

New occurrences of *Dasyprocta nigriclunis* expands species distribution in Caatinga, northeast Brazil

Nuevas ocurrencias de *Dasyprocta nigriclunis* expanden la distribución de la especie en la Caatinga, nordeste de Brasil

RENAN L. A. RIBEIRO^{1*}, GILSON JACK-XIMENES², JOSÉ J. CHEREM³, HUGO B. MOZERLE⁴, MATHEUS D. R. FERREIRA⁵, JAILTON J. F. FERNANDES⁶, AND CHRISTIAN N. BERLINCK⁷

¹Centro Nacional de Pesquisa e Conservação de Mamíferos Carnívoros, Instituto Chico Mendes de Conservação da Biodiversidade. Estrada Hisaichi Take Bayashi, 8600, CEP: 12952-011, Usina, Atibaia. São Paulo, Brasil. E-mail: renan.ribeiro.bolsista@icmbio.gov.br (RLAR).

²Universidade Estadual de Santa Cruz, Campus Soane Nazaré de Andrade. Rodovia Jorge Amado, km 16, CEP: 45662-900, Salobrinho, Ilhéus. Bahia, Brasil. E-mail: giliackx@yahoo.com (GI-X).

³Instituto Tabuleiro. Avenida Desembargador Vitor Lima, nº 260, sala 908, CEP: 88.040-400, Trindade, Florianópolis. Santa Catarina, Brasil. E-mail: jjcherem@gmail.com (JJC).

⁴Rua da Raia, s/n, CEP: 88625-000, Centro, Urupema. Santa Catarina, Brasil. E-mail: hbmbio@yahoo.com.br (HBM).

⁵Centro Nacional de Pesquisa e Conservação de Mamíferos Carnívoros, Instituto Chico Mendes de Conservação da Biodiversidade. Estrada Hisaichi Take Bayashi, 8600, CEP: 12952-011, Usina, Atibaia. São Paulo, Brasil. E-mail: matheusdestro@gmail.com (MDRF).

⁶Parque Nacional do Catimbau, Instituto Chico Mendes de Conservação da Biodiversidade. Rua São José, s/n, CEP: 56537-000, Catimbau, Buíque. Pernambuco, Brasil. E-mail: jailton.fernandes@icmbio.gov.br (JJFF).

⁷Centro Nacional de Pesquisa e Conservação de Mamíferos Carnívoros, Instituto Chico Mendes de Conservação da Biodiversidade. Estrada Hisaichi Take Bayashi, 8600, CEP: 12952-011, Usina, Atibaia. São Paulo, Brasil. E-mail: christian.berlinck@icmbio.gov.br (CNB).

*Corresponding author

The boundaries between *Dasyprocta* species are still in debate and the distribution of agoutis is also uncertain, especially at Caatinga, northeast Brazil, where both *D. prymnolopha* and *D. nigriclunis* exists and there are discordances in synonymize or not these taxa. This note aims to report new records of *D. nigriclunis* obtained through camera trap monitoring, which expands its distribution area. The survey of *Dasyprocta* was conducted in Catimbau National Park, Pernambuco State, from June 2023 to July 2024, and in Dom Inocêncio, Piauí State, from January 2019 to June 2022. Camera traps were installed ~40 cm above the ground, programmed to capture 3 photos at 1-min intervals between bursts, and operated 24 hr/day. An interval of 1 hr was used to define independent records, once *Dasyprocta* species stay for a long time foraging in front of the cameras. The Brazilian government, through Instituto Chico Mendes de Conservação da Biodiversidade, recognizes and considers *D. nigriclunis* a valid species. Thus, we report 50 new records across 15 survey sites. These findings increase the geographic range of *D. nigriclunis*, improve the data for the Brazilian Extinction Risk Assessment, indicates potential collection sites and highlights the need of mammals' survey at Caatinga.

Key words: Agouti; Brazilian endemic species; camera trap; dry forest; geographic range.

Los límites entre las especies del género *Dasyprocta* aún están en debate y la distribución de las pacas también es incierta, especialmente en la Caatinga, donde *D. prymnolopha* y *D. nigriclunis* existen y hay discordancias sobre si estos taxones deben ser sinonimizados o no. Esta nota tiene como objetivo reportar nuevos registros de *D. nigriclunis* obtenidos mediante el monitoreo con cámaras trampa, lo que amplía su área de distribución. El levantamiento de *Dasyprocta* se realizó en el Parque Nacional Catimbau, en el estado de Pernambuco, de junio de 2023 a julio de 2024, y en Dom Inocêncio, en el estado de Piauí, de enero de 2019 a junio de 2022. Las cámaras trampa se instalaron a ~40 cm del suelo, programadas para capturar 3 fotos a intervalos de un minuto entre ráfagas, y operaron 24 hr/día. Se utilizó un intervalo de 1 hr para definir registros independientes, ya que las especies de *Dasyprocta* suelen pasar largos períodos alimentándose frente a las cámaras. El gobierno brasileño, a través del Instituto Chico Mendes de Conservación de la Biodiversidad, reconoce y considera *D. nigriclunis* una especie válida. Así, reportamos 50 nuevos registros en 15 sitios de muestreo. Estos hallazgos amplían el rango geográfico de *D. nigriclunis*, mejoran los datos para la Evaluación del Riesgo de Extinción en Brasil, indican posibles sitios de recolección y destacan la necesidad de realizar inventarios de mamíferos en la Caatinga.

Palabras clave: Bosque seco; cámaras trampa; distribución geográfica; especie endémica brasileña; pacas.

Agoutis are caviomorph rodents of the genus *Dasyprocta* Osgood, 1915, widely distributed from southern México to Argentina (Patton and Emmons 2015). However, the boundaries between some *Dasyprocta* species are uncertain, so the species number of this genus could vary from 10 (Patton and Emmons 2015) to 13 species (Teta and Reyes-Amaya 2021). One example is *Dasyprocta nigriclunis*, which its validity is not consensual (Percequillo et al. 2024). Thomas (1917) stressed doubts about the distinction of *D. nigriclunis* and *D. prymnolopha* and after his opinion, most authors synonymized *D. nigriclunis* to *D. prymnolopha* (Moojen 1952; Cabrera 1961; Woods 1993; Patton and Emmons 2015). The purported synonymization is based on Thomas (1917) who stressed doubts based only on description of Osgood (1915) and examination of specimens of Lamarão, a municipality in the state of Bahia in the North-East region of Brazil. The subsequent authors which followed the Thomas' opinion (Moojen 1952; Cabrera 1961; Woods 1993; Patton and Emmons 2015) also did not examine neither the specimens quoted by Thomas (1917) nor the type of *Dasyprocta nigriclunis*. The taxonomic decision of these authors was based on a fragile argumentation: the Thomas' opinion. The examination of photographs of *D. nigriclunis* type, and comparisons with specimens of *D. prymnolopha* cited by Thomas (1917) stress the differences observed by lack-Ximenes (1999). Based on morphological data lack-Ximenes (1999) suggest that *D. nigriclunis* is a distinct species and not related to *D. prymnolopha*.

According to lack-Ximenes (1999) revision, *Dasyprocta nigriclunis* is an endemic species from northeast Brazil, recognized by a black rump, with no pheomelanic hairs on the sides of the rump and thighs; a black hood starting from the nape extending sometimes until the shoulder's region; sides olivaceous. This species occurs above 400 m at Cerrado and Caatinga biomes (lack-Ximenes 1999; Oliveira and Bonvicino 2011). Based on the Brazilian assessment of *D. nigriclunis* (Percequillo et al. 2024), available on official System of Biodiversity's Extinction Risk Assessment (SALVE; ICMBio 2024), there are few records about *D. nigriclunis*, being currently known from the Brazilian states of Tocantins (lack-Ximenes 1999), Bahia (Osgood 1915; lack-Ximenes 1999; Campos et al. 2019) and Piauí (Zaher 2000; Lima 2009).

Dasyprocta prymnolopha was included in leporina group by lack-Ximenes (1999) based on wide pheomelanic basal band in the eumelanic hairs of the rump. lack-Ximenes (1999) included in the leporina group the following species: *D. aguti* (now recognized as *D. iacki*), *D. leporina*, *D. aurea*, *D. croconota*, *D. prymnolopha* and *D. catrinae*. The leporina group was previously recognized by Thomas (1898) as "*Dasyprocta aguti* and the Species allied to it" or the red- and yellow-rumped agoutis. Despite some variation, the rump of *Dasyprocta prymnolopha* has the black crest between lateral pheomelanic areas with variable width. The pheomelanic region of the rump is formed by 2 types of hairs: hairs with pheomelanic basal and distal region, and 2 or

3 pheomelanic bands interspersed with 1 or 2 eumelanic bands; pheomelanic monocromatic hairs with basal region faded. The pattern of rump coloration and hair types differ *D. prymnolopha* from *D. nigriclunis*.

Here, we reported new records of the *Dasyprocta nigriclunis* obtained by camera trapping monitoring that increases the distribution area of this species at Pernambuco and Piauí states in Brazil, both in the Caatinga biome.

We pooled data from 2 independent camera trap (CT) surveys (Bushnell, models 119739, 119949C and 119932C) conducted in 2 studied sites, installed at ~ 40 cm above the ground, programmed to take 3 photos at 1-min intervals between bursts, and operating 24 hr/day, and since these are semi-arid regions, the cameras were installed on trails and near bodies of water, with at least 1 km of distance between them. We used the web platform Wildlife Insights (<https://www.wildlifeinsights.org/>) to store, organize, and identify all the imagens from focal species records from Catimbau National Park (CNP). The records obtained in Dom Inocêncio were manually sorted.

We installed 15 CT at Dom Inocêncio, from January 2019 to June 2022, and others 10 CT at the CNP, from June 2023 to July 2024. We considered one hr interval for independent records, once *Dasyprocta* species stay for a long time foraging in front of the cameras.

One site where *D. nigriclunis* were recorded is the CNP (Figure 1), the only federal protected area in Pernambuco State, northeast Brazil (excluding the Marine Protected area of Fernando de Noronha). There was only one previous study with mammals at CNP, which did not record *D. nigriclunis* (Geise et al. 2010). With an area of 62,300 ha, the CNP was created in 2002 and includes caatinga vegetation (a Brazilian semi-arid biome with unique and vast dry forest and shrubland ecosystem located in the northeastern), in the transition of "agreste" to "sertão" (transitional between the wetter coastal areas and the drier interior), at Buíque, Tupanatinga and Ibimirim municipalities and located at the Raso da Catarina ecoregion (Velloso et al. 2002). Other records were obtained at the municipality of Dom Inocêncio (Figure 1), which is located in the Caatinga of the arid hinterland, southeastern part of the state of Piauí, close to the border with the state of Bahia, at Southern Sertaneja Depression ecoregion (Velloso et al. 2002). The vegetation in the sampling areas is the wooded steppe savanna (IBGE 2004). The climate of the study area is classified as Köppen's Bsh type, marked by high temperatures, low pluviosity, temporary rivers (Medeiros et al. 2020) and its fauna and flora are adapted to semiarid conditions.

On QGIS, we estimated the Extent of Occurrence (EOO) for *Dasyprocta nigriclunis* based on this new data and previous records, by calculating the minimum convex polygon around them (IUCN 2022). Then, by overlapping EOO and the current species distribution area (Percequillo et al. 2024; ICMBio 2024), we calculate an additional area of potential occurrence of *D. nigriclunis*.

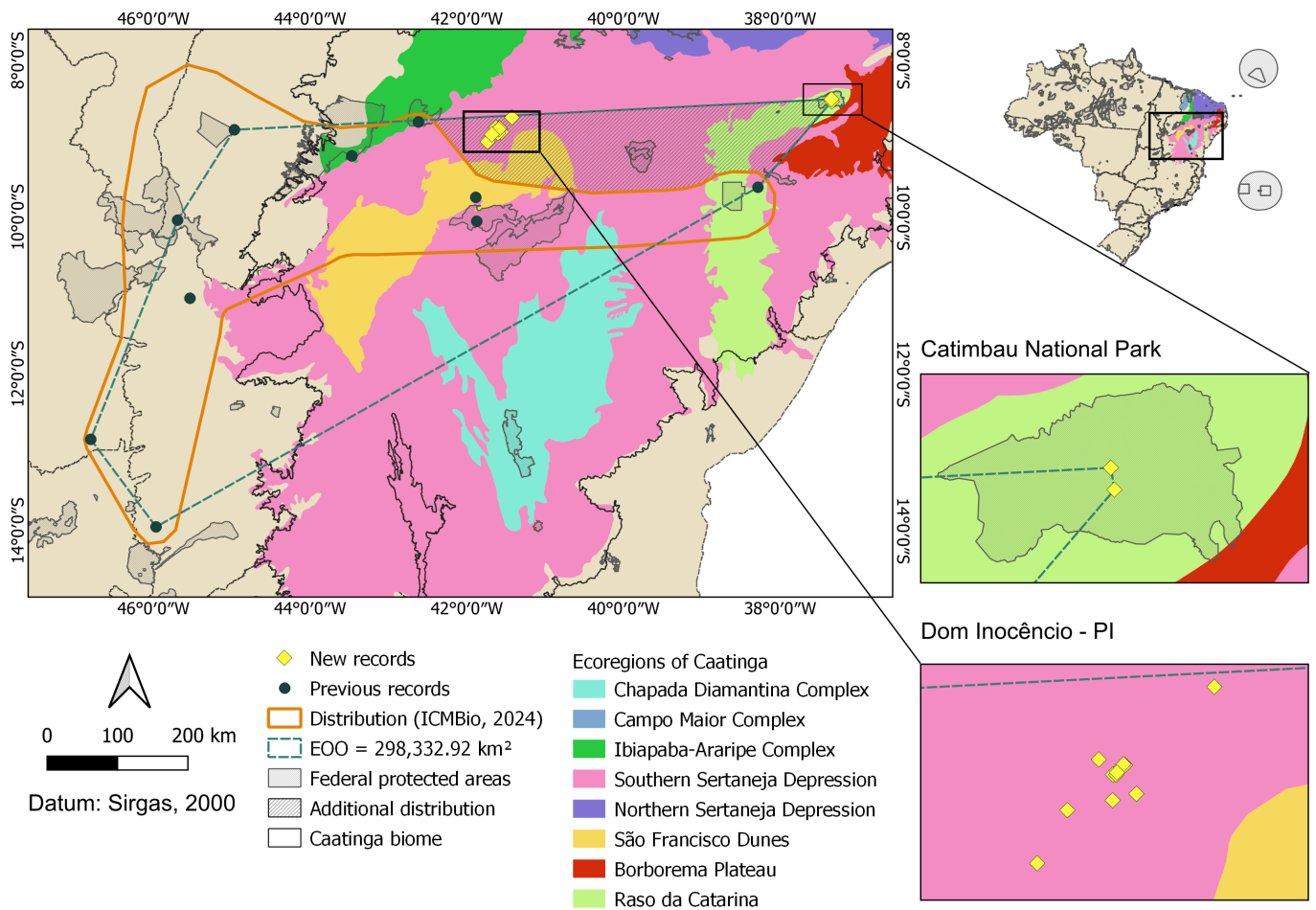


Figure 1. New records, and distribution of *Dasyprocta nigriclunis* and studied sites at Caatinga biome, states of Pernambuco and Piauí, northeast of Brazil. Distribution of *Dasyprocta nigriclunis* (Percequillo et al. 2024; ICMBio 2024); and EOO: proposed Extent of Occurrence.

We obtained 50 new records of *Dasyprocta nigriclunis* in 15 different survey points (Table 1), including 24 independent records at only 2 of 10 survey points at CNP, located 3,100 m apart. The records were taken at the localities of Juá Farm, which gather most of the records, and Cattle Road (Table 1). The first records were obtained at Juá Farm on July 16, 2023, and several others since then, while Cattle Road had only 2 records, on October 30 and November 13, 2023. At Dom Inocência, *D. nigriclunis* had 26 independent records in 13 survey points (Table 1) during all day, from 4:55 to 21:25 hr (Figure 2). The furthest records, on CNP, were 160,977 km away from the previous data. Based on these data, the EOO for *D. nigriclunis* was estimated in 298,332.92 km², and we found a new area of 51,524.68 km² with potential distribution of the species (Figure 1).

Camera traps documentation have increased the number of localities where *Dasyprocta nigriclunis* have been recorded. This is a similar situation to other species of Brazilian *Dasyprocta*, where the number of new records was added based on indirect methods of species identification (ICMBio 2024). Despite the value of camera traps for species identification in surveys, there are limitations to these kinds of data. For some species of *Dasyprocta*, new data for geographic distribution are currently based only on

indirect information, without specimens collected to add information to improve our understanding about zoogeography, evolution, and systematics of Dasyproctidae.

A recent diagnosis of mammal's collections in Brazil, conducted by the Brazilian Collections Committee of the Brazilian Society of Mammalogists found out that both specimens of northeast and Dasyproctidae family are poorly represented on Brazilian collections (Chiquito et al. 2021). For example, only 6 localities reported here are based on specimens deposited in collections and, in the last 30 years, new specimens of *Dasyprocta* have rarely been added to mammal collections. The present total sample available in Brazilian collections for *Dasyprocta nigriclunis* is based on 11 specimens, which is unsatisfactory to taxonomic and morphological studies (Museum of Zoology of the University of São Paulo - MZUSP: 3963, 3964, 3965, 30315; University of Brasília - UNB: 1599, 1561; National Museum of Rio de Janeiro - MNRJ: 24223, 24224, 24225; Serra das Confusões National Park - PNSC 156, 157). We suggest researchers add efforts to collect specimens of *Dasyprocta* and other species poorly sampled in mammal collections. As an alternative to captures, genomic studies can be conducted for taxonomic definitions using specimens in collections, in addition to expanding surveys with environmental DNA techniques.

Table 1. Coordinates (WGS 84) for each survey point with records of *Dasyprocta nigriclunis* in both studies sites.

Study site	Latitude	Longitude	Number of records
Catimbau National Park - Juá Farm	8° 31' 12" S	37° 20' 26" W	22
Catimbau National Park - Cattle Road	8° 29' 34" S	37° 20' 42" W	2
Dom Inocêncio - Piauí	8° 52' 8" S	41° 35' 19" W	2
Dom Inocêncio - Piauí	8° 52' 49" S	41° 36' 4" W	2
Dom Inocêncio - Piauí	8° 43' 35" S	41° 25' 23" W	1
Dom Inocêncio - Piauí	8° 52' 51" S	41° 35' 43" W	1
Dom Inocêncio - Piauí	8° 54' 51" S	41° 33' 36" W	1
Dom Inocêncio - Piauí	8° 51' 49" S	41° 34' 48" W	1
Dom Inocêncio - Piauí	8° 51' 14" S	41° 37' 33" W	2
Dom Inocêncio - Piauí	8° 52' 50" S	41° 35' 43" W	2
Dom Inocêncio - Piauí	8° 51' 44" S	41° 34' 57" W	1
Dom Inocêncio - Piauí	8° 55' 32" S	41° 36' 6" W	2
Dom Inocêncio - Piauí	8° 52' 36" S	41° 35' 38" W	1
Dom Inocêncio - Piauí	8° 56' 34" S	41° 40' 52" W	2
Dom Inocêncio - Piauí	9° 2' 10" S	41° 44' 2" W	8

However, fresh material is also needed to obtain high quality DNA for genomic and metabarcoding techniques (Coba-Males *et al.* 2023).

New species were described for the northeast of Brazil based on collected specimens, including an agouti, *Dasyprocta iacki* (Feijó and Langguth 2013), showing the importance of these kind of materials. However, authors consider that there are still a few specimens collected from this region and some collects are very old (Feijó and Langguth 2013). Brazil has legislations and a system to provide licenses to collect in protected areas for scientific purposes (ICMBio 2022), so the Catimbau National Park and Dom Inocêncio are 2 potential sites to collect *D. nigriclunis*. Once agoutis are already hunted in Caatinga (Alves *et al.* 2016; Barboza *et al.* 2016), which is prohibited with very specific conditions (Brasil 1998), we also suggest that the hunting oversight could destine these animals to university and museums.

The new camera trap records, dates and hours, lead us to infer that the Black-rumped agouti have a strong fidelity with territory and habitat use. Furthermore, the new records published in this study should improve the data of *D. nigriclunis* on SALVE platform (ICMBio 2024), to increase the distribution area of this species, including a new protected area (see the old and new occurrence points in the Figure 2), which is a relevant factor to extinction risk assessment (IUCN 2022; ICMBio 2024). These findings highlight the lack of information of mammal surveys at the Caatinga Biome and its protected areas, which should receive more initiatives in research. In this way, we recommend that a mammal survey should be carried out in other protected areas near to the Catimbau National Park, one example is the Ecological Station Raso da Catarina, which also is situated in the same ecoregion of CNP and has poor information about its mammals' species.



Figure 2. Records of *Dasyprocta nigriclunis* obtained by camera trap survey at Catimbau National Park, Pernambuco, and Dom Inocêncio, Piauí, Brazil. a and b) Juá Farm; c) Cattle Road; d, e, and f) Dom Inocêncio. a) D: 07/16/2023, H: 07:25; b) D: 21/12/2023, H: 06:14; c) D: 13/11/2023, H: 06:12; d) D: 26/01/2019, H: 16:45; e) D: 14/07/2019, H: 16:46; f) D: 03/02/2021, H: 16:58. D = Date, H = Hour. Images available at christian.berlinck@icmbio.gov.br.

Acknowledgements

Authors would like to thank Chico Mendes Institute for the Conservation of Biodiversity (ICMBio) for financing the study on Catimbau National Park, and Caruso Jr. Estudos Ambientais & Engenharia and Sapo Flecha Estudos Ambientais, which coordinated the fauna diagnostic studies in Dom Inocêncio. We would also like to thank A. Caccavo and B. Patterson for their kindness in sharing photographs of *Dasyprocta* specimens deposited on British Museum and Field Museum, as well as the anonymous reviewers for their valuable contributions.

Literature cited

- ALVES, R. R. N., *ET AL.* 2016. Game mammals of the Caatinga biome. *Ethnobiology and Conservation* 5:5.
- BARBOZA, R. D., *ET AL.* 2016. The role of game mammals as bushmeat in the Caatinga, northeast Brazil. *Ecology and Society* 21:2.
- BRASIL. 1998. Lei nº 9.605, de 12 de fevereiro de 1998. Dispõe sobre as sanções penais e administrativas derivadas de

- condutas e atividades lesivas ao meio ambiente, e dá outras providências. Diário Oficial da União, 1998. Brasília DF, Brasil.
- CABRERA, A. 1961. Catálogo de los mamíferos de América del Sur. Imprenta y Casa Editora. Buenos Aires, Argentina.
- CAMPOS, C. B. DE, ET AL. 2019. Medium and large sized mammals of the Boqueirão da Onça, North of Bahia State, Brazil. Papéis Avulsos De Zoologia 59:e20195912.
- CHIQUITO, E. ET AL. 2021. Mammal collections in Brazil: overview and database. Brazilian Journal of Mammalogy n.e.90: e90202105.
- COBA-MALES M. A., ET AL. 2023. From roads to biobanks: Roadkill animals as a valuable source of genetic data. PLoS One 18: e0290836.
- FEIJÓ, A., AND A. LANGGUTH. 2013. Mamíferos de médio e grande porte do nordeste do Brasil: distribuição e taxonomia, com descrição de novas espécies. Revista Nordestina de Biologia 22: 3-225.
- JACK-XIMENES, G. E. 1999. Sistemática da família Dasyproctidae Bonaparte, 1838 (Rodentia, Hystriognathi) no Brasil. Dissertação de Mestrado em Ciências Biológicas (Zoologia), Programa de Pós-Graduação em Zoologia, Universidade de São Paulo. São Paulo, Brasil.
- INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). 2004. Mapa de vegetação do Brasil. 3. ed. Rio de Janeiro: IBGE, 2004. 1 mapa: color. Escala 1:5.000.000. https://geoftp.ibge.gov.br/informacoes_ambientais/vegetacao/mapas/brasil/vegetacao.pdf. Accessed on March 4, 2024.
- INSTITUTO CHICO MENDES DE CONSERVAÇÃO DA BIODIVERSIDADE (ICMBio). 2022. Portaria ICMBio nº 748, de 19 de setembro de 2022. Normatiza o uso e a gestão do Sistema de Autorização e Informação em Biodiversidade - Sisbio, na forma das diretrizes e condições previstas. SEI/ICMBio - 12336330. Brasília DF, Brasil.
- INSTITUTO CHICO MENDES DE CONSERVAÇÃO DA BIODIVERSIDADE (ICMBio). 2024. Sistema de Avaliação do Risco de Extinção da Biodiversidade – SALVE. <https://salve.icmbio.gov.br/>. Accessed on February 27, 2024.
- INTERNATIONAL UNION FOR CONSERVATION OF NATURE (IUCN) STANDARDS AND PETITIONS COMMITTEE. 2022. Guidelines for Using the IUCN Red List Categories and Criteria. Version 15.1. Prepared by the Standards and Petitions Committee. <https://www.iucn-redlist.org/documents/RedListGuidelines.pdf>. Accessed on March 3, 2024.
- GEISE, L., ET AL. 2010. Non-volant mammals, Parque Nacional do Catimbau, Vale do Catimbau, Buíque, state of Pernambuco, Brazil, with karyologic data. Check List 6:180-186.
- LIMA, M. G. M. 2009. Mamíferos de médio e grande porte no parque nacional das nascentes do Rio Parnaíba - Brasil. Dissertação de Mestrado em Ciências Biológicas (Zoologia), Programa de Pós-Graduação em Zoologia, Universidade Federal do Pará. Belém, Brasil.
- MEDEIROS, R.M., E. P. CAVALCANTI, AND J. F. DE M. DUARTE. 2020. Classificação climática de köppen para o estado do Piauí – Brasil. Revista Equador 9:82-99.
- MOOJEN, J. 1952. Os Roedores do Brasil. Instituto Nacional do Livro. Rio de Janeiro, Brasil.
- OLIVEIRA, J. A., AND C. R. BONVICINO. 2011. Ordem Rodentia. pp. 358-414 in Mamíferos do Brasil (Reis, N. R., et al., eds.). Editora Universidade Estadual de Londrina. Londrina, Brasil.
- OSGOOD, W. H. 1915. New Mammals from Brazil and Peru. Field Museum of Natural History Publication, Zoological Series 10:187-198.
- PATTON, J. L., AND L. H. EMMONS. 2015. Family Dasyproctidae. Pp. 733-756 in Mammals of South America, Volume 2, Rodents (Patton, J. L., U. F. J. Pardiñas, and G. D. D'Elia, eds.) University of Chicago Press. Chicago, U.S.A.
- PERCEQUILLO, A.R., ET AL. 2024. *Dasyprocta nigriclunis*. Sistema de Avaliação do Risco de Extinção da Biodiversidade - SALVE. <https://salve.icmbio.gov.br> DOI: <https://doi.org/10.37002/salve.ficha.23265.2> - Accessed on October 23, 2024.
- TETA, P., AND N. REYES-AMAYA. 2021. Uncovering species boundaries through qualitative and quantitative morphology in the genus *Dasyprocta* (Rodentia, Caviomorpha), with emphasis in *D. punctata* and *D. variegata*. Journal of Mammalogy 102:1548–1563.
- THOMAS, O. 1898. Descriptions of new mammals from South America. Annals and Magazine of Natural History 7: 265-275
- THOMAS, O. 1917. Notes on agoutis, with descriptions of new forms. Annals and Magazine of Natural History 20:310–313.
- VELLOSO, A.L., E. V. S. B. SAMPAIO, AND F. G. C. PAREYN. 2002. Ecorregiões: propostas para o bioma caatinga. The Nature Conservancy. Recife, Brasil.
- WOODS, C.A. 1993. Order Rodentia - Suborder Hystriognathi. Pp.771-806 in Mammal Species of the World: A Taxonomic and Geographic Reference (Wilson, D. E., and D. M. Reeder, eds.). Second edition. Smithsonian Institution Press. Washington, U.S.A.
- ZAHER, H. E. D. 2000. Diversidade de vertebrados terrestres da estação ecológica de Uruçuí-Una, Piauí. Relatório técnico não publicado, Universidade de São Paulo. São Paulo, Brasil.

Associated editor: Nicté Ordóñez Garza.

Submitted: August 20, 2024; Reviewed: October 21, 2024.

Accepted: November 25, 2024; Published on line: December 5, 2024.