



SIX NEW SPECIES OF *WURFBAINIA* (ZINGIBERACEAE) FROM THAILAND

W. Kaewsri ¹ & S. Sangvirotjanapat ²

Six new species are described from Thailand: *Wurfbainia ellipticarpa*, *W. geostachyoides*, *W. globosa*, *W. longiflora*, *W. parviflora* and *W. yingyongii*. A line drawing and photographs, information on phenology, distribution, ecology and etymology, and a proposed IUCN conservation category are provided for each species. A key to the species of *Wurfbainia* in Thailand is also provided.

Keywords. *Amomum*, cardamom, flora, ginger, new species, taxonomy.

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Introduction

Wurfbainia Giseke was published in 1792 with *W. uliginosa* (J.Koenig) Giseke as the type (Giseke, 1972). Most subsequent publications have treated this genus as a synonym of *Amomum* Roxb. De Boer *et al.* (2018) carried out a molecular phylogenetic study of the tribe Alpinieae and concluded that *Wurfbainia*, along with *Conamomum* Ridl. and *Meistera* Giseke, should be reinstated to resolve the polyphyly of *Amomum*.

Wurfbainia is morphologically distinct in the Alpinieae by its trilobed anther crest in which the side lobes point upwards and the midlobe is behind the stigma, in contrast to the morphologically similar *Meistera*, which has an eared or a crown-shaped, semilunar anther crest that may be entire to trilobed. Following the new classification, *Wurfbainia* now comprises 27 species and two varieties distributed in Sikkim, Northeast India, Bangladesh and China to Southeast Asia as far as the Philippines and Sulawesi (De Boer *et al.*, 2018).

Thailand is one of the centres of diversity of *Wurfbainia*, having 11 species and two varieties mainly distributed in southwestern and Peninsular Thailand (Newman *et al.*, 2005–). During preparation of the revision of the family Zingiberaceae for the *Flora of Thailand*, six new species of *Wurfbainia* were recognised and are described below, bringing the total number of species in Thailand to 18 (including one with two varieties).

Materials and methods

Field explorations in Thailand were carried out from April 2004 to August 2019. Living materials were photographed and measured in the field. Herbarium collections relevant to *Wurfbainia* were studied at BK, BKF, E, KEP and SING. Digital specimens were examined via the online herbarium databases of the Royal Botanic Garden Edinburgh (RBGE),

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- 12a. Lower leaf surface hairy _____ 13
 12b. Lower leaf surface glabrous _____ 15
- 13a. Ligule bilobed; labellum white with orange blotch spreading to apex __ **6. *W. yingyongii***
 13b. Ligule entire; labellum white with yellow band along centre _____ 14
- 14a. Pseudostem base green; inflorescence of 2 or 3 flowers
W. biflora (Jack) Škorničk. & M.F.Newman
- 14b. Pseudostem base reddish green; inflorescence of 4 or 5 flowers
W. schmidtii (K.Schum.) Škorničk. & A.D.Poulsen
- 15a. Ligule < 3 mm long _____ **3. *W. globosa***
 15b. Ligule ≥ 3 mm long _____ 16
- 16a. Peduncle ≥ 13 cm long; ligule ≥ 13 mm long
W. longiligularis (T.L.Wu) Škorničk. & A.D.Poulsen
- 16b. Peduncle < 13 cm long; ligule < 13 mm long _____ 17
- 17a. Labellum ≤ 1 cm wide; ligule ≥ 5 mm long _____ **1. *W. ellipticarpa***
 17b. Labellum > 1 cm wide; ligule < 5 mm long _____ 18
- 18a. Calyx-to-bracteole ratio ≥ 2; pseudostem base pinkish green
W. villosa (Lour.) Škorničk. & A.D.Poulsen var. *nana*
- 18b. Calyx-to-bracteole ratio < 2; pseudostem base green _____ *W. villosa* var. *villosa*

Species descriptions

1. *Wurfbainia ellipticarpa* Kaewsri, sp. nov.

Similar to *Wurfbainia villosa* (Lour.) Škorničk. & A.D.Poulsen but differs in its narrower labellum (c.1 cm vs c.1.5 cm), inflorescence lax (vs congested) and fruit ellipsoid (vs globose to ovoid) ([Table 1](#)). – Type: Thailand, Kanchanaburi, Thong Pha Phum National Park, c.800 m altitude, 25 v 2004, *Kaewsri* 024 (holotype BKF!; isotypes BK!, E!).
Figures 1, 2.

Table 1. Characters distinguishing between *Wurfbainia ellipticarpa*, *W. globosa* and *W. villosa*

Character	<i>W. ellipticarpa</i>	<i>W. globosa</i>	<i>W. villosa</i>
Inflorescence density	Lax	–	Congested
Labellum width (cm)	c.1	–	c.1.5
Fruit shape	Ellipsoid	–	Globose to ovoid
Ligule apex	–	Bilobed	Round or emarginate
Calyx apex	–	Bilobed	Trilobed
Labellum apex	–	Bilobed	Shallowly trilobed

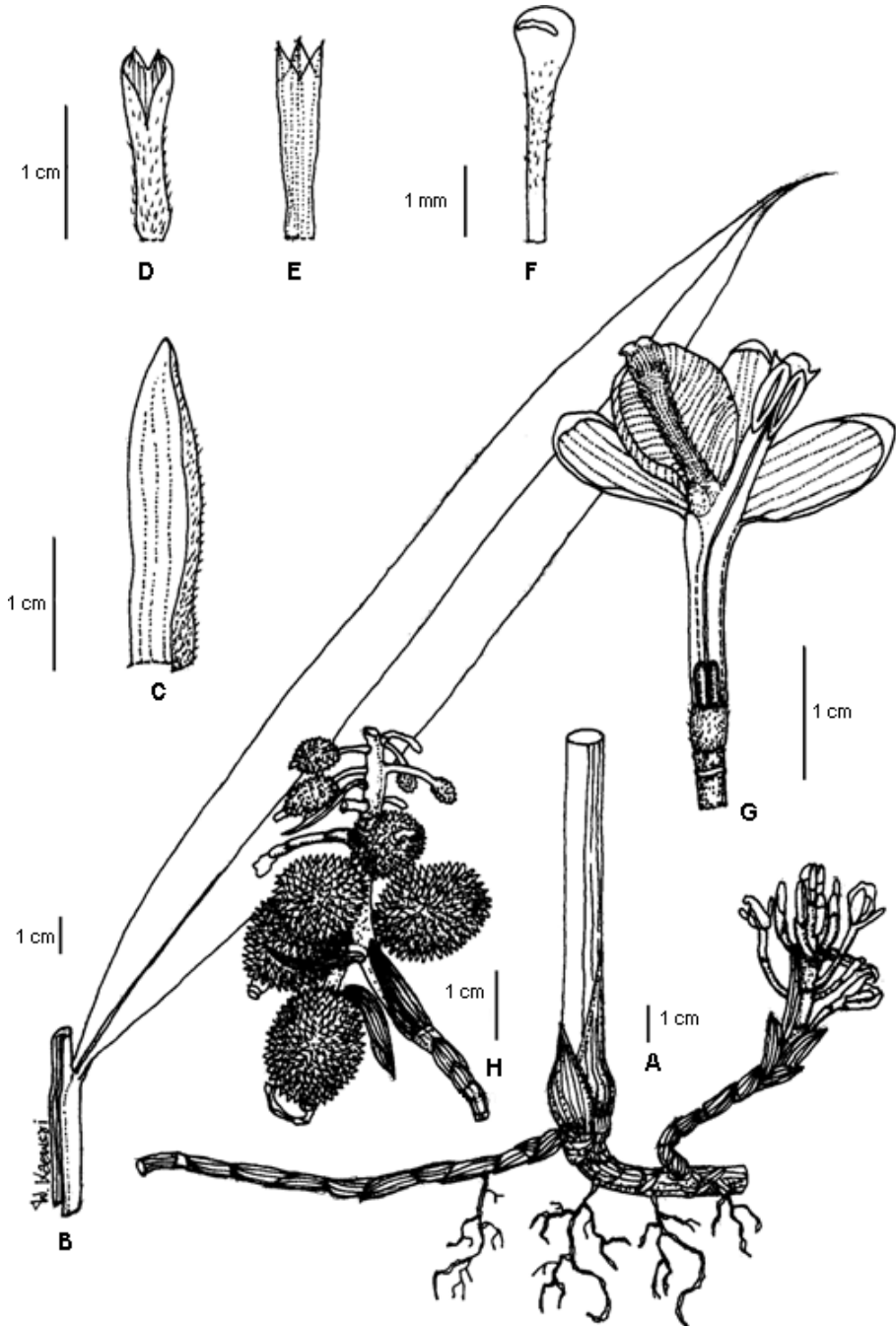


Figure 1. *Wurfbainia ellipticarpa* Kaewsri, sp. nov. A, Rhizome and inflorescence; B, leaf; C, bract; D, bracteole; E, calyx; F, stigma; G, flower (dissected); H, infructescence. Drawn from Kaewsri 024 by W. Kaewsri.

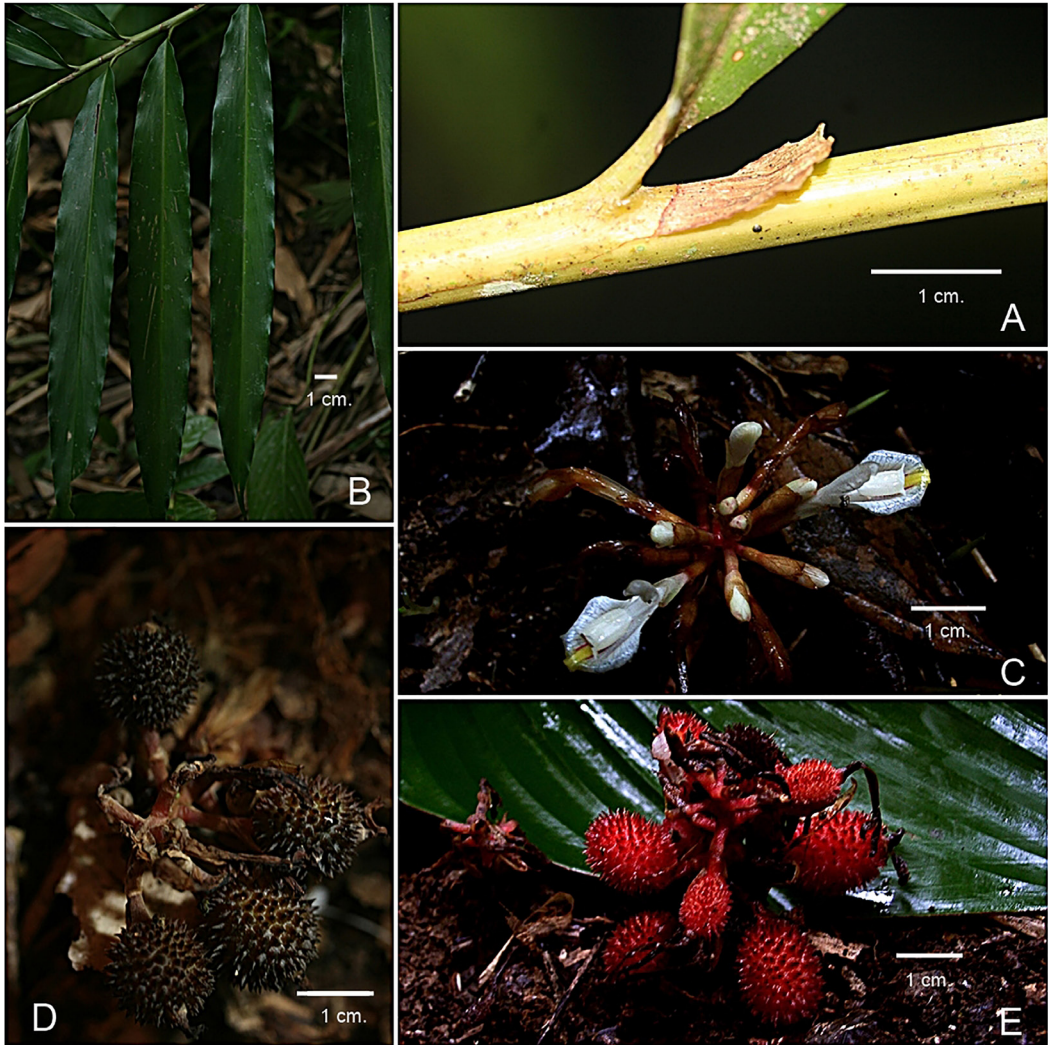


Figure 2. *Wurfbainia ellipticarpa* Kaewsri, sp. nov. A, Ligule; B, leaves; C, inflorescence; D, mature infructescence; E, young infructescence. All photographs of the type collection (Kaewsri 024), taken by W. Kaewsri.

Rhizomatous herb, long creeping, leafy shoot slender, c.1.5 m tall. *Leaf sheaths* glabrous, pale green; ligule apex bilobed or rounded, 5–13 mm long, chartaceous; blades c.25, oblong, 18–35 × 1.5–5.5 cm, base attenuate, apex acuminate, 2–5 cm long, glabrous on both sides, sessile. *Inflorescence* lax, arising from rhizome, obovate, 5–6 × 3–5 cm; peduncle 6–9 cm long; peduncular bracts ovate to oblong, c.1.2 × 0.6 cm, apex rounded, margin entire, brown, glabrous to sparsely pubescent; rachis slightly curved; fertile bracts hooded, ovate to oblong, c.2.5 × 0.7 cm, apex acuminate or mucronate, pale brown, brown pubescent, soon decaying,

submembranous; bracteoles tubular, c.1.4 × 0.4 cm including ovary, apex bilobed, slit c.6 mm on one side, brown, fine pubescent above, membranous. *Flower* c.3 cm long, creamy white; pedicel 1–2 mm long, ovary cylindrical to subglobose, c.3 × 2 mm, glabrous; style c.2.8 cm long, creamy white, pubescent; stigma small bulbous, margin glabrous; epigynous glands blunt, c.1 × 3 mm; calyx tubular, c.1.5 cm long, apex trilobed, creamy white, glabrous; floral tube 1.3 cm long, creamy white, glabrous; dorsal corolla lobe broadly oblong, c.1.3 × 0.6 cm, apex obtuse, creamy white, glabrous; lateral corolla lobes oblong, c.1.3 × 0.5 cm, apex obtuse, creamy white, glabrous; lateral staminodes absent; labellum hooded, ovate, c.1.6 × 1 cm, base cuneate, apex bilobed and reflexed, white with pale yellow band along the centre and broader at apex, pale red veins on each side of the band, glabrous; stamen: filament c.6 mm long, ribbon-like; anther c.6 × 3 mm, glabrous, dehiscing longitudinally; anther crest trilobed, white, central lobe c.1 × 1 mm, apex rounded, reflexed, lateral lobes c.0.5 mm long, small auriculate, erect. *Fruit* 5–8 per infructescence, ellipsoid, c.2 × 1.2 cm, covered with slender spines, pinkish red and turning dark brown when mature; stalk 5–7 mm long; seeds angular, c.1–2 mm in diameter, covered with white aril.

Phenology. Flowering and fruiting between April and September.

Distribution. Known only from the type locality (Figure 3).

Habitat. Thrives in dry evergreen forest in light gaps at 800 m altitude.

Etymology. The specific epithet refers to the ellipsoid fruit.

Proposed IUCN conservation category. Critically Endangered (CR). This species is found only in Thong Pha Phum National Park, Kanchanaburi Province. Two populations were located during fieldwork in 2004. The total number of individuals was below 50. Although they were in good condition and subject to no major threats, the restricted numbers of populations and individuals must be taken into consideration. *Wurfbainia ellipticarpa* is therefore assessed as Critically Endangered according to criterion D.

2. *Wurfbainia geostachyoides* Kaewsri, sp. nov.

Similar to *Wurfbainia microcarpa* (C.F.Liang & D.Fang) Škorničk. & A.D.Poulsen but differs in its shorter ligule (c.2 mm vs 7–10 mm), abaxial blade surface glabrous (vs tomentose) and lateral staminode apex truncate (vs rounded and hooded) (Table 2). – Type: Thailand, Kanchanaburi, Thong Pha Phum, Thong Pha Phum National Park, 950 m altitude, 30 v 2010, Kaewsri 223 (holotype BKF!, isotype BK!). Figures 4, 5.

Clump-forming herb, stem base elevated to c.30 cm above ground by brownish stilt roots, leafy shoot slender, 0.9–1.2 m tall. *Leaf sheaths* dark green and brown when dried; ligule c.2 mm long, shallowly bilobed, lobes obtuse, papery, glabrous; blades 14–16, oblong or ovate-oblong, 8–20 × 2–4 cm, base attenuate, apex caudate, 1–2.5 cm long, glabrous, sessile. *Inflorescence* arising from rhizome, conical to obovate, c.8 × 2.5 cm; peduncle

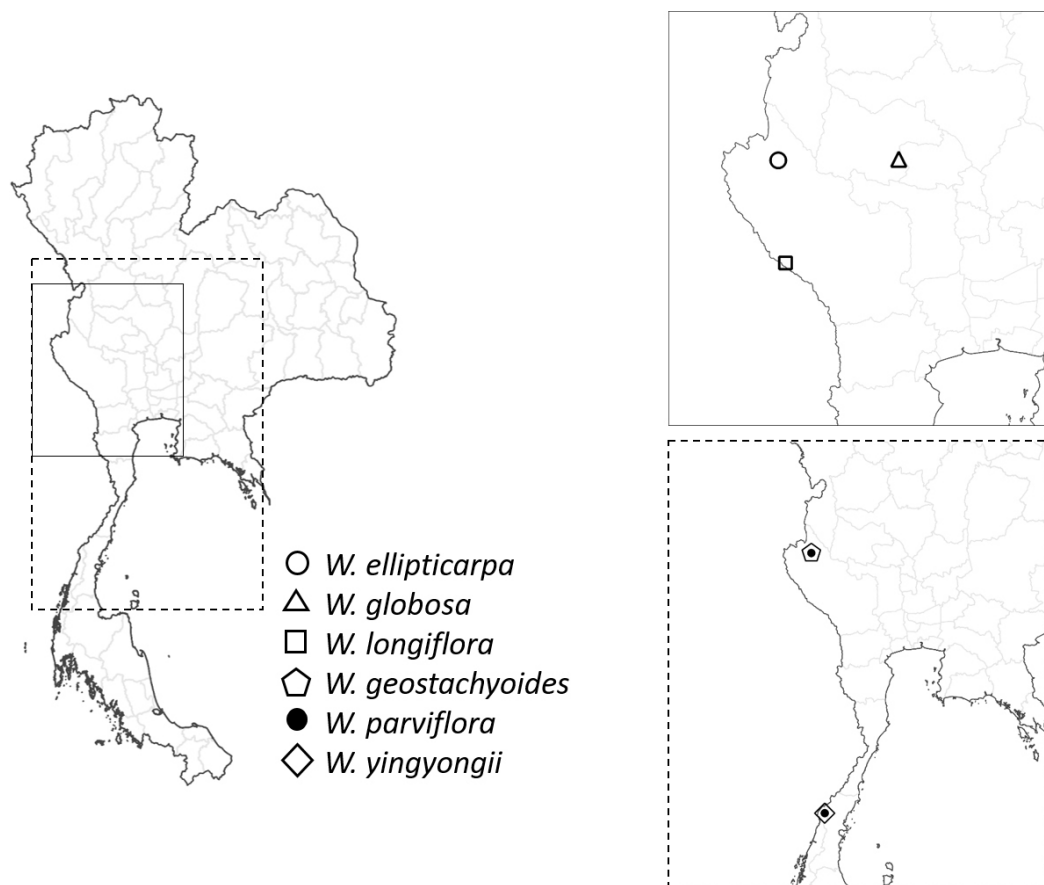


Figure 3. Species distribution map. The unbroken-line box indicates the localities of *Wurbainia ellipticarpa*, *W. globosa* and *W. longiflora*. The dashed-line box indicates the localities of *Wurbainia geostachyoides*, *W. parviflora* and *W. yingyongii*.

c.3.5 cm long; peduncular bracts broadly ovate, pale brown, glabrous, c.0.5–1.5 × 0.5–1 cm, apex acuminate; fertile bracts lanceolate-oblong, 1–1.5 × 0.4–0.5 cm, persistent, leathery, pale brown, outer surface brown pubescent, apex acuminate; bracteoles tubular, c.7 mm long excluding ovary, apex trilobed, brown, outer surface glabrous with pubescent base. Flower c.1.5 cm long, white; ovary cylindrical, c.3 × 2 mm, densely appressed pubescent;

Table 2. Characters distinguishing between *Wurbainia geostachyoides* and *W. microcarpa*

Character	<i>W. geostachyoides</i>	<i>W. microcarpa</i>
Ligule length (mm)	c.2	7–10
Abaxial blade surface	Glabrous	Tomentose
Lateral staminode apex	Truncate	Rounded hood

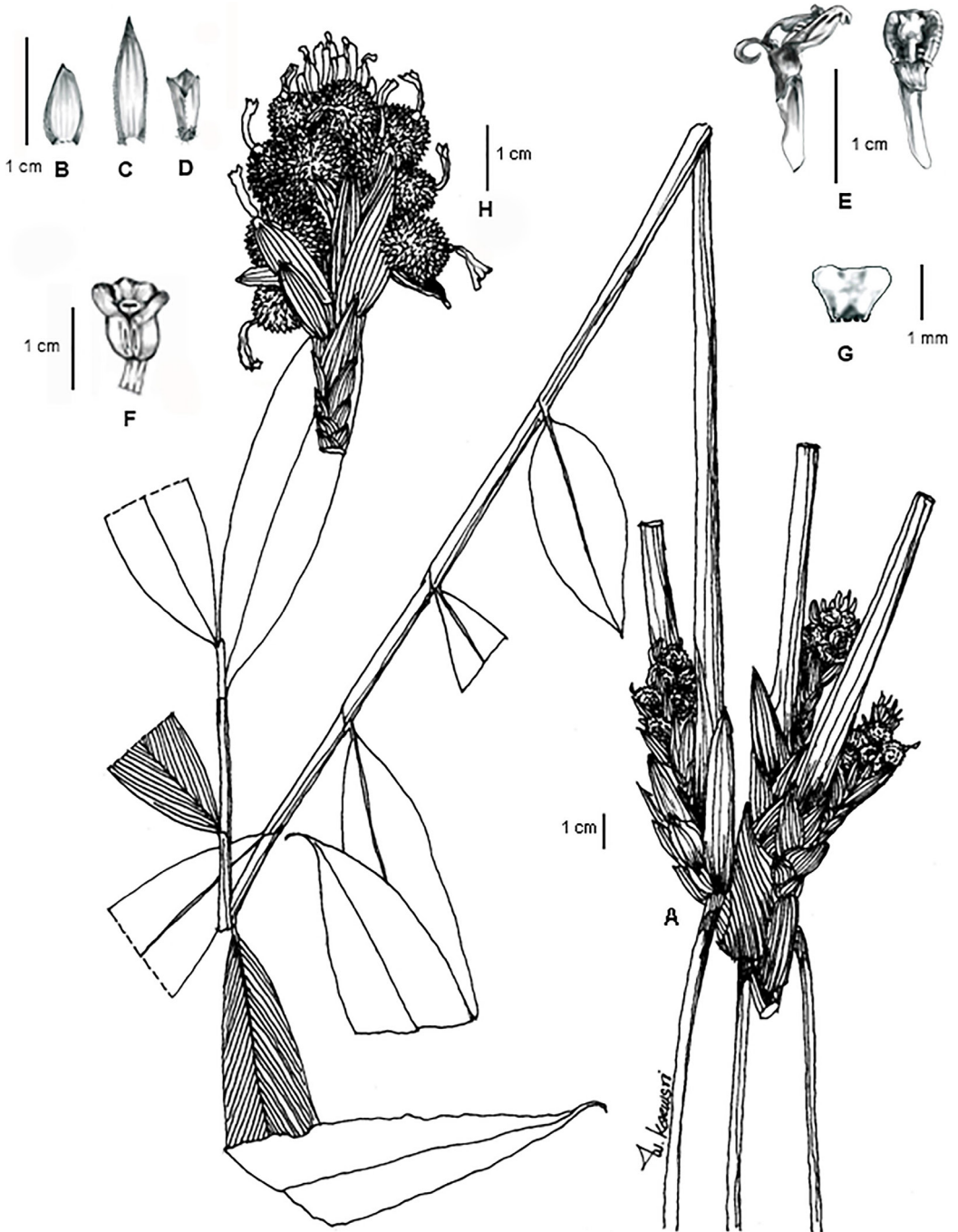


Figure 4. *Wurfbainia geostachyoides* Kaewsri, sp. nov. A, Habit; B, peduncular bract; C, fertile bract; D, calyx; E, flower; F, stamen; G, staminodes; H, inflorescence. Drawn from Kaewsri 223 by W. Kaewsri.



Figure 5. *Wurfbainia geostachyoides* Kaewsri, sp. nov. A, Habit; B, stilt roots and inflorescences; C, ligule; D, leaves; E, flower; F, flowers; G, young fruits; H, ripe fruits. All photographs of the type collection (Kaewsri 223), taken by W. Kaewsri.

style glabrous; stigma clavate, ostiole narrowly transverse, glabrous; epigynous glands c.3 × 1 mm, yellow; calyx tubular, c.11 mm long including ovary, apex trilobed and shallowly split on one side, outer surface pale brown, base pubescent; floral tube 1.1 cm long including ovary, creamy white; dorsal corolla lobe oblong, c.5 × 3 mm, membranous, apex acuminate, revolute; lateral corolla lobes equal; lateral staminodes c.1 mm, apex truncate; labellum hooded, elliptic, c.10 × 6 mm, apex shallowly trilobed, creamy white with scattered crimson spots and dark yellow blotches at apex; stamen: filament ribbon-like, c.5 × 1 mm, creamy

white; anther c.5 × 3 mm, glabrous, dehiscent lengthwise; anther crest reniform, trilobed, rounded, c.7 × 2 mm, creamy white, central lobe c.3 × 2 mm, lateral lobes c.2 × 2 mm. *Fruit* 2–15 per infructescence, globose, covered with fine spines, dark green and turning to dark red when ripe, c.1–1.3 cm in diameter, fruit stalk c.5 mm long; seeds c.2 mm in diameter, angular, arillate.

Phenology. Flowering and fruiting between April and July.

Distribution. Known only from the type locality (see [Figure 3](#)).

Habitat. Dry evergreen and tropical rain forest under shrubs or trees or on hill slopes at 260–950 m altitude.

Etymology. The specific epithet refers to the distinctly woody rhizome raised above ground with stilt roots, which recalls the genus *Geostachys* (Baker) Ridl.

Proposed IUCN conservation category. Critically Endangered (CR). This species is found only in Thong Pha Phum National Park, Kanchanaburi Province. Two populations were observed in 2010 and 2020. They are well protected by forestry officers, but small and restricted populations are of concern. *Wurfbainia geostachyoides* is therefore assessed as Critically Endangered according to criterion D.

Additional specimen examined. THAILAND. Kanchanaburi: Thong Pha Phum, 14°68'85"N, 98°40'27"E, 30 v 2010, *Kaewsri* 151 (BK, BKF).

3. *Wurfbainia globosa* Kaewsri, sp. nov.

Similar to *Wurfbainia villosa* (Lour.) Škorničk. & A.D.Poulsen but differs in its ligule apex bilobed (vs round or emarginate), calyx apex bilobed (vs trilobed) and labellum apex bilobed (vs shallowly trilobed) (see [Table 1](#)). – Type: Thailand, Uthaitхани, Ban Rai District, Huai Khakhaeng Wildlife Sanctuary, Huai Mae-dee Wildlife Protection Unit, 215 m altitude, 1 vi 2004, *Kaewsri* 027 (holotype BKF!; isotypes BK!, E!). [Figures 6, 7](#).

Terrestrial herb, creeping, leafy shoot slender, 1.2–1.7 m tall. *Leaf sheaths* yellow green, glabrous; ligule apex bilobed, 1–2 mm long, with 2 transversal ridges and axil hairy, leathery; blades 16–26, oblong, 15–32 × 6–7.5 cm, base attenuate, apex acuminate, tip caudate, 1.5–2 cm long, surfaces glabrous, sparsely pubescent, petiole sessile. *Inflorescence* arising from rhizome, obovate, c.3–5 × 1.5–3 cm; peduncle 6–10 cm long; peduncular bracts ovate, 0.5–2.5 × 0.3–0.6 cm, hooded, apex acuminate, pale brown; fertile bracts hooded, ovate-oblong, c.2 × 0.7 cm, apex acuminate or mucronate, pale brownish cream, soon decaying, submembranous; bracteoles tubular, c.1 cm long including ovary, apex bilobed, shallowly split on one side, creamy white, membranous, outer surface glabrous, base pubescent. *Flower* c.3.8 cm long, white; ovary cylindrical, c.3 × 3 mm, surface with white pubescence; style c.3 cm long; stigma small bulbous, margin glabrous; epigynous glands c.2 mm long; calyx tubular, c.1.5 cm long including ovary, apex bilobed and shallowly split c.7 mm on

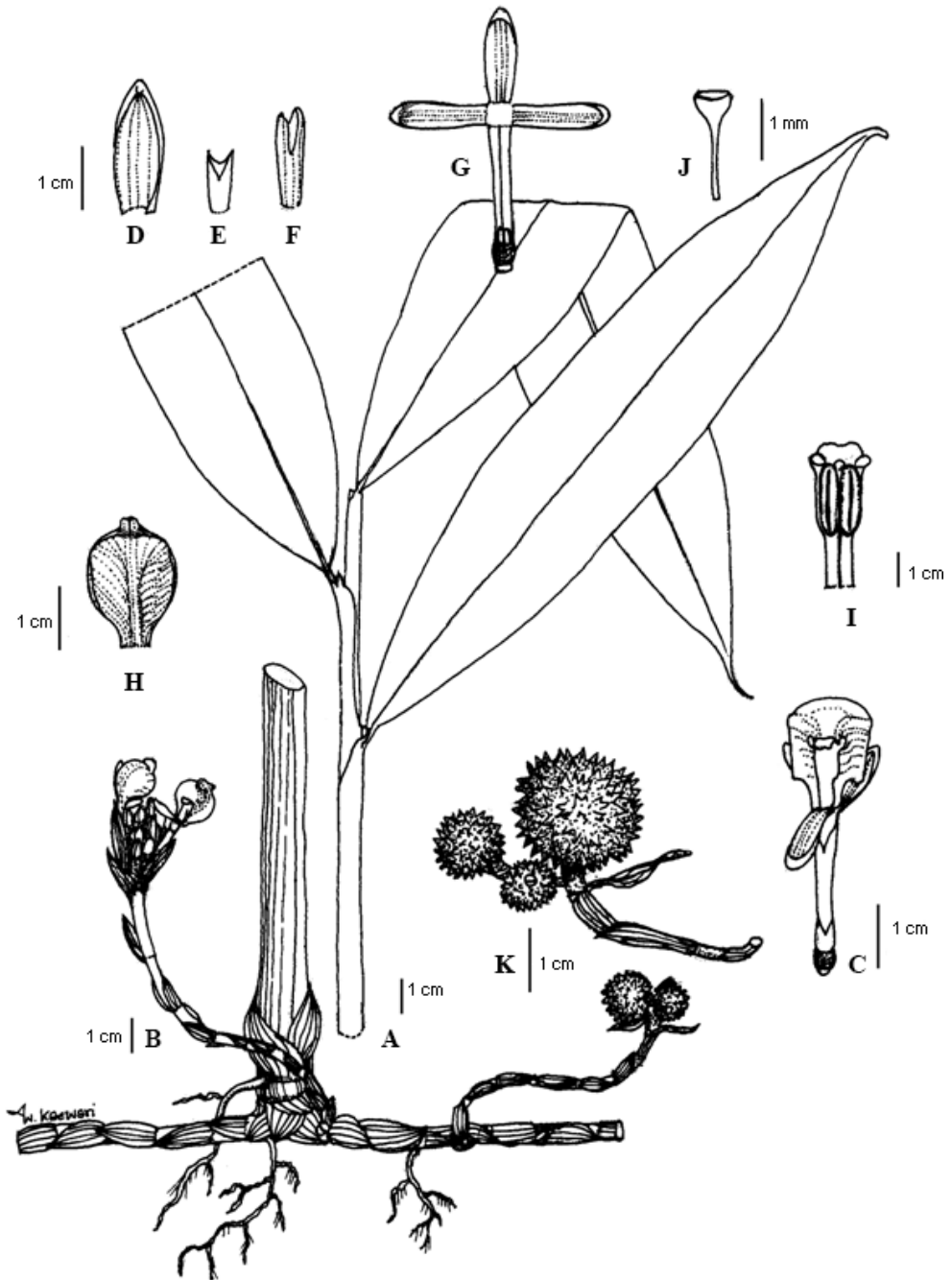


Figure 6. *Wurfbainia globosa* Kaewsri, sp. nov. A, Leaves; B, inflorescence and infructescence; C, flower; D, bract; E, bracteole; F, calyx; G, corolla (dissected); H, labellum; I, stamen; J, stigma; K, fruit. Drawn from Kaewsri 027 by W. Kaewsri.



Figure 7. *Wurfbainia globosa* Kaewsri, sp. nov. A, Flower; B, infructescence. Both photographs of the type collection (Kaewsri 027), taken by W. Kaewsri.

one side, outer surface glabrous, base pubescent; floral tube c.2.5 cm long including ovary, creamy white, pubescent; dorsal corolla lobe hooded, oblong, c.1.5 × 0.5 cm, apex blunt; lateral corolla lobes hooded, oblong, c.1.5 × 0.4 cm, apex blunt; lateral staminodes absent; labellum spatulate, c.2 cm in diameter, hooded, base cuneate, apex bilobed and reflexed, white with yellow band along centre and broader at apex, reddish veins on each side of band; stamen: filament c.8 mm long, ribbon-like, shallowly concave; anther c.5 × 3 mm, dehiscing lengthwise; anther crest trilobed, c.5 × 2 mm, white, central lobe c.3 × 2 mm, rounded and emarginate, reflexed, lateral lobes c.1 × 1 mm, auriculate, erect. *Fruits* 3–5 per infructescence (only one maturing and larger than the others), globose, c.1.8 cm in diameter, covered with stout spines, bright green when young turning red when ripe, stalk c.2 mm long; seeds not seen.

Phenology. Flowering and fruiting between April and August.

Distribution. Known only from the type locality (see [Figure 3](#)).

Habitat. Dry evergreen forest under shrubs or trees at 215 m altitude.

Etymology. The specific epithet refers to the globose fruit.

Proposed IUCN conservation category. Least Concern (LC). This species is common in Huai Mae-dee Wildlife Protection Unit, Huai Khakhaeng Wildlife Sanctuary, Ban Rai District Uthai Thani Province. The population faces no major threats, and there are more than 500 mature individuals. *Wurfbainia globosa* is therefore assessed as Least Concern.

This species is easily recognised by the differing sizes of the fruits on each infructescence. There is one large fruit along with smaller ones (see Figures 6K and 7B).

4. *Wurfbainia longiflora* Kaewsri, sp. nov.

Similar to *Wurfbainia uliginosa* (J.Koenig) Škorničk. & A.D.Poulsen but differs in its shorter leafy shoot (0.6–1.7 m vs 2.4–4.1 m), inflorescence size (3 × 1.2 cm vs 3–5 × 2–3 cm), longer floral tube (3.7–4.2 cm long including ovary vs c.2.5 cm long including ovary) and young fruit white (vs green) (Table 3). – Type: Thailand, Chumphon, Tha Sae, Northern Sadejnaikrom Kromlaung Chumphon wildlife sanctuary, 10°39'35.1"N, 98°54'19.5"E, 215 m altitude, 7 iv 2004, *Kaewsri* 068 (holotype BKF!, isotype BK!).

Figures 8, 9.

Terrestrial creeping herb. *Leafy shoot* slender, 0.6–1.7 m tall, 17–31 leaves, sheaths dark green, smooth, glabrous; ligule apex bilobed, 1–3 mm long, papery, glabrous; petiole 2–5 mm long, glabrous; blades oblong-lanceolate to narrowly oblong, 9.6–28 × 2.3–4 cm, base attenuate to obtuse, apex acuminate, tip caudate, 3–4.1 cm long. *Inflorescence* arising from rhizome, obovate to conical, 3 × 1.2 cm; peduncle 2–3 cm long; flowering head 4- to 6-flowered, compact; peduncular bracts broadly ovate, c.7 × 1–2 mm, apex acuminate, pale brown, glabrous to sparsely pubescent; fertile bracts persistent, ovate to deltoid, 1.8–2 × 1.5–2 cm, apex mucronate, pale brown with scattered dark brown spots, glabrous, papery; bracteoles tubular, c.1.5 cm long including ovary, apex bilobed, pale brown, outer surface glabrous with pubescent base. *Flower* white; ovary subellipsoid, c.2 × 2 mm, surface with pale brown pubescence; style c.4.8 cm long; ovary cylindrical, c.3 × 3 mm, hairy; stigma small bulbous, margin of ostiole hairy; epigynous glands c.5 mm long; calyx tubular, 2.5–4 cm long including ovary, apex bilobed and shallowly split on one side, outer surface pale brown, base pubescent; floral tube 3.7–4.2 cm long including ovary, creamy white, glabrous; dorsal corolla lobe hooded, oblong, c.1.6 × 0.8 cm, apex blunt, membranous; lateral corolla lobes hooded, oblong, c.1.5 × 0.6 cm, apex blunt, membranous; lateral staminodes narrowly subulate, c.5 mm; labellum obovate, hooded, c.1.8 × 1.6 cm, base contracted and clawed, apex shallowly bilobed, white with yellow band along centre and crimson veins on each side of band; stamen: filament c.6 × 1.5 mm, ribbon-like; anthers c.4 × 3 mm, dehiscing lengthwise; anther crest trilobed, rounded, c.5 × 2 mm, whitish, central lobe 3–3.5 mm wide, emarginate, reflexed, lateral lobe c.1 × 1 mm, spreading. *Fruit* subglobose, 1–1.5

Table 3. Characters distinguishing between *Wurfbainia longiflora* and *W. uliginosa*

Character	<i>W. longiflora</i>	<i>W. uliginosa</i>
Leafy shoot length (m)	0.6–1.7	2.4–4.1
Inflorescence size (cm)	3 × 1.2	3–5 × 2–3
Floral tube length (cm)	3.7–4.2	c.2.5
Young fruit colour	White	Green

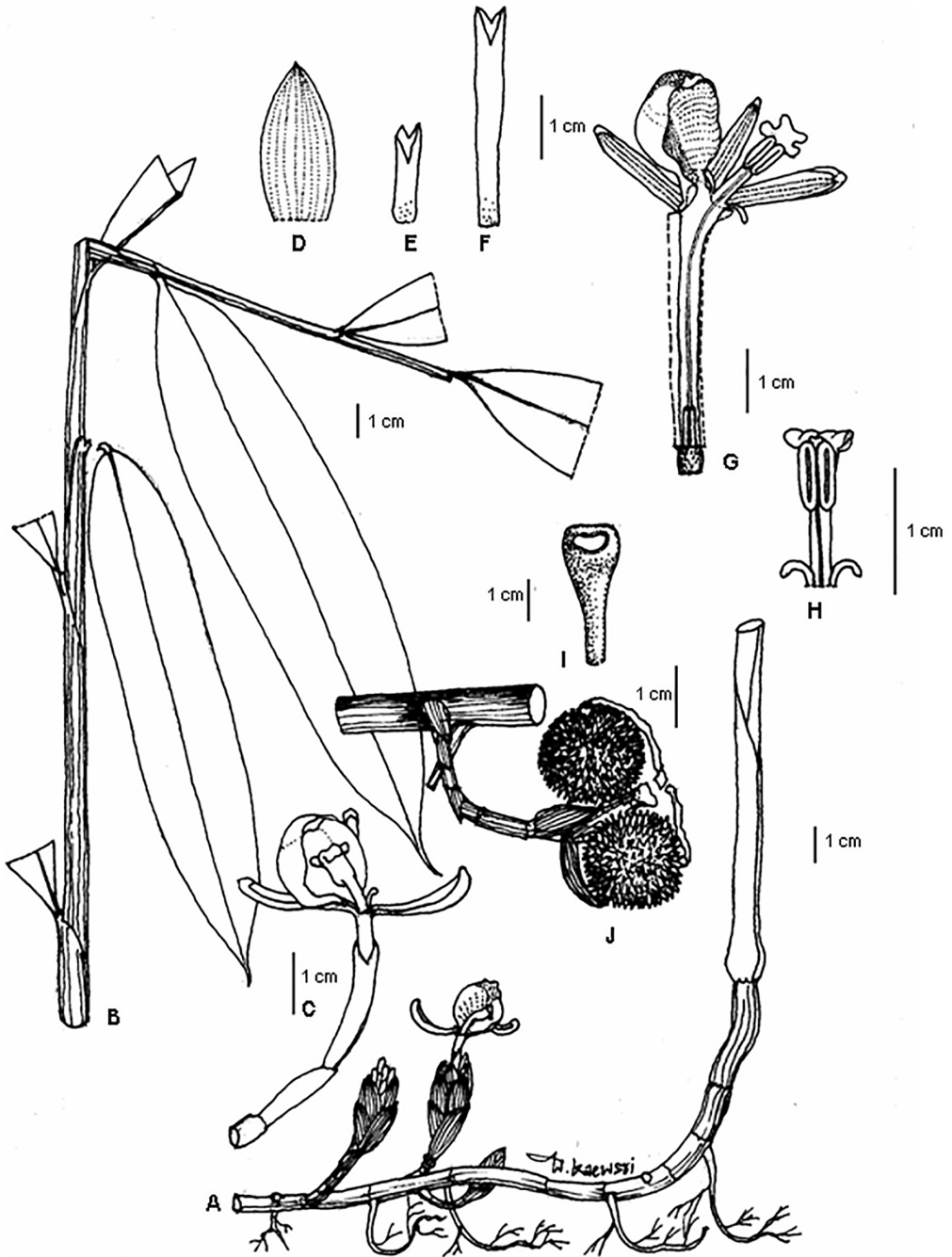


Figure 8. *Wurfbainia longiflora* Kaewsri. A, Inflorescence and rhizome; B, leaves; C, flower; D, bract; E, bracteole; F, calyx; G, flower (dissected); H, stamen and staminodes; I, stigma; J, infructescence. Drawn from Kaewsri 068 by W. Kaewsri.

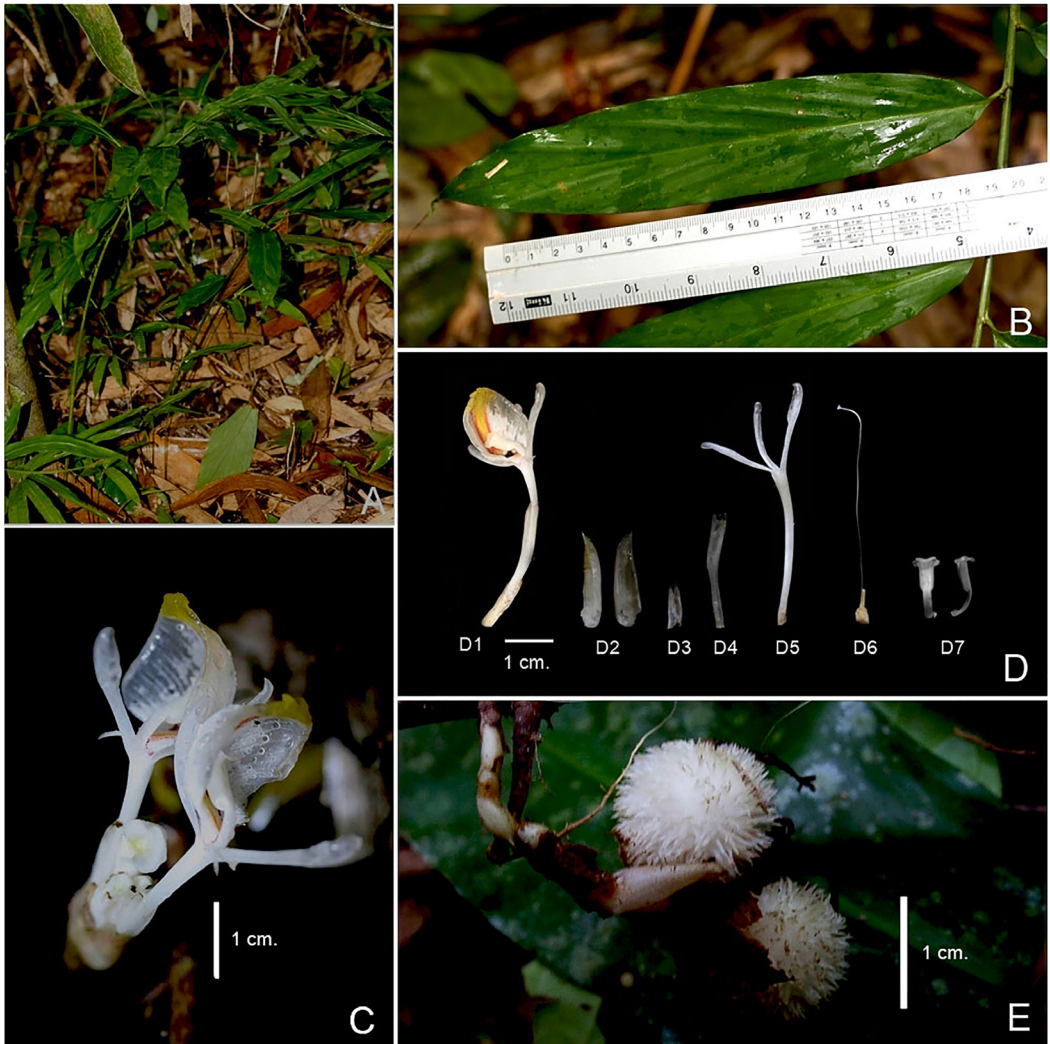


Figure 9. *Wurfbainia longiflora* Kaewsri, sp. nov. A, Habit; B, leaves; C, inflorescence; D, floral parts (D1, flower; D2, bracts; D3, bracteole; D4, calyx; D5, corolla; D6, pistil; D7, stamens); E, infructescence. All photographs of Kaewsri 242, taken by W. Kaewsri.

× 1.6–1.7 cm, 2 (or 3) per infructescence, densely covered with rigid spines, white when young, turning red when ripe, with persistent calyx and stigma c.2 cm long at apex.

Phenology. Flowering and fruiting between April and July.

Distribution. Endemic to Thailand, known only from the type locality, Sadejnakrom Kromluang Chumphon wildlife sanctuary (see [Figure 3](#)).

Habitat. Tropical rain and evergreen forest under shrubs and trees at 215 m altitude.

Etymology. The specific epithet refers to the distinct long floral tube.

Proposed IUCN conservation category. Least Concern (LC). This species is common in the Sadejnaikrom Kromluang Chumphon wildlife sanctuary, which covers parts of Chumphon and Ranong Provinces. It grows in a well-protected area with no threats. Moreover, mature individuals are able to produce descendents and expand the population size by vegetative propagation. *Wurfbainia longiflora* is therefore assessed as Least Concern.

Additional specimen examined. THAILAND. **Chumphon:** Tha Sae, Sadejnaikrom Kromluang Chumphon wildlife sanctuary, 5 vi 2010, *Kaewsri* 242 (BK!, BKF!). **Ranong:** Kra buri, Sadejnaikrom Kromluang Chumphon wildlife sanctuary, 9 iv 2004, *Kaewsri* 079 (BK!, BKF!).

5. *Wurfbainia parviflora* Kaewsri, sp. nov.

Similar to *Wurfbainia micrantha* (Ridl.) Škorničk. & A.D.Poulsen but differs in its blade size (11–21 × 2–4 cm vs 15–30 × 0.6–2 cm), blade pubescent on both sides (vs glabrous on both sides) and calyx tube apex bilobed (vs trilobed) (Table 4). – Type: Thailand, Kanchanaburi, Thong Pha Phum National Park, Headquarters, c.800 m altitude, 25 v 2004, *Kaewsri* 022 (holotype BKF!; isotypes BK!, E!). Figures 10, 11.

Clump-forming herb, leafy shoot slender, 0.8–1 m tall. *Leaf sheaths* pale brown; ligule 0.5–1 mm long, apex bilobed, margin ciliate, fragile; blades 10–12, oblong-lanceolate, oblong or narrowly elliptic, 11–21 × 2–4 cm, base attenuate or obtuse, apex acute, caudate, 2–3 cm long, upper surface glabrate, with brown hair along midvein, lower surface densely subtomentose, sessile. *Inflorescence* lax, arising from rhizome, obovoid or conical, c.(4.8–)5 × (2.6–)3 cm; peduncle c.2.5 cm long; peduncular bracts deltoid, apex acute, margin hairy, brown, subleathery; fertile bracts lanceolate, c.1.5 × 0.6 cm, apex acute, margin ciliate, reddish brown, outer surface with sparse hair, papery; bracteoles tubular, c.1 cm long including ovary, apex acute and shallowly split on one side, outer surface sparsely pubescent. *Flower* c.2.9 cm long, yellowish white; ovary subellipsoid, c.2 mm long, pubescent; style c.3.2 cm long, including ovary; stigma cup-shaped, ostiole narrowly transverse, glabrous; epigynous glands c.2 mm long; calyx c.1.5–2.1 cm long including ovary, apex bilobed and shallowly split on one side, outer surface sparsely pubescent; floral tube equal to calyx, pinkish white, sparsely pubescent; dorsal corolla lobe oblong, c.1 × 0.3 cm long, apex acute; lateral corolla lobes oblong, c.1 × 0.2 cm long, apex acute; lateral

Table 4. Characters distinguishing between *Wurfbainia parviflora* and *W. micrantha*

Character	<i>W. parviflora</i>	<i>W. micrantha</i>
Blade size (cm)	11–21 × 2–4	15–30 × 0.6–2
Blade surfaces	Pubescent	Glabrous
Calyx tube apex	Bilobed	Trilobed

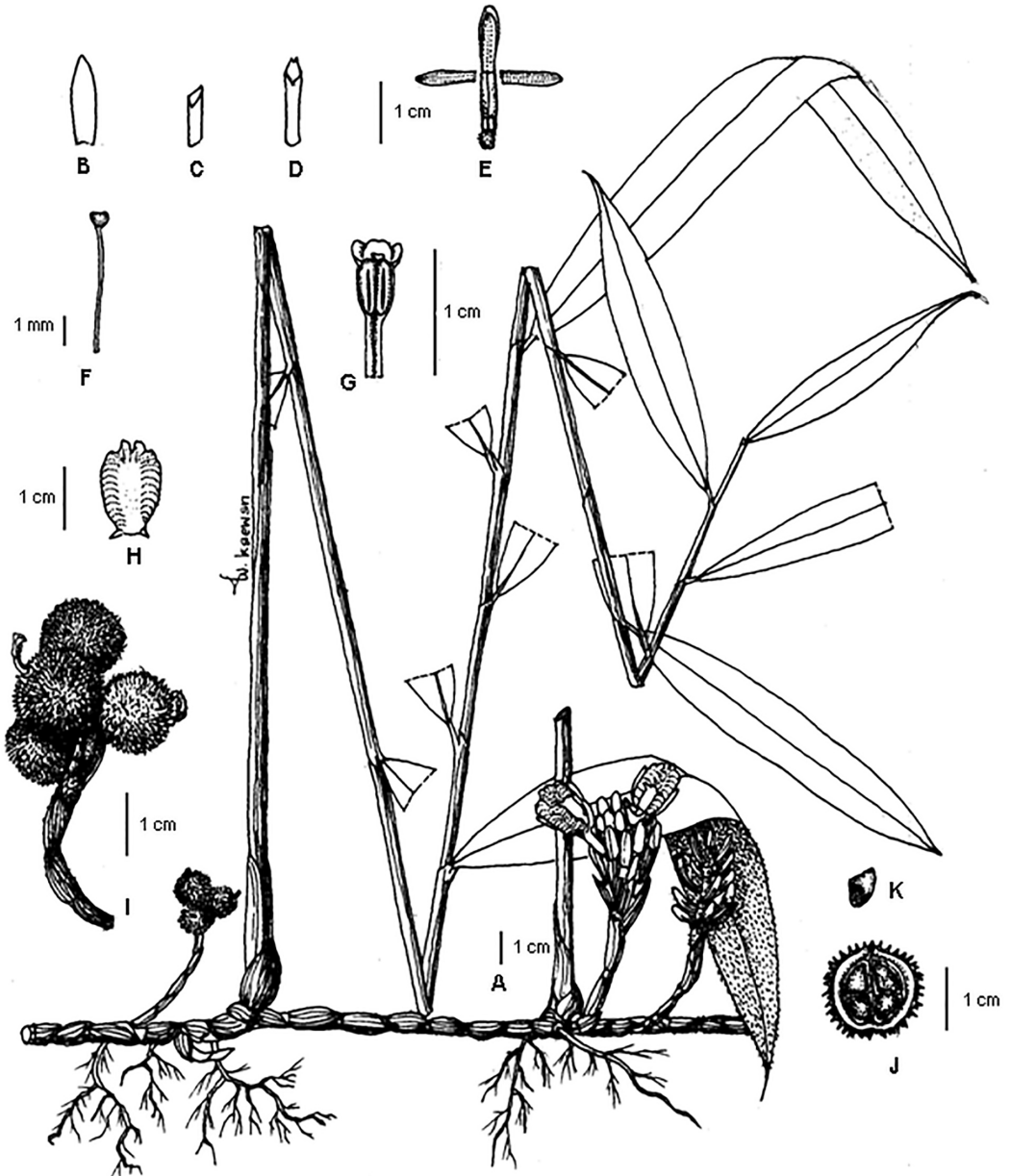


Figure 10. *Wurfbainia parviflora* Kaewsri. A, Habit; B, bract; C, bracteole; D, calyx; E, corolla (dissected); F, stigma; G, stamen; H, labellum; I, inflorescence; J, fruit (longitudinal section); K, seed. Drawn from Kaewsri 022 by W. Kaewsri.



Figure 11. *Wurfbainia parviflora* Kaewsri, sp. nov. A, Inflorescence; B, flower; C, infructescence. All photographs of the type collection (*Kaewsri 022*), taken by W. Kaewsri.

staminodes minute, tooth-like, c.1 mm, creamy white with red spots at base; labellum narrowly hooded, obovoid, c.1.5 × 0.9 cm, base attenuate, apex bilobed, margin wrinkled and revolute, yellow with white blotch from base along median band almost to apex, with scattered crimson dots inside the median blotch and many transverse crimson stripes on each side; stamen: filament ribbon-like, c.5 mm long; anthers c.5 × 2 mm, dehiscing lengthwise; anther crest trilobed, c.3 × 2 mm, pale yellow, central lobe largest, apex rounded and emarginate, slightly reflexed, lateral lobes auriculate, apex rounded. *Fruit* subglobose,

c.1.2–1.5 cm in diameter, 2–4 per infructescence, densely covered with fine spines, pinkish red; seeds c.5 mm in diameter, angular, arillate.

Phenology. Flowering and fruiting between April and August.

Distribution. Known only from the type locality (see [Figure 3](#)).

Habitat. Dry evergreen forest in light gaps at c.800 m altitude.

Etymology. The specific epithet refers to the small flower.

Proposed IUCN conservation category. Least Concern (LC). This species is found only in Thong Pha Phum National Park, Kanchanaburi Province. According to field observations, there are about five subpopulations in the wild. None of these populations are under threat, and they all grow in a well-protected area. *Wurfbainia parviflora* is therefore assessed as Least Concern.

6. *Wurfbainia yingyongii* Kaewsri, sp. nov.

Similar to *Wurfbainia biflora* (Jack) Škorničk. & M.F.Newman but differs in its labellum ovate (vs obovate) and orange middle band on labellum (vs mid-red to dark red band) ([Table 5](#)). – Type: Thailand, Kanchanaburi, Sai Yok National Park, Taodam Forest, primary evergreen forest, 14°16'15.7"N, 98°44'12.6"E, 398 m altitude, 25 iv 2003, *Kaewsri* 001 (holotype BKF!; isotypes BK!, E!). [Figures 12, 13](#).

Clump-forming herb, leafy shoot slender, 0.9–1.8 m tall, base swollen, purple when young. *Leaf sheaths* green; ligule papery, 1–5 mm long, bilobed, sparsely villous; petiole 3–6 mm long, sparsely pubescent; blades (4–)8–16, oblong to broadly elliptic, 10–24(–36) × 5–9 cm, base attenuate or rounded, apex acuminate to obtuse, apex caudate, 1–2 cm long, margin undulate, upper surface glabrous, lower surface densely tomentose. *Inflorescence* arising from rhizome, conical to obovate, c.3 × 1.5 cm; peduncle c.1.5 cm long; peduncular bracts ovate to oblong, apex rounded, densely pubescent, leathery; fertile bracts ovate to elliptic, c.1.8 × 0.9 cm, apex mucronate, margin ciliate, outer surface brownish pubescent; bracteoles tubular, c.1 cm, apex bilobed and shallowly split on one side, outer surface brownish pubescent, margin ciliate. *Flower* c.3 cm long, creamy white; ovary subellipsoid, c.3 mm long, pubescent; style c.1.3 cm long; stigma cup-shaped, c.2.5 mm wide, ostiole ciliate; epigynous glands c.3 mm long; calyx tubular, c.1.6 cm long, apex trilobed and split to 5 mm on one side, outer surface brown pubescent, margin ciliate; corolla creamy white, tube glabrous, c.1.7 cm long including ovary, dorsal lobe hooded, broadly oblong to ovate-oblong,

Table 5. Characters distinguishing between *Wurfbainia yingyongii* and *W. biflora*

Character	<i>W. yingyongii</i>	<i>W. biflora</i>
Labellum shape	Ovate	Obovate
Colour of middle band on labellum	Orange	Mid-red to dark red

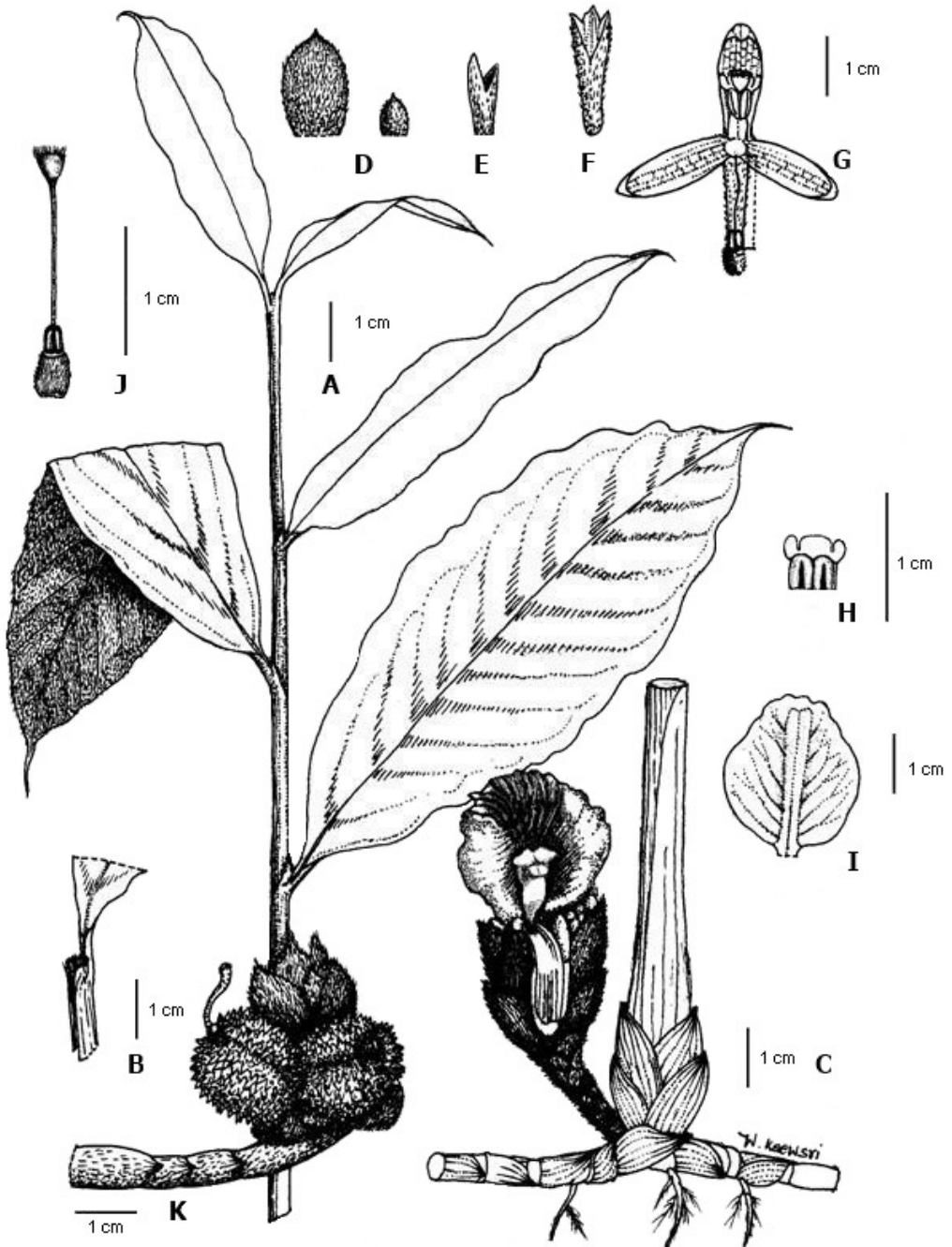


Figure 12. *Wurfbainia yingyongii* Kaewsri, sp. nov. A, Pseudostem with leaves; B, ligule; C, inflorescence; D, bract (left) and peduncular bract (right); E, bracteole; F, calyx; G, flower (dissected); H, anther crest; I, labellum; J, pistil; K, infructescence. Drawn from Kaewsri 001 by W. Kaewsri.

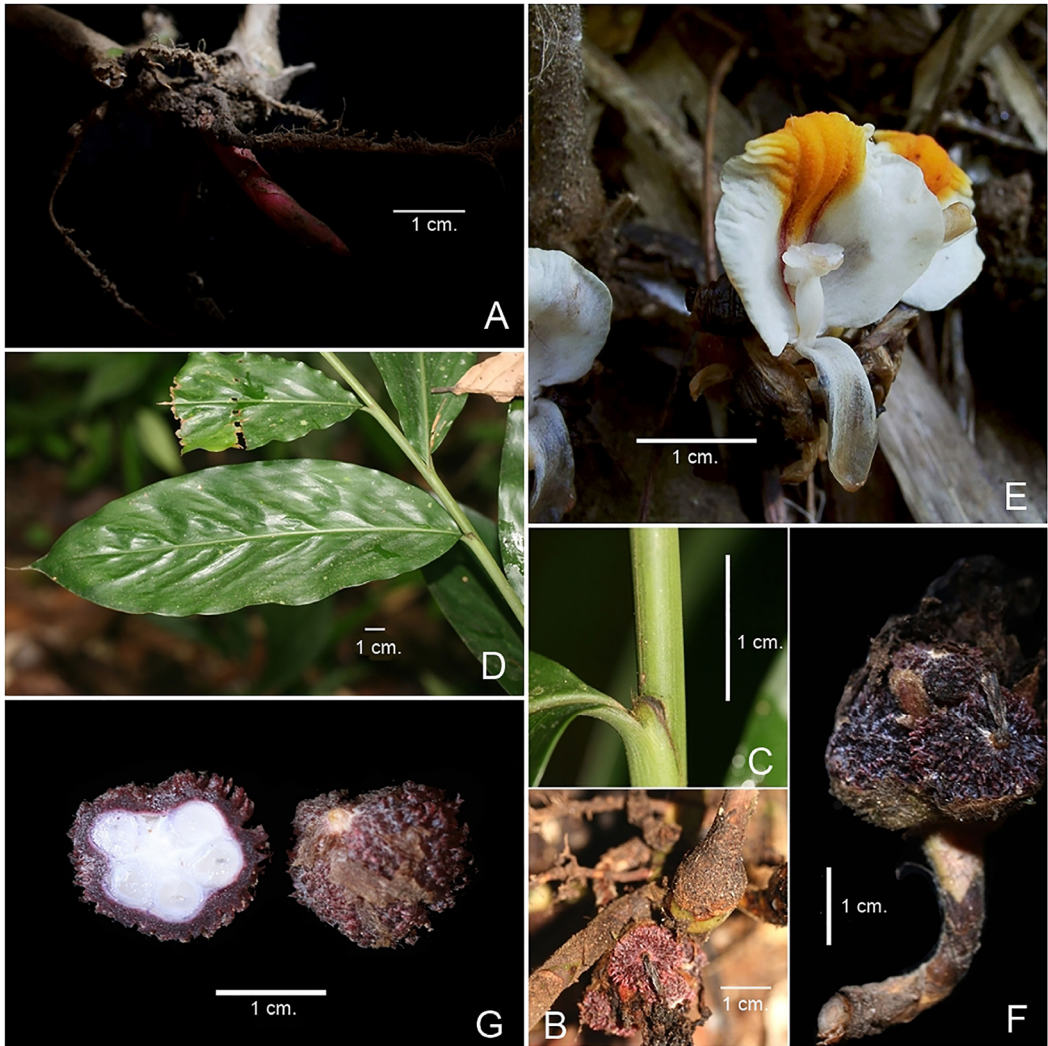


Figure 13. *Wurfbainia yingyongii* Kaewsri, sp. nov. A, Young leafy shoot; B, pseudostem base; C, ligule; D, leaves; E, inflorescence; F, infuctescence; G, fruit (cross-section). All photographs of the type collection (Kaewsri 001), taken by W. Kaewsri.

c.1.9 × 0.7 cm, apex apiculate, lateral lobes slightly smaller, apex blunt, hooded; lateral staminodes absent; labellum broadly ovate, spreading, c.2.3 × 2 cm, base attenuate, apex obtuse and wrinkled, margin wavy and revolute, white with orange-yellow blotch spreading to apex, reddish lateral stripes from base upwards to middle, 2-grooved near apex, sparsely pubescent at base; stamen: filament c.6 × 2.5 mm, shallowly concave; anther 3–4 × 3 mm, dehiscing lengthwise; anther crest horn-like, trilobed, c.4 × 4 mm, creamy white, central lobe slightly reflexed, apex rounded, lateral lobes smaller, apex acute, spreading. *Fruit* globose to

elliptic, 1.5–1.8 cm in diameter, 2 or 3 per infructescence, densely covered with rigid spines, green when young turning dark red when ripe; seeds not seen.

Phenology. Flowering and fruiting between March and July.

Distribution. Known only from the type locality (see [Figure 3](#)).

Habitat. Dry evergreen forest, under shade of shrubs and trees, c.400 m altitude.

Etymology. The specific epithet honours Associate Professor Dr Yingyong Paisooksantivatana, who dedicated his life to the study of *Amomum sensu lato* in Thailand.

Proposed IUCN conservation category. Critically Endangered (CR). This species is found only in Taodam forest, Sai Yok National Park, Kanchanaburi Province. Although it grows in a protected area that is subject to no threats, the population comprises fewer than five mature individuals, which may be destroyed by animal grazing or flooding. *Wurfbainia yingyongii* is therefore assessed as Critically Endangered according to criterion D.

Additional specimen examined. THAILAND. **Kanchanaburi:** Sai Yok, 11 v 2010, *Kaewsri* 138 (BK, BKF); Sai Yok, 28 v 2010, *Kaewsri* 178 (BK, BKF).

This species is characterised by its white labellum with orange centre and ribbed stripes.

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