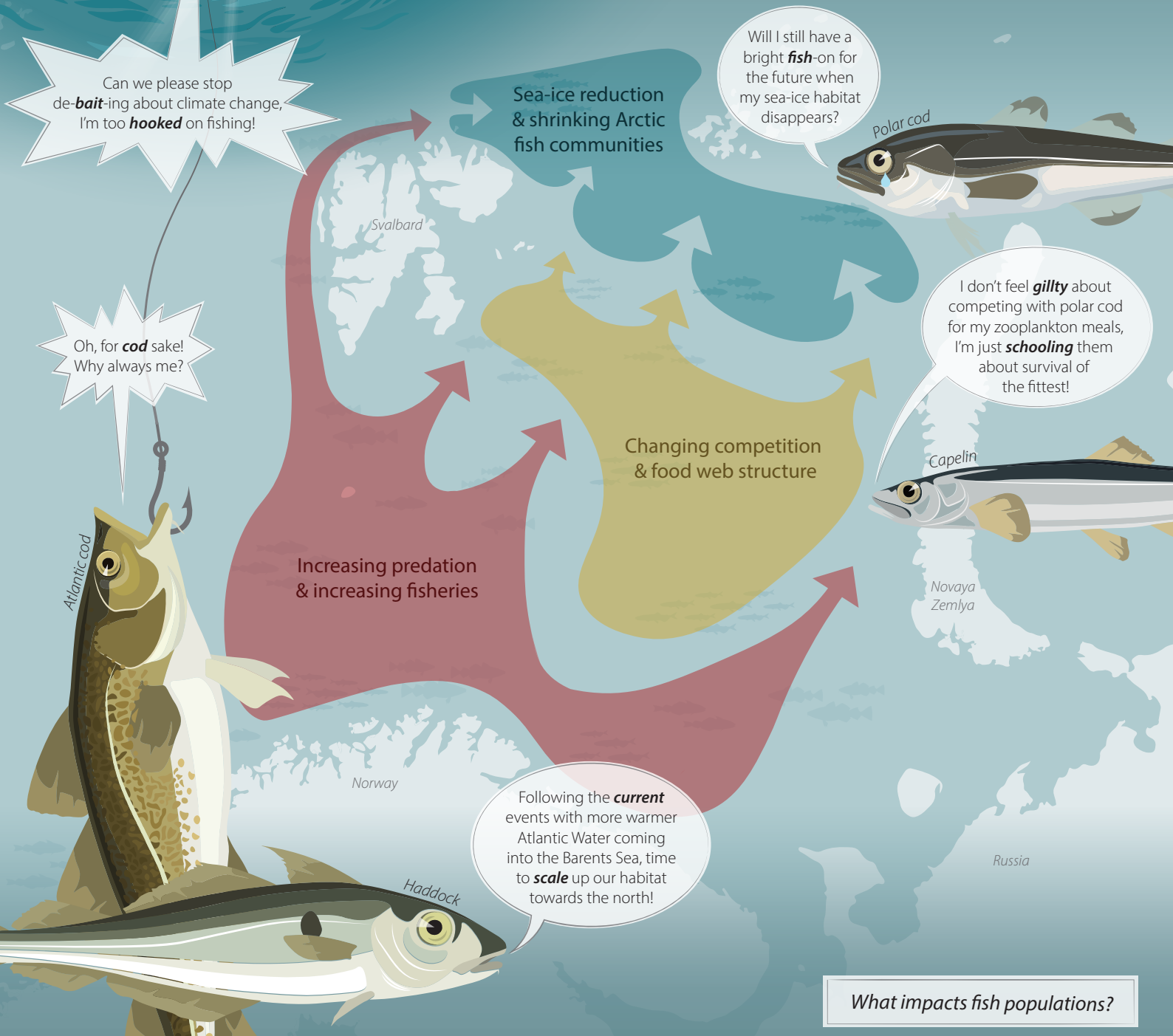


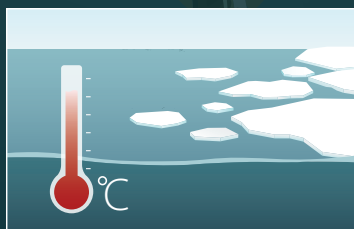


Fish population dynamics

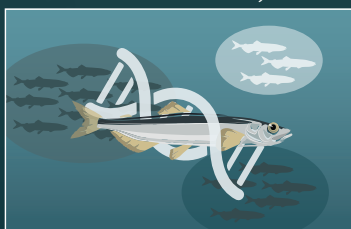
The Barents Sea, a shallow region split between a boreal south and an Arctic north, hosts the world's most productive cod stock and fragile Arctic species. However, climate change is driving major transformations, requiring improved biodiversity management. While fish distribution largely depends on physical conditions such as sea-ice extent and temperature, other factors, including the presence of prey and predators, phenotypic traits, and harvesting activities, also play a significant role.



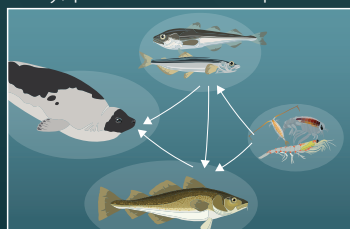
Environmental factors



Genetic diversity



Prey, predation & competition

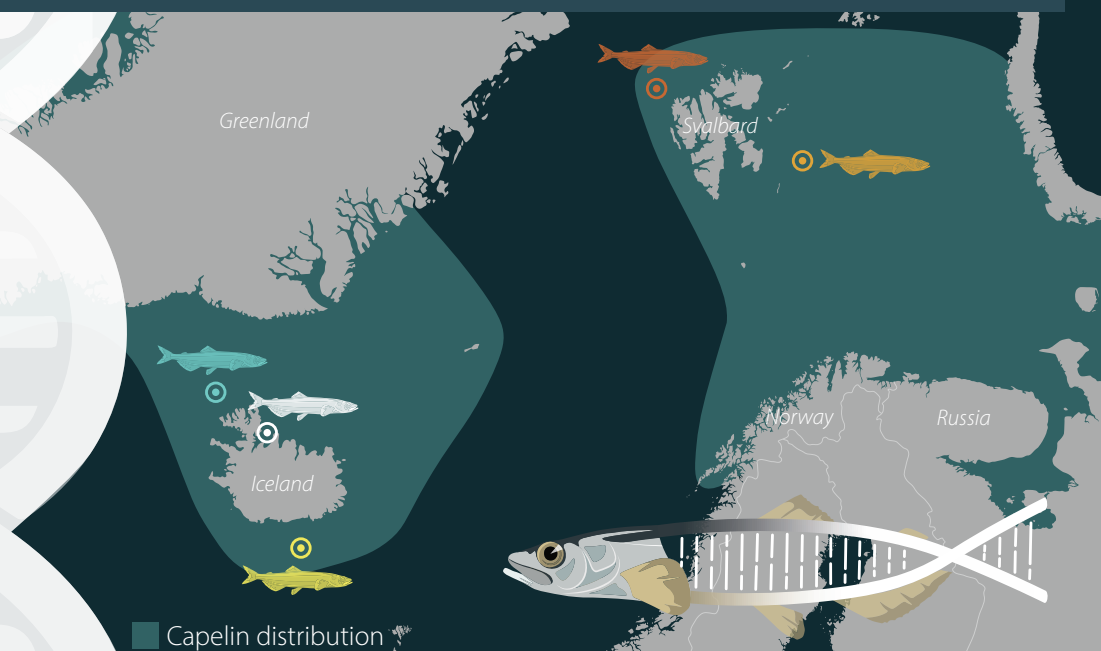


Fishing pressure

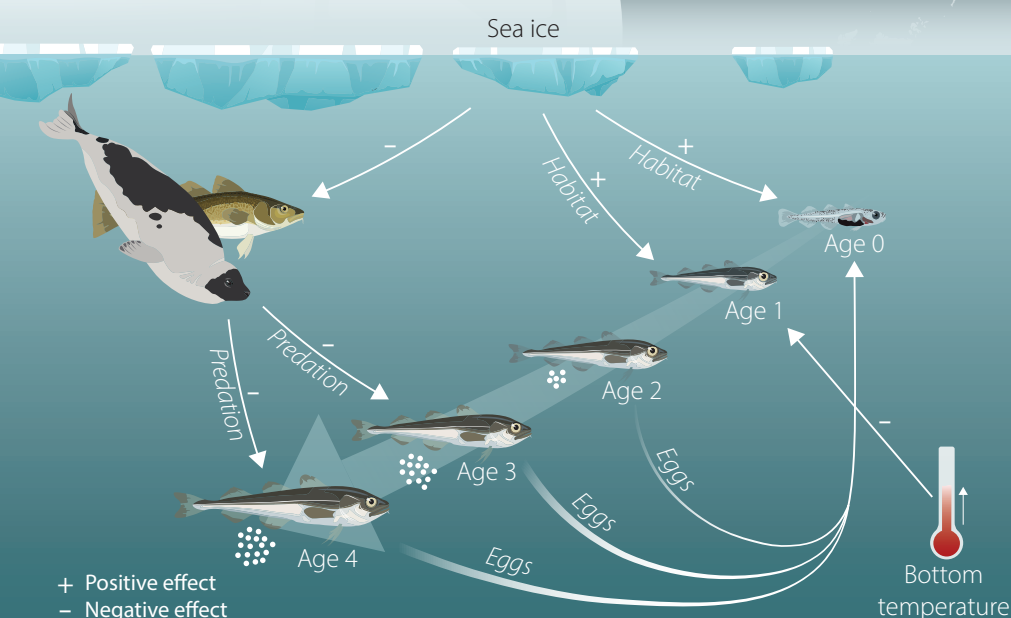


Capelin distribution and genomics

By fully leveraging recent advances in whole-genome sequencing, we gained novel insights into capelin populations across the northern Atlantic. The data reveal three main populations – Icelandic, Barents Sea, and East Greenland – along with sub-populations in the Barents Sea and Icelandic waters. These sub-populations may be coupled to the utilization of different spawning grounds and/or timing, such as spring- and summer spawners.



The effect of sea ice and predators on the different stages of polar cod

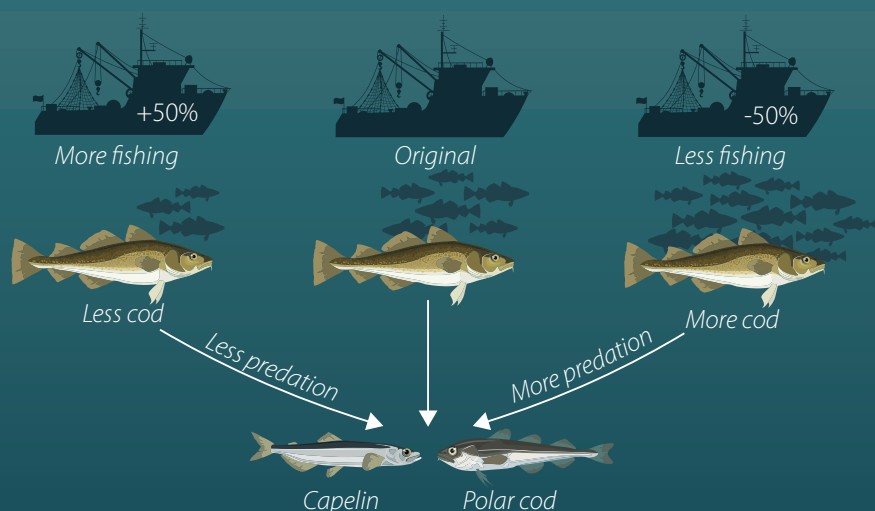


More sea ice benefits polar cod by protecting juveniles from predators and providing a stable habitat. As sea ice retreats, predators like Atlantic cod and harp seals gain increased access, putting greater pressure on older polar cod and threatening population stability.

RECOMMENDATIONS

The distribution of fish populations in the northern Atlantic Ocean is influenced by more than just physical conditions. Key factors also include: (i) the genetic composition and diversity within fish populations, (ii) their adaptive responses to changing environmental conditions, and (iii) their interactions within the food web, such as competition and predation. These factors collectively shape where fish populations are found. Incorporating genomic data and a deeper understanding of species interactions are crucial for developing effective management and conservation strategies. Whole-genome data play a vital role in identifying biologically meaningful management units that reflect true population structures. Integrating these insights into future fisheries management is essential for promoting sustainability and preserving biodiversity.

Harvesting of Atlantic cod and predation



Harvesting affects species across the food chain. Increased cod fishing reduces predation on polar cod and capelin, potentially benefiting polar cod. However, this depends on whether rising capelin populations intensify competition, limiting any benefits.