So close and yet so far: Are humpback whales in the southeast Caribbean a distinct breeding group?

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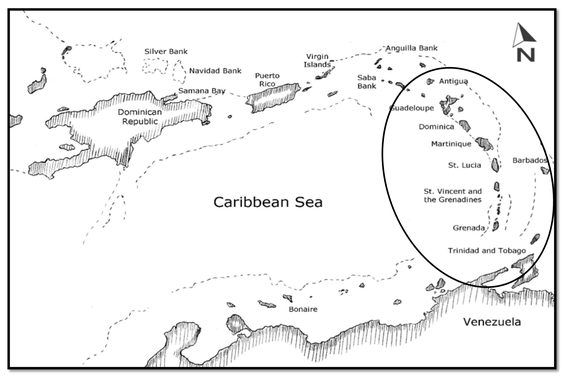
Introduction

Humpback whales wintering in the entire West Indies chain are widely treated as comprising a single breeding population. However, the total available habitat in the West Indies spans more than 2,000km, distribution within it is patchy and often sparse, and most areas outside of Silver Bank and Samana Bay, Dominican Republic, are poorly and sporadically studied.

Historically, the major mating and calving area for humpback whales in the North Atlantic Ocean appears to have been located around the islands of the southern Lesser Antilles. The greatest number of humpback whale catches in the 19th and early 20th centuries were made in the waters from Guadeloupe south to the coast of Venezuela. Densities in these southeastern Caribbean waters today appear to be low, and limited dedicated work has been done there.
More than 200 individuals have been identified near Guadeloupe over the past five years, providing an opportunity to examine the patterns of movement from these waters in greater detail. We present data on the timing and movement patterns of whales from the southeastern Caribbean showing that these are substantially dissimilar to those of whales from the Dominican Republic.

Methods



Photographs of the ventral surface of the flukes were collected from opportunistic and dedicated sources, by academic and government research teams, NGOs, commercial tour operators and members of the public. Between 1972 and 2014, 268 humpback whales were identified by fluke pattern in the study area. All except 19 were photographed during the past ten years. The great majority were photographed off the Guadeloupe archipelago, though 24 were identified in other parts of the study area. Currently, comparison to the North Atlantic Humpback Whale Catalogue (NAHWC) is complete for 168 individuals.

Migratory Destinations

Whales from the southeastern Caribbean were re-sighted in all of the major feeding grounds from US waters to the Norwegian Arctic (Figure 2).

However, the proportion of re-sightings to the different feeding areas differed dramatically (Multinomial exact test, $p = 4.92 \times 10^{-4}$). There is a strong tendency for whales from the southeastern Caribbean to migrate to feeding areas in the eastern North Atlantic, notably to Norway. (Statistical analysis was conducted using only whales identified in the southeastern Caribbean up to and including 2010, the most recent year for which all received photographs have been completely analyzed, n = 95).

In direct contrast to this pattern, individuals feeding in the eastern North Atlantic are under-represented in individuals from the Dominican Republic and Puerto Rico.

Killer Whale Scarring

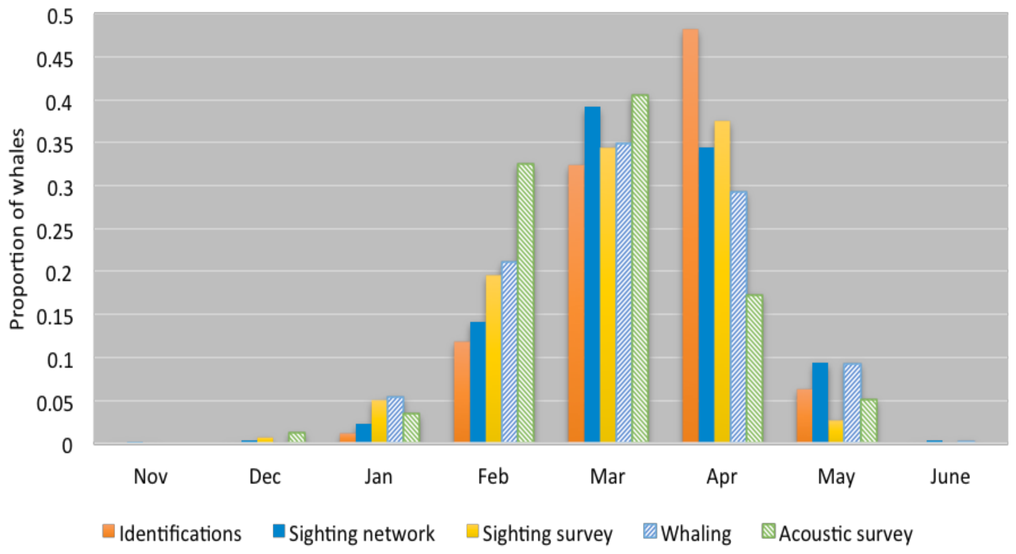
The proportion of whales scarred by killer whales (0.0294 95%CI 0.0116-0.0536, Figure 3) was nearly identical to that previously shown for Norway ($p = 1$ Fisher's exact test; all feeding ground results from McCordic et al., 2014, J. Mar. Biol. Assoc, UK), yet dramatically lower than presented from western feeding areas (Gulf of Maine, $p = 6.1 \times 10^{-5}$; Canada, $p = 2.1 \times 10^{-13}$; Greenland, $p = 2.5 \times 10^{-5}$ Fisher's exact tests). The comparison with Iceland is more ambiguous. The number of scarred individuals differs significantly with the Fisher's exact test ($p = 0.0077$). However, the upper bound of the confidence intervals for the southeastern Caribbean overlaps with the lower bound from Iceland. The scarring proportion for the southeastern Caribbean is nearly identical to that from the Cape Verde Islands, while only about 25% of that seen in the Dominican Republic and Puerto Rico.

Seasonal Occupancy

Humpback whales have been recorded from November until June. The peak in abundance occurs during March and April, declining rapidly during May (Figure 1). The median sighting date for identified animals from Guadeloupe is 3 April, with more than 80% of identified whales from March or April.

This seasonal pattern is consistent with historical whaling records from the region. However, it is in stark contrast to that for modern sightings reported in the Dominican Republic, where whales are at their peak abundances in February and early March, with few animals remaining by early April. This timing difference may be related to the feeding ground destination of these whales, as it has been previously demonstrated that humpback whales from eastern feeding areas are sighted in the Dominican Republic later than are those with feeding area sightings in the western North Atlantic.

Figure 1



Identifications -the dates of all sightings in the NAHWC database. Sighting network - sightings reported to the OMMAG sighting program in the Guadeloupe archipelago 2010 to 2014. Sightings survey -the number of whales sighted per hundred hours of sighting effort, 1998-2009. Acoustic survey - the number of whales detected acoustically per hundred hours of acoustic monitoring, 2001-2009. Both of these were conducted off the leeward coast of Basse Terre island, Guadeloupe by AET. Whaling - dates of humpback whale records from 19th Century whaling logbooks (using data from Table 2 in Reeves et al., 2001, J. Cetacean Res. Manage.*). Most are from the waters between Guadeloupe and Trinidad, though there are also some records from other regions.*

Figure 2

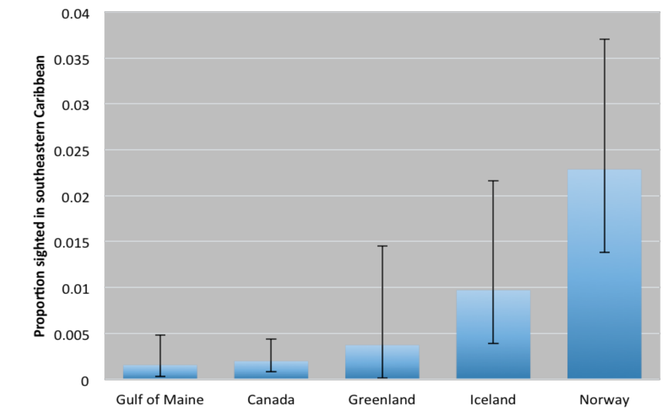
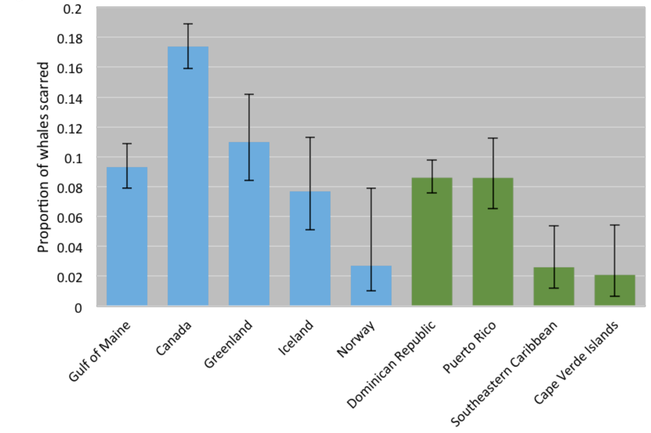


Figure 3



Conclusion

The whales mating and calving in this southeastern Caribbean region are not a representative subset of those that winter in the Dominican Republic. Most of the whales considered here were in the vicinity of Guadeloupe, and studies to the north and south will be needed to examine the spatial nature of this pattern, and define the nature and limits of this group. However, it is clear that some of the whales using the southeastern Caribbean represent a previously un-described and behaviourally distinct population segment within the North Atlantic. Given this, the widely-held idea that there is a single West Indies breeding population is in need of reconsideration.

Acknowledgements

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