

BIOACCUMULATION ACTIVITY

BACKGROUND

FOOD CHAINS /FOOD WEBS

Food chains are a simple way to describe how energy and nutrients move through the ecosystem; or “who eats whom”. The bottom of the food chain is dominated by large numbers of small organisms like plankton. As the chain grows in length, the size of the animals at each level increases, i.e. larger animals eat smaller ones. Interlocking food chains form complex food webs. Food webs are formed because most animals rely on multiple types of food, and help us conceptualise the interconnected nature of ecosystems.

MARINE POLLUTION

Increasing quantities of pollutants (e.g. plastics, oils, industrial waste, agricultural chemicals, untreated sewage) are dumped directly in the sea – or slowly travel there via rivers, runoff and atmospheric deposition. Once released into the environment, recovery is difficult and can continue to cause harm years later. The effect of these pollutants on marine organisms is difficult to measure, but they are known to cause abnormalities (e.g. weakening, hormonal imbalance) and chronic health problems (e.g. neurological disorders, cancer), and in large quantities, can cause immediate death.

BIOACCUMULATION

Minute quantities of toxins in the sea are picked up by marine plankton, which are then eaten by fish and squid and these in turn are eaten by top predators, such as whales, dolphins and sharks. In this way, high concentrations of toxins build up in the body of animals at the top of the food chain. This build-up increases with age and may be passed on from one generation to another. For example, a lactating female whale may deliver high concentrations of toxins to her calf through her milk.

BIOACCUMULATION ACTIVITY

The following activity can be used to explain and visualise bioaccumulation in the classroom. This activity is designed for students Year 4 – 8, and can be used as a follow up or extension activity to creating food chains and food webs.

BIOACCUMULATION ACTIVITY

INSTRUCTIONS

OBJECTIVE

To explain a basic food chain in the marine environment, and the effects of toxins on this system, particularly the build-up of toxins in larger animals (bioaccumulation).

MATERIALS

- The species cards: print these and double-sided, so when cut, one side identifies the organism, and the other explains what they eat and what they are eaten by.
- Pieces to represent toxins (supply your own - e.g. plastic counters, table tennis balls, small rocks, crumpled up balls of paper).

METHODS

- Give every student a card - starting with the larger animals - hand out the shark and large fish first, then make sure there are less little fish than zooplankton, and less zooplankton than phytoplankton.
- If you need more cards for a larger group, print out more phytoplankton and zooplankton cards.
- The idea is to create a "pyramid" shape of students.
- Pass one of each "toxin" to the phytoplankton students.
- These students are then "eaten" by the zooplankton, and so pass the "toxin" on to them.
- Continue passing the "toxins" higher up the food chain, until the one student who is the shark holds all of the "toxins".

DISCUSSION POINTS

Have the students brainstorm answers for the following questions as a class or in small groups. You could then have them do some research to confirm their predictions.

- What effects do you think toxins might have on marine species?
- What are the potential sources of marine toxins in your local area?
- Should we be concerned about pollution sources in Aotearoa New Zealand and globally?
- Why are top predators typically more vulnerable to toxins than species lower in the food web?
- Are all toxins in the marine environment a result of human activity?
- How do marine toxins affect biodiversity? And why is biodiversity in the marine environment so important?
- How do marine toxins affect us as humans?
- What could we do to try and remove some of the toxins from the marine environment? How can we care for our ocean?



PHYTOPLANKTON

MEROITI TIPU



PHYTOPLANKTON

MEROITI TIPU



PHYTOPLANKTON

MEROITI TIPU



PHYTOPLANKTON

MEROITI TIPU



PHYTOPLANKTON

MEROITI TIPU

I MAKE MY OWN FOOD
I AM EATEN BY ZOOPLANKTON

I MAKE MY OWN FOOD
I AM EATEN BY ZOOPLANKTON

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PHYTOPLANKTON MEROITI TIPU



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PHYTOPLANKTON MEROITI TIPU

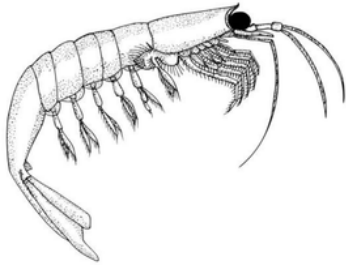
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I AM EATEN BY ZOOPLANKTON

I MAKE MY OWN FOOD
I AM EATEN BY ZOOPLANKTON

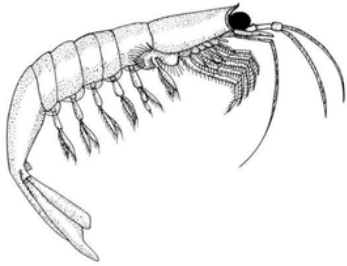
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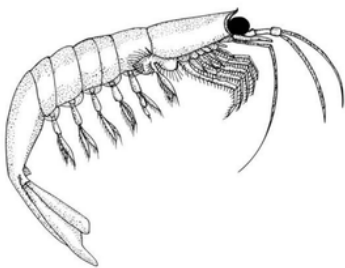
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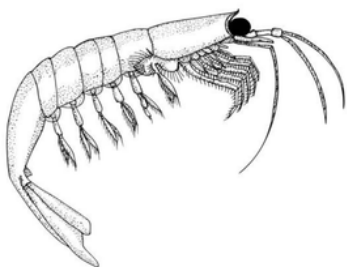
ZOOPLANKTON
MEROITI IKA



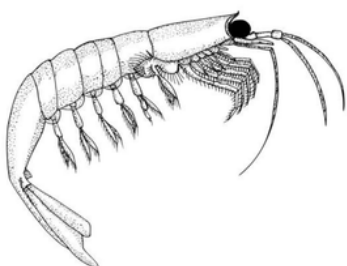
ZOOPLANKTON
MEROITI IKA



ZOOPLANKTON
MEROITI IKA



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MEROITI IKA



ZOOPLANKTON
MEROITI IKA

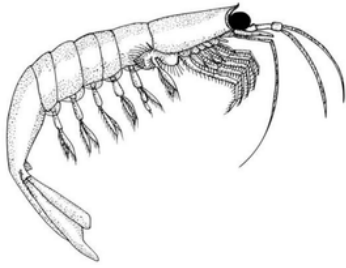
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I AM EATEN BY SMALL FISH

I EAT PHYTOPLANKTON
I AM EATEN BY SMALL FISH

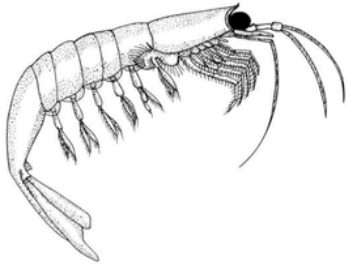
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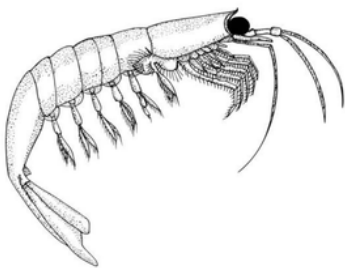
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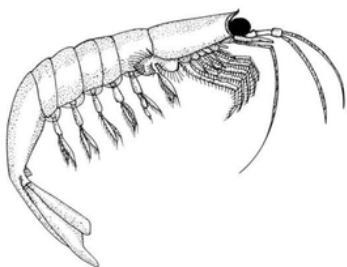
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MEROITI IKA



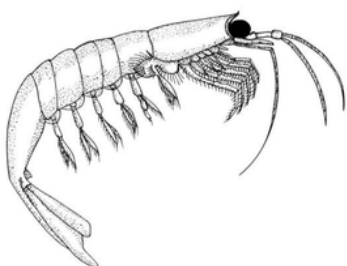
ZOOPLANKTON
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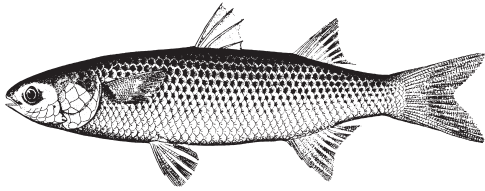
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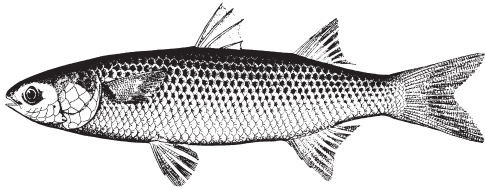
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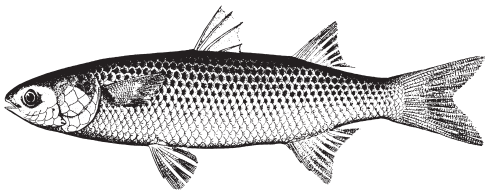
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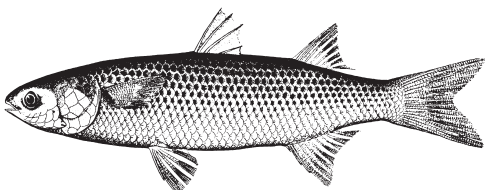
SMALL FISH
IKA ITI



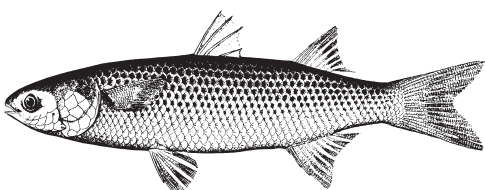
SMALL FISH
IKA ITI



SMALL FISH
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SMALL FISH
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SMALL FISH
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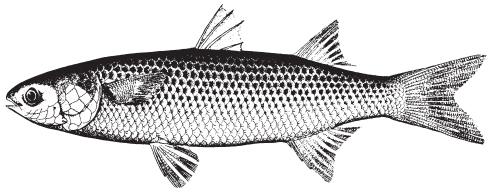
I EAT ZOOPLANKTON
I AM EATEN BY LARGE FISH

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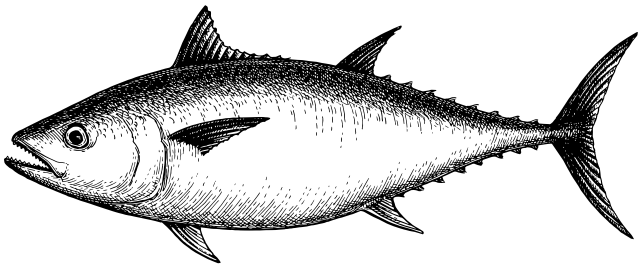
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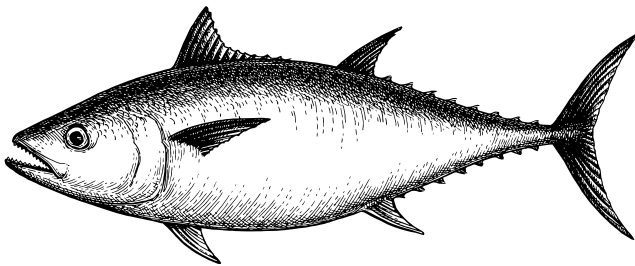
I EAT ZOOPLANKTON
I AM EATEN BY LARGE FISH



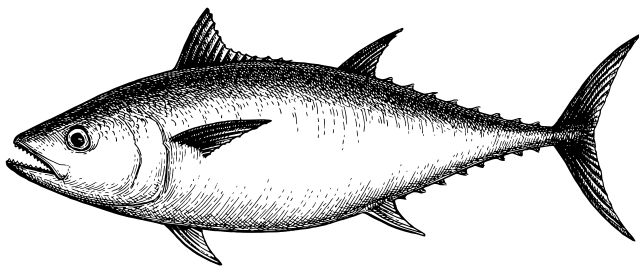
SMALL FISH
IKA ITI



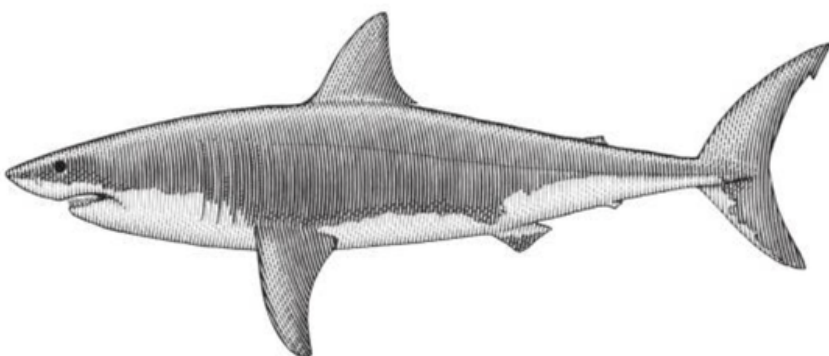
LARGE FISH
IKA NUI



LARGE FISH
IKA NUI



LARGE FISH
IKA NUI



SHARK
MANGŌ

I EAT ZOOPLANKTON
I AM EATEN BY LARGE FISH

I EAT SMALL FISH
I AM EATEN BY SHARK

I EAT SMALL FISH
I AM EATEN BY SHARK

I EAT SMALL FISH
I AM EATEN BY SHARK

I EAT LARGE FISH
I AM NOT EATEN BY ANYTHING