A note on migratory destinations of humpback whales from the eastern Caribbean

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ABSTRACT

Identification photographs of humpback whales taken in the eastern Caribbean were compared with photographs from the North Atlantic to identify re-sightings. Nine individuals were identified in the eastern Caribbean region, seven of these in the Grenadine Islands. There were three re-sightings. Two individuals were re-sighted in northern feeding grounds: one between Newfoundland and Saba Bank; the other between Greenland and Grenada. This demonstrates movement between this breeding and calving area and two of the primary humpback whale feeding grounds in the North Atlantic. The re-sighting rate (0.222) is comparable to the rate of re-sightings between feeding grounds and other breeding areas in the North Atlantic. Another individual was re-sighted in Puerto Rico and Dominica, demonstrating an exchange between the eastern Caribbean and another breeding and calving area in the West Indies.

KEYWORDS: MIGRATION; BREEDING GROUNDS; HUMPBACK WHALE; ATLANTIC OCEAN; MARK-RECAPTURE; PHOTO-ID

INTRODUCTION

To date, there is a paucity of data on humpback whales (*Megaptera novaeangliae*) wintering in the eastern Caribbean. Most concentrate in the North Atlantic in winter for breeding and calving, north of the Dominican Republic primarily on Silver and Navidad Banks and in Samana Bay, while smaller concentrations occur off the west coast of Puerto Rico and near the Virgin Islands (Winn *et al.*, 1975; Whitehead and Moore, 1982; Mattila and Clapham, 1989; Mattila *et al.*, 1989; 1994; Katona and Beard, 1990). East of the Anegada Passage humpback numbers are few but they are reported as far south as Venezuela (Winn *et al.*, 1975; Winn and Winn, 1978). Grenada Bank and the waters surrounding the Grenadine Islands supported about six whaling stations over a period of several decades spanning the turn of the 19th/20th century (Mitchell and Reeves, 1983), thus suggesting that it was an important breeding and calving area. However, little recent data on humpback use of the Windward Islands are available.

While early records are scanty, humpback whales are known to have been taken in the eastern Caribbean during the 19th and 20th centuries by a combination of Yankee whalers, local coastal fisheries and briefly by a modern whaling station at Grenada (for a review see Mitchell and Reeves, 1983). The charts of Townsend (1935) show catches of humpback whales distributed throughout the eastern Caribbean chain during winter, but few in the current centre of concentration near the Dominican Republic, suggesting that this may formerly have been the primary winter destination for humpback whales in the North Atlantic. Published catch estimates for the area indicate a substantial decline in the catch by the turn of the century, although a modern whaling station at Grenada took a reported 174 whales in two years in the mid 1920s (Mitchell and Reeves, 1983; Price, 1985). Humpback whale use of the region appears to be considerably lower today than historically (Mitchell and Reeves, 1983; Price, 1985). This apparent lack of increase is puzzling in light of evidence for a recent increase in the North Atlantic humpback whale population (Katona and Beard, 1990; Barlow and Clapham, 1997; Smith *et al.*, 1999).

There is little information available on the feeding grounds used by humpback whales from the eastern Caribbean. The lack of information on the relationships between individuals visiting eastern Caribbean waters during winter and individuals in other breeding and feeding areas complicates interpretation of the apparent local lack of recovery. Mattila and Clapham (1989) surveyed the Anguilla Bank and identified a single re-sighting from that region to Greenland. This is the only previous information on feeding ground destination for humpback whales from the eastern Caribbean. The same individual was re-sighted on Silver Bank, the only other re-sighting from the region (Mattila and Clapham, 1989). However, Anguilla Bank lies at the northern edge of the eastern Caribbean, approximately 700km from the former concentration in the Grenadines (Fig. 1). We report here on re-sighting results from other individuals identified in the region.

METHODS

Photographic identification has been widely used in the study of distribution, movement patterns, abundance and conservation status of humpback whales in the North Atlantic (Katona *et al.*, 1979; Whitehead, 1987; Katona and Beard, 1990; 1991; Smith *et al.*, 1999). There are two extensive collections of identification photographs with spatial coverage of much of the North Atlantic: the North Atlantic Humpback Whale Catalogue (NAHWC) and the Years of the North Atlantic Humpback Whale (YoNAH) project.

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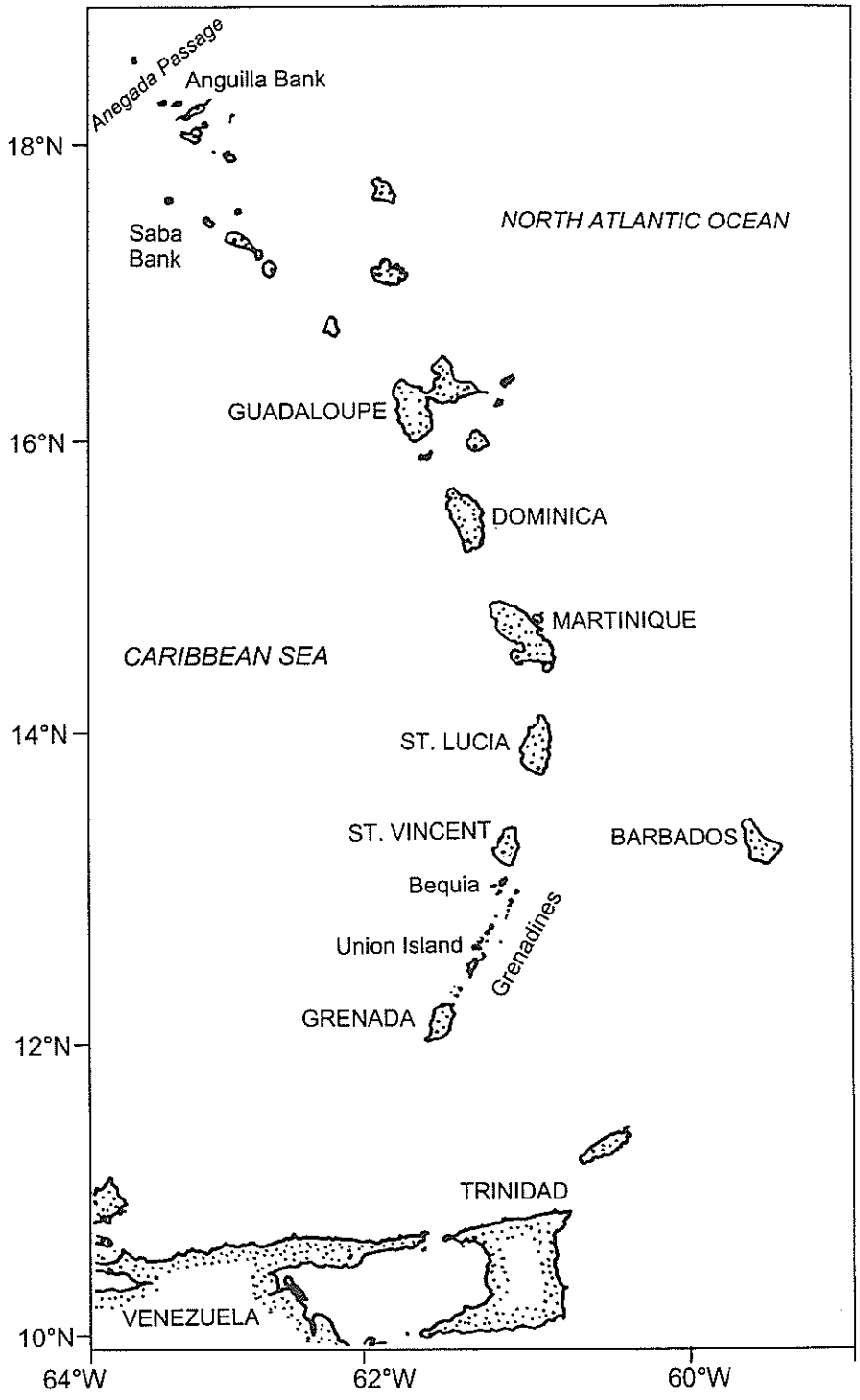

Fig. 1. Map of the eastern Caribbean region showing some of the locations mentioned in the text.

The NAHWC is a collaborative collection of identification photographs. It contains approximately 15,000 images of 5,150 humpback whales. The majority of whales were photographed between 1978 and 1991. Most originate from the western North Atlantic.

The YoNAH project was an ocean-basin-wide, international collaborative effort to study humpback whales in the North Atlantic Ocean. Approximately 5,000 photographs of about 3,000 individual humpback whales were collected during 1992 and 1993. Sampling was conducted in all of the primary regions of humpback whale concentration using sampling protocols designed to minimise heterogeneity of capture probabilities (Smith *et al.*, 1999). There was extensive YoNAH effort on the primary breeding grounds of Silver and Navidad Banks, in Samana Bay and off Puerto Rico. However, there was no YoNAH effort in the eastern Caribbean.

Identification photographs of humpback whales taken in the eastern Caribbean were compared to the NAHWC and YoNAH collections to identify possible re-sightings. Techniques for handling photographs and photographic analysis are described in Katona and Beard (1990) and Smith *et al.* (1999). All photographs were coded for photographic quality on a three point scale from 1 (highest quality) to 3 (lowest quality) (Katona and Beard, 1990). The re-sighting rates reported represent the number of re-sightings between the feeding grounds and each area of the West Indies divided by the number of individuals identified in that region.

RESULTS

The NAHWC contains fluke photographs of nine individuals photographed in the waters between the Anegada Passage and South America in addition to those from the Anguilla Bank which have previously been reported (Mattila and Clapham, 1989). Seven of these were photographed in the Grenadines: three near Grenada, one near Union Island, and three near Bequia (Fig. 1). Two others were sighted elsewhere in the Lesser Antilles: one off Dominica, and one southwest of Saba Bank. Photographs were collected in 1972, 1982, 1985, 1992, 1995 and 1996.

Two individuals were identified from photographs of quality code 3. Photographs of poor quality may obscure markings and these individuals, therefore, have a reduced probability of being re-identified. Two of the whales were photographed after death, having been taken in the Bequia fishery, one in 1982 and the other in 1992. The Bequia fishery is recognised as an aboriginal subsistence whaling operation by the International Whaling Commission and thus is exempt from the present moratorium on commercial whaling. Re-sightings of the two harvested individuals is thus not possible from subsequent samples, in particular the large samples from the YoNAH project.

The feeding ground sample from the NAHWC consists of approximately 980 individuals from the Gulf of Maine, 1,800 from Canada, 410 from west Greenland, 19 from Iceland and 17 from the waters east of Iceland, primarily off northern Norway. The feeding ground sample from YoNAH consists of approximately 240 individuals from the Gulf of Maine, 880 from Canada, 175 from west Greenland, 145 from Iceland and 85 from Norway.

There were three re-sightings. Two individuals were also identified in a feeding area. One individual photographed off Grenada on 16 March 1996 had previously been photographed off Fyllas Bank, Greenland on 8 August 1981 and also on 23 August 1982. A second whale photographed in Witless Bay, Newfoundland on 29 and 31 July 1991 was subsequently photographed near Saba Bank on 25 February 1995. This yields an overall high latitude re-sighting rate for the region of 0.222. A third individual was first photographed off Puerto Rico in March 1979, then off Dominica on 19 March 1995.

DISCUSSION

This sample from the eastern Caribbean is small, spatially and temporally diffuse, and to some extent limited by the quality of available photographs. Two individuals were represented only by poor quality photographs, while two were only identified after being killed in the Bequia fishery. Both of these factors result in a decreased probability of re-sightings. Because of these limitations, use of these data for interpretation of the relationship between the whales sighted in the eastern Caribbean and those using other regions of the North Atlantic for breeding and calving must be treated with caution.

However, the two re-sightings to the feeding grounds from such a limited sample yield a re-sighting rate comparable to that between feeding and breeding areas from the entire NAHWC West Indies sample (0.186) or from the Virgin Islands (0.150), Puerto Rico (0.209) or the Dominican Republic (0.194) (Katona and Beard, 1990; 1991). The small sample size and sample limitations preclude statistical comparison of these rates.

The mixing of whales from different feeding aggregations on common breeding grounds, as seen here, has been reported from all other regions of the West Indies studied (Mattila and Clapham, 1989; Mattila *et al.*, 1989; 1994; Katona and Beard, 1990; Clapham *et al.*, 1993). The single re-sighting to Puerto Rico is consistent with evidence from other studies that individuals move between areas in the West Indies (Mattila and Clapham, 1989; Mattila *et al.*, 1989; 1994; Katona and Beard, 1990).

The apparent lack of humpback whale recovery in the eastern Caribbean could indicate that the region is used by a discrete stock unit which has not recovered from depletion. The results reported here do not indicate any obvious difference in movement patterns between humpback whales wintering in the eastern Caribbean and those elsewhere in the West Indies. The two feeding ground re-sightings demonstrate that individuals from two of the primary humpback whale feeding grounds in the North Atlantic visit this breeding and calving area. Similarly, the re-sighting to Puerto Rico provides evidence of movement between the eastern Caribbean and another section of the West Indies breeding ground. It remains unclear, therefore, why humpback use of the eastern Caribbean remains low.

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