CRIMES CONTRA ANIMAIS SILVESTRES NO OESTE CATARINENSE: UMA ANÁLISE A PARTIR DE AUTUAÇÕES E APREENSÕES REALIZADAS PELA POLÍCIA MILITAR AMBIENTAL DE CHAPECÓ

CRIMES AGAINST WILD ANIMALS IN THE WEST OF SANTA CATARINA, BRAZIL: AN ANALYSIS FROM ASSESSMENTS AND SEIZURES CARRIED OUT BY THE ENVIRONMENTAL MILITARY POLICE OF CHAPECÓ

Eliara Solange Müller[1]
Mariléa Fátima Mattiazzo[2]
Angélica Soligo Cassol[3]
Vanessa Barbisan Fortes[4]

Submetido: 19/02/2021 / Aprovado: 15/06/2022 / Publicado: 04/07/2022.

Resumo

Diversos relatos realizados por órgãos públicos estão relacionados a condutas que, em conjunto, podem constituir tráfico de animais, que, juntamente com outras práticas antrópicas, contribuem para o processo de declínio das espécies animais. Nosso objetivo foi caracterizar os crimes ambientais relacionados à fauna na área de jurisdição da Polícia Militar Ambiental de Chapecó (PMAC), no estado de Santa Catarina. Para tanto, foi realizado levantamento documental nos arquivos da PMAC no período de janeiro/1999 a dezembro/2017. Os crimes ambientais relacionados à fauna envolveram 196 denúncias, das quais 56 resultaram em autuações e 1.016 animais foram apreendidos em 33 municípios. Chapecó foi o município com maior número de casos (97 autuações/539 animais apreendidos), mas os valores *per capita* estão abaixo de 56,2% dos municípios pesquisados. Do total de animais apreendidos, 980 eram aves, 28 eram mamíferos, seis eram lagartos e dois eram tartarugas. A maioria dos animais apreendidos foi solta na natureza (752). É provável que os dados não representem a quantidade real de animais silvestres mantidos em cativeiro ou caçados na região devido à dificuldade de fiscalização e/ou estrutura para alocação adequada dos animais.

Palavras-chave: Crimes ambientais. Tráfico de animais silvestres. Aves.

[1] PhD in Diversity and Wildlife Management, Community University of Chapecó Region, School of Agriculture and Environment, Biological Sciences course, Chapecó, Santa Catarina, Brazil. E-mail: eliara@unochapeco.edu.br.
[2] Master in Environmental Sciences. Military Police of Santa Catarina, Environmental Military Police of Chapecó, Chapecó, Santa Catarina, Brazil. E-mail: marileafatima@yahoo.com.br.
[3] Master in Environmental Sciences. Community University of Chapecó Region, School of Agriculture and Environment, Postgraduate Program, stricto sensu, in Environmental Sciences, Chapecó, Santa Catarina, Brazil. E-mail: angelicaed@unochapeco.edu.br.
[4] PhD in Zoology. Federal University of Santa Maria, Department of Animal Science and Biological Sciences, Palmeira das Missões, RS, Brazil. E-mail: barbisan.vanessa@gmail.com.

DOI: http://dx.doi.org/10.24021/raac.v19i1.6108 Vol. 19, N. 1 (2022)

Abstract

Several reports carried out by public agencies are related to conducts that altogether may constitute animal trafficking, which, along with other anthropic practices, contribute to the process of decline in animal species. Our objective was to collect data on environmental crimes related to fauna in the area of jurisdiction of the Environmental Military Police of Chapecó (EMPC), in the state of Santa Catarina_Brazil. For that, a documentary survey was carried out in the archives of that EMPC from January/1999 to December/2017. Environmental crimes related to fauna comprised 196 complaints, with 56 of them resulting in assessments, and 1,016 animals were seized in 33 municipalities. Chapecó was the municipality with the largest number of cases (97 assessments/539 animals seized), but the *per capita* values are below of 56.2% of the surveyed municipalities. Out of the total number of animals seized, 980 were birds, 28 were mammals, six were lizards and two were turtles. Most of the animals seized were released into nature (752). It is likely that the data do not represent the actual amount of wild animals kept in captivity or hunted in the region because of the difficulty of the inspection and/or structure for proper allocation of the animals.

Keywords: Environmental crimes. Trafficking in wildlife. Birds.

1. INTRODUCTION

Hunting and capture, besides habitat loss and degradation, are among the main factors that threaten the wildlife (PRIMACK and RODRIGUES, 2001; LIMA, 2007). The poaching of thousands of wild animals from their natural environment causes loss of genetic diversity and alters the ecosystems' structure, interfering on biological processes such as imbalance of trophic networks and reduction of zoocorical dispersers (REDFORD, 1992). Wildlife trade also causes impacts on the economy, since it is the third largest illegal traffic in the world (RENCTAS, 2007). Birds are the main target of traffic, and there are at least 295 bird species being traded as pets in Brazil (ALVES et al., 2013). This commerce moves around US$ 10-20 billion per year, Brazil contributing to 10% to 15% of this amount of money, especially as it is considered a source of animals for international trade (RENCTAS, 2007).

From 2002 to 2009, in a country level, a total of 302,977 animals (were not considered so exotic) arrived at the Wild Animals Triage Centers (CETAS) from seizures, rescue (capture of the animal due to a request from the population) and voluntary deliveries (DESTRO et al., 2012). As regards captures, the Southeast region stands out with the highest number of assessments (DESTRO et al., 2012), as it is the region with the highest demand for animals from national and international trade (DESTRO et al., 2012; BORGES et al., 2006; LOPES, 2003). The Brazilian National Network for Combating Wildlife Trafficking produced and made available five maps that highlight the main terrestrial routes used to wildlife trade in Brazil (RENCTAS, 2001). The North, Northeast and Central-West regions of the country are the places where the majority of wildlife poaching occurs; the Southeast region is the main destination of these animals, due to the significant number of consumers (BORGES et al., 2006) and it is a promoter of national and international trade, while the South region is considered a traffic passageway (LOPES, 2003). The South region's map presents a route that passes in the west of Santa Catarina and highlights the municipality of Chapecó as a place for animal sales (RENCTAS, 2001).

In Brazilian environmental legislation there is no crime typified as "wildlife smuggling", but there are penalties for certain conducts towards wildlife such as capturing, transporting, abusing, killing, persecuting, hunting and keeping in captivity, that combined can be interpreted as animal trafficking (BRAZIL, 1998). The wildlife trade is related to cultural issues, status and personal satisfaction when having wildlife as pets, misinformation of the population, education, poverty, lack

of economic options and desire for quick and easy profit (RENCTAS, 2007; AZEVEDO et al., 2017). The assessments carried out by public inspection agencies related to the fauna point out the existence of animal trade and may become a way to minimize this illegal activity and stimulate environmental conservation. In order to do so, the population should be warned that capturing in the wild and illegally raising wild animals is an environmental crime (AVELAR et al., 2015).

Wildlife crime is just one portion of a much bigger issue and although there is some active research in the area, there is a lack of a focused effort that is backed by resources and political support (WILSON-WILDE, 2010). Given this reality, it is important to analyze the environmental crimes related to the fauna that were handled by the Environmental Military Police of Chapecó (EMPC), which is one of the public agencies responsible for inspecting and repressing this environmental crime in the region. Therefore, the aim of this study was to characterize environmental crimes related to fauna in the EMPC jurisdiction, Santa Catarina, Brazil. The data analysis will allow a more detailed overview of this region as part of the national routes of animal trafficking, and may contribute to the elaboration of future proposals to combat such crimes, such as greater efficiency in inspection and environmental education work.

2. MATERIAL AND METHODS

The western region of the state of Santa Catarina is within the Atlantic Forest biome (IBGE, 2008). The region, that was originally covered by the Seasonal Deciduous Forest, Ombrophylous Mixed Forest, and is in the southwest direction. There are fields of fresh water, which are characterized by the presence of araucarias - *Araucaria angustifolia* (Bertol.) Kuntze – interrupted by the occurrence of fields (Klein 1978; IBGE 2004a), and is currently characterized by predominance of secondary vegetation and agricultural activities (IBGE, 2004a; 2004b). Considering this context, anthropogenic pressures on the remnants of natural habitats, which jeopardizes the wildlife, are common, and actions aimed at cohibition and punishment of such crimes are constantly demanded to the responsible public institutions.

In this study we surveyed the archives of the Environmental Military Police of Chapecó (EMPC), covering the period from January 1999 to December 2017, searching for crimes related to the fauna. The data extracted from the archives were: number of reports, assessments and seized animals, the species involved and the destination. The EMPC jurisdiction covers currently 45 municipalities in the western region of Santa Catarina (Fig. 1), but we actually surveyed records of environmental crimes from the 56 municipalities that used to integrate this jurisdiction in the past. We computed the animals that were seized, grouping them according to their taxonomic categories. The taxonomy of mammal species follows Paglia et al. (2012) with the exception of the European hare, whose nomenclature follows Reis et al. (2006), the bird species follows (PIACENTINI et al., 2015) and the lizards and tortoises follow Costa and Bérnils (2018).

To calculate the annual index of seized animals *per capita* the total number of animals seized in each municipality was divided by the number of years covered by the data, and by the number of the municipality inhabitants. The number of inhabitants in each municipality was based on the census held by the Brazilian Institute of Geography and Statistics in 2010 (IBGE, 2010). We also calculated this index to some published data regarding other municipalities (BORGES et al., 2006; LONGATTO and SEIXAS, 2004; PREUSS and SCHAEDLER, 2011; VIANA and ZOCCHE, 2013), in order to compare with data from our own survey.

We tested the relationship between (1) the number of seized animals, or (2) the number of assessments applied by the EMPC, and the number of faunal crime reports that were attended by the EMPC, using a linear regression (PAST PAleontological STatistics Version 3.22). The reported crimes included hunting, transportation, and captivity keeping of wildlife.

DOI: http://dx.doi.org/10.24021/raac.v19i1.6108 Vol. 19, N. 1 (2022)

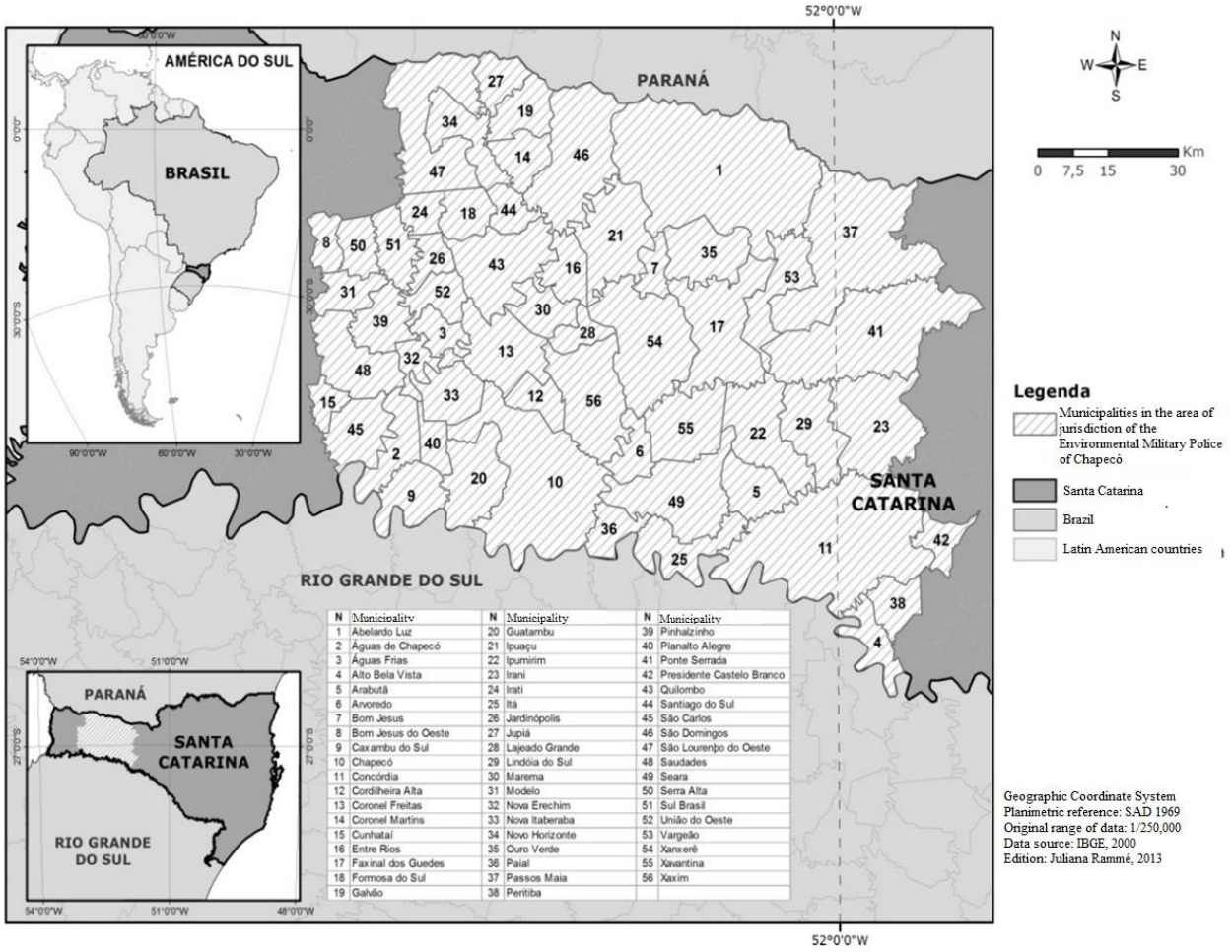

Fig. 1 - Municipalities covered by the jurisdiction of the Environmental Military Police of Chapecó (EMPC).

3. RESULTS AND DISCUSSION

During the studied period the EMPC attended 196 reports of environmental crimes related to fauna, and seized 1,016 animals in 33 municipalities. Most of them – 980 individuals – belonged to the taxon Aves (96.4%), 28 to Mammalia (2.9%), six to Reptiles/Squamata (0.6%), and two to Reptiles/Testudines (0.2%). The seized animals were classified in 59 species: 50 species of birds, seven of mammals, one of lizard, and one of turtle (Table 1). Among the 15 families in the class Birds, the most representative were: Thraupidae (n=334; 34.1%), Cardinalidae (n=256; 26.4%), Fringillidae (n=128; 13.1%), Columbidae (n=109; 11.1%), Psittacidae (n=62; 6.3%), and Turdidae (n=44; 4.5%) (Fig. 2). Of the 28 seized mammals we found 10 capybaras (*Hydrochoerus hydrochaeris* Linnaeus, 1766), of which two individuals were found slaughtered, probably for meat consumption; five armadillos (one *Euphractus sexcinctus* Linnaeus, 1758, two *Dasypus novemcinctus* Linnaeus, 1758 and two individuals of unidentified species); six coatis (*Nasua nasua* Linnaeus, 1766); three brown capuchin monkeys (*Sapajus nigritus* Linnaeus, 1758); one southern anteater (*Tamandua tetradactyla* Linnaeus, 1758); one European hare (*Lepus europaeus* Pallas, 1778, exotic species); and the carcasses of two unidentified mammals. The seized reptiles were six lizards (*Salvator merianae* Duméril and Bibron, 1839) and two tortoises (*Trachemys dorbigni* Duméril and Bibron, 1835).

DOI: http://dx.doi.org/10.24021/raac.v19i1.6108 Vol. 19, N. 1 (2022)

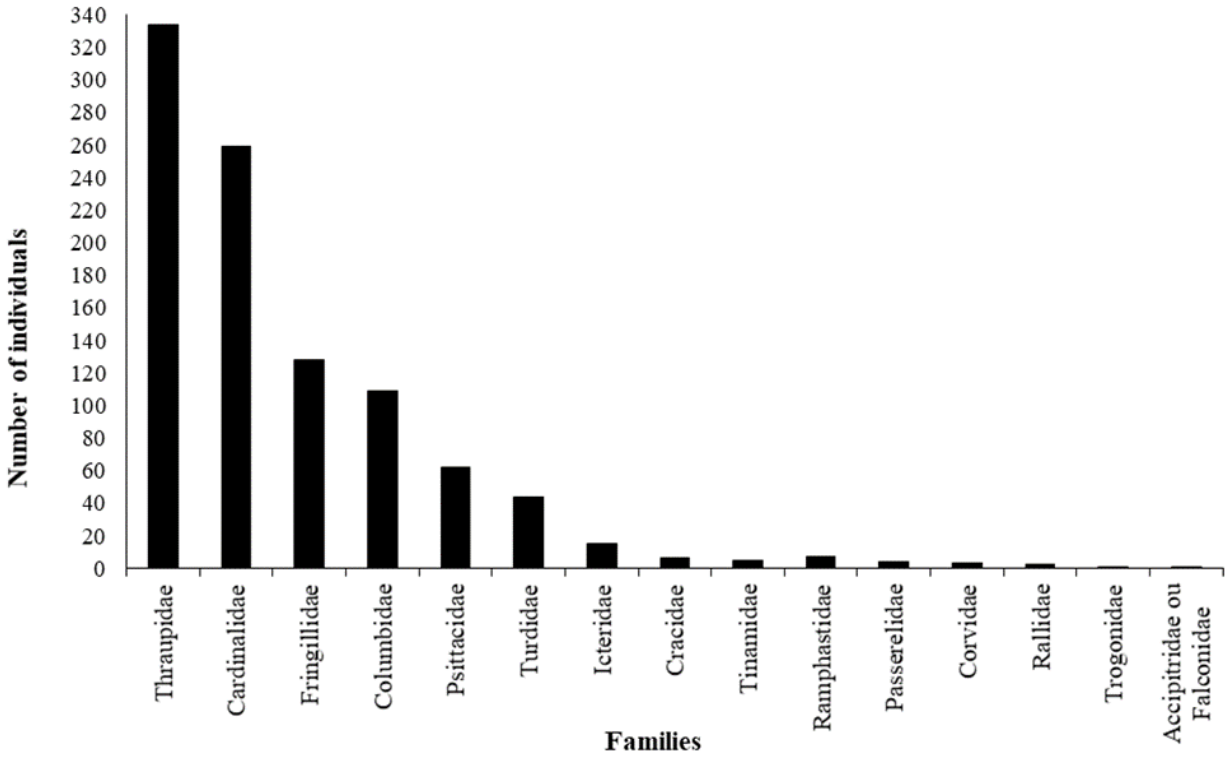

Fig. 2 - Number of individuals seized in each Birds' family in the west of Santa Catarina.

Among the birds seized there were two species threatened with extinction. The vinaceous-breasted amazon, *Amazona vinacea* (Linnaeus, 1758) is "Endangered" according to both the Red List of the International Union for Conservation of Nature (BIRDLIFE INTERNATIONAL, 2017), and the List of Fauna Threatened of Extinction in Santa Catarina (CONSEMA, 2011), and "Vulnerable" according to the list of Brazilian Fauna Threatened of Extinction (BRAZIL 2014). The chestnut-bellied seed-finch, *Sporophila angolensis* (Linnaeus, 1766), appears as "Critically Endangered" in the list of the state of Santa Catarina (CONSEMA, 2011).

Of the 33 municipalities in which there were faunal apprehensions, Chapecó stood out with the highest number of assessments (n=97, 50.8%), followed by the municipality of Coronel Freitas (n=10, 5.2%) (Fig. 3). Chapecó had also the highest number of seized animals (n=539, 53.1%), followed by Modelo (n=63, 6.6%), Coronel Freitas (n=51, 5.4%), and São Lourenço do Oeste (n=43, 4.5%) (Fig. 3). The highest annual *per capita* rate of animals seized recorded was for Modelo (0.00083 animal apprehended per person), followed by Bom Jesus do Oeste, Coronel Freitas, Entre Rios, Lajeado Grande, Passos Maia, Vargeão and Marema (Table 2). Neither the number of assessments ($r^2=0.013$, $p=0.65$) nor the number of animals seized ($r^2<0.001$, $p=0.95$) were related to the number of complaints attended by the EMPC. The highest number of assessments occurred in 2009 (n=29, 14.8%), followed by 2006 (n=23, 11.7%), whereas the highest number of animals seized was 2006 (n=126, 12.4%), followed by 2017 (n=116, 11.4%) (Fig. 4; Table 1).

DOI: http://dx.doi.org/10.24021/raac.v19i1.6108 Vol. 19, N. 1 (2022)

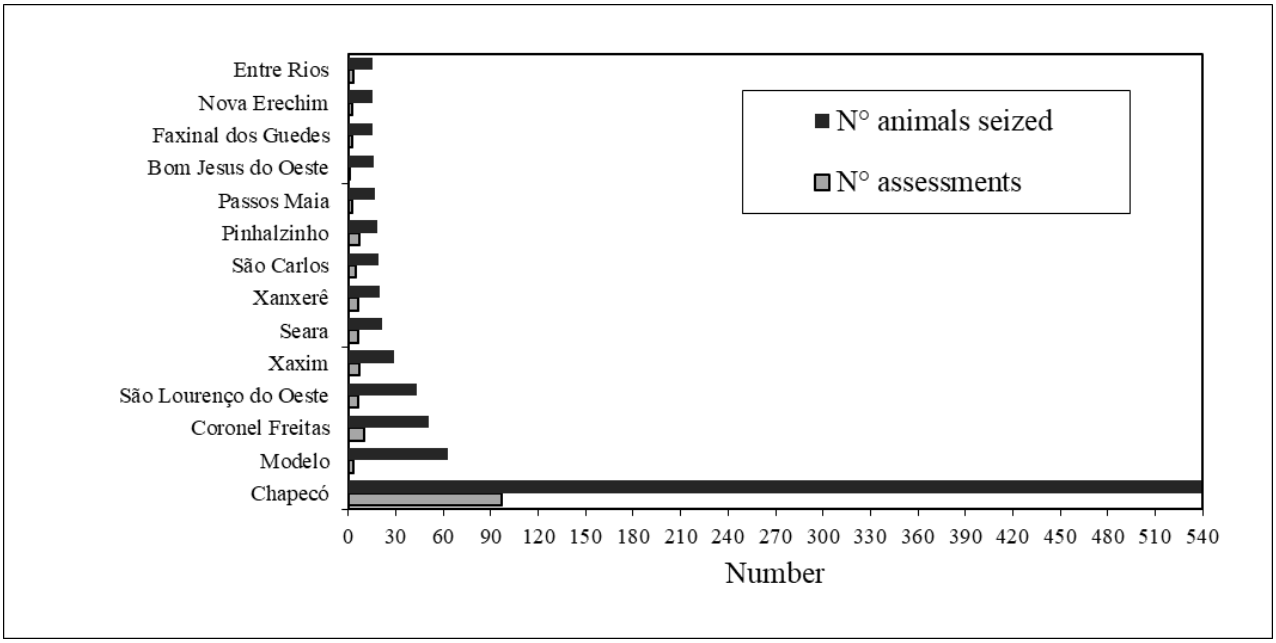

Fig. 3 - Number of assessments and animals seized by municipality of the west of Santa Catarina. In the figure are only the municipalities with the highest absolute number of assessments and animals seized.

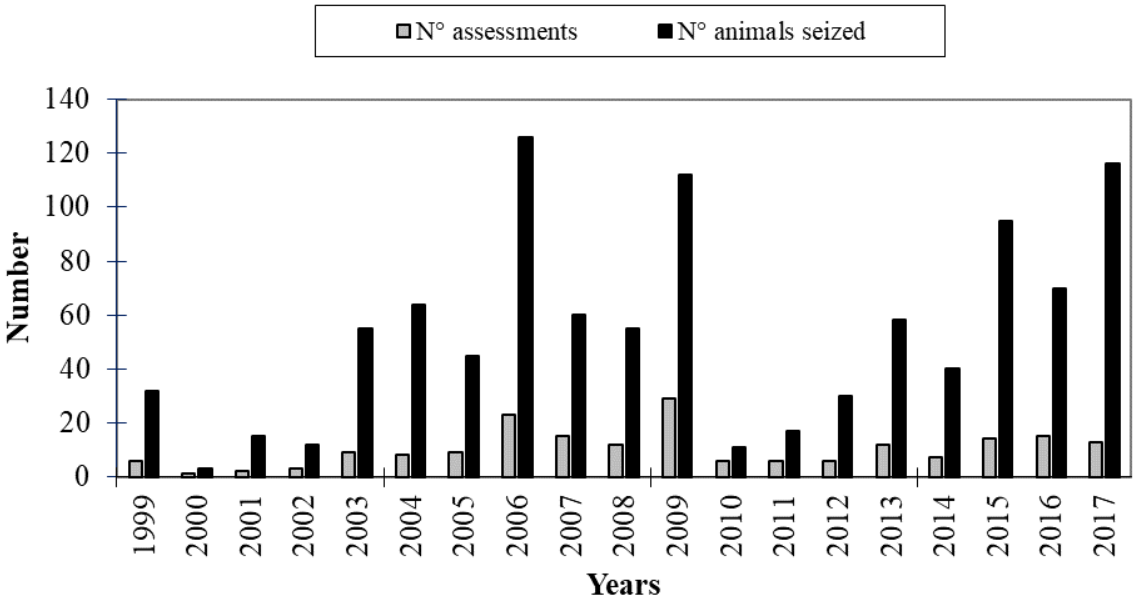

Fig. 4 - Number of assessments and animals seized per year in the west of Santa Catarina.

The animals seized by the EMPC had the following destinies: 752 (74%) were released into nature, 109 (10.7%) were buried, 101 (9.9%) were given to a bona-fide depositary, 21 (2.4%) destined to a triage center of wild animals (CETAS) in the municipality of Florianópolis, 24 (2.1%) destined to a higher education institution, seven (0.7%) incinerated and two (0.2%) destined to a commercial breeding (see Table 1).

DOI: http://dx.doi.org/10.24021/raac.v19i1.6108 Vol. 19, N. 1 (2022)

Table 1 - List of animals seized by the Environmental Military Police of Chapecó from January 1999 to December 2017, within its area of jurisdiction.

ORDER Family (idae) Species	Popular name	Number of individuals	Location	Destination	Year
Mammals					
XENARTHRA (3)					
Myrmecophagidae (1)					
Tamandua tetradactyla Linnaeus, 1758	SouthernTamandua	1	AL	IHE	1999
Dasypodidae (2)					
Euphractus sexcinctus Linnaeus, 1758	Six-banded Armadillo	1	CH	BU	2003
Dasypus novemcintus Linnaeus, 1758	Nine-banded Armadillo	2	CH	BU	2010
Unidentified	Armadillo	2	XXE, V	BU	2007, 2013
RODENTIA (1)					
Caviidae (1)					
Hydrochoerus hydrochaeris Linnaeus, 1766	Capybara	10	AL, SA, CH	BU, BFD	1999, 2006, 2008
PRIMATES (1)					
Cebidae (1)					
Sapajus nigritus (Goldfuss, 1809)	Black-horned Tufted Capuchin	3	S, CH	BU, CB, BFD	2007, 2008, 2009
LOGOMORPHA (1)					
Leporidae (1)					
Lepus europaeus Pallas, 1778	European Hare	1	PM	BU	2001
CARNIVORA (1)					
Procyonidae (1)					
Nasua nasua Linnaeus, 1766	South American Coati	6	CH, CF	BFD, IHE	2006, 2008, 2013
UNIDENTIFIED*		2	CX	IHE	2003
AVES					
TINAMIFORMES (2)					
Tinamidae (2)					

DOI: http://dx.doi.org/10.24021/raac.v19i1.6108 Vol. 19, N. 1 (2022)

Rhynchotus rufescens (Temminck, 1815)	Red-winged Tinamou	1	PM	IHE	1999
Nothura maculosa (Temminck, 1815)	Spotted Nothura	4	PM	IHE	1999
GALLIFORMES (1)					
Cracidae (1)					
Penelope obscura Temmnick, 1815	Dusky-legged Guan	6	NI, XXI	RE, IHE	1999, 2014
ACCIPITRIFORMES ou FALCONIFORMES (1)					
Accipitridae ou Falconidae (1)					
Unidentified	Kite or falcon	1	PM	BU	2001
GRUIFORMES (2)					
Rallidae (2)					
Aramides saracura (Spix, 1825)	Slaty-breasted Wood-Rail	1	CX	IHE	1999
Gallinula galeata (Lichtenstein, 1818)	Common Gallinule	1	SA	RE	2006
COLUMBIFORMES (5)					
Columbidae (5)					
Patagioenas picazuro (Temminck, 1813)	Picazuro Pigeon	78	CF, AL, BJ, MO, CH	RE, BU, BFD	2004, 2009, 2014, 2015, 2017
Patagioenas cayennensis (Bonnaterre, 1792)	Pale-vented Pigeon	1	MO	BU	2015
Zenaida auriculata (Des Murs, 1847)	Eared Dove	4	CH, BJO	RE, BU	2011, 2014
Leptotila verreauxi Bonaparte, 1855	White-tipped Dove	1	Q	RE	2012
Leptotila rufaxilla (Richard & Bernard, 1792)	Gray-fronted Dove	5	V	IHE	2003
Unidentified	Dove	20	PM, ER, V	BU, INC	2001, 2003, 2013
TROGONIFORMES (1)					
Trogonidae (1)					
Trogon surrucura Vieillot, 1817	Surucua Trogon	1	CH	BU	2010
PICIFORMES (1)					
Ramphastidae (1)				BU	
Ramphastos dicolorus Linnaeus, 1766	Red-breasted Toucan	7	A, SC, JU	BFD, RE	2007, 2010, 2017
PSITTACIFORMES (6)					
Psittacidae (6)					
Eupsittula aurea (Gmelin, 1788)	Peach-fronted Parakeet	1	CH	BFD	2012

DOI: http://dx.doi.org/10.24021/raac.v19i1.6108 Vol. 19, N. 1 (2022)

Pyrrhura frontalis (Vieillot, 1817)	Maroon-bellied Parakeet	1	CH	CETAS	2007
Pionopsitta pileata (Scopoli, 1769)	Pileated Parrot	7	CF, M, CH	RE, BFD, CETAS	2002, 2007, 2009, 2017
Pionus maximiliani (Kuhl, 1820)	Scaly-headed Parrot	12	G, XXE, CH, SU, M, ER	BFD, RE, CB	2002, 2006, 2007, 2010, 2011, 2015, 2016, 2017
Amazona vinacea (Kuhl, 1820)	Vinaceous-breasted Parrot	5	CH, SD, ER	BFD	2006, 2009, 2012, 2015
Amazona aestiva (Linnaeus, 1758)	Turquoise-fronted Parrot	25	AL, CH, S, XXE, ITA, XXI, ACH	BFD, BU, CETAS	2001, 2003, 2006, 2007, 2008, 2009, 2010, 2011, 2013, 2014, 2015, 2016
Unidentified		11	G, CH, A	BU, RE, BFD	2002, 2006, 2007, 2010
PASSERIFORMES (31)					
PASSERI (31)					
Corvidae (1)					
Cyanocorax chrysops (Vieillot, 1818)	Plush-crested Jay	3	NI	RE	1999
Turdidae (5)					
Turdus flavipes Vieillot, 1818	Pale-eyed Thrush	1	CH	CETAS	2017
Turdus rufiventris Vieillot, 1818	Rufous-bellied Thrush	23	CH, PM, XXI, CF, XXE, CX	RE, IHE	1999, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2012, 2013, 2017
Turdus amaurochalinus Cabanis, 1850	Creamy-bellied Thrush	4	CH, CF	RE	2004, 2006
Turdus subalaris (Seebohm, 1887)	Eastern Slaty Thrush	1	CH	IHE	1999
Turdus albicollis Vieillot, 1818	White-necked Thrush	2	CH	RE	2007, 2017
Turdus sp.	Thrush	13	PM, SLO, XXI, CH	BU, CETAS, RE	2001, 2004, 2005, 2006, 2014
Passerellidae (1)					
Zonotrichia capensis (Statius Muller, 1776)	Rufous-collared Sparrow	4	CH, SLO	RE, CETAS	2006, 2008, 2013, 2017
Icteridae (4)					
Cacicus chrysopterus (Vigors, 1825)	Golden-winged Cacique	4	S, CH	BFD, RE	2007, 2009, 2016
Icterus pyrrhopterus (Vieillot, 1819)	Variable Oriole	1	CH	CETAS	2017
Gnorimopsar chopi (Vieillot, 1819)	Chopi Blackbird	1	XXE	RE	2009
Molothrus bonariensis (Gmelin, 1789)	Shiny Cowbird	9	SLO, CH, S	BFD, RE, CETAS	2004, 2006, 2007, 2008
Thraupidae (16)					

DOI: http://dx.doi.org/10.24021/raac.v19i1.6108 Vol. 19, N. 1 (2022)

Coryphospingus pileatus (Wied, 1821)	Pileated Finch	1	CH	CETAS	2017
Coryphospingus cucullatus (Statius Muller, 1776)	Red-crested Finch	25	CH, CA, XXI, SC, ITA, Q	RE	2003, 2004, 2005, 2006, 2007, 2009, 2012, 2013, 2016, 2017
Ramphocelus bresilius (Linnaeus, 1766)	Brazilian Tanager	1	CH	BU	2017
Paroaria coronata (Miller, 1776)	Red-crested Cardinal	27	CH, CF, XXE, PIN, SC, PA	RE, BFD	2003, 2004, 2006, 2008, 2009, 2012, 2013, 2014, 2016, 2017
Tangara seledon (Statius Muller, 1776)	Green-headed Tanager	1	CH	BU	2017
Tangara cyanocephala (Statius Muller, 1776)	Red-necked Tanager	1	CH	CETAS	2017
Tangara sayaca (Linnaeus, 1766)	Sayaca Tanager	1	CH	RE	2016
Pipraeidea bonariensis (Gmelin, 1789)	Blue-and-yellow Tanager	2	CH	RE, BU	2005, 2017
Stephanophorus diadematus (Temminck, 1823)	Diademed Tanager	1	CH	RE	2017
Sicalis flaveola (Linnaeus, 1766)	Saffron Finch	87	XXI, CH, S, PA, CA, SLO, NE, SC, PIN, ITA, Q, CX, UO	RE, BFD	2003, 2004, 2005, 2006, 2007, 2008, 2009, 2011, 2012, 2013, 2014, 2015, 2016, 2017
Sporophila lineola (Linnaeus, 1758)	Lined Seedeater	1	ER	BFD	2013
Sporophila frontalis (Verreaux, 1869)	Buffy-fronted Seedeater	1	CH	CETAS	2017
Sporophila caerulescens (Vieillot, 1823)	Double-collared Seedeater	75	XXI, CH, CX, GL, PA, AL, NE, ITA, PIN, CF, SLO, ER, SC	RE, BFD	2002, 2003, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017
Sporophila angolensis (Linnaeus, 1766)	Chestnut-bellied Seed-Finch	2	CH	RE	2000, 2006
Sporophila sp.		1	CH	RE	2006
Saltator similis D`Orbigny & Lafresnaye, 1837	Green-winged Saltator	106	CF, CH, XXI, M, XXE, NE, PIN, S, SLO, Q, FG, SC	RE, BFD, BU, CETAS	2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017
Saltator aurantiirostris Vieillot, 1817	Golden-billed Saltator	1	CH	CETAS	2017
Cardinalidae (2)					

DOI: http://dx.doi.org/10.24021/raac.v19i1.6108 Vol. 19, N. 1 (2022)

Cyanoloxia glaucocaerulea (d'Orbigny & Lafresnaye, 1837)	Glaucous-blue Grosbeak	13	CH, CF, CX	RE, CETAS	1999, 2003, 2004, 2013, 2015, 2017
Cyanocompsa brissonii (Lichtenstein, 1823)	Ultramarine Grosbeak	246	CH, XXI, CF, CA, SLO, PIN, S, PA, MO, CX, M, SU, Q, AL, XXE, NE, SC, G, S, LG, UO, ER, FG	RE, IHE, BFD, CETAS	1999, 2000, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017
Fringilidae (2)					
Spinus magellanicus (Vieillot, 1805)	Hooded Siskin	126	XXI, CF, CH, CA, SLO, PIN, MO, XXE, PA, CX, S, GL, NE, PA, G, ITA, LG, AL, UO, ER	RE, BFD	2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017
Euphonia chalybea (Mikan, 1825)	Green-throated Euphonia	2	CF, XXI	RE	2004, 2005
REPTILE					
SQUAMATA (1)					
Teiidae (1)					
Salvator merianae Duméril & Bibron, 1839	Argentine Black and White Tegu	6	SC, V, ACH	BFD, BU	2007, 2013, 2014
TESTUDINES (1)					
Emydidae (1)					
Trachemys dorbigni (Duméril & Bibron, 1835)	D'Orbigny's slider turtle	2	CH	CETAS	2017

Location: AL-Abelardo Luz, CH-Chapecó, XXE-Xanxerê, V-Vargeão, SA-Serra Alta, S-Seara, PM-Passos Maia, CF-Coronel Freitas, CX-Caxambú do Sul, NI-Nova Itaberaba, XXI-Xaxim, BJ-Bom Jesus, MO-Modelo, BJO-Bom Jesus do Oeste, Q-Quilombo, ER-Entre Rios, A-Arvoredo, SC-São Carlos, J-Jupiá, M-Marema, G-Guatambu, SU-Saudades, SD-São Domingos, ITA-Itá, ACH-Águas de Chapecó, SLO-São Lourenço do Oeste, PA-Planalto Alegre, PIN-Pinhalzinho, UO-União do Oeste, FG-Faxinal dos Guedes, CA-Cordilheira Alta, NE-Nova Erechim, LG-Lageado Grande, GL-Galvão.
Destination: IHE-Institution of Higher Education, BU-Burried, INC-Incinerated, BFD-Bona-fide depositary, CB-Commercial Breeding, RE-Released into the environment, CETAS-Wild Animals Triage Centers.

DOI: http://dx.doi.org/10.24021/raac.v19i1.6108 Vol. 19, N. 1 (2022)

Table 2 - Number of animals seized, time of study and number of animals per capita by municipality or state. The table has only the data with the highest per capita index of each job.

Local	**Nº animals**	Time of study	**Animals seized/year *per capita***	**Author**
Modelo (SC)	63	18 years	0,00083	This study
Bom Jesus do Oeste (SC)	16	18 years	0,00041	This study
Coronel Freitas (SC)	51	18 years	0,00028	This study
Entre Rios (SC)	15	18 years	0,00026	This study
Lajeado Grande (SC)	6	18 years	0,00023	This study
Passos Maia (SC)	17	18 years	0,00022	This study
Vargeão (SC)	13	18 years	0,00020	This study
Marema (SC)	7	18 years	0,00020	This study
Iraceminha (SC)	14	5 years	0,00069	Preuss & Schaedler (2011)
São Miguel do Oeste (SC)	89	5 years	0,00045	Preuss & Schaedler (2011)
Anchieta (SC)	13	5 years	0,00045	Preuss & Schaedler (2011)
Descanso (SC)	15	5 years	0,00036	Preuss & Schaedler (2011)
Maravilha (SC)	35	5 years	0,00028	Preuss & Schaedler (2011)
Guarujá do Sul (SC)	7	5 years	0,00027	Preuss & Schaedler (2011)
Treviso (SC)	47	8 years	0,00152	Viana & Zocche (2013)
Morro Grande (SC)	35	8 years	0,00150	Viana & Zocche (2013)
Meleiro (SC)	66	8 years	0,00117	Viana & Zocche (2013)
Jacinto Machado (SC)	74	8 years	0,00088	Viana & Zocche (2013)
Timbé do Sul (SC)	31	8 years	0,00084	Viana & Zocche (2013)
Siderópolis (SC)	153	8 years	0,00083	Viana & Zocche (2013)
São João do Sul (SC)	23	8 years	0,00076	Viana & Zocche (2013)
Juiz de Fora (MG)	1.629	2 years	0,00144	Borges *et al.* (2006)
Imperatriz (MA)	1257	3 years	0,00165	Azevedo *et al.* (2017)
Jaraguari (MS)	366	4 years	0,01304	Longatto & Seixas (2004)
Três Lagoas (MS)	353	4 years	0,00075	Longatto & Seixas (2004)
Campo Grande (MS)	2601	4 years	0,00074	Longatto & Seixas (2004)
Mato Grosso do Sul (Estado)	4073	4 years	0,00038	Longatto & Seixas (2004)
Goiás (Estado)	3500	1 year	0,00052	Avelar *et al.* (2015)
Bahia (Estado)	15575	8 years	0,00013	Pimentel & Santos (2009)
Acre (Estado)	2320	5 years	0,00056	Nascimento *et al.* (2016)
Bujari (AC)	69	6 years	0,00119	Pires *et al.* (2015)
Senador Guiomard (AC)	43	6 years	0,00033	Pires *et al.* (2015)

The seizures and assessments verified in this study follows the general pattern for animal trafficking in Brazil: birds are the main focus of illegal trade, representing a great percentage of the animals trafficked (AVELAR et al., 2015: 75.8%; NASCIMENTO et al., 2016: 47.2%; PIMENTEL and SANTOS, 2009: 83.9%; BORGES et al., 2006: 53.28%). Among the animals destined to CETAS at the national level, between 2002 and 2009, 250,206 individuals were birds, 34,835

reptiles and 17,936 mammals (DESTRO et al., 2012). In our study, mammals were more seized than reptiles, which was also recorded by Preuss and Schaedler (2011) for the extreme west region of Santa Catarina. Reptiles (lizards and turtles in our study) are less diverse in southern Brazil (ROLL et al., 2017), which may explain the difference from studies that found this taxon as the principal (eastern Amazonia; DIAS JUNIOR et al. 2014) or the second most frequently (states of the Cerrado biome; Pimentel and Santos 2009; Borges et al., 2006) seized by the environmental authorities.

Birds are highly prevalent in the seizures carried out in the state of Santa Catarina (2,534 individuals from 2008 to 2010; NUNES et al., 2012), and also in the neighbor state of Rio Grande do Sul (3,797 individuals from 1998 to 2000; FERREIRA and GLOCK, 2004). Compared to other regional studies, however, the number of birds seized in the west of Santa Catarina is quite lower. In the southern region of this state 1,360 specimens were seized in a period of just eight years (2004-2011; VIANA and ZOCCHE, 2013), while 1,120 specimens were seized in 100 municipalities of the central region of Rio Grande do Sul from 2003 to 2005 (ARAUJO et al. (2010). Maybe some cultural patterns of the human population in this region might explain such differences, due to a higher "acceptance" of practices such as hunting and keeping captive animals (see BRAGAGNOLO et al., 2017, 2019) and, consequently, a lower number of complaints directed to the EMPC, making more difficult to track this crimes.

The most representative birds' families recorded in our study include songbirds and species with exuberant plumage, such as the Ultramarine Grosbeak (*Cyanocompsa brissonii*) which had the highest number of individuals seized (245), followed by Hooded Siskin (*Spinus magellanicus*) (126), Green-winged Saltator (*Saltator similis*) (106), Saffron Finch (*Sicalis flaveola*) (87) and Double-collared Seedeater (*Sporophila caerulescens*) (75), confirming such characteristics as a strong stimulus for birds' trafficking (SOUZA and SOARES FILHO, 2005; PIRES et al., 2015). General characteristics of birds such as ease of capture (PIMENTEL and SANTOS, 2009), high abundance (SOUZA and SOARES FILHO, 2005), broad geographic distribution, high diversity (RIBEIRO and SILVA, 2007), low price in the black market and ease of transportation (CPMA, 2006) also drive this high demand for birds in the illegal trade. We also recorded species used for meat consumption, such as doves (not identified at the species level), Spotted Nothura (*Nothura maculosa*), Red-winged Tinamou (*Rhynchotus rufescens*) and Dusky-legged Guan (*Penelope obscura*), which, despite have been found in very low numbers, denote the existence of hunting as a regular practice in this region.

As occurred with the birds, some mammals and reptiles that are sought for the consumption of meat and/or for obtaining their skin were also recorded, although in low quantities. The capybaras *Hydrochoerus hydrochaeris*, the armadillos *Euphractus sexcinctus* and *Dasypus novemcinctus*, and the lizard *Salvator merianae* recorded in our study were also reported as source of meat in a study carried out in the Northeastern Brazilian Atlantic Forest (SOUZA and ALVES, 2014). Eventually it may be difficult to identify the killed animals at the species level, since they are usually confiscated as body parts, when they already suffered the initial processing for the target purpose, and this may be a confounding factor that hampers the application of fines. Scientific support would be necessary in these cases, in order to allow the carcasses identification through genetic analyses (CARVALHO, 2012), improving reports concerning illegal hunting. For other regions, like the Brazilian Amazon, REDFORD (1992) estimated that 23 million animals are killed per year, of which 4 million are for commercial activities and 19 million for subsistence, and points out that this figure is probably underestimated. Although the southern region represents a completely different reality regarding subsistence hunting, we believe that the impact of this activity should be highly relevant to populations of game species, such as the mammalian families Cervidae, Tayassuidae, Hidrochaeridae, Dasypodidae, besides avian families such as Columbidae and Anatidae, but the extension of this impact remains unassessed.

DOI: http://dx.doi.org/10.24021/raac.v19i1.6108 Vol. 19, N. 1 (2022)

A highest concern should be driven to the threatened species, since the hunting/capture pressures could lead to severe population declines in some localities. This is the case of the vinaceous-breasted amazon, *Amazona vinacea*, whose major threats are the habitat loss and degradation, destruction of their nesting and feeding sites, and capture of pups to serve as pets (SCHUNCK et al., 2011). Among the 167 birds' species trafficked in the state of Santa Catarina from 2008 to 2010, 14 were threatened at country level, and 18 figured in the state list (NUNES et al., 2012). Among 54 avian species that were traffic targets in the southernmost region of this state, Viana and Zocche (2013) recorded two species listed as threatened at country level, and three at international level.

Despite the high numbers of animals seized in Chapecó and other municipalities in the west region of Santa Catarina state, the annual *per capita* rate is still lower than that reported in other studies from the southern region of this state (VIANA and ZOCCHE, 2013), and the Southeast (BORGES et al., 2006), Center-West (LONGATTO and SEIXAS, 2004; AVELAR et al., 2015) and Northeast (AZEVEDO et al., 2017) regions of Brazil. Some of these cited studies included animals that were rescue (capture of the animal due to a request from the population) (BORGES et al., 2006; LONGATTO and SEIXAS, 2004) or that were voluntarily delivered at the environmental bureau by people (AVELAR et al., 2015; AZEVEDO et al., 2017), categories that were not computed in our study. However, even if we considered such categories in our survey, the number of records for the municipalities in the jurisdiction of EMPC, in 18 years, would still be lower (M. F. Matiazzo, personal communication).

Considering that Chapecó is the largest municipality within the surveyed area, hosting the EMPC headquarters, and that this municipality is recognized as a point of animal illegal trade (RENCTAS, 2001), it was expected that the number of assessments and seized animals would be higher. Besides, the municipalities of Modelo, Bom Jesus do Oeste, Coronel Freitas and Entre Rios are located exactly in the traffic route that passes through the western region (RENCTAS, 2001). Thus, the *per capita* rates of assessments and seizures contradicted our expectations. The municipality of Chapecó presented a *per capita* rate that was lower than in 56.2% of the municipalities of Santa Catarina, based on data collected in this study and in the consulted literature.

The highest number of assessments and animals seized in certain years, such as 2006, 2009 or 2017, may indicate higher rates of illegal trade/trafficking, or a higher effort by the environmental bureau for traffic repression (BORGES et al., 2006). Additionally, the results may be influenced by the difficulty of performing flagrant assessments in cases of hunting and, consequently, the difficulty of recording it. Besides, there may be a tendency to change the type of trafficking practices in recent years. The increase in the supply of wild animals on the internet and home deliveries (see LAVORGNA, 2014) may be reducing the number of animals that are transported through traditional routes. Due to these practices the number of seizures during routine road inspections, for example, tends to be reduced, and tracking the faunal crimes depends much more on the occurrence of complaints.

The highest number of animals seized by the EMPC was released in nature, as occur with 78% of the animals seized in Brazil (RENCTAS, 2001). This is not the ideal destination because it may cause unknown environmental impacts, and, in the great majority of cases there is no post-release monitoring. In an analysis done by Marini and Marinho Filho (2006) on several cases of animal translocations, on average 50% were unsuccessful, that is, the individuals that were released did not establish populations, as is the case of birds, the most trafficked (and released) animals recorded in our study. There are some important requirements that must be taken into account before an animal be released into the natural environment: (1) correct identification of the species; (2) knowledge of its geographical origin, in order to avoid introductions (release outside the species' geographic distribution area); (3) assessment of the health state of each individual; (4) behavioral

DOI: http://dx.doi.org/10.24021/raac.v19i1.6108 Vol. 19, N. 1 (2022)

evaluation of each individual, in order to avoid the release of meek animals (since it makes them more susceptible to predators and hunters/catchers); (5) evaluation of the species' social organization, in order to release the animals in adequate social units; (6) choice of an habitat of appropriate quality; (7) elimination of negative factors of the releasing site; (8) evaluation of the local carrying capacity (MARINI and MARINHO FILHO, 2006). Due to the current staff structure of the EMPC, several of those requirements are impossible to apply, however, the first four requirements should be obligatory whenever an animal be released in the natural environment. An alternative way to evaluate the individual's origin is modeling the ecological niche from species vocalization data. Environmental variables influence the population's vocal structures, creating vocal signatures in places where the main environmental parameters isolate populations (MAGROSKI et al., 2017). In order to carry out these analyses, however, it is necessary to train professionals who work in environmental agencies, increase their headcount and partnerships with research institutions, such as universities.

If restitution of the seized animal to nature is not possible, the most appropriate alternative is to send it to a rescue or a rehabilitation center. Longatto and Seixas (2004) reported that 98.4% of the animals seized in the state of Mato Grosso do Sul during the studied period were destined to rehabilitation centers (CRAS), however, pointed out that some of them were in fact released in the environment due to the lack of means to transporting them until CRAS, the difficulty of maintenance and giving them specific care, or still because they naturally occurred in the region. In our study only a small percentage of the seized animals were destined to CETAS, probably because the state of Santa Catarina has only one CETAS, which is located in the city of Florianópolis, approximately 700 kilometers distant from the west region.

Although the Brazilian law considers hunting, capturing and holding captive wildlife as crimes, our data showed that these conducts are common in the study region. Even if the numbers of trafficked animals are low when compared to other studies, there are municipalities in the region which are recognized as part of a national route for wildlife traffic, what requires incisive actions to restraint it. Data regarding hunted animals are probably underestimated, and then special efforts are needed in order to expand the number of complaints about hunters and their activities. It may be a matter of education (NASCIMENTO and ALVES, 2007), being necessary to develop actions aimed to change the way these people understand the natural world. We may infer that people who commercialize or keep wildlife in captivity probably perceive them as commodities and pets rather than as elements belonging to the natural ecosystem, where there are important interrelationships and dependencies to maintain the balance of the environment. The population needs to reformulate the way it sees animals, to perceive them as living beings and that they are not properties of the human being.

It is urgent and necessary that a process of sensitization takes place, that is, the population's emotion needs to be stimulated in order to change habits. "The desire to have a bird in the cage is a tradition of the Brazilian people [...] that generates an illegal and attractive trade" (NASCIMENTO and ALVES, 2007, page 49). One of the ways in which environmental education works to raise awareness is through emotions, developing sensitivity in relation to the behaviors that lead to animal trade, so that the person is willing to understand the importance of leaving animals in their natural habitat. An excellent way to arouse emotions is using bird watching in nature. Bird watching is a playful, practical, sensory and experimental activity with a high potential to stimulate respectful attitudes towards nature because people are charmed and thrilled with this activity.

The small number of assessments and seizures in relation to the number of complaints received by the EMPC highlights the difficulty of catching criminals in action. However, even when assessments and seizures are effectively carried out, these do not always result in the enforcement of fines imposed by the environmental agents, making the inspection act "merely symbolic". Added

DOI: http://dx.doi.org/10.24021/raac.v19i1.6108 Vol. 19, N. 1 (2022)

to this is the fact that the civil responsibility system for crimes against fauna is unable to adequately repair the immense ecosystem damage resulting from hunting and animal trafficking. Thus, the diagnosis of the fauna species targeted by hunting and trafficking in the western region of Santa Catarina is just an initial step before a long way to go in combating this kind of crime.

ACKNOWLEDGEMENTS

We are grateful to the Environmental Military Police of Chapecó for making available data regarding the assessments carried out in the western region. We thank Solange Regina Müller for the English version of this manuscript.

4. REFERENCES

ALVES RRN, LIMA JRF, ARAUJO HFP. The live bird trade in Brazil and its conservation implications: an overview. **Bird Conservation International**, n. 23, p. 53-65, 2013.

ARAUJO ACB, BEHR ER, LONGHI SJ, MENEZES PTS, KANIESKI MR. Diagnóstico sobre a avifauna apreendida e entregue espontaneamente na região central do Rio Grande do Sul, Brasil. **Revista Brasileira de Biociências**, v. 8, n. 3, p. 279-284, 2010.

AVELAR ER, SILVA R, BAPTISTA LAML. Ameaças à sobrevivência de animais silvestres no estado de Goiás. **Uniciências**, v. 19, n. 2, p. 132-140, 2015.

AZEVEDO SA, SILVA GP, BRAGA GMS. Manejo de fauna apreendida no município de Imperatriz, região sudoeste, do estado do Maranhão. **Pubvet**, v. 11, n. 11, p. 1098-1103, 2017.

BIRDLIFE INTERNATIONAL. ***Amazona vinacea***. The IUCN Red List of Threatened Species 2017: e.T22686374A118954406, 2017. Available at https://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T22686374A118954406.en. Accessed on 16 February 2020.

BORGES RC, OLIVEIRA A, BERNARDO N, COSTA RMMC. Diagnóstico da fauna silvestre apreendida e recolhida pela Polícia Militar de Meio Ambiente de Juiz de Fora, MG (1998 e 1999). **Revista Brasileira de Zoociências**, v. 8, n. 1, p. 23-33, 2006.

BRAGAGNOLO C, CORREIA R, MALHADO ACM, MARINS ME, LADLE RJ. Understanding non-compliance: local people's perceptions of natural resource exploitation inside two national parks in northeastern Brazil. **Journal for Nature Conservation**, n. 40, p. 64-76, 2017.

BRAGAGNOLO C, GAMA GM, VIEIRA FAZ, CAMPOS-SILVA JV, BERNARD E, MALHADO ACM, CORREIA RA, JEPSON P, CARVALHO SHC, EFFE MAE, LADLE RJ. Hunting in Brazil: what are the options. **Perspectives in Ecology and Conservation**, n. 17, p. 71-79, 2019.

BRASIL. **Lei nº 9.605 de 12 de fevereiro de 1998, que dispõe sobre as sanções penais e administrativas derivadas de condutas e atividades lesivas ao meio ambiente e dá outras**

providências. 1998. Available at http://www.planalto.gov.br/ccivil_03/LEIS/L9605.htm. Accessed on 20 February 2019.

BRASIL. **Portaria n. 444, de 17 de dezembro de 2014, que reconhece como espécies da fauna brasileira ameaçadas de extinção aquelas constantes da Lista Nacional Oficial de Espécies da Fauna Ameaçadas de Extinção**. 2014 Available at http://www.icmbio.gov.br/portal/images/stories/docs-plano-de-acao/00-saiba-mais/04_-PORTARIA_MMA_N%C2%BA_444_DE_17_DE_DEZ_DE_2014.pdf. Accessed on 05 March 2019.

CARVALHO CBV. Identificação genética de aves vítimas do tráfico de animais silvestres. **Atualidades Ornitológicas On-line**, n. 165, p. 40-44, 2012.

CONSEMA, Conselho Estadual do Meio Ambiente. **Resolução Consema nº 002 de 06 de dezembro de 2011, que reconhece a Lista Oficial de Espécies da Fauna Ameaçadas de Extinção no Estado de Santa Catarina e dá outras providências**. 2011. Available at http://www.fatma.sc.gov.br/upload/Fauna/resolucao_fauna__002_11_fauna.pdf. Accessed on 20 February 2019.

COSTA HC, BÉRNILS RS. Répteis do Brasil e suas Unidades Federativas: lista de espécies. **Herpetologia Brasileira**, v. 7, n. 1, p. 11-57, 2018.

CPMA, Divisão Operacional do Comando da Polícia Militar Ambiental. **Tráfico de animais da fauna silvestre nacional**: dados estatísticos de 2001 a 2005. São Paulo. 2006. 26 p.

DESTRO GFG, PIMENTEL TL, SABAINI RM. Efforts to Combat Wild Animals Trafficking in Brazil. In: LAMEED GA (Ed.). **Biodiversity Enrichment in a Diverse World, InTech**. 2012. p. 421-436. http://dx.doi.org/10.5772/48351

DIAS JUNIOR MBF, CUNHA HFA, DIAS TCAC. Caracterização das apreensões de fauna silvestre no estado do Amapá, Amazônia Oriental, Brasil. **Biota Amazônia**, v. 4, n. 1, p. 65-73, 2014.

FERREIRA CM, GLOCK L. Diagnóstico preliminar sobre a avifauna traficada no Rio Grande do Sul, Brasil. **Biociências**, v. 12, n. 1, p. 21-30, 2004.

GILARDI D. Captured for conservation: will cages save wild birds? A response to Cooney & Jepson James. **Oryx**, v. 40, n. 1, p. 24-26, 2006.

IBGE, Instituto Brasileiro de Geografia e Estatística. **Mapa da vegetação do Brasil**. 3. ed. Escala 1:5.000.000, 2004a.

_____. **Mapa de biomas do Brasil**: primeira aproximação. Escala 1:5.000.000, 2004b.

_____. **Mapa da área de aplicação da Lei n° 11.428 de 2006**. Escala 1:5.000.000, 2008.

_____. **Censo Demográfico 2010**. Rio de Janeiro: IBGE, 2010. https://cidades.ibge.gov.br/

KLEIN RM. **Mapa fitogeográfico do estado de Santa Catarina**. Itajaí: Herbário Barbosa Rodrigues, 1978. 24 p. (Flora Ilustrada Catarinense).

LAVORGNA A. Wildlife trafficking in the internet age. **Crime Science**, v. 3, n. 5, p. 1-12, 2014. Doi:10.1186/s40163-014-0005-2.

LIMA R. O tráfico de animais silvestres. In: RENCTAS, Rede Nacional de Combate ao Tráfico de Animais Silvestres. **Vida Silvestre**: o estreito limiar entre preservação e destruição. Diagnóstico do Tráfico de Animais Silvestres na Mata Atlântica – Corredores Central e Serra do Mar. Brasília: Dupligráfica, 2007, 196 p., p.44-49.

LONGATTO JA, SEIXAS GHF. Experiências da fiscalização do tráfico de animais silvestres em Mato Grosso do Sul. **Natureza & Conservação**, v. 2, n. 1, p. 25-33, 2004.

LOPES JCA. Operações de fiscalização da fauna: análise, procedimentos e resultados. In: RENCTAS Rede Nacional de Combate ao Tráfico de Animais Silvestres. **Animais silvestres**: vida à venda. 2. ed. Brasília: Dupligráfica, 2003. p. 17-49.

MAGROSKI LM, PESSOA AN, LUCENA WG, LOURES-RIBEIRO A, ARAUJO CB. Where to release birds seized from illegal traffic? The value of vocal analyses and ecological niche modeling. **Perspectives in Ecology and Conservation**, n. 15, p. 91-101, 2017.

MARINI MÂ, MARINHO FILHO JS. Translocação de aves e mamíferos: teoria e prática no Brasil. In: ROCHA CFD, BERGALLO HG, SLUYS MV, ALVES MAS. **Biologia da Conservação**: Essências. São Carlos: RiMa, 2006. 582 p., p. 1-32

NASCIMENTO M, ALVES E. **Aves no Rio Grande do Sul**: a problemática do tráfico - educação ambiental e conscientização ambiental. Santa Maria: Palotti, 2007. 56 pp.

NASCIMENTO JS, BADARANE AM, DANTAS MMO, URBANSKI AS, CARMO ECO, RIBEIRO VMF. Espécies silvestres alojadas no Centro de Triagem de Animais Silvestres/Acre: implicações conservacionistas. **Semina: Ciências Biológicas e da Saúde**, v. 37, n. 1, p. 63-76, 2016.

NUNES PB, BARRETO AS, FRANCO E. Subsídios à ação fiscalizatória no combate ao tráfico de aves silvestres e exóticas em Santa Catarina. **Ornithologia**, v. 5, n. 1, p. 26-33, 2012.

PAGLIA AP, FONSECA GAB, RYLANDS AB, HERRMANN G, AGUIAR LMS, CHIARELLO AG, LEITE YLR, COSTA LP, SICILIANO S, KIERULFF MCM, MENDES SL, TAVARES VC, MITTERMEIER RA, PATTON JL. Annotated Checklist of Brazilian Mammals. 2nd Edition. **Occasional Papers in Conservation Biology**, n. 6, p. 1–76, 2012. https://www.researchgate.net/publication/261797142

PIACENTINI VQ, ALEIXO A, AGNE CE, MAURICIO GN, PACHECO JF, BRAVO GA, BRITO GRR, NAKA LN, OLMOS F, POSSO S, SILVEIRA LF, BETINI GS, CARRANO E, FRANZ I, LEES AC, LIMA LM, PIOLI D, SCHUNCK F, AMARAL F R, BENCKE GA, COHN-HAFT M, FIGUEIREDO LFA, STRAUBE FC, CESARI E. Annotated checklist of the birds of Brazil by the Brazilian Ornithological Records Committee / Lista comentada das aves do Brasil pelo Comitê Brasileiro de Registros Ornitológicos. **Revista Brasileira de Ornitologia**, v. 23, n. 2, p. 91-298, 2015.

PIMENTEL PCB, SANTOS JM. Diagnóstico do tráfico de animais silvestres no estado da Bahia: identificação, quantificação e caracterização das espécies-alvo. **Diálogos & Ciência - revista da rede de ensino FTC**, n. 8, p. 35-44, 2009.

PIRES GA, RODRIGUES SFC, MACEDO KR, ANDRADE AMF, FARIKOSKI IO, FREITAS HJ, RIBEIRO VMF. Tráfico de animais silvestres e seus produtos no extremo oeste brasileiro. **Arquivos de Ciências Veterinárias e Zoologia**, v. 18, n. 4, p. 241-245, 2015.

PREUSS JF, SCHAEDLER PF. Diagnóstico da fauna silvestre apreendida e resgatada pela polícia militar ambiental de São Miguel do Oeste, Santa Catarina, Brasil. **Unoesc & Ciência**, v. 2, n. 2, p.141-150, 2011.

PRIMACK RB, RODRIGUES E. **Biologia da Conservação**. Londrina: Editora Planta, 2001. 327 p.

REDFORD KH. The Empty Forest. **BioScience**, v. 42, n. 6, p. 412-422, 1992.

REIS N R, PERACCHI A, PEDRO WA, LIMA IP. **Mamíferos do Brasil**. Londrina: Nelio R. dos Reis, 2006. 437 p.

RENCTAS Rede Nacional de Combate ao Tráfico de Animais Silvestres. **1º Relatório nacional sobre o tráfico de fauna silvestre**. Brasília, 2001. 108 p.

RENCTAS Rede Nacional de Combate ao Tráfico de Animais Silvestres. **Vida Silvestre**: o estreito limiar entre preservação e destruição. Diagnóstico do Tráfico de Animais Silvestres na Mata Atlântica – Corredores Central e Serra do Mar. Brasília: Dupligráfica, 2007, 196 p.

RIBEIRO LB, SILVA MG. O comércio ilegal põe em risco a diversidade das aves no Brasil. **Ciência e Cultura**, v. 59, n. 4, p. 4-5, 2007.

ROLL U, FELDMAN A, NOVOSOLOV M, ALLISON A, BAUER AMR, BÖHM M, CASTRO-HERRERA F, CHIRIO L, COLLEN B, COLLI GR, DABOOL L, DAS I, DOAN TM, GRISMER LL, HOOGMOED M, ITESCU Y, KRAUS F, LEBRETON M, LEWIN A, MARTINS M, MAZA E, MEIRTE D, NAGY ZT, NOGUEIRA CC, PAUWELS OSG, PINCHEIRA-DONOSO D, POWNEY GD, SINDACO R, TALLOWIN OJS, TORRES-CARVAJAL O, TRAPE JF, VIDAN E, UETZ P, WAGNER P, WANG Y, ORME CDL, GRENYER R, MEIRI S. The global distribution of tetrapods reveals a need for targeted reptile conservation. **Nature Ecology & Evolution**, n.1, p. 1677-1682, 2017.

SCHUNCK F, SOMENZARI M, LUGARINI C, SOARES ES (Org.). **Plano de ação nacional para a conservação dos papagaios da Mata Atlântica.** Brasília: Instituto Chico Mendes de Conservação da Biodiversidade (ICMBIO), 2011. 128 p.

SOUZA GM, SOARES FILHO AO. O comércio ilegal de aves silvestres na região do Paraguaçu e sudoeste da Bahia. **Enciclopédia Biosfera**, n. 1, p. 1-10, 2005.

SOUZA JB, ALVES RRN. Hunting and wildlife use in an Atlantic Forest remnant of northeastern Brazil. **Tropical Conservation Science**, v. 7, n. 1, p. 145-160, 2014.

VIANA IR, ZOCCHE JJ. Avifauna apreendida no extremo sul catarinense: apreensões feitas durante oito anos de fiscalização e combate à captura de aves silvestres. **Revista Brasileira de Biociências**, v. 11, n. 4, p. 305-404, 2013.

WILSON-WILDE L. Wildlife crime: a global problem. **Forensic Science Medicine and Pathology**, v. 6, n. 3, p. 221-2, 2010. DOI 10.1007/s12024-010-9167-8.