First record of total albinism in *Molossus molossus* (Chiroptera: Molossidae) from northeastern Brazil

Primeiro registro de albinismo total em *Molossus molossus* (Chiroptera: Molossidade) no Nordeste do Brasil

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Abstract: Albinism is a condition caused by deletion of genes responsible for melanin production, resulting in the total absence of pigments. This genetic disorder is rare in nature and is known from ten Brazilian bat species, among them *Molossus molossus*. Here we report the first occurrence of this condition in *M. molossus* from northeastern Brazil. Since albinism is uncommon, it is important to report cases like this one, providing addicional data to understand albinism in bats and reinforce the importance of museum specimens as source of biological knowledge.

Keywords: Bats. Genetic disease. Maranhão. Mutation. Hypopigmentation.

Resumo: O albinismo é uma condição causada pela deleção de genes responsáveis pela produção de melanina, resultando na total ausência de pigmentos. Esta desordem genética é rara na natureza e conhecida para apenas dez espécies de morcegos brasileiros, entre as quais *Molossus molossus*. Aqui reportamos a primeira ocorrência desta condição em um *M. molossus* no Nordeste do Brasil. Considerando que o albinismo é um fenômeno incomum, advogamos a importância de reportar casos como o presente, fornecendo dados que visem ampliar o conhecimento deste fenômeno e reforçando a importância de espécimes de museus como fonte de conhecimento biológico.

Palavras-chave: Morcegos. Anomalia genética. Maranhão. Mutação. Hipopigmentação.

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INTRODUCTION

Albinism is a condition caused by deletion of genes responsible for melanin production (Griffiths *et al*., 2013), resulting in the total absence of pigments in the skin, hair, and eyes of individuals with this abnormality. This rare genetic disorder has been recorded in several vertebrate groups, including bats (Uieda, 2000), and it is still not completely understood (Rosa *et al.*, 2017). In South America, cases of albinism have been reported for 18 bat species, including ten species in Brazil (Rosa *et al*., 2017; Zortéa & Silva, 2018). Six species belong to the family Phyllostomidae: *Artibeus planirostris* (Spix, 1823), *Carollia perspicillata* (Linnaeus, 1758), *Dermanura cinerea* P. Gervais, 1856, *Desmodus rotundus* (E. Geoffroy St.-Hilaire, 1810), *Diaemus youngii* (Jentink, 1893), and *Gardnerycteris crenulatum* (E. Geoffroy St.-Hilaire, 1803); three species of Molossidae: *Eumops glaucinus* (J. A. Wagner, 1843), *Molossus molossus* (Pallas, 1766), and *Nyctinomops laticaudatus* (E. Geoffroy St.-Hilaire, 1805); and one species of Vespertilionidae: *Myotis levis* (I. Geoffroy St.-Hilaire, 1824).

The first Brazilian case of albinism in *Molossus molossus* was recorded in Rio Grande do Sul state (Veiga & Oliveira, 1995). This species has a wide distribution, from northern Argentina, throughout Brazil and towards southern North America (Eger, 2007). *Molossus molossus* is exclusively insectivorous, well-adapted to urban environments, and can be found occupying the roof linings of residences and other buildings (Reis *et al.*, 2007).

The objective of the present study is to report the first case of albinism in *M. molossus* from northeastern Brazil. This note is a by-product of the project "Roedores do estado do Pará: padrões de distribuição e diversidade e o papel das coleções biológicas", conducted by the Mammalogy Laboratory of the Museu Paraense Emílio Goeldi (MPEG) with aim of training students in taxonomy and curatorial research.

MATERIAL AND METHODS

A total albino adult specimen of *M. molossus* (Figure 1) was found during the curatorial processes of identifying

Figure 1. Dorsal (left) and ventral (right) views of the albino female specimen of *Molossus molossus* (MPEG 45475) from Imperatriz municipality, Maranhão, Brazil. Scale: 10 mm. Photo: A. M. R. Bezerra.

and organizing specimens in the mammalogy wet collection of Museu Paraense Emílio Goeldi (MPEG), Belém, Pará, Brazil. This specimen now is housed under MPEG 45475.

The specimen was collected in July 2004, found in the interior garden of a house (5º 31' 47" S; 47º 29' 28" W) located in Imperatriz municipality, Maranhão, Brazil (Figure 2). This locality is on the right bank of Tocantins River, almost at the junction with the Araguaia River, in a transitional zone between the Cerrado and Amazon biomes (IBGE, 2004a), including areas of savannas and semi-deciduous forests subject to strong anthropic activities (IBGE, 2004b). Figure 2 was generated in Quantum GIS (QGIS) version 2.18.9 'Las Palmas' (QGIS, 2017), and map shapefiles from IBGE (1992) for Brazilian ecological tension areas.

Identification of *M. molossus* was based on external and cranio-dental characters following Gregorin & Taddei (2002) and by direct comparison with other specimens housed in the MPEG. Five external measurements of the alcohol-preserved specimen were taken with a caliper to 0.01 mm precision.

RESULTS AND DISCUSSION

External measurements of the MPEG 45475 *M. molossus* specimen are: head-body length 54.00 mm, tail 31.00 mm, forearm 38.44 mm, ear 10.00 mm, and tragus 2.77 mm. These measurements fall inside the range known for normal female individuals of *M. molossus* (Fabian & Gregorin, 2007). Geiger & Pacheco (2006) observed the integration of albino individuals in a colony of *Nyctinomops laticaudatus*, and found no significant difference in size and weight between albino and normal individuals. Normal individuals of *M. molossus* have fur color varying from dark brown to black, or they may be reddish-brown (Reis *et al*., 2007), but our specimen shows spotless white skin and almost completely white coat, except for a faint ventral line of light grayish fur due the slight coloration of the apical ends of the fur. Also, the specimen has red eyes instead black colored. Mammal albino individuals are unable to produce

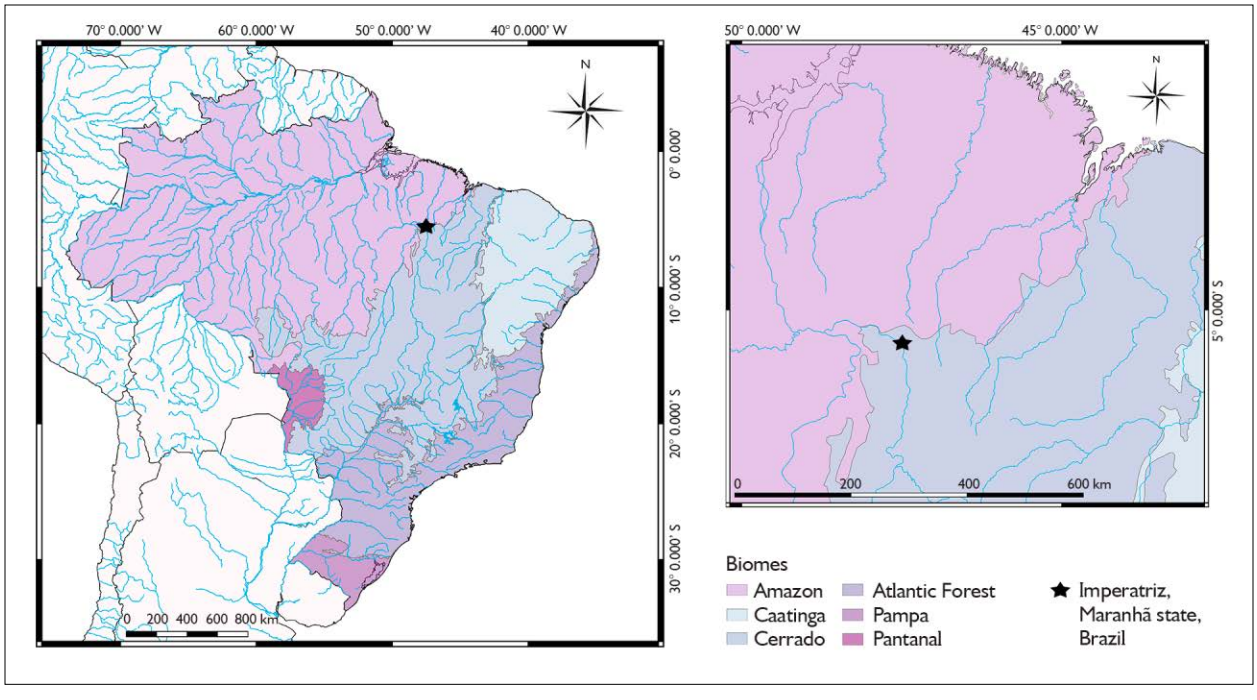

Figure 2. Locality of record of the albino *Molossus molossus* (MPEG 45475) from Imperatriz, Maranhão, Brazil.

melanin pigment, while in leucism there is reduction of melanin resulting in individuals that can be either completely white or not (NOAH, 2018). The difference is that in leucism the eyes are black-colored instead of red or pink, as in our specimen.

Our specimen probably integrated a colony near to the house or was under the roof of the residence where it was found. Albino individuals are more exposed to predation and other stress situations due to their differentiated phenotype. However, as in the *M. molossus* herein described, shelters could safeguard the survival of these individuals, since they protect them from exposure to sunlight and predators. In addition, the nocturnal habits of bats may attenuate the vulnerability compared to other albino species with diurnal habits (Rocha *et al.*, 2013). The only other Brazilian record of albinism in *M. molossus* occurred in a specimen found dead in a fallen hollow trunk, at Santa Vitória do Palmar municipality, Rio Grande do Sul state (Veiga & Oliveira, 1995). This hollow trunk served as a roost for 'numerous individuals of several species and genera' (*ad litteram* Veiga & Oliveira, 1995) and some died when the trunk fell, among them an albino *M. molossus*. It appears that the roosting preferences of *M. molossus* could be favoring the reproductive success of albino individuals (Uieda, 2000). Four other records of pigmentary anomalies in *Molossus molossus* are documented: one from Cuba found in the mammal collection of Museum of Comparative Zoology, Harvard University (Allen, 1939); two specimens from Puerto Rico captured in houses (Heatwole *et al*., 1964); one from Venezuela found in the mammal collection of the Museo de Ciencias Naturales Guanare (Soriano *et al*., 1993); and one from Peru captured in nature (Tello *et al*., 2014).

Chiroptera is the second Neotropical mammalian order in number of records for anomalous color (Abreu *et al.*, 2013). However, albinism is considered an uncommon phenomenon in bats (*e.g*., in Brazil, only 5.6 % of 178 spp., *sensu* Nogueira *et al*., 2014), and patterns of its occurrence are still difficult to determine (Rosa *et al*., 2017). Furthermore, some authors suggest that albinism in bats is not so harmful, since they are acoustically guided (Abreu *et al*., 2013). It is important to report cases like the present one, providing data for revisions that aim to further understand this phenomenon, such as Uieda (2000), Abreu *et al*. (2013), Rosa *et al*. (2017), and Zortéa & Silva (2018). Finally, it is of interest to note that several records of albinism in bats were obtained from museum specimens (*e.g*., Allen, 1939; Soriano *et al*., 1993; Tello *et al*., 2014; present study), demonstrating the importance of well-documented specimens in museum collections.

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