Winter Dissertation one-page outline

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Project title: Environmental drivers of humpback whale (*Megaptera novaeangliae*) distribution in the North East of Iceland.

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Outline:

Over the past decades, the Arctic has experienced a significant reduction in its seasonal sea-ice cover (Fig 1), which is only projected to continue under the current climate change scenarios (2, 3). This dramatic consequence of anthropogenic emissions, however, has also been seen as a possible opportunity for the expansion of trans-Arctic shipping (3,4). The availability of previously impervious routes through the North Pole offers the possibility of a short and direct connection between the Pacific and the Atlantic Ocean (3,4). To prepare and make the most out of these new opportunities, a new port and industrial hub is being developed on the North-Eastern shores of Iceland. The Finnafjord project is designed to be a major centre for current and future trans-Arctic shipping, especially for those travelling through the Northern Sea Route (NSR) and a hypothetical Central Arctic sea route (5). Furthermore, activities such as energy generation, processing of raw mining materials, aquaculture and water desalinization, are also going to be part of this project (5).

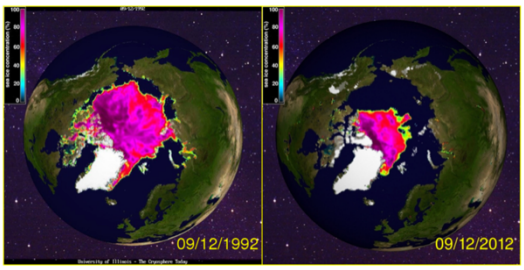

Figure 1: Changes in the Arctic Ice sheet cover between September 1992 and September 2012 (1)

While this could represent a great opportunity for Iceland in the coming years, it is important to understand how the development of these new activities may affect the local environment. The North East region is a very important one for many reasons. Most notably, it represents a key area for Humpback Whales (*Megaptera novaeangliae*). In the last decades especially, Icelandic Humpback population has experienced unprecedented growth, going from around 1,800 individuals in 1987, to 14,600 in 2015, with most of this happening on the Western and Eastern shores (6,7). Humpbacks are a fundamental species for the local ecosystem and understanding their habitat preferences, in this area, could be very important for management strategies to ensure minimum conflict between human uses and wildlife. The main aim of this study will thus be to try and identify the main environmental drivers of Humpback distribution in the North East of Iceland, and I'll be specifically focusing on the years between 2001 and 2015.

Hypotheses/Expected results based on literature review:

- Presence of humpback whales is positively correlated to proximity to the 200m isobaths (7,8,9)
- Presence of humpback whales is positively correlated to areas of higher biological productivity (10)
- Presence of humpback whales is positively correlated to cooler temperatures (11)

Sighting Data: The data for Humpback whale presence has been already acquired from the North Atlantic Sightings Surveys (NASS), done periodically by the Regional Fisheries Management Organisation and the North Atlantic Marine Mammal Commission, for the years between 2001 and 2015.

Proposed environmental parameters: Bathymetry (possibly including slope, shape, elevation and aspect of the sea floor), Sea Surface Temperature, Mixed layer depth, Chlorophyll.

Suggested Methodology based on literature review:

- GIS approach (using qGIS or ArcGIS)
- Correlation analyses between the variables to exclude collinearity

- Generalized Additive Models (GAMs) or Generalized Linear Models (GLMs) to explore the relationship between humpback distribution and environmental variables to see if relationships are significant enough for a species distribution model

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