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Records of atypical pigmented bottlenose dolphins (*Tursiops truncatus*) at the south-western coast of the Black Sea (Zonguldak, Türkiye)

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Abstract: Abnormal coloration shaped as small patches on a body or fins/tail flukes of cetaceans is relatively rare, although such cases have been recorded in multiple species. Several reports of anomalously colored dolphins and porpoises have been documented in the coastal waters of the Black Sea, with uneven distribution across the basin. Recently, during photoidentification (photo-ID) surveys conducted between 2022 and 2023, atypically pigmented bottlenose dolphin (*Tursiops truncatus*) individuals with white patches on their dorsal fins and bodies were spotted in Turkish territorial waters near Zonguldak Province. The analysis of photographs from these sightings offers a simple approach to detect and characterize different types of skin coloration of cetaceans inhabiting the south-western waters of the Black Sea.

Key words: Bottlenose dolphin, piebaldism, Black Sea, photoidentification

The bottlenose dolphin (*Tursiops truncatus*) is considered the largest representative of cetaceans in the Black Sea and is widely distributed along the coastline (Birkun et al., 2014; Gol'din et al., 2017; Popov et al., 2020). The results of photo-ID studies have shown that bottlenose dolphins form resident communities on the northern Black Sea coast connected by different degrees of dispersal (Gol'din et al., 2017; Gladilina et al., 2018); while there is no such evidence for the other regions of the basin, which can be attributed to the lack of specific studies. Photo-ID surveys also contain reports of atypically pigmented animals in the entire Black Sea (Gladilina et al., 2019).

Anomalous types of coloration of cetaceans are quite rare in frequency, although such cases have been documented in multiple species (Fertl et al., 1999; Fertl et al., 2004; Tonay et al., 2012; Lodi and Borobia, 2013; Fertl and Rosel 2018). Three types of abnormal coloration patterns have been described in marine mammals: Albinism—absence of pigmentation with a deficiency of melanin in hair, skin, and eyes; Leucism—reduced pigmentation of the skin with normally colored eyes; and Piebaldism—localized absence of pigment on the skin (Acevedo et al., 2009). Skin discoloration may be related to altered environmental conditions (Wilson et al., 2000; Ewing et al., 2017). Infections can also cause abnormal coloration in cetaceans (Van Bressem et al., 2003; Burdett Hart et al., 2012). Skin lesions or wounds caused by bacterial or viral infections can alter skin pigmentation, resulting in discolored areas. For example, poxvirus infections can cause white or greyish raised patches on the skin of cetaceans (Van Bressem et al., 2009). Decreased pigmentation and other color abnormalities are often associated with a deficiency of melanin, a brownish pigment produced by melanocytes that is responsible for the color of the body, eyes, and hair in most organisms. Melanin production is influenced by several factors including ultraviolet radiation, hormones, and age. There are several reports of piebald dolphins and harbor porpoises with uneven distribution in the coastal waters of the Black Sea basin (Tonay et al., 2012; Gol'din et al., 2017; Kopaliani et al., 2017; Gladilina et al., 2019). Many published occurrences of piebald bottlenose dolphins are from the north-eastern Black Sea region (Gladilina et al., 2019; Savenko, 2020). Several reports are from the north-western and eastern shorelines of the basin (Paiu et al., 2013; Gladilina et al., 2019). Here we added to the list the first reports of anomalously colored bottlenose dolphin individuals sighted on the south-western coast of the Black Sea.

A location on the Turkish Black Sea coast was selected for a research study (Figure 1). In particular, the coastal

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section between Ereğli (41.3145, 31.4115) and Filyos (41.5817, 32.0659) was selected as a priority area for conducting photoidentification surveys. The survey area is characterized by a range of habitats, including the mouth of the Filyos River, industrial and commercial ports near Ereğli, Zonguldak, and Filyos, and water areas with sea caves and rocky cliffs. The water depth in the area ranges from 18 to 900 m.

The study was conducted in the coastal waters of Zonguldak Province in winter, 2022 and spring, 2023 (Figure 1). Small 5-m boats with outboard motors were used as observation platforms. The surveys covered 55 km with an average duration of 3 hours per trip; date and time, geographic coordinates, and weather and sea conditions were recorded during the observations. Once a group of animals was sighted, group size and composition, movements and behavior, presence of immature individuals were recorded.

All specimens were photographed with Canon cameras (M50 and R6) with 18–400-mm lenses on both sides of the dorsal fin (when possible). While the group was too large to photograph each animal individually, our efforts were pointed at obtaining usable and clear photos of some individuals in pods. All photos were downloaded to a stationary computer in the laboratory. Dorsal fin images were reviewed using ACDSee 10.0, and then moderate, good, and excellent quality images were entered into a catalogue according to Würsig and Jefferson (1990).

On 20 February 2022, an atypically pigmented individual of bottlenose dolphin (*Tursiops truncatus*) was encountered near Zonguldak on the south-western Black Sea coast (Figure 2); it was observed 2 km from the shore (41.4368, 31.6835). The depth at the observation site was 90–100 m. The individual was swimming in a group of 22–25 dolphins. When the group was first sighted, the animals were likely feeding as the individuals were coordinated while deep diving and swimming rapidly at the surface. After 20 min of observation, the group changed behavior and the animals moved at low speed in a specific direction. The group consisted of adults accompanied by a smaller individual, probably a subadult, and 3 calves. The hypopigmented dolphin was in close proximity to the immature individual (Figure 2a), suggesting that this individual was a female. The small white patch of irregular shape was located on the left side of the dorsal fin of the dolphin (Figure 2b). In this case, the atypical depigmentation was not associated with any lesions due to apparent trauma or infection and was consistent with the distribution of patches over the body that is typical of piebaldism (Fertl and Rosel, 2018).

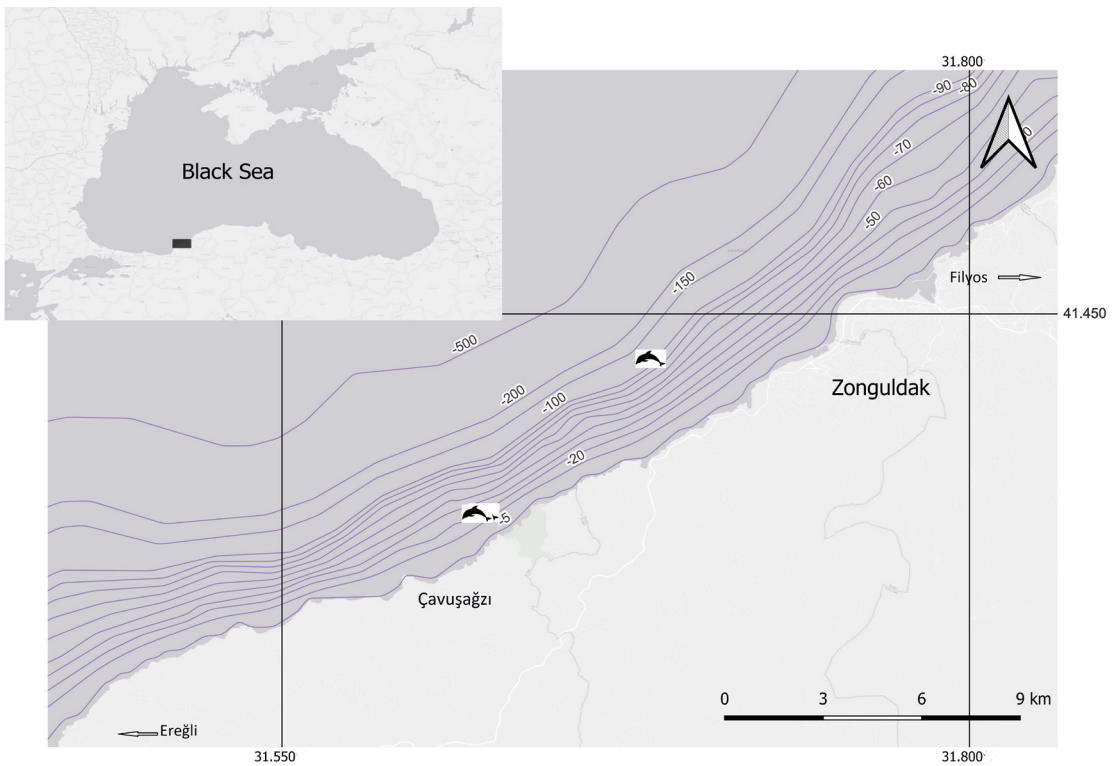

Figure 1. Sampling area and the sightings of unusually colored individuals of the bottlenose dolphin.

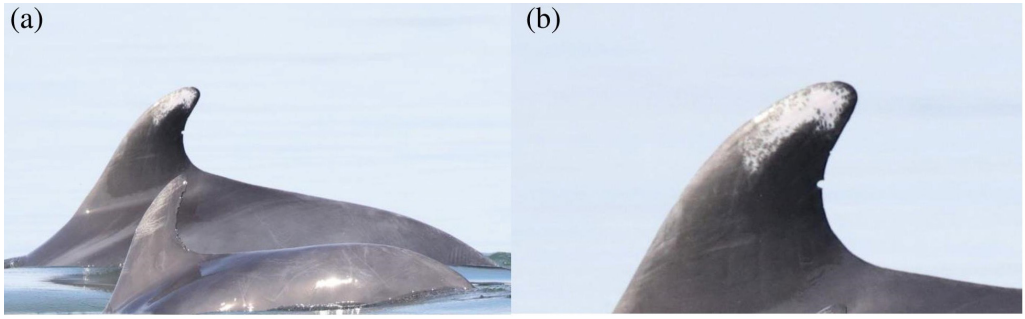

Figure 2. Image of a piebald female of bottlenose dolphin with an immature individual (a) and centered photograph of the dorsal fin (b).

Two more bottlenose dolphins with a patchwork pattern (Figure 3a) were sighted on 24 March 2023. They were sighted near Çavuşağzı (41.3955, 31.6221) 800 m from the shore. The sighting was recorded in good weather conditions and sea state 1–2 (on the Beaufort scale). They were recorded as members of a group consisting of more than 40 individuals; no calves were observed. The animals had unusual white patches on the leading edges of their fins that extended to the top of the caudal peduncle. The similar distribution pattern of these white patches on the bodies and fins of the two individuals contradicts the idea of random movement and growth of the pigment cells that produce piebald patterns. In addition, close examination of the images (Figure 3b) shows that the white patches lack external skin and have scarred wound edges. While the photo-ID data alone cannot determine the exact cause of these atypical color patterns, the lesions could potentially reflect the occurrence of pathogen-related lesions or sun damage.

Depigmentation and abnormal coloration of whale and dolphin species may affect some aspects of the animals' lives. Atypical body coloration could be susceptible to predators (Caro et al., 2011), but the lack of natural competitors of the Black Sea cetaceans negates this advantage of normal coloration. Potential costs of such depigmentation could include impaired visual communication, which has social and ecological implications (Hain and Leatherwood, 1982; Fertl et al., 1999). Hypopigmentation could affect heat absorption, ability to capture prey, and other life parameters in an ecological context that still remain unexplored and require further investigation. Abnormal pigmentation in cetaceans may be indicative of underlying health problems, so monitoring their coloration is critical. The frequency of coloration anomalies appears to be low, although they are a regular occurrence and have been described in more than 30 Black Sea bottlenose dolphin specimens (Gladilina, 2018; Gladilina et al., 2019; Savenko, 2020). However, the largest number of piebald dolphins

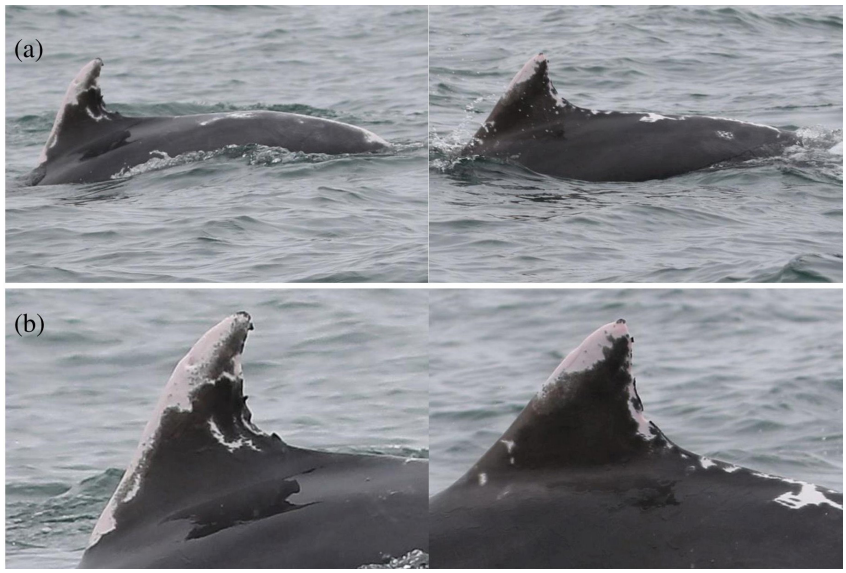

Figure 3. (a) Individuals of bottlenose dolphin with unusual coloration pattern recorded in the study area; (b) magnified images of their fins.

was reported in the north-eastern regions of the basin (Gladilina et al., 2019). The disproportionate distribution of bottlenose dolphin hypopigmented individuals between sites may indicate a higher mutation rate in the KIT gene (Oiso et al., 2012) on the north-eastern coastline. Instances of disproportionate distribution of hypopigmentation across the Black Sea suggest the possibility of population divergence, a hypothesis that could be due to differential environmental selection pressures in different habitat areas.

Photoidentification surveys are simple and useful tools for researchers to track changes in the coloration of individual animals over time, providing valuable insights into the health and welfare of cetacean populations. By regular monitoring the coloration of cetaceans, researchers can detect early signs of disease or other health problems and take the necessary steps to address them. This helps to ensure the long-term conservation and management of cetacean populations.

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