

WILDLIFE TRAFFICKING IN NORTH AND SOUTHEAST OF BRAZIL: 5 YEARS OF STUDY

TRÁFICO DE ANIMAIS SILVESTRES NO NORTE E SUDESTE DO BRASIL: 5 ANOS DE ESTUDO

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ABSTRACT: Trafficking of wild animals has been identified as an exceptionally lucrative activity. Mammals, along with birds and reptiles, are among the most traded animals nationally and internationally. The aim of this paper was to characterize and quantify the species of birds, reptiles and mammals trafficked in the North and Southeast of Brazil. Overall, from 2015 to 2020, approximately 2775 animals were seized, accounting for 1853 specimens of birds, 803 reptiles and 119 mammals. Concerning the conservation status of the species, most belong to the Least Concern category, however, there are threatened species contemplating all the IUCN categories. Trafficking in exotic wildlife raises issues that still need attention and it may result in abandoned animals or invasion of species in balanced environments. In view of this, the profile of trafficked wildlife is necessary in Brazil and other countries, making it possible to combat trafficking as well as implement conservation measures.

Keywords: Wild animal. Wildlife trafficking. Illegal trade.

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RESUMO: O tráfico de animais selvagens foi identificado como uma actividade excepcionalmente lucrativa. Os mamíferos, juntamente com as aves e os répteis, estão entre os animais mais comercializados nacional e internacionalmente. O objetivo deste trabalho foi caracterizar e quantificar as espécies de aves, répteis e mamíferos traficadas nas regiões Norte e Sudeste do Brasil. No total, de 2015 a 2020, foram apreendidos cerca de 2.775 animais, representando 1.853 exemplares de aves, 803 répteis e 119 mamíferos. Quanto ao estado de conservação das espécies, a maioria pertence à categoria Pouco Preocupante, porém, existem espécies ameaçadas contemplando todas as categorias da IUCN. O tráfico de animais selvagens exóticos levanta questões que ainda necessitam de atenção e pode resultar no abandono de animais ou na invasão de espécies em ambientes equilibrados. Diante disso, é necessário traçar o perfil das espécies de animais selvagens traficadas no Brasil e em outros países, possibilitando o combate ao tráfico, bem como a implementação de medidas de conservação.

Palavras-chave: Animais silvestres. Tráfico de animais silvestres. Comércio ilegal.

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INTRODUCTION

Trafficking of wild animals is not a recent activity. It has been identified as an exceptionally lucrative activity, along with the trafficking of weapons, drugs and precious stones. Wildlife trade traditionally occurs person-to-person, however, with the internet expansion, the online trade of animals, especially reptiles, represents a new model for the introduction of invasive species, which poses a risk to the local ecosystem with the possibility of the emergence of new pandemics (Stringham et al., 2021; Sung et al., 2021).

The main source of these animals are the North, Northeast and Midwest of Brazil, with destinations to the Southeast and South of the country, where the main routes of entry and exit of people and goods are located. However, each Brazilian biome has its own wealth, which is immeasurable and incalculable, attracting international attention (Reis et al., 2016; Costa et al., 2018).

The constant characterization of trafficked wild bird species allows the understanding of the market of the groups that obtain these animals, this market contributes to the negative impact on natural populations. However, the understanding allows the planning of preservation and conservation habits (Costa et al., 2018).

Birds are the most trafficked animals, mainly because of the ease of obtaining, ease of marketing due to their beauty and song, often incomparable, and it become an attraction. Birds, along with mammals and reptiles, are among the most traded animals nationally and internationally, often being obtained directly from their natural habitat, which is, directly from nature. Its are hunted for meat consumption and for obtaining and manufacturing by-products, such as skin, leather and teeth (Charity; Ferreira, 2020; Carneiro; Almeida et al., 2021).

The aim of this paper was to characterize and quantify the species of birds, reptiles and mammals trafficked in the North and Southeast of Brazil through official data obtained from the inspection agency. In this context, we sought to determine: (1) the main species seized and their respective status and conservation, (2) the places where the animals were seized and (3) the period of highest prevalence of cases.

Material and methods

The Ethics Committee for the Use of Animals, Universidade Estadual Paulista (CEUA/UNESP) approved the project, under protocol number 0192/2020. In addition, as it

were wild animals, the data were submitted to the National System for the Management of Genetic Heritage and Associated Traditional Knowledge (SisGen) and to the Biodiversity Authorization and Information System (Sisbio), under request number 77075.

To perform the study, a virtual request was made - Integrated Platform for Ombudsman and Access to Information - Fala.Br, of wild animal data seized by the Brazilian Institute of the Environment and Renewable Natural Resources - Ibama, between the years 2015 and 2020 for the Cerrado, Amazon and Atlantic Forest biome. The request was answered and spreadsheets in Excel[®] format with the information were released and sent by email.

For the data obtained from Ibama, the animals were grouped in an Excel[®] spreadsheet in mammals, birds and reptiles, and according to the place of seizure: São Paulo and Pará. In each subgroup, subdivisions were made according to the species, number of animals seized, popular name, origin, biome and risk of threat or extinction, when the information was provided.

To categorize the risk of threat and/or extinction of animals, the information contained in the database of the International Union for Conservation of Nature's Red List of Threatened Species - IUCN was used, covering the categories Extinct (EX), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD) and Not Evaluated (NE) (IUCN, 2024).

To verify the most recent and valid nomenclature of the species, the Integrated Taxonomic Information System database (ITIS, 2024) was used.

Geoprocessing techniques were used to map the place where the animals were captured by the official organ and to prepare the maps, it was used the QGIS[®] software version 3.16.8 LTR associated with Google Earth Pro[®] to obtain the geographic coordinates of the locations reported in the data provided by Ibama.

For the data analysis, the information collected was tabulated in an Excel[®] spreadsheet according to the data acquired from the files.

Tables were presented with the frequency and percentages observed in the categories of each of the variables studied, considering the groups of animals: birds, mammals and reptiles, using the comparison of percentages by the Chi-square test. The count data were analyzed by fitting generalized linear models for the Negative Binomial distribution.

When the factors had more than two category, the Tukey-Kramer multiple comparison tests were applied to study whether the differences observed were statistically significant for each of the categories of variables: year and conservation status.

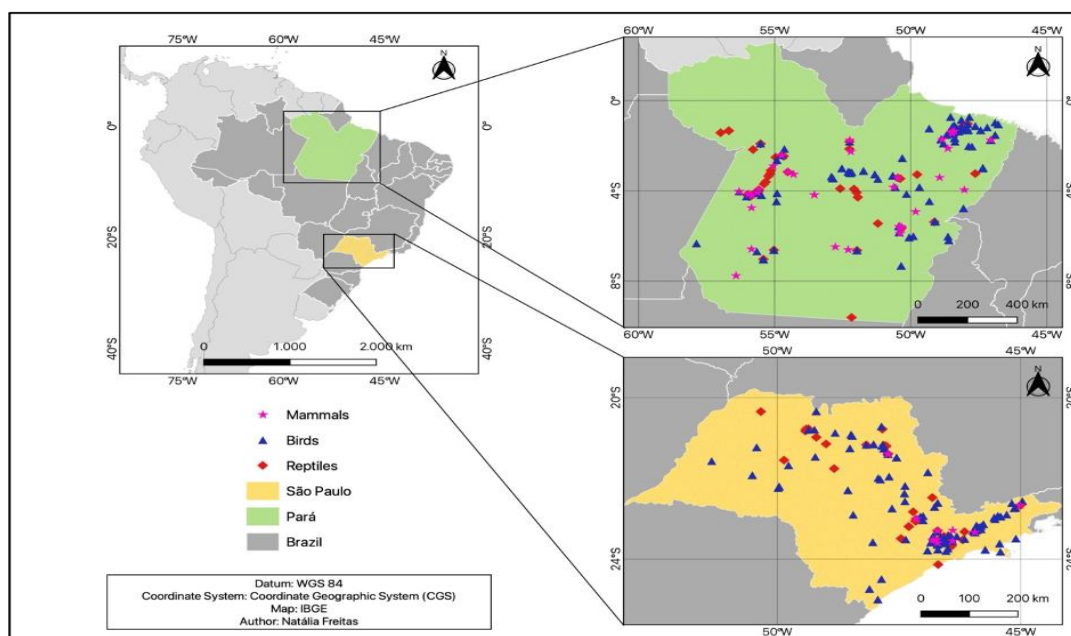
All statistical analyzes were performed using the SAS® software (Statistical Analysis System) version 9.3, using the GENMOD procedure. The significance level adopted for the statistical tests was 5% ($P < 0.05$).

RESULTS

Overall, from 2015 to 2020, approximately 2775 animals were seized, accounting for 1853 specimens of birds, 803 of reptiles and 119 of mammals. Besides, 1470 subproducts were seized, accounting for 1381 products from reptiles and 89 from mammals.

According to the geographic coordinate provided, it was possible to affirm that the majority of seizures occurred in or near the capital of the states as shown in figure 1. Also, in those areas are concentrated the main entry and exit routes of the country such as airports, mails and ports, both for people and goods. These routes were also used to transport illegal animals and their subproducts, for instance shoes, meat, skin, eggs and ornaments.

Figure 1: Map showing the sites of seizures of wildlife by Ibama from 2015 to 2020.



Birds' seizures were more prevalent than reptiles and mammals. The number of birds seized in São Paulo was higher than Pará, accounting for 1031 and 822, respectively. The peak of seizure in Pará was in 2015 while in São Paulo was in 2018.

In the state of Pará, the most seized species was the chestnut-bellied seed finch (*Sporophila angolensis*), followed by the great-billed seed finch (*Sporophila maximiliani*) and the white-faced whistling duck (*Dendrocygna viduata*), while in the state of São Paulo were the green-winged saltator (*Saltator similis*), followed by the double-collared seedeater (*Sporophila caerulea*) and the ultramarine grosbeak (*Cyanocorpus yucas*).

The majority of the species seized were classified as Least Concern (LC). However, seizure of threatened animals occurred, such as the great-billed seed finch (*Sporophila maximiliani*), turquoise-fronted amazon (*Amazona aestiva*), greater rhea (*Rhea americana*), caica parrot (*Pyrilia caica*), golden parakeet (*Guaruba guarouba*), hyacinth macaw (*Anodorhynchus hyacinthinus*), yellow-faced siskin (*Spinus yarrellii*), bare-faced curassow (*Crax fasciolata*), orinoco goose (*Neochen jubata*), white cockatoo (*Cacatua alba*), grey parrot (*Psittacus erithacus*), yellow-crested cockatoo (*Cacatua sulphurea*).

Regarding the IUCN classification, in general, the number of seizures of animals belonging to the LC, NT and EN category in the state of São Paulo was higher in comparison to Pará, while all animals of the VU category were seized in Pará. Moreover, the majority of exotic birds were seized in Pará.

Similarly to the birds, the number of mammals seized in São Paulo was higher than Pará, accounting for 78 and 41, respectively.

In the state of Pará, the most seized species was the lowland paca (*Agouti paca*), followed by the red brocket (*Mazama americana*) and nine banded armadillo (*Dasyus novemcinctus*), agouti (*Dasyprocta aguti*) and the collared peccary (*Pecari tajacu*). The most seized species in the state of São Paulo were the collared peccary (*Pecari tajacu*), followed by the tufted capuchin (*Sapajou sapella*) and the south american coati (*Nasua nasua*), agouti (*Dasyprocta aguti*) and the white-lipped peccary (*Tayassu pecari*).

In addition, 89 subproducts from mammals were seized accounting for 65 meat; 15 horns, 5 subproducts not identified, three skins and one part of clothes. Additionally, meat from wildlife were included in the official data, which were: 30 kg from *Hydrochaeris hydrochaeris* and 19 kg from *Agouti paca*.

Of the 24 species of mammals seized, five species are classified in some category of threat. The species *Tragelaphus imberbes* is classified as Near Threatened (NT); the species *Odobenus rosmarus*, *Tayassu pecari* and *Priodontes maximus* are classified as Vulnerable (VU) and, finally, the species *Panthera tigris* is classified as Endangered (EN).

The seizure of species belonging to the Brazilian fauna was expressive, however, species that do not occur naturally in the state of São Paulo were observed, such as *Sapajus apella*, which naturally occurs in the North of Brazil.

Regarding the IUCN classification, in general, the number of seizures of animals belonging to the LC and VU category in the state of São Paulo was higher in comparison to Pará, while all animals of the NT category were seized in Pará. Moreover, the majority of exotic animals were seized in São Paulo.

Regarding reptiles, quantifying the number of reptiles seized was challenging, mainly due to the manner of transportation. The reptile category was the one that has the higher number of subproducts commercialized such as eggs, bracelets, skin and shoes. In total, 1381 subproducts from reptiles were seized accounting for 789 eggs, 537 skins, 28 bracelets, 17 shoes, one watch and one subproduct not identified.

In the state of Pará, the most seized species was the Amazon turtle (*Podocnemis expansa*), followed by the boa constrictor (*Boa constrictor*) and the yellow-footed tortoise (*Chelonoidis denticulata*). The most seized species in the state of São Paulo were the corn snake (*Panthero phisguttatus*) followed by the broad-snouted caiman (*Caiman latirostris*) and the red-footed tortoise (*Chelonoidis carbonaria*).

In addition, animals sold by the postal service were reported with records of one seizure in the years 2016 and 2018 and seven in the year 2020. The species seized were: six water tiger turtles (*Trachemys dorbigni*) and three iguanas (*Iguana iguana*), which were located only in the postal service of cities in the state of São Paulo.

The seizure peaks in 2015 and 2020 refer to a large volume of animal by-products, such as swamp alligator leather, accounting for 537 products and tracajá eggs, accounting for 789 specimens, respectively.

Of all 34 species recorded, six are distributed in both São Paulo and Pará; 11 are distributed only in the state of Pará (*Podocnemis unifilis*, *Tupinambis quadrilineatus*, *Melanosuchus niger*, *Dracaena guianensis*, *Paleosuchus trigonatus*, *Corallus caninus*, *Caiman crocodilus*, *Chelonoidis carbonaria*, *Chelonoidis denticulata* and *Epicrates cenchria*) and three only in the state of São Paulo (*Bothrops neuwiedi*, *Trachemys dorbigni* and *Caiman latirostris*).

Concerning the conservation status of the seized species, most belong to the Least Concern (LC) category, however, there are threatened species contemplating the Vulnerable (VU) and Critically Endangered (CR) categories. Regarding the IUCN

classification, in general, there number os seizures of animals belonging to the LC, NT and CR category in the state of São Paulo was higher in comparisson to Pará, while all animals of the VU category were seized in Pará. Moreover, the majority of exotic reptiles were seized in São Paulo.

Statistically, there was no significant difference between the number of birds, mammals and reptiles seized in São Paulo and Pará. There was an increase in the seized birds of EN animals when compared to animals belonging to the VU category. Also, the number of birds and reptile seized increased over the years.

DISCUSSION

The diversity of bird captured reflects the great faunal diversity of Brazil, which is home to one of the richest birdlife in the world, with approximately 1,919 species (Piacentini et al., 2015). Studies on the trafficking of wild animals in the Amazon are frequent. This fact is justified not only by the diversity of wild animals, but also by the lower population density, which allows for more accurate monitoring of cases of trafficking in wild animals (Fernandes-Ferreira; Alves, 2017).

Overall, the literature reports birds as the main animal group apprehended. The ease of marketing, demand and price are among the most reported factors for maintaining this trade (Charity; Ferreira, 2020; Almeida; Carneiro, 2021).

In a meta-analysis study conducted by Costa et al. (2018), of the 207 genera found, there was a greater variety of species trafficked in the genus *Sporophila* spp. In addition, the isolated Amazon region is the largest source of specimens for both local and international distribution (Charity; Ferreira, 2020).

The boll weevil (*Sporophila maximiliani*), is an endangered species at national and global level and possibly extinct in different areas of natural occurrence. However, its search still occurs despite its high price when compared to other animal species. This results in an increasingly negative impact on the population and habitat of this species (Farias et al., 2019; IUCN, 2021).

The iron cracker (*Saltator similis*) also stood out as one of the most trafficked species. The thrush, trinca-ferro and cardinal-do-northeast were among the most trafficked domestic species between 2018 and 2019. In addition, they are species frequently found in illegal farms (Charity; Ferreira, 2020).

Within the group of birds, the Passeriformes are the most hunted category. This fact can be justified by the richness of species in this category, ease of obtaining nature, singing and the demand for these animals, especially in street markets and countryside cities, where it is relatively common to keep these animals in cages (Avelar et al. , 2015; Oliveira et al., 2020).

Although mammals were the category with the smallest variety of species apprehended, in Brazil there are about 658 species of mammals and 10% are considered endangered. This diversity places Brazil in second place in the world in number of species (ICMBIO, 2018; Tremori et al., 2018).

The most seized species were *Pecari tajacu*, *Sapajus apella* and *Dasyprocta leporina*. Similar to this study, the literature reports rodents such as *Cuniculus paca* and *Hydrochoerus hydrochaeris*; ungulates such as *Mazama* sp., *Pecari tajacu* and *Tayassu pecari*, and primates such as *Sapajus apella*, as the most frequently hunted animals (Constantino, 2018).

Hunting for consumption is often practiced in the Amazon, however, it occurs in other Brazilian biomes with some particularities. Usually, hunting practiced in the Atlantic Forest biome, although not as intense as in the Amazon, targets smaller animals, especially with a maximum of 3 kg (Constantino, 2018).

In the Amazon, hunting of mammals and birds is frequent, mainly hunting for meat consumption and making by-products with leather. The literature reports that the larger the size of the mammal, the more frequently it hunts for food (Constantino, 2018). This data can be observed in this work, where the capybara, the collared peccary, the wild deer and the paca are among the animals most seized by Ibama.

The state of São Paulo has a strategic location in the country, being an important entry and exit route for people and goods. Therefore, it is not uncommon to find animals being trafficked both within Brazil and to other countries. Many animals are hidden in clothes or bags or even have their documentation altered or falsified (Charity; Ferreira, 2020).

Considering Brazil, the Amazon biome and the Cerrado biome stand out for the volume of reptiles seized when compared to other Brazilian biomes (Constantino, 2018). At the local level, the hunting of each species or group of chelonians has a specific purpose depending on the origin and destination of both: live animals and the by-products.

The yellow-spotted river turtle and the Amazon turtles are among the most hunted species for both consumption and marketing of meat and eggs. (Constantino, 2018; Charity; Ferreira, 2020). The yellow-spotted river turtle eggs were frequently found in the data collected and represented a significant portion of the animals seized.

The reptiles were among the groups most apprehended by the Environmental Military Police of the state of São Paulo between 2012 and 2015. In addition, Brazil is one of the countries with the greatest wealth of reptile species, second only to Australia and Mexico (Beck et al., 2017; Constantino, 2018; Charity; Ferreira, 2020; Fonseca et al., 2021).

Species of *Caiman* spp. genus are often hunted for the sale of leather, even though the material has a lower quality than the leather of species of the genus *Alligator* spp. Between 2005 and 2014, trafficking consisted of whole and fragmented hides, tails and meat. The leather and tail are destined for the production of items for the fashion industry; meat is most sought after by the Chinese, United States, Belgium and the Netherlands markets (Sinovas et al., 2017).

According to Fonseca et al. (2021), in Brazil, the illegal trade in reptiles occurs virtually, through restricted groups and messaging applications. Therefore, it is estimated that traffic is much greater than the data recorded by official agencies, which carry out physical seizures, considering highways, waterways, ports and airports.

The reduction of virtual barriers allows greater connectivity between people from different parts of the world, even kilometers away (Fonseca et al., 2021). According to Marshall et al. (2020), most commercialized animals are not included in the IUCN databases or belong to the category of Least Concern. In this study, it was observed that, despite being discreet, there was an increase in the number of animals sold by the post office.

The introduction of non-native species represents a risk not only for those who acquire a new specimen, but also for the Brazilian ecosystem, since the possibility of invasion by the species cannot be disregarded. In addition, exotic fauna disturbs local animal populations and habitat; causes behavioral changes in animals and promotes species reduction due to competition (Magalhães; São-pedro, 2012; Lal; Nadim, 2021).

Additionally, another topic that should be evaluated and discussed is the seed dispersal activity, as the animals are the main responsables for seed dispersal and its illegal trade may affect the ecosystem in a long term. Reducing seed dispersal results in defaunation and an environment with less variety of trees and fruits for animals. In this

way, animal species may be forced to migrate to other forest areas in search of food, causing ecological imbalance (Krause; Tilker, 2022).

CONCLUSION

Understanding the trafficking market is necessary and must be carried out on a constant basis, since the groups responsible for the commercialization of these animals are constantly looking for alternative methods of selling the animals. Brazilian biodiversity is a continuous target for the illegal animal trade. Based on the results of this study, the search for these animals, both native and exotic, is increasing. Also, it will contribute in the development of strategies to control and combat trafficking and conservation measurements.

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