capsules* 3-valved; each locule with several seeds. *Seeds* biseriate, arillate, embrotega circular, sublateral; hilum prominently, linear, mid-ventral.

About five species, distributed from Malaysia, Thailand to China. Two species in Thailand.

KEY TO THE SPECIES

1. Plants erect with distal tuberous roots; leaves elliptic or lanceolate; petioles and peduncles without long silky pubescence **1. *S. calcicola***
1. Plants decumbent without tuberous roots; leaves ovate-cordate; petioles and peduncles with long silky pubescence **2. *S. ornatum***

1. *Spatholirion calcicola* K. Larsen & S.S. Larsen, Thai Forest Bull., Bot. 31: 39. 2003. Type: Thailand, Nan, Tham Pha Tok, 13 Sept. 1995, *Larsen et al.* 46420 (holotype AAU!; isotypes BKF!, K [K000308042!], L [L0599613!]). Figs. 1C–D & 2.

Thailand.—NORTHERN: Chiang Mai [Chiang Mai–Fang, 27 Jul. 1968, *Larsen et al.* 2762 (AAU-3 sheets, K-2 sheets)]; Nan [Tham Pha Tok, 25 Jul. 1992, *Larsen et al.* 43586 (AAU, BKF, PSU)]; *ibid.*, 13 Sept. 1995, *Larsen et al.* 46420 (AAU, BKF, K, L)]; Lampang [Pang Pue, 420 m alt., 24 May 1915, *Kerr* 3617 (BM, K-2 sheets)]; Ngao, 16 Jul. 1931, *Put* 4010 (BK, BM, K-3 sheets); *ibid.*, Mae Huat, 18 Jun. 1954, *Sangkhachand* 92 (AAU, BKF); Huai Tak, Tham Pha Thai, 23 Sept. 1967, *Tagawa et al.* 10676 (BKF);

ibid., 23 Sept. 1967, *Tagawa et al.* 10669 (BKF); *ibid.*, 24 Sept. 2008, *Middleton et al.* 4581 (BKF); Pratu Pha, 9 Jul. 1965, *Smitinand & Phengklai* 8871 (BKF); Wang Nuea, Chae Son NP, 25 Aug. 1995, *Maxwell* 95-585 (BKF); *ibid.*, 21 Jun. 2013, *La-onsri et al.* 3001 (BKF); Phrae [Rong Kwang, Tham Pha Nang Khoi, 15 Sept. 1999, *Srisanga & Puff* 1072 (BKF)]; Phitsanulok [Noen Maprang, Duan Dao cave, Thung Salaeng Luang NP, 29 Jun. 2008, *Sreepoowiang* 30 (BKF)]; NORTH-EASTERN: Loei [Nong Hin, Ban Puen Phue, 22 Sept. 2007, *Thitimetharoch & Faden* 793 (BKF); *ibid.*, Suan Hin Pha Ngam forest park, Suan Sawan, 2 Aug. 2015, *Middleton et al.* 5856 (AAU); *ibid.*, 5 Jun. 2016, *Puudjaa et al.* 1988 (BKF)]; CENTRAL: Bangkok [cultivated, plant collected from Ngao, Lampang, *Kerr* 20573 (K)].

Distribution.— Laos.

Ecology and Phenology.— Growing on the ground in shaded, moist, wet and high humus litter areas in limestone forest, 100–660 m alt., but very high up in Laos to 1,141 m alt. Flowering and fruiting: May–September.

Vernacular.— Wan nam khang doi (ว่านน้ำค้างดอย)(Lampang).

Notes.— *Spatholirion calcicola* is a common species of limestone forest. The Lao collection, *Leong-Škorničková et al. JLS2514* (E, P, Pha Tad Ke, QBG and SING) is a new record for Laos. It was collected from Houa Phan province, Vieng Thong district, Nam Et-Phou Louey natural protected area, mountain ridges near Ban Phou Vieng. It extends the range of *S. calcicola* which had previously been thought to be restricted to northern and northeastern Thailand.

2. *Spatholirion ornatum* Ridl., J. Bot. 34: 329. 1896. Type: Thailand, Narathiwat [Pattani Circle], Legeh at Tomoh, *Machado s.n.* (lectotype SING!, designated by Larsen & Larsen (2003); isolectotype K [K000854194!]). — *Spatholirion decumbens* N. Fukuoka & N. Hurosaki, Acta Phytotax. Geobot. 48(2): 147. 1997. Type: Thailand, Narathiwat, Khao Nikhom Waeng, *Fukuoka et al. T-96210* (holotype KYO!; isotypes HYO, *n.v.*, Shoei Junior College Herbarium, Kobe, *n.v.*). Fig. 2.

Thailand.—PENINSULAR: Narathiwat [Waeng, 18 Nov. 1971, *C.S.S. 212* (BKF); *ibid.*, Khao Nikhom Waeng, 17 Aug. 1966, *Sangkhachand & Nimanong 1211* (BKF,

KYO); *ibid.*, Ban Bala, south of Waeng, 16 Aug. 1995, *Larsen et al. 45651* (AAU-2 sheets); *ibid.*, Bala Ra waterfall, 23 Dec. 1993, *Fukuoka & Koyama 62023* (BKF); *ibid.*, Khao Bo Lue Sa, 5 Aug. 1999, *Puudjaa & Cholkuchana 646* (BKF); Nikhom Waeng, 4 Sept. 1966, *Prayad 360, 360A & 360B* (BK); *Fukuoka et al. T-96210* (HYO, KYO); Klong Irema, 17 Aug. 2003, *Puudjaa 1206* (BKF); Hala Bala, 21 Sept. 2010, *Puudjaa et al. 1636* (BKF); *ibid.*, 28 Nov. 2006, *Niyomdham & Puudjaa 7836* (BKF); *ibid.*, 24 Sept. 1999, *Niyomdham 5811* (BKF-2 sheets); Sirindhon forest park, 31 Aug. 1996, *Wilkin 839* (BKF, K)].

Distribution.— Malaysia.

Ecology and Phenology.— In evergreen and gallery forests, 0–375 m alt. Flowering and fruiting: August–December.

Vernacular.— Wan nam khang daen tai (ว่านน้ำค้างแดนใต้).

Notes.— *Spatholirion ornatum* is a very restricted area in the type collection, Waeng district, Narathiwat province, the southernmost of Thailand and it is also in Kelantan, Malaysia (Larsen & Larsen, 2003).

3. STREPTOLIRION

Edgew., Proc. Linn. Soc. London 1: 254. 1845. Type species: *Streptolirion volubile* Edgew.

Annual or perennial scandent herbs. *Leaves* spirally arranged, petiolate. *Inflorescences* axillary or leaf-opposed thyrse; all cincinni bracteate; bracts similar to leaves, becoming smaller toward apex of cincinus. *Flowers* bisexual in lower cincinni

and male in upper cincinni, actinomorphic, subsessile. *Sepals* free, equal, petal-like. *Petals* free, equal, not clawed. *Stamens* 6, free, equal, all fertile; filaments bearded; anthers basifixed, with a broad connective, dehiscent latrorse. *Ovary* 3-loculed, with 2 ovules per locule. *Capsule* 3-valved, with 2 seeds per valve. *Seeds* uniseriate, embryotega circular, sublateral; hilum prominently, linear, mid-ventral.

Two species, distributed from the Himalayas to Japan. One species in Thailand.

Streptolirion volubile Edgew., Proc. Linn. Soc. London 1: 254. 1845. Type: India, Himalaya, Dhowli valley, *Edgeworth 1844* (holotype K [K000854207!]). Figs. 1E–F & 2.

Thailand.—NORTHERN: Chiang Mai [Doi Ang Ka, 21 Oct. 1910, *Garrett 78* (BKF, K) & *Garrett 81* (BM); *ibid.*, 30 Nov. 1926, *Garrett 331* (K-3 sheets); *ibid.*, 19 Jul. 1922, *Kerr 6299* (BK, BM, K); Mae Chaem, Doi Inthanon, 11 Jul. 2014, *Prommanut et al. 483* (BK-5 sheets); *ibid.*, 16 Oct. 1979, *Shimizu et al. T-18849* (BKF); *ibid.*, 9 Sept. 1994, *Palee 247* (BKF-2 sheets); *ibid.*, 28 Nov. 1996, *La-ongsri 51* (QBG-2 sheets); *ibid.*, 4 Oct. 2017, *Tanming et al. 1-02* (QBG); *ibid.*, 16 Jul. 1995, *Nanakorn et al. 4421* (QBG-2 sheets); *ibid.*, 22 Aug. 1996, *Nanakorn et al. 7127* (QBG); *ibid.*, 8 Jul. 1998, *Suksathan 1143* (QBG); *ibid.*, 18 Jul. 1965, *Hennipman 3412* (BKF, K); *ibid.*, 8 Dec. 1969, *van Beusekom & Phengklai 2404* (AAU, BKF, K); *ibid.*, 3 Oct. 1971, *Murata et al. T-15959* (AAU, BKF); *ibid.*, 3 Oct.

1971, *Murata et al. T-16102* (BKF, K); *ibid.*, 15 Apr. 1960, *Smitinand & Alsterlund 6696* (BKF); *ibid.*, 30 Oct. 1962, *Smitinand et al. 7654* (BKF); *ibid.*, 28 Dec. 1974, *Geesink et al. 7950* (AAU, BKF, K); *ibid.*, 19 Dec. 1983, *Fukuoka & Ito 35368* (BKF); *ibid.*, 19 Dec. 1965, *Tagawa et al. 2838* (AAU, BKF); *ibid.*, 3 Aug. 1984, *Nanakorn 555* (BKF); *ibid.*, 8 Dec. 1984, *Koyama & Phengklai 48852* (BKF); *ibid.*, 27 Jul. 1988, *Tamura 60274* (BKF); *ibid.*, 15 Jan. 1994, *Fukuoka 62186* (BKF); *ibid.*, the summit, 27 Jul. 1988, *Fukuoka 62287* (BKF); *ibid.*, 7 Oct. 1990, *Chantaranothai et al. 90/654* (K); *ibid.*, 28 Nov. 1993, *Larsen et al. 44966* (AAU); *ibid.*, TOT relay station, 28 Oct. 2000, *Chayamarit et al. 2328* (BKF); *ibid.*, *Phengklai et al. 11393* (BKF); *ibid.*, 11 Nov. 2012, *Tagane et al. T890* (BKF); *ibid.*, Kio Mae Pan, 28 Nov. 1996, *Nanakorn et al. 7942* (QBG-2 sheets); *ibid.*, 2 Oct. 2001, *Norsaengsri 1735* (QBG); Doi Chiang Dao, 14 Oct. 1928, *Put 336* (BK, BM, K); *ibid.*, 10 Nov. 1962, *Smitinand et al. 7790* (BKF); *ibid.*, 17 Aug. 1963, *Smitinand & Sleumer 1084* (BKF); *ibid.*, 27 Sept. 1971, *Murata et al. 15148* (BKF); *ibid.*, 18 Jan. 1983, *Koyama et al. 32706* (BKF, QBG); *ibid.*, 9 Jul. 1998, *Suksathan 1172* (QBG); Doi Suthep, 11 Sept. 1958, *Thai-Danish Bot. 4911* (BKF-2 sheets); Doi Pha Hom Pok NP, 19 Sept. 1967, *Iwatsuki et al. 9602* (BKF); *ibid.*, 10 Nov. 2012, *Chamchumroon et al. 5535* (BKF); *ibid.*, 23 Nov. 1998, *Nanakorn et al. 13686* (QBG); Mae Taeng, 5 Dec. 1977, *Santisuk 1488* (AAU, K); Phayao [Chiang Kham, Rom Yen, Doi Pha Dam, 14 Aug. 2013, *La-ongsri et al. 3022* (QBG)].

Distribution.— India (Himalayan region), Myanmar, China (Yunnan), Korea, Japan, Laos, Vietnam (Tonkin).

Ecology and Phenology.— Exposed areas in mossy, hill evergreen and limestone forests, 1,300–2,565 m alt. Flowering and fruiting: July–December.

Vernacular.— Phak prap khrua (ผักปราบเครือ) (Northern).

Notes.— *Streptolirion volubile* is the most widespread species of the members of tribe Streptoliriae, from the Himalayas to Korea and Japan. In Thailand, it occurs in the high mountains in the north of Thailand.

Lectotypification

Dictyospermum ovatum Hassk., Commelin. Ind.: 24. 1870.— *Aneilema ovatum* Wall., Numer. List [Wallich]: 5206. 1831–1832, *nom. nud.*— *Commelina ovata* Steud., Nomencl. Bot., ed. 2, 1: 402. 1840, *nom. nud.*— *A. ovatum* Kunth, Enum. Pl. 4: 73. 1843, *nom. nud.*— *A. ovatum* (Hassk.) Wall. ex C.B. Clarke, Commelyn. Cyrtandr. Bengal.: 37, t. 25, 1874. Type: Myanmar, Rangoon, *Wallich 5206* (lectotype K [K000854155!], designated here; isoelectotypes K [K000854154!], K-W [K001120131!], K-W [K001120132!]).— *A. subovatum* Ridl., Fl. Malay Penins. 4: 357. 1924.— *D. subovatum* (Ridl.) J.K. Morton, J. Linn. Soc., Bot. 59: 436. 1966. Type: Indonesia, South Kalimantan, Banjarmasin [Borneo, Bangarmassing], *Motley 384* (lectotype K [K000854146!], designated here).

Notes.— The collections, *Gomez s.n.*, *McLelland s.n.* and *Wallich 5206*, are mentioned in the original description and deposited at K. These syntypes were mainly collected from Pegu, Rangoon and Tavoy of Myanmar and they are four sheets *viz.* *McLelland s.n.* (K000854153), *Wallich 5206* has two sheets. Each sheet has two specimens; the first sheet has K001120131 and K001120132 barcodes and the second has K000854154 and K000854155 barcodes. The fourth sheet has three specimens that mixed up of *McLelland s.n.* (K000854157), *Gomez s.n.* (K000854158) and without collector name (K000854156) collections. After careful examination, the right-hand specimen of the first sheet of *Wallich 5206* (K001120131, 5206A) is selected as lectotype because it is a complete specimen with more information than the others.

Ridley (1924) proposed *Aneilema subovatum* as a new species based on four collections, *Haniff s.n.* (K000854148, Langkawi-Telok Apan), *Kurz s.n.* (K000854152, the Andaman Islands which it was labelled as *A. ovatum*), *Godefroy-Lebeuf s.n.* (K000854147, Angkor) and *Motley 384* (K000854146, Borneo-Banjarmassin). All syntypes at K are available for examination and therefore, the Bornean specimen is selected here as the lectotype because it has more flowers.

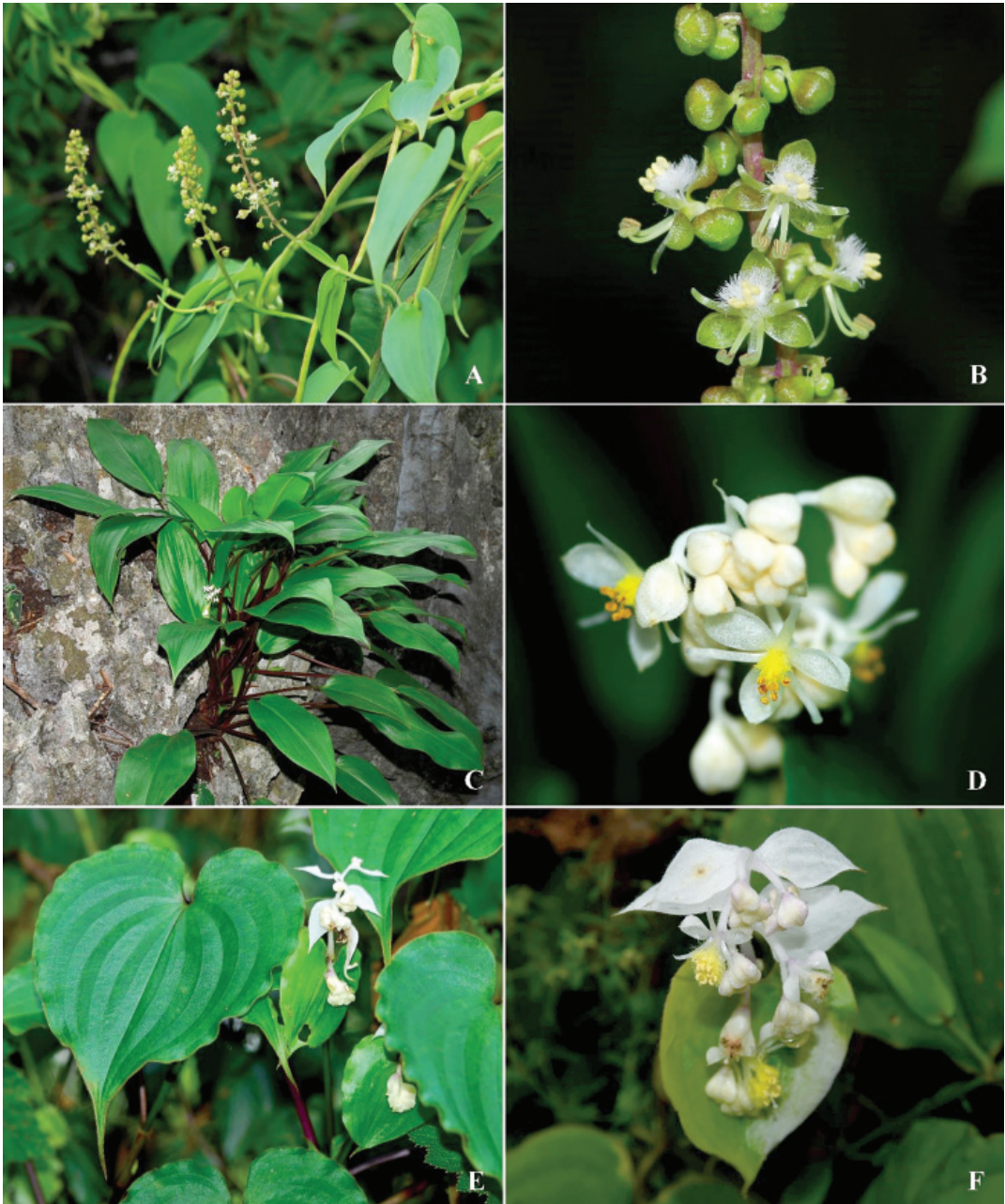


FIGURE 1. Habit and flowers of tribe Streptoliriaeae: A.–B. *Aetheolirion stenolobium*; C.–D. *Spatholirion calcicola*; E.–F. *Streptolirion volubile*. Photos by P. Phonsena.

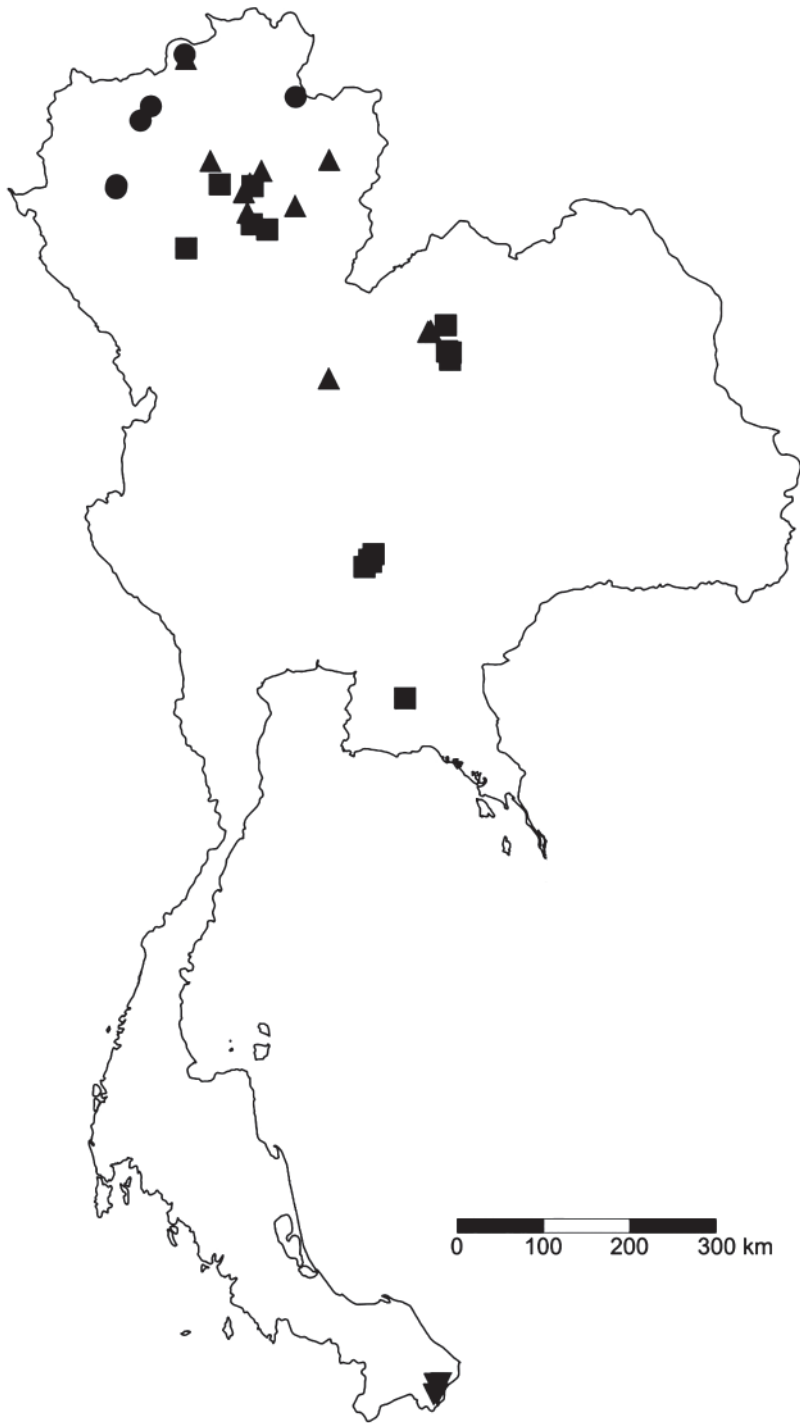


FIGURE 2. Distribution map of tribe Streptoliriae in Thailand: *Aetheolirion stenolobium* (●); *Spatholirion calcicola* (▲); *S. ornatum* (▼); *Streptolirion volubile* (■).

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