Are killer whales (*Orcinus orca*) increasing in Hudson Bay?

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Introduction

In recent years Inuit hunters have noted that killer whales are increasing throughout Nunavut, particularly Hudson Bay, where they were unknown prior to the mid-1900s (Degerbol and Freuchen 1935, Reeves and Mitchell 1988).

In this poster we report on this increase in killer whale sightings and examine how changes in sea ice concentration may have affected killer whale movements and distribution.

Methods

Killer whale sighting reports were collected through a literature review (e.g., Reeves and Mitchell 1988, Hay et al. 2000) and surveys of northern residents, scientists, and tourism operators.

The Foxe Basin (FB), Hudson Bay (HB), Hudson Strait (HS) and James Bay-eastern Hudson Bay (JB-EHB) ecoregions were defined based on Stewart and Lockhart (2005). Hudson Bay and Hudson Strait were further subdivided into subregions (Figure 1) for sea ice analyses.

In total there were 78 reports of killer whales, with another 3 found for the eastern end of Hudson Strait but just outside the study area (Figure 1).

Recent declines in sea ice may be a major factor in increased killer whale presence in the Hudson Bay region. July sea ice concentration (%) data for 1900-2004 were extracted from the HadISST1.1 database (Rayner et al. 2003). These data consist of monthly median concentration values mapped onto a 1-degree equal-area grid. July was used as most killer whale sightings have occurred at this time.

For each region the median July value was calculated. Linear regressions were used to determine whether sea ice trends over time were significant. Spearman correlation coefficients were used to determine if the number of killer whale sightings per decade was correlated with median decadal ice concentration values.

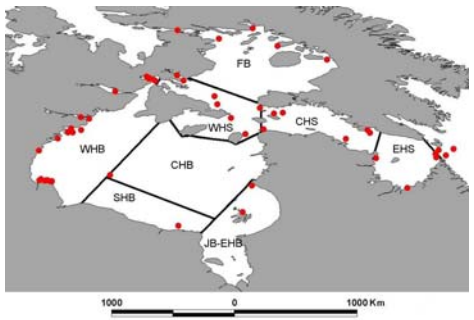

Figure 1. Distribution of killer whale sighting reports in the Hudson Bay region. The eight subregions used for sea ice analysis are also shown.

References

Degerbol, M. and P. Freuchen. 1935. Report of the Mammals Collected by the Fifth Thule Expedition to Arctic North America. New York: AMS Press.
Hay, K. et al. 2000. Final report of the Inuit traditional bowhead knowledge study. Nunavut Wildlife Management Board, Iqaluit, NU.
Rayner, N.A. et al. 2003. Global analyses of sea surface temperature, sea ice, and night marine air temperature since the late nineteenth century. J. Geophysical Res. 108: 1-29.
Reeves, R.R. and E. Mitchell. 1988b. Distribution and seasonality of killer whales in the eastern Canadian Arctic. Rit Fiskideildar 11: 136-160.
Stewart, D.B. and W.L. Lockhart. 2005. An Overview of the Hudson Bay Marine Ecosystem. Canadian Technical Report, Fisheries and Aquatic Sciences, no. 2586.

Results

The number of reported killer whale sightings has increased considerably since 1900 (Figure 2). Early sightings were mostly limited to Hudson Strait, with the first Hudson Bay records occurring in the 1940s. Since the 1960s the majority of records have been reported for Hudson Bay (mostly WHB). Killer whales appear to be rare in southern and eastern Hudson Bay (Figures 1, 2).

From 1900-2004 ice concentration significantly declined in Hudson Strait (Figures 3, 4). Decadal median ice concentration was negatively correlated ($P \leq 0.05$) with the number of killer whale sightings reported per decade for all three regions of Hudson Strait (Spearman correlation coefficients of -0.886, -0.793, and -0.779 for western, central and eastern Hudson Strait, respectively).

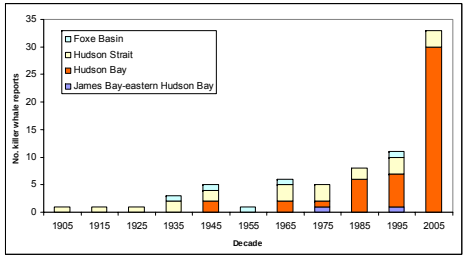

Figure 2. Number of killer whale sightings reported by decade, divided into the four marine ecoregions (excludes four records with unknown date).

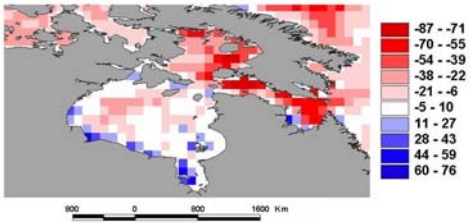

Figure 3. Long term changes in ice concentration, measured as the mean July value for 2000-2004 minus the mean value for 1900-1909.

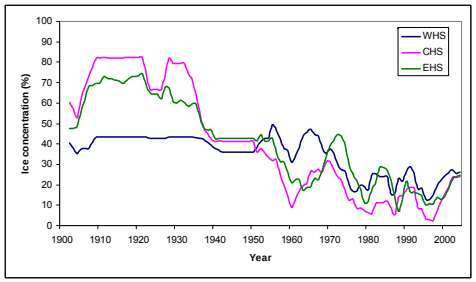

Figure 4. Median ice concentration for western (WHS), central (CHS) and eastern (EHS) Hudson Strait, 1900-2004. Values are 5-year moving averages.

Discussion

The number of sighting reports has increased considerably in recent years, especially in western Hudson Bay. This increase is significantly related to a decline in sea ice in Hudson Strait, suggesting that declining ice cover has influenced killer whale movements and distribution. This is supported by early suggestions (Degerbol and Freuchen 1935) that killer whales were stopped from entering Hudson Bay by ice conditions in Hudson Strait, in addition to Inuit traditional knowledge.

Killer whale ecology in the Canadian Arctic has received little study and there is still much to learn. The Orcas in the Canadian Arctic (OCA) project (comprised of researchers from DFO, University of Manitoba, Government of Nunavut and North/South Consultants, Inc.) is addressing this knowledge gap using a variety of methods, including photo-identification studies (Figure 5), establishment of a sighting network (Figure 6), surveys of Inuit traditional knowledge, and acoustic monitoring (see poster by Chmelnitsky and Ferguson).

Figure 5. Photographs of two adult male killer whales taken in Repulse Bay, Nunavut, August 2005. The two males were present in a group of five whales. Photo credit DFO.

How you can help

The OCA team is interested in receiving reports of killer whale sightings made by northern scientists and residents. A sighting form has been developed (Figure 6, also see poster by OCA team) and distributed to HTOs/HTAs and Conservation Officers throughout Nunavut. If you see killer whales, please let us know!

Figure 6. Killer whale sighting form developed and distributed throughout the Canadian Arctic.