Science of the Total Environment 628–629 (2018) 642–649

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

How can local representations of changes of the availability in natural resources assist in targeting conservation?

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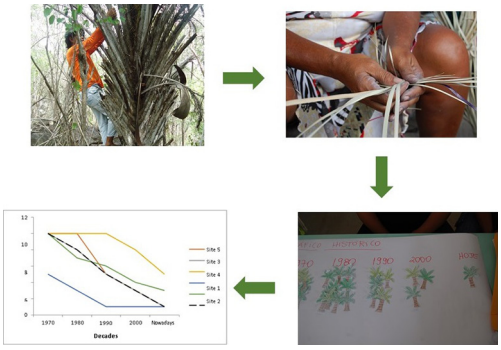
HIGHLIGHTS

- More experienced local extractivists tend to harvest leaves in a more sustainable manner than did young and inexperienced ones.
- The extractivists of *Syagrus coronata* leaves reported a decline in the palm populations.
- The extractivists of *S. coronata* leaves primarily associate such decline to the farming practices of non-indigenous people that lease lands in the area.
- The implementation of conservation strategies for *S. coronata* palm may be limited by the fact that the extractivists recognize the land lease system as the major threat for the species, which is one of the main income generator by this indigenous group.

GRAPHICAL ABSTRACT



ARTICLE INFO

Article history:
Received 22 September 2017
Received in revised form 6 February 2018
Accepted 6 February 2018
Available online xxxx

Editor: D. Barcelo

Keywords:
Local ecological knowledge
Ethnoecology
Sustainability

ABSTRACT

The use and appropriation of natural resources by human groups may be strongly related to the perception that these groups have of the abundance or scarcity of these resources. Researches on environmental representation can be useful to understand the criteria involved in the selection and use of natural resources, to verify if people realize changes in the availability of these resources and the possible causes of these changes and to elaborate conservation strategies, if necessary. However, if people are not realizing these changes, of if they do not perceive themselves as a cause of such scarcity, the developing of conservation strategies will be very difficult to implement. We investigated the drivers of sustainable harvest of *Syagrus coronata* (Mart.) Becc. (ouricuri palm) leaves by the Fulni-ô indigenous people in northeastern Brazil and accessed the representation of changes in the availability of the populations of this species over time. We obtained information about events that, from the point of view of the palm harvesters, pose threats to *S. coronata* populations. More experienced local harvesters tend to harvest leaves in a more sustainable manner than did young and inexperienced harvesters. The Fulni-ô reported a decline in *S. coronata* populations. However, they primarily associate such decline to the farming practices of non-indigenous people that lease lands in the area. Although the Fulni-ô people perceived a shortage of such

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https://doi.org/10.1016/j.scitotenv.2018.02.064

resource, our findings indicate that the implementation of conservation strategies for the ouricuri palm may not be so easy to implement, once it affects one of their main income sources (land lease), which is recognize as the major threat for the species by harvesters. Ours results showed that the relationship between perception of scarcity and ease of implementation of conservation actions should be contextualized.

1. Introduction

The proximity between human populations and the natural environment promotes development of intimate relationships with available resources, generating and modifying local ecological knowledge systems about them (Sieber et al., 2010). These knowledge systems can enable human groups to develop strategies for resource conservation (Lykke, 2000), helping in target efforts for conservation of threatened species and ecosystems, besides providing sustainable management practices (Fraser et al., 2006). Previous studies proposed approaches to integrate local ecological knowledge in the formulation of biodiversity management plans (Fraser et al., 2006; López-Hoffman et al., 2006; Gaoue and Ticktin, 2009; Schmidt and Ticktin, 2012).

The reasons for conducting research in conservation of nature with the help of local ecological knowledge are based, on the one hand, on the argument that people who use natural resources are dependent on them. Thus, it is reasonable to suggest that the management practices of local people will be directed to conservation (Ghazoul, 2007), especially when they notice a decline in resource availability (Salo et al., 2013). However, this is not always true, like, for example, in the case of common-pool resources. When resources (natural or labor) are shared, the logical tendency would be the abuse by individual interests, leading to the exhaustion of these resources (Hardin, 1968). This was evidenced recently in the research conducted by Wilson et al. (2015), which have found continued degradation of the fishery in the Dominican Republic over time. At the same time, Revollo-Fernández et al. (2015), showed the differences between gender in common-pool resource extraction, in which women changed their behavior towards lower extraction compared to men. In this sense, Ostrom et al. (1999) stressed the importance of a shared set of norms for cooperative and sustainable management of common property resources.

Additionally, other situations like harvest for commercial purposes and the wide range of usage of species may lead to unsustainable harvest by local populations (López-Hoffman et al., 2006; Lucena et al., 2007; Meke et al., 2016). Therefore, if changes in resources availability are not appropriately perceived by local people, the adjustments of harvesting practices that ensure the sustainability of the resources may be delayed or overlooked and, in this case, conservation strategies may have less effective outcomes (Lu, 2001; Bodin and Crona, 2008).

As people perception of natural resources is strongly related to the way they will use them (Alessa et al., 2008; Medeiros et al., 2015), understanding the representations of changes in resource availability and the factors influencing its uses are critical to formulating conservation and management strategies that meet local needs (Ghimire et al., 2004; Gaoue and Ticktin, 2009; Fernández-Llamazares et al., 2016). For example, elders and people who have more experience in harvesting natural resources probably accumulated more knowledge about them (Hanazaki et al., 2013), thus, tend to extract these resources in a less detrimental way. However, the body of evidence showing that experience and residency time of local people may positively correlate with extent of local ecological knowledge with direct implications for a more sustainable use of resources is still scarce (but see Ticktin and Johns, 2002, López-Hoffman et al., 2006, Ticktin et al., 2006).

Harvest is very important for learning about natural resources, once the environment promotes the contact between harvesters and these resources (Byg and Balslev, 2001). The sensorial contact promoted by harvest favors the learning about the resources and motivates conservation, once emotional responses will be awakened during this process (Soulé, 1988). For example, people who collect woody resources presented greater knowledge about them in comparison to people who buy or receive them by other people (López et al., 2015). In the same way, people who harvest natural resources more frequently probably will know a greater number of harvest sites, so these variables can also be positively related with sustainable harvest.

In this study, we investigated the techniques used by the Fulni-ô artisans in Águas Belas, Pernambuco, northeastern Brazil, to obtain leaves from *Syagrus coronata* (Mart.) Becc (ouricuri) to test how harvesters experience affects their knowledge and the sustainability of harvest. We aimed to understand their representations of changes in abundance of such species populations over time. The Fulni-ô possesses an ancient and culturally important relationship with the ouricuri palm tree, whose leaves are used for production of household and ritualistic handicrafts and commerce (Pinto, 1956). We worked specifically with the harvesters group to answer the following questions: (i) Do experience in harvest, frequency of harvest and number of harvest sites explain the sustainability of this practice? (ii) Have the palm harvesters noticed changes in abundance of species populations over time? (iii) What factors were noticed by the local harvesters as threats to the populations of *S. coronata?* We expect more experienced Fulni-ô harvesters to obtain resources more frequently, know a higher number of sites and harvest leaves in a more sustainable manner.

2. Material and methods

2.1. Study area

This study was conducted in the Fulni-ô indigenous land which is located in the municipality of Águas Belas (9°07′03″S, 37°07′06″W) and is 311.2 km far from Recife, the capital of Pernambuco state, northeastern Brazil. The municipality has an area of 885.986 km^2 and its current population is around 42,566 inhabitants (CONDEPE/Fidem, 2015). Águas Belas is part of the Ipanema river basin and is part of the Caatinga, a vegetation which is characterized by xerophytic, deciduous and thorny species (Araújo et al., 2007). The climate is semi-arid (BSHW', Köppen, 1948) with two well-defined seasons: the dry season, spanning from 5 to 9 months of the year, and a short rainy season (Prado, 2003), which occurs from May to July. The mean annual temperature of the municipality is 25 °C and the mean annual precipitation is 600 mm (CONDEPE/FIDEM, 2006).

2.2. Study species

The *Syagrus coronata* (Mart.) Becc. palm tree, commonly known as ouricuri, licuri, licurizeiro and coqueiro-cabeçudo, can be found in Brazil in the states of Pernambuco, Alagoas, Sergipe, Bahia and northern Minas Gerais (Lorenzi, 2010). The species inhabits Caatinga and semideciduous forests, as well as areas of transition to the Caatinga and campo rupestre (Noblick, 2017), a phytophysiognomy of the Cerrado biome, with vegetation that occurs at altitudes above 900 m, composed of rocky outcrops and acidic and nutrient poor soils (Benites et al., 2007). *S. coronata* has a single, erect stipe, from 3 up to 12 m high, ultimately replaced by distinctive closely-spaced leaf scars, arranged in rows (Noblick, 2017). The leaves are rigid and whitish inside (Lorenzi, 2010), usually spiraled distributed along the stipe and persisting just beneath the crown (Noblick, 2017). The species is monoecious, and male and female flowers are found in the same

inflorescence, distributed in the lower part of the triad bouquets (a row of female flowers next to two rows of male flowers) while in the upper part there are only male flowers (Lorenzi, 2010). The fruits are monospermic, dark green when immature and yellow-orange when ripe (Santos-Moura et al., 2016), measuring 2.5–3.0 cm in length (Lorenzi, 2010). *S. coronata* has a peak of flowering and fruiting in the summer months from December to March, but it can flower and fruit year around (Noblick, 2017). As an adult, this palm tree can survive in arid and dry environments, and can rapidly expand through pasture and agriculture sites (Noblick, 2017). However, the initial growing of seedlings is not favored in sites with great light intensity (Carvalho et al., 2006).

2.3. The Fulni-ô indigenous people

The Fulni-ô indigenous land has approximately 11,500 ha and is located 500 m from the city of Água Belas (CONDEPE, 1981; Sá, 2002). The Fulni-ô people are distributed in two villages: the main village (or village headquarters) has approximately 3430 inhabitants and the Xixiakhlá village is composed of 100 inhabitants. The Fulni-ô are one of the eleven indigenous groups found in the state of Pernambuco (ISA (Instituto Socioambiental), 2013). Despite their spatial proximity with Águas Belas, they still keep some of their traditions, such as communication in their native language (the *Yaathe*) and the practice of the ouricuri, a secret ritual that lasts three months (from September to December). The ouricuri is a religious meeting, when the Fulni-ô join in a third village with the same name of the palm species and experience their traditional practices like songs, dances and prayers (Dantas, 2011; Silveira et al., 2012).

The economy of Fulni-ô revolves around the production and sale of handicrafts, musical performances in other municipalities and occupations in the tertiary sector (Campos, 2011). Besides the traditional use of *S. coronata* leaves to produce rugs, mats, bags, hats and articles of clothing, the Fulni-ô also use timber and seeds from native species of the caatinga to produce handicrafts. In the past, the commercialization of these products was practically their only source of income. The ouricuri leaves was also used in construction of houses of the indigenous village until mid-1930 (Pinto, 1956), when the Indian Protection Service (SPI) arrived in the village and the houses became mansory. Its leaves are harvested in areas of wetter vegetation types, semi-decidual forest (the altitude swamps or "hills"), near to the indigenous territory. However, it is very common for the artisans (especially the elders) to buy leaves from younger community members or even from people who do not belong to the Fulni-ô ethnic group. The leaves are sold within the village or at the local street fair of Águas Belas, which occurs once a week. Agriculture, hunting and fishing are activities less practiced by the Fulni-ô, and when they perform them, it is for family consumption.

2.4. Community recognition and research approval

The recognition of the Fulni-ô indigenous community happened in the first visit, in the company of other researchers from our research laboratory that had already conducted studies in the region (Albuquerque et al., 2008; Albuquerque et al., 2011a, 2011b, 2011c; Soldati and Albuquerque, 2012). At this occasion, we held a meeting with the indigenous community leaders to explain the objectives of the research and request dissemination of it throughout the community. The project was submitted to the National Commission of Ethics in Research (CAAE 24211014.0.0000.5207), National Indian Foundation (authorization No. 04/AAEP/PRES/2015), National Historical and Artistic Heritage Institute (case No. 2000.000203/2014–35) and System of authorization and information in biodiversity (authorization No. 41944–1), which are responsible for approving research with traditional communities and indigenous peoples.

2.5. Identification of palm harvesters and factors that influenced sustainability of S. coronata leaf harvest

We identified all the Fulni-ô who had been using *S. coronata* for handicrafts production through the snowball sampling technique (see description in Albuquerque et al., 2014). It is a form of intentional selection of informants that consists in identifying for a specific topic of research, an expert who indicates another professional, reaching to a point where all the experts in the community are involved in the process. After locating all artisans, we talked to the local leadership to verify the existence of other professionals that may had not been identified through the snowball, thus locating three more people. At the end, 66 artisans were identified, 26 of whom were palm harvesters and 40 were not but they were buyers of *S. coronata* leaves or received them through donations. Semi-structured interviews (Albuquerque et al., 2014) were conducted only with harvesters' artisans to investigate how they harvest leaves and the factors influencing the sustainability of such practice. The way harvest was performed (if all leaves are harvested from the palm tree or not) was used as a measure of sustainability of leaf harvest, since the removal of 100% of the leaves of a tree species in the Arecaceae family may reduce the production of new leaves or even the death of harvested individuals (Mendoza et al., 1987; Zuidema and Werger, 2000). Additional data on informant's age, experience in harvesting, and number of harvest sites and frequency of harvest were recorded to verify whether these factors would explain the sustainability of this practice among the palm harvesters.

2.6. Representations of changes in S. coronata abundance and threats

After conducting the interviews, we invited all the harvesters to a participatory workshop, during which we conducted community mapping sessions (Sieber et al., 2014) (Fig. 1A and B). Twenty-six artisans, whose age range was from 22 to 80 years, attended the workshop. Twenty of them were harvesters and six were non-harvesters of *S. coronata* leaves. The presence of this little group of non- harvesters was important, as they have stopped to collect leaves recently.

The attendees were invited to draw a map of the region and indicate all the sites where they obtained leaves (see Fig. 2). Next, we asked them to choose six locations from those that were indicated. After choosing the six locations, we used the "Historical graph technique" (Sieber et al., 2014) (Fig. 1C and D), by asking the local harvesters to indicate on a paper, through symbols, their representations of temporal changes in abundance of the populations of *S. coronata* in each of the selected sites. The time span covered was from 1970 to 2014, with intervals of 10 years, totaling five periods for each site. The starting point was 1970 as this was the earliest period when harvesters recalled observing changes in palm abundance. We assure that the younger harvesters, which were born after 1970, only gave their opinion in the more recent temporal clipping, thus avoiding a bias on this method. Once this group was made by the more active harvesters of *S. coronata* leaves, we considered them as very important actors in the participatory workshop.

The number of symbols varied between 0 and 10. No symbol corresponded to the smallest population size (few individuals in the population) and 10 symbols corresponded to the largest population size (many individuals in the population). We used the timeline technique (Sieber et al., 2014) (Fig. 1E and F) to identify, from a historical perspective, the factors that the Fulni-ô consider as threats to the ouricuri populations. The informants indicated events, reporting time, and consequences that had occurred in the region and may had altered the abundance of the populations of this palm tree.

2.7. Data analysis

To test whether factors such as age, experience in harvest, frequency of harvesting and the number of sites used for *S. coronata* leaf harvest explain the sustainability of this practice, the responses obtained from

Fig. 1. Participatory methods used to verify the Fulni-ô representations of changes in the abundance of the populations of *Syagrus coronata* (Mart.) Becc. in the Águas Belas region, Pernambuco, northeastern Brazil. Fig. 1A and B: Community Mapping; Fig. 1C and D: Historical Graph; Fig. 1E and F: Timeline.

the interviews were classified according to the following criteria: the number of sites, years of experience and age were continuous and explanatory variables. The frequency of harvest was categorical and explanatory variable: once a month/once every two months: not frequently (1); once or twice a month: frequently (2); once or twice a week: very frequently (3). The sustainability of harvest practice was also categorical, and it was the response variable: do not harvest young leaves: sustainable (1); harvest all leaves: non-sustainable (0). We generated a correlation matrix to identify autocorrelated variables and subsequently excluded “age” as it was highly correlated with "years of experience in harvesting leaves" ($r = 0.8253$, $p < 0.01$). Moreover, the variable age was less adjusted to the final models than the second variable. A stepwise generalized linear model (GLM) was used to test the influence of explanatory variables (experience in harvest, frequency of harvesting and the number of sites used for *S. coronata* leaf harvest) on the sustainability of harvesting *S. coronata* leaves (response variable, binomial distribution). The results from the historical graph exercise and the timeline were used to verify whether the palm harvesters observed changes in abundance of *S. coronata* populations over time and the threats posed to these populations. All statistical tests were conducted in R 3.2 (R Development Core Team, 2015).

3. Results

3.1. Changes in the abundance and drivers of the sustainability of Syagrus coronata leaf harvesting practice

Local harvesters indicated a decrease in the abundance of all six populations of *S. coronata* between 1970 and 2014 (Fig. 3). When comparing the current (year 2014) abundance of the six ouricuri populations, harvesting sites 1, 3, 5 and 6 were considered to have the same abundance (score 1). Site 2 showed intermediary abundance (score 3) while population in site 4 was the most abundant (score 5) (Fig. 3). Palm harvesters with longer experience in leaf harvesting tended to harvest in a more sustainable way than inexperienced harvesters ($z = 1.905$; $p = 0.05$). The number of harvesting sites and frequency of harvesting did not influence sustainability of the harvest practice ($z = 0.004$; $p = 0.997$ and $z = -1.002$; $p = 0.3164$, respectively).

3.2. What factors were considered as threats to Syagrus coronata?

Local harvesters reported that populations of *S. coronata* started to decrease around 1924 with the arrival of the Indian Protection Service

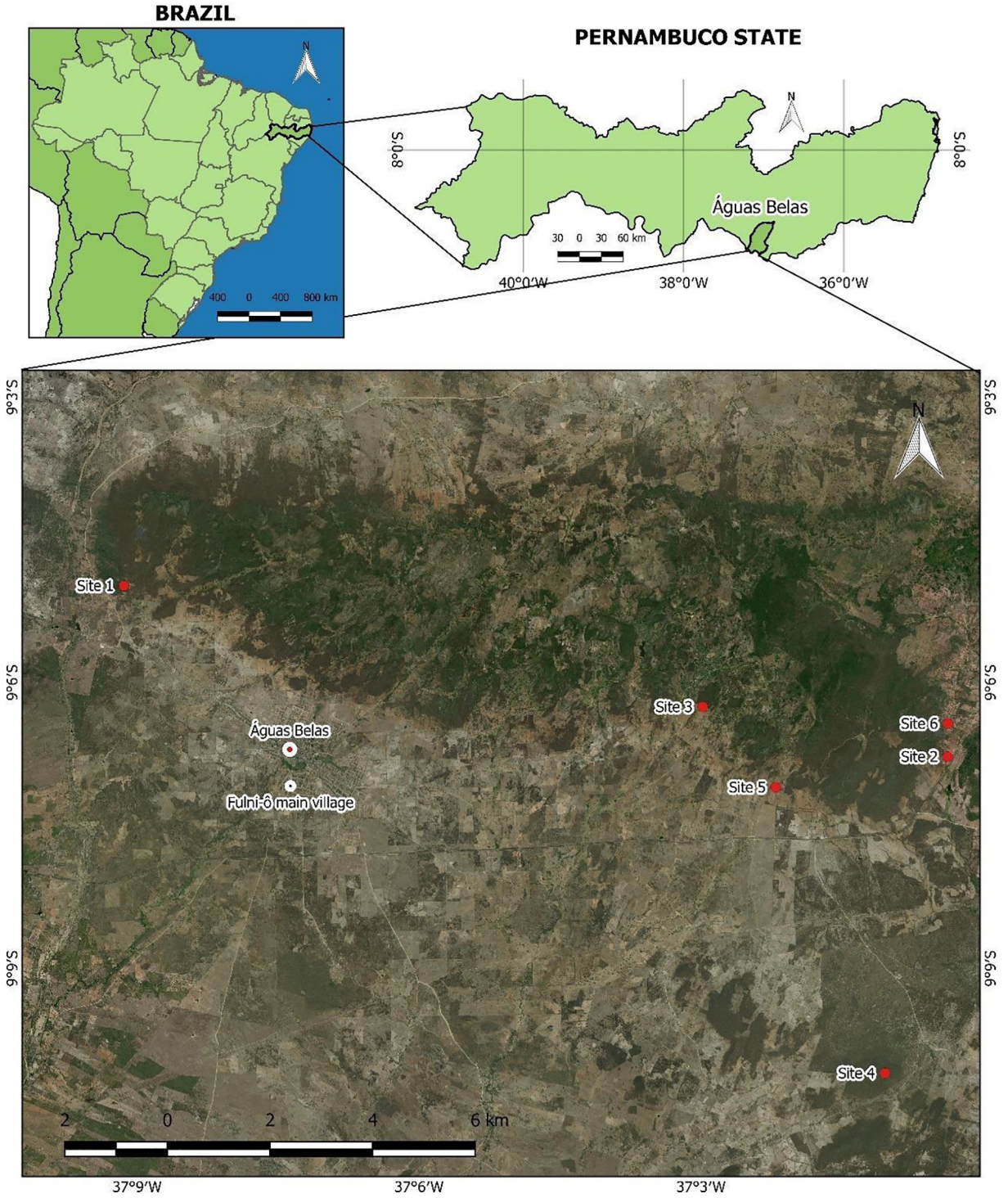

Fig. 2. Palm leaf harvesting sites of *Syagrus coronata* (Mart.) Becc. indicated by the attendees in the participatory workshop that was held in the Fulni-ô indigenous village, Águas Belas, Pernambuco, northeastern Brazil.

(SPI) in the village, which unleashed land leasing in Serra do Comunati (main site of leaf harvesting in the past) (Table 1). Due to the land leasing process, non-indigenous populations moved to the Fulni-ô land. Then, the tenants started burning the area as part of the preparation of the land for farming. In 1970, the populations of *S. coronata* experienced a severe drought in the region. In 1980, the frequency of intentional fires increased further reducing *S. coronata* abundance. The decade of 1990 was indicated as the starting point of the devaluation of handicrafts made with the leaves of Ouricuri, due to a drop in the search for handicrafts. This activity no longer was the main source of income of the Fulni-ô.

In the 2000s, the tenants started to use *S. coronata* leaves to feed cattle during the dry season due to the absence of other plant species used for this purpose. Thus, there was an abrupt decrease in palm populations, consequently reducing harvesting of leaves by the artisans. The recent lack of interest of the Fulni-ô youth in harvesting the leaves and handicraft production was also pointed out by the participants. According to the participants, the disinterest may be due to factors related to land leasing, such as prohibition of entry into the leaf harvesting sites and the decrease in *S. coronata* populations due to farming. Thus, we interpret that the Fulni-ô believed that land leasing, which strongly

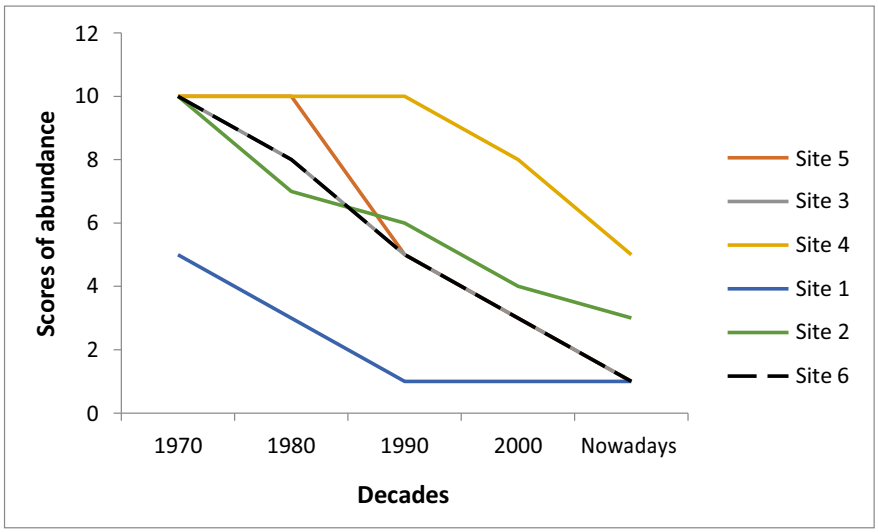

Fig. 3. Abundance of populations of *Syagrus coronata* (Mart.) Becc. represented by the local harvesters of the Fulni-ô indigenous village, Águas Belas, Pernambuco, northeastern Brazil in the decades of 1970, 1980, 1990, 2000 and nowadays. Scores refer to the quantity of symbols attributed to the species populations. It could vary between zero (less abundant) and ten (highly abundant).

contribute to their income, is the main driver of ouricuri populations decline.

4. Discussion

Our findings showed that harvest experience was an important factor in ensuring the sustainable harvest of *S. coronata* leaves. Usually, the time of experience is directly related with age, and both factors seems to influence positively the knowledge of natural resources, although age is most frequently used (López-Hoffman et al., 2006; Hanazaki et al., 2013; Beltrán-Rodríguez et al., 2014; Campos et al., 2015; López et al., 2015). For example, López-Hoffman et al. (2006) have found that older harvesters perceived decline in mangrove over time, and they related it to experience in harvesting, since these two variables were correlated. So, the same result was expected in our work, as more experienced harvesters had more time to accumulate knowledge about less harmful forms of harvest (López-Hoffman et al., 2006). Although expected, the significant and positive relationship between these variables indicates fragility in the process of transmitting information between palm harvesters of different generations regarding sustainability of leaf harvest. Once the less experienced harvesters were collecting *S. coronata* leaves in a more unsustainable form, is possible that there is a gap in the communication between this group of harvesters and the more experienced one. This fact may have consequences on conservation of *S. coronata* individuals and populations, and shows the necessity of implementation of more sustainable techniques of harvest by the less experienced harvesters.

To implement more sustainable harvest techniques of non-timber forest products in any region, harvesters must be able to recognize that a new technique produces a higher resource productivity and, consequently, in greater benefits to the group (Manzi and Coomes, 2009). For example, harvesters of the Peruvian Amazon region presented a higher ease in adopting more sustainable techniques for harvesting fruits of the palm *Mauritia flexuosa* L.F., by realizing that the new technique would contribute to the maintenance of such species, since they can return to the same individual more than once in the harvest time (Coomes, 2004; Manzi and Coomes, 2009). In this sense, the identification of the actors that are involved in a less sustainable harvesting is very important, once these people will be the main actors in the attempt to achieve the implementation of sustainable techniques of harvest. It is necessary that people acknowledge that the excessive removal of the resource may have negative effects on it and, consequently, on the continuity of the activity derived of its harvest.

The perception of scarcity of the resource by itself is not sufficient to achieve the implementation of conservation strategies. The successful conservation of useful natural resources requires that local populations perceive the scarcity of these resources, its consequences (Byg and Balslev, 2006; Horn et al., 2012) and perceive themselves as a cause of such scarcity (Sirén, 2006; Oldekop et al., 2012). For example, Sirén (2006) showed that the perception of indigenous people about the impact of harvesting palm leaves tend to facilitate the adoption of conservation practices. Similarly, Silva et al. (2014) found that members of local communities who used resources from riparian vegetation in northeastern Brazil indicated a decrease in native species and expressed concern about the conservation of these resources. However, the contrary was exposed by Lu (2001), while observing that the group she studied did not manifest the necessity of conservation of useful resources that were considered as abundant.

To reach conservation in practice, is essential to know the bases underlying scarcity and the reasons related to conservation of the resources (such as financial and religious motivations etc.) (Chapman, 1985). In our study, participants perceived a decrease in abundance of populations of *S. coronata* over time. However, they apparently did not see themselves as causal agents of such decrease. They attributed this decline mainly to the tenants who live in their lands, even themselves being the leasers. Such fact may indicate that conservation actions may not be so easy to implement within the Fulni-ô, because it affects one of their income sources. Gaoue and Ticktin (2009) found a similar scenario in a study with the Fulani in Benin, Africa, which harvest foliage of *Khaya senegalensis* (Desr.) A. Juss. For the majority of Fulani, the decline of *K. senegalensis* is related with logging and agriculture, and they emphasized that controlling logging is necessary for maintaining the species populations (Gaoue and Ticktin, 2009). These findings, in addition to the results of the present study show that in a case of an open access system to the resource, is hard to control who use the resource and what is the use for, and probably the perception of species decline will be related with factors beyond the local use of the resource. Hence, our findings showed that the relationship between perception of scarcity and ease of implementation of conservation actions should be contextualized. Furthermore, recognition of the Fulni-ô as causal agents of shortages may be a determining factor in the conservation of populations of *S. coronata*. In this context, the conservation behavior regarding *S. coronata* requires a collective action between harvesters and non-

Table 1
Historical events that was observed and considered by palm extractivists of the Fulni-ô indigenous village as threats to populations of *Syagrus coronata* Mart. Becc during the construction of the timeline.

Time spam	Event	Consequence
Late 17th century and early 18th century	-Junction of the 5 trunks (old Tapuias, Carnijós, Brobadás etc.)	-Current formation of the Fulni-ô ethnic group
1924/1926	-SPI (Indian Protection Service) arrives at the village	-Division of land in parcels and properties (notion of land ownership) -Land leases and first arrivals of non-indigenous populations in the hills around the village -Removal of coconut trees to prepare the land for agriculture
1950–1970	-Installation of a FUNAI office and masonry houses	-Improvement in financial condition of people -Houses in the village cease to be constructed with Ouricuri leaves (strong impact due to the great cultural significance of the thatched-roof houses) -Craft remains
1971–1980	-Severe drought in the region	-Decrease in leaves of the species
1981–1990	-Fires to clear land for agriculture in the Serra do Comunati by non- indigenous populations	-Decrease in the number of individuals of the species
1991–2000	-Devaluation of handicraft activity with Ouricuri leaves due to lack of demand -Deforestation by tenants continues to grow.	-Handicraft activity with the palm continues but ceases to be the main source of income -Decrease in palm trees, mainly in Serra do Comunaty
2001–2010	-Non-indigenous populations begin to use the leaves of the species to feed cattle in dry season -Non-indigenous populations prohibit leaf harvest	-Decrease in leaf harvest and reduction of handicraft production
2011-present	-Deforestation for farming purposes -Some tenants continue preventing leaf harvest	-Decrease in populations of the Ouricuri palm -Decrease in handicraft production -Disinterest of young people in harvesting and handicrafts production

harvesters from an eventual formulation of rules coming from within the community. Therefore, the success of these rules depends on cooperative attitudes (Brooks, 2010).

5. Conclusion

From palm harvesters representations and identification of harvest practices of *S. coronata*, we observe the need for implementation of conservation strategies of this palm species. We found that both socioeconomic (i.e. experience in harvesting) and political (i.e. land leasing) factors are related to not only the way the Fulni-ô obtained the resource but also the way they perceived changes in abundance of populations of *S. coronata*. Despite the perception of resource shortage, the cause attributed to such scarcity is the land lease, which is the main income generator of Fulni-ô people, but also the major threat for the species. This fact indicated that the implementation of strategies that contribute to increasing ouricuri populations may be potentially difficult. We recommend that more sustainable harvest techniques of *S. coronata* should be shared with less experienced palm harvesters of the village. Furthermore, we suggest that other forms of income generation should be discussed among the Fulni-ô people. To preserve the populations of *S. coronata* in the region, it is necessary changes in habits of the Fulni-ô individuals that are not palm harvesters and lease their lands with the purpose of generating income.

As we are talking about sustainability of a local resource, it was very difficult to avoid a local discussion. Besides that, we believe that is very important to show to the indigenous community how the results of our research will help them to achieve conservation efforts. In this way, we tried to show how the results of a local research could be extrapolated to a global level. As an example, we showed that the relationship between perception of scarcity and ease of implementation of conservation actions, which is a common statement in the ethnobiological literature, should be contextualized.

Finally, is important to mention that we recognize that the absence of past ecological data could limited our conclusion about sustainability. That is why the participatory workshop was so important. The assessment of harvesters' representation helped us to understand the availability of *S. coronata* populations in the past, which was only possible with the comparison of the availability of the populations in the present.

Acknowledgements

The authors thank the Fulni-ô people for sharing their knowledge and accompaniment during the interviews. The authors acknowledge the National Council for Scientific and Technological Development (CNPQ) for the PhD scholarship granted to JLAC and the productivity grants in research granted to it and UPA. The authors also thank the members of the Ecology Laboratory and Evolution of Socioecological Systems (LEA) at Federal Rural University of Pernambuco (UFRPE) for the support provided during data collection.

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