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Anomalous pigmentation in rough-toothed dolphin (*Steno bredanensis*) from Cabo Verde: a first report for the Macaronesian region

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RESUMO

Relatamos o primeiro caso documentado de um cetáceo com pigmentação anómalo na República de Cabo Verde – um golfinho-de-dentes-rugosos (*Steno bredanensis*) com hipopigmentação. Este indivíduo que, provavelmente apresenta leucismo ou piebaldismo, representa o primeiro registo na ecorregião da Macaronésia e é apenas o segundo caso conhecido para esta espécie no continente Africano. Consideramos as implicações ecológicas deste fenómeno raro e destacamos a prevalência notavelmente baixa entre as populações de golfinhos.

Palavras-chave: Atlântico Tropical Oriental, cetáceo, Delphinidae, distúrbio cutâneo, hipopigmentação, variação de cor

ABSTRACT

We report the first documented case of an anomalous pigmented cetacean in the Republic of Cabo Verde – a hypopigmented rough-toothed dolphin (*Steno bredanensis*). This individual, likely exhibiting leucism or piebaldism, represents the first record in the Macaronesia ecoregion, and only the second known case for this species in African waters. We consider the ecological implications of this phenomenon and highlight its notably low prevalence among dolphin populations.

Keywords: Eastern Tropical Atlantic, cetacean, Delphinidae, skin disorder, hypopigmentation, colour variation

INTRODUCTION

Mammalian coloration is predominantly governed by the presence or absence of the pigment melanin within the integumentary structures, including the skin, hair, and eyes (Fertl & Rosel 2009). Various pigmentation anomalies have been documented in mammals (dos Santos *et al*. 2016) encompassing: *i*) albinism – a hereditary disorder characterized by a complete absence of melanin in the eyes, skin, and hair; *ii*) leucism – defined by a reduction in pigmentation that typically results in individuals exhibiting white coloration with normally pigmented eyes; *iii*) melanism – involving an overproduction of melanin, leading to an increased deposition of dark pigmentation; and *iv*) piebaldism – which manifests as localized areas of depigmentation, producing irregular light-coloured patches on an otherwise normally pigmented background (Slominski *et al*. 2004; Acevedo & Aguayo 2008; Acevedo *et al.* 2009; Lodi & Borobia 2013; dos Santos *et al*. 2016; Fertl & Rosel 2009; Methion & López 2019; Lindner 2023)

Reports of atypical colouration in cetaceans are scarce (Fertl *et al*. 1999; Quigley & Flannery 2002; Slominski *et al*. 2004; Acevedo & Aguayo 2008; Acevedo *et al*. 2009; Lodi & Borobia 2013; Hauser-Davis *et al*. 2020; Gazda & Russell 2022; Ortega-Ortiz *et al*. 2022; Lindner 2023). Despite their low frequency of occurrence (Lin *et al*. 2023; Lindner 2023), anomalously white individuals have been documented across a broad range of cetacean taxa globally (Fertl *et al*. 1999, 2004; Hauser-Davis *et al*. 2020). In the North Atlantic region, such pigmentation anomalies have been reported in several species, including but not limited to *Tursiops truncatus* (Fertl *et al.* 2004), *Delphinus* spp. (Dobbs 1984), *Phocoena phocoena* (Tonay *et al*. 2012; Robinson & Haskins 2013), *Orcinus orca* (Speckman & Sheffield 2001), *Globicephala* spp. (Hain & Leatherwood 1982), *Physeter microcephalus* (Whitehead 1995), *Stenella frontalis* (Fertl *et al*. 1999; dos Santos *et al*. 2016), and *Balaenoptera physalus* (Methion & López 2019).

Rough-toothed dolphin (*Steno bredanensis* Lesson 1828) is a warm-water cetacean inhabiting tropical, subtropical, and warm-temperate regions, occurring in both pelagic and coastal environments (de Boer 2010). It has a streamlined, robust body with a conical head and a long, narrow, well-defined rostrum (Cardoso *et al*. 2019). The poorly demarcated melon-shaped contributes to its reptilian appearance (West *et al*. 2011). The dorsal fin is prominent – tall, broad-based, and falcate (sickle-shaped) – and accompanied by relatively large pectoral fins (Cardoso *et al*. 2019).

Its pigmentation is typically slate-grey to black, with a darker dorsal cape extending from the rostrum along the back (de Boer 2010; Cardoso *et al*. 2019). The lateral flanks are lighter and often marked with white mottling, while the ventral surface is generally white. A distinctive feature is the bicolouration of the

rostrum: the upper jaw is dark, whereas the lower jaw and lips are stark white (Cardoso *et al*. 2019). Adults can reach a length of 2.65 m long and weigh as much as 155 kg (Cardoso *et al*. 2019).

Steno bredanensis is a highly social species, typically observed in small, cohesive groups comprising 10 to 20 individuals. These groups exhibit strong social cohesion, with individuals often swimming in proximity and engaging in coordinated, synchronous movements (West *et al*. 2011).

The Republic of Cabo Verde is a volcanic archipelago consisting of 10 islands and several islets in the North Atlantic, approximately 570 kilometres off Dakar, Senegal. It is part of the Macaronesian ecoregion (together with the Canary Islands, Madeira and Azores). The waters around Cabo Verde are rich in biodiversity (Freitas 2014; López *et al*. 2019; Roberts *et al*. 2002), with at least 24 cetacean species being reported (Reiner *et al*. 1996; Hazevoet & Wenzel 2000; Hazevoet *et al*. 2010; Berrow *et al.* 2015).

MATERIAL AND METHODS

On 7 July 2025, two small pods of *S. bredanensis* were observed during a boat survey on the western shore of Boavista Island (Fig. 1). The pods were encountered on the continental shelf, at a fishing bank commonly frequented by small artisanal fishing vessels. The dolphins were observed at ~14:15h local time (UTC -1) at 16.097°N, 23.019°W (Fig. 1), with a vessel speed of 4.2 knots, and the encounter lasted for 15–20 min. One of the pods, consisting of four individuals, approached the vessel.

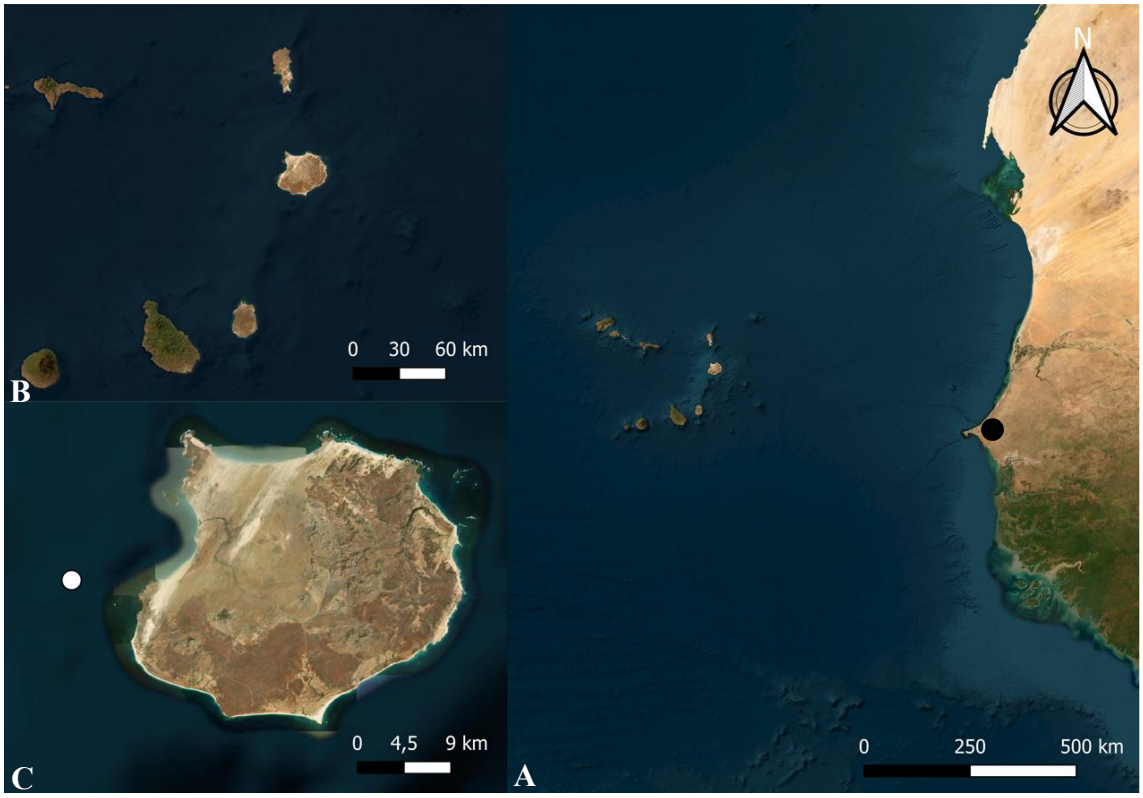

Fig. 1. Geographical location of the study area. **A**) Location of Cabo Verde Archipelago in relation to Dakar, Senegal (back circle in West Africa continent); **B**) enlarged view of the eastern islands of the archipelago, including Boavista; **C**) Boavista showing the sighting location of the anomalously pigmented rough-toothed dolphin (white circle).

During the approach, a whitish individual was observed and the pod was filmed. Footage was recorded from the vessel, using a GoPro Hero 9 (GoPro Inc.) and Insta360 x3 (Insta360) cameras. Observers documented and filmed the presence of the dolphins and their behaviour in association with the fishing activity. Artisanal fishermen in the region have reported interactions with *S. bredanensis*, in which fishermen use rough-toothed dolphins to locate tuna (which often swim together with the dolphins, according to fishermen).

The following additional environmental data were recorded at the sampling site: low swell (~1 m), Beaufort sea state 4, northerly wind, high water visibility, and a sea surface temperature (SST) of ~24.7°C (Copernicus Marine Service, https://doi.org/10.48670/moi-00016).

RESULTS

Both observed pods were associated with artisanal fishery vessels during fishing activity. The closest pod to the observation vessel consisted of four individuals, including one with atypical white pigmentation. This leucistic dolphin showed an apparently normal behaviour. The footage of the videos clearly shows that the individual was mainly white with a faint outline of its characteristic caped pigmentation pattern, as well as some darker spots (Fig. 2 A, B). Although staying mostly behind the other dolphins, the aberrant dolphin approached the observation vessel, performing synchronized swimming with the three normally pigmented individuals, whilst circling and checking the vessel for baitfish. The dolphins remained active at and below the surface throughout the encounter, showing interest in the bait discarded from the boat to attract tuna. They changed direction frequently, eventually moving away in the direction of another fishing boat. The whitish dolphin showed no signs of physical impairment or emaciation. According to the vessel's skipper, the whitish individual had been observed on previous occasions in the same area. Considering the rarity of such atypical cases in the wild, these observations most likely refer to the same individual, as they involve the same species in the same area (video footage documenting the encounter is available as supplementary material https://youtu.be/ rwoFrlJEW8E).

DISCUSSION

The occurrence of anomalously white cetaceans has been reported for at least 25 species (Fertl *et al*. 1999, 2004; Hauser-Davis *et al*. 2020; Ortega-Ortiz *et al*. 2022; Lindner 2023). Anomalously pigmented *S. bredanensis* have previously been reported in Hawaii, exhibiting piebaldism (de Boer 2010), and in the Canary Islands, where light-grey individuals were observed (de Boer 2010). The first record of a white *S. bredanensis* off the African continent was documented off Gabon, West Africa (de Boer 2010). To our knowledge, this is the first documented record of an anomalously white *S. bredanensis* in Cabo Verde and across the Macaronesian ecoregion. The individual is likely exhibiting leucism, characterized by dark eyes and reduced pigmentation resulting in whitish coloration (Fertl & Rosel 2009; Gazda & Russell 2022).

Fig. 2. Photo documentation of the dolphin exhibiting abnormal pigmentation patterns (video material by Gonzalo Mucientes & Sara S. Ratão). **A**) Left lateral view of the individual alongside normally pigmented conspecifics, observed on 7th July 2025, west of Boavista; **B**) Dorsal view of the same individual swimming with another normally pigmented dolphin.

The prevalence of anomalously white cetaceans and the survival prospects of individuals exhibiting such pigmentation remain poorly understood (Fertl *et al*. 2004; Lin *et al*. 2023). Abnormal pigmentation is mainly attributed to genetic anomalies (Fertl & Rosel 2009; Gazda & Russell 2022), but it can also be caused by other factors such as pollution, systematic infections, and scarring (Lin *et al*. 2023). Atypical skin colouration may increase visibility to predators (resulting in higher predation of such individuals), and reduce hunting efficiency due to decreased camouflage or countershading (Pawelek & Körner 1982; Hubbard *et al*. 2010; Lin *et al*. 2023; Lindner 2023). Additionally, for cetaceans it has been suggested that the loss of pigmentation is correlated to: *i*) a higher

probability of UV damage (Methion & López 2019; Hauser-Davis *et al*. 2020; Lin *et al*. 2023); *ii*) reduced heat absorption; and *iii*) reduced attractiveness to the opposite sex (Hauser-Davis et al., 2020). This suggest that such condition may negatively impact the overall fitness of the individual compared to normally pigmented individuals. Nevertheless, the observed individual exhibited no signs of physical impairment or emaciation.

In addition, this was a presumably sexually mature adult. Other reports of adult dolphins with atypical colouration suggest that it may not affect dolphin survival (Hauser-Davis *et al*. 2020). Further research is needed to clarify how (and if) abnormal pigmentation influences not only physical condition but also social dynamics within cetacean populations, and ecological conditions.

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REFERENCES

Acevedo, J., & Aguayo, M. (2008) Leucistic South American sea lion in Chile, with a review of anomalously color in otariids. *Revista de Biología Marina y Oceanografía*, 43, 413–417.

Acevedo, J., Aguayo-Lobo, A., & Torres, D. (2009) Albino Weddell seal at Cape Shirreff, Livingston Island, Antarctica. *Polar Biology*, 32, 1239–1243.

Berrow, S., López Suárez, P., Jann, B., O'Brien, J. Ryan, C., Varela, J.& Hazevoet, C.J., (2015) Recent and noteworthy records of Cetacea from the Cape Verde Islands. *Zoologia Caboverdiana*, 5, 111–115.

Cardoso, J., Francisco, A., De Souza, S. P. & Siciliano, S. (2019) Rough-Toothed Dolphins (*Steno bredanensis*) Along Southeastern Brazil: Report of an Anomalous Pigmented Juvenile and Description of Social and Feeding Behaviors. *Aquatic Mammals*, 45, 30–36.

de Boer, M.N. (2010) First record of a white rough-toothed dolphin (*Steno bredanensis*) off West Africa including notes on rough-toothed dolphin surface behaviour. *Marine Biodiversity Records*, 3, e66.

Dobbs, H. (1984) *The magic of dolphins*. Sheridan House, Boss Ferry, USA, 2603 pp.

dos Santos, R.P., Simião, S., Madruga, P., Mendonça, A.S., Seitre, R. & Gomes-Pereira, J.N. (2016) Anomalously White Atlantic Spotted Dolphins (*Stenella frontalis*, Cuvier, 1892) Off the Azores. *Aquatic Mammals*, 42, 245–252.

Fertl, D., Pusser, L.T. & Long, J.J. (1999) First record of an albino bottlenose dolphin (*Tursiops truncatus*) in the Gulf of Mexico, with a review of anomalously white cetaceans. *Marine Mammal Science*, 15, 227–234.

Fertl, D., Barros, N.B., Rowlett, R.A., Estes, S. & Richlen, M. (2004) An update on anomalously white cetaceans, including the first account for the pantropical spotted dolphin (*Stenella attenuata graffmani*). *Latin American Journal of Aquatic Mammals*, 3, 163–166.

Fertl, D. & Rosel, P.E. (2009) Albinism. *In:* Perrin, W.F., Würsig, B. & Thewissen, J. G. M. (Eds). *Encyclopedia of Marine Mammals (Second Edition)*. Academic Press, USA, pp. 24–26.

Freitas, R. (2014). The coastal ichthyofauna of the Cape Verde Islands: A summary and remarks on endemism. *Zoologia Caboverdiana*, 5, 1–13.

Gazda, S.K. & Russell, M.L. (2022) Fifty Shades of Gray: The First Leucistic Bottlenose Dolphin (*Tursiops truncatus*) Sighting off the Cedar Keys, Florida, Gulf of Mexico. *Aquatic Mammals*, 48, 661–665.

Hain, J.H.W. & Leatherwood, S. (1982) Two Sightings of White Pilot Whales, Globicephala melaena, and Summarized Records of Anomalously White Cetaceans. *Journal of Mammalogy*, 63, 338–343.

Hauser-Davis, R.A., Lemos, L.S., Moreira, S.C. & Siciliano, S. (2020) A scientometric review on leucism in wild dolphins. *Boletim do Laboratório de Hidrobiologia*, 30, 1–9.

Hazevoet, C.J., Monteiro, V., López, P., Varo, N., Torda, G., Berrow, S. & Gravanita, B. (2010) Recent data on whales and dolphins (Mammalia: Cetacea) from the Cape Verde Islands, including records of four taxa new to the archipelago. *Zoologia Caboverdiana*, 1, 75–99.

Hazevoet, C.J., & Wenzel, F.W. (2000) Whales and dolphins (Mammalia, Cetacea) of the Cape Verde Islands, with special reference to the Humpback Whale *Megaptera novaeangliae* (Borowski, 1781). *Contributions to Zoology*, 69, 197–211.

Hubbard, J.K., Uy, J.A.C., Hauber, M.E., Hoekstra, H.E. & Safran, R.J. (2010) Vertebrate pigmentation: From underlying genes to adaptive function. *Trends in Genetics*, 26, 231–239.

Lin, W., Chen, S., Zheng, R., Serres, A., Liu, B., Lin, M., Liu, M. & Li, S. (2023) Anomalous Coloration of Indo-Pacific Humpback Dolphins off Southern China. *Journal of Marine Science and Engineering*, 11, 348.

Lindner, M.S. (2023) Anomalous pigmentation in a dusky dolphin *Lagenorhynchus obscurus* from Golfo Nuevo, Argentinian Patagonia: Pigmentación anómala en delfín oscuro *Lagenorhynchus obscurus* del Golfo Nuevo, Patagonia Argentina. *Revista de Biología Marina y Oceanografía*, 58, 116–121.

Lodi, L. & Borobia, M. (2013) Anomalous colouration in an Atlantic spotted dolphin (*Stenella frontalis*) from southeastern Brazil. *Brazilian Journal of Aquatic Science and Technology*, 17, 1–3.

López, C., Reimer, J.D., Brito, A., Simón, D., Clemente, S. & Hernández, M. (2019) Diversity of zoantharian species and their symbionts from the Macaronesian and Cape Verde ecoregions demonstrates their widespread distribution in the Atlantic Ocean. *Coral Reefs*, 38, 269–283.

Methion, S. & López, B.D. (2019) First record of atypical pigmentation pattern in fin whale *Balaenoptera physalus* in the Atlantic Ocean. *Diseases of Aquatic Organisms*, 135, 121–125.

Ortega-Ortiz, C.D., Meza-Yañez, R., Calleros-Negrete, B.A., Sonten, L.G.H., Liñán-Cabello, M.A., Olivos-Ortiz, A. & Acevedo-Whitehouse, K. (2022) Observations of Hypopigmented Dolphins Sighted in Mexican and Alaskan Waters (2012-2013). *Aquatic Mammals*, 48, 746–752.

Pawelek, J.M. & Körner, A.M. (1982) The biosynthesis of mammalian melanin. *American Scientist*, 70, 136–145.

Quigley, D.T.G. & Flannery, K. (2002) Leucoptic harbour porpoise *Phocoena phocoena* (L.). *Irish Naturalists' Journal,* 27, 170.

Reiner, F., Santos, M.E.D., Wenzel, F.W. & Whale, A. (1996) Cetaceans of the Cape Verde archipelago. *Marine Mammal Science*, 12, 434–443.

Roberts, C.M., McClean, C.J., Veron, J.E.N., Hawkins, J.P., Allen, G.R., McAllister, D.E., Mittermeier, C.G., Schueler, F.W., Spalding, M., Wells, F., Vynne, C. & Werner, T. B. (2002) Marine Biodiversity Hotspots and Conservation Priorities for Tropical Reefs. *Science*, 295, 1280–1284.

Robinson, K.P. & Haskins, G.N. (2013) Rare sighting of an anomalously white harbour porpoise (*Phocoena phocoena*) in the Moray Firth, north-east Scotland. *Marine Biodiversity Records*, 6, e23.

Slominski, A., Tobin, D.J., Shibahara, S. & Wortsman, J. (2004) Melanin Pigmentation in Mammalian Skin and Its Hormonal Regulation. *Physiological Reviews*, 84, 1155–1228.

Speckman, S.G. & Sheffield, G. (2001) First record of an anomalously white Killer Whale, *Orcinus orca*, near St. Lawrence Island, Northern Bering Sea, Alaska. *Canadian Field-Naturalist*, 115, 501–502.

Tonay, A.M., Bilgin, S., Dede, A., Akkaya, A., Yeşilçiçek, T., Köse, Ö. & Ceylan, Y. (2012) First records of anomalously white harbour porpoises (*Phocoena phocoena*) in the Turkish seas with a global review. *Hystrix, the Italian Journal of Mammalogy*, 23, 76–87.

West, K.L., Mead, J.G. & White, W. (2011) *Steno bredanensis* (Cetacea: Delphinidae). *Mammalian Species*, 43, 177–189.

Whitehead, H. (1995). The realm of the elusive sperm whale. *National Geographic*, 188, 56–73.

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