



Quantitative study of wild animals received at the Wild Animals Triage Centers (CETAS) in Bahia and identification of trafficking routes¹

Marilúcia C. Santos² , Debora M. Gomes² , Marialina R. Lima⁴,
Maria V.B. Santos² , Uilton G. Santos² , Robson B. Cerqueira⁵ ,
Juliana T.S.A. Macêdo³  and Pedro M.O. Pedroso^{2,3*} 

ABSTRACT.- Santos M.C., Gomes D.M., Lima M.R., Santos M.V.B., Santos U.G., Cerqueira R.B., Macêdo J.T.S.A. & Pedroso P.M.O. 2021. **Quantitative study of wild animals received at Wild Animals Triage Centers (CETAS) in Bahia and identification of trafficking routes.** *Pesquisa Veterinária Brasileira* 41:e06942, 2021. Laboratório de Patologia Veterinária, Universidade de Brasília, Campus Universitário Darcy Ribeiro, Via L4 Norte s/n, Brasília, DF 70910-970, Brazil. E-mail: pedrosovet@yahoo.com.br

In Brazil, the illegal capture of wild animals is a crime that contributes to the extinction of species, besides causing environmental imbalance and suffering to the animals. Here, we undertook a quantitative survey of animals sent to the “Centro de Triagem de Animais Silvestres” (CETAS - Wild Animals Triage Centers) from units of Porto Seguro, Salvador, and Vitória da Conquista during 2009-2019. The 19,317, 34,460, and 43,874 specimens were registered in the units of Porto Seguro, Vitória da Conquista, and Salvador, respectively. The distribution of the totals by class included 80,948 (82.90%) birds, 12,007 (12.30%) reptiles, 4,661 (4.77%) mammals, and 35 arachnids (0.03%). The operations that generated registration at the CETAS were most frequently apprehensions (67,974; 69.67%), followed by voluntary surrender (13,367; 13.69%), rescues (12,803; 13.11%), and transfers (2,735; 2.67%). The animals came from 236 municipalities in the state of Bahia, with emphasis on the municipalities of Salvador, Vitória da Conquista, Feira de Santana, Lençóis, Jequié, and Paulo Afonso. The evaluation of the quantitative seizures by municipalities indicates that the BR-116 is one of the most representative routes for the illegal traffic of wild animals in the state of Bahia and the country.

INDEX TERMS: Wild animals, apprehension, routes, CETAS.

RESUMO.- [Estudo quantitativo de animais silvestres recebidos nos Centros de Triagens de Animais Silvestres (CETAS) da Bahia e identificação de rotas de tráfico.] No Brasil a captura ilegal de animais silvestres é crime e contribui

para a extinção das espécies, além de causar desequilíbrios ambientais e sofrimentos aos animais. Este trabalho apresenta quantitativos de animais recebidos e/ou armazenados nos Centros de Triagem de Animais Silvestres (CETAS) do estado da Bahia, no período de 2009-2019. Os totais de 19.317, 34.460 e 43.874 espécimes foram registrados nas unidades de Porto Seguro, Vitória da Conquista e Salvador, respectivamente. A distribuição dos totais por classe incluiu 80.948 (82,90%) aves, 12.007 (12,30%) répteis, 4.661 (4,77%) mamíferos e 35 aracnídeos. Quanto à natureza da operação que gerou o registro nos CETAS, as mais frequentes foram apreensão (67.974; 69,67%), entrega voluntária (13.367; 13,69%), resgate (12.803; 13,11%) e transferência (2.735; 2,67%). Os animais foram apreendidos em 236 municípios do estado da Bahia, com destaque para Salvador, Vitória da Conquista, Feira de Santana, Lençóis, Jequié e Paulo Afonso. A avaliação dos quantitativos das apreensões por municípios indica que a BR-116 é uma das

¹ Received on June 30, 2021.

Accepted for publication on July 12, 2021.

² Graduate Program in Animal Sciences in the Tropics (PPGCAT), Escola De Medicina Veterinária e Zootecnia (EMEVZ), Universidade Federal da Bahia (UFBA), Av. Adhemar de Barros 500, Ondina, Salvador, BA 40170-110, Brazil.

³ Laboratório de Patologia Veterinária, Universidade de Brasília (UnB), Campus Universitário Darcy Ribeiro, Via L4 Norte s/n, Brasília, DF 70910-970, Brazil. *Corresponding author: pedrosovet@yahoo.com.br

⁴ Centro de Triagem de Animais Silvestres (CETAS-IBAMA) Salvador, Rua Fernando Pedreira s/n, Cabula, Estrada das Barreiras, Salvador, BA 41195-220, Brazil.

⁵ Laboratório de Doenças Infecciosas, Hospital Universitário de Medicina Veterinária (HUMV), Universidade Federal do Recôncavo da Bahia (UFRB), Rua Rui Barbosa 710, Cruz das Almas, BA 44380-000, Brazil.

rotas de escoamento mais representativa do tráfico ilegal de animais silvestres, no estado da Bahia e no país.

TERMOS DE INDEXAÇÃO: Animais silvestres, apreensão, rotas, CETAS.

INTRODUCTION

The removal of wild animals from nature with the absence of legal permission can be considered to comprise of a set of criminal activity related to the irregular use of wild fauna specimens, involving acts of capture, transport, holding, and commercialization, aimed at obtaining some economic advantage, with damage to the environment (Nassaro 2015). Such conduct threatens Brazilian biodiversity and contributes to the extinction of several species in the medium- and long-term, causing ecological imbalance and suffering to animals (Alves et al. 2012a, ICMBio 2014).

Elevated to being considered a global crime by the United Nations Office on Drugs and Crime (UNODC 2020), wild animal trafficking has an estimated financial movement of around US\$ 10 to 20 billion per year, and Brazil's participation is estimated to be approximately 5-15% of this (Pagano et al. 2009, Silva et al. 2015).

The capture of animals in nature is part of Brazilian tradition and popular culture, where it is common for wild animals to be kept as pets in homes, used in religious rituals or for medicinal purposes, hunted for food or sport, and marketed as a complementary source of income (Alves et al. 2012b).

In Brazil, commercialization is characterized by intense north-south movement, in which the North, Northeast, and Center-West regions participate as capture areas and the South and Southeast regions as major consumers and promoters of national and international trafficking. The main form of internal transport is by land, occurring in several areas with different destinations (RENCITAS 2002, Lopes 2003, Pagano et al. 2009, Insauralde et al. 2010, Destro et al. 2012).

Wild animals involved in trafficking, when seized by law enforcement agencies, are sent to the "Centro de Triagem de Animais Silvestres" (CETAS - Wild Animals Triage Centers), as well as animals that are collected or voluntarily surrendered. The CETAS consists of legally established units responsible for receiving, identifying, assessing, recovering, rehabilitating, and disposing of wild animals under their custody (Brasil 2008).

The state of Bahia stands out on the national scene as one of the main suppliers of wild animal trafficking through the municipalities of Milagres, Feira de Santana, Vitória da Conquista, and Cipó (Rocha et al. 2006). The most concentrated stretch of this illegal trade is located between the municipalities of Feira de Santana and Vitória da Conquista, and the presence of individuals trading wild animals along the BR-116 highway is common (Souza & Soares Filho 2005).

The present study aimed to conduct a quantitative analysis of wild animals received at the CETAS of Porto Seguro, Salvador, and Vitória da Conquista, in addition to identifying possible trafficking routes in the state of Bahia, based on the municipalities mentioned as seizure locations in the entry records of wild animals.

MATERIALS AND METHODS

This study was approved by the Ethics Committee on Animal Use (CEUA) of the "Universidade Federal da Bahia" (UFBA) under protocol

number 50/2019. The study was conducted through an exploratory analysis of the Terms of Entry of Wild Animals (TEAs) from the CETAS units of Porto Seguro, Salvador, and Vitória da Conquista.

For the Salvador and Vitória da Conquista units, the data corresponded to the period from 2009 to 2019. For the Porto Seguro unit, the data came from reports sent by those responsible for the unit, from 2010 to 2016. The report sent by the CETAS Porto Seguro unit did not include data on the municipalities where the events occurred. The CETAS units in Porto Seguro and Salvador are under the administrative responsibility of the "Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis" (IBAMA - Brazilian Institute of Environment and Natural Resources). The CETAS Vitória da Conquista unit is under the administration of the Municipal Secretary of the Environment of Vitória da Conquista.

The variables analyzed were class, order, total number of specimens, form of receipt or collection, and municipality of origin (geographic coordinates). The methods of collecting or receiving animals at the CETAS were classified as apprehension, defined as the deposit of specimens resulting from enforcement actions by the competent agencies, with the issuance of the Notice of Infraction (AI) or the Apprehension and Deposit Term (TAD); rescue, defined as the capture of animals carried out by public agencies in response to a request from the population; voluntary delivery, when the individual spontaneously sought the units or agencies responsible for delivering the specimen kept under their custody; transfer, the displacement between animal CETAS units by technical guidance.

The data from the files and reports were used to prepare tables and survey the municipalities and respective quantities of seized specimens using Microsoft Excel® 2017 software. The data were organized and analyzed through descriptive statistics and tabulated using the same program for the preparation of tables.

In order to identify the animal movement routes, a map was built with Quantum GIS software. The geographic database used was downloaded from the National Department of Transport Infrastructure, Road Network, and Brazilian Institute of Geography and Statistics, administrative and political division. Through the geoprocessing tools, the map containing the municipalities of origin of the animals received at the CETAS units was created, with color classification to differentiate each numerical range.

For species identification, the "Comitê Brasileiro de Registros Ornitológicos" (Brazilian Committee of Ornithological Records - CBRO 2014), Brazilian List of Reptiles, Reptiles of Brazil and its Federative Units: List of species (Costa & Bérnils 2014, 2018), and the Catalogue of life (Roskov et al. 2019) were consulted.

RESULTS

In total, 97,651 wild animals were received and distributed in the CETAS/BA units, with 19,317 in Porto Seguro from 2010 to 2016, and 43,874 in Salvador and 34,460 in Vitória da Conquista from 2009 to 2019. In total, 549 species were identified in the classes Aves, Reptilia, and Mammalia. Birds accounted for 82.90% of the total number of animals, and the others were represented by reptiles, mammals, and arachnids (Table 1).

Birds of 26 orders were received, with the highest number from Passeriformes (68,096; 84.12%), Psittaciformes (7,500; 9.27%), Strigiformes (1,647; 2.03%), and Columbiformes (904; 1.12%). The other orders constituted 2,698 (3.32%). In 103 (0.13%) entries, there was only the word "birds" in the TEAs records (Table 2).

The Reptilia class corresponded to 12.30% of the total number of animals submitted. The order Testudines had the highest number of entries, totaling 7,951 specimens. In 86 of the TEAs, only the term “Reptiles” was mentioned. Detailed information is shown in Table 3.

Table 1. Absolute and relative frequency of vertebrate classes deposited at CETAS units, Bahia, Brazil, from 2009 to 2019

Class	Absolute frequency	Relative frequency%
Birds	80,948	82.90%
Reptilia	12,007	12.30%
Mammalia	4,661	4.77%
Arachnid	35	0.04%
TOTAL	97,651	100%

Table 2. Absolute and relative frequency of birds described by order deposited in the CETAS units, Bahia, Brazil, from 2009 to 2019

Order	Absolute frequency	Relative % frequency
Passerines	68,096	84.12%
Psittaciformes	7,500	9.27%
Strigiform	1,647	2.03%
Columbiform	904	1.12%
Accipitriform	707	0.87%
Falconiform	553	0.68%
Pelecaniform	206	0.25%
Piciformes	194	0.24%
Sphenisciformes	179	0.22%
Procellariiform	174	0.21%
Gruiform	119	0.15%
Caprimulgiform	85	0.11%
Charadriiformes	78	0.10%
Apodiform	59	0.07%
Cathartiform	55	0.07%
Galliform	49	0.06%
Cuculiform	48	0.06%
Tinamiform	43	0.05%
Anseriform	39	0.05%
Cariamiform	27	0.03%
Nyctibiiform	25	0.03%
Coraciiform	22	0.03%
Suliform	20	0.02%
Rheiform	13	0.02%
Galbuliform	2	0.00%
Trogoniform	1	0.00%
Not identified in the TEAs	103	0.13%
TOTAL	80,948	100%

Table 3. Absolute and relative frequency of specimens of the three orders of the Reptilia class deposited in the CETAS units, Bahia, Brazil, from 2009 to 2019

Order	Absolute frequency	Relative % frequency
Testudinata	7,951	66.22%
Squamata	3,913	32.59%
Crocodylia	57	0.47%
Not identified in the TEAs	86	0.72%
TOTAL	12,007	100%

Of the nine orders found in the Mammalia class, Primates and Didelphimorphia accounted for 34.16% and 27.46%, respectively, of the total entry records, as shown in Table 4. The other orders corresponded to 36.69%. In 79 TEAs (1.69%), only the term “Mammals” was included.

The Aves class prevailed quantitatively over the other classes, except for the transfer entry modality, in which the Reptilia class surpassed it. In total, 69.67% of the animals were seized, followed by rescued (13.69%), voluntarily delivered (13.11%), and transferred (2.67%). The form of receipt was not informed for 0.85% of the animals. Overall, 35 specimens of the Arachnida class were received, all belonging to the order Araneae in the rescue modality.

There were 236 municipalities identified in the TEAs of the CETAS units (Fig.1). The municipalities with the highest number of seized specimens were Salvador (11,815), Vitória da Conquista (7,277), Feira de Santana (2,705), Lençóis (2,575),

Table 4. Absolute and relative frequency of specimens of the nine orders of the Mammalia class deposited in the CETAS units, Bahia, Brazil, from 2009 to 2019

Order	Absolute frequency	Relative % frequency
Primates	1,592	34.16%
Didelphimorphia	1,280	27.46%
Pilosa	869	18.64%
Carnivorous	301	6.46%
Rodentia	288	6.18%
Cingulata	194	4.16%
Cetartiodactyla	41	0.88%
Lagomorpha	10	0.21%
Chiroptera	7	0.15%
Not identified in the TEAs	79	1.69%
TOTAL	4,661	100%

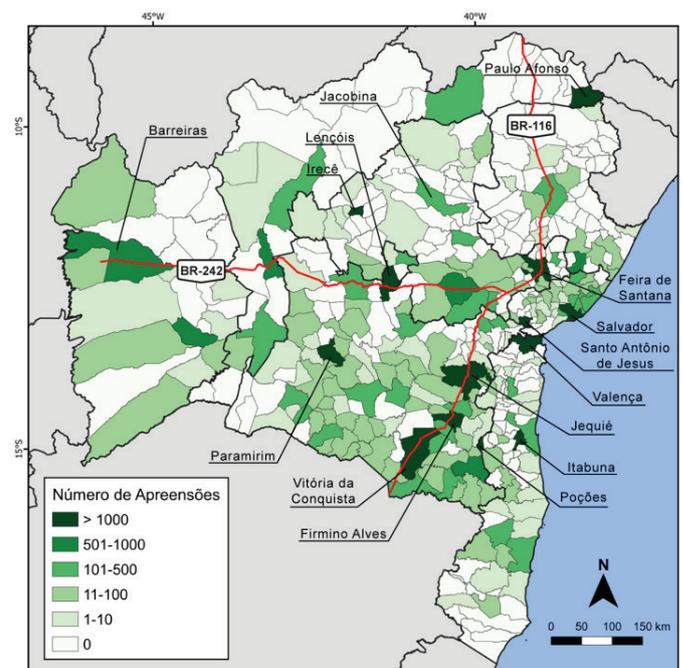


Fig.1. Map of municipalities with entry records in the CETAS units, Bahia, Brazil, from 2009 to 2019.

Jequié (1,946), and Paulo Afonso (1,667). The BR-116 highway emerged as the most used wild animal trafficking route in the state. These data can be seen in Figure 1.

DISCUSSION

The results show that the total number of wild animal species sent to CETAS/BA represents 9.15% of the ~6,000 species seized worldwide (UNODC 2020). This can be considered significant if compared to the study conducted by Masés-García et al. (2021) in Oaxaca, Southern Mexico, whose proportion was 3.8%. The highest volume of wild animals received at the CETAS/BA units corresponded to the class Aves. A similar result was reported by the IBAMA (2002), wherein birds accounted for 82% of the total number of animals smuggled into Brazil. In the state of São Paulo, 98% of the occurrence records corresponded to the class Aves (SEMA/PMA-SP 2006). For the Environmental Military Police of the state of São Paulo, the preference for birds can be associated with the fact that they have a lower price in the illegal market compared to other animals (SEMA/PMA-SP 2006). Alves et al. (2012a), Destro et al. (2012), Mendes (2018), and Silva et al. (2015) corroborate this information and state that the national and international predilection for birds may occur due to their beauty, song, and easy handling, subsequently being more susceptible to domestication.

Among the birds included in this study, the orders that presented the highest numbers were Passeriformes and Psittaciformes. The preference for these two orders has already been consolidated in previous Brazilian studies (Bastos et al. 2008, Franco et al. 2012, Azevedo et al. 2017, Costa et al. 2018). The choice of some passerine birds occurs due to their greater abundance in nature, as well as because they arouse great interest for having a vocal repertoire, exuberant plumage, and strong colors (Alves et al. 2013). Psittaciformes are the most popular pet birds in the world due to their intelligence and ability to imitate the human voice, as well as their beauty and docility (Alves et al. 2012a, Costa 2017). In Brazil, the demand for Psittaciformes has been present since the 16th century, when parrots were some of the main exports to Portugal, according to Bueno (1998).

The second class of animals with the highest number of individuals recorded at the CETAS/BA for the analyzed period was the Reptilia class. In a study conducted by Masés-García et al. (2021), reptiles were identified as the class most targeted by trafficking in the state of Oaxaca. The order Testudinata, which includes terrapins, tortoises, and turtles, accounted for the largest number of records, followed by Squamata and Crocodilia. The results presented in this study are in accordance with those of Mendes et al. (2016) and Souza et al. (2007); however, they differ from those obtained by Avelar et al. (2015), where the order Squamata was the most represented. The order Testudinata stood out because the methods of capture, transport, and marketing of chelonians occur more easily because they are silent, slow, and non-aggressive animals. Such observations can be seen as facilitators for wildlife traffickers (Fuccio et al. 2003). It is reported that the demand for these animals for domestic breeding may be associated with the belief that they promote the cure for respiratory diseases (Pimentel & Santos 2009). In the state of Bahia, Testudinata and Squamata are used as

zootechnical resources by the population of 21 municipalities (Costa-Neto 2011).

In a study conducted by Borges et al. (2006), it was found that the animals with the highest number of rescues belonged to the Squamata order, and one of the reasons given was the lack of attractiveness as pets, except for some species that are of interest to fascinated groups. Souza et al. (2007) pointed out that the lack of interest in keeping snakes may be justified by the population's fear of these animals. For the order Crocodilia, the number was less expressive; 57 specimens were recorded, and these animals have not been used as pets because they are considered dangerous and endanger people's lives (Souza et al. 2007). Reptiles are reported to be used in folk medicine, as subsistence food, and for the marketing of their byproducts, such as meat and skin (Alves et al. 2007).

The Mammalia class was the least representative quantitatively compared to birds and reptiles, a fact already observed by Pagano et al. (2009) and Destro et al. (2012). The Mammalia class presents particularities in relation to the others regarding the modality of entry into the CETAS, considering that the vast majority of records consist of voluntary delivery and rescue. The number of records by seizure is considered low when compared to that of bird species. However, Braczkowski et al. (2019) stated that the trafficking of the jaguar (*Panthera onca*), is intensifying in Latin America, particularly in Brazil, Bolivia, Suriname, Costa Rica, and Peru, to satisfy Southeast Asia, which can be considered worrying in view of the low notification of seizure pointed out in studies concerning the topic. When aiming to understand this low mammal seizure, nothing was found in previous studies that deals with this subject, suggesting that future studies should aim at filling this gap.

The proportion of animals received in the seizure modality identified in the present study was similar to that identified by Vilela (2012). Higher proportions were found in the states of Paraíba (84%) (Pagano et al. 2009) and São Paulo (90%) (Beck et al. 2017). In the CETAS units, it was observed that seizure was the most frequent form of entry of animals, which may indicate actions to combat wildlife trafficking. Despite the legal prohibition of keeping wild animals in captivity through Federal Law No. 9.605/1998 (Brasil 1998), this practice occurs throughout the national territory.

The entry record for the voluntary surrender and rescue modality was less significant than the apprehension modality, which is similar to that observed by Destro et al. (2012) and Avelar et al. (2015). In the semi-arid region of Bahia, it was found that 56.86% of the total notifications related to environmental infraction notices corresponded to the action of keeping wild fauna in captivity (Almeida & Santos 2018). In this case, it is common to breed wild animals as pets, especially birds (Dantas-Aguiar 2011). The use of wildlife in the northeast region is associated with sociocultural and economic factors, since animals are used as a source of protein, especially mammals, and for religious, ritual, and sport purposes (Alves et al. 2009, 2012b, Barbosa et al. 2011).

Regarding the geographical movement of animals, it was possible to identify that the municipalities with the highest volumes of occurrence records are close to or traversed by the BR-116 highway, one of the longest Brazilian highways; for example, Feira de Santana and Vitória da Conquista (Souza & Soares Filho 2005). The BR-116 highway begins

in Fortaleza, Ceará, and runs through 10 states, including Bahia, São Paulo, and Rio de Janeiro, and ends in Rio Grande do Sul at the border with Uruguay, which may indicate that the highway is an outflow route for wild animal trafficking to the southeast and south regions.

The semi-arid region of Bahia stands out for the number of seizures recorded in the municipalities of Irecê and Jacobina. However, the flow of nearby roads is not observed, which may suggest that these municipalities are also areas where wild animals are caught and traded. The municipalities of Salvador, Vitória da Conquista, Feira de Santana, and Paulo Afonso were mentioned by RENTAS (2002), Parliamentary Inquiry Commission on Trafficking in Wild Animals and Plants (Câmara dos Deputados 2003), and Souza & Soares Filho (2005) as wild animal traders. Other municipalities previously mentioned, such as Milagres, Itatim, Riachão do Jacuípe, Ituberá, Castro Alves, and Amargosa, in the present study showed little or no activity (RENTAS 2002, Hamada 2004, Souza & Soares Filho 2005, Carvalho 2006).

However, the number of animals entering the CETAS from the municipalities of Lençóis, in the Chapada Diamantina region, Jequié, Poções, Firmino Alves, Irecê, Santo Antônio de Jesus, Valença, Paramirim, and Itabuna stands out. The entanglement of routes that transport the animals is a challenge for authorities, since the turnover is diverse. Wild animal trafficking networks are highly flexible and changeable and as one access point, information source, or connection is interrupted, another is immediately created (Hernandez & Carvalho 2006).

CONCLUSION

The number of animals sent to CETAS suggests that the state of Bahia is active as a supplier of wild animals for trafficking. The emergence of new municipalities along the BR-116 interstate highway that are active in the scenario of commercialization and outflow of wild animals to other states may identify new routes for wild animal trafficking.

Acknowledgments.- The first author thanks the “Fundação de Amparo à Pesquisa do Estado da Bahia” (FAPESB) for granting him a PhD scholarship; the “Centro de Triagem de Animais Silvestres” (CETAS) Salvador and Vitória da Conquista units for the technical and logistic support and for supplying the database; the state superintendence of “Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis” (IBAMA) in Bahia; the regional management of environmental crimes of the federal highway police of Bahia; and the integrated preventive surveillance and Bahia public prosecutor’s office for providing information on wildlife surveillance in the state.

Conflict of interest statement.- The authors declare that there is no conflict of interest.

REFERENCES

- 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. *Int. J. Develop. Res.* 8(10):23462-23470.
- Alves R.R.N., Gonçalves M.B.R. & Vieira W.L.S. 2012b. Caça, uso e conservação de vertebrados no semiárido brasileiro. *Trop. Conserv. Sci.* 5(3):394-416. <<https://dx.doi.org/10.1177/194008291200500312>>
- Alves R.R.N., Leite R.C.L., Souto W.M.S., Bezerra D.M. & Lourdes-Ribeiro A. 2013. Ethno-ornithology and conservation of wild birds in the semi-arid Caatinga of northeastern Brazil. *J. Ethnobiol. Ethnomed.* 9:14. <<https://dx.doi.org/10.1186/1746-4269-9-14>> <PMid:23445769>
- Alves R.R.N., Lima J.R.F. & Araujo H.F.P. 2012a. The live bird trade in Brazil and its conservation implications: an overview. *Bird Conserv. Int.* 23(1):53-65. <<https://dx.doi.org/10.1017/S095927091200010X>>
- Alves R.R.N., Mendonça L.E.T., Confessor M.V.A., Vieira W.L.S. & Lopez L.C.S. 2009. Hunting strategies used in the semi-arid region of northeastern Brazil. *J. Ethnobiol. Ethnomed.* 5:12. <<https://dx.doi.org/10.1186/1746-4269-5-12>>
- Alves R.R.N., Pereira Filho G.A. & Lima Y.C.C. 2007. Snakes used in ethnomedicine in Northeast Brazil. *Environ. Develop. Sustain.* 9:455-464. <<https://dx.doi.org/10.1007/s10668-006-9031-x>>
- Avelar E.R., Silva R. & Baptista L.A.M.L. 2015. Ameaças à sobrevivência de animais silvestres no Estado de Goiás. *Uniciências* 19(2):132-140. <<https://dx.doi.org/10.17921/1415-5141.2015v19n2p%25p>>
- Azevedo S.A., Silva G.P. & Braga G.M.S. 2017. Manejo de fauna apreendida no município de Imperatriz, região sudoeste do estado do Maranhão. *PUBVET* 11(11):1098-1103. <<https://dx.doi.org/10.22256/pubvet.v11n11.1098-1103>>
- Barbosa J.A.A., Nobrega V.A. & Alves R.R.N. 2011. Hunting practices in the semiarid region of Brazil. *Indian J. Trad. Know.* 10(3):486-490.
- Bastos L.F., Luz V.L.F., Reis I.J. & Souza V.L. 2008. Apreensão de espécimes da fauna silvestre em Goiás - situação e destinação. *Revta Biol. Neotrop.* 5(2):51-63. <<https://dx.doi.org/10.5216/rbn.v5i2.9822>>
- Beck R.M., Reis S.T.J. & Rocha N.S. 2017. Estudo retrospectivo das ocorrências de crimes contra a fauna atendidos pela Polícia Militar Ambiental do estado de São Paulo, 2012-2015. *Braz. J. Forensic Sci. Med. Law Bioeth.* 6(3):453-466. <[https://dx.doi.org/10.17063/bjfs6\(3\)y2017453](https://dx.doi.org/10.17063/bjfs6(3)y2017453)>
- Borges R.C., Oliveira A., Bernardo N. & Costa R.M.M.C. 2006. Diagnóstico da fauna silvestre apreendida e recolhida pela Polícia Militar de Meio Ambiente de Juiz de Fora, MG (1998 e 1999). *Revta Bras. Zool.* 8(1):23-33.
- Braczkowski A., Ruza A., Sanchez F., Castagnino R., Brown C., Guynup S., Winter S., Gandy D. & O'Bryan C. 2019. The ayahuasca tourism boom: an undervalued demand driver for jaguar body parts? *Conserv. Sci. Pract.* 1(12):e126. <<https://dx.doi.org/10.1111/csp2.126>>
- Brasil 1998. Lei nº 9.605, de 12 de fevereiro de 1998. Dispõe sobre as sanções penais e administrativas derivadas de condutas e atividades lesivas ao meio ambiente, e dá outras providências. *Diário Oficial da União, Brasília, DF.* Available at <http://www.planalto.gov.br/ccivil_03/leis/19605.htm>. Accessed on Mar. 12, 2020.
- Brasil 2008. Instrução Normativa Ibama Nº 169, de 20 de fevereiro de 2008. Institui e normatiza as categorias de uso e manejo da fauna silvestre em cativeiro em território brasileiro. *Diário Oficial da União, Brasília, DF.* Available at <<https://www.ibama.gov.br/component/legislacao/?view=legislacao&legislacao=113878>> Accessed on May 12, 2019.
- Bueno E. 1998. *A Viagem do Descobrimento: a verdadeira história da expedição do Cabral*. Vol. 1. Objetiva, Rio de Janeiro, p.95-125.
- Câmara dos Deputados 2003. Comissão Parlamentar de Inquérito destinada a investigar o tráfico ilegal de animais e plantas silvestres da fauna e flora brasileiras. Relatório Final, Câmara dos Deputados, Brasília, DF. Available at <<https://www2.camara.leg.br/atividade-legislativa/comissoes/comissoes-temporarias/parlamentar-de-inquerito/51-legislatura/cpitrafi/relatorio/relatoriofinal.pdf>> Accessed on Feb. 5, 2019.
- Carvalho E.S. 2006. Tráfico interno de fauna silvestre - pássaros. *Revta Bras. Direito Anim.* 1(1):123-137. <<https://dx.doi.org/10.9771/rbda.v1i1.10244>>
- CBRO 2014. Lista das aves do Brasil. 11ª ed. Comitê Brasileiro de Registros Ornitológicos. Available at <http://www.cbro.org.br/PDF/avesbrasil_2014jan1.pdf> Accessed on Jun. 16, 2020.
- Costa F.J.V. 2017. Atualizações sobre o tráfico de animais no Brasil, p.23-50. In: Costa F.J.V., Ferreira J.M., Monteiro K.R.G. & Mayrink R.R. (Eds), *Ciência*

- contra o Tráfico: avanços no combate ao comércio ilegal de animais silvestres. Imprell, João Pessoa.
- Costa F.J.V., Ribeiro R.E., Souza C.A. & Navarro R.D. 2018. Espécies de aves traficadas no Brasil: uma meta-análise com ênfase nas espécies ameaçadas. *Front. J. Soc. Technol. Environ. Sci.* 7(2):324-346. <<https://dx.doi.org/10.21664/2238-8869.2018v7i2.p324-346>>
- Costa H.C. & Bérnills R.S. 2014. Répteis brasileiros: lista de espécies. *Herpetol. Bras.* 3(3):74-84.
- Costa H.C. & Bérnills R.S. 2018. Répteis do Brasil e suas unidades federativas: lista de espécies. *Herpetol. Bras.* 7(1):11-57.
- Costa-Neto E.M. 2011. The popular zootherapy in Bahia State: registration of new animal species used as medicinal resources. *Revta Ciênc. Saúde Coletiva* 16(Supl.1):1639-1650. <<https://dx.doi.org/10.1590/S1413-81232011000700100>> <PMid:21503516>
- Dantas-Aguiar P.R., Barreto R.M., Santos-Fita D. & Santos E.B. 2011. Hunting activities and wild fauna use: a profile of Queixo D'antas community, Campo Formoso, Bahia, Brazil. *Biorem. Biodiv. Bioavil.* 5(1):34-43.
- Destro G.F.G., Pimentel T.L., Sabaini R.M., Borges R.C. & Barreto R. 2012. Efforts to combat wild animals trafficking in Brazil, p.421-436. In: Lameed G.A. (Ed.), *Biodiversity Enrichment in a Diverse World*. InTech, Rijeka, Croatia.
- Franco M.R., Câmara F.M., Rocha D.C.C., Souza R.M. & Oliveira N.J.F. 2012. Animais silvestres apreendidos no período de 2002 a 2007 na macrorregião de Montes Claros, Minas Gerais. *Enciclopédia Biosfera* 8(14):1007-1018.
- Fuccio H., Carvalho E.F. & Vargas G. 2003. Perfil da caça e dos caçadores no Estado do Acre, Brasil. *Revta Aportes Andinos* 6:1-18.
- Hamada H.H. 2004. Tráfico de animais silvestres-uma abordagem analítica do fenômeno criminal no estado de Minas Gerais. *O Alferes* 19(56):59-82.
- Hernandez E.F.T. & Carvalho M.S. 2006. O tráfico de animais silvestres no Estado do Paraná. *Acta Scient., Human Social Sci.* 28(2):257-266. <<https://dx.doi.org/10.4025/actascihumansoc.v28i2.168>>
- IBAMA 2002. Quantitativo de espécimes recebidos nos núcleos de fauna e CETAS em 2002. Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis. Available at <http://www.ibama.gov.br/fauna/trafico/downloads/dados_2002.pdf> Accessed on Jan. 12, 2020.
- ICMBio 2014. Tráfico de animais contribui para extinção de espécies. Instituto Chico Mendes de Conservação da Biodiversidade. Available at <<https://www.icmbio.gov.br/portal/ultimas-noticias/4905-traffic-de-animais-contribui-para-extincao-de-especies>> Accessed on Jan. 12, 2019.
- Insaualde A.L., Guia M. & Felix G. 2010. O tráfico de animais e suas consequências. *Anais XVI Encontro Nacional de Geógrafos, Porto Alegre, RS*, p.1-10. (Resumo)
- Lopes J.C.A. 2003. Operações de fiscalização da fauna: análise, procedimentos e resultados. p.15-49. In: RENTAS (Eds), *Animais Silvestres: vida à venda*, 2ª ed. RENTAS, Brasília.
- Masés-García C.A., Briones-Salas M. & Sosa-Escalante J.E. 2021. Assessment of wildlife crime in a high-biodiversity region of Mexico. *J. Nat. Conserv.* 59:125932. <<https://dx.doi.org/10.1016/j.jnc.2020.125932>>
- Mendes F.L.S. 2018. Apreensão de aves silvestres brasileiras que foram exportadas ilegalmente para Portugal. *Revta Bras. Zool.* 19(1):56-66. <<https://dx.doi.org/10.34019/2596-3325.2018.v19.24688>>
- Mendes F.L.S., Simonian L.T.L. & Mendonça Y.D.S.M. 2016. Análise comparativa de apreensões de animais silvestres em dois estados da região Amazônica. *Revta Bras. Geogr. Fís.* 9(2):658-666. <<https://dx.doi.org/10.26848/rbgf.v9.2.p658-666>>
- Nassaró A.L.F. 2015. Tráfico de animais silvestres e policiamento ambiental (oeste do Estado de São Paulo, 1998 a 2012). *Cultura Acadêmica, São Paulo*, p.22-30.
- Pagano I.S.A., Sousa A.E.B.A., Wagner P.G.C. & Ramos R.T.C. 2009. Aves depositadas no centro de triagem de animais silvestres do IBAMA na Paraíba: uma amostra do tráfico de aves silvestres no estado. *Ornithologia* 3(2):132-144.
- Pimentel P.C.B. & Santos J.M. 2009. Diagnóstico do tráfico de animais silvestres no estado da Bahia: identificação, quantificação e caracterização das espécies-alvo. *Diálogos Ciência, Revta Rede Ensino FTC* 3(8):35-44.
- RENTAS 2002. I Relatório nacional sobre o tráfico da fauna silvestre. Rede Nacional de Combate ao Tráfico de Animais Silvestres, Brasília, p.108.
- Rocha M.D.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. *Revta Biol. Ciênc. Terra* 6(2):204-221.
- Roskov Y., Ower G., Orrell T., Nicolson D., Bailly N., Kirk P.M., Bourgoin T., Dewalt R. E., Decock W., Nieukerken E., Zarucchi J. & Penev L. 2019. Species 2000 & ITIS Catalogue of Life, 2019 Annual Checklist. Available at <www.catalogueoflife.org/annual-checklist/2019> Accessed on Jan. 16, 2020.
- SEMA/PMA-SP 2006. Tráfico de animais da fauna silvestre nacional. Dados estatísticos e estratégias operacionais 2001-2005. Secretaria Estadual do Meio Ambiente e Polícia Militar Ambiental do Estado de São Paulo, São Paulo, p.1-26. Available at <https://www.cetesb.sp.gov.br/noticentro/2006/07/17_pm.pdf> Accessed on Jan. 10, 2019.
- Silva E.M., Oliveira E.L.R., Lima V.F.S., Borges J.C.G. & Porto W.J.N. 2015. Aves silvestres comercializadas ilegalmente em feiras livres da cidade de Arapiraca, Alagoas. *Enciclopédia Biosfera* 11(21):2045-2057.
- Souza G.M. & Soares Filho A.O. 2005. O comércio ilegal de aves silvestres na região do Paraguaçu e Sudoeste da Bahia. *Enciclopédia Biosfera* (1):1-11.
- Souza V.L., Santos T.M., Peña A.P., Luz V.L.F. & Reis I.J. 2007. Caracterização dos répteis descartados por mantenedores particulares e entregues ao centro de conservação e manejo de répteis e anfíbios-RAN. *Revta Biol. Neotrop.* 4(2):149-160. <<https://dx.doi.org/10.5216/rbn.v4i2.5215>>
- UNODC 2020. World Wildlife Crime Report 2020. United Nations Office on Drugs and Crime. Available at <https://www.unodc.org/documents/data-and-analysis/wildlife/2020/World_Wildlife_Report_2020_9July.pdf> Accessed on Sep. 14, 2020.
- Vilela D.A.R. 2012. Diagnóstico de situação dos animais silvestres recebidos nos CETAS brasileiros e *Chlamydomophila psittaci* em papagaios (*Amazona aestiva*) no CETAS de Belo Horizonte, MG. Doctoral Dissertation, Universidade Federal de Minas Gerais, Belo Horizonte. 128p.