

Rattan resource of Bach Ma National Park, Thua Thien Hue province

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Bach Ma National Park (BMNP) is located in the territory of Thua Thien Hue province with the area of 22,031 ha, containing tropical and subtropical moon-soon rain evergreen forests which is representative for a forest ecological system of Vietnam in the central region. According to the statistics and survey results carried out by Vietnamese scientists, the flora of Bach Ma consists of 1,548 spermatophyta plants belonging to 703 genera, 165 families and 332 mushroom species belonging to 132 genera, 55 families. In Vietnam, the subfamily of rattan (*Calamoideae*) is known with 18 species. In Bach Ma, about 50% of these rattan species is represented (Nguyen Nghia Thin, Mai Van Pho, 2003).

The buffer zone of BMNP has an area of 21,300 ha, encompassing 2 towns and 9 communes. The total population in the buffer zone is 65,000 inhabitants belonging to 4 ethnic groups as Kinh, Ca Tu, Van Kieu and Muong. The majority of the local people is poor, their income is unstable and depending on forestry resources. Survey results show that at present, the exploitation of NTFP is the second income source for local people of the buffer zone. It is estimated that hundred thousand tons of rattan had and has been exploited from Bach Ma forests. Therefore, the exploitation of NTFP from natural forests exerts a high pressure on BMNP. In parallel with management, exploitation and sustainable utilization of natural resources in general, and NTFP in particular will make important contribution to forest protection and biodiversity conservation.

As our objective is to achieve the situation as described above, we carry out a study on the inventory/survey and assessment on rattan resources in the buffer zone and core zone of BMNP in order to provide recommendations for sustainable management and utilization of rattan resources in the region. This research project is facilitated TROPENBOS International Vietnam, which supports the development of research and capacity building programmes in tropical countries.

I- Methodology of research

We have applied the following methodology for this study:

- Identifying rattan species is based on a comparison with the morphology. Morphological characteristics are observed in nature or by using a lens in the laboratory. Observations are documented and compared with the description, specimens kept in different museum inside and outside the country.
- Using PRA's tools to collect information from related people.
- Establishing a survey-line at different forest types and natural conditions in BMNP. Collecting samples, investigating living conditions, relationships between rattan species with other ecological conditions. Slope, direction and location are identified by GPS equipment (GPS 12XL).
- Establishing sample plots (dimension: 20x20m) along with the survey-line at 7 regions, as: Km 8 (core zone), Nhi Ho, Cua Truong (Loc Tri), Dam Cay De (Loc Dien), Thac Mo, Thac Truot, Doc Me Oi (Nam Dong) to collect data on species composition, clumps, individuals/clump, length and diameter as well as to observe the growth and development of rattan.

II- Results and discussion

1. Composition of rattan species at BMNP

Surveys and data collection have been carried out at within different time period in the years 2004 and 2005. Thirteen samples of different rattan species have been collected. Based on the important morphological characteristics of rattan, such as leaf-sheath (ocrea, knee, spine and spiny arrangement...), climbing organ (cirrus or flagellum), leaf (lobe of leaf, leaflet, shape and dimension of leaf, leaflet arrangement at leaf-rachis, spine...), inflorescence (bract, inflorescence arrangement, flower...), fruit (shape and arrangement of scales, fruit shape and dimension...), we have identified 11 scientific names of species distributed in BMNP (see table 1). Unfortunately, the time of survey was not a reproductive time for the May rut and May tre species, which means that the collected samples of these two species were not enough for taxonomical purposes. It is intended to collect the flowers and fruits of these two species for scientific name identification in the coming time.

Table 1: Composition of rattan species in BMNP

No	Local name	Scientific name
1	May cun	<i>Calamus bousigonii</i> Becc.
2	May tat	<i>C. tetradactylus</i> Hance
3	May heo	<i>C. rhabdocladus</i> Burret
4	May nuoc da	<i>C. flagellum</i> Griff.
5	Song voi	<i>Plectocomia elongata</i> Mart. ex Blume
6	May ra	<i>Korthalsia laciniosa</i> (Griff.) Mart.
7	May nuoc mo	<i>Calamus ceratophorus</i> Conrard
8	May song	<i>C. platyacanthus</i> Warrb. ex Becc.
9	May rut	<i>C. sp.</i>
10	May tre	<i>C. sp.</i>
11	May cam	<i>C. dioicus</i> Lour.
12	May nuoc nghe	<i>Daemonorops jenkinsiana</i> Mart.
13	May dang	<i>Calamus walkeri</i> Hance

2. Distribution and ecology

Rattan genera consist of relatively many species and their distribution area is ranged over different ecological zones. Rattan can be found in areas which are very diverse in term of elevation, soil type, pH and nutrient composition. Depending on the species, we can find rattan growing naturally in areas where light intensity is varying at wide range.

Our results show that the May nuoc mo species (*Calamus ceratophorus* Conrard) grows best in the area along streams and at the bottom of hills as this species has a high demand for light and humidity. This species can be distributed often from bottom of the hill up to 500m on the slope of the hill. Sometimes it can also be found in the area at 900 – 1000 m above sea level. The species also grows in areas where pH of soil ranges between 5.0 to 5.4 in the buffer zone and between 4.8 to 5.5 in core zone. Survey results show that May nuoc mo species is changed not much in term of its morphology. In the drier areas, *Calamus ceratophorus* species is less present than in wet areas or areas along the stream (11 – 13%), see also table 2. Also, this species is less abundant in areas with a strong light intensity (coverage is 30 – 50%) compared to areas with a weak light area

(coverage 60 – 70%). Our observations show that *Calamus ceratophorus* species have a spiny form and ocrea which provides a suitable living habitat for ants. This enhances its capacity to protect itself against animal's attacks. Symbiosis between ants and rattan species have been carried out by Dransfield (1979), Rickson, Griff (1986) and Uhl (1987).

May cam species (*C. dioicus* Lour.) grow well in wet, high humus, nutrient soils. This species requires a suitable light regime for the growth and development of the aerial stem, but it can not stand for a strong light regime. Seeds germinate well in wet areas with high light coverage (70%-80%) but the survival rate of seedlings is low due to the competition amongst themselves for water, light and nutrients. Results obtained from sample plots show that about 45 – 48 seedlings per ha do survive.

May heo species (*C. rhabdocladus* Burret) are present at an elevation of above 400-500 m above sea level and it is mainly concentrated at the top of hills. Sample plots of May heo species are located at 650 m above sea level and we can find merely May heo. The first calculation shows that the volume of May heo is about 425 clumps/ha: this density is higher than in the area below 550- 600 m. Thus, an appearance of May heo population is closely related to the elevation and other ecological factors. Due to the harvest's impact on this species in the study area, an average height of clump is very low (1.7m).

The May ra species (*Korthalsia laciniosa* (Griff.) Mart.) grows usually in clumps. It can be found with about 4-5 individuals/clump and many clumps consist of 20 individuals. This species can be harvested when the stem diameter is about 1 – 1.5cm. Before 1990 (together with May tat, May nuoc, May song, May heo species) *Korthalsia laciniosa* had also been harvested for markets. At present, this species is only used for local use and therefore the average height of clump is rather high (7,2m).

May song species (*C. platyacanthus* Warrb. ex Becc.) usually grows in area with an elevation of about 500 metres, it distributes in areas with a high humidity, humus and high cover rate (about 70-80%). Surveys show that May song species does not grow in big clumps. May song species is a favourite rattan species in the local market and therefore it is harvested heavily. Based on our calculations, the volume of May song in the survey area is about 175 clumps/ha in natural forests.

May cun species (*Calamus bousigonii* Becc.) is characterized by a big leaf as a parallelogram shape, a wrinkled leaf surface and wavy leaf border. This species grows in areas with a forest cover of about 50-60%. May cun species forms single stemmed; the species is not found in a clump. Local people call this species also 'alone-rattan' or 'faithful-rattan' as if we found a male (or female) plant then we could find in surrounding area the second plant as female (or male). The ecological range of this species is relatively wide. We can find *Calamus bousigonii* Becc species growing in all surveyed elevation. At present, this species is only used for local use, therefore the average height of the plant is relatively high (5,2m in Cua Truong; 6,1m in Thac Mo) as there have been no impact of over-harvesting.

Table 2: The results from the soil analysis in survey-line

No	Study location	Humidity (%)	pH	Carbon (%)	Nitrogen (%)	Phosphate P ₂ O ₅	Potassium K ₂ O
1	Cua Truong	11	5,0	1,99	0,093	0,07	0,85
2	Thac Truot	35	5,1	2,82	0,108	0,035	0,48
3	Nhi Ho	18	5,0	1,92	0,097	0,064	0,43
4	Thac Mo	15	5,3	2,53	0,143	0,068	1,29
5	Dam Cay De	23	5,4	3,47	0,203	0,089	0,85
6	Bach Ma (km 8)	13	5,02	2,74	0,11	0,14	1,52

3. Rattan volume in natural forests

To get data on rattan volume in BMNP forest we had carried out several rattan surveys in the natural forests. Based on our surveys, data can be provided for rattan management in the study area. Statistical data obtained from 27 sample plots are collected showing information on the mean value on number of clumps per sample plot, number of stems per clump and the height of clump. Table 3 shows the results on the rattan density in the core area (without exploitation). The results reveal sample plot with a rattan density of 271 clumps/ha equal to 521 stems/ha (stem with at least 4m in length) for May nuoc mo species; and there are about clumps/ha equal to 147 stems/ha for May heo. In the buffer zone, sometimes old stems with about 10m in length can be found. The longest stem measured in the sample plots in the core zone of BMNP is up to 40metres.

Table 3: Rattan volume from 1 ha of natural forests

Study location in Bach Ma NP	Species	Mean individuals/clump	Number of seedlings /ha	Mean height of clump (m)	Number of clumps with more than 6 individuals/clump/ha	Number of clumps /ha
Km 8	May nuoc mo	7	367	316	91	271
	May heo	3	275	214	84	390
Cua Truong	May nuoc mo	5	125	2,1	2	375
	May cam	9		4,7	2	50
	May cun	1		5,2		100
Nhi Ho (100-200m a.s.l)	May nuoc mo	8	52	1,4	50	150
	May cam	4	45	2,7	56	350
Dam cay Del (150-200m a.s.l)	May nuoc mo	11	100	3,5	100	125
	May cun	1		2,5		25
Thac Mo(500-550m a.s.l)	May nuoc mo	5	225	3,6	187	600
	May cun	4		3,4	25	50
	May cun	1		6,1		287
	May song	1		2,8		175
Thac Truot (550-600m a.s.l)	May nuoc mo	6	25	1,5	25	100
	May cam	5	85	1,2	50	92
	May ra	4		7,2		75
	May nuoc nghe	18		3,8	25	25
	May tat	4	300	5,6		25
	May heo	4	141	2,9	50	208
Doc Me Oi (600-650m a.s.l)	May nuoc nghe	4	58	2,2	25	75
	May cam	7		3,5	50	75
	May cun	1	25	1,2	25	50
	May heo	3	175	1,8	56	425

Survey results show that almost all mature stems in Loc Tri, Phu Loc belonging to buffer zone of BMNP have been exploited. This means that rattan exploitation is under a high intensity. From the 6 sample plots of May nuoc mo species, there are 75 out of 125 stems which have a length longer than 8m and 72% of the total measured individuals have stems less than 4m, which means that they not long enough for exploitation (marketable stem is 4m or above in locality). From among the 8 sample plots of May heo species, there are 28 out of 47 stems which are longer than 8m and 89% of the total individuals measured have stems less than 4m.

4. Harvest impacts on conservation and sustainable utilization of rattan resource in buffer zone of BMNP

The sustainable management and utilization of natural resources is not only important for forest tree resources but also for non-timber forest resources. If the volume of a NTFP species is reduced, not only the existence of that species is threatened but the diversity of forest ecological system is also affected.

Our survey results from the buffer zone of BMNP showed that rattans have been exploited for many purposes. It is used locally for traditional use as for construction materials, knitting, home-used products or it is sold and traded. The rattan is considered as a source of income for the majority of households living in buffer zone in general. The rattan is seen as the second important source of income (rice is the most important source) for poor and landless households. Due to market pressure, rattans have been exploited freely without plans making natural rattan resources become exhausted in this area.

Through interviews, middleman mentioned that there were 7 pre-processing units for rattan export (including boiling, drying and polishing) in the area of BMNP in the years of 1991-1992. During this time, each pre-processing unit could buy its demand of raw materials and produce enough of pre-processed rattan for 3 ships (the weight of a ship was 120 – 140 tons of dry stems of different rattan species) per month. Only Da Bac area of Phu Loc district, Thua Thien Hue there were 3 pre-processing units for rattans in beginning 1990's. In one day a big middleman could buy about 5 trucks of raw rattan materials (each truck contained about 12,000 – 15,000 canes). This means that the rattan collector could harvest about 200 – 500 rattan canes per day. At present, only one or two middlemen are working in this area. They can buy rattans for only about one truck load per month. Now, rattan collectors can harvest only 30 – 40 rattan canes per day from the May nuoc mo species (each cane is 4.2m in length).

In our survey-lines, many clumps of May nuoc nghe species are found. The characteristics of, these clumps meet with the harvestable criteria (about 10 – 15m in length). According to the local people, May nuoc nghe species is harder than May nuoc mo: It is more difficult to split but more durable. The size of May nuoc nghe species is larger than the size of May nuoc mo species. However, interviews show that the buyer is only interested in the marketable length of rattan. Beside this, the rattan collectors are also not interested in exploitation of May nuoc nghe species as it is more difficult to harvest and transport. People only tend to exploit May nuoc nghe species when they could not harvest enough desirable quantity of May nuoc mo rattan within a day.

In the study area of BMNP, the harvesting cycle for rattan is 4-5 years/harvest. After 4 – 5 years, the middleman return to buy harvested rattan. However, sometimes the harvesting cycle is regulated by markets. The people living in the area of BMNP who use rattan for producing goods such as broom or knitting products, harvest rattans on an annual basis. If the stem is longer than the required length during the exploitation, the harvesters cut the stem to the required length. The remaining stem (shorter than 2.5m or too young) is not collected. Almost all interviewed collectors mention their concerns about the over-exploitation of rattan resources in natural forests.

At present, rattan resources in BMNP are not yet rare in term of species but its volume is considerably reduced in the last years. As the middlemen request for a specific size and quality of the stem, harvesters left as a result part of the stem behind; the part which is young or does not meet the requested length. This is a waste of the available resources and also a reason of forest fire during the dry season. The interviews show that some women and children also harvest rattans. As they are not strong enough to pull out long stems, they cut also the timber trees relating to that long stem. Thus, the current situation of rattan exploitation in our study area has had a considerable negative impact to sustainable management and utilization of forestry resources. At present,

middlemen only buy May nuoc mo species, while other rattan species are bought by local producers for making broom, knitting products and agricultural tools.

III- Conclusion

Rattan species in BMNP are relatively diverse in term of species (13), site conditions and ecology. Generally, the distribution of rattans in BMNP has ranged widely. Survey results show that the species composition of rattans is most abundant at an elevation of 500 – 550m. Along the survey-line from the bottom to the top of the hills in BMNP, it is found that on the bottom of the hill, the main species that can be found are May nuoc mo, May cam and May cun. The middle of the hill is the distribution area for May nuoc mo, May tat, May song, May cun and May ra. The top of the hills is suitable to May heo and May cam. May cam, May phun. The May nuoc mo species are distributed at all elevation levels. It is also found that at higher elevation levels, less individuals are present from May nuoc mo. Many May tre, May nuoc da, May nuoc nghe species can be found at elevation from 500m to 600m. In the buffer zone areas, the composition of rattan species is more diverse than in core zone of BMNP, but the number of individuals/clump is smaller and stem length is much shorter than that in core zone.

At this moment, no organizational plan exists for BMNP on NTFP. However, in order to limit the uncontrolled exploitation of rattan and to contribute to conservation of biodiversity in BMNP, we recommend to apply the following rules:

- Selective cutting: This means that only mature rattan individuals are to be harvested, avoiding damages to immature individuals or seedlings during exploitation.
- It does not allow to damage root system during exploitation.
- In each clump it is needed to remain one-year individuals and about 5 – 6 two-year individuals.
- Clumps with less than 6 individuals will not be harvested.
- Stem should be cut above the base about 15 – 20cm.

References

- 1- Tran Phuong Anh, 2004. Chi May-Calamus L. (Palme family –Arecaceae Schultz-Sch. in Viet Nam. Biology magazine, No. 26 (4A: Special research magazine for plant) 64-69. Hµ Néi.
- 1- Huynh Van Keo, Le Van Lan, 2002, Management and utilization of natural resources in BMNP, National workshop proceedings on Raising awareness on sustainable utilisation of biodiversity in Vietnam, 7-8 Oct. 2002.
- 2- Nguyen Nghia Thin, Mai Van Pho, 2003, Diversity of mushroom and plants in BMNP, Agricultural publishing house, 323-324.
- 3- Beccari O. 1911. Classification des Palmiers D’Indo-chine. Bulletin du d’histoire naturelle 3: 148-160.
- 4- Evans. T. D., Khamphone S., Baxa T., Oulathong V. V and Dransfield J. 2002. A synopsis of the rattans (Arecaceae: Calamoideae) of Laos and Neighbouring part of Indochina. Kew Bulletin 57: 1-84.
- 5- Pei Shengji et al. 1991. Flora reipublicae popularis sinicae. Tom 13 (1). Science Press. (Chinese language).