

About Me

Originally from Homer, Alaska

Completed a BSc in Marine Biology at the University of Alaska Southeast

Current Marine Policy master's student at the University of Alaska Fairbanks

Research interests:

- Killer whale behavior and ecology
- Marine mammal interactions with fisheries
- Marine mammal management



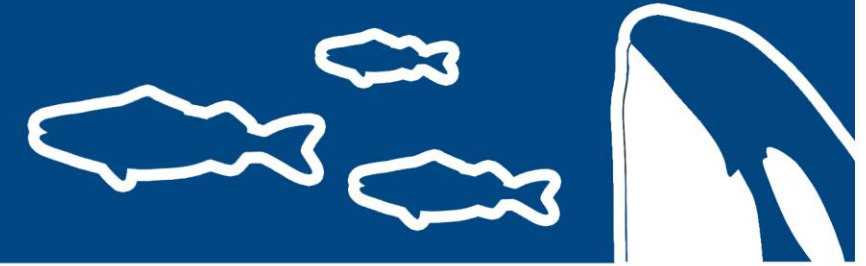
NPFMC Internship

Goal: create informative infographics about Alaska's marine mammals and their interactions with fisheries

1. Killer whale interactions with Alaska's fisheries
2. Marine mammal laws and applications to fisheries management
3. Fishery interactions with Alaska's marine mammals and future outlooks



Understanding Killer Whales & Alaska's Fisheries



Background



Killer whales have been interacting with Alaska's fisheries since at least the **1960s**



Killer whales interact with commercial fisheries **all around the world**, particularly at high latitudes.



Fishing activity provides killer whales with opportunities to forage at a **low energetic cost**.



Not all interactions result in death or injury, though whales can be at risk of bycatch, entanglement, and vessel strikes.



Interactions with fisheries can result in **changed behavior** and may have broader ecosystem consequences.

Interactions occur throughout Alaska's waters, but are most prevalent in the **Bering Sea & Aleutian Islands**

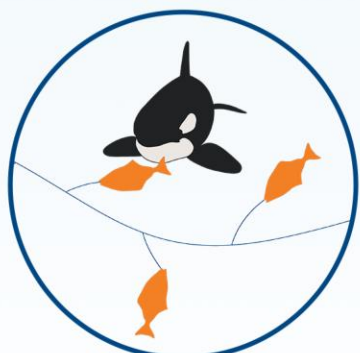


Interaction hotspots

Types of Interactions



Feeding on discards: feeding on lost or discarded catch



Depredation: removal of catch from fishing gear



Secondary foraging: feeding on non-target species attracted by fishing activity

Killer Whale Subspecies

Resident Killer Whale (*Orcinus orca ater*)

Feeds exclusively on **fish**, no evidence of mammal predation



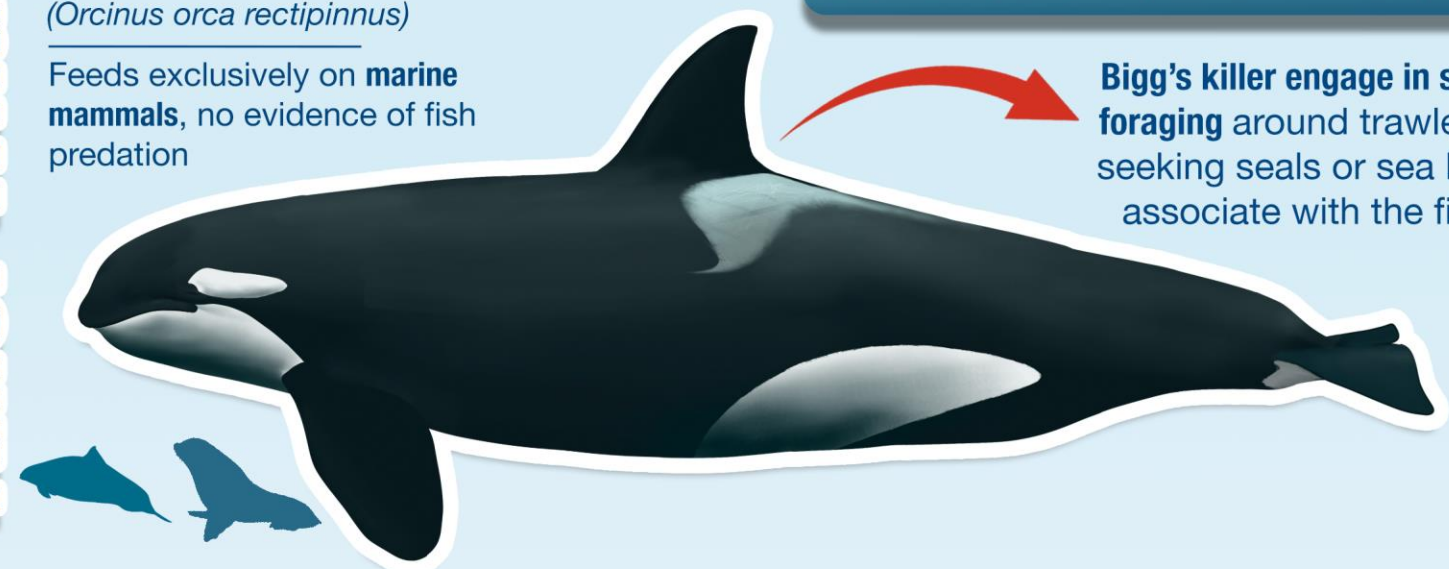
HIGHER level of interaction with fisheries

Depredate sablefish and flatfish from longlines and sometimes slinky pots

Feed on discards from trawlers and some pot fisheries

Bigg's Killer Whale (*Orcinus orca rectipinnus*)

Feeds exclusively on **marine mammals**, no evidence of fish predation



LOWER level of interaction with fisheries

Bigg's killer engage in secondary foraging around trawlers, likely seeking seals or sea lions that associate with the fisheries

How Are Interactions Being Addressed?

Fishery interactions with killer whales require management and monitoring

The North Pacific Fishery Management Council (NPFMC), National Marine Fisheries Service (NMFS), and the fishing industry work together to manage and monitor interactions between killer whales and fisheries.



Protecting Catch

Pot gear protects sablefish catches from depredating killer whales. The use of pots in Alaska's sablefish fisheries in the Bering Sea and Gulf of Alaska was approved by the NPFMC and NMFS in 2008/2017.



Minimizing Foraging Opportunities

Limiting discards, when possible, in the presence of killer whales reduces the incentive to scavenge around trawl vessels.



Gear Modifications

Gear modifications are being tested and implemented by the Amendment 80 trawl fleet to prevent the bycatch of killer whales.



Research & Monitoring

Research efforts are aimed at understanding killer whale behavior around fishing vessels in Alaska. Additionally, fishery observers monitor and document killer whale interactions and takes.



Laws & Regulations

What They Mean for Marine Mammals & Fisheries

In the U.S., marine mammals are managed under two main statutes: The **Endangered Species Act (1973)** and the **Marine Mammal Protection Act (1972)**.

Endangered Species Act

Protects **threatened** and **endangered** species and their **critical habitat**



Requires agencies to seek consultation to **evaluate** if the actions they permit, fund, or carry out will harm listed species & critical habitat



May impose **restrictions on fisheries** if activities jeopardize listed species or critical habitat



Marine Mammal Protection Act



Protects **all marine mammals** from unauthorized take in U.S. waters



Requires fisheries to be managed in a way that **avoids and minimizes** marine mammal bycatch



Requires **marine mammal stock assessments**, which provide updates on marine mammal stocks in the U.S.

Marine Mammal Stock Assessments

How Are Assessments Done?

Step 1

NOAA uses the best available science, through surveys or available data, to compile information on marine mammals.



Step 2

Biologists estimate the following:
A recovery factor between 0.1 and 1.0
Minimum population size
Net productivity rate



Step 3 Calculate the PBR

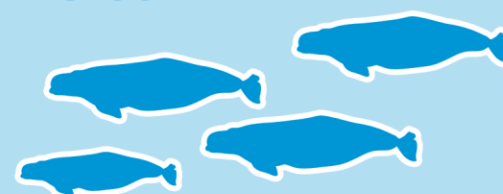
Potential Biological Removal

The maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population.

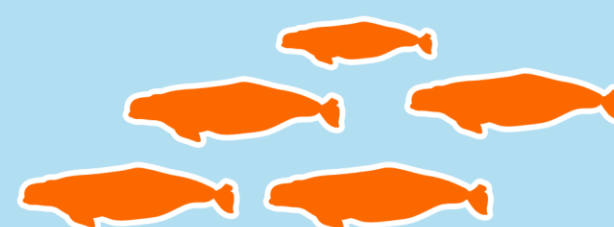
What is a Marine Mammal Stock?

A group of marine mammals of the same species in a common spatial arrangement that interbreed when mature

Stock A



Stock B



Sources of human-caused serious injury and mortality that are considered relative to the PBR include:

Entanglement

Fishery bycatch



Ship strikes

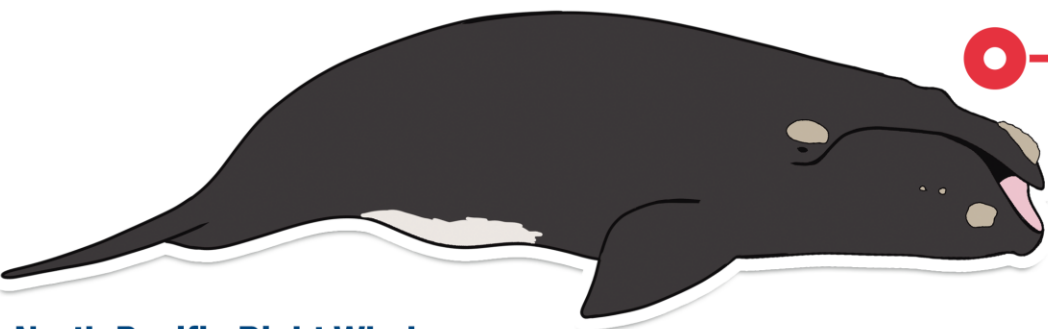
Marine debris

Why Does This Matter?

Marine mammal stock assessments estimate serious injuries and mortalities caused by fisheries. PBR calculations can help inform fisheries management practices, particularly for fisheries that interact with marine mammals.

Looking Ahead: Marine Mammals & Alaska's Fisheries

Alaska is home to numerous marine mammal stocks throughout the Bering Sea, Aleutian Islands, and the Gulf of Alaska. Changing ocean conditions, such as increasing temperatures and declining sea ice, impact Alaska's marine mammals and may change the nature of fishery interactions in the future. The **North Pacific Fishery Management Council (NPFMC)**, **NOAA Fisheries**, and the **fishing industry** work together to monitor and manage marine mammal interactions with fisheries.

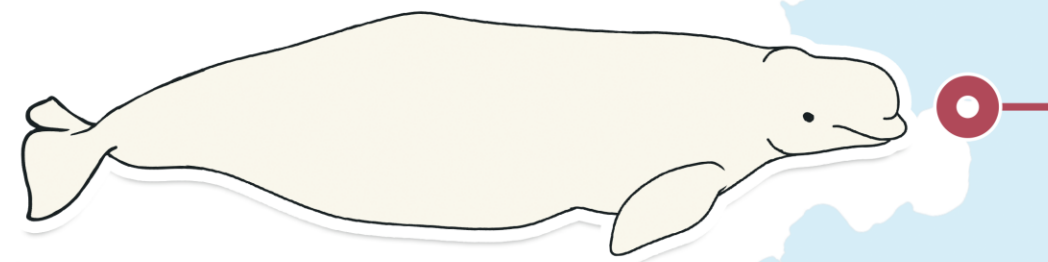


North Pacific Right Whale
(*Eubalaena japonica*) **Endangered (ESA)**

As of 2024, NOAA Fisheries is considering expanding the critical habitat of North Pacific Right Whales. If expanded, this may result in changes to fisheries management in the Bering Sea.

Changing climate in the Bering Sea may also result in right whales occurring in closer proximity to fishing activity, potentially increasing the chances of interactions.

Fisheries Interactions: No documented direct interactions as of 2024, but even single death or serious injury would be catastrophic for recovery.



Cook Inlet Beluga
(*Delphinapterus leucas*) **Endangered (ESA)**

Prey availability is listed as one of the main threats to Cook Inlet belugas. Management of Cook Inlet's salmon fisheries may influence how many salmon, such as coho, chum, and pink salmon, are available to the belugas in the summer months.

It will be important to consider prey availability for belugas when deciding timing and area restrictions for Cook Inlet's salmon fisheries.

Fisheries Interactions: Low level of direct interactions, but impacts may be especially strong in small populations.

Western Stellar Sea Lion
(*Eumetopias jubatus*) **Threatened (ESA)**

Declines in the western Stellar sea lion distinct population segment in the 1990s were linked to competition for prey with pollock fisheries.

Regulations such as no-fishing zones, approach restrictions near rookeries, and harvest limits have contributed to sea lion conservation efforts, though the population will require continued monitoring.

Fisheries Interactions: Level of direct and indirect interactions have been reduced since implementation of regulations, but may still occur at low levels.

Pacific Walrus
(*Odobenus rosmarus divergens*)

As sea ice declines, walrus are spending more time on haulouts, which makes them more susceptible to disturbance from commercial activities. Fisheries may also come into contact with walrus as fishing activities shift north, increasing the potential for interactions.

There are a number of established area-based conservation measures aimed at protecting Bering Sea habitats from fishing impacts, including Walrus Protection Areas.

Fisheries Interactions: Level of direct and indirect interactions are low, but may change in the future.

Species to Watch

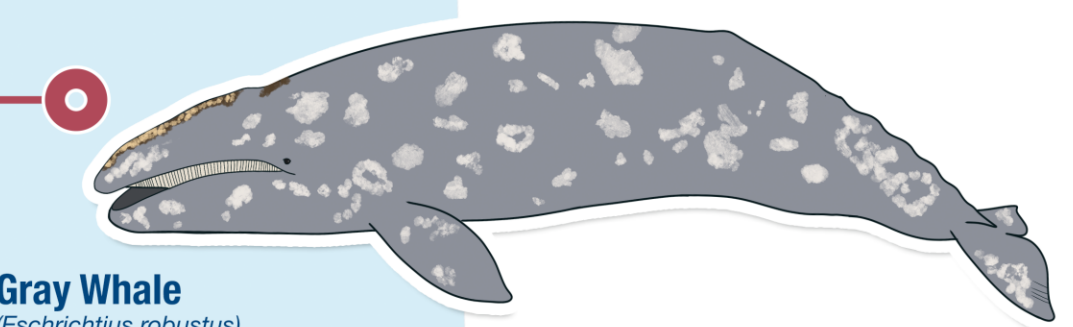


Northern Fur Seal
(*Callorhinus ursinus*) **Depleted (MMPA)**

Northern fur seals have been in decline since the 1990s. Lactating females are reliant upon pollock, a species also targeted by commercial fisheries.

There is a need to understand what, if any, impacts that commercial fishing may have on fur seal prey and habitat.

Fisheries Interactions: Few direct interactions, but indirect interactions such as competition may be detrimental.



Gray Whale
(*Eschrichtius robustus*)

Gray whales are benthic feeders and spend summers foraging in the Bering and Chukchi Seas.

From 2019-2023, eastern North Pacific gray whales underwent an Unusual Mortality Event (UME), linked to poor body condition and malnutrition, likely due to changes in prey availability.

There is a need to understand how bottom trawling impacts benthic feeders like gray whales.

Fisheries Interactions: Direct interactions are uncommon but populations may be sensitive to indirect interactions during UMEs.

Killer Whale
(*Orcinus orca*)

Killer whales have been depredating from Alaska's longline fisheries since at least the 1960s and often forage on discards from trawl vessels.

An increase in the number of killer whales incidentally caught by trawl vessels in 2023 has raised questions about the nature of interactions and how they may change over time.

Fisheries Interactions: Direct interactions are relatively common, though not all interactions result in serious injury or mortality.

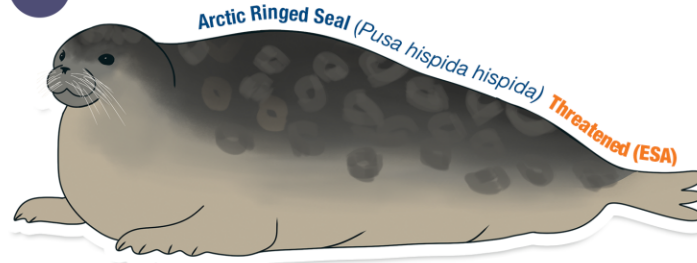
Ice Seals

Ringed Seal
(*Pusa hispida*)

Spotted Seal
(*Phoca largha*)

Ice seals—spotted seals, ribbon seals, spotted seals, and bearded seals—are occasionally taken as bycatch in Alaska fisheries but generally have few direct interactions with fisheries. However, as sea ice declines and seal habitat and foraging areas becomes less suitable, fisheries interactions could become more important to consider in the future.

Fisheries Interactions: Direct interactions are uncommon, but may increase with changes in habitat and foraging opportunities.



Arctic Ringed Seal (*Pusa hispida hispida*) **Threatened (ESA)**

Species of Lesser Concern

Acknowledgements

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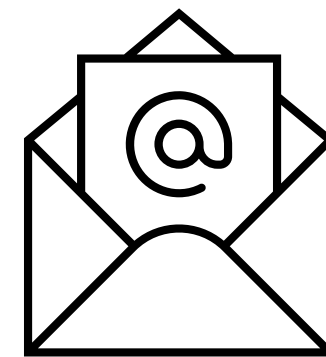
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