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Ten new species of *Globba* section *Globba* from continental South-East Asia

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ABSTRACT

Ten new species of *Globba* from Thailand and Vietnam are described and illustrated; *Globba amnicola*, *G. amplectens*, *G. conferta*, *G. dasycarpa*, *G. grandis*, *G. hilaris*, *G. impar*, *G. nitida*, *G. verecunda* and *G. williamsiana*. Distribution maps and IUCN provisional assessments of each species are provided.

KEYWORDS: Dancing lady, ginger, Thailand, Vietnam, Zingiberaceae.

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INTRODUCTION

Globba L. is a genus of perennial herbs in the tribe Globbeae, Zingiberaceae, distributed in Sri Lanka and India, the Himalaya, southern China, all countries of South-East Asia and northern Australia. They are often encountered in savannas and forests, particularly along watercourses and at the margins of forest gaps. Most species are deciduous, losing their above ground parts in the dry season, though section *Sempervirens* K.J.Williams consists of evergreen species found in aseasonal forests.

About 100 species are reported (Mabberley, 2017) but new species are being described every year and the number expected is likely to reach ca 120 (see numbers in each section below).

Globba species are among the smaller of plants of the Zingiberaceae, normally from 40–70 cm tall though a few species reach 1 m tall or slightly taller. They are easy to recognise by their small, delicate flowers which have a very long filament arching over the labellum. Most Zingiberaceae have trilocular ovaries with axile placentation while *Globba* species generally have unilocular ovaries with basal placentation. Bulbils commonly form on the inflorescences of *Globba*, though not in all species. These bulbils fall easily from the plant and are often missing from herbarium specimens. Bulbil morphology seems to be taxonomically informative but our knowledge is too patchy at present to be sure of this.

Infrageneric classification of *Globba* has placed great emphasis on the number of appendages on the anther which may be zero, two or four (Horaninow, 1862; Schumann, 1904; Larsen, 1972). The most recent classification of *Globba* incorporates information from morphology and molecular systematics and recognises seven sections in three subgenera (Williams *et al*., 2004), as follows:

Subgenus *Globba* section *Globba*. Approx. 40 species

Subgenus *Globba* section *Nudae* K.Larsen. Approx. 30 species

Subgenus *Globba* section *Sempervirens* K.J.Williams. Approx. 15 species

Subgenus *Ceratanthera* section *Ceratanthera* (Horan.) Petersen. Approx. 20 species

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Subgenus *Haplanthera* section *Haplanthera* (Horan.) Petersen. Approx. 10 species

Subgenus *Haplanthera* section *Substrigosae* K.J.Williams. Two species

Subgenus *Haplanthera* section *Mantisia* (Sims) K.J.Williams Four species

Two subsections of *Globba* section *Nudae* have recently been revised throughout their range (Sangvirotjanapat *et al*., 2019a, 2019b) and further revisions of infrageneric taxa are under way.

While preparing a revision of the Zingiberaceae for the Flora of Thailand, and a monographic treatment of *Globba* section *Globba*, ten new species have been found and are described here. Five of these species were collected during an expedition carried out in north and north-eastern Thailand by staff of BKF, QBG, E and Charles University, Prague in 2013, and earlier collections of four of these species were subsequently found in herbaria. Another was collected in Vietnam as part of Sud Expert Plantes Project 350 in 2008. The remainder were found during research visits to herbaria aimed at a revision of *Globba*. All specimens cited in this paper have been seen by the authors.

All the new species belong in *Globba* section *Globba* which is the largest section in the genus and includes the type species, *Globba marantina* L. Members of this section are easily recognised by the presence of four appendages on the anther, occasionally with a minute appendage between each pair (Cao *et al*., 2018). *Globba* section *Sempervirens* also has anthers with four appendages but, while section *Globba* has short peduncles without sterile bracts, section *Sempervirens* has long peduncles bearing sterile bracts. In addition, there is very little overlap in the ranges of the two sections. *Globba* section *Globba* has its centre of diversity in continental SE Asia and is confined to the north of the Isthmus of Kra (Williams *et al*., 2004) while section *Sempervirens* has its centre of diversity in Peninsular Malaysia, and hardly occurs north of the Isthmus of Kra.

DESCRIPTIONS

Globba amnicola M.F.Newman & Sangvir., **sp. nov.**

Similar to *Globba dasycarpa* M.F.Newman in its small habit about 15 cm tall on average, small inflorescence with green bracts but differing by its cream flower with red spot on labellum (vs rich orange flower with no coloured spot) and verrucose fruit (vs softly prickly fruit). Type: Thailand. Mae Hong Son, Mae Sariang District, Salawin National Park, 420 m, 2 Aug. 2013, *Newman, Sangvirotjanapat, Wongnak, Fér, Záveská & Pospíšilová 2588* (holotype **BKF!**; isotypes **E!**, **QBG!**). Fig. 1. & Map 1.

Herb 13–20 cm tall. *Leaf sheaths* ca 3, sparsely pubescent; ligule ca 5 mm long, bilobed, lobes acute; blades 5–6, elliptic or ovate, 3–10 × 1–3 cm, base obtuse, apex acuminate, slightly plicate, pubescent and glaucous below, sessile. *Inflorescence* pendent, conical, ca 3 × 3 cm; peduncle ca 1 cm long beyond leaf sheaths, pale green; rachis pale green, densely pubescent; bracts persistent, elliptic, ca 13 × 9 mm, green, wrapping around cincinni, apex acute or acuminate, sparsely ciliate; cincinni ca 10 mm long, flowers 3–10 per cincinnus; bracteoles caducous, elliptic, 5–10 × 1–6 mm, keeled, yellowish green, semitransparent, apex acute. *Flowers* ca 2.7 cm long; ovary ellipsoid, 2 × 1 mm, pale yellow; calyx infundibuliform, ca 6 mm long, cream or green, lobes acute; floral tube ca 14 mm long, inflated above, cream, hairy; dorsal corolla lobe hooded, elliptic, ca 5 × 1.5 mm, cream, apex acute; lateral corolla lobes slightly smaller than dorsal lobe, shallowly hooded, cream; lateral staminodes elliptic, ca 7 × 3.5 mm, slightly longer than corolla lobes, cream, apex acute; labellum obtriangular, ca 8 × 8 mm, cream with brown-red spot on labellum, base truncate, apex bilobed, lobes acute; nectar tube ca 4 mm long; stamen: filament ca 15 mm long, cream; anther nearly round, ca 1.5 × 1.2 mm, connective tissue cream, semitransparent; appendages 4, triangular, ca 2 × 1 mm, cream, apex acuminate. *Fruit* globose, ca 8 mm in diam., verrucose, yellowish green; seeds not seen. *Bulbils* present in basal bracts, ovoid, ca 5 × 2 mm, corky.

Thailand.— NORTHERN: Mae Hong Son [Mae Sariang District, Salawin National Park, 420 m, 2 Aug. 2013, *Newman et al. 2588* (**BKF**, **E**, **QBG**)].

Distribution.— Endemic to Thailand.

Ecology. — Growing in shade with high humidity along streams or by waterfalls.

Etymology.— Latin, *amnis*, a river and *–cola*, a dweller, referring to the wet, streamside habitat of this species.

Proposed IUCN conservation status.— *Globba amnicola* is endemic to Thailand. The Area of

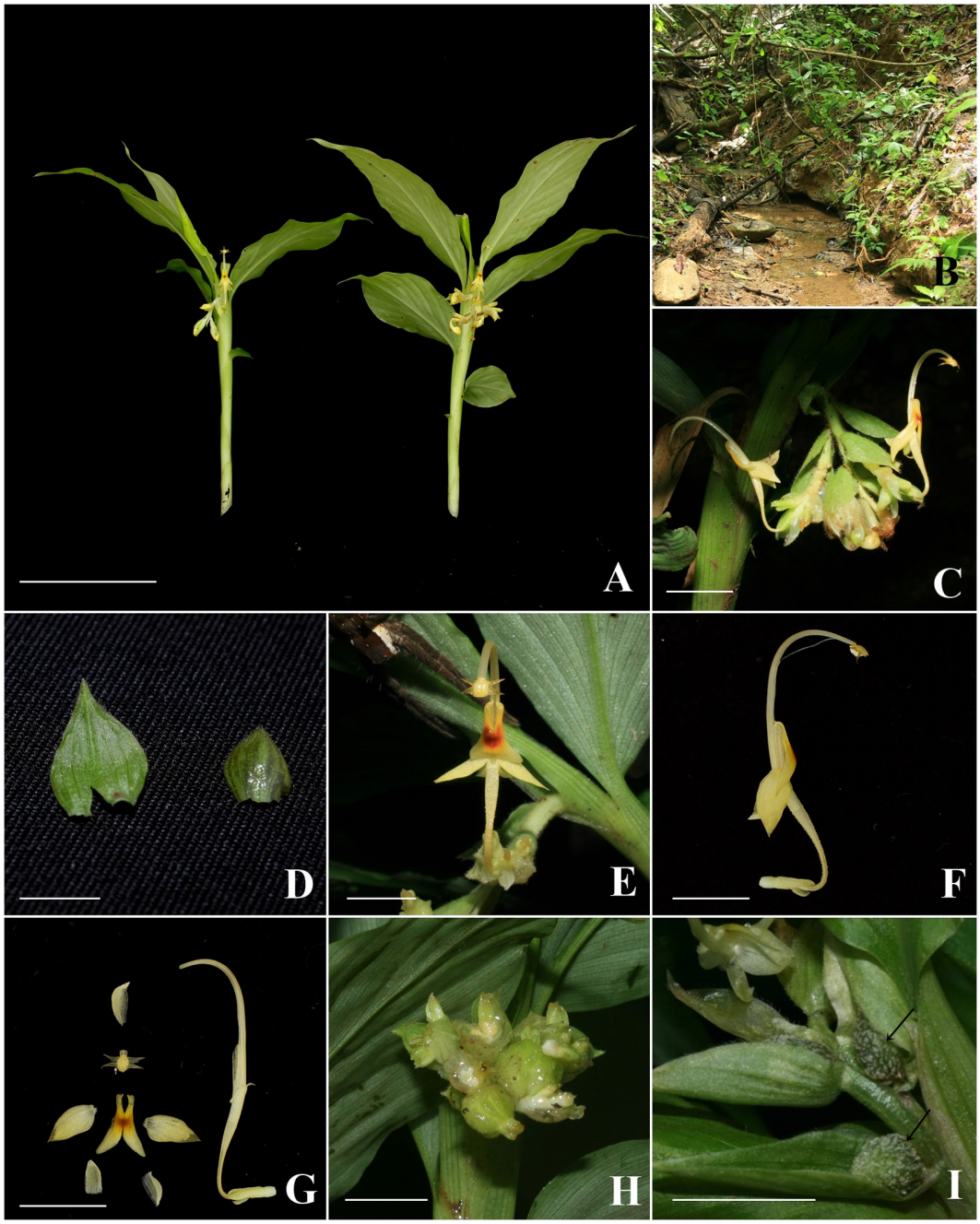


Figure 1. *Globba amnicola* M.F.Newman & Sangvir. (*Newman et al. 2588*) A. Habit; B. Habitat; C. Inflorescence; D. Bract (left) and bracteole (right); E.–G. Flower; H. Infructescence; I. Bulbils (indicated by black arrows). Scale bars; A= 5 cm; C.–I. = 1 cm. All photographed by S. Sangvirotjanapat.

Occupancy (AOO) of the species is 8 km^2, including a new locality recently found in Tak but it still seems likely that the AOO is underestimated. It is only known from two protected areas situated in tourist hot spots and thus in danger of disturbance. *Globba amnicola* is assessed as of Least Concern (LC) but more studies are needed to estimate potential threats.

Notes.— This species is found in western Thailand and probably also occurs in adjacent Burma. The diagnostic characters are small-sized plants and cream-coloured flowers with a red spot on the labellum.

Globba amplectens M.F.Newman, **sp. nov.**

Similar to *G. schomburgkii* Hook.f. in its green imbricate bracts and pendent inflorescence (Fig. 2A) but differing by its short cincinni (vs elongate cincinni) and pale yellow flower with brown spot on the labellum (vs bright yellow with a red spot on labellum). Type: Accession BRG 2000-145, cultivated at Smithsonian Institution, Department of Botany Research Greenhouses, 24 July 2001, *Kress & Bordelon 01-6990* (holotype **US** [00605346!]). Originally collected in Phitsanulok Province, Thailand. Fig. 3 & Map 1.

Herb to 40 cm tall. *Leaf sheaths* 12, green with clear margins, glabrous; ligule bilobed, 13–14 mm long, glabrous; blades 9, broadly elliptic, 12–16 × 6–9.5 cm, green with silver patches below, base decurrent, apex acuminate, entirely glabrous; petiole ca 12 mm long, glabrous. *Inflorescence* recurved, downward pointing, 9 cm long; peduncle 4 cm long beyond leaf sheaths, with 1–2 sterile bracts; rachis 5 cm long, green, glabrous; bracts persistent, glaucous green, wrapping round and enclosing the rachis and cincinni, broadly ovate with shortly acuminate apex, 22 × 23 mm at basal cincinnus to 15 × 12 mm at apex, glabrous; cincinni 1 mm thick, 8–9 mm to first flower, pedicel 2–3 mm long, flowers 3–4; bracteoles persistent, broadly ovate, 11 × 10 mm at base of cincinnus, becoming smaller towards apex, green, thin, glabrous. *Flowers*: ovary ovoid, 2–3 mm, sparsely granular, perhaps with cystoliths; calyx broadly infundibuliform, 5.5–6.5 × 3–4 mm, sparsely granular, lobes acute; floral tube 9–10 mm longer than calyx, yellow, coarsely patent hairy, lobes glabrous, dorsal corolla lobe elliptic, boat-shaped, ca 7 mm long, with narrow apical spur, yellow, lateral corolla lobes slightly smaller, without spurs, yellow; lateral staminodes elliptic, slightly longer than corolla lobes, yellow; labellum obtriangular, shortly bilobed, not reaching corolla, light yellow with dark spot on labellum; stamen: filament yellow, length unknown (specimen lacks fully open flowers); anther 3.5 mm long with 4 acute appendages, 2 mm long. *Fruit* not seen. *Bulbils* present in basal bracts, frequently sprouting on mother plant.

Thailand.— NORTHERN: Phitsanulok (original) [Accession BRG 2000-145, cultivated at Smithsonian Institution, Department of Botany Research Greenhouses, 24 July 2001, *Kress & Bordelon 01-6990* (**US**)].

Distribution.— Endemic to Thailand, known only from Phitsanulok province.

Ecology. — Unknown.

Etymology.— Latin, *amplectens*, clasping or embracing, in reference to the bracts which embrace the cincinni.

Proposed IUCN conservation status.— The type locality is unknown and there are no other collections so *Globba amplectens* must be assessed DD until further information comes to hand.

Notes.— The original material was a living collection made by the late Mark Collins at an unknown locality in Phitsanulok province. This was cultivated at the Smithsonian Institution, Department of Botany Research Greenhouses under accession number BRG 2000-145. When this accession flowered in 2001, Kress & Bordelon made a herbarium specimen from it which is now the holotype. Field survey work must be carried out to discover the wild population in Phitsanulok. There are no open flowers on the type, which is the only known specimen so the dimensions given, which are taken from a bud, must be regarded as approximate.

Globba conferta M.F.Newman, **sp. nov.**

Similar to *Globba candida* Gagnep. in its condensed inflorescence, ca 3 × 3 cm and no bulbil production but differing by its dark red bracts and bracteoles (vs white bracts and bracteoles), bright yellowish orange flowers (vs yellow flowers with white filament and anther appendages) as well as red, trisulcate and smooth fruits (vs white, globose and verrucose fruits). Type: Thailand. Sakon Nakhon, Phu Phan National Park, 350 m, 31 July 1999, *Newman 942* (holotype **BKF!**; isotype **E!**). Fig. 4. & Map 1.

Herb 25–70 cm tall. *Leaf sheaths* 9–10, reddish, especially at base, lower ones glabrescent, upper ones pubescent with densely ciliate margins; ligule rounded, 1 mm long, densely glandular hairy; blades 4–7, narrowly elliptic, 7–13.5 × 1.5–2.3 cm, plain green, base cuneate, apex long acuminate, indumentum densely pubescent below, glabrous to sparsely pubescent above; petiole 5–10 mm, longer on upper leaves, pubescent. *Inflorescence* compact, held roughly at right angles to stem, 2–3 cm long; peduncle ca 5 mm long beyond leaf sheaths, usually without sterile bracts; rachis 0.8–1.0 cm, green, pubescent; bracts persistent, ovate, acute, lowermost to 1.5 × 1.0 cm, red, minutely pubescent; cincinni enclosed in bracts, 2–3 mm to first flower, pedicel ca 1 mm long, flowers 2–3 per cincinnus; bracteoles persistent, ovate, to 10 × 7 mm, white at base, red at tips, minutely pubescent. *Flowers* ca 3 cm long; ovary ovoid, ca 1 mm diameter, minutely pubescent; calyx narrowly tubular, 4 mm long, minutely pubescent, lobes ca 1 mm long, acute; floral tube 12–13 mm longer than calyx, yellow, minutely pubescent, dorsal corolla lobe deeply boat-shaped with cucullate apex, 4–5 × 3 mm, yellow, minutely pubescent, lateral corolla lobes more shallowly boat-shaped, not cucullate, to 4 mm long, yellow; lateral staminodes oblong, apex often emarginate, 8–9 × 3–3.5 mm, considerably longer than corolla lobes, yellow, glabrous; labellum narrowly obtriangular, lobes sometimes slightly divergent, usually emarginate, 8 × 3.5 mm, not reaching ends of lateral corolla lobes, yellow with no spot; stamen: filament 20 mm long, yellow, glabrous; anther 2 × 1 mm; appendages 4, yellow, proximal pair smaller, ca 2 mm long, distal pair larger, 3 mm long. *Fruit* trisulcate, smooth, red; seeds not seen. *Bulbils* absent.

Thailand.— NORTH-EASTERN: Sakon Nakhon [Phu Phan National Park, Sakon Nakhon side, 350 m, 31 July 1999, *Newman 942* (**BKF**, **E**); ibid., Aug. 1987, *Yuktathat 137* (**E**)].

Distribution.— Endemic to Thailand.

Ecology. — On wet seepage among sandstone boulders at 350 m altitude.

Etymology.— Latin, *confertus*, densely crowded, in reference to the small, dense inflorescence.

Proposed IUCN conservation status.— *Globba conferta* is endemic to Thailand. The AAO is 8 km^2, suggesting a status of Critically Endangered but it grows in a protected area and the records seem to underestimate the AOO so it is here assessed as of Least Concern (LC). A further survey is needed to reassess the conservation status.

Notes.— *Globba conferta* has often been determined in herbaria as *Globba annamensis* Gagnep. but the Thai material does not match the type of *Globba annamensis* from Vietnam. This species is recognised by its red bracts and rich yellow flowers. It may be misidentified as *G. candida* Gagnep., which has a very similar inflorescence but with white bracts and flower parts yellow and white (Fig. 2B).

Figure 2. A. *Globba schomburgkii* Hook.f.; B. *G. candida* Gagnep. Photographs by S. Sangvirotjanapat.

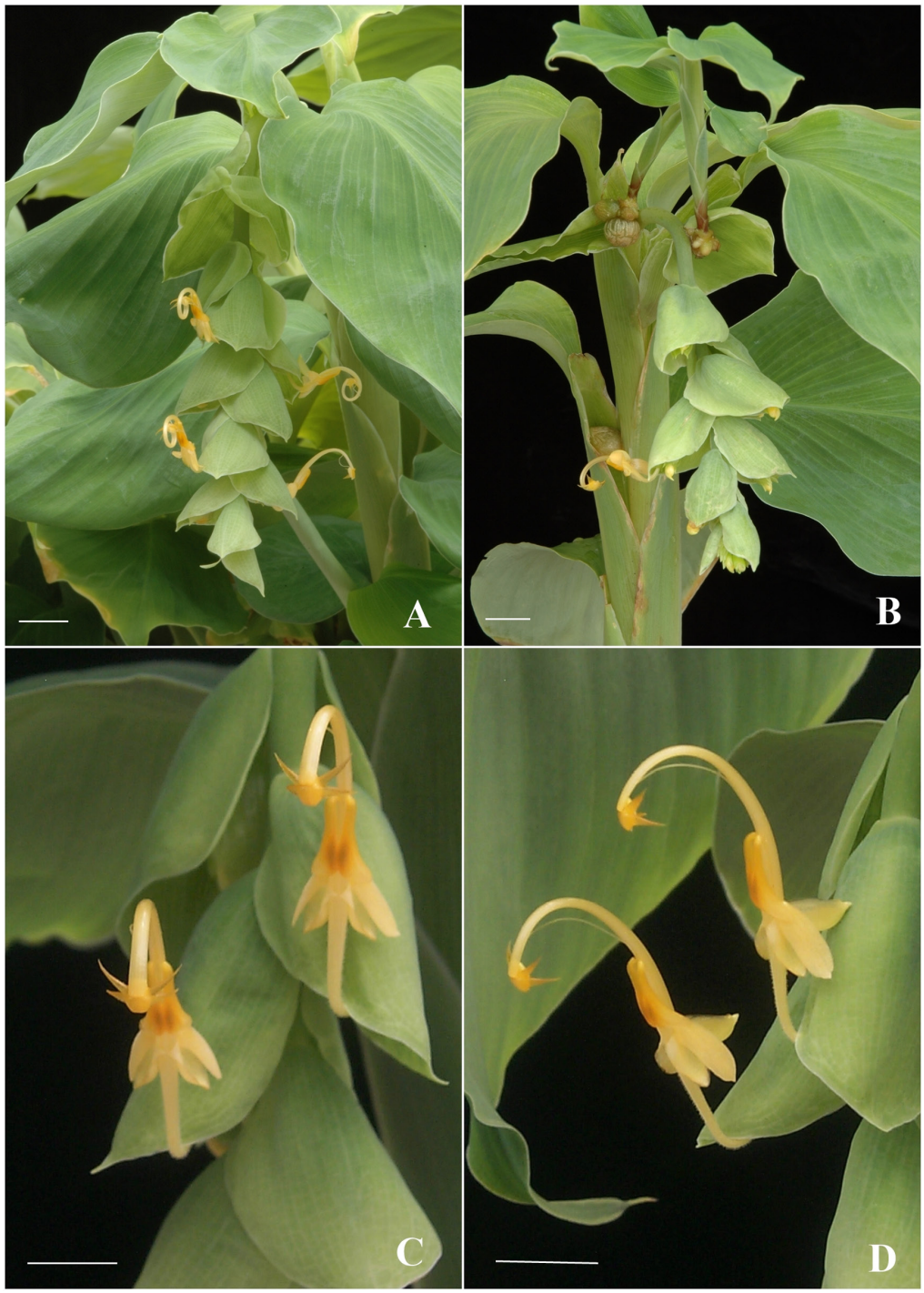
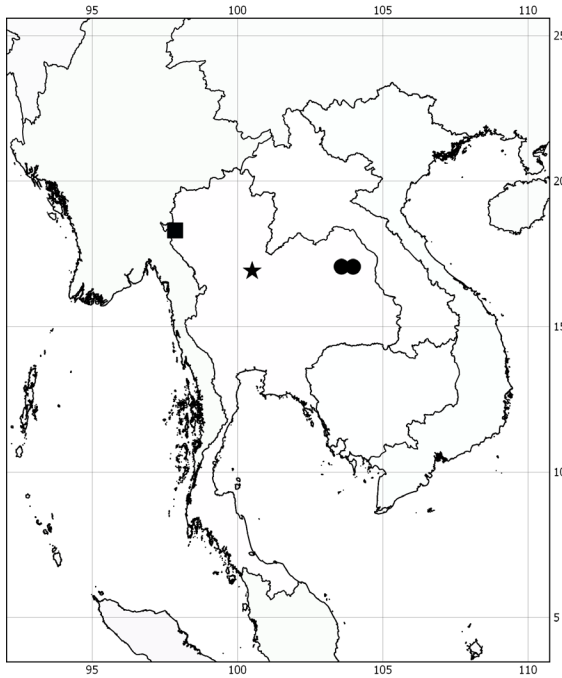


Figure 3. *Globba amplectens* M.F.Newman A. Habit; B. Inflorescence at stage of bulbil production; C. Flower in front view; D. Flower in side view. Scale bars = 1 cm. Photographs courtesy of the Smithsonian's National Museum of Natural History Botany Research Greenhouses.

Figure 4. *Globba conferta* M.F.Newman A. Inflorescence with fruit; B. Flower in front view; C. Flower in side view. Scale bars = 1 cm. Photographed by A. P. Suksathan; B.–C. by S. Ruchisansakun.



Map 1. Distribution of *Globba amnicola* M.F.Newman & Sangvir. (■); *G. amplectens* M.F.Newman (★); *G. conferta* M.F.Newman (●).

Globba dasycarpa M.F.Newman, **sp. nov.**

Similar to *Globba amnicola* in its size (ca 15 cm tall) and inflorescence (ca 2 cm long) but differing by its ovate bracts and bracteoles (vs elliptic bracts and bracteoles) and softly prickly fruit (vs verrucose fruit). Type: Thailand. Phitsanulok, Chat Trakan District, Chat Trakan Waterfalls National Park, 250 m, 19 June 2006, *Poulsen & Suksathan 2395* (holotype **BKF!**; isotypes **E!**, **QBG!**). Fig. 5 & Map 2.

Herb 10–32 cm tall. *Leaf sheaths* 6–9, purplish to green, pubescent throughout to ciliate at margins only; ligule truncate, 2–3 mm long, pubescent to ciliate; blades 4–8, elliptic, 6–10 × 3–4 cm, variegated silvery green with dark green centre above, purple below, base rounded, apex shortly acuminate, sparsely to densely pubescent on both surfaces; petiole absent. *Inflorescence* dense, globose, pendent, 2–4 cm long; peduncle < 1 cm long, decurved just above uppermost sheaths, sterile bracts 0–2, slightly longer and narrower than fertile bracts, 13–17 × 8–10 mm; rachis 1–3 cm long, densely pubescent, sometimes with one branch at base; bracts persistent, ovate, concave, slightly broader than long, 12 × 15 mm at base of inflorescence, gradually diminishing in size, green, sparsely pubescent, especially at margins and apex; cincinni enclosed in bracts, ca 3 mm to first flower, flowers 1–4, sessile, sometimes with 1 or 2 additional buds which never develop; bracteoles as bracts but proportionately smaller. *Flowers*: ovary globose, 2 mm diam., densely covered with soft, flat, triangular prickles, whitish green; calyx green, tubular, slightly inflated, 4–4.5 mm long, glabrous, lobes 3, slightly incurved; floral tube 10–11 mm, yellow, sparsely patent pubescent; dorsal corolla lobe boat-shaped, 5 mm long, yellow; lateral corolla lobes elliptic, almost flat, 4.5 × 2.5 mm, yellow; lateral staminodes obovate, widest near truncate apex, 8.5–9 × 4 mm, much larger than corolla lobes, yellow; labellum obtriangular with two short, acute lobes, 7.5–8 × 6 mm, hardly reaching point of attachment of corolla, yellow without coloured spot; stamen: filament 17–18 mm, yellow; anther 2.3 × 1.3 mm; appendages 4, 2.5 mm long, distal pair broader at base and forked, yellow, semitransparent. *Fruit* globose, 7–8 mm diam., green or yellowish green, softly prickly; seeds not seen. *Bulbils* present in basal bracts, ovoid, 15 × 6 mm, corky.

Thailand.— NORTHERN: Phitsanulok [Chat Trakan Waterfalls National Park, Chat Trakan Waterfall, 19 June 2006, *Poulsen & Suksathan 2395* (**BKF**, **E**, **QBG**); Thung Salaeng Luang National Park, 21 July 1966, *Larsen et al. 675* (**AAU**, **BKF**); 1 May 1961, *Chantamuk 123* (**BKF**, **C**, **K**)]. NORTH-EASTERN: Phetchabun [Phu Hin Rong Kla National Park, 10 May 2002, *Maknoi 219* (**QBG**); ibid., 8 Aug. 2013, *Newman et al. 2625* (**QBG**)].

Distribution.— Endemic to Thailand.

Ecology.— Grows in deciduous forest at 250–1,090 m alt.

Etymology.— Greek, *dasy-* and *carpos*, meaning 'hairy fruit'.

Proposed IUCN conservation status.— *Globba dasycarpa* is endemic to Thailand. Its AOO is small, 28 km^2, suggesting a status of Endangered. The main localities are in Phitsanulok and Phetchabun whereas the single collection from Hod District, Chiang Mai is doubtful. We have found three duplicates of *Chantamuk 123*. Those at **C** and **K** are labelled as being from Thung Salaeng Luang in Phitsanulok while the one at BKF is labelled from Khaem Son

(Pine Camp), Hot District, Chiang Mai. It is not clear whether there has been a mistake in labelling or collection numbering, or whether *Globba dasycarpa* existed in Hot District in 1961. It has never been collected in this district since then, and the exact location of Pine Camp is unknown. It is reasonable to assume that the habitat has been lost though surveys should continue for *Globba dasycarpa* in Chiang Mai Province. In this assessment, we consider the populations in Phetchabun and Phitsanulok alone. The collecting localities all occur in protected areas. Areas accessible to tourists may impose a threat but, since the species occurs in protected areas, it is assessed as of Least Concern (LC).

Note.— *Globba dasycarpa* is recognised by its small size, variegated leaves, compact inflorescence and rich yellow flowers. The soft prickles on the fruit are unique and of diagnostic value.

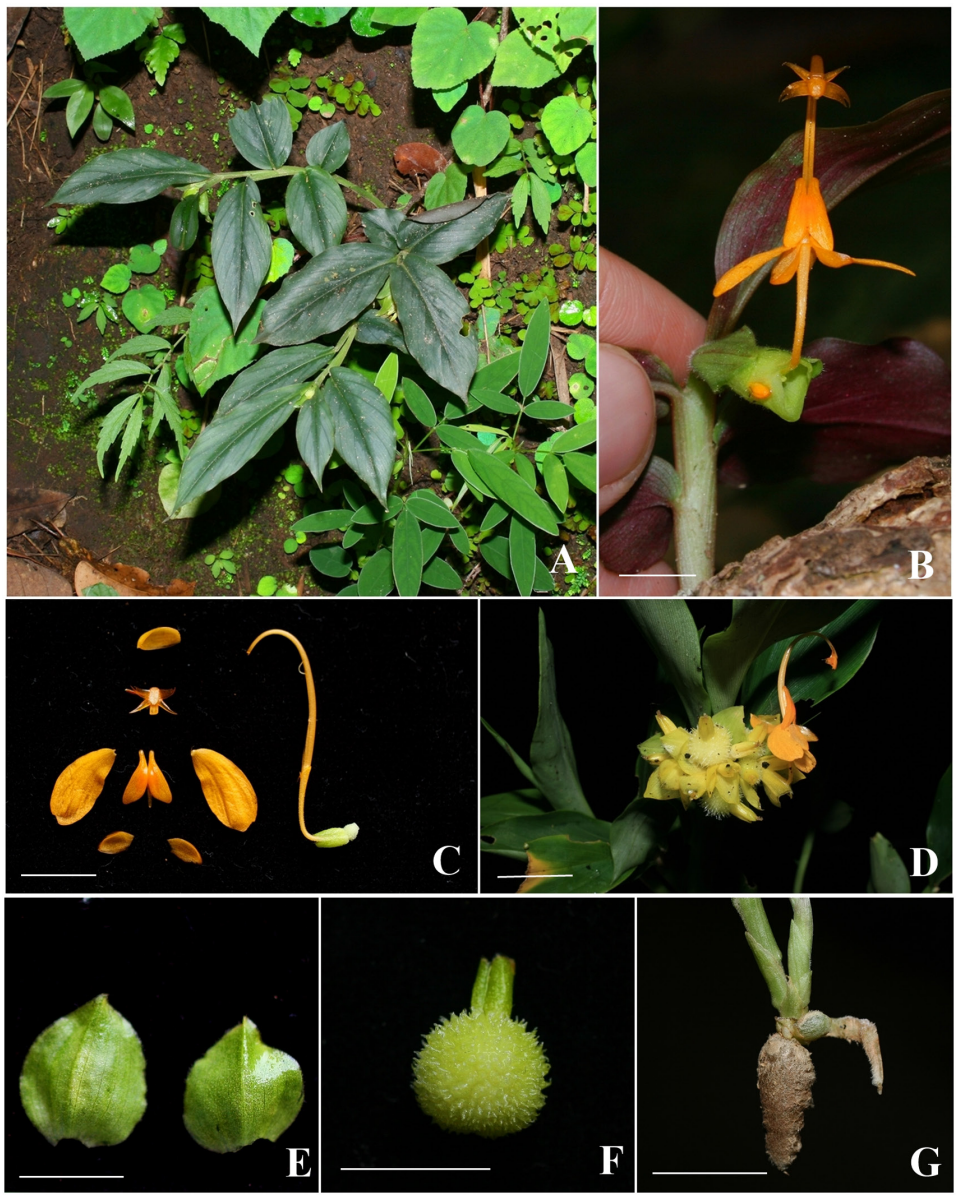


Figure 5. *Globba dasycarpa* M.F.Newman A. Habit; B. Flower from front view; C. Dissection of flower; D. Inflorescence with fruit; E. Bracts; F. Fruit; G. Bulbil. Scale bars = 1 cm. All photographs by S. Sangvirotjanapat.

Globba grandis Sangvir., **sp. nov.**

Similar to *Globba sherwoodiana* W.J.Kress & V.Gowda in its lax and pendent inflorescence and white reflexed bracts but differing by its plain orange flowers (vs orange flower with red spot on labellum), caducous bracts (vs persistent bracts) and occurrence of scaly bulbils (vs bulbils lacking). Type: Thailand. Phetchabun, Nam Nao National Park, 9 Aug. 2013, 890 m, *Newman, Sangvirotjanapat, Sirimongkol, Fér, Záveská & Pospíšilová 2635* (holotype **BKF!**; isotypes **E!**, **QBG!**, **SING!**). Fig. 6 & Map 2.

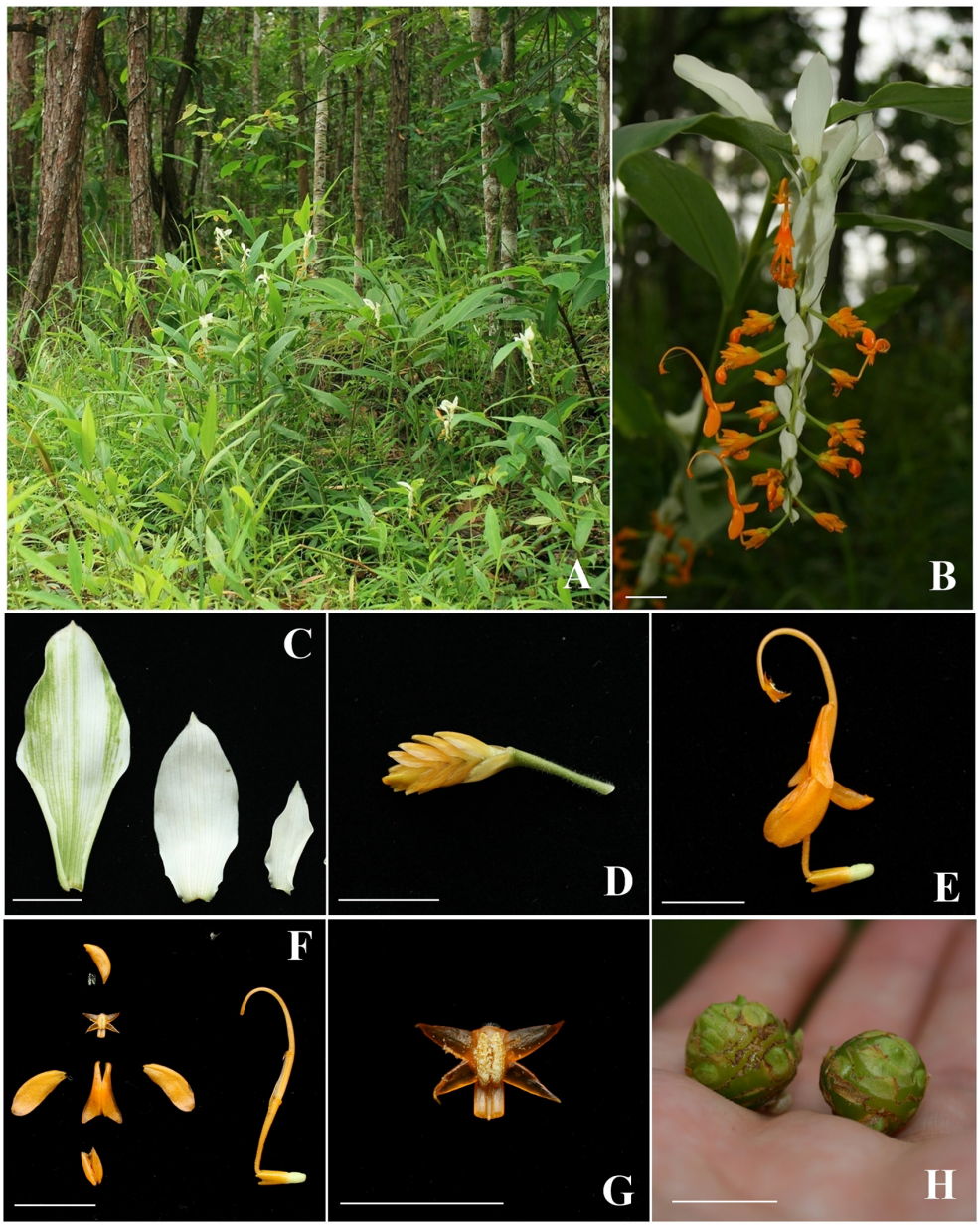


Figure 6. *Globba grandis* Sangvir. A. Habit & habitat; B. Inflorescence; C. Bracts; D. Cincinnus with bracteoles; E. Flower in side view; F. Dissection of flower; G. Anther thecae with appendages; H. Bulbils. All scale bars = 1 cm. All photographed by S. Sangvirotjanapat.

Herb 32–130 cm tall. *Leaf sheaths* ca 4, bladeless, pubescent; blades 7–8, linear or elliptic, 13–28 × 1.5–5.5 cm, plicate, pubescent below and above, sessile, base cuneate or obtuse, apex acuminate. *Inflorescence* pendent, lax, conical, 7–13 × 3–5.5 cm; peduncle 1–5 cm long beyond leaf sheaths, green; rachis green, densely pubescent; bracts persistent, reflexed, elliptic, 1.5–4.5 × 0.4–1.8 cm, apex mucronate, margin undulate, white or greenish white; bracteoles caducous, elliptic, 6–10 × 3–6 mm, yellowish orange, apex acute, keeled; cincinni held at ca 45° to rachis, with flowers crowded at tip, 8–12 mm to first flower. *Flowers* 3.2–3.4 cm long; ovary ellipsoid, 2–3 mm long, white; calyx infundibuliform, ca 5 mm long, trilobed with acute apices; floral tube ca 12 mm long, orange, hairy; dorsal corolla lobe hooded, elliptic, ca 8 × 1.5 mm, orange; lateral corolla lobes hooded, elliptic, ca 6 × 1 mm, orange, apex obtuse; lateral staminodes oblong to slightly curved, ca 11 × 4 mm, orange, apex acute or obtuse, twice as long as lateral corolla lobes; labellum obtriangular, ca 10 × 7 mm, pure orange, base truncate, apex bilobed, lobes acute, nectar tube ca 5 mm long; stamen: filament ca 27 mm long, orange; anther elliptic, ca 1.5 × 1 mm, connective tissue orange, semitransparent; appendages 4, triangular, ca 2 × 1 mm, orange, upper pair bigger, base broader, lower pair narrower, apex acuminate. *Fruit* globose, ca 8 mm in diam., orange, verrucose; seeds not seen. *Bulbils* present along peduncle and lower bracts, ovoid or globose, 7–15 × 6–13 mm, green turning brown at maturity, scaly.

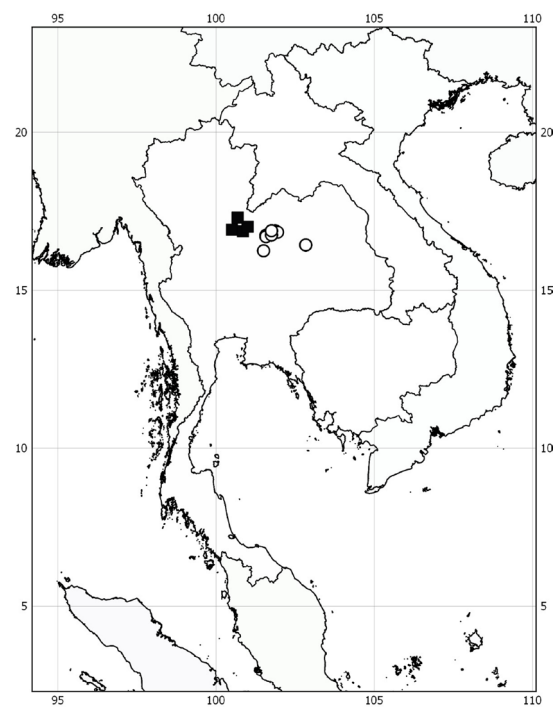
Thailand.— NORTH-EASTERN: Khon Kaen [Pha Nok Khao, 500 m, 9 Sept. 1963, *Smitinand & Sleumer 1118* (**AAU**, **BKF**, **C**, **K**, **L**); Route to Phanokkao, 257 m, 24 July 2010, *Norsaengsri & Thongsorn 6896* (**QBG**); Phuphaman National Park, Chum Phae District, 23 Aug. 2011, *Norsaengsri et al. 8070* (**QBG**); ibid., 427 m, 14 Aug. 2012, *Norsaengsri et al. 9874* (**QBG**)]; Loei [Wang Saphung District, Ban Si Than, 23 June, *Bunpheng 20* (**BKF**, **C**); Phu Kradung, 1,300 m, 22 June 1950, *Bunpheng 294* (**BKF**, **K**, **C**); ibid., 1,040 m, 17 July 1950, *Bunpheng 303* (**BKF**, **C**); ibid., 4 Oct. 1947, *Bunpheng 5* (**BKF**, **C**); ibid., 1 Sept. 1953, *Bunpheng 669* (**AAU**, **C**); ibid., 930 m, 3 Sept. 1967, *Shimizu et al. T 8776* (**AAU**, **BKF**); ibid., Ban Simain, 300 m, 25 Aug. 1988, *Wongprasert sn.* (**BKF**)]; Phetchabun [Nam Nao National Park, 30 July 1964, *Bunchuai 163* (**AAU**, **BKF**); ibid., 950 m, 28 July 1999, *Newman 940* (**BKF**, **E**); ibid., 600 m, 21 May 1951, *Smitinand & Suwannakoset 500* (**BKF**, **P**); ibid., Sam Bon Station, 890 m, 9 Aug. 2013, *Newman et al. 2635* (**E**, **QBG**, **SING**); ibid., Tham Yai (Yai cave), 4 Sept. 2013, *Khattiyot 425* (**QBG**); ibid., 5 Sept. 2013, *Khattiyot 460* (**QBG**); ibid., 17 July 2013, *Maknoi 6133* (**QBG**); ibid., 2 Sept. 2014, *Maknoi 7111* (**QBG**); ibid., Phu Pha Jit, 19 June 2014, *Maknoi 7064* (**QBG**); ibid., Tham Pha Hong (Pha Hong cave), 4 Sept. 2014, *Maknoi 7204* (**QBG**); Lom Kao, 27 July 1964, *Bunchuai 151* (**BKF**)]. EASTERN: Chaiyaphum [Thung Kramang, 900 m, 9 Aug. 1972, *Larsen et al. 31594* (**AAU**, **K**, **P**)].

Distribution.— Endemic to Thailand.

Ecology.— Grows in deciduous forest at 250–1,040 m alt.

Etymology.— Latin, *grandis*, large, referring to its habit, which can be to 1.3 m tall. This is the tallest species in *Globba* section *Globba*.

Proposed IUCN conservation status.— *Globba grandis* is endemic to Thailand. The AOO of 28 km^2 is small, suggesting a status of Endangered. As all known localities are in protected areas and there is



Map 2. Distribution of *Globba dasycarpa* M.F.Newman (■); *G. grandis* Sangvir. (○).

no immediate threat, it is assessed as of Least Concern (LC).

Notes.— *Globba grandis* has ornamental potential, as has *G. sherwoodiana* (Fig. 7A). The big inflorescence and up to 1.3 m tall, robust stems are desirable attributes for horticulture. *Globba grandis* is recognised by its imbricate white bracts with rich orange flowers. The bulbils are scaly, a character otherwise not found in *Globba* section *Globba*.

Globba hilaris Sangvir., **sp. nov.**

Similar to *Globba laeta* K.Larsen in its pendent inflorescence, white reflexed bracts, and yellow flower with red spot on the labellum but differing by the small size of its inflorescence, to 6 cm long (vs 15 cm long), verrucose fruit (vs smooth with three furrows) and corky bulbils (vs bulbils lacking). Type: Thailand. Phetchabun, Nam Nao National Park, 870 m, 8 Aug. 2013, *Newman, Sangvirotjanapat,*

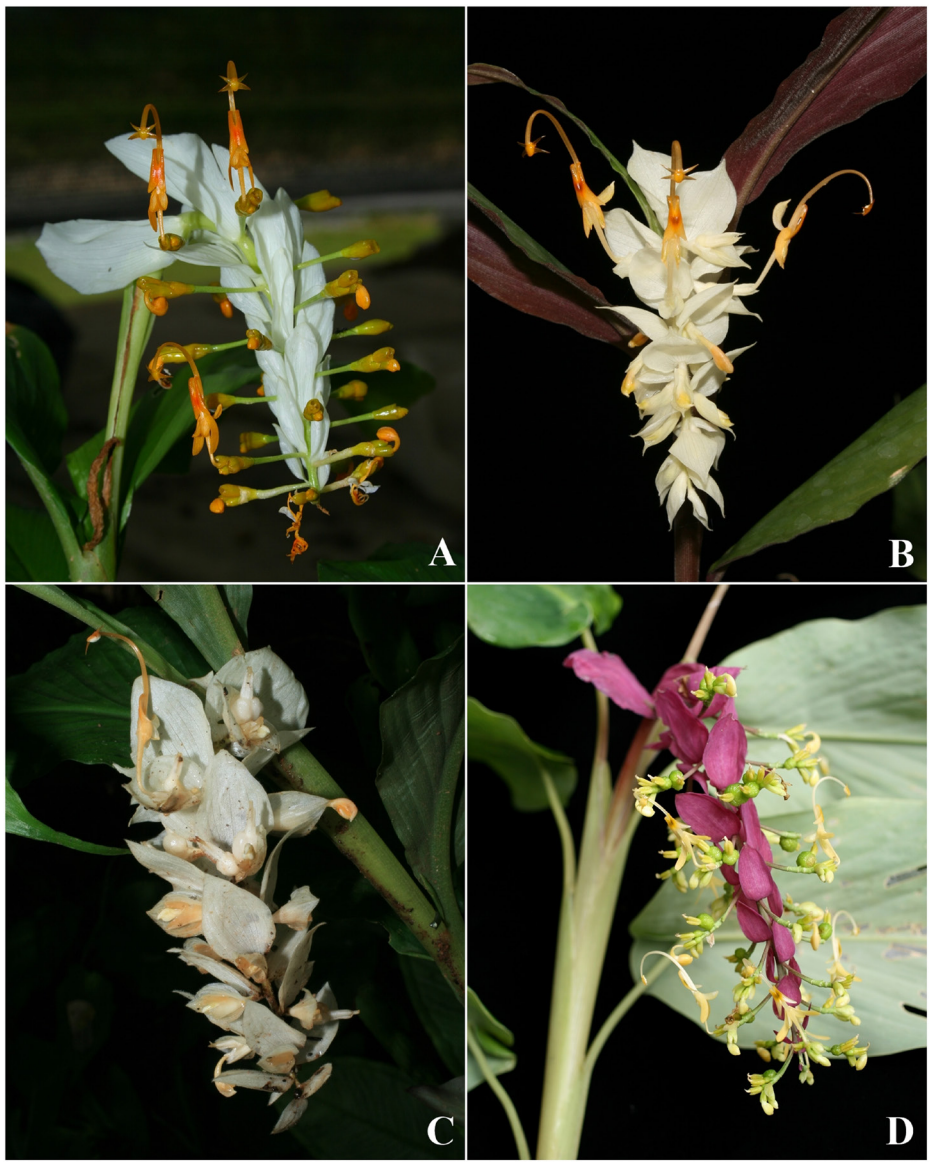


Figure 7. A. *Globba sherwoodiana* W.J.Kress & V.Gowda; B. *G. hilaris* Sangvir.; C. *G. laeta* K.Larsen; D. *G. winitii* C.H.Wright. All photographs by S. Sangvirotjanapat.

Sirimongkol, Fér, Záveská & Pospíšilová 2629 (holotype **BKF!**; isotypes **E!**, **QBG!**, **SING!**). Figs. 7B, 8 & Map 3.

Herb 15–60 cm tall. *Leaf sheaths* dark red, ca 3, sparsely puberulent, to 1 cm in diam.; ligule bilobed, ca 3 mm long; blades 5–9, elliptic, 5–22 × 2–6 cm, puberulent and usually dark red below, base cuneate, apex acuminate, sessile. *Inflorescence* pendent, compact, conical, 2–5.5 × 1.5–2.5 cm; peduncle to 1 cm beyond leaf sheaths, pale green; rachis pale green or white, densely pubescent; bracts persistent, patent, ovate to elliptic, 10–20 × 5–12 mm, greenish white, apex mucronate; cincinni short, to 5 mm long; bracteoles elliptic, ca 8 × 3 mm, white, apex acuminate.

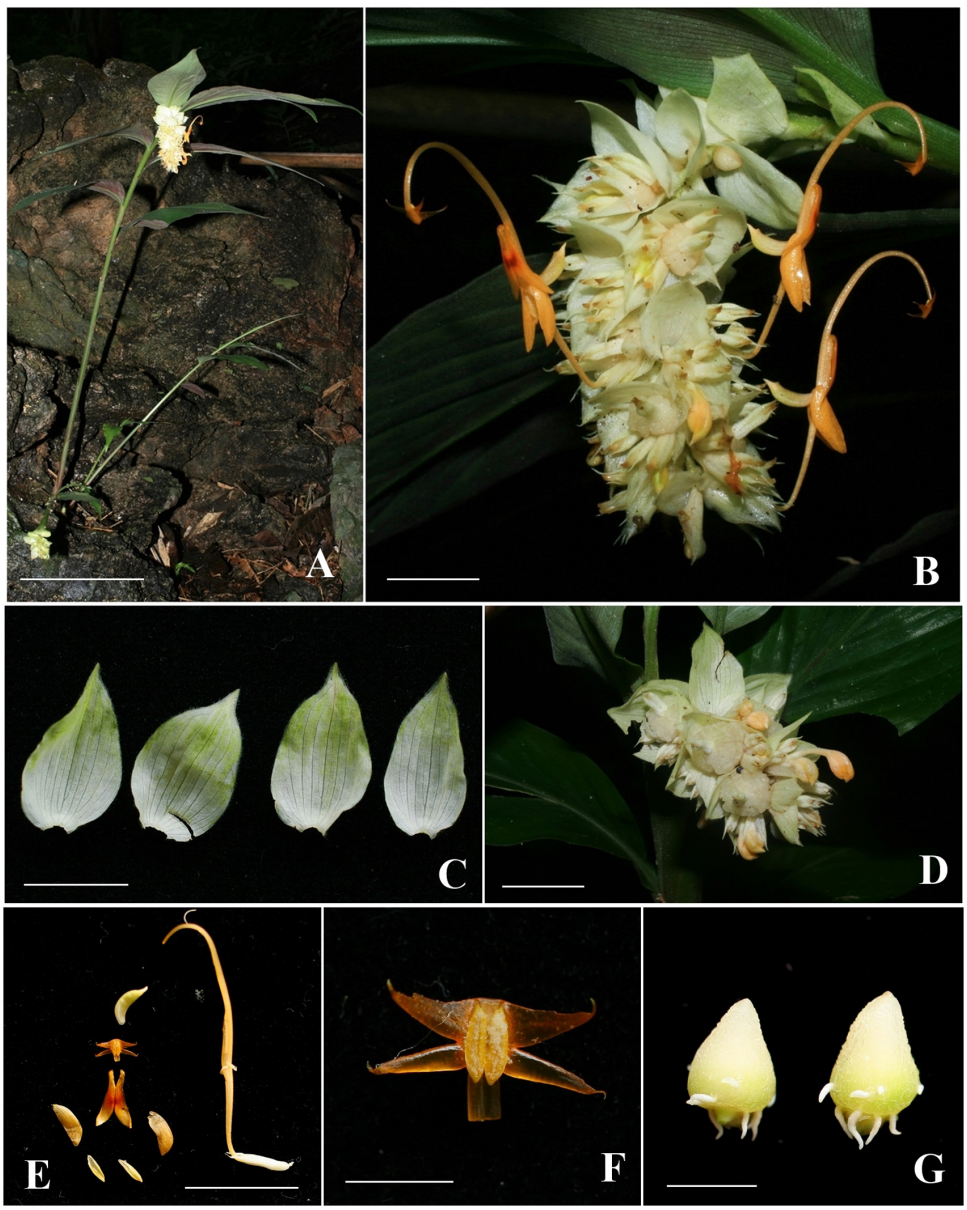


Figure 8. *Globba hilaris* Sangvir. (*Newman et al. 2629*) A. Habit & habitat; B. Inflorescence; C. Bracts; D. Infructescence; E. Dissection of flower; F. Anther thecae with appendages; G. Bulbils. Scale bars; A. = 10 cm; B.–E. = 1 cm; F.= 3 mm; G.= 5 mm. All photographs by S. Sangvirotjanapat.

Flowers ca 3 cm long; ovary ellipsoid, 2 × 1 mm, white; calyx infundibuliform, ca 6 mm long, narrow, with 3 ribs ending in the calyx lobes, white; floral tube ca 10 mm long, pale orange, hairy; dorsal corolla lobe hooded, elliptic, ca 4 × 1.5 mm, pale orange, apex shortly mucronate; lateral corolla lobes hooded, elliptic, ca 3 × 1 mm, pale orange, apex acute; lateral staminodes oblong to slightly curved, ca 7 × 2 mm, orange, apex acute; labellum obtriangular, ca 8 × 5 mm, orange with red spot, base truncate, apex bilobed, lobes acute; nectar tube ca 4 mm long; stamen: filament ca 25 mm long, pale orange; anther elliptic, ca 2 × 1.2 mm, connective tissue orange, semitransparent; appendages 4, semitransparent, triangular, ca 3 × 1 mm, orange, apex acuminate. *Fruit* globose, ca 8 mm in diam., white, verrucose; seeds not seen. *Bulbils* ovoid, ca 7 × 5 mm, in axils of lower bracts, corky.

Thailand.— NORTHERN: Nan [Bo Kluea, Sapan waterfall, a few km N of Ban Bo Kluea, E of road 1081, 600 m, 7 Sept. 1995, *Larsen et al. 46181* (**AAU**, **BKF**); ibid., 850 m, 6 July 2001, *Srisanga 1944* (**BKF**, **E**, **QBG**); Doi Phu Kha, Phu Wae, 1,400 m, 3 July 1999, *Srisanga et al. 897* (**BKF**, **E**, **QBG**)]; NORTH-EASTERN: Udon Thani [Non Sang, 27 May 1968, *Bunchuai 1668* (**BKF**, **C**, **E**, **K**, **L**, **P**)]; Phetchabun [Chulaphorn Dam, 600 m, 5 Aug. 1972, *Larsen et al. 31444* (**AAU**)]; Nam Nao National Park, Chum Phae District, 850 m, 11 Oct. 1979, *Shimizu et al. T18280* (**BKF**)] ibid., 870 m, 8 Aug. 2013, *Newman et al. 2629* (**E**, **QBG**, **SING**)]; EASTERN: Chaiyaphum [Phu Khiao, Thung Kramang, 4 Aug. 1972, *Larsen et al. 31378* (**AAU**); ibid., Oct 1999, *Phengklai 12267* (**BKF**)]; Nakhon Ratchasima [Khao Yai National Park, km 80 at the Korat-Sattahip Highway, 300 m, 10 Aug. 1968, *Larsen et al. 3255* (**AAU**, **BKF**, **E**); ibid., Heo Suwat Falls, 750 m, 8 July 1966, *Larsen et al. 117* (**AAU**, **BKF**, **K**); ibid., 650 m, 9 Sept. 2002, *Maxwell 02-336* (**A**, **BKF**); Korat-Kabin, 9 Sept. 1968, *Santisuk 203* (**BKF**, **P**)]; SOUTH-EASTERN: Chanthaburi [Khao Soi Dao, Bo Nam Ron District, 300 m, 6 July 1974 *Maxwell 74-691* (**AAU**, **BK**); Pong Nam Ron, Hindat, 220 m, 30 Aug. 1956, *Smitinand 3457* (**AAU**, **BKF**, **C**)]; Chonburi [Khao Kum Pang, Bo Thong District, 300 m, 14 July 1999, *Puudjaa & Cholkulchana 594* (**BKF**)]; CENTRAL: Nakhon Nayok [6 Aug. 1970, *Phengklai 3735* (**A**, **BKF**)].

Cambodia.— Unspecified locality, *Martin 708* (**P**).

Laos.— Louangphabang: Bane Phuay Say Khao, 726 m, 14 June 2012, *Leong-Škorničková et al. 1712* (**P**, **QBG**, **SING**).

Distribution.— Cambodia, Lao PDR and Thailand.

Ecology. — Grows in deciduous forest in shaded areas or near streams at 40–850 alt m.

Etymology.— Latin, *hilaris*, meaning cheerful, referring to the appearance of the inflorescence.

Proposed IUCN conservation status.— *Globba hilaris* is a very widespread species with an extent of occurrence of 168,000 km² and AOO of 66 km². The three localities of this species are in protected areas in three regions of Thailand; north, north-east and centre. These localities have no major threats and the species usually occurs in large populations of more than 250 mature individuals. It is therefore assessed as of Least Concern (LC).

Notes.— *Globba hilaris* is recognised by the following characters: condensed inflorescences composed of greenish white bracts, yellow-orange flowers with an obvious dark-red spot on the labellum, and mature inflorescences producing a few bulbils at the lower bracts. When growing in conditions of high humidity, the inflorescence can lengthen (Fig. 7B) resembling *G. laeta* (Fig. 7C). *Globba hilaris* and *G. laeta* are distinguished by having verrucose and smooth fruits, respectively.

Globba impar M.F.Newman & H.Đ.Trần, **sp. nov.**

Similar to the white form of *Globba williamsiana* M.F.Newman & Sangvir. by its pendent inflorescence and white bracts but differing by its large white bracteoles (vs small yellow bracteoles), and ca 3 mm wide lateral corolla lobes (vs ca 1.5 mm wide corolla lobes). Type: Vietnam, Đắk Lắk province, Buôn Đôn District, Bản Đôn, 12° 54′ 48″ N, 107° 50′ 21″ E, 219 m alt., 25 June 2008, *Trần, Leong-Škorničková, Cecilio, Newman, Thi, Dang, Lý & Lamxay 79* (holotype **VNM!**; isotypes **E!**, **P!**, **RUPP!**, **SING!**). (Fig. 9 & Map 3).

Herb to 30 cm tall. *Leaf sheaths* to 10, sometimes reddish, sparsely pubescent; ligule bilobed, 1.5–2 mm long, ciliate; blades 3–5, elliptic, 10–19 × 2.7–4.5 cm, densely pubescent below, glabrescent above, base cuneate, apex acuminate; petiole 0.8–2.3 cm long, pubescent. *Inflorescence* pendent, ca 7–8

cm long; peduncle ca 1 cm beyond leaf sheaths, without sterile bracts; rachis 6–7 cm long, pubescent; bracts persistent, broadly elliptic, 3.5 × 2.0 cm at base diminishing to 1.3 × 0.9 cm at apex of inflorescence, white or pink, shiny, sparsely ciliate at apex; cincinni 7–9 in the inflorescence, to 1.6 cm long to first flower, with ca 8–9 sessile, yellow flowers; bracteoles as bracts but slightly smaller. *Flowers* ca 3 cm long; ovary ovoid, 3 × 2 mm, white, verrucose; calyx somewhat urceolate, 4 mm long, white, glabrous; floral tube ca 9 mm long, pale orange, minutely pubescent, lobes ovate, concave, pale orange, acute; dorsal corolla lobe 5 × 3 mm; lateral corolla lobes 4 × 3 mm; lateral staminodes narrowly ovate,

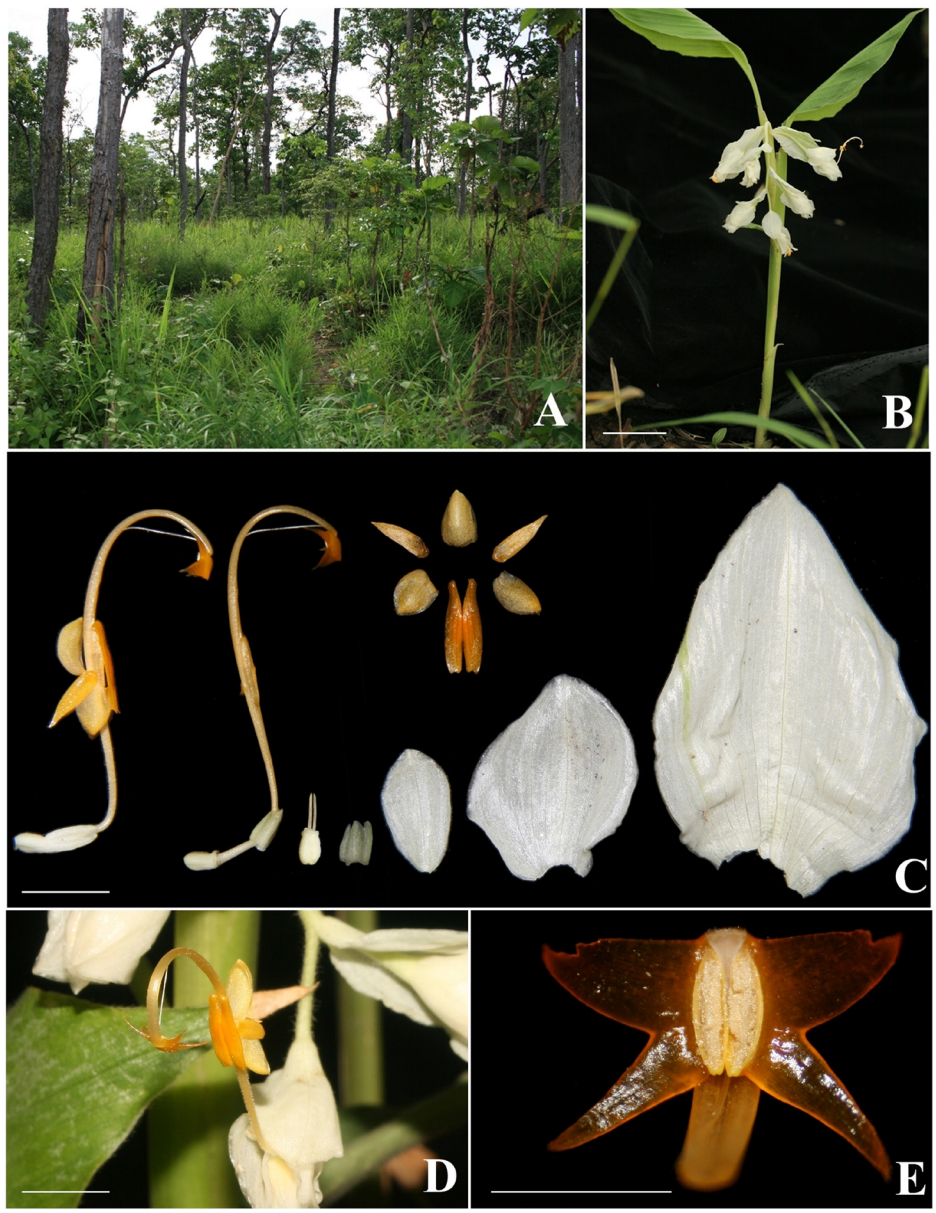


Figure 9. *Globba impar* M.F.Newman & H.Đ.Trần (*Trần et al. 79*) A. Habitat ; B. Habit; C. Dissection of flower; D. Flower from side view; E. anther thecae with appendages. Scale bars B.= 1 cm; C. & E. = 5 mm; D = 1 cm. Photographs by A., C.–E.: Trần Hữu Đăng; B. V. Lamxay.

acuminate, 6 × 2 mm, orange, slightly longer than corolla lobes; labellum more or less rectangular, 8–9 × 3.5 mm, orange without coloured spot, bilobed, each lobe emarginate, shorter than corolla lobes; stamen: filament 16 mm long, orange; anther 2.5 mm long with two acute appendages on each side and sometimes a third, minute one between them, distal appendages often with 2–3 minute teeth at apex; nectary glands 2, subulate. *Fruit* globose, 6–8 mm diam., verrucose; seeds not seen. *Bulbils* absent.

Distribution.— Endemic to Vietnam.

Ecology.— Seasonally dry dipterocarp savanna, among bushes and low, open vegetation, on coarse sandy soil.

Etymology.— Latin, *impar* means unequal or dissimilar, referring to the size of the bracts.

Proposed IUCN conservation status.— This species is only known from the type collection made in 2008. It may occur in the nearby Yok Đôn National Park but a search by the second author in 2019 was unsuccessful. The population found in 2008 had an AOO of < 4 km^2 but the preferred habitat type is fairly common in the area. Bản Đôn is a scenic area, which attracts tourists. While this may protect the habitat to a certain degree, it may also lead to urbanization. With current knowledge, *Globba impar* must be assessed data deficient (DD) but surveys should be carried out to gather data for a more precise assessment. An ex situ collection of *Globba impar* is held at the Royal Botanic Garden Edinburgh under accession number 20081114A.

Notes.— *Globba impar* grows on flat land along the Srepok River in a district which borders Mondulkiri Province of Cambodia. It may occur in similar soil types on the Cambodian side of the border.

Globba nitida M.F.Newman & Sangvir., **sp. nov.**

Similar to *Globba sherwoodiana* W.J.Kress & V.Gowda in its pendent inflorescence with white reflexed bracts, and yellow flower with orange-red spot on labellum but differing by its flat, oval and caducous bracteoles (vs infundibuliform and persistent bracteoles). Type: Thailand. Krabi, Khao Phanom Bencha, 1,150 m, 19 June 2006, *Williams, Pooma, Chamchumroon & Seasin 1977* (holotype **BKF!**; isotypes **A!**, **E!**). Fig. 10 & Map 3.

Herb 70 cm tall. *Leaf sheaths* red, glabrous; ligule truncate, 2 mm long, minutely pubescent; blades ca 5, narrowly elliptic, 18.5–19.5 × 3.2–3.5 cm, plain green, plicate, glabrous, base cuneate, apex long caudate; petiole to 3 mm long, glabrous. *Inflorescence* hanging vertically, conical, 4–9 cm long; peduncle short, to 1.5 cm beyond leaf sheaths, with 2–3 sterile bracts; rachis pubescent; bracts persistent, reflexed, oval, ca 16 × 9 mm at base of inflorescence, diminishing gradually towards apex, white, plastic-like, shining, minutely pubescent; cincinni slender, 5–9 mm long to first flower, flowers 2–3 per cincinnus, sessile; bracteoles caducous, oval, ca 9 × 7 mm, enfolding ovary and calyx, white, glabrous. *Flowers* ca 3 cm long; ovary ovoid, 3 × 1.5 mm, minutely verrucose; calyx 3 mm long, pale yellow, glabrous, with 3 acute lobes; floral tube 8 mm long, yellow, glabrous, lobes hooded, lateral lobes 5 mm long, dorsal lobe slightly larger; lateral staminodes oblong, 5 mm long, yellow, slightly longer than corolla lobes; labellum obtriangular, 11 × 5 mm, yellow with red spot, lobes acute; stamen: filament 20 mm long, pale yellow; anther 2.5 mm long, appendages 2 on each theca with a minute 3rd tooth between them. *Fruit* unknown. *Bulbils* lacking.

Thailand.— SOUTH-WESTERN: Phetchaburi [Kaeng Krachan National Park, Summit of Khao Phanoen Thung, 1,240 m, 8 May 2005, *Middleton et al. 3279* (**BKF**, **E**)]; PENINSULAR: Krabi [Khao Phanom Bencha, trail from Ban San to summit of Khao Phanom Bencha, 1,150 m, 19 June 2006, *Williams et al. 1977* (**A**, **BKF**, **E**)].

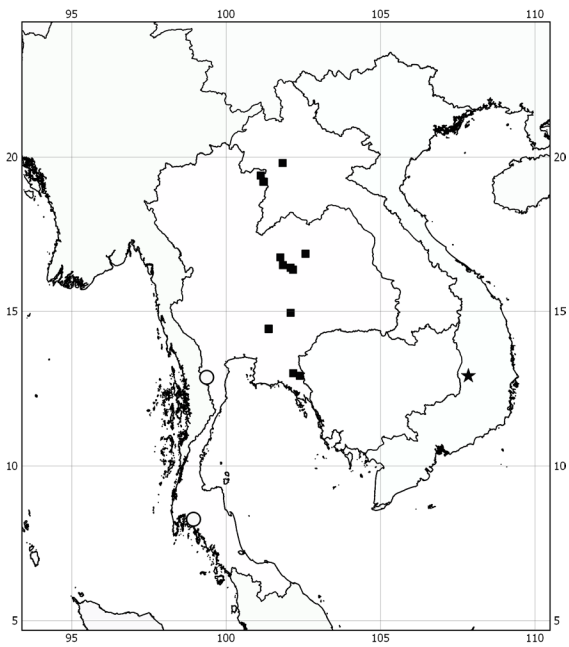
Distribution.— Endemic to Thailand.

Ecology. — Grows in dappled sunlight at 1,150–1,240 m alt.

Etymology.— Latin, *nitidus*, shining, referring to the shiny bracts.

Proposed IUCN conservation status.— *Globba nitida* is restricted to a vulnerable habitat type at high elevation, 1,150–1,240 m alt. with an AOO estimated under 10 km^2. The two localities are situated in protected areas for which reason this species is assessed as of Least Concern (LC). Further surveys are required in particular in the area between the known locations; if other subpopulations are found, a reassessment will be needed.

Figure 10. *Globba nitida* M.F.Newman & Sangvir. (*Williams et al. 1977*) A. Habit & habitat; B. Inflorescence; C. & D. Holotype at **BKF**. Photographs A.–B. by M. Poopath; C.–D. by S. Sangvirotjanapat.



Map 3. Distribution of *Globba hilaris* Sangvir. (■), unspecific locality in Cambodia excluded from this map; *G. impar* M.F.Newman & H.Đ.Trần (★); *G. nitida* M.F.Newman & Sangvir. (○).

Notes.— *Globba nitida* is recognised by its pendent inflorescence with reflexed, white and shiny, plastic-like bracts. It shares these characters with *G. sherwoodiana* but differs from this species by having caducous, flat, elliptic bracteoles (vs persistent, infundibuliform bracteoles)(Fig. 7A). The differences between *G. nitida* and *G. grandis* are in the colour of the bracteoles and flowers. *Globba nitida* has white bracteoles and yellow flowers whereas *G. grandis* has yellow-orange bracteoles and rich orange flowers.

Globba verecunda M.F.Newman & Sangvir., **sp. nov.**

Similar to *Globba marantina* L. in its compact inflorescence, yellowish orange flower with red spot on labellum and verrucose fruit but differing by its pendent inflorescence hidden by the leaves (vs erect or horizontal inflorescence which is easily seen) and lack of bulbils (vs bulbils many). Type: Thailand. Phitsanulok, Chat Trakan Waterfalls National Park, 185 m, 6 Aug. 2013, *Newman, Sangvirotjanapat, Sirimongkol, Fér, Záveská & Pospíšilová 2614* (holotype **BKF!**; isotypes **E!**, **QBG!**, **SING!**). Fig. 11 & Map 4.

Herb 16–60 cm tall, growing in soil among limestone rocks under light shade. *Leaf sheaths* 4–9, green, densely patent hairy along midline and margins, 1–2.5 cm thick, forming distinctly flattened stems at tip; blades 4–9, elliptic, rather large, 12–30 × 3.5–8.5 cm, plain green, plicate in life, glabrous above, densely patent hairy below, base cuneate, apex long acuminate; petiole absent or very short on lower leaves, to 3 cm long on upper leaves, hirsute. *Inflorescence* condensed, pendent, 2–6.5 × 1.5–3.5 cm; peduncle to 3 cm beyond leaf sheaths, without sterile bracts; rachis 2–3 cm long, green, hairy; bracts persistent, elliptic, 26 × 17 mm at base, diminishing to 10 × 5 mm at apex of inflorescence, green or white, densely hairy; cincinni 2.0–2.5 mm thick, 4.5–8.0 mm long to first flower, second order pedicel 1.0–1.5 mm long, with 3–6 orange-yellow flowers; bracteoles persistent, elliptic, somewhat boat-shaped, 17–18 × 10–11 mm at base of cincinnus, becoming smaller towards apex, greenish yellow or white, minutely pubescent. *Flowers* ca 3 cm long; ovary globose, 1.5 mm, finely granular; calyx 6 mm long, narrow, pubescent, orange or white, with 3 ribs ending in the calyx lobes, lobes curving inwards at apices; floral tube ca 15 mm long, orange, dorsal corolla lobe strongly boat-shaped, 7 mm long, orange, pubescent, acute, shortly cucullate, lateral corolla lobes shallowly boat-shaped, 5 mm long, orange, pubescent; lateral staminodes spreading, oblong to slightly curved, 6 × 2 mm, orange, slightly longer than corolla lobes; labellum obtriangular, 7 × 4 mm, orange with orange-red spot, shorter than lateral corolla lobes; stamen: filament 20 mm long; anther 2.5 mm long, appendages 4, 3 mm long, orange, slightly diverging. *Fruit* globose, 8 × 11 mm, surface verrucose, white to orange; seeds not seen. *Bulbils* absent.

Thailand.— NORTHERN: Phitsanulok [Chat Trakan Waterfalls National Park, Chat Trakan Waterfall, 1st level, Maliwan, 185 m, 6 Aug. 2013, *Newman et al. 2614* (**E**, **QBG**, **SING**); ibid., 400 m, 13 Aug. 2000, *Suksathan 2669* (**QBG**); Phu Suan Sai National Park, Chat Trakan District, 1,300 m, 21 June 2006, *Poulsen & Suksathan 2404* (**AAU**, **BKF**, **E**, **QBG**); Phu Soi Dao, 500 m, 14 Aug. 2000, *Suksathan 2674* (**QBG**); Tha Pla, Sirikit Dam, 178 m, 29 June 2012, *Norsaengsri & Tathana 9687* (**QBG**)];

Uttaradit [Phu Soi Dao, Nam Pat, path by waterfall towards pine forest, 680 m, 7 Aug. 2013, *Newman et al. 2619* (**E**, **QBG**); ibid., 700 m, 20 June 2006, *Poulsen & Suksathan 2398* (**A**, **AAU**, **BKF**, **E**, **QBG**); Phumiang-Phuthong Wildlife Sanctuary, Nam Pat District, 300 m, 13 Sept. 2011, *Romklao Botanical Garden 3382554* (**QBG**); ibid., 340 m, 24 Sept. 2010, *Romklao Botanical Garden 1322553* (**QBG**); ibid., 443 m, 13 June 2012, *Romklao Botanical Garden 4852555* (**QBG**)]; NORTH-EASTERN: Loei [Phu Suan Sai, route to Hueang Nga, Na Haeo District, 8 July 2008, *Maknoi 2442* (**QBG**)].

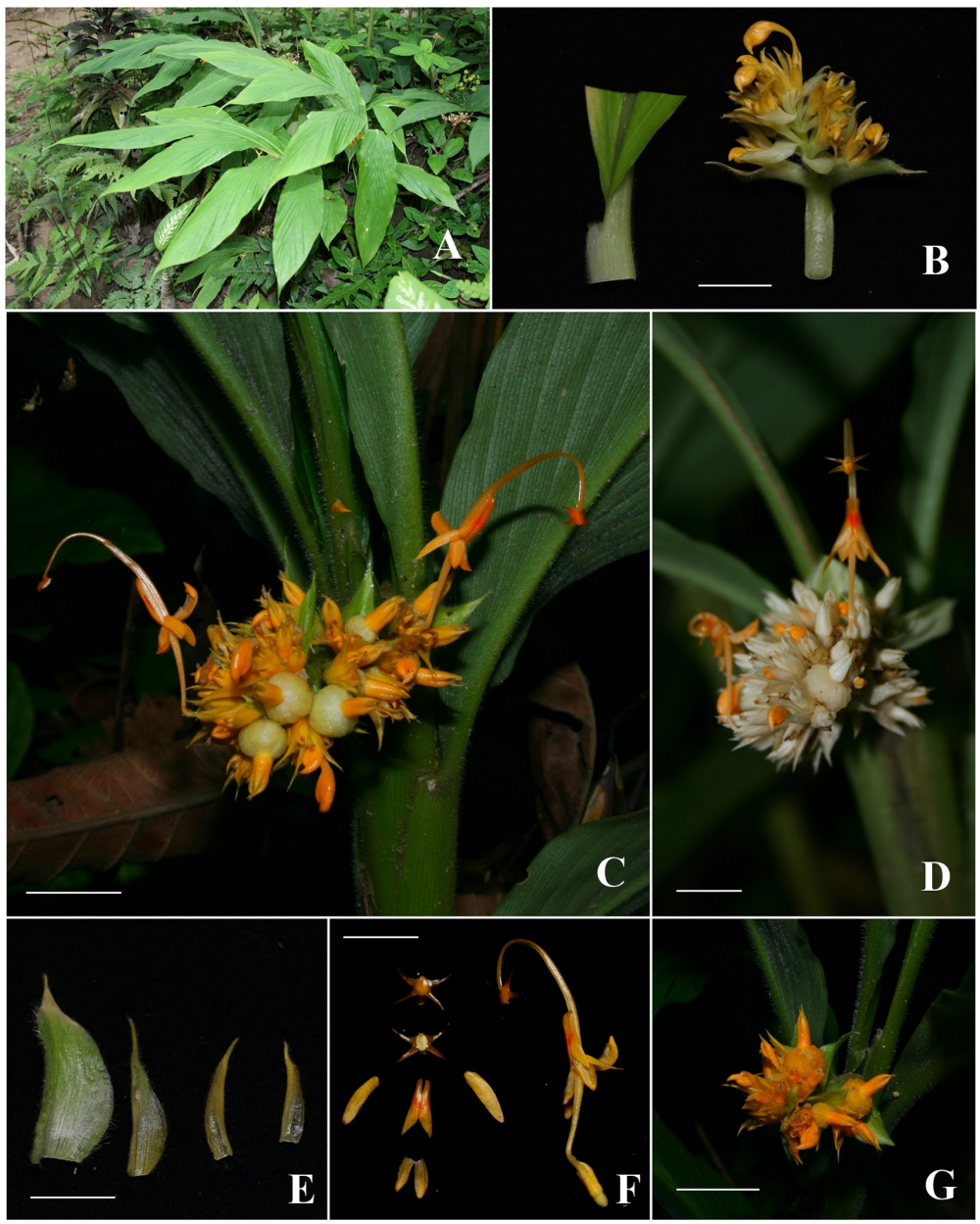


Figure 11. *Globba verecunda* M.F.Newman & Sangvir. A. Habit & habitat; B. Ligule (left) & Inflorescence (right); C. Inflorescence with young fruit; D. Inflorescence (white form); E. Bracts of orange form; F. Dissection of flower; G. Infructescence at maturity. Scale bars = 1 cm. All photographs by S. Sangvirotjanapat.

Distribution.— Endemic to Thailand.

Ecology. — Deciduous forest, growing along the trails near streams at 180–800 m alt.

Etymology.— Latin, *verecundus*, meaning coy or modest, in reference to the inflorescence which is hidden by the leaves.

Proposed IUCN conservation status.— *Globba verecunda* is endemic to Thailand, where it is restricted to three localities in Phitsanulok, Uttaradit and Loei. All localities are situated in protected areas, which are not under serious threat but vulnerable to tourists activities. This species is assessed here as Least Concern (LC).

Notes.— *Globba verecunda* is a large plant with large leaves which hide its small inflorescence. The inflorescence can vary in colour from orange to white. The orange form has green bracts, yellowish-orange bracteoles and orange calyces (Fig. 11C) while the white form has white bracts, bracteoles and calyces (Fig. 11D).

Globba williamsiana M.F.Newman & Sangvir., **sp. nov.**

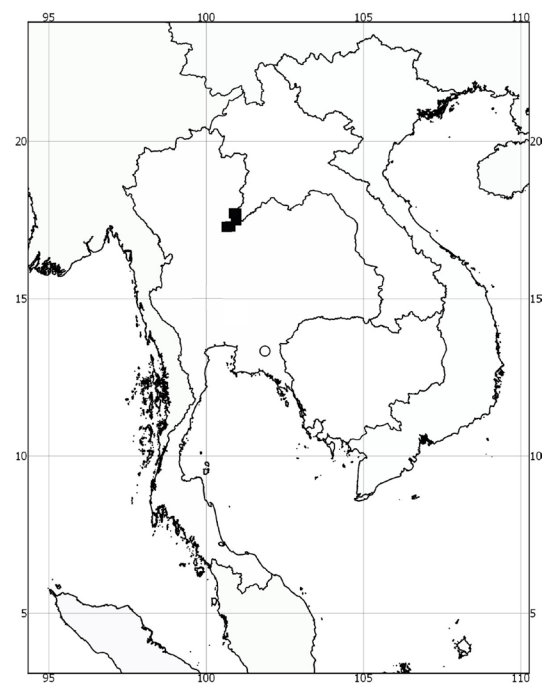
Similar to *Globba winitii* C.H.Wright in its pendent inflorescence with persistent, reflexed bracts but differing by its cuneate leaf bases (vs cordate leaf bases), sessile leaves (vs petiolate), and yellowish orange flower with no spot on labellum (vs yellow with brown spot on labellum). Type: Thailand. Prachinburi, Kabinburi district, Ban Nong Plakhayaeng, 10 Aug. 2009, *Sangvirotjanapat 607* (holotype **QBG!**). Fig. 12 & Map 4.

Herb 30–50 cm tall. *Leaf sheaths* ca 3, sparsely puberulent; ligule bilobed, ca 5 mm long; blades 5–6, elliptic, ca 15 × 2.5 cm, slightly plicate, glabrous below and above, sessile, base cuneate, apex acuminate. *Inflorescence* pendent, conical, ca 8 × 8 cm; peduncle pale green, to 4 cm beyond leaf sheaths; rachis pale green, puberulent; bracts persistent, elliptic, ca 2 × 1 cm, white or pink, reflexed, apex acute; cincinni ca 1–4 cm long, >10 per inflorescence, 5–10 flowers per cincinnus; bracteoles caducous, elliptic, ca 12 × 6 mm, yellowish green, semitransparent, keeled, apex acute. *Flowers* ca 3 cm long; ovary ellipsoid, ca 2 × 1 mm, pale yellow; calyx infundibuliform, ca 6 mm long, yellow, lobes acute; floral tube ca 10 mm long, yellowish orange, hairy; dorsal corolla lobe hooded, elliptic, 3–5 × 1.5 mm, yellowish orange, apex acute, lateral corolla lobes shallowly hooded, elliptic, ca 3 × 1.5 mm, yellowish orange, apex acute; lateral staminodes oblong, ca 8 × 1.5 mm, yellowish orange, longer than corolla lobes, apex acute; labellum obtriangular, ca 8 × 5 mm, yellowish orange with orange spot, base truncate, apex bilobed, lobes acute; nectar tube ca 4 mm long; stamen: filament ca 20 mm long, orange; anther elliptic, ca 2 × 1.2 mm, appendages 4, triangular, ca 3 × 1 mm, apex acuminate. *Fruit* globose, ca 8 mm in diam., yellowish green, verrucose; seeds not seen. *Bulbils* produced along peduncle, corky.

Thailand.— SOUTH-EASTERN: Sa Kaeo [Khao Takrup, 600 m, 6 Nov. 1993, *Larsen et al. 44241* (**AAU**)]; Prachinburi [Kabinburi District, Ban Nong Plakhayaeng, 10 Aug. 2009, *Sangvirotjanapat 607* (**QBG**)]; CULTIVATION VOUCHER: 15 June 2000, *Suksathan 2936* (**QBG**); *Mood M94P24* (**AAU**); 17 July 2013, *Muangyen 0060* (**QBG**), 9 July 2014, *Sangvirotjanapat 688* (**QBG**).

Distribution.— Endemic to Thailand.

Ecology. — Growing on limestone mountains or in decidous forest.



Map 4. Distribution of *Globba verecunda* M.F.Newman & Sangvir. (■); *G. williamsiana* M.F.Newman & Sangvir. (○).

Vernacular.— Dok khao phansa (ดอกเข้าพรรษา).

Etymology.— In honour of Kyle Williams whose PhD thesis at Duke University, and published papers contain great insights into the systematics and evolution of *Globba*.

Proposed IUCN conservation status.— *Globba williamsiana* is endemic to Thailand. The AOO is estimated at 8 km^2, suggesting a status of Critically Endangered. The habitat in SE Thailand has been cleared for rubber plantations. The most recent

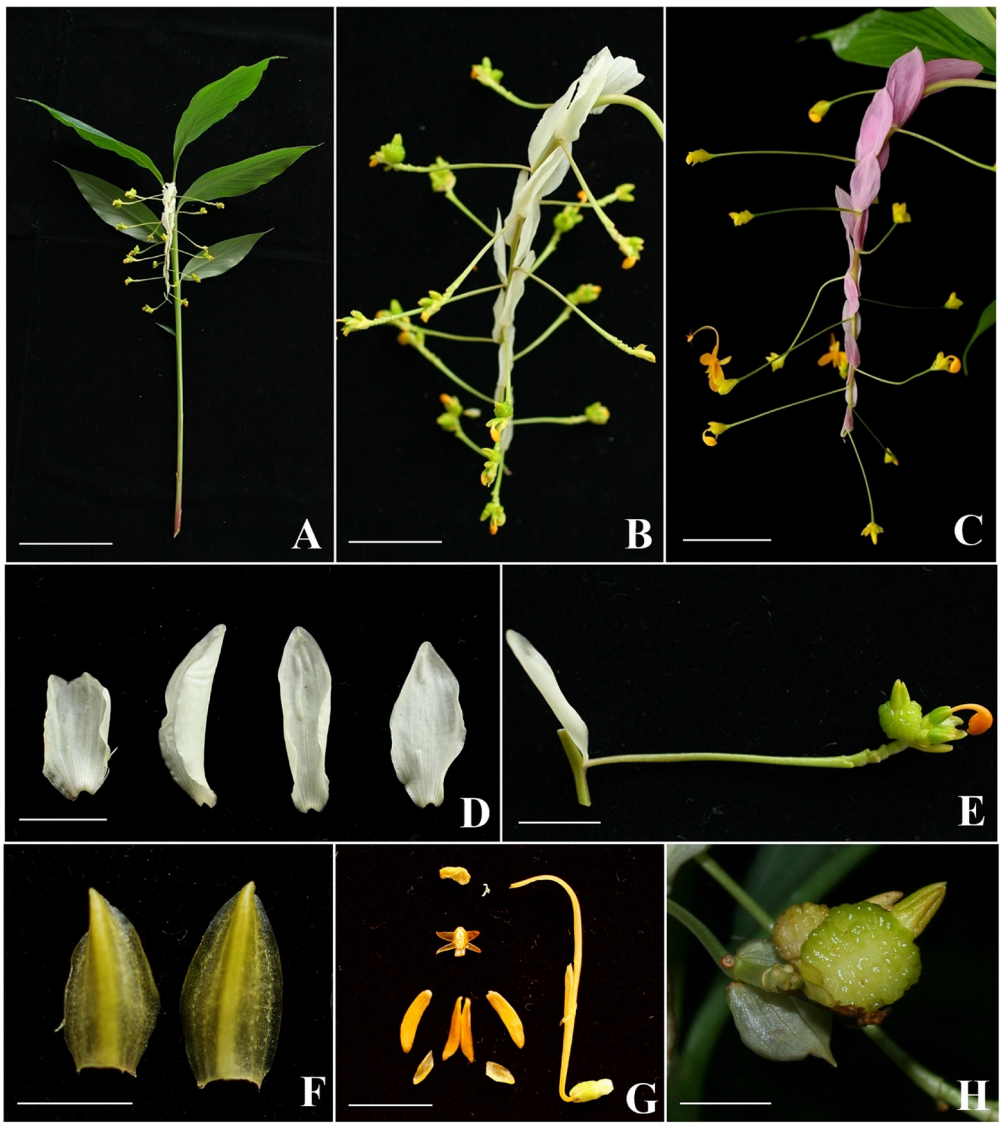


Figure 12. *Globba williamsiana* M.F.Newman & Sangvir. (*Sangvirotjanapat 688*) A. Habit; B. Inflorescence with white bracts; C. Inflorescence with pink bracts; D. Bracts; E. Cincinnus; F. Bracteoles; G. Dissection of flower; H. Fruit. Scale bars; A. = 10 cm; B.–C. = 5 mm; D.–E. & G. = 1 cm; F. & H. = 5 mm. All photographs by S. Sangvirotjanapat.

collection of this species in the wild was made in 2009, so further survey work is required to establish whether it is still extant in nature. The species is cultivated for cut flowers. With the information available at present, it is assessed as Endangered, EN B1ab(i,iii)+B2ab (i,iii).

Notes.— *Globba williamsiana* is well known as an ornamental plant with large and brightly coloured bracts. Individuals selected from the wild have been used to breed artificial hybrids for the horticultural trade. These hybrids are commonly seen in flower markets, indicating that interspecific hybrids can occur in sect. *Globba*. The inflorescence structure and colour of the bracts and bracteoles resemble those of *Globba winitii* (Fig. 7D) very closely and the two species are sometimes confused but the cordate leaf bases of *G. winitii* are highly diagnostic; *G. williamsiana* always has cuneate leaf bases.

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