

## ***Heteropanax thaiensis*, a new species and *Schefflera wrayi* (Araliaceae), a new record to Thailand**

SHUICHIRO TAGANE<sup>1,\*</sup>, SUKID RUEANGRUEA<sup>2</sup>, SOMRAN SUDDEE<sup>2</sup>,  
HIDETOSHI NAGAMASU<sup>3</sup>, AKIYO NAIKI<sup>4</sup> & HIRONORI TOYAMA<sup>1</sup>

### ABSTRACT

Two species of Araliaceae, *Heteropanax thaiensis* Tagane, Suddee & Rueangr., a new species from Phu Kradueng National Park, Loei Province, and *Schefflera wrayi* (King) R.Vig., from Khao Luang National Park, Nakhon Si Thammarat, formerly known only from Malaysia, are added to the flora of Thailand. Descriptions and illustrations, as well as DNA barcodes of *rbcL* and *matK* are provided based on our newly collected specimens.

KEYWORDS: Araliaceae, DNA barcoding, new species, Khao Luang National Park, Phu Kradueng National Park, taxonomy.

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### INTRODUCTION

The family Araliaceae Juss. with ca 50 genera and 1,400 species is widely distributed in tropical and subtropical regions in the world, extending with several species into temperate region (Frodin, 2003 [publ. 2004]). In Thailand, Esser & Jebb (2009, 2010) recently enumerated 12 genera and 54 species: *Aralia* L. (8 spp.), *Arthrophyllum* Blume (3 spp.), *Brassaiopsis* Decne. & Planch. (6 spp.), *Dendropanax* Decne. & Planch. (2 spp.), *Eleutherococcus* Maxim. (1 sp.), *Hedera* L. (1 sp.), *Heteropanax* Seem. (1 sp.), *Macropanax* Miq. (3 spp.), *Panax* L. (1 sp.), *Polyscias* J.R.Forst. & G.Forst., (3 spp.), *Schefflera* L. (21 spp.) and *Trevesia* Vis. (4 spp.).

During our botanical surveys in Phu Kradueng National Park, Loei Province, in July 2015 and Khao Luang National Park, Nakhon Si Thammarat Province, in February and December 2015, we found two unrecorded species of Araliaceae in Thailand. After morphological comparison with related species

based on the dry specimens of several herbaria (ANDA, BKF, BO, BRUN, FOF, FU, K, KYO, L, P, RUPP, SAR, TNS and VNM) and specimen images on the web (e.g. JSTOR Global Plants, <http://plants.jstor.org>), as well as study of relevant literature (Li, 1942; Frodin, 1978; Shang, 1997; Ho, 2003; Xiang & Lowry, 2007; Esser & Jebb, 2010; Tagane, 2015), we concluded that one of them was a new taxon of *Heteropanax* and the other one was identified as *Schefflera wrayi* (King) R.Vig. of Peninsular Malaysia.

To contribute to the Flora of Thailand, we here describe a new species, *Heteropanax thaiensis* Tagane, Suddee & Rueangr. and add *Schefflera wrayi* as new record for Thailand based on our newly collected material. We also provide DNA barcodes of *rbcL* and *matK* regions (CBOL Plant Working Group, 2009). The methods of DNA barcoding were followed the published protocols (Kress *et al.*, 2009; Dunning & Savolainen, 2010).

<sup>1</sup> Center for Asian Conservation Ecology, Kyushu University, 744 Motooka, Fukuoka, 819-0395, Japan.

<sup>2</sup> Forest Herbarium, Department of National Parks, Wildlife and Plant Conservation, Chatuchak, Bangkok 10900, Thailand.

<sup>3</sup> The Kyoto University Museum, Kyoto University, Yoshida Honmachi, Sakyo-ku, Kyoto, 606-8501, Japan.

<sup>4</sup> Iriomote Station, Tropical Biosphere Research Center, University of the Ryukyus, 870 Uehara, Taketomi-cho, Yaeyama-gun, Okinawa, 907-1541, Japan.

\* Corresponding author: stagane29@gmail.com

## DESCRIPTION

### **Heteropanax thaiensis** Tagane, Suddee & Rueangr., sp. nov.

In Thailand, *Heteropanax thaiensis* is similar to *H. fragrans* (Roxb. ex DC.) Seem. but distinguished by smaller leaflets (2.6–6.7 × 1.0–2.4 cm long in *H. thaiensis* vs (3–)5.5–15.5 × (1.5–)3.5–6 cm long in *H. fragrans*), glaucous below (vs greenish), faintly visible secondary veins abaxially (vs prominent and distinct abaxially), tertiary veins invisible on both surfaces (vs distinct abaxially), longer inflorescences (142 cm vs 81 cm long) and fruits strongly compressed laterally (ca 1 mm thick vs weakly compressed laterally, 2–4 mm thick when mature). From the similar *H. brevipedicellatus* H.L.Li of China and northern Vietnam, the new species differs in having more numerous secondary veins (7–10 pairs vs 5 or 6 pairs), longer inflorescence (vs 30–70 cm), and smaller fruits (ca 3 × 5.5 mm vs 5–6 × 7–8 mm). Type: Thailand, Loei Province, Phu Kradueng National Park, near Tham So Nuea Waterfall, 16°52'44.44"N, 101°44'35.35"E, alt. 1223 m, 11 June 2015, fr., Tagane *et al.* T4678 (holotype BKF!; isotypes FU!, K, KYO, P). Fig. 1.

Trees, 7 m tall, bark greyish brown; young twigs ferruginous stellate hairy, soon glabrous. Leaves tripinnately compound, 86–119 cm long; petiole 23.5–43 cm long, petiole and rachis glabrous; leaflets elliptic or oblong-elliptic, 2.6–6.7 × 1.0–2.4 cm, upper surface glabrous, lower surface sparsely stellate pubescent, glaucous, apex acuminate, acute, acumen 0.6 cm long, base cuneate, margin entire; midrib prominent on both surfaces when dry, secondary veins 7–10 pairs, arising at 60–70° from midrib, obscure adaxially, faintly visible abaxially, tertiary veins invisible on both surfaces. Flowers unknown. Inflorescence consisting of umbel-bearing racemes corymbosely arranged on terminal common axis, axes ferruginous stellate hairy, common axis 142 cm long; racemes 44 per secondary axes, up to 65 cm long, each bearing 24–30 umbels; umbels ca 1.5 cm in diameter, consisting of many flowers; rachis of umbel 1.4–2.0 cm long; bract triangular, 0.5 mm long. Drupe strongly compressed laterally, 3 mm long, 5.5 mm in wide, less than 1 mm thick when dry, very sparsely stellate hairy; pedicels ca 4.5 mm long, glabrescent; ovary 2-carpellate; styles 2, persistent, ca 0.4 mm long, united near the base.

Thailand.— NORTH-EASTERN: Loei [Phu Kradueng National Park, near Tham So Nuea Waterfall, 16°52'44.44"N, 101°44'35.35"E, alt. 1223 m, 11 June 2015, with fruits, Tagane *et al.* T4678 (holotype BKF!; isotypes FU!, K, KYO, P)].

Distribution.— Endemic (so far known only from the type locality).

Vernacular.— Unknown.

Ecology.— On slopes in evergreen forest, ca 20 m apart from a stream; alt. 1223 m.

Etymology.— The specific epithet refers to the country where the type specimen was collected.

DNA barcodes.— GenBank accession No. LC147382 (*rbcL*), LC147383 (*matK*), based on Tagane *et al.* T4678.

Note.— The genus *Heteropanax* Seem. is composed of trees, characterized by 2–5-pinnately compound leaves, terminal erect inflorescence, 2-carpellate ovaries, and laterally compressed fruits and seeds. The genus comprises about 11 species distributed in the Old World. While one species, *Heteropanax fragrans* (Roxb. ex DC.) Seem., is widely distributed from India to throughout Southeast Asia including Thailand, the other species have limited distribution areas (Li, 1942; Shang, 1997; Ho, 2003; Xiang & Lowry, 2007; Srivastava *et al.*, 2010; Tagane *et al.*, 2015). *Heteropanax thaiensis* is also considered to have a narrow range of distribution.

Conservation status.— Critically Endangered (CR) (IUCN, 2012). At present, *Heteropanax thaiensis* is known from only a single individual in the southwestern area of the top plateau, at an altitude of 1223 m. Phu Kradueng is a famous mountain in northeastern Thailand and has been intensively surveyed by many botanists (e.g., Koyama, 1986). However, we could not find specimens of this species in the major herbaria (ANDA, BKF, BO, BRUN, FOF, FU, K, KYO, L, P, RUPP, SAR, TNS and VNM), indicating that this is a rare species. Therefore it is suggested that *H. thaiensis* should be placed under the IUCN category 'Critically Endangered' because of its small number of individuals estimated to be less than 250 and limited distribution with an area of occupancy estimated to be less than 10 km<sup>2</sup> (criterion B2a).

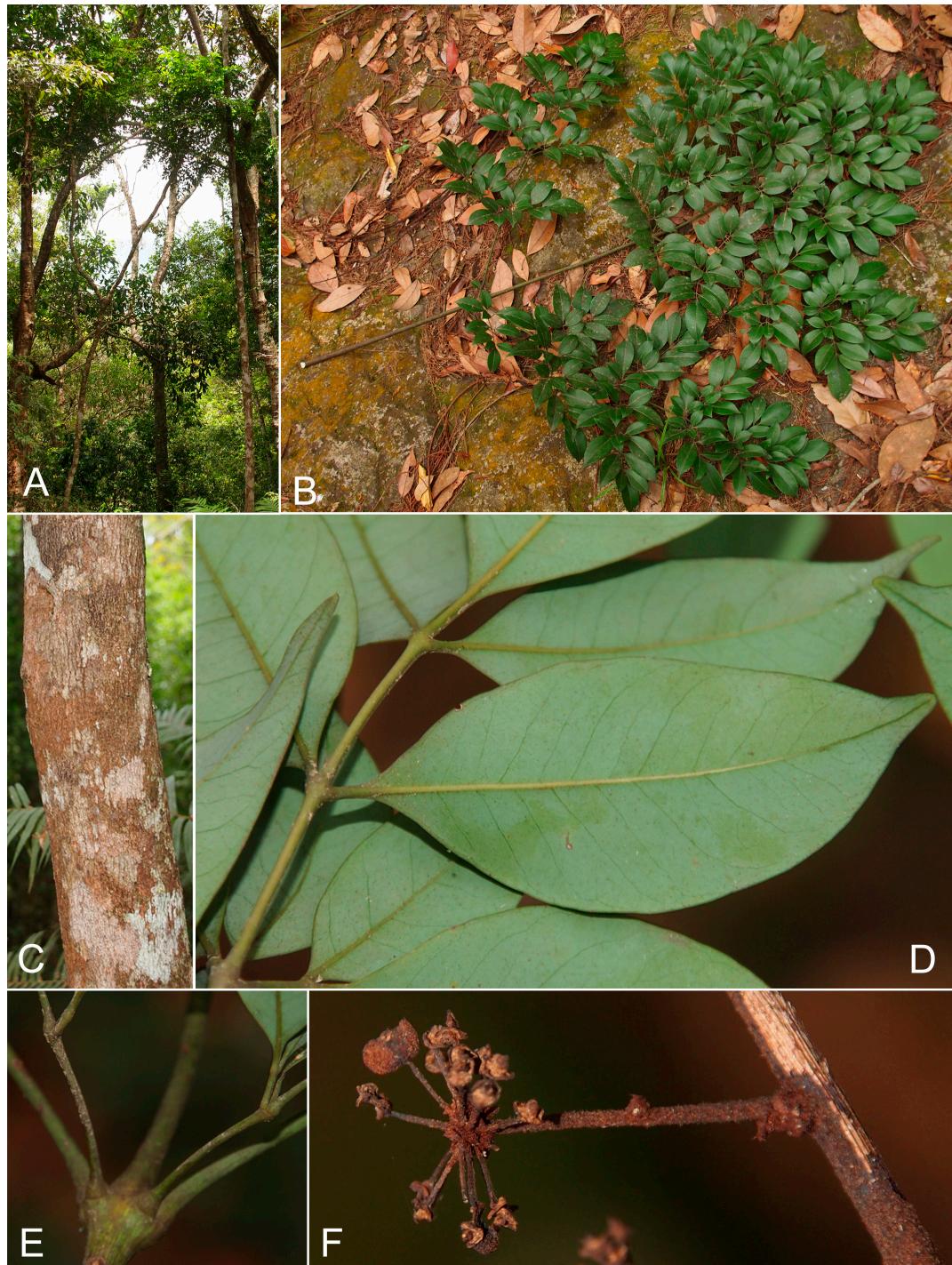


Figure 1. *Heteropanax thaiensis* Tagane, Suddee & Rueangr., A. habit; B. leaf; C. bark; D. abaxial surface of leaflets; E. node of petiole, rachis and petiolules ; F. dried umbel with only one fruit. All photographed on 11 June 2015.

**Schefflera wrayi** (King) R.Vig., Ann. Sci. Nat., Bot. sér. 9, 9: 333 (1909); Frodin, Tree Fl. Malaya 3: 30. 1978.—*Heptapleurum wrayi* King, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 67: 55. 1898. Type: Malaysia, Pahang, Gunong Brumber, alt. 7000 ft, no date, *J.L. Wray* 1585 (K!) Fig. 2.

Trees, 7 m tall, DBH 24 cm; twigs tomentose with flesh colored stellate hairs when young, soon glabrous, with conspicuous lenticels. Leaves alternate, densely stellate hairy when young, soon glabrous, palmately compound, (22–)32–60 cm long; petiole (11–)16–37 cm long; petiolules (1–)1.9–7.3 cm long, leaflets (8–)13–20, oblong-ovate to elliptic-ovate (2.5–)5.2–14.7 × (1.4–)2.1–7.2 cm, thinly coriaceous, apex acuminate, acumen to 1.5 cm long, base cuneate, obtuse, rounded, margin serrulate, glaucous abaxially; midrib slightly prominent adaxially, prominent abaxially, secondary veins 8–12 pairs, prominent on both surfaces, tertiary veins reticulate, slightly prominent on both surfaces. Inflorescences and flowers not seen. Infructescences a terminal panicle of racemes, almost glabrous except near the base of axes that are sparsely stellate hairy; primary axis 29–37 cm long, secondary axes 2 cm long apically, 20 cm long at base; racemes 2–12.5 cm long, bracts triangular, ca 1 mm long, sparsely stellate hairy to glabrous. Fruits globular, 3.5–4 mm in diameter, prominently 5-ridged when dry, glabrous, crowned by the confluent column of styles, column of style ca 2 mm long, glabrous; pedicels 1–5 mm long, glabrous. Seeds 5 per fruit, strongly laterally compressed otherwise hemispherical, ca 3.5 mm long, 2 mm wide, 0.2 mm thick, yellowish light brown, glabrous.

Thailand.—PENINSULAR: Nakhon Si Thammarat [Khao Luang National Park, near the summit, in montane evergreen forest, 8°29'39.1"N, 99°44'26.8"E, alt. 1763 m, 11 Feb. 2015, fr., *Tagane et al. T3776 (BKF!, FU!, K, KYO, P)*; on the trail from Khiriwong village to the summit, in lower montane evergreen forest, 8°29'35.7"N, 99°44'33.7"E, alt. 1693 m, 18 Dec. 2015, young fr., *Tagane et al. T5229 (BKF!, FU!, K, L)*].

Distribution.—Malaysia (Malay Peninsula).

Vernacular.—Unknown.

Ecology.—Locally common in lower montane to montane evergreen forest, at 1690–1770 m alt. Fruiting specimens were collected in December and February.

DNA barcodes.—GenBank accession No. LC147384 (*rbcL*), LC147385 (*matK*), based on *Tagane et al. T3776*.

Note.—*Schefflera wrayi* occurs very locally in the montane zone of Mt Berembun (as Gunong Brumber in King, 1898), Pahang, Peninsular Malaysia (King, 1898; Frodin, 1978), ca 600 km far from Mt Khao Luang. The population in Khao Luang showed slight differences from that of Mt Berembun [i.e. more numerous leaflets (vs 7–9) and almost glabrous axes of the infructescence (vs densely covered with flesh-colored stellate hairs)] but this variation is considered to be within intraspecific variation. Among the species of *Schefflera* in Thailand, *S. wrayi* is distinct in having variable numbers of leaflets from (8–)13–20, serrulate margin on the whole length of leaflets, leaves glaucous beneath, and flowers in panicles of racemes instead of umbels.

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## REFERENCES

- CBOL Plant Working Group (2009). A DNA barcode for land plants. *Proceedings of the National Academy of Sciences of the United States of America* 106: 12794–12797.
- Dunning, L.T. & Savolainen, V. (2010). Broad-scale amplification of *matK* for DNA barcoding plants, a technical note. *Botanical Journal of the Linnean Society* 164: 1–9.
- Esser, H.-J. & Jebb, M.H.P. (2009). The Araliaceae of Thailand. *Thai Forest Bulletin (Botany)*, Special Issue: 1–6.

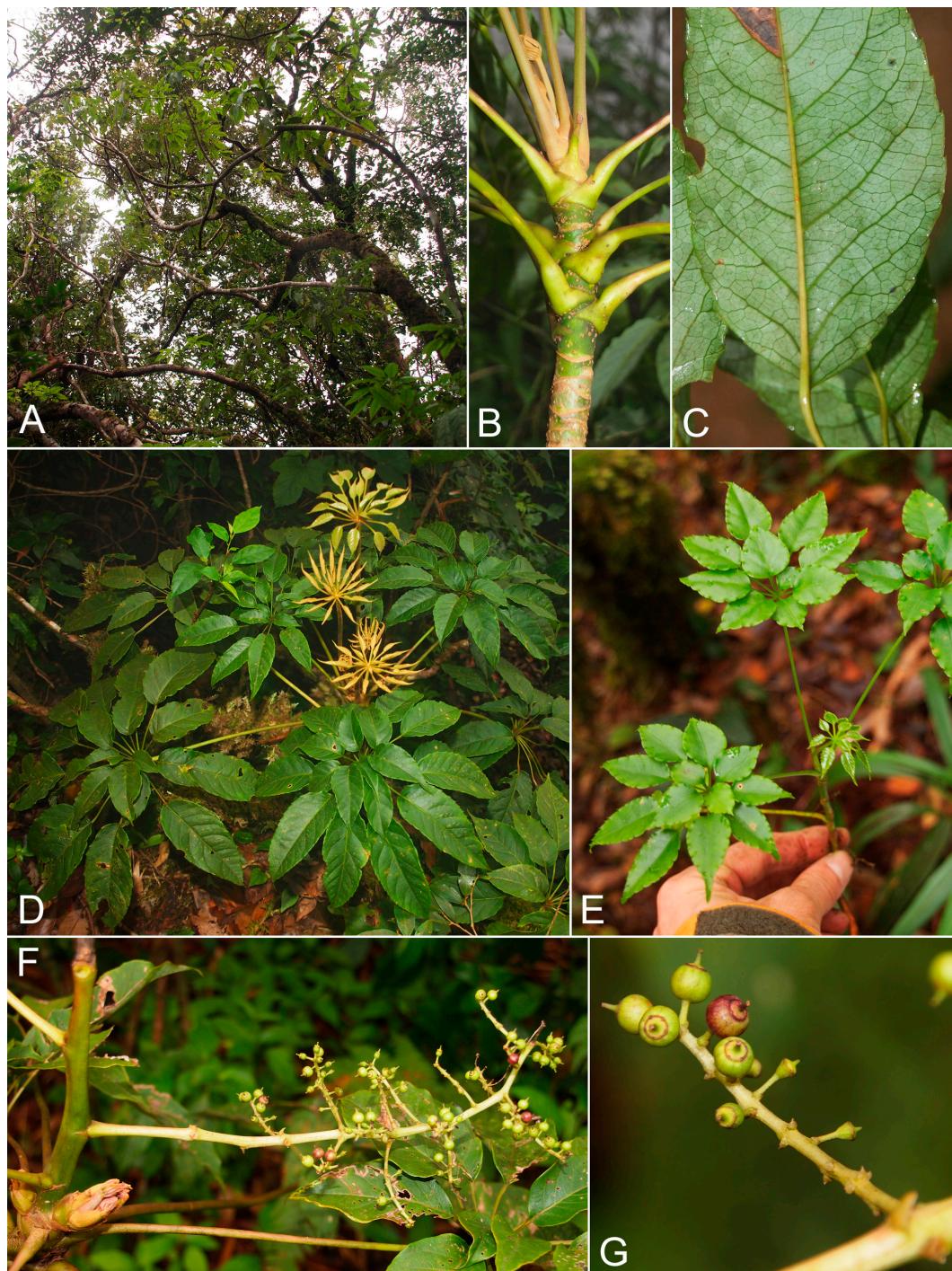


Figure 2. *Schefflera wrayi* (King) R. Vig. A. habit; B. top of branch; C. abaxial surface of leaflet; D. leafy twig; E. sapling; F. portion of infructescence; G. fruits. Photographed: A, B & D–G on 11 February 2015, C on 18 December 2015.

Esser H.-J. & Jebb, M.H.P. (2010). A new *Schefflera* and taxonomic notes on Araliaceae from Thailand. *Thai Forest Bulletin (Botany)* 38: 160–166.

Frodin, D.G. (1978) *Schefflera*. In: F.S.P. Ng (ed), *Tree Flora of Malaya* 3: 25–32. Forest Research Institute, Kepong.

Frodin, D.G. (2003 publ. 2004). *Heteropanax*. In: Frodin, D.G. & R. Govaerts (eds), *World Checklist and Bibliography of Araliaceae*: 196–197. Royal Botanic Gardens, Kew.

Ho, P.H. (2003). *An Illustrated flora of Vietnam* 2. Young Publishing House, Ho Chi Minh City, 951 pp. [In Vietnamese]

IUCN (2012). *The IUCN Red List of Threatened Species*. Version 3.1. Prepared by the IUCN Species Survival Commission, Gland, Switzerland and Cambridge, U.K. Available at <http://www.iucnredlist.org> [accessed 20 Mar 2016].

King, G. (1898). Materials for a flora of the Malayan Peninsula. *Journal of the Asiatic Society of Bengal*. Part 2. *Natural History* 67: 1–63.

Koyama, H. (ed) (1986). *A Preliminary Check List of the Pteridophytes and Dicotyledons of Phu Kradung in Thailand*. Kyoto University, Kyoto, 148 pp.

Kress, W.J., Erickson, D.L., Jones, F.A., Swenson, N.G., Perez, R., Sanjur, O. & Bermingham, E. (2009). Plant DNA barcodes and a community phylogeny of a tropical forest dynamics plot in Panama. *Proceedings of the National Academy of Sciences of the United States of America* 106: 18621–18626.

Li, H.-L. (1942). The Araliaceae of China. *Sargentia* 2: 1–234.

Shang, C.-B. (1997). Espèces nouvelles d’Araliaceae asiatiques. *Adansonia* 19: 77–83. [In French]

Srivastava, R.C., Singh, R.K. & Mukherjee T.K. (2010). Bioculturally important rare new species of *Heteropanax* Seem. (Araliaceae) from Eastern Himalaya, Arunachal Pradesh. *Indian Journal of Traditional Knowledge* 9: 242–244.

Tagane, S., Toyama, H., Chhang, P., Nagamasu, H. & Yahara, T. (2015). Flora of Bokor National Park, Cambodia I: Thirteen new species and one change in status. *Acta Phytotaxonomica et Geobotanica* 66: 95–135.

Xiang, Q.B. & Lowry, P.P. (2007). Araliaceae. In: Z.-Y. Wu, P.H. Raven & D.-Y. Hong (eds), *Flora of China* 13: 435–491. Beijing, Science Press and Missouri Botanical Garden Press, St. Louis. <http://www.efloras.org>.