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Case report

Partial albinism in Hawksbill turtle (*Eretmochelys imbricata*) in Rio Grande do Norte, Brazil

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ABSTRACT

Albinism is a genetic disorder in which there is a defect in melanin production, a pigment which gives color to the skin, hair and eyes. This congenital malformation can also occur in sea turtles, although it is not fatal, but it reduces their chances of survival in the natural environment. Even so, there are still no reports of its occurrence in *Eretmochelys imbricata*, a species known as the hawksbill turtle or legitimate turtle, with wide distribution in tropical seas. The present study describes the case of an individual with partial albinism in the *E. imbricata* species, found on the northern coast of Rio Grande do Norte, Brazil. The animals were collected at Cabo de São Roque beach in January 2020 during the reproductive season of the species. After analyzing the animal, it can be classified as having partial piebald albinism, since it still has lighter spots both on the skin and in the carapace and plastron regions.

Keywords: anomalies, sea turtle, Piebald, Testudines

INTRODUCTION

Albinism is the result of a genetic disorder with an autosomal recessive character which results in a defect in the release of pigments by melanocytes (Bakos *et al*., 2009). In albinism, the homozygosity of recessive alleles is reflected in the inability to produce and release melanin, which is the pigment responsible for the black and brown color of animals, including humans (Griffiths *et al*., 1998). Furthermore, Rishi *et al*. (2020) clarifies that these recessive genes are responsible for the pigmentation intensity of the skin, hair and eyes.

Normally, individuals with true albinism have a total absence of cutaneous (light or white) and retina pigmentation (red eyes) (Castillo *et al*., 2006). However, the absence of melanin in specimens with partial albinism is restricted to some body regions, and may present skin or coat with light colors, not necessarily white, and pigmented areas in other regions of the body (Berdeen and Otis, 2011).

The occurrence of albinism in sea turtles has already been reported for the *Chelonia mydas* and *Carreta caretta* species on the beaches of Northern Cyprus and Turkey (Kaska and Downie, 1999), *Caretta caretta* on the beaches of Florida (Drennen 1990), and *Lepidochelys olivacea* on the coast of Mexico (Ibarra and Gasca, 2009). However, its occurrence in the *Eretmochelys imbricata* species has not yet been described.

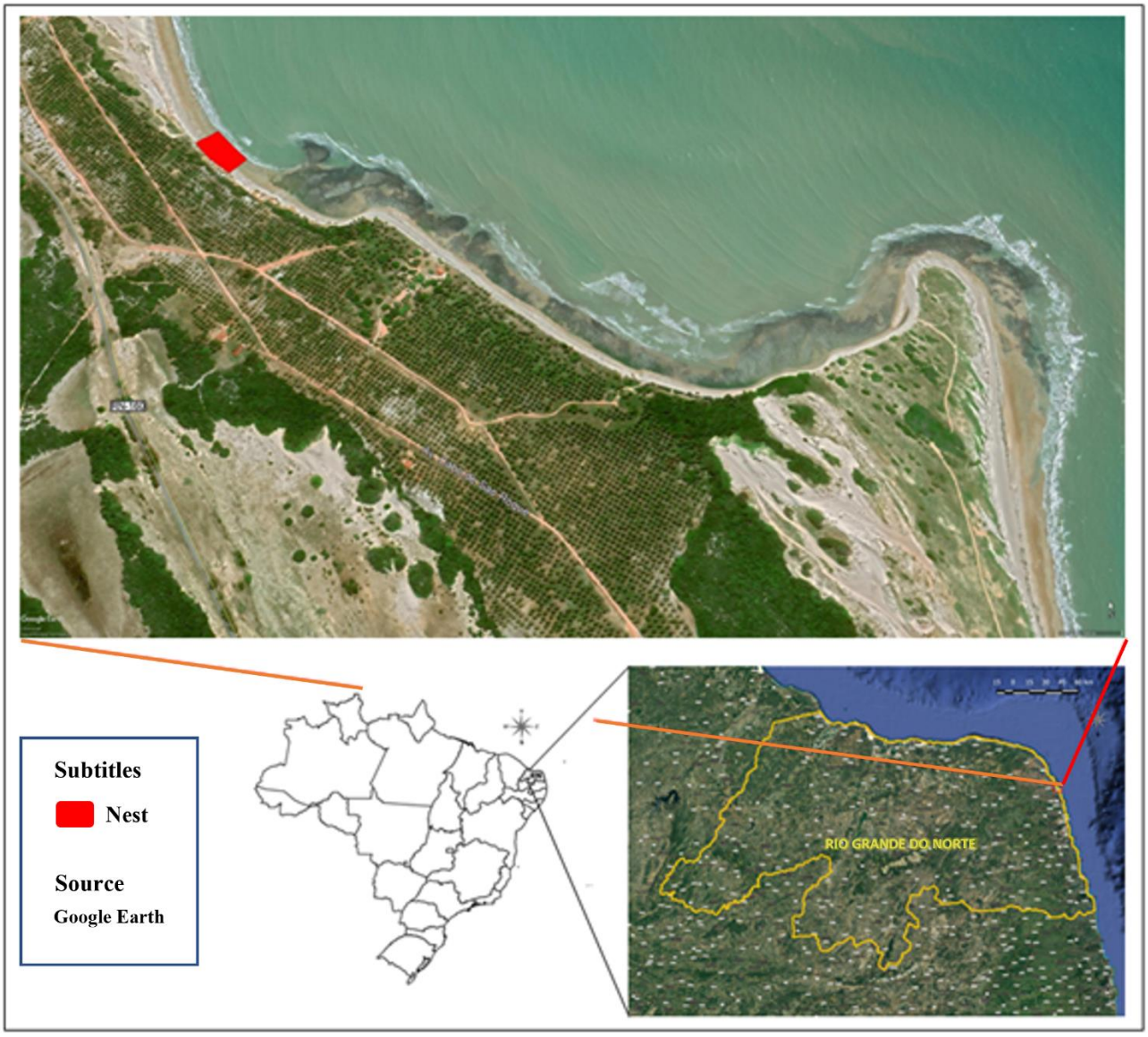

Figure 1 Spawning area of the hawksbill turtle (*Eretmochelys imbricata*) on Cabo de São Roque beach, northern coast of Rio Grande do Norte, 2020.

In Brazil, *Eretmochelys imbricata* is a species known as hawksbill turtle or legitimate turtle, with wide distribution in tropical seas and rarely found in subtropical seas (Santos *et al.*, 2013). Its spawning and feeding areas in Brazil are north of Bahia, Sergipe and the south and north coast of Rio Grande do Norte (Moura *et al.*, 2012). It is critically endangered in both Brazil and abroad according to the International Union for Conservation of Nature (IUCN, 2022).

This study aims to describe the case of an individual with partial albinism in the *Eretmochelys imbricata* species found on the northern coast of Rio Grande do Norte, Brazil. In addition, we seek to bring new data on this topic, especially regarding albinism in sea turtles, as abnormalities like this can be considered relatively rare and may indicate negative changes in the turtle's biology.

MATERIALS AND METHODS

Collection site

The turtles were collected at Cabo de São Roque beach, north coast of Rio Grande do Norte (Figure 1) (Latitude: 5° 30' 59" South, Longitude: 35° 15' 45" West), in January 2020 during the spawning season of the species. The spawning period in this region mainly occurs from November to April, with greater concentration in the months of January, February and March.

Animals

The evaluated animals were collected from a nest in the spawning monitoring range of the Cabo de São Roque Protection and Conservation Association (APC Cabo de São Roque) (TAMAR/ICMBio/MMA - SISBIO License no. 64308-2). Stillborn, non-viable eggs, viable eggs and hatchlings were collected from the nest. Eggs were opened with scissors to evaluate non-viable eggs, the fetus was removed and dissected from the eggshell and fetal membranes. Next, it was fixed in a 4% paraformaldehyde solution for 48 hours. After the fixation period, images were obtained using a photographic camera (Canon Eos 1100D rebel t3).

Nomenclature

The animals were classified according to embryonic development staging table for *Chelonia mydas* (Al-Mukhaini *et al.*, 2010).

RESULTS

A total of 80 non-hatched, 0 non-viable eggs, 75 hatched eggs and 9 stillbirths were found in the evaluation nest. The species commonly lays 80 to 200 eggs in a single nest, and up to 7 nests in a reproductive season, with an incubation period between 50 and 65 days (Moura *et al.*, 2012). In hatched eggs, it was observed that the hatchlings had their umbilical opening partially connected to the chorioallantoic-amniotic membranes, the yolk sac completely exposed in the coelomic cavity and the transverse fold of the plastron formed an angle which gave the body a partially flexed appearance (Figure 2). These characteristics were described by Al-Mukhaini *et al.* (2010) for fetuses at 54 days of incubation.

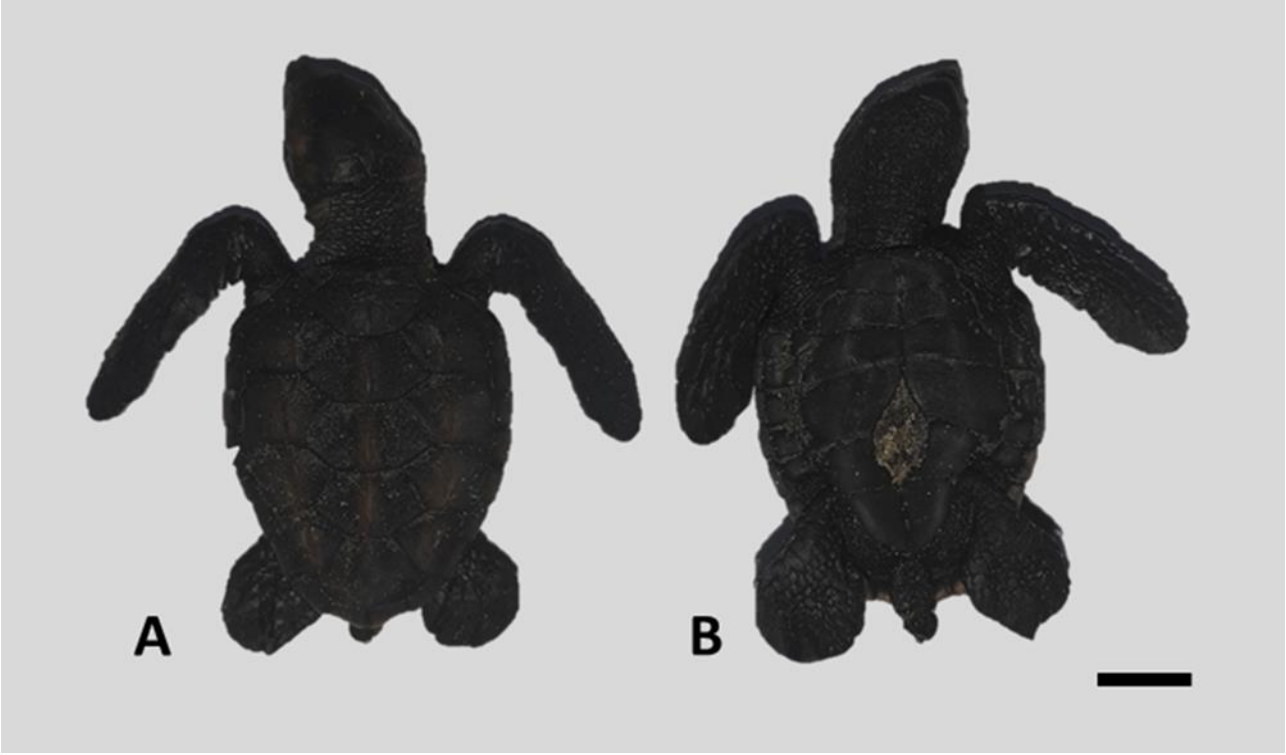

Figure 2 Newly hatched *Eretmochelys imbricate* turtles estimated to be 54 days old; A: dorsal view; B: ventral view; scale: 1 cm

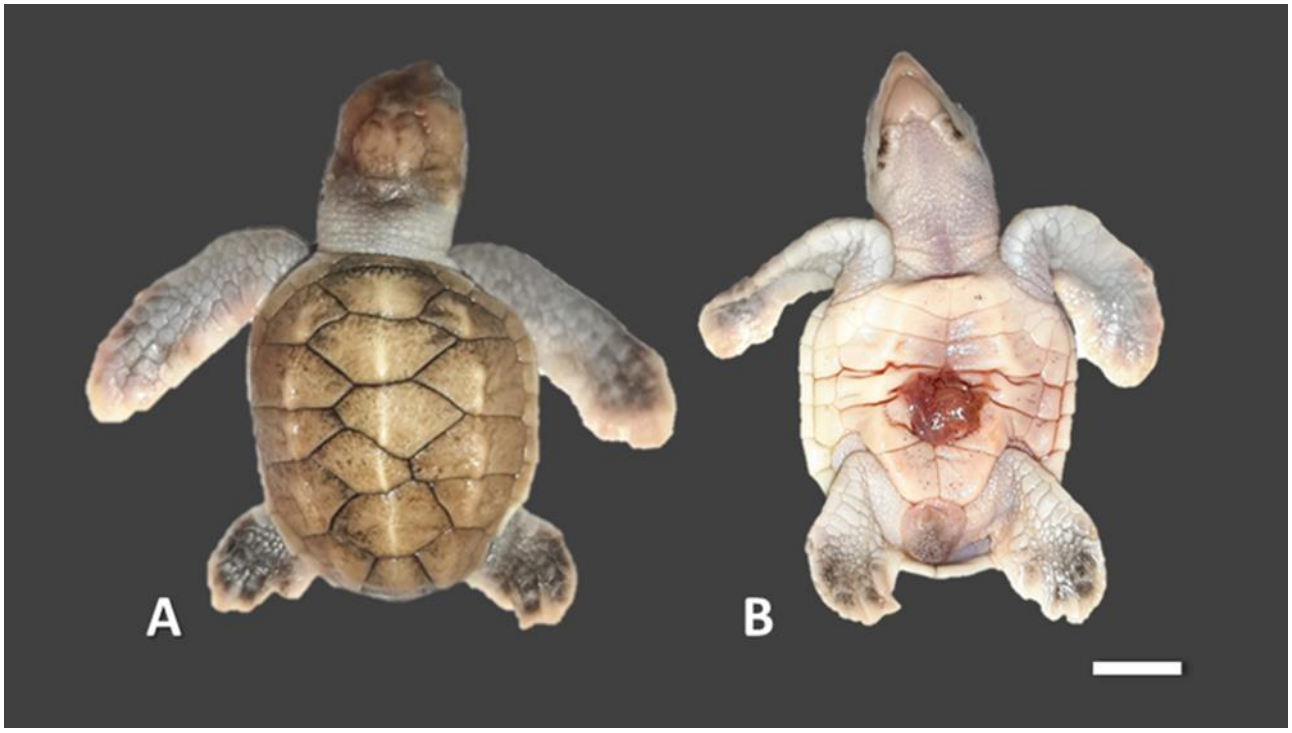

Figure 3 Partial albinism in non-hatched fetus of *Eretmochelys imbricata* with an estimated age of 52 days; A: dorsal view; B: ventral view; scale: 1 cm.

However, when evaluating the non-hatched eggs, it was possible to observe that one of the fetuses had a variation in its skin pigmentation, carapace and plastron, suggestive of partial albinism (Figure 3). This observation becomes evident when comparing to hatchlings which showed characteristic pigmentation of the species (Figure 2).

DISCUSSION

Developmental anomalies in sea turtles are considered relatively uncommon, but there are indications that these changes in these animals may arise from hereditary factors, as well as from environmental influences (Dodd 1988; Drennen 1990), as the most common congenital malformations in sea turtles are albinism, supra and undernumbered carapace plates and twinning (Drennen 1990; Kaska and Downie 1999).

Albinism can be associated with several factors such as incubation temperature (Cañón and Orozco 2004), variation in the intermediate lobe of the pituitary affected by environment effects which govern pigment production (Harless and Morlock 1989). and the expression of a recessive homozygous gene (Godfrey and Mrosovsky 1995). In some cases, pigment deficiency becomes a genetically polymorphic characteristic, meaning that when alleles are so common that they are found in more than 1% of the chromosomes in the population (Harless and Morlock 1989).

The partial albinism found in the present case may be associated with individual genetic alterations, since the other fetuses in the same nest presented external anatomical characteristics within the standard for the species, even when submitted to the same edaphoclimatic conditions as the albino fetus. Albinism was the most common abnormality observed in *Carreta carreta* by Drennen (1990), reaching a total of 24.35% of the total physical abnormalities found in 1987-1988 in Florida; however, carapace shield and cephalic deformation (8%) abnormalities were more common in embryos from the beaches of Northern Cyprus and southwestern Turkey in the years 1994 to 1996 reported by Kaska and Downie (1999).

Partial Albinism can be subdivided into: Leucism - characterized by the retention of color in the eyes, beak and scales, but the skin does not contain color pigment (Forrest and Naveen 2000); Xanthic - animals only produce yellow

pigment (Hiller 1983); Piebald - presenting spots with no pigment in a normally pigmented individual (Acevedo *et al*., 2008). Thus, the animal in the present report can be classified as having Piebald-type partial albinism, since it has lighter spots on both the skin as well as in the carapace and plastron regions.

Albinism is not necessarily a fatal malformation, but according to Ibarra and Gasca (2009), it has always been accompanied by another lethal malformation in *Lepidochelys olivacea* hatchlings. Despite being stillborn, the individual with partial albinism in the present study did not have any other apparent abnormalities.

The occurrence of Piebald-type partial albinism in non-hatched fetus of *Eretmochelys imbricata*, approximately 52 days old, found in a nest located on the beach of Cabo de São Roque -RN, Brazil, was probably caused by individual genetic alteration, as there was only one individual in the nest with this malformation. From the observations made about individuals with partial albinism, this is expected to generally contribute to the process of evaluating sea turtle nests, and to analyzing geographic and temporal malformation trends in this species in the future.

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