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**North Atlantic Humpback Whale Catalog Summary**

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## **North Atlantic Humpback Whale Catalog Summary**

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The North Atlantic Humpback Whale Catalogue (NAHWC) is a long-term ocean-basin-wide database of sightings and photographic-identification (photo-ID) images, a collaborative effort to compile humpback sightings throughout the North Atlantic Ocean. Since its first publication in 1977, the NAHWC has grown to include 42,810 fluke photographs corresponding to sightings of 10,421 non-calf humpback whales (as of 4/4/2021). The NAHWC is only possible through the collaborative of contributors from around the world, including over 700 scientists and individuals from 40 countries, representing over 80 organizations and governmental agencies.

Sightings are regularly collected and submitted from all areas of humpback aggregation in the North Atlantic. The five major feeding grounds in mid- to high-latitudes of the North Atlantic are the Gulf of Maine, Atlantic Canada, West Greenland, Iceland, and northern Norway. The winter breeding/calving grounds of humpbacks in the North Atlantic are in the Cape Verde Islands and the West Indies. The NAHWC also includes identifications from the migratory stop-over regions of the Azores, Bermuda, and the United States mid-coast from Florida north to Rhode Island, with most sightings from the waters off Virginia and New York (Barco et al. 2002; Brown et al. 2018).

Within the breeding/calving range in the West Indies, the majority of humpback identifications originate from the waters off the Dominican Republic (Silver Bank, Navidad Bank, Mouchoir Banks, and Samana Bay), with fewer sightings from Puerto Rico and further east. Very few humpback sightings with photo-identification images from the Virgin Banks or waters off the US and British Virgin Islands have been collected since Mattila and Clapham's (1989) surveys in the late 1980s. Of the total 113 humpbacks identified in the Virgin Islands region in the NAHWC, only four individuals have been sighted over the past three decades. Increased photo-identification research effort from the Virgin Banks other waters in the northwestern extent of the Lesser Antilles is a priority to further research the spatial and temporal differences between whales breeding in the Greater vs. Lesser Antilles, referred to here as the southeast Caribbean (the Anegada Passage south to the coast of Venezuela).

Recent photo-ID data and analyses suggest that humpbacks in the southeast Caribbean are behaviorally distinct from whales sighted in the Greater Antilles in their feeding ground use and arrive later to the southeast Caribbean (Stevick et al. 2018; Jones 2018). Resightings do exist between the southeast Caribbean and Dominican Republic, but fewer than would be expected if the species were truly panmictic in the West Indies. Movement between the southeast Caribbean and the Cape Verde Islands has also been documented; eight whales total have been resighted in both regions in different years, an increase of four since Stevick et al. (2016) reported on the first resightings. Accounting for sample sizes (for years 1970-2015), transition probabilities were found to be highest from the southeastern Caribbean to the feeding grounds of Iceland and

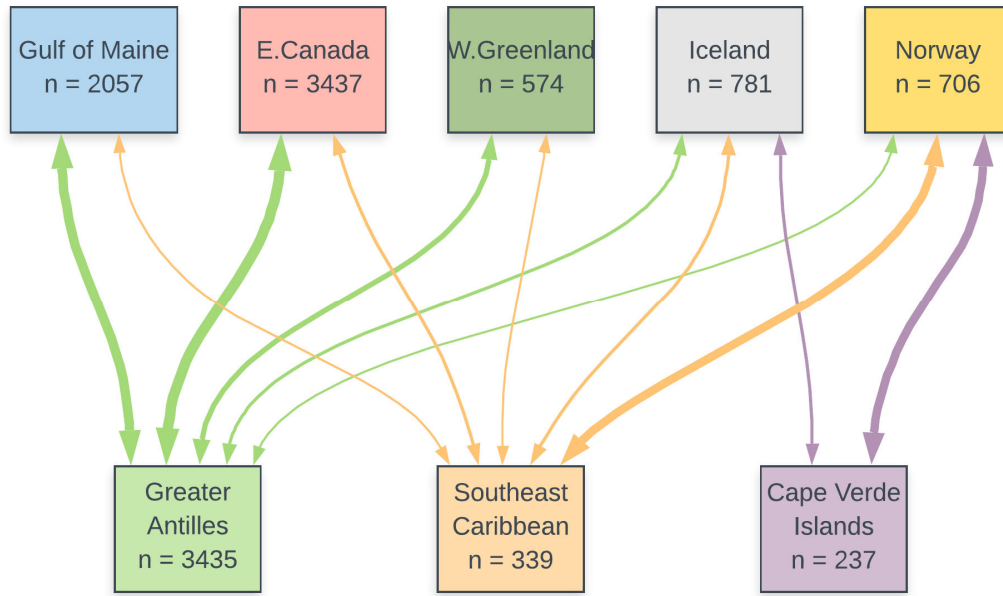
Norway, from the Cape Verde Islands to Iceland and Norway, and from the Greater Antilles to Canada and the Gulf of Maine (Jones 2018). Whales found in the southeastern Caribbean displayed movement patterns and latitudinal preferences in feeding ground destinations most similar to the migratory patterns of whales breeding in the Cape Verde Islands (Jones 2018). Further studies integrating photo-ID data, genetics, and acoustic analyses are needed to research the differences between humpback using the southeastern Caribbean region compared to the Greater Antilles.

Without a global or ocean-basin-wide stranding and reporting scheme for humpback mortalities, the NAHWC remains a resource for reporting and identifying dead humpback whales when a ventral fluke photograph can be collected. A total of 158 dead non-calf humpbacks have been cataloged to date. Photo-ID images should be collected when possible from all future humpback takes or incidental mortalities to improve knowledge on stock identities and movement patterns of these animals.

Additional opportunistic sightings are collected from other regions, such as the British Isles and Mediterranean Sea, to track the species in areas that do not fit in current descriptions of NA humpback breeding, feeding, or migratory stop-over areas. Humpbacks sighted in the British Isles have thus far been resighted in two breeding regions: Cape Verde (Berrow et al. 2021) and the southeast Caribbean (Jones et al. 2017). The NAHWC now includes six humpbacks sighted in the Mediterranean (Frantzis et al. 2004; Genov et al. 2009; Ruíz et al. 2018). We recently discovered the first resighting of a whale documented in the Mediterranean to a breeding ground in the West Indies (Violi et al. in prep). This offers the first insight into stock identity of a humpback visiting the Mediterranean.

### **Summary of current knowledge on the population structure of humpback whales in the North Atlantic from photo-identification**

Photo-identification data suggests that humpbacks in the North Atlantic exhibit site fidelity to their maternal feeding ground with some movements between adjacent feeding grounds. On the southern breeding/calving grounds of the West Indies, whales from each feeding area mix unequally and arrive at different times (Figure 1; Stevick et al. 2018). In the Cape Verde Islands, an endangered distinct population segment, resightings have only been found to the eastern North Atlantic feeding grounds of Iceland and northern Norway (Wenzel et al. 2020), despite larger sample sizes from western feeding grounds (the Gulf of Maine, Atlantic Canada, and West Greenland). Humpbacks from the southeastern Caribbean (the Anegada Passage to the coast of Venezuela) have been reidentified on all five feeding grounds but are more frequently sighted in eastern feeding areas. Humpbacks identified off the Greater Antilles, primarily on the banks off the Dominican Republic, have been resighted on all five feeding grounds but have a higher probability of migrating to western North Atlantic feeding grounds.



**Figure 1.** Samples sizes in the NAHWC of cataloged individuals from all major feeding and breeding/calving grounds across all years (1958-2020\* preliminary results for more recent years where sightings remain to be cataloged). The Greater Antilles area includes humpback sightings from the waters off the Dominican Republic ranging east to the Virgin Islands. The Southeast Caribbean area includes sightings primarily around Guadeloupe and Martinique, but ranges from the Anegada Passage southeast to the coast of Venezuela. N in each box represents the number of unique, non-calf individuals identified in each region. Lines between regions represent documented photo-ID resightings of individuals between each feeding and breeding ground with lines weighted by the relative number of whales resighted.

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