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Editors:
**Gilles Lessard and
Amy Chouinard**

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Bamboo Research in Asia



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Bamboo Taxonomy in the Indo-Malesian Region

Soejatmi Dransfield¹

Present knowledge of bamboo taxonomy in the Indo-Malesian region (Indian subcontinent, Sri Lanka, Bangladesh, Burma, Indochina, and Malesia) is discussed. Twenty genera are recognized and each of them is given a short diagnostic field character. A checklist of species of some genera is also given but is only preliminary.

Bamboos have a tree-like habit yet are members of the grass family, the Gramineae. They have sometimes been treated as a different family from the Gramineae; however most agrostologists agree to keep them in Gramineae, in the subfamily Bambusoideae. All members of the bamboos possess similar anatomical features in the leaf blades, that is fusoid cells and arm cells, that separate the bamboos from the grasses. Some herbaceous genera in the Gramineae have anatomical features as well as some other characters in common with the bamboos. These genera are included in the same subfamily and are considered as a primitive group in the subfamily.

Bamboos can be characterized as having woody, usually hollow, culms, a complex rhizome system, petiolate leaf blades, branches at the culm nodes, and a prominent sheathing organ. Some bamboo species are believed to produce flowers once, after 20–30 years, and then die. Some other species produce flowers the whole year round and do not die after flowering. The basic unit of the reproductive phase, the spikelet or the pseudospikelet, has one to several flowers or florets. In general, the bamboo floret has three lodicules, six stamens, and an ovary with three stigmas. Many parts of bamboo plants, such as culm sheaths, internodes, and also inflorescences are often covered by light-brown to dark-brown, or black stiff, irritant hairs.

Bamboos occur mostly in natural vegetation of tropical, subtropical, and temperate regions and are found in great abundance in tropical Asia. There are about 750 species in about 45 genera. Many of them are indigenous to the monsoon areas of tropical Asia and have a limited distribution. Many of them are found only in cultivation. The distribution of bamboos has been greatly modified by human intervention (166).

As a rule classification of flowering plants, including bamboos, is based mainly on the structure of the flower. Previously, botanists (Ruprecht, Munro) named bamboo plants from flowering specimens, but because bamboos often flower infrequently, naming them in this way is of little use to field-workers acquainted with the living plants. Recently, botanists (Kurz, Holttum, McClure) have suggested and used almost all parts of bamboo plants in naming, classifying, and recognizing bamboo species.

¹Dransfield is working independently on the taxonomy of bamboos.

This paper presents the state of knowledge of bamboo taxonomy in the Indo-Malesian region, covering India, Sri Lanka, Bangladesh, Burma, Indochina, and Malesia (Malaysia, Philippines, Indonesia, and Papua New Guinea).

History of Bamboo Taxonomy

The first bamboo genus, *Bambusa*, was published and described by Schreber in 1789. It was based on one species, *B. arundinacea*, a thorny bamboo from India. Since then, many genera and species have been described and published.

The first comprehensive work on bamboo taxonomy is that of Ruprecht (345). This work is based mainly on herbarium specimens and on previous literature. Ruprecht apparently recognized 67 species of nine genera. His work was followed by more extensive work by Colonel Munro (260). The work includes bamboo species of the world and is also based on the herbarium and literature. Munro recognized about 170 species of 21 genera and divided the genera into three divisions. The first one consisted of the genera that possess three stamens and three stigmas in the flowers and culms without thorns, for example *Arundinaria*. The second group included the so-called true bamboos, *Bambusa*, *Gigantochloa*, etc. The third group consisted of genera that are characterized by the peculiar structure of the fruit, a thick pericarp enclosing the seed or embryo. Of 21 genera, about 14 occur in tropical Asia, comprising about 120 species. Munro's system of classification has now been adopted as the basis of bamboo classification, such as by Benthham (43) and E.G. Camus (63), with some modification.

After Munro's work, many bamboo articles have been concerned with local floras. In 1876, Kurz, who spent time in the botanic gardens in Bogor (Indonesia), and then in Calcutta (India), and studied bamboos as living plants, published a valuable account on the use of bamboos and the bamboo species occurring in Asia (209). Kurz was the first botanist who studied the bamboos as living specimens and introduced the importance of the vegetative characters, such as culm sheaths, in recognizing bamboo species. He, however, did not propose any formal classification of bamboos.

In 1896, Gamble, who was once a forest botanist in India, produced a monograph of the *Bambusae of British India*, which includes the Indian subcontinent, Burma, and Malaya (104). Gamble traveled much in India and recognized the importance of vegetative characters in identifying bamboo species. His system of classification was adopted from Benthham's system. Gamble's work remains as a fundamental work for Indian bamboos. He recognized about 15 genera.

Blanco (48) published and described many plant species from the Philippines, including bamboos, without collecting the plants. His descriptions are very short and brief; many local names are cited. All bamboos were described under the name *Bambusa*. Later, Merrill (253) interpreted and published Blanco's species of *Bambusa*; they belong to other genera, such as *Gigantochloa*, *Schizostachyum*, *Dendrocalamus*, or *Dinorchloa*. Gamble (105) described many species of bamboos sent by Merrill, but because Gamble was familiar only with the Indian bamboos, some of his interpretations were wrong. Since then, there has been no taxonomic work on the bamboos of the Philippines, which I believe is rich in native bamboo species. Many of Merrill's names and Gamble's names of bamboo species are still being used. In my opinion, they should be revised.

The account of bamboos in Java was made by Backer (25), and many of Rumphius' names (344) were cited as synonyms.

The bamboos from Indochina can be found in the works of E. G. Camus and A. Camus (63, 64).

Holtum, who was the director of the botanic gardens in Singapore, published his excellent account on bamboos of the Malay Peninsula in 1958 (166). His work is now basic to the region and its adjacent countries, such as Indonesia. Some years earlier he published a suggested new classification of bamboos differing from that of Munro and that of Gamble (adopted from Bentham). His classification is based mainly on the structure of the ovary. Holtum's classification was supported by Grosser and Liese (112) working on wood anatomy of the Asiatic bamboos. However, they did not propose any formal classification.

It seems that by employing different structures, for example fruit structure of Munro's and ovary structure of Holtum's, one can arrive at different conclusions.

Although McClure (244, 246) did not propose any new formal bamboo classification, his suggestions on using all parts of vegetative characters and of flower structure have been accepted both for identifying bamboo species and in classifying the bamboos. Unfortunately until now a formal classification on bamboos based on several characters has not been published.

Bamboo Genera in the Indo-Malesian Region

The 20 genera recognized in this paper are adopted from various authors; they are Gamble (104, India, Sri Lanka, and Burma; 105, Philippines), Merrill (253), Backer (25, Java), Holtum (166, Malay Peninsula; 165, New Guinea), Lin (221, Thailand), and McClure (244, 246).

I have included a short description of each genus based either on other authors' descriptions or on my personal field observations and study of the herbarium specimens.

It is already known that in bamboos there are two types of root system (244): pachymorph and leptomorph. Nearly all native bamboos in the Indo-Malesian Region have pachymorph rhizome. There are also principally two types of spikelets in bamboos: the ordinary, typical grass spikelet and the so-called pseudospikelet. The former consists of glumes (two or more), one or more florets, each with a lemma, a palea, stamens, an ovary, and lodicules (if present). The spikelets are usually borne in a panicle or in raceme. The latter was introduced by McClure (247) to separate it from the true spikelet because it consists of a true spikelet, one or more lateral branch buds below the true spikelet, and a prophyll at the base. The pseudospikelets are borne in lateral branches or in a special flowering branch of up to 3 m long. The true spikelet is found in five genera occurring in the Indo-Malesian Region, *Arundinaria*, *Racemobambos*, *Nastus*, *Yushania*, *Thamnocalamus*, and the pseudospikelet is found in the other 15 genera.

I have arranged the genera on the basis of the two types of spikelet together with their natural relationships; for example the genera that are related to each other are put one after another. A checklist of species of each genus (except *Arundinaria* and *Dinorchloa*) is also given under the genus concerned. The number of species in each genus is preliminary, because it is expected that there are still many undescribed bamboo species in places like Burma, Indochina, Palawan, Luzon, Mindanao, Borneo, Sumatra, Sulawesi, the Moluccas, etc.

***Arundinaria* Michaux**

Arundinaria is a bamboo genus of temperate countries in Asia (Japan, China, Korea, the Himalayas, the northern part of Indochina) and Madagascar. The genus was described in 1803 by Michaux. Since then, the number of species has increased enormously. There are about 480 published names, but many of them have now been put into other genera, for example *Yushania*, *Thamnocalamus*, *Sasa*, *Indocalamus*, etc. Many *Arundinaria* species were introduced to Europe, North America, and in the mountains of the tropics.

***Yushania* Keng**

Yushania is a small genus found in Taiwan and in Luzon (Philippines). The genus was described based on *Arundinaria niitakayamensis* from Taiwan, which differs from the typical *Arundinaria* species in having two stigmas in its flower. *Y. niitakayamensis* is also found in Luzon. This genus is very little known, even though botanists have recognized it as a distinct genus from *Arundinaria*. More intensive investigation of this genus is needed. There is a possibility that some species of other genera related to *Arundinaria*, such as *Racemobambos*, belong to *Yushania*.

***Racemobambos* Holttum**

The genus *Racemobambos* is confined to Malesia, especially Malaya, North Borneo, Ceram, and New Guinea and its surrounding islands, and is found only in montane forest. There are about 10 species in the genus, and each species has a limited distribution. The use of this bamboo is not known. The species of *Racemobambos* are scrambling or scandent bamboos. In the field they can be recognized by their thin-walled culms and the many branches in each culm node. The spikelet has three glumes and more than one floret. The species are *R. ceramica* Ceram (Indonesia); *R. congesta* New Guinea; *R. gibbsiae* Mt. Kinabalu, Borneo (Malaysia); *R. glabra* Sarawak, Sabah (Malaysia); *R. hirsuta* Mt. Kinabalu (Malaysia), not certain; *R. hirta* New Guinea; *R. multiramosa* New Guinea; *R. raynallii* New Guinea; *R. rigidifolia* Sabah (Malaysia), not certain; *R. schultzei* New Guinea; *R. setifera* Malay Peninsula; and *R. tessellata* Mt. Kinabalu (Malaysia), not certain.

***Nastus* Nees**

The genus *Nastus* is found mainly in the southern hemisphere from Madagascar to Solomon Islands. In Malesia, there are about 11 species, each of them having a very limited distribution and being found only in the montane vegetation.

The vegetative parts resemble those of *Racemobambos*, so it is rather difficult to separate them without flowers. *Nastus* has one floret with several glumes in the spikelet. The only species found in Java, *N. elegantissimus*, is found in a small area in West Java. It is used for poles for the drying of tobacco leaves by local people. The species are *N. elatus* New Guinea; *N. elegantissimus* Java; *N. holttumianus* New Guinea; *N. hooglandii* New Guinea; *N. longispicula* New Guinea; *N. obtusus* New Guinea; *N. productus* New Guinea, Solomon Islands; *N. reholttumianus* Flores (Lesser Sunda Islands); *N. rudimentifer* New Guinea; *N. schlechteri* New Guinea; and *N. schmidtzii* Flores (Lesser Sunda Islands).

***Thamnocalamus* Munro**

Thamnocalamus is a genus of temperate climates in Asia. Two species are

found in the Himalayas. *T. spathiflorus* was introduced to Europe as an ornamental plant. The species of this genus were included in the genus *Arundinaria*. The genus differs from *Arundinaria* in having many branches of the same level and size in each node. The species are *T. aristatus* Himalaya; and *T. spathiflorus* Himalaya.

***Bambusa* Schreb.**

With the exception of *B. vulgaris*, *Bambusa* was confined to Asia until McClure (246) transferred the genus *Guadua* of tropical America to *Bambusa*. There are about 30 species of *Bambusa* in tropical Asia. Many of them are among the most useful plants. The species are diverse vegetatively and in flowering behaviour, but they share a similar structure in having a many-flowered spikelet. It seems that there are two groups of species of *Bambusa* in Asia. The first group includes species that have long internodes and a thin-walled culm and are found usually in the mountains. They flower all the time, and they do not die after flowering. The second group consists of species that have shorter internodes and a thick-walled culm. They grow usually in the lowlands and flower infrequently. Holttum (166) suggested that the first group probably belong to another genus, but they are still retained in the genus *Bambusa*. Further investigation is required.

Two species, *B. arundinacea* and *B. blumeana*, produce excellent pulp for paper making. The species of *Bambusa* are used for building materials, only when there are no other bamboos, such as *Dendrocalamus* or *Gigantochloa*, available.

The species of *Bambusa* can usually be recognized in the field from the culm sheaths; diagnostic characters are the presence of auricles, erect blades, and dark-brown hairs on the sheath. Certain species can be recognized easily, for example by their thorny lower branches, as in *B. arundinacea* and *B. blumeana*, other species by the alternate arrangement of lateral branches along the culm, as in *B. vulgaris*. The species are *B. amahussana* Moluccas; *B. arundinacea* (*B. bambos*) planted or wild in Asia; *B. atra* Moluccas, New Guinea; *B. balcoa* Bangladesh, India, Burma; *B. binghamii* Burma; *B. blumeana* (*B. spinosa*) planted and wild in tropical Asia; *B. brevicephala* New Guinea; *B. brassii* New Guinea; *B. burmanica* Burma, Thailand, Malay Peninsula; *B. cornuta* Luzon, not certain; *B. forbesii* New Guinea; *B. fruticosa* New Guinea; *B. glaucescens* (*B. nana*, *B. multiplex*) ornamental or hedge plant in the tropics; *B. heterostachya* Malay Peninsula; *B. hirsuta* New Guinea; *B. horsfieldii* Java, not certain; *B. klossii* Malay Peninsula; *B. magica* Malay Peninsula; *B. microcephala* New Guinea; *B. montana* Malay Peninsula; *B. pallida* Burma, Thailand; *B. pauciflora* Malay Peninsula; *B. pierreana* Indochina; *B. polymorpha* Burma, India, Bangladesh, Thailand; *B. ridleyi* Malay Peninsula; *B. riparia* New Guinea; *B. solomonensis* Solomon Islands; *B. tulda* India, Bangladesh, Burma; *B. ventricosa* China, introduced in Southeast Asia as an ornamental plant; *B. vulgaris* planted in the tropics; and *B. wrayi* Malay Peninsula, Sabah; etc.

***Gigantochloa* Kurz**

Most species of *Gigantochloa* are useful for local people and are planted for everyday use in villages. The genus is confined to the area from Burma, Indochina to Malay Peninsula and the Philippines. None of the species in Java are native; they are believed to have been introduced from the Asian mainland during the migration of people from the North. Two Javanese species, *G. atter* and *G. verticillata*, are planted widely in Java and have no relatives in the Asian

mainland. It seems there has been selection by humans long ago. The species are usually found in the lowlands. *Gigantochloa* species have culms with relatively thick walls. The culms are usually very durable as compared with those of *Bambusa*. The size of the culm varies from species to species. They can be as large as 20 cm in diameter and as tall as 30 m as in *G. levis* in Sabah. The species with large culms are often confused with another genus, *Dendrocalamus*, whose culms are very often 20 cm in diameter (*D. asper* and *D. giganteus*).

In the field *Gigantochloa* can be recognized by the straight culms, the absence of prominent auricles on the culm sheaths, the long blade of the culm sheath, and the node, which is not swollen. The culms usually have short branches at the node.

There are about nine species altogether in *Gigantochloa*, but the genus needs to be revised. The species of *Gigantochloa* have never been recorded to flower gregariously as in the case of *Bambusa* spp. and *Dendrocalamus* spp., but sometimes all the culms of one or more clumps produce flowers. It is not known whether the plant (or the clump) dies after flowering or only the culms that produce flowers. The species are *G. apus* Java, planted; *G. hasskarliana* Malay Peninsula, Java, planted; *G. latifolia* Malay Peninsula, probably in South Thailand too; *G. levis* Malay Peninsula, Philippines (Luzon), Sabah; *G. ligulata* Malay Peninsula, Thailand; *G. ridleyi* Malay Peninsula; *G. scortechenii* Malay Peninsula; *G. wrayi* Malay Peninsula; and *G. verticillata* Java, planted (including *G. maxima* and *G. robusta*); etc.

***Dendrocalamus* Nees**

There are about 10 species in *Dendrocalamus*, and they are mainly found wild in the lowlands from India to Indochina and the Malay Peninsula. One of them, *D. asper*, is planted everywhere in the archipelago, from the lowlands to about 1000 m in altitude (Toraja, Sulawesi). Its culms are highly prized as building material. It has a thick wall, a diameter up to 20 cm. The shoot of this species is considered one of the best for food.

In the field, the genus can be recognized by its thick-walled culms, swollen nodes, and aerial roots at the lower nodes. The species usually have white or light-brown hairs on the culm sheaths.

One species of the genus, *D. strictus*, is well-known in producing flowers gregariously. The culm is also the source of pulp for paper making. The species are *D. asper* planted everywhere in Southeast Asia; *D. brandisi* India, Thailand, Burma; *D. dumosus* Malay Peninsula; *D. elegans* Malay Peninsula; *D. giganteus* native in Burma, introduced elsewhere in Southeast Asia; *D. hirtellus* Malay Peninsula; *D. membranaceus* India, Thailand, Burma; *D. pendulus* Malay Peninsula; *D. sinuatus* Malay Peninsula; and *D. strictus* India, Burma, Thailand.

***Thyrsostachys* Gamble**

Thyrsostachys is native in Thailand and Burma and consists of about two species. One species, *T. siamensis*, has been introduced to other countries and is now established as an ornamental plant in Malaysia and Indonesia. It has slender, erect culms that have branches only in the upper nodes. In the field it can be recognized by its compact clump with erect, slender culms and its narrow leaf blades. In its native country it is used for basket making, fences, etc.; it is also used as raw material for paper making. The species are *T. oliveri* Burma, Thailand; and *T. siamensis* Burma, Thailand.

***Oxytenanthera* Munro**

Oxytenanthera is an African genus, *O. abyssinica* being widespread in Africa. Eight species in the genus were described from Asia, but the position of these species in the genus is doubtful as discussed by Holttum (1966). He suggested that the Asiatic species of *Oxytenanthera* belong to either *Dendrocalamus* or *Gigantochloa*. An intensive investigation of the genus is required. Most of the Asiatic species are found in the mainland.

***Phyllostachys* Sieb. et Zucc.**

Phyllostachys is a genus of subtropic and temperate regions of Asia, extending to Himalaya, with its centre of distribution in China. Many of the species were introduced to Europe, North America, and the mountains in the tropics such as in Java. Species of this genus are useful bamboos in their native countries, such as in China and in Japan. In the tropics, for example in Java, they are used as an ornamental and hedge plant, and the culms are used for local industry in items for which the strong culms are needed, such as in umbrella handles.

The genus is easily recognized by a combination of various vegetative characters, including straight culms with swollen nodes; furrowed internodes along its entire length, especially above the node bearing a fully developed branch complement; branches typically two in each node; leaf blades with tessellate venation; and culm sheath glabrous, narrowed toward the top. The shape of the internode is so characteristic for the genus that it enables one to recognize the genus from only a piece of dried culm. However, the species are difficult to differentiate. There are about 30 species in the genus; three species were introduced to Java, only one species, *P. aurea*, has established itself in limited areas in Central Java.

***Schizostachyum* Nees**

In the field, *Schizostachyum* is easily recognized by its thin-walled culms (except *S. caudatum* from Sumatra, which has almost solid culms). Almost all species of *Schizostachyum* produce flowers the whole year round. The spikelets are slender, 1–3 cm long. The diameter of the culm varies from species to species; for example *S. brachycladum* has culms with a diameter of about 7 cm, whereas *S. longispiculatum* has culms with a diameter up to 1 cm. The culms are light, yet durable, and easily split. There are about 22 species in the genus, and they are found from Thailand throughout Malesia. Many species are confined to very small areas. Most of the species are found growing wild or spontaneously along roadsides, near villages, or in the forest. This is probably the reason that most *Schizostachyum* species are widely used by local people. The culms are used for making rafts, flooring, roofing, baskets, handicrafts, etc.

Not all species are useful. *S. grande*, found only in the Malay Peninsula, became a smothering weed in the hill dipterocarp forest after the area was logged. The culms are about 6 cm in diameter, have a very thin wall, and are useless.

Some species in the Philippines described under *Schizostachyum* may belong to a different genus. In this listing, they are not included. An investigation of the genus is much needed. Species are *S. aciculare* Malay Peninsula; *S. alopecurus* New Guinea; *S. biflorum* Java; *S. blumei* Sumatra, Java, Borneo, probably Sulawesi; *S. brachycladum* planted or wild in Southeast Asia; *S. brachythyrus* New Guinea; *S. caudatum* Sumatra; *S. gracile* Malay Peninsula; *S. grande* Malay Peninsula; *S. insulare* Malay Peninsula; *S. iraten* Java, not

certain; *S. jaculans* Malay Peninsula, probably Borneo; *S. lima* Philippines, Sulawesi, Moluccas, New Guinea, probably Borneo; *S. longispiculatum* Malay Peninsula, Borneo; *S. lumampao* Luzon; *S. serpentinum* Java, not certain; *S. terminale* Malay Peninsula; *S. whitei* New Guinea; and *S. zollingeri* Malay Peninsula, Java, Sumatra, Sulawesi, and probably Borneo; etc.

***Cephalostachyum* Munro**

Cephalostachyum is a genus of about seven species occurring in the areas between northeast Himalaya, Assam, and Burma to Thailand. They are usually shrubby or arborescent bamboos, with thin-walled culms. One species, *C. pergracile*, has been introduced and planted in the botanic gardens in Singapore and in Bogor (Indonesia).

Holttum (166) suggested that *Cephalostachyum* species should be included in the genus *Schizostachyum* on the basis of the structure of the spikelet. I think it is reasonable to treat *Cephalostachyum* as distinct from *Schizostachyum* until monographic work of each genus is done.

In their native countries *Cephalostachyum* species are useful for basket making. The species are (104) *C. capitatum* Bangladesh, Burma; *C. fuchsianum* Bangladesh, Burma; *C. flavescence* Burma; *C. latifolium* Bangladesh, Burma; *C. pallidum* Bangladesh, Burma; *C. pergracile* Bangladesh, India, Thailand; and *C. virgatum* Burma.

***Teinostachyum* Munro**

Teinostachyum is a small genus of three species occurring in Sri Lanka, India (Assam), Burma, and probably in Indochina. Each of the species has a very limited distribution. As in the case of *Cephalostachyum*, Holttum (166) also suggested that *Teinostachyum* should be included in the genus *Schizostachyum*. In my opinion *Teinostachyum* should be kept separate from *Schizostachyum* until monographic work is done. The species are *T. attenuatum* Sri Lanka; *T. griffithii* Bangladesh, Burma; and *T. wightii* India.

***Neohouzeoua* A. Camus**

Neohouzeoua is also a small genus of about four species occurring in the areas between Assam and the northern part of Indochina. Two of the species were transferred from the genus *Teinostachyum*. *Neohouzeoua* is related to *Schizostachyum* in having thin-walled culms. Little is known about its natural history or its uses. The species are *N. dulloo* Burma, Indochina; *N. helferi* Burma; *N. mekongensis* Indochina; and *N. stricta* Burma.

***Pseudostachyum* Munro**

Pseudostachyum is a monotypic genus found in east Himalaya, Assam, and Upper Burma. *P. polymorphus* is a large shrub and easily recognized by its thin-walled culms and its commonly diseased inflorescences full of galls. Local people use this bamboo for making baskets.

***Melocanna* Trin.**

Melocanna has apparently one species only, *M. baccifera*, which is found in Bangladesh, Assam, and Burma. It has been introduced elsewhere in the tropics. *M. baccifera* is a very interesting bamboo from many points of view. In the areas where it grows, this species is a very useful plant for all purposes, such as building material, basketry, etc. This bamboo produces flowers gregariously and then dies. The fruit is large, sometimes as large as a pear. It has a thick pericarp, no

endosperm, and an embryo with a large scutellum. It germinates when it is still on the parent plant (i.e., it is viviparous).

In the field, this species can be recognized by its open clump and erect culms with intact culm sheaths that have long narrow blades.

***Ochlandra* Thwaites**

Ochlandra is found in Sri Lanka and in southern India. There are about six species in the genus. *Ochlandra* is also an interesting bamboo genus, because all species have relatively large fruits with thick pericarp, such as those of *Melocanna* but smaller, and also a large number of floral parts, especially the stamens (as many as 120 in one floret). Little is known about the natural history of the genus, and more intensive investigation is required. The culms of *O. travancorica*, which is found abundantly in South India, produce good quality fibre for paper and rayon. The species are *O. brandisii* India; *O. rheedii* India; *O. setigera* India; *O. stridula* Sri Lanka; *O. travancorica* India; and *O. wightii* India.

***Dinochloa* Büse**

Dinochloa species are climbing bamboos. There are about 20 species in the genus, found growing in the forests of Thailand and throughout Malesia. Each species has a limited distribution except for *D. scandens*, which is widespread in the western part of Malesia. In the field, the genus is easily recognized by its climbing habit with zigzag culms. Mature culms are strong and are usually used by local people as material for making rough baskets to carry stones. Other uses are not known. In cleared or logged forests, such as in Sabah, *Dinochloa* species can become a very serious weed problem, preventing regeneration of commercial timber.

From a taxonomic point of view, *Dinochloa* is a very interesting genus. The inflorescence is huge, up to 3 m long, leafless, bearing a large number of very small spikelets, and producing a large number of fruits. The fruit has also a thick pericarp, no endosperm, and an embryo with large scutellum. Because *Dinochloa* species are useless economically, little is known of their natural history. At the moment, I am conducting a taxonomic study, and, thus, this listing of species is not complete, including only *D. aguilari* Luzon; *D. maclelandii* India, Burma, Thailand; *D. luconiae* Luzon; *D. pubiramea* Philippines; and *D. scandens* western part of Malesia.

***Melocalamus* Benth**

Melocalamus is monotypic with its species *M. compactiflorus*. It is found growing wild in the mountains from eastern Bangladesh to northwest Thailand. This species is also very interesting. It is related to *Dinochloa*. It has a large fruit with a thick pericarp, no endosperm, and an embryo with large scutellum. It was recorded that the fruits germinate while they are still on the parent plant. Little is known about its natural history.

In the area where this species grows, local people use it for making baskets.

Conclusions and Suggestions

It is already widely understood that researchers working on a particular aspect (anatomy, cytology, cytogenetics, etc.) of a certain plant need the correct botanic name as a point of reference. Local names have to be avoided, for they

often cause much confusion; for example, local names often apply to more than one plant, and they differ from place to place. Botanic or scientific names have precise meaning. An example in bamboos: *Dendrocalamus asper* (synonyms: *Bambusa aspera*, *Dendrocalamus flagellifer*) belongs to the genus *Dendrocalamus*, which has a thick-walled culm of a good quality. This species is found planted throughout Indonesia and is supposed to be native to Burma. It is called *betung* or *petung* in Java and *bambu Jawa* in North Sulawesi because it is believed to come from Java. *D. asper* produces the best-quality bamboo shoots. *Poring* is a local name of a common bamboo in Sabah. It has culms of variable size, 10–20 cm in diameter and up to 30 m tall. It was identified as *D. asper* because of its size. However, anyone wishing to invest in this bamboo as a source of good bamboo shoots for export would be disappointed. Careful study of its morphology showed *poring* to be a species of *Gigantochloa*, *G. levis*, which has culms with thinner walls and poorer shoots than those of *D. asper*. Another example: “Malaysian bamboo” is used as a name for a bamboo species introduced into Africa as a tool for harvesting the fruit of oil-palm plantations. Actually there are more than a dozen bamboos native to Malaysia, so no one knows which species the “Malaysian bamboo” is. For this reason cooperation between taxonomists and others is required.

An inventory of bamboo species should be carried out in each country in Southeast Asia. For this purpose herbarium collections of bamboos are needed. If there is no botanist in a particular area, then the material should be sent to an institution where a bamboo taxonomist works or where a good collection of bamboos with correct botanic names is available for identification (Appendix).

The inventory can be extended to a systematic study (including revision) on a particular group of bamboos. As with many flowering plants, bamboo must be studied in the field so that it can be studied as a living material. This work or study can be done intensively by local botanists who have plenty of opportunities to see bamboos in the field. However, international cooperation should be regarded as a part of this study. In any systematic or taxonomic study, type specimens of the plants and early literature should be consulted. Many earlier botanists specializing in Indo-Malesian bamboos worked at the Royal Botanic Gardens, Kew (U.K.), so that most of the type specimens are deposited there. Furthermore, earlier foresters in the east sent bamboo material to Kew either to be named or to expand the general collection. It is suggested that any botanist who wishes to work on the systematics of Asiatic bamboos, especially from India, consult the Kew collections.

From the taxonomic point of view, bamboos present many interesting problems. At present, I am working on the delimitation of each Indo-Malesian genus, but such work depends very much on field observations that cannot be done at Kew. In some cases, however, a good collection of bamboo plants with complete field notes and a photograph of the plant (Appendix) can be very helpful in this work. Again international cooperation is needed.

In the modern concept of plant taxonomy (78), all aspects of investigation are employed in plant classification, including anatomy, cytology, phytochemistry, physiology, embryology, and ecology. Classification of grasses (excluding bamboos) is a good example of this modern concept and should be extended to bamboos. Wood anatomy, leaf anatomy, and embryo of many bamboos have already been investigated. Any information on all these aspects would be welcome and would be very useful for future bamboo classification.

Inventory work can be carried out in conjunction with ethnobotanic work; the result could be practical, local guides to bamboo identification and uses.