

# How Does Anthropogenic Noise Pollution Affect the Reproductive Capabilities of Whale Species?

Trevor Nassar, Rubenstein School of Environment and Natural Resources, University of Vermont

## Background

- As humans continue to develop, noise pollution becomes a greater issue for concern. Transport like cars, planes, and boats used for shipping are a major source of loud anthropogenic noise.
- It is suspected that with an increase in noise pollution, whale species that depend on communication through sound, such as the Humpback or Sperm whale, are negatively affected by this (Farmer et al., 2018).

## Motivation

- Though increased noise pollution could have large implications for wildlife, very little research has been conducted on this particular issue. The lack of research regarding this has left a gap in our understanding of how sea creatures that are highly dependent on sound are impacted by this relatively recent change in habitat conditions.
- Humpback Whales (*Megaptera novaeangliae*) (Figure 1) are a good species to study due to much of their behavior depending on soundwaves (Dunlop et al., 2020).

## Hypothesis

- I hypothesize that noise pollution caused by human uses will show a direct impact on the number of mating couples within each population.



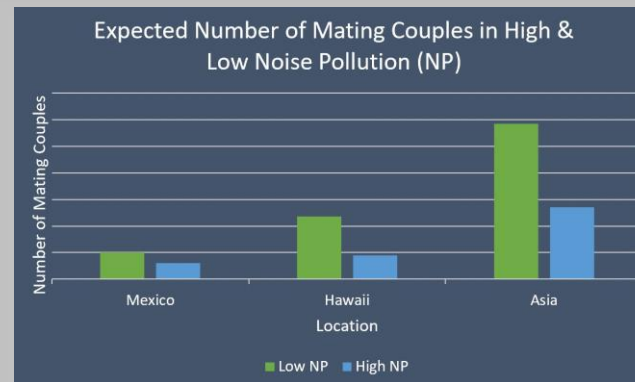
**Figure 1:** A mother humpback with her newborn calf.  
<https://www.hawaiimagazine.com/content/scienlists-capture-video-minutes-old-humpback-whale-calf-annual-migration-hawaii-begins>

### Literature Cited

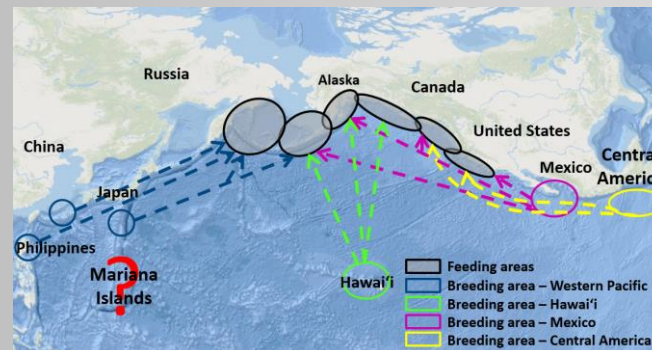
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## Prediction

- I predict that with an increase in anthropogenic noise pollution, reproductive rates of humpback whale populations will decrease. Seeing as these whales' major form of communication is through sound, any disruption significant enough to affect breeding behavior will ultimately result in less successfully reproductive couples (Rossi-Santos et al., 2015)



**Figure 2:** This graph shows the study's expected outcome when comparing reproduction under varying levels of noise pollution



**Figure 3:** This map (left) illustrates the breeding sites and migration patterns of Humpback Whales. Photo provided by the NOAA.

## Study Design

- Trackers will be attached to groups of Humpback Whales that will be followed to their breeding grounds on a yearly basis.
- A field experiment of three different breeding locations in the Pacific Ocean off the coasts of Mexico, Hawaii, and Asia (Figure 3) will be studied (Titova et al., 2017).
- At each site, an analysis will be conducted using decibel readers to give ambient readings of noise pollution. Each recording will be added up and averaged out over the course of the breeding season to know if the typical decibel readings exceed those of the whales themselves.
- Any averaged decibel recording below that of the normal breeding communication levels of 126 to 158 decibels (dB) will be marked as "Low NP" and any reading at or above normal decibel range of whale communication will be categorized at "High NP" (Chen et al., 2016).
- The number of couples that successfully produce an offspring in each breeding pocket will be recorded.

## Intended Analysis

- Using the collected data, a T-test would be performed as the dependent variable (successful reproductive couples) is continuous and the independent variable (amount of noise pollution) is categorical.
- Comparing breeding sites with similar conditions (i.e. two different spots in Hawaii) will provide insight to how much these whales are affected by anthropogenic influence, specifically noise pollution (Figure 2).