Abundance and utilization of *Pyrenacantha sylvestris* in Budongo Forest Reserve, western Uganda

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Abstract

Pyrenacantha sylvestris S. Moore (Icacinaceae), locally known as Kateganende, has been extensively harvested by local people yet poorly managed. This has created a gap between its utilization and conservation. A study was therefore conducted to document its abundance and utilization in Budongo Forest Reserve. Abundance was assessed in ten systematically sampled plots of 20 × 50 m. Five of the plots were established in logged forest (compartment N2) and the other five in the nature reserve (compartment N15). Individual *P. sylvestris* and trellises were recorded and their respective diameter at breast height measured. Questionnaires designed to capture information on the utilization of *P. sylvestris* were administered to 40 systematically selected respondents adjacent to the forest reserve. Abundance was highest in logged areas of the forest ($\chi^2 = 14.8$, d.f. = 4, $P < 0.01$). Individuals in the diameter class 0.1–0.5 cm were the most abundant. *Pyrenacantha sylvestris* in the forest were mostly hosted in the trellises of the diameter class 1.0–10 cm. Over-reliance and use of *P. sylvestris* threaten the survival of the species. There is a need to create awareness and regulate its harvesting. In addition, research needs to be conducted on the possibility of propagating and domesticating this plant.

Key words: Budongo, climbers, lianas, *Pyrenacantha sylvestris*, Uganda

Introduction

Lianas, climbers or woody vines are a significant component of most tropical forests (Schnitzer & Bongers, 2002). They comprise 15–25% of woody plant stems and species in forest sample plots around the tropics (Gentry, 1991), and contribute up to 40% of forest leaf area and leaf productivity (Hegarty & Caballé, 1991). Moreover, climbers are structural parasites on other plants (Darwin, 1867) and as such may slow tree growth (Clark & Clark, 1990), increase host trees' risk of death (Putz, 1984a,b), and are a major pest in managed and plantation tropical forests (Appanah & Putz, 1984). Lianas and climbers have been shown to delay and alter gap-phase regeneration processes through competitive interactions with juvenile trees (Schnitzer *et al.*, 2000).

Recent research suggests that the abundance of lianas and climbers is changing. Long-term monitoring of populations in Amazonia (Phillips *et al.*, 2002) and leaf-fall in Central America (Wright *et al.*, 2004) suggest that lianas and climbers are becoming more dominant and productive even in mature forests. In spite of their significance, lianas are persistently understudied. For example, several factors have been proposed to promote large liana abundance in forests, including soil fertility and seasonality (Gentry, 1991), availability of suitable trellises (Hegarty & Caballé, 1991) and prior human disturbance (Ballée & Campbell, 1990), but few quantitative data are available to evaluate these claims. Those data that are available are rarely standardized, rendering large-scale comparative analysis of structure and composition, let alone the dynamics, difficult (Burnham, 2004).

The largest lianas that reach and potentially dominate the canopy of mature forests are especially understudied. One result is that lianas are ignored in models of forest processes and so the potential feedbacks of changing liana dominance and dynamics on stand-level biodiversity and carbon balance remain unexplored. Standardized structural and life-history data are needed from a range of sites if the role of large lianas is to be better understood.

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In Uganda, climbing plants are also little studied despite being a key component of the forest and despite their use by local communities mainly for medicinal purposes and as ropes. In the past, foresters often regarded lianas as weeds and eradicated them, making them one of the most threatened plant life forms (Jacobs, 1976). In this article we report the abundance and utilization of *Pyrenacantha sylvestris* S. Moore (Icacinaceae) in Budongo Forest Reserve. *Pyrenacantha sylvestris*, locally known in the area as Kateganende, has been extensively harvested by local people yet poorly managed. This has created a gap between its utilization and conservation.

Materials and methods

Budongo Forest Reserve is a medium altitude, moist, semi-deciduous forest. It is in Bugahya County in Hoima district, and in Buliisa, Bujenje and Burulli counties in Masindi district, in western Uganda. It is located between 1°31′–1°55′N and 31°18′–31°42′E on the edge of the western rift valley in western Uganda (Howard, 1991). It covers an area of 825 km^2, making it Uganda's biggest forest reserve (Hamilton, 1984). Budongo Forest Reserve was gazetted as a central forest reserve in 1932. It has one of the longest continuous research records of any tropical high forest in Africa (Langoya & Long, 1997) with permanent sample plots dating back to the beginning of the 20th century. Budongo forest is of exceptional biodiversity importance, ranking third in overall importance in the country (Howard, Davenport & Mathews, 1996). The reserve, which is a mixture of tropical high forest with a large population of mahoganies, woodlands and savanna grasslands, has about 465 species of trees and about half of the forest reserve is dominated by *Celtis*, *Khaya* and *Cynometra*.

Abundance of *P. sylvestris* was assessed in ten systematically alternating sampled plots of 20 × 50 m (Kent & Cook, 1996). Five of the plots were established in logged forest (compartment N2) and the other five in the nature reserve (compartment N15). The plots were established along 500 m long transects. In each sample plot, the presence of *P. sylvestris* was noted, and the stems counted and recorded. The corresponding individual diameter at breast height (DBH) was measured. Trellises were also identified and their DBH measured. Utilization of *P. sylvestris* by local community was assessed by administering a semi-structured questionnaire to 40 systematically selected households living adjacent to the forest reserve. The questions focused on the pattern of harvest and the uses of *P. sylvestris* by the local communities.

Abundance was computed using MINITAB statistical package. Chi-squared tests (Fowler & Cohen, 1988) were used to compare abundance in logged forest areas and the nature reserve. Spearman rank correlation was used to test the relationship between host diameter and the number of individuals of *P. sylvestris* hosted. Questionnaire responses were coded and analysed using the Statistical Package for Social Sciences (SPSS, 2004). The coding involved structuring the responses from the open-ended questions and assigning them nominal values for analysis.

Results

Socio-economic characteristics of households

The socio-economic characteristics of the respondents are presented in Table 1. The majority (90%) of the respondents were above 26 years. About 83% were subsistence farmers. The average family size was seven people per household. Sixty-one per cent were male and about 83% were subsistence farmers. Eighty-four per cent of the respondents owned livestock. Goats (51.3%) and cattle (34%) were the major livestock animals reared. More than 76% of the respondents had lived in the study area for over 10 years and about 40% owned less than 3 ha of land. The majority (44%) of the households had annual income less than Ug. Shs. 200,000.

Abundance of P. sylvestris

Abundance of *P. sylvestris* was highest in logged areas of the forest ($\chi^2 = 14.8$, d.f. = 4, $P < 0.01$) and the individuals in the diameter class 0.1–0.5 cm were the most abundant (Table 2). *Pyrenacantha sylvestris* were mostly hosted in the trellises of the diameter class 1.0–10 cm followed by trellises of 11–20 cm. Trellises >50 cm diameter hosted the least number of *P. sylvestris* (Fig. 1). There was, however, a negative correlation between host diameter and the number of individuals of *P. sylvestris* hosted ($R_s = -0.82$, $P < 0.001$).

Pattern of harvest and uses of P. sylvestris

Most (90%) of the households interviewed did not have any definite schedule in harvesting *P. sylvestris*.

Table 1 Socio-economic characteristics of the households (n = 40)

Factor	%
Age (years)	
<25	10
26–50	76
>50	14
Sex	
Male	61
Female	39
Current occupation	
Agriculture (farmer, herdsman)	83
Service worker (councillors, teachers)	02
Student	04
Others (pit sawyers, charcoal burners)	11
Educational background	
No formal education	13
Primary	75
Secondary	09
Tertiary	03
Household yearly income (Ug. Shs.)	
<200,000	44
201,000–400,000	39
>400,000	17
Family size (number of persons)	
1–5	42
6–10	54
>10	04
Plot/land size (hectare)	
<3	40
4–6	53
>6	07
Period of stay (years)	
<10	24
11–20	37
>20	39
Ownership of animals	
Yes	88
No	12
Types of animals owned	
Cattle	44
Goats	56
Pigs	17
Bees	37
Sheep	29

The time for harvest depends on individuals. They use *P. sylvestris* as rope for construction work, especially in building huts and granaries; bundling of firewood; making duiker traps in the forest and hanging loops for drying clothes (Table 3).

Table 2 Abundance of *Pyrenacantha sylvestris*

Abundance by site			Abundance by DBH class		
Plot number	Nature reserve	Logged forest	DBH (cm)	Frequency	%
1	45	48	0.1–0.5	312	78.8
2	49	70	0.6–1.9	74	18.7
3	17	37	1.0–1.5	7	1.80
4	24	38	1.6–2.0	1	1.30
5	15	54			
Average	30	49			

DBH, diameter at breast height.

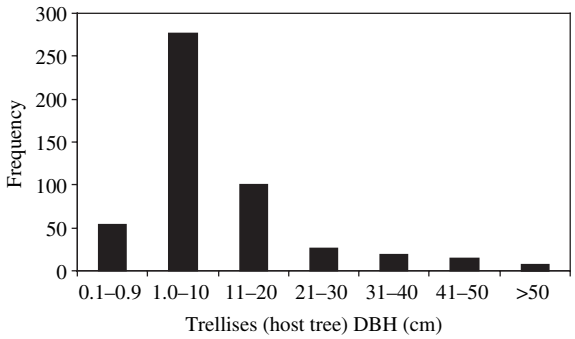

Fig 1 Number of *Pyrenacantha sylvestris* in relation to host diameter at breast height (DBH)

Table 3 Pattern of harvest and uses of *Pyrenacantha sylvestris* (n = 40)

Variable	%
Pattern of harvest	
No definite schedule	95
Every 4 days	05
Uses	
Rope for construction work	81
Bundling of firewood	73
Making duiker traps	49
Hanging loops	44

Discussion

Before planning for sustainable use and management of forest resources, forest managers and other stakeholders need to know the availability of the resources. According to Peters (1994), information on the abundance of forest

plants is relevant to the sustainable management and use of nontimber forest resources. This is because the population of species commonly harvested by local people often deteriorate and become extinct with each successive harvest. In this respect, it was felt necessary to generate information on the abundance and local use of *P. sylvestris* in Budongo Forest Reserve. Such information helps to guide the planning and rational decision-making process on resource use and management in protected areas.

The abundance of *P. sylvestris* was highest in logged areas of the forest. According to Grubb (1987), habitat influences the distribution and abundance of climbers and vines. As noted in this study, more stems of *P. sylvestris* were found in logged forest areas than in the nature reserve. This observation is consistent with Putz (1984a) who reported that logged forest areas often have open canopies that support the growth of lianas and other climbers. The same observation could be used to explain why *P. sylvestris* was more abundant in the logged areas of Budongo Forest Reserve. Generally, canopies that permit high light intensities to reach the forest floor support the growth of plants underneath them. In the context of this study, it can be said that the relatively more open canopies, as was the case with logged areas, supported the growth of *P. sylvestris* in Budongo Forest Reserve. Considering that *P. sylvestris* is a climber, the finding corroborates with an observation by Peters (1994) that forest vines and climbers easily adapt, grow and reproduce under sparse canopies receiving high light intensities.

It was also noted that there were many stems of *P. sylvestris* in the smallest diameter class of 0.1–0.5 cm. The finding could be attributed to the intense exploitation of *P. sylvestris* stems of larger diameter classes by local communities. In addition, many stems of *P. sylvestris* tend to re-sprout after cutting or when they are damaged. The harvesting of *P. sylvestris* could therefore be sustainable in Budongo Forest Reserve if the traditional harvesting method that involves leaving a stub on the clump is encouraged. It was found that *P. sylvestris* in the forest were mostly hosted in the trellises of the diameter class 1.0–10 cm. Putz (1984a) reported that the dimensions of the supports on which the lianas could climb depended partly on the climber and the climber mechanism used. There was, however, a negative correlation between host diameter and the number of individuals of *P. sylvestris* hosted.

A significant lesson that can be learned from this study is that a plant species can be protected through good knowledge of its ecology and use by the local communities living adjacent to the forest reserves. Local communities should be directly involved in the management of the reserve. Local participation and involvement are keystones in natural resource conservation. The success of conservation of resources, including *P. sylvestris* in Budongo Forest Reserve, will largely depend upon local input. There is a need to create awareness and to regulate the harvesting of this plant. In addition, research needs to be conducted on the possibility of propagating and domesticating it.

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