

Full Length Research Paper

# A study of the status and conservation strategies for Rattans in the forests of the Western Ghats of Karnataka, India

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The rattans of Peninsular India belong to only one genus namely *Calamus* and of the 21 species reported here, 20 are from the western Ghats Forests. Of these, the status of *Calamus delessertianus* and *Calamus rheedei* is uncertain and of the remaining 18 species 15 are endemic to the Western Ghats. Among the five states falling within the jurisdiction of the Western Ghats, Karnataka has the maximum number of *Calamus* species (13), of which 11 are endemic to the Western Ghats. Of these, three species namely, *Calamus lacciferus*, *Calamus lakshmanae* and *Calamus prasinus* are restricted only to Karnataka Region of the Western Ghats. Of the 13 species of *Calamus* occurring in Karnataka, 12 are found in Kodagu District. Studies undertaken to determine the status of rattans in some cane rich forests of Kodagu, Dakshina Kannada and Uttara Kannada Districts of Karnataka by belt transect method have revealed that Sampaje, Karike and Makut in Kodagu District, Subramanya and Charmadi in Dakshina Kannada District and Anantavadi (Honnavar) in Uttara Kannada District are rich in some species of rattans including those endemic to the Western Ghats. The population of *C. lakshmanae* (restricted only to Karnataka) is high in Sampaje Forest, *C. prasinus* (restricted only to Karnataka) is high in Karike Forest and *Calamus stoloniferus* (restricted to Karnataka and Maharashtra) is very high in Makut Forest of Kodagu District. In Dakshina Kannada District, *Calamus nagabettai* is well distributed in about 25 km radius around Subramanya, while Charmadi area possesses a rich population of *Calamus thwaitesii* and fairly good representations of *C. prasinus*, *C. pseudotenuis* and *C. nagabettai*. The density of population of *Calamus karnatakensis* (restricted to Karnataka and Goa) is very high in Anantavadi Forests near Honnavar.

**Key words:** Western Ghats, Karnataka, *Calamus* sp., *Daemonorops* sp., *Plectocomia* sp., *Korthalsia*.

## INTRODUCTION

Worldwide, there are about 600 species of rattans belonging to 13 genera. Of the 13 genera of rattans, *Calamus* is the largest genus with about 370 species. In India, rattans are represented by 4 genera viz., *Calamus*, *Daemonorops*, *Plectocomia* and *Korthalsia* with a total of about 60 species (Basu, 1992; Renuka, 1992, 1995). They are distributed in three major regions viz.

North-eastern India, the Western Ghats and the Andaman and Nicobar Islands. Endemism in Indian rattans is very high and of the 60 species, 43 are endemic to the country. All the rattans of Peninsular India belong to only one genus viz. *Calamus*, with a representation of 21 species (Renuka, 1999).

From the Western Ghats Region, where rattans form an integral part of the ecosystem, 20 species of *Calamus* have been reported, of which the status of two species (*Calamus delessertianus* Becc. published in 1908 and *Calamus rheedei* Griff. published in 1845) is uncertain (Renuka, 1992). Of the remaining 18 species, 15 are endemic to the Western Ghats (Renuka, 1999).

Rattans grow under a variety of ecological conditions. They have a tendency to occupy different altitudinal and

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**Abbreviations:** DBH, Diameter at breast height; MSL, mean sea level.

rainfall zones. They are distributed from sea level to about 2000 m above m.s.l, and show altitudinal preferences. Most species, however, are distributed below 1000 m and only four species, viz., *Calamus brandisii* Becc., *Calamus gamblei* Becc., *Calamus pseudotenuis* Becc., Hook. f., and *Calamus lacciferus* Lakshmana and Renuka are found above this level (Lakshmana, 1993). Similarly, one can classify them under 1500, 1500 to 3000 and 3000 mm and above rainfall zones. A few species like *Calamus thwaitesii* Becc. and Hook. f. and *Calamus rotang* L. have overlapping zones (Lakshmana, 1993). In Peninsular India, some species are found in wet evergreen forests with an annual rainfall of 5000 mm, while there are some others which are found in areas with an annual rainfall of 750 mm only. Some species are found growing along streams, in marshy areas and coastal regions, while few others grow along the fringes of shoal forests at higher altitudes. The evergreen forests of Western Ghats form the largest natural home of rattans. Some species inhabit semi-evergreen and moist deciduous forests as well. *C. thwaitesii* is well distributed along the Western Ghats from Goa in the north to Kerala in the south. In contrast, there are some others like *Calamus stoloniferus* Renuka which is confined to very restricted areas. Species like *C. thwaitesii* and *Calamus hookerianus* Becc. are colonising which can grow in open areas and in areas exposed due to felling of trees, while species like *Calamus travancoricus* Becc. and Hook. f. are found as undergrowth in dense forests.

Of the five states falling within the jurisdiction of the Western Ghats, Karnataka has the maximum number of *Calamus* species. Of the 13 species occurring in Karnataka, all except *C. pseudotenuis* and *C. thwaitesii* (which are also reported from Sri Lanka) are endemic to Western Ghats (Table 1). Of these, three viz., *C. lacciferus* Lakshmana and Renuka, *Calamus lakshmana* Renuka and *Calamus prasinus* Lakshmana and Renuka are restricted only to the Karnataka Region of the Western Ghats (Renuka, 1992; Lakshmana, 1993). *Calamus nagabettai* Fernandez and Dey are also confined to the Western Ghats of Karnataka but there is a report of the occurrence of a few plants of this species in Kerala. *Calamus karnatakensis* Renuka and Lakshmana are restricted to the Western Ghats of Karnataka and Goa and *C. stoloniferus* Renuka to Karnataka and Maharashtra. The remaining species are distributed in the states of Karnataka, Kerala and Tamil Nadu. Of the 13 species of *Calamus* found in Karnataka, all except *Calamus metzianus* Schlecht are found in Kodagu District.

## CONSERVATION OF RATTANS IN THE WESTERN GHATS OF KARNATAKA

Some cane rich forests of Kodagu, Dakshina Kannada

and Uttara Kannada Districts of Karnataka were chosen to study the status of rattans, under a project funded by IPGRI. For the determination of the species diversity and density of population of rattans, belt transect method was adopted. For this, a required number of transects of 250 m x 4 m were laid in the study area. Each transect was divided into 25 quadrats and each was 10 m long. The number of transects laid in each area is given in Table 9. The following details of rattans occurring within the transect were recorded: names of species, species-wise, number of clumps, number of canes more than 1 m long and number of seedlings. The supporting plant species of rattans were also identified. Other trees and bamboos with DBH more than 100 mm were also recorded in each of the transect.

Based on the studies on the status of rattans in the three districts of Karnataka, the locations - Sampaje, Karike and Makut in Kodagu District, Subramanya and Charmadi in Dakshina Kannada District and Anantavadi (Honnavar) in Uttara Kannada District are recommended for *in situ* conservation of some species of rattans endemic to Western Ghats.

A brief description of these locations, the species of rattans occurring there and the plant species associated with them are given below, along with a note on the reason for suggesting *in situ* conservation of those forests.

### KODAGU

#### Sampaje

The study area lies between 75° 30' to 75° 33' E longitude and 12° 30' to 12° 32' N latitude with the elevation ranging between 140 and 500 m above m.s.l. It receives an annual rainfall of about 4268 mm. The vegetation is of evergreen type. The dominant tree species is *Knema attenuata*. The other common plant species met with are *Archidendron monadelphum*, *Diospyros candolleana*, *Euonymus crenulatus*, *Humboldtia brunonis*, *Kingiodendron pinnatum* and *Sterculia urens*. Three species of rattans have been recorded in this area viz. *Calamus lakshmana*, *C. thwaitesii* and *C. prasinus*, of which *C. lakshmana* is the most common species followed by *C. thwaitesii* and *C. prasinus* (Table 2).

Since the distribution of *C. lakshmana* is restricted to Karnataka Region of the Western Ghats and its population is high in Sampaje Forest, this location is recommended for *in situ* conservation of *C. lakshmana*.

#### Karike

The Karike Reserve Forest near Bhagamandala lies between 75° 25' to 75° 27' E longitude and 12° 27' to 12° 30' N latitude with the elevation ranging between 180 and

**Table 1.** Species of *Calamus* occurring in Karnataka region of the Western Ghats.

Name of species	Distribution in Karnataka	General distribution
* <i>Calamus dransfieldii</i> Renuka	Kodagu (Bhagamandala, Balur); Dakshina Kannada	Karnataka, Kerala, Tamil Nadu
* <i>C. gamblei</i> Becc. and Hook. f.	Kodagu (Talakaveri, Karike); Chikmagalur (Kudremukh)	Karnataka, Kerala, Tamil Nadu
* <i>C. karnatakensis</i> Renuka and Lakshmana	Kodagu (Talakaveri, Karike); Shimoga (Kargal, Nagodi, Agumbe); Uttara Kannada (Anantavadi)	Goa, Karnataka
* <i>C. lacciferus</i> Renuka and Lakshmana	Kodagu (Bhagamandala); Chikmagalur (Samse, Koppa) Shimoga (Agumbe); Uttara Kannada (Gersoppa)	Karnataka
* <i>C. lakshmanae</i> Renuka	Kodagu (Makut, Sampaje, Karike); Uttara Kannada (Honnar)	Karnataka
* <i>C. metzianus</i> Schlecht.	Uttara Kannada	Karnataka, Kerala
* <i>C. nagabettai</i> Fernandez and Dey	Kodagu, Dakshina Kannada (Subramanya, Charmadi)	Karnataka, Kerala
* <i>C. prasinus</i> Lakshmana and Renuka	Kodagu (Sampaje, Makut, Karike); Dakshina Kannada (Subramanya, Charmadi, Mangalore)	Karnataka
<i>C. pseudotenuis</i> Becc. and Hook. f.	Kodagu; Hassan	Karnataka, Kerala, Tamil Nadu, Sri Lanka
* <i>C. stoloniferus</i> Renuka	Kodagu (Makut)	Maharashtra, Karnataka
<i>C. thwaitesii</i> Becc. and Hook. f.	Karnataka	Goa, Karnataka, Kerala, Tamil Nadu, Sri Lanka
* <i>C. travancoricus</i> Beddome	Kodagu	Karnataka, Kerala, Tamil Nadu
* <i>C. vattayila</i> Renuka	Kodagu (Munrot, Sampaje, Karike); Dakshina Kannada (Subramanya)	Karnataka, Kerala, Tamil Nadu

\*Endemic to the Western Ghats.

400 m above m.s.l. It receives an annual rainfall of about 5568 mm. The vegetation is of evergreen type and the dominant species is *K. attenuata*, the other common species are *A. monadelphum*, *Aglaia lawii*, *Otonophelium stipulaceum*, *Chionanthus mala-elengi*, *Cinnamomum malabratrum*, *Kingiodendron pinnatum* and *Polyalthia fragrans*. Five species of rattans have been recorded in this area viz. *C. thwaitesii*, *C. gamblei*, *C. prasinus*, *Calamus* sp. and *Calamus vattayila*. *C. thwaitesii* is the most common species, followed by *C. gamblei*, *C. prasinus*, *Calamus* sp. and *C. vattayila* (Table 3).

This location is recommended for *in situ* conservation of *C. prasinus*, whose distribution is restricted to the Karnataka Region of Western Ghats, as there is a significant level of population of this species in this locality.

#### **Makut**

The Makut Reserve Forest near Virajapet taluk lies between 75° 45' 15" to 75° 45' 18" E longitude and 12° 5'

**Table 2.** The details of rattans recorded in the two transects of Sampaje study area.

Transects		<i>C. lakshmanae</i>	<i>C. prasinus</i>	<i>C. thwaitesii</i>
SJ1	I	5	1	1
	II	19	1	1
	III	5	3	35
SJ2	I	6	2	1
	II	19	2	4
	III	25	3	5

I: Number of clumps of rattans; II: Number of canes > 1 m; III: Number of seedlings of rattans.

**Table 3.** The details of rattans recorded in the five transects of Karike study area.

Transects		<i>C. gamblei</i>	<i>C. prasinus</i>	<i>C. thwaitesii</i>	<i>C. vattayilla</i>	<i>Calamus</i> sp.
K1	I	-	-	6	-	-
	II	-	-	19	-	-
	III	6	-	41	-	-
K2	I	-	1	9	-	2
	II	-	3	17	-	5
	III	-	5	38	-	-
K3	I	9	-	14	-	-
	II	16	-	26	-	-
	III	10	-	52	-	-
K4	I	24	2	12	-	-
	II	52	2	16	-	-
	III	37	10	58	-	-
K5	I	-	1	9	-	-
	II	-	1	12	-	-
	III	-	22	9	3	-

I: Number of clumps of rattans; II: Number of canes > 1 m; III: Number of seedlings of rattans.

26" to 12" 5' 28" N latitude with the elevation ranging between 200 and 500 m above m.s.l. It receives an annual rainfall of about 5054 mm. The vegetation is of evergreen type and the dominant species is *Baccaurea courtallensis*, the other common species being *A. monadelphum*, *Hopea ponga*, *Olea dioica*, *K. attenuata* and *D. candolleana*. The three species of rattans recorded here are: *C. stoloniferus*, *C. thwaitesii* and *C. prasinus*. Of these, *C. stoloniferus* is the most common one followed by *C. thwaitesii* and *C. prasinus* (Table 4). This location is recommended for *in situ* conservation of *C. stoloniferus* because its distribution is restricted to Karnataka and Maharashtra Regions of Western Ghats and the population density of this species is very high in this location.

## DAKSHINA KANNADA

### Subramanya

The study area lies between 75" 35' to 75" 36' E longitude and 12" 41' to 12" 45' N latitude with the elevation ranging between 120 and 270 m above m.s.l. It receives an annual rainfall of about 4410 mm. The vegetation is of evergreen type with *H. ponga* as the dominant species and *Lophopetalum wightianum*, *Aporusa lindleyana* and *Holigarna ferruginea* being the co-dominants. Other frequently met species are *C. malabattrum*, *K. attenuata*, *Mastixia arborea*, *Ochlandra travancorica* and *Vateria indica*. In this area there are three species of rattans namely, *Calamus thwaitesii*, *C. nagabettai* and *C. prasinus*.

**Table 4.** The details of rattans recorded in the two transects of Makut study area.

Transects		<i>C. prasinus</i>	<i>C. stoloniferus</i>	<i>C. thwaitesii</i>
MAK1	I	2	40	27
	II	15	66	-
	III	1	41	63
MAK2	I	1	22	4
	II	2	66	-
	III	1	54	8

I: Number of clumps of rattans; II: Number of canes > 1 m; III: Number of seedlings of rattans.

**Table 5.** The details of rattans recorded in the 15 transects of Subramanya study area.

Transects		<i>C. nagabettai</i>	<i>C. thwaitesii</i>	<i>C. prasinus</i>
S1	I		30	-
	II		51	-
	III		93	6
S2	I		15	1
	II		21	-
	III		59	6
S3	I		9	-
	II		18	-
	III		64	14
S4	I		23	8
	II		40	14
	III		124	56
S5	I		14	4
	II		37	6
	III		61	37
S6	I		1	29
	II		12	12
	III		29	94
S7	I		5	35
	II		6	32
	III		10	152
S8	I		5	12
	II		2	1
	III		11	32
S9	I		7	35

Table 5. Contd.

	II	9	19	1
	III	16	181	2
S10	I	125	24	-
	II	63	25	-
	III	372	107	-
S11	I	1	28	-
	II	4	40	-
	III	6	118	-
S12	I	4	22	-
	II	2	13	-
	III	10	58	-
S13	I	19	68	-
	II	23	27	-
	III	59	276	-
S14	I	9	29	2
	II	8	44	2
	III	25	164	-
S15	I	22	81	2
	II	13	22	2
	III	106	385	-

I: Number of clumps of rattans; II: Number of canes > 1 m; III: Number of seedlings of rattans.

Of these, *C. nagabettai* and *C. thwaitesii* are clump forming, while *C. prasinus* has solitary canes. *C. thwaitesii* stands are more common compared to *C. nagabettai* and *C. prasinus* (Table 5).

*C. nagabettai* is well distributed in about 25 km radius around Subramanya as compared to its distribution in other locations in Dakshina Kannada and Kodagu. The perennial streams as well as evergreen vegetation seem to favour the higher population of this species here. Since *C. nagabettai* canes are extensively extracted by the local people and tribes of this area for the manufacture of baskets and other handicrafts it is necessary to mark this area for *in situ* conservation of *C. nagabettai*. It will also help in the conservation of *C. prasinus* which has been found in some transects in this location.

### Charmadi

The study area lies between 75° 25' 40" to 75° 26' 45" E longitude and 13° 3' 5" to 13° 4' 10" N latitude with the elevation ranging between 300 and 900 m above m.s.l. It

receives an annual rainfall of about 4125 mm. The vegetation is of evergreen type, with *A. monadelphum* as the dominant species. The other common species met with are *Acronychia pedunculata*, *H. brunonis*, *A. lindleyana*, *O. travancorica* and *Ixora brachiata*. Four species of rattans have been recorded in this area viz. *C. thwaitesii*, *C. prasinus*, *C. psuedotenuis* and *C. nagabettai*. *C. thwaitesii* is the most common species, followed by *C. prasinus*, *C. psuedotenuis* and *C. nagabettai* (Table 6).

Since this area possesses rich population of *C. thwaitesii* and has fairly good representation of other three species including *C. prasinus* it is recommended for *in situ* conservation.

### UTTARA KANNADA

#### Anantavadi

The Anantavadi Reserve Forest near Honnavar lies between 74° 29' 19" and 74° 29' 48" E longitude and 14°

**Table 6.** The details of rattans recorded in the three transects of Charmadi study area.

Transects		<i>C. nagabettai</i>	<i>C. prasinus</i>	<i>C. psuedotenuis</i>	<i>C. thwaitesii</i>
CH1	I	2	16	-	45
	II	3	2	-	3
	III	12	14	-	200
CH2	I	2	-	9	33
	II	-	-	9	1
	III	7	-	16	99
CH3	I	2	3	-	68
	II	1	2	-	5
	III	2	1	-	177

I: Number of clumps of rattans; II: Number of canes > 1 m; III: Number of seedlings of rattans.

**Table 7.** The details of rattans recorded in the three transects of Anantavadi study area.

Transects		<i>C. karnatakensis</i>	<i>C. thwaitesii</i>
ANT1	I	59	17
	II	170	42
	III	270	82
ANT2	I	67	16
	II	190	29
	III	264	41
ANT3	I	57	8
	II	325	10
	III	248	19

I: Number of clumps of rattans; II: Number of canes > 1 m; III: Number of seedlings of rattans.

10' 30" and 14" 10' 45" latitude with the elevation ranging between 30 and 50 m above m.s.l. It receives an annual rainfall of about 3500 mm. The vegetation is of evergreen type and the dominant species is *H. ferruginea*. *I. brachiata*, *Aporusa lindleyana* and *Elaeocarpus serratus* are some of the common species met with. Two species of rattans have been recorded in this area viz. *C. karnatakensis* and *C. thwaitesii*, the former being more common than the latter (Table 7). The vegetation in the reserve forest is poor and the area is open. There is, however, good regeneration in this area of *C. karnatakensis* which is a clump forming cane.

This area is recommended for *in situ* conservation of *C. karnatakensis* because it is restricted to Karnataka and Goa Regions of Western Ghats and density of population of this species is very high in this area.

#### MASS PLANTING OF RATTAN SEEDLINGS IN KARNATAKA

Karnataka Forest Department has taken up extensive

planting of rattans, such as *C. thwaitesii*, *Calamus dransfieldii*, *C. nagabettai*, *C. prasinus*, *C. lakshmanae* and *C. vattayila* which are economically important and are used by tribal and local people for furniture, basket making etc. Such artificial plantations of selected species will serve to reduce the pressure on the naturally occurring rattans in the regions. Plantings have been taken particularly in Kanara and Kodagu forest circles covering the districts of Kodagu, Dakshina Kannada and Uttara Kannada. Particulars of planting in some of the areas in these districts, covering a total area of about 4436 ha, for which information is available, is given in Table 8. The most common species in the plantation is *C. thwaitesii* which is extensively used in cane industry. The other common cane species planted which are commercially exploited are *C. nagabettai* and *C. prasinus*. In all 10, 63, 150 seedlings have been planted in the above areas and the average survival is 81%. If this type of extensive cultivation of cane is continued by the forest department in the future, the pressure on wild populations will be reduced considerably.

**Table 8.** Details of cane plantations in some of the Western Ghats forests of Karnataka\*.

	<b>Name of the species planted</b>	<b>Total area of planting (ha)</b>	<b>Total number of seedlings planted</b>	<b>Percent survival</b>
<b>Kanara circle</b>				
Karwar division:				
Gopishitta range	<i>C. thwaitesii</i>	149	59,600	78
Kadra range	<i>C. thwaitesii</i>	174	69,600	90
Kumbarwada range	<i>C. thwaitesii</i>	120	48,000	95
Joide range	<i>C. thwaitesii</i>	175	70,000	92
Ankola range	<i>C. thwaitesii</i>	75	30,000	80
Mastikatta range	<i>C. thwaitesii</i>	320	128,000	79
Ramanguli range	<i>C. thwaitesii</i>	45	18,000	65
Honnavar division:				
Gersoppa range	<i>C. thwaitesii</i>	793	317,200	70
<b>Kodagu circle</b>				
	<i>C. dransfieldii</i>			
Mangalore division	<i>C. nagabettai</i>	995		
Kundapur division	<i>C. prasinus</i>	160		
Madikeri division	<i>C. lakshmanae</i>	534		
Virajpet division	<i>C. thwaitesii</i>	323		
	<i>C. vattayila</i>			
Mangalore division:				
Uppinangadi range	<i>C. nagabettai</i>	90	42,600	93
Subramanya range	<i>C. prasinus</i>	357	213,750	67
	<i>C. thwaitesii</i>			
Madikeri division:				
	<i>C. nagabettai</i>			
	<i>C. prasinus</i>			
Bhagamandala range	<i>C. lakshmanae</i>	126	66,400	82
	<i>C. thwaitesii</i>			
	<i>C. vattayila</i>			

\*Data of 10 years (1989 to 1999) supplied by Karnataka forest department.

**Table 9.** The number of transects laid in each area.

<b>Area</b>	<b>No. of transects laid</b>
<b>Kodagu</b>	
Sampaje	2
Karrike	5
Makut	2
<b>Dakshina Kannada</b>	
Subramanya	15
Charmadi	3
<b>Uttara Kannada</b>	
Anantavadi	3



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## REFERENCES

- Basu SK (1992). Rattans (Canes) in India - A Monographic Revision. Rattan Information Centre, Kepong, Kuala Lumpur.
- Renuka C (1992). Rattans of Western Ghats - A Taxonomic Manual. Kerala Forest Research Institute, Peechi, Kerala, pp. 61-68..
- Renuka C (1995). A Manual of the Rattans of Andaman and Nicobar Islands. Kerala Forest Research Institute, Peechi, Kerala.
- Renuka C (1999). Indian rattan distribution - An update. Indian Forester, 125: 591-598.
- Lakshmana AC (1993). Rattans of South India. Evergreen Publishers, Bangalore, pp. 180-188.