# Food web shuffle (For the teacher)

Who eats who? Students will put the organisms in the right position of the food web and make the right connections. How are they interconnected?

**Duration:** 60 minutes

## Learning outcomes

Scan the QR code

## Materials

- Information and images of the organisms (Handout 1 and 2)
- Background sheets (Handout 3). Alternatively, you can use a large white board or a blank A3 sheet (or two A4 sheets) and draw the background yourself.
- Material for drawing
- Tape
- Scissors

## GUARDNA cards

**Species Cards**
- Bowhead whale
- Killer whale
- Narwhal
- Ringed seal
- Walrus

**Stakeholder Cards**
- Consumers
- Hunters

**Uses Cards**
- Foods

## Background

A food web consists of all the interconnected food chains within a single ecosystem. Each organism in an ecosystem is part of multiple food chains, representing various paths that energy and nutrients can follow as they move through the ecosystem. These chains can range from simple and short to complex and lengthy. Together, all these overlapping food chains form a food web.

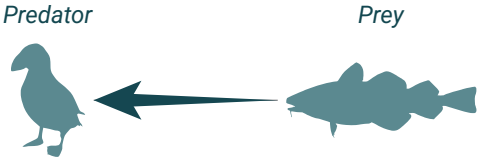
Food chains begin with primary producers, organisms that create their own food through photosynthesis by using sunlight and carbon dioxide ($CO_2$). The next level, known as primary consumers, consists of herbivores that eat the primary producers. Secondary consumers, which are carnivores or omnivores, feed on the primary consumers. Finally, tertiary consumers, or top predators, consume both primary and secondary consumers, maintaining balance within the food web.

## Preparation

1. Split the students in groups (4-6 students).
2. Print one set of Handouts 1, 2, 3 and 4 per group.
3. Cut out the sets of organisms in Handout 2.
4. Tape together the two parts of the background (Handout 3 and 4).

## Procedure

1. Distribute a set of organisms and the background to each group.
2. Let the students arrange the organisms. Have them tape the cut-outs of each organism in the appropriate place and draw arrows to illustrate the food web as they understand it (see example below). A short description of the food preferences of each organism can be found in Handout 1 and in the GUARDNA cards. Encourage students to do additional research if needed.
3. Each group presents their food web to the rest of the class.
4. Compare the groups' food web, and then provide the solution with an explanation (see the hints given in the Follow-up discussion section).
5. Leave one of the food webs on display for the entire classrom and continue with the Follow-up discussion section.




*Draw the arrows in your food chain following this example.*

### Follow-up discussion

- **In this activity, the students pictured a simplified version of the Arctic food web, which other animals or life stages would you add to the food chain?**
  In this activity, we presented a simplified version of the Arctic food chain. However, in reality, many marine and terrestrial animals are missing from this web. While it might not seem obvious, terrestrial (land) and marine food webs are very strongly connected. Some species can eat or be eaten by species outside the marine ecosystem. Using the food web in this activity for example, ringed seal pups can get eaten by gulls, Arctic foxes and wolves, and large ringed seals by walrus and Greenland sharks, which are not pictured here. Seabirds are also part of diet for some marine mammals, like killer whales.

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Animals at different life stages can also be placed in different positions in a food web. An example of this are fish larvae. They are not only important as they grow to be a fish, like cod, that is food for many animals; fish larvae themselves are also an important segment of marine food webs. They are a part of zooplankton and are prey species for gelatinous zooplankton , and smaller fish. There are other seal species, like harp seals, where adults are hunted by humans, killer whales and sharks, and pups are a prey for polar bears, foxes and wolves.

- **What would happen to the other animals in the marine food web if a large fish, for example cod, was overfished?** Remove the cod from the diagram to make it easier for your students to visualise the consequences of removing one animal from the food web.

  Because all the parts of food web are so well interconnected, removing one species can cause a domino effect and lead to disruption of the whole ecosystem, impacting biodiversity and the survival of other species in the food web.

  Let's take the cod as an example.

  Removing cod will lead to increase in the abundance of zooplankton which cod preys on. That will in turn cause decrease in phytoplankton mass because of overgrazing of zooplankton. The oxygen production will be affected with decrease of phytoplankton. Cod is also one of the most important prey species for larger animals, such as narwhal, seabirds, and ringed seals. Removing the cod from those food chains will lead to decrease in their numbers, and the numbers of their predators, like killer whales and polar bears. In the end, humans, who consume cod and other species preying on cod, will also be greatly impacted as they are one of the top predators in almost all of the food chains.

  Removing only one species lead to a whole cascade of events and disturbances. To keep the ecosystems healthy, it is important to maintain biodiversity—the variety of life in a specific ecosystem. Loss of biodiversity can have far-reaching consequences and makes ecosystems more fragile and vulnerable to disturbances. Each and every species in food web has its role, even if we do not see it immediately. This exercise highlights the importance of every species in maintaining the balance and health of ecosystems.

## Extension

- **Explore the impact of human activities on marine food webs.** Use and discuss the GUARDNA "Threat" cards to understand how pollution, overfishing, climate change, and other human activities affect the intricate balance of marine food webs.
- **Learn about ecosystem-based management.** Traditionally, scientists and managers focused on individual species when studying and proposing management regulations. However, as you have learned, ecosystems are complex and interconnected. Focusing solely on a single species without considering its relationships with other species and its role within the broader ecosystem can lead to poor management decisions. Today, management has shifted towards ecosystem-based management: an integrated approach that considers the entire ecosystem, including human impacts, in resource management decisions. This approach is guided by adaptive management principles, which allow for adjustments based on ongoing observations and feedback.

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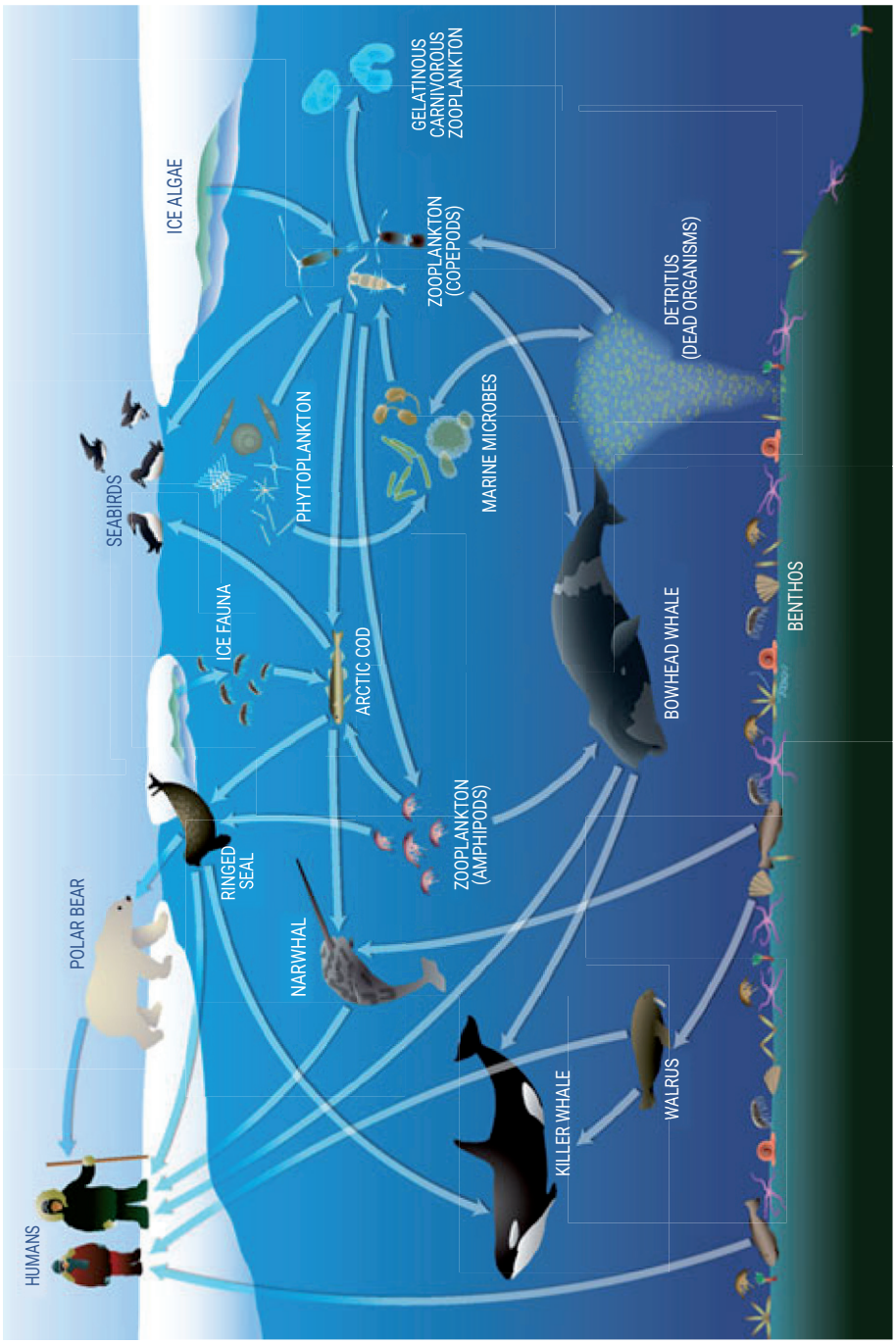
**The figure below shows a simplified example of the Arctic marine food web (modified from Darnis et al., 2012) and a potential solution for this exercise.**




## References


Darnis, G., Robert, D., Pomerleau, C. et al. (2012). Current state and trends in Canadian Arctic marine ecosystems: II. Heterotrophic food web, pelagic-benthic coupling, and biodiversity. *Climatic Change* 115, 179–205. https://doi.org/10.1007/s10584-012-0483-8