

Chapter 20

ORGANISMS AND THEIR ENVIRONMENT



The environment is made of many different types of **ecosystems**, such as seashores, forests, lakes and deserts.

Each ecosystem can be divided into a:

- **habitat** – the non-living (**abiotic**) part, i.e. the physical area in which organisms live
- **community** – the living (**biotic**) part, i.e. all the different organisms living in that particular habitat.

Each community is made up of many different populations. A **population** is all the members of a particular species living in one habitat – for example, the population of red squirrels in an oak wood.



Match each ecological term to its definition

ecosystem

all populations of all organisms in an ecosystem

habitat

the living and non-living parts of a specific area

community

all members of one species in an ecosystem

population

the role of one species within an ecosystem

niche

the non-living part of an ecosystem



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Different types of organism can be grouped in several ways. One grouping system is based on how organisms obtain their food.

Some organisms produce their own food. They are called **producers**.



Plants produce their own food using light energy from the Sun. Some types of bacteria can also make their own food by using light or chemical reactions.

Other organisms cannot make their own food. They are called **consumers**.



Is each organism a producer or a consumer?

producer

dandelion ✓

rosebush ✓

holly ✓

cedar tree ✓

consumer

koala ✓

shark ✓

tiger ✓

eagle ✓

Well done! ✕

?

C

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↶

Consumers can be grouped into different types:

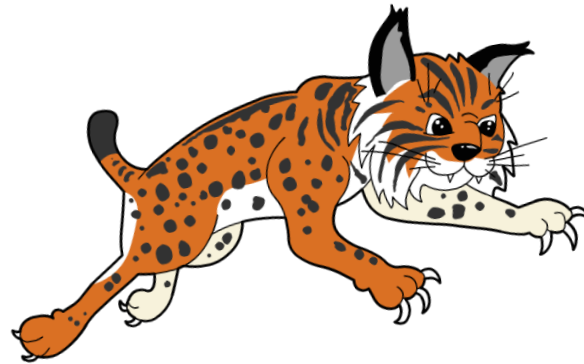
Herbivores

These consumers eat producers.



Carnivores

These consumers eat other consumers.



Omnivores

These consumers eat other consumers and producers. Omnivores eat animals and plants. Most humans are omnivores.



What is the definition of each feeding type?

carnivore

An organism that only eats other consumers.

consumer

An organism that produces its own food.

herbivore

An organism that only eats producers.

omnivore

An organism that eats consumers and producers.

producer

An organism that cannot make its own food.



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Predator-prey relationships

Animals that are high up in food chains, such as the fox, tend to be hunters that are skilled at locating and killing their food. These hunters are called **predators**.



The animals on which the predator feeds are called their **prey**.

Prey animals tend to be well adapted to avoid the predator.

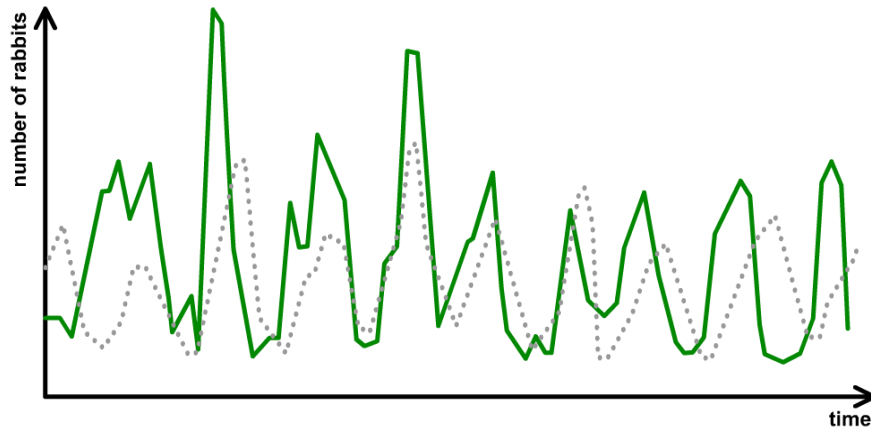


Common prey adaptations include camouflage or the ability to produce poisonous toxins.



Prey population changes

The relationship between predator and prey population numbers in a food web is very close and follows a cyclical pattern. This means that it rises and falls in a fairly regular cycle. Why is this?



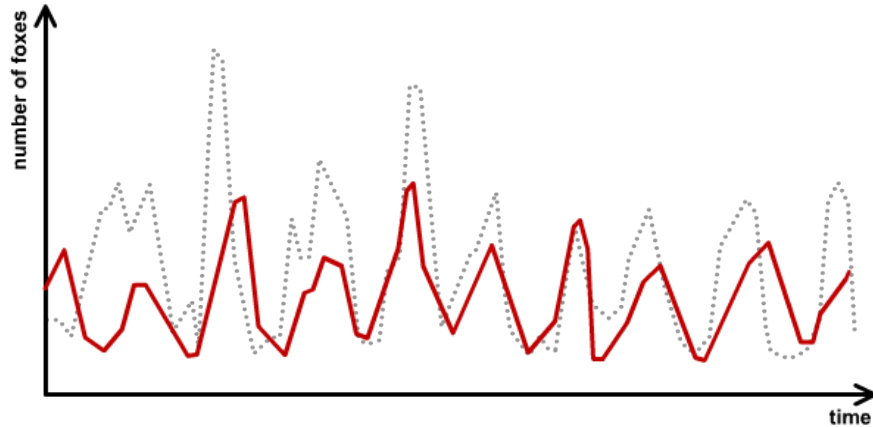
The rabbit population changes due to both the vegetation growing season **and** changes in the fox population.

Individual rabbits must compete for food and mates, and must also avoid being killed by their predators, the foxes.



Predator population changes

The fox population also follows a cyclical pattern very similar to the rabbit population. Why is this?



The fox is very dependent on rabbits for food, so as the rabbit population changes so does the fox population.

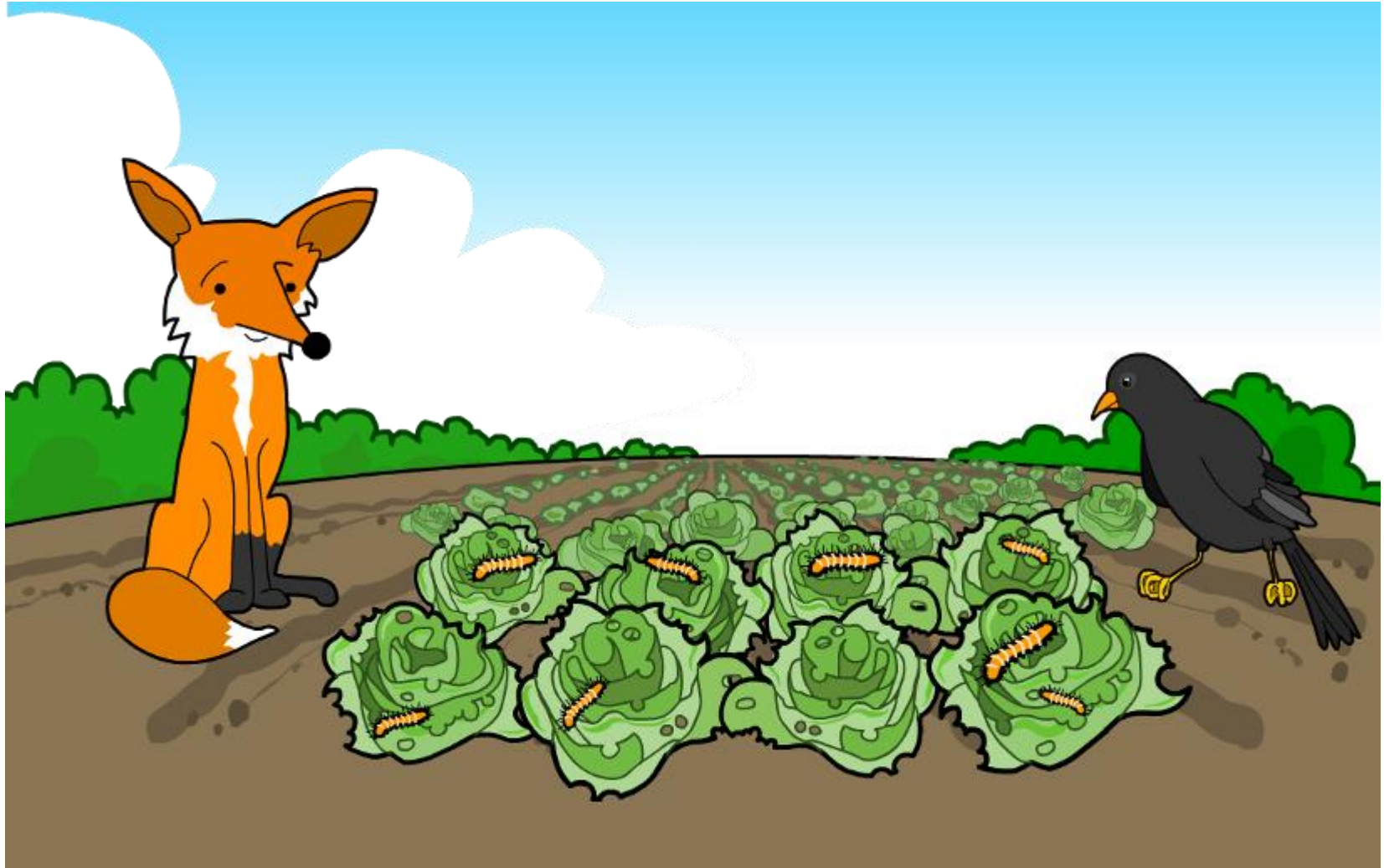
This is why the fox population rises and falls slightly after the rise and fall of the rabbit population.

How do cyclical rises and falls in population numbers affect the organisms in a larger food web?

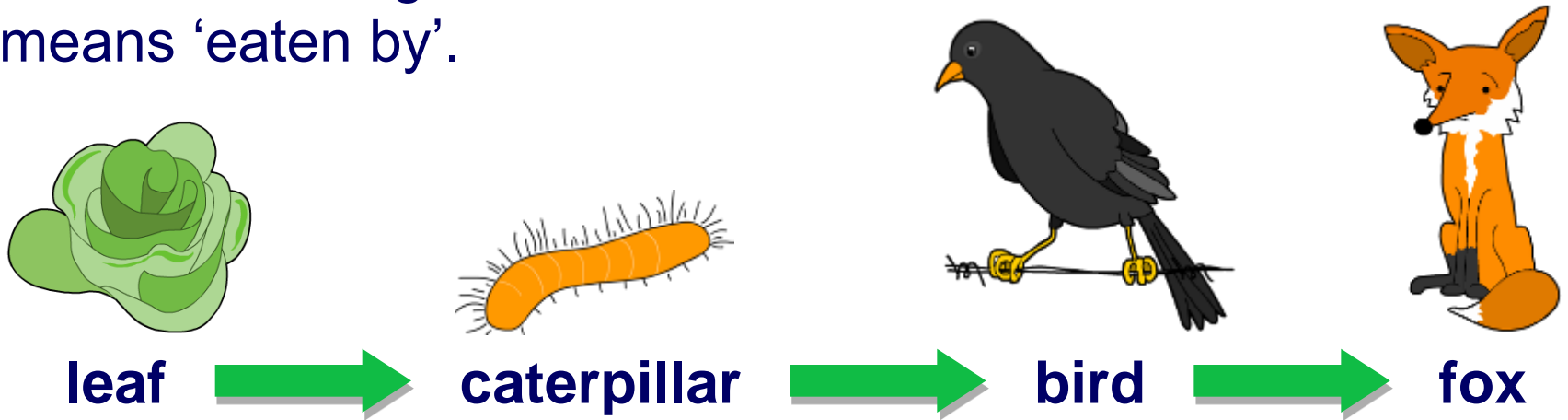


Food chains – who eats what?

Can you see a food chain in this habitat?



A food chain is a sequence that shows how each individual feeds on the organism below it in the chain. Each arrow means 'eaten by'.



What does this food chain show?

A leaf is eaten by a caterpillar, which is then eaten by a bird, which is then eaten by a fox.

Energy is transferred from one organism to another in the direction of the arrow.

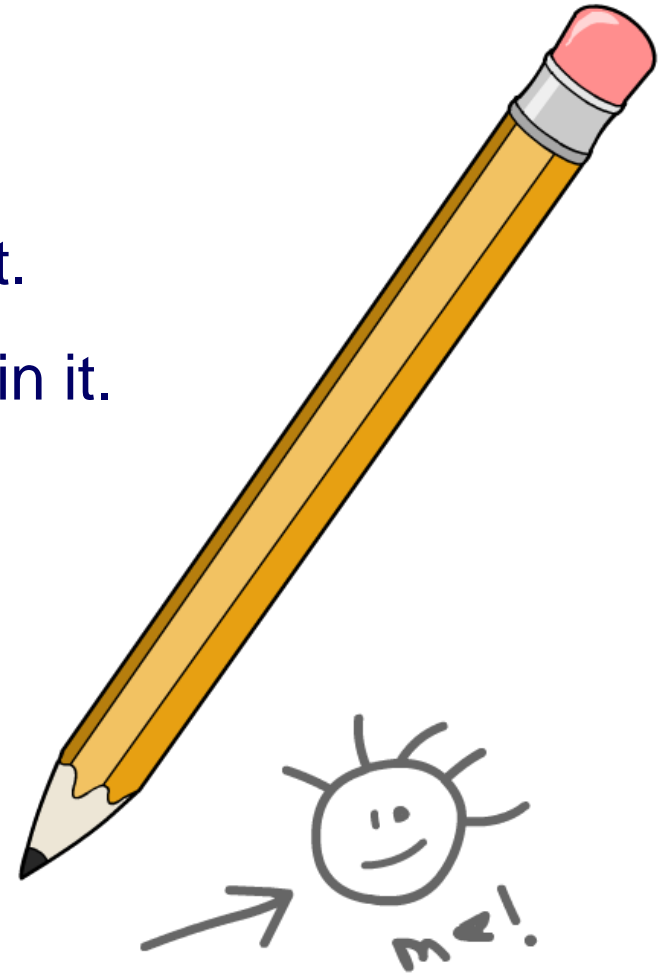


Food chains – draw your own

Draw your own food chains based on the following guidelines:

- A food chain from a **forest** habitat.
- A food chain from an **ocean** habitat.
- A food chain with **four organisms** in it.
- A food chain that ends with **you!**

Use arrows () to show the transfer of energy between the organisms that you choose.



Building an Antarctic food chain

Read the following information about which species feed on the organisms below it, and draw a food chain that shows the feeding relationships in this habitat.

Click "**start**" to begin.



start

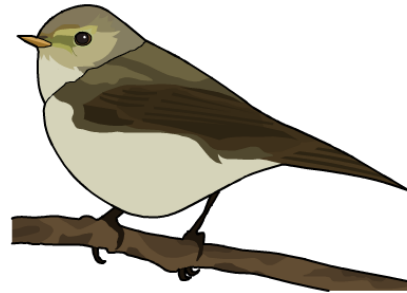


Producer, herbivore or carnivore?

Food chains always start with a **producer**.

If the producer is a plant, only a small part of it might be involved in the food chain, such as its seeds, fruits, leaves or even dead leaves.

From a food chain, we can tell if an organism is a **producer**, a **herbivore** or a **carnivore**.



leaf



snail



bird



owl

What are the feeding types of the animals in this food chain?



Name that feeding type

What is the feeding type of each organism?



seaweed

producer ✓



limpet

herbivore ✓



crab

carnivore ✓

Well done! ✗



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Ranking consumers

Consumers eat plants or animals, or both. A food chain can be used to rank different types of consumers.



seaweed



limpet



crab



human

producer

**primary
consumer**

**secondary
consumer**

**tertiary
consumer**

- Producers – make their own food.
- Primary consumers – eat producers.
- Secondary consumers – eat primary consumers.
- Tertiary consumers – eat secondary consumers.



Primary, secondary or tertiary?

What is the feeding type of each organism?



tree



moth



blue tit



owl

producer ✓

primary
consumer ✓

secondary
consumer ✓

tertiary
consumer ✓

Well done! ✗



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What is a food web?

Why is it a good idea for an organism to have different sources of food? Animals usually eat many different things and are involved in lots of different food chains:

plants → aphid → ladybird → blue tit → owl

plants → moth → blue tit → owl

plants → vole → stoat

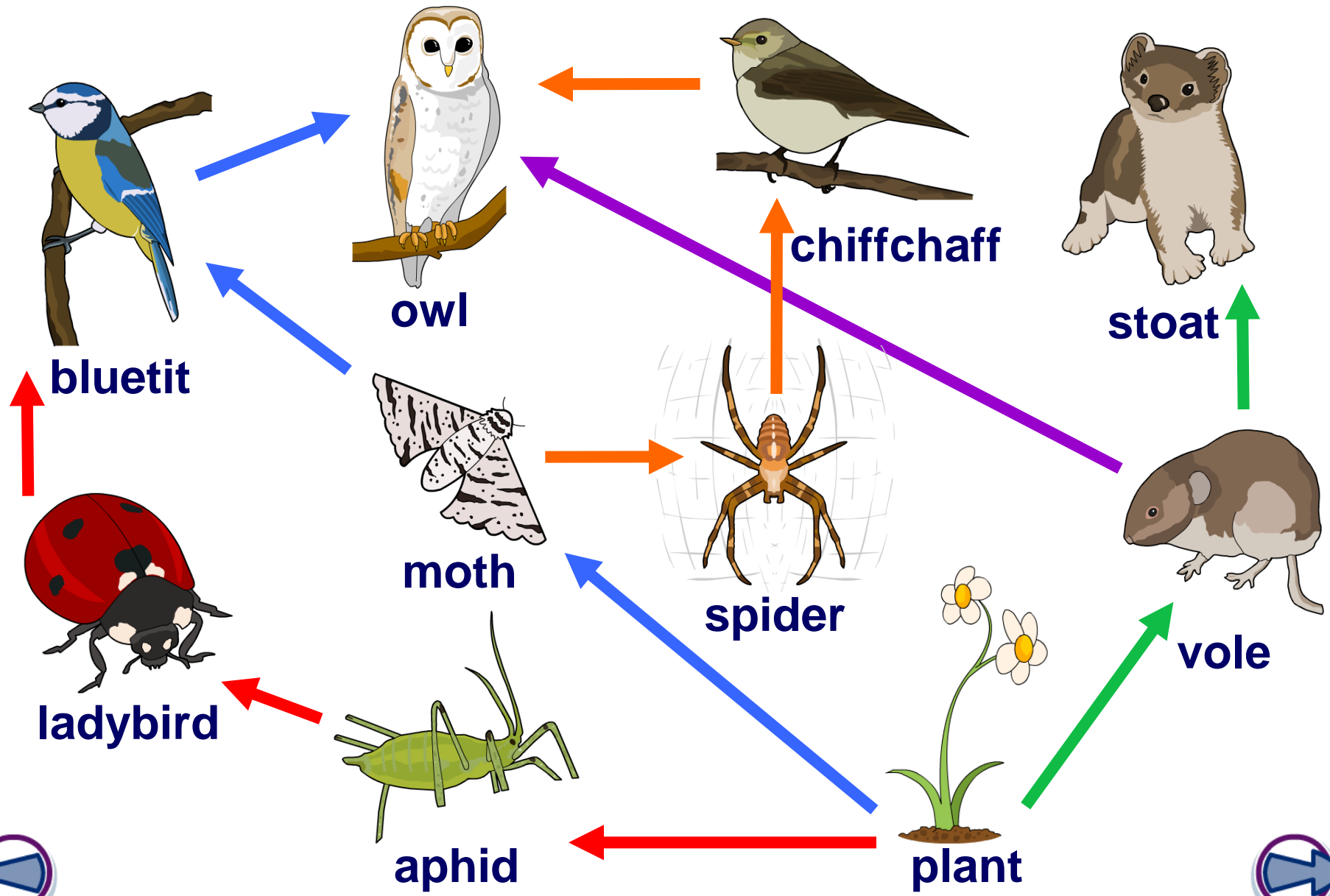
plants → vole → owl

These food chains can be put together in a **food web**, which shows how the food chains are connected.

What would the food web for these food chains look like?

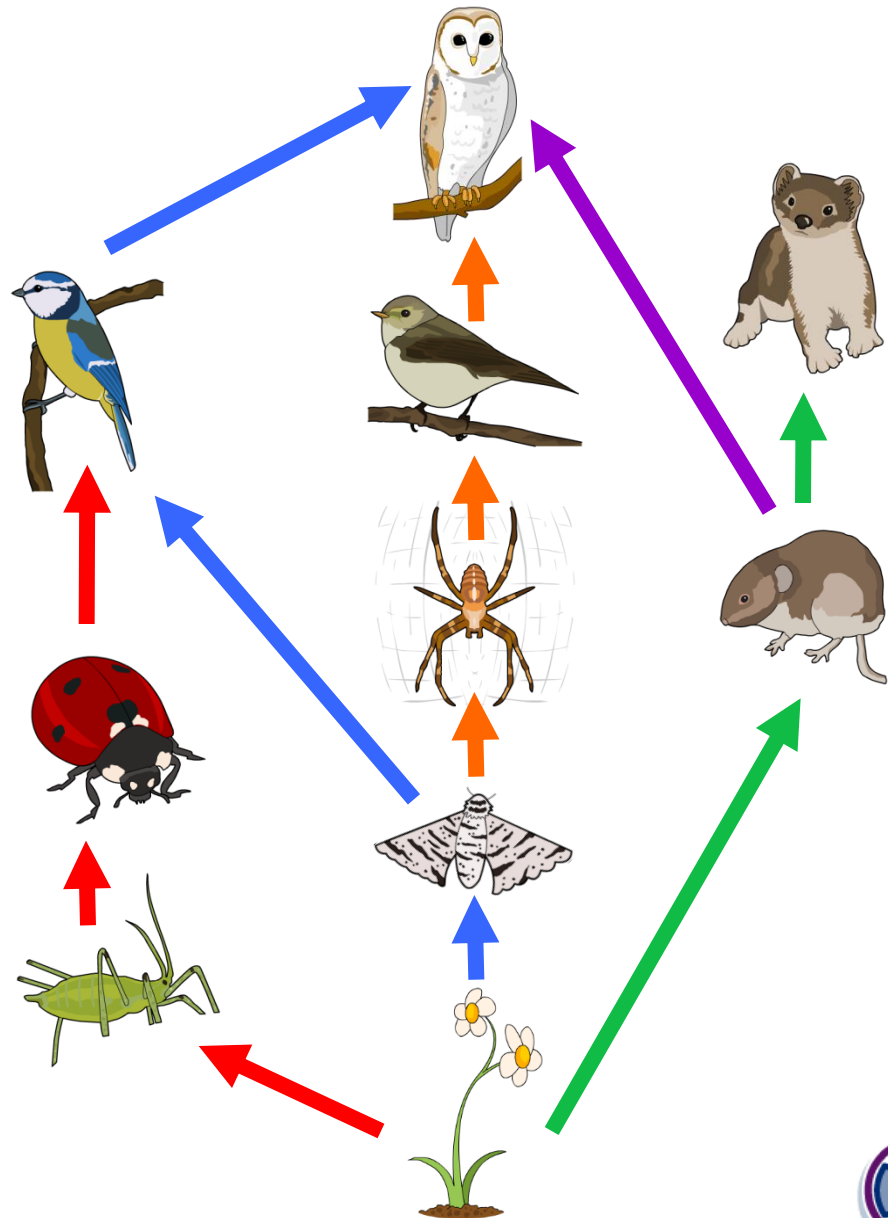


Food webs



Using a food web

1. Name the producer in this food web.
2. Name two herbivores in this food web.
3. Name two species that are top carnivores.
4. How many secondary consumers are there?
5. Which food chains include the moth?



What is the food web?

Make a note of these food chains and then click "start" to build the food web made up of these food chains.

algae → mussel → starfish

algae → barnacle → seagull

algae → mussel → whelk → crab → seagull

algae → limpet → whelk → crab → seagull



start



Changes in the food chain

Nearly every species of animal is dependent on a number of other species for survival – this is called **interdependence**.

Currently human activity is damaging the natural habitats of many animals.

This will not only affect the animals in the area, but it could have far-reaching effects on the rest of the species in the food web.

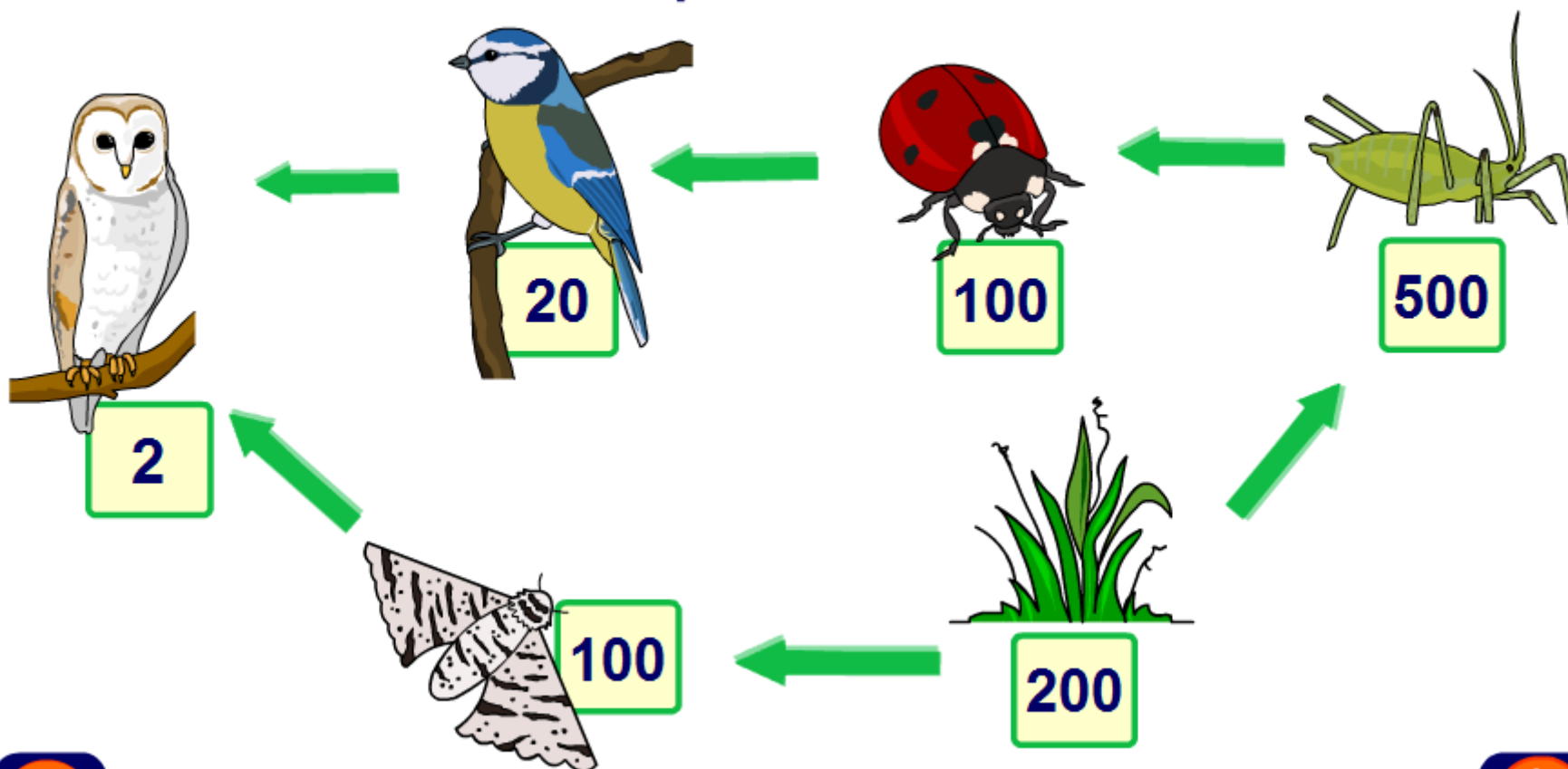


If the population of a species declines dramatically how might this affect the other species that depend upon it?



Changes in a food web

Click an animal to see how the food web could change if the species dies out



Food webs in action

The organisms in a food chain are highly dependent on each other. Even a small change in the number of producers or consumers can have dramatic effects on the rest of the food chain.



Click "**start**" to determine how a group of marine organisms are affected by changes in the food chain.



start



Match the feeding relationship terms to their definitions

food chain

producer

consumer

herbivore

carnivore

omnivore

biomass

trophic

living material that makes up organisms

organism that eats other organisms

organism that eats plants and animals

sequence showing feeding relationships

a feeding level in a food chain

organism that only eats plants

organism that makes its own food

organism that only eats animals



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How is energy transferred in a food chain?

The Sun is the source of all energy. How is this energy transferred through a food chain?

Click the Sun or "**play**" to find out more.



Why aren't food chains very long?

This tiger is a top predator; the final level in a food chain.



Most food chains only contain four or five species, why is this?

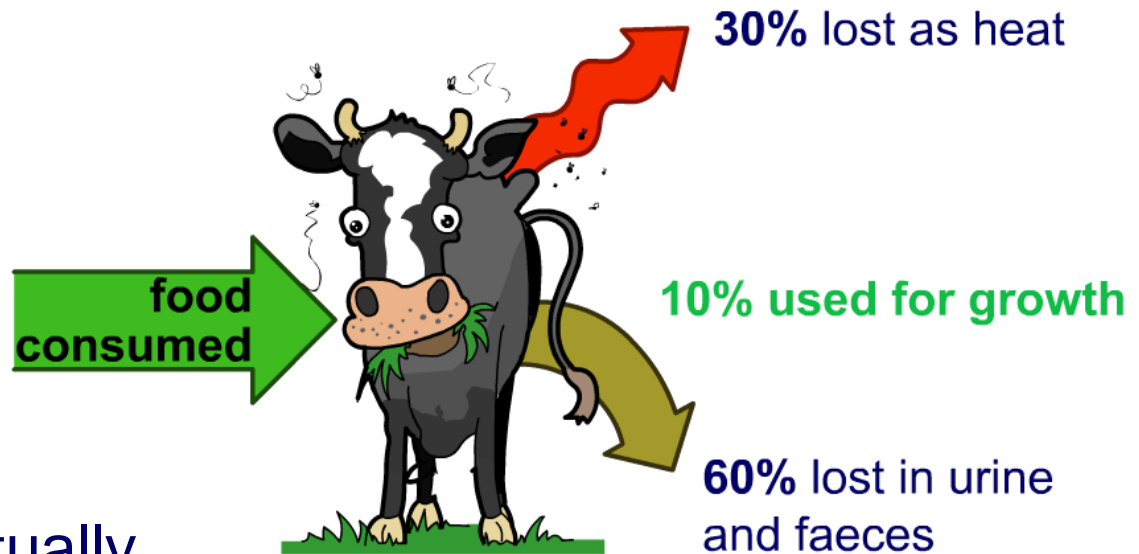
Energy is lost at all levels in food chains. Animals at the top of a long food chain would not get enough energy to survive.

Why do organisms need to feed?

Most animals get their energy from food. If the producers at the bottom of the food chain are small organisms, then the consumers at the top of chain need to eat many of them to gain enough energy.

Much of the energy that prey generate is lost on a daily basis through heat, growth and waste.

Very little energy is actually transferred to the predator.



Food chains and pyramids

What can pyramids show about energy transfer?



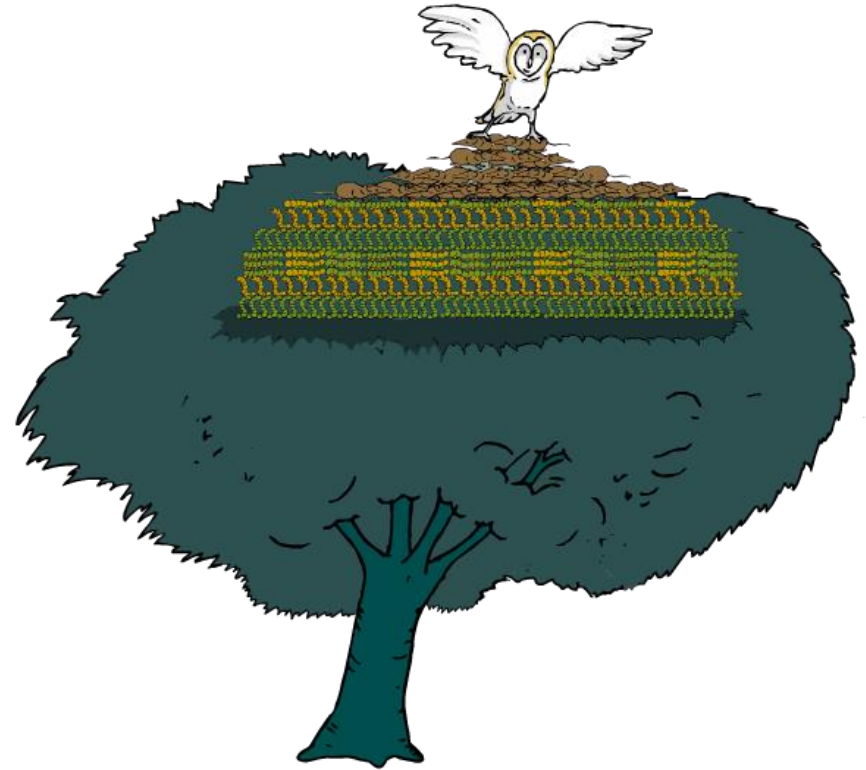
What are pyramids of numbers?

Pyramids of numbers are a **quantitative** way of representing food chains.

They record the number of organisms at each trophic level in a specified area.

What are the problems of representing food chains in pyramids of numbers?

Pyramids of numbers only give an accurate impression of the flow of energy in a food chain if the organisms are of similar size. Measuring the **biomass** at each trophic level can give a more accurate picture.



Comparing pyramids of numbers and biomass

Click on a type of pyramid below to see how the same food chain can be represented in different quantitative ways.



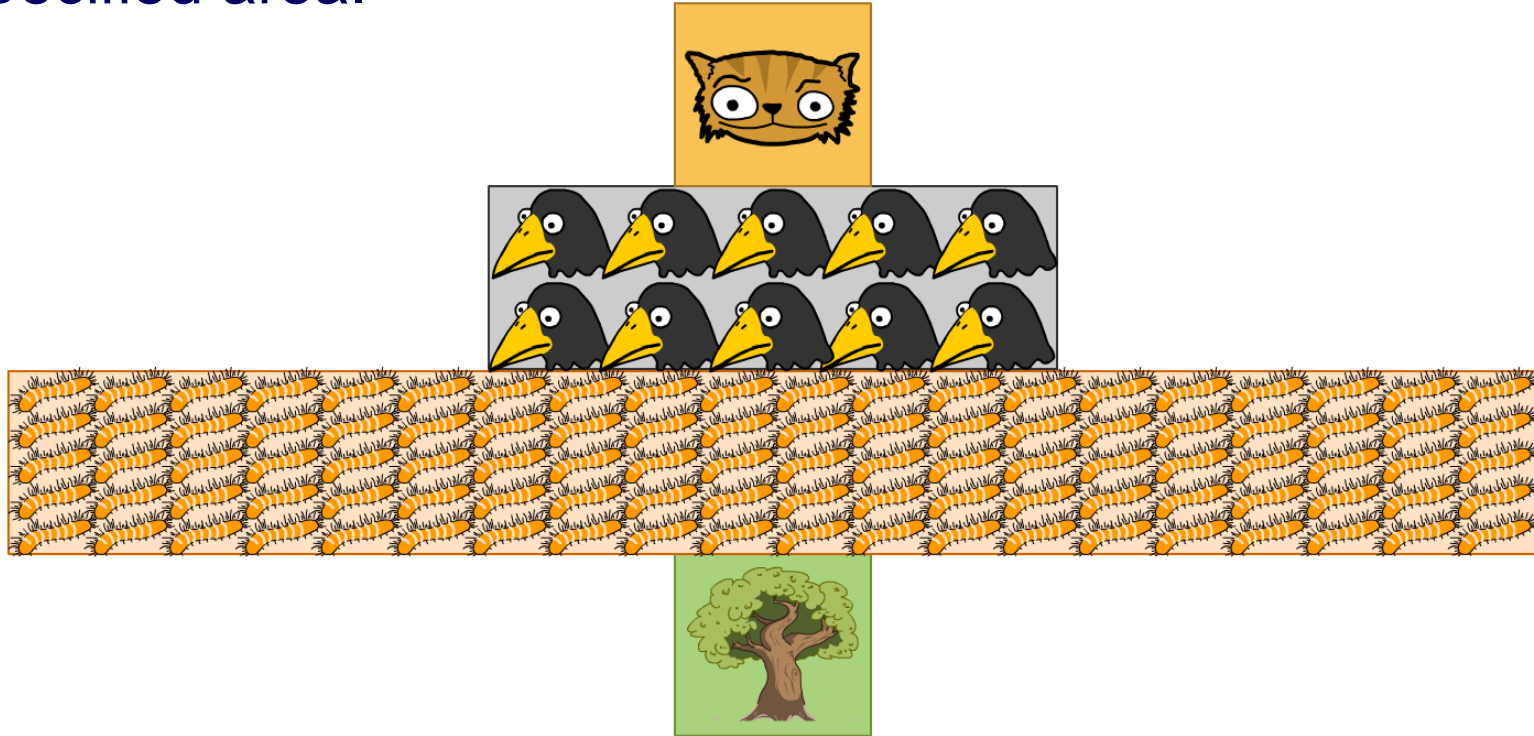
numbers

biomass



Understanding pyramids of numbers

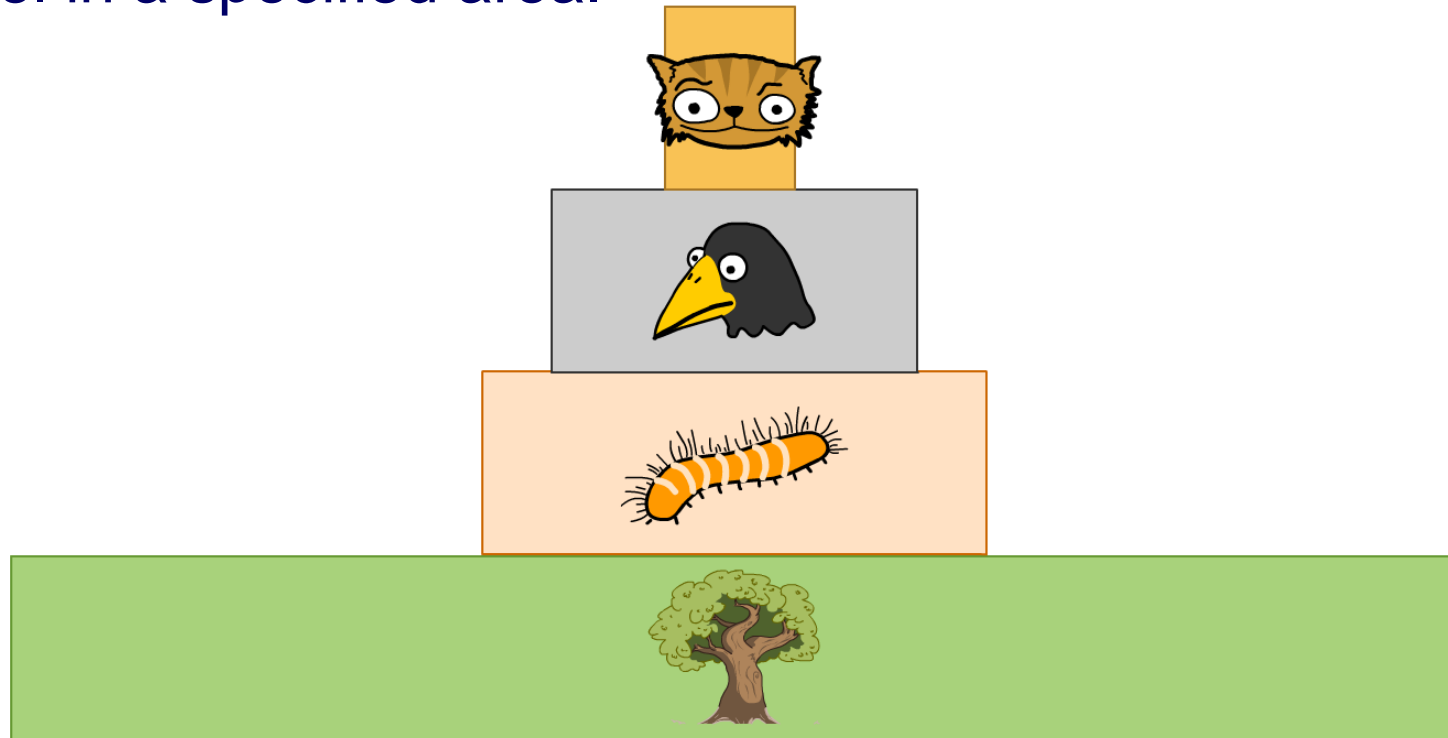
In a pyramid of numbers, the length of each bar represents the **number of organisms** at each trophic level in a specified area.



As a single tree can support many organisms, this food chain produces an unbalanced pyramid.

Understanding pyramids of biomass

In a pyramid of biomass, the length of each bar represents the **amount of organic matter** – **biomass** – at each trophic level in a specified area.



At each trophic level, the amount of biomass and energy available is reduced, giving a pyramid shape.



What are the missing words about food chains and pyramids?

1. Biomass is the living material that makes up .
2. Plants are called primary because they make their own food by photosynthesis.
3. Biomass and energy are transferred from one organism to another along food .
4. A pyramid of is a scale drawing that represents the amount of organisms at each trophic





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What are the missing words about food chains and pyramids?

represents the amount of organisms at each trophic level.

5. A pyramid of  is a scale drawing that represents the mass of living material at each trophic level.
6. A pyramid of numbers that represents a food chain containing a single tree at the first trophic level will be  at the bottom relative to the middle.



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How is energy lost in food chains?

Organisms do not use all the energy from their food for growth.

Click a trophic level below to find out how energy is lost.



primary
producer



primary
consumer



secondary
consumer



Why do some animals need more energy?

Mammals and birds are able to regulate their body temperature. This has many advantages but it uses lots of energy.

Other animals, such as snakes, lizards and fish, are unable to regulate their body temperature, so need less energy.

Would it be more energy efficient to farm snakes for food than chickens?



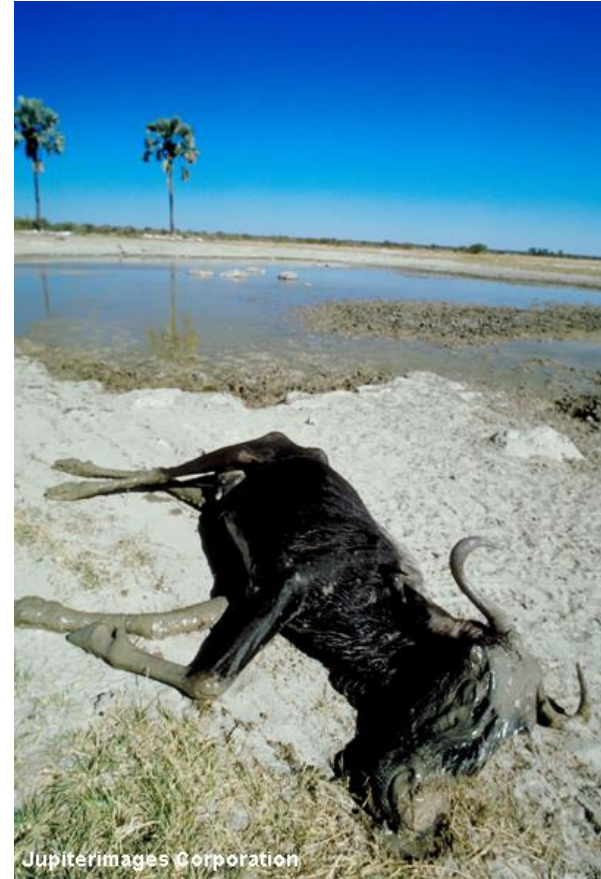
Death benefits?

When animals and plants die, they are decomposed by microbes.

In this way, the nutrients that were stored in animals and plants are eventually returned to the soil.

The nutrients fertilize the soil, helping producers, such as plants, to grow better.

As the number of producers increases, how will this affect the populations of organisms higher up in the food chain?





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6. A pyramid of numbers that represents a food chain containing a single tree at the first level in the food chain will be at the bottom relative to the middle.



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Feeding relationships

biomass – The living material that makes up all organisms.

carnivore – An organism that only eats other animals.

consumer – An organism that feeds on plants or animals.

ABC

DEF

GHI

JKL

MNO

PQR

STU

VWX

YZ



How quickly can you unscramble
anagrams of words about

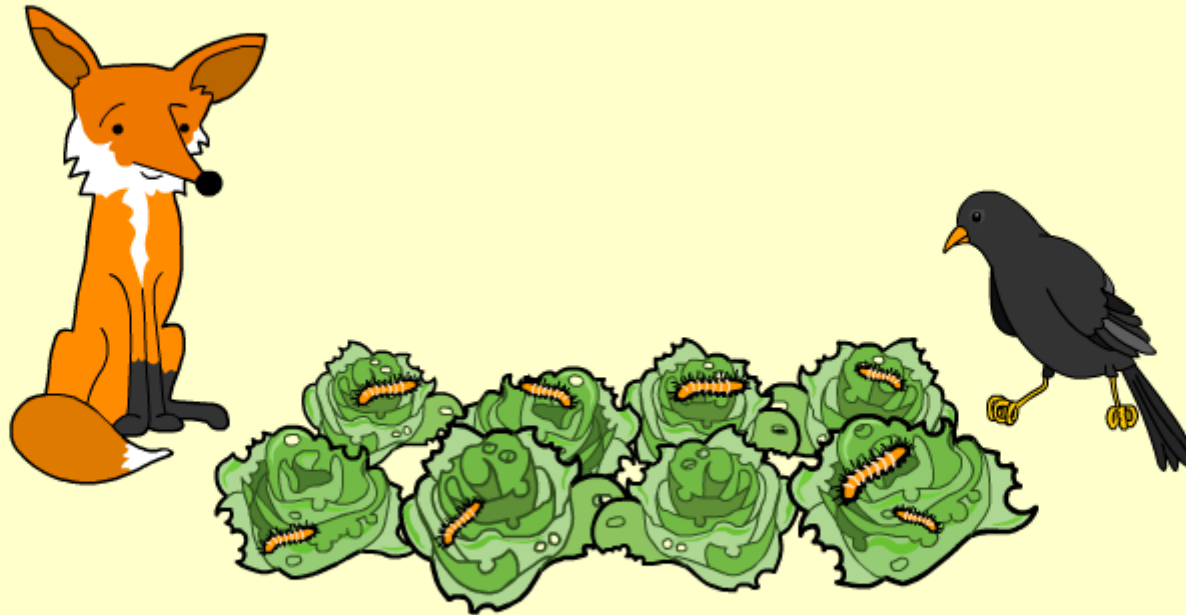
f e e d i n g

r e l a t i o n s h i p s ?

start



Are you adaptable enough for this
quiz on feeding relationships?



start

