

Albinism in *Carollia perspicillata* (Chiroptera; Phyllostomidae), in the state of Rondônia, Brazil. A brief review of albinism in bats

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Resumo

Albinismo em *Carollia perspicillata* (Chiroptera; Phyllostomidae), no Estado de Rondônia, Brasil. Uma breve revisão de albinismo em morcegos. Albinismo é um fenômeno pouco comum em morcegos. Na literatura, 67 espécies de morcegos foram reportadas com a mutação. A proposta desse artigo é relatar um caso de albinismo completo em *Carollia perspicillata*. Um morcego, jovem, macho, albino foi capturado em um bueiro sob a rodovia BR364, localizado em uma área antropogênica na Vila de Caiçara, município de Porto Velho, no estado de Rondônia. O animal estava aparentemente bem integrado ao grupo, saudável e de tamanho normal para a espécie. Um breve resumo de albinismo em morcegos é apresentado.

Palavras-chaves: Abrigo urbano; Hipopigmentação; Mamíferos

Abstract

Albinism is a phenomenon that is not very common in bats. In the literature, sixty-seven bat species with this mutation have been reported. The purpose of this paper is to report a case of complete albinism in *Carollia perspicillata*. A young male albino bat was captured in a culvert under the BR 364 highway, located within an anthropogenic area in the district of Caiçara, municipality of Porto Velho, in the northern Brazilian state of Rondônia. The animal was apparently well integrated into the group, healthy and of normal size for the species. A brief review of albinism in bats is also provided.

Key words: Hypopigmentation; Mammals; Urban shelter

Introduction

Albinism is caused by a rare gene mutation that provides instructions for the synthesis of proteins involved in melanin production. Melanin is produced by melanocyte cells, which are found in the skin and eyes. Animals with albinism show a significant reduction in the amount of melanin (partial albinism) or no pigment in the eyes, skin, or hair (true or complete albinism) (NOAH, 2015). In addition, the red eyes of albino animals are caused by the reflection of red blood cells in the retinal blood vessels (MILLER, 2005).

Another pigmentation variation in mammals is leucism, which is characterized by individuals with partial or total discoloration of the skin and/or fur. However, the pigmentation of eyes and claws is normal. Leucism has on occasion been confused with partial albinism and results from a reduction in all types of pigment, while albinism results from only a reduction in melanin production (MILLER, 2005).

Worldwide, complete albinism in bats has been recorded in 64 individuals of 38 species (UIEDA, 2000). Most of the recent cases were published in Latin American and Asian countries.

The neotropical bat genus *Carollia* (GRAY, 1838) currently includes eight species, five of which are known from Brazil. This genus includes some of the most abundant species of mammals and plays an important role in seed dispersal and regeneration of forests. There are three reports of albinism in *C. perspicillata* (CHARLES-DOMINIQUE et al., 2001; BOADA; TIRIRA, 2010; FALCÃO, 2014). The purpose of this paper is to report a case of complete albinism in *Carollia perspicillata* (LINNAEUS, 1758), from the Brazilian state of Rondônia, and to provide a brief review of albinism in bats.

Materials and Methods

The review was developed based on a database search of international (PubMed, ScienceDirect and LILACS) and national (SciELO) literature and annals of the most important events related to Chiroptera, between 2001 and 2015, using the following key words: bats,

Chiroptera, albinism and hypopigmentation. This period was selected because the last list of rabies positive bats for Brazil by UIEDA et al. was published in 2000.

The record of albinism was made during a five-year survey conducted between 2010 and 2014 in three districts (Caiçara, Abunã and Mutum) of the municipality of Porto Velho, in the northern Brazilian state of Rondônia. Daytime collections were performed twice a year, in the dry and rainy seasons. Collections were made in August 2010, March 2011, April and July 2012, February and August 2013, and January and July 2014.

In all three surveyed districts, culverts under the BR364 highway were used as shelters by *C. perspicillata* colonies. The culvert where the albino specimen was found (UTM 0315841 8963087) is in the Caiçara District, is made of iron and has an internal diameter of 2 m for its entire 20 m length. It has a double opening and was built in the 1980s (Figure 1). Selected individuals roosting in this culvert were tagged with metal rings and their sex, age and reproductive condition were recorded.

FIGURE 1: The culvert where the albino bat *Carollia perspicillata* was collected, in the Caiçara District, Rondônia, Brazil.



The environment around the shelter includes a perennial lake originating from the enlargement of the stream on both sides of the shelter, in an Amazon rainforest remnant within an anthropic area. The immediate area contains abundant Piperaceae plants, which constitute the main food source for this species (MIKICK et al., 2003).

The region is categorized as a rainy tropical climate. The average annual temperature ranges from 24°C to 26°C, with little variation throughout the year (only 10°C). The summer is hot and rainy, while the winters are dry and mild. The annual precipitation ranges from 1400 to 2600 mm (INMET, 2017).

Results

Table 1 lists the cases of albinism (complete or partial) recorded for bats worldwide since the review by Uieda (2000), totaling sixty-seven species (151 individuals) from 40 countries.

TABLE 1: Records of albinism (complete or partial) in bats according country of collection.

Country	Species	References
	38 species/64 specimens	Uieda (2000)
Mexico	<i>Desmodus rotundus</i> (4), <i>Artibeus jamaicensis</i> (1)	Sánchez-Hernández et al. (2010) **
	<i>Artibeus jamaicensis</i> (1), <i>Dermanura watsoni</i> (1), <i>Carollia sowelli</i> (1)	Hernández-Mijangos (2009) *
	<i>Glossophaga soricina</i> (1)	García-Morales et al. (2010)
Brazil	<i>Eumops glaucinus</i> (1), <i>Dermanura cinerea</i> (1)	Sodré et al. (2004); Oliveira and Aguiar (2008)
	<i>Nyctinomops laticaudatus</i> (4)	Geiger and Pacheco (2006) *
	<i>Myotis levis</i> (2)	Miranda et al. (2012)
Canada	<i>Carollia perspicillata</i> (2)	Falcão (2014); Present study
	<i>Myotis luvifugus</i> (1)	Sodré et al. (2004)
Argentina	<i>Sturnira erythromos</i> (2)	Barquez et al. (2003) *
	<i>Eptesicus furinalis</i> (1)	Pautasso et al. (2009)
	<i>Desmodus rotundus</i> (1)	Ramírez et al. (2010)
French Guiana	<i>Tadarida brasiliensis</i> (1)	Romano et al. (2015)
	<i>Rhinophylla pumilio</i> (1), <i>Carollia perspicillata</i> (1)	Charles-Dominique et al. (2001)
Venezuela	<i>Molossus molossus</i> (1), <i>Carollia brevicauda</i> (1)	Soriano et al. (1993) *
	<i>Micronycteris microtis</i> (4)	Acosta et al. (2011)
Peru	<i>Molossus rufus</i> (1)	Rengifo et al. (2014)
	<i>Molossus molossus</i> (1)	Tello et al. (2014) **
Ecuador	<i>Carollia perspicillata</i> (1)	Boada and Tirira (2010) **
Colombia	<i>Uroderma bilobatum</i> (3)	Mantilla-Meluk enad Jiménez-Ortega (2011) *
Costa Rica	<i>Micronycteris minuta</i> (1)	Gamba-Rios (2010)
Spain	<i>Pipistrellus pygmaeus</i> (1)	Alcalde (2009)
Czech Republic	<i>Nyctalus noctula</i> (1), <i>Myotis myotis</i> (1)	Murariu and Chisamera (2006); Leblanc and Taupin (2005)
Poland	<i>Myotis nattereri</i> (1), <i>Eptesicus serotinus</i> (1)	Leblanc and Taupin (2005)
France	<i>Rhinolophus ferrumequinum</i> (4), <i>Rhinolophus hipposideros</i> (3)	Leblanc and Taupin (2005)
	<i>Myotis myotis</i> (2), <i>Myotis emarginatus</i> (1), <i>Miniopterus schreibersi</i> (2)	Prévost et al. (2011)
The Netherlands	<i>Plecotus auritus</i> (1), <i>Myotis daubentonii</i> (1), <i>M. dasycneme</i> (1), <i>M. mystacinus</i> (1)	Buys et al. (2002)
Germany	<i>Eptesicus serotinus</i> (1)	Natuurbericht (2015)
Germany	<i>Pipistrellus pipistrellus</i> (1), <i>Eptesicus serotinus</i> (1), <i>Myotis myotis</i> (1)	Leblanc and Taupin (2005)
Croatia	<i>Nyctalus noctula</i> (1)	Murariu and Chisamera (2006)
Romania	<i>Nyctalus noctula</i> (1)	Murariu and Chisamera (2006)
European Russia	<i>Eptesicus serotinus turcomanus</i> (1), <i>Pipistrellus nathusii</i> (1), <i>Myotis mystacinus</i> (1)	Smirnov et al. (2014) **
Great Britain	<i>Myotis nattereri</i> (1)	Leblanc and Taupin (2005)
Switzerland	<i>Eptesicus furinalis</i> (1)	Leblanc and Taupin (2005)
Indian Réunion	<i>Hipposideros diadema nicobarensis</i> (1), <i>Rhinopoma microphyllum</i> (1)	Devkar et al. (2011); Aul and Marimuthu (2006)
Réunion	<i>Mormopterus francoismoutoi</i> (1), <i>Rhinolophus cornutus</i> (1)	Ramasindrazana et al. (2014)
Moldova	<i>Eptesicus serotinus</i> (1)	Obada and Gas (2003, apud Smirnov et al., 2014)
China	<i>Miniopterus magnate</i> (1)	Feng et al. (2007)
Taiwan	<i>Pipistrellus abramus</i> (1), <i>Hipposideros terasensis</i> (1)	Hsu (2003, apud Smirnov et al. 2014)
Borneo	<i>Hipposideros cervinus</i> (1)	Naharuddin et al. (2015)
Sudan	<i>Scotophilus leucaster</i> (1)	Leblanc and Taupin (2005)
Australia	<i>Taphozous georgianus</i>	Leblanc and Taupin (2005)
Total	67 species/151 specimens	

* According Marin-Vasques et al. (2010), some of these reports represent cases of leucism. ** These authors used leucism as a synonym for partial albinism.

When making the eight collections in this shelter where the albino bat (Figure 2) was found, the population of *C. perspicillata* varied from 50 and 200 individuals. While collecting in August 2011 and July 2014, cohabitation of *C. perspicillata* with a few (5 to 10) specimens of *Glossophaga soricina* (Pallas's long tongued bat) and 10 to 50 specimens of *Trachops cirrhosus* (fringe-lipped bat) was recorded.

FIGURE 2: Albino specimen of *Carollia perspicillata* showing the presence of translucent dactylopatagium and red eyes (Photograph by Patricio Rocha).



The collected albino individual of *C. perspicillata* (Zoology Museum of the University of São Paulo, Brazil- MZUSP35367) was a young male (right forearm 40 mm; left forearm 39.5 mm; weight 10 g). It was roosting in a colony of approximately one hundred normally pigmented *C. perspicillata*. Of these, 39 were females (9 were pregnant, 14 were young, 6 were lactating and had their 10 pups with them) and 12 were males (8 adults and 4 young).

Discussion

The albino *C. perspicillata* reported in this study was roosting in a culvert. According to a review of albino bats published by Uieda (2000), only six of 64 bats were captured with mist nets while flying, and 39 were captured in daytime roosts, such as caves, mines, galleries, buildings, tree holes and bird boxes. The author proposed that these enclosed roosts may be important for the survival of albino bats because they offer protection

against sunlight, water loss and predation; this could explain why there are no records of albinism from bat species that preferentially use external roosts. Of the albino specimens reported since the review by Uieda (2000), the majority have been found in enclosed roosts (35 individuals) and just eleven were captured with mist nets or a harp trap (Table 2).

In the review of Uieda (2000) a similar proportion between males (47.4%) and females (52.6%) was observed. Among the reports with information about sex since that review, 27 were females (61.4%) and 17 were males (38.6%) (Table 2). In some species, females live in maternity colonies segregated from the males. This fact suggests that females are more easily captured in relation to males, who live in small groups or in various shelters and locations or are segregated from the colony by dominant males, and could explain the predominance of females over males. Romano et al. (2015) reported an albino individual of *Tadarida brasiliensis* in an attic inhabited by females during the final stages of pregnancy, parturition, and lactation.

The bat subject of this paper was apparently well integrated into the group, healthy and of normal size for the species. Although albinism may bring disadvantages (UIEDA, 2000), some authors have reported that albino bats live long lives (UIEDA, 2000; PRÉVOST et al., 2011). Among 45 bats where the age was reported, 18 (40%) were classified as adults. This indicates that albino bats can live until an adult age and become integrated into their colonies.

In relation to reproduction of albino bats, Sánchez-Hernández et al. (2010) found two reproductively active adult females of *D. rotundus* and one pregnant *A. jamaicensis*. Acosta et al. (2011) reported two females, one pregnant and one lactant, of *Micronycteris microtis*. Miranda et al. (2012) reported two lactant females of *Myotis levis*. However, an albino female maintained in captivity by Uieda (2001) for 28 months with normally colored males and females did not become pregnant, unlike other females in the group. Based on the review, the majority of the 151 albino individuals, in 27 species, were from the family Vespertilionidae (40.9%). This was also observed by Uieda (2000), probably because of the high species diversity in the family.

TABLE 2: Data of records of albino bats according type of shelter and capture, sex and type of albinism.

Species	Shelter		Mist net/ Harp trap	Sex		Albinism	
	Artificial	Natural		Male	Female	Complete	Partial
<i>Artibeus jamaicensis</i> (1)			1				
<i>Carollia perspicillata</i> (3)	1		2	1	2	2	1
<i>Carollia brevicauda</i> (1) *					1		
<i>Dermanura cinerea</i> (1)			1	1		1	
<i>Desmodus rotundus</i> (5) *		4		3	1	5	
<i>Eptesicus furinalis</i> (1)	1				1	1	
<i>Eptesicus serotinus</i> (1)		1		1	1	2	
<i>Eptesicus serotinus turcomanus</i> (4)	4			1	3		4
<i>Eumops glaucinus</i> (1)				1		1	
<i>Glossophaga soricina</i> (1)			1		1	1	
<i>Hipposideros cervinus</i> (1)			1		1		1
<i>Hipposideros diadema nicobarensis</i> (1)		1		1		1	
<i>Micronycteris microtis</i> (4)		4		1	3		4
<i>Micronycteris minuta</i> (1)			1		1	1	
<i>Miniopterus magnater</i> (1)					1	1	
<i>Miniopterus schreibersii</i> (1)		1					
<i>Molossus molossus</i> (2)				1	1	2	
<i>Molossus rufus</i> (1)	1			1		1	
<i>Mormopterus francoismoutoui</i> (1)		1			1	1	
<i>Myotis levis</i> (2)	2				2		2
<i>Myotis mystacinus</i> (1)	1				1		1
<i>Nyctalus noctula</i> (3)	3				3		3
<i>Nyctinomops laticaudatus</i> (4)	4			2	2		4
<i>Pipistrellus nathusii</i> (1)	1				1		1
<i>Pipistrellus pygmaeus</i> (1)	1				1	1	
<i>Plecotus auritus</i> (1) *	1					1	
<i>Rhinolophus ferrumequinum</i> (1)		1			1	1	
<i>Rhinopoma microphyllum</i> (1) *	1					1	
<i>Sturnira erythromos</i> (2) *			1	2			2
<i>Tadarida brasiliensis</i> (1)	1				1	1	
<i>Uroderma bilobatum</i> (3)			3	1	2		3
Total	22	13	11	17	32	25	26

* incomplete data.

The number of cases of albinism in *D. rotundus* is greater than in other species, and includes 12 individuals, considering all records since UIEDA (2000). However, it is unlikely that this represents a higher incidence of albinism in the species, and probably reflects the high sampling rates of a species targeted by a rabies control program.

Within the subfamily Carollinae, there have been reports of albinism in *Rhinophylla pumilio* (CHARLES-DOMINIQUE et al., 2001), *Carollia*

brevicauda (Soriano et al, 1993) and *Carollia sowelli* (HERNÁNDEZ-MIJANGOS, 2009). Among the three reported cases of albinism in *C. perspicillata*, two were cases of complete albinism (FALCÃO, 2014): an adult female, captured in a mist net; and a young male, captured in a shelter of this study. Boada and Tirira (2010) used leucism as a synonym for partial albinism for an adult female captured by a mist net.

This work reports the second record of albinism for *C. perspicillata* in Brazil. Given that albinism is a rare

hypopigmentary disorder, cases should be reported to increase the knowledge of such variation in bats.

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