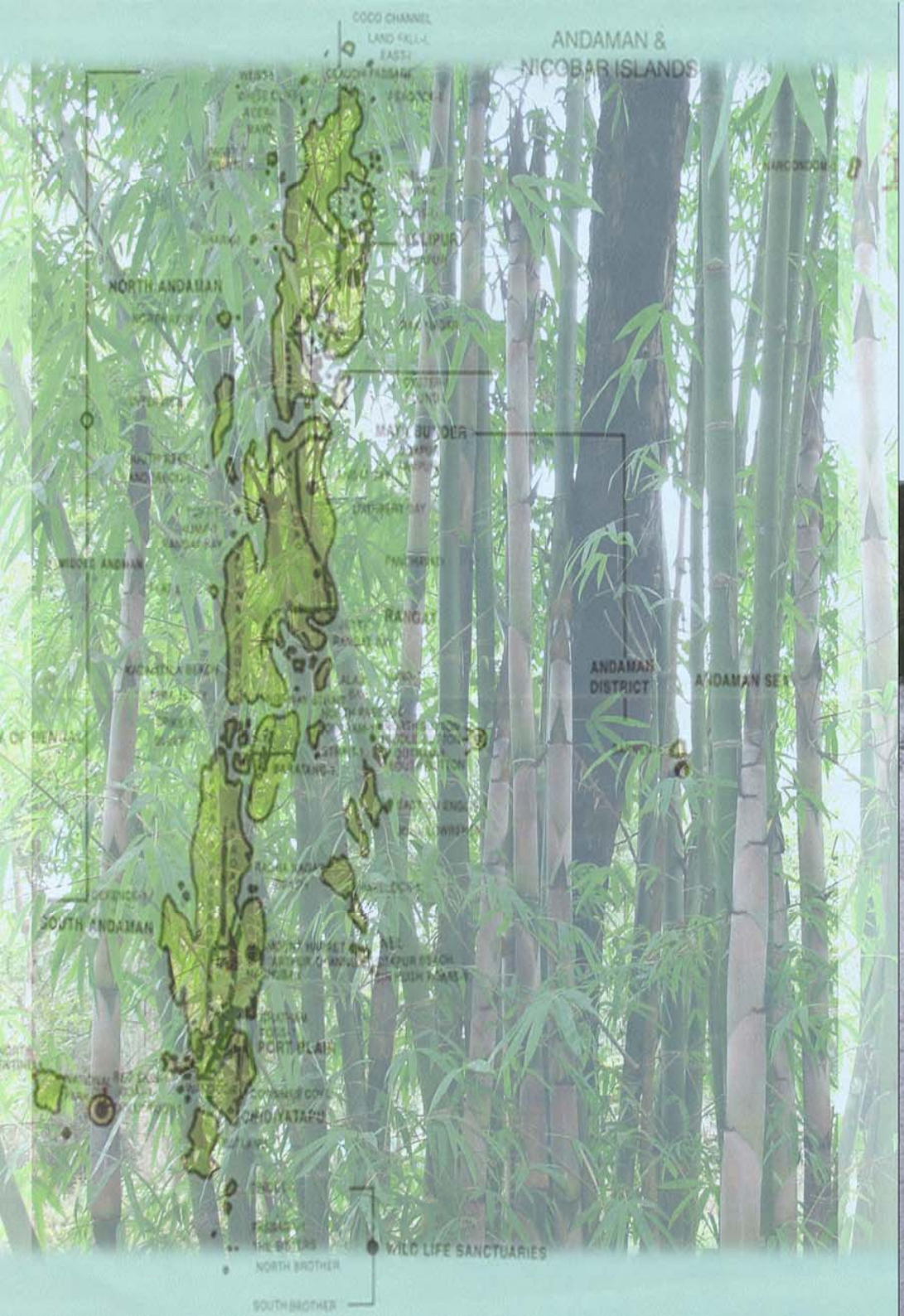

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ALL INDIA COORDINATED PROJECT ON TAXONOMY (AICOPTAX)

GRASSES & BAMBOOS

(Part-1)

PROJECT COMPLETION REPORT

BAMBOOS OF ANDAMAN AND NICOBAR ISLANDS

M.S. Muktesh Kumar

KERALA FOREST RESEARCH INSTITUTE
(An Institution of Kerala State Council for Science, Technology and Environment)
Peechi, 680 653, Kerala

June 2011

ALL INDIA COORDINATED PROJECT ON TAXONOMY **(AICOPTAX)**

GRASSES & BAMBOOS

PROJECT COMPLETION REPORT
(April 2000- March 2011)

BAMBOOS OF ANDAMAN AND NICOBAR ISLANDS

Part-I

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Ministry of Environment & Forests
NEW DELHI

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TAXONOMY OF BAMBOOS

BAMBOOS OF ANDAMAN AND NICOBAR ISLANDS

Final report of the Research Project No. KFRI 358/2000

PART - I

M.S. Muktesh Kumar
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(An Institution of Kerala State Council for Science, Technology and Environment) Peechi 680 653, Kerala

JUNE **2011**

CONTENTS

Project Proposal

Project Title	:	Taxonomy Capacity Building Project on Bamboos
All India Cordinator	:	Dr. V.J. Nair Emeritus Scientist Botanical Survey of India (Southern circle) Coimbatore
Collaborating Institute	:	Kerala Forest Research Institute
Principal Investigator	:	Dr. Muktesh Kumar Forest Botany Department Forest Ecology and Biodiversity Conservation Division

Objectives:

1. Survey, collection, identification and preservation
2. Maintain collection and taxonomic data bank
3. Develop identification manual
4. Train college teachers and students and local communities in para taxonomy

Project Period	:	2000-2011
Budget	:	26.41 Lakhs
Funding Agency	:	Ministry of Environment & Forests Govt. of India, New Delhi

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Abstract

Andaman & Nicobar islands are the largerst archipelago system consisting of 306 islands, over 300 islets and constitute one of the hotspot of biodiversuty. The total geographical area is 8, 249 km^2 with a coastline of 1, 962 km. The northern group of islands, the Andaman group, is 6, 408 km^2 and the Nicobar group is 1, 841km^2. It is seperated from mainland India by almost 1,000 km. There are 3,552 plant species known from these islands. As regards bamboos, not much work has been done because most of the areas are unexplored. The author has made extensive collection of bamboos of both Andaman & Nicobar group. There is high degree of endemism in these islands. In Andaman & Nicobar islands only 8 species belonging to 5 genera are known to occur**.** Five species viz. *Dinochloa nicobariana, Pseudobambusa kurzii, Schizostachyum andamanicum, S. kalpongianum,* and *S. rogersii* are endemic to these islands. Recent report on the occurrence of *Dendrocalamus calostachys, Schizostachyum dulloa* and *S. polymorphum* from the wild is to be re- examined. Probably the said species might have been recently introduced to the Island and cultivated. In the present report description of all the naturally occurring bamboos in Andaman and Nicobar Island is given. The illustrations are provided only for the newly described species. Critical comments or notes have been priovided where ever necessary.

INTRODUCTION

The importance of floristic studies and role of taxonomy in identification of a species hardly needs any justification. For proper utilization of plant resources and their effective conservaton, it is always essential to have floristic inventories of all types of plants from different parts of the country. This becomes imperative particularly after the Convention of Biological Diversity (CBD), which emphasizes the need to document a whole range of organismic diversity, to conserve these bioresources and moniter the efficacy of conservation measures adopted. CBD aims at conservation, sustainable use and the fair and equitable benefits arising from utilization of the genetic resources of biodiversity. A sound taxonomic base is a prerequisite for environmental assessment, ecological resarch, effective conservation, management and sustainable use of biological resources. It has been found that there is an inadequacy of coverage of taxonomic groups. Comparison of distribution of expertise with that of collections and with the number of species in different types of fauna and flora so far recorded from India, shows that there are only a few taxonomists to adequately handle the less studied group of organisms as well as other specialised groups.

Therefore, to bridge this gap, both in terms of our knowledge on the diversity and distribution of hitherto neglected group of organisms where, only a few specialists are available in the country and to develop capacity in taxonomy of these groups an All India Coordinated Project on Taxonomy (AICOPTAX) was initiated, under the Ministry of Environment and Forests, New Delhi (MoEF) in the year 2000. Accordingly, a coordinating unit at Botanical Survey of India (BSI), Southern Circle, Coimbatore, to work on Grasses and Bamboos, under the leadership of Dr. V.J. Nair, Emeritus Scientist and two collaborating units, one at Botanical Survey of India, Kolkota under the leadership of Dr. Paramjit Singh to work on Bamboos of North East India and another unit at Kerala Forest Research Institute, Peechi, Kerala, under my Investigatorship to work on Bamboos of Andaman & Nicobar Islands and Peninsular India were identified.

Area Profile

Andaman and Nicobar Islands are the largest archipelago system in the Bay of Bengal, consisting of 306 islands and 206 rocks and rocky outcrops and are latitudinally situtated between 6^0 45' N to13^0 41' N and longitudinally between 92^0 12' E to 93^0 57' E. The total geographical area is 8, 249 km^2 with a coastline of 1, 962 km. The northern group of islands, the Andaman group, is 6, 408 km^2 and the Nicobar group is 1, 841km^2 (Fig.1.). This large archipelago is separated from mainland India by almost 1000 km: the nearest landmass in the north is Myanmar, roughly 280 km north of Landfall Island, the northern most island in the Andaman Group. The closest landmass to the Great Ncobar Island is Sumatra, 145 km south. The Great Andaman Group of islands is made up of North, Middle and South Andaman Islands, with Baratang Island situtated between Middle and South Andaman Islands . Ritchie's Archipelago, a group of islands, is located east of Middle Andaman and Labyrinth group of islands is situated southwest of South Andaman. Rutland lies southeast of South Andaman and Little Andaman island 55 km soouth of South Andaman, across the Duncan passage. The land area of 6408 km^2 of the Andaman Group constitutes almost 90% (5629 km^2), as reserve or protected forest of which 36% is Tribal Reserve. The elevation in the Andamans ranges between 0- 732 m, Saddle Peak in North Andaman Island being the highest (Jayaraj and Andrews, 2005).

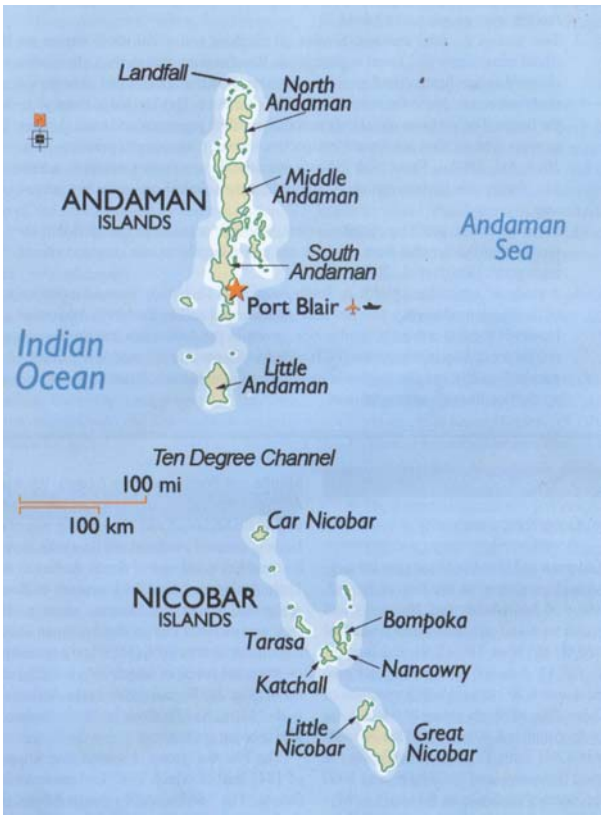

Fig. 1. Andaman and Nicobar Islands

The Nicobar group is spread over an area of 1,841 km^2 of which 1,542 km^2 are recorded as forests. The Nicobars are separated from the Andamans by the 10^0 channel, a wide gap of 160 km with heavy tidal flows, making sea transport by small boats difficult. The Nicobars consist of 24 islands in three distinct clusters of which 12 are inhabited with 170 villages and hamlets. The northern group consists of Car Nicobar and Batti Malv and the central or the Nancowry Group, consist of Tillanchong, Chora, Teressa, Bompoka, Trinket, Kamorta, Katchal, and Nancowry. The southern group consist of the two large islands Little and Great Nicobar, together with Pigeon, Megapode, Kondul, Pilo Milom menchal, treis, Trak and Meroe Islands. The entire Nicobar is a Tribal Reserve and has four Sancturies, three of which are islands. An area of 885 km^2 in Great Nicobar Island is designated as the Great Nicobar Biosphere Reserve and two other areas within it as National Parks; Great Niccobar Island also has the highest peak in the Nicobar Group, Mount Thullier that is 670 m in height (Pande, et al, 1991; Das, 2001; Andrews and Sankaran, 2002).

Climate

The Andaman and Nicobar archipelago is situated in the equatorial belt and is exposed to marine influences and have a tropical climate, warm, moist and equable. The temperature ranges from 18^0 C to 35^0 C. The proximity of the sea and abundant rainfall prevent extremes of heat and these islands experience both the Northeast and the Southwest monsoons. The southwest monsoon commences during April/May acccompanied by high velocity winds with heavy downpour right through July to September. The northeast monsoon usually commences during October and continue into December. The average annual rainfall ranges from 3, 000 to 3,500 mm and humidity varies from 66 to 85 percent . In some years the Islands experience rains throughout the year. Cyclones occur during the monsoons, accompanied by very strong wind, mainly during May and November and in some years during mid April (Chakravarthy *et al*.,1987).

Vegetation

The insular nature of the territory, physical isolation between the islands and from the neighbouring mainlands through millions of years resulted in the evolution of a rare and distinct flora, which though related to the mainland Indian flora, shows much closer affinity with the Myanmar, Malaysian and Indonesian floras. The rich natural vegetation of the Andaman and Nicobar Islands can be classified as tropical evergreen. The vegetation and floristics based on the proximity of the sea and salinity of the soil, is placed into two types as Littoral and Inland types (Balakrishnan, 1989).

The Andaman group of Islands in the Bay of Bengal is considered as continental Islands with characteristic vegetation. These Islands are unique because of the tropical humid climate and insular nature and considered to be one of the 12 biogeographical zones of India (Nayar, 1996). Due to their physical geography and climatic conditions the area is not easily approachable for the scientific expeditions. Hence the floristic studies of these Islands are in three stages viz. fully explored, underexplored and unexplored.

Species Diversity

These islands are one of the national wealthy forest regions enriched with a variety of flora, structuring from tall canopy trees to the underground herb forming distinct layers or synusiae. The flora shows affinities towards the Burmese and Malaysian type (Hajra *et al.*, 1999) and the isolated island ecosystem nature favoured these forests in maintaining high endemism, rarity and flora distinct from the neighbouring land. Due to the inaccessibility in approaching these islands as well as due to the presence of primitive tribes, much study was not carried out earlier in these areas related to phytodiversity. However, in the recent past considerable floristic and ecological studies (Balakrishnan and Rao, 1983; Ananda and Chakraborti, 1987; Dagar, 1989; Dagar and Singh, 1999; Pradeep, 1998; Hitendra *et al*., 2004; Roy *et al.*,2005; Prasad *et. al*., 2007; 2008; Reddy *et al*. 2008) were initiated to reveal the species richness and diversity of these islands.

Andaman and Nicobar Islands (ANI) constitute one of the hotspots of biodiversity. Floristicaly, the Andaman and Nicobar Islands show elements from Indo-Chineese and Indo- Malayan and 3,552 plant species have so far been reported. Currently 40 plant

species have been found to be localized, not known from more than one locality (Kumar and Remesh, 2000a).

Eighty five species are recorded as rare, endangered and threatened, and the World Conservation Monitoring Centre (WCMC) has classified 365 as threatened (Gabryal *et al*., 2008). Of the 630 species of higher plants in the Red Data Book, 46 species are from these Islands (Andrews *et al.*,2006*).* Over 50 species of plants have been collected only once and never again from these islands and are known only from their type collections (Kumar and Remesh, 2000a). From Andaman Islands 36 species of plants belonging to 17 families are included in the Red Data book (Ahlawat, 2001). With regard to the bamboos of Andaman Islands no serious efforts have been made after Gamble (1896) and Parkinson (1923). Recent explorations by the author and his team, particularly in Andaman Islands have added two new species to Indian bamboo flora (Kumar and Remesh, 2003). Naithani *et al.,* (2008) published a status paper on bamboo and rattan resources of Andaman & Nicobar Islands.

The major significance of ANI is the high level of endemism of plant species. Representing 700 genera belonging to 140 families, about 14% of the angiosperm species are endemic to the islands. Among the non- endemic angiosperms, about 40% are not found in mainland India, but have only extended distribution in South East Asia. (Rao,1996). There are 120 orchid species reported from both island groups, of which eight are listed as rare and endangered. Ellis (1987) reported 120 species of pteridophytic flora belonging to 36 families for both island groups. Awasthi and John (1987) recorded 51 resource potential species from Great Nicobar Islands as having 21 uses and Ellis (1989) reported some more exploitable plant species. Ellis *et al*., (2000) has given the biodiversity-rich sites of the Islands. The studies on the phytodiversity of North andamans revealed that semi evergreen forests have a higly diverse community with high species richness that enhances biological richness in the north Andaman forests (Prasad *et al*., 2007) . The Botanical Survey of India has surveyed nearly 70 per cent of the Island and has brought out two publications (Hajra *et al*., 1999; Sinha *et al*., 1999) on the flora of Andaman & Nicobar Islands. Recently, Narcondum Island, Barren Island, Jarawa areas and grasslands of Nicobar have been surveyed by them (Jayaraj and Choudhury, 2011).

MATERIAL AND METHODS

Botanical explorations were conducted throughout the Islands such as South Andaman, Middle Andaman, and North Andaman and Saddle Peak to assess the diversity of bamboos occurring in this part of the phytogeographic region. Field visits were conducted to several areas of Great Nicobar Islands like, Jhaunala, Laful, Schompenhut, Kophenheat, Little Nicobar, Kachal, Nancowry, Kamrota, Bompoka, Teressa, Chowra and Car Nicobar Islands. Herbarium sheets were prepared using appropriate techniques of the specimens collected from different forest areas. The voucher specimens were deposited in the KFRI herbarium. Critical taxonomic studies were carried out. The herbarium specimens deposited in the major Indian Herbaria like DD, CAL, PBL and MH as well as the Cibachoromes from Kew Herbarium were also consulted. The Grass Flora (Clayton *et al.,* 2006) was also used for confirming the identity of certain species.

RESULTS AND DISCUSSION

History of Bamboo exploration in Andaman Islands

Colonel Munro (1868) in his *Monograph on Bambusaceae* described three species, *Dinochloa tjankorreh, Melocanna kurzii* (Based on *Pseudobambusa kurzii*), and *Oxytenanthera nigrociliata* from Andaman Islands. Kurz (1870a, 1870b) made some critical observations on *Bambusa andamanica* and described a new species *Melocanna kurzii* in his paper entitled “On some new or imperfectly known Indian plants" in *Journal of the Asiatic Society of Bengal*. Kurz (1878) in his *Flora of British Burma* included three bamboos, *Dinochloa andamanica, Gigantochloa andamanica* and *Cephalostachyum schizostachyoides* from Andaman Islands. Subsequently, Gamble (1896) in his *Bambuseae of British India* described four species of bamboos namely *Pseudobambusa kurzii , Bambusa lineata, Dinochloa tjankorreh* var. *andamanica* and *Oxytenanthera nigrociliata* from Andamans. Besides this, Brandis (1906) in his *Indian Trees* described a new species under the genus *Schizostachyum* viz. *Schizostachyum rogersii* based on the specimen collected by C.G.L. Rogers.

During the study of the forests flora of Andaman Islands C.E. Parkinson (1923) mentioned five species of bamboos namely, *Pseudobambusa kurzii , Bambusa lineata, Dinochloa andamanica, Oxytenanthera nigrociliata* and *Schizostachyum rogersii* from Andaman Islands.

Bamboo diversity and distribution

The main types of vegetation are Andaman giant evergreen, Andaman semi- evergreen, Andaman moist deciduous, Andaman hill-top stunted evergreen littoral forests, Mangrove forests and Andaman tropical evergreen forests (Nayar, 1996). Bamboos of Andaman Islands are distributed mainly in Andaman semi evergreen and Andaman hill top stunted evergreen littoral forests. Some of the major bamboo growing areas under different Forest Divisions are: Kalipur, Kalara, Kalighat, Nischintapur, Nabagram, Radhanagar, Gandhinagar, Stanagar, Kishorinagar (Diglipur); Tugapur, Karmatang, Austin, Bajota, Pathartikry (Mayabunder); Rampur, Thoratang, Bakultala, Kalsi, Kadamtala (Middle Andaman); Kalpong, Bikentikri, Saddle peak (North Andaman); Loojig, Adjig, Jarw creek, Wrafter creek (Baratang) and Jirkatang, Potatang, Pymanallah, Shoal Bay, Rutland, Chidya Tapu, Mount Harriot (South Andaman).

Bamboos are found almost as pure patches or mixed with other timber species. The species *Gigantochloa andamanica* is commonly found, as bamboo brakes associated with Andaman moist deciduous forests. *Dinochloa scandens* var. *andamanica* is distributed in the ecotone regions, Andaman giant evergreen forests and Andaman tropical evergreen forests or intermingled with trees of Andaman semi-evergreen forests. *Neololeba atra* is distributed in the tropical evergreen forests. The genus *Schizostachyum* is distributed in the ecotone regions of the Andaman semi-evergreen forests or found as a component of Andaman hilltop stunted evergreen littoral forests.

The stature and form of bamboos of Andaman are the following:

Tree form-These forms include tall bamboos up to 12m with large to medium sized culms and are clump forming with pachymorph rhizomes. The species like *Gigantochloa andamanica* and *Neololeba atra* belong to this category.

Stragglers- are medium sized bamboos up to 10m tall, the tip of the clump arching and sometimes drooping down or some climb on to the adjacent trees and some are bushy. Species like *Schizostachyum rogersii, Schizostachyum andamanicum, Schizostachyum kalpongianum* and *Pseudobambusa kurzii* belong to this group.

True climbers- have thin culms with a zig zag nodal and internodal arrangements which need support of the adjacent trees from their juvenile stage itself. *Dinochloa scandens* var. *andamanica* and *D. nicobariana* are the only climbing bamboos found in the Islands.

Phytogeography and Endemism

Though related to the mainland Indian flora, the bamboo flora of Andaman Groups shows much closer affinity with the Myanmar flora. Bamboo genera like, *Bambusa*, *Shizostachyum* and *Gigantochloa* extend their distribution to Southeast Asia including Myanmar, Thailand, Malaysia and Indonesia. The Andaman and Nicobar Islands stretching from Arakkan-yoma in Myanmar to Sumatra in Indonesia are characterized by a rare and distinct flora although exhibiting phytogeographical affinity with the neighbouring biogeographic zones of Southeast Asian countries and northeast, Western Ghats and Deccan Peninsular biogeographic zones of mainland India by virtue of which the islands constitute a transition zone, phytogeographically (Rao, 1999).

The Andaman Islands are reported to harbour seven species of bamboos under four genera among these except *Neololeba atra* and *Gigantochloa andamanica*, all other species are endemic to these Islands. In Andamans *Neololeba atra* is represented only by a few clumps found distributed in the Rutland Islands of South Andaman alone. However, it is reported that Gabryal, *et al*., (2008) were unable to locate this species at Rutland. Species like *Schizostachyum kalpongianum, Schizostachyum andamanicum* are confined to North Andaman Islands and *Schizostachyum rogersii* is found endemic to Middle Andaman Islands. As in most tropical island flora, the most peculiar feature of the endemic plants is their restricted distribution. Most of the endemics in these islands occur in very limited localities and habitats in small populations. The extreme competition for space and sunlight in a tropical evergreen forest limits the distribution of most species and they can only survive in very small populations in limited areas.

This makes them extremely vulnerable to extinction. Destruction of even a small forest area in these islands may render the endemics living there extinct as they do not occur in other areas, nor do they have any chances for migration.

This is the reason why most of the endemics have been so far collected only from type localities and also many of them have not been recollected for many years even after intensive explorations (Balakrishnan, 1989).

This endemism is due to isolation from mainland Asia (Das, 1999). Considering the size and area of the islands, loss of habitat leading to extinctions will have far greater consequences in terms of the loss of genetic diversity than comparable areas elsewhere. The degree of endemism is very high in these localities. Bamboos that are endemic to Andaman Islands are *Dinochloa scandens* var. *andamanica, Dinochloa nicobariana, Pseudobambusa kurzii , Schizostachyum andamanicum, Schizostachyum kalpongianum* and *Schizostachyum rogersii*. In the ANI the percentage of endemism is found to be 85.7 per cent.

Present Scenario

During the study on Indian bamboos the author could explore, survey and collect all the bamboos occurring in Andaman & Nicobar Islands. The critical studies of these specimens revealed that in addition to the Parkinson's collection two additions were made to bamboos of Andamans (Kumar and Remesh, 2000b). There are two specimens collected from Andaman Islands that are yet to be named, for they are incomplete. Recently, Gabryal, *et al.*, (2008) have reported altogether 20 species of bamboos including the native as well as cultivated ones from Andaman and Nicobar groups of Islands. The list of bamboos occurring in Andaman and Nicobar Islands is given in Table-1.

Table. 1. List of Bamboos occurring in Andaman & Nicobar Islands

Major islands	Species distributed
Great Nicobar Island	*Neololeba atra* (Lindl.)Widjaja, *Dinochloa nicobariana* Majumdar *Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani, *Bambusa bambos*(L.)Voss *Bambusa vulgaris* Schrad. ex Wendl. *Dendrocalamus strictus*(Roxb.) Nees *Dendrocalamus giganteus* Munro
Little Nicobar	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani,
Katchal	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani, *Dinochloa nicobariana* Majumdar *Bambusa vulgaris* Schrad. ex Wendl. *Melocanna baccifera* (Roxb.)Kurz *Dendrocalamus strictus*(Roxb.) Nees *Dendrocalamus giganteus* Munro *Thyrostachys oliveri* Gamble
Nancowry	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani,
Kamorta	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani, *Bambusa bambos*(L.)Voss *Bambusa vulgaris* Schrad. ex Wendl.
Bompoka	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani
Teresa	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani
Chowra	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani
Car Nicobar	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani, *Dinochloa nicobariana* Majumdar *Bambusa bambos*(L.)Voss *Bambusa vulgaris* var.*striata* (Lodd. ex Lindl.)Gamble *Bambusa vulgaris* var.*vittata* A.& C.Riviere *Dendrocalamus giganteus* Munro
Little Andaman	*Gigantochloa andamanica* Kurz *Pseudobambusa kurzii* (Munro)Ohrnb. *Bambusa bambos*(L.)Voss *Bambusa tulda* Roxb. *Bambusa vulgaris* Schrad. ex Wendl. *Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani, *Schizostachyum kalpongianum* M. Kumar & Remesh *Dendrocalamus strictus*(Roxb.) Nees *Dendrocalamus giganteus* Munro
Rutland	*Neololeba atra* (Lindl.)Widjaja, *Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani *Gigantochloa andamanica* Kurz. *Pseudobambusa kurzii* (Munro)Ohrnb.
North Sentinel Islands	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani *Gigantochloa andamanica* Kurz *Pseudobambusa kurzii* (Munro)Ohrnb.

South Andaman	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani, *Gigantochloa andamanica* Kurz. *Pseudobambusa kurzii* (Munro)Ohrnb. *Schizostachyum rogersii* Brandis *Bambusa bambos*(L.)Voss *Bambusa multiplex* (Lour.)Raeus.ex Schult & Schult.f. *Bambusa tulda* Roxb. *Bambusa vulgaris* var.*striata* (Lodd. ex Lindl.)Gamble *Bambusa vulgaris* var.*vittata* A.& C.Riviere *Schizostachyum kalpongianum* M. Kumar& Remesh *Dendrocalamus giganteus* Munro *Dendrocalamus strictus*(Roxb.) Nees *Thyrostachys oliveri* *Meloccana baccifera*(Roxb.)Kurz
Havelock island	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani, *Gigantochloa andamanica* Kurz. *Pseudobambusa kurzii* (Munro)Ohrnb.
Henry Lawrence Island	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani, *Gigantochloa andamanica* Kurz. *Pseudobambusa kurzii* (Munro)Ohrnb.
Middle Andaman	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani, *Gigantochloa andamanica* Kurz *Pseudobambusa kurzii* (Munro)Ohrnb. *Meloccana baccifera* (Roxb.)Kurz *Schizostachyum rogersii* Brandis *Bambusa bambos*(L.)Voss *Bambusa vulgaris* var.*striata* (Lodd. ex Lindl.)Gamble *Bambusa vulgaris* var.*vittata* A.& C.Riviere *Dendrocalamus strictus*(Roxb.) Nees *Dendrocalamus giganteus* Munro *Schizostachyum andamanicum* M. Kumar& Remesh *Schizostachyum kalpongianum* M. Kumar& Remesh *Thyrostachys oliveri* Gamble
North Andaman	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani, *Gigantochloa andamanica* Kurz *Pseudobambusa kurzii* (Munro)Ohrnb. *Schizostachyum andamanicum* M. Kumar& Remesh *Schizostachyum kalpongianum* M. Kumar& Remesh *Schizostachyum rogersii* Brandis *Bambusa bambos*(L.)Voss *Bambusa vulgaris* var.*striata* (Lodd. Ex Lindl.)Gamble *Bambusa vulgaris* var.*vittata* A. & C. Riviere *Dendrocalamus strictus*(Roxb.) Nees *Dendrocalamus giganteus* Munro *Dendrocalamus strictus*(Roxb.) Nees *Thyrostachys oliveri* Gamble
Interview Islands	*Dinochloa scandens* (Bl. ex Nees) O. Ktz. var. *andamanica* (Kurz) Naithani, *Gigantochloa andamanica* Kurz *Pseudobambusa kurzii* (Munro)Ohrnb. *Schizostachyum kalpongianum* M. Kumar & Remesh

TAXONOMIC TREATMENT

Field Identification Keys (Native Bamboos)

a. <u>Key based on Vegetative characters</u>

1a. Culms erect or straggling……..…...2

1b. Culms Zig-zag……..7

2a. Culms erect …….……...…….…….3

2b. Culms straggling……..……5

3a. Culms with pendulous tip, auricle with auricular setae……...4

3b. Culms with erect tip, auricle without setae ..……*Gigantochloa andamanica*

4a. Culm sheath pubescent with appressed hairs, blade as long as the sheath……..……..……..*Neololeba atra*

4b. Culm sheath covered with hairs in chevron pattern, blade short……..…….. *Pseudobambusa kurzii*

5a. Rhizomes short necked, culm sheath with well marked auricle and auricular setae.....6

5b. Rhizome long necked, culm sheath with rudimentary auricle and auricular setae…….…*Schizosytachyum rogersii*

6a. Blade long, auricular setae short, nodes well marked with a spongy nodal ring……...…… *Schizosytachyum andamanicum*

6b. Blade short auricular setae long and coiled, spongy nodal ring absent in nodes……..…… *Schizosytachyum kalpongianum*

7a. Culms zig-zag, leaf sheath glabrous and smooth……..... *Dinochloa scandens* var. *andamanica*

7b. Culms suberect, leaf sheath hairy…….... *Dinochoa nicobariana*

b. <u>Key based on floral characters</u>

1a. Palea keeled ……..2

1b. Palea not keeled ……3

2a. Style short lodicules absent……7

2b. Style long, lodicules present……5

3a. Style with three stigmas ……..…… *Neololeba atra*

3b. Style monostigmatic……4

4a. Filaments free…….. *Pseudobambusa kurzii*

4b. Filaments united……*Gigantochloa andamanica*

5a. Caryopsis with angular projections ……*Schizostachyum kalpongianum*

5b. Caryopsis with smooth surface ……..6

6a. Caryopsis beak slightly bent…….*Schizosytachyum andamanicum*

6b. Caryopsis beak straight…… ….…..…..*Schizosytachyum rogersii*

7a. Bi-fid non-plumose stigma……..*Dinochloa scandens* var. *andamanica*

7b. 3 -fid-plumose stigma……..*Dinochloa nicobariana*

Dinochloa nicobariana Majumdar, Fl. Ind. Enum. Monocot 277.1989; Tewari, Monogr. Bamboo 81. 1992; Seethalakshmi & M. Kumar, The Bamboos of India, a Compendium, 148. 1998; Ohrnberger, The Bamboos of the World, 293. 1999. **Figs.2-3.**

A climbing bamboo. Branches smooth and nodes with a ring formed by the base of fallen sheaths. ***Culms*** green, hairy, scandent over the trees; branchlets numerous from the nodes, slender; nodes marked by prominent nodal rings; internodes up to 30 cm long. ***Culm-sheaths*** green, long, having white dense tomentum, imperfect blade leafy, deciduous, nearly as broad as sheath. ***Leaves*** 5-12 cm long and 0.6-1 cm broad, lanceolate, attenuate to the base with very short petiole, apex setaceous, smooth on both surfaces; midrib narrow, secondary veins 4-5 pairs; leaf sheaths appressed, hairy. ***Inflorescence*** a large compound panicle; spikelets clustered, 0.2-0.4 cm, straw-coloured, one- flowered; empty glumes 2, 2.5-3.5 mm broad, obtuse; flowering glume similar to empty glume, 2.5 mm long; palea long, convolute, 2.5 mm long. ***Stamens*** 6, included, free, acute tip, filament short. ***Ovary*** oval ending in a thick style; stigmas three, plumose. ***Caryopsis*** not known.

This species has been collected in flower for the first time from 16 km, Nicobar during 1993.

World Distribution: India: This species is distributed in Car Nicobar and Great Nicobar (A & N Islands).

Fig.2. *Dinochloa nicobariana*

Specimens examined: INDIA: Nicobar Islands (Katchal), 16th km, Nicobar, sea level, Renuka & Vijayakumar, 7046 (KFRI)., *M. Remesh & A.J. Robi, 26402* (KFRI); *P. Chakravarty,1129* (CAL).

Uses: The long cane like culm is used as rope by the aborigines of the Nicobar.

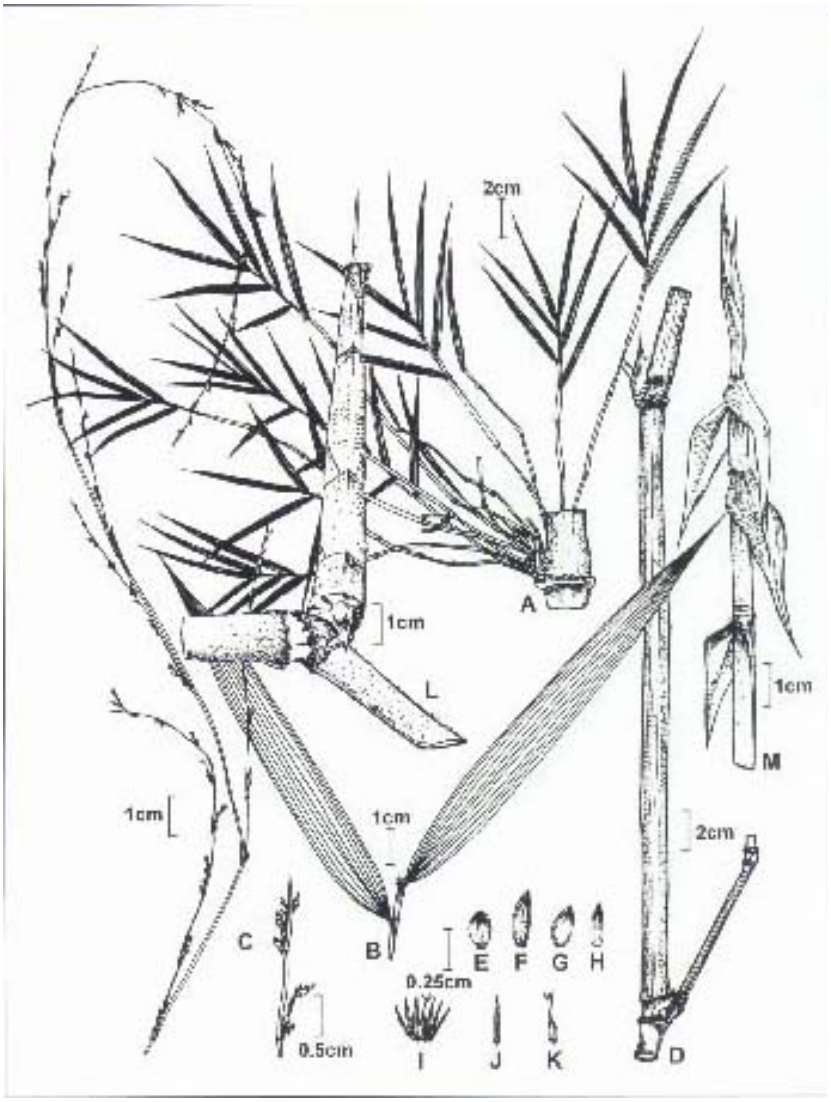

Fig. 3. ***Dinochloa nicobariana*** A. Leafy branchlet with part of culm; B. leaves; C. Flowering branch; D. a portion of culm; E. empty glume; F&G. flowering glumes; H. palea; I. flower with pistil and stamens; J. stamen; K. pistil; L. vegetative shoot arising from the node with juvenile sheaths; M. young shoot with culm-sheath and auricles.

Dinochloa scandens (Bl. ex Nees) O. Ktz. var. ***andamanica*** (Kurz) Naithani, Ind. For. 126(9): 1008. 2000; *Dinochloa andamanica* Kurz, J. Asiat. Soc. Bengal 42(11); 253, 1873; Camus, Les Bambusees 169. 1913; Blatter, Indian For. 55: 602. 1929; Varmah and Bahadur, Indian For. Rec. (n.s) 6(1): 3. 1980; Tewari, Monogr. Bamboo 78. 1992; *Dinochloa tjankorreh* var. *andamanica* (Kurz) Gamble, Ann. Roy. Bot. Gard. Calcutta

Fig.4. *Dinochloa scandens* var. *andamanica*

7: 112-113. 1896; Hook. f., Fl. Brit. India 7: 414. 1897; Seethalakshmi & M. Kumar, The Bamboos of India, a Compendium,142. 1998; Ohrnberger, The Bamboos of the World, 293. 1999. **Fig.4.**

Plants with long, green, glossy, culms. ***Culms*** single, creeping along the ground and rooting at the nodes or climbing over tall trees usually to a height of 35 m; branches geniculate, single as long and stout as the culms; branchlets slender, numerous in whorls hanging with dense foliage; nodes swollen marked by the base of fallen culm sheath; internodes 23-46 cm long, 2.5 cm diameter, walls thin. ***Culm sheaths*** green, less than one fourth of the length of the internodes with a fugacious white bloom; imperfect blade leafy, deciduous, nearly as broad as sheath. ***Leaves*** 23-30 cm long and 5-7.5 cm broad ovate lanceolate, attenuate at the base into a very short petiole, apex setaceous, smooth on both surfaces scabrous on the edges; midrib prominent, transverse veinlets

conspicuous owing to pellucid dots; leaf sheaths appressed hairy when young glabrous when old, ligule broad, truncate, ciliate, fimbriate. ***Inflorescence*** a large compound panicle of spicate thin branches; rachis curved and nodes with a ring. ***Spiklets*** clustered, 2-2.5 mm long, glossy straw coloured, one flowered; empty glume 1 with 1 or 2 smaller glumes at the base below the articulation, broad, obtuse; convolute blunt flowering glume, similar to empty glume; palea round much convolute. ***Stamens*** included; filaments short; anthers with an acute tip. ***Ovary*** oval, ending in a thick style; stigma bifid, non-plumose. ***Caryopsis*** not known.

World Distribution: India: The species is distributed in Andaman and Nicobar Islands. Mostly occur as impenetrable tangled thickets and often climbing on the tall trees.

Specimens examined: INDIA: Andaman Islands, Middle Andaman, way to Panighat, *M. Remesh &Viswakumar 20771*(KFRI); Jarwa creek, (KFRI); Great Nicobar, 8th km, near Military camp, *M. Remesh & A.J. Robi, 20769* (KFRI); Nicobar Islands, 16th km, *Renuka & Vijayakumar, 7046*(KFRI); Little Andaman, *M. Remesh & A.J. Robi, 26414* (KFRI); way to Kakana, *M. Remesh & A.J. Robi, 26409* (KFRI); Nicobar Ils, Katchal, *M. Remesh & A.J. Robi, 26412* (KFRI); Kamorta, *M. Remesh & A.J. Robi, 26411* (KFRI); Mount Harriot NP, *M. Remesh & Viswakumar 20767*(KFRI).

Uses: The long cane like culm is used as rope by the aborigines of the Nicobar.

Notes: Majumdar (1989) treated *Dinochloa andamanica* as synonym of *Dinochloa scandens* . However, *D. andamanica* differes from *D. scandens* by having leaves upto 38 cm long and 5 cm broad; leaf sheaths more ciliate at mouth; ligule more fimbriate and spikelets straw colured. On the basis of these characters Naithani (1993) stated that it is better to treat *D. andamanica* as variety of *D. scandens*. A new combination *Dinochloa scandens* (BI. ex. Nees) O. Ktz. Var *andamanica* (Kurz) Naithani was proposed (Naithani, *et.al*. 2000).The zig-zag culms and the characteristic girdle is unique to the genus *Dinochloa.*

A specimen observed from Chidiya Tapu, had a beautiful purplish colour of the girdle at all the nodal regions and all part of the culms are glabrous and smooth. Since the specimen was sterile unless flowering is seen it can be considered to be *D. scandens* until confirmation?

Gigantochloa andamanica (Kurz) Kurz, Prelim. Rep. For. Veg. Pegu, 1875: App. A p. cxxxvii, App. B p. 93, in key; Kurz, For. Fl. Brit. Burma, 2, 556: 1877; *Bambusa andamanica* Kurz in J. Asiat. Soc. Bengal n.s. 39,2,88. 1870; The Bamboos of the world, Ohrnberger, 252, 1999. **Fig.5.**

An evergreen tufted bamboo. ***Culms*** hollow, 6-9 m high, glaucous-green, sometimes striped; nodes scarcely thickened, hairy; internode 40-50 cm long, lower ones shorter. ***Culm-sheaths*** 10 to 20 cm long, upto 20 cm broad, narrowed upwards, green, densely covered with appressed dark-brown hairs, ciliate on the margins; auricle glossy green, end rounded; imperfect blade shorter than the sheath , sparingly dark-brown bristly above; ligule narrow, entire. ***Leaves*** lanceolate; leaf blades 15-25 cm long , 1-1.5 broad, attenuate or rounded at base, at the base rounded or rarely truncate and contracted in a short 2.5-3.5 cm long acuminate petiole; mid-rib narrow; leaf sheath hairy when young later glabrous on maturity, keeled. ***Inflorescence*** a leafy panicle, the leaves early deciduous with cylindrically linear spikelets; Rachis striate. ***Spikelets*** 1.5-2.5 cm long, linear, sharply subulate, acuminate, straight, marked by conspicuous black fringes to the glumes; 6-7 flowered in dense cluster, fertile flower 2-3; empty glume 2-3, ovate mucronate, ; palea narrow boat shaped, toothed at the apex, minutely pale ciliate along the angle of the back, 2-keeled, minutely bi-fid at the apex, 3-5 nerverd, the outer paleas conspicuously balckish brown, fringed, the lower 3 much shortened and empty; ***Stamens*** exerted, short; anthers purple, 1-1.5 cm long, each ending in a fine setaceous hairy point. ***Ovary*** narrowly ellipsoid, rounded above and terminating in a long style; style undevided, stiff, shortly hirsute; stigma somewhat thickened, white-pilose. ***Caryopsis*** narrow, linear, rounded above and minutely pubescent; style persistent.

Fig.5. *Gigantochloa andamanica*

World Distribution: India: Andaman Islands, Myanmar- Southern part, Pegu,

Specimens examined: INDIA: way to Kausalyanagar, Middle Andaman, *M. Remesh 20785*(KFRI); Little Andaman, 50m, *M. Remesh & A.J. Robi, 26416* (KFRI).

Notes: Widjaja (1987) has observed that *Gigantochloa andamanica* (Kurz) Kurz is not conspecific with *Gigantochloa nigrociliata* (Buse) Kurz.

Neololeba atra (Lindl.)Widjaja, Reinwardtia, 11:114.1997; *Arundarbor tenuis*(Munro)Kuntze Revis. Gen.Pl.2: 761. 1891; *Bambusa atra* Lindl., Penny, Cyclop. 3: 357. (1835) *Type:* Epitype: Ambon, Caju Poeti, Robinson 33, K, L, BO; *Bambusa lineata* Munro, Trans. Linn. Soc. London 26:120. 1868; Gamble, Ann. Roy. Bot. Gard. Calcutta 7:46. 1896. *excl.* specimen of Andaman Islands. *Bambusa rumphiana* Kurz, J. Asiat. Soc. Bengal 39(2): 86. 1870 (excl. Syn. *B. amahussana*), Indian For. 1: 341. 1876; *Dendrocalamus forbesii* Ridl., Journ. Bot. 24: 360 (1886); *Arundunaria coboni* F.M. Baily, Queensland Agic. Jour. 20: 71 (1908), *Gigantochloa novoguineensis* Rendle in Gibbs, Duch NW. New Guinea: 199 (1917), *Bambusa forbesii* (Ridl.) Holttum, Kew Bulletin 21: 271 (1966), Tewari, Monogr. Bamboo 28. 1992;

Seethalakshmi & M. Kumar, The bamboos of India, a compendium, 33. 1998; Ohrnberger, The Bamboos of the world, 253, 1999. **Figs. 6-7.**

A tufted reed like bamboo.***Culms*** 5-8 m tall, 3-4 cm diameter near base; green or dark green or yellowish with green stripes; internodes 40-70 cm long; nodes marked by prominent ring like sheath scar. ***Young shoot*** slender; sheath flame shaped; auricles distinct, ciliate. ***Culm sheaths*** 12-18 cm long, 8-10 cm broad at base, golden brown hairs on back towards base, top truncate; culm sheath ligule dentate, fringed with 5-7 mm long stiff hairs; auricles 1-1.5 cm long, horizontal each side of the blade, with long bristles; blade as long as the sheath, erect, ovate-lanceolate, acuminate, base 5 cm broad and rounded. ***Leaves*** on main culms upto 60 cm x 10 cm broad, dull green above, pale beneath, ovate-lanceolate to linear-lanceolate; auricles with long bristles; ligule with short bristles. ***Inflorescence*** a terminal spike or panicle at the tip of the leafy branchlets bearing clusters of sessile spikelets; rachis rounded, striate. ***Spikelets*** ovate-acute, 1-1.25 cm long, about 5mm broad, much compressed, bearing usually 1-2 basal empty glumes; 10 fertile flowers and a terminal imperfect flower, rachillae short glabrous; empty glumes ovate, long-mucronate; flowering glume similar but longer and white ciliate on the margins; palea a little shorter than the flower; glumes, narrow, 2-keeled; lodicules apparently none. ***Stamens*** exerted, filaments often apparently monadelphous but separable; anthers narrow; connective apiculate. ***Ovary*** oblong whitish, pubescent; stigmas purple, plumose. ***Caryopsis*** with adherent pericarp.

World Distribution: Asia-tropical: Indo-China, Malaysia and Papuasia. Australasia: Australia. Pacific: northwestern. Also occur in the Moluccas, New Guinea and northernSulawesi and the Philippines. Under cultivation in Bogor, (Indonesia), Indian Botanic Gardens, Calcutta, (India), Peradeniya, (Sri Lanka) and Singapore (Dransfield & Widjaja, 1995).

Fig. 6. *Neololeba atra*

Specimen examined: INDIA: Andaman Islands, Rutland, near Ranchi hamlet, (South Andaman), 100m, *M. Remesh & A.J. Robi 20787* (KFRI).

Uses: Culms are used for basketry, handicrafts, building materials and fish traps.

Fig.7. Type specimen- *Bambusa lineata*

Pseudobambusa kurzii (Munro) Ohrnb., Bamboos of the World 4: 19. 1997 (n.v.,fide IPNI); *Melocanna kurzii* Munro in Trans. Linn. Soc. London 26:134. 1868, *Bambusa kurzii* (Munro) N.P. Balakr. in Bull. Bot. Surv. India, 22 (1-4); 176 (1982, "1980"); *Schizostachyum kurzii* (Munro) R.B. Majumdar in S. Karthikeyan *et al*., Fl. Ind. Enum. Monocotyl., 281.1989, Type: *Kurz s.n.* (CAL, holo), S Andaman Isl., Macpherson's Straits; Seethalakshmi & M. Kumar, The bamboos of India, a compendium, 248. 1998. **Figs. 8, 9.**

All the following names are superfluous, being homotypic with *Melocanna kurzii*. No bracketed author, as the basionym is illegitimate.

Bambusa schizostachyoides Kurz [in hb. Ex Munro in Trans. Linn. Soc. London 26: 134. 1868, in syn]; ex Gamble, Ann. Bot. Gard. Calc. 7: 48, t. 44. 1896 ("Bamb. Brit. India"); cited by Gamble in Hook. f., Fl. Brit. India 7: 393. Dec. 1896, nom superfl. ; E.G Camus & A. Camus in Humbert, Fl. Gen. Indochine 7; 603. 1923 (record for S Vietnam); *Teinostachyum schizostachyoides* Kurz in Rep. Veg. Andaman Isl.: 55. Jan-Apr. 1870, cited by Kurz in J. Asiat. Soc. Bengal n.s 39, 2: 89, so later in 1870; nom. superfl., *Cephalostachyum schizostazhyoides* Kurz, Prelim. Rep. For. Veg. Pegu, App. A: 87 App. B. 94, 1875 (n.v., fide IPNI); For. Fl. Brit. Burma 2 : 565. 1877, pro sp. nov., nom. superfl.- *Psedobambusa schizostachyoides* T.Q. Nguyen in Bot. Zhurn. 76(7) : 992. 1991.

Fig. 8 *Pseudobambusa kurzii*

An evergreen, tufted bamboo. ***Culms*** 6-9 m high, 7.5 to 10 cm diameter, green, glossy; nodes not thickened; internodes 45 to 60 cm long, walls very thin; branches 1 to 4 from each node. ***Culm sheaths*** 12 cm long and 10 cm wide, brown in colour; auricle with recurved; sheath blade 5 cm long, covered with microciliate hairs. ***Leaves*** lanceolate to linear- lanceolate, 10 to 17.5 cm long, 1.3 to 3 cm broad, rounded or attenuate below in

to a short 5 mm petiole; above ending in a subulate, twisted, scabrous point; scabrous above along marginal veins and hairy near the base; pale and glabrous beneath; scabrous on one or both edges; main vein shining, conspicuous, secondary 5 to 6, intermediate 5; leaf- sheaths striate, hispid at first, then glabrous, ending abruptly without callus, and furnished with 6 to 10 long, white, twisted , stiff bristles on a long falcate auricle, ciliate at the edges; ligule long. ***Inflorescence*** a terminal panicle, bearing bracteate heads of few spikelets; bracts narrow, smooth truncate or acuminate; rachis truncate, pubescent, joints about 2.5 cm long. ***Spikelets*** smooth, cylindric, 1.3 to 1.4 cm long, bearing 1 to 2 empty glumes, 2 to 3 fertile flowers, then a terminal imperfect one; rachilla short, glabrous; empty glumes ovate, mucronate, many- nerved; flowering glumes similar but longer, 1 cm long, rough, above; palea narrow, 8 mm long, acuminate, membranous, 3- nerved on the back, ciliate on the keels. Lodicules 0 to 3, often absent, when present lanceolate, blunt, 3 to 5 nerved, shortly ciliate, one much larger than the others. ***Stamens*** scarcely exserted; anthers purple, 1 to 1.2 cm long; cells unequal, roughly apiculate. ***Ovary*** stalked, hairy, narrowly elliptic, flattened and somewhat triquetrous, gradually narrowed upwards in to a long style. Style 3-fid; stigmas minutely hairy. ***Caryopsis*** obliquely oblong, nearly 1.2 cm long, smooth, ending in a long stiff beak.

World Distribution: Asia: India (Throughout Andaman Islands), Vietnam (Southern part- Dongnai, Baria) and probably in Thailand (Ohrnberger,1999).

Specimen examined: INDIA: Andaman Islands, Rutland, near Ranchi hamlet, (South Andaman), 100m, *M. Remesh & A.J. Robi 26404* (KFRI); Ramnagar, near Kalighat, (North Andaman), 50m, *M. Remesh & A.J. Robi 26420* (KFRI); Bigendigiri, (North Andaman), *M. Remesh & A.J. Robi 26421*(KFRI); Jirkatang, (South Andaman),), *M. Remesh & A.J. Robi 26408* (KFRI); Chidyatapu, (South Andaman),), *M. Remesh & A.J. Robi 26406* (KFRI); Little Andaman, (South Andaman), 50m, *M. Remesh & A.J. Robi 26415* (KFRI); *Kurz, S* Kew herbarium *K000357959* (K).

Note: While working on the bamboos of Andaman Islands, two bamboos were found to be distinct in their floral characters such as, three flowered spikelet, two keeled palea, three lodicules, six stamens with free filaments, slightly flattened ovary with hairs on the surface,

undivided plumose stigma (stigmatic apex characteristic with the presence of long hairs

which is sometimes branched in appearance). Owing to the above characters these bamboos

Fig. 9. Type specimen - *Bambusa schizostazhyoides* (K)

could not be accommodated under any of the genera like, *Bambusa*, *Dendrocalamus*, *Gigantochloa* or *Spherobambusa*. However, the specimen agrees with the vegetative and floral characters of a monotypic genus *Pseudobambusa* erected by Nguyen (l99l) collected from Burma (including Andaman Islands) and Vietnam. He had proposed a new combination, *Pseudopseudobambusa kurzii* (Kurz) Nguyen, based on *Pseudobambusa kurzii* Kurz. Our specimen differs from *Pseudobambusa kurzii* in having an undivided plumose stigma. Critical and comparative studies of the specimen with the description of Munro (1868), of *Melocanna kurzii* Munro that the stigmatic apex is three lobed, makes our specimen distinct from it, in having a single stigma. In all the subsequent descriptions after Munro (1868), presence of three divided stigmas has been mentioned. Due to the presence of long hairy stigmatic apex, it is likely that there is a misinterpretation of the said taxon in

having three lobed stigmatic apex. The Andaman Islands were formerly considered as a part of British Burma. The supposed occurrence of this species in Burma (Myanmar) is erroneous. Though it is mentioned in Kurz's Forest Flora of Burma, but he there gives as provenance only South Andaman. We feel that we can consider the specimen collected by us, is similar to the one that has been described by Nguyen (l99l). However, the said species need further investigation for its generic and specific delimitations.

Schizostachyum andamanicum M. Kumar & Remesh**,** Blumea 48:187.2003

Type: India, Andaman Islands, Saddle Peak (North Andaman), 150-732 m. *Remesh & Viswakumar, 20780* (holotype-KFRI, isotype-MH, L). **Figs. 10-12.**

A semiscandant sympodial bamboo. ***Culms*** straggling, arching over neighbouring plants and forming large bushes in hill slopes. thin walled, 18-22 cm long, 1.2-1.8 cm in diameter, pale green with purplish tinge when young, yellowish green to golden yellow when mature, clothed with minute silky hairs; internode hollow; nodes somewhat swollen with smooth spongy nodal ring. ***Branch complements*** a cluster of slender subequal branches. ***Young shoot*** greyish green with pale orange to purplish brown tinge. ***Culm sheath*** rigid, 13-16 cm long, at base 4-6 cm wide; at apex 4-5 cm wide, greyish green with purplish orange tinge, clothed by few brown hairs; auricle small elongated, dark brown up to 2 mm high with many long silky white bristles, coiled. ***Culm sheath blade*** linear lanceolate, 5-7 cm long, up to 0.8 cm wide, purplish-brown bearing few bristles near the rounded basal part, inner surface sparsely hairy, hairs silky white, outer glabrous; ligule, up to 2 mm long. ***Leaves*** linear lanceolate, 8-32 x 2.6-4.8 cm, base broadly attenuate, glabrous; leaf sheath glabrous, margin serrulate; auricle small, 1 mm high with few bristles. ***Inflorescence*** indeterminate, terminating in leafy branches. ***Spikelets*** up to 1.2 cm long single flowered, arranged in a group of semi verticillate clusters at each node, thin; lemma membraneous, up to 9 x 4 mm, bearing a rachilla extension at the base; palea membraneous, up to 7 x 5 mm, apex bifurcated; lodicules 3, unequal, 2 large (3 x 2 mm, 3 x 3 mm) and one small (2 x 1 mm), margins and apices toothed. ***Stamens*** 6; filaments free; anthers 2.5-3 mm long, apex obtuse, unequal, with fine hairs. ***Ovary*** slender, glabrous; style flattened up to 1 cm long; stigma 3, unequal, tufted, plumose. ***Caryopsis*** up to 15 x 4 mm, basal part globular, beak slightly bent.

Fig. 10. *Schizostachyum andamanicum*

World Distribution: India- This species occurs in hilltop stunted evergreen forests at an altitude of 350-732 m. and endemic to North Andaman Islands.

Specimen examined: INDIA: Andaman Islands, Saddle Peak (North Andaman), 150-732 m.,; Chidiyatapu, (South Andaman), *M. Remesh & A.J. Robi 26405* (KFRI); Bigendigiri (North Andaman) 50m, *Remesh & Viswakumar, 20777* (KFRI); Ramnagar, Kalighat, (North Andaman) Rutland, South Andaman, *M. Remesh & A.J. Robi 26403* (KFRI); Badakhari, (South Andaman), *M. Remesh & A.J. Robi 26401* (KFRI).

Notes: *Schizostachyum andamanicum* is similar to *S. gracile* (Munro) Holttum, in general appearance and culm sheath structure, but it differs from the latter in having a highly straggling culm, short internodes (up to 20 cm), a well marked nodal line with a spongy ring, short anthers with obtuse apex and a fringe of fine hairs, unequal stigma and caryopsis with a slightly bent beak.

Fig. 11. Type specimen *Schizostachyum andamanicum* (KFRI)

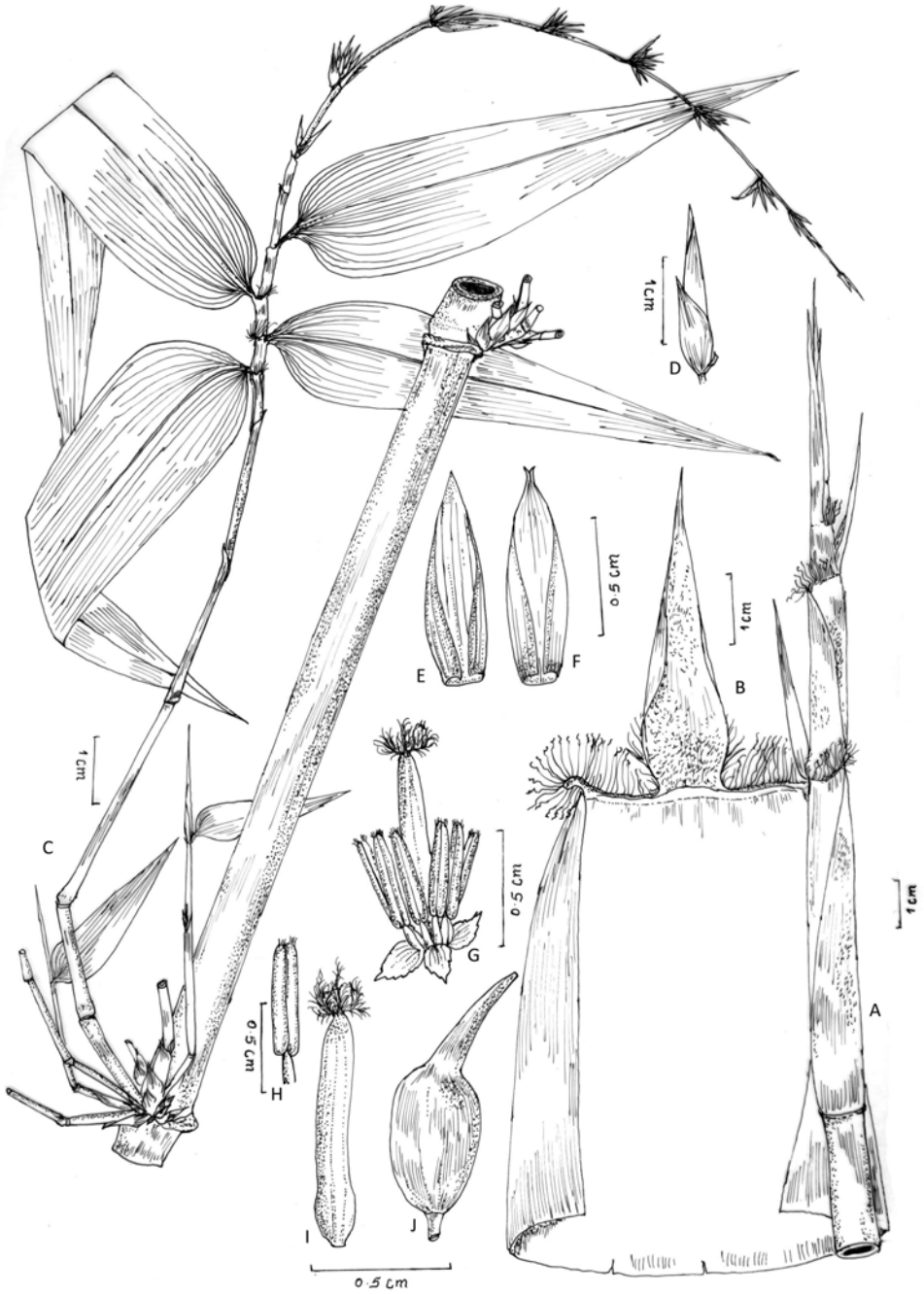

Fig. 12. *Schizostachyum andamanicum* M. Kumar & Remesh A. Young shoot; B. Cul sheath; C. Culm with flowering branch floret; D. Spiklete; E. Lemma; F. Palea; G. Floret with lodicule; H. Stamen; I. Ovary; J. friut

Schizostachyum kalpongianum M. Kumar &Remesh, Blumea 48:189.2003

Type: India, Andaman Islands, North Andaman, Kalpong Damsite, ± 200 m, *M. Kumar & Remesh 20778* (holotype KFRI, isotype - MH, L). **Figs. 13-15.**

Fig. 13 *Schizostachyum kalpongianum*

Straggling sympodial bamboo. ***Culms*** up to 5 m tall, arching over neighbouring trees. ***Internodes*** up to 40-45 cm long, hollow thin walled, 2-2.5 cm in diameter, pale green with brownish hairs when young, becoming dull green and glabrous with white powdery below the nodes. ***Branch complements*** a cluster of slender subequal branches. ***Young shoots*** pale orange red. ***Culm sheaths*** 15-20 cm long, 9-14 cm wide at the base, rigid, orange-red with golden brown to dark brown hairs; auricle conspicuous up to 4 mm high with long bristles, tip coiled up to 2.5-3 cm. ***Culm sheath blade*** 8-12 cm long, 2.5 cm wide near the base, brownish orange, rigid, conical, outer surface glabrous, inner surface with silky white hairs (up to 9 mm), base slightly rounded, 1.6-1.8 cm wide at junction with the sheath; apex acuminate, from the inner side of the blade numerous silky white hairs originated behind the ligule; ligule, short up to 4 mm long, margin wavy. ***Leaves*** linear lanceolate, base broadly attenuate, glabrous on both surface; leaf blade 22-34 x 3.5-5 cm; leaf sheath with appressed white hairs; auricle up to 2 mm long, bearing white bristles. ***Inflorescence*** indeterminate, terminating in leafy branches. ***Spikelets*** a group of semiverticillate clusters at each node, thin 1.2-1.3 cm long, two flowered consisting of a sterile and fertile floret and a rachilla extension of 7-8 mm long, bearing a rudimentary floret (up to 2 mm long); lemma 7 x 4 mm;

Fig. 14. Type specimen *Schizostachyum kalpongianum* (KFRI)

palea 8-9 x 5-6 mm, glabrous, apex fringed with fine hairs; lodicules 3, equal up to 3 x 2 mm, ovate, apex acuminate, margin serrate. ***Stamens*** 6; anthers up to 5 mm long, apex rounded; filaments free. ***Ovary*** tubular, glabrous, 9 mm long; style long, glabrous well marked with stigmatic base; stigma 3, equal, pinkish and highly plumose. ***Caryopsis*** 15-18 x 2-6 mm, ovoid, rounded, basal part with an acute tip, beak surface with angular projections, glabrous.

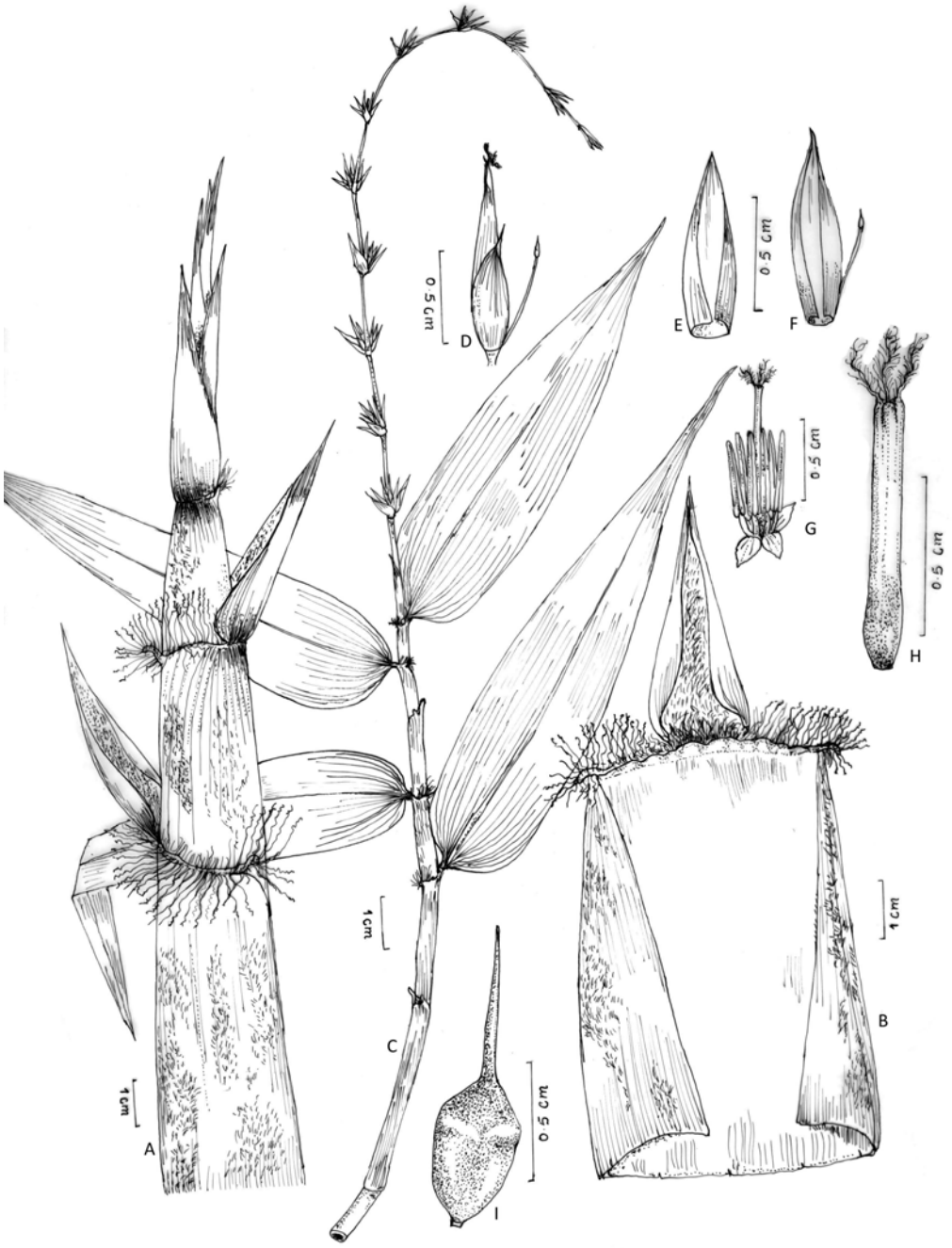

Fig. 15. *Schizostachyum kalpongianum* M. Kumar & Remesh A. Young shoot; B. Culm sheath; C. Flowering twig; D. Spiklete; E. Lemma; F. Palea with rachilla extension; G. Floret with lodicule; H. Ovary; I. Fruit

World distribution: India- Andaman Islands .

Specimen examined: INDIA: Andaman Islands, Kalpong Damsite, (North Andaman) ± 200 m, *M. Kumar & Remesh 20778* (KFRI); Rangath (Middle Andaman), *M. Remesh & A.J. Robi 26418* (KFRI);below Sadle peak, *M. Remesh & Viswakumar 20782* (KFRI); Bigendigiri (North Andaman), *M. Remesh & A.J. Robi 26422* (KFRI).

Uses: The natives of Andaman Islands use this bamboo for making basketteries.

Notes: *Schizostachyum kalpongianum* is similar to *S. gracile* (Munro) Holttum in appearance and nature of culm sheath etc. but it is distinct from the former in having a straggling culm and long internodes (up to 45 cm), characteristic features of culm sheath such as ligule, blade and caryopsis oblong with angular projections. *Schizostachyum kalpongianum* is also closely related to *S. andamanicum* in appearance but differs in having a less straggling culm habit, large culms with long internodes (up to 45 cm), conical blade with silky white to golden brown hairs on the inner surface, a fringe of silky white hairs in between the blade juncture and ligule, equal sized stigma and lodicule, caryopsis with angular projections and a straight beak.

Schizostachyum rogersii Brandis, *Indian Trees* 679. 1906; Camus, Les Bambusees 178. 1913; Parkinson, For. Fl. Andaman Islands 272.1923; Blatter, Indian For. 55: 603.1929; Varmah and Bahadur, Indian For. Rec. (n.s) Bot. 6(1): 4.1980; R.B. Majumdar in S. Karthikeyan *et al.* Fl. Indiae Enum. Monocot.282.1989; Tewari, Monogr. Bamboo. 147.1992; Seethalakshmi and M. Kumar, Bamboo. India Comp. 257.1998; Ohrnberger, Bamboo. World 335.1999.

Type: India, Andaman Islands, Potatang Creek, February 1904. C. Gilbert Rogers Alt. ±40ft., 69 (Lectotype: K selected here). **Figs. 16-17.**

Sympodial bamboo. ***Culms*** straggling, tufted, weak, 3-9 m tall and 0.5-2cm diameter, overarching or supported by trees; walls thin. ***Culm sheaths*** shorter than the internodes, thin, 7.6-10 cm long, hairs very fugacious, base 5-6.3 cm broad, tapering to 2 cm, with 2 small auricles at the apex; ***Culm sheath blade*** narrow, reflexed, as long as the sheath. ***Leaves*** 18-23 cm long and 2.5-3.8 cm broad, fine hairs on the underside, transverse veins prominent, oblique and bent. ***Inflorescence*** a long spike terminating in leafy branchlets, with distant half whorls of spikelets supported by bracts. ***Spikelets*** 1-flowered, glabrous, the fertile 1.2 cm long, the sterile shorter; empty glumes 2-4; palea convolute, minutely 2-dentate, keels distinct; lodicules 3, unequal; ***Stamen*** 6, filaments

free; anthers yellow, obtuse, 4 mm long apex fringed with minute hairs. ***Ovary*** glabrous; style thick, cylindric, hollow; stigmas 3 , plumose. ***Caryopsis*** ellipsoid to ovoid, 15-16 x 2-6 mm, rounded, basal part with an acute tip with a long beak of long persistent style.

Fig. 16 *Schizostachyum rogersii*

World distribution: Andaman Islands of India

Specimens examined: INDIA: Andaman Islands, Middle Andaman, India, Potang Creek, February 1904. Alt. ±40ft., *C. Gilbert Rogers 69* (K); Shaktighat, Bakulthala, Kousalya Nagar Alt. 100m(Middle Andaman), *M.Remesh & Viswakumar 20784* (KFRI); Rani nagar, *M.Remesh & Viswakumar 20783*(KFRI); Jirkatang, (South Andaman),), *M. Remesh & A.J. Robi 26407* (KFRI).

Uses: Great Andamanese use the culms of this species for making arrows and blowpipes.

Notes: *Schizostachyum rogersii*, hitherto not collected after the type collection. C. Gilbert Rogers first collected this species on 05.02.1904, which was subsequently critically studied by Brandis (1906) and published as a new species in Indian Trees in 1906. There is no representative herbarium specimen in any of the Indian herbaria neither at Port Blair (PBL) nor in the Central National Herbarium, Kolkota (CNH). However, a

cibachrome sheet of the type specimen obtained from Kew herbarium is deposited in the National Herbarium

After the type collection no one has relocated this species. The collection of this specimen during the present study from Middle Andamans is hence a rediscovery of this endemic, rare and threatened species from Andamans after a lapse of 96 years.

Fig. 17. Type specimen *Shizostachyum rogersii* (K)

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