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Ruhooglandia and *Widjajachloa*, two new genera of Malesian bamboos (Poaceae: Bambusoideae) and their distinction from *Nastus* and *Chloothamnus*

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Summary. Two new genera of bamboos, *Ruhooglandia* S.Dransf. & K.M.Wong and *Widjajachloa* K.M.Wong & S.Dransf., are described for Malesia. They are distinguished from *Nastus* Juss. sensu stricto (based on *N. borbonicus* J.F.Gmel. from the Réunion) and *Chloothamnus* Buse, the correct genus for a related group of Malesian bamboos formerly confused with *Nastus*, in morphological as well as molecular characteristics.

Henrard (1936) has already identified *Chloothamnus* Buse as the correct name for the group of bamboos among which *C. chilianthus* Buse (1854) is the earliest named and therefore the type species. The name *C. chilianthus* however is a synonym of *C. elegantissimus* (Hassk.) Henrard (1936) because the latter is based on *Bambusa elegantissima* Hassk. (1844), an earlier published epithet.

The type specimen of *C. chilianthus* is a Junghuhn collection from NW Sumatra, as noted by Henrard (1936), although Dr Elizabeth Widjaja (Herbarium Bogoriense, BO) has expressed some doubt that this species of bamboo occurs in Sumatra because she has collected extensively in that general area and elsewhere in Sumatra and did not record the presence of this species (Widjaja, pers. comm. 2014).

In fact, it is not impossible that Junghuhn's material collected in Java before 1839 and after March 1842, and in Sumatra during 1840–1842 had been mixed up, because his job in Java

was not continued in 1839 and he had applied to go to another position in Sumatra, where he served during 1840–1842 (van Steenis-Kruseman 1950). His account (Junghuhn 1847) mentions interesting plants but in the case of bamboos, only as far as their use as fences and in other *ad hoc* ways. We are not able to definitely demonstrate this possible confusion in labelling, but even if it were true that the provenance (locality) of Junghuhn's specimen was wrongly recorded (due to mismatching notes with materials), and Widjaja's experience demonstrates so far that this Javan bamboo does not occur in Sumatra, we would still need to accept that the Junghuhn specimen is the type of *C. chilianthus*. In other words, whether or not this bamboo species occurs in Sumatra, and even if the Sumatra locality on the Junghuhn specimen is a mistake, that species is still valid. Consequently, the genus *Chloothamnus* is validly established with a type specimen.

This would mean that *Chloothamnus* is the correct name for the group of bamboos in Indonesia that includes *C. elegantissimus*, which until more recently (Dransfield & Widjaja 1995, BPG 2012) has been maintained in *Nastus* s.l. because of conventional placement and lack of clarifying investigation; but which (below) can be shown to be distinct from *Nastus* s.s. All of these bamboo taxa have true spikelets as the basic unit of the inflorescence. It should also be noted that *Oreiostachys* Gamble (1908) is a synonym of *Chloothamnus*, as the original description of *Oreiostachys* was based on *Junghuhn 143* (a leafy specimen that is also the type of *Bambusa elegantissima* = *Chloothamnus elegantissimus*) as well as *Pulle 3173* (inflorescences).

OTHER MALESIAN GENERA CONFUSED WITH *NASTUS*

The *Nastus* species from the Madagascar–Indian Ocean region are also in need of closer morphological studies, and it is as yet uncertain if they fall neatly into a single generic entity. For example, *Nastus borbonicus*, the type from Réunion, has an erect habit, whereas the Madagascan *N. elongatus* A.Camus is a clambering bamboo. Difference in habit seems also to be correlated to other morphological differences, such as the branch bud and branch complement dipping below the culm nodal level in *N. elongatus* but not *N. borbonicus*.

Recent molecular analyses (Clark et al. 2007, Chokthaweepanich 2014) also indicate that typical *Nastus* (typified by *N. borbonicus* J.F.Gmel. from the Réunion) and another Madagascar species *N. elongatus* A.Camus belong to the same Hickeliinae clade, which is widely separated from another clade comprising the Malesian *N. elegantissimus* (= *Chloothamnus*) and *N. productus*. There seems to be at least two ways to easily distinguish the Malesian taxa concerned from the *Nastus* alliance in Réunion-Madagascar. One is that the midrib on the leaf upper surface is prominent in the *Nastus* alliance in Réunion-Madagascar but flat in the Malesian taxa (BPG 2012). Additionally, our recent studies have indicated that the flowering panicle in Réunion-Madagascar *Nastus* has branches either appressed to the

rachis (main axis) of the synflorescence, or ascending at a steep angle from it, whereas in the Malesian genera, the panicle branches diverge widely from the rachis.

The distinctive features of *Nastus hooglandii* that separate it from other Malesian '*Nastus*' have been elucidated by Holttum (1967) in his New Guinea paper, but in addition, the presence of subtending bracts or sheaths in the inflorescence branching is a major difference from *Chloothamnus* or *Nastus productus*. Also, the hairy glumes are quite extraordinary. These could be adequately seen even in the images of the holotype in K or isotype in A available through JSTOR Global Plants [https://plants.jstor.org].

On the other hand, *Nastus productus* is quite different from the other so-called '*Nastus*' and also merits a new genus. It has a bud and branch complement that 'dips' below the nodal line, the main (primary) axis of the branch complement is at first dormant (as in *Dinochloa*), and its higher-order axes typically develop first and do not rebranch (all of which are distinct from the rest of the so-called *'Nastus*' constituting *Chloothamnus* in Malesia).

As such, the so-called *Nastus hooglandii* Holttum and *N. productus* (Pilg.) Holttum, which can be distinguished from *Chloothamnus* by rather distinctive sets of character-states, are here recognized as new genera because there are no available names for them.

KEY DISTINGUISHING *CHLOOTHAMNUS* AND TWO NEW GENERA FROM *NASTUS*

1A. Midrib of leaf adaxial surface prominent. Branches of flowering panicle appressed to the rachis (main axis) of the synflorescence or ascending at an acute angle from it .... ***Nastus*** Juss. sensu stricto (type: *N. borbonicus*) [Réunion]

1B. Midrib of leaf adaxial surface flat or sunken. Branches of flowering panicle widely diverging (to more than 45 degrees to even perpendicularly) from the rachis (main axis) of the synflorescence [Malesia],

2A. Inflorescence bracteate at points of branching (segmented with the presence of subtending sheaths or bracts); glumes conspicuously brown-hairy .... ***Ruhooglandia*** S.Dransfield & K.M.Wong (based on *'Nastus' hooglandii*)

2B. Inflorescence ebracteate (without subtending sheaths or bracts at points of branching); glumes glabrous or at most sparsely pale-hairy,

2A. Branch bud and branch complement above the culm nodal level. Rachilla extension absent or weakly developed and not consistently present and inconspicuous, never as long as the perfect flower below it. Palea of perfect flower not grooved down the back ..... ***Chloothamnus*** Buse

2B. Branch bud and branch complement dipping below the culm nodal level. Rachilla extension bearing an imperfect terminal floret present, conspicuous, and as long as the perfect flower below it. Palea of perfect flower grooved down the back ..... ***Widjajachloa*** K.M.Wong & S.Dransfield (based on '*Nastus' productus*)

THE NEW GENERA

Ruhooglandia S.Dransfield & K.M.Wong, **gen. nov.**
This new Malesian genus is distinctive by its flowering panicle with branches widely diverging from the main synflorescence axis; bracteate inflorescences (with the presence of subtending sheaths or bracts at points of branching); determinate inflorescence units; and conspicuously hairy glumes.

(Fig. 1)

TYPE SPECIES: *Ruhooglandia hooglandii* S.Dransfield & K.M.Wong, **comb. nov.**
Basionym: *Nastus hooglandii* Holttum, Kew Bull. 21(2) (1967) 287.
TYPE: *Hoogland 9322*, Papua New Guinea, Huon Peninsula, Morobe District, summit area of Mt. Rawlinson, 3200 m, 30 Jun 1964 (holo K, iso A, BRI, CANB, L, LAE, US).

NOTES. The subtending inflorescence sheaths or bracts are 1–2-keeled structures often found at the base of the spikelets (prophyll-like and with their back appressed to the axis). These subtending bracts are usually glabrous or minutely hairy along their edge. In the type species, the uppermost ones are c. 3 mm long, ovate with a long tip; the middle ones are c. 6 mm long, ovate-lanceolate with pointed tip; and the lower ones are 10–20 mm long with modified blades 10–20 mm long, with linear tapering to long tips. They are all glabrous.

Holttum (1956) gives a good description and a detailed diagnostic figure, to which can be added the features highlighted in the diagnosis above. We name this genus after Dr Ruud ('Ru') D. Hoogland, Dutch botanist who collected the type specimen of this genus.

DISTRIBUTION: Known only in the Huon Peninsula and the Eastern Highlands of Papua New Guinea.

Widjajachloa K.M.Wong & S. Dransfield, **gen. nov.**

This new Malesian genus is distinguished by its solitary branch bud which dips below the culm nodal level; an initially dormant primary branch axis that later reiterates its parent axis in size and development and occurring together with usually many short and slender higher-order branches that do not typically rebranch away from their base; a flowering panicle with ebracteate branches widely diverging from the main synflorescence axis; determinate inflorescence units; and glabrous glumes.

(Fig. 2–3)

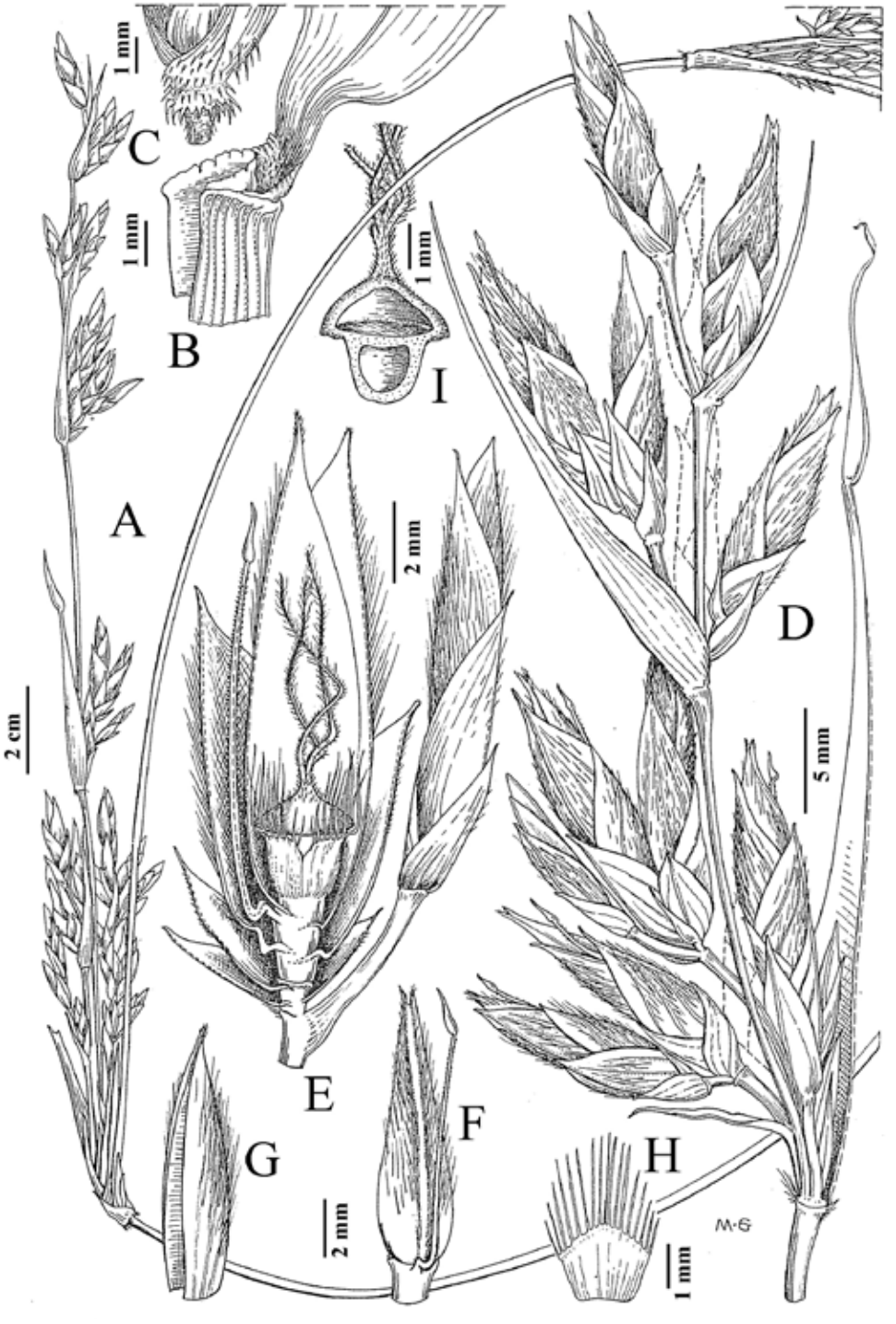

Fig. 1. *Ruhooglandia hooglandii*. **A**, inflorescence habit; **B**, top of leaf-sheath with ligule and base of blade; **C**, pulvinus and base of sheaths showing stiff reflexed hairs; **D**, part of panicle with half sheath removed to show base; **E**, spikelet in sectional view with no stamens present; **F**, palea, with extension of rachilla and rudimentary floret; **G**, lemma; **H**, lodicule; **I**, ovary, longitiudinal section. All drawn from *Hoogland 9322*. Reproduced from *Kew Bulletin* 21(2), with permission.

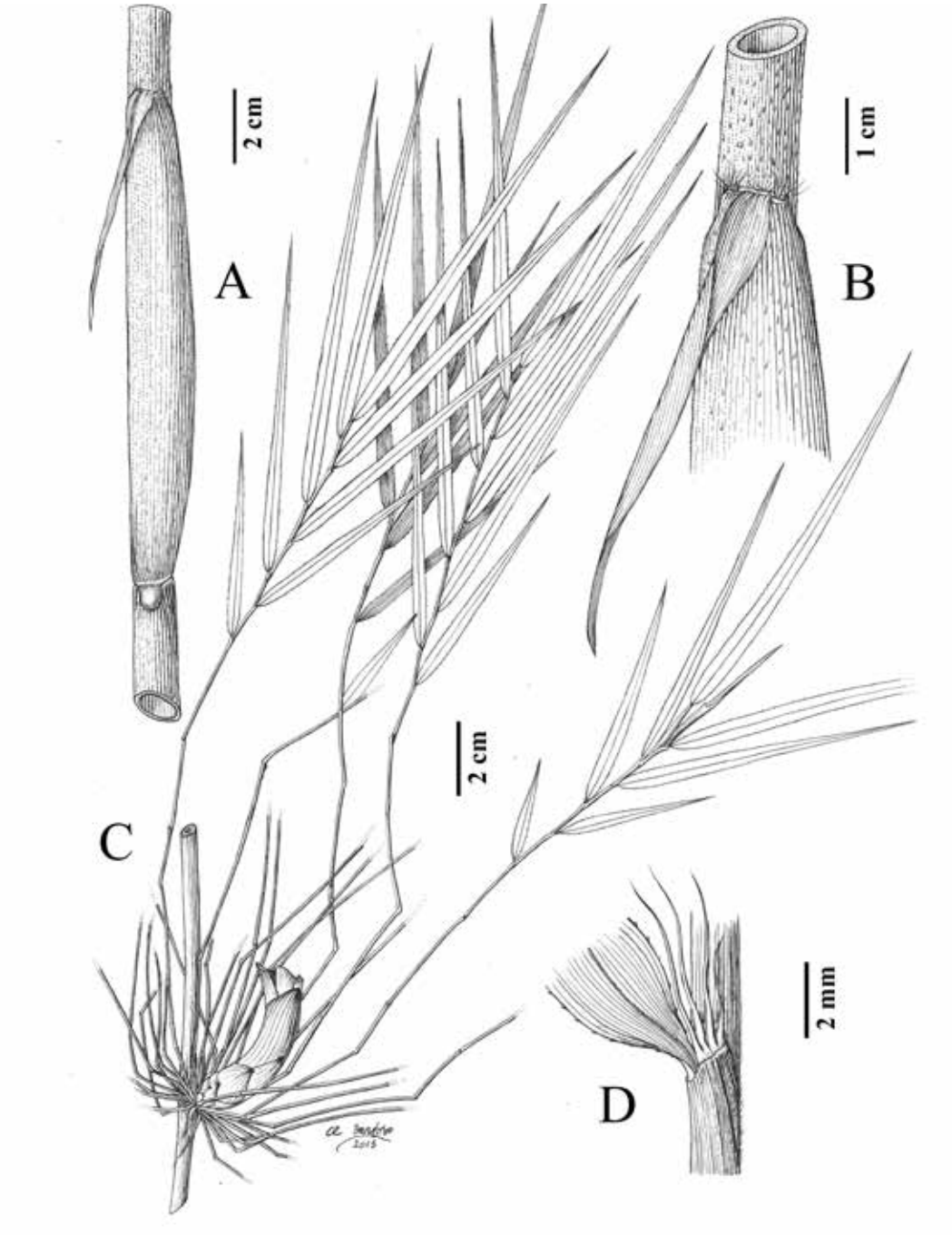

Fig. 2. *Widjajachloa producta*, vegetative parts. **A.** Portion of culm with intact sheath; note the nodal line and position of the primary branch bud 'dipping' below the general level of the node. **B.** Detail of culm sheath apex. **C.** Structure of branch complement, showing the dominant primary axis with a dense cluster of very slender higher-order leafy branches from its base. **D.** Detail of base of leaf blade and top of leaf sheath, showing long-bristly auricle on one side. All from *Widjaja EAW 6627* (BO). (Drawn by Wahyudi Santoso)

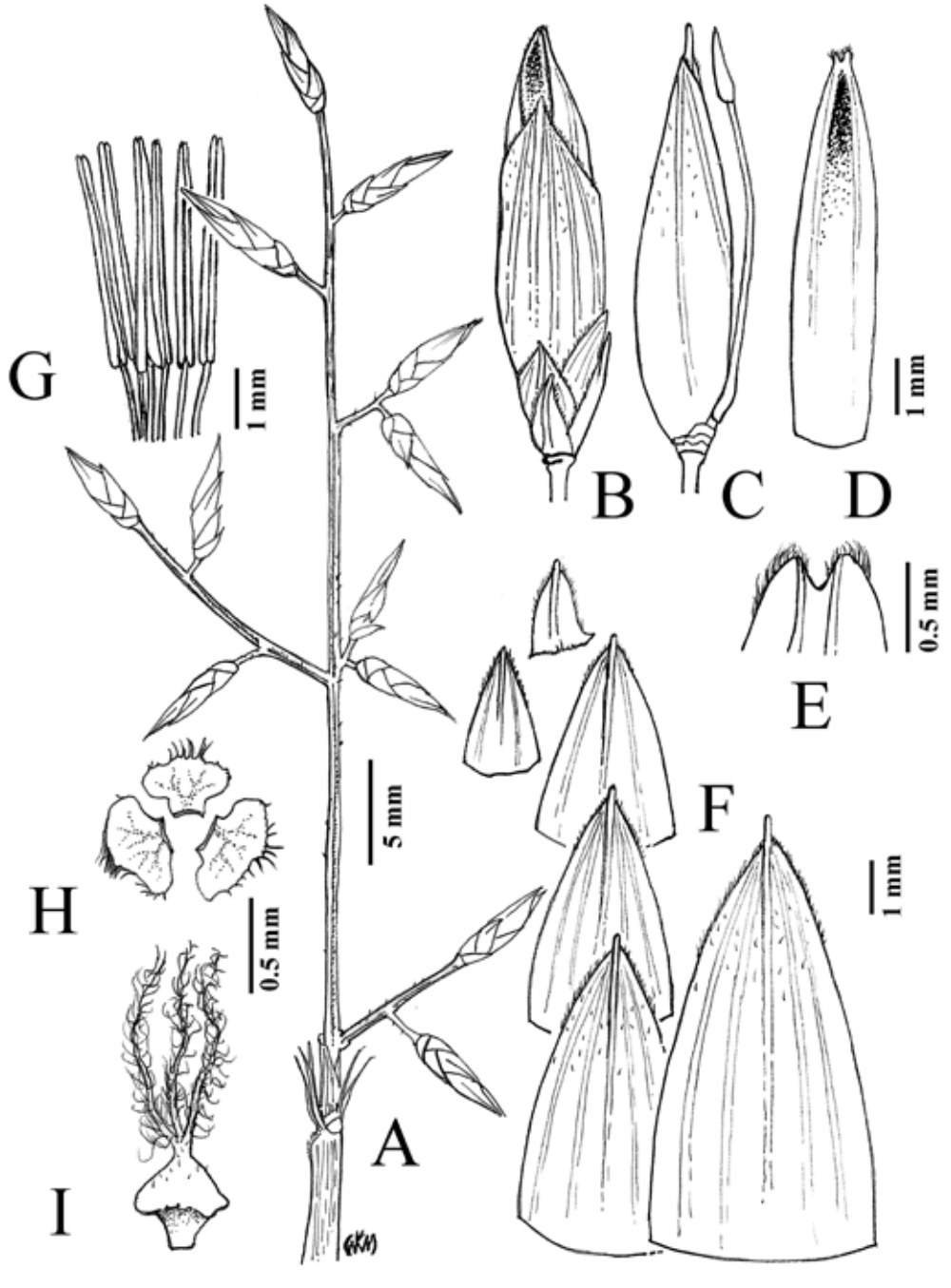

Fig. 3. *Widjajachloa producta*, inflorescence and floral parts. **A.** Structure of flowering branch. **B.** Spikelet. **C.** Spikelet with all glumes removed leaving the sole perfect floret and a long rachilla extension carrying a terminal vestigial flower (empty lemma). **D.** Palea, dorsal view, showing shallow groove down the back. **E.** Detail of cleft palea apex. **F.** Five glumes of increasing size from the base of the spikelet upwards and the lemma. **G.** Staminal complement. **H.** Lodicule complement. **I.** Gynoecium. All from *Womersley NGF 11340* (BO), except G, after van Royen (1979) based on *van Royen NGF 10904* (L). (Drawn by K.M. Wong)

TYPE SPECIES: *Widjajachloa producta* (Pilg.) K.M.Wong & S.Dransfield, **comb. nov.**
Basionym: *Oreiostachys producta* Pilg. in Engl. Bot. Jahrb. 62 (1929) 460.
Synonym: *Nastus productus* (Pilg.) Holttum, Kew Bull. 10(4) (1956) 594, 21(2) (1967) 289–291.
TYPE: *Keysser s.n.*, Papua New Guinea, Bolan Mountains, 2400–3000 m, 1913 (holo B, destroyed; iso BM).

NOTES. A good description is provided by Holttum (1956), to which the diagnostic features above may be added. This new genus is named after our colleague Dr Elizabeth Anita Widjaja, bamboo specialist at the Herbarium Bogoriense.

DISTRIBUTION: A rather common bamboo in mountains across New Guinea, at elevations around 1000–3000 m.

ACKNOWLEDGEMENTS

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