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Research Article

Hunting and wildlife use in an Atlantic Forest remnant of northeastern Brazil

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Abstract

The hunting of wild vertebrates is a widespread practice in Brazil. From a socioeconomic perspective, this is important for providing meat and other products. However, there are big conservation implications for the hunted species; this highlights the need for research on hunting activity within that context. This paper investigates, from an ethnozoological point of view, the hunting and use of wildlife in the municipality of Conde, in the Atlantic Forest area of the State of Paraíba. We interviewed local hunters, and 68 huntable animals were registered in the following categories: mammals (24), birds (26) and reptiles (18). The motivations for hunting in the surveyed area include the use of meat as food, zootherapy (use of parts of the animal's body for medicinal purposes), the capture of animals for pets, and control hunting of animals that threaten agriculture, kill laying hens, and present a risk to the hunter's health. The techniques for capturing the animals include hunting with a hound dog, use of a shotgun, ambushing ("tocaia"), imitation ("arremedo"), and traps. The registration of species enhances knowledge regarding the hunting of wildlife in the State of Paraíba. This paper is particularly important as there is no research on hunting in the Atlantic Forest area. We expect our results to contribute to the implementation/perfecting of public policies that address wildlife management and conservation of the region's biodiversity.

Keywords: Hunting, Atlantic Forest, Ethnozoology, Conservation, Animal uses

Resumo

A caça de vertebrados silvestres é uma prática disseminada no Brasil. Sob uma perspectiva socioeconômica, tem papel importante por fornecer carne e outros produtos. Por outro lado, tem importantes implicações conservacionistas, resultando em impacto sobre as espécies exploradas, o que evidencia a necessidade de pesquisas que abordem a atividade cinegética e os seus conhecimentos associados entre as populações brasileiras. Este trabalho objetiva investigar, a partir de uma abordagem etnozoológica, o uso e a caça de animais silvestres no município do Conde, área inserida na Mesorregião Mata Paraibana do Estado da Paraíba. Foram entrevistados caçadores sendo registrados 68 animais cinegéticos, distribuídos nas categorias mamíferos (24), aves (26) e répteis (18). As técnicas utilizadas durante a captura dos animais incluem a caça com cachorro, espingarda, tocaia, arremedo e armadilhas. O uso dos recursos faunísticos associa-se principalmente ao consumo da carne, também sendo relatados usos zooterápicos, para fins de estimação e a caça de controle. A caça é considerada uma atividade antiga na região, sendo atualmente motivada principalmente pelo entretenimento, com exceção da caça aos animais que ameaçam a agricultura, a criação de galinhas e representam riscos à saúde do caçador. Há o registro do declínio de algumas espécies animais na opinião dos informantes, os quais atribuem tal fato principalmente ao desmatamento e queimadas na região e à pressão da caça. A realidade vivenciada pelos caçadores e o seu conflito com a legislação de proteção da fauna constitui um aspecto fundamental na compreensão dos entraves e possibilidades na conservação dos recursos faunísticos do município. O registro das espécies amplia o conhecimento da fauna cinegética no estado da Paraíba, onde ainda não foram realizadas pesquisas sobre caça em áreas de Mata Atlântica, sendo este o primeiro trabalho. Espera-se que nossos resultados contribuam com a implementação / aprimoramento de políticas públicas direcionadas ao manejo da fauna silvestre, visando à conservação da biodiversidade da região.

Palavras-chave: Caça, Mata Atlântica, Etnozoologia, Conservação, Uso de animais

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Introduction

The Brazilian Atlantic Forest, although it is fragmented and threatened by destruction in several regions, is one of the most important rainforests on the planet [1]. Located in a high demographic density area, since Brazil's colonization this biome has suffered aggression from different cycles of forest exploitation that have reduced its vegetation drastically [2] and affected all of its wildlife diversity. The impacts on the Atlantic Forest include the overexploitation of its resources by human populations (for timber, fruits and wild animal hunting, for example), and land exploitation for human use, such as pastures, agricultural crops and forestry [3].

Unfortunately, many of the area's wide diversity of vertebrates are threatened. Besides losing their habitat, one of the main reasons for this is hunting, which, although forbidden in Brazil by Law 5.196/67, continues to be practiced for subsistence, as a sport, as a form of recreation, and even as a profession [4-6]. As in other rainforests of the world, hunting activity affects animal populations more or less profoundly. Therefore, conservation measures need to consider the social, cultural and ecological aspects that are involved.

It is widely known that factors such as excessive exploitation, hunting, and illegal wild animal commercialization threaten several vertebrate species all over Brazil [7-13]. Efficient strategies of animal conservation must consider the human element and its interactions with other animals. Understanding hunting's multidimensional context is essential for providing efficient conservation solutions [8, 13]. Measures for preserving and using wildlife sustainably must address not only zoological and ecological information, but also the economic and cultural interactions that connect the ecological and social systems in one common system, where they influence each other mutually [14-17].

Generally, studies about hunting are still scarce in Brazil [18, 19]. In a review of ethnozoology, Alves and Souto [19] found only 28 publications about hunting activities published in Brazil. This research has focused on the Amazon region and, more recently, on the northeastern semi-arid region [8, 9, 20-22]. Regarding the Atlantic Forest, studies published about hunting in the Atlantic Forest are scarce [5] and are non-existent in Paraíba, where the fragments of the Atlantic Forest are reduced to small and very vulnerable islands [23]. Because most of the Brazilian species which are threatened with extinction inhabit the biome [2], ethnozoological studies about hunting and regional animal use will be essential to environmental management and conservation of local species.

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This study documents and characterizes the use of wildlife resources in the Atlantic Forest area of the State of Paraíba, the hunting practices associated with such uses, and an assessment of their implications for conservation. The results are expected to support conservation strategies and management for the more exploited species. Knowledge of how wildlife is used by the local population and their impacts on biodiversity will contribute to public policies for conservation and preservation of the wildlife patrimony, which is a valuable source of food for the local populations.

Methods

Study area

The research was conducted in five rural communities (Utinga, Barra de Gramame, Ipiranga, Mituaçu and Gurugi) from the municipality of Conde, located in the micro-region of João Pessoa/PB, more specifically in the south of João Pessoa city (07° 15’ 36” S e 34°54' 28" O), in the eastern portion of Paraíba, and in the middle region of the Paraíba Forest, which is the most populated region in the state (Figure 1). The vegetation is predominantly Sub-Evergreen Forest, with parts of Sub-Deciduous Forest and Savannah/Forest. The native vegetation of the Atlantic Forest is currently scarce, having been replaced mainly by the sugarcane monoculture [24].

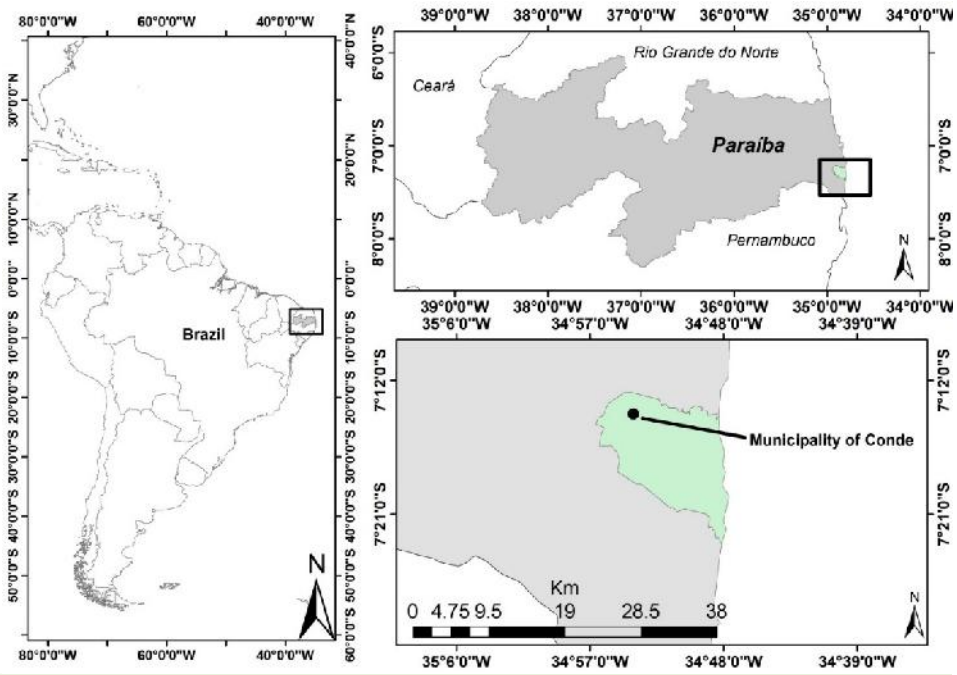


Fig. 1. Map of the Municipality of Conde, State of Paraíba, Brazil.

Procedures

The research was carried out from November 2011 to December 2012 (five days per month). Information about hunting and the use of vertebrates were gathered through semi-structured questionnaires, complemented by free interviews and informal conversation [25]. Eighteen male hunters from 24 to 82 years old were interviewed. Among them, key informants were chosen (more experienced hunters), selected by the “native experts” criterion, that is, those people who recognize themselves and are recognized by their own community as culturally competent [26]. In addition to the interviews, these experts were followed during their hunting activities. After the first interviews, the selection of the other informants was carried out

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through the "snow ball" sampling technique [27]. In the surveyed area, only men have been reported as hunters. Attempts were made to interview all local hunters, but some interviews were cancelled, or failed to provide much information, because interviewees were reluctant to answer questions. Prior informed consent was obtained for all interviews. The interviewees practice subsistence agriculture and raise cattle and goats. Demographics of the interviewees are summarized in Table 1.

The hunted species' vernacular names were registered as told by the interviewed and were identified as follows: 1) analysis of the species or body parts of the species donated by the interviewed; 2) analysis of the animal photographs taken during the interview and while following the hunting activities; and 3) through vernacular names with the help of taxonomists who were familiar with the studied wildlife.

The classification and nomenclature used followed the determination of the Brazilian Committee of Ornithological Registration for Birds [28] and the Brazilian Society of Herpetology [29] for reptiles. For mammals, the "Mammal Species of the World" [30] was used. The conservation status of the registered species follows IUCN [31] and the Brazilian Red List [11]

Table 1. Information on educational attainment, age, income, and gender of interviewees (n=18).

Gender	Number of interviewees	Percentage (%)
Male	18	100
Female	0	0
Age		
Less than 30 years old	5	27.8
30–39	2	11.1
40–49	5	27.8
50–59	1	5.5
60 or older	5	16.7
Educational attainment		
Illiterate	4	22.2
Primary level incomplete	7	38.9
Primary level complete	3	6.7
Secondary level incomplete	4	22.2
Monthly income*		
Not mentioned	2	11.1
Less than US$ 325	5	27.8
Between US$ 325 and 650	9	50
Between US$ 650 and 975	2	11.1.9

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Data analysis

From the data obtained during the interviews, the species accumulation curve of the richness of observed animals (mentioned) (S_{obs}) was calculated by field of study. The collector curve was randomized 1000 times and the value average was calculated using the software EstimateS© version 8.2 [32]. The EstimateS© was also used to calculate a non-parametric species richness estimator (Chao2), projecting the total number of species used in the same area. Chao2 was chosen because it applies to incidence data. The Chao2 estimator is based on the concept that rare and uncommon species carry information about the number of missing species in the sample:

$C\ ao2 = S_{obs} + \frac{Q_1^2}{2Q_2}$, where Q_1 and Q_2 are the number of species that appear in only one or two samples (uniques and duplicates).

The comparison between the used/observed species and the estimator curve, together with the respective confidence intervals of 95%, allows a check of the sample's level of influence.

Results

The interviewed hunters mentioned 68 game animals, distributed in the following categories: mammals, birds and reptiles (Figure 2).We identified 64 species and the Chao2 estimator indicated an estimated richness of 70.8 (± 6.05) species, an approximate number of the general richness of mentioned animals when we include the non-identified species (n=4). The species rarefaction curve demonstrates a complete stabilization, reaching the asymptote in approximately 15 interviews, indicating sampling efficiency in the data collection (Figure 3).

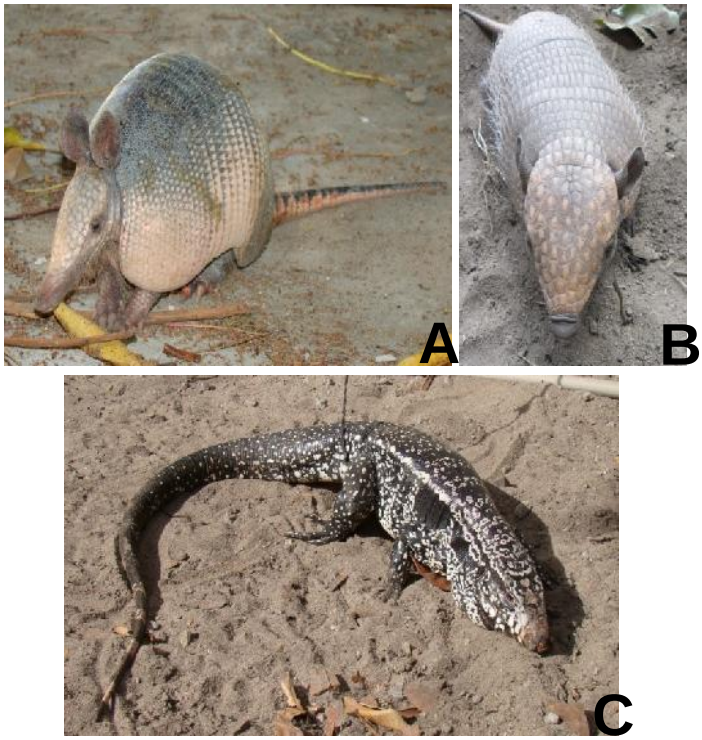


Fig. 2. Examples of huntable species mentioned by the interviewed hunters of the municipality of Conde, Paraíba. A=*Dasypus novemcinctus*; B=*Euphractus sexcinctus;* C=*Tupinambis merianae.* Photo credits: Jamylle Barcellos de Souza

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The bird group was the most frequently mentioned, (n=26 species), followed by the mammals (n=24) and the reptiles (n=18) (Appendix 1). The motivations for hunting in the region include the use of meat as food, zootherapy (use of parts of the animal's body for medicinal purposes), the capture of animals for pets and, only for the bird group, commercialization. "Control hunting" was noticed in the surveyed area, characterized here as hunting for crop protection, preventing the predation of pets, self-protection and the protection of hound dogs, and slaughtering due to the fear of dangerous animals.

The majority of the interviewed hunters (n=15) preferred the meat of hunted animals rather than meat derived from domestic animals. The hunted meat is said to be tastier and, for many, has a special value since it was obtained with personal effort. Another reason for preferring hunted meat (also considered to be healthier) values the meat's natural quality over that of domestic beef cattle or chicken which have been fed chemically altered food. The hunters also elected as their most appreciated species, the *Dasypus septemcinctus* (Brazilian lesser long-nosed armadillo), *D. novemcinctus* (Nine-banded armadillo), the *Cabassous unicinctus* (Southern naked-tailed armadillo), the *Cuniculus paca* (Spotted paca), the *Dasyprocta prymnolopha* (Black-rumped agouti) and the big birds like the *Penelope superciliaris* (Rusty-margined guan).

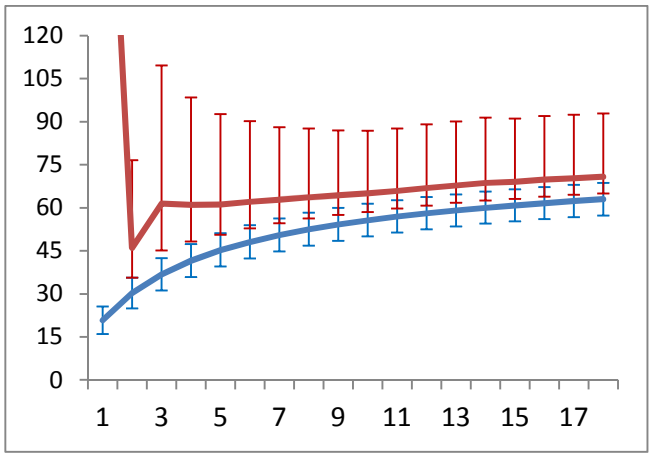


Fig. 3. Accumulation curves of the huntable species mentioned (S_{obs} curved, blue) and the species richness curve estimated by Chao2 (red), Confidence intervals of 95% of the S_{obs} curve and the estimated species curve (Chao2). In the chart, the *y axis* corresponds to the number of species and the *x axis*, the number of samples (interviewed).

There are also eating restrictions on the hunted meat. The *Tupinambis merianae* (Black and white tegu) was also appreciated, but it was not considered one of the tastier meats, being considered by some a "tallowy" animal, because it has omnivorous eating habits. The following species were considered to have "heavy meats": *Hydrochoerus hydrochaeris* (Capybara), *C. paca, Euphractus sexcinctus* (Six-banded armadillo), due to their eating habits which include carrion, and *T. merianae* for eating snakes. The *D. septemcinctus* and *D. novemcinctus* are considered the cleanest animals of all, not having any eating restrictions.

Some parts of the animals' bodies were also used as medications in popular medicine. The use of these alternative medications varies according to the infirmity being treated and the parts used. Most of the hunters (n=12) saved the tails of captured *D. septemcinctus* e *D. novemcinctus*. They use them or give them to other dwellers of the region for zootherapeutic treatment of earaches. The tails are also considered hunting "trophies".

The fat of the *T. merianae* was also mentioned as being used for medicinal purposes by half of the hunters interviewed (n=9). It was indicated for the treatment of sore throats and other symptoms. The bone of the *I. iguana* for the removal of splinters in the skin was mentioned by two hunters. The zootherapeutic use of the shell of the *Caiman latirostris* (Broad-snouted

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caiman) and the rattle of the *Crotalus durissus* (Neotropical rattlesnake) to treat tiredness was mentioned by only one of the hunters.

Wild animals are also hunted when perceived as a threat, leading to negative attitudes towards the animals. In the surveyed area, control hunting is subdivided into: a) the protection of people; b) the protection of hound dogs while hunting and; c) the protection of domestic animals and crops. The *Cerdocyon thous* (Crab-eating fox) and the *Leopardus tigrinus* (Oncilla) are the most hunted species for protecting domestic animals, such as hens. Attacks on fields by species such as the *H. hydrochoeris* have also been the motivation for killing wild animals. Populations of these particular species, according to the hunters, have increased greatly in the region, generating intense conflict with the local dwellers, who consider them to be a "plague."

Even though they are not a target species for hunting in the region, the *Tamandua tetradactyla* (Collared anteater) also suffers from intense hunting pressure for its attacks on dogs during hunts; when it is cornered, it uses its big claws and frequently wounds or kills dogs. Encounters between hound dogs and the *T. tetradactyla*, culminating in the death of the latter, were reported by most of the interviewed.

The use of wild species as pets did not seem to be frequent in the researched region. It must be highlighted that some animals were held in captivity, such as the *E. sexcinctus*, *D. septemcinctus, D. novemcinctus* and the *D. prymnolopha*; however, this was motivated by the use of the animal as food. The *Iguana iguana* (Common iguana) also drew the attention of some hunters and were manually captured and released in their backyards as pets. Similarly, the commercialization of wild animals appears not to be frequent in the region. One of the few cases that involved the purchasing of species, such as the *D. septemcinctus, D. novemcinctus*, was by older hunters who no longer practiced hunting activities and wished to use them as food, buying them from famous hunters. The approximated price of an entire armadillo was R$ 30,00 (US$ 14.00).

We identified five hunting techniques practiced in the capturing of local game species. All of the hunters interviewed had shotguns and used them for capturing most of the animals. Hunting with a hound dog was frequent throughout the region. There was also the use of several traps, such as crude cages ("arapuca"), snare traps ("laço"), armadillo traps ("tatuzeira") or mousetraps, among others. The ambushing ("tocaia") or waiting ("espera") technique was used in association with the shotgun. The use of imitation ("arremedo") was also registered, by blowing commercialized whistles that imitate the sounds of certain species or even performed by the hunter whistling or using other vocal techniques.

The hunting period varied according to the technique that was being used and the hunter's available time, ranging from an hour, usually for the installation of traps, or one or two days, such as a weekend hunt. The moon also influenced the hunting decisions, determining the best days and hours for capturing animals. The interviewed hunters affirmed that the best hunting nights are the ones in which the moon takes longer to appear, during its waning phase. This is related to some animals' nocturnal habits, since the waning moon nights are darker.

According to the hunters, in this region "the woods have an owner," an entity called "Cumadre Florzinha." As part of their culture, they believe that she is the one who defines the "laws of the wood." Even the more skeptical hunters prefer not to disrespect her and take care not to curse when they are in the woods, which is considered as a form of insult. Noticing the presence of the "owner of the woods" is a warning to them not to continue the hunt.

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Usually, the wildlife resources management adopted by the interviewed hunters is mostly associated with the reproductive cycles of species with a bigger hunting pressure, including the armadillos (*E. sexcinctus*, *D. septemcinctus, D. novemcinctus, C. unicinctus*). All of the hunters report "pausing" their hunting activities during the reproductive period of the armadillo species. These pausing periods are from November to February and during the month of May. Their concern with maintaining the animal population is deeply connected to the pleasure of hunting, since, if a new generation of a huntable animal is interrupted, the region's hunting activity will be reduced.

The preference for hunting male animals was also reported by all of the hunters interviewed. When the hunters occasionally capture a pregnant female or a female with cubs, they release her immediately. Even though hunting was considered a type of entertainment in the region, it was also noticed that all of the interviewed hunters limit their hunting activities to animals that can be used for food, which decreases the hunting pressure on other species that are not used for their meat.

Discussion

In neotropical areas, the most huntable species are usually those that provide the greatest amount of products and sub-products for human use [12, 33-35]. Bigger animals, such as mammals, have been the favorites among hunters in the surveyed area, confirming a trend also found in other papers about hunting activity [10, 36-40]. Birds were mostly used for pets and commerce, and the reptiles were the most used group in zootherapy and control hunting [9, 34, 41]. A similar pattern was seen in the surveyed area. However, birds do not seem to be much exploited for commerce or as pets, as occur in other regions [9, 42-48]. The registration of huntable species improves knowledge about huntable wildlife in the State of Paraíba, as there is no research on hunting in the Atlantic Forest area. Species with wide geographic distribution, such as some species of armadillos, are also hunting targets in other regions of the State [49].

The most representative group in the control hunting category is the reptile, especially the serpents. These are seen by the hunters as an imminent danger to themselves or any other person, which increases the frequency of snake killing, even though they do not represent a real danger to health. Despite the fact that the interviewed hunters have a vast knowledge of the diversity of snakes and recognize the venomous species, i.e. the *Bothrops jararaca* (Jararaca snake), some hunters consider that all snakes represent serious risks to health. A similar situation was found in studies about hunting in the Brazilian semi-arid northeast, where even the non-venomous serpents were considered dangerous and killed. [41, 50, 51].

Previous studies have pointed that hunters use different strategies for different types of game [5, 8, 9, 20, 52]. This diversity of hunting strategies also was observed in the surveyed area and reflects the need to assess the richness of the hunted animals that live in different habitats, as discussed in previous studies [8, 9, 52]. Hunters might use only one strategy for capturing an animal or a combination of two or more strategies. Local hunting also involves knowledge about the ecology of game species and others factors that influence ecological processes, such as the phases of the moon. Human culture has been greatly influenced by the obvious waxing and waning of the moon [53]. Thus, it is not surprising that the lunar cycle affects important human activities, such as fishing and hunting [54-58]. The influence of the moon in hunting activities recorded in our study has also been observed in other studies, such as the research of Leo Neto [58] on hunting with Indians in Pernambuco, Brazil, and Almeida *et al.* [59], on hunting in the Northern Region.

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Implications for conservation

Hunting is part of the daily life of rural communities in the surveyed area, largely motivated by the entertainment it provides and, though not strictly necessary for subsistence, it has nutritional importance. From the 64 huntable species identified, 42 are in threatened species lists: 18 are mammals, 21 are birds and 3 are reptiles, distributed in the categories of: vulnerable, low concern, low risk and data defficient [11, 31]. Species in the categories of the greatest conservationist concern, such as the *L. tigrinus* (Figure 4), classified as vulnerable, reinforce the need for more efficient actions and public policies that address the region's wildlife management.

Some hunting strategies adopted by hunters in the surveyed area may regulate the predatory impact on game species, such as "pausing" their hunting activities during the reproductive period of some species and the preference for hunting male animals. Similar strategies have been adopted by hunters in other localities [58, 60]. Taboos and traditional beliefs also may have positive effects on animal conservation [13, 61, 62]. Symbolic practices, such as belief in Cumadre Florzinha, may affect directly or indirectly a hunter's handling of the animal species, due to the required respect of animals and the environment, and to hunters abandoning the hunt because "Cumadre Florzinha does not want them to" [58]. McDonald [63] argues that some game animals are tabooed in South America to prevent overexploitation or local extinction. Food taboos, as recorded for some game animals in our study, also may play a role in biodiversity conservation. For example, Colding and Folke [64] found that a number of threatened populations of species, including endemic and keystone species, benefit from such taboos.



Fig. 4. Cub of *Leopardus tigrinus* captured for the pet trade in municipality of Conde, Paraíba. Photo credit: Jamylle Barcellos de Souza

Conflicting interactions between wild life and human communities are extremely important and represent a significant challenge for conservation managers who must try to benefit both parties involved [41]. Some game species recorded in our study are targets of conflict caused by attacks on domestic animals or crop damage, an aspect which was also registered in others localities by previous authors [8, 51]. This underscores the importance of including such problems in the context of animal conservation in Brazil.

We recommend environmental education actions in the schools of the municipality, as well as courses for teachers, mini-courses for volunteers, and lectures to associations that value the region's wildlife richness and the importance of protecting such species and their remaining forest habitats. Regarding reptiles, a group that is widely killed in control hunting, we highlight the need for specific educational actions to break prejudices related to serpents and teach the recognition of potentially dangerous species and ways to avoid accidents associated with these animals. To diminish the conflicts between the population and wild animals killed in control hunting, we also suggest changes in the structure of coops, and the construction of barriers, such as fences around the crops, in order to prevent the intrusion of wild species.

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Appendix 1. Animals hunted in the Atlantic Forest areas of the municipality of Conde, Paraíba State, Northeastern Brazil.

Species	Common names	Citations	Uses	Conservation Status	
				MMA	IUCN
Mammals (n= 24 species; 35,3%)					
Order Cingulata Illiger, 1811					
Euphractus sexcinctus (Linnaeus, 1758)	Six-banded armadillo	18	F; P		LC
Dasypus novemcinctus (Linnaeus, 1758)	Nine-banded armadillo	18	F; M		LC
Dasypus septemcinctus (Linnaeus, 1758)	Brazilian Lesser Long-nosed Armadillo	2	F; M		LC
Cabassous unicinctus (Linnaeus, 1758)	Southern Naked-Tailed Armadillo	13	F		LC
Order Rodentia Bowdich, 1821					
Hydrochoerus hydrochaeris (Linnaeus, 1766)	Capybara	18	F; C		
Dasyprocta prymnolopha (Linnaeus, 1766)	Black-rumped agouti	16	F		
Cuniculus paca (Linnaeus, 1766)	Spotted paca	8	F		
Coendou prehensilis (Linnaeus, 1758)	Brazilian Porcupine	1	F		LC
Galea spixii (Wagler, 1831)	Spix's Yellow-toothed Cavy	5	F		LC
Guerlinguetus alphonsei (Thomas, 1906)	Squirrel	2	P		LC
Order Carnivora Bowdich, 1821					
Cerdocyon thous (Linnaeus, 1766)	Crab-eating fox	13	C		LC
Eira Barbara (Linnaeus, 1758)	Tayra	3	F		LC
Galictis spp.	Grison	2	F		
Puma yaguarondi (Saint-Hiláre, 1803)	Jaguarundi	5	C		
Leopardus tigrinus (Schreber, 1775) -	Oncilla	5	C	VU	VU
Nasua nasua (Linnaeus, 1766)	South American coati	5	F		LC
Lontra longicaudis (Olfers, 1818)	Neotropical Otter	4	F		DD
Procyon cancrivorus (Cuvier, 1798)	Crab-eating Raccoon	13	F		LC
Order Primates Linnaeus, 1758					
Callithrix jacchus (Linnaeus, 1758)	White-tufted-ear Marmoset	3	F; P		LC
Order Didelphimorphia Gill, 1872					
Didelphis albiventris (Lund, 1840)	White-eared Opossum	10	F; C		LC
Order Pilosa Flower, 1883					
Bradypus variegatus (Schinz, 1825)	Brown-throated Sloth	3	F		LC
Tamandua tetradactyla (Linnaeus, 1758)	Collared anteater	18	F; C		LC
Order Lagomorpha (Brandt, 1855)					
Sylvilagus brasiliensis (Linnaeus, 1758)	Tapeti	4	F		LC
Unidentified species	Raposa gato	4	C		
Birds (n=26 species; 38,2%)					
Order Tinamiformes Huxley, 1872					
Crypturellus tataupa (Temminck, 1815)	Tataupa Tinamou	1	F		LC
Crypturellus parvirostris (Wagler,1827)	Yellow-legged tinamou	10	F		LC
Nothura maculosa (Temminck, 1815)	White-bellied nothura	2	F		LC
Order Columbiformes Latham, 1790					
Patagioenas speciosa (Gmelin, 1789)	Scaled Pigeon	4	F		LC

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Patagioenas cayennensis (Bonnaterre, 1792)	Pale-vented Pigeon	5	F	LC
Columbina minuta (*Linnaeus,* 1766)	Plain-breasted Ground-Dove	3	F	LC
Columbina talpacoti (Temminck, 1811)	Ruddy Ground Dove	2	F	LC
Columbina picui (Temminck, 1813)	Picui Ground-dove	1	P	LC
Order Gruiformes Bonaparte, 1854				
Aramides cajanea (Statius Muller, 1776)	Grey-necked Wood-rail	5	F	
Gallinula chloropus (Linnaeus, 1758)	Common Moorhen	4	F	
Order Galliformes Linnaeus, 1758				
Penelope superciliaris (Temminck, 1815)	Rusty-margined Guan	10	F	LC
Order Passeriformes Linnaeus, 1758				
Ortalis guttata (Spix, 1825)	Speckled Chachalaca	10	F	LC
Vanellus chilensis (Molina, 1782)	Southern lapwing	1	F	LC
Leptotila verreauxi (Bonaparte, 1855)	White-Tipped Dove	7	F	LC
Icterus pyrrhopterus (Vieillot, 1819)	Variable Oriole	1	P; T	LC
Icterus jamacaii (Gmelin, 1788)	Campo Troupial	1	P; T	LC
Sporophila bouvreuil (Statius Muller, 1776)	Capped Seedeater	2	P; T	LC
Sporophila angolensis (Linnaeus, 1766)	Chestnut-bellied Seed-Finch	1	P; T	
Tangara sayaca (Linnaeus, 1766)	Sayaca Tanager	3	P; T	
Sporophila nigricollis (Vieillot 1823)	Yellow-bellied Seedeater	2	P; T	LC
Sporophila leucoptera (Vieillot, 1817)	White-bellied Seedeater	1	P; T	LC
Zonotrichia capensis (Statius Muller, 1776)	Rufous-collared Sparrow	1	P; T	LC
Euphonia chlorotica (Linnaeus, 1776)	Purple-throated Euphonia	1	P; T	LC
Sicalis flaveola (Linnaeus, 1766)	Saffron Finch	1	P; T	LC
Paroaria dominicana (Linnaeus,1758)	Red-cowled Cardinal	2	P; T	LC
Cyanoloxia brissonii (Lichtenstein, 1823)	Ultramarine Grosbeak	1	P; T	
Reptiles (n=18 species; 26,5%)				
Order Crocodylia Gmelin 1789				
Caiman latirostris (Daudin 1802)	Broad-snouted Caiman	6	F; C; M	LC
Order Squamata Oppel, 1811				
Tupinambis merianae (Duméril & Bribon,1839)	Black And White Tegu	18	F; M	LC
Iguana iguana (Linnaeus 1758)	Common iguana	15	F; P; M	
Liophis viridis (Günther, 1862)	Crown Ground Snake	5	C	
Micrurus ibiboboca (Merrem, 1820)	Coral Snake	8	C	
*Oxyrhopus trigeminus (*Dumeril, Bibron & Dumeril, 1854)	Brazilian False Coral	5	C	
Spilotes pullatus (Linnaeus, 1758)	Tiger snake	8	C	
Crotalus durissus (Linnaeus, 1758)	Neotropical rattlesnake	9	C, M	LC
Epicrates assissi (Machado, 1945)	Brazilian rainbow boa	8	C	
Bothrops erythromelas (Amaral, 1923)	Caatinga lancehead	6	C	
Tantilla melanocephala (Linnaeus, 1758)	Black-headed snake	3	C	
Oxybelis aeneus (Wagler, 1824)	Brown vine snake	3	C	
Philodryas nattereri (Steindachner, 1870)	Paraguay Green Racer	4	C	
Drymarchon corais (Boie, 1827)	Indigo Snake	4	C	

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Unidentified species	Cobra d´água	1	C
Unidentified species	Cobra siricucu	3	C
Unidentified species	Cobra aracatifa	2	C
Unidentified species	Cobra jararacuçu	1	C

Legend: F- Food resource, M- Medicinal, P- Pets, C- Conflicting relationships and T- Trade. IUCN Red List categories (World Conservation Union; www.iucnredlist.org/): LC - Least Concern, DD - Data Deficient, VU – Vulnerable. MMA- Presence in the Brazilian Red List

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