**ACTIVITY: Investigating toxins and bioaccumulation**

**in marine food webs**

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| **Activity idea**In this activity, students learn about feeding connections (food webs and food chains) within a marine ecosystem and then observe how toxins bioaccumulate as they are passed through these connections.By the end of this activity, students should be able to:* use content vocabulary associated with food webs and bioaccumulation
* begin to interpret marine food web diagrams
* use an interactive to view how toxins bioaccumulate within food webs and food chains.
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[Introduction/background](#paoruzv37wp6)

[What you need](#axvn1d2hvcf5)

[Teaching suggestions](#qve6hny5gna8)

[What to do](#7k0di351i5z7)

[Extension ideas](#8fot33akj460)

## Introduction/background

Bioaccumulation is the process by which compounds accumulate or build up in an organism at a rate faster than they can be broken down. Very tiny phytoplankton cells (a type of microscopic algae) can produce potent toxins. Phytoplankton is eaten by zooplankton (tiny microscopic animals). The toxins don’t seem to harm these small creatures.

Although the toxin produced by one phytoplankton cell is minuscule, it can accumulate quickly through the food web as each consumer takes in more and more of the toxin. The larger animals get the bigger doses of accumulated toxin. Some deaths of whales and sea lions have been attributed to this process. In many cases, toxins can be transported through the food web to humans, often through contaminated shellfish.

## What you need

Images

* [Marine trophic pyramid](https://www.sciencelearn.org.nz/images/379-marine-trophic-pyramid)
* [Marine food web](https://www.sciencelearn.org.nz/images/380-marine-food-web)
* [Tuna sandwich](https://www.sciencelearn.org.nz/images/145-tuna-sandwich)

Articles

* [Toxins and food webs](https://www.sciencelearn.org.nz/resources/367-toxins-and-food-webs)
* [Monitoring shellfish](https://www.sciencelearn.org.nz/resources/372-monitoring-shellfish)

Interactive

* [Bioaccumulation in the sea](https://www.sciencelearn.org.nz/image_maps/119-bioaccumulation-in-the-sea)

## Teaching suggestions

## What to do

1. Use the images [Marine trophic pyramid](https://www.sciencelearn.org.nz/images/379-marine-trophic-pyramid), [Marine food web](https://www.sciencelearn.org.nz/images/380-marine-food-web) and [Tuna sandwich](https://www.sciencelearn.org.nz/images/145-tuna-sandwich) to:
* Discuss marine food web concepts. Pay special attention to the arrows within the food web – they represent the transfer of energy and always point away from the organism being eaten to the one that is doing the eating. The arrows do not show who eats whom.
* Make observations about the way the information is presented in each of the diagrams. Consider how the representations get the message across and why it’s been presented in this particular way.
* Build a list of content vocabulary associated with food webs.
1. Discuss students’ understanding or experience of food poisoning from seafood. Discuss how this might be related to marine food webs. The articles [Toxins and food webs](https://www.sciencelearn.org.nz/resources/367-toxins-and-food-webs) and [Monitoring shellfish](https://www.sciencelearn.org.nz/resources/372-monitoring-shellfish) provide useful background information.
2. Use the [Bioaccumulation in the sea](https://www.sciencelearn.org.nz/image_maps/119-bioaccumulation-in-the-sea) interactive to view how toxins bioaccumulate as they are passed through food webs.
3. Discuss the ways that toxins are able to move through various food chains within the food web.
4. Consider solutions to this problem, for example: ways to prevent harmful algal blooms, ongoing monitoring to alert people to potential blooms/problem areas, rahui, etc.

## Extension ideas

1. Research harmful toxic blooms in your local area. These can be associated with the marine environment or freshwater systems if you live away from the coast.
* What were the causes?
* What were the consequences?
* Did people have to change their behaviour, for example: avoid swimming or fishing in the area or keep pets away?
* Is this an ongoing issue? If so, create a timeline of events.
* What actions can you take to inform others about the issue?
1. Research [Land Air Water Aotearoa (LAWA)](https://www.lawa.org.nz/). Find out about the water quality in your local area, which places are suitable for swimming and which places are off limits.