

## Taxonomic notes on the genus *Alphonsea* (Annonaceae) in Thailand

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### ABSTRACT

The following four species in the genus *Alphonsea* (Annonaceae) are new records for Thailand: *Alphonsea glandulosa*, *A. kingii*, *A. lucida* and *A. malayana*. *Alphonsea lutea* var. *longipes* is reduced to a taxonomic synonym of *A. glandulosa*. The reinstatement of *A. pallida* is proposed and explained. Complete descriptions are provided here for both *A. pallida* and *A. siamensis* following the recent discovery of the fruits of the former and the flowers of the latter. Descriptions of all taxa with notes on their distribution, ecology, vernacular names and photographs are also provided.

KEYWORDS: Miliuseae, new record, reinstatement, taxonomy.

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### INTRODUCTION

The genus *Alphonsea* Hook.f. & Thomson (Annonaceae) comprises 23 to 34 species distributed in India, Sri Lanka, Bangladesh, Myanmar, China, Thailand, Laos, Cambodia, Vietnam, Malaysia, Indonesia, Papua New Guinea and the Philippines. (Kessler, 1995; Chatrou *et al.*, 2012; Turner, 2018). The genus is, in contrast to many other genera of the family, easily recognizable by its flower structure, having petals with a saccate base and a reflexed apex at anthesis, miliusoid stamens and multi-seeded monocarp (Kessler, 1995; Mols *et al.*, 2004).

In Thailand, six to 12 species of this genus have been reported (Craib, 1925; Kessler, 1995; Pooma & Sudddee, 2014; Turner, 2018). However, in preparing the *Alphonsea* account for the Flora of Thailand, we discovered four species new to the flora and a new synonym of *A. glandulosa* Y.H.Tan & B.Xue. In addition, we provide, for the first time, complete descriptions of *A. pallida* Craib and *A. siamensis* Kessler, and propose that *A. pallida* should be reinstated as a distinct species.

### MATERIALS AND METHODS

We made fresh field collections in Thailand

and also examined specimens from the following herbaria: AAU, ABD, BCU, BK, BKF, BM, C, CAL, CAS, CMU, CMUB, E, K, KKU, L, OWU, P, PSU, QBG, US and WAG (herbarium acronyms follow Thiers, 2019). Most type specimens cited have been seen, indicated in the text by !; types not seen are indicated by *n.v.* (non vide).

### TAXONOMIC TREATMENT

***Alphonsea glandulosa*** Y.H.Tan & B.Xue, PLoS ONE 12(2): e0170107(11). 2017. Type: China, Yunnan, 7 Apr. 2016, *Y.H.Tan 10145* (holotype **HITBC!**; isotypes **IBSC n.v.**, **KUN n.v.**).—*A. lutea* Hook.f. & Thomson var. *longipes* Craib, Bull. Misc. Inform. Kew 1922: 169. 1922; Craib, Fl. Siam. 1(1): 62. 1925; Kessler, Bot. Jahrb. Syst. 118(1): 103. 1995, **syn. nov.** Type: Thailand, Prae, Me Song, alt. ca 360 m, 18 Mar. 1920, *Vanpruk 444* (holotype **K** [K000959956!]). Fig. 1A–D.

Tree 9–40 m tall; deciduous, bark brown, greyish-brown or grey. Twigs lenticellate, densely brown appressed hairs when young, later glabrous, often with ridges extending along the twig from petiole base. Leaves subcoriaceous to chartaceous, lanceolate, elliptic, oblong-lanceolate, broadly ovate

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or ovate, 4–18 by 1.5–8 cm, base cuneate or slightly rounded, apex acuminate or acute, the acumen 2–15 mm long, margins entire, revolute, adaxial surface slightly shiny, glabrous, midrib sunken, sometime with brown pubescent hairs; abaxial surface glabrous or sparsely brown appressed pubescent, with densely brown or orangish-brown glands, secondary veins 7–12 per side, petiole 2–5 mm long, moderately brown pubescent, transversely densely striate. *Inflorescences* extra-axillary or leaf-opposed, 3–13-flowered, peduncle 2–5 mm long, with 3–7 bracts, individual pedicels 6–20 mm long, each bearing a single bracteole near the middle, bracts ovate, 0.8–1.5 mm long, bracteole ovate, 0.8–1.5 mm long, buds conical. *Sepals* brownish-green to brown, connate at base, ovate, 1–2 mm by 1.5–2.5 mm, obtuse, reflexed, hairy outside, glabrous insides. *Outer petals* greenish-yellow to yellow, ovate or ovate-triangular, 8–12 by 5–7 mm, apex obtuse or acute, densely hairy outside, moderately hairy inside; inner petals greenish-yellow to pale whitish-yellow, ovate-triangular or ovate, 7.5–11 by 4.5–7 mm, apex obtuse, hairy outside, glabrous except hairy at apex, with glandular tissue near the base, apparent as a transverse ridge inside. *Stamens* 25–35, oblong, 0.8–1 mm long. *Carpels* 4–7, ovary ellipsoid-oblong, 2–3 mm long, hairy, stigma U-shaped, 0.5–0.8 mm long. *Torus* conical. *Fruit* of 4–6 monocarps borne on a pedicel 1–3 cm long. *Monocarps* green when young, turning dark yellow, ovoid, ellipsoid-ovoid or subglobose, smooth, densely brown pubescent, 2–3.5 by 1.7–3 cm, apex rounded, with a longitudinal groove at abaxial side, sometimes constricted between seed, base contracted into a stipe 2–10 mm long. *Seeds* 6–13 per monocarp, ellipsoid-reniform, 1–1.5 by 0.5–0.8 cm, smooth.

Thailand.—NORTHERN: Chiang Rai [Mae Sai, Tham Luang-Khun Nam Nang Non Forest Park, alt. 505 m, 27 Mar. 2012, *Norsaengsri & Tathana 9247* (BKF, QBG); *ibid.*, alt. 602 m, 10 July 2012, *Norsaengsri & Tathana 9708* (QBG); Doi Luang NP, 31 Mar. 2015, *Norsaengsri 11996* (QBG); *ibid.*, 5 May 2015, *Norsaengsri 12244* (QBG)]; Mae Hong Son [alt. 500 m, *Geesink et al. 5957* (L, P)]; Phrae [Mae Song, alt. 300 m, 18 Mar. 1920, *Vanpruk 444* (K); *ibid.*, *Vanpruk 997* (BKF); *ibid.*, alt. 451 m, 30 Apr. 2013, *La-onsri et al. 2833* (QBG)]; Phayao [Phu Sang NP, 25 Mar. 1998, *SC 122* (BKF)]; Muang, Doi Luang NP, alt. 600 m, 8 May 1997, *Maxwell*

*97-492* (BKF, CAS, CMUB, L); *ibid.*, alt. 600 m, 28 May 1997, *Gardner & Sidisunthorn 2157* (CAS, CMUB, L); *ibid.*, alt. 400 m, 6 May 2002, *Chalermglin 450506* (L)]; Nan [Tham Sakoen NP, alt. 722 m, 15 July 2012, *La-onsri et al. 2405* (QBG)]; Lamphun [Doi Khun Tan NP, alt. 1025 m, 4 April 1994, *Maxwell 94-454* (CAS, CMUB, L)]; Lampang [Wang Nuea, Doi Luang NP, alt. 600 m, 25 Mar. 1977, *Maxwell 97-219* (BKF, CMUB, L); *ibid.*, 10 July 1997, *Maxwell 97-716* (BKF, CMUB, L); *ibid.*, alt. 400 m, 10 April 1999, *Chalermglin 420410* (L)]; Chae Sorn NP, alt. 650 m, 28 April 1996, *Maxwell 96-640* (BKF, CMUB); *ibid.*, 2 June 1996, *Maxwell 96-784* (BKF, CAS, CMUB)]; Sukhothai [Srisatchanalai NP, 1 Apr. 2015, *Maknoi 7668* (QBG)]; NORTH-EASTERN: Phetchabun [Nam Nao NP, alt. 900 m, 17 Apr. 2002, *Chalermglin 450417* (L); *ibid.*, 28 May 2013, *Maknoi 5553* (QBG); *ibid.*, Phu Pha Chit, 11 Apr. 2014, *Maknoi 6847* (QBG); *ibid.*, 18 June 2014, *Maknoi 7006* (QBG)]; Loei [Phu Luang NP, June 1968, *Bunchuai 1678* (BKF); *ibid.*, alt. 885 m, 27 May 2009, *Norsaengsri & La-onsri 5603* (QBG)]; Phukradueng, Phanok Khao, 1 Mar. 2011, *Norsaengsri et al. 7754* (QBG); *ibid.*, alt. 348 m, 21 Feb. 2019, *Leeratiwong & Chalermglin 19-1416* (PSU)]; EASTERN: Chaiyaphume [Khon San, Chulaphorn dam, alt. ca 800 m, 20 July 2007, *Wongprasert 077-4* (BKF); *ibid.*, alt. 850 m, 20 June 2003, *Wongprasert 036-25* (BKF)]; Nam Phrom dam, alt. 650 m, 25 Mar. 1980, *Smitinand & Santisuk s.n.* (BKF)]; Nakhon Ratchasima [Khao Yai NP, alt. 800 m, 30 Nov. 1994, *Smitinand s.n.* (BKF)]; SOUTH-WESTERN: Uthai Thani [Huay Kha Kgaeng WS, 5 May 2002, *Khoonchampa & Thongpukdee s.n.* (L)]; Kanchanaburi [Khwaeng Noi Basin, alt. 200 m, 30 May 1946, *Kostermans 773* (BK, L, P, SING)]; Srisawat, Than Lot Noi cave, alt. 565 m, 29 June 2017, *La-onsri et al. 5224* (QBG)]; CENTRAL: Nakhon Nayok [Muang, Khao Yai NP, alt. 790 m, 30 June 2002, *Boonkongchart 137* (BKF, CMUB, L); *ibid.*, alt. 825 m, 13 Mar. 2002, *Maxwell 02-91* (BKF, CMU, CMUB, L); *ibid.*, alt. 600 m, 16 Dec. 2006, *Maxwell 06-981* (QBG); *ibid.*, alt. 760 m, 24 Mar. 1994, *Brockelman 65* (CMUB); *ibid.*, *Panpeng s.n.* (CMUB); *ibid.*, alt. 760 m, 16 May 1998, *Charoenchai 631* (BKF, CAS, CMUB, L)].

Distribution.— China.

Ecology.— Scattered on shaded or streamside

areas in tropical rain, dry evergreen, hill evergreen or mixed deciduous forest; limestone hill in dry dipterocarp forest; alt. 400–1,025 m; Flowering: December–May; fruiting: April–July

Vernacular.— Cha fang (จำผาง).

Note.— Examination of the type specimens of *Alphonsea glandulosa* and *A. lutea* var. *longipes* shows that these taxa are conspecific, both having inner petals with a transversely glandular ridge on the inner base. Therefore, *A. lutea* var. *longipes* is treated to be a synonym under *A. glandulosa*. In addition, this species is found in China and is recorded for the first time in Thailand, where it occurs in all floristic regions except the South-East and the Peninsular.

**Alphonsea kingii** J.Sinclair, Gard. Bull. Singapore 14: 386. 1955; Kochummen in Whitmore, Tr. Fl. Malaya 1: 67. 1972; Kessler, Bot. Jahrb. Syst. 118(1): 103. 1995. Type: Malaysia, Perak, Kinta, Jan. 1885, *King's Collector [Kunstler] 7097* (lectotype CAL [CAL0000025047!], selected by Turner, 2016; isolectotypes CAL [CAL000025046!], K [K000959957!]. Fig. 1E–G.

Tree, small tree or shrub 1.5–15 m tall; bark brownish-black to brown. *Twigs* lenticellate, moderately covering with brown appressed hairs when young, later glabrous to sparsely hairy, often with ridges extending along the twig from the petiole base. *Leaves* subcoriaceous to chartaceous, elliptic, lanceolate, lanceolate-elliptic, oblong-lanceolate, ovate-elliptic or rarely ovate, 3–13 by 2–6 cm, base rounded, slightly cordate or cuneate, apex acute, acuminate or obtuse, the acumen 0–20 mm long, margins entire, adaxial surface shiny, glabrous or sometimes with very sparsely brown hairs at midrib, midrib flattened to slightly sunken, abaxial surface glabrous except with sparse hairs on midrib or margins, secondary veins 6–13 per side, petiole 2.5–4 mm long, moderately to sparsely brown hairy, with shallow grooves. *Inflorescences* extra-axillary or leaf-opposed, 1–10-flowered, peduncle 1.5–4 mm long, with 1–4 bracts, individual pedicels 5–13 mm long, each bearing a single bracteole near to the middle, bracts ovate, 0.5–2 mm long, bracteole ovate, 0.5–1.5 mm long, buds conical. *Sepals* brown to brownish-green, connate at base, broadly ovate, 1–2 mm by 1.5–2 mm, obtuse, reflexed, hairy outside, glabrous inside. *Outer petals* greenish-yellow or whitish-yellow,

triangular-ovate, 5.5–14 by 3.5–8 mm, apex obtuse to slightly acute, hairy outside, hairy to glabrous at base inside; inner petals greenish-yellow to pale whitish-yellow, triangular-ovate, 6–13 by 3–7 mm, apex obtuse or slightly acute, hairy outside, glabrous or particularly hairy at apex inside. *Stamens* 15–35, oblong-elliptic to elliptic, 0.8–1.5 mm long. *Carpels* (2–)3–5, ovary oblong, 1.8–2.5 mm long, hairy, stigma U-shaped, 0.3–0.8 mm long. *Torus* conical. *Fruit* of 1–4 monocarps borne on a pedicel 1–3 cm long. *Monocarps* green when young, turning yellow, cylindrical, ellipsoid or ovoid-ellipsoid, with slightly verrucose to verrucose surface, glabrous or with sparse brown hairs, 2–5 by 1.2–2.5 cm, apex rounded, sometimes with a longitudinal ridge at abaxial side, base contracted into a stipe 0.2–1.5 cm long. *Seeds* 2–8 per monocarp, ellipsoid-ovoid or reniform-ovoid, 0.8–2 by 0.7–1.5 cm, smooth.

Thailand.— SOUTH-WESTERN: Prachuap Khiri Khan [Sam Roi Yot, alt. 300 m, 5 May 1974, *Larsen & Larsen 33616* (AAU, L)]; PENINSULAR: Phangnga [Muang, alt. 50m, 22 Apr. 2006, *Gardner & Sidisunthorn ST2609* (L, QBG)]; Nakhon Si Thammarat [2 Mar. 1957, *Thaworn 959* (BKF)]; Phatthalung [Ko Si-Ko Ha Island, alt. ca 50 m, 12 Apr. 1928, *Kerr 15150* (AAU, BK, BM, L)]; Chai Ya Buri park, Pa Phrayom, alt. 245 m, 23 Oct. 2018, *Leeratiwong 18-1408* (PSU); *ibid.*, 1 Mar. 2019, *Leeratiwong 19-1406* (PSU); *ibid.*, 27 May 2019, *Leeratiwong 19-1423* (PSU); Khao Chiak, Muang, alt. 179 m, 8 Mar. 2019, *Leeratiwong 19-1407* (PSU)]; Songkhla [Rattaphum, Khao Rak Kiat, alt. 56 m, 2 May 2018, *Leeratiwong 18-1410* (PSU); *ibid.*, 3 July 2018, *Leeratiwong 18-1426* (PSU); *ibid.*, 8 Feb. 2018, *Leeratiwong 19-1412* (PSU); *ibid.*, 29 Mar. 2019, *Leeratiwong 19-1411, 19-1413* (PSU); *ibid.*, 9 May 2019, *Leeratiwong 19-1427* (PSU)].

Distribution.— Malaysia (type)

Ecology.— Scattered on limestone hill in dry evergreen forest; shaded areas in tropical rain forest; alt. 40–380 m; flowering: February to August; fruiting April to October.

Vernacular.— Tam yao khao rak kiat (ตำหยายเขารักเกียรติ)(General).

Note.— *Alphonsea kingii* is distinguished by its verrucose to slightly verrucose monocarp covering with or without hairs. It was formerly known only from Malaysia (Sinclair, 1955; Turner, 2016; Turner

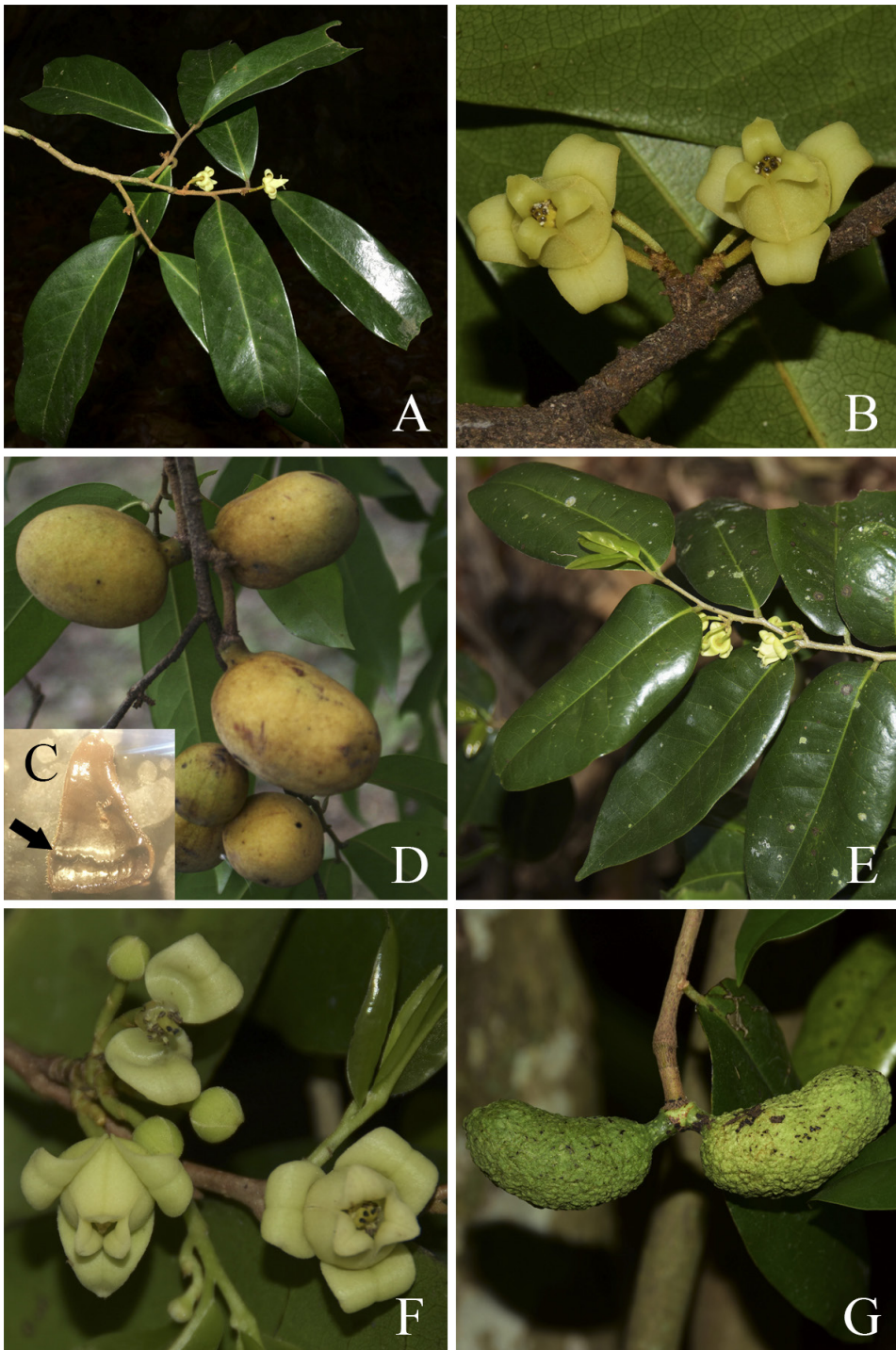


Figure 1. *Alphonsea glandulosa* Y.H.Tan & B.Xue: A. flowering branch, B. flowers, C. inner petal with glandular ridge (arrow) near the base on inside surface, D. monocarps; *A. kingii* J.Sinclair: E. flowering branch, F. flowers, G. monocarps. Photos by C. Leeratiwong (A–C, E–G) and P. Chalermglin (D).

& Utteridge, 2017; Turner, 2018), but it is newly reported here for Thailand, extending its range into the south-western and peninsular regions of the country.

**Alphonsea lucida** King, J. Asiat. Soc. Bengal, Pt. 2 Nat. Hist. 61(1): 126. 1892; Ridl., Fl. Malay Penins. 1: 98. 1922; J. Sinclair, Gard. Bull. Singapore 14(2): 387. 1955; Kochummen in Whitmore, Tr. Fl. Malaya 1: 67. 1972; Kessler, Bot. Jahrb. Syst. 118(1): 94. 1995. Type: Malaysia, Perak, Larut, Jan. 1884, *King's Collector* [H.H. Kunster] 5387 (lectotype CAL [CAL0000004701!], selected by Kessler, 1995; isolectotypes BM [BM000946057!], G n.v., K [K000574900!]). Fig. 2A–B.

Tree 8–15 m tall; bark blackish-brown. *Twigs* lenticellate, sparsely covered with brown appressed hairs when young, later glabrous to sparsely hairy, often with ridges extending along the twig from the petiole base. *Leaves* chartaceous to subcoriaceous, elliptic, broadly elliptic, lanceolate or lanceolate-elliptic, 6–17 by 2–6.5 cm, base cuneate, apex acuminate or acute, the acumen 3–12 mm long, margins entire; adaxial surface glabrous, shiny, midrib slightly sunken to flattened; abaxial surface glabrous except with sparsely brown pubescent at midrib, secondary veins 8–14 per side, petiole 5–8 mm long, sparsely hairy, with rugose surface. *Inflorescences* extra-axillary, 1–3-flowered, peduncle 1.5–3 mm long, with 1–4 bracts, individual pedicels 6–8 mm long, each bearing a single bracteole near to the tip, bracts ovate, 0.5–1 mm long, bracteole ovate, 0.8–1 mm long, buds broadly conical. *Sepals* brownish-green, connate at base, ovate, 2–3 mm by 2.5–3.5 mm, obtuse, reflexed, hairy outside, glabrous insides. *Outer petals* greenish-yellow or yellow, triangular-ovate or ovate, 11–13 by 4.5–6 mm, apex obtuse, hairy both sides; inner petals greenish-yellow to pale whitish-yellow, ovate-triangular or triangular-elliptic, 12–14 by 4.5–5 mm, apex obtuse to slightly acute, hairy outside, glabrous to sparsely hairy at apex inside. *Stamens* 30–40, ovate to elliptic, 0.8–1.5 mm long. *Carpels* 2–3, ovary elliptic-oblong or oblong, 2.5–3 mm long, hairy, stigma U-shaped, 0.5–0.8 mm long. *Torus* conical. *Fruit* of 1–3 monocarps borne on a pedicel 0.5–1.5 cm long. *Monocarps* green when young, colour at maturity unknown, subglobose to ellipsoid-globose, very verrucose, densely brown hairy, 1.5–4.5 by 2.2–3.5 cm, apex rounded, base

contracted into a stipe 5–10 mm long. *Seeds* 6–8 per monocarp, ellipsoid, ca 2 cm long, smooth.

Thailand.— PENINSULAR: Pattani [Khao San Kala Khiri, alt. ca 500 m, 3 Apr. 1928, *Kerr 15015* (BM, K, L)]; Narathiwat [Ba Cho, alt. ca 400 m, 3 July 1923, *Kerr 7170* (BK, BM, K, L)].

Distribution.— Malaysia (Perak, type).

Ecology.— Scattered on tropical rain forest; alt. 400–500 m; flowering: January to March; fruiting: April to July.

Vernacular.— Tam yao pak tai (ตำหยาวปักชัใต้) (General).

Note.— *Alphonsea lucida* is similar to *A. johorensis* J. Sinclair from Malaysia, but differs in having 1–2 monocarp in fruit (vs 3–6 monocarps in *A. johorensis*) and monocarps 2.2–3.5 cm wide (vs ca 1.5 cm in width in *A. johorensis*). The Thai specimens have narrower petals, 4.5–6 mm (vs ca 8 mm) and fewer carpels, 2–3 (vs 6 carpels) than the specimens of *A. lucida* from Malaysia. This species is a new record for Thailand and is only known from two collections from Pattani and Narathiwat Provinces.

**Alphonsea malayana** Kessler, Bot. Jahrb. Syst. 118: 97. 1995. Type: Malaysia, Selangor, 8th mile, Genting Highlands road, 17 Mar. 1976, *Kochummen FRI 23183* (holotype L [L0180172!]; isotypes K [K000574894!], **KEP!**). Fig. 2C–D.

Small tree or tree 8–12 m tall; bark greyish-brown. *Twigs* lenticellate, glabrous to sparsely brown appressed hairs when young, later glabrous, often with ridges extending along the twig from the petiole base. *Leaves* subcoriaceous, lanceolate, lanceolate-elliptic or elliptic, 2.5–10 by 1–3.5 cm, base cuneate, apex acuminate or acute, the acumen 2–10 mm long, margins entire, not reflexed, adaxial surface not shiny, glabrous, midrib slightly sunken; abaxial surface glabrous or sometimes with very sparsely appressed hairy at midrib, secondary veins 5–10 per side, petiole 2–5 mm long, sparsely hairy. *Flowers* not seen. *Fruit* of 1 monocarp borne on a pedicel 1 cm long. *Monocarps* green or greyish green when young, colour at maturity unknown, ovoid to subglobose, slightly verrucose, with very sparsely brown hairs or glabrous, 1.8–4 by 1.3–3 cm, apex rounded or mucronate, base contracted into a stipe 3–6 mm long. *Seeds* not seen.

Thailand.— PENINSULAR: Satun [La-ngu, Tarutao NP, alt. 50–950 m, 31 Mar. 2006, *Gardner ST2533* (BKF, L, QBG)]; Yala [Betong, Hala-Bala WS, alt. 950 m, 22 May 2005, *Middleton et al. 3574* (BKF)].

Distribution.— Malaysia (Selangor, type).

Ecology.— Scattered on tropical rain forest or the edge areas between mangrove and lowland forests; alt. 50–950 m; unknown in flower; fruiting: March to May.

Vernacular.— Tam yao malay (ตำยาหมาเลย์) (General).

Note.— *Alphonsea malayana* closely resembles *A. pallida*. Nevertheless, it is different from the latter in having ovoid to subglobose monocarps with a slightly verrucose surface and not constricted between seeds (vs cylindrical or ellipsoid monocarps with a smooth surface and constrictions between the seeds). A newly recorded species for Thailand, it is only found in the Peninsular region in Satun and Yala Provinces.

*Alphonsea pallida* Craib, J. Nat. Hist. Soc. Siam 6: 45. 1923 & Fl. Siam. 1(1): 63. 1925. Type: Thailand, Nakhon Si Thammarat, Khao Rum, alt. 360 m,

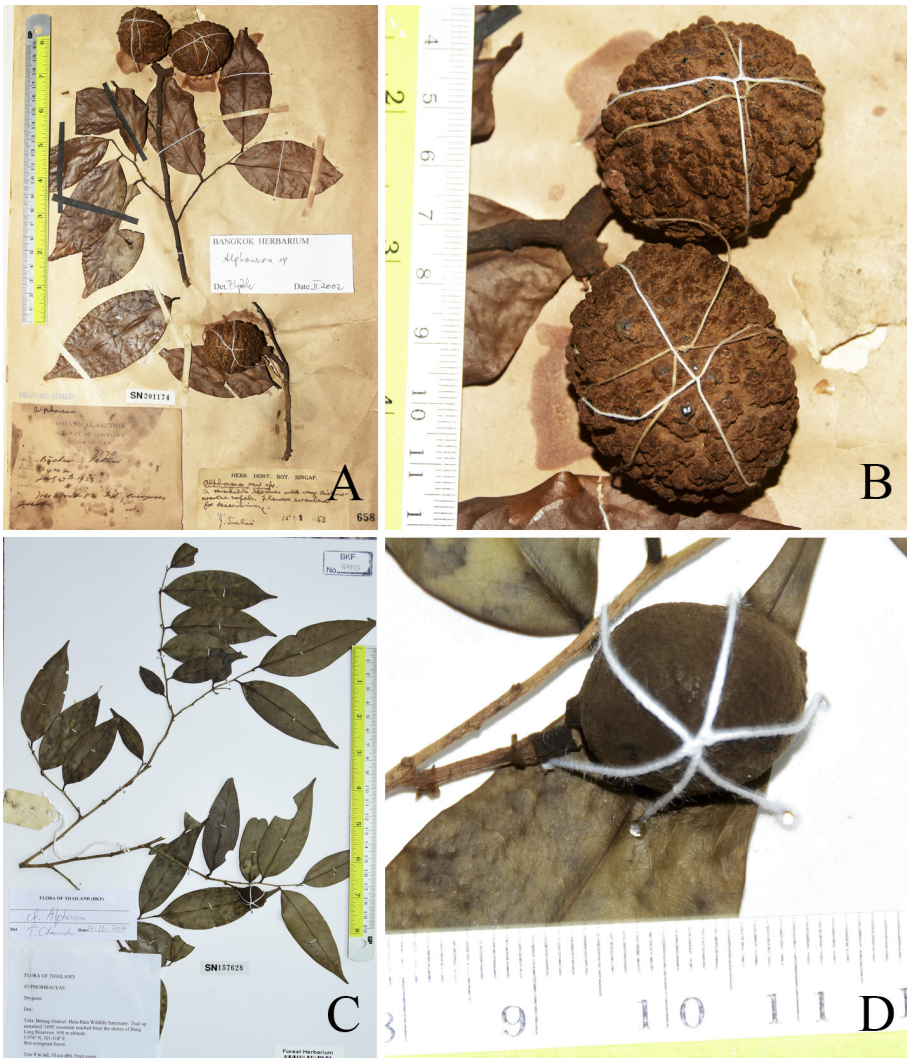


Figure 2. *Alphonsea lucida* King: A. fruiting branch, B. monocarps; *Alphonsea malayana* Kessler: C. fruiting branch, D. monocarps. Photos by C. Leeratiwong (A–D); A–B from Kerr 7170 (BK); C–D from Middleton et al. 3574 (BKF).

Feb. 1922, *Smith 622* (holotype **K** [K000574893!]; isotypes **ABD n.v.**, **BK** [BK257656!]). Fig. 3A–B.

Small tree or tree 6–20 m tall; bark dark brown. *Twigs* lenticellate, with brown or greyish-brown appressed hairs when young, later glabrous often with longitudinally striate ridges. *Leaves* coriaceous, lanceolate, elliptic, elliptic-lanceolate, broadly elliptic or ovate-lanceolate, 4–14 by 1.3–5.5 cm, base cuneate, apex acute or acuminate, the acumen 2–10 mm long, margins entire, sometimes slightly revolute; adaxial surface shiny, glabrous, midrib flattened or slightly sunken; abaxial surface glabrous, sometimes sparsely hairy on midrib, secondary veins 7–14 per side, petiole 2–5 mm long, moderately to sparsely brown hairy, wrinkled. *Inflorescences* extra-axillary, 1–4-flowered, peduncle 3–5 mm long, with 1–3 bracts, ovate, 0.5–1 mm long, individual pedicels 5–13 mm long, slender, each bearing a single bracteole near the base, bracteole ovate, 0.5–1 mm long, buds conical. *Sepals* greenish-yellow or green, connate at middle, ovate, 0.8–1 by 0.8–1.2 mm, obtuse, sparsely hairy outside, glabrous inside. *Outer petals* pale whitish-yellow or yellow, triangular-ovate, 8–15 by 4–6.5 mm, apex acute to obtuse, moderately hairy outside, glabrous to sparsely hairy at apex inside; inner petals yellow or pale whitish-yellow, lanceolate-triangular, 8.5–15 by 3.5–6 mm, apex acute or obtuse, densely grey hairy at margins and upper part and glabrous at lower part outside, glabrous or sparsely hairy at apex inside. *Stamens* 18–25, oblong, 0.8–1.5 mm long. *Carpels* 1–2, ovary oblong, 2–3 mm long, densely grey-hairy, stigma U-shaped, 0.2–0.5 mm long. *Torus* conical. *Fruit* of 1–(2) monocarps borne on a pedicel 1–1.5 cm long, slender. *Monocarps* green when young, turning yellow, cylindrical or ellipsoid, constricted between seeds, smooth, sparsely to moderately appressed short pubescent, 2–4 by 1–1.5 cm, apex rounded to mucronate, base contracted into a stipe 3–7 mm long. *Seeds* ca 5, reniform-ellipsoid, 6–8 by 4–5 mm, brown.

Thailand.—PENINSULAR: Nakhon Si Thammarat [Khao Rum, alt. 360 m, Feb. 1922, *Smith 622* (**ABD**, **BK**, **K**); Khao Luang, alt. ca 600 m, 21 Oct. 1951, *Smitinand 973* (**BKF**, **K**); *ibid.*, alt. ca 400 m, 28 Apr. 1928, *Kerr 15427* (**BK**, **BM**, **K**); *ibid.*, alt. 660 m, 24 Mar. 1955, *Snan 55* (**BKF**); Kiriwong, Khao Luang, alt. 1700 m, 26 Mar. 1955, *Snan 31* (**BKF**); Na Bon, Khao Maen, alt. 600 m, 8 Feb. 2005, *Williams et al. 1276* (**BKF**); Phi Poon, Khao Luang NP, alt. 470 m, 2 Mar. 2006, *Gardner ST2416* (**BKF**, **L**); *ibid.*, alt.

500 m, 21 June 2019, *Leeratiwong & Chalermglin 19-1428* (**PSU**); Trang [Khao Chong, 14 Jan. 1968, *Sangkhachand 1544* (**BKF**, **L**, **K**, **P**); *ibid.*, 4 Apr. 1967, *Sangkhachand 1837* (**BK**); *ibid.*, 11 Apr. 1969, *Phusomsaeng 112* (**BKF**, **L**, **K**, **P**); *ibid.*, 8 Mar. 1970, *Chermsirivathana & Kasem 1671* (**BK**)].

Distribution.— Endemic to Thailand.

Ecology.— Scattered on tropical rain forest; alt. 360–1,700 m; flowering: February to July; fruiting: March to January.

Vernacular.— Dok mai nang (ดอกไม้หนิง)(General).

Note.— *Alphonsea pallida* was placed as a taxonomic synonym of *A. boniana* Finet & Gagnep. by Kessler (1995). From specimen comparison of *A. pallida* and *A. boniana*, however, we have found characters to distinguish the two species (Table 1). Therefore, we reinstate *A. pallida* as a distinct species here. Craib (1925) described this species based on a flowering collection (*Smith 622* from Nakhon Si Thammarat Province), but he had no information about the fruit. Recently, we collected a fruiting specimen from Phi Poon district, Nakhon Si Thammarat Province and also examined specimens with fruits from the BKF herbarium and are now able to present a full description of fruits and seeds for this species. In addition, photographs and a brief description of both flowering and fruiting plants of this species were published in Gardner *et al.* (2015), where it was identified as *Alphonsea* sp. A.

**Alphonsea siamensis** Kessler, Bot. Jahrb. Syst. 118(1): 100. 1995. Type: Thailand, Chumphon, Bang Son, 8 Mar. 1928, *Put 1463* (holotype **K** [K000574889!]). Fig. 3D–F.

Shrub to tree 3–15 m tall; bark brown, blackish-brown or greyish-brown. *Twigs* lenticellate, sparsely to moderately covered with brown appressed hairs when young, later sparsely pubescent to glabrous, often with ridges extending along the twig from the petiole base. *Leaves* chartaceous to subcoriaceous, elliptic, ovate-elliptic, oblong-elliptic or ovate, 3–12 by 1.5–4.5 cm, base rounded to cuneate, apex acute, acuminate or obtuse, the acumen 0–10 mm long, margins entire; adaxial surface glabrous, except with very sparse brown hairs, shiny, midrib flattened to slightly sunken; abaxial surface glabrous, sometimes with sparse, long, brown pubescence at midrib or margins, secondary veins 7–13 per side, petiole 2–6

Table 1. Morphological comparison of *Alphonsea pallida* and *A. boniana*.

Characters	<i>A. pallida</i>	<i>A. boniana</i>
Abaxial surface of inner petals	having a glabrous patch toward the base	uniformly hairy
Monocarp surface	smooth and having sparse to moderate hairs (Fig. 3B.)	verrucose and having dense hairs (Fig. 3C.)
Monocarp apex	rounded to mucronate	mucronate
Number of seeds per monocarp	ca 5	8–16

mm long, sparsely hairy, with shallow grooves. *Inflorences* extra-axillary or leaf-opposed, 1–5-flowered, peduncle 1.5–3.5 mm long, with 1–3 bracts, individual pedicels 5–15 mm long, each bearing a single bracteole near to the middle or near to base, bracts ovate, 0.5–0.8 mm long, bracteole ovate, 0.8–1 mm long, buds broadly conical. *Sepals* brownish-green, connate at base to middle, broadly ovate, 1.2–2 mm by 1.5–2.5 mm, obtuse, reflexed, hairy outside, glabrous insides. *Outer petals* greenish-yellow or yellow, triangular-ovate or ovate, 11–15 by 6–7 mm, apex obtuse, hairy both sides except glabrous at base inside; inner petals greenish-yellow to pale whitish-yellow, ovate-triangular or triangular-elliptic, 11–14 by 4.5–6.5 mm, apex obtuse to slightly acute, hairy outside, glabrous to sparsely hairy at apex inside. *Stamens* 15–22, ovate, elliptic or oblong-elliptic, 0.8–1.6 mm long. *Carpels* (2–)3–5, ovary oblong or elliptic-oblong, 2–3.5 mm long, hairy, stigma U-shaped, 0.3–0.6 mm long. *Torus* conical. *Fruit* of 3–4 monocarps borne on a pedicel 0.7–2 cm long. *Monocarps* green or greyish green when young, colour at maturity unknown, cylindrical, ellipsoid or ovoid, smooth or slightly verrucose, densely brown hairy (velutinous), 1.5–4 by 1–2 cm, apex rounded, sometimes with a longitudinal groove at lower side, irregularly constricted between seed on dry monocarps, sessile or base contracted into a stipe 2–5 mm long. *Seeds* not seen.

Thailand.— SOUTH-WESTERN: Ratchaburi [Chom Phon cave, 27 Aug. 1999, *Niyomdham* 5799 (BKF); *ibid.*, 3 Aug. 2005, *Chaowasku et al.* 11 (BKF); *ibid.*, alt. 120 m, 25 Feb. 2019, *Leeratiwong & Chalermglin* 19-1414 (PSU); *ibid.*, *Leeratiwong & Chalermglin* 19-1415 (PSU); *ibid.*, 28 Feb. 1965, *Sakol* 411 (BK)]; Phetchaburi [Khao Luang, 11 Mar. 1965, *Sakol* 499 (BK); Kaeng Krachan NP, alt. 370 m, 26 Mar. 2003; *Middleton et al.* 1718 (BKF, E, K, L, OWU); *ibid.*, alt. 380 m, 13 Sept. 2006, *Phonsena et al.* 5223 (BKF, L)]; Prachuap Khiri Khan [Bang

Saphan, 27 Dec. 1927, *Put* 1398 (BK, BM, K, L, P); Kui Buri, alt. 450 m, 23 Jan. 2004, *Middleton et al.* 2413 (BKF, L); Sam Roi Yot, alt. ca 300 m, 12 July 1924, *Kerr* 10942 (BM, K); *ibid.*, 9 May 1974, *Larsen & Larsen* KL 33764 (AAU, K, L); *ibid.*, 3 Dec. 1929, *Put* 2522 (K); *ibid.*, Khao Dang, 2 Aug. 2005, *Chaowasku et al.* 9 (BKF)]; CENTRAL: Saraburi [Khao Khaow, alt. ca 150 m, 5 Mar. 1965, *Smitinand & Phengklai* 8652 (BKF)]; SOUTH-EASTERN: Sa Kaeo (Kabin Buri, alt. ca 50 m, 24 Dec. 1924, *Kerr* 9758 (BK, K)]; PENINSULAR: Chumphon [Bang Son, 8 Mar. 1928, *Put* 1463 (K)]; Surat Thani [Samui, alt. 52 m, 14 Apr. 2018, *Leeratiwong* 18-1425 (PSU)]; Krabi [Muang, Tham Sua temple, alt. 250 m, 29 Mar. 2005, *Sidisunthorn* ST1780 (BKF, L, QBG); Khao Phanom, alt. ca 100 m, 25 Mar. 1930, *Kerr* 18650 (AAU, K, L); 24 Mar. 2008, *Chamchumroon et al.* VC2541 (BKF)].

Distribution.— Endemic to Thailand.

Ecology.— Scattered on limestone or sandstone hills in dry evergreen or mixed deciduous forest; alt. 50–450 m; flowering: December–April; fruiting: February–June.

Vernacular.— Chan khao (จันทขาว)(Sa Kaeo); tam yao sayam (ตำหยาวสยาม)(General).

Note.— *Alphonsea siamensis* was described by Kessler (1995), but the description of the species was not complete, because flowering material was unknown. During fieldwork at Chom Phon cave in Ratchaburi Province in February 2016, the complete flowers of this species were found. Therefore, a full description is presented here that agrees with the brief description and photos of the flower in this species shown by Gardner *et al.* (2015). The species is endemic to Eastern, South-Western, Central, Southern-Eastern and Southern floristic regions of Thailand. This species is characterised by having velutinous monocarps with irregular constrictions between the seeds in the dry condition.



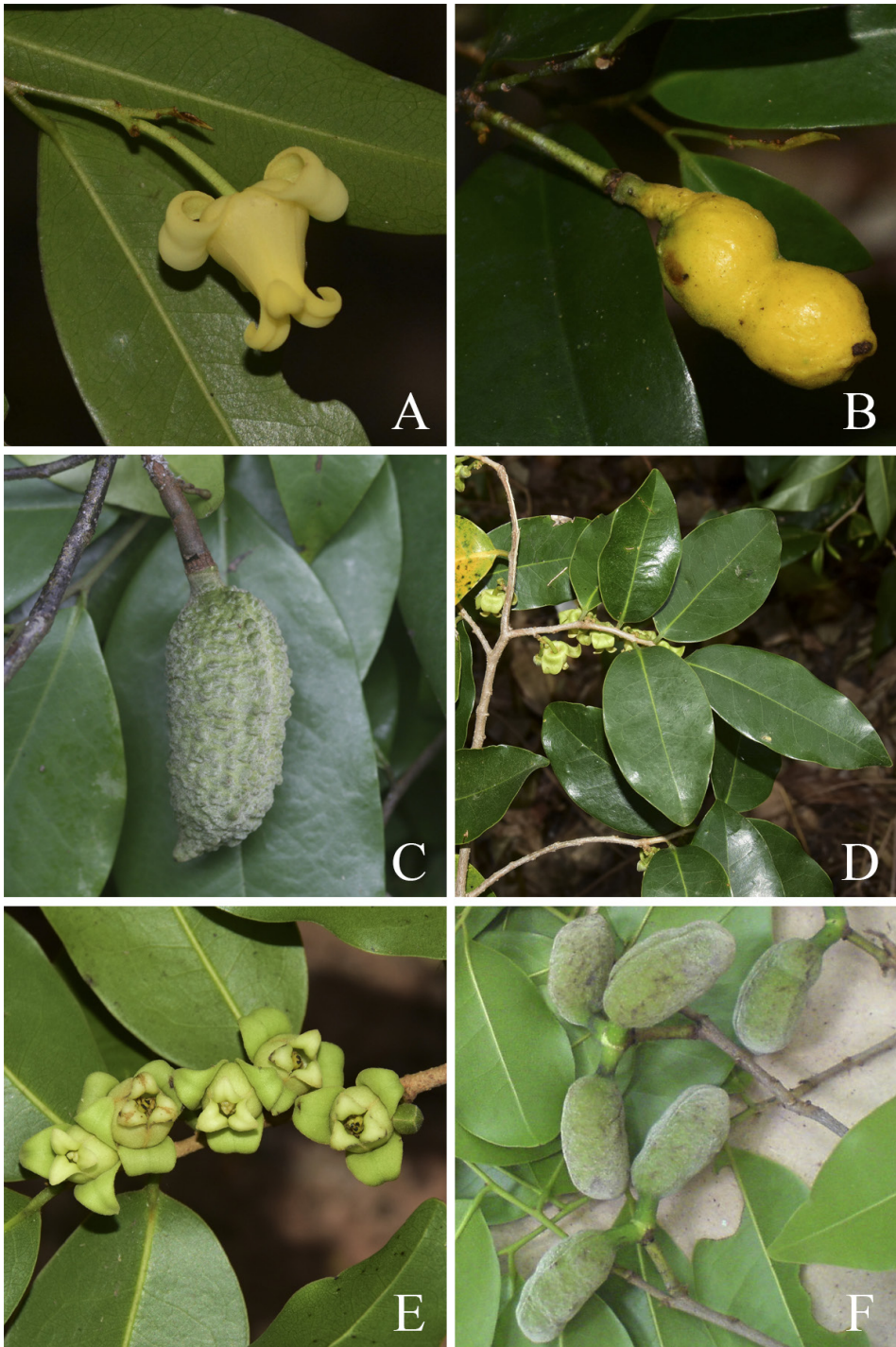


Figure 3. *Alphonsea pallida* Craib: A. flower, B. monocarp; *A. boniana* Finet & Gagnep.: C. monocarp; *A. siamensis* Kessler: D. flowering branch, E. flowers, F. monocarps. Photos by C. Leeratiwong (A–E) and Kithisak Aongyong (F).

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## REFERENCES

- Chatrou, L.W., Pirie, M.D., Erkens, R.H.J., Couvreur, T.L.P., Neubig, K.M., Abbott, J.R. Mols, J.B., Maas, J.W., Saunders, R.M.K. & Chase, M.W. (2012). A new subfamilial and tribal classification of the pantropical flowering plant family Annonaceae informed by molecular phylogenetics. *Botanical Journal of the Linnean Society* 169: 5–40.
- Craib, W.G. (1925). *Florae Siamensis Enumertio* Vol. 1. part 1. Siam Society, Bangkok.
- Gardner, S., Sidisunthorn, P., Chayamarit, K. & Utteridge, T.M.A. (2015). *A field guide to forest trees of Southern Thailand Volume 1, Acanthaceae-Escalloniaceae*. Kobfai Publishing Project, Bangkok.
- Kessler, P.J.A. (1995). Studies on the tribe Saccopetaleae (Annonaceae), IV. Revision of the genus *Alphonsea* Hook.f. & Thomson. *Botanische Jahrbucher für Systematik, Pflanzengeschichte und Pflanzengeographie*. 118: 81–112.
- Mols, J.B., Gravendeel, B., Chatrou, L.W., Pirie, M.D., Bygrave, P.C., Chase, M.W. & Kessler, P.J.A. (2004). Identifying clades in Asian Annonaceae: monophyletic genera in the polyphyletic Miliuseae. *American Journal of Botany* 91(4): 590–600.
- Pooma, R. & Suddee, S. (eds). (2014). *Tem Smitinand's Thai Plant Names*, revised edition 2014. Office of the Forest Herbarium, Department of National Parks, Wildlife and Plant Conservation, Bangkok. 826 pp.
- Sinclair, J. (1955). A revision of the Malayan Annonaceae. *Gardens' Bulletin Singapore* 14: 149–516.
- Thiers, B. (2019 and continuously updated). *Index Herbariorum: A global directory of public herbaria and associated staff*. New York Botanic Garden's Virtual Herbarium.
- Turner, I.M. (2016). Notes on the Annonaceae of the Malay Peninsula. *Gardens' Bulletin Singapore*. 68(1): 65–69.
- \_\_\_\_\_. (2018). Annonaceae of the Asia-Pacific region: names, types and distributions. *Gardens' Bulletin Singapore* 70(1): 409–744.
- Turner, I.M. & Utteridge T.M.A. (2017). A new species of *Alphonsea* (Annonaceae). *Thai Forest Bulletin (Botany)* 45(1): 42–46.