

2040 - Seaweed in the Food Chain



Name _____

Class _____

Teaching Sequence

Work through this resource material in the following sequence:

20 minutes	Preparation - Flipped classroom
10 minutes	Part A: Activating Prior Knowledge
15 minutes	Part B: Marine Food Webs
10 minutes	Part C: Collapsing Food Webs
30 minutes	Part D: Seaweed Solutions
5 minutes	Reflection

Preparation - Flipped classroom



If your class are already familiar with food web and food chains, you may choose to skip straight to Part B and allow students to spend even more time on their solutions!

Prior to participating in this lesson, students should complete the following flipped classroom activity. Students should watch the following two clips (in this order) and answer the related questions (also available on the Student Worksheet):

Clip 1 - [Fabulous Food Chains](#)

Clip 2 - [Home Sweet Habitat](#)

Questions:

- In your own words, describe a food chain.
- In your own words, describe a food web.
- What is the original source of all the energy in a food chain/web and why?
- What is at the bottom of an Arctic food web and how would you describe them?
- Why do you think we need food web models?
- Where does our understanding of ecosystems fit with our understanding of food chains?
- What vocabulary presented in these clips was new to you?
- What information presented in these clips are you unclear about? What would you like to know more about?
- Bonus question: How might studying food webs help us to understand some of the ways we can look after ecosystems?

Part A: Activating Prior Knowledge

Step 1.

Begin this lesson by inviting students to share their thoughts in response to the two clips they watched and their answers to the associated questions. Explain to students that they will be using the concepts presented in these clips in this lesson, so encourage students to share when they need more information or when they are unclear about something. Below are some suggested answers to the questions they were given:

- In your own words, describe a food chain.

Suggested answer: A food chain is a model that shows how energy flows between living things in an ecosystem. Energy in a food chain starts with the sun whose rays are converted into chemical energy by plants. The energy is then transferred up the food chain when animals eat the plants and bigger animals eat those animals.

- In your own words, describe a food web.

Suggested answer: A food web is a representation of how organisms within an ecosystem receive and transfer energy. It is a more complex representation as it shows a range of living things and how they all interact with one another.

- What is the original source of all the energy in a food chain/web and why?

Suggested answer: Plants take the energy from the sun's rays and convert it into chemical energy, such as Carbon Dioxide, water, light, sugar and oxygen.

- What is at the bottom of an Arctic food web and how would you describe them?

Suggested answer: Phytoplankton. Some are bacteria, some are protists, and most are usually single-celled plants.

- Why do you think we need food web models?

Suggested answer: Many animals within an ecosystem have multiple sources of food which may also be food sources for other animals. Food chain models are a linear representation of the flow of energy and so are limited in terms of understanding ecosystems; food web can show complexity around the flow of energy and can help us to better understand the ecosystem as a whole.

- Where does our understanding of ecosystems fit with our understanding of food chains?

Suggested answer: All living things in a habitat interact with other living and non-living things in that area, forming a system called an ecosystem. Food chains help us to understand what eats what in an ecosystem and how energy flows within an ecosystem.

- What vocabulary presented in these clips was new to you?

- What information presented in these clips are you unclear about? What would you like to know more about?

- **Bonus question:** How might studying food webs help us to understand some of the ways we can look after ecosystems?

Suggested answer: By studying food webs we can understand where ecosystems might be vulnerable to things like pollution or climatic changes. This means we can take action to protect the vulnerable elements of that ecosystem.



You could add any new vocabulary identified by students to your class glossary. You could record things students would like to know more about and use these to guide further inquiry or as homework tasks.

The following factsheets may also be useful here:

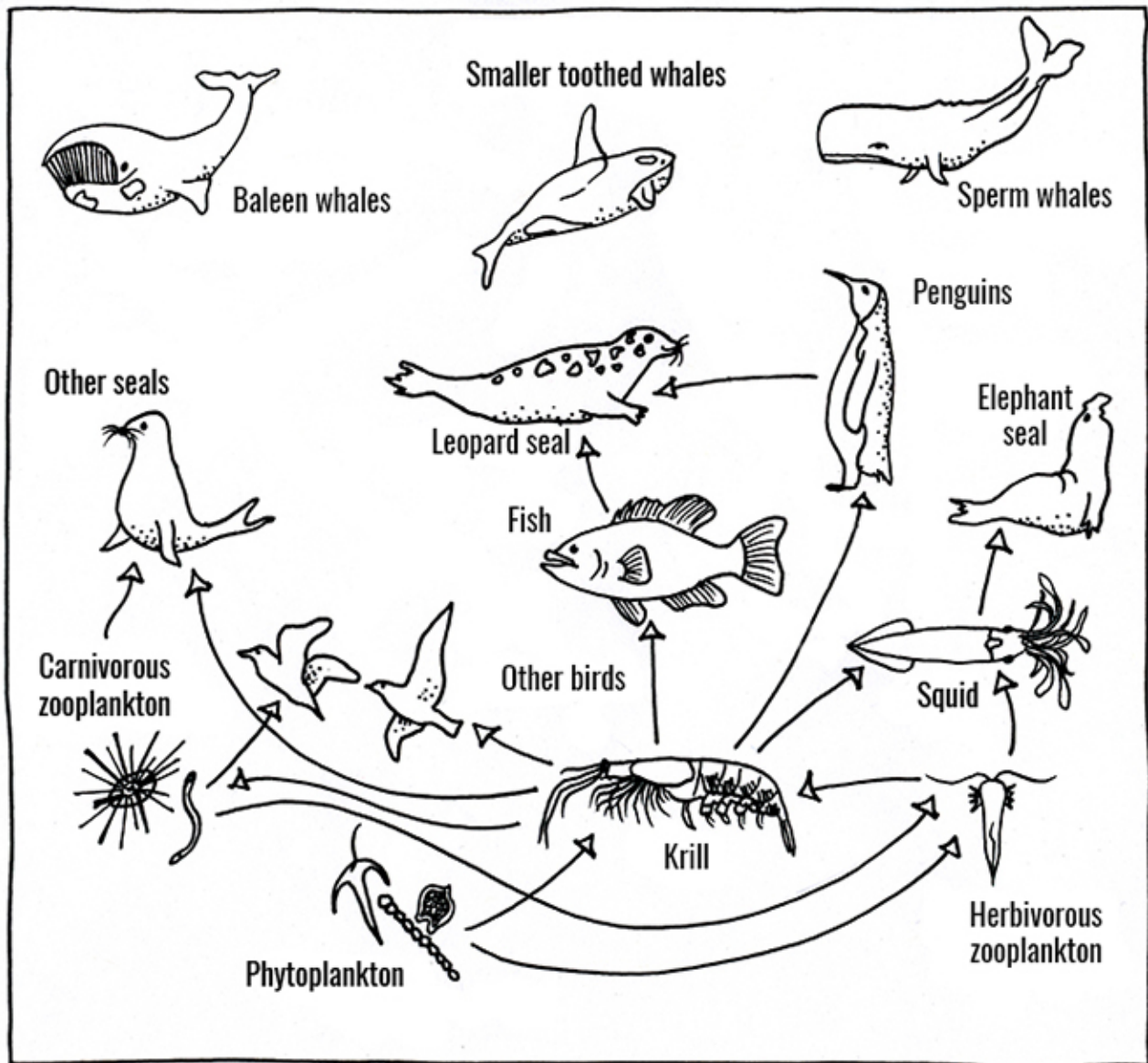
- [Food chains and food webs](#)
- [Trophic levels](#)

Part B: Marine Food Webs

Step 1.

Explain to students that there are many different ecosystems that could be used to demonstrate food chains and food webs. In this lesson, they will be focusing on marine ecosystems.

Share the [following image](#) with students, explaining that it shows some of the organisms you might find in a marine food web (image also available on the Student Worksheet):

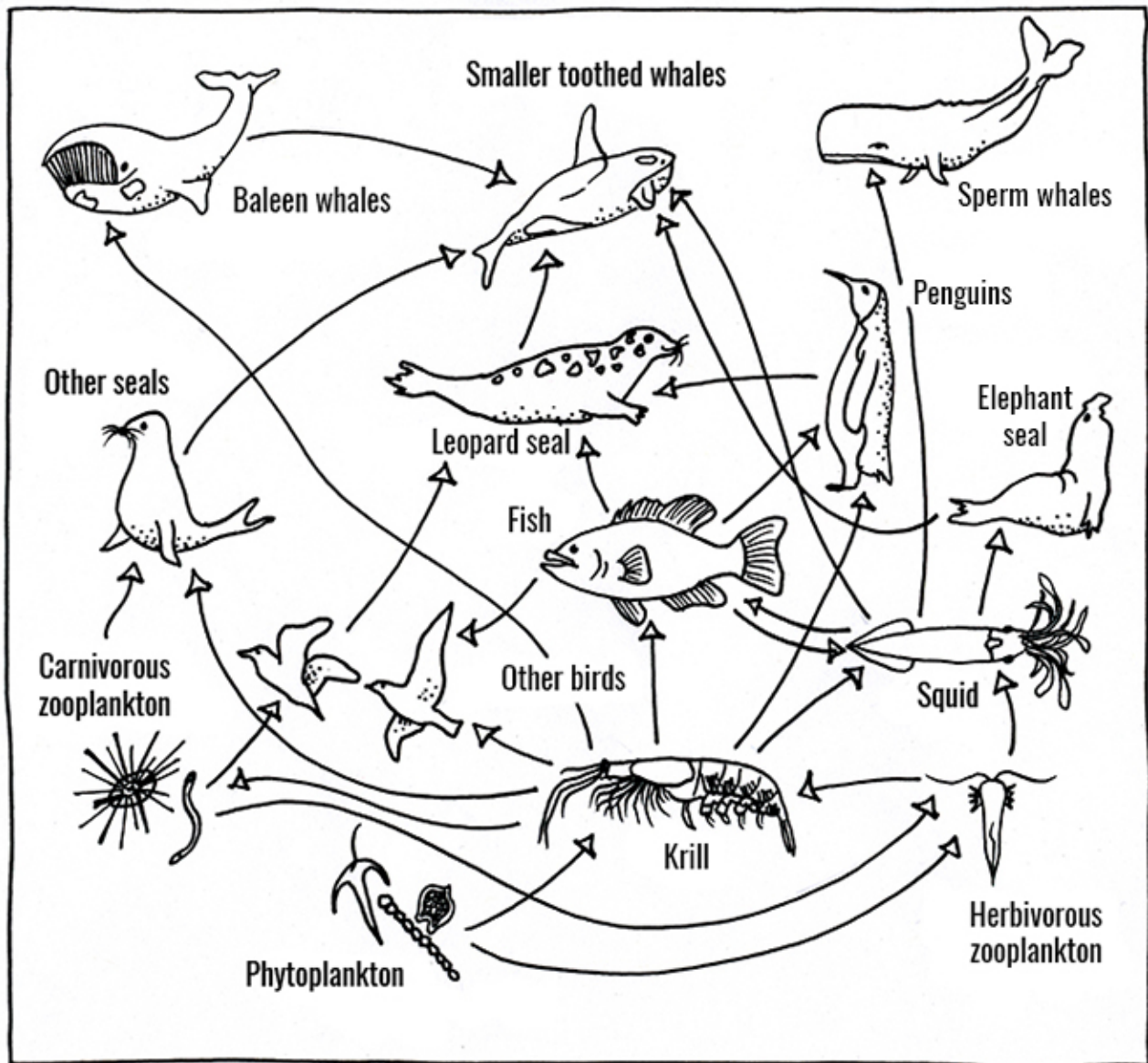


Working in pairs or as a class, invite students to add arrows to complete the flows of energy in this food web.



When creating a food chain or food web you use arrows to show the direction the energy flowing. It is important to note that the arrow always points to the animal that has just eaten something, as this shows the flow of energy.

Once complete, share the [following image](#) with students, and take some time to discuss and compare student work with the answers below:



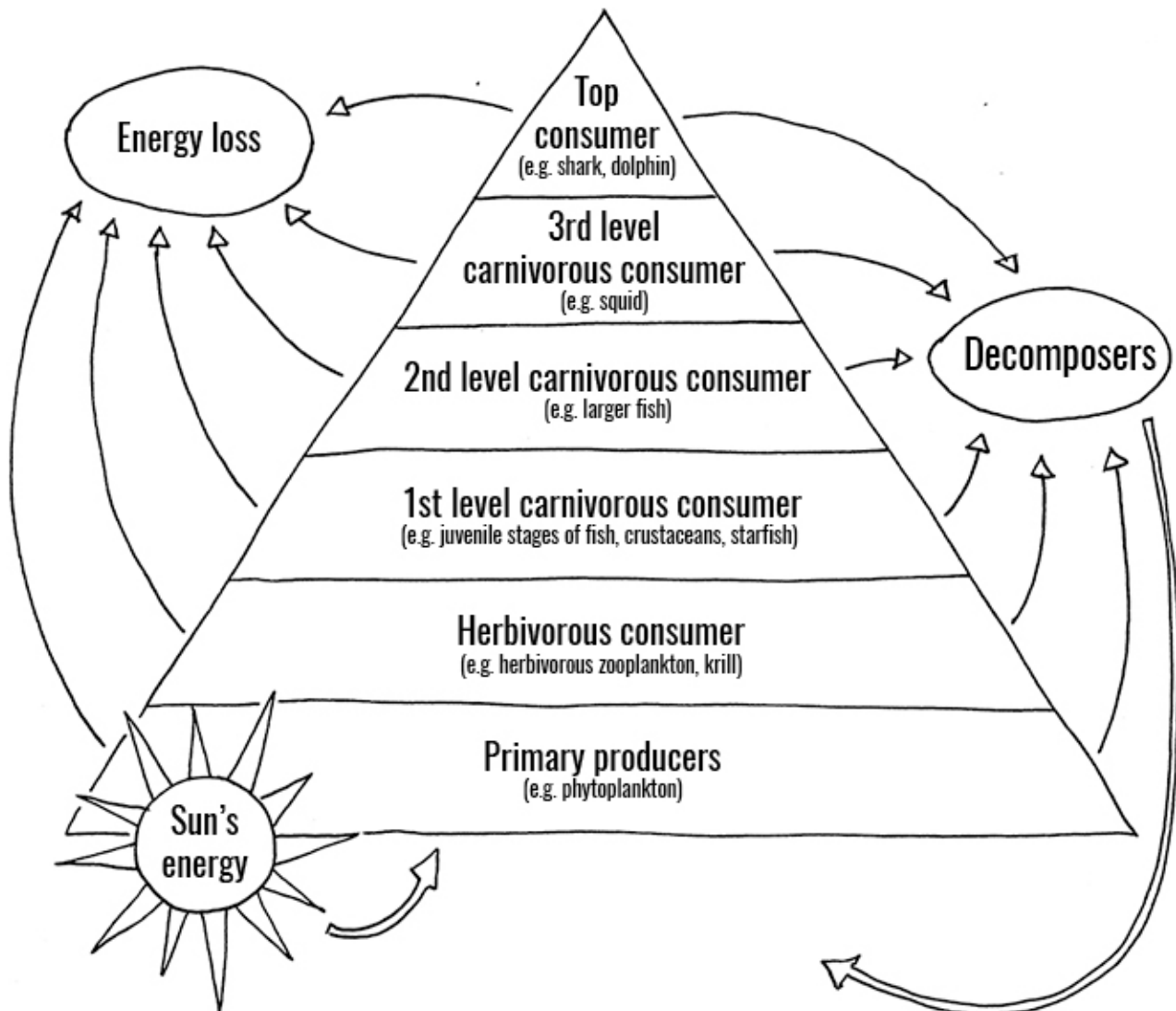
Through your discussion, invite students to suggest which organisms they believe are:

- At the top of the food web
- At the bottom of their food web.

Suggest to students that those organisms at the top of the food web are those that are not consumed by any other organisms. Those at the top are called 'top consumers'. The organisms at the bottom of the food web are those that get their energy from the sun, not from other organisms. Those at the bottom of the food web are called 'primary producers'.

Step 2.

Project the [following image](#), explaining that it describes the trophic levels present in food webs. A trophic level refers to the position an organism occupies in the food chain. For example, a primary producer - such as a plant - is at the bottom of the food chain. A carnivore is at the top of the food chain.



Invite students to work as a class to discuss this image.

EXTEND: Invite students to refer again to the Marine Food Web from earlier, and to annotate this image to include the trophic level of each organism.

Part C: Collapsing Food Webs

Step 1.

Explain to students that they will now explore the importance of the different organisms in the food chain.

Break the class into pairs and give each pair a copy of this worksheet, [Marine food webs activity](#). Students should work in their pairs to (following instructions also available on the Marine Food Webs activity sheet):

1. Cut out each of the organisms at the bottom of this sheet.
2. Try to match the organisms to their position on the blank food web below. Glue or tape the organisms in place.
3. Once complete, students should work in their pairs to discuss and record their responses to the following questions:
 - What do you think might happen if the smaller toothed whales in this food web went extinct? How would the food web respond? Explain your answer.
 - What do you think might happen if fish stocks plummeted drastically? How would the food web respond? Explain your answer.
 - What would happen if algae were removed from this food web? How would the food web respond? Explain your answer.
 - Based on your answers, which scenario do you think would have the biggest impact? Would it be worse if a producer or consumer disappeared?



As students work, remind them of what the arrows in the food web indicate (i.e. the direction of energy flow).

Once complete, invite pairs to share the answers to these questions with the class. The aim of this activity is to demonstrate the importance of those organisms at the bottom of the food web: without primary producers like algae and zooplankton, we would probably see animals higher up the food chain disappear.

Part D: Seaweed Solutions

Step 1.

Now explain to students that marine ecosystems are increasingly under pressure from human activities, such as:

- *Rising ocean temperatures* – Global warming is causing temperatures to rise in the oceans.
- *Ocean acidification* – Human activities cause more greenhouse gases to be released into our atmosphere. One of these greenhouse gases is CO₂. Oceans absorb CO₂, causing a change in the chemical composition of the oceans. Our oceans are becoming more acidic, resulting in changes to shellfish and coral reefs. Find out more about ocean acidification here: [Ocean Acidification Factsheet](#).
- *Pollution* – There are several different types of pollution that affect marine environments, including chemical pollution, plastic waste, and sediments that wash into coastal environments from terrestrial activities.
- *Over-fishing* – Over-fishing affects marine environments in many ways, including by removing important parts of the food chain.

NOTE: Further information about some of the human activities that can cause these issues can be found [in this lesson](#).

However, there are some human activities that could help to improve ocean health by supplementing the bottom of marine food chains. In addition, this activity could also help humans. Explain to students that they will now watch a clip from the 2040 documentary that describes seaweed farming and the benefits to humans and our environment.

Before you watch this clip, invite students to share what they already know about seaweed. You can then explain the following:

- Seaweeds are actually algae. The term seaweed refers to several groups of multicellular algae, including red algae, green algae, and brown algae.
- Some seaweed species - such as kelp - provide essential nursery habitats for many marine species including juvenile fish and marine mammals.
- Some seaweed species are important food sources for marine animals.
- Seaweeds have two specific requirements in terms of growth;
 1. They need seawater (or at least brackish water) and
 2. They need sunlight to drive photosynthesis. Many also require a firm attachment point (like a rock) although there are some species that float freely.
- Ocean algae (from seaweeds to planktons) produce up to 90 percent of our Earth's oxygen.
- Some species of kelp grow as much as 60cm per day and may grow to be as tall as 45 metres.

Step 2.

Now watch the following clip with students. As they watch, invite students to record anything that they think relates to food chains and food webs. In addition, students should be encouraged to record anything they find interesting or important:



2040 – Seaweed as Food Password: 2040EDU

Once complete, invite students to share their thoughts about this clip through class discussion. Consider some of the following questions in your discussion:

- What is this clip about? What happened in this clip?
- How does this clip relate to marine food chains and food webs?
- How do you think marine aquaculture and seaweed farming could help marine health?
- What did you find interesting or important about this clip?
- What would you like to know more about?
- What other actions do you think humans could take to improve marine environments, and in particular, marine food webs?

Explain to students that in the final activity they will focus on this last question.

Step 3.

Invite students to work in groups to undertake research and find out what other actions humans can take to improve the health of marine environments and how these actions might benefit marine food webs. Students could create:

- A scientific poster
- An infographic - [this website](#) may be useful in creating an infographic

Students could focus on particular species, explaining what actions can be taken to improve habitat health and numbers for this species, and then describing how improving habitat health for this species will benefit other organisms in this food chain. Alternatively, students could focus on habitats - such as coastal or coral reef – and explain how improving these habitats will benefit food chains within these habitats.

Step 4.

Invite students to share their work through a gallery walk:

Gallery walk

A gallery walk enables students to provide feedback on their peers' work. Display students' work around the classroom and place a piece of blank paper next to each work to collect votes on. Invite students to move around the room viewing each others' work, then vote for their three favourite posters.

As an extension, students could also record one thing they like about the posters displayed, one thing they wonder, and one thing that may improve the work.

Reflection

Invite students to work independently to respond to the following question (also available on the Student Worksheet):

- How does thinking about ecosystems in terms of food webs and food chains help you understand how we can care for these ecosystems? Provide an example.

Take It Further

To expand on student's learning in this activity, consider following up with this lesson; [2040 Vision For Your Community](#).

Teacher Reflection

Take this opportunity to reflect on your own teaching:

- What did you learn about your teaching today?
- What worked well?
- What didn't work so well?
- What would you share?
- Where to next?
- How are you going to get there?

What's Your 2040?

Record your students' work in their communities with the hashtag #whatsyour2040 and share their visions in the '2040: [The Regeneration' Facebook Group](#).

The 2040 crew would love to see your class's work.

These lessons have been created in partnership with

2040, Good Thing Productions

