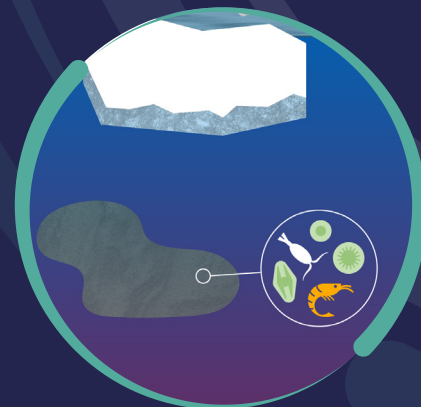


MARINE ECOSYSTEMS

CLIMATE CHANGE IS INCREASINGLY THREATENING LIFE IN THE SOUTHERN OCEAN, ONE OF EARTH'S MOST REMOTE AND FRAGILE ECOSYSTEMS. THIS STUDY ASKED HOW FUTURE CONDITIONS MIGHT AFFECT TINY BUT VITAL CREATURES CALLED COPEPODS - ZOOPLANKTON THAT PLAY A HUGE ROLE IN THE OCEAN'S FOOD WEB.



RESEARCH

PolarRES focused on four dominant Antarctic copepod species. These species dominate the zooplankton biomass and rely on carbon-rich fat reserves to support them during winter diapause in deep waters. Using decades of copepod data and hindcast high-resolution regional ocean climate models (MetROMS and HCLIM) we developed Ecological Niche Models (ENMs) to map habitat suitability and environmental conditions for copepod survival. We then applied future climate projections to simulate how these might change under potential future climate regimes.



RESULTS

This study was the first to map copepod populations across the Southern Ocean over different seasons and years. ENMs showed strong variability in range limits, hot spots, and life cycle events like maturation and diapause timing. Historical simulations showed declining biomass and habitat area, driven by warming and fewer phytoplankton (a critical food source). Future projections, representing two scenarios differing in extent of ocean temperature rise, predicted that copepods might shift further south and, unexpectedly, habitat suitability and biomass might increase. However, the increases should be interpreted cautiously as current models lack full integration of phytoplankton.

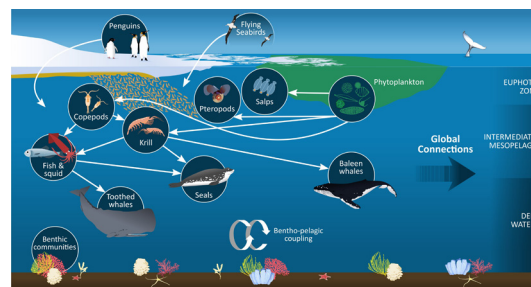


Figure: Copepod's role in the food web, credit: Nadine Johnston, BAS & Johnston et al 2022.



POLICY ACTIONS NEEDED

- Improve models by including copepods food sources
- Use results to guide future ecosystem assessments and research programmes
- Establish long-term monitoring programmes that include copepods
- Including copepods in Earth System Models and conservation and management plans
- Promote public awareness of copepods' global ecological importance

IMPORTANCE

Copepods are an essential ecosystem component. They help move nutrients through the ocean, support fisheries, wildlife and tourism, and store carbon - helping regulate Earth's climate. Understanding how they will respond to future change will help educators, scientists, and policymakers protect ocean life and plan for the future. This research supports global efforts by groups like BIOPOLE, SCAR, CCAMLR, IPCC, and MEASO.

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