D. Ohrnberger* and J. Goerrings**: The Bamboos of the World - A Preliminary Study of the Names and Distribution of the Herbaceous and Woody Bamboos (Bambusoideae Nees v. Esenb.) - Documented in Lists and Maps

Revised manuscript received July 19, 1985.

GENUS
CHUSQUEA

Chapter 1: Nomenclature (by D. Ohrnberger)

*Chusquea* has more species than any other genus of American bamboos. The species have solid culms and more than one bud at a node. The genus includes morphologically heterogeneous species and a revision is deemed necessary. At present, the genus contains about 90 generally recognized species and several not yet described. A total of 92 species are listed in the present work, of which about 8 are questionable and 2 are fossil species. The list also contains 6 varieties and 1 form. The references cited here are abbreviated; full references will be found in a bibliography to appear in a later number of this journal. The publication year of a given reference is followed by its page numbers. An asterisk, *, indicates that the work contains one or more figures of the taxon concerned, these being helpful for identification in many ways.

The Genus


type: *Chusquea scandens* Kunth - cf. Calderón and Soderstrom, 1980:19


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Chusquea subgenus Rettbergia (Raddi) Nees v. Esenb., 1834:467,489

The Species


Urban, 1920:52

Species not well known.

Chusquea acuminata Doell in Martius, 1880:204 - Dutra, 1938:146 - McClure, 1973:74

Chusquea tenuis Glaziou ex E.G. Camus, 1913:90,* - McClure, 1973:74, as a synonym

Chusquea affinis Munro ex E.G. Camus, 1913:80,* - McClure, 1973:74


According to Munro, 1868:58, C. andina is probably an alpine form of C. culeou.


Dendragrosis anelythra Nees v. Esenb. ex Munro, 1868:63, as a synonym


Quila (Argentina)


Rettbergia bambusoides Raddi, 1823:18,* as R. "bambusaeoides" - Nees v. Esenb., 1829:536

Nastus bruneus A.N. Desvaux, 1831:107,[err.211]


Chusquea quila cv. Bambusaeoides (Hackel ex Brennecke, 1980:5, without description)


Chusquea breviglumis Philippi, 1858:103 - Munro, 1868:58, as a synonym under C. culeou - cf. Parodi, 1945:66,70


Rettbergia capitata Nees v. Esenb. ex Munro, 1868:69, as a synonym


**Chusquea circinata** Soderstrom and Calderón, 1978:156,* - McVaugh, 1983:120-121,*


*Chusquea machrisii* hort. ex Soderstrom and Calderón, 1978:160, as a synonym


Culeú, Colihue, Coligüe (Argentina)

**Chusquea culeou** f. *longiramea* Parodi, 1941:343 - Parodi, 1945:64 - McClure, 1973:75 - Nicora in Correa, 1978:19, as a synonym under *C. culeou*

**Chusquea culeou** var. *tenuis* D. McClintock, 1983:486

*Chusquea breviglumis* hort.

culms: thinner and shorter.


*Arundo canila* Molina ex Steudel, 1854:336, as a synonym

*Chusquea parvifolia* Philippi, 1864:299 - Philippi,1873:578 - Munro, 1868:56, as a synonym under *C. cumingii*

*Arundo quillinga* Molina ex Munro, 1868:56, as a synonym under *C. cumingii*

**Chusquea decolorata** Munro ex Parodi, 1945:65-66 - McClure, 1973:75
**Chusquea capituliflora** var. **pubescens** McClure and Smith in Reitz, 1967:28,* - McClure, 1973:74


**Chusquea circinata** Soderstrom and Calderón, 1978:156,* - McVaugh, 1983:120-121,*


*Chusquea machrisii* hort. ex Soderstrom and Calderón, 1978:160, as a synonym


Culeú, Colihue, Coligüe (Argentina)

**Chusquea culeou** f. **longiramea** Parodi, 1941:343 - Parodi, 1945:64 - McClure, 1973:75 - Nicora in Correa, 1978:19, as a synonym under **C. culeou**

**Chusquea culeou** var. **tenuis** D. McClintock, 1983:486

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*Arundo canila* Molina ex Steudel, 1854:336, as a synonym

*Chusquea parvifolia* Philippi, 1864:299 - Philippi,1873:578 - Munro, 1868:56, as a synonym under **C. cumingii**

*Arundo quillina* Molina ex Munro, 1868:56, as a synonym under **C. cumingii**

**Chusquea decolorata** Munro ex Parodi, 1945:65-66 - McClure, 1973:75
*Chusquea deficiens* Parodi, 1941:335-338,* - McClure, 1973:75


*Chusquea ligulata* Munro, 1868, partly; cf. Johow, 1896:141


**Chusquea juergensii** Hackel, 1909:325-326, as C. "Jürgensii" - E.G. Camus, 1913:82, as C. "jürgensii" - McClure, 1973:75


**Chusquea pilgeri** E.G. Camus, 1913:83, based on C. lehmannii Pilger


Arthrostylidium leptophyllum (Nees v. Esenb.) Doell in Martius, 1880:175 - Hackel in Wettstein, 1908:81

Arundinaria leptophylla (Nees v. Esenb.) Hackel, 1903:69 - Hackel, 1903:518


**Chusquea ligulata** Munro, 1868:62 - E.G. Camus, 1913:93 - McClure, 1973:75

**Chusquea linearis** N.E. Brown, 1901:76 - Hitchcock, 1922:452 - McClure, 1973:75


Chusquea lorentziana  Grisebach, 1874:249-250 - Parodi, 1941:338,* - McClure, 1973:75


Tihuen (Argentina)


*Chusquea bambusoides* subsp. *oxylepis* Hackel in Wettstein, 1908:81-82


Fossil species of the Tertiary from Argentina.


*Chusquea perligulata* (Pilger) McClure, 1973:75
*Guadua perligulata* Pilger in Diels, 1937:57-58,*


*Chusquea ramosissima* Pilger, 1905:149-150; not Lindman, 1900

*Chusquea sandiensis* Pilger, 1920:29, based on *C. ramosissima* Pilger


*Ludolfia pinifolia* (Nees v. Esenb.) Dietrich, 1833:25

*Dendragrostis pinifolia* Nees v. Esenb. ex Munro, 1868:55, as a synonym


*Chusquea heterophylla* var. *elongata* Doell in Martius, 1880:207 - McClure,
1973:75, as a synonym under *C. pinifolia*


*Chusquea pinifolia* var. *heterophylla* (Nees v. Esenb.) Hackel in Wettstein, 1906:21, and 1908:82

*Chusquea heterophylla* var. *microphylla* Doell in Martius, 1880:207 - McClure, 1973:75, as a synonym under *C. pinifolia*

*Chusquea heterophylla* var. *squamosa* Doell in Martius, 1880:207 - McClure, 1973:75, as a synonym under *C. pinifolia*


*Chusquea maurofernandeziana* Hackel ex E.G. Camus, 1913:86,* - Hackel ex Pittier, 1892:61, without description - McClure, 1973:76, as a synonym under *C. pittieri*


*Chusquea pubescens* Steudel, 1854:337 - Munro, 1868:66, as a synonym under *C. quila* - E.G. Camus, 1913:96, as a synonym under *C. quila* - Parodi, 1945:69, as a synonym under *C. quila* - McClure, 1973:76


*Chusquea purdieana* Munro, 1868:56 - E.G. Camus, 1913:84,* - McClure, 1973:76


*Arundo quila* Molina, 1782:279 - Poiret, 1804:274 - Roemer and Schultes, 1817:512
Nastus quila (Molina) Schultes in Roemer and Schultes, 1830:1361

Chusquea intermedia Steudel in Lechler, 1857:52, without description - Munro, 1868:66, as a synonym

Chusquea quila var. laxiflora E. Desvaux in Gay, 1854:447 - Parodi, 1945:69, as a synonym under C. quila

Chusquea quila var. longipila E.G. Camus, 1913:198, invalid name - McClure, 1973:76, as a synonym under C. quila

Nastus prolifér N.A. Desvaux, 1831:211 - McClure, 1973:76, as a synonym under C. quila

Chusquea quila cv. Longiramea (Parodi ex Brennecke, 1980:5, without description)

Quila (Argentina)


Chusquea phacellophora Pilger, 1923:456 - McClure, 1973:76 as a synonym

Tacuarembó (Argentina)

"Chusquea roltoti" Berry, 1929:2-3 - McClure, 1973:76

Fossil species of the late Tertiary from Colombia.


Mustelia arundinacea Cavannaíles ex Trinius ex Steudel, 1840:361, as a synonym - Steudel, 1841:168, as a synonym - Munro, 1868:64, as a synonym - cf. McClure, 1957:205

Nastus chusque Humboldt, Bonpland and Kunth, 1816:201 - Sprengel, 1825:113 -
Bambusa chusque (Humboldt, Bonpland and Kunth) Poiret, 1817:494, as "Bambos chusque"?

Nastus chusquea (Humboldt, Bonpland and Kunth) Raspail, 1825:442

Chusquea jamesonii Steudel, 1854:337, as C. "Jamesoni" - Munro, 1868:64, as a synonym - McClure, 1973:76, as a synonym, and 75

Chusquea quitensis var. patentissima Hackel, 1908:161 - E.G. Camus, 1913:95 - Henrard in Herzog, 1921:77 - Hitchcock, 1927:312, as a synonym under C. scandens

Chusquea meyeriana var. patentissima (Hackel) E.G. Camus, 1913:94


Chusquea simplicifolia Munro ex Hemsley in Godman and Salvin, 1885:587, error for C. simpliciflora


Dendragrostis tenella Nees v. Esenb. ex Doell in Martius, 1880:201, as a synonym

Chusquea tenella var. latifolia Dutra, 1938:146 - McClure, 1973:76


Chusquea ciliata Philippi, 1864:299 - Munro, 1868:66, as a synonym - Parodi, 1945:68, as a synonym under C. uliginosa - McClure, 1973:76, as a synonym

Chusquea quila (not Kunth, 1830) in the sense of E. Desvaux in Gay, 1854:447; cf. Munro, 1868:66


1980:37

* Chusquea tuberculosa * Swallen, 1931:14 - McClure, 1973:76

* Chusquea hispida * McClure, 1942:179,* - McClure, 1973:76, as a synonym


* Chusquea uruguayensis * Arechavaleta, 1897:546-547 - Parodi, 1941:333,* - McClure, 1973:76,69

* Chusquea valdiviensis * E. Desvaux in Gay, 1854:446 - Philipp, 1864:299 - Munro, 1868:66, as a synonym under *C. quila* - Parodi, 1945:69, as a synonym under *C. quila* - McClure, 1973:76 - Nicora in Correa, 1978:21, as a synonym under *C. quila*


Invalid Species Names


* Chusquea longipila * E.G. Camus, 1913:pl.61,fig.A*, invalid name

* Chusquea macahensis * Glaziou ex E.G. Camus, 1913:97, invalid name under *C. urelytra* Hackel
Chapter 2: Distribution (by J. Goerrings and D. Ohrnberger)

Following the Central and South American mountain range (Andes), the genus *Chusquea* is distributed from Mexico to Chile and Argentina. *Chusquea* occurs moreover in the eastern South America and on Caribbean islands.

The habitat of most species of *Chusquea* is the understory of forests in the cool and temperate climate at high altitudes. A few species are found in forests on slopes at low elevations. *Chusquea* is the genus with the southernmost latitudinal extension among the bamboos. Some species reach to about 47° South.

The genus has an altitude range from slightly above sea level to the lower limit of perpetual snow. In the midtropics *Chusquea* is usually found between 1500 and 3000 m altitude.

A few species have been introduced into the USA, Mexico, Cuba and Europe as ornamental plants.

![Map of South America and Caribbean Islands](image)

Figure 1. *Chusquea*
Central America and Caribbean Islands:
- Mexico, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama.
- Greater Antilles:
  - Cuba, Jamaica, Haiti, Dominican Republic, Puerto Rico (USA).
South America:
- Guyana, Venezuela, Colombia, Ecuador, Peru, Bolivia, Chile, Archipiélago Juan Fernández (Chile), Argentina, Brazil, Paraguay, Uruguay.
Figure 2.
*Chusquea abietifolia*
Greater Antilles: Cuba, Jamaica, Haiti, Dominican Republic, Puerto Rico (USA). Wet woods, mostly above 1000 m altitude.

Figure 3.
*Chusquea acuminata*

Figure 4.
*Chusquea affinis*
Brazil: Minas Gerais.
Figure 5.
*Chusquea andina*
Chile: Biobío. Chillán, almost up to elevations of perpetual snow.

Figure 6.
*Chusquea anelythra*

Figure 7.
*Chusquea anelytroides*
Brazil: São Paulo, Rio de Janeiro.
Figure 8. *Chusquea argentina*
Argentina: Río Negro.
Chile: Valdivia.

Figure 9. *Chusquea bambusoides* var. *bambusoides*
Brazil: from Espírito Santo across Rio de Janeiro to Santa Catarina.

Figure 10. *Chusquea bambusoides* var. *minor*
Brazil: Santa Catarina: Itajaí.
Figure 11.
*Chusquea bilimekii*
Mexico: State of Mexico.

Figure 12.
*Chusquea breviglumis*
Chile: Biobío: Cordillera de Chillán.

Figure 13.
*Chusquea capitata*
Brazil: from Minas Gerais and Espírito Santo to Santa Catarina.
Figure 14. *Chusquea capituliflora* var. *capituliflora*
Brazil: Minas Gerais, Rio de Janeiro, São Paulo, Santa Catarina.

Figure 15. *Chusquea capituliflora* var. *pubescens*
Brazil: Santa Catarina: Brusque, Corupá.

Figure 16. *Chusquea carinata*
Mexico: Veracruz: Orizaba, in thickets.
Figure 17.  
*Chusquea ciricinata*  
Mexico: Michoacán: near Uruapan.  
Jalisco: near Aultán.  
On mountain slopes between 1000 and 1600 m altitude.

Figure 18.  
*Chusquea coronalis*  
From Mexico (Sinaloa, Colima, Chiapas), Guatemala, El Salvador to Costa Rica.  
Inhabits forested river valleys and slopes of ravines (barrancas), between 65 and 1800 m altitude.  
Cultivated in Cuba and the USA.

Figure 19.  
*Chusquea culeou* f. *culeou*  
Chile: Valdivia.  
Argentina: Neuquén, Río Negro, Chubut.  
In humid deciduous forest. *C. culeou* is the southernmost species among the bamboos, extending to about 47° south latitude at Lago Buenos Aires between Chile and Argentina.
Figure 20.
*Chusquea culeou*
  f. *longiramea*
Argentina: Río Negro.
Chile: Araucanía.

Figure 21.
*Chusquea cumingii*
Chile: Valparaíso, Concepción, Cordillera de Ranco, Aconcagua, Cauquenes.

Figure 22.
*Chusquea decolorata*
Chile.
Figure 23.
*Chusquea deficiens*
Argentina: Salta: Cerros de Maíz Gordo, at about 1800 m altitude.

Figure 24.
*Chusquea delicatula*
Bolivia: Yungas.

Figure 25.
*Chusquea discolor*
Brazil: from Rio de Janeiro to Santa Catarina.
Figure 26.
*Chusquea dombeyana*
Peru: mountain thickets.
Colombia: Bogotá, Tolima, at 2800 m altitude.
Ecuador: at 1200 - 1800 m altitude.

Figure 27.
*Chusquea fasciculata*
Brazil: Minas Gerais.

Figure 28.
*Chusquea fendleri*
Colombia and Venezuela, altitude range ca. 1800-2800 m.
Figure 29. **Chusquea fernandeziana**
Chile: endemic to Más a Tierra, island of the Juan Fernández archipelago.

Figure 30. **Chusquea galeottiana**
Mexico: Guerrero, Oaxaca, Chiapas, up to 2700 m altitude.

Figure 31. **Chusquea gracilis**
Brazil: Santa Catarina: Cacador.
Figure 32.
*Chusquea huantiensis*
Peru: Dept. Ayacucho: Huanta, San Miguel, at about 3000 m altitude.

Figure 33.
*Chusquea ibiramae*
Brazil: Santa Catarina: Brusque and Ibirama.

Figure 34.
*Chusquea inamoena*
Peru: Tunín: Tarma, at 2700 m altitude.
Figure 35.
*Chusquea juergensii*
Brazil: Rio Grande do Sul, in the plains at 400 - 600 m altitude.

Figure 36.
*Chusquea lanceolata*
Guatemala: Chimaltenango, El Progreso, Sololá, Quetzaltenango, between 2000 and 3300 m altitude.

Figure 37.
*Chusquea lehmannii*
Colombia: in dense forests at 2500 - 3000 m altitude.
Figure 38. *Chusquea leptophylla*
Brazil: Rio de Janeiro, Minas Gerais, at 1400 - 2000 m altitude.
Santa Catarina, at about 1000 m altitude.

Figure 39. *Chusquea liebmannii*
On steep slopes between 375 and 1400 m altitude in the tropical deciduous forest and in thickets.

Figure 40. *Chusquea ligulata*
Colombia: Bogotá.
Figure 41.
*Chusquea linearis*
Guyana: only known from the summit of Mount Roraima.

Figure 42.
*Chusquea longifolia*
From southern Mexico (Chiapas) to Panama (Chiriqui), between 1700 and 4100 m altitude. Common in Costa Rica above 2000 m altitude.

Figure 43.
*Chusquea longipendula*
Bolivia: Nor-Yungas, on moist shady banks. Cochabamba, in forests at 2000 m altitude.
Figure 44. *Chusquea lorentziana*
Argentina: Salta, Tucumán, Catamarca.
Between 1000 and 1500 m altitude.

Figure 45. *Chusquea macrostachya*
Chile: Valdivia, Los Lagos, and Chiloé Island.

Figure 46. *Chusquea mexicana*
Mexico.
Figure 47.  
*Chusquea meyeriana*  
Brazil: from Minas Gerais and Rio de Janeiro to Rio Grande do Sul.

Figure 48.  
*Chusquea mimosa*  
Brazil: Santa Catarina: Bom Retiro, Campo Alegre and Sao Joaquim.

Figure 49.  
*Chusquea montana*  
Chile: Valdivia.  
Argentina: Neuquén, Río Negro.
Figure 50. *Chusquea mulleri*
Mexico: Veracruz; Orizaba, in thickets.

Figure 51. *Chusquea nelsonii*
Mexico: Guerrero; between Tixtla and Chilapa de Alvarez at 1500 - 2100 m altitude.
Chiapas: in thickets.

Figure 52. *Chusquea nigricans*
Chile: Valdivia, 800 m altitude.
Figure 53.
*Chusquea oligophylla*
Brazil: São Paulo, Rio de Janeiro.

Figure 54.
*Chusquea oxylepis*
Brazil: São Paulo, Paraná, Santa Catarina.

Figure 55.
*Chusquea palenae*
Chile: Valley of Río Palena.
Figure 56.  
**Chusquea pallida**  
Colombia: Santa Marta.  
Venezuela: near Caracas at 450 m altitude.

Figure 57.  
**Chusquea parviflora**  
Chile: Concepción: Lota, Tomé.

Figure 58.  
**Chusquea perligulata**  
Ecuador: Chimborazo, at moist sites in mountain forest, about 3200 m altitude.
Figure 59.
*Chusquea peruviana*
From Colombia to Bolivia, in mountain thickets at 2800 - 3000 m altitude.
Brazil: Santa Catarina.

Figure 60.
*Chusquea picta*
Peru: in forests of the Andes.

Figure 61.
*Chusquea pinifolia*
Brazil: São Paulo, Minas Gerais, Rio de Janeiro, between 1300 and 2750 m altitude.
Figure 62.  
*Chusquea pittieri*  
From southern Mexico (Chiapas) throughout Central America to Panama, in forest between 1400 and 2700 m altitude, preferring slopes. Large populations on the slopes of some volcanos in Costa Rica.

Figure 63.  
*Chusquea polyclados*  
Peru: Cajamarca; Hualgayoc, 3100 - 3300 m altitude.

Figure 64.  
*Chusquea pubescens*  
Chile.
Figure 65.
*Chusquea pubispicula*
Peru: Puno: Sandía, frequently between 2600 and 2800 m altitude.

Figure 66.
*Chusquea purdieana*
Colombia: Vélez: Monte del Moro in humid areas.

Figure 67.
*Chusquea quila*
Chile: Andes: Valparaíso, Valdivia, Cautín, Llanquihue, and Isla Chiloé.
Argentina: Neuquén.
Figure 68.
*Chusquea ramosissima*
Tropical and subtropical South America from eastern Paraguay, eastern Argentina (Missiones, Corrientes) and southern Brazil (São Paulo, Santa Catarina, Rio Grande do Sul), to northern Uruguay. At about 500 m altitude. Peru: Sandia.

Figure 69.
*Chusquea scabra*
Only known from Costa Rica: Cartago; on moist mountain slopes at 1200 - 1630 m altitude.

Figure 70.
*Chusquea scandens*
In forests from Colombia to Bolivia, up to 3300 m altitude.
Figure 71.  
*Chusquea sclerophylla*  
Brazil: Rio de Janeiro.

Figure 72.  
*Chusquea sellowii*  
Brazil: São Paulo, Santa Catarina.

Figure 73.  
*Chusquea serrulata*  
Colombia, Ecuador, Peru to Bolivia, in forest between 1300 and 3000 m altitude.
Figure 74.
*Chusquea simpliciflora*
From Mexico to Venezuela and Ecuador, in dense wet forest at low altitudes between about 50 and 800 m.

Figure 75.
*Chusquea sneideri*
Colombia: Province Popayán, at 2700 m.

Figure 76.
*Chusquea spadicea*
Colombia: Antioquia.
Figure 77.  
*Chusquea spencei*
Venezuela: Corillera del Litoral near Caracas: Pico Naiguatá.  
Colombia: along the Cordillera Oriental.

Figure 78.  
*Chusquea straminea*
Peru: Amazonas: Chachapoyas, 2400 - 2600 m altitude.

Figure 79.  
*Chusquea sulcata*
Mexico: Chiapas: Mount Orando.
Figure 80.

*Chusquea swallenii*

Brazil: Santa Catarina: Caçador.

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Figure 81.

*Chusquea tarmensis*

Peru: Junín: Tarma, 2100 - 2600 m altitude.

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Figure 82.

*Chusquea tenella*  
var. *tenella*

Brazil: from Minas Gerais to Rio Grande do Sul.
Figure 83. *Chusquea tenella* var. *latifolia*
Brazil: Rio Grande do Sul; São Leopoldo.

Figure 84. *Chusquea tenuiflora*
Chile: Santiago, Biobío (Lota), Valdivia, Isla de Chiloé.

Figure 85. *Chusquea tenuiglumis* var. *tenuiglumis*
Brazil: Minas Gerais.
Figure 86. 
*Chusquea tenuiqlumis* 
var. *laxiuscula*  
Brazil: Lagoa Santa.

Figure 87. 
*Chusquea tenuiqlumis*  
var. *subcylindrica*  
Brazil: Caldas.

Figure 88. 
*Chusquea tonduzii*  
Costa Rica: endemic. Common in the Cordillera de Tala- manca between 2400 and 3140 m altitude, below the páramo.
Figure 89.
*Chusquea tuberculosa*
Venezuela: Distrito Federal:
Upper Catuache wood near Caracas.
Colombia: Dept. Santander: at 2500 m altitude.

Figure 90.
*Chusquea uliginosa*
Chile: Valparaiso, Puerto Montt, Valdivia, in humid areas.

Figure 91.
*Chusquea uniflora*
In the Andes from Colombia to Bolivia.
Figure 92. *Chusquea urelytra*

Figure 93. *Chusquea uruguayensis*

Figure 94. *Chusquea valdiviensis*
Chile: Valdivia.
Figure 95.
*Chusquea virgata*
Costa Rica: apparently endemic; widely distributed in central parts at about 1300 m altitude, but rare.

Figure 96.
*Chusquea wettsteinii*
Brazil: São Paulo (?): Itapecirica, in forest at about 1000 m. Paraná: Serra do Mar.

Figure 97.
*Chusquea wilkesii*
Brazil: Province Rio de Janeiro: Serra dos Órgãos.
Stephen M. Young*: The Flowering of Bambusa paniculata (Poaceae: Bambusoideae) in Southern Mexico

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Bambusa paniculata (Munro) Hackel is a widely-distributed yet uncommon bamboo of Bambusa subgenus Guadua. It was first described by Munro (1868) from Brazilian specimens collected in the states of Goiás and Pernambuco.

This interesting bamboo is not large, rarely measuring over ten meters tall and seven centimeters in diameter. It exhibits a number of distinctive characteristics which distinguish it from other bamboos of subgenus Guadua. Weakly erect and often scrambling culms turn noticeably yellow with age, and cascades of narrow, pendant branch leaves are readily visible among surrounding vegetation (Fig. 1). Culm leaves are rather stiff; and the blades, one half to one third as long as the entire culm leaf, are deciduous from the sheaths (Fig. 2). Culm leaves on new shoots are a beautiful yellow-green color covered by purple horizontal stripes (Fig. 3). These colors gradually fade to light yellow with age. There is one main branch with few to numerous subsidiary branches at each node, and each branch is armed with slender, very sharp thorns which make entrance to a clump difficult. The spikelets are usually few-flowered, pubescent, flattened, and usually occur in clusters of three or more (Fig. 4). One side of the spikelet is often purple and the other side green.

For a more detailed description of the morphological features of Bambusa paniculata see Doell in Martius (1880), McClure (1955) and Pohl (1980).

B. paniculata grows in a wide range of ecological conditions, but is often found in drier areas such as deciduous forest and savannah that other species of subgenus Guadua will not tolerate. It is rarely found above 1300 meters elevations.

B. paniculata also has a wide geographic distribution. It has been recorded from every country in Central America except Belize and from the South American countries of Venezuela, Brazil, and Paraguay. Besides B. paniculata, only two species of Bambusa subgenus Guadua, B. amplexifolia and B. guadua, have been recorded from both North and South America.

In Mexico, B. paniculata has rarely been collected, and appears to be rare. Its northernmost locality was recorded from the state of Nayarit (30 miles south of Acaponeta, H.S. Gentry 6808, 15 Jan 1943, F). I have seen only two additional collections from Mexico, both from the state of Oaxaca (Between La Galera and Pochutla, Liebmam 130, Oct 1842, US and Loma Bonita, E. Hernandez 620, 5 Apr 1945, TEX). Liebmann's collection was originally used to describe Chusques spinosa by Fournier (1886), but additional study has determined that it is indeed B. paniculata.

During July 1984, I visited southern Mexico to collect bamboos as part of my research on Bambusa guadua. In the states of Chiapas and Oaxaca, I was fortunate enough to observe and collect flowering specimens of B. paniculata.

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In Chiapas, I collected from a small clump one kilometer south of the Rio Margaritas (22 km south of Pijijiapan), elevation 50 meters, along the Pacific coastal road. When I first drove by this clump, which was growing on a small hillside and partially covered by tall grass, I mistook it for a clump of *Chusquea* because of its clambering habit and narrow branch leaves. The presence of many dead culms in the clump may have been the result of a partial flowering, but I did not observe any spikelets.

Four days later, I found a few clumps of *B. paniculata* along the transisthmus highway seven kilometers north of Matias Romero, elevation 150 meters, in the state of Oaxaca. None of these culms were discovered to be in flower. Here, as in many parts of southern Mexico, *B. paniculata* is known by the common name “Otate” and is used to some extent for fences, gates, and roof supports. I was told that it is fairly common in the area around Matias Romero.

My next and last encounter with *B. paniculata* occurred north of Pochutla in southern Oaxaca. I arrived in Pochutla from the East on the road from Salina Cruz, and I noticed that a species of small diameter *Bambusa* was being used quite extensively for fences and roof supports. I visited a small warehouse where bundles of this bamboo were being sold (Fig. 5) and learned that north of the city grew large groves of the same bamboo that were presently flowering and dying.

I later found these masses of dead and dying culms twelve kilometers north of Pochutla on the road to Oaxaca. They were covering many hectares of rolling terrain, at approximately 200 meters elevation (Fig. 6). There was no doubt these were culms of *B. paniculata*. Flowering was said to have begun in June, and local farmers could not remember the last time it had occurred. New shoots were present in some clumps, and seedlings were seen growing in others. Unfortunately, many dead clumps were being cleared for cornfields. I did not have ample time in the area to determine population sizes, but I did not observe any further clumps along the road north or south of the one-kilometer-wide zone of flowering. A thorough search of the areas around Pochutla and along the newly opened coastal road at similar elevations would probably reveal additional populations.

I travelled north from Pochutla to the city of Oaxaca, on to Jalapa, Veracruz and west to Merida, Yucatan, but I was unable to locate another clump of *B. paniculata*.

**References**


Figure 1. Narrow, pendant branch leaves.
Figure 2. Culm leaf sheaths with detached or deciduous blades.
Figure 3. Culm leaf sheath and blade of new shoot.
Figure 4. Spikelets.
Figure 5. Bundles of culms at bamboo warehouse, Pochutla, Mexico.

Figure 6. Hillside near Pochutla covered with flowering culms.
Errata


Page 43, footnote 2, b), 2nd sentence, beginning with "Their different circumspections of
the genera ...". My intention was to say as follows: The genera of the Thamnocalamus
complex were differently defined and circumscribed by Chinese authors, partly leading to
changes in nomenclature that causes confusion of the (species) names.

Page 44, section "The Genera", line beginning with "Ampelocalamus":
For "C.Y. Sheng" read "G.Y. Sheng".

Page 45, line beginning with "Chimonobambusa":
For "3 sp." read "9 sp.".

Page 47, line beginning with "Mustelia":
For "1840" read "1841".

Page 48, line beginning with "Qionghuea":
For "W.T. Yi" read "T.P. Yi".

Page 50, Table 1, line beginning with "ATOMOCHLOEAE":
For "ATOMOCHLOEAE" read "ANOMOCHLOEAE".

Page 50, Table 1, line beginning with "OLYREA":
For "Alberella" read "Arberella".

Page 51, Table 1 Continued, line beginning with "MELOCANNEAE":
For "Thyrochiton" read "Thyrsochiton".

Page 54, section "The Species", line beginning with synonym "Sasa bitchuen" under
"Sasa bitchuen":
For "Nakai, 1925:143" read "Nakai, 1925:149".

Page 61, line beginning with synonym "Arundinaria hashimoi f. minaguchii" under
"Sasa bitchuen" (on page 60):
For "(Makino and Koidzumi ex Koidzumi) Murata in Kitamura and Murata" read "(Makino and Koidzumi) Murata in Kitamura and Murata".

Page 64, line beginning with synonym "Pleioblastus viridistriatus var. agrestis" under
"Sasa bitchuen" (on page 63):
For "as "virid-striatus"" read "as P. "virid-striatus β agrestis" ".

Page 64, line beginning with synonym "Sasa bitchuen" under "Sasa bitchuen" (on page 63):
For "(Hackel ex Nakai) Nakai ex Koidzumi" read "(Hackel ex Nakai) Koid-

Page 65, line beginning with synonym "Pleioblastus kongosanensis cv. vagans" under
"Sasa bitchuen" (on page 63):
For "Pleioblastus kongosanensis cv. vagans" read "Pleioblastus kongosanensis cv. Vagans".

Page 67, line beginning with species "Sasa bitchuen":
Page 80, Figure 21:
For scale "1:12,000,000" read "1:25,000,000".

Dieter Ohrnberger
Mannheim, 14 June 1985
Elizabeth A. Widjaja*: Ethnobotanical Notes on *Gigantochloa* in Indonesia with Special Reference to *G. apus*

Revised manuscript received January 18, 1986

**Abstract**

The traditional uses of various species of the giant bamboo genus *Gigantochloa* found in Indonesia are described. Special reference is given to *Gigantochloa apus* with regards to its wide uses for building material, furniture, food resources, packaging and basketry, handicrafts, musical instruments, fishing implements and weaponry. The area of distribution and the respective local uses are tabulated. Methods of cultivation of these bamboos are presented.

**Introduction**

*Gigantochloa* Kurz ex Munro is a genus of giant bamboos growing widely in tropical Asia. In Indonesia the genus plays a very important role in the daily life of the people. This is evident from the fact that the bamboos are extensively used for village houses, furniture, handicrafts, and musical instruments. Locally they also feature prominently in fishing implements and cooking utensils; they are also used extensively as food. Therefore, it is not surprising that many species of *Gigantochloa* are cultivated so that they are a common sight in the Indonesia rural countryside.

The purpose of this study is to identify the established uses of species of *Gigantochloa* as they are known and practiced today in many areas of Indonesia. The opportunity is also used to compare the folk nomenclature and classification of the species with those produced by professional plant taxonomists. The traditional practices of the people in cultivating these species and the possible scientific explanation of these practices will also be elaborated.

**Materials and Methods**

The data presented here have been accumulated during the course of a taxonomic study of Malesian species of *Gigantochloa*. Field work was undertaken in many areas of Indonesia in 1982-1984; the specimens collected were deposited in the Herbarium Bogoriense (BO), the Herbarium of the Royal Botanic Gardens, Kew (K), and the Rijksherbarium at Leiden (L). Notes recorded on specimens available in those as well as in other herbaria were also incorporated in this study. Ethnobotanical information has mostly been obtained by interviewing the local people; it is supported by direct observation. The nomenclature used is that adopted by Widjaja (1985).

Useful Species of *Gigantochloa* in Indonesia

Of the 19 accepted species of *Gigantochloa* for Malesia (Widjaja, 1985), 13 occur in Indonesia. Among these, the Indonesians are known to use as many as 12 species for various purposes. The species (Table 1) vary in the size, strength and color of their culms; these features have determined the uses of each species.

As shown in Table 1, the use of a particular species is not the same in all areas of its distribution, because there seems to be a good correlation between the species and the local tribe's degree of cultural development. To illustrate this, one may look at the use and the pattern of distribution of *G. apus* (Schultes and Schultes) Kurz which seems to follow the migrations of the Javanese. It is well known that this species has been used in Java for ages. When the Javanese migrate to other islands, they always try to bring living rhizomes of this species with them. Consequently in new resettlement areas such as Central Sulawesi, Central Kalimantan and Riau Island, people will not use a local or unfamiliar species straight away because they are very strict to their traditional habits. Some migrating people correctly assert that the local bamboos are not as good as *G. apus* for building materials and handicrafts so they bring this species with them from their native villages in Java. It is only after a considerable period of time and only if the familiar species is not available then they experiment with local species.

It is estimated that approximately 60% of all bamboos consumed in Java are *G. apus*; the rest are *G. pseudorundinacea* (Steudel) Widjaja, *G. atter* (Hasskort) Kurz, *G. atroviolacea* Widjaja and bamboos belonging to other genera. *G. apus* has been used for a long time by the Javanese for building material, packaging, handicrafts, and furniture due to the strength and pliability of its culms. It is also cheaper than other bamboos due to its abundance.

One factor that contributes to the popularity of *G. apus* is the fact that it is resistant to borer attacks. In spite of the fact that the starch content of *G. apus* depends on the habitat, the accepted view that the higher the starch content of the culms the more they are susceptible to borer attacks does not appear to apply to this species. Whether there is a physical or anatomical explanation for this phenomenon requires further careful study (Sulthoni, 1983).

Uses of *Gigantochloa*

As stated above the tribes that make up the Indonesian people have used bamboos in many different ways from time immemorial. The more important uses still practiced today are elaborated below.

Building Materials

Monroy (1955) estimated that 80% of the bamboos consumed in Indonesia are used for building materials, 10% for packaging, 5% for fencing and 5% for other purposes. It is a fact that a house can be constructed solely out of bamboos, including its pillars, floors, walls, doors, windows, rafters and roof-laths as well as its ceilings and roofs (Felix, no date; Soedarmadi, 1972). It is therefore clear that the most important use of bamboo in Indonesia is for building purposes.
Sindoesowarno (1963) reported that 35% of the houses in Indonesia were entirely made of bamboo and that another 35% used bamboo in one way or another. Understandably, the use of bamboo in rural area housing is greater than in urban areas. In recent years the use of bamboo for housing tended to decrease, because according to Sulthoni (1983) bamboo consumption in 1976 for building construction in Central Java was less than timber but greater than non teak timber; the figure for East Java and Bali was almost the same as that of Central Java. According to him more than 50% of the bamboo used in building rural houses were employed for walls, roof-laths, rafters and ceilings. The greatest demand is for roof-laths and rafters which in 1980 amounted to more than 400,000 cubic meters. Sharma (1980) estimated that the total bamboo demand in Indonesia is about 600 million pieces, equal to about 3.3 million metric tons annually. The contribution of Gigantochloa to the total bamboo consumption for building construction in Indonesia amounts to about 60%.

Besides houses, numerous village structures such as smoke houses for drying newly harvested tobacco, raised guard houses in rice fields called dangau, roadside food shops called lepau, hot houses for growing mushrooms, lumbung padi or store houses for rice, cattle sheds and many others, all use bambu tali (G. apus), bambu gombong (G. pseudoarundinacea) or bambu ater (G. atter) as their main components of construction. Surau-- the individual Moslem family praying center-- is often exclusively made of Gigantochloa, and similarly, only the split culms of Gigantochloa apus are used in constructing the traditional Hindu-Balinese worshipping place called palinggih. Because of their large size and relative strength, the culms of G. pseudoarundinacea and G. atter are more frequently used for pillars and other major framework of buildings, whereas G. apus is used for making floors, walls, rafters and roofs. Although structurally possible, one finds only rarely G. atrovioleacea being used for building construction (except walls), because this species has other uses which are economically more attractive (see below).

In recent years, people in some villages have been experimenting with the use of Gigantochloa and other bamboos as a replacement for metal rods in reinforced concretes. Admittedly this innovative use is limited to simple construction.

Previously bamboos were extensively employed as scaffoldings in the construction of city buildings. This has declined in recent years due to the availability of metal scaffoldings which are easier to manipulate and reusable so that in the long run they are cheaper, especially in the construction of multistoried buildings.

Gigantochloa is also much used in making fences around houses, gardens and orchards. Not only the culms but even the smallest branches are employed as space fillers in the fences, especially if a compact fence is being built.

Gigantochloa is a source of popular material for building village bridges. It is also used as pipe line to bring water from distant places by interconnecting adult culms. For this purpose only G. apus, G. pseudoarundinacea, G. robusta Kurz, and G. atrovioleacea seem to be suitable.

Furniture

Village houses are normally furnished with furniture partly or wholly made of bamboo. Balai-balai (a kind of bed), para-para (a combination of rack and cupboard), benches and crude tables are kinds of bamboo furnitures commonly seen in rural areas. Nowadays a number of interior decorators have begun to introduce bamboo furniture in city houses. Consequently new designs of chairs, sofas, and tables are being developed.
Gigantochloa apus is commonly used for furniture in the rural areas, followed by G. atter and G. pseudoarundinacea. In recent times G. atrovioleacea is being used more and more for constructing modern furniture, undoubtedly due to the attractive, blackish pigmentation of the culms. The fact that in nature G. atrovioleacea is rarer than G. apus or G. pseudoarundinacea makes this species much sought after; hence, it fetches a better price.

Food Resources

The Indonesians probably learned from the Chinese how to use young bamboo shoots as food. Species of Gigantochloa commonly used for this purpose are G. atter, G. nigrociilita (Büse) Kurz, and G. levis (Blanco) Merrill. They are mostly eaten as a vegetable and are either cooked or rarely eaten raw. During the course of this study it was noted that some people also eat G. robusta, G. hasskalliiana (Kurz) Backer in Heyne, G. pruriens Widjaja, and G. pseudoarundinacea.

According to data released by the Indonesian Health Department (Anonymous, 1979) 100 grams of fresh bamboo shoots contain 27 calories, 2.6 grams of protein, 0.3 grams of fat, 5.2 grams of carbohydrate, 13 milligrams of calcium, 4 milligrams of vitamin C and 91 grams of water. On the other hand, Walther et al. (1910, 1911) reported that the young bamboo shoots of certain species release hydrogen cyanide (HCN) or prussic acid; this cyanide is contained in the glucoside taxiphyllin and it is from fresh shoots of members of the genus Gigantochloa that the HCN represents more than 0.15% of this glucoside. Although a high concentration of HCN may sometimes be found in commercial edible bamboo shoots, the cyanide will disappear after boiling or drying.

G. apus probably has a higher concentration of HCN than the other members of Gigantochloa, because the young shoots of this species are bitter. Similarly the leaves of this species also produce a bitter substance so that they are never used in making bacang, a rice delicacy prepared by wrapping rice and spiced meat in bamboo leaves and then boiled. Also the culms of species of Gigantochloa are never used in cooking another rice delicacy called lemang.

Packaging and Basketry

Before Indonesian daily life was invaded by plastic bags, G. apus represented a very important source of packaging material for the Javanese and Balinese. Various types of artifacts can be found, ranging from the strongly but crudely made huge basket for carrying dried fish and other things to distant areas, to the smallish besek (boxes) for food. We should also include bongsang, an ephemeral container for multiple purposes made from loosely interwoven, split bamboo.

Since all of these packaging containers should be disposable and able to accommodate soft things without damaging them, pliable thin strips of bamboo are invariably used; no species other than G. apus is appropriate as raw material for this purpose. This species is also widely used as a source of string for tying these packages and other wrappers. The specific epithet of G. apus was derived from the old Javanese word apus which means string.

For more permanent containers, several kinds of bamboo baskets have been developed in many areas of Indonesia. They differ both in size and shape as well as the purpose and the methods of carrying them according to the habits of the tribes. In Java broad based baskets called keranjang seem to be preferred as they are suitable for carrying on top of the head (by women) or suspended on shoulder carrying poles (by men). In
Borneo and Celebes, tall baskets provided with shoulder belts are more common since they are suitable for walking along narrow footpaths in the thick forest. Understandably, species of *Gigantochloa* other than *G. apus* are employed for this kind of basket. An example is *budak*, a huge rice container from Madura.

**Handicrafts**

One of the important uses of species of *Gigantochloa* in Indonesia is in the handicraft industry. Table mats, fans, boxes, hats, handbags, purses, flower vases, ash trays, lamp shades, and a thousand other bric-a-brac are woven, shaped or carved beautifully out of bamboo manifesting in some cases the artistic ability of the people.

Probably the most developed bamboo handicrafts industry in Indonesia is the weaving of bamboo splits, for which *G. apus* has been exclusively employed. In weaving splits many different patterns have been created, normally with particular meanings specific to each tribe. Basically there are 2 main groups of patterns used (Basuki, 1982): the *sasag* pattern which is made by matting one split horizontally against another split vertically, and the *kepang* pattern made by feeding one split between two splits horizontally or vertically. Within both groups numerous variations are known, each with its own specific name. In recent years new patterns have been introduced, undoubtedly influenced by wider contacts with outsiders.

**Musical Instruments**

Bamboo musical instruments have been variously developed by most tribes in Indonesia. They can be in the form of the simple *tong-tong* (one bamboo internode with a narrow slit cut lengthwise) to the very sophisticated *gambang* (a series of bamboo culms of different sizes and tones). Apparently bamboo musical instruments were known in Java for a very long time, because xylophone-like instruments made of bamboo and known as *calung* are illustrated on the Borobudur temple which was built in about the 8th century AD. The most complicated instruments which almost make up a complete orchestra are those developed by the Menadonese of North Sulawesi and the Sundanese of West Java. In the latter area, some of the popular bamboo musical instruments made from *Gigantochloa* are *angklung*, *calung*, *celempung*, *goong*, *gambang* and *rengkong* (see the reviews by Widjaja 1977, 1980).

The most suitable species for making musical instruments is *G. atrovio lacea*, whose culms to have the right combination of size, texture, and other physical properties. Other species frequently used are *G. atter*, *G. pseudoarundinacea*, and *G. apus*. The Baduy tribe of West Java also make bamboo musical instruments from *G. robusta*.

**Fishing Implements**

Many traditional fishing implements are made of bamboo by most tribes in Indonesia. These range from the simple *pancing* (fishing-rods) and *karamba* (bamboo boxes placed in running water for rearing fresh water fish) to the many kinds of *huru* (fishing traps) of various sizes and shapes.

When *G. apus* is not available in the area, the people make fishing implements of other bamboo although they are less flexible and less durable.
Weaponry

Indonesians used bambu runcing as an emergency weapon during the war of independence 1945-1949, no doubt learning from the experience of their forefathers who had been known to use similar armory for a long time. For this purpose, the upper part of an adult culm of G. atter or G. apus was cut into a manageable size -- normally about 3 m long with a diameter of 5-7 cm -- and sharpened so that it would serve as a javelin or spear. In Eastern Madura, large numbers of such sharpened culms of G. atter (as well as other bamboos), were planted as stakes on a large tract of open area to prevent parachutists from making smooth and safe landings.

Other Uses

The sharp edge of a freshly split G. atter culm (or other bamboo) known as sembilu has often served as a knife in many Indonesian traditional ceremonies. It is especially employed where there is a taboo against using metal knives such as in the severance of the umbilical cords of newborn babies as well as in the circumcision ceremony of male Moslem children. The taboo probably arose because of fatal experiences due to the lack of knowledge of aseptic technology.

In North Sumatra, G. pruriens which is reported to grow there is used as the harvesting-pole of fruits of oil palms largely because of the straightness and lightness of its culms; it has been suggested that Melocanna baccifera is also suitable for harvesting oil palm (Widjaja, 1980). Moreover the culms of G. pruriens are also used by the Batak people for writing their traditional calendar.

Gigantochloa apus and G. atter represent very important materials in making tangga or bamboo ladders in Indonesia. There are 3 types of bamboo ladder which can be seen in many areas. The commonest type is the one called taraje by the Sundanese; it is made of two, 2-3 m long, bamboo culms connected by horizontal bamboo rungs set in holes made every 30 cm. Sigai is a one culmed, bamboo ladder used for climbing the sugar palm tree. Notches are carved out to form convenient steps for climbing. Ijan is a three culmed, bamboo ladder made by binding the culms together on one end. This ladder is used to dry tobacco and cloves or for weighing rice during harvesting time.

In the old days, as in many other countries, jajangkungan or bamboo stilts made of small culms of G. apus (or other bamboos) were used for walking in flooded areas. Nowadays, they are only used as a children’s toy. Many other kinds of toys, such as wiggling snakes, whistles, piston air guns, masks, frames for kites and so on, are also made of G. apus.

Cultivation

Bamboo was probably brought into cultivation many thousands of years ago, but there is no archaeological evidence to support this. It is assumed that the center of origin of Gigantochloa was probably somewhere on the mainland of South East Asia. Several species appear to have been brought to Indonesia, probably accidentally by sea, when used for making rafts during prehistoric migrations. Because of the ease of propagation of bamboo, even from a single node, people could by chance leave pieces of bamboo and these pieces would grow. The other possibility is that when people understood precisely which
species were most useful, they may have chosen these and brought them along for making temporary dwellings during migration and for other purposes.

This presume that bamboo was used a long time ago, even before the neolithic era. In some parts of Indonesia such as Bali, Lombok, South Sulawesi (Toraja) and Timor, people use bamboo more than in any other region. Because of this, many anthropologists including Berthe-Friedberg (1980, pers. comm.) suggest there might have been a bamboo age between the stone age and the bronze age.

Nowadays, one rarely sees local people starting a new grove of bamboo in a Javanese village. The bamboos growing now were mostly planted some years ago. According to information collected around Bogor, there are three traditional methods of bamboo propagation:
1. One method is to plant a *dongkelan*, which is a piece of the lower culm, together with the rhizome basal to it. For this method, culms of 9 months to 2 years old are used to establish new plants.
2. A part of the upper portion of the culm, removed when the foregoing method is employed, are cut into pieces with one or two internodes, laid out on the ground and covered with a thin layer of soil. The buds at the nodes will start growing after some time.
3. A piece of an old culm with two internodes is split lengthwise and then laid in the soil with the convex side upwards. This method requires continuous and careful maintenance as the chance of failure is very high.

Propagation of *Gigantochloa* from seeds can also be effected and for this purpose seeds can be gathered when the bamboo clump is flowering. Few people have a chance to see the bamboos they plant themselves come to flower, because most species of *Gigantochloa* flower 30-40 years after planting the rhizome. Moreover, local people are not happy to see their bamboo flowering because they believe it is a bad omen.

The distance between bamboo plantings depends on the area and the species. Most species of *Gigantochloa* have a tufted clump habit so that they need only a limited distance between clumps. The most favorable time to propagate bamboo is the beginning of the rainy season.

People can harvest the culms any time, though the dry months of the year are considered the most appropriate harvesting time as it will diminish starch content and attack by insects. To prevent insect boring, the culms are placed in muddy water soon after cutting. In actual practice, culms are usually harvested when they are about three years old. The Sundanese and Javanese say the time for harvesting culms is after *umur dua adi* which means after the culms produce young shoots twice. In this way the young shoots will continue to flourish and the culms are old enough to be used for many purposes.

Obviously only a limited area can be planted by these traditional methods. The economic success of commercial bamboo exploitation will depend to some extent on cultivation on a large scale of useful bamboos, selected for quality and high productivity. The establishment of plantations to provide raw material for bamboo shoots, paper, and innumerable kinds of handicrafts calls for the prompt production of at least a million rooted propagules from a single plant. Therefore the large scale production of bamboo plants in the future will require the development of special techniques of micro-propagation such as tissue culture.
Folk Nomenclature and Classification

Vernacular Names

Bamboos in general are called buluh by the Malay speaking people (Malay Peninsula, Sumatra, Kalimantan, Sarawak, and North Borneo). The Sundanese of West Java call them awi, whereas the Javanese (Central and East Java), the Madurese, the Balinese, and the Bunaq call them pring, perêng, tiying, and ma respectively. Therefore, the vernacular names given to species of Gigantochloa in Indonesia vary from one area to another because there are numerous local languages. Thus for a single bamboo, such as G. atrovioleacea, we encounter different names such as pring wulung (Javanese), awi hideung (Sundanese), or bambu hitam (Indonesian), all of which mean black bamboo. Gigantochloa apus is called pring tali, awi tali, and tiying tali by the East Javanese, Sundanese, and Balinese respectively; each name means string bamboo. In Central Java more people call it pring apus than pring tali. The word apus derived from Kawi words also means string or bound. As indicated above this is the best bamboo for making string.

In North Sumatra the Batak people call G. pruriens, buluh rejen, which means hairy bamboo referring to the dense itching hairs which cover the back side of the culm sheaths. In East Java, the Javanese call G. manggong Widjaja, pring manggong, from the sound of its rubbing culms when the wind blows.

Some herbarium specimens contain the vernacular names noted down by collectors. During the course of this study, it became apparent that such notes should be handled with care. Confusion has often arisen due to the carelessness of collectors in noting down the vernacular names, mostly because many collectors have a poor understanding of the local languages and a hazy concept of species. The confusion of pring ater (often appearing on labels of G. atter and G. pseudoarundinacea) or pring wulung (used to denote G. atrovioleacea and G. robusta) are cases in point. Most local people know their flora by their vernacular names very well, and a plant taxonomist who is conversant with the local language and has a clear taxonomic insight of the bamboo concerned will benefit greatly from these names (Table 2.).

It is of interest to note that in Java the geographic names of many places were derived from the vernacular names for species of Gigantochloa such as Cigombong and Gombong (G. pseudoarundinacea), candi (temple) Pring Apus, Ciapus (G. apus), Ciater (G. atter), Majalengka (G. nigroelata) and so on.

Folk Classification

In many parts of Indonesia, the local people easily recognize every species of bamboo occurring in their surroundings. They also recognize that bamboos represent a distinct plant group which differs from trees and grasses because bamboos have characteristic culms with internodes. Although they have not been taught the principles of taxonomy, they can separate one species from the others by using specific characters such as leaf size, culm thickness, and culm color. This folk taxonomy is revealed in many vernacular names based on local languages for different species. The Javanese divide bamboo roughly into 3 groups: first, pring which is big, straight with slightly thick culms and big leaves (members of the genus Dendrocalamus and Gigantochloa); second, hawur or haur which is thick bamboo, not straight, of medium size with small leaves (such as species of the genus Bambusa); third, buluh which is very small in size, with very thin and not very tall but straight culms, and leaves of medium size (such as species of Schizostachyum).
This type of division is also recognized by the Sundanese and Balinese by using a special name for each group such as awi, aur and buluh.

In West Java the Sundanese people use some specific (although taxonomically not always diagnostic) characters such as culm thickness and culm diameter for differentiating bamboos within the genus Gigantochloa. Different species of Gigantochloa found in West Java are characterized by the Sundanese as follows: awi gombong (G. pseudoarundinacea), because of its thinner culm walls, is separated from awi mayan (G. robusta). These two species, because of their wider culm diameter, are distinguished from awi tali (G. apus), awi lengka (G. nigrociliata), and awi lengka tali (G. hasskarliana). Awl lengka can be separated from awi lengka tali easily since the former has very thin culms and more palatable, young shoots. The culms of these two species usually have a very small diameter, whereas awi tali culms have a medium diameter. Also, the former species have smaller leaves than the later. If the people live in the area where awi mayan is not found, they differentiate awi gombong and awi tali based on the leaf size together with the strength of the culm. They recognized correctly that awi gombong has bigger leaves than awi tali.

A more sophisticated system of bamboo recognition has been developed by the Dayak Kenyah people living in East Kalimantan (Widjaja, 1983). These people use more meaningful taxonomic evidence for differentiating species of Gigantochloa as well as other bamboos they know. One can construct a dichotomous key to the species based on their system to organize their knowledge and understanding of bamboos. Since they employ the culm sheaths and their appendages (auricle, ligule, blade) in recognizing a type of plant (which surprisingly correspond to scientifically established species), a plant taxonomist will have no difficulty using the wisdom of these people for taxonomic purposes.

The same system of bamboo recognition has also been developed by the Bunaq people living in East Timor as reported by Friedberg (1982).

**Looking Ahead**

In the more developed areas of Indonesia, the advance of modern technology has made its impact on the way the people conduct their daily life. For the most part many traditional customs together with their associated products have to give way to modern innovations. Consequently in areas near Bogor, for example, it is unlikely that one will find bamboo bridges or bamboo pipe lines. On the other hand, the awareness of the advantage of "return to nature" has given rise to an appreciation of the beauty of certain traditional technological products. The increasing demands for bamboo furnitures or bamboo fences produced using modern inventions in recent years bear witness to this. Unfortunately the revival is associated with the fashion of the day, so that more often than not they are frightfully expensive and beyond the reach of the average citizens.

Be that as it may, it is unthinkable that the traditional role played by bamboo will disappear totally, even in the unlikely case that modern technology will penetrate evenly the whole Indonesian archipelago. Nevertheless much of the information on the ethnobotanical meaning and significance of traditional uses of bamboos are disappearing very fast. For example, the real purpose of the green and white paints which are always used in coloring the Kabaena (South East Celebes) bamboo musical instruments is not as yet documented, and so far no satisfactory explanation has been given by old or knowledgeable people from the area. It is along this line that field research should be undertaken for
the benefit of the development of bamboo ethnobotany.

This paper forms part of a thesis submitted in partial fulfillment of the degree of Doctor of Philosophy in the University of Birmingham (United Kingdom). I should like to thank Dr. Mien A. Rifai, Herbarium Bogoriense, Bogor for kindly supervising this study.

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### Table 1. Known Uses of *Gigantochloa*

<table>
<thead>
<tr>
<th>Species</th>
<th>Areas of Distribution</th>
<th>Building</th>
<th>Furniture</th>
<th>Food</th>
<th>Packaging</th>
<th>Handicrafts</th>
<th>Musical Instruments</th>
<th>Fishing Implements</th>
<th>Weaponry</th>
<th>Other Uses</th>
</tr>
</thead>
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<tr>
<td>atrovioleacea</td>
<td>J,SSU.</td>
<td>J</td>
<td>J</td>
<td>J</td>
<td>J</td>
<td>J, J</td>
<td>J</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hasskarliana</td>
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<td>EK, J</td>
<td>J</td>
<td></td>
<td>EK</td>
<td>EK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>levis</td>
<td>EK, M</td>
<td>EK, M</td>
<td>EK</td>
<td></td>
<td>EK</td>
<td>EK</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>manggong</td>
<td>EJ</td>
<td>EJ</td>
<td>EJ</td>
<td></td>
<td>EJ</td>
<td>EJ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nigroclita</td>
<td>WJ,B.</td>
<td>WJ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>pruriens</td>
<td>NSU.</td>
<td>NSU</td>
<td>NSU.</td>
<td>NSU.</td>
<td>NSU.</td>
<td>NSU</td>
<td></td>
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</tr>
<tr>
<td>pseudo-arundinacea</td>
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<td>J,B,WSU</td>
<td>J,WSU.</td>
<td>J</td>
<td>B, J</td>
<td>J</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>ridley</td>
<td>B</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>robusta</td>
<td>WJ,B, WSU, MEN.</td>
<td>WJ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>wrayi</td>
<td>SSU.</td>
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</tr>
</tbody>
</table>

**Key**

- **B**: Bali
- **CJ**: Central Java
- **CS**: Central Sumatra
- **EJ**: East Java
- **EK**: East Kalimantan
- **IJ**: Irian Jaya
- **J**: Java (West, Central, East)
- **M**: Moluccas
- **MAD**: Madura
- **MEN**: Mentawai
- **NK**: North Kalimantan
- **NSU**: North Sumatra
- **R**: Riau
- **SS**: South Sulawesi
- **SK**: South Kalimantan
- **SSU**: South Sumatra
- **WJ**: West Java
- **WK**: West Kalimantan
- **WSU**: West Sumatra
Table 2. Vernacular Names of Indonesian *Gigantochloa*

<table>
<thead>
<tr>
<th>Species</th>
<th>Vernacular Name</th>
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<tbody>
<tr>
<td>achmadii</td>
<td>buluh apo (P)</td>
</tr>
<tr>
<td>apus</td>
<td>pring tali (J); awi tali (S); perrêng talê (M);</td>
</tr>
<tr>
<td></td>
<td>tiying tali (B); bambu tali, bambu apus (I).</td>
</tr>
<tr>
<td>atrovioleca</td>
<td>pring wulung, pring ireng, pring ulung (J);</td>
</tr>
<tr>
<td></td>
<td>awi hideung (S); bambu hitam (I).</td>
</tr>
<tr>
<td>atter</td>
<td>pring jawa, pring legi (J); awi ater, awi temen (S);</td>
</tr>
<tr>
<td></td>
<td>perrêng kêlês (M); bambu ater (I).</td>
</tr>
<tr>
<td>hasskarliana</td>
<td>awi lengka tali, awi tela (S); pring jajang kapur,</td>
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<td></td>
<td>pring jajang kertas (J); tiying putih (B); buluh mayan (Pal);</td>
</tr>
<tr>
<td></td>
<td>buluh lekukai (Lamp); buluh sorik (Bat-Tap); buluh didi (Alas);</td>
</tr>
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<td></td>
<td>bulok busi (Day-Ken); bambu lengka tali (I).</td>
</tr>
<tr>
<td>levis</td>
<td>bulok tup (Day-Ken).</td>
</tr>
<tr>
<td>manggong</td>
<td>pring manggong (J); tiying jahe (B).</td>
</tr>
<tr>
<td>nigrociilata</td>
<td>awi lengka (S); tiying tabah (B); bambu lengka (I).</td>
</tr>
<tr>
<td>pruriens</td>
<td>buluh regen (Bat-Karo, Alas); buluh belangke (Melayu);</td>
</tr>
<tr>
<td></td>
<td>buluh yakyak (Gayo).</td>
</tr>
<tr>
<td>pseudoarundinacea</td>
<td>awi andong, awi gombong (S); pring gombong, pring surat (J);</td>
</tr>
<tr>
<td></td>
<td>tiying jajang suwat (B); buluh batuang danto (P);</td>
</tr>
<tr>
<td></td>
<td>bambu gombong (I).</td>
</tr>
<tr>
<td>ridleyi</td>
<td>tiying kaas, tiying jajang, tiying jajang batu,</td>
</tr>
<tr>
<td></td>
<td>tiying aya (B).</td>
</tr>
<tr>
<td>robusta</td>
<td>awi mayan (S); tiying jelepung (B); buluh riaw (P);</td>
</tr>
<tr>
<td></td>
<td>buluh poring (Bat-Tap).</td>
</tr>
<tr>
<td>wrayi</td>
<td>buloh dabo (Pal).</td>
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Key

<table>
<thead>
<tr>
<th>Alas</th>
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<th>J :Javanese</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>:Balinese</td>
<td>Lamp :Lampung</td>
</tr>
<tr>
<td>Bat-Karo</td>
<td>:Batak-Karo</td>
<td>M :Madurese</td>
</tr>
<tr>
<td>Bat-Tap</td>
<td>:Batak-Tapanuli</td>
<td>P :Padang</td>
</tr>
<tr>
<td>Day-Ken</td>
<td>:Dayak-Kenyah</td>
<td>Pal :Palembang</td>
</tr>
<tr>
<td>Gayo</td>
<td>:Gayo</td>
<td>S :Sundanese</td>
</tr>
<tr>
<td>I</td>
<td>:Indonesian</td>
<td></td>
</tr>
</tbody>
</table>
L. G. Clark*: Notes on Two Viny West Indian Bamboos

Revised manuscript received March 19, 1986

The Islands of the West Indies support a surprisingly diverse native bamboo flora. About half of the 18-20 bamboo species known from the West Indies belong to two woody bamboo genera, Arthrostylegium Ruprecht and Chusquea Kunth (McClure, 1973; Calderón and Soderstrom, 1980). These species are all slender and clambering or viny. Dr. Thomas R. Soderstrom of the Smithsonian Institution recently called my attention to a problem involving two of these bamboos, Arthrostylegium sarmentosum Pilger and Chusquea abietifolia Grisebach.

In flowering condition these two taxa are distinct (see Hooker, 1885 and Chase, 1914 for illustrations), but vegetatively their viny habit and reduced leaves are strikingly similar, making proper identification of the two difficult. Both species range from low to middle altitudes (about 800-2000 m) and are known from Cuba, Jamaica, Hispaniola and Puerto Rico. Arthrostylegium sarmentosum may also occur on Trinidad.

Grisebach (1864) originally described Chusquea abietifolia from flowering material collected in Jamaica. The specific epithet refers to the short, rigid, almost needle-like leaves of this species. Arthrostylegium sarmentosum was originally described by Pilger (1903 in Urban), who based his description on vegetative material from Puerto Rico. Pilger (1903 in Urban) clearly described the leaves of this species as being narrowly lanceolate, obtuse, papery and up to 4 cm long and 5 mm wide. Chase (1914) later described and illustrated the spikelets of A. sarmentosum after collecting flowering plants on Puerto Rico.

Recent attempts by myself and others to find C. abietifolia on Puerto Rico were unsuccessful, leading us to wonder whether the vegetative Puerto Rican specimens identified as C. abietifolia were actually A. sarmentosum. To our knowledge, no flowering specimens of C. abietifolia have ever been collected from Puerto Rico, even though two gregarious blooming episodes of this species on Jamaica were well documented (Seifriz, 1920, 1950). I examined numerous collections of these two species at the U.S. National Herbarium of the Smithsonian Institution to determine if there are any reliable vegetative characters that could be used to distinguish between them.

Although each species exhibits a branch complement typical of its genus, this feature is not easy to see on most specimens. Foliage leaves provide the best vegetative characters for separating the two species, and the differences are listed in Table 1. A foliage blade of each species is illustrated in Figure 1. The abaxially prominent midrib and thick margins of C. abietifolia are perhaps the most conspicuous differences.

* Department of Botany, Iowa State University, Ames, Iowa 50011.
Table 1. Differences in Foliage Leaf Blades between *Chusquea abietifolia* and *Arthrostylidium sarmentosum*

<table>
<thead>
<tr>
<th></th>
<th>C. abietifolia</th>
<th>A. sarmentosum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stiff, with midrib abaxially prominent and margins thickened</td>
<td>Thin, midrib abaxially visible but not prominent and margins thin</td>
<td></td>
</tr>
<tr>
<td>Apex mucronate</td>
<td>Apex acuminate</td>
<td></td>
</tr>
<tr>
<td>Base tapered to cuneate, rarely somewhat rounded</td>
<td>Base rounded</td>
<td></td>
</tr>
<tr>
<td>Pseudopetiole not very distinct, about 0.5 mm long</td>
<td>Pseudopetiole distinct, 0.5 - 1 mm long</td>
<td></td>
</tr>
<tr>
<td>1 - 4 cm long</td>
<td>2.3 - 5 cm long</td>
<td></td>
</tr>
<tr>
<td>1.5 - 4 mm wide</td>
<td>3 - 5 mm wide</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1. Foliage leaf blades, abaxial view;
Using these criteria, I found that there are indeed three collections of *C. abietifolia* from two localities in Puerto Rico. *Stevens 4755* and *Hess 116* were collected in 1913 and 1914 respectively on Monte Alegriño. A third specimen, *Sargent 3062*, was collected from Los Tres Picachos, Jayuya in 1943. This represents the last known collection of *C. abietifolia* on the island. Currently efforts are underway to relocate this species, but it is possible that it has disappeared from Puerto Rico. Recent collections from Jamaica and Haiti indicate that *C. abietifolia* still occurs on those two islands.

In 1982, I collected *A. sarmentosum* from a vigorous population near the Reserva Forestal Maricao on Puerto Rico. Carlos Betancourt of the University of Puerto Rico, Mayaguez, has also collected this species recently from Luquillo and Toro Negro. From these observations *A. sarmentosum*, in contrast to *C. abietifolia*, is widespread on Puerto Rico and apparently thriving.

Although not closely related, the two West Indian bamboos, *C. abietifolia* and *A. sarmentosum*, have both evolved delicate culms, a viny habit, and reduced, narrow leaves. Because they share virtually the same distribution and habitat in addition to their strikingly similar vegetative morphology, identification of the two species from vegetative material has become a source of taxonomic confusion. After closely examining many specimens of both species, I found that there are consistent differences in the foliage leaf blades which can be used to separate the two. The historical distribution patterns of the two species are confirmed, but it has been over 40 years since *C. abietifolia* was last collected on Puerto Rico. Efforts to relocate *C. abietifolia*, and better document the distribution of *A. sarmentosum* and related species on Puerto Rico should be continued.

**Acknowledgements**

I thank Dr. Thomas R. Soderstrom of the Smithsonian Institution for bringing this interesting problem to my attention, and Dr. Richard W. Pohl of Iowa State University for reviewing this manuscript.

**Addendum**

Just recently (February, 1986) I received some bamboo material collected by David Edelman, who is working on a bamboo project in Mayaguez, Puerto Rico under the direction of Dr. Soderstrom. Mr. Edelman kindly agreed to search for *Chusquea abietifolia* on Puerto Rico, and I am happy to report that he did indeed relocate one vegetative population of this species near Maricao, on Monte del Estado in the drainage of the Rio Maricao (Edelman 58, Edelman & Hollenberg 59). Edelman believes this site to be the same as the Mont Alegriño locality where this species was collected previously, but Monte Alegriño does not appear on any maps he has found. The population of *C. abietifolia* was growing intermixed with the more common *Arthrostylidium sarmentosum*, which may explain why *C. abietifolia* has been overlooked before.

**References**


Wen Yue Hsiung*: Growth Pattern of Monopodial Rhizomes of Bamboo Plants

Revised manuscript received April 14, 1986

ABSTRACT

Botanically, rhizomes are the main stems of bamboo trees which produce culms as branches and new rhizomes as propagules. The apex of a rhizome shoot consists of apical and subapical meristems from which intercalary meristems are derived by successively basipetal formation of nodal septa. Elongation of a rhizome results from the acropetal elongation of its individual internodes. Each internode undergoes cell division, differentiation, elongation and maturity through the activity of intercalary meristem.

Introduction

Rhizomes are the most important organs of bamboo plants and have multiple functions in their growth and propagation. Botanically, rhizomes are the main stems of bamboo trees which produce culms as branches and new rhizomes as propagules. Rhizomes also serve as reservoirs which store moisture and nutrients and as passages from which water and nutritional materials are transported. Around rhizome nodes, roots develop for absorption and anchorage. Actually, the growth pattern of rhizomes is closely related to the development and production of bamboo stands.

Apical Growth of Rhizome Shoots

Apical meristems are responsible for the apical growth of rhizome shoots that leads to form the underground network of the rhizome system. The apical dome of a rhizome shoot consists of an outer mantle of 4-5 layers of cells known as tunica which is remarkably uniform in cell size and cell arrangement and an interior mass of unlayered cells known as corpus. Between the tunica and corpus there is a transitional layer of cells with outward wall uniform and inward walls distorted. Both tunica and corpus are characterized by dense cytoplasm, large nuclei and active mitoses (Fig. 1).

In the lower part of apical meristem, a youngest sheath primordium is initiated by periclinal division and appears as a small protrusion. Its outer layer is directly transformed from the tunica and its interior part is derived from the peripheral meristem. As the apical meristem continues to grow, the sheath primordium develops into a young sheath and another new sheath primordium occurs alternately on the opposite position just a little above the former primordium. The initiation of a sheath primordium indicates the beginning of differentiation of apical meristem. Morphologically the youngest sheath primordium is the first appendage of a rhizome apex and may be recognized as a dividing mark with the apical meristem proper above and the subapical meristem below.

In the subapical meristem, cell division and differentiation are very active. Pith meristem and peripheral meristem become distinguishable in their cell size and nuclei. In the pith meristem, cells are large, vacuolated and loosely arranged in 14-20 longitudinal files. Their division and differentiation are much retarded as compared with those in the

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