

## Notes on the genus *Argostemma* (Rubiaceae) from Lao PDR

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### ABSTRACT

Three species of *Argostemma* (Rubiaceae) are newly recorded for Lao PDR: *A. ebracteolatum*, *A. pictum* and *A. verticillatum*. Descriptions and photographs of the new records are provided, and a key to *Argostemma* in Lao PDR is presented.

KEYWORDS: *Argostemma*, key, new record, Lao PDR, taxonomy

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### INTRODUCTION

*Argostemma* Wall., a genus of Rubiaceae of ca 100 species in the Old World tropics, is largely confined to the South-East Asia (Robbrecht, 1988) but with two species in tropical West Africa (Sridith & Puff, 2000; Mabberley, 2008). For Lao PDR, Newman *et al.* (2007a) and Newman *et al.* (2007b) first recorded a species of the genus, *A. laeve* Benn., from Khammouan province. Lanorsavanh & Chantarantthai (2013, 2016) recorded three species *A. laotica* Lanors. & Chantar., *A. neurocalyx* Miq. and *A. siamense* Puff from Bolikhamxai province, and, most recently, Tagane *et al.* (2017) recorded an additional species, *A. lobbii* Hook.f., from Bolikhamxai province.

During botanical surveys of the first author in northern Lao PDR, Luangphrabang Province in July 2014 with S. Souvannhakhoummane, and Luangnamtha Province in August 2015 with C. Phongoudome and in the southern Attapeu Province in June 2014 with V. Lamxay, many unnamed specimens were collected and identified and include new records for Lao PDR, viz *Argostemma ebracteolatum* E.T.Geddes, *A. pictum* Wall. and *A. verticillatum* Wall. In 1999, Sridith indicated the type specimens of *A. ebracteolatum*, *A. pictum*, *A. pubescens*, *A. repens* and *A. rotundifolium* were holotypes, but this is an error to be corrected to lectotypes, nevertheless the lectotypification was effectively done by him.

### KEY TO THE SPECIES OF ARGOSTEMMA IN LAO PDR

1. Corolla bell-shaped
  2. Flowers 5-merous; corolla pubescent outside
  2. Flowers 4-merous; corolla glabrous outside
1. Corolla wheel-shaped
  3. Leaves clustered; stem erect
    4. Leaves in 1–2 pairs; filaments not curved
      5. Stem and leaves pubescent; leaf apex acute or rounded; corolla hairy
        6. Leaves elliptic or lanceolate; corolla lobes not strongly recurved and tip very coiled; anther opening by apical pores **A. laotica**
        6. Leaves ovate or triangular; corolla lobes strongly recurved and tip very coiled; anther opening by longitudinal slits **A. pictum**
      5. Stem and leaves glabrous; leaf apex acuminate; corolla glabrous **A. siamense**
    4. Leaves in 2 pairs, pseudo-verticillate; filaments curved **A. verticillatum**
  3. Leaves scattered along stem; stem prostrate to suberect or ascending
    7. Stem glabrous; leaves linear, glabrous **A. lobbii**
    7. Stem pubescent; leaves elliptic or oblanceolate, pubescent **A. laeve**

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## NEW RECORDS

**1. *Argostemma ebracteolatum*** E.T.Geddes, Bull. Misc. Inform. Kew 1927(4): 165. 1927. Type: Thailand, Chiang Mai, Mae Chaem (Me Cham), 14 Jul. 1922, *Kerr* 62764 (lectotype **K!** [K000760179], isolectotypes **BK!** [257307], **BM!** [BM000028695], designated by Sridith, 1999).

— *A. pubescens* E.T.Geddes, Bull. Misc. Inform. Kew 1927(4): 167. 1927. Type: Thailand, Chiang Mai, Doi Sutep, 26 Jul. 1914, *Kerr* 3298 (lectotype **K!** [K000760178], isolectotypes **ABD!** [ABDUH: 2/391], **BK!** [257313], **BM!** [BM000028692], designated by Sridith, 1999).

— *A. repens* E.T.Geddes, Bull. Misc. Inform., Kew 1927(4): 168. 1927. Type: Thailand, Nakhon (Nakawn) Sawan, Khao (Kao) Pado, 4 June 1922, *Kerr* 6068 (lectotype **K!** [K000760180], isolectotypes **ABD!** [ABDUH: 2/393], **BK!** [257315], **BM!** [BM000028693], designated by Sridith, 1999). Fig. 1A–B.

Perennial herb, attached to substrate with dense, much-branched matted roots. *Stems* erect, 2–10 cm long, pubescent. *Leaves* opposite, internode between leaf pairs very short, pseudo-verticillate, slightly anisophyllous; lamina membranaceous, elliptic or ovate, 2.5–4 by 1.3–3 cm, base acute, apex acute, lower surface pale or light green, upper surface dark green, venation prominent and raised below, pubescent, dots or streaks along midrib and veins or junction of veins; lateral veins 5–7 pairs. *Petioles* 2–5 mm long, pubescent. *Stipules* triangular, 2–2.5 by 1.5–2 mm, pubescent. *Inflorescences* 5–9-flowered, compound cyme; peduncles 1–1.5 cm long, densely pubescent. *Flowers* 5-merous, actinomorphic. *Calyx* coriaceous, pale green; lobes triangular, 1–1.5 by 1–1.5 mm, erect or slightly spreading densely pubescent outside. *Corolla* white, bell-shaped, pubescent outside; tube 1–3 mm long; lobes triangular, 4–4.5 by 4–5 mm, spreading or occasionally reflexed, slightly pubescent outside, throat pubescent. *Stamens* 5, free, inserted near the base of the corolla tube; filaments ca 2 mm long; anthers slightly curved, yellow, semi-basifixed and slightly sagittate at base, ca 3 mm long, without apical appendages, opening by apical pore. *Ovary* densely pubescent; style filiform, ca 6 mm long, shortly exerted from corolla tube ca 1 mm long, glabrous; stigma capitate.

Laos.— Luangphrabang [Pha Youk Village, Nan District, 18 July 2014, *KS* 728 (Biology Herbarium of National University of Laos)].

Distribution.— Thailand.

Ecology.— On limestone wet rock in mixed deciduous, deciduous and dry evergreen forests, 540–1,100 m alt.; flowering July and fruiting July to August.

Notes.— *Argostemma ebracteolatum* resembles *A. thaithongae* Sridith, endemic to Thailand, in the bell-shaped corolla and 5-merous flower, but differs in having not only being densely hairy on stem, leaves and inflorescence but also the exterior of the corolla. It is unlikely to be confused with other species in Laos as only *A. neurocalyx* has a bell-shaped corolla but is 4-merous.

**2. *Argostemma pictum*** Wall. in Roxb., Fl. Ind. (ed. Carey & Wall.) 2: 327. 1824. Type: Malaysia, Penang, 1892, *Wallich, Numer. List* 8392 (lectotype **K!** [K000172892]; isolectotypes **K!** [K000172894], **K-W!** [K-W001125373] designated by Sridith, 1999), non Korth., 1851.

— *A. bifolium* Ridl., Fl. Malay. Penins. 5: 314. 1925. Type: Malaysia, Perak, Maxwell's Hill, Dec. 1892, *Ridley s.n.* (holotype **K!** [K000760231]).

— *A. rotundifolium* E.T.Geddes, Bull. Misc. Inform., Kew 1927(4): 168. 1927. Type: Thailand, Yala, Betong (formerly in Pattani), 2 Aug. 1923, *Kerr* 7470 (lectotype **K!** [K000760185]; isolectotypes **ABD!** [ABDUH: 2/394], **BK!** [257316], **BM!** [BM000028699], **K!** [K000760184], **SING!** [SING0058412], designated by Sridith, 1999). Fig. 1C–D.

Perennial herb, attached to substrate with dense, matted roots. *Stems* erect, 7–8.5 cm long, pubescent. *Leaves* opposite, 1 or 2 pairs (one leaf pair several times large than the others and internodes between leaf pairs very short, pseudo-verticillate), slightly or strongly anisophyllous; lamina membranaceous, ovate or triangular, 3–5.7 by 2.8–5.7 cm, base truncate, attenuate, rounded or occasionally cordate, apex acute or rounded, lower surface pale or light green, upper surface dark green, venation prominent and raised below; lateral veins 5–6 pairs, sparsely hairy above and sparsely to densely hairy below. *Petioles* sub-obsolete. *Stipules* ovate, 2.5–3

by 3–3.5 mm, bifid tip, pubescent. *Inflorescences* 7–15-flowered, umbel-like or cymose; peduncles 5–6 cm long, glabrous; bracts 4–5, basally fused, forming a cup-like involucre, linear or ovate, 2–4 by 1–2 mm, green, pubescent, raphides conspicuous. *Flowers* 5-merous, actinomorphic; pedicels 8–10 mm long, glabrous. *Calyx* coriaceous, green; lobes ovate, triangular, 1–1.2 by 1–1.2 mm, spreading, glabrous, raphides conspicuous. *Corolla* white, star-shaped, outside densely covered with very short hairs, inside glabrous; tube 0.5–1 mm long; lobes narrowly triangular, 5–7 by 2–2.5 mm, strongly recurved and tip very coiled. *Stamens* 5, insert at the base of the

corolla tube; filament free, 1–1.5 mm long, broad and thick, swollen connective; anther connivent into anther cone, pale yellow, basifixed, oblong, 4.2–4.5 mm long, with short appendages, opening by longitudinal slits. *Ovary* pubescent; style filiform, 5–6 mm long, long exserted, glabrous; stigma capitate.

Laos.— Attapue [(Vonglakhone Kao Village, Phou Vong District, 17 June 2014, *Larnorsavanh et al. 1075* (Biology Herbarium of National University of Laos)].

Distribution.— Myanmar, Thailand, Peninsular Malaysia.

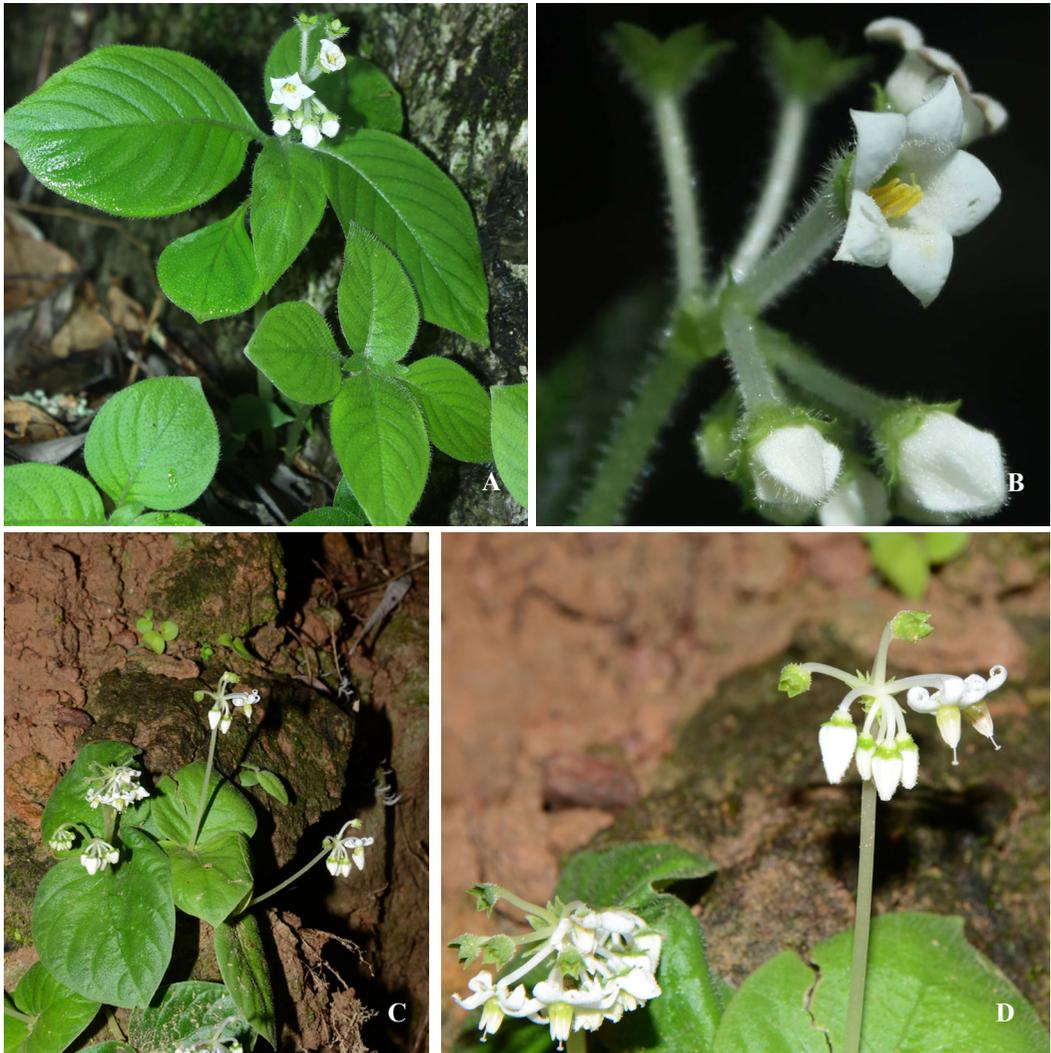


Figure 1. *Argostemma ebracteolatum*. A. habitat, leaves and inflorescences; B. inflorescences and flowers. *KS 728* (photos by K. Souvannakhoummane). *A. pictum*. C. habitat, leaves and inflorescences; D. inflorescences and flowers. *Lanorsavanh 1075* (photos by S. Lanorsavanh).

Ecology.— On moist sandstone rocks with soil or on wet ground in evergreen forests, 100–410 m alt.; flowering June to July and fruiting June to August.

Notes.— *Argostemma pictum* resembles *A. neurocalyx* but it distinguished by the wheel-shaped corolla which is 5-merous, and very strongly recurved with the tip coiled.

**3. *Argostemma verticillatum*** Wall. in Roxb., Fl. Ind. (ed. Carey & Wall.), 2: 325. 1824; Type: Nepal, Moreko, July 1821, Wallich, Numer. List 8394A (holotype K-W! [K-W001125376]). Fig. 2.

Perennial herb with rhizome or tubers. *Stems* erect, 3.5–9 cm long, glabrous. *Leaves* opposite, 2-pairs, internodes between leaf pairs very short, pseudo-verticillate, slightly anisophyllous; lamina membranaceous, elliptic or ovate, 1.5–6 by 0.5–1.8 cm, base acute, apex acute or acuminate, lower surface light green, upper surface dark green, venation prominent and raised on both surfaces, sparsely pubescent above, glabrous below. *Petioles* sub-obsolete. *Stipules* oblong or ovate, ca 2 by 1 mm, glabrous or sparsely pubescent apex. *Inflorescences* 1–7-flowered, compound cyme; peduncles 1–3.2 cm long, glabrous; bracts in groups of 4 or basally fused,

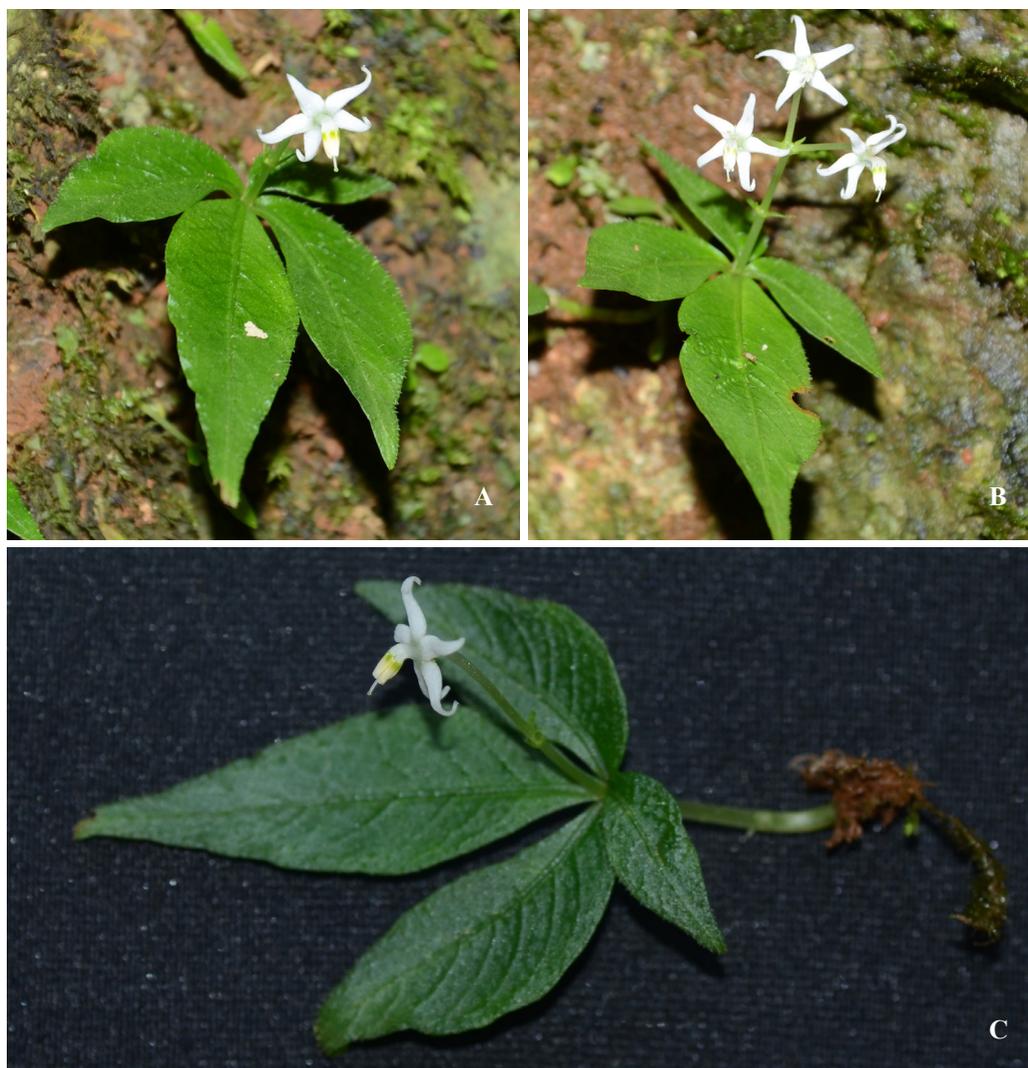


Figure 2. *Argostemma verticillatum*. A. habitat, leaves and inflorescences; B. inflorescences and flowers; C. habit. Lanorsavanh 1085 (photos by S. Lanorsavanh).

elliptic, oblong or linear, 1.5–2.2 by 0.5–1 mm, green, glabrous. *Flowers* 5-merous, actinomorphic; pedicels 8–10 mm long, glabrous. *Calyx* coriaceous or chartaceous, green, lobes triangular, ca 1 by 0.5–1 mm, spreading, glabrous, raphides very conspicuous. *Corolla* white, star-shaped, glabrous; tube ca 0.5 mm long; lobes narrowly triangular, ca 5 by 1.5 mm, spreading, sometime tips recurved, raphides very conspicuous. *Stamens* 5, insert at the corolla tube; filament curved, fused around the middle and forming a short filament tube, 1.5–2 mm long; anther free but cone-like arrangement, yellow, basifixed, oblong, ca 2 mm long, with very short appendages, opening by oblique elongated pores. *Ovary* glabrous; style filiform, 2.5–3 mm long, glabrous; stigma globular.

Laos.—Luangnamtha [Kaolao Cave, Nam Eng Village, Viengphoukha District, 13 Aug. 2015, *Lanorsavanh et al. 1085* (Biology Herbarium of National University of Laos)].

Distribution.—India, Nepal, Myanmar, Thailand.

Ecology.—On moist rocks near small waterfall in evergreen forests, 740–2,200 m alt., flowering and fruiting July to August.

Notes.—*Argostemma verticillatum* is recognized by its curved filaments which its fused around the middle and forming a short filament tube. Because the Chinese species have free filaments (Chen & Taylor, 2011), therefore, we exclude China from the distribution information; further study is needed to clarify this character.

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