

# The genus *Agapetes* D. Don ex G. Don (Ericaceae) in Thailand

SANTI WATTHANA

Queen Sirikit Botanic Garden, The Botanical Garden Organization, Chiang Mai 50180, Thailand

**ABSTRACT.** A taxonomic revision of the genus *Agapetes* D. Don ex G. Don in Thailand is presented. Twelve species are recognized. A key to the species, descriptions, ecological data and geographical distributions are provided.

**KEYWORDS:** Taxonomy, Ericaceae, *Agapetes* D. Don ex G. Don, Thailand

## INTRODUCTION

*Agapetes* D. Don ex G. Don is distributed from the Himalayan region to south China and mainland southeastern Asia and comprises ca. 80 species. It belongs to the tribe Vaccinieae Rchb. (Stevens *et al.*, 2004) but the generic delimitation has not been solved satisfactorily due to the very closely related polyphyletic genus *Vaccinium* L. (Stevens, 1985; Stevens *et al.*, 2004; Ruizheng & Stevens, 2005). In Thailand, *Agapetes* may be distinguished from *Vaccinium* chiefly because of its larger corollas, usually more than 1 cm long (only *A. inopinata* Airy Shaw is sometimes shorter while *Vaccinium* in Thailand generally has much smaller flowers). Generally there is no difficulty in separating the two genera in Thailand and it is practical to keep them separate. The last revisions of this genus were

those of Airy Shaw (1939, 1948, 1959), but he did not himself give a description to all species. Historically the study of *Agapetes* in Thailand was begun by Fletcher (1938). He listed four species of *Agapetes* in the *Florae Siamensis Enumeratio*, namely *A. hosseana* Diels, *A. loranthiflora* D. Don ex G. Don var. *glabrata* C.B. Clarke, *A. parishii* C.B. Clarke and *A. saxicola* Craib. Sleumer (1966) reported two additional species: *A. lobbii* C.B. Clarke and *A. bracteata* Hook.f. ex C.B. Clarke. Recently, another new species, *A. thailandica* Watthana, has been described from Doi Suthep, a well known botanical exploration area (Watthana, 2001). This present work is a part of the revision of the Ericaceae for the Flora of Thailand.

## MATERIALS AND METHODS

This treatment for the Flora of Thailand is based on the herbarium specimens from AAU, BK, BKF, BM, C, CMU, E, K, L, P and QBG. Abbreviations follow Thiers (2012). Comparative morphology was used to delimit species in all cases.

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\* Corresponding author: santiqsbg@gmail.com

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**TAXONOMIC TREATMENT****AGAPETES**

D. Don ex G. Don, Gen. Hist. 3: 862. 1834; C.B. Clarke in Hook.f., Fl. Brit. Ind. 3: 443. 1881; Ridl., Fl. Mal. Pen. 2: 204. 1923; Dop in Lecomte, Fl. Indo-Chine 3: 699. 1930; Airy Shaw, Bull. Misc. Inform. Kew 1935: 24. 1935; Sleumer, Bot. Jahrb. Syst. 70: 97. 1939; Airy Shaw, Kew Bull. 1948: 77. 1948; 13: 468. 1959; Sleumer, Fl. Mal. Ser. I. 6(5): 878. 1967; H. Shuhua, Acta Bot. Yunnan. 5(2): 142. 1983; H. Shuhua & F. Ruizheng in W. Zhengyi, C. Jie & C. Shunkun, Fl. Yunnan. 5: 287. 1991; Stevens *et al.* in Kubitzki, Fam. & Gen. Vasc. Pl. 6: 184. 2004; F. Ruizheng & P.F. Stevens in W. Zhengyi & P.H. Raven, Fl. China 14: 504. 2005.

Shrub, often epiphytic; roots thickened or with woody tubers. *Leaves* spiral or pseudoverticillate, margin entire or remotely serrate. *Inflorescences* axillary or terminal;

(sub-)corymbose, racemose or solitary. *Flowers* usually large, (0.8-)1.5-6 cm long, bright red, pink or white; pedicel gradually thickened towards the apex, rarely slender, articulate or rarely non-articulate; bracts and bracteoles usually small, sometimes foliaceous. *Calyx* tube adnate to the ovary, cup-shaped or globose, limb separated into 5 lobes usually fused at the base. *Corolla* tubular, tubular-urceolate or campanulate, lobes 5. *Stamens* 10, connivent forming a tube but not fused; anthers granular, with or without spurs, extending apically into two long, narrow, free tubules which open by apical pores or slits; filaments short or long. *Ovary* falsely 10-locular, inferior; disk glabrous or hairy; style filiform; stigma capitate or truncate. *Fruits* fleshy berry with persistent calyx. *Seeds* numerous, ellipsoidal, the testa reticulate.

Twelve species and one variety have been recorded from Thailand.

**KEY TO THE SPECIES**

1. Corolla campanulate or campanulate-tubular with long lobes, more than 1/3 of the corolla length ..... 2
1. Corolla tubular or urceolate-tubular with short lobes, less than 1/3 of the corolla length .... 4
2. Corolla shorter than 2 cm (including the lobes) ..... 3
2. Corolla longer than 2 cm ..... **4. A. lobbii**
3. Leaves ovate-lanceolate, apex acuminate-caudate; blade 3.5-6 cm long .... **1. A. bracteata**
3. Leaves obovate-oblong, apex obtuse; blade 2-3 cm long ..... **9. A. saxicola**
4. Corolla distinctly curved ..... **6. A. macrostemon**
4. Corolla straight (rarely slightly curved in *A. setigera* var. *verticillata* before opening) .... 5
5. Filaments longer than the anthers ..... 6
5. Filaments shorter than the anthers ..... 8
6. Corolla less than 1.2 cm long ..... **3. A. inopinata**

6. Corolla more than 1.2 cm long ..... 7
7. Leaves small, up to 3.5 cm long. Flowers tubular, ridged; pedicel articulate with the ovary. Young branches with dense long hairs (rarely shiny and glabrous) ..... **2. *A. hosseana***
7. Leaves large more than 4 cm long. Flowers narrowly tubular-urceolate, not ridged; pedicel not articulate with the ovary, Young branches glabrous ..... **11. *A. thailandica***
8. Stamens with spurs ..... 9
8. Stamens without spurs ..... 12
9. Calyx lobes oblong-triangular longer than 7 mm ..... **7. *A. megacarpa***
9. Calyx lobes triangular shorter than 7 mm ..... 10
10. Corolla less than 2.5 cm long ..... **10. *A. setigera* var. *verticillata***
10. Corolla more than 2.5 cm long ..... 11
11. Pedicels with glandular hairs ..... **5.1 *A. loranthiflora* var. *loranthiflora***
11. Pedicels glabrous ..... **5.2 *A. loranthiflora* var. *glabrata***
12. Corolla tubes less than 3.5 cm long ..... **8. *A. parishii***
12. Corolla tubes more than 3.5 cm long ..... **12. *A. variegata***

**1. *Agapetes bracteata*** Hook.f. ex C.B. Clarke in Hook.f., Fl. Brit. Ind. 3: 448. 1881; Brandis, Indian Trees: 405. 1906; Airy Shaw, Kew Bull. 13: 503. 1959; Sleumer, Dansk Bot. Ark. 23(3): 303. 1966. Type: Burma (Myanmar), Moulmein, Thoung-gyun, 1,500 m, *T. Lobb s.n.* (lectotype K! selected here).

*Agapetes subcaudata* Merr., J. Arnold. Arbor. 21: 381. 1940. Type: Vietnam, Annam, Dalat, rain forest, 2,000 m, 12 March 1939, *H. Greenway 24* (holotype A, picture at K!).

Epiphytic shrub up to 1 m high, with sub-cylindrical woody tubers, adnate to the tree trunk; branches terete or subterete, with glandular hairs turning glabrous when old. *Leaves* spiral, ovate-lanceolate, 3.5-6 by 1.2-2.5 cm, apex acuminate-caudate, base obtuse to rounded, margin entire and revolute, with 2 glands at the base, glabrous, coriaceous; midrib slightly prominent above; veins 5-6 pairs rather obscure; petiole 2-3 cm

long, hairy, flattened and grooved above. *Inflorescence* an axillary or terminal raceme, 4-10 cm long; peduncle rachis and pedicel pubescent with glandular hairs; pedicel 0.7-1.4 cm long, articulate at both ends, apex thick; bracts lanceolate or elliptic, apex acute to acuminate, 6-12 by 1.5-4 mm. *Calyx* tube cup-shape, 1-1.5 by 1.5-2 mm, pubescent with glandular hairs up to 0.5 mm long; calyx lobes 5, separate almost to the base, 1.5-2 by 1 mm with glandular hairs outside, acute, margin with dense short white hairs. *Corolla* campanulate, white, 12-15 by 4-5 mm; tube 4-6 by 4-5 mm, sparsely pubescent especially near the base; lobes narrowly triangular, 7-9 by 2 mm, strongly recurved. *Stamens* 10; filaments *ca.* 3 mm long, hairy; anthers narrowly oblong, 2.5-3 mm long, granulate, apex with tubules, 6-6.5 mm long, with 2 spurs, *ca.* 0.9 mm long, opening by elongate pores. *Style* glabrous, 1-1.2 cm; stigma truncate; disk glabrous. *Fruits*

globose, hairy, *ca.* 0.5 cm in diam. (when young). Fig. 1A.

Thailand.— SOUTH-EASTERN: Prachinburi (Khao Yai).

Distribution.— Myanmar (type), Indochina.

Ecology.— On mossy tree branches, in evergreen forest, alt. 900-1,300 m.

Phenology.— Flowering February-March.

Vernacular.— Sa mek khao (ສະເມັກຫາວ).

Specimens examined.— *B. Hansen et al.* 11367 (BKF, E, K, P); *E. Hennipman* 3945 (BKF, K); *Kasem* 457 (BK); *K. Larsen et al.* 27 (BKF); *M. Poopath et al.* RP 6143 (BKF); *T. Santisuk* 6890 (BKF); *T. Smitinand & H. Sleumer* 8342 (BKF); *S. Watthana* 1104 (QBG).

**2. *Agapetes hosseana*** Diels, Repert. Spec. Nov. Regni Veg. 1: 16. 1905; Craib, Bull. Misc. Inform. Kew 1911: 404. 1911; Dop in Lecomte, Fl. Gen. Indo-Chine 3: 700. Fig. 80. 1930; H.R. Fletcher in Craib, Fl. Siam. Enum. 2: 311. 1938; Airy Shaw, Kew Bull. 13: 505. 1959; Sleumer, Dansk Bot. Ark. 23(1): 79. 1963. Type: Siam (Thailand), Doi Suthep, *ca.* 1,500 m to 1,700 m, 12 December 1904, *C.C. Hosseus* 219 (holotype M!; isotypes BM!, K!).

Epiphytic or terrestrial shrub up to 1 m high, with woody tubers; branches with dark brown setose hairs, rarely glabrous and shiny. *Leaves* spiral, oblanceolate, obovate, oblanceolate-oblong to elliptic, 1.7-3.5 by 0.6-2 cm, base cuneate, apex retuse, obtuse to mucronate, margin entire and revolute, with 1-2 pairs of glands at the base, glabrous

on both surfaces, coriaceous; midrib distinctly prominent above near the base, prominent and thick beneath; veins 6-9 on each side, distinct above, obscure beneath; petiole 1-3 by 1-2 mm, glabrous, flattened above. *Flowers* bright red, orange-red or light green, solitary or fasciculate with 2-4 flowers on axillary leaves or branches; bracts attached at the base of the pedicel, broadly triangular *ca.* 0.5 by *ca.* 0.7 mm, hairy and ciliate; pedicel 1-1.8 cm long, glabrous, thickened at the apex, articulate at both ends. *Calyx* tube 2-2.5 by 2-3 mm (*ca.* 1.5 by 1.5 mm when dry), hairy to subglabrous; calyx limb campanulate, 2.5-3 mm long, divided to 1/3-1/2 of the length; calyx lobes shortly triangular, *ca.* 1 mm long, apex acute, hairy outside, glabrous inside. *Corolla* tubular, 15-23 by 3-5 mm, with 5 longitudinal ridges, glabrous on both surfaces; lobes, triangular *ca.* 1 by 1.5-1.8 mm. *Stamens*: filaments flattened, white, 7-10 by 0.4-0.7 mm, sparsely hairy to almost glabrous; anthers 3-4 mm long, granular, with 2 spurs, 1-2 mm long, dimorphic; tubules 2.5-4 mm long, opening by elongate pores. *Style* 1.4-2.4 cm long, glabrous; stigma truncate; disk glabrous. *Fruits* globose, 0.8-1 cm in diam. *Seeds* numerous, oblong-linear, 1.8-2 by 0.8-0.9 mm. Figs. 1B-D.

Thailand.— NORTHERN: Mae Hong Son (Khun Yuam, Doi Khun Huai Pong), Chiang Mai (Doi Chiang Dao, Doi Suthep-Pui, Doi Inthanon, Doi Mon Chong, Chom Thong); NORTH-EASTERN: Loei (Phu Luang); SOUTH-EASTERN: Prachin Buri (Khao Yai), Chanthaburi (Khao Soi Dao).

Distribution.— South Myanmar and Laos.

Ecology.— Epiphytic shrubs on tree branches in evergreen forest or terrestrial shrubs on rocks on limestone hills, or on the ground in open areas at high elevation, alt. 1,250-2,500 m.

Vernacular.— Sa pao lom (สะปาลอม).

Specimens examined.— *C.F. van Beusekom et al.* 1288 (BKF, K, L, P), 1349 (BKF, K, L, P), 1749 (BKF, L, P), *C.F. van Beusekom & C. Phengklai* 2429 (BKF, L); *N. Fukuoka et al.* T-62289 (BKF), T-34552 (BKF); *Garrett* 333 (K, L); *R. Geesink et al.* 7975 (K, P); *B. Hansen & T. Smitinand* 12781 (AAU, BKF, E, K, L, P); *E. Hennipman* 3298 (L); *C. C. Hosseus* 351 (K), 354 (L, M, P), 359 (E, M), 393 (K); *K. Iwatsuki et al.* T-9684 (L); *A.F.G. Kerr* 5328 (BK, E, K), 5587 (BK, E, K), 9633 (BK, E, K, L); *F. Konta et al.* 3892 (BKF), 4385 (BKF), *F. Konta & C. Phengklai* 3892 (BKF); *H. Koyama et al.* T-32711 (BKF), T-33273 (BKF), *H. Koyama & C. Phengklai* T-40004 (BKF); *T. Koyama* 15633 (BKF); *K. Larsen* 21 (BKF, L, P), *K. Larsen et al.* 2785 (BKF); *J.F. Maxwell* 87-1532 (BKF, L), 90-195 (L), 96-147 (BKF); *D. Middleton et al.* 4491 (BKF); *S. Mitsuta et al.* T-45352 (BKF, L); *G. Murata et al.* T-15313 (BKF, K, L); *C. Niyomdham* 6 (BKF, K), 5227 (BKF), 5319 (BKF), *C. Niyomdham & R. Kubat* 1373 (BKF, K); *E.P. Nootboom* 831 (BKF, K, L, P); *P. Palee* 116 (BKF, L); *C. Phengklai* 7097 (BKF), *C. Phengklai et al.* 7420 (BKF); *P. Phongsena et al.* 6120 (BKF); *R. Pooma* 337 (BKF), 394 (BKF), 624 (BKF); *Put* 3007 (BK, K), 4508 (BK, E); *T. Santisuk* 219

(BKF), 1026 (BKF); *T. Shimizu et al.* T-10231 (L), T-18117 (BKF), T-20252 (BKF), T-20598 (BKF); *H. Sleumer* 4747 (L), 4752 (K, L); *T. Smitinand* 5475 (BKF, L), 6676 (BKF, K), 7315 (BKF), *T. Smitinand et al.* 10501 (BKF); *H. Takahashi* T-62504 (BKF), T-63675 (BKF); *M. Tagawa et al.* T-2868 (BKF), T-9519 (BKF, L); *N. Tamura* T-60285 (BKF); *S. Tsugaru* T-61861 (BKF); *Umpai* 501 (BK); *S. Watthana* 1229 (QBG), 1230 (QBG); *P. Wilkie et al.* PW 447 (BKF, K); *Winit* 1342 (BK, BKF, E, K).

Notes.— *Agapetes hosseana* is very similar to *A. mannii* Hemsl. but it differs from *A. mannii* by usually having setose hairs on the young branches and red or orange flowers while *A. mannii* is only pubescent on the young branches with mostly green flowers rarely red. Recent field studies reveal that there are green flowered populations of *A. hosseana* from lower northern (Phitsanulok: Phu Hin Rong Kla), northeastern (Loei: Phu Luang) and southeastern (Prachinburi: Khao Yai and Chanthaburi: Khao Soi Dao). They are considered to be just a color form. A few plants in the Khao Soi Dao population have shiny glabrous branches. However, they are still treated as separate from *A. mannii* Hemsl., due to lack of pubescence on the branches and the relatively larger leaves (usually more than 1.5 cm long). Moreover, the specimens of *Watthana* 1229 (QBG) and 1230 (QBG), from Mae Taman, Chiang Mai province, show variation in hairiness with few setose hairs and shiny young branches. These shiny specimens are still considered to be part of the *A. hosseana* entity.

**3. *Agapetes inopinata*** Airy Shaw, Kew Bull. 14: 299. 1960; P.F. Stevens, J. Arnold Arbor. 66: 475. 1985; H. Shuhua & F. Ruizheng in W. Zhengyi, C. Jie & C. Shunkun, Fl. Yunnan. 5: 298. 1991; S. Watthana & C. Trisonthi, Thai. For. Bull. 27: 19. 1999; F. Ruizheng & P.F. Stevens in W. Zhengyi & P.H. Raven, Fl. China 14: 514. 2005. Type: Burma (Myanmar), S. Shan State, Loimwe, 1,500-1,800 m, 2 April 1929, *Kingdon Ward 8788* (holotype F, picture at K!; isotypes SUNIV, fragm. A).

*A. glandulosissima* (C.Y. Wu ex W.P. Fang & Z.H. Pan) S.H. Huang, Acta Bot. Yunnan. 5(2): 148. Fig. 1. 1983.—*Vaccinium glandulosissimum* C.Y. Wu ex W.P. Fang & Z.H. Pan, Acta Phytotax. Sin. 19(1): 109. 1981. Type: China, Yunnan, Cangyuan, 1,600 m, April 1936, *C.W. Wang 73251* (holotype HP; isotype A).

Epiphytic shrubs on tree trunks up to 1.5 m tall, with subsphaeroidal gray and glabrous woody tubers; young branches with dense brown glandular-hairs up to 2 mm long often pubescent; twigs glabrous, gray. *Leaves* lanceolate to oblong-lanceolate, 3-6 by 1.3-2.3 cm, acuminate to caudate at apex, rounded at base, margin entire and revolute, coriaceous-chartaceous, dark green above and pale green beneath; midrib prominent on both sides; veins 8-11 on each side, curved and joined at apex, distinct above, glabrous on both surfaces; petiole glabrous, up to 2 mm long. *Inflorescence* shortly racemose, terminal or axillary, up to 2-4 cm long, 2-6 flowered; peduncle 5-10 mm long; rachis up to 10 mm long, greenish, covered with dense glandular-hairs and often pubescent; bracts lanceolate or subulate,

1.5-4 mm long, brown, apex acuminate, covered with glandular hairs, the veins distinct when dry, with 2 bracteoles at the base close to the bract, slightly smaller than bracts; pedicels 6-8 mm long, apex articulate, with dense glandular-hairs up to 1 mm long. *Calyx* tube globose, 1-1.5 by 1.5 mm, densely glandular-hairy with a lax to dense pubescence; calyx lobes triangulate, 1-1.8 by 0.9-1.2 mm, midrib and veins distinct when dry. *Corolla* tubular but slightly swollen at the middle part, bright red, densely glandular-hairy outside with a lax to dense pubescence, glabrous inside, tube 8-10 by 5 mm; lobes triangular green turning red when old, 0.8-1 by 1.5-1.8 mm. *Stamens*: filaments whitish, flattened, 3-5 mm long, sparsely glandular-hairy to glabrous; anthers 1.5-1.8 mm long, brown, with spurs on the back, ca. 0.5 mm long; tubules 2-2.8 mm long, opening by elongate pores. *Style* 8-9 mm long, glabrous. *Fruits* white, 0.8-1 mm in diam., glandular-hairy. Fig. 1E.

Thailand.— NORTHERN: Chiang Mai (Doi Pha Hom Pok), Nan (Doi Phuka).

Distribution.— Myanmar (type), China (Yunnan).

Ecology.— On tree branches in hill evergreen forest, alt. 1,600-1,700 m.

Phenology.— Flowering in February and July; fruiting in March.

Specimens examined.— *P. Srisanga et al.* 2430 (QBG); *S. Watthana* 224 (QBG).

Notes.— This species has a relatively short corolla for the genus *Agapetes*, but differs from the genus *Vaccinium* as found in Thailand by having a bright red corolla and relatively large fleshy white fruits (Watthana & Trisonthi, 1999). Airy Shaw

(1960), when describing this species, placed it into his series Longifiles, subseries Racemosae. The fruit is fleshy, and comparable in size to some members of series Longifiles such as *A. saxicola* and *A. hosseana*.

**4. *Agapetes lobbii*** C.B. Clarke in Hook.f., Fl. Brit. Ind. 3: 448. 1881; Airy Shaw, Bull. Misc. Inform. Kew: 37. 1935; 13: 476. 1959; Sleumer, Dansk Bot. Ark. 23(3): 303. 1966; H. Shuhua, Acta Bot. Yunnan. 5(2): 144. 1983; H. Shuhua & F. Ruizheng in W. Zhengyi, C. Jie & C. Shunkun, Fl. Yunnan. 5: 291. 1991; F. Ruizheng & P.F. Stevens in W. Zhengyi & P.H. Raven, Fl. China 14: 506. 2005. Type: Burma (Myanmar), Moulmein, Thoung-gyne (not gyun), alt. 5,000 ft, 1857, *T. Lobb s.n.* (holotype K!; isotypes BM!, K!).

*A. racemosa* Watt ex Kanjilal, Fl. Assam 3: 139. 1939. Type: Assam, Manipur State, Naga Hill, hill behind Kohima, 1,800 m, 28 February 1882, *G. Watt 6180* (holotype E; isotype K!).

*A. corallina* Cowan, Notes Roy. Bot. Gard. Edinb. 18: 36. 1933. Type: Burma (Myanmar), Myitkyina Distric., Htawgaw Hill, alt. 4,600 ft, 30 November 1930, *Sukoe 34* (holotype E!; isotype K!).

*A. stenantha* Rehd., J. Arnold Arbor. 14: 350. 1933. Type: Burma (Myanmar), between Sadon and Yunnan Chinese border at Chiangtifang and Kambaiti, alt. 7,600 ft, November 1922, *J.F. Rock 7514* (holotype A).

Shrub or epiphytic shrub up to 2.5 m high, with sphaeroidal to elongate woody tubers; young branches glabrous, angular;

old branches terete, with scattered lenticels. *Leaves* spiral; elliptic, elliptic-oblong to lanceolate, 4-10 by 1.2-4 cm, base obtuse, cuneate to attenuate, with a pair of glands near the base, apex acuminate to caudate, margin remotely serrate near the apex to entire, glabrous on both surfaces, coriaceous; midrib distinct on both sides; veins 6-10 on each side; petiole 3-5 by 1.5-2 mm, glabrous. *Inflorescence* axillary raceme; peduncle and rachis 3-10 cm long, glabrous to subglabrous; peduncle 0.3-1.5 cm long, glabrous; pedicel 1-2.3 cm long, of unequal lengths, articulate at both ends, thickened at the apex, glabrous; bracts triangular, 0.5-2 mm long, apex acuminate, margin usually fimbriate with glandular hairs, deciduous, with 2 bracteoles at the base slightly smaller than the bracts. *Calyx* tube 1-2.5 by 1.5-2.5 mm, glabrous to subglabrous, smooth or slightly ridged; calyx limb 1.8-3.3 mm divided to 1/4 of its length, with 5 longitudinal ridges which continue along the lobes, glabrous on both surfaces; lobes triangular, 1.2-3 by 0.8-1.5 mm, acute with a terminal gland. *Corolla* bright red to pale pink with dark red streaks, campanulate, 2.2-2.9 cm long; tube 10-14 by 5-7 mm, 5-ridged, glabrous on both sides; lobes linear-triangular, strongly recurved and twisted, 12-15 by 2-3 mm. *Stamens* exerted; filaments flattened, 3-5 mm long, slightly hairy to glabrous; anthers 5-7 mm long, granular, without spurs; tubules 1.3-1.7 cm long, opening by slits. *Style* 2.6-3 cm long, glabrous; stigma truncate; disk glabrous. *Fruits* globose, 4-5 mm in diam. (when young). Fig. 1F.

Thailand.— NORTHERN: Mae Hong Son (Doi Khun Huai Pong, Doi Pui, Khun Yuam), Chiang Mai (Doi Inthanon), Chiang Rai (Doi Tung, Doi Nang Non), Phayao (Phu Langka), Nan (Doi Phuka), Phitsanulok (Phu Miang, Phu Hin Rong Kla, Phu Soi Dao); NORTH-EASTERN: Loei (Phu Kra Dung, Phu Luang, Phu Ruea, Na Haew)

Distribution.— Myanmar (type).

Ecology.— On large trees in montane forest, on limestone and sandstone rocks in open areas of the forest, alt. 1,200-2,000 m.

Phenology.— Flowering December-March; fruiting April-May.

Vernacular.— Samek (ခဲးမိက်).

Specimens examined.— *H. Koyama et al.* T-31632 (BKF, QBG); *J.F. Maxwell* 06-117 (CMU, QBG); *W. Nanakorn et al.* 8235 (QBG); *M. Norsaengsri* 6457 (QBG); *P. Srisanga* 2369 (QBG), 2429 (QBG); *P. Suksathan* 1231 (QBG), 1706 (QBG), 2250 (QBG), 2293 (QBG) 3652 (QBG); *S. Watthana & P. Srisanga* 193 (QBG); *S. Watthana & P. Suksathan* 1623 (QBG), 1657 (QBG); *S. Watthana et al.* 226 (QBG); *M. Wongnak* 82 (QBG).

**5. *Agapetes loranthiflora*** D. Don ex G. Don, Gen. Hist. 3: 862. 1834; C.B. Clarke in Hook.f., Fl. Brit. Ind. 3: 446. 1881.— *Thibaudia loranthiflora* Wall., nom nud. Type: Burma (Myanmar), Tavoy, orae Tenasserim, *W. Gomez* in *Wallich* 754 (holotype K-W!; isotype K!).

*Vaccinium verticillatum* (D. Don ex G. Don) Kurz var. *elegans* Kurz, J. As. Soc. Beng. 42(2): 84. 1873; 46(2): 214. 1877.— *A. variegata* (Roxb.) D. Don ex G. Don var. *elegans* (Kurz) Airy Shaw, Kew Bull.

1948: 89. 1948. Type: Burma (Myanmar), Pegu Yomah, E and W Slope, Top of kambala Tong, 3,200 ft, 24-26 February 1871, *Kurz* 2993 (holotype K!).

**5.1 var. *loranthiflora*** Epiphytic shrub up to 1.5 m high, with elongate swollen tubers; branches angular when young becoming terete, glabrous and with lenticels. *Leaves* pseudoverticillate, oblong-ob lanceolate, rarely elliptic, 4-14 by 1-5 cm, apex (sub-) acute, base obtuse to sub-cordate, margin slightly serrate at the upper part to subentire, revolute, coriaceous; midrib subprominent above, distinctly prominent beneath; veins 10-21 on each side, glabrous; petiole short, 2-4 by ca. 1.5 mm, flattened above. *Flowers* 3-8 in an axillary or terminal corymb; peduncle 0.5-1 cm long, rachis 0.5-1.7 cm long, with whitish pubescence and glandular hairs up to 1.7 mm long; floral bracts triangular, 1.5-2 mm long, acuminate, with 2 small bracteoles at the base of the pedicel, ca 0.8 mm long; pedicels 1.5-2.7 cm long, slender, slightly thicker at apex, with white pubescence and with glandular hairs, articulate at both ends. *Calyx* tube subglobose, 1.5-2.5 mm high, 2-3 mm in diam. (when dry), with white pubescence and with glandular hairs; calyx limb 4-7 mm long; calyx lobes triangular 3.5-5.5 by 1.5-2 mm, apex acute with an apical gland, the outer surface with white pubescence, glabrous inside, midrib distinct outside. *Corolla* pink to pale pink with dark pink streaks, tubular but slightly swollen at the distal half, 3.5-4.6 by 0.8-1 cm (up to 1.4 cm broad when flattened); lobes triangular, 6-12 by 3-5 mm, obtuse at apex, 5-ridged, glabrous to scattered with glandular hairs along the ridges.



*Stamens*: filaments flattened, 3-4.5 mm long; anther 7-11 mm long; tubules 2.3-3.3 cm long, with 2 short spurs up to 0.7 mm long, opening by elongate pores or slits. *Style* 3.5-4.8 cm long, glabrous; stigma capitate, 1.5-2.0 mm in diam.; disk glabrous. *Fruits* white, ca. 1.2 mm in diam., hairy. Fig. 1G.

Thailand.— NORTHERN: Tak (Umphang); SOUTH-WESTERN: Kanchanaburi (Tong Pa Poom), Phetchaburi (Kaeng Krachan), Prachuap Khiri Khan (Thap Sakae); PENINSULAR: Phangnga (Mueang).

Distribution.— Myanmar (type).

Ecology.— Epiphyte on mossy tree trunks in evergreen forest, alt. 960-1,000 m.

Phenology.— Flowering December-January.

Specimens examined.— *M. van de Bult* 510 (BKF, CMU); *D.J. Middleton et al.* 3729 (BKF); *S. Watthana* 227 (QBG), 4105 (QBG).

Notes.— This species is close to *A. grandiflora* Hook.f. but its flower is smaller and its leaves are oblanceolate with an obtuse apex, while, *A. grandiflora* has elliptic leaves with an acute to acuminate apex.

**5.2 var. *glabrata*** C.B. Clarke in Hook.f., Fl. Brit. Ind. 3: 446. 1881.—*A. variegata* (Roxb.) D. Don ex G. Don var. *glabrata* (C.B. Clarke) Airy Shaw, Kew Bull. 1948: 88. 1948. Type: Burma (Myanmar), Moulmein, limestone rock, banks of the Atsan, *T. Lobb s.n.* (lectotype K! selected by Airy Shaw, Kew Bull. 1948: 89. 1948).

Epiphytic shrub up to 2 m tall, with elongate swollen tubers; young branches angular becoming terete. *Leaves* pseudoverticillate,

oblanceolate-oblong, 4-11 by 1.5-3.2 cm, apex obtuse, base obtuse to slightly cordate, margin slightly serrate; midrib subprominent above, prominent beneath; veins 10-14 on each side; petiole thick, short, 1.5-2 by ca. 2 mm. *Flowers* 3-6 in a terminal or axillary corymb; peduncle and rachis 5-7 mm long, glabrous; peduncle very short; floral bracts shortly triangular ca. 0.5 mm long; pedicel 1.5-2.7 cm long, slender, apex thickened articulate at both ends, glabrous. *Calyx* tube 1.5-2 mm high, 2.5-3 mm in diam. (when dry), glabrous; calyx limb 2.5-3 mm long; calyx lobes triangular 2-2.5 by 1.8-2 mm, acute at apex. *Corolla* pink with dark pink streaks, tubular but slightly swollen at the distal half, 4-4.5 by ca. 1 cm, glabrous; lobes triangular, each 8-10 by 3-4 mm, apex obtuse, recurved. *Stamens*: filaments flattened, 4-5 mm long; anthers 7-8 mm long; tubules 3-3.3 mm long, with 2 spurs at the upper half, up to 1 mm long, opening by elongate pores or slits. *Style* glabrous, 4.2-4.5 cm long; stigma capitate, ca. 1.5 mm in diam.; disk glabrous. *Fruits* not seen.

Thailand.— PENINSULAR: Ranong (Nam Tok Ngao), Surat Thani (Khao Nom Sao), Phangnga (Sri Pangnga; Khao Kata Kum).

Distribution.— Myanmar (type).

Ecology.— In evergreen forest, alt. 700-850 m.

Phenology.— Flowering December-January.

Specimens examined.— *S. Gardner & S. Khumchompoo* ST2096 (BKF); *A.F.G. Kerr* 12046 (BK, BM, K); *S. Watthana* 1719 (QBG).

Notes.— There is some doubt about the variation of hairiness on the calyx and corolla of this species. More specimens are needed to clarify the situation.

**6. *Agapetes macrostemon* (Kurz) C.B. Clarke** in Hook.f., *Fl. Brit. Ind.* 3: 443. 1881; Airy Shaw, *Kew Bull.* 13: 475. 1959. — *Vaccinium macrostemon* Kurz, *J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist.* 42(2): 85. 1873; *Fl. Brit. Burma* 2: 87. 1877. Type: Burma (Myanmar), Martaban, hill east of Tounghoo, alt. 1200-1800 m, March, *Kurz s.n.* (holotype CAL).

Epiphytic shrub up to 1 m high, with elongate swollen tubers; young branches triangular, with spreading hairs to glabrous; old branches terete. *Leaves* pseudovercillate, narrowly to broadly elliptic, 6.5-11.5 by 1.7-4.5 cm, apex acuminate, base subcordate to cuneate with 2 glands, margin entire and revolute, coriaceous; midrib subprominent above near the base, distinctly prominent beneath; veins 10-13 on each side, anastomosing, glabrous. *Inflorescence* axillary or terminal raceme, 5 to 10-flowered; peduncle 0.5-1 cm long, finely pubescent to glabrous; rachis 1-2 cm long, finely pubescent or glabrous; floral bracts triangular, 1.5-2.5 mm long, acuminate, hairy to glabrous; with 2 bracteoles at the base of the pedicel, slightly smaller than the bract; pedicel hairy to glabrous, 0.6-1.3 cm long, articulate at both ends. *Calyx* glabrous to finely pubescent; calyx tube ovoid to ellipsoid, 2-2.5 by 1-2 mm; calyx limb tubular-campanulate, 4-5 mm long, divided to about half its length; lobes narrowly

triangular, 1.5-2.2 by 1 mm, acuminate with an apical gland, with slightly distinct veins. *Corolla* tubular, curved, 25-35 by 5-7 mm, glabrous, slightly 5-ridged; lobes linear-triangular, 5-6 by 1.2-2 mm, strongly recurved. *Stamens*: filaments 1.3-1.7 cm, flattened, glabrous; anthers 6-7 mm long, without spurs; tubules 0.7-1.2 cm long, opening by elongate pores. *Style* 2.5-3.5 cm long; stigma truncate; disk glabrous. *Fruits* ellipsoid or ovoid, hairy to glabrous, 1-1.3 by 0.7-1 cm, with persistent calyx. *Seeds* ellipsoid to ovoid, *ca.* 1 mm long. Fig. 1H.

Thailand.— NORTHERN: Mae Hong Son (Pai, Huai Hee), Chiang Mai (Mae Tang, Wiang Haeng).

Distribution.— Myanmar (type).

Ecology.— On trees in montane forest, alt. 1,400-1,800 m.

Phenology.— Flowering March-April; fruiting June.

Vernacular name.— Maeo nam (แมวหน้า), Prathat kariang (ประทัดกระเที๋ยง).

Specimens examined.— *S. Indhamusika* 125 (QBG); *J.F. Maxwell* 95-334 (CMU); *T. Smitinand s.n.*, (BKF); *S. Watthana & C. Maknoi* 1059 (QBG).

Notes.— *Agapetes macrostemon* is easily recognized by its distinctly curved corollas, lacking banded markings and having curved stamens. Kurz's specimen from Martaban (Kurz, 1877), *Parish s.n.* (K) from Moulmaei and *W.A. Robertson* 131 (K) from S. Shan State have glabrous calyces. Studies of Thai material showed that there is variation of hairiness on the calyx and corolla from glabrous to pubescent.

**7. *A. megacarpa*** W.W. Sm., Notes Roy. Bot. Gard. Edinb. 11: 194. 1919; Airy Shaw, Kew Bull. 1948: 80. 1948; 13: 472. 1959; H. Shuhua, Acta Bot. Yunnan. 5(2): 145. 1983; H. Shuhua & F. Ruizheng in W. Zheng, C. Jie & C. Shunkun, Fl. Yunnan. 5: 293. 1991; F. Ruizheng & P.F. Stevens in W. Zhengyi & P.H. Raven, Fl. China 14: 507. 2005. Type: China, Yunnan, Shweli-Salwin divide, in open thickets, Lat. 25° 6' N, alt 2,100 m., April 1917, *G. Forrest 13698* (holotype E!; isotype K!).

Epiphytic shrub up to 2-4 m high, with elongate swollen tubers; gray young branches angular, glabrous; basal branches up to 5 mm in diam., with dense lenticels. *Leaves* pseudoverticillate, rarely spiral, elliptic-oblong to oblanceolate-oblong, 9.5-14 by 2.5-5 cm, base obtuse to subcordate, apex acute to acuminate, margin entire to slightly crenate, often slightly undulate, with glands along the margin, coriaceous, glabrous; midrib (sub-) prominent above, distinctly prominent beneath; veins 11-16 on each side; petiole short, *ca.* 2 mm long, glabrous, flattened above. *Inflorescence* terminal or axillary corymb; peduncle up to 5 cm long, glabrous; rachis 4-10 mm long, glabrous; floral bracts triangular, 1-1.5 by 1 mm, margin entire with 2 small bracteoles at the base of the pedicel, *ca.* half size of bracts; pedicels 2.4-4 cm long, articulate at both ends, apex thickened, glabrous. *Calyx* tube glabrous, cup-shaped, 4-5 by 5-8 mm (3-4 by 3-5 mm when dry), glabrous; calyx limb divided to the base into 5 lobes, narrowly triangular or oblong-triangular, 9-14 by 2.5-3 mm, distinctly veined when dry, apex with a terminal gland. *Corolla*

tubular but slightly swollen in the distal half, 4.3-6 by 1.2-1.9 cm, glabrous, red to pinkish-red with dark red streaks, 5-ridged; corolla tube 3.5-4.8 cm long; corolla lobes triangular, 8-12 by 6 mm. *Stamens*: filaments flattened, 3-5 by 2 mm, curved, hairy at apex; anthers 8-9 by 1-2 mm, granular; tubules 3.5-4 cm long, with spreading hairs and with 2 spurs, *ca.* 1 mm long, opening by slits up to 2 cm long. *Style* 5-6 cm long, glabrous; stigma subobtusate; disk glabrous. *Fruits* subglobose, 1-1.2 cm in diam., fleshy, with persistent calyx. Fig. 2A.

Thailand.—NORTHERN: Chiang Mai (Doi Angkhang, Doi Pha Hom Pok), Chiang Rai (Doi Tung, Doi Nang Non), Nan (Doi Phuka, Bo Kleua, Sakoen).

Distribution.—China (Yunnan; type).

Ecology.—On limestone hill and in montane forests, alt. 820-1,600 m.

Phenology.—Flowering June-February.

Vernacular.—Pratag angkhang (ประทัดช้างวง).

Specimens examined.—*J.F. Maxwell* 09-29 (CMU, QBG); *P. Srisanga* 739 (QBG), 858 (QBG), 1581 (QBG), 1863 (QBG), 2112 (QBG), 2233 (QBG); *P. Suksathan* 1434 (QBG), 1462 (QBG), 1465 (QBG), 2261 (QBG), 2264 (QBG), 3621 (QBG); *S. Watthana* 389 (QBG), 1443 (QBG).

Notes.—The type specimen of *A. megacarpa* was collected by G. Forrest in 1917 from S. China but has only fruits. He noted that the flower was creamy yellow with a question mark and the calyx ruddy. The fruits were nearly ripe. Airy Shaw (1959) provided descriptions from additional material including branches with flowers. These appear to be identical to all Thai specimens.

**8. *Agapetes parishii*** C.B. Clarke in Hook. f., *Fl. Brit. Ind.* 3: 445. 1981; H.R. Fletcher in Craib, *Fl. Siam. Enum.* 2: 311. 1938; Airy Shaw, *Bull. Misc. Inform. Kew* 1935: 31. 1935; 1948: 90. 1948. Type: Burma (Myanmar), Nat-toung expedition, 1867, *Parish s.n.* (lectotype K! selected by Airy Shaw, *Bull. Misc. Inform. Kew* 1935: 31. 1935).

Epiphytic shrub about 1 m high, with elongate swollen tubers; branches angular, glabrous; old branches terete. *Leaves* pseudovercillate, elliptic-oblong to narrowly elliptic, 8-15 by 2.5-5 cm, base cuneate with a pair of glands, apex acute, margin entire and revolute, glabrous on both surfaces, coriaceous; midrib subprominent above, distinct beneath; veins 11-17 on each side, anastomosing at the apex and with a distinct marginal vein; petiole swollen 3-5 by 2-4 mm, flattened above. *Inflorescence* axillary corymb; bracts small, *ca.* 1 mm long, margin fimbriate, with 2 small bracteoles at the base of the pedicel, slightly smaller than the bract; peduncle up to 1 cm long; rachis up to 2 cm long; pedicel filiform, 1.5-2.5 cm long, thickened at apex, articulate at both ends, glabrous. *Calyx* tube 1.5-3 by 2-4 mm; calyx limb divided almost to the base; lobes triangular, 3-4 by 1.5-2 mm. *Corolla* tubular, 2.5-3 cm long, 5 ridged, glabrous, red with dark red streaks; lobes triangular, 5-6 by 2-2.5 mm. *Stamens*: filaments flattened, 2 mm long, hairy at the apex; anthers 4-5 mm long, without hairs and spurs; tubules 1.8-2 cm long, opening by slits. *Style* 2.5-3 cm long, glabrous; stigma truncate; disk glabrous. *Fruits* globose, 6-7 mm in diam. (immature). Fig. 2B.

Thailand.— NORTHERN: Mae Hong Son (Khun Mae Lan, Khun Yuam, Mae La Noi), Chiang Mai (Om Koi), Tak (Doi Mu Sur, Doi Pae Poe, Umphang), Kamphaeng Phet (Mae Wong); SOUTH-WESTERN: Kanchanaburi (Khao Ri Yai).

Distribution.— Myanmar (type).

Ecology.— On trees in lower montane forest, alt. 1,100-1,600 m.

Phenology.— Flowering November-March.

Vernacular.— Pra tat doi (ประทัดดอย), Khao yen nuea (เขายืนเหนือ).

Specimens examined.— *BGO Staff* 8355 (QBG); *W. Pongamornkul* 1606 (QBG); *P. Suksathan* 2064 (QBG), 2968 (QBG); *N. Tanaka et al.* HN8336 (QBG); *S. Watthana* 2322 (QBG), *S. Watthana & P. Srisanga* 194 (QBG).

**9. *Agapetes saxicola*** Craib, *Bull. Misc. Inform. Kew* 1935: 334. 1935; H.R. Fletcher in *Fl. Siam. Enum.* 2: 311. 1938; Airy Shaw, *Kew Bull.* 1948: 92. 1948; Sleumer, *Dansk Bot. Ark.* 23(1): 79. 1963. Type: Siam (Thailand), Loei, Phu Kradung, 1,200 m, on rocks, *Kerr* 8696 (holotype K!; isotypes BK!, BM!, E!).

Shrub up to 1.5 m high, with swollen subspheroidal tubers; young branches glandular hairy becoming glabrous, gray. *Leaves* spiral, obovate to oblanceolate, 1-3 by 0.6-1.7 cm, apex obtuse to acute, base cuneate, margin entire and revolute, with 2 glands at base, coriaceous; midrib grooved above, prominent beneath; veins 4-7 on each side, sparsely hairy to glabrous on both surfaces; petiole 1-3 mm long, densely hairy. *Inflorescence* terminal or axillary corymb

up to 4 cm long, 3-4-flowered; bracts lanceolate, elliptic to obovate, 4-8 by 2-3 mm broad, hairy, with 2 small bracteoles at the base of the pedicel up to 1.5 mm long, deciduous; pedicels *ca.* 1 cm long, with dense glandular hairs, up to 1.5 mm long, articulate at both ends, distally thicker. *Calyx* with glandular hairs; calyx tube subglobose, 1.5-2 by 2-2.5 mm, sparsely hairy; calyx limb 2-2.5 mm long, glabrous inside; calyx lobes triangular 1.3-1.8 by 1.5 mm, acute at apex. *Corolla* campanulate, 13-16 mm long; corolla tube 6-8 mm long, glabrous; corolla lobes narrowly triangular, 6-7 by 2 mm, strongly recurved. *Stamens*: filaments 3-5 mm long, flattened, hairy; anthers 3.5-4 mm long, granular, with 2 spurs, 1.5-2 mm long, opening by elongate pores. *Style* 1.4-1.6 cm long; stigma truncate. *Fruits* fleshy when ripe, globose, dark red to black, *ca.* 1 mm in diam. *Seeds* ellipsoid, flattened, 1.1-1.5 mm long, 0.7-0.8 mm broad. Fig. 2C.

Thailand.—NORTHERN: Phitsanulok (Phu Miang); NORTH-EASTERN: Phetchabun (Phu Hin Rong Kla), Loei (Phu Luang, Phu Kradung).

Distribution.—Endemic.

Ecology.—On open areas of sandstone forest, alt. 1,200-1,500 m.

Phenology.—Flowering December-May; fruiting September-November.

Vernacular.—Ngao nam tip (เหง้าน้ำทิพย์), Yaang khon (ยางขน), Sri thanonchai (ศรีธนนชัย).

Specimens examined.—*M. Norsangsri* 999 (QBG); *P. Suksathan* 1269 (QBG); *S. Watthana* 2200 (QBG); *S. Watthana* & *P. Suksathan* 1557 (QBG); *M. Wongnak* 98 (QBG).

**10. *Agapetes setigera*** D. Don ex G. Don var. ***verticillata*** Wall. ex C.B. Clarke in Hook.f., Fl. Brit. Ind. 3: 443. 1881; Airy Shaw, Bull. Misc. Inform. Kew 1935: 33. 1935. Type: India, Khasia, E. montibus Pundooa Bengalae Orientalis 1821, *M.R. Smith s.n.* in *Wallich 753* (holotype K-W!).

Epiphytic shrub up to 1 m high, with swollen tubers; young branches angular; old branches terete, glabrous, with lenticels. *Leaves* pseudoverticillate, oblanceolate, rarely elliptic, 6-9 by 1.6-4 cm, apex subacute, base cuneate, rounded or slightly cordate, margin slightly serrate at the upper part, revolute, coriaceous; veins 9-14 on each side; petiole short. *Inflorescence* axillary, corymbose, 3-7-flowered; peduncle, rachis, pedicel and calyx with dense puberulent and glandular hairs; peduncle and rachis 5-8 mm long; pedicel 1.2-1.7 cm long; floral bract small, triangular, *ca.* 0.5 mm long, apex acute, margin ciliate. *Calyx* tube subglobose, 2-2.5 by 2.3-2.5 mm, with dense hairs; calyx limb 2.5-3 mm long; calyx lobes 1.8-2 by 1.5 mm, triangular, with a prominent midrib, acute at apex, often with a terminal gland, glabrous inside, distinctly veined when dry. *Corolla* red-pink with darker red-pink streaks, tubular but slightly swollen at the distal half, 16-18 by 4.5-5 mm, subglabrous, with a few pubescent and glandular hairs along the ridge, 5-ridged; lobes triangular-oblong, 2-3 mm by 1.5 mm, sub-obtuse at apex. *Stamens*: filaments flattened, *ca.* 2 mm long; anthers 4-5 mm long; tubules 1-1.2 cm long, curved with 2 minute spurs, opening by elongate pores. *Style* 1.7-1.9 cm long, curved at the upper part, glabrous; stigma capitate, *ca.* 1.5 mm in diam.; disk glabrous.

Fruits pale green, 5 by 4 mm when young. Fig. 2D.

Thailand.— SOUTH-WESTERN: Phetchaburi (Kaeng Krachan).

Distribution.— India (type).

Ecology.— On tree branch in evergreen forest, alt. 960 m.

Phenology.— Flowering and fruiting in March.

Specimens examined.— *D. Middleton et al.* 1799 (BKF, K), *S. Watthana* 2321 (QBG).

**11. *Agapetes thailandica*** Watthana, Edinb. J. Bot. 58(3): 423. 2001.—*Agapetes variegata* auct. non (Roxb.) D. Don ex G. Don: J.F. Maxwell, Nat. Hist. Bull. Siam Soc. 37(2): 183. 1989. Type: Thailand, Chiang Mai, Chom Thong, Doi Song Mea, epiphytic shrub on tree branch in mountain forest, alt. 1,500 m, *S. Watthana*, *P. Suksathan* & *G. Argent* 587 (holotype QBG!; isotype E!).

Epiphytic shrub to 1 m high, with thickened roots, entirely glabrous. Leaves spiral, oblong, oblong-elliptic, oblong-lanceolate to lanceolate, 6-15 by 2.6-6 cm, apex obtuse to retuse, base cuneate, margin revolute; midrib subprominent above, prominent beneath; veins 8-10 on each side, anastomosing near the margin and sometimes forming a weak intramarginal vein; petiole thickened, 2-4 mm long. Flowers solitary or fasciculate on old branches; bracts 0.5 mm long, elliptic, ciliate; pedicel filiform, 2-2.8 cm long, not articulated with the calyx. Calyx tube 1.5-2 by 1.5-2 mm; calyx limb 1-1.5 mm long; calyx lobes triangular, ca. 1 mm long, acute

at apex. Corolla at first solid bright red with green lobes, the lobes turning red with age, tubular but slightly swollen in the distal half, 20-25 by 4-6 mm; lobes triangular, each 1.0-1.5 mm long. Stamens: filaments free, flattened, 1.5-1.7 cm long, white; anthers 4-5 mm long, with 2 recurved spurs, 1-1.2 mm long; tubules 4.0-5.0 mm long, opening by elongate pores or slits. Style white, apex greenish, 2.1-2.5 cm long; stigma truncate, green. Fruits up to 1.5 cm diam., glaucous. Seeds flattened, ellipsoid, ca. 2 mm long, 1.0 mm broad. Fig. 2E.

Thailand.— NORTHERN: Mae Hong Son (Khun Yuam, Pai), Chiang Mai (Chom Thong, Doi Inthanon, Doi Suthep, Doi Chiang Dao).

Distribution.— Endemic.

Ecology.— On trees in montane forest, alt. 1,500 m.

Phenology.— Flowering November-February.

Vernacular.— Prathat Suthep (ประพัตต์สุเทพ).

Specimens examined.— *J.F. Maxwell* 87-1623 (CMU), 95-656 (CMU); *S. Watthana*, *P. Suksathan* & *G. Argent* 587 (E, QBG).

**12. *Agapetes variegata* (Roxb.)** D. Don ex G. Don, Gen. Hist. 3: 862, 1834.—*Ceratostema variegatum* Roxb., Hort. Beng.: 33. 1814 (*nom. nud.*); Fl. Ind. 2: 413. 1832. Type: Bangladesh, *Roxburgh Icones* 2247.

*Thibudia macrantha* Hook., Curt. Bot. Mag. 77: t 4566. 1851.—*Vaccinium variegatum* Kurz var. *macranthum* (Hook.) Kurz, J. Asiat. Soc. Beng., Pt. 2, Nat. Hist. 42(2): 84. 1873.—*Agapetes macranthum*

(Hook.) Hook.f. in Benth. & Hook.f., Gen. Pl. 2: 571.1876. —*A. variegata* (Roxb.) D. Don ex G. Don var. *macrantha* (Hook.) Airy Shaw, Kew Bull. 1948: 89. 1948. Type: Burma (Myanmar), Moulmain, Curt. Bot. Mag. 77: t 4566. 1851.

Epiphytic shrub up to 2 m high, with elongate woody tubers; branches glabrous. *Leaves* pseudovercillate, elliptic to elliptic-oblong, 8-15 by 2-5 cm, base obtuse, apex acute to acuminate, margin revolute; midrib prominent near the base above, prominent beneath; veins 10-13 on each side, anastomosing near the margin; petiole thickened, 2-3 mm long, flattened above. *Inflorescence* axillary corymbose or fasciculate; peduncle and rachis very short, glabrous; floral bracts 1-1.5 mm long, triangular, apex acute; pedicel filiform, 1.8-2.3 cm long, articulate at both ends. *Calyx* 5-6 mm long, glabrous; calyx tube ca. 4 by 4 mm (2-2.5 by 2-2.5 mm when dried); calyx limb 3-4 mm long; calyx lobes triangular, 2-3.5 by ca. 2 mm, subacute with a terminal gland. *Corolla* tubular slightly swollen at the distal part, red with dark streaks, 3.5-5 by 1.0-1.6 cm; lobes triangular, each 8-10 mm long, 4 mm broad. *Stamens* 3.8-4.8 mm long; filaments 5-6 mm long, flattened, curved, hairy on the outer; anthers 5-7 mm long, granular, hairy on the outer side; tubules 3.2-3.8 cm long, without spurs, opening by elongate pores or slits. *Style* 4.2-4.8 cm long; stigma truncate; disk glabrous. Young fruits up to 1 cm in diam. Fig. 2F.

Thailand.— SOUTH-WESTERN: Kanchanaburi (Sangkhlá); PENINSULAR:

Ranong (Khao Pha Mi), Suratthani (Khao Sok), Phangnga (Sri Phangnga).

Distribution.— Bangladesh (type), Myanmar.

Ecology.— On trees in evergreen forest, alt. 200-900 m.

Phenology.— Flowering in August.

Vernacular.— Prathad yai (ประทัดใหญ่).

Specimens examined.— *C.F. van Beusekom* & *C. Phengklai* 441 (BKF); *C. Phengklai et al.* 2921 (BKF); *S. Watthana* 717 (QBG).

Notes.— This species is similar to *A. grandiflora* Hook.f. but that species has spurs on the stamens.

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FIGURE 1. A. *Agapetes bracteata* Hook.f. ex C.B. Clarke (Photo by Henrik Æ. Pedersen); B-D. *A. hosseana* Diels; E. *A. inopinata* Airy Shaw; F. *A. lobbii* C.B. Clarke; G. *A. loranthiflora* D. Don ex G. Don var. *loranthiflora*; H. *A. macrostemon* (Kurz) C.B. Clarke



FIGURE 2. A. *Agapetes megacarpa* W.W. Sm.; B. *A. parishii* C.B. Clarke; C. *A. saxicola* Craib; D. *A. setigera* D. Don ex G. Don var. *verticillata* Wall. ex C.B. Clarke; E. *A. thailandica* Watthana; F. *A. variegata* (Roxb.) D. Don ex G. Don