

Virtual Population Analysis of North Atlantic Right Whales

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Abstract

North Atlantic right whales are the most critically endangered population of large baleen whales in existence. Although this species was once abundant along the Atlantic coast of North America, extensive hunting for blubber and baleen depressed the population to extremely low numbers by the end of the commercial whaling era. Despite a moratorium on commercial whaling since 1986, and protection of North Atlantic right whales by the International Whaling Commission Schedule since 1946, the population has failed to recover and extinction is predicted in less than 200 years. Today the two biggest threats to North Atlantic right whales are anthropogenic: entanglements in commercial fishing gear and strikes by large vessels. U.S. and Canadian policy focus on mitigating these two threats to protect the species and promote recovery of the population.

The listing of a species as threatened or endangered under the Endangered Species Act is typically a function of current population size relative to the pristine population size. In the case of the North Atlantic right whales, biologists are certain that with only 350 individuals remaining in the population it can be listed as critically endangered. However, an incomplete understanding of the population dynamics of North Atlantic right whales has led to much speculation about the pre-exploitation and post-exploitation population size. Several attempts have been made to reconstruct the population back to these states using historical whaling data and genetic analyses. However, there is still a large degree of uncertainty surrounding these estimates. An accurate estimate of the pre and post whaling population size would allow for more reliable measures of population recovery.

Virtual population analysis is a fishery management tool used to reconstruct fish populations by cohort for the purpose of stock assessments. The calculation is based on several parameters: catch, fishing effort, and natural mortality. It is considered the most efficient and reliable method for fishery stock assessments. To date virtual population analysis (VPA) has not been applied to a cetacean population not being actively hunted. I propose to manipulate the standard VPA model to reconstruct the population of North Atlantic right whales back to the period when commercial whaling for this species ended in 1935. A reliable estimate of the post-exploitation population will provide a baseline for right whale management. The model also allows for projections about how population would look today if not for ship strikes and entanglements to reveal the impact these events have had on the population's recovery. Additionally, the VPA model can create future population projections and I aim to model the future North Atlantic right whale population under varying degrees of ship strikes and entanglements. This research will perhaps answer questions about the future directions of right whale policy including whether or not the population would significantly improve in the absence of ships strikes and entanglements and if recovery is a real possibility.