NOTAS SOBRE

MAMÍFEROS SUDAMERICANOS

Sociedad Argentina para el Estudio de los Mamíferos

Notas sobre Mamíferos Sudamericanos 2023, vol. 5
DOI: https://doi.org/10.31687/SaremNMS23.10.4
Versión on-line ISSN 2618-4788

NOTAS SOBRE
MAMÍFEROS
SUDAMERICANOS

First record of the ghost bat *Diclidurus* (Chiroptera, Emballonuridae) in the Atlantic Forest of Alagoas state, Brazil

Camila F. Gonçalves (1, 2), Roberto Leonan M. Novaes (3), André dos Santos (4), Patrício Adriano da Rocha (5), Ana Paula Carmignotto (6), and Pedro M. Galetti Jr. (2)

(1) Programa de Pós-Graduação em Ecologia e Recursos Naturais, Universidade Federal de São Carlos, São Carlos, SP, Brasil. (2) Departamento de Genética e Evolução, Universidade Federal de São Carlos, São Carlos, SP, Brasil. (3) Fundação Oswaldo Cruz, Fiocruz Mata Atlântica, Rio de Janeiro, RJ, Brasil. (4) Usina Coruripe, Coruripe, AL, Brasil. (5) Programa de Pós-Graduação Ciências Biológicas (Zoologia), Departamento de Sistemática e Ecologia, Universidade Federal da Paraíba, João Pessoa, PB, Brasil. (6) Departamento de Biologia, Universidade Federal de São Carlos, Sorocaba, SP, Brasil. [corresponding author: cafgoncalves17@gmail.com]

Citación: Gonçalves, C. F., R. L. M. Novaes, A. dos Santos, P. A. da Rocha, A. P. Carmignotto, & P. M. Galetti Jr. 2023. First record of the ghost bat *Diclidurus* (Chiroptera, Emballonuridae) in the Atlantic Forest of Alagoas state, Brazil. Notas sobre Mamíferos Sudamericanos 5:e23.10.4.

ABSTRACT
Diclidurus species are rare in inventories due to the difficulty in capturing them using traditional methods. Here, we present the first record of the genus *Diclidurus* in the Atlantic Forest of Alagoas state, northeastern Brazil, documented by video and photographs by a local citizen. Although this new record does not extend the geographic distribution of this genus, it confirms its presence in this region, highlighting the relevance of this area for further studies on bats and the role of citizens in increasing biodiversity knowledge.

Keywords: bat occurrence, citizen science, natural history, Northeastern Brazil, species distribution

RESUMO – Primeiro registo do morcego-fantasma *Diclidurus* (Chiroptera, Emballonuridae) na Mata Atlântica do Estado de Alagoas, Brasil. As espécies de *Diclidurus* são raras em inventários devido à dificuldade em as capturar utilizando métodos tradicionais. Aqui, apresentamos o primeiro registo do gênero *Diclidurus* na Mata Atlântica do estado de Alagoas, nordeste do Brasil, documentado por vídeo e fotografias por um cidadão local. Este novo registro, embora não expanda a distribuição geográfica do gênero, confirma a sua presença nessa região e destaca a relevância desta área para novos estudos sobre morcegos, enquanto ilustra o papel do cidadão leigo no aumento do conhecimento sobre a biodiversidade.

Palavras-chave: ciência cidadã, distribuição de espécies, história natural, Nordeste do Brasil, ocorrência de morcego

Ghost bats (genus *Diclidurus* Wied-Neuwied, 1820) take their name from their conspicuous white fur (Ceballos & Medellin 1988; Jones & Hood 1993), and range from

Recibido el 6 de abril de 2023. Aceptado el 8 de septiembre de 2023. Editor asociado João Oliveira.

western Mexico to Central and South America, reaching north and eastern Brazil (Hood & Gardner 2008). The genus includes four species, *Diclidurus albus* Wied-Neuwied, 1820, *D. ingens* Hernández-Camacho, 1955, *D. Isabella* (Thomas, 1920), and *D. scutatus* Peters, 1869.

Diclidurus species are insectivorous bats with fast flight ability that forage at high heights in the forest canopy, open areas or above water courses, as well as in urban areas (Sodré & Uieda 2006; Escobedo & Velazco 2012). These characteristics make this taxon uncommon in inventories carried out with the use of traditional ground-level mist nets to capture bats (Garbino et al. 2013). *Diclidurus albus*, for example, has only 38 documented occurrences in the literature, with the other species being even rarer, with 20 (*D. scutatus*) or fewer (*D. ingens* and *D. isabella*) records (Dalponte & Aguiar 2009; Garbino et al. 2013; Novaes et al. 2017; Vela-Ulian et al. 2020).

For hundreds of years, farmers, hunters, hobbyist naturalists, traditional populations, and other non-academic observers have collected information on the biotic environment and their organisms, such as plants, fungi, invertebrates (including pollinating insects), fish, amphibians, reptiles, and birds (Miller-Rushing et al. 2012; Kobori et al. 2016). In recent years, projects and initiatives have been created to promote the sharing about biodiversity information, such as iNaturalist (www.inaturalist.org) and Wikiaves (www.wikiaves.com.br) platforms. Also, field relationships established between researchers and local citizens are a great source for data sharing. This type of data has been incorporated by researchers and have contributed to increase our understanding on biodiversity (Warren et al. 2001; Miller-Rushing & Primack, 2008; Theobald et al. 2015), including the uncovering of novel species (Winterton 2020; Rosa et al. 2022), as well as the detection of rare species (Wilson et al. 2020; Mesaglio et al. 2021). The present study reports the first occurrence of the ghost bat *Diclidurus* in the Atlantic Forest of Alagoas state, made by a local citizen.

André dos Santos, an employee of the Usina Coruripe responsible for monitoring reforested areas and accompanying researchers during field surveys in Coruripe forest fragments. Santos has extensive field experience in the region, being able to easily recognize different animals and plants, and actively collaborating in researches conducted in the area. On February 20th, 2023, Santos spotted a bat with white fur resting around seven meters high in the forest canopy (latitude -10.102928; longitude -36.280337) at 10:38 a.m., and captured images of it on photographs and video recording (Fig. 1; Video S1). Posteriorly, he contacted the authors via messages to carry out the proper identification of the recorded specimen.

The ghost bat was recorded at the Mutum de Alagoas I RPPN (Reserva Particular do Patrimônio Natural – "Private Reserve of Natural Heritage"), which together with two other RPPNs (Mutum de Alagoas II and Afrânio Menezes) comprise an Atlantic Forest continuum of 544.97 ha, as part of the private property of the Usina Coruripe, the largest company in the sugar and ethanol sector in North/Northeast Brazil. Usina Coruripe presents a high commitment to local sustainable development, allocating about 17,000 ha of native forest fragments for preservation, of which 9,000 ha (53%) have already been implemented as RPPNs (Relatório de Sustent-

abilidade Safra 2021/2022). The three fragments (Mutum de Alagoas I and II, and Afrânio Menezes) were recently proposed as high priority areas for conservation and maintenance of the endemic biodiversity of the region (M. Beltrão, personal communication). Their present vegetation is characterized by ombrophilous forest with different successional stages (primary and secondary forest patches) and includes species from Myrtaceae, Clusiaceae, and Arecaceae families, such as *Psidium cattleianum* (Araçá-rosa) and *Garcinia gardneriana* (Bacupari) (Machado et al. 2012), *Handroathus cristatus* (Ipê-amarelo) and *Euterpe oleracea* (Açaí) (A. dos Santos, personal communication). At the time of the reported sighting, the surrounding sugar cane plantation had recently been planted, and it was at the initial stage of growth (A. dos Santos, personal communication).

We reviewed the records of *Diclidurus* in the Atlantic Forest in three online databases (Web of Science, Google Scholar, ScienceDirect) using the following keywords: "*Diclidurus*" AND "Atlantic Forest" OR "Mata Atlântica". This search included scientific papers, book chapters, and in monographs, dissertations, and theses, which were considered if supported by voucher specimens with coordinates.

We found only eight records of *Diclidurus* specimens for the entire Atlantic Forest, with six records based on vouchers deposited in scientific collections, one voucher apparently lost, and one based on a captured and released specimen (Table 1; Fig. 2C). For the Pernambuco Endemism Center (PEC), only two previous records were found: one from Pernambuco (Guerra 2007), located 202 km to the north (vouchered), and another from Paraíba state (Ferreira et al. 2013, not vouchered), located 377 km north from the present record. The third northeastern record, from Bahia state, is from approximately 647 km south of the present record. Barbosa Leal et al. (2022: supplementary material) cite a record of *Diclidurus* sp. for an area of Caatinga in the municipality of Piranhas, state of Alagoas. However, the authors do not mention this record in the state list of species or throughout the text, which led us to classify this record as doubtful, not considering it here.

Recently, the PEC has been the subject of several studies on its persisting biodiversity (Lima et al. 2020; Ramos et al. 2021), particularly in the Alagoas state, including descriptions of new species (Junior et al. 2020; Dos Santos et al. 2022; Dubeux et al. 2022). Bats are considered the most diverse group in the PEC, representing 53% of its mammalian fauna (Feijó et al. 2023), and the one in which most new species have been described in the last years (Vilar et al. 2015; Nunes et al. 2018). This tendency will probably continue to increase, since Alagoas state preserves areas with high sampling relevance for the group (Carvalho et al. 2021).

According to a review conducted by Barbosa Leal et al. (2022), the Alagoas state, including Caatinga and Atlantic Forest biomes, presents 66 bat species belonging to 40 genera and eight families. However, these authors point out that bat richness may be biased due to the almost exclusive use of mist net sampling, which could underestimate the diversity of aerial insectivores (Silva & Bernard 2017), as is the case for species of the genus *Diclidurus*.

Diclidurus species are morphologically similar externally, and their identification

from photographs is not possible (Hood & Gardner 2008). *Diclidurus albus* and *D. scutatus* are the most similar species of the genus, basically differing in some measurements, such as forearm length (less than 60 mm in *D. scutatus* and between 60 and 70 mm in *D. albus*) and length of maxillary toothrow (less than 7 mm in *D. scutatus* and more than 7 mm in *D. albus*), and qualitative skull characters (presence of large palatine fenestra in *D. scutatus*, absent in *D. albus*) (Hood & Gardner 2008). Thus, the species identity of records based on unvouchered material cannot be confirmed, but based on the geographic distribution and nearby records, it is expected and plausible that the species recorded here is *Diclidurus albus* (Fig. 2A).

Ghost bats are solitary, and all field observations indicate the use of palm tree leaves as roost during the day (Bonaccorso 2019). However, the current record is the first of a *Diclidurus* individual roosting in a non-palm tree, indicating the use of other resources for roost.

Although the present note does not extend the distribution of *Diclidurus* species, it adds information on the natural history of an elusive bat genus. Despite no citizen science program is formally implemented in the region, the present study reinforces the importance of public participation in scientific research, increasing the support for basic and applied science (Theobald et al. 2015). Indeed, even singular records collected by citizens (as the one provided here) can catalyze further discoveries and important conservation efforts (Mesaglio et al. 2021; Lewanzik et al. 2022).

Figure 1. Photograph of a live specimen and the zoom of the ghost bat *Diclidurus* spotted resting in a forest canopy.

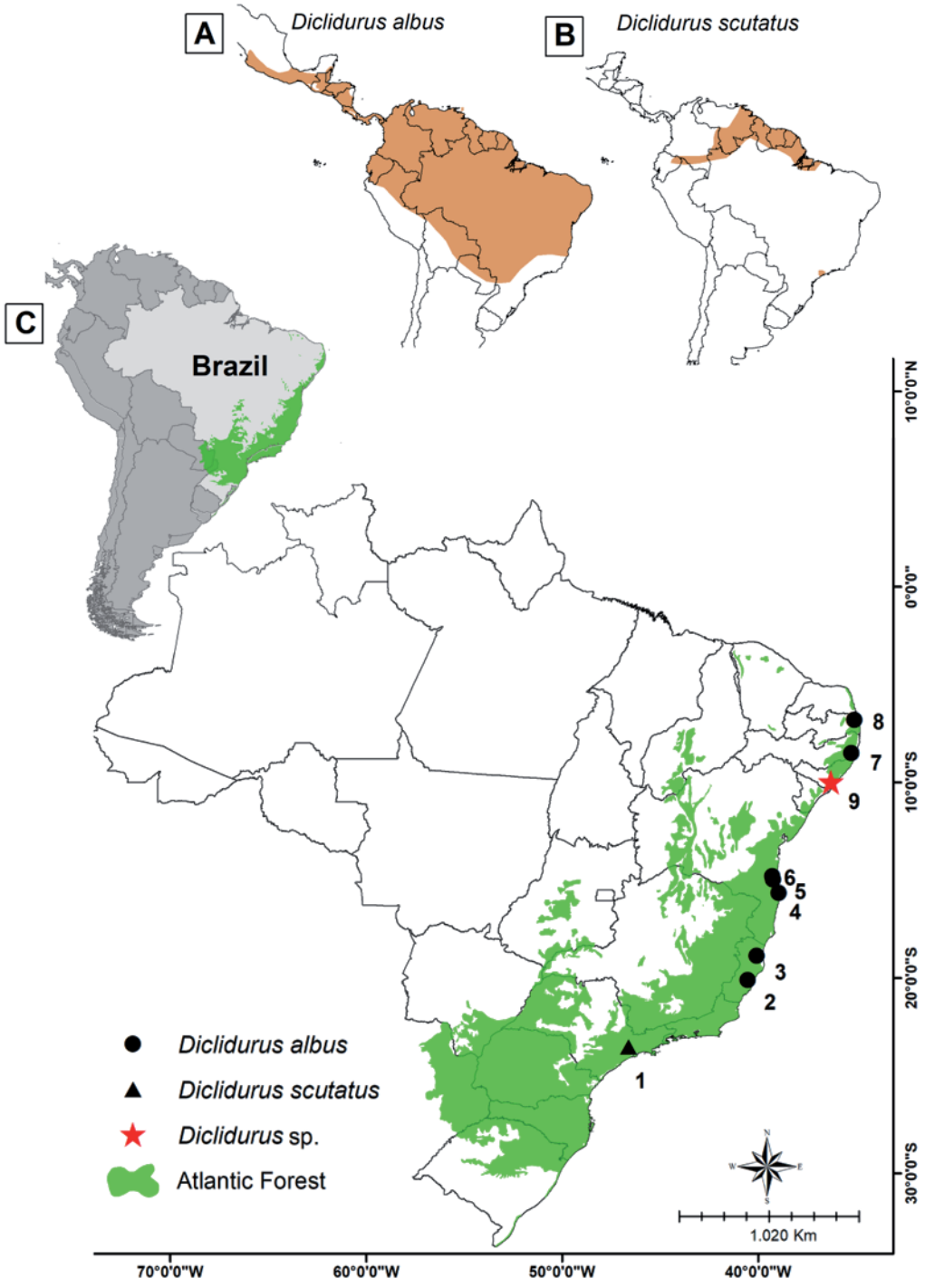

Figure 2. A) IUCN distribution for *D. albus* (Lim et al. 2016); B) IUCN distribution for *D. scutatus* (Sampaio et al. 2016); C) Records of *D. albus* (circle), *D. scutatus* (triangle) and the new record for Coruripe, Alagoas (red star) in the Atlantic Forest (biome limits by Olson et al. 2001). For a description of the localities numbers in the map, see Table 1.

Table 1. Locality records for the genus *Diclidurus* in the Atlantic Forest, listing vouchers associated with each record. Acronyms indicate the Brazilian states: SP - São Paulo; ES - Espírito Santo; BA - Bahia; PE - Pernambuco; PB - Paraíba; AL - Alagoas.

Map	Taxa	Latitude/ Longitude	State	Municipality	Source	Voucher
1	*Diclidurus scutatus*	-23.533822; -46.617119	SP	São Paulo	Sodré & Uieda (2006)	MZUSP 32344
2	*Diclidurus albus*	-20.102987; -40.529556	ES	Santa Leopodina	Ruschi (1953)	CMBML 28 (probably lost, see Vela-Ulian et al. 2020)
3	*Diclidurus albus*	-18.894926; -39.742602	ES	Sooterama	Damásio et al. (2021); Vela-Ulian et al. (2021)	UFES-MAM 2780
4	*Diclidurus albus*	-15.650463; -38.950366	BA	Canavieiras	Hood & Gardner (2008)	ZMB 4478 (holotype)
5	*Diclidurus albus*	-14.967125; -39.233701	BA	Buerarema	Vaz (2005)	MN (10995 and 11189)
6	*Diclidurus albus*	-14.786012; -39.280645	BA	Itabuna	Faria et al. (2006)	CMARF 2102
7	*Diclidurus albus*	-8.664029; -34.881432	PE	Recife	Guerra (2007)	UFPE 371
8	*Diclidurus albus*	-6.805353; -35.083638	PB	Rio Tinto	Ferreira et al. (2013)	No voucher
9	*Diclidurus* sp.	-10.102928; -36.280337	AL	Coruripe	This study	No voucher

ACKNOWLEDGEMENTS

The authors thank Usina Coruripe. CFG thanks Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) and Programa de Pós-Graduação em Ecologia e Recursos Naturais da Universidade Federal de São Carlos (PPGERN – UFSCar) for PhD fellowship (Financial Code 001, 2020/88887.498109). CFG, PMGJ and APC thank Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP, 2017/23548-2), PMGJr also thanks Conselho de Desenvolvimento Científico e Tecnológico (CNPq, 303524/2019). RLMN has received support from Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ E-26/204.243/2021; E26/200.631/2022 and E26/200.395/2022). We also thank two anonymous reviewers and the editors for helpful comments on the manuscript.

SUPPLEMENTARY ONLINE MATERIAL

Video S1. A specimen of the genus *Diclidurus* was recorded resting in a canopy tree at Coruripe, Alagoas state, northeastern Brazil.

LITERATURE CITED

Barbosa Leal, E. S., et al. 2022. Bats from Alagoas State, Northeastern Brazil: updated checklist based on literature, collections, and acoustic records. Mastozoologia Neotropical 29:e0613. https://doi.org/10.31687/saremMN.22.29.2.02.e0613

Bonaccorso, E. J. 2019. Family Emballonuridae. Handbook of the mammals of the world. Vol. 9. Bats (D.E. Wilson & A.R. Mittermeier, eds.). Lynx Editions, Barcelona.

Carvalho, C. S., et al. 2021. Environmental heterogeneity and sampling relevance areas in an Atlantic Forest endemism region. Perspectives in Ecology and Conservation 19:311–318. https://doi.org/10.1016/j.pecon.2021.05.001

Ceballos, B. G., & R. A. Medellin. 1988. *Diclidurus albus*. Mammalian Species 316:1–4.

Dalponte, J. C., & L. M. S. Aguiar. 2009. The first record of *Diclidurus ingens* Hernandez-Camacho, 1955 (Emballonuridae) in Central Brazil. Biota Neotropica 9:249–252.

Damásio, L., et al. 2021. Diversity and Abundance of Roadkilled Bats in the Brazilian Atlantic Forest. Diversity 13:335. https://doi.org/10.3390/d13070335

Dos Santos, A. C., A. M. S. D. F. Vaz, M. A. Da Silva, A. P. Paula, L. D. L. Feitoza, & R. De Carvalho. 2022. A new species of *Bauhinia* (Cercidoideae, Leguminosae) from the states of Pernambuco and Alagoas, Brazil. Phytotaxa 576:289–296. https://doi.org/10.11646/phytotaxa.576.3.5

Dubeux, M. J., et al. 2022. Two new species of geckos of the genus *Phyllopezus* Peters, 1878 (Squamata: Gekkota: Phyllodactylidae) from northeastern Brazil. Zootaxa 5120:345–372. https://doi.org/10.11646/zootaxa.5120.3.3

Escobedo, M., & P. M. Velazco. 2012. First confirmed record for Peru of *Diclidurus scutatus* Peters, 1869 (Chiroptera: Emballonuridae). Check List 8:554–556.

Faria, D., B. Soares-Santos, & E. Sampaio. 2006. Bats from the Atlantic rainforest of southern Bahia, Brazil. Biota Neotropica 6. https://doi.org/10.1590/S1676-06032006000200022

Feijó, A., et al. 2023. Mammals of the Pernambuco Endemism Center: Diversity, Biogeography, Research Gaps, and Conservation Concerns. Animal Biodiversity and Conservation in Brazil's Northern Atlantic Forest (G. A. Pereira Filho, F. G. R. França, R. R. N. Alves, & A. Vasconcellos). Springer International Publishing, Cham.

Ferreira, A. P., D. C. Melo, & A. Loures-Ribeiro. 2013. *Diclidurus albus* Wied-Neuwied, 1820 (Chiroptera: Emballonuridae): first record of the species in the state of Paraíba, Brazil. Check List 9:793–796.

Garbino, G. S., C. C. Aquino, & C. C. Aires. 2013. Second record of the pale brown ghost bat *Diclidurus isabella* (Thomas, 1920)(Chiroptera, Emballonuridae) from Brazil and range extension into southwestern Brazilian Amazonia. Mammalia 77:231–234. https://doi.org/10.1515/mammalia-2012-0061

Guerra, D. Q. 2007. Chiroptera de Pernambuco: distribuição e aspectos biológicos. Master's thesis. Universidade Federal de Pernambuco, Brazil.

Hood, C., & A. L. Gardner. 2008. Family Emballonuridae. Mammals of South America, vol. 1: Marsupials, xenarthrans, shrews, and bats (A. L. Gardner, ed.). Chicago University Press, Chicago.

Jones, J. K., & C. S. Hood. 1993. Synopsis of South American bats of the family Emballonuridae. Texas Tech University, Texas 155:1–32.

Junior, I. de O.,A. Aptroot, L. A. dos Santos, J. G. Cavalcante, A. Košuthová, & M. E. da Silva Cáceres. 2020. Two further new lichen species from the Atlantic Forest remnant Pedra Talhada (Alagoas, Brazil), with a species list. The Bryologist 123:617–632. https://doi.org/10.1639/0007-2745-123.4.617

Kobori, H., et al. 2016. Citizen science: a new approach to advance ecology, education, and conservation. Ecological Research 31:1–19. https://doi.org/10.1007/s11284-015-1314-y

Lewanzik, D., et. al. 2022. Evaluating the potential of urban areas for bat conservation with citizen science data. Environmental Pollution 297:118785. https://doi.org/10.1016/j.envpol.2021.118785

Lim, B., B. Miller, F. Reid, J. Arroyo-Cabrales, A. D. Cuarón, & P. C. de Grammont. 2016. *Diclidurus albus*. The IUCN Red List of Threatened Species 2016:e.T6561A21986615. https://dx.doi.org/10.2305/IUCN.UK.2016-2.RLTS.T6561A21986615.en

Lima, J. H. A., M. A. Freitas, I. J. Roberto, M. N. Kokubum, M. M. Dubeux, & P. S. Nunes. 2020. New records of *Xenodon rabdocephalus* (Wied-Neuwied, 1824) (Serpentes: Dipsadidae) in the Pernambuco Endemism Center, Northeastern Brazil. Herpetology Notes 13:517–522.

Machado, M. A. B. L., L. D. F. de Carvalho Chaves, J. L. R. Neto, & R. P. de Lyra Lemos. 2012. Florística do estrato arbóreo de fragmentos da Mata Atlântica do Nordeste oriental, município de Coruripe, Alagoas, Brasil. Revista Ouricuri 2:055–072.

Mesaglio, T., A. Soh, S. Kurniawidjaja, & C. Sexton. 2021. First Known Photographs of Living Specimens: the power of iNaturalist for recording rare tropical butterflies. Journal of Insect Conservation 25:905–911. https://doi.org/10.1007/s10841-021-00350-7

Miller-Rushing A. J., & R. B. Primack. 2008. Global warming and flowering times in Thoreau's Concord: A community perspective. Ecology 89:332–341. https://doi.org/10.1890/07-0068.1

Miller-Rushing, A. J., R. B. Primack, & R. Bonney. 2012. The history of public par-ticipation in ecological research. Frontiers in Ecology and the Environment 10: 285–290. https://doi.org/10.1890/110278

Novaes, R. L. M., V. C. Cláudio, & A. A. Kuniy. 2017. Range extension of *Diclidurus scutatus* (Chiroptera, Emballonuridae) to southwestern Amazonia. Acta Amazonica 47:359–364.

Nunes, H., P. A. da Rocha, J. Sales, F. Lopes Rocha, & P. Cordeiro-Estrela 2018. First record of *Uroderma magnirostrum* Davis, 1968 (Chiroptera, Phyllostomidae) in the northeastern Atlantic Forest of Brazil. Oecologia Australis 22:312–319. https://doi.org/10.4257/oeco.2018.2203.10

Olson, D. M., et al. 2001. Terrestrial ecoregions of the world: a new map of life on Earth. Bioscience 51:933-938. https://doi.org/10.1641/0006-3568(2001)051[0933:TEOTWA]2.0.CO;2

Ramos, D. M. S., L. G. Da Silva, J. P. Souza-Alves, I. R. Carlos, & M. A. Montes. 2021. New record of Ocelot, *Leopardus pardalis* (Linnaeus, 1758) (Felidae), in an Atlantic Forest fragment in the Pernambuco Endemism Center, northeastern Brazil. Check List 17:1067–1073. https://doi.org/10.15560/17.4.1067

Relatório de Sustentabilidade Safra. 2021/2022. <https://www.usinacoruripe.com.br/socioambiental#relatorio-sustentabilidade.pdf>.

Rosa, R. M., D. C. Cavallari, & R. B. Salvador. 2022. iNaturalist as a tool in the study of tropical molluscs. PLoS ONE 17:e0268048. https://doi.org/10.1371/journal.pone.0268048

Ruschi, A. 1953. Família Emballonuridae: Descrição das espécies: *Rhynchiscus naso* e *Diclidurus albus albus*, com algumas observações a respeito. Boletim do Museu de Biologia Prof. Mello Leitão (Zoologia) 12:1–13.

Sampaio, E., B. Lim, & S. Peters. 2016. *Diclidurus scutatus*. The IUCN Red List of Threatened Species 2016:e.T6564A21986499. https://dx.doi.org/10.2305/IUCN.UK.2016-2.RLTS.T6564A21986499.en

Silva, C. R., & E. Bernard. 2017. Bioacoustics as an importante complementary tool in bat inventories in the Caatinga Drylands of Brazil. Acta Chiropterologica 19:409–418.

Sodré, M. M., & W. Ueda. 2006. First record of the ghost bat *Diclidurus scutatus* Peters (Mammalia, Chiroptera, Emballonuridae) in São Paulo City, Brazil. Revista Brasileira de Zoologia 23:897–898.

Theobald, E. J., et al. 2015. Global change and local solutions: Tapping the unrealized potential of citizen science for biodiversity research. Biological Conservation 181:236–244. https://doi.org/10.1016/j.biocon.2014.10.021

Vaz, S. M. 2005. Mamíferos colecionados pelo Serviço de Estudos e Pesquisas sobre a Febre Amarela nos municípios de Ilhéus e Buerarema, Estado da Bahia, Brasil. Arquivos do Museu Nacional 63:21–28.

Vela-Ulian, C. M., J. P. Maires-Hoppe, & A. D. Ditchfield. 2020. New records of bats (Chiroptera) in the Atlantic Forest of Espírito Santo, southeastern Brazil. Mammalia 85:52–63. https://doi.org/10.1515/mammalia-2019-0109

Vilar, E. M., H. Nunes, J. L. Nascimento, & P. Cordeiro-Estrela. 2015. Distribution extension of *Ametrida centurio* Gray, 1847 (Chiroptera, Phyllostomidae): first record in the Brazilian Atlantic Forest. Check List 11:1–5. http://dx.doi.org/10.15560/11.1.1503

Warren, M. S. et al. 2001. Rapid responses of British butterflies to opposing forces of climate and habitat change. Nature 414:65–69. https://doi.org/10.1038/35102054

Wilson, J. S., A. D. Pan, D. E. M. General, & J. B. Koch. 2020. More eyes on the prize: an observation of a very rare, threatened species of Philippine Bumble bee, *Bombus irisanensis*, on iNaturalist and the importance of citizen science in conservation biology. Journal of Insect Conservation 24:727–729. https://doi.org/10.1007/s10841-020-00233-3

Winterton, S. L. 2020. A new bee-mimicking stiletto fly (Therevidae) from China discovered on iNaturalist. Zootaxa 4816:361–369. https://doi.org/10.11646/zootaxa.4816.3.6