



Effects of Climate Change on Marine Mammal Distribution

[More resources are needed to increase our understanding of the effects of climate change on marine mammals](#)

What We Know:

- Climate change and warming temperatures are resulting in changes in marine mammal distribution.
- Changes in marine mammal distribution may be in response to ecosystem changes (e.g., prey availability, habitat loss) and may expose species to new threats and ecological conditions.

Case Study: North Atlantic Right Whale

- The North Atlantic right whale (NARW) is critically endangered – fewer than 350 individuals remain.
- Entanglement in fishing gear and vessel strikes are the main causes of death and injury.
- Climate change has contributed to an increase in deaths and injuries.
 - The whales distribution shifted in response to changes in the abundance and distribution of their copepod (*Calanus finmarchicus*) prey, driven by rapid warming in the Gulf of Maine.
 - The whales moved to areas with higher prey availability but no protective measures, exposing them to new risks of entanglement and vessel strike, especially in the Gulf of St. Lawrence where 17 whales died in 2017.
 - In response, Canada has implemented protective measures to reduce vessel strikes and entanglement in fishing gear in the Gulf of St. Lawrence.
- Poor maternal body condition and marked declines in birth rates indicate female right whales may not be finding sufficient food resources to support pregnancy. Climate change, in combination with long-term health effects from entanglement and vessel strike trauma, may continue to reduce calving success going forward.



North Atlantic right whale with propeller scars (NOAA).



What We Don't Know:

1. **Comprehensive understanding of how shifts in distribution impact different species.** NARW have been adversely affected by the change in preferred prey availability, but we do not yet fully understand how such shifts will affect various species. Bowhead whales in the Arctic are experiencing an increase in seasonal open-water due to climate change, which may result in increased, rather than reduced, feeding opportunities.
2. **How and when distributions will shift.** We cannot currently predict when species may change their occupation patterns and distribution, or what new threats they will face in new, or less frequently used, habitats. We do not know if NARW distributions will shift again or where it may shift.

What We Need:

Lessons learned about the North Atlantic right whale are applicable to other marine mammal species. To increase the understanding of effects of climate change on marine mammal distribution we need to:

1. **Improve and increase monitoring to better detect shifts in distribution.** As the ocean warms, right whales and other species will likely continue to modify their distributions and behaviors to adapt. We need to detect changes in distributions and anticipate what new threats species may encounter in new or less-frequently used areas and adapt mitigation measures as shifts occur.
2. **Adaptive management measures** to mitigate risks to marine mammals in a timely manner when areas of new/increased risk are detected – e.g., Canadian dynamic fishery closures to reduce risk to NARW. Reducing human-caused impacts to marine mammals in new areas will increase species' resilience in adapting to climate-related changes.
3. **Broad adoption of new technologies or regulations** to ensure species are protected regardless of where they range in response to a changing climate. E.g., widespread adoption of “on demand” fishing gear would keep whales safe from entanglement in both the U.S. and Canada. Vessel speed and routing regulations in the Arctic may be necessary to protect whales as shipping expands into newly ice-free areas.



North Atlantic right whale with ocean-going vessel in the background (NOAA).

So What?

Understanding climate change impacts and associated range shifts has implications beyond management of North Atlantic right whales. It is relevant to ensuring our shared use of oceans, minimizing human-marine mammal conflicts, and informing fishery management.