










Survey of avifauna housed in the wild animal triage centers in the state of Bahia, period 2009 to 2019, emphasizing trafficking

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ABSTRACT: Brazil is one of the primary suppliers of wildlife for trafficking, which constitutes a significant threat to biodiversity, which can cause the extinction of species, especially birds, the most important victims of trafficking. This study analyzed the wild avifauna collected in the Triage Centers of Wild Animals (CETAS) of Bahia, to inventory the most apprehended species that are threatened with extinction, and estimate the municipalities that function as suppliers and traders of wildlife. Data from 2009 to 2019 were made available by the Salvador and Vitória da Conquista units, and that from 2010 to 2016 was made available by the, Porto Seguro unit. The survey was conducted through the entry records of birds, considering apprehension, spontaneous deliveries, rescues, and transfers between units involved in the study. Out of the total 80,948 birds analyzed, 65,315 (80.68%) were apprehended; 7,885 (9.74%) were voluntary deliveries; 6,196 (7.65%) were rescues, and 1,034 (1.28%) were transfers. There was no entry modality for 518 (0.64%) specimens. The most trafficked species were *Sicalis flaveola* (Saffron Finch), *Sporophila nigricollis* (Yellow-bellied Seedeater), *Paroaria dominicana* (Red-cowleard Cardinal), *Cyanoloxia brissonii* (Ultramarine Grosbeak), *Sporophila caeruleascens* (Double-collared Seedeater), and *Sporophila albogularis* (White-throated Seedeater). Nine hundred twenty six specimens exhibited some threat. Analysis showed that the greatest flow of bird traffic occurs on BR 242 and BR 116. The municipalities that comprise the mesoregions Center-South, Center-North Baiano, and the Metropolitan Region of Salvador are those with greater concentrations of illegal activity. Irecê and Paulo Afonso constitute areas for the capture and commercialization of wild animals.

Key words: Bahia, birds, illegal trade, trafficking route.

Levantamento de avifauna alojada nos Centros de Triagem de Animais Silvestres no estado da Bahia, período 2009 a 2019, com ênfase no tráfico

RESUMO: O Brasil é um dos principais fornecedores de vida silvestre para o tráfico. Essa prática configura ameaça à biodiversidade brasileira, provoca extinção de espécies, sobretudo da avifauna, as principais vítimas do tráfico. O estudo objetivou analisar a avifauna silvestre recolhida nos Centros de Triagem de Animais Silvestres (CETAS) do estado da Bahia, buscando quantificar as espécies mais apreendidas, ameaçadas de extinção e estimar os municípios que atuam como possíveis fornecedores e comercializadores de vida silvestre. Os dados disponibilizados pelas unidades de Salvador e Vitória da Conquista compreenderam o período de 2009 a 2019 e unidade de Porto Seguro, o período de 2010 a 2016. O levantamento foi realizado através dos registros de entrada de aves, considerando apreensões, entregas espontâneas, resgates e transferências entre unidades envolvidas no estudo. Foram recebidas 80.948 aves, sendo procedentes de apreensões 65.315 (80,68%); entregas voluntárias 7.885 (9,74%); resgates 6.196 (7,65%) e transferências 1.034 (1,28%). Não houve registro de modalidade de entrada para 518 (0,64%) espécimes. As espécies mais traficadas foram *Sicalis flaveola* (Canário-da-terra), *Sporophila nigricollis* (Papa-capim), *Paroaria dominicana* (Cardeal-do-nordeste), *Cyanoloxia brissonii* (Azulão), *Sporophila caeruleascens* (Coleirinho) e *Sporophila albogularis* (Golinho). Identificou-se 926 espécimes com algum tipo de ameaça. A análise demonstrou que o maior fluxo de tráfico de aves ocorre nas BR 242 e BR 116. Os municípios que compõem as mesorregiões Centro-Sul, Centro Norte Baiano e a Região Metropolitana de Salvador são os que possuem maiores fluxos de atuação no comércio ilegal. Irecê e Paulo Afonso são áreas de captura e comercialização intensa de animais silvestres.

Palavras-chave: aves, Bahia, comércio ilegal, municípios, rota do tráfico.

INTRODUCTION

Globally, wild animal trafficking is the third most profitable illegal activity; second only to drug and arms trafficking (RENCTAS, 2002;

PIRES & MORETO, 2016), and produces an estimated financial value of 23 billion dollars (KAR & SPANJERS, 2017). Brazil is one of the leading suppliers of wildlife for illegal trafficking, which poses a threat to biodiversity and stimulates the

extinction of numerous species (RENTAS, 2002), especially birds (VILELA et al., 2016). Numerous studies estimated that four billion birds are illegally removed from Brazil annually. The predilection for birds can be associated with singing, other vocalizations, beauty, broad geographic distribution, and diversity (CAVALCANTI & NUNES 2019; SILVA et al., 2015; COSTA et al., 2018). However, for accurate and current information, the Wild Animal Triage Centers - CETAS, defined as institutional units created by the Brazilian Institute for the Environment and Renewable Natural Resources IBAMA, through the Instruction Normative 169/2008 (BRASIL, 2008), should be consulted. Furthermore, such results are essential to inform decision-making regarding Brazilian wild fauna management and conservation projects. This study analyzed the wild avifauna collected by apprehensions, spontaneous deliveries, rescues, and transfers between the CETAS units taking part in the study, to quantify the most frequently seized species, and to identify endangered species, and the municipalities that work with wildlife suppliers and marketers in the state of Bahia.

MATERIALS AND METHODS

Research was performed using data collected in three CETAS units. For the Porto Seguro unit, the data comprised the period from 2010 to 2016. For the Salvador and Vitória da Conquista units, the data corresponded to the period from 2009 to 2019. Additionally, the records of the Terms of Apprehensions and Deposits (TAD's) were consulted for the purpose of compiling Violation Notices (VN), and the occurrences of spontaneous deliveries, rescues, and transfers between units. Apprehension was considered the deposit of specimens resulting from the inspection action of environmental agencies operating in the Brazilian territory. When a civil citizen delivers a specimen kept in his custody, the action is considered a spontaneous delivery. Rescue constitutes the capture of free-living wildlife, by competent authorities, and transfer when animals are transferred between the CETAS units.

In the present study, only apprehension data were included for the definition of trafficking. The database of the CETAS units participating in the study were tabulated, containing information regarding the class, scientific nomenclature, local popular name, the reason for entry (apprehensions, spontaneous deliveries, rescues, transfers), and the geographic coordinate of the city of origin.

Data were tabulated, organized, and analyzed using descriptive statistics in *Excel, Microsoft Office*[®]. With the information in the TAD's, and using the Quantum Gis software (QGis) geoprocessing tools, a map was charted displaying the cities of origin of the animals received in the study units, including color classification, to differentiate each numerical range. The geographic database used was downloaded from the National Department of Transport Infrastructure (DNIT), road network, and the Brazilian Institute of Geography and Statistics (IBGE), administrative and political division.

The global conservation status of Brazilian avifauna and the degree of extinction risk was classified according to Ordinance MMA No. 444 (BRASIL, 2014). The scientific nomenclature of the species followed the Brazilian Committee of Ornithological Records (CBRO, 2015), and the project was approved by the Ethics Committee on the Use of Animals (CEUA) of the Federal University of Bahia (UFBA), with protocol number 50/2019.

RESULTS

The present study analyzed 80,948 birds. Birds apprehended represented 65,315 (80.68%); 7,885 (9.74%) were voluntary deliveries; 6,196 (7.65%) were rescues and 1,034 (1.28%) were transfers. The form of entry for 518 (0.64%) specimens did not appear in the records, though 26 orders, 55 families, and 355 species were identified (Table 1). The entry of 926 specimens with some threats were registered, distributed in 10 orders, and 14 families (Table 2). The most trafficked species were: *Sicalis flaveola* (Saffron finch), *Sporophila nigricollis* (Yellow-bellied seedeater), *Paroaria dominicana* (Red-cowled) (Figure 1). Seven federal highways (BR) displayed an active flow for wild bird traffic, with highways BR 242 and BR 116 with the highest flow of apprehensions (Figure 2), and 190 municipalities appeared as confiscation and rescue sites (Figure 3).

DISCUSSION

Data revealed that apprehensions were responsible for the most substantial number of birds deposited in CETAS participating in this study. The orders with the highest entry volumes were Passeriformes, Psittaciformes, and Strigiformes. The most seized species were *Sicalis flaveola*, *Sporophila nigricollis*, and *Paroaria dominicana*. There is a discreet relationship between the bird

Table 1 - Wild Bird species forwarded to the CETAS - BAHIA, in the period 2009 to 2019.

Order	Family	Species	N° of specimens
Passeriformes	<i>Cardinale</i>	<i>Cyanoloxia brissonii</i>	4.573
		<i>Icteridae</i>	<i>Gnorimopsar chopi</i>
	<i>Thraupidae</i>	<i>Sicalis flaveola</i>	23.796
		<i>Sporophila nigricollis</i>	10.893
		<i>Paroaria dominicana</i>	4.912
		<i>Sporophila caerulescens</i>	3.569
		<i>Sporophila albogularis</i>	3.300
		<i>Saltator similis</i>	2.708
		<i>Sporophila bouvreuil</i>	943
		<i>Sporophila angolensis</i>	868
		<i>Sporophila lineola</i>	809
		<i>Coryphospingus pileatus</i>	780
		<i>Sporophila leucoptera</i>	664
		<i>Turdidae</i>	<i>Turdus rufiventris</i>
Psittaciformes	<i>Psittacidae</i>	<i>Eupsittula cactorum</i>	1.775
		<i>Amazona aestiva</i>	1.429
		<i>Eupsittula aurea</i>	990
		<i>Amazona amazonica</i>	786
Total			66.341

traffic and the municipalities close or crossed by federal highways, with the South-Central Baiano mesoregion being the one with the highest concentration of bird apprehension.

Similar data for apprehension were obtained in studies performed in other Brazilian regions (BORGES et al., 2006; ROCHA et al., 2006; DESTRO et al., 2012; SOUZA & VILELA, 2013; PEREIRA et al., 2019; SILVA & BERNARD, 2016). Keeping birds as pets is a pastime, dating back to the colonization period, and has been perpetuated throughout the national territory.

According to PIACENTINI et al. (2015), Brazil has one of the richest avifaunas worldwide, with 1919 identified species, the majority being Passeriformes distributed in all biomes. This diversity is reflected in bird specimens sent to CETAS throughout Brazil, resulting from actions to combat wildlife trafficking, where the orders Passeriformes and Psittaciformes predominate.

According to FERREIRA & MORGANTE (2017), the demand to supply the wild pets (Pets) market is the modality that most encourages wildlife trafficking in Brazil and is very strongly aimed at songbirds, parrots, and macaws. Furthermore, such demand is associated with financial costs, since properly legalized specimens raised in captivity are more expensive than those collected illegally.

Most of the birds that entered CETAS-BA were Passeriformes (84.11%), Psittaciformes (9.26%), and Strigiformes (2%), which demonstrated that these are the primary species trafficked in the state of Bahia. Previous research displayed comparable results for the Passeriformes and Psittaciformes orders (BASTOS et al., 2008; SOUZA & VILELA 2013; NASCIMENTO et al., 2016; AZEVEDO et al., 2017; PEREIRA et al., 2019). The mentioned data diverged from the study performed by PAGANO et al. (2009), where the order of Columbiformes was more expressive than Psittaciformes. Bird characteristics, such as the its exuberant colors, plumage, vocalization, docility, easy domestication, and wide distribution in nature may link Passeriformes and Psittaciformes to the primary capture targets for wild bird traffic (ROCHA et al., 2006; SOUZA & VILELA, 2013; NASCIMENTO et al., 2016).

For the present study, the Thraupidae (Passeriformes) family was the most significantly affected, with the apprehension of 55,648 (69.1%) individuals, followed by *Psittacidae* with 7,480 (9.29%), and *Cardinalidae* with 4,591 (5.7 %). Comparable results have been described before (SOUZA & VILELA, 2013; FREITAS et al., 2015; NASCIMENTO et al., 2016; AZEVEDO et al., 2017; PEREIRA et al., 2019). Studies performed by PAGANO et al. (2009) and SANTOS et al. (2019),

Table 2 - Threatened species which entered in the CETAS - BAHIA, and their respective extinction risk class according to the Ordinance MMA n° 444/2014.

Order	Family	Species	N° of specimens	Extinction risk class	
Galliformes	<i>Cracidae</i>	<i>Ortalis guttata</i>	16	CR	
		<i>Penelope superciliaris</i>	13	CR	
		<i>Penelope jacucaca</i>	5	VU	
Procellariiformes	<i>Diomedeidae</i>	<i>Diomedea exulans</i>	2	CR	
		<i>Thalassarche chlororhynchos</i>	1	EN	
Psittaciformes	<i>Psittacidae</i>	<i>Aratinga solstitialis</i>	18	EN	
Accipitriformes	<i>Accipitridae</i>	<i>Amadonastur lacermulatus</i>	1	VU	
Apodiformes	<i>Apodidae</i>	<i>Lophornis gouldii</i>	1	VU	
Charadriiformes	<i>Sternidae</i>	<i>Sterna dougallii</i>	4	VU	
		<i>Sterna hirundancea</i>	15	VU	
Passeriformes	<i>Corvidae</i>	<i>Cyanocorax hafferi</i>	1	VU	
		<i>Fringillidae</i>	<i>Spinus yarrellii</i>	180	VU
	<i>Rhynchocyclidae</i>	<i>Hemitriccus furcatus</i>	1	VU	
		<i>Thraupidae</i>	<i>Sporophila falcirostris</i>	75	VU
			<i>Sporophila frontalis</i>	191	VU
			<i>Sporophila maximiliani</i>	62	CR
			<i>Sporophila nigrorufa</i>	36	VU
			<i>Sporophila ruficollis</i>	1	VU
		<i>Tangara peruviana</i>	1	VU	
Piciformes	<i>Picidae</i>	<i>Celeus flavus</i>	1	VU	
		<i>Procellariidea</i>	<i>Procellaria aequinoctialis</i>	4	VU
Psittaciformes	<i>Psittacidae</i>	<i>Amazona rhodocorytha</i>	166	VU	
		<i>Amazona vinacea</i>	17	VU	
		<i>Aratinga solstitialis</i>	52	EN	
		<i>Guaruba guarouba</i>	7	VU	
		<i>Pionus reichenowi</i>	2	VU	
		<i>Pyrrhura leucotis</i>	5	VU	
Tinamiformes	<i>Tinamidae</i>	<i>Pulsatrix perspicillata</i>	46	VU	
		<i>Crypturellus noctivagus</i>	1	VU	
Total			926		

Critically endangered (CR), Endangered (EN), Vulnerable (VU).

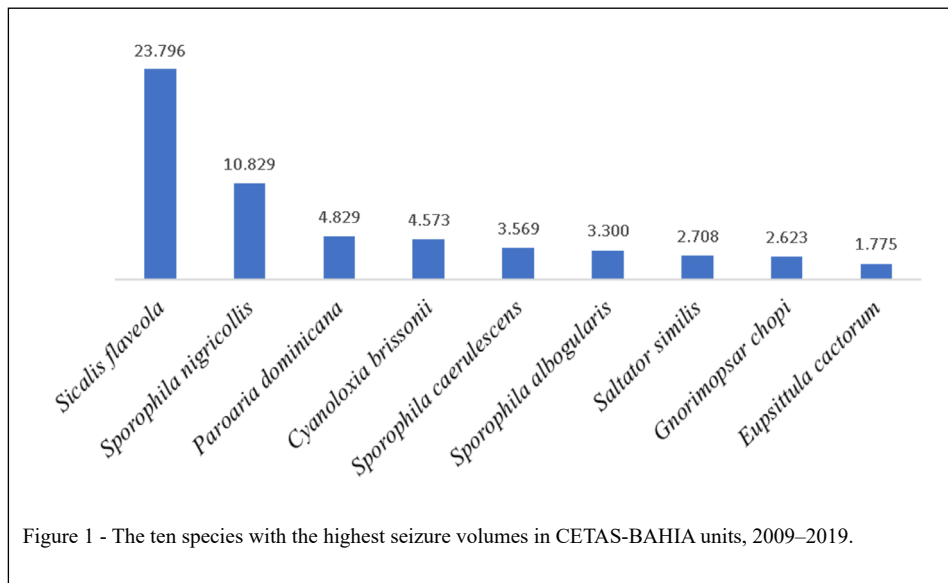
indicated higher numbers of apprehensions in the families *Columbidae* and *Icteridae* respectively, than in the *Cardinalidae*.

The birds of the *Thraupidae* family comprise a broad group of birds that feed on fruits, nectar, and insects (SIGRIST, 2009). The singing melody represents a high level of social interaction (ALVES et al., 2013), and the small size favors illegal transport, which can be considered attractive to caged bird breeders, in addition to the low marketing value at open fairs (RENTAS, 2002; ROCHA et al., 2006; DESTRO et al., 2012).

For Psittaciformes, the preference is associated with the ability to imitate the human

voice, intelligence, beauty, and docility (ALVES et al., 2010). The more significant anthropic pressure suffered by the families as aforementioned can be noted above all due to the appreciation for these birds in the illegal trade of wild animals, a factor that directly impacts the conservation of these species.

The most trafficked species reported in this study (Table 1), were consistent with prior results in agreement with previous reports cited by (BASTOS et al., 2008; PAGANO et al., 2009; SOUZA & VILELA, 2013; FREITAS et al., 2015; PEREIRA et al., 2019). SOUZA & SOARES-FILHO (2005) displayed similar results, differing only regarding the species *Gnorimopsar chopi* (Chopi Blackbird), which was the second most



trafficked species. As for species preference, it can be explained by the variation in species availability in the region, where the most common species are also the most captured (COSTA, 2017).

Among the 28 species identified with some degree of threat, 4 species are considered critically endangered, *Sporophila maximiliani* (Great-billed Seed finch), *Ortalis guttata* (Speckled Chachalaca), *Penelope superciliaris* (Rusty-margined Guan), *Diomedea exulans* (Wandering Albatross) (Table 2) or that is, they have a high risk of extinction. In addition, two endangered species, when there is a possibility of extinction soon, and twenty-two species are considered vulnerable when the species faces a high risk of extinction in the wild.

There is pressure to capture threatened species, such as *Sporophila maximiliani*, which is already quite rare in nature, *Sporophila frontalis* and *Spinus yarrellii* (PAGANO et al., 2009; ALVES et al., 2012; REGUEIRA & BERNARD, 2012; COSTA, 2017). Additionally, despite being a crime, it is common to sell birds in open markets in the Northeast region (GAMA & SASSI, 2008; REGUEIRA & BERNARD, 2012).

Among the endangered species identified in this study, some are outside their area of occurrence, suggesting that these birds were transported from neighboring states: for example, *Penelope superciliaris alagoensis*, with an occurrence area in the states of Pernambuco and Alagoas, and *Aratinga solstitialis* in other regions. According to the Red Book of Brazilian Fauna Threatened with Extinction, this

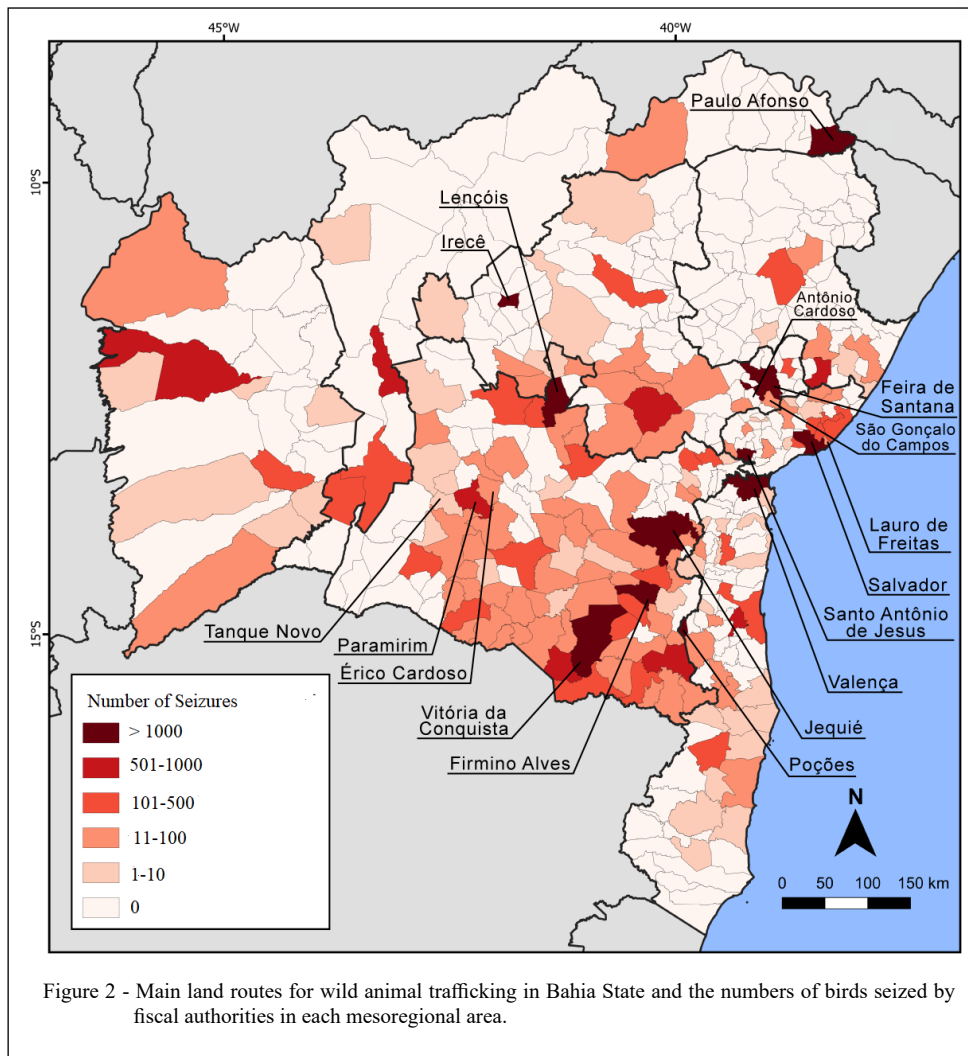
species *Aratinga solstitialis*, excessively captured in recent decades, is endemic to the North of the country, and has disappeared from most places of occurrence (ICMBio, 2018).

The internal movement of Brazilian birds between states and regions has been observed by ROCHA et al. (2006). This event can be associated with a high internal demand for birds since 70% of the total number of birds illegally removed from the wild can be traded internally, while 30% are exported to other countries (RIBEIRO & SILVA, 2007).

For a species to be considered threatened with extinction, it must be evaluated based on technical prerequisites, such as population size, available habitat quality, distribution, among others (KIERULFF et al., 2007). In some cases, when a species is considered threatened, populations are already in such small sizes that their recovery is difficult.

Trafficking and loss of habitat have detrimentally affected the *Cyanopsitta spixii* (little blue or Spix's macaw), which is an endemic species from northeastern Brazil, that according to *Red Book of Brazilian Fauna Threatened with Extinction* (ICMBio, 2018), has not been seen since October 2000. The primary causes of the disappearance of this species include trafficking and habitat loss.

For SOUZA & VILELA (2013), removing animals from their natural environments is one of the primary problems and must be solved by the fauna protection agencies. More agile studies of mapping and population identification of the most trafficked birds can prematurely indicate the risk



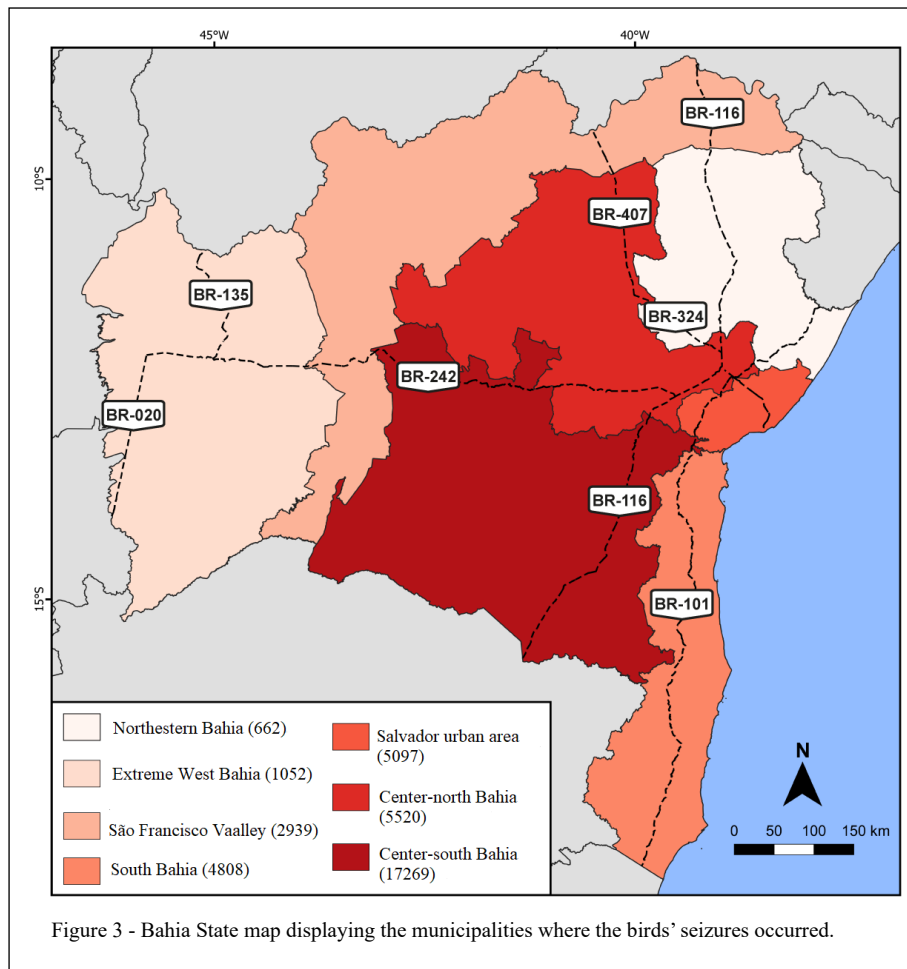
of each species, enabling the elaboration of actions directed at identified species population recovery. Preservation areas are also essential tools. When kept protected and safe, they have excellent conservation potential for avifauna (PERRELLA et al., 2018; MOURA et al., 2010).

As for the municipalities (Figure 3), different patterns characterize capture, transit or deposit, and commercialization areas. The municipalities furthest away from the highways, such as Paramirim, Érico Cardoso, and Tanguê Novo, constitute capture areas. The municipalities surrounding larger cities, such as Lauro de Freitas, Antônio Cardoso and São Gonçalo dos Campos, operates as a deposit area. The commercialization centers are the municipalities that are nearest to highways and possess airports such as Salvador, Feira de Santana, Jequié and Vitória da Conquista.

Irecê and Paulo Afonso act simultaneously as an area for capturing and selling wild animals, facilitated by proximity to both Federal highways BR 324 and BR116.

The municipalities of Feira de Santana and Vitória da Conquista are indicated as the stretch with the highest concentration of illegal trade in wild animals in Bahia (SOUZA & SOARES-FILHO, 2005). In the present study, the cities mentioned are included among the ten cities where the apprehension of birds occurred, which indicates the continuous illegal activities. New municipalities were identified, with fluent movement for bird sale, Valença, Firmino Alves, and Lençóis, which may signal new wild bird trafficking routes in Bahia.

The Center-South, Center-North Baiano, and the Metropolitan Region of Salvador are the regions with the most outstanding rates of



apprehensions, emphasizing the cities of Vitória da Conquista and Barreiras. In the other mesoregions, the capture rate is in smaller volumes. This movement may indicate that these municipalities can serve as bird exits for the Southern states, South-East and Midwest regions and, or even to states in the Northeast, such as Piauí, as already indicated in the Parliamentary Inquiry Commission investigating the traffic of Wild Animals and Plants (2003).

These results pointed out the fundamental role of federal highways in traffic, whether in movement between municipalities inside the state or interstate. The knowledge of the diversity and quantity of wild birds sent to CETAS-BA units had fundamental importance in observing the movement of wild animals in the state of Bahia, making it possible to identify the current dynamics and future tendencies concerning capture transit, and destination of trafficked birds.

This information serves as a scientific basis for the adoption of public policies focused on

combating the trafficking of wild animals, developing programs that address the proper screening and disposal of these animals when apprehended or delivered to specific agencies, also enabling the planning, creation, and targeting of actions to identify the most threatened species and prevent extinction.

CONCLUSION

Apprehension was the most common method of entry of birds into CETAS-BA. The Passeriformes and Psittaciformes orders, and the Thraupidae and Psittacidae families, displayed the highest volumes of apprehensions. The most trafficked species was *Sicalis flaveola*.

Threatened species, such as *Sporophila maximiliani*, *Sporophila frontalis*, and *Spinus yarrellii*, are not native to the state of Bahia. This observation suggested that Bahia is a route for the trafficking of these species, coming from the Northeast and North regions.

The state of Bahia constitutes a crucial route of capture and commercialization for wild bird traffic, and the highways that pass through the state are illegal commercial routes, especially BR 116 and BR 224. Furthermore, the study suggested that Barreiras and Vitória da Conquista are municipalities used to transport birds trafficked to other states.

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DECLARATION OF CONFLICT OF INTEREST

The authors declare that there is no conflict of interest. The founding sponsors had no role in the study's design, in the collection, analysis, or interpretation of data, in the writing of the manuscript, and in the decision to publish the results.

AUTHORS' CONTRIBUTIONS

All authors contributed equally to the conception and writing of the manuscript. In addition, all authors critically reviewed the manuscript and approved the final version.

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