

Diversity, distribution pattern and use of bamboos in Meghalaya

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Abstract: Of the 35 bamboo species recorded from Meghalaya, 32 (91.4%) species under 9 genera are sympodial type and only three (8.6%) species under two genera are monopodial type. Four of these species are endemic to North-East India. A maximum number of 22 bamboo species were found in tropical forests (0-900 m a.s.l.), followed by 19 species in subtropical forests (900-1200 m a.s.l.) and 18 species in temperate forests (1200-2000 m a.s.l.). Twelve (34.3%) species have been described as wild, three (8.6%) species as cultivated, four (11.4%) species as planted and 16 (45.7%) as both cultivated and wild. Fifteen species reported earlier could not be located during the present survey. This has been attributed to taxonomic ambiguity and redefinition of the State political boundary. A survey on the uses of bamboo revealed that 14 bamboo species are edible, 11 species are used as raw material for paper, pulp and rayon, 21 species are used for construction, scaffolding, flooring, walling, roofing and fencing, 24 species for agricultural implements, handicrafts, matting and basketry, four species for other uses such as sports goods, musical instruments and five species as ornamentals. The most commonly used species are *Bambusa balcooa*, *B. bambos*, *B. cacharensis*, *B. jaintiana*, *B. nutans*, *B. tulda*, *Dendrocalamus hamiltonii*, *D. hookeri*, *D. sikkimensis*, *D. strictus*, *Melocanna baccifera*, *Schizostachyum dullooa* and *S. manni*.

Key words: Bamboo diversity, altitudinal distribution, uses, Meghalaya.

INTRODUCTION

Bamboos occur naturally in all the continents except Europe and Antarctica. They occur between the latitudinal range of 46°N and 47°S and altitudinal range of 0-4000 m a.s.l. covering tropical, subtropical, temperate and alpine regions (Dransfield, 1992). Bamboos often constitute a separate forest sub-type or occur as brakes (Champion and Seth, 1968). According to Ohrnberger (1999), the subfamily Bambusoideae of the family Poaceae comprises 1,575 species of woody and herbaceous bamboos. The bamboos distributed over 70 genera cover an area of 14 million ha worldwide (Dransfield and Widjaja, 1995). About 80 per cent of the species are confined to China, India and Myanmar and are found in 7 million ha of bamboo forests (Perez *et al.*, 1999, Zhengyi *et al.*, 2006; Newman *et al.*, 2007). The first comprehensive work on the bamboos of India, Myanmar and Malaya was a monograph prepared by Gamble (1896), and Blatter (1929) updated the information on Indian bamboos later. Additional treatments on bamboos of North-East India were prepared by Bor (1938, 1940).

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Bamboos of Meghalaya have received very little attention by the workers in the past. Only a few sporadic works have been published (Naithani, 2007, 2008)..

Most bamboo species of Meghalaya, particularly the lesser known ones have not been studied in terms of distribution, utility pattern and conservation status in natural forests. The present study aims at providing a comprehensive account on distribution, diversity and uses of bamboos of Meghalaya following a thorough literature and extensive field surveys.

STUDY AREA

The study has been conducted in Meghalaya, which lies between 25° 47' and 20° 10'N latitudes and 89° 45 and 92° 47 E longitudes in North-East India and covers an area of 22,429 km². The topography of the State is undulating with an elevational range between 50-1980 m a.s.l. The climate of the area is monsoonic with distinct warm-wet (May-October) and cold-dry (November-February) seasons. About 90 per cent of the rainfall occurs during the period May-September. Temperature varies from place to place depending on aspect and altitude. The average monthly temperature ranged from 33°C to 14°C at lower altitudes and 26°C to 8°C at higher altitudes.

METHODS

Field visits for documenting the distribution of bamboo species were undertaken in seven districts of Meghalaya viz., East Khasi Hills, West Khasi Hills, Jaintia Hills, Ri-Bhoi, East Garo Hills, West Garo Hills and South Garo Hills districts during 2005-2007. The bamboos were put under three distribution classes, viz., tropical (occurring between 0-900 m a.s.l. range), subtropical (900-1200 m a.s.l.), and temperate forests (between 1200-2000 m a.s.l.). The local people were interviewed for documenting the utilization of bamboos in their day-to-day life using a structured questionnaire. Bamboo specimens were collected and identified with the help of herbarium at Botanical Survey of India, North-Eastern Circle, Shillong. The voucher specimens have been deposited at the Herbarium in the Department of Botany, North-Eastern Hill University, Shillong.

RESULTS

Bamboo diversity

Thirty five bamboo species, two varieties and one forma under 11 genera were recorded during the field survey conducted throughout the State (Table 1 and Annexure 1). Four species viz., *Bambusa cacharensis*, *Neomicrocalamus mannii*, *N. prainii*, and *Schizostachyum mannii* were endemic to North-East India. Fifteen species viz., *Arundinaria kurzii*, *B. khasiana*, *B. pseudopallida*, *B. teres*, *D. giganteus*, *D.*

Table 1. Genera, species and rhizome types of bamboos found in Meghalaya

Genera	Rhizome type	Species
<i>Bambusa</i>	Sympodial	<i>Bambusa balcooa</i> , <i>B. bambos</i> , <i>B. cacharensis</i> , <i>B. jaintiana</i> , <i>B. multiplex</i> , <i>B. multiplex</i> var. <i>riviereorum</i> , <i>B. nutans</i> , <i>B. pallida</i> , <i>B. polymorpha</i> , <i>B. tulda</i> , <i>B. vulgaris</i> , <i>B. vulgaris</i> var. <i>vittata</i> , <i>B. vulgaris</i> forma <i>waminii</i>
<i>Chimonobambusa</i>	Sympodial	<i>Chimonobambusa callosa</i>
<i>Dendrocalamus</i>	Sympodial	<i>Dendrocalamus hamiltonii</i> , <i>D. hookeri</i> , <i>D. longispathus</i> , <i>D. sahnii</i> , <i>D. sikkimensis</i> , <i>D. strictus</i>
<i>Gigantochloa</i>	Sympodial	<i>Gigantochloa albociliata</i> , <i>G. andamanica</i> , <i>G. macrostachya</i>
<i>Melocalamus</i>	Sympodial	<i>Melocalamus maclellandii</i>
<i>Melocanna</i>	Sympodial (Non clump)	<i>Melocanna baccifera</i>
<i>Neomicrocalamus</i>	Sympodial	<i>Neomicrocalamus mannii</i> , <i>N. prainii</i>
<i>Phyllostachys</i>	Monopodial	<i>Phyllostachys mannii</i> , <i>P. nigra</i>
<i>Pseudosasa</i>	Monopodial	<i>Pseudosasa japonica</i>
<i>Schizostachyum</i>	Sympodial	<i>Schizostachyum dullooa</i> , <i>S. helferi</i> , <i>S. mannii</i> , <i>S. munroi</i> , <i>S. polymorphum</i>
<i>Sinarundinaria</i>	Sympodial	<i>Sinarundinaria falcata</i> , <i>S. hirsuta</i> , <i>S. griffithiana</i>

calostachyus, *Dinochloa compactiflora*, *Gigantochloa kurzii*, *Schizostachyum capitatum* var *decompositum*, *S. griffithii*, *S. pallidum*, *Sinarundinaria hookeriana*, *S. intermedia*, *S. microphylla* and *S. polystachya* reported by earlier workers from Meghalaya were not found during the field survey. Thirty two (91.4%) species under 9 genera were sympodial type and only three (8.6%) species under two genera were monopodial type. Twelve (34.3%) species were wild, three (8.6%) species were cultivated, four (11.4%) species were planted and 16 (45.7%) species were both cultivated and wild (Annexure 1). Twenty-four species were found in East Khasi Hills, 12 species in West Khasi Hills, 23 species in Jaintia Hills, 11 species in Ri-Bhoi, 12 species in East Garo Hills, 14 species in West Garo Hills and 10 species were found from South Garo Hills districts (Table 2).

Distribution pattern

Maximum number of species were found in tropical forests (24), followed by subtropical forests (22) and temperate forests (19) (Table 3). The similarity in species composition was highest between tropical and subtropical forests (69.6%), and lowest between tropical and temperate forests (37.2%) (Table 4). Seven species viz., *Bambusa jaintiana*, *B. pallida*, *B. tulda*, *D. hamiltonii*, *D. hookeri*, *S. helferi* and *S. mannii* had wide altitudinal distribution covering tropical, subtropical and temperate regions. *B. jaintiana*, *D. hookeri* and *S. mannii* were confined to Jaintia and Khasi Hills while *B.*

Table 2. Distribution of bamboo species in seven districts of Meghalaya

Species name	East	West	Jaintia	Ri-Bhoi	East	West	South
	Khasi	Khasi	Hills		Garó	Garó	Garó
	Hills	Hills			Hills	Hills	Hills
<i>Bambusa balcooa</i>			+		+	+	+
<i>B. bambos</i>					+		+
<i>B. cacharensis</i>			+				
<i>B. jaintiana</i>			+				
<i>B. multiplex</i>	+						
<i>B. multiplex</i> var. <i>rivieroerum</i>	+						
<i>B. nutans</i>	+		+			+	
<i>B. pallida</i>	+	+	+	+	+	+	+
<i>B. polymorpha</i>				+			
<i>B. tulda</i>	+	+	+	+	+	+	+
<i>B. vulgaris</i>	+		+			+	+
<i>B. vulgaris</i> var. <i>vittata</i>	+						
<i>B. vulgaris</i> forma <i>waminii</i>				+			
<i>Chimonobambusa callosa</i>	+	+					
<i>Dendrocalamus hamiltonii</i>	+	+	+	+	+	+	+
<i>D. hookeri</i>	+	+	+				
<i>D. longispathus</i>			+		+		
<i>D. sahnii</i>	+						
<i>D. sikkimensis</i>					+	+	+
<i>D. strictus</i>	+		+	+			
<i>Gigantochloa albociliata</i>				+		+	
<i>G. andamanica</i>	+		+			+	
<i>G. macrostachya</i>	+		+		+		
<i>Melocalamus maclellandii</i>				+			
<i>Melocanna baccifera</i>	+	+		+	+	+	+
<i>Neomicrocalamus mannii</i>			+				
<i>N. prainii</i>	+		+				
<i>Phyllostachys mannii</i>	+	+	+	+			
<i>P. nigra</i>	+						
<i>Pseudosasa japonica</i>	+						
<i>Schizostachyum dullooa</i>		+	+	+	+	+	+
<i>S. helferi</i>	+	+	+		+	+	+
<i>S. mannii</i>	+		+				
<i>S. munroi</i>	+		+			+	
<i>S. polymorphum</i>	+		+	+	+		
<i>Sinarundinaria falcata</i>	+	+	+				
<i>S. griffithiana</i>	+	+	+			+	
<i>S. hirsuta</i>	+	+					

balcooa, *B. bambos*, *D. sikkimensis*, were found mainly in Garo Hills. *B. pallida*, *B. tulda*, *D. hamiltonii*, *Melocanna baccifera*, *Schizostachyum dullooa* and *S. helferi* had a wide range of distribution almost throughout the State.

Table 4. Sorensen's similarity (%) matrix for bamboo species in different forest types of Meghalaya

Forest type	Tropical	Subtropical	Temperate
Tropical	100.0	69.6	37.2
Subtropical	69.6	100.0	68.3
Temperate	37.2	68.3	100.0

Uses of bamboo

Of the total 35 bamboo species, 11 species are used as raw material for paper, pulp and rayon, 21 species are used for construction, scaffolding, flooring, walling, roofing and fencing; 24 species for agricultural implements, handicrafts, matting and basketry, four species for other minor uses such as for sports goods, musical instruments and five species as ornamentals. (Fig.1 and Annexure 2). The most commonly used species are *B. balcooa*, *B. bambos*, *B. cacharensis*, *B. jaintiana*, *B. nutans*, *B. tulda*, *D.*

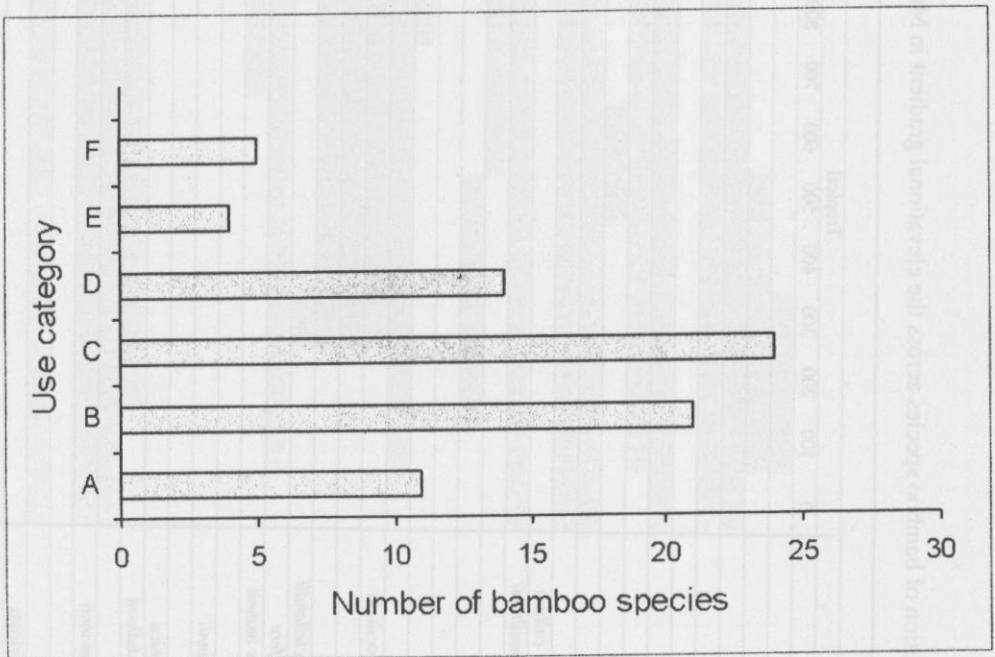


Figure 1. Utility pattern of different bamboo species in Meghalaya. (A- Raw material for paper, pulp and rayon industry; B- Construction, scaffolding, flooring, walling, roofing, fencing; C- Agricultural implements, handicrafts, matting, basketry; D- Common edible bamboo shoots; E- Sports goods, musical instruments; and F- Ornamentals)

hamiltonii, *D. hookeri*, *D. sikkimensis*, *D. strictus*, *Melocanna baccifera*, *Schizostachyum dullooa* and *S. mannii*. Fourteen bamboo species are edible, of which only three species viz., *B. balcooa*, *D. hamiltonii* and *M. baccifera* are widely used.

DISCUSSION

A review on the bamboo species occurring in India and North-East India revealed highly variable figures. About 125 bamboo species under 23 genera occur in India (Tewari, 1992; Varmah and Bahadur, 1980) with an estimated bamboo area of 3-10 million ha (Biswas, 1988; Fu and Banik, 1995). Similarly, about 78 species belonging to 19 genera occur in North-Eastern region (Biswas, 1988, Hore, 1998). A total of 26-44 species of bamboo under 9-11 genera with four varieties and 1 forma have been reported from Meghalaya by earlier workers (Gamble, 1896; Tewari, 1992; Shukla, 1996; Seethalakshmi and Kumar, 1998; Naithani, 2007). Naithani (2007) recorded two new species and one variety viz., *Bambusa balpakramii* Naithani, *Bambusa meghalayeana* Naithani and *Melocanna baccifera* var. *gigantea*. According to the latest nomenclature, *Arundinaria khasiana* and *A. suberecta* have been merged under *Sinarundinaria falcata* (Naithani et. al., 2006). Therefore, the variability in number of bamboo species occurring in a particular State or geographical region may be attributed more to the ambiguity in taxonomic classification such as change, reallocation or renaming of the reported species rather discovery of new species. During our study, 15 species reported earlier from Assam/Meghalaya could not be located. A detailed re-evaluation and analysis of these species indicate that most of these species were either synonyms or results of taxonomic ambiguity. Most of the studies cited above pertain to the period of undivided Assam, except Naithani (2007), who has also not reported any of these species. Hence, it may be safely concluded that the total number of bamboo species in Meghalaya should be around 35.

CONCLUSION

The study reveals that our understanding on at least 25 bamboo species of Meghalaya, particularly those lesser-known species and the species with conservational importance is extremely poor. Some of these are, species of *Arundinaria*, *Chimonobambusa*, *Schizostachyum*, *Sinarundinaria*, *Neomicrocalamus* and all the four endemic species mentioned earlier. Investigations to document their distributional range, population size in the wild, propagation techniques, growth behavior and management need to be taken up for their commercial exploitation and conservation.

Most uses of bamboos in Meghalaya continue to be traditional and therefore, bamboo as a commodity remains low-paying. The value addition efforts for the bamboos of Meghalaya need to be accelerated to make the bamboo sector an important contributor to the State's economy. Management strategy for all the species should be developed on a priority basis and proper management needs to be ensured for their development.

Bamboo-dominated ecosystems need to be identified, assessed and monitored to ensure that measures are taken to protect the bamboo habitats of the State. Mass propagation of endemic species need to be taken up for introduction into the field to ensure their continued existence. An integrated programme involving effective utilisation, mass production and cultivation, and conservation of taxonomically important bamboo species need to be launched in the State on a priority basis.

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Annexure 1. Bamboo species of Meghalaya and their distribution

Species	Vernacular name	Worldwide distribution	Distribution in Meghalaya
<i>B. balcooa</i> Roxb.	Beru, Borua, Wannah (Garo)	Australia, Bangladesh, Laos, Nepal, South Africa, India: Arunachal Pradesh, Assam, Bihar, Dehradun (FRI), Kerala, Manipur, Meghalaya, Nagaland, Orissa, Tripura, Uttar Pradesh, West Bengal	East Garo Hills: Jengal; Jaintia Hills: Umkiang; West Garo Hills: Ampati, Garobada, Modinagar, Rongram; South Garo Hills: Barengapara, Chambalgi
<i>B. bambos</i> (Linn.) Voss	Wahkanteh (Garo)	Bangladesh, Indonesia, Laos, Malaya, Malaysia, Myanmar, Nepal, Southern China, Sri Lanka, Thailand, West Indies, Vietnam, India: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Dehradun, Goa, Jammu and Kashmir, Karnataka, Konkan, Madhya Pradesh, Manipur, Maharashtra, Meghalaya, Mizoram, Orissa, Punjab, Rajasthan, West Bengal, Tamil Nadu	East Garo Hills: Bhalughat, Mahendraganj range, Rongrenggiri; South Garo Hills: Angratoli Reserved Forest
<i>B. cacharensis</i> Majumdar	Ba (Jaintia)	India: Assam, Manipur, Meghalaya, Tripura	Jaintia Hills: Amdoh, Badarpur, Bob Nongkhen, Bob Rangtilla, Damchara, Dawki, Lakroh, Pasadwar, Muktapur, Pdengskab, Pyrtakuna, Ratachera, Riahjalong, Sonapyrdi, Syndai, Twahusdiah, Umkiang, Umlari

<i>Bambusa jaintiana</i> Majumdar	Kolongki, Wathesa, Wathibok (Garo), Thengrangrai, Thning (Jaintia), U Skhen (Khasi, Jaintia)	Myanmar, India: Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Tripura, Sikkim	Jaintia Hills: Amdoh, Badarpur, Bob Nongkhen, Bob Rangtilla, Cheruphi, Damchara, Dawki, Diengshynrum, Ialong, Jarain, Jowai, Khliehriat, Lakroh, Leshka, Lumshnong, Muktapur, Muswang, Mynkre, Nartiang, Pambuh, Pasadwar, Pdengskab, Phramer, Pynthor Langtein, Pyrtakuna, Ratachera, Riahjalong, Shken Talang, Sonapyrdi, Syndai, Tongseng, Twahusdiah, Umkiang, Umlari, Umsalang, Umsyiem, Wahiajer, Wapung
<i>B. multiplex</i> (Lour.) Raeusch. ex J.A. and J.H. Schults		Bangladesh, Europe, Indo-China, Indonesia, Iraq, Japan, Laos, Malaya, Malaysia, Myanmar, Pakistan, Soviet Union, Sri Lanka, India: Arunachal Pradesh, Assam, Bihar, Dehradun (FRI), Maharashtra, Manipur, Meghalaya, Nagaland, Tamil Nadu, Tripura, West Bengal (IBG, Howrah)	East Khasi Hills: Ward's Lake Shillong
<i>B. multiplex</i> var. <i>rivieroerum</i> (R. Maire) Chiang and Fung		China, Indonesia, Thailand, India: Meghalaya	East Khasi Hills: Ward's Lake Shillong
<i>B. nutans</i> Wall. ex Munro	Seringjai (Khasi)	Bangladesh, Laos, Thailand, India: Arunachal Pradesh, Assam, Bihar, Dehradun (FRI), Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tripura, West Bengal	East Khasi Hills: Nongshken, Pynursla, Shella, Tangmang, Umkrem; Jaintia Hills: Dawki, Riahjalong; West Garo Hills: Samphalgi
<i>B. pallida</i> Munro	Wago (Garo), U Shken (Khasi)	Bangladesh, Bhutan, China, Laos, Myanmar, Thailand, India: Arunachal Pradesh, Assam, Dehradun (FRI), Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tripura, West Bengal	East Khasi Hills: Mawmluh, Pynursla, Shillong, Upper Shillong, Tangmang; East Garo Hills: Jaintia Hills: Jowai, Syndai hills, Umtohpoh; Ri-Bhoi: Arpnewmer, Erpakon, Lasharai, Nongkhyllam, Nongpoh, Patharkhmah, Umling, Umran, Umroi, Umsning, Umling; West Garo Hills: West Khasi Hills: Mawdoh, Mawrusyiar, Nongshiliang, Nongshram, Nongriat, Rambrai, Shalang, Umsaw; South Garo Hills

<i>B. polymorpha</i> Munro		Bangladesh, China, Laos, Myanmar, Thailand, India: Arunachal Pradesh, Assam, Manipur, Dehradun (FRI), Madhya Pradesh, Karnataka, Kerala, Tamil Nadu, Tripura, West Bengal	Ri Bhoi: Umsaw, Quinine
<i>B. tulda</i> Roxb.	Wati (Garo), Thengrangai (Jaintia), Rnai (Khasi)	Bangladesh, China, Costa Rica, Indonesia, Laos, Myanmar, Thailand, Vietnam, India: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Madhya Pradesh, Dehradun (FRI), Karnataka, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tripura, Uttar Pradesh, West Bengal	East Khasi Hills: Barapani, Pynursla, Nongshken, Nohwet, Tangmang, Mawshun, Mawsynram, Pomshutia, Pongtung, Shella, Shillong, Umniuh, Upper Shillong; East Garo Hills: Jaintia Hills: Amdoh, Badarpur, Bob-Nongkhen, Bob-Rangtilla, Damchara, Dawki-Jarain, Lakroh, Muktapur, Pasadwar, Pdengskab, Pyrtakuna, Ratachera, Riahjalong, Sonapyrdi, Syndai, Twahusdiah, Umkiang, Umlari; Ri-Bhoi: Arphewmer, Erpakon, Lailad, Lasharai, Nongkhylllem, Nongpoh, Patharkhmah, Umling, Umran, Umroi, Umsning, Umling; South Garo Hills: Baghmara; West Garo Hills: Tura; West Khasi Hills: Mairang, Mawdoh, Mawkyrwat, Nonglang, Nongshiliang, Nongshram, Nongstoin, Rambrai
<i>B. vulgaris</i> Schrad. ex Wendl.	Wamannah (Garo), Baruba, Shken shilot (Jaintia)	Algeria, Bangladesh, Bourbon, Cape, Central and South America, Dublin (Glasnevin Gardens), Europe, Java, Kew (Royal Botanic Gardens), Laos, Madagascar, Malaya, Mauritius, Mexico, Moluccas, Myanmar, Sri Lanka, Thailand, West Indian Islands, India: Arunachal Pradesh, Assam, Bihar, Dehradun (FRI), Karnataka, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, Madhya Pradesh, Sikkim, Uttar Pradesh, West Bengal	East Khasi Hills: Mawriang, Shella; West Garo Hills: Samphalgiri-Anguri; Jaintia Hills: Dawki, Jowai, Myntdu river, Riahjalong, Ummulong; South Garo Hills: Gulpani area between Baghmara and Balphakram, Phulbari

<i>B. vulgaris</i> var. <i>vittata</i> A. and C Riviere	Siej stem (Khasi)	China, Japan, Philippines, India: Manipur, Meghalaya, Dehradun (FRI)	East Khasi Hills: Ward's Lake, Shillong
<i>B. vulgaris</i> forma <i>waminii</i> Wen		India	Ri-Bhoi: Umsaw, Quinine
<i>Chimonobambusa callosa</i> (Munro) Nakai	U Skong, U Spar (Khasi)	Bhutan, India: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim	East Khasi Hills: Mawphlang, Mawsynram, Nongkrem, Shillong, Swer, Upper Shillong, Weiloi; West Khasi Hills: Mairang
<i>Dendrocalamus hamiltonii</i> Nees and Arn. ex Munro	Wanoke (Garo), Siej heh (Khasi)	Bangladesh, Bhutan, China, Laos, Nepal, Upper Myanmar, Vietnam, India: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Dehradun, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, Uttar Pradesh, West Bengal	East Khasi Hills: Garampani, Nongshken, Pynursla, Tangmang, Shella; Jaintia Hills: Dawki, Jowai, Ladrymbai, Pasadwar, Ratachera, Sonapur, Syndai, Umkiang; East Garo Hills: Duragiri, Rongrenggiri; Ri-Bhoi: Arpewmer, Erpakon, Lasharai, Nongkhylliem, Nongpoh, Patharkhmah, Umbang, Umling, Umran, Umroi, Umsning; South Garo Hills: Baghmara, Bajengdoba, Rangung, Songsak, Williamnagar; West Garo Hills: Salmanpara, Manchor; West Khasi Hills: Domiasiat, Jirang, Mairang, Mawdoh, Mawthylliang, Nongkhlaw, Nonglang, Nongpyndeng, Nongshiliang, Nongshram, Nongstoin, Pambriew, Porla, Pynnohumiong, Rwiang river, Seinduli, Shalang, Sonapahar
<i>D. hookeri</i> Munro	Siej jong, Seij sai, U Ktang (Khasi)	India: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, North-Bengal, Sikkim, Uttar Pradesh, West Bengal (IBG, Howrah)	East Khasi Hills: Upper Shillong, Shillong; Jaintia Hills: Jowai, Raliang; West Khasi Hills: Mairang, Nongstoin, Shalang
<i>D. longispathus</i> Kurz		Bangladesh, Laos, Myanmar, India: Assam, Bihar, Calcutta, Dehradun (FRI), Kerala, Manipur, Meghalaya, Mizoram, Orissa, Tripura, West Bengal	East Garo Hills: Damra; Jaintia Hills: Umkiang
<i>D. sahnii</i> Naithani & Bahadur	Tawang (Khasi)	Tibet, Arunachal Pradesh, Meghalaya	East Khasi Hills: San Mer Upper Shillong;

<i>D. sikkimensis</i> Gamble	Wadah (Garo)	Bhutan, China, Europe, India: Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, West Bengal	East Garo Hills: Darbok, Nokrek, Sasatgiri, Simsang river; South Garo Hills: Rangmatgiri; West Garo Hills: Tura Peak
<i>D. strictus</i> (Roxb.)		Bangladesh, Burma, China, Europe, Indonesia, Java, Laos, Malaya, Myanmar, Nepal, North Tanzania, Sri Lanka, Taiwan, Thailand, Uganda (Entebbe Botanic Garden), India: Andhra Pradesh, Assam, Eastern Ghats, Dehradun (FRI), Gujarat, Himachal Pradesh, Karnataka, Madhya Pradesh, Manipur, Maharashtra, Meghalaya, Mizoram, Nagaland, Orissa, Rajasthan, Sikkim, Tripura, Uttar Pradesh, Western Ghats	East Khasi Hills: Umiang; Ri- Bhoi: Nongpoh, Umsaw, Quinine; Jaintia Hills: Umkiang
<i>Gigantochloa</i> <i>albociliata</i> Kurz		Bangladesh, Europe, Indo- China, Laos, Myanmar, Thailand, India: Arunachal Pradesh, Assam, Chhatisgarh, Dehradun (FRI), Meghalaya, Tripura, West Bengal	Ri-Bhoi: Umsaw, Quinine West Garo Hills: Rongram
<i>G. andamanica</i> (Kurz) Kurz	Washut, Wah- thibok (Garo)	Andaman Island, Laos, Myanmar, Malay Peninsula extending to Sumatra and Java, India: Assam, Bihar, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Orissa, Tripura	East Khasi Hills: Mawmluh; Garo Hills: Rongmachakgiri; Jaintia Hills: Near Ioski, Khengsneng-Garampani; West Garo Hills: Danakgiri, Phulbari
<i>G. macrostachya</i> Kurz	Tekserah (Garo), Siej lakar (Khasi)	Myanmar, India: Arunachal Pradesh, Assam, Meghalaya, Mizoram	East Khasi Hills: Nongshken, Tangmang; Jaintia Hills: Dawki; East Garo Hills: Samphalgiri
<i>Melocalamus</i> <i>maclellandii</i> (Munro) Naithani		Bangladesh, Myanmar, India: Arunachal Pradesh, Assam, Dehradun (FRI), Meghalaya	Ri-Bhoi: Umsaw Quinine
<i>M. baccifera</i> (Roxb.) Kurz	Watrai (Garo), Tyrlaw (Khasi), Artem (Mikir)	Bangladesh, China, Florida, Gautemala, Jamaica, Myanmar, Thailand, Singapore, India: Arunachal Pradesh, Assam, Dehradun (FRI), Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, West Bengal	East Khasi Hills: Mawmluh; East Garo Hills: Bajengdoba, Jengjal, Mendal, Samphalgiri, Sugiri; Ri-Bhoi: Nongpoh; West Garo Hills: Garobada, Modinagar, Tura; West Khasi Hills: Nongshram, Shalang; South Garo Hills: Dalu, Gasuapara

<i>Neomicrocalamus mannii</i> (Gamble) Pandey	Bneng (Jaintia)	India: Arunachal Pradesh, Meghalaya, Mizoram, Nagaland	Jaintia Hills: Jarain, Umksiar, Umtru dam site,
<i>N. prainii</i> (Gamble) Keng	U-Spit (Khasi), Tyrpit (Jaintia)	India: Arunachal Pradesh, Assam, Meghalaya, Nagaland, Sikkim	East Khasi Hills: Cherrapunji, Laittyrra, Mawsynram, Sohrarim forest, Umiam valley; Jaintia Hills: Jarain road, Mynkaimanpud
<i>Phyllostachys mannii</i> Gamble	Shken, Siej Naga, Siej Naka, U Spar (Khasi)	Myanmar, China, England, India: Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Sikkim	East Khasi Hills: Cherrapunjee, Mawphlang, Mawrynkneng, Mawsynram, Myllem, Shillong, Smit, Swer, Upper Shillong, Weilo; Jaintia Hills: Jowai, Muswang, Wapung; Ri-Bhoi: Umsning; West Khasi Hills: Mairang, Mawkyrwat, Nongstoin, Nongpyndeng
<i>P. nigra</i> (Lodd. ex Lindl.) Munro		Algeria, America, Australia, China, Europe, Indonesia, Japan, Korea, Marocco, Philippines, Taiwan, U.S.S.R., India: Meghalaya, Sikkim	East Khasi Hills: Ward's Lake, Shillong
<i>Pseudosasa japonica</i> (Sieb. and Zucc. ex Steud.) Makino ex Nakai		Algeria, China, England, France, Indonesia, Japan, Korea, Taiwan, U.S.S.R. India: Arunachal Pradesh, Meghalaya, Sikkim	East Khasi Hills: Ward's Lake, Shillong
<i>Schizostachyum dullooa</i> (Gamble) Majumdar	Wadroo (Garo), Siejla (Khasi), Tarang (Jaintia),	Bangladesh, Hills of Bhutan, Upper Myanmar, Vietnam, India: Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, West Bengal	East Garo Hills: Siju; Jaintia Hills: Umkiang; Ri-Bhoi: Nongkhylllem; West Khasi Hills: Markasa, Nongshiliang, Sohtyngia; West Garo Hills; South Garo Hills: Balphakram
<i>S. helferi</i> (Munro) Majumdar	Wati (Garo), Tuma (Jaintia) Tmar (Khasi)	Myanmar, India: Arunachal Pradesh, Assam, Manipur, Meghalaya	East Khasi Hills: Cherrapunji, Mawsynram, Shella; East Garo Hills: Rongrengiri, Siju; Jaintia Hills: Amdoh, Badarpur, Bob Nongkhen, Bob Rangtilla, Damchara, Dawki, Muktapur, Pasadwar, Pdengskab, Pyrtakuna, Ratachera, Sonapyrdi, Syndai, Tongseng, Twahusdiah, Umkiang, Umlari, Wahiajer; West Garo Hills: West Khasi Hills: Domiasiat; South Garo Hills: Balphakram
<i>S. mannii</i> Majumdar	Serim (Jaintia), Tyra (Khasi)	India: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland	East Khasi Hills: Laittyra, Mawsmi, Shillong Peak; Jaintia Hills: Amdoh, Badarpur, Bob-Nongkhen, Bob-Rangtilla,

			Cheruphi, Damchara, Dawki road, Jowai, Muktapur, Mynkre, Pasadwar, Pdengskab, Pyrtakuna, Ratachera, Rymbein river, Sonapyrdi, Syndai, Twahusdiah, Umkiang, Umlari, Wahiajer; Garo Hills
<i>S. munroi</i> Kumar and Singh	Wati (Garo), Sylli (Khasi, Jaintia)	Bhutan, India: Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim	East Khasi Hills: Cherrapunji, Mawsmi; Mawsynram, Pynursla, Shillong-Dawki road, Syntung; West Garo Hills: Tura; Jaintia Hills: Lumshnong, Mynkaimanpyut
<i>S. polymorphum</i> (Munro) Majumdar	Wachal (Garo), Tyra (Khasi, Jaintia)	Bhutan, Myanmar, Nepal, Vietnam, Yunnan Province of China, India: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, West Bengal	East Khasi Hills: Barapani, Mawkyrnot, Phlangtyngur; Ri-Bhoi: Nongkhylllem Jaintia Hills: Leshka area; East Garo Hills: Balphakram, Siju
<i>Sinarundinaria falcata</i> (Nees) Chao and Renvoize	U Kdait, Namlang (Khasi)	Bhutan, Myanmar, Nepal, Laos, Europe, North and South America, Thailand, Uganda (Entebbe Botanic Garden), India: Arunachal Pradesh, Himachal Pradesh, Kashmir, Manipur, Meghalaya, Mizoram, Sikkim, Uttarakhand, West Bengal	East Khasi Hills: Cherrapunji, Jatah Lakadong, Lad Mawphlang, Mawsmi, Pynursla, Umsaw, Upper Shillong, Shillong, Weiloi; Jaintia Hills: Jowai, Mynkaimanpyud, Myntdu valley; West Khasi Hills: Kynshi river, Lum-Kyllang, Mairang, Mawkrywat, Nongkhnun, Nongstoin, Rangblang, Sohsynniang, Umsaw, Wah Kaji
<i>S. griffithiana</i> (Munro) Chao and Renvoize	Wamana (Garo), Tyrpait (Jaintia), Khnap, Spar (Khasi)	Bhutan, China, Europe, Laos, Myanmar, Tibet, Vietnam, India: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, West Bengal	East Khasi Hills: Cherrapunji, Jatah Lakadong, Langkyrdem, Mawkrynot, Mawmluh forest, Mawphlang, Mawsynram, Nongkhlaw, Phlangtyngur, Pynursla, Smit, Sohra; West Khasi Hills: Mairang, Mawkrywat; Jaintia Hills: Near Syntung, Jowai, Jarain road; West Garo Hills: Nokrek
<i>S. hirsuta</i> (Munro) Chao and Renvoize	U Kdait, U Stewiong, U Stoh (Khasi)	India: Arunachal Pradesh, Meghalaya, Nagaland, Sikkim, West Bengal	East Khasi Hills: Elephant falls, Mawphlang, Mawsynram, Nongkrem, Sohiong forest, Upper Shillong; West Khasi Hills: Mairang

Annexure 2. Taxonomic description and uses of bamboo species found in Meghalaya

Species name	Habitat	Part used	Uses
<i>Bambusa balcooa</i>	Cultivated and wild	Branch, culm, leaf, young shoot	Agricultural implements, construction applications, house roofing, thatching, partition wall, scaffolding, firewood, brooms, winnowing tray, baskets, musical instruments, raw materials for paper and pulp industry; leaves are used as fodder for cattle and goat; young shoots are edible; also grown as hedges.
<i>B. bambos</i>	Cultivated and wild	Culm	Walling, flooring, partition walls, baskets.
<i>B. cacharensis</i>	Cultivated and wild	Branch, culm, leaf, young shoot	Construction applications, house roofing, thatching, partition wall, scaffolding, firewood, baskets; leaves are used as fodder for cattle and goat; young shoots are edible.
<i>B. jaintiana</i>	Cultivated and wild	Branch, culm, leaf, young shoot	Construction applications, house roofing, thatching, partition wall, scaffolding, firewood, baskets; leaves are used as fodder for cattle and goat; young shoots are edible.
<i>B. multiplex</i>	Planted	Culm, leaf	Fencing, grown as hedges.
<i>B. multiplex</i> var. <i>rivieroerum</i>	Planted	Whole plant	Grown as an ornamental plant.
<i>B. nutans</i>	Wild	Culm, leaf, young shoot	Construction applications, making ropes, poles, water pipes, spindle and other local purpose, raw material for paper industry; grown as ornamental species, also used for religious purposes; young shoots edible.
<i>B. pallida</i>	Cultivated and wild	Culm	Supporting material for construction purposes, raw materials for paper and pulp industry, baskets, mats, vessels to store water.
<i>B. polymorpha</i>	Cultivated	Culm	Supporting material for construction purposes, making baskets, mats, grown as an ornamental plant.
<i>B. tulda</i>	Cultivated and wild	Culm, young shoot	Supporting material for construction purposes, thatching, walling, roofing, scaffolding, mats, raw materials for paper, pulp and rayon industry, musical instrument, toys, baskets, food-grain containers, fishing rods, handicrafts, firewood, winnowing fan for rice and food grains; young shoots are edible.

<i>B. vulgaris</i>	Cultivated and wild	Culm, young shoot	Raw material for pulp, paper industry, thatching, walling, roofing, fencing, scaffolding, furniture, animal cages, poles, handicrafts; young shoots are edible.
<i>B. vulgaris</i> var. <i>vittata</i>	Planted	Culm	Grown as an ornamental plant.
<i>B. vulgaris</i> forma <i>waminii</i>	Cultivated	Culm	Grown as an ornamental plant.
<i>Chimonobambusa callosa</i>	Cultivated and wild	Culm, leaf	Fencing, thatching of native houses, musical instruments, smoking pipes, arrows.
<i>Dendrocalamus hamiltonii</i>	Wild	Branch, culm, leaf, young shoot	Raw material for pulp, paper and rayon industry, supporting materials for concrete buildings and bridge construction; roofing, walling, scaffolding, fencing, matting, firewood, agricultural implements, kitchen and cookware components, fishing rods, animal cages and baskets, handloom and handicrafts, poles, water and milk vessels, binding and caning of chairs, floats for timber rafts; branchlets used as tooth brush, bows; young bamboo shoots are edible; leaves used as fodder for cattle and goat.
<i>Dendrocalamus hookeri</i>	Cultivated and wild	Culm, young shoot	Walling, flooring, partition walls, baskets, water storing vessel; young shoots edible.
<i>D. longispathus</i>	Wild	Culm, young shoot	Raw material for pulp, paper industry, thatching, walling, roofing, handicrafts, baskets, tooth picks, food-grain containers; grown as an ornamental plant; young shoots edible.
<i>D. sahnii</i>	Planted	Culm	Walling, fencing.
<i>D. sikkimensis</i>	Cultivated and wild	Culm, young shoot	Raw material for paper and pulp industry, fencing, poles, huts, ropes, boxes, water pipes; young shoots edible.
<i>D. strictus</i>	Cultivated and wild	Branch, culm, leaf, roots	Supporting material for construction purposes, raw material for paper, pulp and rayon industry, furniture, agricultural implements, vessels for holding water, bows and arrows, flooring, roofing, rafters, battens, baskets, walking sticks, branches used as tooth brush; leaves used as fodder for cattle; roots used as brooms and tooth brush; seeds used as food grains.
<i>Gigantochloa albociliata</i>	Cultivated and wild	Culm	Making baskets, fencing.
<i>G. andamanica</i>	Wild	Culm	Building huts and basket work, raw material for paper mills.

<i>G. macrostachya</i>	Cultivated and wild	Culm, young shoot	Baskets, mats; young shoots edible.
<i>Melocalamus maclellandii</i>	Cultivated	Whole plant	Caning of baskets.
<i>Melocanna baccifera</i>	Cultivated and wild	Branch, culm, leaf, rhizome, young shoot	Raw material for paper, pulp and rayon industry, supporting material for concrete building and bridge construction, fencing, thatching, matting, walling, roofing, water pipes, food grain containers, animal cages and feeding baskets, cattle sheds, farm house, musical instruments, handloom and handicrafts, hockey sticks; branches are used as brooms; leaves used as fodder for cattle and goat; young shoots and fruits are edible.
<i>Neomicrocalamus mannii</i>	Wild	Culm	Walling.
<i>N. prainii</i>	Wild	Culm	Basket making.
<i>Phyllostachys mannii</i>	Cultivated	Branch, culm, leaf, young shoot	Fencing, poles, baskets, walking sticks, firewood; branches are used as broom sticks, supporting materials for tendril climber vegetables; leaves are used as fodder for cattle and goat; young shoots edible.
<i>P. nigra</i>	Planted	Whole plant	Grown as an ornamental plant.
<i>Pseudosasa japonica</i>	Planted	Whole plant	Grown as an ornamental plant.
<i>Schizostachyum dullooa</i>	Cultivated and wild	Culm, young shoot	Supporting material for construction purposes, thatching, walling, roofing, handicrafts, water vessel, baskets, mats, boxes to carry pan; young shoots edible.
<i>S. helferi</i>	Wild	Culm	Basket making.
<i>S. mannii</i>	Wild	Culm	Basket making.
<i>S. munroi</i>	Wild	Culm, leaf	Bows and arrows, baskets; leaves used as fodder.
<i>S. polymorphum</i>	Wild	Culm, young shoot	Basket work, tying ceilings, making mats; young shoots edible.
<i>Sinarundinaria falcata</i>	Cultivated and wild	Culm	Walling, flooring, partition walls, fishing rods.
<i>S. griffithiana</i>	Wild	Culm	Tying thatch of native houses.
<i>S. hirsuta</i>	Wild	Culm, leaf	Walling of huts to hold mud plaster, roofing material, temporary partition walls, doors, nursery sheds, fences; young leaves are used as fodder for cattle.