Understanding habitat in a changing ocean: modeling the distribution of Atlantic Wolffish

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The global increase of atmospheric greenhouse gases contributes to rapid changes in coastal and marine systems, including temperature, acidity, circulation, stratification and oxygen concentration. As conditions change, critical marine habitats may shift, deteriorate, or disappear completely. Understanding current and future changes in our oceans can help managers predict species distributions and support conservation and resource management efforts.

To explore how rare species can be impacted by such changes in coastal Newfoundland, our study focuses on Atlantic Wolffish habitat in Conception Bay. Since the 1980s, the Atlantic Wolffish has declined significantly in abundance and occupied area, primarily due to fisheries bycatch. Following an estimated loss of 60% of the mature population, the Atlantic Wolffish was listed under the Species at Risk Act in 2003. Due to the narrow preferred temperature range (0 to 4°C) and reduced population size, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) recognizes Atlantic Wolffish as a species that may be vulnerable in a changing climate. Recent research on temperature acclimatization of fish also suggests that cold water species are among the most impacted, even by small temperature changes.

This project combines movement data from tagged Atlantic Wolffish, high resolution bathymetry from multibeam sonar, underwater videos, sediment samples and moored thermographs to develop habitat maps and predictive distribution models. The study area for this project includes 30 km^2 of coastal waters along the northeastern side of Conception Bay, Newfoundland and Labrador. Of particular interest is an area near Bauline, where Atlantic Wolffish have been recorded pairing, feeding, and guarding developing eggs in dens formed by coastal bedrock and boulder features. Hourly temperature records from thermographs installed near wolffish dens at 2 m and 24 m depth indicate that this area experiences high temperature variability. In 2013, 30% of temperature readings at 24 m exceeded 4°C and 10% exceeded 8°C, suggesting that current temperatures may already place Atlantic Wolffish at the upper range of their tolerance. Underwater videos, sediment samples, and the analysis of the multibeam sonar from Conception Bay indicate that the bedrock and boulder features necessary for wolffish dens are rarely present at greater depths where water is colder and temperatures are more consistent throughout the year. If temperatures continue to rise, the areas used by Atlantic Wolffish for denning and nursery habitat may become inaccessible.

This presentation will discuss possible changes to Atlantic Wolffish habitat and the tools we are using to understand, monitor, and predict species distribution in a changing ocean.

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