Arctic Food Webs

ACTIVITY TIME

40-50 minutes

LEARNING OUTCOMES

- Discuss roles of primary producers and consumers in a food web.
- Describe food web interactions specific to the arctic sea ice.
- Illustrate an arctic marine food web.

OVERVIEW

WHY?

Food webs help us understand the interconnected nature of ecosystems. They help us understand human's place in ecosystems.

WHAT?

- The organisms that live in a sea ice ecosystem.
- The predator and prey relationships between these species.

HOW?

Watch a video showing numerous sea ice organisms

Learn the Inuktitut names and Inuit knowledge species

In groups, choose a species to focus on

Create a food web

Talk about your findings and make connections

CONTENTS

PREPARATION

RESOURCES

Sea Ice Ecology video
From majestic narwhals swimming along a crack in the ice to mighty walrus basking on the spring ice, this short video montage shows many different creatures that live in the Arctic marine ecosystems.
https://arcticeider.com/links/afw03

Interactive Food Web & Wildlife Profiles
Access profiles of arctic marine wildlife and use the interactive food web to visualize connections between species.
https://arcticeider.com/links/afw04

Food Web Sorter SMART Notebook Activity
Smart Notebook file which can be used to explain basic trophic levels. Student can come up to the board and drag the creature icons to the correct location.
https://arcticeider.com/links/afw1

IMAGE 1 A snowy owl looks for dinner.

IMAGE 2 White in the winter, arctic fox turn brown in the summer to match their surroundings.

BACKGROUND

"Cree and Inuit observe and respect a natural order of relationships connecting the largest animals to the smallest organisms. For instance, in the open-water season, Inuit dispose of sea mammal carcasses so the shrimp have the food they need and can, in turn, support the many fish, birds, and sea mammals that eat them." (McDonald, M. A et al.)
In the winter, sea ice is a very important physical or **abiotic** component of the arctic **ecosystem** it impacts all of the wildlife surrounding it.

The marine arctic **food web**, like all other food webs, is made up of **primary producers**, consumers and **decomposers**.

IMAGE 3 Phytoplankton, a type of marine algae, gives the water its green colour.

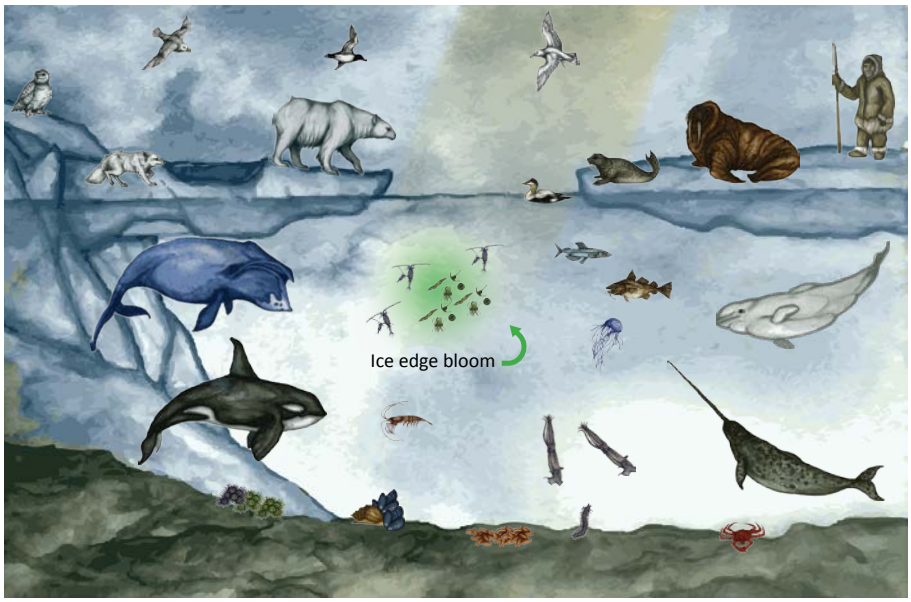

FIGURE 1 When sea ice melts in spring, sunlight reaches phytoplankton at the ice edge and causes it to bloom, forming the base of the marine Arctic food web.

VOCABULARY

Abiotic: Non-living elements of an ecosystem, such as weather and climate.

Decomposers: Organisms that break down and recycle waste and dead organisms.

Ecosystem: A community of organisms that interact with each other and their environment.

Food web: A diagram that depicts energy transfer between organisms in an area.

Herbivore: An organism that only eats plants.

Pelagic: Relating to the open ocean.

Photosynthesis: The process of turning the sun's energy into sugar as done by plants.

Phytoplankton: Microscopic algae that convert sunlight into energy. Phytoplanton are important primary producers in marine food webs.

Primary production: The conversion of energy from sunlight into organic compounds, such as sugars.

Primary producers: Organisms such as plants and algae that make their own food by converting energy from the sun into organic compounds like sugars.

Trophic level: The position of an organism in a food web, based on its distance from primary production.

Zooplankton: Primary consumers in marine food webs. Small animals that graze on phytoplankton.

PRODUCERS

On land and in the ocean, producers are plants that convert energy from the sun into sugars through **photosynthesis**. In the ocean, these plants are seaweeds, sea grasses and microscopic algae called **phytoplankton**. In open-water, or **pelagic**, ecosystems phytoplankton form the base, or first **trophic level** of the marine food web.

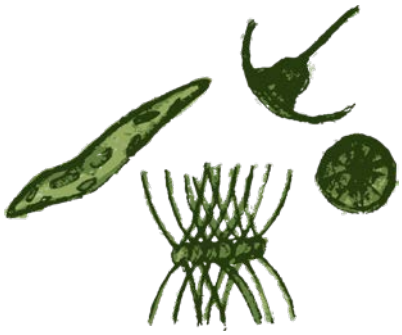

IMAGE 4 Phytoplankton

One unusual feature of marine arctic food webs is that **primary production** can only occur during a very short period of the year. Short winter days mean there is little or no sunlight to support photosynthesis. Even as the days grow longer, thick sea ice and snow cover prevent sunlight from reaching phytoplankton in the water column. Spring blooms of phytoplankton often occur first at the ice edge.

CONSUMERS

Consumers include **herbivores** that feed on producers, predators that feed on herbivores, and predators that eat other predators.

Primary Consumers

Marine arctic food web herbivores eat phytoplankton. These herbivores are commonly called **zooplankton** and include pelagic crustaceans like copepods.

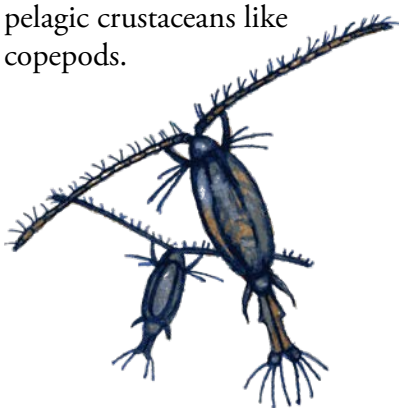

IMAGE 5 Copepods.

Secondary Consumers

Secondary consumers include organisms from multiple trophic levels; from small krill and prawn, which generally eat zooplankton, to larger species like cod and eiders, which eat these smaller species and each other. Even simple food webs can have many trophic levels.

IMAGE 6 Ringed seal.

Top Consumers

The highest trophic level includes apex predators that are at the top of the food chain. Orcas and polar bears are two iconic examples of important apex predators in the arctic.

IMAGE 7 Polar bear.

DECOMPOSERS

Decomposers are another important group in every ecosystem, because they break down organic materials and make nutrients available to other organisms. However, they do not fit into a specific trophic level because they eat dead matter from all levels and deliver the last step in various organic matter and nutrient cycles.

IMAGE 8 Marine bacteria

Understanding the roles of different groups of organisms is integral to understanding how ecosystems work and how we are a part of them. One way we do this is by creating food web diagrams. Food web diagrams are simplified depictions of some of the relationships in an ecosystem.

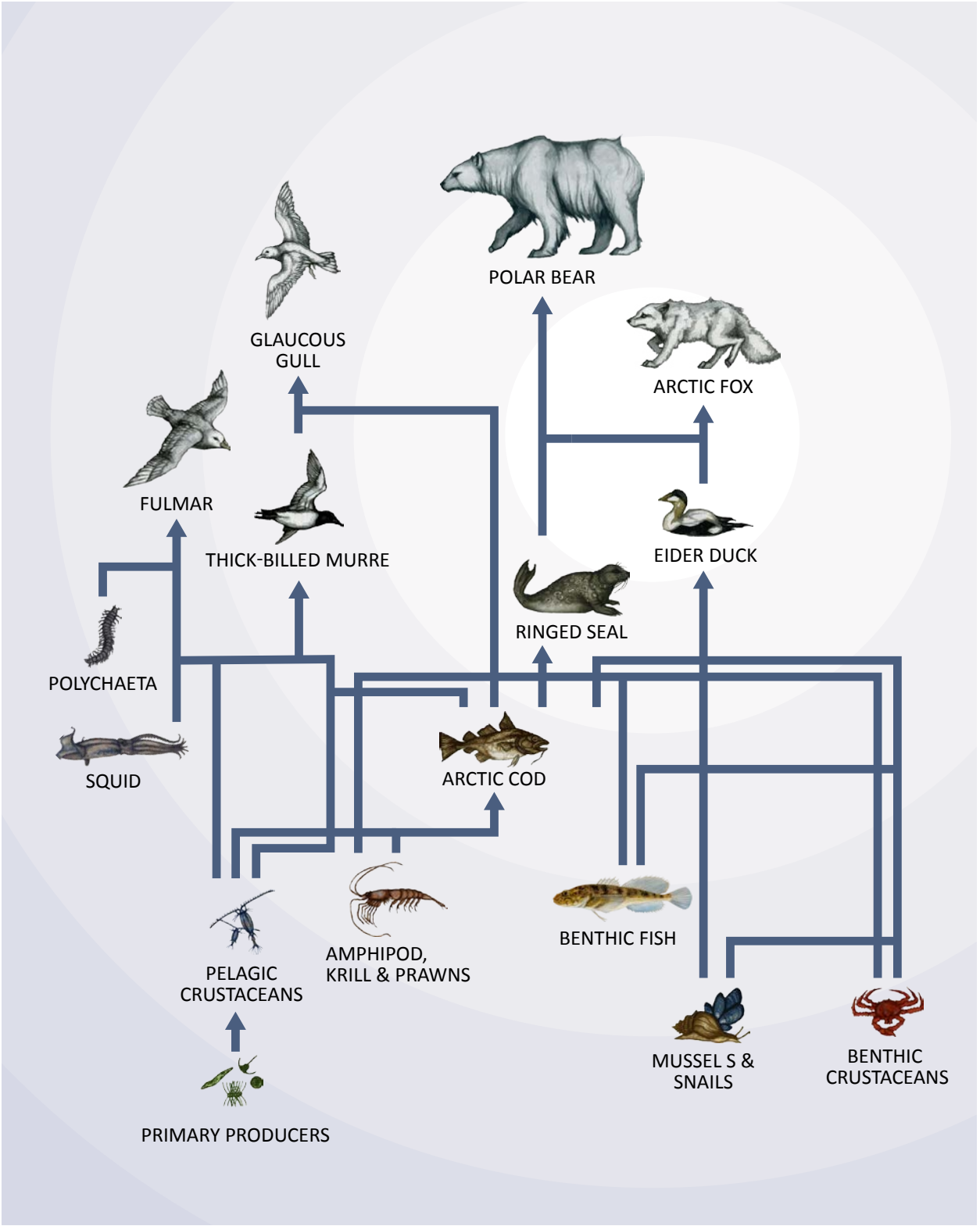

FIGURE 2 A simplified arctic coastal food web.

DISCUSSION QUESTIONS

1. Where do all of the creatures in the food web ultimately get their energy from?

2. Why are primary producers so important in the arctic marine food web? Indicate the primary producers on your food web.

3. What is the role of polynyas in the arctic food web?

4. Put humans on your food web, what do you notice and what allows humans to be different than all the other animals?

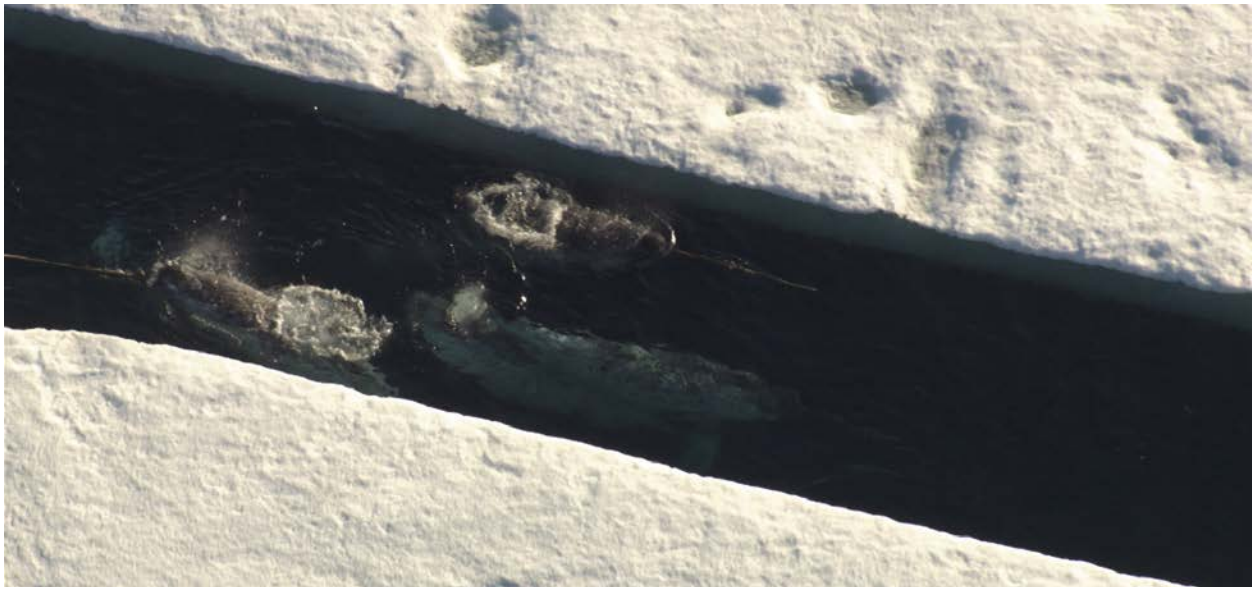

IMAGE 9 Narwal swim through a lead in the sea ice.

5. How would the extinction of one of the species on your food web affect the other species?

6. Why is it important for food webs to have many different connections?

7. What would be the downside of having a very simplified food web?

8. Which animals in your food web are hunted in your community? Which ones have you tried?

IMAGE 10 Orcas trapped in a polynya. If they don't escape soon, the polynya will close and they will run out of air. (D & A Weetaluktuk)