

## **Bambusa gurgandii K. M. Wong & M. H. Diep (Poaceae, Bambusoideae), a New Species of Bamboo from Vietnam**

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Source: Candollea, 70(2) : 211-218

Published By: The Conservatory and Botanical Garden of the City of Geneva (CJBG)

URL: <https://doi.org/10.15553/c2015v702a6>

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# Bambusa gurgandii K. M. Wong & M. H. Diep (Poaceae, Bambusoideae), a new species of bamboo from Vietnam

Khoon Meng Wong & My Hanh Diep

## Abstract

WONG, K. M. & M.H. DIEP (2015). *Bambusa gurgandii* K. M. Wong & M. H. Diep (Poaceae, Bambusoideae), a new species of bamboo from Vietnam. *Candollea* 70: 211-218. In English, English abstract. DOI: <http://dx.doi.org/10.15553/c2015v702a6>

*Bambusa* Schreb. (Poaceae, Bambusoideae) is a large and complex tropical and subtropical Asian genus that is currently being taxonomically remodeled through morphological and molecular phylogenetic approaches. The type and type alliance of the genus is, however, morphologically well distinguished. Preliminary documentation suggests there could be some 60-70 species of *Bambusa* in Vietnam, although confirmation requires more rigorous herbarium-based vouchering. A new species of bamboo belonging to the type alliance, *Bambusa gurgandii* K. M. Wong & M. H. Diep, is described, known only from cultivated specimens in Vietnam. It belongs to the group of unarmed *Bambusa* species including *Bambusa burmanica* Gamble, *Bambusa farinacea* K. M. Wong, *Bambusa nutans* Wall. ex Munro, *Bambusa polymorpha* Munro, *Bambusa teres* Buch.-Ham. ex Munro and *Bambusa tulda* Roxb. but is distinguished by details of the pseudospikelets and flowers.

## Keywords

POACEAE – BAMBUSOIDEAE – *Bambusa* – Vietnam – Phu An Bamboo Village – Taxonomy

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Submitted on May 21, 2015. Accepted on June 11, 2015.

Edited by M. W. Callmander

## Introduction

### *Bamboos of Vietnam*

Taxonomic studies of the bamboos of Vietnam very much began with the French botanical research by BALANSA (1890), CAMUS (1913), CAMUS & CAMUS (1923), and CAMUS (1927, 1952), although the largest of these earlier accounts (CAMUS, 1913) was essentially worldwide in purview and enumerated only few Vietnam or Indo-Chinese bamboos. For example, CAMUS (1913) listed only ten species known in either Vietnam or Indo-China in general, out of 68 species enumerated under *Bambusa* Schreb. Subsequently, there was a hiatus in detailed taxonomic work brought on by regional wars and disruptive upheavals leading to the transition to modern Vietnam. Only much later did the scientific interest in bamboos rekindle (e.g., NGUYEN, 1989, 1990, 1991) but, as HAEVERMANS et al. (2013) showed, this has at times been hampered by a poor documentation or distribution of type material, potentially rendering precise interpretation problematic.

Meanwhile, general listings of bamboos within Vietnam, including both wild and cultivated taxa, continued to grow in number. From the time of CAMUS & CAMUS (1923), who reported 57 bamboo species in 12 genera, the tallies and estimates leapt to 123 bamboo species of 20 genera (PHAM, 1999), about 200 species (VU & LE, 2004), and 216 species and subspecies within 25 genera (NGUYEN, 2006), and more recently 210 species and subspecies in 27 genera (NGUYEN & TRAN, 2010a). Although descriptions, specimen citations and illustrations were clearly made for many of the more recent diagnoses and records of genera (e.g. NGUYEN & TRAN, 2012; NGUYEN et al., 2013; NGUYEN & TRAN, 2013, 2014; TRAN et al., 2013, 2014) and species new to Vietnam (e.g. LE et al., 2009; NGUYEN & TRAN, 2010b; NGUYEN et al., 2012), these were mostly based on new discoveries of taxa in the wild and careful accounting and documentation of numerous species found in association with human settlements had yet to be accomplished.

Thus, there have been comparatively few critical studies of the large and potentially useful bamboos in village or rural settings throughout Vietnam, for which identifications remained contentious in many cases. The recent descriptions of four new *Dendrocalamus* Nees species by NGUYEN & XIA (2013) and NGUYEN et al. (2013) reveal just how little is known about this category of bamboos. In short, the country-wide enumeration of bamboos in Vietnam is far from complete.

### *Bambusa* and its type alliance

The type species of *Bambusa* is *B. bambos* (L.) Voss ( $\equiv$  *Arundo bambos* L.). This and its type alliance, i.e., those species most closely related to it in terms of both vegetative and reproductive characters, are morphologically distinguished from many other species that have been accepted in the genus (WONG, 1993a, 2005). So defined, *Bambusa* s.s. can be delimited by the

characters in WONG (2005), chiefly including an erect-suberect culm habit, erect culm-sheath blades with conspicuously lobe-like bristly auricles, mid-culm branch complement with a dominant primary axis, pseudospikelets with 3-10 perfect flowers, elongated rachilla internodes that disarticulate below the flowers, and a thickened hairy ovary summit.

Whereas a number of species varying greatly from this set of characteristics have been removed to other genera (WONG, 1993b, 2005; WIDJAJA, 1997; SUNGKAEW et al., 2008) that are now also confirmed to be phylogenetically distinct by molecular characteristics (SUNGKAEW et al., 2009; GOH et al., 2010), many taxa varying in only a few characters are still retained in *Bambusa*. The relationship between these taxa (*Bambusa* s.l.), the type alliance (*Bambusa* s.s.) and other large genera such as *Dendrocalamus* and *Gigantochloa* Kurz ex Munro in the same subtribe have been shown to be complex, probably resulting from introgressive hybridisation among the key groups (GOH et al., 2013).

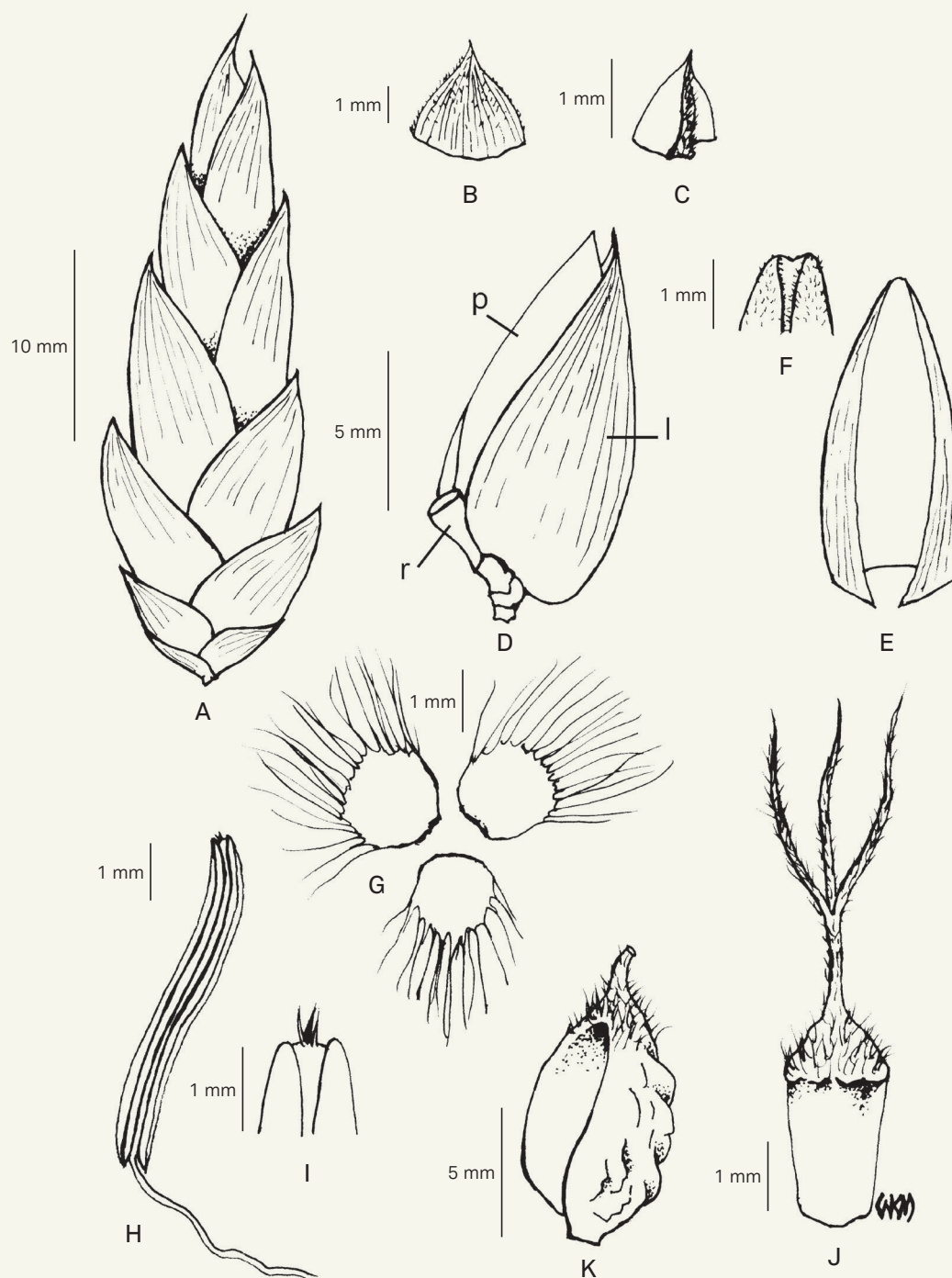
### *A new species of Bambusa from Vietnam*

Although the list by NGUYEN (2006) included 67 *Bambusa* species and NGUYEN & TRAN (2010) included 62 species and subspecies in *Bambusa*, the taxa conforming to *Bambusa* s.s. can be discerned by the characters as given above. These include a number of species developing spiny branches at the lower culm nodes, including the type species *B. bambos* and another commonly planted species in Vietnam, *B. blumeana* J. A. & J. H. Schultes, as well as a number of non-spiny species such as *B. nutans* Wall. ex Munro and *B. tulda* Roxb. As the new bamboo species does not develop any spine-branches, it falls into the latter group.

The new species described here is a bamboo known as “lồ ô vàng” in Vietnamese and was collected from the Hue Province in Thua Thien, Nam Dong, at Khe Tre. It is cultivated in the Phu An Bamboo Village living collections under the accession number 45, and is the same in all morphological aspects (Fig. 1 & 2) as another similar bamboo from the same district called “lồ ô đen”, also cultivated at Phu An but under the accession number 40. Both these clones, although given different vernacular names by the same informant at the time of collection, are ostensibly identical aside from a slight difference in culm-sheath hair colour (“vàng” means yellow and probably refers to the visibly yellowish fresh culm sheaths of the former with only scanty pale brownish hairs, whereas “đen” means black and refers to the dense covering of dark brown to black hairs on culm sheaths of the latter) (Fig. 1A, 3). It was also possible to ascertain that these were the same species from flowering material available for both when the authors examined the species characteristics at Phu An together with Jacques (“Jacky”) Gurgand, a long-time associate of the Bamboo Village Project.



**Fig. 1.** – *Bambusa gurgandii* K. M. Wong & M. H. Diep, general vegetative and pseudospikelet characters. **A.** Culm shoot; **B.** Culm node, showing a narrow ring of dense appressed pale hairs just above each node; **C.** Branch leaves with conspicuous laterally spreading, bristly sheath auricles; **D.** Part of flowering branch, showing pseudospikelets with extruded maroon anthers. [Photos: **A:** M. H. Diep; **B-D:** K. M. Wong]



**Fig. 2.** – *Bambusa gurgandii* K. M. Wong & M. H. Diep, pseudospikelet and floral characteristics. **A.** Pseudospikelet with, from base, two bracts subtending prophyllate buds, a single glume, eight perfect flowers visible, with the 9th perfect flower and 1–2 terminal vestigial flowers hidden by the 8th flower; **B.** Bract subtending a prophyllate bud; **C.** Prophyll of bud subtended by basal bract; **D.** Lowermost perfect flower in lateral view with lemma (l), palea (p) and rachilla segment (r); **E.** Palea, ventral view; **F.** Detail of palea apex; **G.** Lodicule complement; **H.** One of six anthers; **I.** Anther apex showing blunt connective and tuft of spines; **J.** Mature ovary; **K.** Caryopsis with sulcate dorsal side. [Drawing: K. M. Wong]

## Methods and materials

This study follows earlier taxonomic investigations that sought to revise the heterogeneous assemblage of bamboos of the Malay Peninsula placed into *Bambusa* s.l. (WONG, 1993a, 1993b) during which the type alliance of *Bambusa* (i.e., the type species and others most closely related in morphology) was identified and its morphological traits assessed to obtain a defining set of character-states. Segregates from *Bambusa* s.l. that were established as distinct genera that could be morphologically distinguished have remained separate in subsequent molecular phylogenetic studies (GOH et al., 2010, 2013), and taxa identified as members of the type alliance have also generally cohered even in molecular phylogenetic studies utilising other gene regions (YANG et al., 2010). This has increased confidence that *Bambusa* s.s. defined through these studies is both a taxonomic and genetic entity with distinctive morphological traits.

Morphological studies were conducted following conventional herbarium techniques, with specimens (including types) examined from the herbaria CAL, K, KEP, and SING. In addition, relevant specimen images from the BM and P herbaria on the JStor Global Plants website [<https://plants.jstor.org>] were consulted. Material of the new taxon being diagnosed was collected from clumps cultivated at the Phu An Bamboo Village bambusetum at Phu An, Ben Cat, Binh Duong, Vietnam, as they began to flower and fruit between May and November 2014. The material was processed at PBB and SING.

## Systematics

*Bambusa gurgandii* K. M. Wong & M. H. Diep, **spec. nova** (Fig. 1-2).

**Typus: VIETNAM. Prov. Binh Duong:** Ben Cat, Phu An Bamboo Village, cultivated as Accession 45 (introduced from Hue Province, Thua Thien, Nam Dong, Khe Tre, 16°10'53"N 107°43'12"E, 350 m alt.), 24.XI.2014, *M. H. Diep, C. K. Le, J. Gurgand et al. MH 100* (holo-: SING [SING0210902 shoot & leafy branch, SING0210903 culm sheath, SING0210904 inflorescence and leafy branch, SING0202907 pseudospikelets in spirit]!; iso-: G!, IBSC!, K!, P!, PBB!, US!, VNM!).

*Bambusa gurgandii* resembles *B. polymorpha* Munro in having conspicuously bristly-auriculate culm sheaths with erect blades, conspicuous laterally extending and long-bristly leaf-sheath auricles, glabrous lemmas, glabrous palea keels and maroon anthers. It differs from *B. polymorpha* in its sparsely pale brown to medium brown or black hairy culm sheaths, glabrescent and slightly white-waxy mid-culm internodes, glabrous leaf blades, and blunt anther apices. In contrast, *B. polymorpha* has densely white-hairy culm sheaths, conspicuously pale appressed-hairy and intensely white-waxy mid-culm internodes, hairy lower leaf surfaces, and apiculate anther apices.

Clumping *bamboo* to c. 15 m tall. Culms plain green, to 10 cm diameter, quite stiffly erect and apically only slightly arching, with well-spaced culms about 10-30 cm apart. *Culm internodes* with a conspicuous covering of appressed pale hairs all over the basal few internodes, this becoming scantier and more restricted to the internode base towards mid-culm, with a consistent narrow ring of dense appressed pale hairs just above each node; and a slight white-waxy bloom all over. *Culm sheaths* on mature culms 22-32 cm long, mainly pale green, infused with yellowish green at the top of the sheath proper; with scattered pale brown to medium brown or black appressed hairs and a slight white-waxy bloom all over the back; basal part at the sheath insertion with a 2-3 mm narrow ring-like band of dense spreading medium to dark brown hairs 2-3 mm long; blade 5.5-24 cm long, broad to narrowly triangular, erect but loosely held (not tightly appressed) against the next sheath or internode, medium green, with a slight white-waxy bloom on the outer (abaxial) side, with fine 2-4 mm long sinuous pale brown bristles at the base of the margin, the blade base with a few corrugations as it continues with only slight constriction into laterally elongate, spreading lobe-like auricles; auricles 5-10 mm high, protruding to 1-1.5 cm laterally from the sheath margin and slightly downcurved at the end, purplish brown, with sinuous bristles on the edge 5-7 mm long; ligule a leathery low subentire rim 1-2.5 mm high with 2-5 mm long narrowly triangular teeth on the margin. *Branch buds* solitary at each branching node, the prophyll broadly dome-shaped with fused margins and resembling a broad hood around the bud. *Branches* at mid-culm with the primary axis dominant in size and length with 2-several higher-order branches from its base, less often with only the primary axis developed. *Branch leaves* mostly c. 10-23 cm long, to 1.5-2.6 cm broad, dark green, slightly glaucous on the lower (abaxial) surface, glabrous on both surfaces; auricles conspicuous laterally spreading narrow lobes 0.5-1 mm high and 3-5 mm long, slightly downcurved at the end, margins with fine spreading bristles 5-7 mm long; ligule inconspicuous; sheath glabrous; the abaxial side of the sheath apex developing a scale-like callus 1-2 mm long with subentire-erose margin. *Inflorescences* iterant, with the basic flower-bearing unit consisting of ellipsoid pseudospikelets bearing prophyllate buds at their base and the spikelet proper distal to these, the prophyllate buds themselves developing into new pseudospikelets. *Pseudospikelets* slightly flattened, when mature to 2-3.8 cm long, 7-9 mm wide; each with 1-3 bracts subtending prophyllate buds, 1 empty glume, 5-9 perfect flowers, and 1-2 terminal vestigial flowers consisting of an empty lemma or a lemma and palea only; rachilla internodes 1-1.5 mm long, glabrous and disarticulating between flowers. *Flower* with lemma 12-16 mm long, 18-21-veined, back glabrous and pale green, margins glabrous, apex with a short cusp c. 1 mm long; palea 12-15 mm long, 2-keeled, the back strongly sulcate, 7-veined, glabrous, the apex acuminate to very slightly cleft, the keel thickened,

glabrous, the wings 4-veined, glabrous except for the minutely ciliate apical part including the margins; lodicules 3, rounded, c. 1 mm diameter developing to 2-3 mm diameter in the mature flower, thin-hyaline and delicate, bearing 1 mm long cilia on the margins; stamens 6, filaments free, 4-5 mm long developing to 10-18 mm long when mature, white turning brown, anthers 8-9 mm long when extruded, the apical part of the connective blunt and bearing a tuft of 3-5 spreading minute spines, the thecae maroon turning brown; ovary c. 1 mm long, ovoid, with a thickened apex bearing long hairs 0.5-1 mm long, style 0.5-1.5 mm long bearing 3 linear stigmas c. 3 mm long with short hairs all over. *Fruit* a caryopsis, obovoid, 8-12 mm long, 4-4.5 mm across, somewhat 3-angled with the dorsal (back) portion strongly sulcate and smooth, the apex conspicuously thickened and hairy, the ventral surfaces smooth to minutely tuberculate.

*Etymology.* – This new species is named for Jacques Gurgand (Fig. 3), a firm associate of the Phu An Bamboo Village with an extraordinary interest in the bamboos of Vietnam, who celebrated his 80th birthday in February 2015, and worked with the authors to elucidate the characters of this new bamboo species.

*Conservation status.* – *Bambusa gurgandii* is known only from plants in cultivation, the extent of which has not been ascertained at the type locality in the Hue Province from where it was introduced. Its presence in other parts of Vietnam has also not been ascertained. It has so far not been documented in the better-known bamboo floras of South China and India, so even if it were indigenous to Vietnam, the new species is therefore assigned a preliminary status of “Data Deficient” [DD] following IUCN Red List Categories and Criteria (IUCN, 2012).

*Notes.* – In having conspicuous laterally spreading culm-sheath auricles with long bristles, erect triangular culm-sheath blades, as well as few-many-flowered, slightly flattened pseudospikelets often longer than 1 cm with elongate rachilla internodes, *Bambusa gurgandii* resembles the group of species including *B. burmanica* Gamble, *B. farinacea* K. M. Wong, *B. nutans* Wall. ex Munro, *B. polymorpha*, *B. teres* Buch.-Ham. ex Munro, and *B. tulda* Roxb. It is easily distinguished from *B. polymorpha* as explained in the diagnosis above. Furthermore, it differs from *B. burmanica* and *B. teres* in its blunt (not apiculate) anther apices and glabrous (not hairy) rachilla internodes; from *B. farinacea* in its maroon anthers with blunt apices bearing a cluster of minute spines (not yellow anthers with emarginate glabrous apices) and glabrous (not hairy) palea keels; from *B. nutans* in its glabrous (not hairy) lemma margins, blunt (not apiculate) anther apices and glabrous (not hairy) rachilla internodes; and from *B.*



Fig. 3. – Jacques Gurgand holding dark-haired culm sheaths of the form of *Bambusa gurgandii* K. M. Wong & M. H. Diep known as “lồ ô đen”. [Photo: K. M. Wong]

*tulda* in its glabrous (not fine-hairy) lemma margins, glabrous (not fine-hairy) palea keels, blunt anther apices with a cluster of minute spines (not emarginate anther apices without spines), and glabrous (not short-hairy) rachilla internodes.

### Acknowledgements

We acknowledge the help of Jacques Gurgand in both establishing the Phu An bambusetum collections as well as the documentation of this new species. K. M. W. acknowledges the support of the National Parks Board, Singapore and the Singapore Botanic Gardens, and M. H. D. the support of the Museum of Natural History, Paris, Viet Nam National University of Ho Chi Minh City and the Vietnam Government in their work towards documenting the bamboo resources of Vietnam and Southeast Asia. Y. W. Low kindly assisted with formatting of the figures used. We thank Professor Xia Nianhe of the South China Botanical Garden and Dr. Le Viet Lam of the Department of Science and Technology for Economic and Technical Branches, Ministry of Science and Technology, Hanoi City, Vietnam, for their opinions on this novelty described here. Dr. K. C. Koshy of the Jawaharlal Nehru Tropical Botanical Garden and Research Institute, Thiruvananthapuram, Kerala, India, and Dr. Martin W. Callmender of the Missouri Botanical Garden, St. Louis, U.S.A., provided much constructive suggestion for improving the manuscript.

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