

## ABUNDANCE AND COMMERCIALIZATION OF *PHOENIX RECLINATA* IN THE KING WILLIAMSTOWN AREA, SOUTH AFRICA

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Received March 2003

**GYAN, C. A. & SHACKLETON, C. M. 2005. Abundance and commercialization of *Phoenix reclinata* in the King Williamstown area, South Africa.** In the Eastern Cape of South Africa the fronds of the wild palm *Phoenix reclinata* are harvested by rural women and manufactured into hand brushes, which are sold in urban centres. This paper reports on the abundance of *P. reclinata* palms, the profile of the harvesters, and the economic returns from trading in palm brushes as a case study of locally driven non-timber forest product commercialization. The palm resource was in a reasonable state with most clumps being lightly (36%) or moderately (43%) harvested, with many others uncut due to physical or culturally defined refugia. Tall trees within a clump were uncut because the fronds were too high. The estimated production of fronds was less than 25% of the local demand. Consequently, harvesters were seeking alternative areas and species. Mean gross monthly income was R475 (USD45) which was an important cash contribution. Net income was 75% of this. Income earned per seller was influenced by factors such as age, education, hours in the trade, and whether any household member received an old-age pension from the State. Older and less educated sellers had been trading longer than younger or more educated vendors.

Key words: Brushes – constraints – harvesting intensity – income – palms – refugia – women

**GYAN, C. A. & SHACKLETON, C. M. 2005. Kelimpahan dan pengkomersilan *Phoenix reclinata* di kawasan King Williamstown, Afrika Selatan.** Di Tanjung Selatan, Afrika Selatan pelepah palma liar *Phoenix reclinata* dituai oleh wanita luar bandar untuk dibuat berus tangan dan dijual di pusat-pusat bandar. Kertas kerja ini melaporkan tentang kelimpahan palma *P. reclinata*, profil para penuai serta pulangan ekonomi daripada perniagaan berus palma sebagai satu kajian kes tempatan bagi pengkomersilan produk hutan bukan kayu. Sumber palma berada dalam keadaan yang agak baik dan kebanyakan rumpun dikategorikan sebagai tertuai sedikit (36%) atau tertuai sederhana (43%). Banyak rumpun tidak dituai kerana refugium fizikal atau refugium budaya. Pokok tinggi dalam satu-satu rumpun tidak dituai kerana pelepahnya terlalu tinggi. Anggaran penghasilan pelepah adalah kurang daripada 25% daripada permintaan tempatan. Akibatnya, para penuai mencari kawasan serta spesies alternatif. Purata pendapatan kasar bulanan ialah R475 (USD45) dan ini merupakan sumbangan wang tunai yang penting. Pendapatan bersih ialah 75% daripada jumlah ini. Pendapatan yang diraih oleh setiap penjual dipengaruhi oleh faktor seperti usia, pendidikan, tempoh berniaga dan sama ada terdapat ahli keluarga yang menerima pencen tua daripada Kerajaan. Penjual yang lebih tua dan kurang berpendidikan lebih lama berkecimpung dalam perniagaan ini berbanding penjual muda atau yang lebih berpendidikan.

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## Introduction

All over the world the informal production and sale of handicrafts and utilitarian items from natural resources is a source of income for rural households (Neumann & Hirsch 2000). The same applies in southern Africa, a region characterized by growing human populations and widespread poverty (Aliber 2003), but with an accelerating tourism market. Handicraft production is a favoured development option by rural enterprise developers in government and non-government organizations and donor agencies because it requires low capital inputs, often minimal skills, and yet it provides the much needed supplementary income in support of rural livelihoods.

Since the production of handicrafts is mainly based on extraction of natural resources from the wild, the sustainable harvesting of the resource is a matter of concern to the resource users, conservationists and enterprise developers, perhaps at odds with rural development objectives (Arnold & Ruiz Perez 2001). The heavy exploitation of a resource can have detrimental effects on the income earned by the resource users as well as the viability and productivity of the resource itself (Heinsohn 1991, Heinsohn & Cunningham 1991, Braedt & Standa-Gunda 2000, Choge 2000).

The Eastern Cape province is the poorest of South Africa's nine provinces, with a high level of poverty, rural unemployment and economic stagnation. The use of natural resource is an integral component of rural livelihoods in the province (e.g. Shackleton *et al.* 2002, Cocks & Wiersum 2003). Hence, handicraft production, using existing knowledge and skills, can play a role in providing income and thereby contribute to rural livelihood. Fibre-based products, such as brushes and baskets, have been identified as useful contributors to the income of rural women and form part of their livelihood strategies and diversification. Among the species used to produce these products are *Flagellaria guineensis* (a forest liana), *Cannamois virgata* (a reed of the Restionaceae) and *Phoenix reclinata* (a palm).

In King Williamstown brush sellers utilize both restioids and *P. reclinata*. The palm leaves are harvested from local populations, bound together and shredded to make short-handled brushes. Despite the assumed commercial importance of palm leaves to the harvesters in the King Williamstown area, limited data exist on the abundance of *P. reclinata*, current demand, annual leaf production, or the effects of defoliation, all of which are required to help with the management of the resource. Hence, this paper reports on a background study assessing the abundance of the resource along a tributary of the Buffalo River in the King Williamstown area, as well as the demand for the resource and the profile of the resource users.

*Phoenix reclinata* is a wild date palm that grows to a height of 3 to 6 m, sometimes up to 10 m. It may grow as a stemless suckering bush, but usually several stems develop from the base. The leaves are pinnate, and compound, with 30–50 leaflets on either side of the rachis and the lowermost leaflets are reduced to spines. They occur along river banks and in seasonally inundated low lying, open grassland, typically in dispersed clumps. It is widespread throughout most countries in southern Africa. The fruits are edible. *Phoenix reclinata* has also been used to make 'kilts' for Xhosa boys taking part in initiation ceremonies, but demand for this is

probably waning. In some areas the sap is tapped to brew palm wine, but that does not happen in the Eastern Cape.

## Materials and methods

### *Study area*

The study area comprised the populations of *P. reclinata* along the Ngkokweni river, a tributary of the larger Buffalo River in the Eastern Cape, South Africa and the marketing centre of King Williamstown (31° 53.0' S; 27° 23.5' S). The vegetation on the uplands is short (< 4 m), dry savanna dominated by *Acacia karroo*, locally classified as eastern thorn bushveld. In the incised river valleys, thicker and drier vegetation formations dominate; it is termed valley thicket and characterized by *Euphorbia* spp., *Diospyros* spp., *Mystroxydon aethiopicus* and *Plumbago auriculata*. High human and livestock densities have resulted in marked fragmentation and disturbance of the natural vegetation. Mean annual rainfall is approximately 650 mm, with most occurring in, but not restricted to, the warmer summer months (November–April). The altitude is approximately 550 m above sea level.

King Williamstown is a regional administrative centre of approximately 120 000 people. It is surrounded by numerous rural villages at varying distances away. Residents of these villages engage in only limited small-scale agriculture and animal husbandry, and most rather commute as migrant labourers to King Williamstown and other larger economic centres, or to the commercial farms in the region. Most households collect a variety of natural resources such as fuelwood and edible and medicinal plants from surrounding grasslands, savannas and forests for everyday needs. Currently the village lands are largely open access systems, reflecting the current transition from tribal authorities being responsible for land and resource use to elected municipal structures that lack human and financial resources, and also rate resource use issues as a low priority. Therefore, anyone may harvest *P. reclinata* along the river.

According to the national census in 2001, approximately 40% of adults of the district are unemployed. About 15% of households reported no cash incomes whatsoever, and 57% have a household income of less than R500 per month (against a rural poverty datum of R700 per month). Three quarters of households earn less than R1000 per month. The provision of old-age pensions (R560 per month for female citizens older than 60) by the State is a vital source of cash income to approximately one-third of rural households in the area. A total of 53.5% of the population is female. The mean age is 27 years old. Mean household size is 4.8 persons.

### *Methodology*

A survey was conducted on the palm brush sellers frequenting the market town of King Williamstown to provide a profile of the trade and demand for *P. reclinata*. A total of 38 brush sellers were interviewed by means of a structured interview schedule, covering aspects of social profile, income generation, costs, and

constraints to production and trade. This sample constituted almost 100% of the sellers in the King Williamstown area. Direct costs were recorded and harvesting time was allocated an opportunity cost of R6.00 per hour in the final calculation of net income, which approximates R25.00 per day as the daily wage for casual manual labour in the town environs. Typically data were reported as units per month, and were then multiplied by 12 to derive annual values. Such extrapolation masks the frequently high variation between months associated with informal rural household enterprises, and thus annual figures may represent overestimates of income. It also became apparent during the study that most sellers could not disaggregate incomes derived from palm brushes and brushes made from other materials. Values reported here are thus total incomes from selling brushes as a livelihood activity. The interviews were conducted in the local language, Xhosa, with the help of a translator. At the time of the field work, the Rand dollar exchange rate was USD1 = R10.50.

Complementary to the interviews, a survey was undertaken of the abundance of *P. reclinata* trees along the Ngqokweni River. The number and size of clumps of palms were recorded in 100 m transects along the river at every 300 m, along a distance of 8 km, providing a total of 20 transects. According to harvesters there was no more *P. reclinata* along the river after this point as far as its confluence with the Buffalo river, 4 to 5 km further downstream. The size of each clump within transects was measured as the linear length of the clump parallel to the river. The number of stems per clump was counted from a sample of 28 clumps. Each stem was classified either as a mature stem (with a woody stem visible) or immature stem (with no real stem as yet). The number of leaves and the length of each leaf were measured for one mature stem in each of the 28 clumps to determine the mean number of leaves per stem. Each clump was assigned a visual estimate of harvesting intensity based on the degree of cutting of fronds. Stems with few fronds removed were classified as lightly harvested. Stems where approximately half the fronds had been harvested were classified as medium, and if more than half of the fronds had been harvested, severe. Fronds cut do not regrow, but replacement is rapid.

Five local harvesters were accompanied on collecting trips, and the lengths and number of palm leaves harvested were recorded. The length of each harvested leaf was measured. The number of brushes produced from the harvest was counted. The relationship between clump length and number of stems per clump was examined via linear regression. Pearson's correlation matrix was constructed to highlight the relationship between monthly income from trading and a number of socio-economic variables such as age, education levels, number of years trading, household size and number of jobs per household. A *t*-test was used to examine differences in mean income between vendors that receive a monthly old-age pension from the State and those who do not because this alternative income source may affect the need for alternative income generation via the sale of brushes. Since income from trading in brushes is likely to be influenced by the amount of effort expended, a one-way analysis of variance (ANOVA) was used to test for differences in mean income for traders working daily, relative to those traders working two to four days a week, or those working only on weekends or less frequently. The mean values presented are accompanied by the standard error.

## Results

### *Resource abundance*

There was a mean of 3.1 clumps of *P. reclinata* per 100 m transect, with an estimated total of 248 clumps for the 8 km stretch of the Ngqokweni river (Table 1). The mean length of the clumps was 2.5 m, although several were longer than 20 m. Regression results showed that number of stems was significantly related with clump length where number of stems =  $2.44 \times \text{clump length (m)}$ , with  $r^2 = 0.88$  and  $p < 0.001$ . This gave an estimate of 1513 stems for the study area. The mean number of leaves per mature stem was 14.8. Consequently, there was a standing stock of approximately 22 392 leaves along the river, with a mean length of 1.8 m per leaf. Some of the harvesters stated that there had been little change in abundance of palms in the area over the last few years. Of those stating that there had been a change, most stated that it was temporary in relation to fires, droughts and sometimes browsing by livestock.

### *Brush selling as a means of livelihood*

All sellers were female, with an average age of 33.1 years. Over 70% were 35 years or younger, fitting the age profile for the area. Average household size was 6.2 persons, which was greater than the area mean of 4.8. The average number of people with formal wage employment per household was 0.9, but approximately one third (31.6%) of households had no members in formal employment, and were dependent upon the income from selling brushes as their only source of cash. Almost half of the respondents (44.7%) had been trading for five years or less, although the average number of years trading brushes was 8.9. The average number of years of schooling was 7.3, but 34% had six years or less, and were thus functionally illiterate. There was a negative correlation between education level (number of years) and number of years trading ( $r = -0.69$ ;  $n = 38$ ;  $p < 0.001$ ), as seen in Table 2, indicating that the less educated vendors generally stayed in the trade probably because of limited alternative opportunities.

**Table 1** Abundance of *Phoenix reclinata* (mean  $\pm$  SE) based on 20 transects

	Per 100 m transect	Total for study area (8 km stretch of river)
No. of clumps	3.1 $\pm$ 1.1	248
Clump length (m)	7.8 $\pm$ 3.2	624
No. of stems	18.9 $\pm$ 7.8	1513
No. of leaves (14.8 $\pm$ 1.7 leaves per mature stem)	280 $\pm$ 32.2	22 392

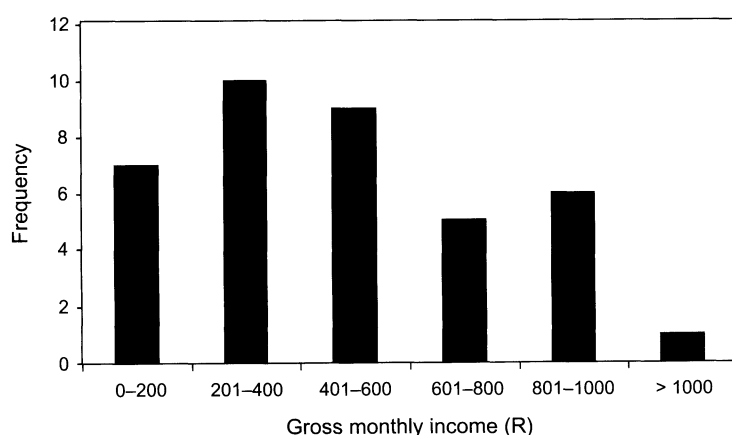
Mean gross monthly income from brush selling was R474, although there was wide variation, with a minimum of R30 and a maximum of R1100 per month (Figure 1). This wide gap is because for some brush sellers it is their only means of livelihood in an area of high poverty and unemployment and, therefore, more time was dedicated to manufacture and selling, whereas for others it was only a part-time activity for supplementary income. Those participating in manufacture or selling on a daily basis earned more than double those who participated on an ad hoc basis, i.e. weekends only, or less ( $F_{2, 35} = 8.53$ ;  $p < 0.001$ ;  $n = 38$ , Table 2).

There was a positive correlation between years trading and gross monthly income ( $r = 0.42$ ;  $n = 38$ ;  $p < 0.005$ ), suggesting that the more experienced traders earned more, and probably also viewed brush trading as a full-time occupation relative to newcomers (Table 3).

Direct costs consisted of transport to and from harvesting and selling sites (73.4%), collection and vending permits (4.8%), and materials such as needles and twine, and nails for long-handled brushes made from restioids (21.8%). Mean total costs were R121 per month. Thus, mean net monthly income was R356, representing 75% of the mean gross income. This includes an opportunity cost of

**Table 2** Mean gross monthly income ( $\pm$  SE) relative to effort expended (unlike superscripts indicate significant differences)

Frequency of participation in brush manufacture and sale		
Daily	2–4 times per week	Weekends or less
R 610 $\pm$ 63.8 <sup>a</sup>	R 491 $\pm$ 107.9 <sup>ab</sup>	R 267 $\pm$ 37.2 <sup>b</sup>
(n = 21)	(n = 3)	(n = 14)



**Figure 1** Gross monthly income earned from brush sales ( $n = 38$ )

**Table 3** Correlation matrix of respondent attributes and monthly income earned by selling brushes

	No. of years schooling	Household size	No. of workers in household	No. of years trading brushes	Gross monthly income
Age	- 0.785 *	- 0.068	- 0.074	+ 0.833 *	+ 0.394 *
No. of years schooling		+ 0.123	+ 0.097	- 0.687 *	+ 0.200
Household size			- 0.208	- 0.173	- 0.381 *
No. of workers in household				- 0.051	+ 0.096
No. of years trading brushes					+ 0.418 *

\* = significant at least at 0.05 level; n=38

R6.00 per hour for harvesting. Half of the brush sellers also forfeited on family life for parts of the month because they travelled and stayed for several days in other bigger Eastern Cape urban centres like Queenstown, Port Elizabeth, Stutterheim and East London to sell their produce. King Williamstown was not the only selling point. Their school going children assisted some brush sellers. These children sell during weekends and holidays. The mean number of hours per day spent selling brushes was 7. Some of the brush sellers hawked from the same spot daily except on Sundays, mainly in front of larger retail stores, whilst others moved around.

The selling of brushes as a source of income was ranked highly by all vendors, but this was influenced by whether or not they also received the State old-age pension. Of the 29 vendors not receiving pension, 13 (44.8%) rated brush selling as their primary source of income, and seven (24.1%) rated it as their second most important source. Of the nine vendors that did receive pension, none ranked it as their primary income source, although two earned more money from brush selling than from their pension. Eight of the nine vendors ranked brush selling as the second most important income source, after their pension. The mean gross monthly income from the sale of brushes from vendors not receiving pension (R513.10) was not significantly ( $t = 1.66$ ;  $p > 0.05$ ) higher than those that did receive monthly pension (R348.11). On average, 190 reed brushes or 22 palm brushes are sold per month by each vendor. The price of the brushes ranged between R5.00–R7.00, depending on whether it was long-handled or short brush. The short palm brushes were cheaper and were priced at R5.00–R6.00. The input cost for long brush production was more as packets of nails and twine were bought whereas only twine was needed for short brush production. Brush making skills were acquired from relatives and friends at no monetary cost.

### Harvesting and manufacture

*Phoenix reclinata* was regarded as the best fibre for production of short brushes, whereas a number of Cape reed species (Restionaceae) were preferred for making long-handled brushes. However, respondents stated that there has been growing use of Cape reeds for short brushes because the palm resource was not easily available.

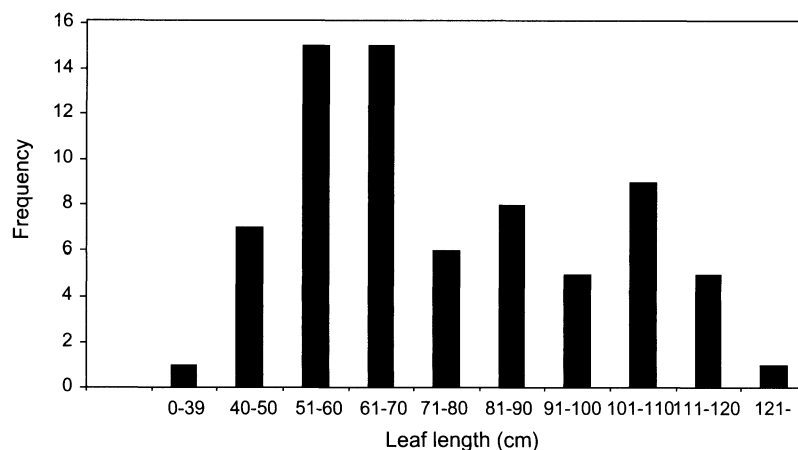
The brush sellers tend to harvest and produce their own brushes. Of the 38 brush sellers interviewed, 32% harvested palms along the Ngqokweni River and on average, collected three sacks of palm leaves per month. A full sack contained about 76 cut fronds. Thus, monthly demand by the palm brush producers was approximately 8664 fronds, of which 32% was collected from the Ngqokweni river, as well as other tributaries of the Buffalo River. Thus, demand from this site was 2772 fronds per month.

Visual estimates of harvesting intensity of the different clumps showed that 43% were ranked as medium harvested (i.e. approximately 50% of leaves harvested), followed by clumps with only light harvesting (36%). Only 21% were ranked as heavily harvested. These clumps were generally the most accessible ones.

Larger clumps had a greater number of leaves. This can be explained by the fact that the larger clumps had more mature stems that were not easily accessible to harvesters. Along the cliffs, clumps appeared denser and not harvested since access was difficult because of steep cliffs and deep waters beneath the trees.

Palm fronds were cut with a sickle. Some leaves out of immediate reach were pulled down with a looped wire, but leaves on tall stems, or overhanging the water were inaccessible. Brush production started immediately after harvesting while the fronds were fresh; dried leaves are brittle and cannot be utilized for brush making.

The mean length of uncut leaves on a mature stem was 1.8 m. The average length of a cut leaf for brush making was 74 cm, with 68% being less than 1 m (Figure 2). Generally, over half of the fronds were not harvested; only the top half



**Figure 2** Frequency distribution of lengths of harvested leaves (n = 72)



to one-third of the easily accessible fronds were harvested. Old and new fronds were harvested but dried and damaged fronds were discarded. The harvesters repeatedly returned to the same area to harvest but during the summer rainy season access to the palms was partly reduced because the rivers were full. All harvesters stated that cutting had little impact on the palms, and that new fronds regrew rapidly, usually within a matter of 3–6 months.

The pinnate leaflets are shredded with a safety pin, needle or any sharp object. It took, on the average, about 16 min to shred one cut frond. The shredded fronds were left in the sun to dry for approximately three days before being bound together to make brushes.

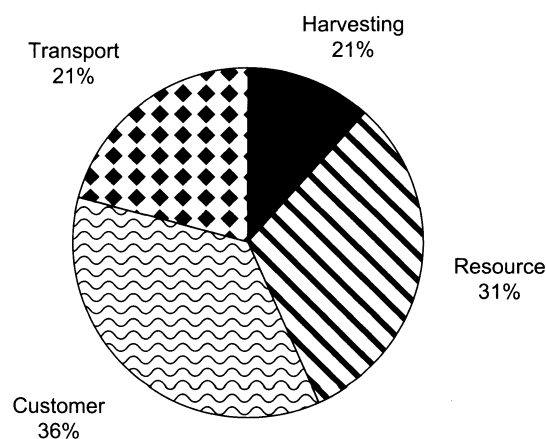
### *Constraints to brush production and trade*

Four categories of issues were raised when considering constraints to trade and a secure livelihood from it, namely, customer constraints, transport, harvesting problems and resource supply issues.

The most frequently stated problem (by 36% of the respondents) was related to customer constraints (Figure 3). Some brush sellers complained about being driven away from the places where they sold the brushes by the adjoining shop owners and harassment in the form of seizures of their products. They had to contend with indifferent clients and those who were unwilling to pay a reasonable price resulting in price cuts on bad selling days.

Resource accessibility issues were raised by 31% of the sellers. The palm was difficult to access because of the high cliffs. Accessibility was most difficult in summer when the river was full. Tall palm stems were also out of reach.

Approximately one-fifth (21%) of the sellers listed difficulties with transport. Palm frond harvesters faced the problem of walking long distances to the resource site. Most brush makers used hired vehicles to collect palms from farmlands far away from their homes and this entailed some overhead costs.



**Figure 3** Constraints faced by brush sellers (n = 38) (see text for details)

Harvesting constraints included a number of related problems associated with harvesting resources in remote areas. Due the inability of most harvesters to swim, harvesting next to the river was risky. Growing fears of criminals and rapists also curtailed the number of times the women go harvesting along the Buffalo River. They also mentioned problems of snakebites and bee stings.

### Discussion

The abundance of palm fronds for brush production depended on the number of palm stems, the rate of leaf production, and the frequency and intensity of leaf defoliation. Within the study area most clumps were moderately harvested, yet in some transects, the palms were largely inaccessible because of steep cliffs and the proximity to deep pools, providing physical refugia. Not only was there a fear of drowning in such pools, but many residents believe that these areas are inhabited by river spirits and it was taboo to disturb them by harvesting along the banks. Consequently, there was also an element of a cultural refuge for maintenance of the palm populations. Lastly, fronds of tall stems were also not harvested because they were out of reach of the harvesters, even when a wire loop was used. This may be regarded as a growth-form refuge. These physical, cultural and growth-form refugia currently limit excessive exploitation of the population of *P. reclinata* as a whole. In contrast, readily accessible areas had been severely harvested although they were mostly immature stems.

Determination of sustainable harvest yields for *P. reclinata* in the study area requires details of frond production rates. Estimates are available from other studies. Ratsirarson *et al.* (1996) observed that approximately four new leaves per year are produced by an adult individual, three new leaves per juvenile and one leaf per year by seedlings. With an estimated total number of stems in the study area as 1513, then the upper estimate of fronds that can be produced per year was almost 7565 and the minimum, approximately 3026. These upper and lower limits represent only 22.0 and 9.2% respectively of the estimated annual demand required by those harvesters frequenting the Ngqokweni River. Hence, the growing use of alternative species and sites. With demand far in excess of supply, the role of refugia in maintaining the population along the Ngqokweni River is likely to be significant. On the supply side, it is necessary to determine the impact of frond harvesting for this species, as well as the respondent assertions that cut fronds regrow and can be reharvested within six months.

Some researchers have examined the effects of defoliation on palm reproduction and growth (Mendoza *et al.* 1987, Chazdon 1991, Kinnaird 1992) and argued that the potential and specific effects of defoliation on particular species depended on the kind and quantity of tissue removed as well as the development stage of the plant. Chazdon (1991) found that removal of leaves in *Geonoma congesta* had no significant influence on reproduction at clonal level and the rates of leaf production per initial crown size were greater in defoliated ramets. Mendoza *et al.* (1987) on the other hand observed that defoliation affected the growth of juvenile palms but did not affect mature palms although the reproductive capacity of all palms were affected. Kinnaird (1992) explained that access to high-growing leaves damaged

the apical meristem and prevented further growth and that preferential harvesting might affect palm population structure. Leaf size and the rate of leaf production increased with palm age and size (Cunningham 1988, Kinnaird 1992). This was also observed in the study where mature stems produced more and longer leaves. Harvesting was less severe in mature stems because the leaves were not easily accessible. Although palms are resilient to selective defoliation, they should not be over harvested since excessive defoliation causes a reduction in vigour and productivity, resulting in exhaustion of non-structural carbohydrate reserves (Cunningham 1988).

The high pressure on the *P. reclinata* resource along the Ngqokweni River needs to be reviewed within the context of significant poverty in the Eastern Cape. This widespread poverty leaves local communities with little option but to rely on natural resources for daily needs and opportunities to generate cash income. Brush vendors had a mean gross monthly income of R474, only slightly less than the value of the State old-age pension. Of the vendors, 69% rated brush selling as either the first or second most important source of income for their households. This is in a region where 15% of households report no cash income whatsoever, and 57% of households earn less than R500 per month. It is thus clear that brush manufacture and trade is a key contributor to the livelihoods of the participants. Thus, there is a need for sustainable use of *P. reclinata* not only to conserve the resource but also to ensure continuous contributions to local livelihoods. This is even more so given that all the participants are women, frequently the most neglected sector in impoverished rural areas (Aliber 2003).

This study has shown that although resource demand exceeds probable sustainable supply, different forms of refugia and the reported rapid regrowth of the cut palms have provided a mechanism for ensuring maintenance of the local palm population, such that resource users feel that there has been little change in abundance. The need to generate income in an economically depressed region means that harvesting pressure is likely to remain high for the foreseeable future. Local harvesters have adapted to resource constraints by harvesting from other areas and other species such as Cape reeds. The income earned vary, largely a reflection of the effort expended, but is also related to the presence or absence of other sources of cash income such as old-age pensions. Participation in the handicraft market cannot meet all livelihood needs, but it is an important contribution and means for a cash income. For some participating on an irregular basis, it represents more of a safety net or supplementary activity, but for others it has become a major and secure component of their livelihood.

### Acknowledgments

Special thanks are due to L. W. Tusani for his invaluable assistance in language translation and field assistance. Thanks are also due to the brush makers of King Williamstown for providing valuable information in this project. S. Shackleton provided useful comments on earlier drafts of this paper.

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