

Hukaung Valley Rattan Survey

2005

# Trip Report

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## ACKNOWLEDGMENTS

The 2005 Hukaung Rattan Survey was a great success. We collected many rattans and recorded the first ecological data on wild rattan populations in the Hukaung Valley. We also made innumerable new friends, sampled a variety of different forms of transportation, and learned much about the natural beauty of Myanmar and its peoples. We feel privileged to have had the opportunity to work in the Hukaung Valley and to start unravelling the botanical mysteries of this unique region. The local landscapes and plant life are truly awe inspiring - and everywhere we went we were greeted by smiles.

Many people were responsible for the success of the Rattan Survey. We would especially like to thank the Myanmar Forest Department for granting us permission to conduct the research. The Wildlife Conservation Society (WCS) played a key role in developing and organizing the rattan project and we gratefully acknowledge their continual support. In the WCS Yangon office, U Than Myint and U Saw Tun Khaing helped us put together the original survey proposal and then shepherded it through until it was approved. Dr. Alan Rabinowitz and Dr. Josh Ginsberg from the WCS New York office, provided - and continue to provide - invaluable advice about the Hukaung Valley and conservation priorities in Myanmar.

We are especially grateful for the hard work, enthusiasm, and good humor of all of the members of the survey team, scientific staff as well as field assistants, cooking crew, and elephant handlers. We could not have selected a better, more pleasant, group of people to work with. Finally, we would like to thank the Center for Environmental Research and Conservation (CERC) at Columbia University and the Committee for Research and Exploration of the National Geographic Society for their financial support. Thanks to all for an amazing trip...

Andrew  
Charles M. Peter



## Executive Summary

From January 9 to February 11, 2005, a systematic survey of the rattans of the Hukaung Valley was conducted. Field activities involved both specimen collection and quantitative forest inventory. A total of 41 collections representing 15 rattan species were made, each collection with 5 duplicates yielding 205 plant specimens. Eight of the rattan species are new records for Myanmar; one of the collections is a new species to science. Natural rattan populations were sampled in ten 10 x 200 m transects (total area = 20,000 m<sup>2</sup>) at different elevations along the Ledo Road. Twelve different rattan species were encountered in the transects, with as many as six species growing together in a single transect. Total rattan densities ranged from 195 to 7,415 individuals/hectare, with densities of merchantable cane (≥ 4 m long) ranging from 40 to 1,152 individuals/hectare. Preferred commercial species such as “kadin” (*Calamus* cf. *nambariensis*), “yamata” (*Calamus palustris*) and “ye-kyein” (*Calamus floribundus*) were found to occur at densities of 85, 40, and 30 harvestable canes/hectare, respectively.

In spite of intense commercial harvesting, the rattan populations along the Ledo Road are thriving. Populations of all species, even the commercial ones, are actively regenerating. Even robust rattan populations, however, can be over-exploited, and the rattan resources of the Hukaung Valley should be actively managed to avoid resource depletion. Small-scale cultivation of selected species at the village level is also recommended.

## Introduction

This report contains the results from a systematic survey of the taxonomy, ecology, and management potential of rattan in the Hukaung Valley Tiger Reserve in northern Kachin State, Myanmar. Descriptions of the rattan survey team and the survey route are first presented, followed by a summary of field procedures, a detailed listing of the results from the field activities, and a brief analysis of the local rattan trade. A final section discusses the potential for exploiting rattans on a sustainable basis in the Hukaung Valley, and offers several management recommendations for achieving this objective.



# Survey Team



The survey team was composed of an interdisciplinary team of plant scientists from several different institutions:



**U Myint Maung** is the Warden of the Hukaung Tiger Reserve. U Myint Maung was the official liaison of the expedition and was in charge of most of the field and travel logistics.



**Dr. Andrew Henderson** is a Curator in the Institute of Systematic Botany at the New York Botanical Garden.

Dr. Henderson is a leading authority on palm systematics and has published extensively on the taxonomy and biology of palms.



**Dr. Charles Peters** is the Kate E. Tode Curator of Botany in the Institute of Economic Botany at the New York Botanical

Garden. Dr. Peters is a plant ecologist and a forester specializing in the ecology,

use, and management of tropical forest resources and he has written extensively on this subject.



**U Saw Lwin** is an orchidologist and Ph.D. candidate in the Department of Botany at the University of Yangon.

He is also CEC member of the Myanmar Floriculturist Association and an avid photographer. U Saw Lwin helped out with all aspects of the botanical survey, worked the left side of the transect, and was an invaluable translator.



**U Tin Maung Ohn** is an Associate Professor in the Department of Botany at the University of Yangon.

U Tin Maung Ohn did general botanical collecting, helped with specimen pressing and drying, and was a key member of the right side of the transect crew.



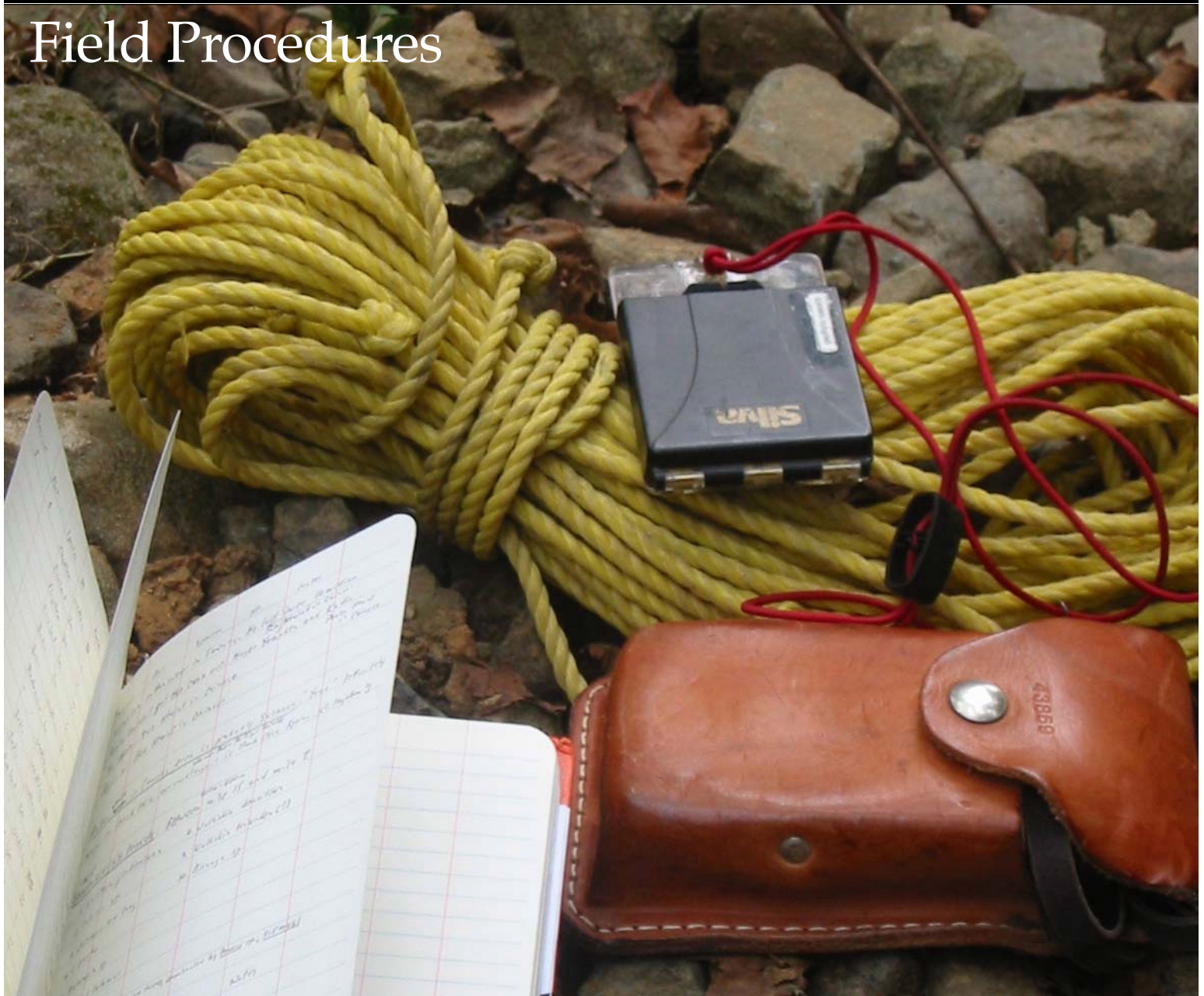
**U Kyaw Lwin** is Demonstrator and Ph.D. candidate in the Department of Botany at Mandalay University. U Kyaw Lwin also did general botanical collecting, helped with specimen preparation, and worked the right side of the transect line.



**U Tun Shaung** is a media and field assistant in the WCS Myanmar Program. U Tun Shaung documented the rattan survey with photographs and digital video and he played a critical role in organizing the logistics for the trip



# Field Procedures



The rattan survey was designed to collect taxonomic and ecological information about the rattan species growing in the Hukaung Valley. Replicate herbarium specimens were collected of all species encountered. Duplicates were deposited at Yangon University (RANG), the University of Mandalay, the Myanmar Forest Herbarium at Yesin (RAF), and the New York Botanical Garden (NYBG).

Immediately on retuning from the field each day, collections were trimmed, folded in newspaper, soaked in a 70% alcohol solution, and bundled into thick plastic bags. The “pickled” specimens were stored in the plastic bags and trans-

ported with the survey team until they were dried in Tanai using a simple plant drier and two charcoal stoves. The coordinates of each collection were determined using a Garmin 12 XL Global Positioning System (GPS) device.

Ecological data on wild populations were collected using 10 X 200 m (2000 m<sup>2</sup>) transects. All transects were corrected for slope (see table on next page) using a Spiegel Relaskop. After first clearing the line and measuring out 20 m with a nylon transect rope (pictured above) and correcting for slope, the transect rope was then laid on the ground to represent the centerline of the plot. Two teams then

slowly scanned 5 m to the left and 5 m to the right of the centerline and called out the identity and estimated height (to the nearest meter) of every rattan encountered. If it was not possible to determine the taxonomic identity of a rattan in the field, a temporary morpho-species name was assigned and agreed on by all members of the field crew. The data from the transect were tallied in separate 10 X 20 m plots (200 m<sup>2</sup>). The elevation and geographic location of each transect was recorded using a GPS device; transect bearings were maintained with a Silva compass. The transects were located at a range of different elevations and substrates along the Ledo Road between



Namyun and the Wildlife Corridor 22 m south of Tanai.

All taxonomic identifications and rattan collections were performed by A. Henderson. C. Peters selected the location of all transects, did the georeferencing and tallied the ecological data. U Tun Shaung led the clearing crews, U Saw Lwin searched the left side of the line, and U Tin Maung and U Gyaw Lwin worked the right side of the line. After several weeks of running transects, the crews got very efficient at collecting these ecological data. Depending on the topography and the density of rattan, a 2000 m<sup>2</sup> transect could usually be completed in from 1.5 to 2 hours. All members of the team were trained in the theory and methods of quantitative forest inventory.

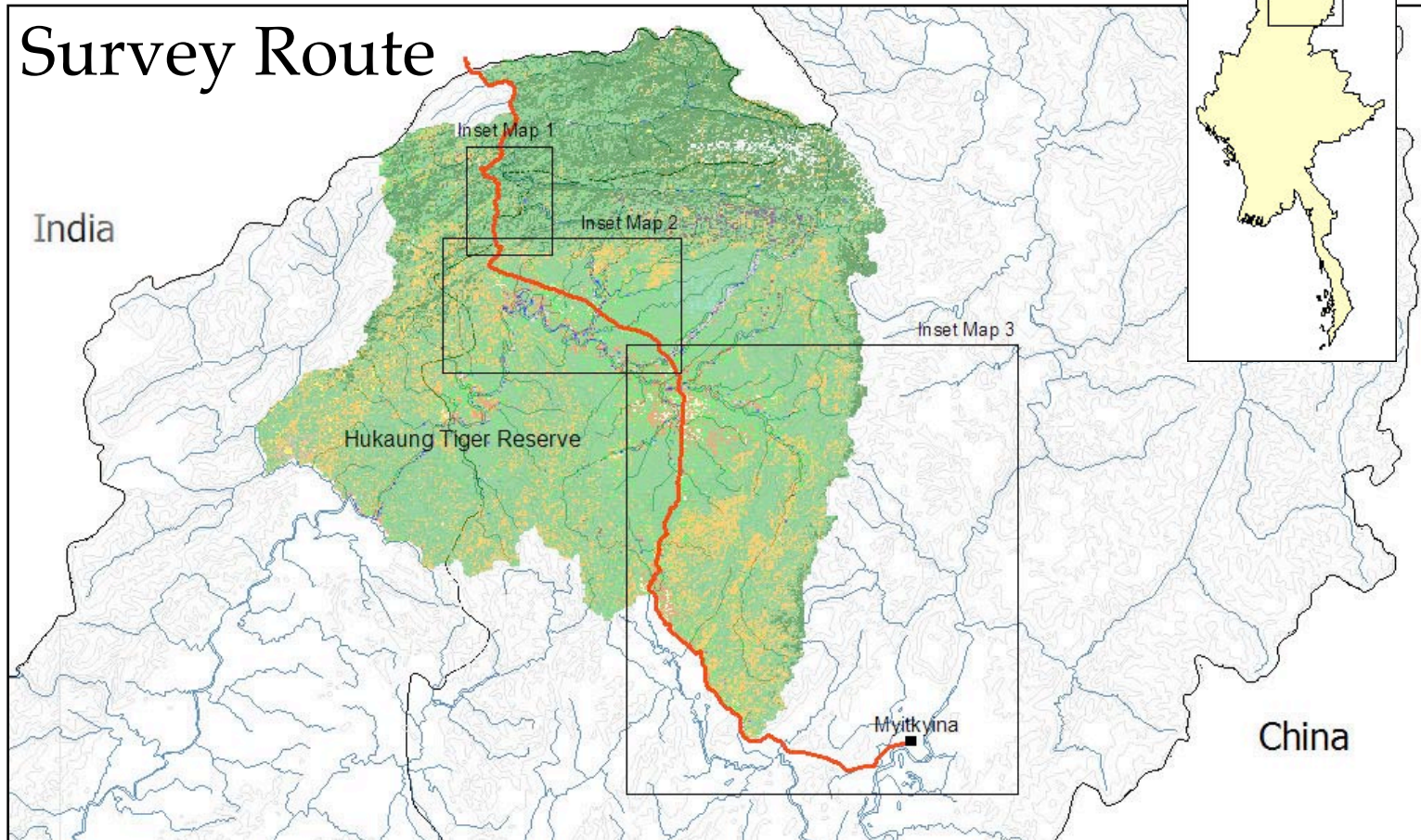
slope (%)	Horizontal Distance (m)				
	5	10	15	20	25
10	5.02	10.05	15.07	20.10	25.12
20	5.10	10.20	15.3	20.40	25.50
30	5.22	10.44	15.66	20.88	26.10
40	5.39	10.77	16.16	21.54	26.93
50	5.59	11.18	16.77	22.36	27.95
60	5.83	11.66	17.49	23.32	29.15
70	6.10	12.21	18.31	24.41	30.52
80	6.40	12.81	19.21	25.61	32.02
90	6.73	13.45	20.18	26.91	33.63
100	7.07	14.14	21.21	28.28	35.36

**Slope corrections for different distances and percent slopes. Table values show the distance along a slope that must be traveled to obtain the horizontal distance indicated by the column heading. All rattan survey transects were corrected for slope using these values.**





# Survey Route



The rattan survey was oriented along the Ledo Road (red line in map), a southeast to northwest diagonal that bisects the Hukaung Tiger Reserve. After finishing the necessary preparations in Yangon, the survey team flew to Myitkyina in Kachin State on January 9, 2005. We then took the Ledo Road and traveled north by car and four-wheel drive truck to the village of Namyun in Sagaing Division, about 30 miles from the border with India at an elevation of approximately 980 meters above sea level (masl).

From Namyun, we slowly worked our way south on foot using elephants for portage, stopping three times before Shimbweyang to establish a base camp, collect rattans, and run inventory transects. We continued on southwards to Tanai where we set up camp in the Hukaung Tiger Reserve office and constructed a drier to dry our specimens. On February 7 we arrived in Myitkyina, and two days later we boarded a train to Mandalay. The following afternoon we caught another southbound train, and 18 hours later we were back in Yangon with

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seven boxes of specimens and a fieldbook full of inventory data.

A more detailed description of the survey route, together with the results from each day of fieldwork, is presented in the following section. For the purpose of this report, the survey is divided into three segments. Each segment is represented by a separate map (inset maps 1, 2, and 3 indicated above). These maps show the main villages, rivers, and topographic features along the Ledo Road and pinpoint the exact location of each base camp, plant collection and inventory transect. The maps were prepared by C. Peters using ArcGIS 8, the GPS waypoints recorded in the field, and spatial information kindly provided by Kyaw Thinn Latt, GIS and Database Manager, in the WCS Myanmar Program.



**Using elephants to pull rattan specimens out of the forest canopy.**



# Collections and Transects



The collection and transect data from the rattan survey are presented in ecological, rather than chronological, order to reflect the relationship between different rattan species and the environment. To this end, the survey results are grouped according to the elevation along the Ledo Road where they were collected. As is shown on the location map on the next page, the most northerly plant collections were made above Namyun in Sagaing Division in the foothills of the Patkai Bum mountain range; transects are shown as numbered triangles.

The herbarium labels for the rattan collections include the names of all seven members of the survey team. For ease of citation in this report, however, the collections are referenced simply as Henderson et al. plus the collection number.

## Henderson et al. 3141

*Calamus flagellum* Griff. was collected on 19 January 2005 from a tract of steep roadside forest at an elevation of 502 masl. Stems were clustered, 15 m tall with a diameter of 2.8 cm; stem sheath green with black spines to 5 cm. Coordinates of the collection locality are 26°59'N and 96°12'E. This rattan is known locally as "mauk chee kyein", or monkey dung cane. It is not harvested commercially because the cane is too brittle and splits easily. This collection is a new record for the species in Myanmar (Kress *et al.*, 2003).

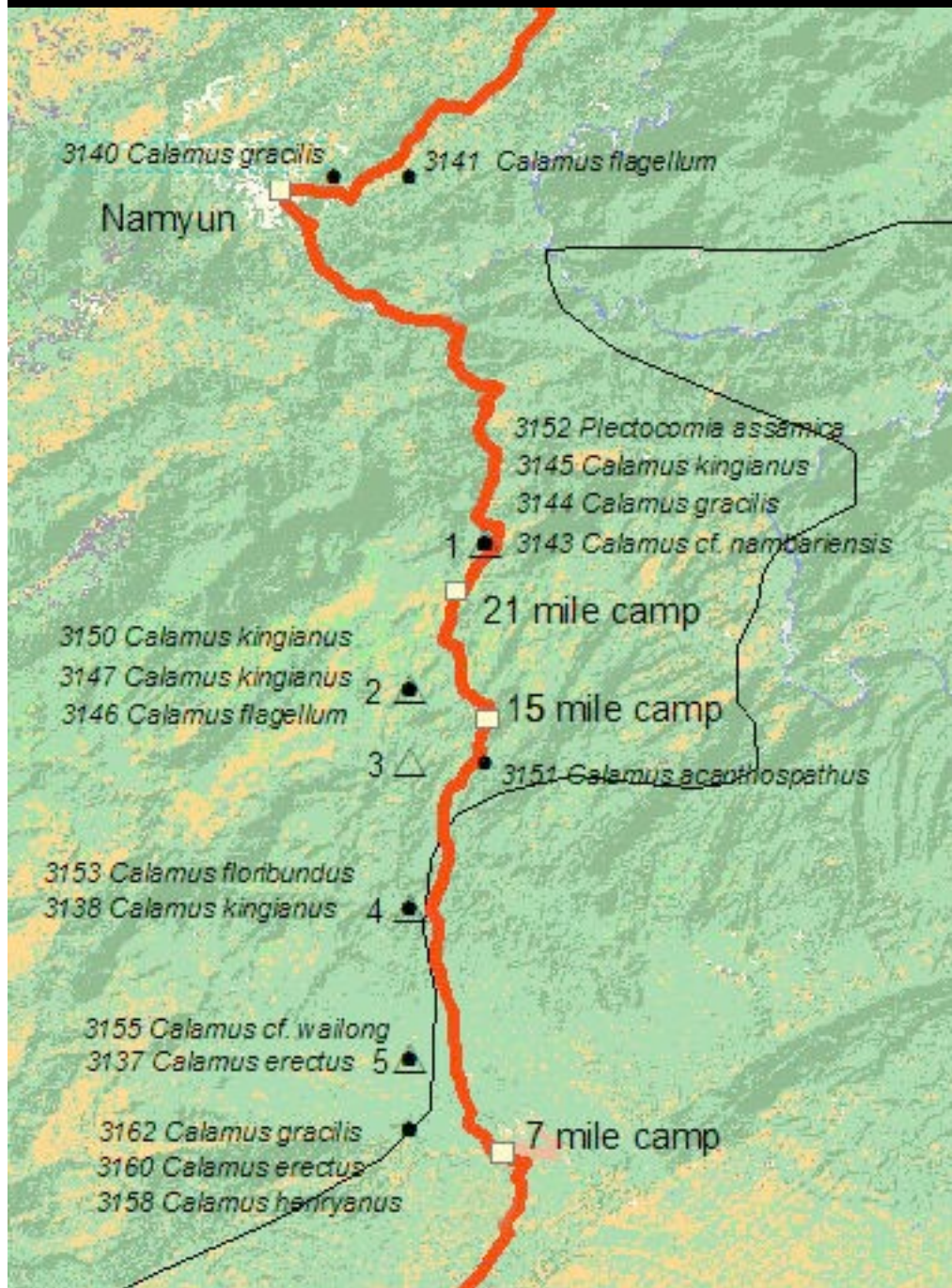
## Henderson et al. 3140

*Calamus gracilis* Roxb. was also collected growing in steep forest along the Ledo



**Calamus flagellum Griff.**





Road on 19 January 2005. This is a clustering palm, 15 m tall and about 1.5 cm in diameter, with small upward pointing spines, a well-developed ocrea<sup>1</sup>, and orange fruits. The species is known locally as “kyetu kyein”, or chicken egg cane because of the texture and color of the stem. This small-diameter cane is smooth and strong with few nodes and it is harvested commercially for making furniture and handbags. The collection locality

was 26°59'N and 96°11'E at 428 masl. *Calamus gracilis* is also a new record for Myanmar.

After making these two collections, a new base camp was set up at Mile 21 and fieldwork was conducted at this locality for several days. Venturing out from camp several miles to the north, four rattan were collected and a 2000m<sup>2</sup> rattan transect was laid out and inventoried.



**Calamus gracilis Roxb.**

## Henderson et al. 3143

*Calamus cf. nambariensis* Becc. was collected from a steep slope forest at coordinates 26°54'N and 96°13'E at an elevation of 1040 masl. This was a solitary rattan, 4.7 cm in diameter, with a yellowish sheath and brown, downward pointing spines. The leaf sheath exhibits



**Calamus cf. nambariensis Becc.**

<sup>1</sup>An extension of the leaf sheath beyond the base of the petiole.



a prominent knee<sup>2</sup> with brown stripes. *Calamus cf. nambariensis* is known locally as “kadin” and it is one of the most important and heavily collected canes in the Hukaung Valley. This collection is a new record for the species in Myanmar.

### Henderson et al. 3144

Another example of *Calamus gracilis* Roxb. was collected in roadside forest along the Ledo Road at an elevation of 1040 masl. The rattan was clustered with over 20 stems, 10m tall and 0.8 cm in diameter. The collection locality was 26°54’N and 96°13’E.

### Henderson et al. 3145

*Calamus kingianus* Becc. was collected along the Ledo Road at an elevation of 1040 masl. Stem clustered, up to 2 m tall and 1.0 cm in diameter. Sheaths green with scattered, black spines up to 1.0 cm



**Calamus kingianus Becc.**

long. Ocrea absent, inflorescence flagellate<sup>3</sup>. *Calamus kingianus* is another new

record for Myanmar. No local name or use were reported for this rattan

### Henderson et al. 3152

*Plectocomia assamica* Griff. was collected from roadside forest at an elevation of 850 masl. This is a massive, solitary rattan, up to 15 m tall and 12.0 cm in diameter. Sheaths armed with reddish-brown spines. Leaves spirally arranged with a



**Plectocomia assamica Griff.**

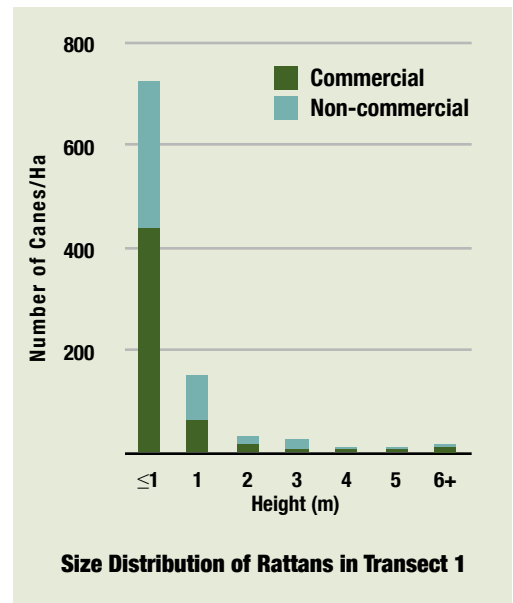
distinctive silver-grey color on the lower surface. Cirrus<sup>4</sup> to 2m long. Inflorescences are terminal, all at the same stage, i.e. the species is hypaxanthic, or flowers only once and then dies. *Plectocomia assamica* is known locally as “sin kyein” or elephant cane because of its large size. The cane is used occasionally to make bed frames or other large items of furniture.

## Transect 1

Transect 1 was laid out about 1.0 m north of the mile 21 base camp at an elevation of 1040 masl. The first plot was located at 26°54’N and 96°13’E; the transect then proceeded down a 30-40% slope along a bearing of S45°E. Rattan harvesters were noted working very close to the transect.

The data from the transect 1 - and all subsequent transects - are presented in two ways. First, a size-class histogram showing the number and size of all the rattan stems encountered is presented to illustrate the overall structure and regeneration of the rattan resource in that habitat. The histogram is divided into commercial and non-commercial species to give some idea of the available harvestable volume. Seedlings and small saplings are grouped in the ≤ 1 m class.

The size-class histogram for transect 1 is shown below. As indicated by the large number of individuals in the ≤1 m class,



the rattan community on the site is actively regenerating itself. Even the commercial species are represented by almost 500 seedlings/hectare. It is also worth

<sup>2</sup>a swelling on the leaf sheath at the base of the petiole.

<sup>3</sup>bearing a flagellum, or climbing organ developed from a modified inflorescence, borne on a leaf-sheath.

<sup>4</sup>climbing organ of rattan developed from the extension of the leaf tip.



Number of Rattan Stems/Hectare in Transect 1

Species	Height Class (m)							Total
	≤1	1	2	3	4	5	6	
<i>Calamus cf. wailong</i> (C)	425	60	15	5		5	5	515
<i>Calamus acanthospathus</i>	165	25	5					195
<i>Calamus sp.</i>	120	55	10	10	5	5	5	210
<i>Calamus gracilis</i> (C)	10				5		5	20
<i>Calamus flagellum</i>				10				10
<b>Total:</b>	720	140	30	25	10	10	15	950

noting that, in spite of the fact that the area had been recently harvested, there are still merchantable canes (≥ 4m tall) in the forest. The progressive reduction in numbers from smaller to larger size classes for both commercial and non-commercial species suggests that natural mortality, rather than harvesting, is largely responsible for the observed structure of the rattan community.

The transect data is also presented in the form of a summary table showing the number of individuals per size class for each rattan species. Commercial species are indicated by the letter “C” in parenthesis. As shown in the table, almost 1000 rattan individuals/hectare from five different species were recorded in transect 1. Associated palm species in the transect included *Plectocomia assamica* Griff., *Livistona jenkinsiana* Griff., *Pinanga sp.*, *Salacca secunda* Griff., and *Wallichia sp.*

After finishing transect 1, fieldwork shifted to an area about 2 miles south of 21 mile camp where three rattan collections were made and transect 2 was completed.

### Henderson et al. 3146

*Calamus flagellum* Griff. was collected at an elevation of 881 masl at coordinates 26°52'E and 96°12'E. The rattan was 5 m

tall, 3 cm in diameter, and had a 4m long infructescence with yellowish-brown fruits.

### Henderson et al. 3147

Another example of *Calamus kingianus* Becc. was collected from steep forest along the Ledo Road at an elevation of 881 masl. The rattan was 3m tall and 1.0 cm in diameter with long, black spines. The collection locality was 26°52'N and 96°12'E.

### Henderson et al. 3150

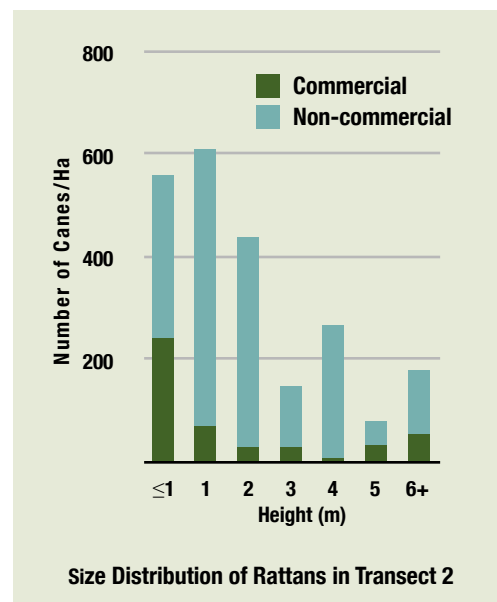
A third *Calamus kingianus* Becc. was collected at 881 masl and 26°52'N, 96°12'E. Stems clustered, 4 m tall and 1.5 cm in diameter.

## Transect 2

Transect 2 was established about 1.0 mile south of 21 mile camp at 880 masl. The transect started at 26°52'N and 96°12'E and continued along a bearing of S60°E across a moist ravine. In some places the transect crossed areas with more than 100% slope<sup>5</sup>. The transect ended behind a rattan camp where workers had been collecting “kadin” (*Calamus cf. narbariensis* Becc.) cane for several months. Sev-

eral thousand rattan canes were stockpiled in this landing. In spite of the slope and the harvesting pressure, the forest here was full of rattan.

The structure of the rattan community recorded in transect 2 is shown in the size-class histogram below. Although the histogram indicates that the rattan



community is adequately regenerating on the site, the lack of a smooth, negative exponential distribution as was found in transect 1 suggests that regeneration levels fluctuates from year to year.

The distributions of commercial and non-commercial species are notably different. This could have resulted because the non-commercial species are simply better adapted to this site, or, more plausibly, because the populations of commercial species have been reduced through harvesting. A positive sign is that the commercial species are continuing to recruit seedlings into the ≤1 m size class, even under intensive harvesting.

The summary table below shows that transect 2 contains 2450 rattan canes per hectare, of which 360 are commercial species. Almost 2000 of these stems are *Calamus flagellum* Griff. The most valued species, “kadin” (*Calamus cf. nambariensis*)

<sup>5</sup>100% slope = 45 degrees.



Number of Rattan Stems/Hectare in Transect 2

Species	Height Class (m)							Total
	≤1	1	2	3	4	5	6+	
<i>Calamus cf. nambariensis</i> (C)	55	35	25	15		10	40	180
<i>Calamus flagellum</i>	300	535	405	110	255	240	100	1945
<i>Plectocomia assamica</i>	15	5	5	10	5		25	65
<i>Calamus gracilis</i> (C)	185	30		10	5	20	10	260
<b>Total:</b>	555	605	435	145	265	270	175	2450

is represented by 50 merchantable canes/ hectare, even after the site was harvested by rattan collectors. Four rattan species were recorded in this transect.

Following the completion of transect 2, a new base camp was established at mile 15. The field crew spent several days working in this locality making collections and running transects.

### Henderson et al. 3151

*Calamus acanthospathus* Griff. was collected south of 15 mile camp at 26°51'N and 96°13'E. The rattan is solitary, 10 m tall, with a diameter of 2.0 cm. The

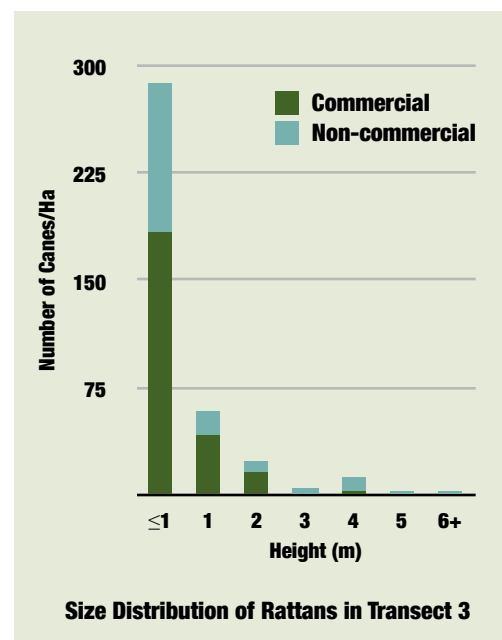


**Calamus acanthospathus Griff.**

sheath is green with densely arranged spines to 1.0 cm long; flagellum present, 2.0 m long. This collection is a new record for the species in Myanmar.

### Transect 3

Transect 3 was run through a well-preserved track of hill forest at an elevation of 821 masl. The starting point of the transect was near mile marker 178 on the



Ledo Road at 26°51'N and 96°12'E. The forest contained many large trees and the understory was open; there was no evidence of harvesting.

The structure of the rattan community in transect 3 reflects a negative exponential

or inverse-J distribution suggesting that regeneration is occurring at a sufficient level to maintain rattan in the forest. In spite of the lack of visible evidence of harvesting, the absence of commercial species in the 5 and 6+ m classes suggests that cane removal may have occurred. Note the change in scale of the y-axis relative to that shown for transects 1 and 2. The multi-storied canopy and low light levels in the understory of the forest reduce the overall abundance of rattan which exhibits optimal growth and establishment under high light levels.

The summary table for transect 3 shown on the following page demonstrates the dominance of commercial species in the smaller size classes. Over half of all the seedlings on the site are “kadin” and “kyetu kyein”. The complete lack of merchantable canes of these two species is also notable in the table. None of the other species, however, is represented by many individuals in the larger size classes, suggesting that light suppression and natural mortality, rather than harvesting, is responsible for this pattern.

### Henderson et al. 3153

*Calamus floribundus* Griff. was collected from steep forest along the Ledo Road at an elevation of 1000masl. The collection



**Calamus floribundus Griff.**



Number of Rattan Stems/Hectare in Transect 3

Species	Height Class(m)							Total
	≤1	1	2	3	4	5	6+	
<i>Calamus flagellum</i>	30	6	4	3	8	2	1	54
<i>Plectocomia assamica</i>	74	11	4		1		1	91
<i>Calamus gracilis</i> (C)	90	21	11		2			124
<i>C.alamus cf. nambariensis</i> (C)	92	20	3					115
<b>Total:</b>	286	58	22	3	11	2	2	384

locality was 26°49'N and 96°12'E. Stems clustered, 2m tall and 1.5 cm in diameter. Sheaths are covered with densely arranged black spines; knee and ochrea present. This rattan, known locally as "ye-kyein" or water cane, is a very important commercial species.

### Henderson et al. 3138

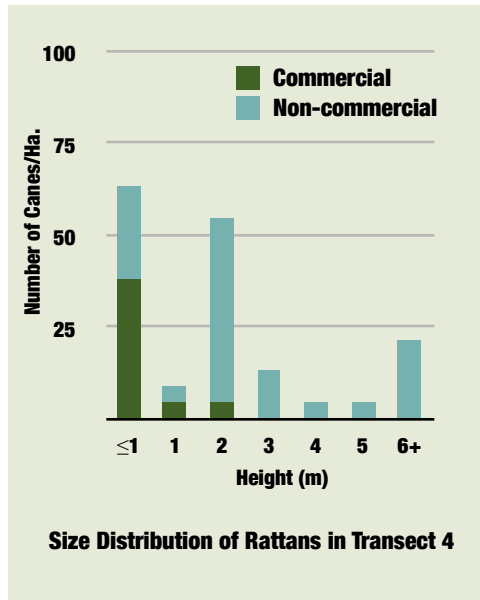
Another example of *Calamus kingianus* Becc. was collected from the forest at an elevation of 963 masl with coordinates of 26°49'N and 96°12'E. Stems clustered, sheath green with dark spines. Local informants called this small cane rattan "kyetu kyein".

### Transect 4

Transect 4 was laid out at 2649'N and 9612'E at an elevation of 610 masl near mile 13 on the Ledo Road. The transect was oriented downslope along a south-westerly bearing. The forest was well-developed, with many large trees, and very flat in some areas.

This transect exhibited the lowest density and diversity of rattans of all ten transects sampled. Although the closed canopy and reduced light levels are at least partially responsible for the low abundance of rattans on this site, other factors must also be operating. Forest with similar structure and composition at this elevation usually contained a much higher stocking of cane.

As is shown in the size-class histogram for transect 4, of the few rattans that are found on the site, most of them are non-commercial species. Also, neither the commercial or the non-commercial species appear to be regenerating on a continual basis. There are peaks and valleys in the distribution and large variation in the proportion of commercial and non-



commercial species in each size class. For example, the ≤1 m class is dominated by non-commercial species, while the 1 m class contains more commercial species. The complete lack of commercial species in the larger size classes suggests that periodic harvesting may be the reason for this pattern.

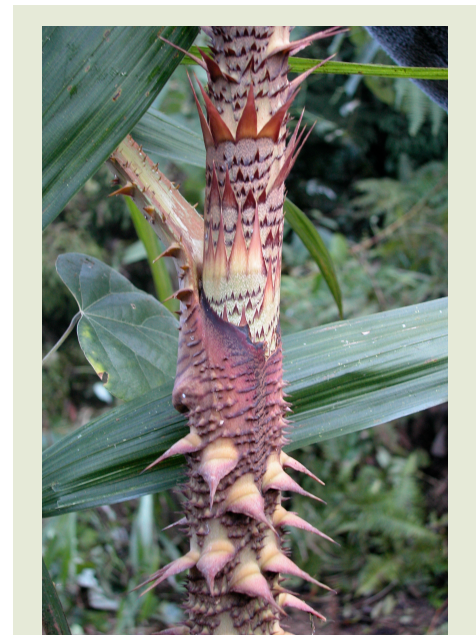
The summary table for transect 4 shown on the following page clearly reflects he

dominance of *Calamus flagellum* on the site. Over 70% of all the stems counted in the transect were of this species. This species is also responsible for the discontinuities in the size-class distribution of the rattan community. *Calamus flagellum* is regenerating itself well on the site, but apparently not every year. It is unclear whether the low volume of commercial canes recorded is attributable to harvesting, or simply the natural difficulties experienced by some species in establishing and growing in this habitat. Associated palm species observed in the transect included *Livistona jenkinsiana* Griff, *Wallichia densiflora* Mart., and *Pinanga* spp.

After finishing this fieldwork, the base-camp was transferred to mile 7 on the Ledo Road, and several collections and transects were made in this new locality.

### Henderson et al. 3155

*Calamus cf. wailong* S.J. Pei & S.Y. Chen was collected north of 7 mile camp at an elevation of 915 masl at coordinates 26°47'N and 96°12'E. Stem solitary, 20 m tall and 3.4 cm in diameter. Sheaths reddish-brown with long, flattened downward pointing spines. Knee present, swollen and stripped; ochrea very



*Calamus cf. wailong* S.J. Pei & S.Y. Chen



Number of Rattan Stems/Hectare in Transect 4

Species	Height Class (m)							Total
	≤1	1	2	3	4	5	6	
<i>Calamus flagellum</i>	25	4	50	13	4	4	21	121
<i>Calamus cf. nambariensis</i> (C)	25							25
<i>Calamus gracilis</i> (C)	13	4	4					21
<b>Total:</b>	63	8	54	13	4	4	21	167

short. The rattan is known locally as “taung kyein”, or mountain cane, and it is an important commercial species. It should be noted, however, that this local name seems to be used for several different species of *Calamus* that grow in the mountains. *Calamus cf. wailong* is a new record for Myanmar.

### Henderson et al. 3137

*Calamus erectus* Roxb was collected north of 7 mile camp at an elevation of 983 masl. The collection coordinates are



**Calamus erectus Roxb.**

26°47N and 96°12E. Stems solitary, 2 m tall and 3 cm in diameter. Petioles with whorls of yellow spines. This rattan is known locally as “mauk chee kyein” or monkey dung cane, which reflects, more

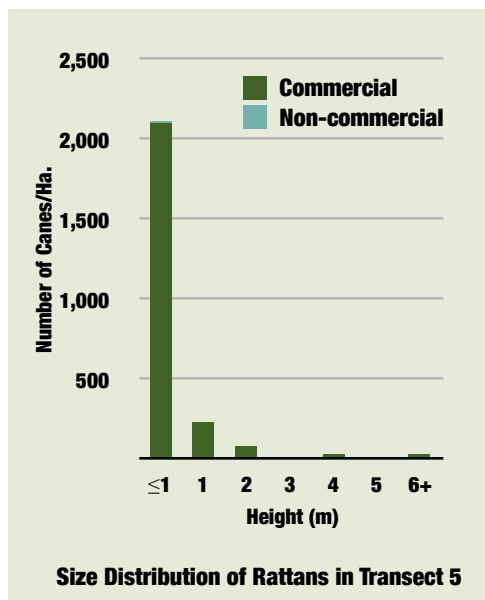
than anything, its lack of commercial value. This collection is a new record for *Calamus erectus* in Kachin State.

### Transect 5

Transect 5 was located north of 7 mile camp in a well-developed tract of hill forest dominated by large *Prunus* trees. The first plot in the transect was located at 26°47N and 96°12'E at an elevation of 550 masl. In some places, the slope of the transect was in excess of 100%.

Very few rattan species were tallied in this transect, but there were a lot of rattan canes and the great majority of them were from commercial species. Some evidence of past rattan harvesting was noted.

This pattern is indicated in the size-class histogram for the transect. The relative



volumes of non-commercial species in the transect are so low that they don't even appear at the current scale. The regeneration of commercial species is so abundant on the site that the y-axis of the histogram extends to 2,500 canes, more than three times that recorded in any other transect.

The absence of canes in the larger size class reflects past rattan harvests. It should be noted, however, that there are still a few larger merchantable canes in the forest to produce seeds, and sufficient advance regeneration of seedlings and small rattans such that in a few years the site will again be well stocked with harvestable rattan.

The summary data for transect 5 provides further details about the structure of the rattan community in this area. Ninety-eight percent of all the rattan individuals encountered in transect 5 were “kadin” canes, and of these, 85% are seedlings less than 1.0 m tall. *Calamus gracilis* and *C. erectus* are also present on the site, but in pre-commercial sizes and at densities of less than 20 - 30 individuals/hectare.

These forests will require several years to develop their value as a source of rattan. Although growth rates and mortality patterns will ultimately determine the number of harvestable rattan canes that develop on this site, the current level of stocking in the seedling class suggests a final density of 800 -1,000 “kadin” canes/hectare, i.e. about one cane every 10 m<sup>2</sup>. If allowed to develop, this rattan stand would be virtually impenetrable.

### Henderson et al. 3162

An additional example of *Calamus gracilis* Roxb. was collected near 7 mile camp at an elevation of 847 masl. The collecting site was located at 26°46'N and 96°12E. The rattan was 2m tall.

### Henderson et al. 3160

Another example of *Calamus erectus* Roxb. was collected near 7 mile camp at



Number of Rattan Stems/Hectare in Transect 5

Species	≤1	1	Height Class (m)					Total
			2	3	4	5	6+	
<i>Calamus cf. nambariensis</i> (C)	2060	190	65		15	5	20	2355
<i>Calamus gracilis</i> (C)	15	20						35
<i>Calamus erectus</i>	15	5						20
<b>Total:</b>	2090	215	65		15	5	20	2410

an elevation of 847 masl at coordinates 26°46N, 96°12E. Only flowers and fruits were collected.

### Henderson et al. 3158

*Calamus henryanus* Becc. was collected near 7 mile camp at coordinates 26°46N and 96°12E. The rattan was growing at an elevation of 847 masl in steep hill for-

The location map for the next segment of fieldwork is shown on the following page. The area surveyed extends from south of 7 mile camp, through Shimbweyeng, to Tanaing. As described below, 19 rattan specimens and 4 transects were made.

### Henderson et al. 3136

Another specimen of *Calamus henryanus* Becc. was collected south of 7 mile camp at an elevation of 445 masl. The coordinated of the collection locality are 26°45N and 96°13E. Stems clustered, 5 m tall and 1.5 cm in diameter. Sheaths green with brown spines; knee and flagellum present.

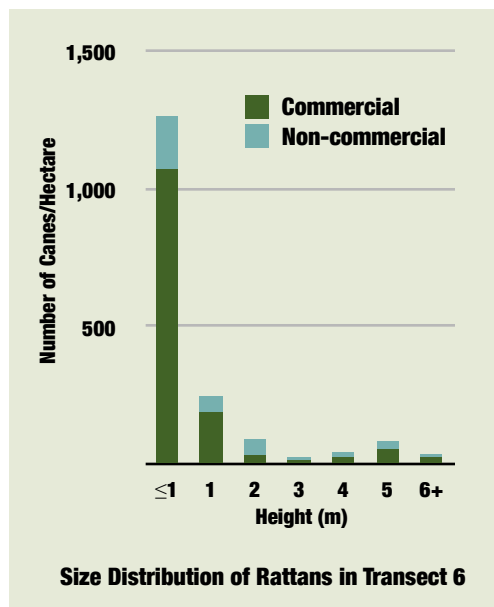
### Transect 6

Transect 6 was established south of 7 mile camp at an elevation of 510 masl. The first plot was located at 26°45N and 96°13E and from there the transect continued along a bearing of S60°W through well-developed forest. The transect ended after 200m at the edge of a steep cliff.

The site was very rich in palms. In addition to the rattans recorded, associated palms included *Areca triandra* Roxb., *Livistona jenkinsiana* Griff., *Wallichia densiflora* Mart., *Wallichia* spp., *Salacca* sp., and *Pinnanga* spp. There was little evidence of harvesting

As is shown in the size-class histogram for the transect, an abundance of rattans were encountered, and a large percentage

of them were commercial species. The size structure of the rattan community follows a negative exponential distribution which indicates a continual rate of seedling establishment. The sharp drop in numbers from the ≤1 m to 1 m class, however, suggests that there is a recruitment bottleneck from the seedling



to sapling stages. Light suppression resulting from the closed canopy is one likely cause of this mortality. It should be noted that an alternative, more optimistic, explanation to the current structure of the rattan community is that the number of rattan individuals on site is actively increasing and that the large numbers in the ≤1 m class will survive and eventually become merchantable canes.

The summary table for transect 6 highlights the dominance of “kadin” (*Calamus cf. nambariensis*) on the site, especially in the smaller size classes. Almost 80% of all the rattan individuals in transect 6 are “kadin” seedlings. There are over 60 merchantable canes/hectare, and the extreme seedling numbers suggest that the number of harvestable canes will increase over time.

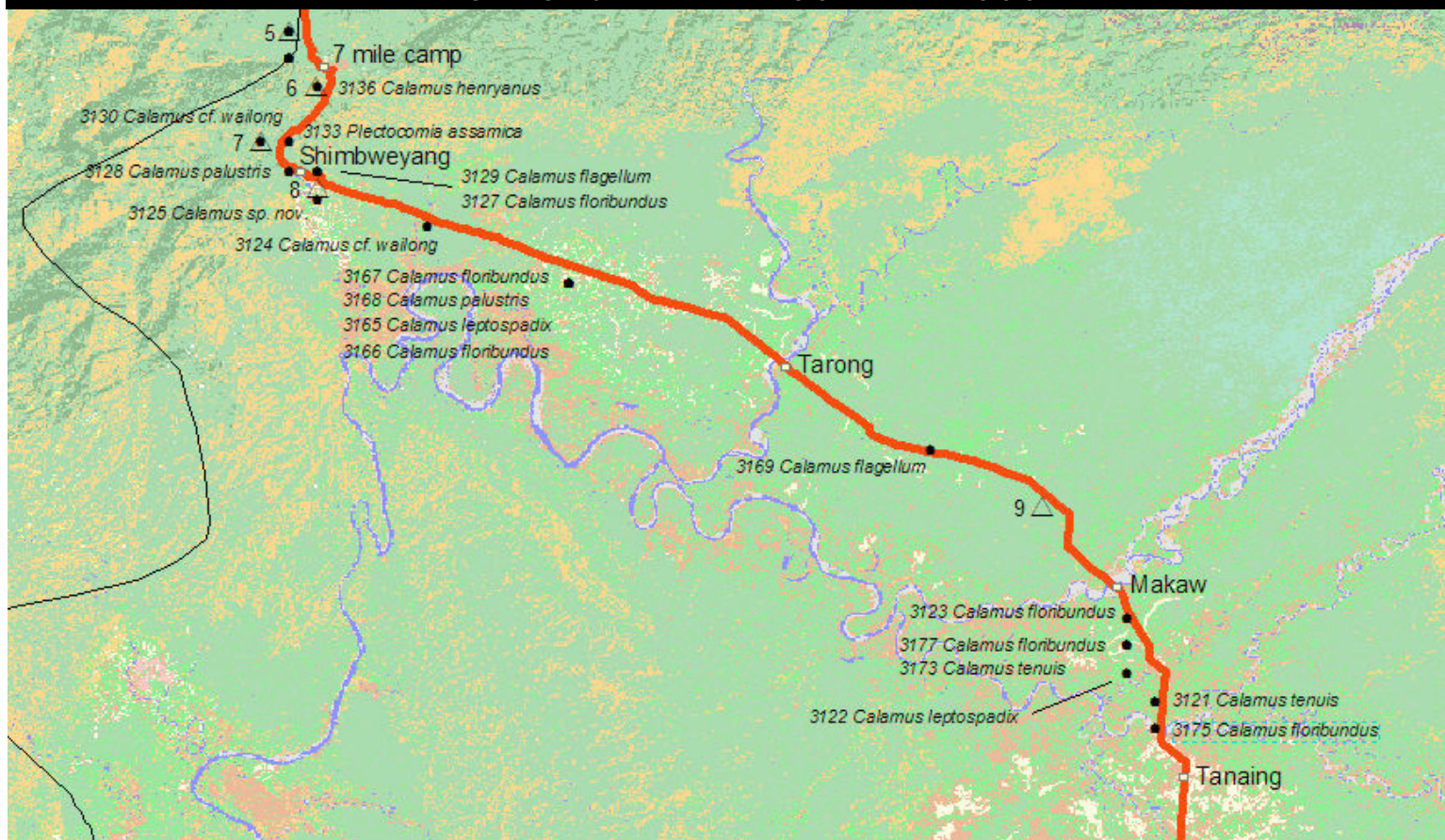
From a management perspective, harvesting a few adult canes would open up the canopy and stimulate the growth of these seedlings. The only non-commercial species that might compete



**Calamus henryanus Becc.**

est. Stems clustered, 7 m tall and 1.5 cm in diameter. Stem greenish-brown with flat, brown spines; flagellum present. This collection is a new record for *Calamus henryanus* in Myanmar.





with *Calamus cf. nambariensis* for access to increased light is *Calamus henryanus*, and the density of this species seems far too low for it to dominate the canopy gaps created by harvesting.

### Henderson et al. 3130

*Calamus cf. wailong* S.J. Pei and S.Y. Chen was collected from roadside forest at an elevation of 260 masl at coordinates 26°43N, 96°11E. Stem solitary, 25 m long and 3 cm in diameter. Sheath greenish-brown with reddish stripes on knee and flattened, greenish spines. Cirrus 2m long.

### Henderson et al. 3133

*Plectocomia assamica* Griff. was collected from steep forest along the Ledo Road at an elevation of 220 masl. The collection locality was 26°43N and 96°12E. Stem solitary, erect, not flexible, 15 m tall and 15 cm in diameter including sheath. Diameter without sheath approximately 5 cm. Leaflets silvery-gray on the lower surface; cirrus 2.5 m long with groups of

**Number of Rattan Stems/Hectare in Transect 6**

Species	Height Class (m)							Total
	≤1	1	2	3	4	5	6+	
<i>Calamus cf. nambariensis</i> (C)	1050	185	30	10	20	45	20	1360
<i>Calamus henryanus</i>	195	50	60	5	20	30	5	365
<i>Calamus erectus</i>		5						5
<i>Calamus gracilis</i> (C)	10							10
<b>Total</b>	1255	240	90	15	40	75	25	1740

hooks. This rattan is known locally as “sin kyein”.

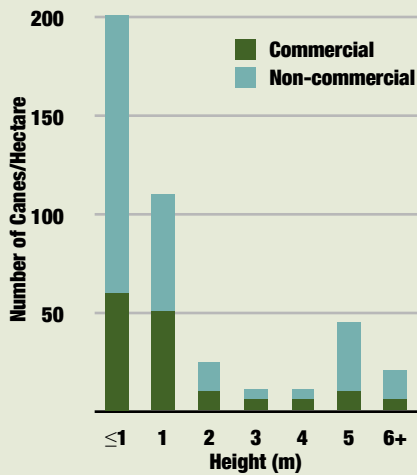
### Transect 7

Transect 7 was laid out north of the town of Shimbweyang near the mile 164 signpost at 220 masl. The first plot was located at 26°43N, 96°11E and the transect then continued up a 40% slope heading due East.

In addition to rattans, the transect forest contained several other species of palms including *Areca triandra* Roxb., *Livistona jenkinsiana* Griff., *Wallichia densiflora* Mart., *Caryota maxima* Blume ex Mart., *Arenga westerhoutii* Griff., *Pinanga* spp., and *Salacca secunda* Griff. A few cut rattan stems were noted on the site.

The size-structure of the rattan community recorded in transect 7 is shown in the histogram below. The abundance of rattans on the site is low relative to that re-





Size Distribution of Rattans in Transect 7

corded in other transects, but both commercial and non-commercial species appear to be regenerating themselves. The spike in the number of individuals in the 5 m class is either a sampling anomaly or reflects a particularly successful reproductive event that occurred several years ago. Although not abundant, there are harvestable canes of commercial species.

The summary table for this transect provides more detailed information about the local rattan community. *Calamus flagellum* is the dominant rattan on the site in most size classes, while *Calamus* cf. *wailong*, or “taung kyein” is the most important commercial species.

The relatively large number of “taung kyein” seedlings suggests that the density of this species could be increased some-

what through management. This objective, however, could be difficult to achieve given the ubiquity and abundance of *Calamus flagellum* in the Hukaung Valley. Management interventions would always run the risk of having this non-commercial species take over in the canopy gaps.

### Henderson et al. 3128

*Calamus palustris* Griff. was collected from a disturbed area near Shimbweyang at an elevation of 196 masl. The coordinates of the collection locality are 26°42N and 96°12E. Stems clustered, 15 m long and 3.1 cm in diameter. Sheaths



Calamus palustris Griff.

yellowish-green, densely covered with many short spines and fewer, longer spines. Ocrea short, or absent; knee prominent and spiny.

This rattan is an important commercial species known locally as “yamata kyein” or “pyant kyein” in some localities. The cane from this species must be treated with diesel before it is sold. The species is widely used to make furniture.

### Henderson et al. 3129

*Calamus flagellum* Griff. was collected near Shimbweyang from a tract of forest on flat land at an elevation of 196 masl. The collection locality was 26°42N, 96°13E. Stems clustered, 20 m long and 3.5 cm in diameter. Sheaths light brown, densely covered with black spines; ocrea very short, open. Inflorescences 2 m long, flagellate; fruit green, ellipsoidal.

### Henderson et al. 3127

*Calamus floribundus* Griff. was collected from lowland forest near Shimbweyang at an elevation of 190 masl at coordinates 26°42N and 96°13E. Stems clustered, 4 m long and 2.5 cm in diameter. Flagellum present.

## Transect 8

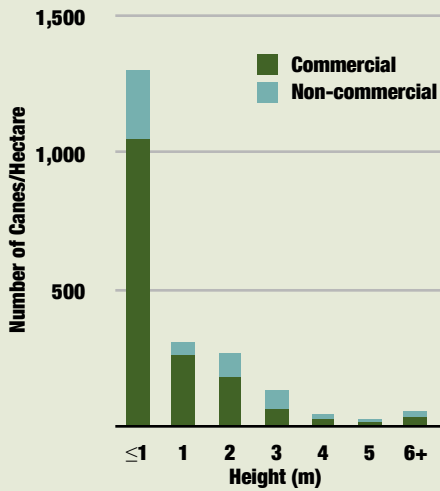
Transect 8 was established south of Shimbweyang in a tract of forest on flat terrain at an elevation of 190 masl. The first plot was located at 26°41N, 96°13E; and the transect continued due East for 240 m. The transect was very close to town and there was much evidence of harvesting and disturbance.

The size class histogram for the transect clearly shows that, even this close to a town, there is a remarkable abundance of commercial rattans in the forest. Commercial species dominate in the smaller size classes and they are represented by reasonable densities in the merchantable classes as well. The small dips in the 4 and 5 m class are undoubtedly due to harvesting, but overall the commercial

Number of Rattan Stems/Hectare in Transect 7

Species	Height (m)							Total
	≤1	1	2	3	4	5	6+	
<i>Calamus flagellum</i>	135	55	15	5	5	35	5	255
<i>Calamus</i> cf. <i>wailong</i> (C)	60	50	10	5	5	5	5	140
<i>Calamus henryanus</i>	5	5						10
<b>Total</b>	200	110	25	10	10	40	10	405





Size Distribution of Rattans in Transect 8

rattans on the site are maintaining themselves.

The summary table below highlights the striking diversity and abundance of rattans in transect 8. Six different species were recorded on the site, more than in any other transect. Four of the species are commercially harvested. *Calamus floribundus*, or “ye-kyein” is the most abun-

greater number of harvestable cane. Given the proximity of the transect to Shimbweyang, the availability of such a large number of harvestable canes is somewhat surprising and very encouraging from a management perspective. The commercial species exhibit a very smooth negative exponential distribution suggesting that regeneration is continual and adequate to replace the mortality in the larger size classes. *Calamus flagellum*, which is so abundant in other sites, is apparently kept in check competitively by *Calamus floribundus* and *Calamus palustris* in this forest. Controlled harvesting and light canopy opening will undoubtedly continue to favor these latter two species.

### Henderson et al. 3125

*Calamus* sp. nov. was collected from a disturbed area near the gold mine outside of Shimbweyang. The elevation of the site was 190 masl at coordinates 26°41N and 96°13E. Stems clustered, 4m long and 1 cm in diameter. Sheaths green with whitish tomentum<sup>6</sup>; spines brown, flat-



Calamus sp. nov.

that the stems are used for weaving. This collection is a new species to science.

### Henderson et al. 3124

Another specimen of *Calamus* cf. *wailong* S.J. Pei and S.Y. Chen was collected from lowland forest near the village of Taseik at an elevation of 200 masl. The collection locality was 26°40N and 96°17E. Stem solitary, 11 m long and 4 cm in diameter. Sheath reddish-green with oblique rows of flattened spines. Ocrea short; knee present. Cirrus 2 m long.

### Henderson et al. 3167

A third specimen of *Calamus floribundus* Griff. was collected from lowland forest along the Ledo Road between Shimbweyang and Tanai. The collection site was located at 26°38N, 96°22E at an elevation of 195 masl. Stems clustered, 4 m tall and 1.5 cm in diameter.

### Henderson et al. 3168

An additional collection of *Calamus palustris* Griff. was made in lowland forest between Shimbweyang and Tanai at 26°38E and 96°22E. The elevation of the

Number of Rattan Stems/Hectare in Transect 8

Species	Height (m)							Total
	≤1	1	2	3	4	5	6+	
<i>Calamus floribundus</i> (C)	412	168	134	46	21	4	8	793
<i>Calamus henryanus</i>	92	17	38	59	21	8	12	247
<i>Calamus gracilis</i> (C)				4				4
<i>Calamus palustris</i> (C)	626	88	38	8		4	21	785
<i>Calamus flagellum</i>	164	34	46	8			8	260
<i>Calamus</i> cf. <i>wailong</i> (C)				4				4
<b>Total</b>	1294	307	256	129	42	16	49	2093

dant species with good representation in all size classes, even the merchantable ones. *Calamus palustris*, or “yamata kyein” is slightly less abundant but has a

tened. Ocrea present, dense, bristly; flagellum present, 1.5 m long. Inflorescences flagellate. This rattan is known locally as “htin phu”, and it is reported

<sup>6</sup> thick covering of hair  
HKV Trip Report



site was 195 masl. Sheaths with long, flattened, downward-pointing spines. Ocrea very short or absent; cirrus present.

## Henderson et al. 3165

*Calamus leptospadix* Griff. was collected from lowland forest along the Ledo Road between Shimbweyang and Tanai at an elevation of 195 m. The site was located at 26°38N and 96°22E. Stems clustered, 5 m tall and 1.7 cm in diameter. Sheaths greenish-brown with yellow, needle-like



**Calamus leptospadix Griff.**

spines. Knee present; ocrea present; flagellum present. This collection is a new record for *Calamus leptospadix* in Myanmar.

## Henderson et al. 3166

An additional specimen of *Calamus floribundus* Griff. was collected along the Ledo Road between Shimbweyang and Tanai at an elevation of 195 masl. The collection locality coordinates are 26°38N and 96°22E. Stems clustered, 3 m tall and 1.7 cm in diameter. Sheaths greenish-brown with black spines. Knee obscure; ocrea present. This rattan is known locally as “ye-kyein”.

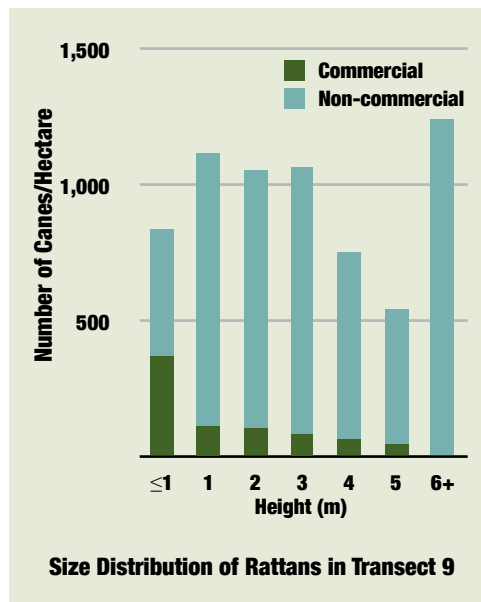
## Henderson et al. 3169

Another collection of *Calamus flagellum* Griff. was made along the Ledo Road between Shimbweyang and Tanai at coordinates 26°32N, 96°35E. Stems clustered, 6 m tall and 4.5 cm in diameter. Sheaths densely covered with black, flattened spines. Knee obscure or absent; ocrea present, fibrous, soon falling.

## Transect 9

Transect 9 was established in lowland, seasonally flooded forest north of Tanai at 26°30N and 96°39E. The site was essentially flat, and so full of rattan as to be virtually impenetrable.

The impressive density of rattan in Transect 9 is illustrated in the size-class histogram presented below. There are over 1000 rattans canes/hectare in most of the



larger size classes. Unfortunately, most of the canes are of non-commercial species. The distribution of sizes in this rattan stand provides useful information about the dynamics of the community. The size-class distribution is almost flat, and there are more larger individuals than smaller individuals. This suggests that the site has become fully occupied with rattan, to the point that the canopy is so

tightly closed and the understory so dark that regeneration is lacking. This situation could be remedied by carefully opening the canopy, but, in this case, most of the individuals that would respond to the liberation treatment would probably be non-commercial species.

A detailed breakdown of the number of individuals per species and size class in transect 9 is shown in the summary table on the following page. In total, there are over 6,500 rattan canes/hectare in this forest, and 88% of them are *Calamus flagellum*. The periodic flooding and water-logged soils on the site are clearly advantageous to this species. In spite of the presence of commercial rattans, it would be very difficult to modify the floristic composition of the community to favor these taxa. Their density is too low and their competitive ability too limited to displace *Calamus flagellum* from this habitat.

## Henderson et al. 3123

*Calamus floribundus* Griff. was collected from a disturbed area near the village of Makaw along the Ledo Road at an elevation of 212 masl. The coordinates of the collection site are 26°26N, 96°42E. Stems clustered, 6 m long and 2.5 cm in diameter. Sheaths densely spiny with black, needle-like spines. Ocrea very bristly; knee present; flagellum absent.

## Henderson et al. 3177

An additional specimen of *Calamus floribundus* Griff. was collected at 212 masl from a disturbed roadside near Lamung village in Tanai Township. The collection site was located at 26°25N, 96°42E. Stems clustered, scrambling, 3 m tall. Staminate flowers collected at anthesis<sup>7</sup>.

## Henderson et al. 3173

*Calamus tenuis* Roxb. was collected at 26°25N, 96°42E from a low lying, swampy area dominated by grass near the village of Lamung in Tanai Township.

<sup>7</sup>floral emergence; the time when flowers are expanding.



Number of Rattan Stems/Hectare in Transect 9

Species	Height (m)							Total
	≤1	1	2	3	4	5	6+	
<i>Calamus flagellum</i>	475	1000	950	985	685	500	1230	5825
<i>Calamus gracilis</i> (C)	80	40	35	55	55	20		285
<i>Calamus palustris</i> (C)	285	65	60	20		20		450
<i>Calamus cf. wailong</i> (C)					5			5
<b>Total</b>	840	1105	1045	1060	745	540	1230	6565

Stems clustered, forming large clumps, 3 m tall and 1.5 cm in diameter. Sheaths green, mottled pinkish-brown initially, with scattered, black spines. Knee prominent; ocrea present, small, membranous. Flagellum present. This rattan,

the collection site are 26°24N and 96°42E. Stems clustered, 4 m long and 2 cm in diameter. Sheaths brown with black, needle-like spines, those at the apex longer and light brown. Ocrea absent; knee present; flagellum present.



**Calamus tenuis** Roxb.

known locally as “ye-kyein”, or water cane, is an important commercial species. This collection is a new record for *Calamus tenuis* in Kachin State.

### Henderson et al. 3122

*Calamus leptospadix* Griff. was collected from a disturbed area near Tanai at an elevation 199 masl. The coordinates of

### Henderson et al. 3121

*Calamus tenuis* Roxb. was collected from a disturbed wet area near the Ledo Road at an elevation of 206 m and at coordinates 26°23N, 96°43E. Stems clustered, forming thickets, 6 m long and 2.5 cm in diameter. Sheaths green with mottled, pink-brown tomentum; spines, black, 2 cm long. Ocrea present; knee present; flagellum present. Known locally as “ye-kyein”, or water cane.

### Henderson et al. 3175

*Calamus floribundus* Griff. was collected from lowland forest near Tanai River, 8 km downstream from Tanai at 26°22N and 96°43E. Stems clustered, 4 m tall and 1.5 cm in diameter. Sheaths greenish with yellowish-brown spines. Knee present; ocrea present, fibrous; flagellum present.

The location map for the remainder of the fieldwork is shown on the following page. Two more collections and one more transect were made in the Hukaung Tiger Reserve, and three additional collections were made along the road north of Myitkyina heading to the confluence of the Me Hka and Mali Hka Rivers where the

Ayeyarwaddy River begins. After completing this fieldwork, the rattan survey team and the collections started slowly making their way back to Yangon.

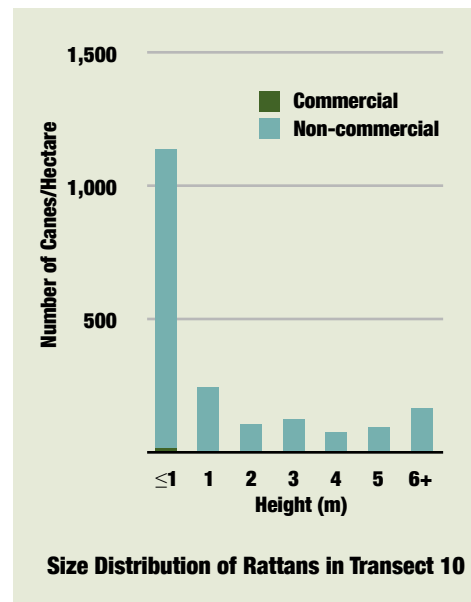
### Henderson et al. 3174

*Calamus* sp. nov. was collected 38 km south of Tanai on the road to Myitkyina at an elevation of 285 masl; the locality is 26°03N, 96°43E. Stems clustered, 4 m tall and 0.8 cm in diameter. Sheaths greenish-brown with many flattened, brown spines. Knee present; ocrea densely bristly; flagellum present. This collection is a new species to science.

### Transect 10

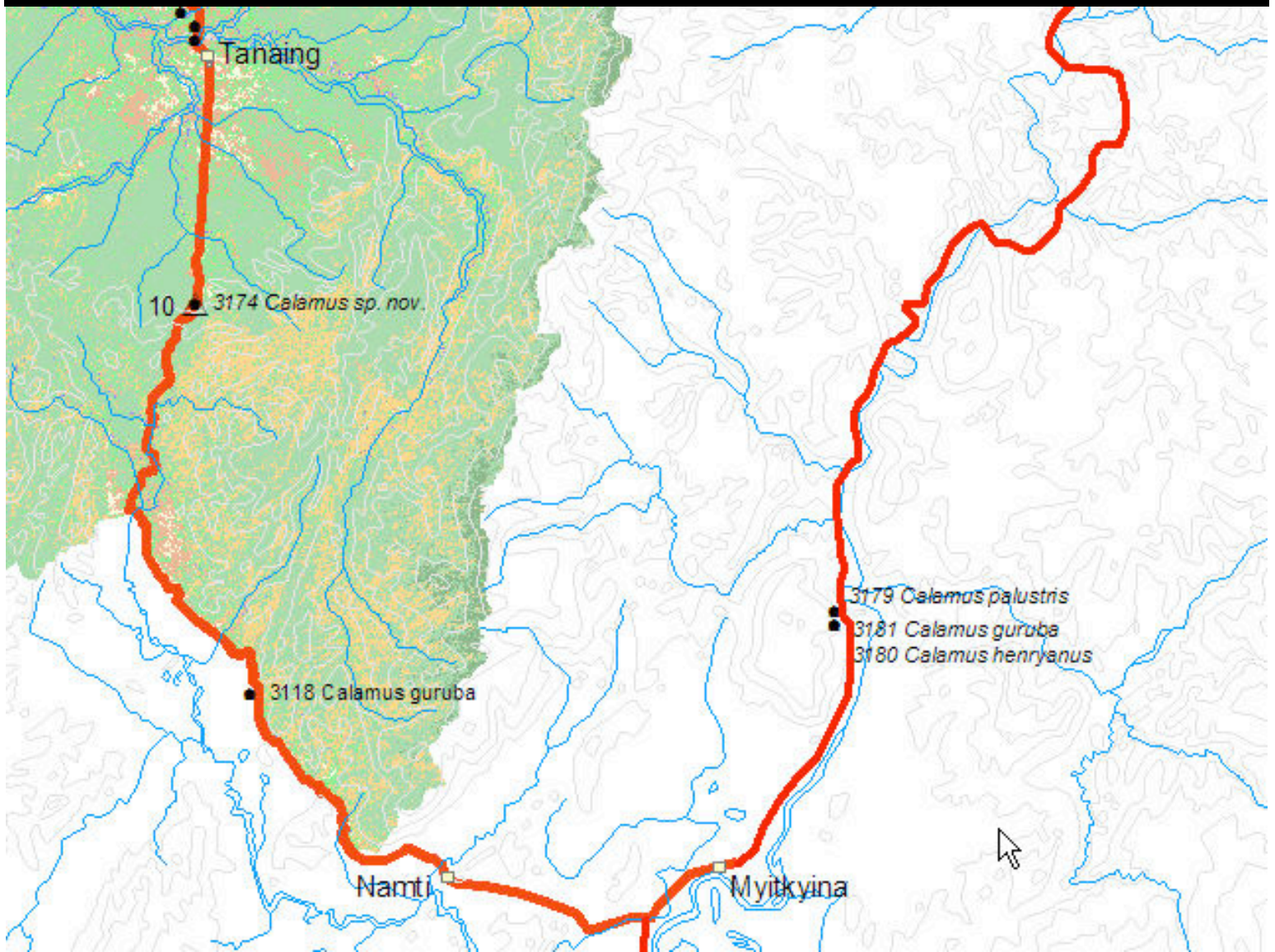
Transect 10, the final transect, was run in flat, well-developed forest in the wildlife corridor south of Tanai. The first plot, located at 26°03N, 96°43E, was at an elevation of 285 masl. There was slight evidence of disturbance near the road.

The size-class histogram for Transect 10 depicts the classic negative exponential



distribution of a plant community that is actively regenerating itself. The problem, in this case, is that virtually none of the species that comprise the distribution are commercial species. There was quite a bit of rattan in this forest, but none of it was worth harvesting.





This pattern is further illustrated by the summary table for Transect 10. Only five stems belong to the commercial *Calamus palustris*. Over half (66%) of the canes are *Calamus sp. nov.*, a new species collected for the first time during this survey. As in several of the other transects, *Calamus*

*flagellum* is a dominant component of the rattan community. It is hard to determine if this species is abundant because it competes so well in a variety of different habitats, or simply because its cane is brittle and it always avoids harvesting. For whatever reason, eight out

of the ten transects sampled during the rattan survey contained significant quantities of *Calamus flagellum*. This species is the most ubiquitous and abundant of all rattans in the Hukaung Valley.

### Henderson et al. 3118

*Calamus guruba* Buch.-Ham. was collected in a disturbed area by the road near the village of Lawa, 90 km north of Myitkyina in Hpakant Township. The collection locality is 25°35'N, 96°47'E. Stems clustered, forming thickets, 3 m long and 2 cm in diameter. Sheaths green with brown tomentum; spines upward-pointing. Ocrea prominent, brown; knee prominent; flagellum present. This rattan, known locally as "kyein ni" or red cane because of its reddish sheath, is an important commercial species.

Number of Rattan Stems/Hectare in Transect 10

Species	Height (m)							Total
	≤1	1	2	3	4	5	6+	
<i>Calamus sp. nov.</i>	900	150	45	90	35	20	15	1255
<i>Calamus flagellum</i>	220	90	55	25	35	65	140	630
<i>Calamus palustris</i> (C)	5							5
<b>Total</b>	1125	240	100	115	70	85	155	1890





***Calamus guruba* Buch.-Ham.**

### Henderson et al. 3179

*Calamus palustris* Griff. was collected from steep forest along the road from Myitkyina to the confluence of the Me Hka and the Mali Hka Rivers. The collection site was located at 25°41N, 97°29E at an elevation of 227 masl. Stem solitary; juvenile plant.

### Henderson et al. 3181

*Calamus guruba* Buch.-Ham. was collected at 25°40N, 97°29E along the road to the confluence of the Me Hka and Mali Hka Rivers. The elevation of the site was 223 masl. Stems clustered, 4 m tall.

### Henderson et al. 3180

Another specimen of *Calamus henryanus* Becc. was collected at an elevation of 223 masl from steep forest along the road from Myitkyina to the confluence of the Me Hka and Mali Hka Rivers. The collection site is located at 25°40N, 97°29E. Stems clustered, 5 m tall and 1.5 cm in diameter. Sheath covered with brown tomentum; spines, flattened, green, upward-pointing. Knee present; ocrea very short; flagellum present.

After finishing this last round of field-collections slowly began to make their way back to Yangon.



**U Kyaw Lwin and U Tin Maung Ohn with a leaf of *Plectocomia assamica* Griff. This is the specimen being collected by elephant in the photo on page 5.**



# Rattan Trade



In addition to the collections and transects, a preliminary analysis of the rattan trade in the Hukaung Valley was also completed as part of the rattan survey. Interviews were conducted with Three Red Stars Co., Ltd. and Khin Sow Trading Co., both major rattan traders in Myitkyina, and the survey team met with U Kyaw Soe Khaing, the Director of the Kachin State Forest Department. An assortment of rattan collectors, buyers, and truck drivers were also interviewed in the field.

The Three Red Stars Company has been trading rattan for over a decade. They harvest four main species, i.e. “ye-kyein”, “yamata”, “kyein ni”, and “kyet-u kyein” from the Tanai region. Much of this material is sent to Mandalay where it is used

to make furniture and handbags. Company representatives complained that it was getting harder and harder to get people to collect rattan, because of the competition from gold mining.

The Khin Soe Trading Company, run by Daw Kin Tint, is a major supplier of rattan from the Hukaung Valley. They harvest primarily “yamata” and “kadin” from Hpakant and Tanai townships. Both of these species must be treated with diesel before the cane can be sold.

Daw Kin Tint reported that cane production in the area has been declining. She remembers that when rattan harvesting started in Kachin State in 1993-1994, the Myitkyina region alone exported 10 million canes. Currently the production is

less than 3 million canes from all of Kachin State. Much of this material is exported to China.

U Kyaw Soe Khaing at the Forest Department reported that 4 million rattan canes is the 2005 production target for Kachin State. This is down a bit from last year when 5.4 million canes were harvested. Total rattan production for all of Myanmar was 20.9 million canes last year, and U Kyaw Soe Khaing estimated that over half of this production went to China.

Collectors must pay a rattan tax to harvest canes in the Hukaung Valley, and this tax fluctuates with the size of the cane. Small canes may be only 2 kyat per



**Major Commercial Rattan Species from the Hukaung Valley**

Local Name	Scientific Name	Notes
ye-kyein	<i>Calamus tenuis</i> Roxb. <i>Calamus floribundus</i> Griff.	stretches when wet; may include several other rattan species from the lowlands.
taung kyein	<i>Calamus cf. wailong</i> S.J. Pei & S.Y. Chen	probably several other species with this same local name; relatively slow growing.
kyet-u kyein	<i>Calamus gracilis</i> Roxb. <i>Calamus kingianus</i> Becc.	popular cane with foreign traders; similar to “sega” ( <i>Calamus caesius</i> Bl.) from Singapore. Can be split very fine; very few nodes. Used for making furniture and handbags.
yamata	<i>Calamus palustris</i> Griff.	very strong cane; used for furniture, tool handles, cordage. Must be treated with diesel; sulfur may be used to brighten color.
kadin	<i>Calamus cf. nambariensis</i> Becc.	large cane rattan; exploited very heavily in Hukaung Valley.
kyein ni	<i>Calamus guruba</i> Buch.-Ham.	reddish sheath; used for making furniture.

cane, while the tax on larger canes may be up to 15 kyat per cane.

All the collectors interviewed in the field said that rattan abundances had decreased dramatically in the last thirty years. One collector from Shimbweyang remarked that in earlier times it was possible to harvest rattan canes with up to fifty 4 m segments in it.

The collectors say that rattan harvesting in Hukaung Valley is controlled by when the Ledo Road is dry enough to get the rattan out. Harvest season usually extends from November to March. If the rattan is abundant and accessible, a collector can reportedly collect 30 canes/day. The normal rate of harvest is about 15 canes/day. Collectors rarely search more than two or three miles from the Ledo Road for rattan.

A standard rattan truck in the Hukaung Valley (see image p.21) carries 100 bundles of rattan, each bundles containing 30 canes (3,000 canes total). Daw Kin Tint had five such trucks loaded with kadin canes in the Hukaung Valley at the time of the rattan survey. Collectors had been harvesting and stockpiling this cane for almost three months. This material was sent to Myitkyina where it will be washed

and treated with diesel. After treatment, it will be trucked to Bhamo, then to Lweje on the border with China, and finally in to China.

The table above lists the major commercial rattan canes in the Hukaung Valley. It is important to note that there is much variability in the common names used for rattans in Kachin State. The same species may be called by several common names depending on the locale, and the same common name may be used to describe

several different species. Most common names seem to refer to broad groups of species defined by their morphological characteristics or habitat requirements. “Ye-kyein”, for example, includes several species that tolerate swampy conditions or grow in low-lying habitats, while “taung kyein” is frequently used to refer to any rattan that grows in the mountains. Similarly, “kyet-u kyein” is applied to several different species of light colored, small cane rattan.



**Rattan landing with *Calamus cf. nambariensis* (“kadin”) cane near 21 mile camp, Ledo Road.**



# Conclusions and Recommendations



The rattan survey in Hukaung Valley has highlighted several key points about this important forest resource. First, in spite of all that was heard about declining rattan supplies, the inventories suggest that there is still an abundance of rattan in the Hukaung Valley and much of it is still very close to the road. Transect 2, for example, was located directly behind a large rattan camp where thousands of *Calamus* cf. *nambariensis* ("kadin") canes were being stockpiled for transport (lower photo on p. 22). There were still 180 "kadin" individuals/hectare in the transect, and 50 of them were of commercial size, i.e.  $\geq 4.0$  m long.

Second, the major impact of rattan harvesting is to cream off the larger individuals in the population. For most of the species surveyed, there was still an abundance of individuals in the smaller size classes that would grow to replace the harvested canes. Right outside of

Shimbweyang (Transect 8), there were few merchantable canes of "yamata" (*Calamus palustris*) and "ye-kyein" (*Calamus floribundus*), but hundreds per hectare of each species in the smaller size classes. Given time to grow, the local stock of rattan will replenish itself. Because no one wants to buy a rattan cane that is only 3 m long, the local populations continue to be able to regenerate under high levels of commercial exploitation.

Third, the great majority of the rattan harvested from the Hukaung Tiger Reserve comes from a 1 to 3 mile strip on either side of the Ledo Road. The current price for rattan is simply not high enough to motivate collectors to go further into the forest. Relative to the total area of the reserve, the strip from which rattan is harvested is quite small. The same area is, in many cases, disturbed forest, which is very productive habitat for rattan - but

not for many of the animal species protected in the reserve.

What is suggested by all of these points is that the rattan resources in Hukaung Valley are very amenable to management and sustainable use. In fact, in spite of the current abundance of cane, continued uncontrolled exploitation will eventually lead to resource depletion unless some form of management is implemented. It would be easiest, and most useful, to initiate these management activities in the near future while there are still significant quantities of commercial species in the forests along the Ledo Road.

Two options for the sustainable management of rattans in the Hukaung Valley seem warranted. The first option would be the controlled exploitation and enrichment of natural rattan populations in a buffer strip or multiple use zone along designated sections of the Ledo Road. An



annual harvest quota should first be derived to insure a sustainable yield. Defining a maximum allowable harvest would require additional inventories of commercial species (to quantify the *stock* of the resource) coupled with yield studies (to quantify *production*) of annual rattan growth. These baseline data are relatively easy to collect and crews of local collaborators or villagers could be trained to do the fieldwork. Sustainability would be achieved by harvesting only the growth each year and leaving the existing stock of rattan at its current level. Enrichment treatments could be employed as necessary to augment the stock of particularly valuable species.

The second option would involve the cultivation of selected commercial species in small-scale agro-forestry systems at the village level. Cultivation efforts should start small at first by initiating demonstration plantings in selected villages. Based on the outcome of this experience, additional collaborating villages could be added using different rattan species in different habitats. It would be a good idea to arrange a buyer for this rattan before starting the project as a guarantee to villagers for their participation.

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