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Areas susceptible to defaunation? an assessment based in the illegitimate use of Brazilian wildlife

This study sought to identify potential areas susceptible to defaunation, in the different biomes and regions of Brazil. Therefore, we assessed records of 13,573 AIA (Environmental Violation Reports) tilled by Ibama from 2012 to 2016. The results showed that 194,335 wild animals were seized, generating US$ 57,140,139.13 in administrative fines. The captures occurred in 1,255 Brazilian municipalities, especially Caicó (RN), Recife (PE) and Cáceres (MT), with 27,677, 17,347 and 11,751 animals, respectively. The Northeast region had the highest amount in fines (US$ 28.9 million) and an annual average of 28,753 specimen apprehended, with a record above 100%, when compared to the annual average from 1992 to 2000, in a past study. The states of Minas Gerais, Rio Grande do Norte and Pernambuco had the highest absolute numbers. In the distribution by Class, birds, mammals and reptiles ranked 90.21%, 1.16% and 8.63% of the captures, respectively. As to the threatened species, there were 2,257 specimens, of which 70.05% were birds, most in the 'Vulnerable' threat ranking. We have concluded that the large illegal use of wild animals may lead to defaunation in some areas of Brazil, especially in the northeast region.

Keywords: Fauna; Inspection; Wild animals.

Áreas suscetíveis à defaunação? uma avaliação baseada no uso ilegítimo da fauna brasileira

Este estudo buscou identificar potenciais áreas suscetíveis à defaunação, nos diferentes biomas e regiões do Brasil. Assim, foram avaliados registros de 13.573 AIA (Autos de Infração Ambiental) lavrados pelo Ibama de 2012 a 2016. Os resultados mostraram que 194.335 animais silvestres foram apreendidos, gerando US$ 57.140.139,13 em multas administrativas. As capturas ocorreram em 1.255 municípios brasileiros, com destaque para Caicó (RN), Recife (PE) e Cáceres (MT), com 27.677, 17.347 e 11.751 animais, respectivamente. A região Nordeste teve o maior valor em multas (US$ 28,9 milhões) e média anual de 28.753 exemplares apreendidos, com recorde acima de 100%, quando comparado à média anual de 1992 a 2000, em estudo anterior. Os estados de Minas Gerais, Rio Grande do Norte e Pernambuco apresentaram os maiores números absolutos. Na distribuição por Classe, aves, mamíferos e répteis ocuparam 90,21%, 1,16% e 8,63% das capturas, respectivamente. Quanto às espécies ameaçadas, foram 2.257 exemplares, dos quais 70,05% eram aves, a maioria no ranking de ameaça 'Vulnerável'. Concluímos que o grande uso ilegal de animais silvestres pode levar à defaunação em algumas áreas do Brasil, principalmente na região Nordeste.

Palavras-chave: Fauna; Inspeção; Animais selvagens.

Topic: **Uso de Recursos Naturais**

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Teresa Cristina Albuquerque de Castro Dias
Universidade Federal do Amapá, Brasil
http://lattes.cnpq.br/8883372963770513
http://orcid.org/0000-0002-1214-0209
teresa.cristina.dias@gmail.com

Daguinete Maria Chaves Brito
Universidade Federal do Amapá, Brasil
http://lattes.cnpq.br/8253405830178022
http://orcid.org/0000-0001-9856-4290
dagnete@uol.com.br

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INTRODUCTION

Illegal trade of wild animals is one of the main causes of local reduction and extinction of several species in the whole world (BENNETT et al., 2002; LIMA, 2007; CHALLENDER et al., 2014; SUTHERLAND et al., 2014; IIED, 2015). This activity has created great environmental and economic losses, especially in neotropical countries, where there is a great threat to the maintenance of biodiversity (MILNER-GULLANDA et al., 2003).

Brazil has one of the richest biodiversity of the planet. With an area of 8,547,403.50 km^2, it is among the countries with the richest wild life in the world, ranking 1st in total number of species. It is the 2nd richest in diversity of mammals and amphibians (IUCN - International Union for the Preservation of Nature) (2019), the 3rd in number of birds and the 4th in the number of reptiles (MITTERMEIER et al., 1992).

According to Saab (2006), the diversity of the Brazilian wildlife has always been praised and an object of desire in the world scene. The country, since its colonial times, has had its natural resources exploited in an arbitrary and irrational way, mostly because it was believed they were infinite and automatically renewable.

Wild life's illegal trade is the third largest business in the planet, surpassed only by arms and drug trafficking. It is believed that the turnover of this activity is between 10 and 20 billion dollars annually in the world and Brazil has about 10% of the total (RENCTAS, 2007).

The black-market exposes society to risks and damages to the health, the economy and the environment (GFI, 2011). Annually, millions of birds, fishes, insects, reptiles and mammals are taken away from the ecosystems and traded illegally in the country and overseas.

According to RENCTAS (2007), 38 million animals are taken away from their habitats in the Brazilian territory to feed this illegal market. It is estimated that only 10% of the total captured animals arrive alive at the final destination, while the others perish due to the terrible conditions of capture and transport, and only 0.45% of those who survive is seized (RENCTAS, 2001).

Removing wild life from their natural environment for illegal trade or to maintain in captivity, is one of the main problems to be solved by the bodies in charge of their protection (VIDOLIN et al., 2004). Products derived from wild life are used in many ways, especially as food, but also for clothing and tools and for magical-religious medical purposes (ALVES et al., 2012a; ALVES et al., 2012b; KUHNEN et al., 2012; DIAS JÚNIOR et al., 2013).

The individual who captures an animal from nature does not have the least concern with its ecological function and the environmental unbalance that the removal from their habitats can cause; there is no respect for their reproduction cycles and not even for their stages of development. This irrationality, on top of the greed, is what prevents the renewal of the stock of specimens of a species and causes, finally, its extinction (BECHARA, 2003).

The Brazilian Institute of the Environment and Renewable Natural Resources – IBAMA, is the federal autarchy responsible for enforcing public policies on the environment and environmental monitoring, which often result in seizures of wildlife individuals. It is considered a seizure the receipt of a specimen resulting

from an inspection action with a record of Police Report (BO) or Environmental Violation Report (AIA) (BORGES et al., 2006).

Research done by Destro et al. (2012) discloses that the states of Minas Gerais (MG), Rio Grande do Sul (RS), Espírito Santo (ES), São Paulo (SP) and Rio de Janeiro (RJ) held most animal capture and the largest number of fines applied between 2005 and 2010.

Survey of these seizures are essential for the assessment of the levels of illegal use of wild life, which can lead to reduction of the animal population in certain areas. Such biological phenomenon, which is already a reality in some regions of the planet, is called by scientists defaunation.

Defaunation is a process of local extinction of wild population caused by human action that can take to the global extinction of certain species. Scientists estimate that at least 322 species of vertebrate animals have been led to extinction by men since the beginning of navigation by Europeans (DIRZO et al., 2014).

Along the years, researchers have indicated the numbers of defaunation in Brazil. It is estimated that at least 60 million vertebrate animals (mostly birds, mammals and reptiles) are illegally removed from nature every year, only in the Brazilian Amazon (FA et al., 2002). This work has the purpose to identify areas susceptible to defaunation, based on the illegal use of wild life in Brazil.

MATERIALS AND METHODS

Field of Study

The study was carried out in Brazil and comprehended the seven biomes (Amazônia, Caatinga, Cerrado, Atlantic Forest, Marinho Costeiro, Pampas and Pantanal) in the five regions (North, Northeast, Midwest, Southeast and South) and 5,568 municipalities in a total area of 8,515,759,090 km^2 (IBGE - Brazilian Institute of Geography and Statistics) (2019). The variety of biomes and regions reflects the enormous wealth of flora and fauna, sheltering the largest biodiversity of the planet. This rich variety of life – translated into more than 20% of the total number of the Earth's species – ranks Brazil to the main nation among the 17 megadiverse countries (ICMBio, 2018).

Methods

The research was performed between January 2012 and December 2016, determined by the feasibility of access to documental information made available by Ibama. The data was collected, assessed and classified in 2017.

AIA (Environmental Violation Reports) reports were assessed leading to fines given by Ibama's inspection division. Digital document data was collected, with regards to the apprehension of birds, mammals and reptiles, determining the total amounts applied in fines for crimes against wild life, and identifying the main violations and the places where they occurred, classifying each specie as to its preservation status, in accordance with the criteria provided in the List disclosed by UICN (International Union for the Preservation of Nature). The number of seized animals was quantified, highlighting the areas where the highest volumes

of seizures occurred, and which ones were susceptible to defaunation, due to their illicit use. The species were listed as identified in official documents, made available by the federal environmental agency. All information was collected in Brazilian real (BRL). We adjusted all values to 2016 BRL by using the Extended National Consumer Price Index. Then, we converted the values to US$ by using the exchange rate (1 US$ = 3.25 BRL) on the last day of 2016 according to the US Treasury Department[1].

RESULTS AND DISCUSSION

Offenses committed

13,573 AIA (Environmental Violation Reports) reports were assessed regarding crime against wild life that led to administrative fines, in a total of US$ 57,140,139.13. This total of administrative procedures represented the apprehension of 194,335 wild animals (Table 1).

Table 1: Amount of values and total amounts of fines (US$) per year.

Year	Number of animals	Total amounts (US$)
2012	33,588	12,326,104.66
2013	44,680	13,438,163.35
2014	70,992	15,617,292.58
2015	16,930	7,330,522.64
2016	28,145	8,428,055.90
Total	**194,335**	**57,140,139.13**

Places of occurrence of the violations

Violations related to wildlife were recorded in 1,255 municipalities, 26 states and at the Federal Capital, especially the municipalities of Caicó (Rio Grande do Norte), Recife (Pernambuco) and Cáceres (Mato Grosso), with 27,677, 17,347 and 11,751 animals involved in wild life violation, respectively.

In the geographic distribution of the AIA (Environmental Violation Reports) reports, we see that there were a larger number of procedures in places where Ibama has regional offices. In the total assessment of the procedures, by region, the Northeast had the largest amount (US$ 28.9 million). On the other hand, the South had the smallest amount in fines – US$ 2.1 million (Table 2).

Table 2: Total amounts (US$) in fines applied by state and region.

States	NORTE	NORDESTE	CENTRO-OESTE	SUDESTE	SUL	Total
ACRE	224,769.23					224,769.23
AMAPA	92,769.23					92,769.23
AMAZONAS	2,654,076.90					2,654,076.90
PARA	1,762,861.50					1,762,861.50
RONDONIA	130,769.23					130,769.23
RORAIMA	2,430.307.60					2,430.307.60
TOCANTINS	65,769.23					65,769.23
ALAGOAS		1,108,493.50				1,108,493.50
BAHIA		3,847,538.40				3,847,538.40
CEARA		4,977,969.20				4,977,969.20
MARANHAO		552,307.69				552,307.69
PARAIBA		2,407,692.30				2,407,692.30
PERNAMBUCO		7,322,153.80				7,322,153.80
PIAUI		688,000.00				688,000.00

[1] https://www.fiscal. treasury.gov/fsreports/rpt/treasRptRateExch/historicalRates.htm

RIO GRANDE DO NORTE		7,828,387.60				7,828,387.60
SERGIPE		220,215.38				220,215.38
DISTRITO FEDERAL			681,017.23			681,017.23
GOIAS			2,978,855.30			2,978,855.30
MATO GROSSO			3,948,307.60			3,948,307.60
MATO GROSSO DO SUL			194,430.76			194,430.76
ESPIRITO SANTO				654,830.76		654,830.76
MINAS GERAIS				8,228,639.60		8,228,639.60
RIO DE JANEIRO				1,016,973.20		1,016,973.20
SAO PAULO				1,016,973.20		1,016,973.20
PARANA					270,430.76	270,430.76
RIO GRANDE DO SUL					1,225,630.70	1,225,630.70
SANTA CATARINA					609,969.23	609,969.23
Total	7,361,322.92	28,952,757.87	7,802,610.89	10,917,416.76	2,106,030.69	57,140,139.13

The data confirms the finds of Jupiara and Anderson in 1991. Most wild life illegally traded comes from the North, Northeast and Midwest, heading towards the South and Southeast in federal highways. The main destination points are the states of Rio de Janeiro and São Paulo, where they are sold in free markets or exported through the main ports and airports of these regions. The international destination of these animals is usually Europe, Asia and North America (RENCTAS, 2001).

As to the number of animals, Minas Gerais, Rio Grande do Norte and Pernambuco recorded the highest numbers, (Figure 1). In Minas Gerais, occurrences happened primarily in the municipalities of Contagem (1,073 individuals), in the capital Belo Horizonte (1,530), Monte Azul (2,012), Mirabela (1,835) and Uberlandia (998). In Rio Grande do Norte, Caicó was the municipality with the highest number, with 27,677 animals. In Pernambuco, the highest number was in the capital, Recife, with 17,347 animals.

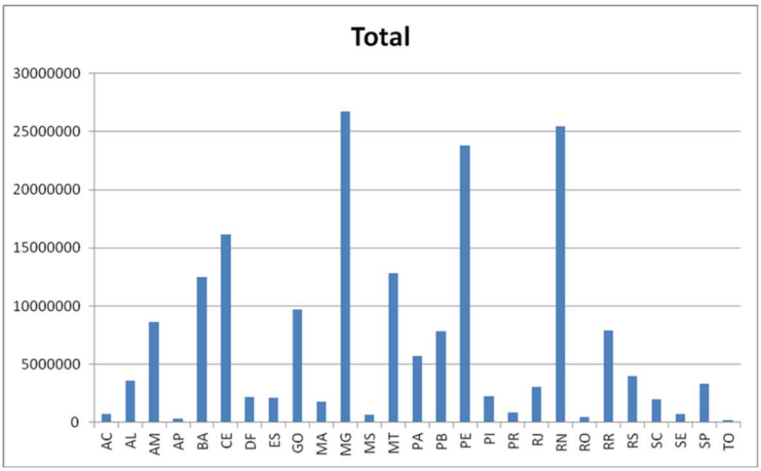

Figure 1: Number of animals seized by Ibama in Brazilian states.

If we compare the total number of animals seized in the country between 1992 and 2000 (263,972 animals), an annual average of 32,996 animals (RENCTAS, 2001), to the total number of animals seized between 2012 and 2016 (194,335 animals), an annual average of 38,867 animals, we see an increase of 15.11%. This is a concerning fact, mostly when we see that the first research was done using data from Ibama and the Environmental Miltary Police of the states, and the second, only from Ibama. This suggests that the illegal use of wild life presents even larger dimensions than what is provided in this study.

Table 3: Number of animals seized by state and region.

	REGIONS					
States	**NORTE**	**NORDESTE**	**CENTRO-OESTE**	**SUDESTE**	**SUL**	**Total**
ACRE	303					303
AMAPA	128					128
AMAZONAS	2,135					2,135
PARA	2,289					2,289
RONDONIA	181					181
RORAIMA	1,074					1,074
TOCANTINS	331					331
ALAGOAS		2,662				2,662
BAHIA		20,816				20,816
CEARA		24,532				24,532
MARANHAO		1,127				1,127
PARAIBA		14,226				14,226
PERNAMBUCO		24,928				24,928
PIAUI		3,492				3,492
RIO GRANDE DO NORTE		51,643				51,643
SERGIPE		340				340
DISTRITO FEDERAL			839			839
GOIAS			6,547			6,547
MATO GROSSO			12,767			12,767
MATO GROSSO DO SUL			397			397
ESPIRITO SANTO				1,497		1,497
MINAS GERAIS				14,523		14,523
RIO DE JANEIRO				1,229		1,229
SAO PAULO				1,012		1,012
PARANA					918	918
RIO GRANDE DO SUL					3,319	3,319
SANTA CATARINA					1,080	1,080
Total	**6,441**	**143,766**	**20,550**	**18,261**	**5,317**	**194,335**

When comparing data regarding the states and their regions (Table 3), the scenario is even more concerning. The Northeast region, as a for instance, between 1992 and 2000 registered an annual average of 13,505 animals (RENCTAS, 2001). At the time of this study, the region's annual average was 28,753 animals, showing an increase of over 100%.

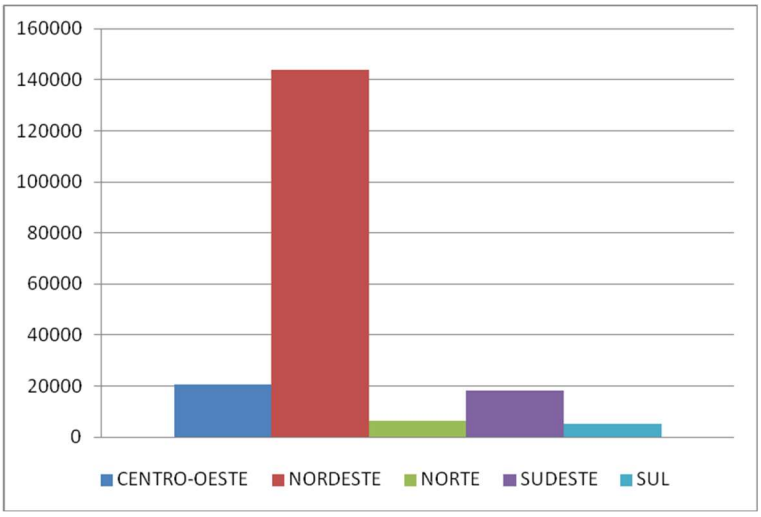

Figure 2: Number of animals per region.

In absolute numbers, the Northeast region stands out negatively compared to the other regions, with 143,766 seized animals (Figure 2). In general, the number of environmental agents doing inspections is reasonable, considering the total number of employees of the federal environmental agencies (Ibama and

ICMBio (Chico Mendes Institute of Preservation of Biodiversity)), added to the group of state and municipal public bodies throughout the national territory. However, a fact that calls attention for Ibama's low performance in some regions, is the decrease in inspection capacity throughout the years, due to the closing of several regional offices.

It also stands out that in Brazil, as a rule, environmental inspection focus in the petty offender. According to RENCTAS (2001), environmental crimes committed by large corporations or organized gangs, almost always follow through without the effective discomfort of state repression.

In case of the Brazilian wild life, the situation is alarming. The illegal trade of wild life, for instance, continues to be a growing activity in the country. Traditional and well-known points of sale of wild animals operate without much problem, as it is the case of free markets in several Brazilian cities. There are also the crimes (illegal buy and sale of wild animals), a growing business in social media.

Main violations

Except for the general fauna infractions (not classified), of all violations committed, the following stood out: "To sale, disclose for sale, export or acquire, keep, keep in captivity or deposit…" and "To practice of abuse, mistreat, harm or disable wild animals," with 51,373 and 32,532 animals involved in these illegalities, respectively (Table 4).

Table 4: Violations committed against Brazilian wildlife between 2012 and 2016, based in data provided by Ibama.

Environmental violations	Amount of animals	Total (US$)
To trade of wild and Exotic Brazilian fauna species, as well as products and objects from it…	5	770.77
To stop having, zoo and authorized nurseries, the faunistic collection registry book...	9	1,461.54
To prevent fauna breeding about the nest, shelter or natural nurseries modification, damage and destruction...	321	322,460.00
General Fauna Infractions (Non-classified information)	97,948	28,734,282.63
To introduce of animal specimens in the country, or outside their natural distribution area...	440	374,523.08
To keep wildlife specimens in captivity coming from non-authorized breeding grounds…	355	253,538.46
To kill, chase, hunt, trap, capture, specimens of wildlife, native or in migratory route…	11,199	4,565,773.80
To chase wildlife species...	1	153.85
To practice an act of abuse, bad-treatment, to wound or to mutilate wild animals…	32,532	9,753,213.80
To transport eggs, larvae or specimens of wild fauna, native or in migratory route…	146	22,461.54
To use wildlife species, their nests, shelter or naturals nurseries	6	3,692.31
To sell, disclose for sale, export or acquire, keep in captivity or deposit…	51,373	13,107,807.35
Total	**194,335**	**57,140,139.13**

"To sell, disclose for sale, export or acquire, keep in captivity or deposit, use or transport eggs, larvae or specimens of wildlife, native or in migratory route, as well as products and objects from it, coming from non-authorized breeding grounds, with license or legal framework as provided for in item III, sole paragraph, article 29 of the Law of Environmental Crime (Law 9605/98) and article 24 of Decree 6539/2008, which applies a fine of US$ 153.85 per individual of species not in the official lists of risk or threat of extinction; or US$ 1,538.46 per individual of species in the official lists of the Brazilian wild life threatened of extinction, including the Convention on International Trade in Endangered Species of Wild Fauna and Flora – CITES.

Seized species

In qualitative and quantitative assessment of the procedures researched, we find the proportion and details of the seized species.

The annual average of seizures was of 38,867 animals, occurring in larger number in 2014, with 70,992 specimens, and the least number occurred in the following year (2015), with 16,930 individuals (Table 5). The large variation exposed in these records may be due to fluctuations, both in the quantities sold, and in the intensity and rigor of the inspection.

Table 5: Total number of animals per class and year.

Year	Birds	Mammals	Reptiles	Total
2012	31,356	553	1,679	33,588
2013	31,995	233	12,452	44,680
2014	69,261	800	931	70,992
2015	15,578	293	1,059	16,930
2016	27,131	357	657	28,145
Total	**175,321**	**2,236**	**16,778**	**194,335**

In the Class distribution of birds, mammals and reptiles, seizures were of 90.21%, 1.16% and 8.63%, respectively. These results follow national results, presented in surveys of apprehensions of fauna in other regions of the country, which also showed high numbers in the apprehension of birds in relation to other Classes. However, they are partially different from the percentages presented in northern states, as, for example in the studies of Dias Júnior et al. (2014), where reptiles ranked the highest due to the high number of the use of these animals for food in the region.

The differences in the seizures recorded between the states of the north and south of the country are explained by the purpose of use of the illegally traded animal (SILVEIRA, 2006). In the states of Minas Gerais, São Paulo and Paraná, for instance, at least 86% of the total number of seized animals were for pet trade (VIDOLIN et al., 2004; BORGES et al*.,* 2006; FIGUEIRA, 2007), while in the black market in the Amazon, the animals are primarily meant for human food, reinforcing the pattern described by Fuccio et al. (2003) in studies done in the state of Acre, and Dias Júnior et al. (2014) in Amapá.

Table 6: Total number of animals per class and state of the federation.

States	Birds	Mammals	Reptiles	Total
ACRE	195	29	79	303
ALAGOAS	2,099	115	448	2,662
AMAPA	39	15	74	128
AMAZONAS	633	133	1,369	2,135
BAHIA	20,572	118	126	20,816
CEARA	24,458	60	14	24,532
DISTRITO FEDERAL	733	36	70	839
ESPIRITO SANTO	1,458	13	26	1497
GOIAS	6,466	47	34	6547
MARANHAO	742	59	326	1127
MATO GROSSO	923	26	11,818	12,767
MATO GROSSO DO SUL	358	21	18	397
MINAS GERAIS	14,452	30	41	14,523
PARA	1356	73	860	2289
PARAIBA	14,156	39	31	14,226
PARANA	883	30	5	918
PERNAMBUCO	24,885	23	20	24,928
PIAUI	3327	159	6	3492

RIO DE JANEIRO	1080	29	120	1229
RIO GRANDE DO NORTE	50,905	717	21	51,643
RIO GRANDE DO SUL	2,979	261	79	3319
RONDONIA	127	28	26	181
RORAIMA	236	30	808	1,074
SANTA CATARINA	913	97	70	1,080
SAO PAULO	837	42	133	1,012
SERGIPE	310	2	28	340
TOCANTINS	199	4	128	331
Total	**175,321**	**2,236**	**16,778**	**194,335**

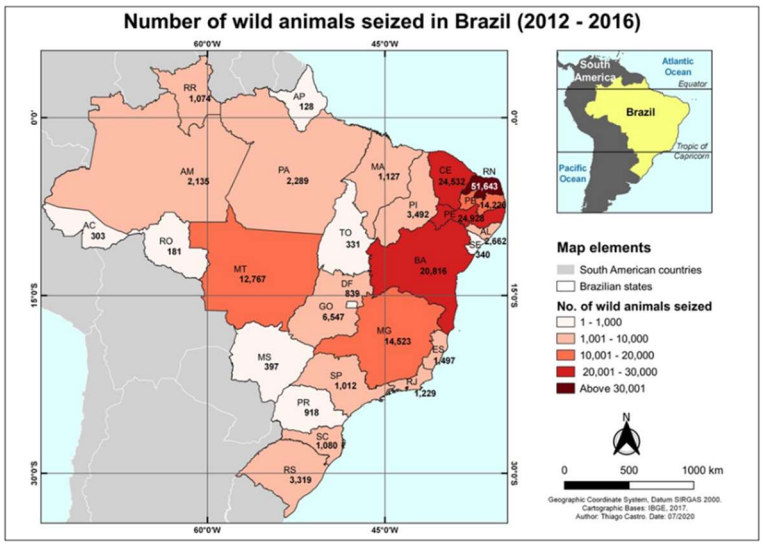

Figure 3: Number of wild animals seized in Brazil (2012 – 2016).

The five major bird apprehensions occurred in the states of Rio Grande do Norte, Pernambuco, Ceará, Bahia and Minas Gerais, comprehending 77.16% (around 135 thousand) of the total number of birds. With regards to mammals, the states of Rio Grande do Norte, Rio Grande do Sul, Piauí, Amazonas and Bahia stood out, in a total of 62.07% of the 2,236 animals. As to reptiles, Mato Grosso, Amazonas, Pará, Roraima and Alagoas ranked in the first five positions, in a total of 91.21% of the total number of seized animals (Table 6, Figure 3).

Table 7: Ranking of the thirty Brazilian municipalities with the largest number of seized wild animals, between 2012 and 2016.

Classification	Cities	State	Amount of Animals	Scientific name	Popular name
1º	CAICO	RN	27,677	*Zenaida auriculata* *Columbina sp* *Cavia aperea*	Arribaçã Rolinha Preá
2º	RECIFE	PE	17,347	*Sicalis flaveola* *Sporophila lineola* *Cyanocompsa brissonii* *Sporophila caerulescens*	Canário-da-terra Bigodinho Azulão Papa-capim
3º	CACERES	MT	11,751	*Caiman yacare*	Jacaré
4º	SAO BENTO	PB	10,394	*Zenaida auriculata*	Arribaçã
5º	EUNAPOLIS	BA	5,545	*Sicalis flaveola* *Sporophila nigricollis* *Sporophila caerulescens*	Canário-da-terra Coleiro-baiano Papa-capim
6º	IGUATU	CE	4,482	*Zenaida auriculata* *Paroaria dominicana* *Sporophila albogularis*	Arribaçã Galo da Campina Golinho
7º	RIACHUELO	RN	3,456	*Zenaida auriculata*	Arribaçã
8º	IRAUCUBA	RN	3,123	*Zenaida auriculata*	Arribaçã
9º	NATAL	RN	3,092	*Zenaida auriculata* *Columbina sp*	Arribaçã Rolinha

10º	PETROLANDIA	PE	2,970	*Sicalis flaveola* *Paroaria dominicana* *Sporophila albogularis*	Canário-da-terra Galo da Campina Golinho
11º	QUIXELO	CE	2,800	*Zenaida auriculata*	Arribaçã
12º	JUAZEIRO DO NORTE	CE	2,667	*Zenaida auriculata* *Sicalis flaveola*	Arribaçã Canário-da-terra
13º	BREJO DO CRUZ	PB	2,503	*Zenaida auriculata*	Arribaçã
14º	PICOS	PI	2,377	*Zenaida auriculata*	Arribaçã
15º	LAJES	RN	2,320	*Zenaida auriculata*	Arribaçã
16º	AFONSO BEZERRA	RN	2,216	*Zenaida auriculata*	Arribaçã
17º	UBAITABA	BA	2,016	*Sicalis flaveola* *Gnorimopsar chopi* *Amazona aestiva*	Canário-da-terra Graúna Papagaio verdadeiro
18º	MONTE AZUL	MG	2,012	*Paroaria coronata* *Sporophila caerulescens* *Carduelis carduelis* *Saltator similis*	Cardeal Coleirinho Pintassilgo Trinca-ferro
19º	CACU	GO	1,877	*Sicalis flaveola*	Canário-da-terra
20º	MIRABELA	MG	1,835	*Turdus merula* *Icterus jamacaii* *Paroaria dominicana*	Melro Corrupião Galo da Campina
21º	PARAMBU	CE	1,768	*Zenaida auriculata*	Arribaçã
22º	FIRMINO ALVES	BA	1.580	*Sicalis flaveola*	Canário-da-terra
23º	CAICARA DO NORTE	RN	1,570	*Zenaida auriculata*	Arribaçã
24º	ITAMARAJU	BA	1,553	*Sicalis flaveola* *Sporophila caerulescens*	Canário-da-terra Papa-capim
25º	BELO HORIZONTE	MG	1,530	*Saltator maximus* *Saltator similis* *Knipolegus poecilocercus* *Amazona aestiva*	Bicudo-verdadeiro Trinca-ferro Pretinho Papagaio verdadeiro
26º	MEDEIROS NETO	BA	1,523	*Sicalis flaveola*	Canário-da-terra
27º	ITABELA	BA	1,493	*Sicalis flaveola* *Sporophila nigricollis* *Sporophila caerulescens*	Canário-da-terra Coleiro-baiano Papa-capim
28º	MOSSORÓ	RN	1,422	*Sicalis flaveola* *Zenaida auriculata* *Cyanocompsa brissonii*	Canário-da-terra Arribaçã Azulão
29º	SALVADOR	BA	1,273	*Sicalis flaveola*	Canário-da-terra
30º	SOBRAL	CE	1,166	*Zenaida auriculata*	Arribaçã

The municipality of Caicó (RN) registered the largest number of seized animals in the country (27,677), of which 25,838 (93.35%) regard the *Zenaida auriculata* species (Table 7). Com o nome popular de *avoante, avoete, arribação, arribaçã* or dove of flock, the species is disposed in the open formations of South America, from Colombia, Venezuela, Trinidad-Tobago and Guianas, to the South Center of Argentina. In Brazil (caatinga), the dove of flock is again found in large numbers, and several last century and early century writers refer to them as "a divine aid to deprived human populations" (ANTAS, 1986).

Since 1979, the issue of illegal slaughter of dove of flocks in the Northeast region has been a concern of Brazilian scientists. From that year on, a series of works was initiated, aiming at the preservation of the natural habitats of this species. However, random slaughter continues.

The second city, Recife, registered 17,347 animals involved in illegal actions, of which 16,177 (93.25%) regard the species *Sicalis flaveola* (*Canário da Terra*). The species is widely distributed in the country and lives in open areas, rural landscapes, forest edges, areas of cerrado, natural fields in the Caatinga biome.

The great demand for this species occurs due to the fact that this bird is admired for the singing, being therefore a constant target of the trafficking of wild animals. Other occurrences regarding species and the municipalities, are listed in Table 7.

The distribution by the Brazilian biomes, shows that the biggest number of seizures occurred in the biomes Caatinga and Atlantic Forest, with 72,911 and 36,953 seized specimens, respectively. In contrast, the biomes Amazonia (6,110) and Cerrado (5,724), showed the lowest records. The quantitative distortions of seizures between the biomes, can be justified by the following issues:

Big differences with regard to demographic densities and, consequently, to the more effective inspection presence in the most populous cities, are factors that must be considered. Another relevant aspect, relates to the differences in the purpose about wildlife illegal use, as mentioned above.

The capture of specimens for food purpose, of great effectiveness in the Amazon is restricted, as a rule, to the near places of hunters residences, allowed by the law, when practiced for subsistence. On other hand, in the biomes most densely populated, where prevails the capture and transport for trading purpose, there are greater susceptibility to the inspection actions that results in seizures. In what regards to the most impacted classes, there are large predominance of birds. This result, has already showed evident in the most of previous researches with the similar issue to the present study.

Birds

175,321 species of birds were accounted for. Of this total, 47.06% of the crimes occurred with *Zenaida auriculata* (landing bird), and 26.08% of *Sicalis flaveola* (*Canário da Terra*). The others (26.86%) are divided between Psittaciformes (*araras e papagaios*) and other passerines such as *Sporophila angolensis* (*Curió*) and other birds of the type *Sporophila,* confirming the results found in the study made by Costa (2005), Rocha et al. (2006) and Pagano et al. (2009), which highlights the passerines of the *Sporophila* type topping the apprehensions made in northeast Brazil.

Intense capture of passerines in Brazil targets the internal market, as the Brazilian population has always had special fondness for “cage birds”, with songbirds being the species most found in captivity (RENCTAS, 2001). Another reason that points to more use of passerines, is due to the fact that this type is the most comprehensive representative of the Brazilian birdlife (ZARDO et al., 2009). The capture of this large number of birds is a true threat for several species, due to the fact that its high trade value stimulates this illegal practice. With regards to the dove of flocks, 54.30% of the cases were in the state of Rio Grande do Norte and 24.54% in the state of Ceará. The unbridled use of this species comes from a long time and, in most cases, the animals are used for trade and food.

Mammals

A total of 2,236 specimens of mammals were accounted for, of which 1,842 animals (82.4%) rank first as the most captured species (Table 8).

Table 8: List of the most seized mammals by Ibama's inspection.

Nº Ordem	*Nome científico*	Nome popular	Nº de indivíduos	%
1º	*Cavia aperea*	Preá	489	26,55
2º	*Dasypus SP*	Tatu	372	20,20
3º	*Cebus SP*	Macaco	330	17,92
4º	*Dasyprocta SP*	Cutia	217	11,78
5º	*Cuniculus paca*	Paca	137	7,44
6º	*Pecari tacaju*	Cateto	108	5,86
7º	*Hydrochaeris hydrochaeris*	Capivara	99	5,37
8º	*Mazama SP*	Veado	90	4,89
	Total		1.842	100,00

Of this total, 26.55% of the apprehensions were *Cavia aperea* (*preá*), 20.20% *Dasypus sp* (*tatu*), 17.92%, primates. Besides these, 11.78% were *Dasyprocta sp* and 7,44%, *Cuniculus paca*. These species *(Cuniculus paca and Dasyprocta sp)* are widely used as food in many Amazon communities. They have wide geographical disposition, and are found in every region, ranking high in the preference of hunting and illegal trade of mammals (ESCOBEDO et. al., 2006).

In Latin America, the species *Pecari tajacu* and *Hydrochaeris hydrochaeris*, are currently among the most hunted species (ROBINSON et al., 1991; MOREIRA et al., 1997) because besides the meat, there is great interest in their hides, for which there is great demand in the international market. According to Sowls (1997), these species could be rationally exploited with a management plan that would favor survival in their natural habitat and could produce surpluses to be used by man.

Reptiles

16,778 specimens of reptiles were accounted for. Most (92.93%) were alligators (12,200) and chelonians (3,299). Among the alligators, the species *Caiman yacare* stood out with 11,802 individuals, followed by *Caiman latirostris* (*jacaré do papo amarelo*) (349 individuals).

Among the chelonians, the species *Podocnemis expansa* stood out, the Amazon Turtle (9.58%), followed by *Podocnemis unifilis – tracajá* (3.98%). It is emphasized that the turtle and the tracajá were in the list of threatened species but in the Amazon, they are currently protected by the National Center of Reptiles and Amphibians – RAN and continue to rely on preservation programs.

In some states of the Amazon, the seizing of reptiles in relation to birds (as in the case of Amapá, quoted by Dias Júnior et al. (2014)), opposes the trend provided in studies performed in other states of the federation (RENCTAS, 2001; VIDOLIN et al., 2004; LONGATTO et al., 2004; BEZERRA et al., 2004; BORGES et al., 2006; BASTOS et al., 2008; PIMENTEL et al., 2009; ZARDO et al., 2009; PREUSS et al., 2011), a local peculiarity that can be explained by the significant number of chelonians, which account for 96% of the total number of seized reptiles. This result shows that there is great demand for the meat of the called "hoof animals", traditional food in the Brazilian Amazon (REBÊLO et al., 2000).

Threat levels

There was a record of 2,257 threatened specimens, of which 70.05% are birds, most under the threat level 'Vulnerable', where the species *Amazona petrei* (parrot charão), *Amazona rhodocorytha* (*Chauá*) and

Amazona vinacea (*papagaio-do-peito-roxo*). These three species are part of the National Action Plan for Preservation of the Atlantic Forest Parrots - PAN Parrot.

Illegal trade of wild animals affects the *Amazona* species in a special way, given the fact that they are greatly appreciated as pet birds. Locally, the little birds are removed from the nests and raised as pet birds by the collector, or sold to persons in the community, an activity that is part of the popular Brazilian culture, but it creates a problem when the captured birds are traded (ICMBio, 2018). In this way, it is clear that the traffic ban must be carried out primarily in the catch regions of these animals, as well as on roads interlinking those regions to large centers. Moreover, this ban must be linked to a work of environmental education and the involvement of the population with the preservation cause (ICMBio, 2018).

In absolute numbers there were 1,041 specimens of *Sporophila maximiliani* (*Bicudo*) recorded, a species ranked as Critically Endangered (CR).

As to Mammals, 627 individuals (threatened) were seized from nature, with *Cavia intermedia* (Preá) standing out with 489 individuals (Critically Endangered – CR), and species such as *Panthera onca* (*Onça pintada*) and *Puma concolor* (*Onça parda*), top of the food chain (Threat Level – Almost Threatened and Vulnerable, respectively) (Table 9). In 2016, 16 (sixteen) *Panthera onca* (jaguar) were found dead in the inlands of Pará, slaughtered by the offenders and seized by Ibama investigators in only one operation.

Table 9: List of species seized in Brazil between 2012 and 2016, with a larger degree of threat according to UICN (International Union for Preservation of Nature).

Nº	Scientific name	Popular name	Class	Degree of threat	N	%
1	*Amazona pretrei*	Papagaio-charão	Bird	VU	5	0.22
2	*Amazona rhodocorytha*	Chauá	Bird	VU	27	1.20
3	*Amazona vinacea*	Papagaio-de-peito-roxo	Bird	VU	23	1.02
4	*Arremonops conirostris*	Tico-tico	Bird	VU	276	12.23
5	*Guaruba guarouba*	Ararajuba	Bird	VU	72	3.19
6	*Harpia harpyja*	Gavião-real	Bird	VU	1	0.04
7	*Sporagra yarrellii*	Pintassilgo-do-nordeste	Bird	VU	17	0.75
8	*Sporophila frontalis*	Pixoxó	Bird	VU	80	3.54
9	*Sporophila maximiliani*	Bicudo	Bird	CR	1.041	46.12
10	*Sporophila melanogaster*	Caboclinho-da-barriga-preta	Bird	VU	1	0.04
11	*Sporophila nigrorufa*	Caboclinho-do-sertão	Bird	VU	38	1.68
12	*Alouatta ululata*	Macaco-guariba	Mammalia	EM	1	0.04
13c	*Ateles belzebuth*	Macaco-aranha	Mammalia	VU	2	0.09
14	*Cavia intermédia*	Preá	Mammalia	CR	489	21.67
15	*Lagothrix lagothricha*	Macaco-barrigudo	Mammalia	VU	2	0.09
16	*Leopardus guttulus*	Gato-do-mato	Mammalia	VU	7	0.31
17	*Leopardus wiedii*	Gato Maracajá	Mammalia	NT	3	0.13
18	*Myrmecophaga tridactyla*	Tamanduá bandeira	Mammalia	VU	1	0.04
19	*Ozotoceros bezoarticus*	Veado-campeiro	Mammalia	VU	9	0.40
20	*Panthera once*	Onça	Mammalia	NT	29	1.28
21	*Priodontes maximus*	Tatu canastra	Mammalia	VU	2	0.09
22	*Puma concolor*	Onça-parda	Mammalia	VU	5	0.22
23	*Saimiri vanzolinii*	Macaco-de-cheiro	Mammalia	VU	5	0.22
24	*Sapajus cay*	Macaco-prego	Mammalia	VU	2	0.09
25	*Tapirus terrestres*	Anta	Mammalia	VU	13	0.58
26	*Tayassu pecari*	Queixada	Mammalia	VU	53	2.35
27	*Tolypeutes tricinctus*	Tatu bola	Mammalia	EM	4	0.18
28	*Chelonia mydas*	Tartaruga-verde	Reptilia	VU	49	2.17
	TOTAL				2,257	100.00

CR – Critically Endangered; EN – Endangered; VU – Vulnerable; NT – Near Threatened; LC – Least Concern; DD – Data deficient.

CONCLUSIONS

Brazil, in the condition of megadiverse country, holds a rich and exuberant fauna, suffering a systematic exploration of native specimens. In this study, it has been demonstrated that the illegimate use of these animals, especially birds, takes place continuously, covering all Brazilian regions.

The regional differences on purpose of improper use, poses an even bigger challenge to the monitoring, specially those developed by Ibama, by the structural agency limitations. Trade practiced in the Northeast and Southeast regions, is facilitated by extensive road network and access to ports, that most of times, takes animals to international destinations. Even 'subsistence', widely practiced in the northern region (with an emphasis in the Amazon biome), is also responsible for the subtraction of significant amount of individuals. At the end of this research, it was possible to indicate which areas were most pressured by the suppression of wild fauna. However, the indication of the actual occurrence of defaunation must be obtained by surveying and monitoring the squads in these areas, to be carried out in later studies.

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