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Knowledge and Strategies of Armadillo (*Dasypus novemcinctus* L. 1758 and *Euphractus sexcinctus* L. 1758) Hunters in the "Sertão Paraibano", Paraíba State, NE Brazil

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ABSTRACT

The hunting of nine-banded (*Dasypus novemcinctus*) and six-banded (*Euphractus sexcinctus*) armadillo is a common practice in the semi-arid region of Brazil where predominates the *Caatinga* biome, of which these animals constitute important protein resource in local communities. In order to gain access to these resources, hunters have developed specific strategies and techniques that are described in the present work. The main hunting strategies encountered were: Firearms, locally named as "sovaqueira" or "garruncheira" constitute the basic equipment to the hunter and may be homemade or manufactured; Hunting dogs, used by almost all local hunters brings greater efficiency during hunting activities. Additionally, armadillos are captured using mechanical traps which include "tatuzeira" or "pebeira", both with a trigger mechanism. Flooding the burrows was a technique considered high efficient in capturing both armadillo species. The choice of which strategy to use depends on each hunters preference or skills. Subsistence hunting occur regularly in the study areas and both armadillo species are traditionally considered local delicacies as well as alimentary taboo. Achieving sustainable use of faunal resources is of great importance to the local human communities, and the successful conservation of hunted wildlife requires collaboration at all scales, involving local people, resource extraction companies, governments and scientists.

Keywords: *Caatinga* biome, conservation, faunal resource, hunting activity

INTRODUCTION

Wildlife has provided food and useful materials for human communities in all parts of the world since time immemorial, although the relationships between humans and animal species vary depending on that animal's significance to any given culture (Holland 1994; Barnett 2000; Bennett *et al*. 2002; Alves and Alves 2011; Souto *et al.* 2011), and their body parts or by-products are used in a wide variety of ways: as pets, as clothing and tools, in cultural activities, and for medicinal and magic-religious purposes (Leeuwenberg and Robinson 1999; Alves *at al*. 2009; Souto *et al*. 2009, 2010; Costa-Neto and Alves 2010).

In Brazil, hunting has a key role in several forms of faunal resource use and this activity continues (to a greater or lesser extent) to the present day even though it has negative impacts on wildlife populations (Bodmer 1995; Alvard *et al*. 1997; Leeuwenberg and Robinson 1999; Alves *et al*. 2009; Hanazaki *et al*. 2009). In addition to being considered one of the world's 17 most mega-diverse countries (incorporating 70% of the world's catalogued animal and plant species) and being known for its diverse cultural heritage (Elisabetsky and Wannmacher 1993; Alves *et al*. 2007; Albuquerque *et al*. 2007) little is really known about the use of the biodiversity in Brazil nor the consequences of hunting on wild animal communities, especially in the semi-arid regions (the *Caatinga* Biome). Many of the rural population in Northeastern Brazil are extremely poor, and the long and frequent droughts there diminish regional productivity and increase the necessities of those people (Sampaio and Batista 2004; Albuquerque *et al.* 2009; Souto *et al.* 2010). As a result, hunting activities (combined with extractivist and pastoral practices) represent significant threats to that biome (Leal *et al*. 2005; Alves 2009).

Mammals are among the animals most valued for bush-meat mainly due to their generally larger sizes, which represents a higher return of animal protein per unit of hunting effort (Alvard *et. al.* 1997; Barrera-Bassols and Toledo 2005; Schenck *et al*. 2006). Among the mammals taken as game in NE Brazil, the six-banded (*Euphractus sexcinctus*) and nine-banded armadillos (*Dasypus novemcinctus*) are highly sought after as primarily protein sources and for folk medicines (Valle 2007; Alves and Rosa 2007a, 2007b; Barboza *et al*. 2007; Alves 2009; Alves *et al*. 2009; Souto *et al.* 2011). Although no ethnozoological studies have yet been undertaken on the interactions between the communities in the semi-arid region of Paraiba and these animals, it is becoming increasingly important due to intense hunting pressures on these animals and significant environmental changes in the area.

We will describe here local knowledge concerning two species of armadillos and the strategies used for hunting them in the semi-arid region of Paraíba State. Issues related to hunting activities and their importance to traditional Brazilian communities has not been sufficiently studied, but are of great importance to the management of protected areas and the development of conservation policies. Our results should be useful in formulating management plans and proposals for regulating hunting that will permit the sustainable use of the faunal resources of that region.

MATERIALS AND METHODS

Fieldwork was carried out from January to March 2008 in the municipality of Sousa and from October to December 2008 in the municipality of São Mamede in the semi-arid region of Paraíba State, Brazil (the *Caatinga* biome). Open as well as semi-structured interviews were conducted with 55 local inhabitants (51 men and 4 women), distributed as follows: Municipality of Sousa (n = 32; 28 men and 4 women), Municipality of São Mamede (n = 23,

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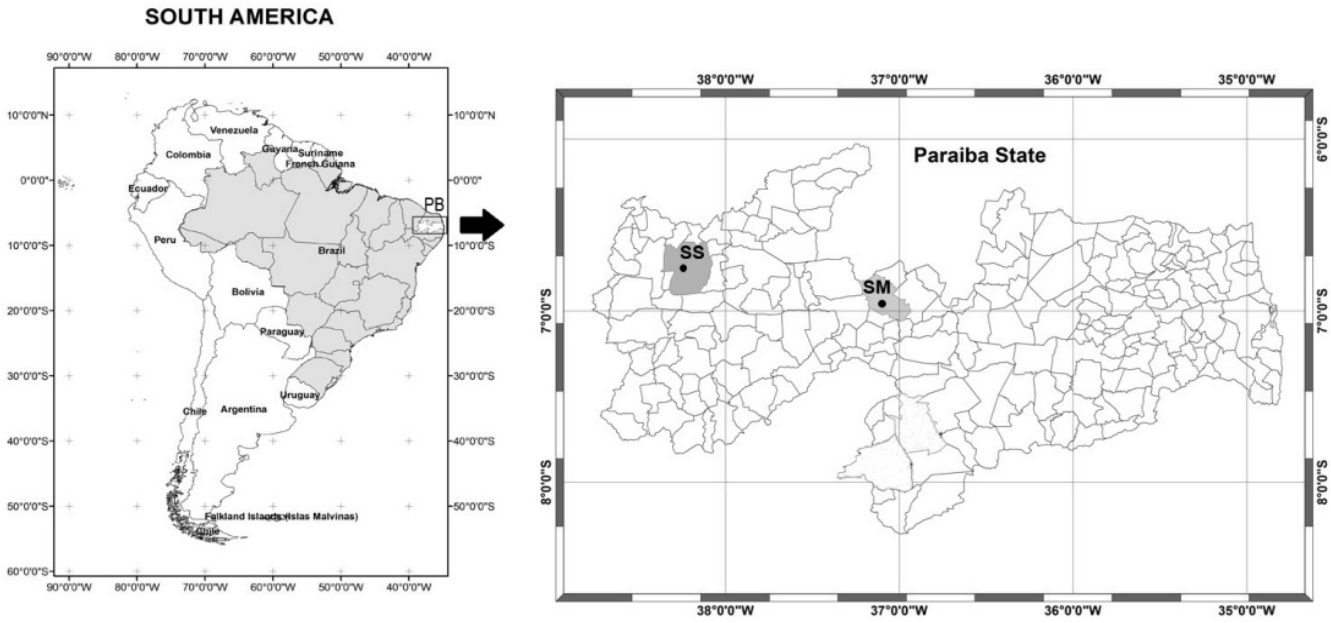

Fig. 1 Map of study area, Municipalities Sousa and São Mamede, Paraiba State, NE Brazil.

all men). The choice of the study sites was based on the following criteria: (1) indications of subsistence hunting in the area; (2) accessibility; (3) familiarity with local residents, (4) a lack of studies in the areas of ethnoecology and ethnozoology at those sites, (5) cultural diversity.

The municipalities surveyed are all included in the *Caatinga* biome. The regional climate is semi-arid with an annual rainfall of 431.8 mm (limited to the rainy season between January and April), with an average annual temperature of 28°C (Brazilian Government 2005). The vegetation of this semi-arid region (*Caatinga* biome) is largely composed of deciduous shrub/arboreal species, and many of the plants bear strong thorns. The regional topography is a rolling landscape dissected by deep, narrow valleys (Paraíba 2008).

Municipality of Sousa

The municipality of Sousa is located in the *Sertão* meso-region of western Paraíba State, NE Brazil (06º 45' 33" S x 38º 13' 41" W) (**Fig. 1**) and covers an area of 842 km^2 (IBGE 2009). The climate is semi-arid with an annual rainfall rate of 431.8 mm, which is limited to a rainy season between November and April. The local vegetation is composed of spiny deciduous and semi-deciduous species characteristic of the semi-arid *Caatinga* region (Brasil 2005).

The total population of the municipality is approximately 63800, of which 73.8% live in urban areas (PNUD-ONU 2004). This population has a Human Development Index (HDI) of 0.658 (PNUD-ONU 2004). The interviewees ranged in age between 25 and 51 (mean: 39.75); 25% (n = 8) of the interviewees were semi-literate, and 43.7% (n = 14) had attended school for less than 8 years. At least 84.5% (n = 27) were married; 18.75% (n = 6) earned R$ 510 (US$ 167) or less per month, while the majority, 59.3% (n = 19), earned from one to two minimum wages per month (US$ 300-600).

Municipality of São Mamede

The municipality of São Mamede is located in the central portion of Paraíba State (**Fig. 1**) and encompasses an area of 610 km^2 with 7782 inhabitants (5567 in urban areas and 2215 in the rural zone) (IBGE 2009). The region is characterized by a semi-arid climate (Brasil 2005a). The main economic activities in the area are subsistence farming and livestock breeding, which account for from 50 to 75% of the local economy (Brasil 2005a).

The interviewee ages ranged from 25 to 51 years (mean: 38.1); 13% (n = 3) were semiliterate, while 69.5% (n = 16) had attended school for less than 8 years. At least 74% (n = 17%) were married; 13% (n = 3) earned R$ 510 (US$ 167) or less per month while 74% (n = 17) earned from one to two minimum wages per month (US$300-600).

Procedures

Information concerning hunting practices and strategies was obtained using semi-structured questionnaires complemented with free interviews and informal conversations (Huntington 2000). Interviewees were chosen by using the snowball technique (Bailey 1982), based on information initially provided by specialist hunters. Interviews were conducted on a one-to-one basis. Key-informants (more experienced hunters) were selected from among the interviewees using the criterion of "native specialists" – people who consider themselves, and are considered by the community, as culturally competent in this area (Hays 1976; Marques 1995). Due to the fact that hunting was generally practiced by men, the majority of respondents were male. Attempts were made to interview all local specialists at each of the research localities. However, some interviews were cancelled or failed to provide much information because the interviewees were often reluctant to answer questions (hunting is illegal in Brazil under most circumstances).

Prior informed consent was obtained from all informants. Only native residents (adults) and those living in the region for more than 2 years were interviewed. We informed the hunters about our research goals before initiating the interviews, which encompassed the following subjects: their knowledge about each of the armadillo species they hunted; their hunting techniques; the main reasons they hunted these animals, etc. Ethical approval for this study was obtained from the Ethics Committee of Paraíba University State.

The two focal game animals (armadillos) of this project were identified by: analyzing specimens donated to us; photographs of these animals taken during the interviews; based on their vernacular names (with the aid of taxonomists familiar with the fauna in the study area).

RESULTS AND DISCUSSION

Wildlife is an important resource for many populations in Latin America and armadillo hunting is a very common practice in Brazil, especially in *Caatinga* areas. Hunting knowledge is generally passed orally from generation to generation and is part of the culture of the people who live in that semi-arid domain (Alves *et al*. 2009, 2010).

Fig. 2 Examples of firearms used by local hunters in semi-arid northeastern region of Brazil. (**A**) "Sovaqueira". Typical homemade rifle. (**B**) "Garrucheira". Manufactured firearm with a long barrel.

Fig. 3 Hunting dogs in training process. (**A**) Dogs being stimulated by hunter to attack a six-banded armadillo (*E. sexcinctus*). (**B**) The most experienced of the pack biting the six-banded armadillo on the head.

E. sexcinctus and *D. novemcinctus* are captured in the study area for different purposes, including: subsistence (food resources), for commercial ends (illegal markets), or sport (leisure and entertainment). This activity is very widespread, which indicates the economic and cultural significance of these animals to the people in this region. A total of 26 hunters indicated that they hunted for two or more motives, and in addition to eating these animals they were also kept as pets, used as zootherapeutics, or their body parts sold as souvenirs.

Hunting activities employed various capture techniques adapted to the specific habitats where the armadillo species are found. The techniques and strategies used by hunters include: firearms, hunting dogs, armadillo traps, and flooding the burrows.

Firearms

According to Alves *et al*. (2009), firearms represent the most basic hunting equipment of most hunters in the semi-arid region of Paraiba, even if not directly used for killing their prey (firearms are considered important as a means of self-defense against unexpected threats in the bush). Our results corroborated this finding, as 80% (n = 44) of the respondents said that they make frequent use of unlicensed firearms while hunting six- and nine-banded armadillos. Many of the firearms used by hunters are homemade muzzle-loading rifles ("sovaqueira", "soqueira" or "soca-soca") (**Fig. 2A**) and the hunter must use a ramrod to compact the lead shot and gunpowder inside the barrel. Manufactures rifles designed to be loaded with cartridges (multiple projectiles) or bullets (individual projectiles), known as "garruncheiras", "cartucheiras" or "carabinas" (**Fig. 2B**) may have long or short barrels, according to each hunter's preference.

The use of firearms generally allows the hunter to kill more animals within a given period of time than other hunting strategies. Previous researchers noted that the use of firearms is now almost a universal practice and is very efficient for capturing the local fauna (Mena *et al*. 2000; Almeida *et al*. 2002). Stearman (2000) reported that the shift to firearms as the primary method of hunting by the Huaorani tribe of Ecuador increased by 15% the biomass and numbers of animals captured using traditional weapons.

The proliferation of equipment such as spotlights, laser pointers, and other modern technologies has improved hunting effectiveness, and in addition to increasing the efficiency of subsistence hunting it has also stimulated commercial and sport hunting (Ortiz 2002; Minzenberg 2005).

Hunting dogs

Hunting dogs are the most important allies of hunters, and together with weapons, make the chances of hunting success much higher (Johnson *at al*. 2003; Mecozzi and Guthery 2008; Alves *at al*. 2009; Hanazaki *et al*. 2009). According to the interviewees, good hunting dogs must demonstrate hardiness and tenacity from an early age, and that the best way to assure a good litter is to choose the best breeding line of dogs. Good litters and bloodlines can be very profitable to hunter-breeders when offered for sale.

Training the dogs follows simple conditioning techniques that start in the third month of life with puppies, with direct contact with young armadillos (*D. novemcinctus* or *E. sexcinctus*) that are placed in bags or tied (either dead or alive) onto trees at varying heights during training (**Fig. 3A, 3B**). At 5 months of age the dogs that best demonstrate their natural instinct and skills will accompany the hunter, gaining experience in packs with other experienced dogs. According to the hunters, contact with these skilled dogs is not only the most important part of training for novices, but will also reveal if the dogs have the endurance needed to trail, chase and kill armadillos. The most appreciated dogs are those that can chase and capture a nine-banded arma-

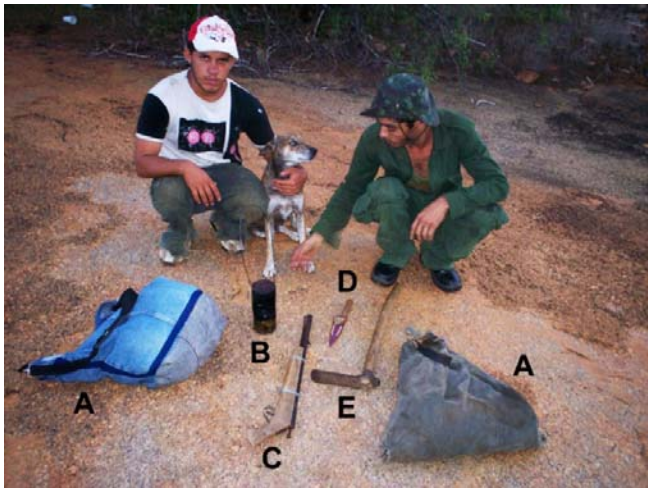

Fig. 4 Common tools used by armadillo hunters during hunting. (**A**) "Bisaco". Rucksack for carrying small objects. (**B**) "Candeeiro". Homemade flashlight. (**C**) "Sovaqueira". Typical homemade rifle. (**D**) Knife. (**E**) Small hoe.

dillo after a long hunt. Most knowledgeable hunters agree that not even dogs that are in good shape can always catch an adult nine-banded armadillo because of its flexibility and velocity - which makes the hunt that much more pleasurable and rewarding.

Most hunters in the survey areas (n = 49) used at least two dogs to hunt armadillos. Since hunts generally take place at night, a good tracking plan in a pre-defined area must be chosen in order to increase the probability of success. This form of hunting requires good physical preparation for humans, too, as long distances can be covered both walking and running while carrying additional equipment (**Fig. 4**). According to Alves *at al*. (2009), hunters usually select areas with intact vegetation where larger animals are more abundant and tend to use established game trails.

As the dogs are unleashed they can follow the hunters or scour the area, and when they start to bark it indicates that they have cornered some prey (usually in a burrow); the hunters will follow the barking and then attempt to capture the animal by digging it out of the burrow (using shovels and hoes) or use an iron hook to pull it out. However, if the dogs go off chasing a nine-banded armadillo many hunters prefer to just wait in one spot - and if the dogs are able to kill the prey they will bring it back to their owners. At the end of a hunt, the dogs are well cared for, and any injuries treated, and they will usually be rewarded with some of the meat that was caught. These same strategies have been reported in the Amazon region where both diurnal and nocturnal hunting activities are undertaken by groups of hunters and tracking dogs and can cover large areas of deep forest over several days (Lisboa 2002; Trinca 2004).

The interviewees reported that when hunting with dogs, games animals are taken regardless of their sex or reproductive state, and pregnant females or those with young are often killed. According to researchers in others parts of the world, hunting dogs are indispensable for hunting large or mid-size animals and increase the capture rates of certain prey species; they aid in the hunt, but not by killing the prey, but rather tracking and cornering animals so that the hunters can kill them (Redford and Robinson 1987; Alvard and Kaplan 1991; Koster 2008). Encounter rates and hunting successes vary greatly among hunters with and without dogs. Koster (2008) reported that hunters with dogs encountered approximately nine times as many agoutis as unaided hunters in Nicaragua; nocturnal species (including nine-banded armadillos - *Dasypus novemcinctus*) were normally only encountered during the day when using dogs.

Armadillo traps: 'Tatuzeira', 'Pebeira' and 'Cachorro-de-Arame'

Armadillo traps (called '*tatuzeira*', '*pebeira*' or '*cachorro-de-arame*') are commonly used to capture both *E. sexcinctus* and *D. novemcinctus* (although they are constructed differently for each armadillo species). The origin of these devices probably dates back to ancient times and are linked to the local cultures and traditions of each region. Both the 'tatuzeira' and 'pebeira' traps have the same trigger mechanisms as the 'cachorro-de-arame' trap, mainly differing in terms of their shapes, sizes and building materials. While the first are square-shaped and wooden, the second has a cylindrical shape and is made out of iron; both have one open end with a trigger mechanism that closes a trapdoor after the animal has entered (**Fig. 5A, 5B**). These are passive hunting strategies as the hunter does not actively search for the prey. It is considered a selective method although it is not unusual to catch other animals that live opportunistically in armadillo dens.

The traps are placed at the mouth of the armadillo burrow so that when the animal comes out for food or water it will be caught inside the trap. This technique requires patience and repeated checking of the traps. Often the hunters will just come back the following day to verify if any animals have been captured. Comparable methods have been reported in other regions of Brazil (Smith 1976; Lisboa 2002). Almeida *et al*. (2002) documented a type of trap called "jequi" that is used by local hunter in Acre State that consists of a basket placed at the entrance of the armadillo den (similar to the "tatuzeira"). Alves *at al*. (2009) documented the same technique being used by hunters in the municipal district of Pocinhos, Paraíba State, where this type of trap is locally known as "*jejeré*" or "*jequi*"; it is used in cases where the armadillo hides deep within its den.

Despite the advantages of using this passive technique (less physical effort and time required, and the animals can be captured alive), just 10.9% (n = 6) of the interviewees preferred this method to active pursuits with weapons and dogs. It is probable that some hunters who use this technique cannot afford to own dogs, or are fearful of being caught and arrested by civil or federal authorities.

Flooding the burrows

This was the simplest technique described by the hunters, but no less efficient. It consists of pouring water into the armadillo's burrow, forcing it to emerge. This strategy has been used by 100% of the interviewees and is most useful when the burrow is too deep (or the tools at hand are insufficient to dig it out) and can be used to capture both armadillo species.

According to the interviewees, the combination of this strategy with any of the others described above makes it more likely to capture these animals while still alive. The main drawback is that water may be hard to find near the burrows, principally during the dry season in the *Caatinga*.

Subsistence hunting and taboos

Subsistence hunting is a topic of considerable interest to scholars as well as development agencies and environmental organizations (Swanson and Barbier 1992; Alvard 1995), and will be defined here as the customary and traditional use of wild animals for purposes of meeting basic nutritional, material, social, and spiritual needs (Hitchcock *et al*. 1996). Subsistence hunting in the *Caatinga* biome is influenced by a multifaceted array of biological, socioeconomic, political, and institutional interactions.

The use of armadillos as food resources is quite common in the study area and the intensity of this activity does not seem to be diminishing, for these animals are considered local delicacies. The majority of hunters (56.35% (n = 31) hunt about once a week, and on rare occasions twice. Three interviewees (5.45%) were full-time hunters who

Fig. 5 Armadillo traps technique used in the semi-arid region of Paraiba State, Brazil. (**A**) Front view of a "tauzeira" with the trigger mechanism. (**B**) Side view of a "cachorro-de-arame" trap near a six-banded armadillo (*E. sexcinctus*).

hunt armadillos on a regular and frequent basis; they justified this practice by citing their low incomes.

Hunting native animals was strictly forbidden by Brazilian environmental legislation until 1998, but after that date new regulations permitted hunting activities when done exclusively under circumstances of necessity to satiate the hunger of the hunter and his/her family (Brazilian Federal Law No. 9605/98). The persistence of hunting activities in Brazil in spite of its general illegality is closely associated with cultural questions and with the fact that these animals can have great nutritional importance to low-income families that do not obtain sufficient protein resources from domestic animals (Bennett and Robinson 2002). The growth of hunting activities in rural areas in Latin America is a consequence of historical, social, economical and political underdevelopment (Ojasti 1997).

Both species of armadillos are much appreciated and consumed by the hunters, but 60% (n = 33) of the interviewees stated that the nine-banded armadillo tasted best; 18.2% (n = 10) stated that the six-banded armadillo has a particular flavor that combines well with traditional regional foods; 21.8% (n = 12) of the informants indicated that both species were delicious and nutritious, principally when captured alive and raised at home for fattening ("cevar") – a common habit, especially with six-banded armadillos. These results are in agreement with other studies that have shown the gastronomic appeal of both armadillo species to rural populations in Northeastern Brazil, principally in the semi-arid region of Paraíba State (Silva 1993; Mourão *et al*. 2006; Alves *et al*. 2009).

During a visit to the municipality of Sousa we were able to witness a veteran hunter slaughter and prepare a specimen of *E. sexcinctus* that had been maintained in captivity for 50 days for fattening (**Fig. 6A-D**). According to the hunter, the procedure is very similar to the killing and preparation of a chicken, or other game species, and a blessing is first given as an act of respect for the animal.

The flesh of the six-banded armadillo is considered "remosa" and there are food taboos associated with it, and it is not to be eaten by individuals with health problems such as infections, cuts, scrapes, wounds, venereal diseases, swelling, hoarseness, hepatitis, lumbago, or experiencing menstruation or pregnancy. This taboo of six-banded armadillo meat may reflect the omnivorous and scavenger dietary habits of this species. Reports of people dying after consuming six-banded armadillo meat are rare, but do occur according to 2.8% (n = 6) of the interviewees.

Dias (2006) noted that the ingestion of raw or undercooked meat of either armadillo species is one of the main vehicles of *Trypanosoma cruzii* transmission; the meat can also transmit parasites that are capable of causing abortions or fetal damage among individuals with immunosuppressive problems (Naiff *et al*. 1986). Armadillos have been extensively used in research on leprosy because these animals not only readily contract this disease but also demonstrate more extreme symptoms than seen in humans. Body organs

Fig. 6 Armadillos as delicacies on Paraiba semi-arid. Procedures to kill and cook a six-banded armadillo (*E. sexcinctus*). (**A**) "Slaughter". The animal is hit in the head with an iron bar. (**B**) "External cleaning". After washed and cleaned immersion in boiling water. (**C**) Removal of the remaining fur using fire. (**D**) "Internal cleaning". Animal is ready to be cooked.

that remain untouched in the worst human cases have been found laden with bacilli in armadillos. This may be due to the fact that the body temperatures of armadillos are slightly lower than most mammals. It has been demonstrated that armadillos can pass leprosy to humans (Bagagli *et al.* 1998; Corredor *et al*. 2005).

D. novemcinctus is considered a sentinel animal for epidemiological studies of certain fungal diseases such as PCM (Paracoccidioidomycosis) (Corredor *et al*. 2005), and these animals are natural hosts to *Paracoccidioides brasiliensis* and fungus samples have been isolated from their internal organs.

Traditions and conservation

The local hunters stressed that the hunter's spirit exists since their brotherhood from the past and even now such instinct still lives among them. Thus they do not traditionally classify themselves into castes or hierarchy, and are only known for their love of hunting. According to the elders historical accounts of most of the hunting community members' practices during this epoch ensured the proper use of wildlife resources through cultural and social bonds among them, and even today different groups of hunters share their local knowledge and insights on the use of faunal resource.

The different techniques used for hunting armadillos (*E. sexcinctus* and *D. novemcinctus*) in the municipalities studied varied according the hunters intentions and needs. These animals frequently represent complimentary protein

sources to families with low incomes and less access to other food resources in the semi-arid region of northeastern Brazil; but local human populations also use armadillos in other ways besides just as food (for medicinal and ornamental purposes, and as pets) – which indicates the economic and cultural significance of the local fauna (Alves *et al*. 2009).

Religious calendars and seasonal changes act as parameters for cultural and livelihood activities. Saint John's Eve (June 25), for example, marks the celebration of the rainy season in the region – and therefore calls for the consumption of the largest armadillos; the Day of the Patron Saint of Brazil (October 12) and All Souls' Day (November 2) are traditionally related to thanks-giving celebrations, mourning, and prayer, as well as enjoyment, drinking and eating to calm the dead spirits and cheer the living; Christmas Eve (December 23-24) is considered the best moment to give a fatted armadillo as a gift of friendship.

Hunting is generally considered destructive and illegal within global institutional frameworks, and traditional populations have been viewed as important agents of exploitation and pressure on the native fauna. Although no analyses of hunting pressure were undertaken in the present study, the hunters themselves demonstrated concerned about noticeable declines of nine-banded armadillo (*D. novemcinctus*) populations. According to 80% (n = 44) of the hunters, this armadillo is becoming increasingly rare because of food and commercial resource demands. Mourão *et al*. (2006) reported in an ethnotaxonomic study of the mastofauna in Paraíba State that the nine-banded armadillo is the most highly appreciated game animal in the municipality of Paulista. Fully 100% of hunters in Alagoas State elected the meat of this animal as having the most pleasant taste, and as being one of the most hunted animals (Paiva and Campos 1995). Alves *at al*. (2009) reported that *D. novemcinctus* and *P. yagouaroundi* are among the species most cited by local hunters in the municipality of Pocinhos, Paraíba State, and were evaluated by them as demonstrating population declines. Hanazaki *et al*. (2009) reported that armadillos are hunted to attend urban demands from cities such as Cananéia and Iguape in São Paulo State, Brazil.

According to the IUCN Red List, both *D. novemcinctus* and *E. sexcinctus* are listed as "LC" - of Least Concern (IUCN 2011). A possible justification for this classification can be found in their wide distribution, tolerance of habitat variations, and their presumed lack of population declines (Aguiar 2004; IUCN 2011). However, this does not mean that these two specimens are not being over exploited locally and threatened by extinction in specific areas. Although the two armadillo species were mainly used as food resources in the survey area, hunting cannot be fully explained simply by the need for nourishment. Subsistence hunting in the *Caatinga* biome, as elsewhere in the world, is shaped by complex arrays of biological, socio-economic, political, and institutional factors - and understanding this multi-dimensio-nal background is critical to creating effective conservation solutions. As stressed by Redford (1991), native inhabitants should not be considered *ecologically noble savages* despite their profound knowledge about their environment. There is a real need to alter our views about hunting and gathering activities but also to invite local people to participate in the planning processes designed to conserve faunal resources.

As local knowledge is incorporated into a complex body of locally constructed knowledge, minimizing harvesting impacts on animal populations is of fundamental importance and represents an ideal conservation and wildlife management strategy. Whereas little attention has been given up until now to the social uses of the biodiversity found in Brazil, an understanding of the traditional uses of faunal resources must be interwoven with strong environmental regulations, for the effectiveness of wildlife planning will depend on the creation of communication channels between academic and governmental institutions and the human populations that depend on those hunting activities.

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