

Potential distribution of rattans in Asia-Pacific and Africa

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SUMMARY

This study was designed to produce global overview and regional distribution maps of all rattan species occurring in the Asia-Pacific region (South, Southeast and East Asia, Papua New Guinea and Australia) and Africa. Qualitative data on distribution of rattans were combined with data on existing forest cover. In the course of the study, 610 individual rattan species and subspecies in 13 genera of the sub-family Calamoideae were mapped. The highest figures of potential species richness (92 spp per square km) were recorded in Sarawak, Malaysia.

INTRODUCTION

Despite their economic and social significance, statistics on rattan resources, are very limited. Classified as a "non-timber forest product", rattan is not routinely included in resource inventories. A good, transparent estimate of rattan resources has yet to be developed.

As a first step to improving the information available, the International Network for Bamboo and Rattan (INBAR) and the UNEP World Conservation Monitoring Centre (UNEP-WCMC) have jointly initiated a project to estimate the magnitude and distribution of rattan resources within natural stands. The first stage of the project is to combine information on the distribution of rattan species with the global data on forest cover to determine distribution and estimate the total area of forest containing rattan.

The following information resources were kindly provided as in kind contribution by the Herbarium of the Royal Botanic Gardens Kew:

1. Kew ALICE Palm DB: list of species with general information about distribution on the country level.
2. Kew Palm Specimen DB: list of species that naturally occur in New Guinea with distribution data and elevation range.
3. Kew Herbarium: information about distribution on the provincial level and elevation range.

SCOPE OF THE STUDY AND METHODOLOGY

Rattans are spiny climbing plants from the sub-family Calamoideae, which also includes tree palms such as *Raphia* and *Metroxylon* and shrub palms such as *Salacca*. There are 13 different genera of rattans that include in all some 600 species. Some of the species in fact do not climb, being shrubby palms of the forest undergrowth; nevertheless, reproductive features link them with other species that are climbers, and hence they are included in the rattan genera (Uhl and Dransfield 1987).

With habitats ranging from sea level to over 3,000 m elevation, from equatorial rainforests to monsoon savannahs and the foothills of the Himalayas, there is a huge range of ecological adaptation among rattans. However, rattans are predominantly plants of primary rain and monsoon forest (Dransfield and Manokaran, 1993). Some species may be adapted to growing in secondary habitats, but these are the exception. Furthermore, rattan entering world trade is, overwhelmingly, collected in the wild,

with only a very small proportion coming from cultivated sources. Not all rattans are equally useful. Stem diameter varies enormously from 2-3 mm diameter among the smallest species to 10 cm in exceptionally large species. Within a size class, not all species are of equal quality, some being brittle, others of poor external appearance.

Rattans are distributed in tropical and subtropical areas in the Asia-Pacific region and Africa. No rattans are found growing naturally in other tropical and sub-tropical areas, or in the temperate regions (Table 1).

In the present study 45 countries were identified as potentially containing rattan resources. The project gathered data on 610 species and subspecies in total.

For each species, available information sources such as existing databases and herbarium specimens were searched to acquire data about its distribution. These data were principally political units (country, province, locale), altitudinal range and forest type. They were entered into an Access database containing 11 fields (Table 2) and multiple records for each species (a total of 2053 records). For some species and locations the information available in the bibliographic sources was more detailed than for others: only 60% of records contain information about altitudinal range, while more than 90% of records have data about species distribution on the provincial level.

Initially, the data were stored in an Access table, which was then converted into a DBF file. Only 6 fields of the original data spreadsheet (Table 2) were used to generate individual grids in the Arc View format. For each species listed in the initial table, a single grid (potential distribution) was generated. Individual grids were shaped according to the available information about species natural distribution in political units on the country and province levels and altitudinal range (minimum and maximum altitude). The information about the distribution of existing forest cover provided by UNEP-WCMC was used as a mask to eliminate areas not forested. In cases where there was no information about distribution of a species within the country, the whole country was regarded as a smallest distribution unit. When multiple data on altitudinal range existed for the same species, the broadest range was applied.

Individual grids for each subspecies were merged by corresponding species. Individual grids for each species were sorted and merged by genus. Integration of 610 species in a single grid generated a potential species richness map for the whole distribution area.

Information from the attribute tables associated with the species richness maps was used to calculate the total area potentially containing rattan species and the potential species richness per square km.

Table 1
Distribution and ecology of 13 genera of Calamoideae.

Genus	Number of species	Distribution	Ecology
Calamus	370	All areas	No species in semi-arid habitats. From sea level to 3000 m
Calospatha	1	Malaysia	
Ceratolobus	6	Malay peninsular, Java, Sumatra, Borneo	
Daemonorops	115	From India and south China through the Malay Archipelago to New Guinea	Primary tropical rain forest on great variety of soils
Eremospatha	12	West Africa, Congo Basin, eastward to Tanzania	Rain forest, swampy soil
Korthalsia	26	Sunda Shelf, Indochina, Burma, Andaman Islands, Sulawesi, North Guinea	Lowland and hill tropical rain forest, absent in montane forest
Laccosperma	7	West Africa, Congo basin	Rain forest, swampy soil
Myrialepis	1	Indochina, Burma, Thailand, Peninsular Malaysia, Sumatra	From sea level to 1000 m, prefer disturbed sites in primary forest.
Oncocalamus	5	Equatorial west Africa and the Congo Basin	Lowland tropical rain forest
Plectocomia	16	From Himalayas, south China and Hainan, through Burma and Indochina to the Sunda Shelf and the Philippines	From sea level to 2000 m in the mountains.
Plectocomiopsis	5	South Thailand, Peninsular Malaysia, Sumatra, Borneo	Wide range of forest types, up to 1200 m altitude
Pogonotium	3	Malay Peninsula, Sarawak	700-1000 m altitude, transition between lowland and montane forest
Retispatha	1	Borneo	Hill dipterocarp forest, absent from montane and heath forest

Table 2. Data fields in the Access and GIS databases

Field	Description	Access Database	GIS Database
<i>Genus</i>	Species name at generic rank	All records	Not used
<i>Species</i>	Species name at subgeneric rank	All records	Not used
<i>Name</i>	Unique combination of generic and subgeneric species names	All records	All records
<i>Country</i>	Defined as in the UNEP-WCMC data source	All records	All records
<i>Province</i>	Defined as in the UNEP-WCMC data source	If available	If available
<i>Location</i>	Geographic name other than province	If available	If relevant
<i>Type</i>	Explanation of data in location field	If available	Not used
<i>Almin</i>	Minimum altitude	If available	If available
<i>Almax</i>	Maximum altitude	If available	If available
<i>Direction</i>	Additional information about species distribution, e.g. within a certain forest type	If available	If relevant *
<i>Source</i>	Source of data	All records	Not used

* List of forest types is provided in the Annex 1.

RESULTS

In total, the final regional database covers 610 individual rattan species. The largest national complement of species was for Indonesia, which had 246 described species, followed by Malaysia (205 species) (Table 3).

Each of the 648 generated maps shows the distribution of an individual species or subspecies as it was described in the available information sources and derived from the geographic and forest cover data available at UNEP-WCMC. Due to space limitations individual species distribution maps are not provided in the report.

In addition potential distribution maps were generated for the 13 genera of rattans. The genera range from widely distributed (Calamus, Map 4) to nationally endemic. Most genera were distributed across several countries. Only rattans from the genus Calamus are distributed both in Asia and Africa, others are confined to a single region.

The map of combined rattan species distributions (map 1) shows a total of 7,543,920 km² of forest in the Asia-Pacific region and Africa that potentially contains rattan. More than 57% (4,365,000 km) of the total area of the forest potentially containing rattans has potentially from 1 to 5 species per km² (Chart 1), while potential species richness of more than 46 species per km was recorded for about 436,000 km (less than 6% of the regional total).

The maximum potential species richness, 92 species/ km² , was recorded for a total area of 8,400 in Sarawak, Malaysia. In Africa, the highest potential species richness (up to 15 species per km²) was recorded for a rather small area in Cameroon (Map 3).

Table 3. Number of rattan species in the countries of the Asia-Pacific region and Africa.

Country	Number of species	Country	Number of species
Indonesia	246	Central African Republic	5
Malaysia	205	Gabon	5
Philippines	84	Ivory Coast	5
Brunei	81	Cambodia	4
Thailand	69	Hong Kong	4
India	60	Sierra Leone	4
China	57	Liberia	3
Papua New Guinea	42	Solomon Islands	3
Laos	29	Taiwan	3
Myanmar (Burma)	27	Congo	2
Vietnam	21	Uganda	2
Singapore	18	Burundi	1
Cameroon	17	Fiji	1
Equatorial Guinea	12	Gambia	1
Bangladesh	11	Guinea	1
Nigeria	11	Nepal	1
Sri Lanka	10	Niger	1
Australia	9	Sudan	1
Angola	8	Tanzania	1
Bhutan	7	Togo	1
Ghana	7	Zambia	1
Zaire	7	Zimbabwe	1
Benin	5		
		Species in all countries	611

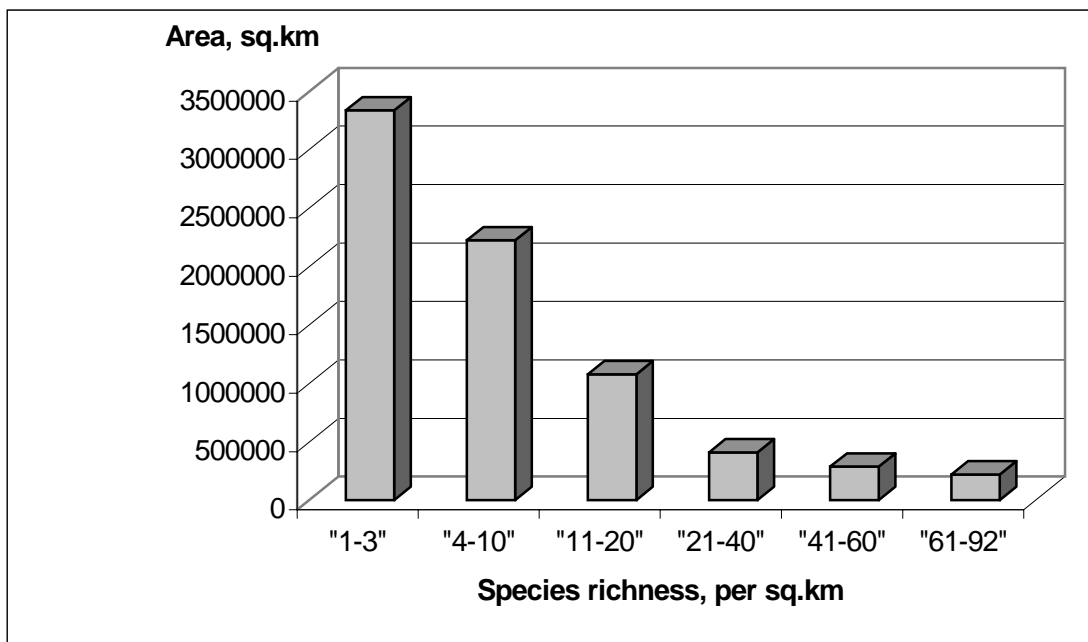


Chart 1. Distribution density of rattan species richness classes.

DISCUSSION

The results of the study should be regarded as a first approximation of distribution of rattan species in natural forests of Asia-Pacific and Africa. Since the study was largely based on the existing sources of data (electronic databases and herbarium specimens) it reflects the present state of knowledge about taxonomy and distribution of rattans in the world.

The results of the study might have several applications:

1. Biodiversity conservation. The threats to rattan come from several sources, among which are decreasing natural forest cover leading to loss of habitat, selective exploitation of stems for the furniture industry and other pressures arising from the expansion of agriculture, including invasive species (Dransfield, 2000). Of the approximately 600 species of rattan, 117 are recorded as being threatened to some degree. While this listing may give some indication of the global threats to rattan species, very few of the listed species are known in any detail. The results of the study might help to locate threatened rattan species, as well as identify potential threats for those species that are not currently recorded as threatened.
2. Resolving taxonomic and nomenclature problems. Most taxonomic studies have been country based. In concentrating on a defined political area, there is a tendency for unidentified species to be described as new local endemics, when they may well be species described and well known in neighbouring areas (Dransfield, 2000). The results of the study, and especially potential species richness maps, may help to identify priority areas for further taxonomic studies.

3. Eco-geographic history of the region. Several rattan species have very restricted distribution areas. This fact can not be explained by current climatic and soil conditions or extent of the existing forest cover. Therefore, eco-geographic history of the area should be taken into account in future studies.
4. Resource quantification. Data available on growing stock of different rattan species in virgin and logged forests (e.g. Mohd Shahwahid and Awang Nor, in print) could be combined with potential species distribution maps, thus giving approximate estimate of total amount of rattan stems for the whole area.
5. Conservation priorities. The results of the study indicate the need to review conservation status and priorities of forest conservation in areas of apparent species richness (Cameroon, Nigeria, Sarawak).

The interpretation of the absolute richness data and the distribution patterns is subject to a number of limitations, including:

- Due to the lack of ecological information and location details in the species descriptions, the boundaries of (sometimes rather large) administrative units were used for species mapping. This resulted in somewhat artificial boundaries of species distributions and in high estimates of species richness per square km.
- Due to the lack of information about species distribution in some countries and inconsistency of taxonomic approach used in different countries rather sharp differences in species richness levels on opposite sides of national boundaries were reflected.
- Due to the time limitations no crosschecks of the results have been done. This has resulted in inadequate reflection of the distributions of some species, especially those reported from more than one country.

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Annex I. Forest types selected for the study (as provided by UNEP-WCMC).

CIFOR codes	Zone	Description	Present in most countries	Present only in 6 countries*
514	TEMPERATE AND BOREAL	Evergreen needleleaf forest	no	yes
515	TEMPERATE AND BOREAL	Deciduous needleleaf forest	no	no
516	TEMPERATE AND BOREAL	Mixed broadleaf/needleleaf forest	no	yes
518	TEMPERATE AND BOREAL	Broadleaf evergreen forest	no	no
512	TEMPERATE AND BOREAL	Deciduous broadleaf forest	no	yes
114	TEMPERATE AND BOREAL	Freshwater swamp forest	no	no
513	TEMPERATE AND BOREAL	Sclerophyllous dry forest	no	yes
931	TEMPERATE AND BOREAL	Disturbed natural forest	no	yes
517	TEMPERATE AND BOREAL	Sparse trees/parkland	no	yes
321	TEMPERATE AND BOREAL	Exotic species plantations	no	no
331	TEMPERATE AND BOREAL	Native species plantations	no	no
341	TEMPERATE AND BOREAL	Unspecified Forest Plantation	no	no
777	TEMPERATE AND BOREAL	Unclassified forest data	no	no
614	TEMPERATE AND BOREAL	Woodland mosaic - principally needleleaf trees	no	no
122	TROPICAL FORESTS	Lowland evergreen broadleaf rain\forest	yes	yes
123	TROPICAL FORESTS	Lower montane forest	yes	yes
121	TROPICAL FORESTS	Upper montane forest	yes	yes
113	TROPICAL FORESTS	Freshwater swamp forest	yes	no
125	TROPICAL FORESTS	Semi-evergreen moist broadleaf forest	yes	yes
421	TROPICAL FORESTS	Mixed needleleaf/broadleaf forest	no	no
510	TROPICAL FORESTS	Needleleaf forest	no	no
111	TROPICAL FORESTS	Mangrove	yes	yes
930	TROPICAL FORESTS	Disturbed natural forest	yes	yes

521	TROPICAL FORESTS	Deciduous/semi-deciduous broadleaf forest	yes	yes
520	TROPICAL FORESTS	Sclerophyllous dry forest	no	no
522	TROPICAL FORESTS	Thorn forest	no	no
523	TROPICAL FORESTS	Sparse trees/parkland	no	yes
320	TROPICAL FORESTS	Exotic species plantations	no	yes
330	TROPICAL FORESTS	Native species plantations	no	no
10	ALL	Water bodies	no	no
888	ALL	Cloud	no	no
999	ALL	No data	no	no
900	ALL	Non-forest landcover	no	no

* Bhutan, China, Nepal, Niger, Singapore, Taiwan. Due to the limitations of the available forest maps additional forest types were selected for these countries.

Annex II.

List of maps:

Map 1. Potential rattan species richness.

Map 2. Potential rattan species richness (Asia).

Map 3. Potential rattan species richness (Africa).

Map 4. Potential distribution of the genus Calamus.