Tradition and Trade: Culture and Exploitation of Avian Fauna by a Rural Community Surrounding Protected Areas in the South of Bahia's State, Northeastern Brazil

Antonio Iderval Sodré Neto (✉ aisneto@uesc.br)

Programa de Pós-Graduação em Ecologia e Conservação da Biodiversidade – PPGEBCB, Universidade Estadual de Santa Cruz -UESC

Ricardo Evangelista Fraga

Instituto Multidisciplinar em Saúde, Universidade Federal da Bahia

Alexandre Schiavetti

Universidade Estadual de Santa Cruz

Research Article

Keywords: bird trade, specialized habits, local avifauna, illegal wildlife trade

Posted Date: October 11th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-959191/v1>

License: This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Version of Record: A version of this preprint was published at Journal of Ethnobiology and Ethnomedicine on March 8th, 2022. See the published version at <https://doi.org/10.1186/s13002-022-00515-x>.

Abstract

Background: Illegal capture and trade of wild birds are some of the most present types of wildlife trade in Brazil, and are often associated with cultural and socioenvironmental aspects. Those habits are particularly present in rural communities, where bird trade can be a source of income in dire economic situations and bird-keeping is a cultural trait passed from generations.

Methods: We conducted a series of direct interviews with bird-keepers and traders within the surrounding region of the *Parque Nacional de Boa Nova* regarding wild bird trade and socioenvironmental aspects, then associated the collected information using different exploratory analysis.

Results: A total of 21 avian species was mentioned as being used as pets and in commercialization, contests and breeding, most of the occurring naturally in the surrounding region. Most respondents were men possessing low levels of education and income. Bird-keeping was surrounded by practices regarding the captive individual's health and singing abilities. Mentioned methods used to capture wild birds often involved specialized traps and were mostly conducted within the national park's area. Bird trade was said to occur mostly in urban settlements, and the value of captive birds was said to vary based on species and beforehand training. The official establishment of the protected area impaired all practices related bird-keeping and trade, mostly as a result of increased surveillance by environmental agencies.

Conclusion: The collected information presents a series of specialized habits and practices involved in bird-keeping, bird capture and bird trade, many of them being associated with the local avifauna surrounding the region. Our study also points the efficiency of protected area surveillance to contain practice's related to illegal wildlife trade.

Background

The worldwide interest in wildlife products is assumed to be worth billions of US dollars every year; a fact that is especially relevant in poor countries and regions presenting considerable preserved remnants of natural resources, as those could be exploited by local residents as a potential alternative source of income amidst critical economic positions and an increasing demand for wildlife products [1–4].

In Brazil, one of the most popular instances of wildlife trade is the illegal trade and the captivity of avian species [5], practices that are often associated with economical vulnerability [3,6], cultural aspects [7–9] and proximity to natural resources and conservation areas [10]. The main source of supply for the illegal bird trade in Brazil often relates to rural settlements and communities, where local dwellers would be primarily responsible for capturing valuable species and selling them to middleman for a fraction of the price that captive birds would reach in other locations such as big city centers [11]. The primary motivation for this interaction is described as economic vulnerability, as rural residents would see in the illegal bird trade an easy mean of alternative income [12,13]. Socioeconomical factors also seems to influence illegal bird trade activity at a municipal scale, as counties presenting higher socioeconomic metrics such as gross domestic product (GDP) and human development index (HDI) would be most

associated with avian species commercialization, whereas municipalities presenting lower values of those metrics would be more related to bird capture and trapping, serving as source areas to supply the illegal demand for avian species [3].

The relationship between socioenvironmental elements and wild bird trade is especially prevalent in the Northeast of Brazil, a region that is thought to shelter most of the source areas for wild bird capture and traffic [10–12]. In this region, illegal trade and transportation of wild birds is widely described occurring along main highways that connects many big city centers with small municipalities, effectively creating a trafficking route for illegal trade of avian species [5,10,12]. In fact, the relevance of roads and highways in the Northeast is so paramount to the wild bird trade that it often occurs on the very roadside of some main highways that connects this region to others in the country [13].

Although there are a number of works tackling the wild bird trade in Brazil at a broader scale [5,10,11], there is still a need to explore this theme from an ethnozoological point of view in order to reach a better understanding of wild bird trade implications and motivators [10,14]. In this instrumental case study, we conducted a series of direct interviews with local residents of a rural settlement adjacent to a federal protected area located close to two federal highways connecting the Northeast to other Brazilian regions; a site that is often described as a source area for supplying the wild bird trade in the region [13,15–17]. The information gathered can help characterize the dynamics involved in bird trade and clarify how much bird-keeping is intertwined with socioenvironmental and cultural aspects of a region adjacent to a protected area known for its avian species diversity [18].

Methods

Ethical approval

This study was approved by the Research Ethics Committee of the Instituto Multidisciplinar em Saúde-Campus Anísio Teixeira under the CAAE no. 43546621.5.0000.5556.

Study area

Our research was conducted within the Boa Nova's municipality (Figure 1), in both rural and urban settlements. The *Parque Nacional de Boa Nova* (cat II from IUCN) can be found adjacent to this city as a protected area established to preserve the natural Atlantic Forest and Caatinga ecosystems located within the region, as well as the transition zone between those two known as “vine forest”. Alongside the park's founded in 2010, a buffer zone known as *Refúgio de Vida Silvestre de Boa Nova* (cat V from IUCN) was also established to serve as a link between the distinct fragments of the park [19]. The protected areas are surrounded by two federal highways: BR-030 and BR-116. Those are responsible for connecting the Northeast region with other regions in Brazil and are described as key points to the local wild bird trade dynamics and often relate to the transport of newly-captured birds within the region to other places within the country where those would be sold [13].

Data collection and analysis

We used direct semi-structured interviews [20] to infer traditional knowledge of local bird keepers about bird-keeping, capture and trade in the considered region, as well as personal perceptions about how those activities were affected after the establishment of the national park. To identify and select informants we used snowball sampling, a method where respondents ought to provide contact information about other potential informants that would be coherent to the research's goal [21], as well as opportunistic sampling when feasible.

Qualitative data were treated by codification and triangulation, where relevant information was identified, compared, categorized and interpreted, enabling the classification of pertinent mentions and quotations into a larger cohesive context [22]. Quantitative analysis was conducted by calculating the use value () relative to each cited species using a simplified formula derived from the original method proposed by Phillips & Gentry (1993): $U_i = \frac{u_i}{n}$; where u_i = the number of uses stated by each informant for a particular species and n = the total number of informants [24]. Intending to inspect the relationship between socioeconomic factors and practices involved in bird-keeping and commercialization, we conducted a Multiple Correspondence Analysis (MCA): an exploratory multivariate analysis, which summarizes the relationship between variables in a two-dimensional coordinate map where variables allocated closer to each other are more related [25]. In order to guarantee a higher quality of representation in our MCA, we filtered our results to exhibit only variables, presenting a *squared cosine* (cos^2) higher than 0.4. We also created a chord diagram delving into the different uses attributed to each species, as well as the frequency of citations linking each species to each particular usage.

Species identification

Species were identified through direct visualization and photographic records. Visual identification was done by comparing photographs with a Brazilian avian species identification guide [26]. Identification by popular name was done by comparing recorded citations with specifications from the Brazilian Ornithological Records Committee [27]. To confirm if mentioned species were coherent to the considered region, we consulted specific guide books concerning avian species occurring within the Atlantic Forest [28] as well as available records of avian species reported within the considered region, including online photographic registries [29–31]. The conservation status of cited species was determined by the guidelines of IUCN's Red List [32].

Results

Bird-keepers' socioeconomic profile

We interviewed a total of 40 birds-keepers or ex-bird-keepers in the considered region. The majority of interviews bird-keepers were men ($n = 34$), inhabited rural areas ($n = 28$), had only completed primary education ($n = 32$) and reported an income less than minimum wage ($n = 29$). Respondent's age ranged from 20 to 78 years, with the mean being 48 years old. Our Multiple Correspondence Analysis points a

correlation between settlements and wild birds' commercialization (Figure 2). The majority of respondents that reported buying and selling wild birds inhabited the urban area and were from a specific age range (20 to 45 years old).

Species and uses

A total of 21 avian species (including one hybrid) was mentioned, most of those being of the Passeriformes order (n = 19) and the Thraupidae family (n = 12). Four major uses were associated with birds: pet, trade, contest and breeding (Table 1). While keeping birds as pets was a practice associated with all mentioned species, trade was linked mainly to songbirds. Breeding and usage in the contests were related only to a few particular species (Figure 3).

Bird-keeping

Motivations for keeping birds as pets were varied, ranging from attraction for the bird's aesthetic, singing or the company, to statements that bird-keeping is a cultural tradition among local residents passed between generations. Urban residents that previously habited rural areas associated bird-keeping as a way to "remember the old home", keeping species common to the previous dwelling place as a memento. Many of the interviewed (n = 26) also noted that among their local bird-keeping culture, there seems to be a preference for *Sporophila nigricollis* and *Saltator similis* individuals.

Respondents mentioned different practices to keep captive birds healthy. A common habit is to move bird cages to a sunny place every morning in order to guarantee enough natural light exposition to captive individuals. Different types of food were mentioned, varying between seeds of local Poaceae species to distinct rations for particular avian species. Captivity was reported to affect the bird's plumage and singing. Periodic molting presented by some captive individuals is known as "feather recalling" by local bird-keepers, and is related foremost to the stress of captivity, especially in newly-caged individuals. Different approaches to decrease molting and increase the quality of plumage and singing were mentioned, such as offering different types of seed and fruits or applying vitamins to the captive individual (Figure 4). Bird-keepers also can use the presence of other captive birds to encourage singing, a process described as "warming up", done primarily by introducing a captive female of the species of the concerned individual in proximity. For territorial avian species, warming up can also be done by introducing another male in the vicinity.

Bird trade

Commercialization of songbirds is regarded as a popular practice in the region and as a resort to obtain money when needed. Some respondents admitted to participating in wild bird trade in the last year (n = 13) involving monetary compensation or using certain species as a currency in exchanges between other local known bird-keepers. Although the legal repercussion of such practices is a well-known fact, between bird-keepers, all respondents that admitted engaging in bird trade do not see themselves as "bird traffickers", justifying that in their opinions, that would be a classification most suited to sellers of a large quantity of captive individuals involving a destination outside the city. As such, large scale bird trafficking

is generally frowned upon by local bird-keepers, since this could attract attention of surveillance to the region.

The value of trade birds was said to depend mainly on two factors: the species and whether the captive bird was trained beforehand. Newly captured individuals (called by local bird-keepers as “wild”) were said to possess a much lower price, varying between U\$ 5.00 to U\$ 19.00 per individual according to species. After a process of “taming” which involves putting the wild bird in a small cage and familiarizing it with human presence, prices were said to vary between U\$ 17.00 and U\$ 114.00. This taming process could take between three months to one year, depending on the bird species and size (typically, larger birds would need more time to be tamed). Wild birds were said to be cheaper compared to tamed birds because newly captured birds could harm themselves against the cage in the first months of captivity and would not sing as often or with the same attractiveness as tamed birds.

Trained songbirds that could perform distinct chants were said to be valued at much higher prices. *Sporophila nigricollis* individuals that could perform specific chants were said to be valued at prices as high as U\$ 380.00, while the value of trained *Saltator similis* individuals could reach U\$ 570.00. Training songbirds to perform specific chants was said to be a difficult and slow process that involved capturing wild individuals at a very young age and submitting them for hours of daily recording of the desired chant. Even with training, only a few individuals would be capable of performing the specific chant flawlessly. Territorial birds – such as *Cyanoloxia brissonii* – were said to be valued by “bravery”, as most aggressive birds would possess higher value in trade. The method to measure territorial birds aggressively was described as putting two encaged birds of the same species in the same vicinity; the first individual to bristle its feathers would be considered less “brave” than its counterpart. Trained birds were said to be submitted to compete against others of the same species in clandestine contests known as “*rinhas*”, often involving some kind of monetary prize. Songbirds would be tested against each other based on chant type or frequency, while territorial birds would compete by fighting against each other.

Methods and strategies used to capture

Most respondents reported capturing birds in the last year ($n = 24$), specifying this practice as a local tradition among different generations. Strategies reported to be used in capture would often involve specialized traps (Figure 5) or procedures (Table 2), according to the desired species, size, and would be performed at recognizing locations acknowledged for a large abundance of birds or the presence of a particular species, often within the national park's area. *Saltator similis*, for example, was said to be a species that could only be found in deep vine forest regions of the park, while *Cyanoloxia brissonii* was mostly associated within the arid areas characterized as the Caatinga expanse of the park.

The season also was said to influence avian species availability and capture. The optimal time for bird capture was said to be the rainy season, occurring between November and March. In this period, avian species abundance was said to increase next to natural bodies of water, such as waterfalls and rivers, and some popular species in the region, such as *Sporophila lineola*, could only be found and captured in this specific time period.

In the rural settlements, some respondents (n = 7) cited a practice known as “bird ordering”, a process that would involve the visit of an outsider offering advanced payments to local residents in exchange for captured avian species that they would later return to collect. Although no respondent admitted engaging in such practices, it was said that bird ordering is a recurring thing in the region, especially between known bird trappers and local large-scale traders. Another common occurrence is the visit of bird hunters from nearby cities to capture avian species located inside the park. Respondents linked those outsiders mostly to the cities of Manuel Vitorino (n = 29) and Poções (n = 27), areas where wild bird trade would be more present and even conducted in open markets thorough the cities.

Bird-keeping and trade after the park's establishment

All respondents (n = 40) agreed that after the park's establishment in 2010, practices of bird-keeping, capture and trade declined drastically within the urban perimeter of the city and rural settlements alike. The main reason attributed to this decline was the increased surveillance by environmental agencies, such as the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) and Chico Mendes Institute for Biodiversity Conservation (ICMBio), consequential to the park's foundation. More than half of the urban perimeter's respondents (n = 7) have had captive birds apprehended before by such agencies. In rural settlements, a few respondents (n = 4) admitted releasing captive birds in fear of penalty, after gaining knowledge that those agencies were inspecting their respective surroundings. Two respondents from the urban perimeter explained that keeping a hybrid species obtained by breeding a male *Spinus magellanicus* with a female *Serinus Canaria* could be a way of cheating surveillance by official agencies, and one of them could even breed those hybrids in his own home. Their reasoning was that as being hybrids, these individuals (Figure 6) could not be reintroduced in a natural environment, therefore, surveillance agents would not make a significant effort to apprehend them.

Discussion

The overall socioeconomic profile of interviews bird-keepers and traders were consistent with what is traditionally described when discussing illegal bird trade in Brazil: low income and education levels, as well as inhabitants and occupations most related to rural settlements [33–37]. The prevalence of males is also recurrent among ethnological studies involving avian species [33,35,37–39] and seems to be a cultural factor associated with those practices, although there are exceptions [34,36].

The Thraupidae family was shown to be the most popular among local bird-keepers, seen that belonging species were most frequently cited as pets and in commercialization; especially those included in the *Sporophila* genus. Preference for the species of this particular family and genus is recurring trend among bird-keepers [37]. A total of 21 avian species were cited; a relatively low number in comparison with other ethnological surveys [33,38,40,41]. However, it is worth noting that with the exception of *Serinus Canaria* – an exotic species – all cited species are native and can be found with relative ease within the covered area of the park, especially those presenting higher [28–31]. Availability and access are factors that may influence species preference for bird-keeping [5,39], and could explain favoritism for certain species, seen

that *Sporophila nigricollis* was the most popular species associated with bird-keeping and commercialization, even though other mentioned species such as *Sicalis flaveola*, *Paroaria Dominicana* and *Cyanoloxia brissoni* have considerable higher apprehension's numbers in Brazil [42].

The main alleged way to obtain captive birds was through capture, a practice that seems to be common to both rural and urban settlements within the limits of Boa Nova's municipality. Capturing avian species with the intention to keeping pets was said to be a local tradition passed forward by traditional knowledge, a tendency described in other areas alongside the Northeastern region [9,38]. Many of the methods and traps mentioned by local residents are also common to other described source sites for a bird's capture alongside the North and Northeastern regions, even though the analyzed region is considerably distant to those [34,37,41,43]. Respondents also showed considerable knowledge about some species' ecology, such as seasonal abundance fluctuations and preferred dwelling environments, yet another trait associated with areas where bird-trapping and bird-keeping are considered cultural traditions [37]. Contrastingly, studies conducted within bigger city centers suggest commerce as the main source for captive bird's acquirement [40].

Alongside capture, bird trade also seems to be a cultural habit among bird-keepers from the urban area, where many birds-keepers would maintain an informal contact network with other bird-keepers to buy, sell and trade avian species, using those as some sort of currency in clandestine exchanges; a kind of practice that is easier to engage within urban settlements given the ease of access promoted by pavement roads and higher population density when compared to rural locations. The perceived dynamics of trade also share many traits with what is described in other ethnoornithological studies, such as this very trade chain between urban bird-keepers [33,37] and the fact that most of the local traders do not see themselves as "bird traders" or "traffickers" but as hobbyists [41]; the commercial aspect involved in bird-keeping practices would only be a part of collecting and raising avian species as pets. Pricing was also another factor that corresponded with the general descriptive trend, where newly caught birds would possess a much lower market value when compared to trained and tamed individuals [33,36,37]. In our study, we perceived a special demand for songbirds such as *Sporophila nigricollis* and *Saltator similis*. Individuals of these species who would excel at singing could reach prices ten times higher than their newly-captured counterparts, according to local traders. The reasons for such an increase in value could be related to personal attraction for singing qualities or could be due to interest in submitting those songbirds in clandestine contests known as "*rinhas*".

The demand for avian species that could be submitted for such contests is another recurring topic when discussing cultural aspects surrounding bird-keeping with Brazil [36,37,39,41]. In this study, we identified two distinct types of contests: competitions involving songbirds – where those would be measured by singing qualities such as frequency, duration and volume of vocalization – and competitions involving physical fighting between territorial species. *Sporophila nigricollis* and *Saltator similis* were associated with singing contests, whereas *Cyanoloxia brissoni* was related only to bird fighting. Although *Paroaria domicana* and *Sicalis flaveola* were associated with bird-fighting in other studies [37,39] there was no

association between these species and bird-fighting by respondents, a factor that could suggest a regional trait regarding avian species preferences in contests.

Some bird-keepers displayed a specialized knowledge about some particular species nature and habits, such as the diet needed to raise a healthy individual in captive. Some of the perceived customs and practices related to the maintenance of captive individuals were also observed by other authors, such as periodic molting and encouragement of singing by placing another captive individual in the vicinity [41]. One respondent even demonstrated specialized knowledge about how to breed *Spinus magellanicus* with *Serinus Canaria*; according to himself and another respondent, this would be a way to evade surveillance by official environmental agencies since, in their own sense, it would not constitute a crime, as the captive individual origin would be domestic, therefore, no individual would be removed from his natural habitat.

Since its establishment in 2010, the *Parque Nacional de Boa Nova* and its associated *Refúgio de Vida Silvestre de Boa Nova* have both been addressed in large operations regarding illegal wildlife trade surveillance and apprehension, with hundreds of captive birds being rescued [15,18,44]. It seems that large scale bird trade is acknowledged by local bird-keepers, and some of them shun this activity, as it would be a kind of endeavor maintained by a small number of known individuals within the city that would attract unwanted attention to all local birds-keepers from a legal perspective. All respondents agreed that after the protected area's establishment and its consequential supervision by official agencies, the local tradition of bird-keeping and bird capture was heavily impaired; the main reason being the fear of apprehension and penalty. As such, many reported reducing the number of individuals maintained in captivity, freeing captive individuals or stopping bird-keeping altogether after apprehension. It is worth noting that many respondents mentioned habitants of nearby municipality's travelling in the park vicinity intending to capture wild birds. According to them, those bird trappers would avoid the main highways and travel by rural roads to dodge the attention of surveillance conducted in main highways, intending to sell newly captured birds within their own cities, where official oversight by environmental agencies would be less present or non-existent.

Although the presented responses would suggest a parallel and disconnected chain between local bird trade and large-scale wildlife trade occurring in the region, it should be noted that given the sensitive nature of the matter, many local bird trappers could be reluctant to admit any association or contact with large-scale bird traders. The knowledge about local large-scale traders and the dynamics of trade within the region displayed by many respondents would suggest some kind of, at least superficial, exchange between those who engage in bird-keeping and trapping as a cultural habit and large-scale traders responsible for gathering and directing a large number of captive birds to be sold in other locations.

Conclusion

Bird-keeping is a cultural habit alongside the surrounding regions of the *Parque Nacional de Boa Nova*, and as such, share many traits with what is described regarding bird-keeping, capture and trade in Brazil, although the availability and access to some species naturally occurring thorough the area seems to

influence some local peculiarity's regarding preferences and uses. Although this habit seems to be present in both urban and rural settlements within Boa Nova, the dynamics involving bird trade seem to occur mainly in the urban perimeter, where bird-keepers that identifies themselves as hobbyists conduct a local trade chain that involves mostly trained captive birds, with each other. The establishment of the protected area characterizing the national park seemed to greatly impair bird-keeping and capture within the region, mainly through the consequential surveillance and apprehensions from environmental agencies responsible for the park's maintenance.

Abbreviations

CAAE: Certificate of Presentation for Ethical Consideration

IUCN: International Union for Conservation of Nature

UV: Use value

MCA: Multiple Correspondence Analysis

IBAMA: Brazilian Institute of Environment and Renewable Natural Resources

ICMBio: Chico Mendes Institute for Biodiversity Conservation

Declarations

Ethics approval and consent to participate

All the individuals who participated in this research signed a consent form agreeing to be a participant beforehand, under the arrangement that no personal information that could reveal the participant's identity would be disclosed. Our research was approved by the CEP UFBA - Vitória da Conquista - CEP Instituto Multidisciplinar em Saúde - Campus Anísio Teixeira – UFBA under the CAAE 43546621.5.0000.5556.

Consent for publication

The consent form allowing the collection of personal information for usage in this research also included a clause explicating and allowing the usage of collected information on scientific communication and publishing.

Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available, as personal information regarding location, gender, age and income could reveal the identity of respondents, breaching the anonymity guaranteed when agreeing to participate in this research by the researchers and the ethics committee. Any kind of data that would not breach the respondent's anonymity can be obtained from the corresponding author under reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

This research was funded by the *Fundação de Amparo à Pesquisa do Estado da Bahia* under the grant term number “BOL0337/2020”. The resources granted by this institution allowed full dedication to this research, making it possible to conduct all activities ranging from the study’s design to its execution and redaction.

Authors' contributions

AISN, REF, AS – Conception and design of this research and interpretation of collected data, as well as writing and redacting the manuscript. AISN – Data collection and analysis. All authors read and approved the final manuscript.

Acknowledgements

We would like to thank the *Fundação de Amparo à Pesquisa do Estado da Bahia* for the financial support that allowed integral dedication to this research’s conception and execution. We offer a special thanks to Edson Ribeiro Luiz for valuable input regarding this study’s design, as well as all interviewees who shared their knowledge and customs with us.

References

1. Baker SE, Cain R, van Kesteren F, Zommers ZA, D’Cruze N, Macdonald DW. Rough Trade: Animal Welfare in the Global Wildlife Trade. *BioScience*. 2013 Dec 1;63(12):928–38.
2. Barber-Meyer SM. Dealing with the Clandestine Nature of Wildlife-Trade Market Surveys. *Conservation Biology*. 2010;24(4):918–23.
3. Santos LP dos, de Araujo DR. Aspectos socioeconômicos dos municípios Brasileiros com ocorrência de tráfico de animais silvestres no bioma Cerrado. *Élisée – Revista de Geografia da UEG*. 2015;4(2):211–21.
4. Wyler LS, Sheikh PA. International Illegal Trade in Wildlife: Threats and U.S. Policy. 2013;26.
5. Nóbrega Alves RR, De Farias Lima JR, Araujo HFP. The live bird trade in Brazil and its conservation implications: an overview. *Bird Conservation International*. 2013 Mar;23(1):53–65.
6. Hernandez ÉFT, Carvalho MS de. O tráfico de animais silvestres no Estado do Paraná. *Acta Sci Human Soc Sci*. 2006 Dec 1;28(2):257–66.
7. Bezerra DMM, de Araujo HFP, Alves ÂGC, Alves RRN. Birds and people in semiarid northeastern Brazil: symbolic and medicinal relationships. *Journal of Ethnobiology and Ethnomedicine*. 2013 Jan 8;9(1):3.

8. dos Santos Soares VM, de Lucena Soares HK, da Silva Santos S, de Lucena RFP. Local knowledge, use, and conservation of wild birds in the semi-arid region of Paraíba state, northeastern Brazil. *Journal of Ethnobiology and Ethnomedicine*. 2018 Dec 4;14(1):77.
9. Teixeira PHR, Thel T do N, Ferreira JMR, de Azevedo SM, Junior WRT, Lyra-Neves RM. Local knowledge and exploitation of the avian fauna by a rural community in the semi-arid zone of northeastern Brazil. *Journal of Ethnobiology and Ethnomedicine*. 2014 Dec 24;10(1):81.
10. Destro GFG, De Marco P, Terribile LC. Comparing environmental and socioeconomic drivers of illegal capture of wild birds in Brazil. *Envir Conserv*. 2020 Mar;47(1):46–51.
11. Destro GFG, Lucena T, Monti R, Cabral R, Barreto R. Efforts to Combat Wild Animals Trafficking in Brazil. In: Lameed GA, editor. *Biodiversity Enrichment in a Diverse World* [Internet]. InTech; 2012 [cited 2021 Feb 25]. Available from: <http://www.intechopen.com/books/biodiversity-enrichment-in-a-diverse-world/efforts-to-combat-wild-animals-trafficking-in-brazil>
12. Renctas. 1º Relatório Nacional sobre o Tráfico de Fauna Silvestre. 2002.
13. Souza GM de, Oliveira A. O COMÉRCIO ILEGAL DE AVES SILVESTRES NA REGIÃO DO PARAGUAÇU E SUDOESTE DA BAHIA. *Enciclopédia Biosfera*. 2005;10.
14. Alves RR, Souto WM. Ethnozoology in Brazil: current status and perspectives. *J Ethnobiology Ethnomedicine*. 2011;7(1):22.
15. MPF denuncia associação criminosa especializada em tráfico de animais silvestres, no Parque Nacional de Boa Nova [Internet]. Rede 2D. 2021 [cited 2021 Sep 3]. Available from: <https://rede2d.com/regiao/mpf-denuncia-associacao-criminosa-especializada-em-trafico-de-animais-silvestres-no-parque-nacional-de-boi-nova>
16. PF deflagra operação de combate ao tráfico de pássaros silvestres no sudoeste baiano [Internet]. Agência Sertão. 2020 [cited 2021 Sep 3]. Available from: <https://agenciasertao.com/2020/08/27/pf-deflagra-operacao-de-combate-ao-trafico-de-passaros-silvestres-no-sudoeste-baiano/>
17. Fiscalização apreende mais de 170 aves em condições de maus-tratos dentro de veículo no sudoeste da Bahia [Internet]. G1. [cited 2021 Sep 3]. Available from: <https://g1.globo.com/ba/bahia/noticia/2021/03/24/fiscalizacao-apreende-mais-de-170-aves-em-condicoes-de-maus-tratos-dentro-de-veiculo-no-sudoeste-da-bahia.ghtml>
18. Instituto Chico Mendes de Conservação da Biodiversidade - Boa Nova é destino para observadores de aves [Internet]. [cited 2021 Sep 3]. Available from: <https://www.icmbio.gov.br/portal/ultimas-noticias/20-geral/7111-boi-nova-e-destino-para-observadores-de-aves>
19. Teixeira IMV. DECRETO DE 11 DE JUNHO DE 2010. 2010.
20. da Silva TLL, Moura JMB, Hora JSL, de Oliveira ES, Souza A dos S, da Silva NA, et al. Implementing Ethnobiological Research: Pretests, Quality Control, and Protocol Reviews. In: de Lucena RFP, Cruz da Cunha LVF, Alves RRN, editors. *Methods and Techniques in Ethnobiology and Ethnoecology* [Internet]. New York, NY: Springer New York; 2019 [cited 2021 Feb 25]. (Springer Protocols Handbooks). Available from: <http://link.springer.com/10.1007/978-1-4939-8919-5>

21. Noy C. Sampling Knowledge: The Hermeneutics of Snowball Sampling in Qualitative Research. *International Journal of Social Research Methodology*. 2008 Oct 1;11(4):327–44.
22. de Sousa DCP, Magalhães HF, de Oliveira ES, Albuquerque UP. Qualitative Data Analysis. In: de Lucena RFP, Cruz da Cunha LVF, Alves RRN, editors. *Methods and Techniques in Ethnobiology and Ethnoecology* [Internet]. New York, NY: Springer New York; 2019 [cited 2021 Feb 25]. (Springer Protocols Handbooks). Available from: <http://link.springer.com/10.1007/978-1-4939-8919-5>
23. Phillips O, Gentry AH. The useful plants of Tambopata, Peru: I. Statistical hypotheses tests with a new quantitative technique. *Econ Bot*. 1993 Jan 1;47(1):15–32.
24. Albuquerque U, Lucena R, Monteiro J, Nunes A, Almeida C. Evaluating Two Quantitative Ethnobotanical Techniques. *Ethnobotany Research & Applications*. 2006 Dec 31;4.
25. Husson F. Multiple Correspondence Analysis (MCA). In: *Exploratory Multivariate Analysis by Example Using R*. 2nd ed. 2017. p. 235. (Computer Science and Data Analysis).
26. Grantsau R. Guia completo para identificação das aves do Brasil Vol. 1. 1ª edição. São Carlos, SP: Vento Verde; 2010.
27. Pacheco JF, Silveira LF, Aleixo A, Agne CE, Bencke GA, Bravo GA, et al. Lista comentada das aves do Brasil pelo Comitê Brasileiro de Registros Ornitológicos – segunda edição. 2021 Jul 26 [cited 2021 Aug 24]; Available from: <https://zenodo.org/record/5138368>
28. Endrigo E. Aves da Mata Atlântica [Internet]. 2006 [cited 2021 Aug 24]. 224 p. (Coleção Aves nos Biomas Brasileiros; vol. 1). Available from: <https://avesefotoseditora.com.br/produto/livro-aves-da-mata-atlantica/>
29. Wikiaves. Parque Nacional de Boa Nova | WikiAves - A Enciclopédia das Aves do Brasil [Internet]. 2021 [cited 2021 Aug 24]. Available from: https://www.wikiaves.com.br/wiki/areas:pn_de_boa_nova:inicio
30. Wikiaves. Refúgio de Vida Silvestre de Boa Nova | WikiAves - A Enciclopédia das Aves do Brasil [Internet]. 2021 [cited 2021 Aug 24]. Available from: https://www.wikiaves.com.br/wiki/areas:rsv_de_boa_nova:inicio
31. Gonzaga LP, Pacheco JF, Bauer C, Castiglioni GDA. An avifaunal survey of the vanishing montane Atlantic forest of southern Bahia, Brazil. *Bird Conservation International*. 1995 Sep;5(2–3):279–90.
32. IUCN. The IUCN Red List of Threatened Species [Internet]. 2021 [cited 2021 Aug 24]. Available from: <https://www.iucnredlist.org>
33. de Oliveira WSL, Borges AKM, de Faria Lopes S, Vasconcellos A, Alves RRN. Illegal trade of songbirds: an analysis of the activity in an area of northeast Brazil. *Journal of Ethnobiology and Ethnomedicine*. 2020 Mar 30;16(1):16.
34. Barbosa JAA, Nobrega VA. Aspectos da caça e comércio ilegal da avifauna silvestre por populações tradicionais do semi-árido paraibano. *REVISTA DE BIOLOGIA E CIÊNCIAS DA TERRA*. :12.
35. d. M, C. P, d. R, d. RR. Aspectos da comercialização ilegal de aves nas feiras livres de Campina Grande, Paraíba, Brasil. *Revista de Biologia e Ciências da Terra*. 2006;6:204–21.

36. Alves RR da N, Nogueira EEG, Araujo HFP, Brooks SE. Bird-keeping in the Caatinga, NE Brazil. *Hum Ecol.* 2010 Feb 1;38(1):147–56.
37. Souto WMS, Torres MAR, Sousa BFCF, Lima KGGC, Vieira LTS, Pereira GA, et al. Singing for Cages: The Use and Trade of Passeriformes as Wild Pets in an Economic Center of the Amazon—NE Brazil Route. *Tropical Conservation Science.* 2017 Jan 1;10:1940082917689898.
38. Alves RRN, Leite RCL, Souto WMS, Bezerra DMM, Loures-Ribeiro A. Ethno-ornithology and conservation of wild birds in the semi-arid Caatinga of northeastern Brazil. *J Ethnobiology Ethnomedicine.* 2013 Feb 27;9(1):14.
39. Bezerra MMD, Araujo FPH, Alves RNR. Keeping wild birds as pets in a semiarid region of rio grande do norte state, northeastern brazil. Keeping wild birds as pets in a semiarid region of rio grande do norte state, northeastern brazil. 2017 Aug;032(01):085–93.
40. Licarião MR, Bezerra DMM, Alves RRN. Wild birds as pets in Campina Grande, Paraíba State, Brazil: An Ethnozoological Approach. *An Acad Bras Ciênc.* 2013 Mar;85:201–13.
41. Fernandes-Ferreira H, Mendonça SV, Albano C, Ferreira FS, Alves RRN. Hunting, use and conservation of birds in Northeast Brazil. *Biodivers Conserv.* 2012 Jan 1;21(1):221–44.
42. Costa FJV, Ribeiro RE, De Souza CA, Navarro RD. Espécies de Aves Traficadas no Brasil. *Fronteiras.* 2018 Aug 30;7(2):324–46.
43. Bezerra DMM, de Araujo HFP, Alves RRN. Captura de aves silvestres no semiárido brasileiro: técnicas cinegéticas e implicações para conservação. *Tropical Conservation Science.* 2012 Mar 1;5(1):50–66.
44. PF/Divulgação. Polícia Federal desarticula esquema de tráfico de aves em MOC e outras 11 cidades do Estado. O Norte [Internet]. [cited 2021 Sep 14]; Available from: <https://onorte.net/minas-do-norte/pol%C3%ADcia-federal-desarticula-esquema-de-tr%C3%A1fico-de-aves-em-moc-e-outras-11-cidades-do-estado-1.801509>

Tables

Table 1. List of mentioned species and number of citations regarding each type of use.

Taxonomic categories (order/family/species)	Popular name	Citations per type of use				UV	Conservation Status (IUCN)
		Trade	Breeding	Pet	Contest		
Passeriformes							
Thraupidae							
<i>Sporophila nigricollis</i> (Vieillot, 1823)	Yellow- bellied Seedeater	13	0	30	7	1.250	LC
<i>Saltator similis</i> (d'Orbigny & Lafresnaye, 1837)	Green- winged Saltator	13	0	23	3	0.975	LC
<i>Sicalis flaveola</i> (Linnaeus, 1766)	Saffron Finch	3	0	19	1	0.575	LC
<i>Sporophila caerulescens</i> (Vieillot, 1823)	Double- collared Seedeater	4	0	10	0	0.350	LC
<i>Sporophila bouvreuil</i> (Statius Muller, 1776)	Copper Seedeater	4	0	5	0	0.225	LC
<i>Sporophila angolensis</i> (Linnaeus, 1766)	Chestnut- bellied Seed-Finch	4	0	5	0	0.225	LC
<i>Paroaria dominicana</i> (Linnaeus, 1758)	Red-cowled Cardinal	2	0	5	0	0.175	LC
<i>Sporophila leucoptera</i> (Vieillot, 1817)	White- bellied Seedeater	1	0	2	0	0.075	LC
<i>Sporophila maximiliani</i> (Cabanis,1851)	Great-billed Seed-Finch	0	0	2	0	0.050	VU
<i>Sporophila lineola</i> (Linnaeus, 1758)	Lined Seedeater	0	0	2	0	0.050	VU
<i>Sporophila falcistrotris</i> (Temminck, 1820)	Temminck's Seedeater	1	0	1	0	0.050	LC
<i>Tangara sayaca</i> (Linnaeus, 1766)	Sayaca Tanager	1	0	1	0	0.050	LC
Fringillidae							

<i>Spinus magellanicus</i> (Vieillot, 1805)	Hooded Siskin	7	2	8	0	0.425	LC
<i>Serinus canaria</i> (Linnaeus, 1758)	Atlantic canary	0	2	4	0	0.175	LC
<i>Spinus magellanicus</i> X <i>Serinus canaria</i>	Pintagol	2	0	2	0	0.100	-
Cardinalidae							
<i>Cyanoloxia brissonii</i> (Lichtenstein, 1823)	Ultramarine Grosbeak	9	0	21	7	0.925	LC
Icteridae							
<i>Gnorimopsar chopi</i> (Vieillot, 1819)	Chopi Blackbird	4	0	13	0	0.425	LC
<i>Icterus jamaicae</i> (Gmelin, 1788)	Campo Troupial	3	0	6	0	0.225	LC
Turdidae							
<i>Turdus rufiventris</i> (Vieillot, 1818)	Rufous-bellied Thrush	8	1	11	0	0.500	LC
Psittiformes							
Psittacidae							
<i>Amazona aestiva</i> (Linnaeus, 1758)	Turquoise-fronted Parrot	0	0	1	0	0.025	LC
<i>Aratinga auricapillus</i> (Kuhl, 1820)	Golden-capped Parakeet	0	0	1	0	0.025	NT

Recorded species are presented by taxonomical order and in ordered by the number of citations in descending order. The use value (UV) is calculated considering frequency of citation and attributed usages. Conservation status was defined by IUCN's Red List.

Table 2. List of mentioned strategies used in bird trapping and frequency of citations of each.

Method	Description	Used to catch	Number of citations
<i>Alçapão</i>	A cage-like trap made of wood, metal and fiber. It can be only opened on top. The main mechanism is set off by pressure; as the bird reaches the flooring of the trap, the mechanism goes off and lower the upper lid, entrapping the bird.	All types of avian species. Sometimes smaller species do not have enough weight to set off the closing mechanism and larger species cannot enter the trap, allowing those to escape.	24
<i>Visgueira</i>	A type of natural glue extracted from jackfruit sap. It is typically applied in branches or twigs close to natural bodies of water. Often the glue can harm the entrapped bird when removing it from the trap.	Smaller avian species. The glue is not strong enough to entrap larger species.	12
<i>Esbarro</i>	A cage-like trap made of wood, metal and fiber. It can be opened at all sides, allowing birds coming from any direction to enter. As the bird touches the inside of the trap the main mechanism goes off, closing all sides of the trap simultaneously.	All types of avian species, especially larger ones. Sometimes smaller species do not have enough weight to set off the closing mechanism, allowing those to escape.	8
<i>Chama</i>	A captured bird that serves as bait to catch a particular species. Normally, it is located inside a small cage attached to a larger trap. It is especially effective to use a female of the desired species or a male when the desired species present territorial behavior.	All types of avian species that can be attracted by other individuals from the same species or territorial species that tend to attack other avian species.	5
Mirror	A piece of mirror located on the flooring of a trap that is set off by pressure, such as an <i>alçapão</i> . Seeing its own reflection in the mirror, the bird approaches the trap as if it was another individual.	All types of avian species that can be attracted by other individuals from the same species or territorial species that tend to attack other avian species.	2
Recorder	A recording of the desired species vocalization, usually reproduced by a smartphone nearby a trap.	All types of avian species that can be attracted by another individual's vocalization.	1

Methods are displayed by number of citations in descending order. All the names attributed to each method/trap, as well as their description and target species for each one was provided by interviewees who engage in bird trapping.

Figures

Figure 1

Study area. Location of the protected areas relative to the city of Boa Nova and nearby municipalities, as well as the highways BR-030 and BR-116.

Figure 2

Multiple Correspondence Analysis displaying the relationship of analyzed variables. In this two-dimensional coordinate map, socioeconomic factors allocated closer to each-other suggests an association between analyzed variables. The presented information regarding capture, keeping and trade refer to the last year.

Figure 3

Chord diagram depicting frequency of usage attributed to each mentioned species. In this figure, each line associated with a species portrays one respective mention.

Figure 4

Captive *Sporophila nigricollis* displaying molting. In order to guarantee a healthy change of feathers, multiple types of food are provided.

Figure 5

Tools used in bird trapping. Traps are often coupled with cages containing captive individuals of the desired species (Figure 5a). In this picture, one of the most traditional traps to capture wild birds in the region, known as “Alçapão” (Figure 5b).

Figure 6

Hybrid individuals known locally as “Pintagol”. We identified both a juvenile (Figure 6a) and an adult (Figure 6b) individuals of this breeding between *Spinus magellanicus* and *Serinus canaria*.