

## SHORT COMMUNICATION

# Territorial expansion of *Zenaida auriculata* (Aves: Columbidae) in the Brazilian Amazon

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## ABSTRACT

Birds are considered bioindicators of environmental quality because they are sensitive to environmental changes. The eared dove (*Zenaida auriculata*) is associated with open areas, has low sensitivity to environmental changes and is widely distributed in Brazil, although it is not typically found in the Amazon region. We analyzed the biogeographic expansion of this species in the Brazilian Amazon through searches carried out on digital citizen science platforms. The records of *Z. auriculata* were related with the area of accumulated deforestation in the biome. We identified 804 records of *Z. auriculata* in the Brazilian Amazon, of which 259 were in areas where its occurrence had been previously unknown. We show that the species has been expanding its geographic distribution, clearly overlapping with deforested areas.

**KEYWORDS:** deforestation, eared dove, biogeography, citizen science

## Expansão territorial de *Zenaida auriculata* (Aves: Columbidae) na Amazônia brasileira

### RESUMO

As aves são consideradas bioindicadores de qualidade ambiental por serem sensíveis às mudanças ambientais. A avoante (*Zenaida auriculata*) é associada a áreas abertas, possui baixa sensibilidade às mudanças ambientais e é amplamente distribuída no Brasil, apesar de não ser tipicamente encontrada na Amazônia. Nós analisamos a expansão biogeográfica desta espécie na Amazônia brasileira por meio de buscas em plataformas digitais de ciência cidadã. Os registros obtidos de *Z. auriculata* foram relacionados com a área de desmatamento acumulado no bioma. Identificamos 804 registros de *Z. auriculata* na Amazônia brasileira, dos quais 259 em regiões onde sua ocorrência era desconhecida. Nós mostramos que a espécie vem ampliando sua distribuição geográfica em nítida sobreposição com áreas desmatadas.

**PALAVRAS-CHAVE:** desmatamento, avoante, biogeografia, ciência cidadã

Many anthropogenic factors currently affect bird populations and assemblages, including hunting, invasion of exotic species, deforestation and associated forest fragmentation (Tubelis and Cavalcanti 2000; Gimenes and Anjos 2003). The response to anthropogenic factors varies among species, as some benefit from anthropic interventions and expand their populations, whereas others become locally extinct (Marini and Garcia 2005).

The eared dove, *Zenaida auriculata* (Des Murs, 1847) (Columbidae) is a gregarious bird that can form large flocks and has a wide geographic distribution, ranging from the Caribbean to Patagonia (Sick 1997). It occurs in practically all of the Brazilian territory, but is uncommon in the Amazon biome, except for the subspecies *Z. a. marajoensis* (present in

the northwest of Pará state to the north of Maranhão state), *Z. a. jessieae* (found in the region of the lower Amazonas River), and *Z. a. stenura* (distributed from Colombia to Suriname and down to the northern tip of Brazil) (Pinto 1978). The species is preferentially granivorous, has low sensitivity to environmental disturbances, lives in fields and open formations, and its presence has been strongly associated with damage to crops (Silva and Guadagnin 2018). It is also found in several Brazilian urban centers (Fontoura and Orsi 2014).

In recent decades, there have been increasing sightings of the eared dove where it had not been recorded before in the Amazon region, in new open areas due to deforestation (eBird 2020; Tâxeus 2020; WikiAves 2020). Here we provide

**CITE AS:** Ortúzar-Ferreira, C.N.; Tavares, G.M.; Franchin, A.G. 2022. Territorial expansion of *Zenaida auriculata* (Aves: Columbidae) in the Brazilian Amazon. *Acta Amazonica* 52: 166-171.

a review of records of *Z. auriculata* in the Brazilian Amazon documented in community science platforms.

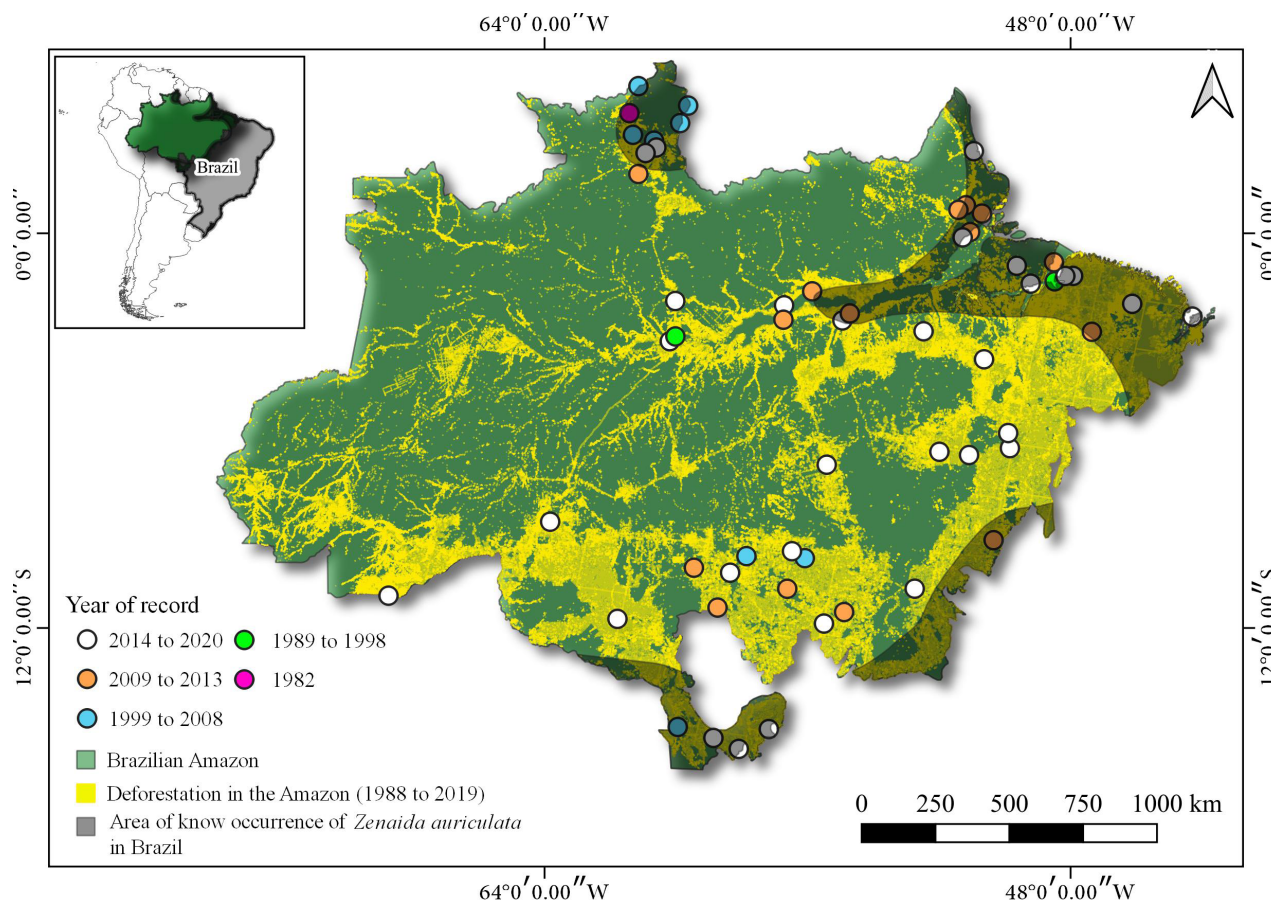
We searched digital citizen science platforms (WikiAves, eBird, and Táceus), which are large databases of records of Brazilian species by both academics and laymen, to find previously undocumented appearances of the species in the Amazon biome. The search period was 1982 to 2020, using *Zenaida auriculata* as search term. Subsequently, we filtered the records for locations in the Amazon biome. For eBird and Táceus, we included the records of the lists that contained the species. In Wikiaves, we analyzed the sound and photographic database of the species and excluded erroneous records (species misidentified as *Z. auriculata*). To assess the relation between bird records and deforested areas, the QGIS software was used to overlay the location points of *Z. auriculata* on a map of accumulated deforestation between 1988 and 2019 in the Amazon biome, provided by the National Institute for Space Research (*Instituto Nacional de Pesquisas Espaciais* - INPE).

We identified 804 records of *Z. auriculata* in the Brazilian Amazon, the oldest in 1982 and most recent in 2020. Of

these, 259 records (32.2%) were from areas where the species was not previously known to occur (IUCN 2021). The data compilation showed that all records of *Z. auriculata* outside its known distribution area occurred in deforested areas (Figure 1), and most of them occurred in the last six years of the survey period (2014 – 2020) (Table 1).

Ranvaud *et al.* (2001) demonstrated how *Z. auriculata* easily takes advantage of agricultural crops, adapting its diet to different types of grains. This is possibly the reason why populations of *Z. auriculata* are dispersing to deforested areas, which are, to a large extent, being occupied by crops such as soybean and maize. Corn and soybean seedlings are among the main food items of the species (Okawa *et al.* 1999; Ranvaud *et al.* 2001; Cândido Jr. *et al.* 2008).

There are populations of *Z. auriculata* that migrate seasonally from southern states such as São Paulo and Paraná to the Brazilian northeastern region (Bucher 1982; Souza *et al.* 2007; Oliveira *et al.* 2016), which suggests that other populations can establish migratory routes to the Amazon if they find favorable conditions there.



**Figure 1.** Records of eared dove, *Zenaida auriculata* in the Amazon biome in Brazil overlaid on a map showing the accumulated deforestation in the region from 1982 to 2020. Geographic coordinate system: Datum Sirgas (2000); Cartographic sources: IBGE (2020), INPE (2021), IUCN (2021). This figure is in color in the electronic version.

**Table 1.** Records of eared dove (*Zenaida auriculata*) in the Brazilian Amazon in three digital citizen science platforms. \* = locality in area not previously registered as occurrence area of the species according to IUCN (2021).

State	Municipality	Number of records				Year of record		
		WikiAves	Táxeus	eBird		WikiAves	Táxeus	eBird
				N individuals	Presence on list			
Acre	Brasília*	-	-	6	-	-	-	2018
Amapá	Calçoene	1	-	4	-	2019	-	2019
Amapá	Ferreira Gomes	-	-	3	-	-	-	2014, 2017
Amapá	Itaubal	1	-	13	2	2014	-	2019, 2020
Amapá	Macapá	4	1	58	6	2014, 2016, 2018	2012	2011, 2014, 2016, 2017, 2018, 2019
Amapá	Mazagão	-	-	4	-	-	-	2019, 2020
Amapá	Porto Grande*	2	1	11	1	2014, 2016	2013	2015, 2017, 2018, 2019
Amazonas	Iranduba*	1	-	-	-	2017	-	-
Amazonas	Manaus*	1	-	1	-	2015	-	1993
Amazonas	Nhamundá*	-	-	44	-	-	-	2016, 2017
Amazonas	Parintins*	3	-	-	-	2010, 2012, 2013	-	-
Amazonas	Presidente Figueiredo*	1	-	-	-	2015	-	-
Maranhão	Centro Novo do Maranhão	-	-	9	-	-	-	2018
Maranhão	São Luís	-	-	2	-	-	-	2019, 2020
Mato Grosso	Alta Floresta*	-	-	7	1	-	-	2009, 2014, 2016, 2017
Mato Grosso	Aripuanã*	3	-	-	-	2013, 2014	-	-
Mato Grosso	Barra dos Bugres	-	-	1	-	-	-	2019
Mato Grosso	Cláudia*	1	-	-	-	2013	-	-
Mato Grosso	Jauru	1	-	-	-	2019	-	-
Mato Grosso	Juína*	1	-	-	-	2014	-	-
Mato Grosso	Juruena*	1	-	-	-	2017	-	-
Mato Grosso	Mirassol d'oeste	1	-	20	-	2016	-	2016
Mato Grosso	Nova Bandeirantes*	-	-	1	2	-	-	2006, 2009
Mato Grosso	Paranaíta*	1	-	3	-	2015	-	2015, 2017
Mato Grosso	São José do Rio Claro*	-	-	97	-	-	-	2015, 2017, 2018, 2019
Mato Grosso	Sinop*	-	-	17	-	-	-	2015, 2017, 2019
Mato Grosso	Tabapora*	-	-	5	-	-	-	2014
Mato Grosso	Vila Bela da Santíssima Trindade	-	-	4	3	-	-	2006, 2015, 2016, 2017
Pará	Belém	-	-	7	1	-	-	1998, 2017, 2018
Pará	Belterra	1	-	10	-	2016	-	2016, 2017
Pará	Brasil Novo*	1	-	-	-	2015	-	-
Pará	Canaã dos Carajás*	1	-	-	-	2016	-	-
Pará	Castanhal	-	-	2	-	-	-	2019
Pará	Ilha de Marajó	-	-	11	-	-	-	2017

Table 1. Continued

State	Municipality	Number of records				Year of record		
		WikiAves	Táxeus	eBird		WikiAves	Táxeus	eBird
				N individuals	Presence on list			
Pará	Joanes	-	-	-	1	-	-	2010
Pará	Muaná	1	-	-	-	2017	-	-
Pará	Novo Progresso*	-	-	8	-	-	-	2019
Pará	Oriximiná*	3	-	4	-	2013, 2017	-	2017
Pará	Ourilândia do Norte*	1	-	3	-	2015	-	2015
Pará	Pacajá*	-	-	2	-	-	-	2018
Pará	Paragominas*	1	-	-	-	2011	-	-
Pará	Parauapebas*	-	-	3	-	-	-	2015
Pará	Santa Isabel do Pará	-	-	1	-	-	-	2017
Pará	Santana do Araguaia	-	-	18	4	-	-	2014, 2015, 2017
Pará	Santarém	18	-	73	8	2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019	-	2013, 2015, 2016, 2017, 2018, 2019
Pará	São Felix do Xingú*	2	-	1	1	2019	-	2019
Rondônia	Rolim de Moura*	3	-	-	-	2015	-	-
Rondônia	Porto Velho*	-	-	1	1	-	-	2017, 2020
Roraima	Alto Alegre	1	-	18	-	2018	-	2003
Roraima	Amajari	3	-	21	1	2016	-	1982, 2004, 2007, 2015, 2017, 2018, 2019
Roraima	Boa Vista	18	-	153	3	2003, 2009, 2011, 2012, 2015, 2016, 2018, 2019, 2020	-	2001, 2003, 2013, 2015, 2019, 2020
Roraima	Bomfim	1	-	4	1	2011	-	2001, 2017
Roraima	Cantá	-	-	11	-	-	-	2015, 2020
Roraima	Caracarái*	1	-	8	2	2016	-	2014, 2017, 2019, 2020
Roraima	Macajáí	2	-	-	1	2018	-	2019
Roraima	Normandia	3	-	7	1	2010, 2015, 2016	-	2001, 2003, 2015
Roraima	Pacaraima	-	-	1	1	-	-	2001, 2017
<b>Total</b>		<b>84</b>	<b>2</b>	<b>677</b>	<b>41</b>			

Historically, some species have been favored by the anthropization of natural environments, or even by deforestation (Rutt *et al.* 2019). These species are less sensitive to changes, are easily adaptable to ecological niches in open areas that result from deforestation. For example, *Fluvicola nengeta* (Linnaeus, 1766) has been reported to expand to the Amazon (Aguiar 2010), to southern Brazil (Straube *et*

*al.* 2007) and to regions with anthropogenic desertification in the state of São Paulo (Willis 1991). Another columbid, *Patagioenas picazuro* (Temminck, 1813), also exploited the effects of deforestation that turned the Brazilian southeast drier and more pastoral, to settle in the region (Willis and Oniki 1987). *Zenaida auriculata* seems to be following this pattern in the Amazon region.

Borges *et al.* (2017) report the presence of *Vanellus chilensis* (Molina, 1782), *Elaenia flavogaster* (Thunberg, 1822), *Athene cunicularia* (Molina, 1782) and *Geranoaetus albicaudatus* (Vieillot, 1816) in the central Amazon, which further indicates the colonization of this region by bird species not normally associated with the Amazon biome and calls for long-term monitoring to better understand this colonization dynamics.

*Zenaida auriculata* is a species with great adaptive plasticity, benefiting from anthropization due to its ability to live in cities or agricultural landscapes (Cândido Jr. *et al.* 2008), two scenarios that result from deforestation. This may explain how this species has been expanding its distribution and colonizing different areas of the Brazilian Amazon, given the drastic changes that have taken place in this biome. Given that most records are quite recent, future monitoring will determine whether these populations establish themselves permanently in these areas, e.g., by strating to reproduce. Finally, we emphasize the relevance of data provided by citizen science platforms in determining the range expansion of *Z. auriculata*. These platforms can be a valuable source of information for the monitoring of bird distribution, particularly in scenarios of rapid environmental.

## ACKNOWLEDGMENTS

The authors are immensely grateful to the WikiAves platform for providing the stimulus to ornithological knowledge. We would also like to thank the reviewers and editors for comments and suggestions that substantially contributed to the improvement of the manuscript.

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**RECEIVED:** 15/09/2021

**ACCEPTED:** 18/02/2022

**ASSOCIATE EDITOR:** Sérgio H. Borges



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