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Anatomical deformities in the tail flukes of humpback whales in Southeastern Brazil

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This note reports two cases of conspicuous anatomical deformities in the tail flukes of adult humpback whales (*Megaptera novaeangliae*) from the breeding stock "A" (Gales et al., 2011), which breeds in the Western Atlantic Ocean (Bortolotto et al., 2017). The two records were from research cruises conducted during the 2023 (n = 26) and 2024 (n = 26) breeding seasons in southeastern Brazil. Both individuals were photo-identified and included in the profile of the Humpback Whale Institute on the Happywhale platform, a global database for individual identification and recognition of marine mammals (Cheeseman et al., 2021).

Case 1: On 9 July 2023, a group of two adult humpback whales was recorded on the coast of Rio de Janeiro State (23º00'16"S, 42º57'49"W). One individual, with an estimated body length of 13 m, had a noticeably deformed tail fluke; both lobes of the tail fluke when viewed ventrally were ruled upwards (Fig. 1). The whale swimming pattern behavior was normal as persistent linear movements in a well-defined northeastern direction. Any distinctive marks, scars or coloration on its body were not observed. The individual was not in the Happywhale catalog but is now added as IBJ-8577 [1].

Case 2: On 5 July 2024, three adult humpback whales were sighted together on the coast of Rio de Janeiro State (23º06'26"S, 43º05'27"W). One of these individuals had a serious malformation, previously unreported in the literature. The trailing edge of the tail fluke did not exhibit the characteristic serration of the species; furthermore, both caudal lobes were narrower than in a normal fluke. However, the most striking feature was a prominent formation, similar in shape to a tail fluke, predominantly white in color, positioned in the caudal notch region, giving the impression that a second, smaller tail fluke was formed attached to the main fluke. This structure apparently did not have scar tissue,

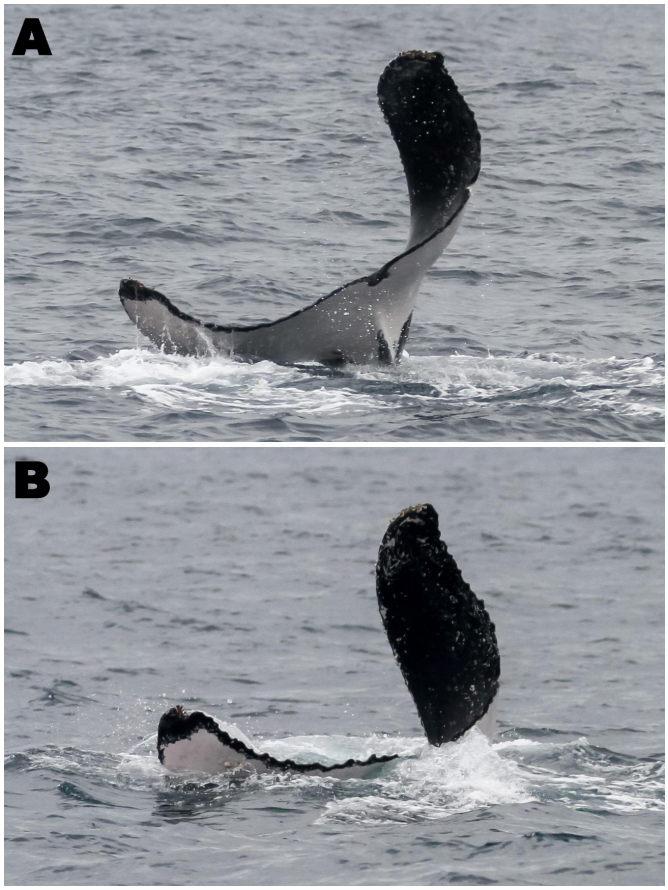

Figure 1. Humpback whale (IBJ-8577) with an anomaly in both lobes of the tail fluke sighted off Rio de Janeiro on 9 July 2023.

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Figure 2. Humpback whale (IBJ-8589) with a morphological anomaly resembling a set of fused tail flukes. Sighted in Rio de Janeiro on 5 July 2024.

Figure 3. Aerial image of the humpback whale (IBJ-8589) showing the white coloration on the dorsal part of the anomalous tail fluke prominence. Sighted off Rio de Janeiro on 5 July 2024.

appearing to be an abnormal anatomical extension (Fig. 2). Aerial images taken with a DJI Phantom 4 PRO drone revealed that the prominence reported here in the caudal notch region had a white dorsal coloration (Fig. 3). Additionally, using the vertical aerial photogrammetry technique (Christiansen et al., 2016), it was possible to measure the total length of the individual at 12.19 m, while the other two accompanying whales measured 11.77 and 12.34 m, respectively. The measurements were made using an R script (R Core Team 2014; available for download in Christiansen et al., 2016). The whale was traveling normally moving northeastward with directionality well defined. There were no other abnormalities observed on the body. Additionally, no visible skin lesions or marks were noted in other areas, indicating that the only deformity present was confined to the tail fluke. This individual was not in Happywhale and is now cataloged as IBJ-8589 [2].

The whales were recorded as IBJ-8577 and IBJ-8589; there were no previous sighting records of these specimens on the Happywhale platform. The origin of these anomalies is unknown.

Body malformations have been recorded in different species from various ocean basins. Examples include (but are not limited to): collapsed or bent dorsal fin in killer whale (*Orcinus orca*) in New Zealand waters (Visser, 1998); five different cases of malformations in dorsal fin, tail fluke, and in back of the body, behind the blowhole were observed in humpback whales in Ecuador (Castro et al., 2011); malformation of the right lobe of the tail fluke was recorded for a humpback whale photographed in the eastern coast of Madagascar (Faria & Rakotoharimalala, 2012); loss of digits and radial deviation in the pectoral flipper of a Guiana dolphin (*Sotalia guianensis*) stranded in southeastern Brazil (Marigo et al., 2013); laterally bent dorsal fins in false killer whales (*Pseudorca crassidens*), pantropical spotted dolphins (*Stenella attenuata*), and spinner dolphins (*Stenella longirostris*) observed in the nearshore in Hawaii (Stack et al., 2019); two functional blowholes with separate nasal passages and blowhole-associated muscles in a pantropical spotted dolphin photographed off Brazil (Relvas et al., 2020); absence of peduncle and flippers for a beluga (*Delphinapterus leucas*) fetus in Alaska (Burek-Huntington et al., 2022), and deformed tail flukes in harbour porpoise (*Phocoena phocoena*) stranded in California (Sullivan & Houck, 1979). Cases of abnormal ribbon or string-shaped tail flukes have been reported in stranded harbor porpoises in the Netherlands. However, it was concluded that these anomalies were caused by extreme regeneration after tail amputations by fishermen of individuals caught incidentally in nets and released back into the sea (Kompanje, 1998).

The anatomical deformities in the tail flukes reported here appear to be viable and seemingly without major negative consequences for the mobility and survival of the two humpback whales reported in this note. Both were adult individuals of robust body size and appeared healthy, in good body condition, and were interacting with other individuals in the group. To fully understand the implications of these anatomical deformities, continuous monitoring of these whales is essential. However the duration of observation with these animals is typically limited, making it challenging to draw definitive conclusions. Continued observations may reveal other deformities in humpback whales from the Western Atlantic Ocean and provide a more comprehensive analysis of their possible causes, as well as obtaining resighting data for longevity assessment. There are few documented cases of anatomical deformities in humpback whales. Dedicated research is crucial for understanding the causes and implications of these deformities for conservation efforts.

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