

CHROMATIC ABERRATION RECORD OF *SULA LEUCOGASTER* IN WESTERN SOUTH ATLANTIC

Lodi, L. ^{a*}, Maricato, G. ^a, Albuquerque, L.E. ^a & Cunha, L. S. T. ^a

^aInstituto Mar Adentro, Rio de Janeiro, Brasil.
*liliane_lodi@yahoo.com (Corresponding author).

Cite as: Lodi, L., Maricato, G., Albuquerque, L.E. & Cunha, L. S. T. (2024). Chromatic Aberration Record of *Sula leucogaster* in Western South Atlantic. Braz. J. Aquatic. Sci. Technol. 28(2):001-003. ISSN 1983-9057. DOI: 10.14210/bjast.v28n2.20597

Received: 10/09/2024. **Revised:** 25/10/2024. **Accepted:** 25/10/2024. **Published:** 14/12/2024.

Document type: Nota Técnica.

Funding: The authors received no specific funding for this work.

Competing interest: The authors declare no competing interest.

Copyright: This document is under the Creative Commons Attribution Licence (CC BY 3.0 DEED).

ABSTRACT

This technical note presents a rare record of potentially leucistic Brown Booby (*Sula leucogaster*) in March 2024 in Rio de Janeiro, southeastern Brazil. In addition to the absence of coloration in the plumage, which was white, beak, pupil and iris were without their original color for the species. This record contributes to expanding knowledge about the occurrence and distribution of individuals of this species with anomalous coloration in the Western South Atlantic, highlighting the importance of documenting and studying color anomalies in seabirds.

Keywords: Brown Booby. Coloration Abnormality. Plumage. Southeastern Brazil.

1 Introduction

The Brown Booby (*Sula leucogaster*, Boddaert, 1783) is characteristic of tropical and subtropical seas, inhabiting coastal and oceanic islands (Nelson, 1978). In Brazil, breeding colonies are recorded from the São Pedro and São Paulo Archipelago (0° 55'N, 29° 20'W) to the Moleques do Sul Islands (27° 51'S, 48° 26'W) (Branco et al., 2005; Filho & Vooren, 2009). On coastal islands of Rio de Janeiro State, the species nests in the Santana Archipelago and on the Cabo Frio, Franceses, Cagarra, Redonda, Alfavaca, Grande, and Jorge Grego Islands (Alves, et al., 2004; Coelho et al., 2004; Cunha et al., 2013).

On March 12, 2024, during systematic boat-based cetacean surveys by the Ilhas do Rio Project, the occurrence of a single Brown Booby with anomalous coloration was recorded (23°2'26"S, 43°2'42"W) approximately 6.69 km from the nearest coastline (Fig. 1). Photos were obtained using a Canon EOS 90D camera equipped with a 100-400 mm lens, at an approximate distance of five meters from the seabird.

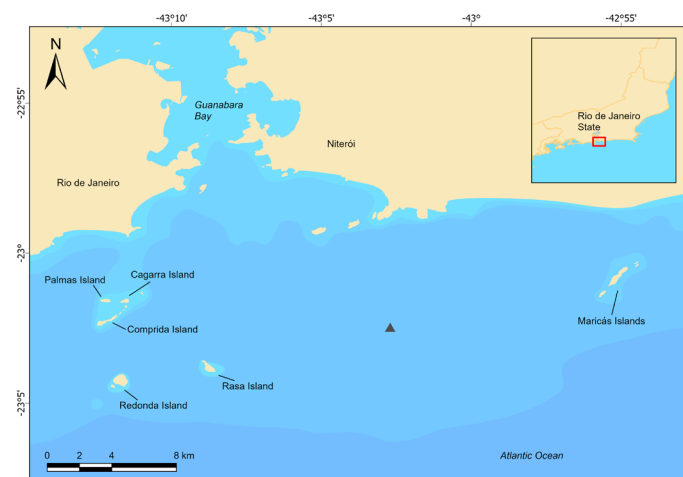


Fig. 1. Location where the *Sula leucogaster* individual with anomalous coloration was observed along the coast of Rio de Janeiro, southeastern Brazil, on March 12, 2024. The triangle marks the position of the individual.

Leucism is characterized by the complete loss of pigment in all or part of the plumage, except for the eyes, which will always maintain their normal coloration. Soft parts, such as the skin and beak, may or may not retain their normal coloration. Different forms of leucism are known and can vary from only a few white feathers (<25%) to totally white individuals (100%) (van Grouw, 2006; van Grouw et al., 2011). Albinism is a condition where the birds have a complete white plumage without any melanin pigmentation and the beak, the feet and the eyes will be pink, and the skin pale. Leucistic birds always have colored eyes which distinguish them from albinos (Nemésio, 1999; Nemésio, 2001 b; Hosner & Lebbin, 2006; Guay et al., 2012; van Grouw et al., 2016). The reason for this is that only the pigments of the iris are missing and the pigments in the back of the eyeball remain present and therefore the eyes look dark (van Grouw, 2006). In this present case the iris is white, different from leucistic, albino or normal colored birds.

In addition to the complete absence of coloration in the plumage, which was white, the individual also had a light pink-flesh beak, infused with yellowish on proximal lower mandible, reminding that of females, and a light iris showing a marked reduction in color and dark pupil. The iris of the bird is white, and not gray as it is naturally in *S. leucogaster* without leucism (Fig. 2 A and B). In adult birds, it is possible to determine the sex by vocalization, size, and color of the skin around the eyes, which in males is blue and in females yellow with a dark spot in front of the eyes. However, in this case, using only visual and photos records, it was not possible to determine the sex.

The individual was floating with wet wing feathers, appearing to be weak, but without visual signs of malnutrition. The observation occurred approximately one month after a record of a leucistic Brown Booby on the coast of the São Paulo State was reported, close to Moela Island (Costa et al., 2024), approximately 370 km south of the present record. As chromatic aberration is an uncommon condition among birds of the genus *Sula* (Castillo-Guerrero et al., 2005), it may be the same individual. However, in Costa et al. (2024) it is possible to see a darker area of the plumage in the back of the head as well as in part of the neck, which could be pigmented feathers, a shadow or an oil stain. The resolution of the image does not allow us to understand what causes this dark color, nor does it allow us to visualize the color of the bird's iris.



Fig. 2 A and B. Potential leucistic individual of *Sula leucogaster* seen in Rio de Janeiro, southeastern Brazil, on March 12, 2024. The plumage is completely white, the beak is light pink-flesh, and the iris is white.

The closest Brown Booby reproductive colonies to the record presented here are located approximately 14.95 km (Cagarra Island) and 15.50 km away (Redonda Island). Combining the two islands, which are used for reproduction and rest, the colony was estimated at 2,500 individuals (Cunha, 2019). Boobies are gregarious birds that usually land in the water, forming groups of dozens of individuals. The absence of other brown boobies along with the white individual reported here may indicate difficulties in interacting with other birds, or it may reflect a juvenile in its dispersal behavior. The Brown Booby is considered a resident species, without migratory movement and with high natal philopatry and site fidelity, although young birds disperse from the natal colony, they tend to return to the natal location to breed. Studies have shown that the average distance of its daily foraging movements, in relation to the breeding colony, can vary between 6.5 km and 8.4 km (Nunes et al., 2018) and between 16.6 km and 39.2 km (Weimerskirch et al., 2009).

Although the absence of coloration in the plumage does not allow determination of whether the individual was juvenile or an adult, juveniles Brown Booby individuals undertake long journeys before returning to their natal colony to begin their reproductive life (Nelson, 1978), which may suggest that this bird is a juvenile individual.

Abnormalities in plumage coloration in *S. leucogaster* appear to be uncommon and have received little attention in detailed studies in the family Sulidae (Castillo-Guerrero et al., 2005; Costa et al., 2024). This

record expands knowledge about the occurrence and distribution of individuals with chromatic aberration of the species. The present record does not fit perfectly in leucism or albinism definitions since the bird had black pupil and iris without original coloration, which may lead us to a new classification of anomaly. Different classifications are presented for anomalous coloration in birds (e.g. Nemésio, 1999; Nemésio 2001 a; Nemésio 2001b; van Grouw, 2006; Guay et al., 2012; van Grouw et al., 2016). It is, therefore, difficult to give exhaustive descriptions and definitions for these categories since an exception can always be found (van Grouw, 2006) as the present record appears to be.

In the Gulf of California, Mexico, five different records of leucistic *S. leucogaster* were documented between January and March 2003 and between February and May 2004 (Castillo-Guerrero et al., 2005). Additionally, in Brazil, leucistic brown boobies were reported in March 1985 and between October to December 1986 in Cabo Frio Island, Rio de Janeiro State, erroneously categorized as albinism, being the same individual (Coelho & Alves, 1991; Gonçalves Jr. et al., 2008), and in February 2024 on the Moela Island, São Paulo State (Costa et al., 2024).

Mallet-Rodrigues (2001) recorded an albino cormorant (*Nannopterum brasilianum*) in Jarauá Lake, in the state of Amazonas, which was constantly persecuted by other birds of the same species. Forrest & Naveen (2000) observed that in penguins of the genus *Pygoscelis*, leucism did not affect their reproductive success, with several records of individuals reproducing for many years in a row. However, these birds had faded plumage, not completely white.

According to the review carried out by Guay et al. (2012), a variety of genetic and environmental factors can contribute to the occurrence of plumage aberrations in birds including genetic mutation, diet, age, diseases, parasites, and injuries. The authors cite detailed evidence for each of these causes, particularly for land birds in Australia. Lee & Keeler (1951) state that some changes in bird pigmentation may be correlated to morphological, physiological, and behavioral changes. However, according to his own observation, his review of the topic is based on many flawed reports that do not allow a precise determination of the type of alteration described, whether albinism or leucism, preventing the correct association of plumage changes with other alterations. Clapp (1974), reports that a young black tern (*Anous minutus*) captured on Laysan Island, northwestern Hawaii, presented partial leucism, flying difficulties, and reduced weight, which was associated with a deficient diet. Albino or leucistic birds may have a low survival rate due to the lack of their protective coloration (Holt et al., 1995; Collins, 2003). The absence of melanin makes the keratin structure more susceptible, accelerating its wear (Bonser, 1996). Further boat surveys were subsequently carried out in this area, and the individual in question was not seen again, making it impossible to make considerations about its survival.

Studies are needed to determine the impact of these anomalous colorations on the survival and reproductive success of these birds, but this represents a great challenge since these birds are observed at sea, making it impossible to determine their resting or breeding site.

2 Acknowledgments

Ilhas do Rio Project (Phase V, Year I), is carried out by Instituto Mar Adentro under the technical curatorship of WWF-Brazil and the sponsorship of the IEP Association and JGP, and Master Sponsorship from Credit Suisse, part of the UBS group, which provided financial and logistical support which made reporting on the present record possible. Special thanks to three anonymous reviewers for their valuable suggestions of the original manuscript. Monica Borobia reviewed the English version of this manuscript.

References

- Alves, V.S.; Soares, A.B.A. & Couto, G.S. 2004. Aves marinhas e aquáticas das ilhas do litoral do Estado do Rio de Janeiro. In: Branco, J.O. (ed.) Aves marinhas e insulares brasileiras: bioecologia e conservação. UNIVALI, Itajaí, Santa Catarina. 83-100 pp.
- Bonser, R.H.C. 1996. The mechanical properties of feather keratin. *J. Zool.* 239 (3): 477-484.
- Branco, J.O.; Fracasso, H.A.A.; Machado, I. F.; Bovendorp, M. & Verani, J.R. 2005. Dieta de *Sula leucogaster* Boddaert (Sulidae, Aves) nas Ilhas Moleques do Sul, Florianópolis, Santa Catarina Brasil. *Rev. Bras. Zool.* 22(4): 1044-1049.
- Castillo-Guerrero, J.A.; Mellik, E.; Peñaloza-Padilla, E. & Prado-López, M. 2005. Anomalously pigmented brow boobies in the Gulf of California: leucism an possibly hybridization with the Blue-footed Booby. *Western Birds.* 36: 325-328.
- Clapp, R.B. 1974. Albinism in the Black Noddy (*Anous tenuirostris*). *The Condor.* 76(4): 464-465.
- Coelho, E.P. & Alves, V. S. 1991. Um caso de albinismo em *Sula leucogaster* na ilha de Cabo Frio, Rio de Janeiro (Pelecaniformes: Sulidae). *Ararajuba.* 2(1): 85-86.
- Coelho, E. P.; Alves, V. S.; Soares, A. B. A.; Couto, G.; Efe, M. A.; Ribeiro, A. B. B.; Viellard, J. & Gonzaga, L.P. 2004. O atobá-marrom (*Sula leucogaer*) na ilha de Cabo Frio, Arraial do Cabo, Rio de Janeiro Brasil. In: Branco, J.O. (ed.) Aves marinhas e insulares brasileiras. UNIVALI, Itajaí, Santa Catarina. 233-254 pp.
- Costa, J. H. A.; Passos, R.; Souza, U. P.; Selinger, A. & Souza, T. R. 2024. New record of leucism in Brow Booby (*Sula leucogaster*) on the Brazilian coast. *UNISANTA Bioscience.* 13(1): 28-31.
- Collins, C. T. 2003. A leucistic Willet in California. *Western Birds.* 34: 118-119.
- Cunha, L. 2019. Aves marinhas. In: Bertoncini, A.; Moraes, F.; Borgonha, M.; Aguiar, A. & Duarte, B. (eds.). Guia de biodiversidade marinha e mergulho das Ilhas do Rio. Museu Nacional Série Livros, N° 65, Rio de Janeiro. 305-315 pp.
- Cunha, L.; Alves, V.; Rajão, E. & Lanna, A. 2013. Aves do Monumento Natural das Ilhas Cagarras. In: Moraes, F.; Bertoncini, A. & Aguiar, A. (eds.). História, pesquisa e biodiversidade do Monumento Natural das Ilhas Cagarras. Museu Nacional Série Livros, N° 48, Rio de Janeiro. 177-205 pp.
- Filho, R. C. B. & Vooren, C. M. 2009. Monitoramento da avifauna. In: Viana, D. L.; Hazin, F. H. V. & Souza, M. A. C. (eds.) O arquipélago de São Pedro e São Paulo: 10 anos de estação científica. Marinha do Brasil. Secretaria da Comissão Interministerial para os Recursos do Mar. Brasília, Distrito Federal. 261-268 pp.
- Forrest, S. C. & Naveen, R. 2000. Prevalence of leucism in Pygocelid penguins of the Antarctic Peninsula. *Waterbirds.* 23(2): 283-285.
- Guay, P. J.; Potvin, D. A. & Robinson, R. W. 2012. Aberrations in plumage coloration in birds. *Aust. Field Ornithol.* 29(1): 23-30.
- Gonçalves Jr., C. C.; Silva, E. A.; De Luca, A. C.; Pongiluppi, T. & Molina, F. B. 2008. Record of a leucistic Rufous-bellied Thrush *Turdus rufiventris* (Passeriformes, Turdidae) in São Paulo city, Southeastern Brazil. *Rev. Bra. Ornitol.* 16(1): 72-75.
- Hosner, P. A. & Lebbin, D. J. (2006). Observations of plumage pigment aberrations of birds in Ecuador, including Ramphastidae. *Bol. SAO* 16 (1): 30-43.
- Holt, D. W.; Robertson, M. W.; & Ricks, J. T. 1995. Albino Eastern Screech-owl, *Otus asio*. *Can. Field-Nat.* 109(1): 121-122.
- Lee, F. & Keeler, C. E. 1951. Pigment variations and their correlates in birds. *The Auk.* 68(1): 80-85.
- Mallet-Rodrigues, F. 2001. An albino Olivaceous Cormorant *Phalacrocorax brasilianus* in the Brazilian Amazon. *Cotinga.* 15: 14.
- Nelson, J. B. 1978. The Sulidae, Gannets and Boobies. 1st ed. University of Aberdeen by Oxford University Press. Oxford, U.K, 1012p.
- Nemésio, A. 1999. Plumagens aberrantes em Psittacidae neotropicais – uma revisão. *Melopsittacus.* 2(2/4): 51-58.
- Nemésio, A. 2001a. Colour production and evolution in parrots. *Int. J. Ornithol.* 4(2): 75-102.
- Nemésio, A. 2001b. Plumagens aberrantes em *Emberizidae* neotropicais. *Tangara.* 1(1): 39-47
- Nunes, G. T.; Bertrand, S. & Bugoni, L. 2018. Seabirds fighting for land: phenotypic consequences of breeding area constraints at a small remote archipelago. *Sci. Rep.* 8(1): 665.
- van Grouw, H. 2006. Not every white bird is an albino: sense and nonsense about colour aberrations in birds. *Dutch Birding.* 28: 79-89.
- van Grouw, H.; Russel, S. & Merne, O. 2016. Notes on colour aberrations in Common Guillemot *Uria aalge* and Northern Gannet *Morus bassanus*. *Sea Birds J.* 24(24): 33-41.
- Weimerskirch, H.; Shaffer, S. A.; Tremblay, Y.; Costa, D. P.; Gadenne, H.; Kato, A.; Ropert-Coudert, Y.; Sato, K. & Aurioules, D. 2009. Species -and sex- specific differences in foraging behaviour and foraging zones in blue-footed and brown boobies in the Gulf of California. *Mar. Ecol. Prog. Ser.* 391: 267-278.