Economic Botany

Vol. 61 No. 1
Spring 2007

Devoted to Past, Present, and Future Uses of Plants by People

Gung Aung's elephant Aung Bu carries rattan (the elusive *Plectocomia assamica* Griff.) out of a forest in northern Myanmar, beginning its journey through a global market. See the article by Charles Peters et al. on page 3.

Published for The Society for Economic Botany
by The New York Botanical Garden Press
Issued 30 March 2007

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The Rattan Trade of Northern Myanmar: Species, Supplies, and Sustainability[1]

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The Rattan Trade of Northern Myanmar: Species, Supplies, and Sustainability. Although Myanmar exports millions of dollars of rattan cane each year, the last systematic treatment of rattans in this country was done over 100 years ago, and virtually nothing has been written about the collection and trade of this important forest resource. Here we report the results from a study of rattans in the Hukaung Valley Tiger Reserve in northern Myanmar. A total of 15 species of rattan were encountered; seven species are new records for Myanmar and two species are new to science. Inventory transects revealed that the density of commercial rattans in local forests averages 40.5 canes ≥4 m long/hectare. Populations of all species appear to be actively regenerating. The current pattern of rattan exploitation, however, is largely uncontrolled and will eventually lead to resource depletion unless some form of management is implemented.

Key Words: Myanmar, Hukaung Valley, rattan, sustainable harvesting, non-timber forest products.

Rattans are spiny climbing palms native to the Old World tropics. The long flexible stem, or cane, from these palms forms the basis of a thriving international industry, currently worth about 6.5 billion dollars a year (ITTO 1997). Most of the cane entering world trade originates from Southeast Asia, and is collected, with few exceptions, from wild populations. Although Indonesia and Malaysia are the largest commercial producers of rattan (Manokaran 1990), several other countries in the region export millions of dollars worth of rattan each year (INBAR 2004).

Of special interest in this regard is Myanmar. Unlike many neighboring countries where the local rattans are relatively well-studied, e.g., Lao PDR (Evans et al. 2001; Evans et al. 2002), China (Pei et al. 1991; Yin and Zeng 1997), Thailand (Hodel 1998), and India (Renuka 1992, 1995; Basu 1992), the last systematic treatment of rattans in Myanmar was done over 130 years ago (Kurz 1874). A review of major herbaria throughout the world reveals only 63 rattan specimens from Myanmar (Henderson and Peters, unpublished). This lack of information is especially noteworthy given that Myanmar contains over half of all the remaining forest in mainland Southeast Asia (FAO 1997).

What we are presented with in Myanmar is a

[1] Received 29 September 2006; accepted 26 November 2006.

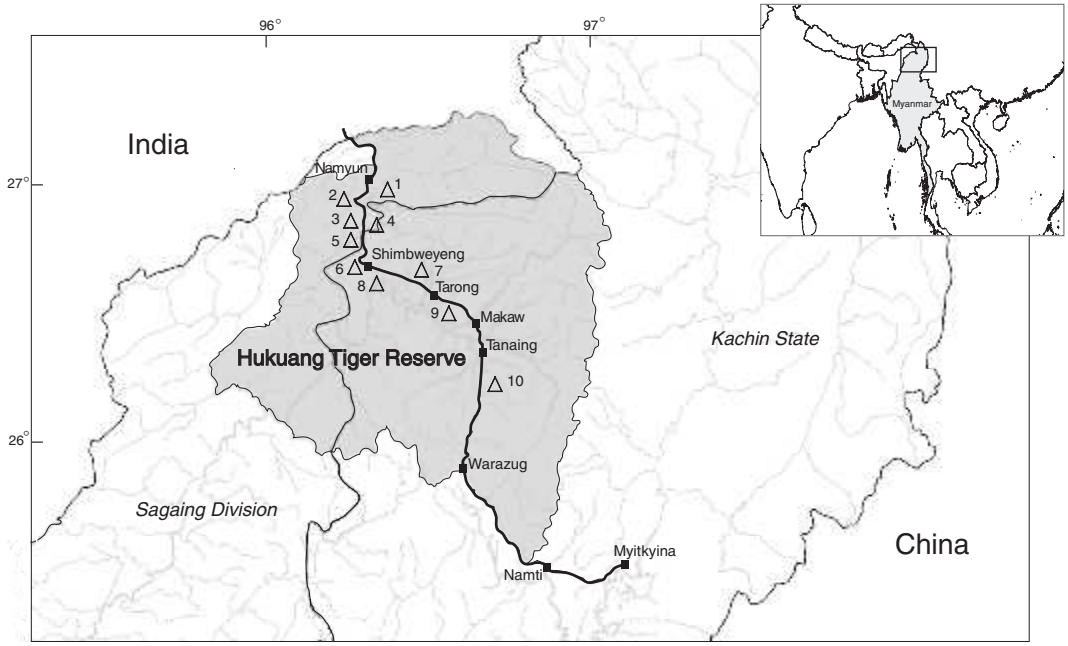

Fig. 1. Location of the Hukaung Tiger Reserve in northern Myanmar. Ledo Road is shown as bold line. Triangles represent rattan inventory sites.

vast expanse of forest that contains an undefined quantity of an extremely valuable plant resource about which virtually nothing is known. As a first step to remedy this situation, a systematic survey of rattans was conducted in the Hukaung Valley Tiger Reserve of northern Myanmar in early 2005. The objective of the survey was to document the diversity and abundance of rattans within the reserve, to assess the local rattan trade, and to describe the structure, regeneration status, and potential for sustainable management of wild rattan populations.

Survey Route and Methods

The Hukaung Valley Tiger Reserve (HKVTR) is located in Kachin State and the Sagaing Division of northwestern Myanmar near the border with India (Fig. 1). The reserve, which comprises a large lowland plain and the foothills of the Patkai and Kumon mountain ranges to the northwest and southeast, respectively, extends over 21,000 km^2 of evergreen forest. It is the largest tiger reserve, and one of the largest tracts of protected forest, in the world. The main access to the Hukaung Valley is provided by the Ledo Road (bold line shown in Fig. 1), a 765 km jungle track built by the Allies at the end of World War II to move supplies between India and China. The road was largely abandoned after the war, many of the bridges washed out, and it is currently passable only from November to March during the dry season.

The Ledo Road served as the main axis of the rattan survey. As is shown in Fig. 1, the survey team started at Namyun in the northeastern corner of the reserve and proceeded south toward Tanaing, making base camps every 10–15 km at different elevations and substrates to collect rattans and conduct ecological fieldwork. At each site, the local rattans were sampled quantitatively using 10 m wide transects composed of contiguous 10×20 m sample plots. All rattan species in each plot were identified, measured for height, and recorded. If it was not possible to determine the taxonomic identity of a rattan in the field, a temporary morpho-species name was assigned. For ceaspitose or clumped species, the height of the clump was recorded and the number of individual stems counted on a subsample of plants.

Replicate herbarium specimens were collected

for each new rattan species encountered with flowers or fruit, both in and out of the transect plots. Voucher specimens were deposited at Yangon University (RANG), the Myanmar Forest Herbarium at Yesin (RAF), Mandalay University (ASM), and The New York Botanical Garden (NY).

To gather information about commercial harvesting and the local rattan trade in northern Myanmar, interviews were conducted with the owners of Three Red Stars Co., Ltd., and Khin Sow Trading Co., both major rattan traders in Myitkyina, as well as with the Director of the Kachin State Forest Department. An assortment of rattan collectors, buyers, truck drivers, and local Kachin, Naga, and Lisu villagers were also consulted about the collection and sale of rattan in northern Myanmar.

Results

Rattan Species

Published checklists suggest that there are from 20 to 37 rattan species in Myanmar distributed among five genera. Lace's (1912) original list includes 20 species of *Calamus*, two species of *Plectocomiopsis*, and one species each of *Korthalsia*, *Daemonorops*, and *Plectocomia*. Seventy-five years later, the Forestry Department's (1987) list includes 25 species of *Calamus*, three species of *Korthalsia*, and two species each of *Daemonorops*, *Plectocomia*, and *Plectocomiopsis*, while Hundley and Chit Ko Ko (1987), also from the Forest Department, report 27 species of *Calamus* and four species of *Korthalsia* in Myanmar that same year. The recent checklist produced by Kress et al. (2003) mirrors the 1987 Forestry Department list with the exception that one species of *Plectocomia* has been dropped. Given that none of these compilations are specimen based and that much of the nomenclature is outdated, it is hard to assess how well these lists of names reflect what's actually in the forest.

The collection results from the Hukaung Valley rattan survey are shown in Table 1. A total of 15 rattan species were encountered along the Ledo Road, and half of them are harvested commercially. Seven of the species are new records for Myanmar; two of the species are new to science. Based on these results, additional assessments in other areas of the country would undoubtedly reveal that Myanmar contains a higher diversity of rattan than previously thought. The limestone islands of the Myeik Archipelago in the Tanintharyi Division, the Ponnyadaung Range in the western part of the Sagaing Division, and almost any forested region in Shan State are all promising rattan habitats that have yet to be collected. Assuming that all of the taxa listed by Kress et al. (2003) actually occur in Myanmar, there are at least 42 species of rattan in this country.

There is much variability in the local names used for rattans in northern Myanmar. Although the generic name for all cane is "kyein," a given species may be called by several different names depending on the locale and ethnic group, and the same common name may be used to describe several different species. Rather than a one-to-one correspondence, most common names for rattan seem to refer to broad groups of species defined by their morphological characteristics or habitat requirements. For example, "ye-kyein" includes several species that tolerate swampy conditions or grow in low-lying habitats, while "taung kyein" refers to any rattan that grows in the mountains. Similarly, "kyet-u kyein" is applied to several different species of light-colored, small cane rattan.

Production and Trade

The first steps toward developing a rattan industry in Myanmar were taken in 1970 when the Ministry of Forestry opened several rattan purchasing centers in Kachin State and Tanintharyi Division and subsequently exported 15 tons of rattan cane to Singapore (Win Myint 2004). The local rattan trade continued to grow over the next two decades, and by the early 1990s Myanmar was exporting an average of 12,000 metric tons of rattan each year valued at over 3.6 million dollars (INBAR 2004). The great majority of this material, i.e. over 95%, is sold to China.

Annual production data for rattan in Myanmar from 1991 to 2003 are shown in Fig. 2. In addition to totals for the entire country (histogram), production data for Kachin State and Sagaing Division are also graphed (line plot) to show the relative contribution of northern Myanmar. In terms of total rattan production, there is a notable drop in the amount of rattan collected after 1996. An average of 60.3 million rattans canes per year were collected during the interval from 1991 to 1996, while less than a third of this quantity was collected in subsequent years. Although the abrupt drop in 1997 is undoubtedly a reflection of the economic crisis that occurred

Table 1. Rattan species recorded in Hukaung Valley Tiger Reserve, northern Myanmar. Species reported as new records are not included in Kress et al. (2003).

Species	Local Name	Voucher	Notes
Calamus acanthospathus Griff.		Henderson et al. 3151 NY*	Noncommercial; new record for Myanmar
Calamus erectus Roxb.	thaing kyein	Henderson et al. 3137 NY	Noncommercial
Calamus flagellum Griff.	myauk chi kyein (monkey dung cane)	Henderson et al. 3146 NY	Noncommercial; cane is brittle and splits easily; new record for Myanmar
Calamus floribundus Griff.	ye-kyein (water cane)	Henderson et al. 3177 NY	Important commercial species; used for tying log rafts; split cane used for making furniture, handicrafts, and household utensils
Calamus gracilis Roxb.	kyet-u kyein (chicken egg cane)	Henderson et al. 3140 NY	Commercial species, popular with foreign traders; can be split very fine and has few nodes; used for making furniture; quality similar to that of sega (*C. caesius* Bl.) cane
Calamus guruba Buch.-Ham	kyein-ni (red cane)	Henderson et al. 3118 NY	Commercial species with reddish sheath; split cane used for making furniture; used for tying teak logs to make rafts
Calamus henryanus Becc.	taung kyein (mountain cane)	Henderson et al. 3158 NY	Noncommercial; new record for Myanmar
Calamus leptospadix Griff.		Henderson et al. 3165 NY	Noncommercial; new record for Myanmar
Calamus cf. *nambariensis* Becc.	kadin	Henderson et al. 3143 NY	Important commercial species; heavily exploited in Hukaung Valley; large cane; new record for Myanmar
Calamus palustris Griff.	yamata	Henderson et al. 3128 NY	Important commercial species resilient and durable, large cane; similar to *C. manan* Miq.; used for framing furniture and making household utensils
Calamus sp. nov.	htin phu	Henderson et al. 3125 NY	Noncommercial; stems split and used locally for weaving; new species
Calamus sp. nov.		Henderson et al. 3174 NY	Noncommercial; new species
Calamus tenuis Roxb.	ye-kyein (water cane)	Henderson et al. 3173 NY	Commercial species; split cane used for making furniture, mats, and baskets; heavily exploited
Calamus cf. *wailong* S.J Pei & S.Y. Chen	taung kyein (mountain cane)	Henderson et al. 3155 NY	Commercial species; used for furniture and basketry; new record for Myanmar
Plectocomia assamica Griff.	sin kyein (elephant cane)	Henderson et al. 3152 NY	Noncommercial; massive cane occasionally used to make bed frames and other large items of furniture

*Herbarium labels for the voucher specimens contained the names of all seven members of the survey team: A. Henderson, C. Peters, U Myint Maung, U Saw Lwin, U Tin Maung Ohn, U Kyaw Lwin, and U Tun Shaung.

throughout Asia during this year, the inability of the Myanmar rattan trade to return to previous production levels in later years suggests that other factors are at work here. Excessive harvesting and resource shortage may be partially responsible for this pattern, but the fact that production levels have consistently averaged about 20 million canes/year, rather than continually declined, suggests that economic policies and structural impediments may be more to blame.

The production data shown for northern Myanmar follows the same general pattern as the national average and usually represent about half of all of the rattan harvested in the country (Fig.

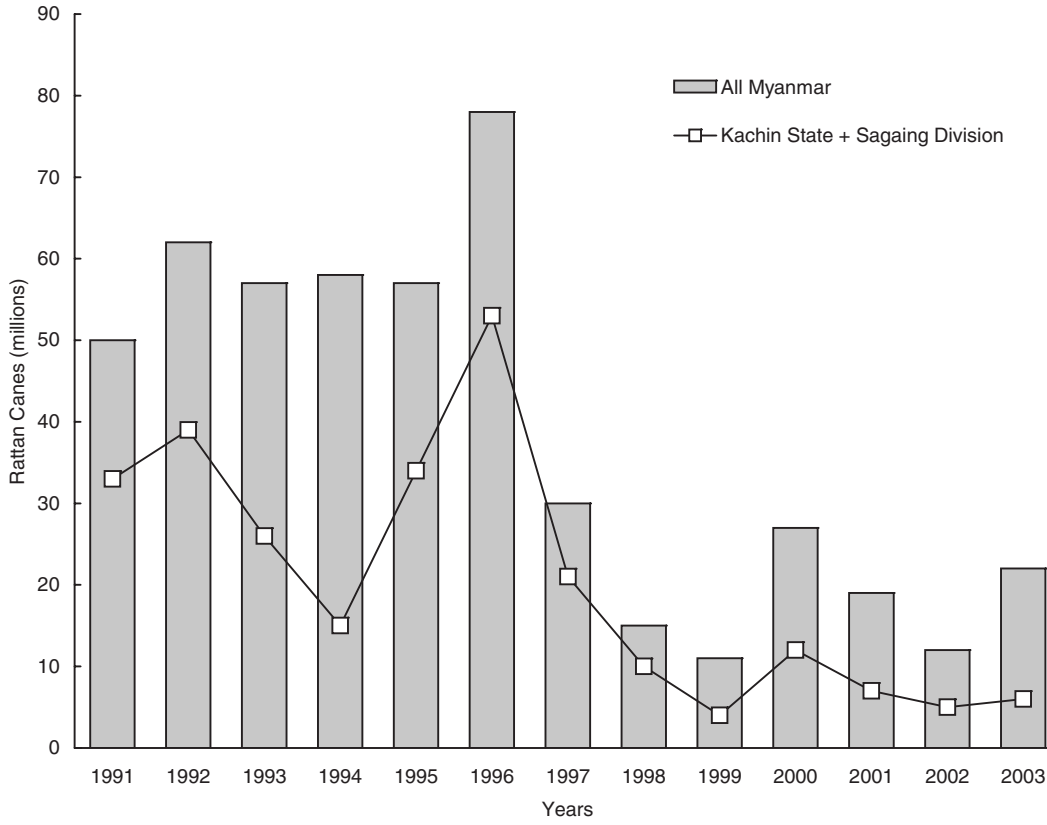

Fig. 2. Annual production data for rattan in Myanmar. Line plot shows production totals for Kachin State and Sagaing Division in northern Myanmar (adapted from data presented in Win Myint 2004).

2). The line for the northern region, however, deviates from this trend during the period from 1993 to 1995, when there was a notable drop in the number of rattan canes harvested. This drop in productivity may have been caused by the political instability that characterized the region during these years. With the exception of the major towns and railroad corridor, Kachin State has been virtually independent from Myanmar since the early 1960s due to the activities of the Kachin Independence Army (KIA). Increasingly violent clashes between the KIA and the Myanmar army came to a head in 1994 when the army launched a major offensive and seized the local jade mines which were a major source of funding for the insurgency (Smith 1999). A cease-fire agreement with the government was signed shortly thereafter, and the improved security and access to local forests undoubtedly stimulated rattan harvesting.

The low-level, sporadic collection of rattan by villagers for subsistence use is unregulated in Myanmar, while commercial collection requires a license from the Forest Department. These licenses are granted based on productivity "targets" that have been established for different regions and species. Last year, for example, the official government target for the entire country was 23.4 million canes, with 4.2 and 2.5 million cane targets for Kachin State and Sagaing Division, respectively (Forest Department 2005). Given the lack of available inventory data about wild rattan populations and the existing taxonomic difficulties with many local species, it is unclear how these targets are actually derived. Once a license has been granted, commercial collectors are required to pay a tax on each rattan cane harvested equal to about 25% of the prevailing market price for the resource.

Given the bad road conditions, the prevalence of malaria, and the difficulty of drying cane dur-

Fig. 3. Rattan collectors in the Hukaung Tiger Reserve, northern Myanmar. Top left. Stockpiling rattan canes in a forest landing. Top right. Tying rattan into bundles of 30 canes. Bottom. Trucks on the Ledo Road loaded with canes for transport out of the reserve.

ing the rainy season, the harvest of rattan in the Hukaung Valley is limited to a brief four-month period during the dry season. If the rattan is abundant and accessible, a collector can reportedly harvest up to 30 canes/day; the normal rate is about 15 canes/day. After collection, the cane is transported to a landing (Fig 3A), usually located near the road and the camp where the collectors stay, where it is trimmed and tied into bundles of 30 canes (Fig. 3B). Once a sufficient quantity of rattan has been collected, the material is loaded into trucks (Fig. 3C) for transport out of the Hukaung Valley. Each of the five trucks shown in Fig. 3 is carrying 100 bundles of *Calamus* cf. *nambariensis* cane (3,000 canes total). The collectors had been harvesting and stockpiling this rattan for almost three months.

The great majority of the rattan cane collected in the Hukaung Valley is sent to Myitkyina where it must be processed and dried before it can be exported. The most common form of processing is to soak the green cane in boiling diesel for about 20 minutes to kill insect pests, brush it with sawdust, and then spread it out to cure in the sun. Sodium hydroxide is occasionally used to bleach the cane of some species, e.g. *C. palustris*. The processed material is then trucked to the China where it is carefully inspected, weighed, and sold.

Conversations with rattan buyers and collectors inevitably ended with a comment about how rattan production had been declining in recent years. Buyers felt that it was getting harder and harder to motivate people to collect rattan, as more money could be made working in local gold mines. Collectors thought that rattan supplies were diminishing, and several reminisced about the old days when it was possible to find canes over 200 m long. There was a general consensus among all parties that there used to be a lot more rattan in the Hukaung Valley than there is now.

Current Supplies of Rattan

The results from the inventory transects revealed that the current density of harvestable rattan in the Hukaung Valley ranges from 15 to 2515 canes ≥ 4 m long/ha with an average density of 396.1 canes ≥ 4 m long/ha (Table 2). Although the largest number of canes was recorded in a lowland, seasonally-flooded site, rattan density was not related to either elevation or latitude. In terms of commercial species, local forests contain an average of 40.5 canes ≥ 4 m long/ ha; *Calamus* cf. *nambariensis* and *C. gracilis* were the most abundant commercial species with 17.5 and 12.2 canes ≥ 4 m long/ha., respectively. It is important to note that these density data are all from forests that are being actively harvested.

Population data for commercial species that include seedlings and pre–merchantable canes provide a useful assessment of what future supplies of rattan in the Hukaung Valley might look like. Size-class diagrams for five commercial species are presented in Fig. 4; a separate diagram for transect 2 is also included to contrast the distributions of commercial and noncommercial species and illustrate the population impacts of harvesting. The histograms for each species were constructed using the results from all transects and then adjusting the totals to a per hectare basis.

Several points of interest are apparent in Fig. 4. First, the population structure of all commercial species exhibits an inverse J-shaped distribution in which there are exponentially more small plants than large plants. Although total population size varies greatly from one species to the next, all of the rattans appear to be actively regenerating themselves. Second, there is a notable reduction in the number of canes in the merchantable size classes, i.e. ≥ 4 m tall, of all commercial species, this pattern clearly reflecting the selective mortality of commercial harvesting. Finally, as is shown in the histogram from transect 2, noncommercial species have an obvious competitive advantage when growing with commercial species. Noncommercial species—mostly *C. flagellum* in this case—exhibit the greatest number of individuals in all size classes, and the marketable classes are almost exclusively occupied by these taxa. That said, transect 2 was established behind the landing shown in Fig. 3, where collectors had been harvesting *C.* cf. *nambariensis* cane for almost three months, and there were still 50 merchantable canes per hectare recorded in the inventory. There may indeed be less rattan in Hukaung Valley than there used to be, but there is still a lot of harvestable cane in the forest.

Potential for Sustainable Use

The persistence of commercial rattan in northern Myanmar after decades of intensive exploitation seems to be the result of both ecological and market factors. From an ecological perspective, all of the rattan populations surveyed appear to be

Table 2. Number of marketable (≥4.0 m long) rattan canes recorded in 10×200 m transect in the Hukaung Valley Tiger Reserve, Myanmar. Density values are expressed as canes/hectare.

	Transect No.									
	1	2	3	4	5	6	7	8	9	10
Elevation (m)	1040	880	821	610	550	510	220	190	200	285
Location	N26°54' E96°13'	N26°52' E96°12'	N26°51' E96°12'	N26°49' E96°12'	N26°47' E96°12'	N26°45' E96°13'	N26°43' E96°11'	N26°41' E96°13'	N26°30' E96°39'	N26°03' E96°43'
Species										
C. flagellum		595	11	29			45	8	2415	240
C. floribundus								33		
C. gracilis	10	35	2						75	
C. henryanus						55		41		
C. cf *nambariensis*		50			40	85				
C. palustris								25	20	
C. sp. nov.	15									70
C. cf. *wailong*	10						15		5	
P. assamica		30	2							
TOTALS:										
All rattans	35	710	15	29	40	140	60	107	2515	310
Commercial species	20	85	2	—	40	85	15	58	100	—

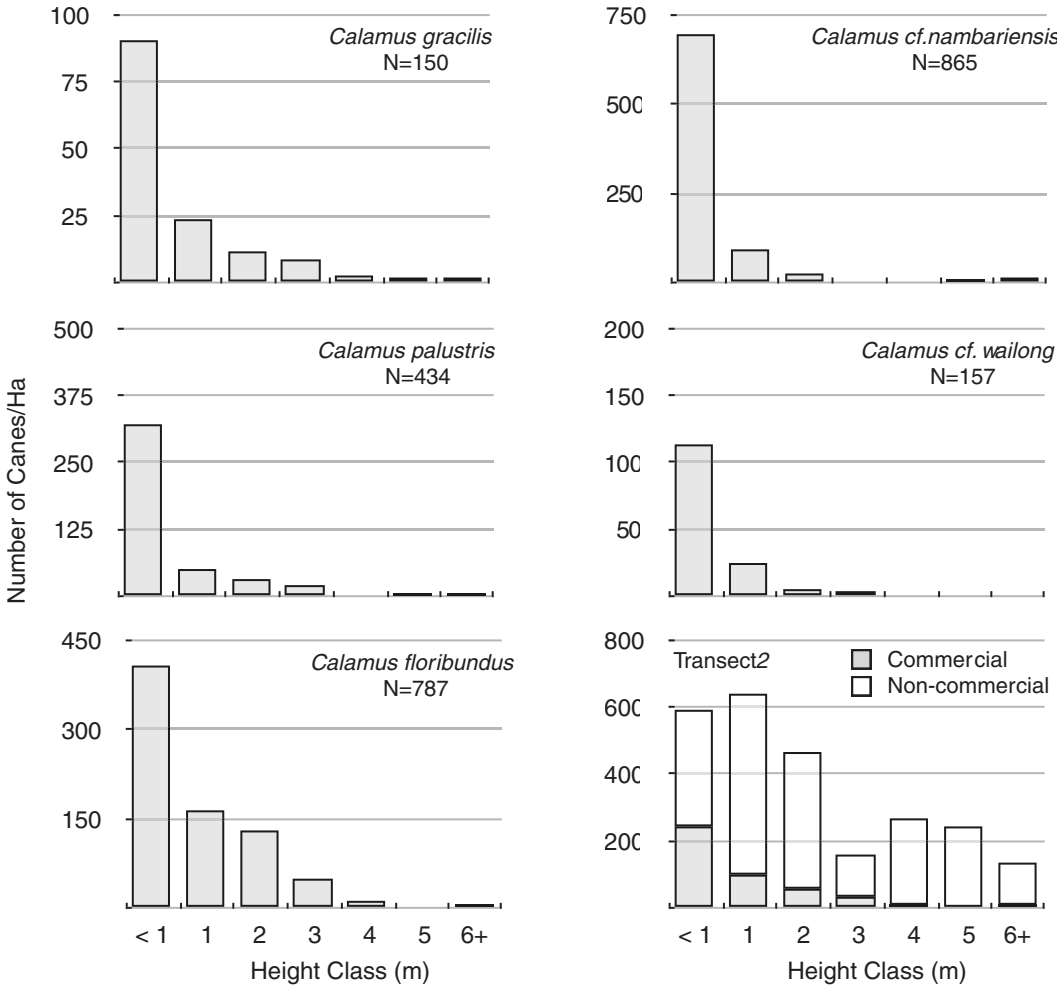

Fig. 4. Size-class histograms for populations of five commercial rattan species in the Hukaung Tiger Reserve, northern Myanmar. Data represent pooled results from all transects. Histogram at lower right shows the distribution of commercial and noncommercial species in transect 2.

recruiting enough new seedlings each year to replace the mortality of the adult canes harvested. This is an encouraging finding, because it suggests that the local rattans have yet to be irreparably overexploited. Of even greater long-term importance, however, is the simple reality that no one wants to buy a rattan cane that is less than 4 m long. Collectors sweep through the forest and selectively removed only the largest canes of a given species, which, in most cases, represents less than 5% of the total number of stems in that population. This material will subsequently be replenished by the growth of individuals in the smaller-size classes if the population is given sufficient time to recover.

In terms of the compatibility of commercial rattan harvesting and tiger conservation, it is important to note that the great majority of the rattan harvested from the Hukaung Valley Tiger Reserve comes from a 1.0 to 3.0 km strip on either side of the Ledo Road. The current price of rattan is simply not high enough to motivate collectors to go further into the forest. Relative to the total size of the reserve, the area from which rattan is harvested is actually quite small. This same area experiences frequent human traffic and is

composed of forest that has been disturbed to varying degrees—a very productive habitat for rattan, but not for many of the animal species protected in the reserve. Operationally, the tigers and the rattan collectors seem have chosen to exploit different habitats in the Hukaung Valley.

Conclusions

The forests of northern Myanmar contain an abundance of rattan resources with great potential for sustainable use. The current pattern of rattan exploitation, however, is largely uncontrolled and will eventually lead to resource depletion unless some form of management is implemented. To avoid this depletion, management activities should be initiated while natural populations of important commercial species are still intact and actively regenerating.

The results from the present study suggest two options for the sustainable management of rattan in the Hukaung Valley. The first option would be the controlled exploitation of natural rattan populations along designated sections of the Ledo Road. The amount of rattan removed each year from these populations should be based on reliable harvest quotas derived from periodic inventories and yield studies of all commercial species (*sensu* Peters 1996). Enrichment treatments could be employed as necessary to increase the abundance of particularly valuable species. The second option would involve the cultivation of selected commercial species in small-scale agroforestry systems at the village level. Cultivation efforts should start small by initiating limited demonstration plantings in a few communities.

In each case, management activities offer an opportunity to increase local livelihoods, to conserve the rattan resource, and, perhaps most importantly, to more closely engage local communities in the stewardship of the Hukaung Valley Tiger Reserve. The next phase of our rattan research in Myanmar will specifically address the issue of community management and sustainable harvesting.

Acknowledgments

The authors would especially like to thank the Myanmar Forest Department for granting permission to conduct the rattan survey. The Wildlife Conservation Society (WCS) played a key role in developing the research, and we gratefully acknowledge the support of U Than Myint and U Saw Tun Khaing in the WCS Yangon office, and Dr. Alan Rabinowitz and Dr. Josh Ginsberg from WCS New York. A warm thank-you to all members of the survey team including field assistants, cooking crew, and elephant handlers. Financial support was provided by the Committee for Research and Exploration of the National Geographic Society and the Center for Environmental Research and Conservation (CERC) at Columbia University.

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