

EIGHT NEW RECORDS OF *ZINGIBER* MILL. (ZINGIBERACEAE) FOR THE FLORA OF LAO P.D.R.

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Eight *Zingiber* species (*Z. densissimum* S.Q.Tong & Y.M.Xia, *Z. kerrii* Craib, *Z. ligulatum* Roxb., *Z. nudicarpum* D.Fang, *Z. orbiculatum* S.Q.Tong, *Z. parishii* Hook.f. subsp. *phuphanense* Triboun & K.Larsen, *Z. recurvatum* S.Q.Tong & Y.M.Xia and *Z. smilesianum* Craib) are newly recorded for the flora of Laos, raising the total number of species to 25. Colour illustrations, notes on their distribution, and citations of the specimens supporting the new records are given, as well as vernacular names and uses. An updated checklist of *Zingiber* in Laos, with an indication of the current sectional placement of each species, is presented.

Keywords. Ethnobotany, *Zingiber densissimum*, *Zingiber kerrii*, *Zingiber ligulatum*, *Zingiber nudicarpum*, *Zingiber orbiculatum*, *Zingiber parishii* subsp. *phuphanense*, *Zingiber recurvatum*, *Zingiber smilesianum*.

INTRODUCTION

Zingiber Mill. (Zingiberaceae: Zingibereae) comprises 100–150 species and is widely distributed in tropical to warm-temperate Asia (Bai *et al.*, 2015a), with its centre of diversity in monsoonal continental Asia. A general introduction to the genus has recently been provided by Bai *et al.* (2015a) and is not repeated here. In the latest comprehensive account of Zingiberaceae, Gagnepain (1908) reported 13 species of *Zingiber* in the Indochinese region. Although no recent revision of *Zingiber* exists, in the *Checklist of the Vascular Plants of Lao PDR* (Newman *et al.*, 2007), 13 species of this genus were reported. Since then, *Zingiber jiewhoei* Škorničk. (Leong-Škorničková *et al.*, 2014) and *Zingiber nitens* M.F.Newman (Newman, 2015) have been described from the Lao People's Democratic Republic (Laos). The occurrence in Laos of *Zingiber isanense* Triboun & K.Larsen, described from Thailand, and *Zingiber xishuangbannense* S.Q.Tong, described from China, has also been reported (Triboun *et al.*, 2014; Bai *et al.*, 2016). Although this brings the number of species in Laos to 17, this number still compares poorly to Thailand, with 56 species (Triboun *et al.*, 2014), and China, with at least 42 species (Wu & Larsen, 2000, including additional

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novelties reported by Bai *et al.*, 2015b, 2016). The very low collection density recorded in Laos (Newman *et al.*, 2007), and the low number of *Zingiber* species so far recorded, certainly reflects a lack of field exploration rather than a lack of diversity, and the number of species is expected to rise sharply in the near future. A similar situation has also been observed in neighbouring Vietnam, from which nine new species have recently been described (Leong-Škorničková *et al.*, 2015).

In this paper, we record eight species of *Zingiber* in the flora of Laos for the first time, namely *Z. densissimum* S.Q.Tong & Y.M.Xia, *Z. kerrii* Craib, *Z. ligulatum* Roxb., *Z. nudicarpum* D.Fang, *Z. orbiculatum* S.Q.Tong, *Z. parishii* Hook.f. subsp. *phuphanense* Triboun & K.Larsen, *Z. recurvatum* S.Q.Tong & Y.M.Xia and *Z. smilesianum* Craib. Notes on their distribution and colour illustrations are provided to facilitate identification of the newly recorded species in the field. Full details of the specimens from Laos that support the new records are also given, along with vernacular names and notes on uses. These records increase the number of species in Laos from 17 to 25. An updated checklist of *Zingiber* in Laos (Newman *et al.*, 2007) is presented, with an indication of the current sectional placement of each species.

MATERIALS AND METHODS

Surveys and collections of Zingiberaceae for *ex situ* conservation were carried out between 2011 and 2015. Herbarium specimens were prepared and deposited in the National Herbarium of Lao P.D.R. (HNL). Duplicates, when available, were distributed to other herbaria (E, HITBC, K, P, QBG and SING). Vernacular names and information on uses were recorded at the time of collection from local people, including local healers, traders and old women, who were shown the living plants or colour photographs. The descriptions and the photographs presented here were prepared from living material in the field, and from living plants cultivated in the nursery of Pha Tad Ke Botanical Garden.

Original descriptions, type material and other collections of all *Zingiber* species known to occur in Laos and adjacent countries were studied at HITBC, HN, HNL, KUN, QBG, SING and VNMN. In addition, specimens were examined as high-resolution digital images from AAU, E, K and P. Two main publications were used as the baseline against which to determine a new record, namely Gagnepain's revision of the Zingiberaceae of Indochina (1908) and the *Checklist of the Vascular Plants of Lao PDR* (Newman *et al.*, 2007). All published papers dealing with the genus *Zingiber* in monsoonal Asia were also checked for the occurrence of new records in Laos.

NEW RECORDS

1. ***Zingiber densissimum*** S.Q.Tong & Y.M.Xia, *Acta Phytotax. Sin.* 25(6): 467 (1987); *Fl. Yunnan.* 8: 538 (1999); Wu & Larsen, *Fl. China* 24: 330 (2000). – Type: China, Yunnan, Menghai, 1400 m, 7 x 1986, S.Q. Tong & Y.M. Xia 24998 (holo HITBC! [as YNTBI in protologue]). **Fig. 1A–D.**

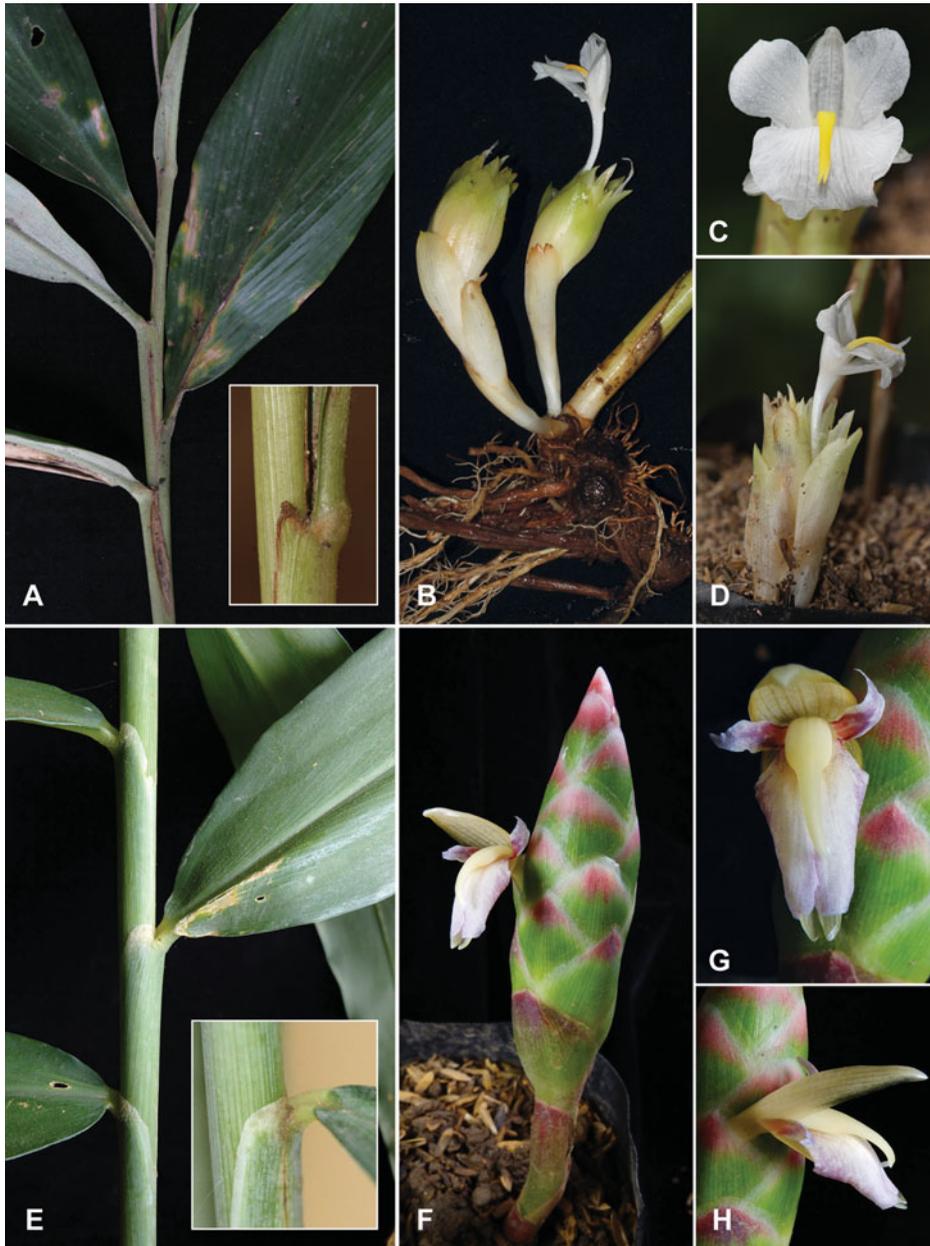


FIG. 1. *Zingiber densissimum* S.Q.Tong & Y.M.Xia (from *Souvannakhoummane* et al. KS672): A, part of leafy shoot with ligule in inset; B, inflorescences (side view); C, flower (front view); D, inflorescence and flower (side view). *Zingiber kerrii* Craib (from *Phouthavong & Souvannakhoummane* KP378): E, part of leafy shoot with ligule in inset; F, inflorescence; G, flower (front view); H, flower (side view). (Photographs: A–D, and inset of A and E, K. Souvannakhoummane; E–H, J. Leong-Škorničková.)

Distribution. Known only from Xiengkhouang province in Laos. This species, originally described from southern China by Tong & Xia (1987), has also been reported from Thailand (Triboun *et al.*, 2014). Although a specimen collected by *A.J.B. Chevalier* 38526 (P) from southern Vietnam bears similarities to *Zingiber densissimum* and was annotated by P. Triboun as such, the distance from other known records is almost 1000 km. This Vietnamese record therefore deserves re-collection and further study to determine the exact identity of this collection.

Ecology and phenology. Growing in dry evergreen forest, deciduous forest mixed with pine forest, and in pine forest with grassland patches, 800–1500 m altitude. Flowering from July to September, flowers open in the afternoon.

Vernacular name and uses. Lao: ຂີ່ງດອກຂາວ (khing dok khao [white-flowered ginger]; recorded in Xiengkhouang). During the rainy season, this species is found in Nongphet vegetable market in Xiengkhouang. Young inflorescences are eaten boiled or fried.

Additional specimens examined. LAOS. **Xiengkhouang:** Phoukoud district, near the top of Phoukoud mountain, 1332 m altitude, 19°33'23.0"N, 103°02'34.6"E, 23 viii 2014, *Souvannakhoummane et al.* KS672 (HNL); Bong village, c.700 m altitude, 19°41'41.9"N, 103°07'36.9"E, 23 x 2015, *Souvannakhoummane & Luangxai s.n.* (HNL); Youdphae village, c.800 m altitude, 19°41'41.9"N, 103°07'36.9"E, 5 ix 2017, *Souvannakhoummane & Luangxai* KS-Bio 0025 (HNL), Pek district, Or-An village, Phousan mountain, 1845 m altitude, 19°39'26.0"N, 103°21'18.7"E, 7 ix 2017, *Souvannakhoummane & Malaiphet* KS-Bio 0033 (HNL).

This species is rather rare in Laos. It is similar to *Zingiber orbiculatum* in having white flowers and bright yellow anthers, but can be recognised by its smaller leafy shoot with leaves arranged in the upper part of the pseudostem, prominently plicate leaves with white villous indumentum on the lower side of the lamina, and bilobed ligules.

2. *Zingiber kerrii* Craib, Bull. Misc. Inform. Kew 10: 403 (1912); Thongam *et al.*, Taiwania 58(4): 291 (2013); Bai *et al.*, Gard. Bull. Singapore 67(1): 137 (2015). – Type: Thailand, Chiang Mai province, Doi Sootep, 900–1200 m, 24 vii 1910, *A.F. Kerr* 1290 (lecto K [K000255235], isolecto K [K000255234], P [P00450941] [digital images seen]). **Fig. 1E–H.**

Zingiber menghaiense S.Q.Tong, Acta Phytotax. Sin. 25(2): 145–146, pl. 1, f. 2 (1987); Wu & Larsen in Fl. China. 24: 326 (2000); Bai *et al.*, Gard. Bull. Singapore 67(1): 137 (2015). – Type: China, Yunnan Province, Xishuangbanna Daizu Zizhizhou, Menghai Xian, Menghai Zhen, under the forest on the roadside, 1200 m, 2 vii 1982, *Tong, S.Q. & Li, A.M.* 32860 (holo HITBC!, iso KUN!).

Zingiber stipitatum S.Q.Tong, Acta Phytotax. Sin. 25(2): 146–147, pl. 1, f. 3 (1987); Wu & Larsen in Fl. China. 24: 326 (2000); Bai *et al.*, Gard. Bull. Singapore 67(1): 137 (2015). – Type: China, Yunnan Province, Dehong Daizu Jingpozu Zizhizhou, Ruili Shi, Mengxiu Xiang, on the way from Mengxiu Cun to Daoba Zhai, 1200 m, 25 vii 1983, *S.Q. Tong & C.J. Liao* 24836 (holo HITBC! [as YNTBI in protologue]; iso HITBC!, KUN!).

Distribution. Known from Louangphabang province in Laos. This species, originally described from Thailand, has since been reported from India (Thongam *et al.*, 2013; Triboun *et al.*, 2014), Myanmar and China (Bai *et al.*, 2015a).

Ecology and phenology. In Laos, this species occurs in deciduous forest and mixed bamboo forest, at about c.600 m altitude. In China, it has been reported to occur in grassy areas at the edge of the forest and in evergreen broadleaved forest at 700–1300 m altitude (Bai *et al.*, 2015a). Flowering from June to August. The flowers open in the morning.

Vernacular name and uses. Lao: ຂີ່ງຂັນໝາກເບັ່ງ (khing khan mak beng [lotus-bud ginger]; recorded in Louangphabang); Khmu: ວຮາງວຮະເວ້ຍິມ (hang ha ve yim [old red inflorescence ginger]; recorded in Louangphabang). This species is used as a vegetable by Khmu people, who harvest the plants from the forest. Young inflorescences and young shoots are boiled or steamed, or fried with chili and dried fish.

Additional specimens examined. LAOS. **Louangphabang:** Xiengngeun district, Houay hia Village, 19°44'16.3"N, 102°12'13.8"E, c.600 m altitude, 11 viii 2013, Phouthavong & Souvannakhoummane KP378 (HNL and living collection at Pha Tad Ke Botanical Garden).

This species is similar to *Zingiber laoticum* Gagnep. in the entire plant being glaucous externally (particularly prominent in young shoots, becoming inconspicuous when older), pale green bracts with pink-red margins and rhizomes and pseudostems that are purple-red internally. The labellum and staminodes of *Zingiber kerrii* Craib are, however, cream-white to pinkish, with a dark red patch at the base of the labellum and staminodes, and the staminodes are narrowly ovate and almost free to the base, whereas the labellum and staminodes of *Z. laoticum* Gagnep. are pale yellow with dense dark purple-brown mottling throughout, and the staminodes are almost fully adnate to the labellum (see Leong-Škorničková & Newman, 2015: 216).

3. *Zingiber ligulatum* Roxb., *Asiat. Res.* 11: 348 (1810); Roxb., *Fl. Ind.* 1: 51 (1820); Baker, *Fl. Brit. India* 6: 245 (1892); K.Schum., *Pflanzenr.* IV, 46 (Heft 20): 186 (1904).
– Type: Hindostan, pre-dating 1810, *Roxburgh* (not located; see notes). **Fig. 2A, B.**

Distribution. This species was originally described from India, and has recently been reported from Myanmar (Romand-Monnier, 2013) and Thailand (Triboun *et al.*, 2014). It is known only in cultivation in Laos.

Ecology and phenology. This species has been seen only in cultivation near rice fields and in gardens, in sandy clay mixed with rocks. Flowering occurs from late March to June.

Vernacular name and uses. Khmu: ຂີ່ງຄາງຄາວ (khing khang khao [pungent-smell ginger], recorded in Louangphabang). The rhizome is used as a laxative and for treatment of stomach ailments. The young inflorescences are eaten as a vegetable.



FIG. 2. *Zingiber ligulatum* Roxb. (from Souvannakhoummane et al. KS812): A, basal part of leafy shoot with inflorescence and a ligule in inset; B, detail of flower (semi-side view). *Zingiber nudicaipum* D.Fang (from Leong-Škorníčková et al. JLS-2386): C, part of leafy shoot; D, basal part of leafy shoots with multiple inflorescences and detail of ligule in inset; E, flower (front view); F, flower (side view). (Photographs: A and B, K. Souvannakhoummane; C–F, J. Leong-Škorníčková.)

Additional specimens examined. LAOS. **Louangphabang:** Chomphet district, Chan Tai village, near rice field, 161 m in altitude, 19°52'52.0"N, 102°06'02.7"E, 12 ix 2014, *Souvannakhoumane* et al. KS812 (HNL, Pha Tad Ke BG).

The exact identity of *Zingiber ligulatum* has not yet been fully clarified. According to a note in the protologue, the species is “a native of Hindostan where it was first noticed by Colonel Hardwicke”. Roxburgh’s original specimen of *Zingiber ligulatum* has not been located. The original description is brief, consisting of four lines only, but there is a more detailed description and a colour drawing in a later work by Roxburgh (Roxburgh, 1820). An identical colour drawing of this species also exists in the *Icones Roxburghianae*, of which we have seen the copy deposited at K. Our collections are a good match to the description and the colour drawing published by Roxburgh in 1820, and we therefore hesitate to apply a new name to them until the identity of *Zingiber ligulatum* and other closely related taxa in sect. *Cryptanthium* are clarified following re-collection of living material in India. Our Lao collections look identical to the material known from Thailand, where this species, as in Laos, also occurs only in cultivation (Triboun, 2006; Dr Pramote Triboun, Thailand Institute of Scientific and Technological Research, personal communication).

4. *Zingiber nudicarpum* D.Fang, *Guihaia* 2: 139 (1982); Wu & Larsen, *Fl. China* 24: 326 (2000); Lý *et al.*, *Bioscience Discovery* 8(1): 2 (2017). – Type: China, Guangxi Province, Baise Xian, Nabi, 340 m, 30 vi 1981, *D.H. Qin et R.Z. Huang* 36982 (holo GXMI!). **Fig. 2C–F.**

Distribution. Although we have observed this species widely in Laos, only a few herbarium specimens collected in Houaphan (northern Laos) and Attapeu (southern Laos) exist. The species was originally described from Guangxi (southern China), and has since been reported from five localities in Vietnam (Lý *et al.*, 2017).

Ecology and phenology. Growing in evergreen forests, often near streams and rivers, in clay, sometimes mixed with rocks. Flowering occurs from late March to June.

Vernacular name and uses. Lao: ຂົງປີດິນ (khing pee din [soil flower ginger], recorded in Houaphan). Young inflorescences are eaten as a vegetable. This species is occasionally sold in vegetable markets in Vientiane, although according to the vendors, the species is brought from Houaphan and Phoukhaoukhouay (Vientiane province).

Additional specimens examined. LAOS. **Attapeu:** Dong Ampham National Protected Area, 14°42'27"N, 107°31'25"E, 16 iii 2011, *Newman* 2442 [cultivated at RBGE, originally from *Lamxay* et al. VL1967] (E); **Houaphan:** Vieng Thong district, Nam Et-Phou Louey Natural Protected Area, Tad Hokdon waterfall, 789 m altitude, 20°6'16"N, 103°22'18"E, 07 vi 2013, *Leong-Škorničková* et al. JLS-2386 (E, QBG, SING, living collection at Pha Tad Ke Botanical Garden).

Zingiber nudicarpum D.Fang is very similar to *Zingiber peninsulare* Theilade. The differences can be summarised as follows: larger habit up to 3 m tall, villous leaf sheaths, labellum purple-red with yellow mottling toward apices in *Zingiber*

nudicarpum (versus smaller habit 1.2–2 m tall, glabrous leaf sheaths and labellum dark purple with white spots). Further studies across the area of distribution are needed to establish if these two species are distinct or conspecific.

5. *Zingiber orbiculatum* S.Q.Tong, Acta Phytotax. Sin. 25(6): 463 (1987); Wu & Larsen, Fl. China 24: 329 (2000); Aung *et al.*, Bull. Natl. Mus. Nat. Sci., Ser. B, 41(3): 108 (2015). – Type: China, Yunnan, Mengla, 620 m, 20 vii 1981, S. Q. Tong 24804 (holo HITBC!; iso HITBC, KUN). **Fig. 3A–D.**

Distribution. This species is quite common in northern Laos, being recorded in four provinces to date (Oudomxai, Louangphabang, Xaignabouly and Houaphan). It was originally described from China (Tong & Xia, 1987) and has since been reported from Thailand and Myanmar (Aung *et al.*, 2015; Triboun *et al.*, 2014).

Ecology and phenology. Growing in mixed deciduous forest and bamboo forests, occasionally also found in margins of secondary forest. Flowering occurs from late May to July, followed by fruiting from July to September. The flowers open in the afternoon. In Myanmar, it has been reported to grow in shade in semi-evergreen forest at c.865 m altitude (Aung *et al.*, 2015).

Vernacular name and uses. Hmong: ຸ່ງຂຸ້ງ (pa khia [flowering ginger]; recorded in Louangphabang, where the local people harvest young inflorescences and young shoots of this species, which is commonly found near rice fields and cultivated in villages. It is usually prepared as a vegetable dish with fresh fish or pork, or with dried chilli and dried fish.

Additional specimens examined. LAOS. **Oudomxai:** Xay district, Ban Faen, 717 m altitude, 20°42'57.5"N, 102°05'06.9"E, 16 vi 2012, Leong-Škorničková *et al.* JLS-1725 (HNL, SING); **Louangphabang:** Xienggeun district, Houy Hia village, 11 viii 2013, Phouttavong & Souvannakhoummane KP328 (HNL); 1866–1868, Thorel *s.n.* (P, P00289157); **Xaignabouly:** Tongmixay district, 27 v 2014, Srisanga *et al.* L2-323 (QSB!); **Houaphan:** Xam Nuea district, Ban Houa Xieng, 1035 m altitude, 20°28'06.9"N, 103°56'03.2"E, 3 vi 2013, Leong-Škorničková *et al.* JLS-2266 (E, P, QBG, SING).

Although the white flower resembles that of *Zingiber densissimum* S.Q.Tong & Y.M.Xia, this species is easily recognised by its broadly ovate to almost orbicular bright red spike and robust leafy shoots composed of glabrous leaves more or less evenly distributed along the pseudostem.

6. *Zingiber parishii* Hook.f. subsp. **phuphanense** Triboun & K.Larsen, Thai J. Bot. 6(1): 62 (2014). – Type: Thailand, Sakon Nakhon, Phu Phan National Park, 11 vi 2002; P. Triboun & C. Kantachote 3323 (holo BK n.v.; iso AAU n.v., KKU n.v.) **Fig. 3E–H.**

Distribution. This subspecies, recently described from Thailand (Triboun *et al.*, 2014), is fairly common in Laos.

Ecology and phenology. Growing in mixed deciduous forest, and at the foot of limestone hills, dipterocarp forest mixed with bamboo and open areas near forest

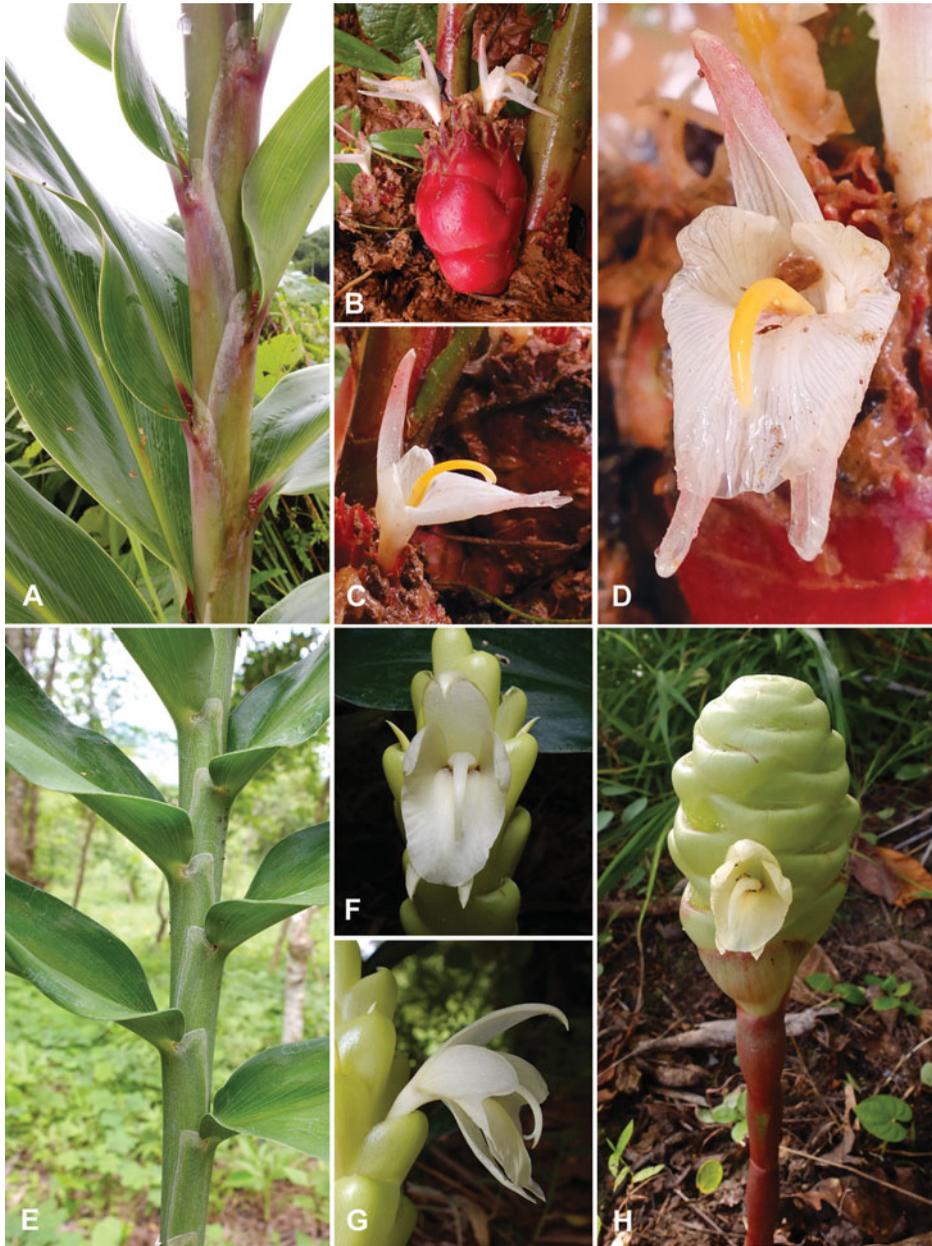


FIG. 3. *Zingiber orbiculatum* S.Q.Tong (from Leong-Škorničková et al. JLS-1725): A, part of leafy shoot with ligules; B, inflorescence with flowers in side view; C, detail of flower (side view); D, detail of flower (front view). *Zingiber parishii* Hook.f. subsp. *phuphanense* Triboun & K.Larsen (from Leong-Škorničková et al. JLS-1753 and Leong-Škorničková et al. JLS-1834): E, part of leafy shoot with ligules; F, flower (front view); G, flower (side view); H, inflorescence with flower in front view. (Photographs by J. Leong-Škorničková.)

margins, on clay soil mixed with granite soil. Flowering in June to September. The flowers open in the afternoon.

Vernacular name and uses. Lao: ຂີງປ່າ (khing pa [wild ginger]; recorded in Louangphabang). Young leaves and young inflorescences are favoured by local people for their pleasant smell, and are used as vegetables. Young leaves are cooked with fermented bamboo shoots and Mekong fish soup. Young inflorescences are boiled or fried and eaten with spicy *lap* (minced meat salad). It is occasionally cultivated in gardens. The rhizome is used to cure stomach ailments.

Additional specimens examined. LAOS. **Louangphabang:** Chomphet district, Pha Tad Ke area, 19 vi 2012, *Leong-Škorničková* et al. JLS-1753 (HNL, SING); ibidem, 23 viii 2014, *Souvanhkhoumane* KS789 (HNL); Louangphabang district, along road side to Ban Long Lao Mai, 473 m, 19°49'52.87"N, 102°6'39.44"E, 20 vi 2012, *Leong-Škorničková* et al. JLS-1766 (HNL, SING); Louangphabang district, 3 xi 1965, *Vidal* 4256 (P, P00507829); **Vientiane Capital:** Xaythany district, Ban Dong Mak Kay, 190 m altitude, 18°06'35.3"N, 102°41'05.4"E, *Leong-Škorničková* et al. JLS-1834 (HNL, SING).

This subspecies of *Zingiber parishii* has only recently been described from Thailand (Triboun *et al.*, 2014). It is distinguished by its pale-yellow labellum, with only small and sparse dark purple patches at the base compared with mottling throughout the labellum in the nominal variety. Although we have been unable to examine the type material, the species has been identified using the original description, which included illustrations and photographs, and its identity was also confirmed by Dr Pramote Triboun.

7. *Zingiber recurvatum* S.Q.Tong & Y.M.Xia, *Acta Phytotax. Sin.* 25(6): 470 (1987); Wu & Larsen, *Fl. China* 24: 329 (2000). – Type: China, Yunnan Province, Mengla, 700 m, 4 vii 1981, S.Q.Tong (holo HITBC! [as YNTBI in protologue], iso KUN!). **Fig. 4A–C.**

Distribution. Known from two locations in Louangphabang province, Laos. The species was originally described from Mengla, Yunnan (Tong & Xia, 1987), about 150 km from the Lao collections.

Ecology and phenology. Growing in evergreen forest, in areas with high moisture and clay soil mixed with small stones, often occurring together with ferns and *Piper umbellatum* L. Flowering and fruiting from August to November. The flowers open in the morning. In China, it also occurs in moist evergreen forest at c.700 m altitude (Tong & Xia, 1987).

Vernacular name and uses. No vernacular name or uses have been recorded.

Additional specimens examined. LAOS. **Louangphabang:** Louangphabang district, Long Lunh Village, c.1000 m altitude, 19°55'34.5"N, 102°20'50.5"E, 19 ix 2012, *Phouthavong* et al. KP246 (HNL); ibidem, 19 ix 2012, *Phouthavong* et al. KP244 (HNL); Xiengngeun district, Houy Hia village, c.600 m altitude, 19°44'16.3"N, 102°12'13.8"E, 11 viii 2013, *Phouthavong* &

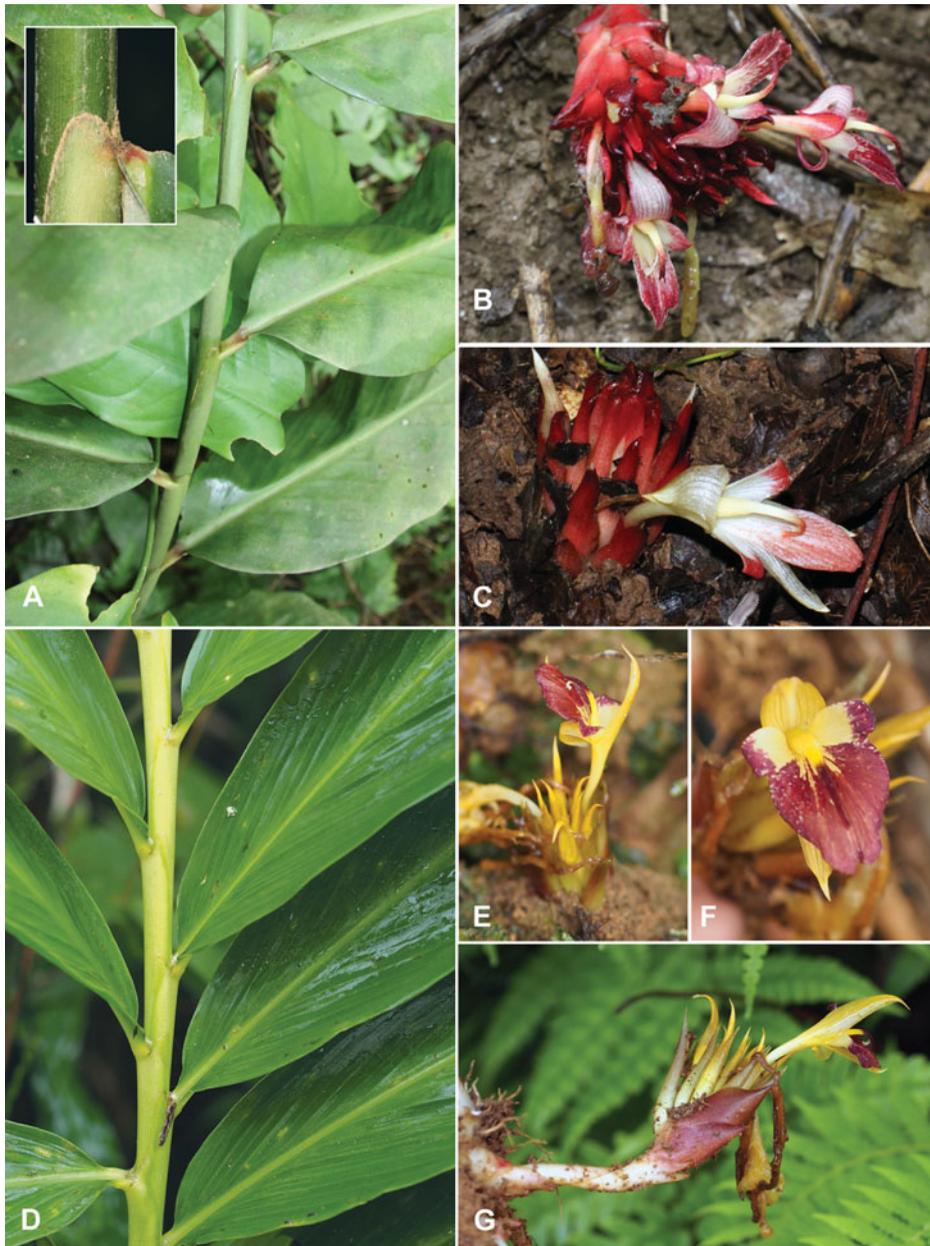


FIG. 4. *Zingiber recurvatum* S.Q.Tong & Y.M.Xia (from *Phoutthavong* et al. KP246, KP451 and *Souvannakhoummane* et al. KS 794): A, part of leafy shoot with ligule in inset; B, inflorescence with flowers in front view; C, detail of inflorescence with flower (semi-side view). *Zingiber smilesianum* Craib (from *Souvannakhoummane* & *Malaiphet* KS-Bio 0024 and *Souvannakhoummane* & *Malaiphet* KS-Bio 0031): D, part of leafy shoot with ligules; E, detail of inflorescence partially buried in the ground; F, flower (front view); G, inflorescence with flower (side view). (Photographs: A and C–G, K. Souvannakhoummane; B, K. Phoutthavong.)

Souvannakhoummane KP451 (HNL); Tad Kouangsi waterfall, 24 ix 2014, *Souvannakhoummane* & *Phoutthavong* KS794 (HNL).

Zingiber recurvatum appears to be very similar to *Zingiber larsenii* Theilade, which is somewhat smaller in habit and with ligule lobes that are supposed to be more triangular. The ligule shape in Lao populations seems to vary from triangular to round. The distance between the type localities of the two species is about 300 km, with Lao collections in between. Although yet unreported, the second author has also seen *Zingiber recurvatum* in several locations in northern Vietnam, suggesting that it is likely to be a widespread species. Further study of the intraspecific variability of *Zingiber recurvatum* and *Z. larsenii* and their relationship to each other is needed.

8. *Zingiber smilesianum* Craib, Bull. Misc. Inform. Kew 10: 403 (1912); Theilade, Nordic J. Bot. 19(4): 406 (1999). – Type: Thailand, Chiang Mai province, Doi Sootep, on edge of evergreen jungle, 1200–1500 m, 9 ix 1910, *Kerr* 1311a (lecto K! [K000255228]; isolecto BM! [BM000797146], E! [E00097856]). **Fig. 4D–G.**

Zingiber teres S.Q.Tong & Y.M.Xia, Acta Phytotax. Sin. 25(6): 468 (1987); Wu & Larsen, Fl. China 24: 332 (2000). – Type: China, Yunnan: Menglian, Dai-Lahu-Va Zu Zizhixian, 1170 m, 9 x 1986, *S.Q. Tong & Y.M. Xia* 42403 (holo HITBC! [as YNTBI in protologue], iso KUN!)

Distribution. This species is rare in Laos and Thailand (Craib, 1912: 403–404; Triboun *et al.*, 2014).

Ecology and phenology. Growing in evergreen montane forest near summits, between 1400 and 1880 m. Flowering occurs from September to October, and the flowers open in the afternoon.

Vernacular name and uses. No vernacular name has been recorded. Young shoots and young inflorescences are used as a green vegetable. Young inflorescences are also used with other vegetables to prepare pork or fish soup.

Additional specimens examined. LAOS. **Xiengkhouang:** Pek district, Or-An Village, along road side to Phousan mountain, 1600 m, 19°63'83.60"N, 103°40'13.37"E, 6 ix 2016, *Souvannakhoummane* & *Malaiphet* KS-Bio 0024 (HNL); near summit of Phousan Mountain, 1845 m, 19°67'43.17"N, 103°41'12.16"E, 7 ix 2016, *K. Souvannakhoummane* & *Malaiphet* KS-Bio 0031 (HNL).

Triboun *et al.* (2007) placed *Zingiber teres* in synonymy with *Z. smilesianum* Craib. Although our Lao collections key out as *Zingiber larsenii* in Triboun's key to Thai *Zingiber* (Triboun *et al.*, 2014), and as *Z. teres* in the key in the *Flora of China* (Wu & Larsen, 2000), they are of stouter habit and most of the populations have densely villous lamina abaxially. There are, however, no differences in floral characters. Further studies of Lao collections may justify their recognition as a subspecies.

UPDATED CHECKLIST FOR LAOS

This updated checklist of *Zingiber* in Laos follows the format of Newman *et al.* (2007). The current sectional placement is given after each name. When the sectional placement is in doubt or is not clear owing to the intermediate nature of the characters, the species is marked with a question mark or a reference to the latest discussion of its placement.

Zingiber Mill.

Zingiber corallinum Hance (sect. *Zingiber*) Laos: Vientiane: *J.E. Vidal* 5915 (P).

Zingiber densissimum S.Q.Tong & Y.M.Xia (sect. *Cryptanthium*)

Laos: Xiengkhouang: *K. Souvannakhoummane et al.* KS672 (HNL); *K. Souvannakhoummane & P. Luangxai* KS-Bio 0025 (HNL); *K. Souvannakhoummane & Malaiphet* KS-Bio 0033 (HNL).

Zingiber isanense Triboun & K.Larsen (sect. *Cryptanthium*?)

Laos: Salavan: *V. Lamxay et al.* VL1999 (E, SING); *V. Lamxay et al.* VL2015 (E, SING).

Zingiber jiewhoei Škorničk. (sect. *Zingiber*)

Laos: Vientiane: *J. Leong-Škorničková et al.* JLS-1807 (holo SING; iso E, HNL).

Zingiber junceum Gagnep. (sect. *Zingiber*?)

Salavan: *Thorel* 2408 (P [3]).

Zingiber kerrii Craib (sect. *Zingiber*)

Laos: Louangphabang: *K. Phouthavong & K. Souvannakhoummane* KP 378 (HNL).

Zingiber laoticum Gagnep. (sect. *Zingiber*)

Laos: Xaignabouly: *C. Thorel* (P). Xiengkhouang: *K. Souvannakhoummane et al.* KS406 (HNL).

Zingiber ligulatum Roxb. (sect. *Cryptanthium*)

Laos: Louangphabang: *K. Souvannakhoummane et al.* KS812 (HNL).

Zingiber mekongense Gagnep. (sect. *Cryptanthium*)

Laos: Xaignabouly: *C. Thorel* (P). Louangphabang: *V. Lamxay et al.* VL2028 (E); *J. Leong-Škorničková et al.* JLS-1691 (E, SING); *J. Leong-Škorničková et al.* JLS-1674 (E, SING); Vientiane Capital: *J. Leong-Škorničková et al.* JLS-1851 (HNL, E, SING); Xiengkhouang: *J. Leong-Škorničková et al.* JLS-2241 (E, SING, QBG); Oudomxai: *V. Lamxay et al.* VL1169 (E). Vientiane: *J.E. Vidal* 1807 (P).

Zingiber monophyllum Gagnep. (sect. *Pleuranthesis*)

Laos: Xiengkhouang: *C.J. Spire* 164 (P).

Zingiber montanum (J.Koenig) Link ex A.Dietr. (sect. *Zingiber*)

Laos: Louangphabang: *Somdy s.n.* (cultivated at Pha Tad Ke BG; although there is no herbarium specimen supporting this record, the species is occasionally cultivated and was recorded by Newman *et al.*, 2007).

Zingiber neotruncatum T.L.Wu, K.Larsen & Turland (sect. *Zingiber*)

- Laos: Champasak: *E. Poilane* 28360 (P).
- Zingiber nitens** M.F.Newman (sect. *Dymczewiczia*)
Laos: Bolikhamxai: *M.F. Newman* 2647 (holo E, incl. spirit).
- Zingiber niveum** Mood & Theilade (sect. *Zingiber*)
Laos: Salavan: *E. Poilane* 16187 (P).
- Zingiber nudicarpum** D.Fang (sect. *Zingiber*)
Laos: Attapeu: *V. Lamxay et al.* VL1967 (E); Houaphan: *J. Leong-Škorničková et al.* JLS-2386 (E, SING, QBG).
- Zingiber officinale** Roscoe (sect. *Zingiber*)
Laos: Xaignabouly: *J.E. Vidal* 4305 (P).
- Zingiber orbiculatum** S.Q.Tong (sect. *Cryptanthium*)
Laos: Houaphan: *J. Leong-Škorničková et al.* JLS-2266 (E, P, SING, QBG); Louangphabang: *K. Phouthavong et al.* KP328 (HNL); *Thorel s.n.* (P00289157); Oudomxai: *J. Leong-Škorničková et al.* JLS-1725 (HNL, SING); Xaignabouly: *P. Srisanga et al.* L2-323(QSB); Vientiane: *J.E. Vidal* 1809 (P).
- Zingiber ottensii** Valetton (sect. *Zingiber*)
Laos: Louangphabang: *K. Souvannakhoummane et al.* KS438 (Pha Tad Ke BG).
- Zingiber parishii** subsp. **phuphanense** Triboun & K.Larsen (sect. *Zingiber*)
Laos: Louangphabang: *J. Leong-Škorničková et al.* JLS-1753 (HNL, SING); *K. Souvannakhoummane et al.* KS789 (HNL); *J. Leong-Škorničková et al.* JLS-1766 (HNL, SING); *J.E. Vidal* 4256 (P); Vientiane capital: *J. Leong-Škorničková et al.* JLS-1834.
- Zingiber pellitum** Gagnep. (sect. *Dymczewiczia*)
Laos: Champasak: *J.F. Maxwell* 98–1017 (CMU); *C. Thorel* 2173 (P[4]).
- Zingiber recurvatum** S.Q.Tong & Y.M.Xia (sect. *Cryptanthium*)
Laos: Louangphabang: *K. Phouthavong et al.* KP246 (HNL); *K. Phouthavong & K. Souvannakhoummane* KP451 (HNL).
- Zingiber smilesianum** Craib (sect. *Cryptanthium*)
Laos: Xiengkhouang: *K. Souvannakhoummane et al.* KS-Bio 0024 (HNL); *K. Souvannakhoummane et al.* KS-Bio 0031 (HNL).
- Zingiber thorelii** Gagnep. (sect. *Cryptanthium*; provisionally accepted in this section by Bai *et al.*, 2016)
Laos: Champasak: *C. Thorel* 2363 (P [2]); *V. Lamxay* VL1083 (E, [2]). Saravan: *E. Poilane* 16116 (P); *V. Lamxay & S. Chanthavongsa* VL1113 (E); *C. Thorel* 2363(P); *V. Lamxay et al.* VL1083 (E). Xaisomboun Special Area: *J.E. Vidal* 5970 (P).
- Zingiber xishuangbannaense** S.Q.Tong (sect. *Cryptanthium*; provisionally accepted in this section by Bai *et al.*, 2016)
Laos: Louangphabang: *K. Phouthavong & K. Souvannakhoummane* KP 452 (QBG). Vientiane: *J.E. Vidal* 5946 (P). *J. Leong-Škorničková et al.* JLS1705 (Living at Pha Tad Ke BG).

***Zingiber zerumbet* (L.) Roscoe ex Sm. (sect. *Zingiber*)**

Laos: Champasak: *J.F. Maxwell* 98–881 (CMU); *V. Lamxay et al.* VL1914 (E).
Louangphabang: *C. Dupuy* 270 (P). Vientiane: *J.E. Vidal* 1808 (P).

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