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First record of humpback whales in the Caribbean coast of Costa Rica

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Humpback whales (*Megaptera novaeangliae*) are present in all oceans and undergo seasonal migrations from feeding grounds at high latitudes to reproductive areas at low latitudes (Dawbin, 1966; Clapham & Mead, 1999). There are currently 14 distinct population segments (DPSs) recognized worldwide (Bettridge et al., 2015). Of these, two migrate to the Pacific Central American waters to breed: the Central American population (DPS 6) and the Southeastern Pacific population (DPS 13), also known as Breeding Stock G (BSG; IWC, 1998). Central American humpback whales are observed off the Pacific of Central America during their boreal winter (December–April) and migrate from feeding areas in California, Oregon, and Washington (*e.g.*, Steiger et al., 1991; Calambokidis et al., 2000; Rasmussen et al., 2012, De Weerdt et al., 2023). Humpback whales from BSG are also seen off the Pacific coast of Central and South America in the austral winter (June–November) (Rasmussen et al., 2007; Palacios-Alfaro et al., 2012; Chereskin et al., 2019; De Weerdt et al., 2020) and migrate from feeding areas off the Antarctic Peninsula and the Fuegian Archipelago in Chile (Acevedo-Gutierrez & Smultea, 1995; Stevick et al., 2004; Rasmussen et al., 2007; Acevedo et al., 2017). In the Caribbean waters of Central America, the only report of humpback whales is from a lone individual that was seen several times from January to April 2016 off Guatemala and Belize (Ramos et al., 2016; Ortiz-Wolford et al., 2022). Specifically, for Costa Rica there are no confirmed sightings of humpback whales in Caribbean waters based on reviews of the gray and scientific literature (May-Collado, 2009; May-Collado et al., 2018). However, historically there has been a lack of dedicated systematic surveys for marine mammals in this region.

In the Atlantic Ocean there are three distinct population segments: West Indies (DPS 1), Cape Verde/Northwest Africa (DPS 2), and Brazil (DPS 7). The West Indies breeding area ranges from Cuba to southeastern Venezuela, and this population migrates to feeding areas in the Gulf of Maine, eastern Canada, western Greenland, and to some extent central Iceland and eastern Norway (Katona & Beard, 1990; Clapham et al., 1993; Palsbøll et al., 1997; Acevedo et al., 2008, Bettridge et al., 2015). Whales from the Cape Verde Islands, along with those from an undetermined breeding area in northwest Africa, primarily feed in Iceland and Norway (Wenzel et al., 2009; Bettridge et al., 2015). Finally, the Brazil DPS main breeding area encompasses the Abrolhos Bank at the eastern Brazilian coast and the feeding area of this population is in South Georgia and South Sandwich Islands (Zerbini et al., 2004, 2006; Stevick et al., 2006; Rossi-Santos et al., 2008; Engel & Martin, 2009; Bettridge et al., 2015).

Historical and observation records suggest that the breeding range of both Brazil and West Indies DPSs could be expanding (de Boer & Willems, 2015; Martinez et al., 2019; Ristau et al., 2020; Pusineri et al., 2021; Bolaños et al., 2023). For the Brazil population, Ristau et al. (2020) support a possible extension of its breeding range, or the recolonization of a historical breeding area, along the Equatorial coast of Brazil, French Guiana (also see Martinez et al., 2019 and Pusineri et al., 2021), Suriname, and Guyana, based on historical stranding data, observation records, and the biopsy of an animal stranded in the Amazonian Equatorial coast. Sightings off Colombia (closer to Costa Rica) were reported by Bolaños et al. (2023). These include two

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sightings in the Gulf of Urabá, which borders Panama, one in June and one in November, and one sighting in Barú, Cartagena de Indias, in November (J. Bolaños, Caribbean-Wide Orca Project, pers. comm., 20 February 2024). The time of year for all three of these sightings corresponds to the breeding season in Brazil, which extends from June to November (Seyboth et al., 2023). Conversely, de Boer & Willems (2015) report on a mother-calf pair of humpback whales off Suriname in April and suggest this is a southern extension of the breeding range for the West Indies population. The timing of the breeding season for the West Indies population is between January and May, with some sightings occurring as early as December and as late as June (Heenehan et al., 2019; Stevick et al., 2019). However, peak abundance is different for the core of the population off the Dominican Republic (January–February) versus the southeastern Caribbean (March–April) (Stevick et al., 2019). Bolaños et al. (2023) also report on records of humpback whales for every month of the year in the southern Caribbean, with peaks in February - March and October–November. Acevedo et al. (2008), using published and unpublished records from 1853 to 2006, found that humpback whales have been sighted every month of the year off the coast of Venezuela. In French Guiana humpback whales have been acoustically detected in both January and June (Pusineri et al., 2021). Therefore, the western Caribbean region represents an area likely used by two distinct humpback whale populations at different times of year (Acevedo et al., 2008; Ristau et al., 2020; Bolaños et al., 2023), with some potential of overlap in June or possibly November–December. This has also been documented on the Pacific side of Central America, where whales from the Central America DPS are observed between December and April, while BSG is seen June–November (Acevedo-Gutierrez & Smultea, 1995; Rasmussen et al., 2007, 2012; De Weerdt et al., 2020).

Here we report the first record of humpback whales in the Caribbean waters of Costa Rica. The sighting took place on 15 October 2023, at 17:35 h nearby Parque Vargas off Isla Uvita, in the province of Limon (9°59'54.3372" N, 83°00'56.6208" W, Fig. 1) by Mr. Allen Araya Bougle, a fisherman with over 30 years of experience working in the area. The fisherman filmed the whale encounter for approximately 13:47 min using his cell phone (Samsung Galaxy A51). The depth of the sighting was 18.4 m based on the General Bathymetric Chart of the Oceans (GEBCO, 2023) and the distance to the closest area in land, Punta Blanca, was 1.01 km (0.46 km NE of Isla Uvita). From the videos, the individuals were positively identified as humpback whales due to their long pectoral flippers, small dorsal fin over a hump on their backs, and fluke shape (Clapham, 2009). The sighting consisted of a mother-and-calf pair (Fig. 2A). The calf was identified based on its size relative to its mother (Clapham et al., 1999) and consistent association with her. The calf was observed breaching two times and lobbed its tail (Fig. 2B and D). When another fishing boat approached the whales fast and directly to about 20 m, the pair dove and changed direction and was not seen again. The observers' boat remained approximately 80 m away from the pair during the encounter. The fisherman indicated that he has observed humpback whales in this area in past years, also in October, but there are no photos or videos to confirm those sightings.

This sighting supports the hypothesis of a possible extension of the Brazil DPS beyond the furthest extent previously reported off Colombia (Bolaños et al., 2023). The timing of the sighting (October) corresponds with the breeding season of the Brazil DPS and is within the same period as the Bolaños et al. (2023) sightings off Colombia (June, November). This extension could be due to the recovery of this population and its increase in size (Bortolotto et al., 2016; Zerbini et al., 2019). As humpback whale populations recover from whaling, animals may expand their range to previously occupied areas, or seek new regions (Reeves et al., 2004; Andriolo et al., 2010; Clapham & Zerbini, 2015; Martinez et al., 2019; Pusineri et al., 2021).

If this sighting indeed represents an extension of the Brazil DPS, the wide extent of this population's range needs to be considered for management and conservation purposes. As the Brazilian humpback whale population continues to grow, there are concerns on how this change will affect its vulnerability to different human activities throughout its range. Bezamat et al. (2014) estimated that the likelihood of vessel collision for humpback whales in the Abrolhos Bank, the main breeding area for this population, will increase as the population continues to grow. The higher risk of collision comes from cargo and tanker

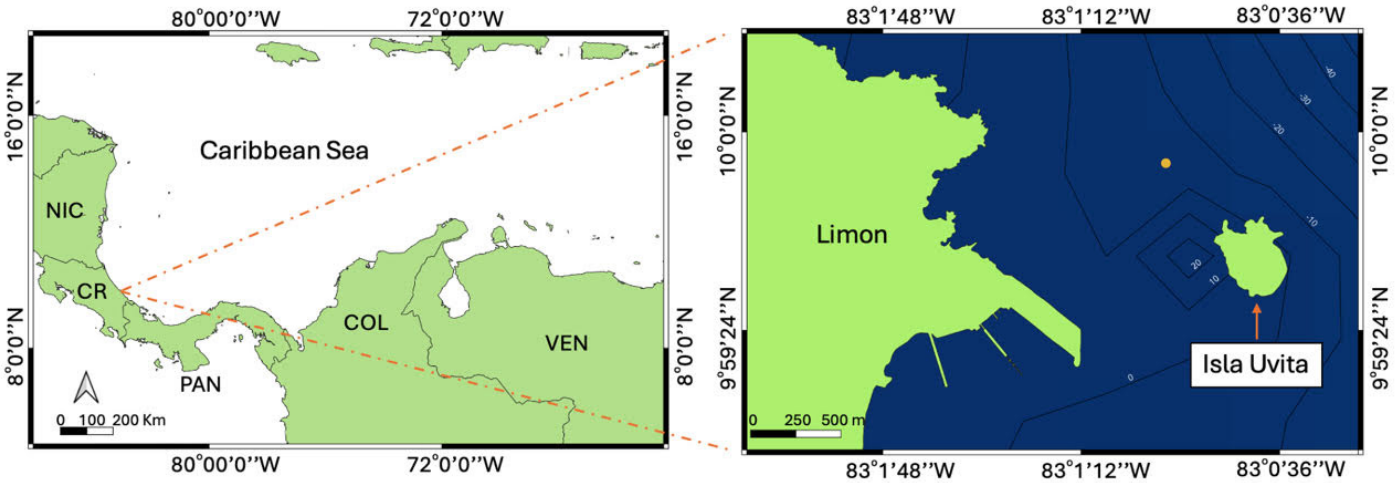

Figure 1. Sighting location (yellow dot) of humpback whale (*Megaptera novaeangliae*) mother-and-calf pair in the Caribbean coast of Limon, Costa Rica.

Figure 2. Photographic evidence of mother-calf humpback whale (*Megaptera novaeangliae*) pair sighted on 15 October 2023 in the Caribbean coast of Limon, Costa Rica. A) Mother-and-calf dorsal fins, B) Tail splash, C) Calf jump, and D) Adult flipper.

vessels, which are the most densely distributed in the area (Portal et al., 2023). In our study area, shipping could be the most important threat to humpback whales. Puerto Limon is one of two most important ports in Costa Rica, used for cargo and tankers to carry exports (bananas, coffee, plants, etc.) and docking of cruise ships (www.japdeva.go.cr). Additionally, the Panama Canal on the Caribbean side (town of Colon) could also represent an important threat to these whales, as has been shown for BSG whales in the Pacific side (Guzman et al., 2013). Another potential threat is entanglement in fishing gear, as has been shown in humpback whales in Brazil (Moura et al., 2013) where some whales have been observed entangled in fishing gear commonly used in coastal areas by artisanal and semi-industrial fishing vessels (Ott et al., 2016). In the Caribbean, fisheries are an important source of livelihood in the region (FAO, 2014), but the potential impact of fisheries in the Caribbean is unknown for large whales. However, at least one case of interaction between fisheries and small cetaceans has been described in the Caribbean of Central America (Edwards & Schnell, 2001) and in other parts of the Caribbean, restriction of fishing gear within humpback whale breeding season has been implemented (Betancourt et al., 2012).

In summary, the sighting of humpback whales in October off the coast of Limon, Costa Rica may indicate that the Brazilian breeding area is even larger than was previously known. This highlights the importance of continuous monitoring in this region. Further studies will allow us to confirm the identity of the whales and possibly clarify the extent of the breeding areas from both the Brazil and West Indies populations. It will also help to identify potential threats in the area so that appropriate conservation and management measures can be considered.

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