

CONTROL AND MONITORING OF THE HUNTING FAUNA IN THE SEMI-ARID REGION OF PERNAMBUCO: IMPLICATIONS FOR CONSERVATION

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ARTICLE INFO

Article History:

Received 04th July, 2018
Received in revised form
22nd August, 2018
Accepted 16th September, 2018
Published online 30th October, 2018

Key Words:

Wildlife seizures, Environmental crimes, Environmental Notices of Violation, Semi-arid of Pernambuco.

ABSTRACT

This paper is aimed to investigate the Environmental Notices of Violation – ENV, applied in crimes against wildlife in the Brazilian semi-arid region by IBAMA. 592 ENV were analysed, which were generated based on data from DOC IBAMA and SEI systems between January 2006 and December 2017, relative to seizures of birds, reptiles, and mammals, resulting in warnings and fines. In 76 cities in the semi-arid region of Pernambuco, the ENV generated administrative fines totaling R\$ 24.142.800,00. The animals seized by IBAMA represented 12,894 live animals, and 3,053 of them were not classified by their agents. They identified 9,416 birds, 132 mammals, 146 reptiles, and 147 fighting cocks. In addition, 1672 whole animals slaughtered, 2 paws of *Puma concolor* and 2 horns of *Mazama gouazoubira* were recorded in the seizures. Among the species seized and identified, 16 were birds, 2 were mammals and 2 were reptiles presenting a threat according to IUCN. Furthermore, 30 species of birds, 7 species of mammals, and 6 species of reptiles were identified in the CITES appendices. Therefore, the results demonstrated the need for investment in environmental monitoring and community development through ecotourism in order to generate income and stimulate the conservation of the Caatinga biome.

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Citation: Mahatma Lenin Avelino de Almeida, Geraldo Jorge Barbosa de Moura; Daniela Santos Silva and Carlos Alberto Batista Santos. 2018. "Control and monitoring of the hunting fauna in the semi-arid region of pernambuco: implications for conservation", *International Journal of Development Research*, 8, (10), 23728-23735.

INTRODUCTION

The diversity of wildlife in the Brazilian semi-arid, for the most part covered by caatinga biome (ALVES *et al.*, 2012, ALBUQUERQUE *et al.*, 2012, SILVA, *et al.*, 2003, OLIVEIRA, *et al.*, 2003), attracts criminals connected with the traffic of fauna, which only behind of the word billing drug trade, moving from 10 to 20 billion dollars for year (RECNTAS, 2016). In Brazil, the animals traffic is a crime and it is regularized by several legislation, having several

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organs acting in the combat, just like the IBAMA and ICMBio. However, the vast territorial extension, the reduced number of agents, the low severity of the penalties predicted in the environmental legislation, associated to the misery in which great part of the population lives make impossible the efficiency of the actions of combat to the fauna traffic (OKI; PANDEFF, 2016; ALVES *et al.*, 2012; ALVES *et al.*, 2009). The state of Pernambuco has 88% of its territorial portion covered by the semi-arid region and the hunting practice is associated with the local culture. In the semi-arid, animals serve a variety of activities such as feeding, ritual and religious practices, commercialization of pets, and the control of animals considered harmful in order to attack crops, domestic

animals and men (FERNANDES-FERREIRA *et al.*, 2012; FERREIRA *et al.*, 2012; PEREIRA; SCHIAVETTI, 2010). The Brazilian Institute of the Environment and of the Renewable Natural Resources – IBAMA, is one of the main organs of inspection of the crimes related to environmental resources and through the production of Environmental Notices of Violation (ENV). The IBAMA applies administrative sanctions with warnings and / or fines to the offenders, with subsequent identification of the seized animals, forms of use and final destiny of the individuals (TRIGUEIRO; COSTA, 2016). Studies in the Brazilian semi-arid region investigate the relationship between man and wild fauna, estimating qualitative and quantitative aspects related to most impacted species and types of environmental crimes, can be used specially to subsidize actions for conservation and awareness of scarce wildlife resources (ALVES *et al.*, 2012). Through the exposed, this work proposed to investigate the way human being relates to the wild fauna, through analysis of the Environmental Notices of Violation made in the seizure of animals by IBAMA in the semi-arid region of Pernambuco.

MATERIAL AND METHODS

Study Area: The study was carried out in the semi-arid region of Pernambuco, Brazil, which is composed of 127 cities, covering a total area of 86.135 km² (88.5% of the total area of the state) (ACCIOLY *et al.*, 2017) and a population of approximately 3,236,741 people (MINISTÉRIO DA INTEGRAÇÃO NACIONAL, 2005).

Methods: This study is about a documentary, descriptive research that sought among other aspects, to register the control and monitoring of the most captured hunting species in the semi-arid region of Pernambuco, in cities with IBAMA acting, in the semi-arid region of Pernambuco between January 2006 to December 2017. The data were collected from the analysis of the Environmental Notices of Violation – ENV, accessed in the DOC IBAMA system and Electronic System of Information – ESI, referring to the environmental crimes of wild fauna, with focus on the hunting vertebrates. The data analysis took into consideration the total number of notices of violation, total values of fines applied, recurrence of criminal human conducts present in the records, the species apprehended identified on ENV, and the physical condition the animals were in with the infractor in the apprehension (ALMEIDA; SANTOS, 2018). For the analysis of the conservation status of the registered hunting species was used the lists: International Union for Conservation of Nature (IUCN), Convention about International Trade of Wild Flora and Fauna Species in Danger of Extinction (CITES), and Official National List of Fauna Species threatened of Extinction (Brazilian Ministry of Environment, 2014).

RESULTS

The results showed that 592 environmental notices of violation were applied in crimes against wildlife by IBAMA in 76 cities of the semi-arid region of Pernambuco between January 2006 and December 2017, which generated 592 administrative fines and no warnings (Figure 1). The fines recorded a total of R\$ 24,142,800.00 during the period, with an average of approximately R\$ 2,194,800.00/ year. The values of the fines vary according to the quantity of specimens seized and also with the degree of vulnerability of the species, with fines applied from R\$ 500.00 to R\$ 5.000,00 per species (IBAMA,

2016). Another aspect analyzed was the classification of human behaviors in the semi-arid region of Pernambuco at the time of the IBAMA seizure. It revealed that the action of "keeping the wild fauna in captivity" was the one that had the largest volume of notifications, corresponding to 243 (40,91%) environmental notices of violation registered, followed by the conduct of "exposing for sale" with 154 (25,93%), and the action of "transporting", with 48 (8,08%) notifications. There were still other conducts registered with less intensity according to Table 01. In relation to animals, the study revealed that 12,894 live animals were seized in the cities of the semi-arid region of Pernambuco, and 3,053 of them were not classified by IBAMA agents. live animals identified were 9,416 birds, 132 mammals, 146 reptiles, 147 fighting cocks. Birds represented 95.68% of the total number of live specimens, with 109 species belonging to 24 families. 5 species have ecological status according to IUCN (2018) in danger of extinction and 9 are listed as vulnerable species, while 4 species are listed in Appendix I, 25 species in Appendix II, and 2 species in Appendix III of CITES (2018). Also, there are 1 critically endangered specie, 3 endangered species, and 7 vulnerable species according to the Brazilian Ministry of Environment (2014) (Table 02).

Table 1. Quantity and percentage of environmental notices of violation according to human conduct and the respective violation from 2006 to 2017 recorded in IBAMA seizures in the semi-arid region of Pernambuco

Registered human conduct ENV	N° ENV	% ENV
Keep in captivity	243	40,91%
Market /expose the sale /sell	154	25,93%
Carry	48	8,08%
Shoot /kill	42	7,07%
Purchase	40	6,73%
Store maintain on deposit /saving	28	4,71%
To practice ill-treatment	18	3,03%
To hunt	9	1,52%
Obstructing the inspection action	6	1,01%
Use	3	0,51%
Failing to report the death of animals	2	0,34%
Introduce species of exotic fauna	1	0,17%

The mammals represented 1,34% of the seizures, totaling 132 specimens of 16 species and 12 families. 1 species is critically endangered and 1 other species is endangered, all with estimated population reduction, according to IUCN (2018). In addition, 3 are in Appendix I, 6 species in Appendix II, 2 species in Appendix III of CITES (2018), and 2 endangered and 1 vulnerable in the list of Brazilian Ministry of Environment (2014) (Table 03). Reptiles represented 1.48% of the total number of specimens seized, totaling 146 specimens of 7 species and 6 different families. 2 other species are endangered according to IUCN (2018), 1 is listed in Appendix I and II, 4 in Appendix II, and 1 listed in Appendix III of CITES (2018), and none of them are listed by Brazilian Ministry of Environment (2014) (Table 04). In the seizures, dead animals were also registered, and the forms of seizure were included in the notices of violation: slaughtered, commercialization, custody, storage, and transport of animals (Table 05).

DISCUSSION

IBAMA in the state of Pernambuco was able to register an average of 53.8% of Environmental Notices of Violation (ENV) in the studied years and 59,9% of the cities belonging

Table 2. List of bird species seized in the semi-arid region of Pernambuco between 2006 and 2017, classified according to IUCN (2018), CITES (2018), and Brazilian Ministry of Environment (2014) threat levels

Family	Scientific name	Popular name	N	Category and criteria IUCN	Current population trend IUCN	CITES	MMA	
Accipitridae	<i>Elanus leucurus</i>	gavião-peneira	1	Least Concern (LC)	Increasing	II	-	
	<i>Geranoaetus melanoleucus</i>	águia-serrana	1	Least Concern (LC)	Stable	II	-	
Anatidae	<i>Dendrocygna autumnalis</i>	marreca	5	Least Concern (LC)	Increasing	III	-	
	<i>Netta erythrophthalma</i>	paturi-preta	2	Least Concern (LC)	Decreasing	-	-	
Cardinalidae	<i>Cyanoloxia brissonii</i>	azulão	451	Least Concern (LC)	Unknown	-	-	
	<i>Cyanoloxia cyanooides</i>	picagordo-negro	3	Least Concern (LC)	Decreasing	-	-	
Cariamidae	<i>Cariama cristata</i>	seriema	17	Least Concern (LC)	Stable	-	-	
Columbidae	<i>Columbina minuta</i>	rolinha-de-asa-canela	1	Least Concern (LC)	Stable	-	-	
	<i>Columbina passerina</i>	rolinha-cinzenta	1	Least Concern (LC)	Decreasing	-	-	
	<i>Columbina picui</i>	rolinha-picui	103	Least Concern (LC)	Stable	-	-	
	<i>Columbina squammata</i>	fogo-apagou	35	Least Concern (LC)	Stable	-	-	
	<i>Columbina talpacoti</i>	rolinha-caldo-de-feijão	22	Least Concern (LC)	Increasing	-	-	
	<i>Leptotila rufaxilla</i>	juriti-verdadeira	13	Least Concern (LC)	Stable	-	-	
	<i>Leptotila verreauxi</i>	juriti-pupu	3	Least Concern (LC)	Increasing	-	-	
	<i>Patagioenas cayennensis</i>	pomba-galega	3	Least Concern (LC)	Stable	-	-	
	<i>Patagioenas picazuro</i>	asa-branca	14	Least Concern (LC)	Increasing	-	-	
	<i>Zenaida auriculata</i>	arribaçã	1699	Least Concern (LC)	Increasing	-	-	
	Corvidae	<i>Cyanocorax cyanopogon</i>	canção	49	Least Concern (LC)	Decreasing	-	-
	Cotingidae	<i>Procnias nudicollis</i>	araponga	8	Vulnerable (VU)	Decreasing	-	-
	Cracidae	<i>Ortalis araucuan</i>	Aracuã	2	Least Concern (LC)	Decreasing	-	-
Cuculidae	<i>Coccyzus melacoryphus</i>	papa-lagarta-acanelado	1	Least Concern (LC)	Stable	-	-	
Estrildidae	<i>Estrilda astrild</i>	bico-de-lacre	16	Least Concern (LC)	Stable	-	-	
Falconidae	<i>Falco sparverius</i>	gavião-quiriquiri	1	Least Concern (LC)	Stable	II	-	
	<i>Caracara plancus</i>	carcará	3	Least Concern (LC)	Increasing	II	-	
Fringillidae	<i>Euphonia chlorotica</i>	guriatã-de-coleira	9	Least Concern (LC)	Stable	-	-	
	<i>Euphonia violacea</i>	gaturamo-verdadeiro	13	Least Concern (LC)	Decreasing	-	-	
	<i>Spinus magellanicus</i>	pintasilgo	2	Least Concern (LC)	Stable	-	-	
	<i>Spinus yarrellii</i>	pintasilgo do nordeste	25	Vulnerable (VU)	Decreasing	II	VU	
Furnariidae	<i>Pseudoseisura cristata</i>	carrega-madeira-do-sertão	6	Least Concern (LC)	Increasing	-	-	
Icteridae	<i>Anumara forbesi</i>	anumará	2	Endangered (EN)	Decreasing	-	-	
	<i>Cacicus cela</i>	xexeu	18	Least Concern (LC)	Decreasing	-	-	
	<i>Cacicus solitarius</i>	iraúna-de-bico-branco	4	Least Concern (LC)	Stable	-	-	
	<i>Chrysomus ruficapillus</i>	garibaldi	28	Least Concern (LC)	Stable	-	-	
	<i>Gnorimopsar chopi</i>	pássaro preto	57	Least Concern (LC)	Stable	-	-	
	<i>Icterus cayanensis</i>	pega	2	Least Concern (LC)	Stable	-	-	
	<i>Icterus jamacaii</i>	corrupião	189	Least Concern (LC)	Stable	-	-	
	<i>Icterus pyrrhopterus</i>	encontro	13	Least Concern (LC)	Stable	-	-	
	<i>Molothrus bonariensis</i>	chupim	1	Least Concern (LC)	Increasing	-	-	
	<i>Zonotrichia capensis</i>	tico-tico	145	Least Concern (LC)	Stable	-	-	
	Passerellidae	<i>Colaptes campestris</i>	pica-pau-do-campo	1	Least Concern (LC)	Increasing	-	-
Picidae	<i>Ceratopipra rubrocapilla</i>	cabeça-encarnada	3	Least Concern (LC)	Decreasing	-	-	
	<i>amazona aestiva</i>	papagaio verdadeiro	631	Least Concern (LC)	Decreasing	II	-	
Psittacidae	<i>Amazona farinosa</i>	papagaio-moleiro	1	Near Threatened (NT)	Decreasing	II	-	
	<i>Amazona amazonica</i>	papagaio do mangue	2	Least Concern (LC)	Decreasing	II	-	
	<i>Amazona autumnalis</i>	papagaio-diadema	2	Least Concern (LC)	Decreasing	II	-	
	<i>Amazona Vinacea</i>	papagaio-de-peito-roxo	2	Endangered (EN)	Decreasing	I	VU	
	<i>Anodorhynchus hyacinthinus</i>	arara-azul-grande	1	Vulnerable (VU)	Decreasing	I	-	
	<i>Ara ararauna</i>	arara canidé	1	Least Concern (LC)	Decreasing	II	-	

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	<i>Ara chloropterus</i>	arara-vermelha	5	Least Concern (LC)	Decreasing	II	-
	<i>Brotogeris chiriri</i>	periquito-de-encontro-amarelo	1	Least Concern (LC)	Stable	II	-
	<i>Deropterus accipitrinus</i>	anacã	2	Least Concern (LC)	Decreasing	II	-
	<i>Diopsittaca nobilis</i>	maracanã-nobre	1	Least Concern (LC)	Stable	II	-
	<i>Eupsittula cactorum</i>	periquito jandaia	475	Least Concern (LC)	Stable	II	-
	<i>Eupsittula cactorum</i>	periquito jandaia	475	Least Concern (LC)	Stable	II	-
	<i>Forpus xanthopterygius</i>	tuim	46	Least Concern (LC)	Stable	II	-
	<i>Guaruba guarouba</i>	guaruba	1	Vulnerable (VU)	Decreasing	I	VU
	<i>Pionus fuscus</i>	maitaca-roxa	4	Least Concern (LC)	Decreasing	II	-
	<i>Pionus menstruus</i>	maitaca-de-cabeça-azul	3	Least Concern (LC)	Decreasing	II	-
	<i>Primolius maracana</i>	maracanã-verdadeiro	40	Near Threatened (NT)	Decreasing	I	-
	<i>Pyrrhura griseipectus</i>	tiriba-de-peito-cinza	15	Endangered (EN)	Increasing	II	EN
Ramphastidae	<i>Ramphastos toco</i>	Tucano	22	Least Concern (LC)	Decreasing	II	-
	<i>Selenidera maculirostris</i>	Araçari-poca	6	Least Concern (LC)	Decreasing	III	-
	<i>Pteroglossus aracari</i>	Araçari	2	Least Concern (LC)	Decreasing	II	-
Strigidae	<i>Athene cucularia</i>	coruja-buraqueira	1	Least Concern (LC)	Decreasing	II	-
Thraupidae	<i>Coereba flaveola</i>	cambacica	3	Least Concern (LC)	Stable	-	-
	<i>Coryphospiza melanotis</i>	tico-tico-de-máscara-negra	5	Vulnerable (VU)	Decreasing	-	EN
	<i>Coryphospingus cucullatus</i>	tico-tico-rei	7	Least Concern (LC)	Stable	-	-
	<i>Coryphospingus pileatus</i>	tico-tico-rei-cinza	97	Least Concern (LC)	Stable	-	-
	<i>Dacnis Cayana</i>	saíra-azul	166	Least Concern (LC)	Stable	-	-
	<i>Emberizoides herbicola</i>	canário-do-campo	3	Least Concern (LC)	Decreasing	-	-
	<i>Paroaria coronata</i>	cardeal	8	Least Concern (LC)	Stable	II	-
	<i>Paroaria dominicana</i>	galo-da-campina	917	Least Concern (LC)	Stable	-	-
	<i>Paroaria gularis</i>	Paroaria gularis	14	Least Concern (LC)	Stable	-	-
	<i>Ramphocelus bresilius</i>	tiê-sangue	1	Least Concern (LC)	Stable	-	-
	<i>Ramphocelus carbo</i>	bico-de-prata	2	Least Concern (LC)	Stable	-	-
	<i>Saltator coerulescens</i>	sabiá-gongá	2	Least Concern (LC)	Decreasing	-	-
	<i>Saltator similis</i>	trinca ferro	40	Least Concern (LC)	Decreasing	-	-
	<i>Sicalis flaveola</i>	canário-da-terra	2652	Least Concern (LC)	Stable	-	-
	<i>Sicalis Luteola</i>	tipio	62	Least Concern (LC)	Increasing	-	-
	<i>Sporophila albogularis</i>	golinha	110	Least Concern (LC)	Stable	-	-
	<i>Sporophila americana</i>	coleiro-do-norte	2	Least Concern (LC)	Decreasing	-	-
	<i>Sporophila angolensis</i>	curió	13	Least Concern (LC)	Increasing	-	-
	<i>Sporophila bouvronides</i>	estrela-do-norte	1	Least Concern (LC)	Stable	-	-
	<i>Sporophila bouvreuil</i>	caboclinho	77	Least Concern (LC)	Decreasing	-	-
	<i>Sporophila caerulescens</i>	coleirinho	63	Least Concern (LC)	Increasing	-	-
	<i>Sporophila falcirostris</i>	cigarra-verdadeira	1	Vulnerable (VU)	Decreasing	-	VU
	<i>Sporophila frontalis</i>	pioxó	3	Vulnerable (VU)	Decreasing	-	VU
	<i>Sporophila leucoptera</i>	patativa-chorona	4	Least Concern (LC)	Stable	-	-
	<i>Sporophila lineola</i>	bigode	76	Least Concern (LC)	Stable	-	-
	<i>Sporophila maximiliani</i>	bicudo	14	Endangered (EN)	Decreasing	-	CR
	<i>Sporophila nigrorufa</i>	caboclinho-do-sertão	8	Vulnerable (VU)	Decreasing	-	VU
	<i>Sporophila nigricollis</i>	papa-capim	441	Least Concern (LC)	Increasing	-	-
	<i>Sporophila plumbea</i>	patativa	155	Least Concern (LC)	Stable	-	-
	<i>Tachyphonus rufus</i>	maria preta	3	Least Concern (LC)	Stable	-	-
	<i>Tangara cayana</i>	frei-vicente	8	Least Concern (LC)	Stable	-	-
	<i>Tangara fastuosa</i>	pintor	37	Vulnerable (VU)	Decreasing	II	VU
	<i>Tangara palmarum</i>	sanhaço-de-coqueiro	4	Least Concern (LC)	Stable	-	-
	<i>Tangara sayaca</i>	sanhaço	24	Least Concern (LC)	Stable	-	-
	<i>Tangara Seledon</i>	saíra-sete-cores	3	Least Concern (LC)	Stable	-	-
	<i>Volatinia jacarina</i>	tiziu	3	Least Concern (LC)	Stable	-	-

Tinamidae	<i>Crypturellus parvirostris</i>	inhambu-chororó	5	Least Concern (LC)	Decreasing	-	-
	<i>Crypturellus tataupa</i>	inhambu-xintã	1	Least Concern (LC)	Stable	-	-
Trochilidae	<i>Eupetomena macroura</i>	beija-flor-tesoura	7	Least Concern (LC)	Unknown	II	-
Turdidae	<i>Cichlopsis leucogenys</i>	sabiá-castanho	4	Endangered (EN)	Decreasing	-	EN
	<i>Turdus amaurochalinus</i>	sabiá-poca	3	Least Concern (LC)	Stable	-	-
	<i>Turdus fumigatus</i>	sabiá-da-mata	1	Least Concern (LC)	Decreasing	-	-
	<i>Turdus leucomelas</i>	sabiá-barranco	1	Least Concern (LC)	Stable	-	-
	<i>Turdus rufiventris</i>	sabiá-laranjeira	123	Least Concern (LC)	Stable	-	-
Tyrannidae	<i>Lophotriccus vitiensis</i>	maria-fiteira	2	Least Concern (LC)	Stable	-	-
	<i>Pitangus sulphuratus</i>	bem-te-vi	4	Least Concern (LC)	Increasing	-	-

Legend: 1. IUCN: VU - Vulnerable; NT - Near Threatened; LR / CD - Low Risk / Conservation Dependent; LC-Least Concern; DD - Data deficient; (*) - Not on the IUCN List; 2. CITES I: Annex I of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). They include endangered species that are or potentially could be affected by trade. Trade in these species shall be authorized only after careful consideration and under exceptional conditions; Cites II: Annex II of CITES includes those species which, although not currently in danger of extinction, will fall into this category if their trade is not subject to strict regulations in order to avoid exploitation above the carrying capacity of the populations; CITES III: Species included in Annex III of CITES through a declaration from any country are those whose exploitation needs to be restricted or prevented and which requires cooperation in its control, and may be allowed to be commercialized, by means of a license or certificate, by the Administrative Authority; 3. MMA: Extinct in Nature (EW), Critically Endangered (CR), Endangered (EN) and Vulnerable (VU).

Table 3. List of mammals species seized in the semi-arid region of Pernambuco between 2006 and 2017, classified according to IUCN (2018), CITES (2018), and Brazilian Ministry of Environment (2014) threat levels

Family	Scientific name	Popular name	N	Category and criteria IUCN	Current population trend IUCN	CITES	MMA
Callitrichidae	<i>Callithrix jacchus</i>	saguim	1	Least Concern (LC)	Stable	I	
	<i>Saguinus nigricollis</i>	Black Mantle Tamarin	1	Least Concern (LC)	Decreasing	II	
Canidae	<i>Cerdocyon thous</i>	raposa	2	Least Concern (LC)	Stable	II	
Caviidae	<i>Kerodon rupestris</i>	mocó	5	Least Concern (LC)	Stable		
Cebidae	<i>Sapajus xanthosternos</i>	macaco-prego-do-peito-amarelo	1	Critically Endangered (CR)	Decreasing	II	EN
	<i>Sapajus libidinosus</i>	macaco-prego	4	Least Concern (LC)	Decreasing	II	
Cervidae	<i>Mazama gouazoubira</i>	veado-catingueiro	10	Least Concern (LC)	Decreasing		
Chlamyphoridae	<i>Euphractus sexcinctus</i>	tatu-peba	31	Least Concern (LC)	Stable		
	<i>Tolypeutes tricinctus</i>	tatu-bola-da-caatinga	20	Vulnerable (VU)	Decreasing		EN
Dasypodidae	<i>Dasyopus novemcinctus</i>	tatu-verdadeiro	2	Least Concern (LC)	Stable		
Dasyproctidae	<i>Dasyprocta leporina</i>	cutia	38	Least Concern (LC)	Stable		
Didelphidae	<i>Didelphis albiventris</i>	sariguê	1	Least Concern (LC)	Stable		
Myrmecophagidae	<i>Tamandua tetradactyla</i>	tamanduá-mirim	8	Least Concern (LC)	Unknown		
Procyonidae	<i>Nasua nasua</i>	quati	1	Least Concern (LC)	Decreasing	III	
	<i>Procyon cancrivorus</i>	guaxinim	1	Least Concern (LC)	Decreasing	-	
Tayassuidae	<i>Pecari tajacu</i>	caitatu	6	Least Concern (LC)	Stable	II	

Legend: 1. IUCN: VU - Vulnerable; NT - Near Threatened; LR / CD - Low Risk / Conservation Dependent; LC-Least Concern; DD - Data deficient; (*) - Not on the IUCN List; 2. CITES I: Annex I of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). They include endangered species that are or potentially could be affected by trade. Trade in these species shall be authorized only after careful consideration and under exceptional conditions; Cites II: Annex II of CITES includes those species which, although not currently in danger of extinction, will fall into this category if their trade is not subject to strict regulations in order to avoid exploitation above the carrying capacity of the populations; CITES III: Species included in Annex III of CITES through a declaration from any country are those whose exploitation needs to be restricted or prevented and which requires cooperation in its control, and may be allowed to be commercialized, by means of a license or certificate, by the Administrative Authority; 3. MMA: Extinct in Nature (EW), Critically Endangered (CR), Endangered (EN) and Vulnerable (VU).

Table 4. List of reptiles species seized in the semi-arid region of Pernambuco between 2006 and 2017, classified according to IUCN (2018), CITES (2018), and Brazilian Ministry of Environment (2014) threat levels

Family	Scientific name	Popular name	N	Category and criteria IUCN	Current population trend IUCN	CITES	MMA
Boidae	<i>Boa constrictor</i>	jiboia	4			I,II	
Iguanidae	<i>Iguana iguana</i>	iguana	116			II	
Podocnemididae	<i>Podocnemis unifilis</i>	tracajá	1	Vulnerable (VU)	unspecified	II	
Teiidae	<i>Salvator merianae</i>	teiú-gigante	4	Least Concern (LC)	Stable	II	
Testudinidae	<i>Chelonoidis carbonarius</i>	jabuti-piranga	19			II	
Viperidae	<i>Crotalus durissus</i>	cascavel	1	Least Concern (LC)	Unknown	III	
	<i>Lachesis muta ssp. rhombeata</i>	surucucu-pico-de-jaca	1	Vulnerable (VU)	Decreasing	-	

Legend: 1. IUCN: VU - Vulnerable; NT - Near Threatened; LR / CD - Low Risk / Conservation Dependent; LC-Least Concern; DD - Data deficient; (*) - Not on the IUCN List; 2. CITES I: Annex I of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). They include endangered species that are or potentially could be affected by trade. Trade in these species shall be authorized only after careful consideration and under exceptional conditions; Cites II: Annex II of CITES includes those species which, although not currently in danger of extinction, will fall into this category if their trade is not subject to strict regulations in order to avoid exploitation above the carrying capacity of the populations; CITES III: Species included in Annex III of CITES through a declaration from any country are those whose exploitation needs to be restricted or prevented and which requires cooperation in its control, and may be allowed to be commercialized, by means of a license or certificate, by the Administrative Authority; 3. MMA: Extinct in Nature (EW), Critically Endangered (CR), Endangered (EN) and Vulnerable (VU).

Table 5. List of species seized in the semi-arid region of Pernambuco between 2006 and 2017, classified according to the slaughtering situation at the time of seizure

Class	Family	Scientific name	Popular name	Situation at the time of seizure	by-product found in seizure	N
Aves	Columbidae	<i>Zenaida auriculata</i>	arribaça	Slaughter	whole animal slaughtered	1521
Aves	Columbidae	<i>Zenaida auriculata</i>	arribaça	Carry	whole animal slaughtered	144
Aves	Columbidae	<i>Zenaida auriculata</i>	arribaça	To hunt	whole animal slaughtered	1
Mammalia	Dasypodidae	<i>Dasyopus novemcinctus</i>	tatu-verdadeiro	Carry	whole animal slaughtered	1
Mammalia	Cervidae	<i>Mazama gouazoubira</i>	veado-catingueiro	Save	horns	2
Mammalia	Chlamyphoridae	<i>Euphractus sexcinctus</i>	tatu-peba	Slaughter	whole animal slaughtered	1
Mammalia	Chlamyphoridae	<i>Euphractus sexcinctus</i>	tatu-peba	Carry	whole animal slaughtered	3
Mammalia	Tayassuidae	<i>Pecari tajacu</i>	caitatu	Save	Head	5
Mammalia	Felidae	<i>Leopardus wiedii</i>	gato-maracajá	Kill	whole animal slaughtered	1
Mammalia	Felidae	<i>Puma concolor</i>	onça-parda	Save	paws	2

to the semi-arid region. However, surveillance was more efficient in the search and seizure of captive-bred animals (40.91%) and in wild animal trade (25.93%) (Table 1), demonstrating that surveillance is only reaching the final link of the trafficking of wild animals and has a little efficiency in combating illegal market supply, hunting, and transporting species. The total amount of fines applied presented a significant amount (R\$ 24,142,800.00), which could finance several environmental actions to reduce the levels of traffic of wild animals. However, the agency suffers from the inefficiency of the collection of fines imposed. According to the IBAMA management report (2016), it was only possible to collect in the years 2014 to 2016 less than 0.5% per year of the total fines applied. Regarding the animals seized in the semi-arid region of Pernambuco, our results registered a worrying volume of seizures of animals with 130 species used illegally, of which 31 are already considered as endangered (IUCN, 2018; MMA, 2014) and 61 species affected by animal trafficking (CITES, 2018). Studies in the semi-arid place the hunting activities as one of the major responsible for the extinction of at least 41 species of fauna that occur in the Caatinga (ALVES et al., 2012; SCHÖBER, 2012; NASCIMENTO; CAMPOS, 2011). In the years surveyed, birds represented more than 95% of the seizures, registering at least 16 species classified as high threat, and 27 species with low threat, but with declining populations (Table 2). The Thraupidae family stood out in the region due to the greater number of species (36) and the largest number of specimens (4,980) seized. In the state of Pernambuco, trade in wild birds is reported as a common situation, especially in open fairs, and in a previous study 106 species of at least 30 Brazilian wild bird families were traded in the free trade fairs of the Metropolitan Region of Recife, capital of the state of Pernambuco (PEREIRA; BRITO, 2005).

Thus, birds are considered the most exploited group through hunting, due to both their availability of species and the habit of creating wild birds as pets and consequently being a high-profit market in Brazil and internationally (ALVES et al., 2012; RECNTAS, 2016). Estimates indicate that 4 billion birds per year are traded illegally, and 70% of them are destined for internal commerce. The others 30% go to the European, Asian and American markets (ROCHA et al., 2006). The mammal group had a small participation in the IBAMA seizures in the semi-arid region of Pernambuco (Table 3). Hunting and trading of these species generally works to supply international animal traffic, conflicts with carnivorous mammals, subsistence consumption, and market of exotic meats by the high biomass return (ALVES et al., 2012; DANTAS-AGUIAR et al., 2011; OLIVEIRA, et al., 2003). However, it was possible to find in the seizures animals slaughtered as the *Leopardus wiedii*, and also parts of animals like the paws of *Puma concolor* and the horns of *Mazama gouazoubira*. The reptiles were the group of animals that presented the smallest variety of species seized in the semi-arid region of Pernambuco. Studies indicate that such animals are hunted to supply both markets and fairs in Brazil, with destination for pet shops, private collections, zoos (ALVES et al., 2011; FITZGERALD, 1989; ALVES et al., 2007), besides the use in popular medicine, subsistence food and trade of by-products mainly meat and skin (SANTOS et al., 2016). Finally, even in view of the reality presented, IBAMA closed, in 2016, the only office located in the semi-arid region of Pernambuco, located in the city of Salgueiro. Thus, only remains the central office in Recife, which meets the demands and specificities of the coastal region, an area of Atlantic forest, very culturally and physically diverse from the semi-arid region of Pernambuco. This situation may already have influenced the reduction of the number of Environmental Notices of Violation (ENV)

presented in 2017 (Figure 1) and impact on the reduction of environmental inspections in the semi-arid region of Pernambuco in the coming years.

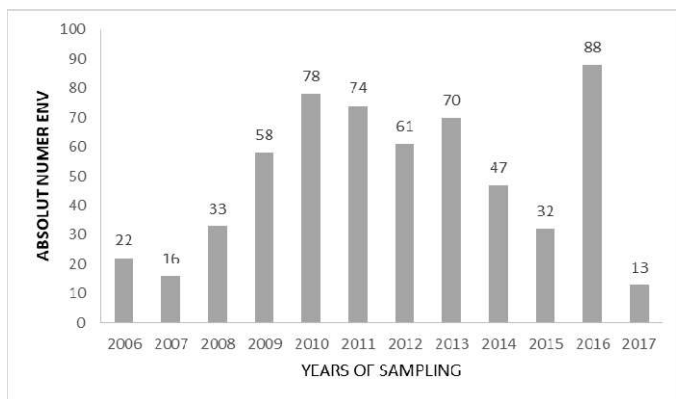


Figure 1. Quantity of environmental notices of violation processed by IBAMA in the semi-arid region of Pernambuco, from 2006 to 2017

Conclusion

The illegal withdrawal of animals from the Brazilian semi-arid region is a serious problem that must be faced as soon as possible. Therefore, the Brazilian government must guarantee the resumption of investments in Pernambuco through the installation of new units, hiring of servers, monitoring of the areas affected by hunting and more effective forms of collection of environmental Fines. Thus, the IBAMA can ensure that the national fauna will not be used irregularly in the country, and also it is not going to other nations through international traffic. Also, the research showed that the situations of environmental crimes in the semi-arid region of Pernambuco are mostly linked to wild birds. Thus, this situation can be minimized by investing in ecotourism to observe the species sought by the traffickers, using the local inhabitants to generate income in the region and create a more favorable condition for the maintenance of every ecosystem that the fauna is inserted, and the environmental education.

REFERENCES

Accioly, L. J. De O.; Silva, E. A.; Cavalcanti Junior, E. A.; Alves, E. S.; Pereira, A. G. De S.; Silva, R. S.; Ramos, R. R. D.; Silva, R. R. Mapeamento do uso e cobertura das terras do Semiárido pernambucano (escala 1:100.000). Rio de Janeiro: Embrapa Solos, 2017. 100 p. il. color. (Embrapa Solos. Boletim de pesquisa e desenvolvimento, 260). Available online at <https://www.embrapa.br/busca-de-publicacoes/-/publicacao/1079144/mapeamento-do-uso-e-cobertura-das-terras-do-semiarido-pernambucano-escala-1100000>. Access in 30/08/2018.

Albuquerque, Araújo, E., Lima, A., Souto, A., Bezerra, B., Freire, E. M. X., Sampaio, E., Casas, F. L., Moura, G., Pereira, G., Melo, J. G., Alves, M., Rodal, M., Schiel, M., Neves, R. L., Alves, R. R. N., Azevedo-Júnior, S. and Telino Júnior, W. 2012. Caatinga revisited: ecology and conservation of an important seasonal dry forest. *Scientific World Journal in press*. Available online at <http://www.tswj.com/aip/205182/>

Almeida, M. L. A.; Santos, C. A. B. 2018. Diagnosis of fauna apprehension in the semi-arid region of Bahia: an analysis from the Environmental Notices of Violation. *International Journal of Development Research*. Vol. 08, Issue, 06, (no prelo).

Alves, R. R. N., Souto, W. M. S.; Mourão, J. S. 2010. A Etnozoologia no Brasil: Importância, Status atual e Perspectivas. NUPEEA, Recife, PE, Brazil.

Alves, R. R. N., Lima, J. R. F.; Araújo, H. F. 2012. The live bird trade in Brazil and its conservation implications: an overview. Bird Conservation International, Doi: 10.1017/S095927091200010X1-13.

Alves, R. R. N., Gonçalves, M. B. R., and Vieira, W. L. S. 2012. Caça, uso e conservação de vertebrados no semiárido Brasileiro. *Tropical Conservation Science* 5 (3):394-416.

Alves, R. R. N., Mendonça, L. E. T., Confessor, M. V. A., Vieira, W. L. S. and Lopez, L. C. S. 2009. Hunting strategies used in the semi-arid region of northeastern Brazil. *Journal of Ethnobiology and Ethnomedicine* 5:1-50.

Alves, R. R. N., Rosa, I. L. and Santana, G. G. 2007. The Role of Animal-derived Remedies as Complementary Medicine in Brazil. *BioScience*, 57: 949-955.

Alves, R. R. N., Vieira, K. S., Santana, G. G., Vieira, W. L. S., Almeida, W. O., Souto, W. M. S., Montenegro, P. F. G. P. and Pezzuti, J. C. B. 2011. A review on human attitudes towards reptiles in Brazil. *Environmental Monitoring and Assessment*, DOI 10.1007/s10661-011-2465-0 1-25.

Bennett, E. L.; Milner-Gullanda, E. J.; Bakarr, M.; Eves, H. E.; Robinson, J. G.; Wilkie, D. Hunting the world's wildlife to extinction. Bodmer, R. E. and Robinson, J. G. 2004. In: Silvius, K., Bodmer, R. E. and Fragoso, J. M. V. (Eds). People in nature: wildlife conservation in South and Central America., pp.299-323. Columbia University Press, New York, USA.

Bennett, E., Eves, H., Robinson, J. and Wilkie, D. 2002. Why is eating bushmeat a biodiversity crisis. *Conservation Pract.* 3: 28-29.

Borges, R. C.; Oliveira, A.; Bernardo, N.; Costa, R. M. M. C. Diagnóstico da fauna silvestre apreendida e recolhida pela Polícia Militar de Meio Ambiente de Juiz de Fora, MG (1998 e 1999). *Revista Brasileira de Zoociências*, v. 8, n. 1, p. 23-33, 2006.

Brasil. 2014. Ministério do Meio Ambiente – MMA. Portaria nº 444, de 17 de dezembro de 2014. Lista nacional oficial de espécies da fauna ameaçadas de extinção. Available from: http://www.icmbio.gov.br/portal/images/stories/biodiversidade/fauna-brasileira/avaliacao-do-risco/PORTARIA_N%C2%BA_444_DE_17_DE_DEZEMBRO_DE_2014.pdf.

Brasil. 2017. Câmara dos Deputados. PL 6268/2016. Available online at <https://www.camara.gov.br/proposicoesWeb/fichadetramitacao?idProposicao=2113552>

Brasil. Congresso Nacional. Legislação Federal. Lei Nº 9.605, de 12 de Fevereiro de 1998 que dispõe sobre as sanções penais e administrativas derivadas de condutas e atividades lesivas ao meio ambiente, e dá outras providências. 2016. Available online at http://www.planalto.gov.br/ccivil_03/leis/L9605.htm. Access in 30/10/2017.

Brasil. Decreto No. 2.848 de 07 de Dezembro de 1940 – Dispõe sobre as sanções penais e administrativas derivadas de condutas e atividades lesivas ao indivíduo, e dá outras providências. Available online at http://www.planalto.gov.br/ccivil_03/decreto-lei/del2848.htm. Access in: 30/10/2017.

Convenção sobre comércio internacional das espécies da flora e fauna selvagens em perigo de extinção – CITES. Checklist of CITES Species. Available online at <http://checklist.cites.org/#/en>. Access in: 30/06/2018.

- Costa, R. L. Ecologia e manejo de espécies da fauna da bacia fauna nativa, para que o Amazônica com interesse econômico. Instituto Brasileiro de Desenvolvimento Florestal-Pa. UFPA, 2006.
- Dantas-Aguiar, P. R., Barreto, R. M., Santos-Fita, D. and Santos, E. B. 2011. Hunting Activities and Wild Fauna Use: A Profile of Queixo D'antas Community, Campo Formoso, Bahia, Brazil. *Bioremediation, Biodiversity and Bioavailability* 5:1-10.
- Dias Júnior, M. B. F., H. F. A. Cunha and T. C. A. C. Dias. 2014. Caracterização das apreensões de fauna silvestre no estado do Amapá, Amazônia Oriental, Brasil. *Biota Amazônia* 4(1):65-73.
- Dwiwedi, R. S. 2004. Un-nurtured and untapped super sweet non-sacchariferous plant species in India. Available online at <http://www.ias.ac.in/currsci/jun10/articles/19.html>
- Fernandes-Ferreira, H., Mendonça, S. V., Albano, C., Ferreira, F. S. and Alves, R. R. N. 2012. Hunting, use and conservation of birds in Northeast Brazil. *Biodiversity and Conservation*, 221-244.
- Ferreira, F. S., Albuquerque, U. P., Coutinho, H. D. M., Almeida, W. O. and Alves, R. R. N. 2012. The Trade in Medicinal Animals in Northeastern Brazil. *Evidence-based Complementary and Alternative Medicine* 2012:1-20.
- Ferreira, H. F.; Moura, Geraldo J.B.; Alves, R. R. N. História da caça no Brasil nos séculos XVI e XVII. In: Jairton Fraga e Juracy Marques. (Org.). *Ecologia Humana e Agroecologia*. 1ed. 2016, v. 1, p. 311-333.
- Fitzgerald, S. 1989. International wildlife trade: whose business is it? World Wildlife Fund.
- Gama, T. F.; Sassi, R. 2008. Aspectos do comércio ilegal de Pássaros Silvestres na Cidade de João Pessoa, Paraíba, Brasil. *Gaia Scientia* 2:1-20.
- Instituto Brasileiro do meio Ambiente e dos Recursos naturais – IBAMA. Crimes contra a fauna. 2018. Available online at http://ibama.gov.br/phocadownload/cites/legislacao/decreto_cites.pdf. Access in: 22 de jul. 2018.
- Instituto Brasileiro do meio Ambiente e dos Recursos naturais – IBAMA. Relatório de Gestão Ibama. 2016. Available online at http://www.ibama.gov.br/phocadownload/auditorias/relatorio_gestao/2016-ibama-relatorio-gestao.pdf. Access in: 22 de out. 2016
- Instituto Brasileiro do meio Ambiente e dos Recursos Naturais – IBAMA. Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis. DECRETO nº 3.179, DE 21 DE SETEMBRO DE 1999. Dispõe sobre a especificação das sanções aplicáveis às condutas e atividades lesivas ao meio ambiente, e dá outras providências. 2016. Available online at <http://www.ibama.gov.br>. Access in: 22 de out. 2017.
- International Union for Conservation of Nature – iucn. Red List, 2018. Available online at <http://www.iucnredlist.org/search>. Access in: 01/06/2018.
- Leal, I. R., Silva, J. M. C. D. A., Tabarelli, M. and Lacher Jr., T. E. 2005. Changing the Course of Biodiversity Conservation in the Caatinga of Northeastern Brazil. *Conservation Biology* 19:701-706.
- Lopes, J. C. A. O Tráfico de Animais Silvestres no Brasil, 2009. Available online at <http://www.jardimdeflores.com.br>. Access in 30/10/2017
- Milner-Gulland, E. J. and Bennett, E. L. 2003. Wild meat: the bigger picture. *Ecol. Evol.* 18(7):361-367.
- Ministério da Integração Nacional - MI. Nova delimitação do Semiárido Brasileiro (Cartilha). Brasília, DF: Secretaria de Políticas de Desenvolvimento Regional/MIN, 2005. 35 fls.
- Nascimento, J. L. and Campos, I. B. 2011. Atlas da fauna brasileira ameaçada de extinção em unidades de conservação federais. Instituto Chico Mendes de Conservação da Biodiversidade, Brasília.
- Observatório Unifg do Semiárido Nordeste. Mapa Localização Semiárido Bahia. 2018. Available online at <http://observatorio.faculdadeguanambi.edu.br/wp-content/uploads/2018/06/LOCALIZA%C3%87%C3%83O-DO-SEMI%C3%81RIDO-BAIANO-1.pdf>. Access in: 01/06/2018.
- Oki, V. G.; Pandeff, P. A. 2016. Análise da efetividade da Lei de Crimes Ambientais e o tráfico de animais no Brasil. *AMPLIANDO Revista Científica da Facerb*, v. 3. n. 1. Jan./Jun. 2017.
- Oliveira, J. A., Gonçalves, P. R. and Bonvicino, C. R. 2003. Mamíferos da Caatinga. In: Leal, I. R., Tabarelli, M. and Silva, J. M. C. (Eds). *Ecologia e conservação da caatinga*, pp.275-333. Ed. Universitária da UFPE Recife, Recife.
- Pereira, G.A. and Brito, M.T., 2005. Diversidade de aves silvestres brasileiras comercializadas nas feiras livres da Região Metropolitana do Recife, Pernambuco. *Atualidades ornitológicas*, 126(1), p.7.
- Pereira, J. P. R. and Schiavetti, A. 2010. Conhecimentos e usos da fauna cinegética pelos caçadores indígenas “Tupinambá de Olivença” (Bahia). *Biota Neotropica* 10:175-183.
- Porfírio Junior, N. F. Responsabilidade do Estado em face do Dano Ambiental. São Paulo: Malheiros Editores, 2002.p. 116
- Rede nacional Contra o Tráfico de Animais Silvestres - renctas. 1º Relatório Nacional Sobre o Tráfico de Fauna Silvestre. 2001. Disponível em: http://www.renctas.org.br/files/rel_renctas_pt_final.pdf. Access in: 01/11/2017.
- Rede Nacional Contra o Tráfico de Animais Silvestres - RENCTAS. Cruel tráfico de animais silvestres. Available online at <http://www.renctas.org.br/cruel-trafico-de-animais-silvestres-ligia-meira-martoni/>. Access in: 01/11/2017.
- Rocha, M. S. P., Cavalcanti, P. C. M., Sousa, R. L.; Alves, R. R. N. 2006. Aspectos da comercialização ilegal de aves nas feiras livres de Campina Grande, Paraíba, Brasil. *Revista de Biologia e Ciências da Terra* 6:204-221.
- Santos, C. A. B; de Albuquerque U.P; Souto, W.M.S; Alves, R. R. N. 2016. Assessing the effects of Indigenous Migration on Zootherapeutic Practices in the Semi-arid Region of Brazil. *PLoS ONE* 11(1): e0146657. Doi:10.1371/journal.pone.0146657
- Schober, J. 2002. Caatinga: preservação e uso racional do único bioma exclusivamente nacional. *Ciência e Cultura* 54:6-7.
- Sick, H. 1993. *Birds in Brazil: a natural history*. Princeton University Press, New Jersey.
- Sick, H. 1997. *Ornitologia Brasileira*. Nova Fronteira, Rio de Janeiro.
- Silva, J. M. C., Souza, M. A., Bieber, A. G. D. and Carlos, C. J. 2003. Aves da Caatinga: Status, uso do habitat e sensibilidade. In: Leal, I. R., Tabarelli, M. and Silva, J. M. C. (Eds.), *Ecologia e conservação da caatinga*, pp.237-274. Ed. Universitária da UFPE, Recife, Brasil.
- Superintendência de desenvolvimento do Nordeste – sudene. Municípios que compõem o semiárido baiano. 2018. Available online at <http://sudene.gov.br/images/arquivos/conselhodeliberativo/resolucoes/resolucao115-23112017-delimitacaodosemiarido.pdf>. Access in: 01/06/2018.