



Key Stage 3 – Antarctic relationships

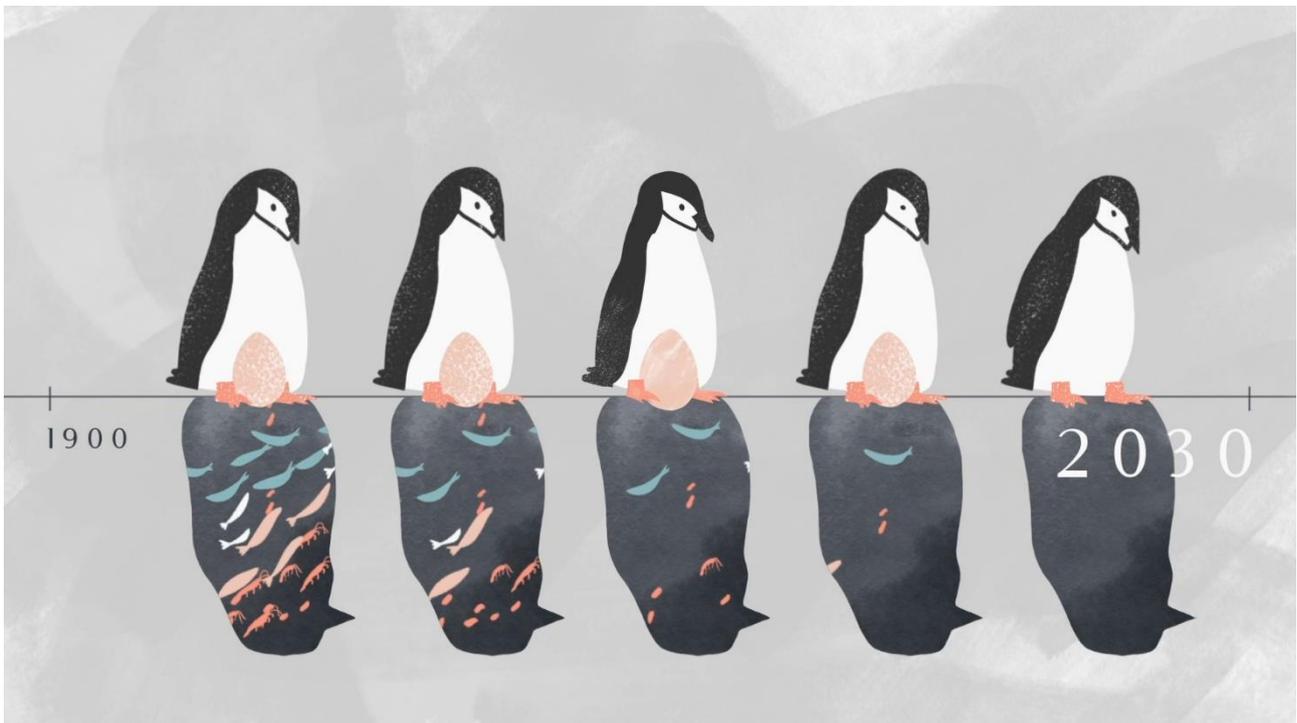
Notes for teachers

At a glance

Penguins integrate a long life-span with shorter-term foraging needs. This means their breeding success is usually a reflection of the quality of the environment in any given year. Penguinologists at The University of Oxford are collecting data about penguin populations to provide early warning of ecosystem change and future population trends of Antarctic organisms.

In this activity, students use information about Antarctic organisms to build a food web, and then use this to work out how changes to other populations could affect the chinstrap penguin population.

The activity can easily be adjusted to be an at-home activity or homework.



Learning Outcomes

- Students construct a food web.
- Students determine the effects of population change on another species.

Each student will need

- Copy of student worksheet pages 1 and 2
- A3 piece of paper
- scissors



Possible Lesson Activities

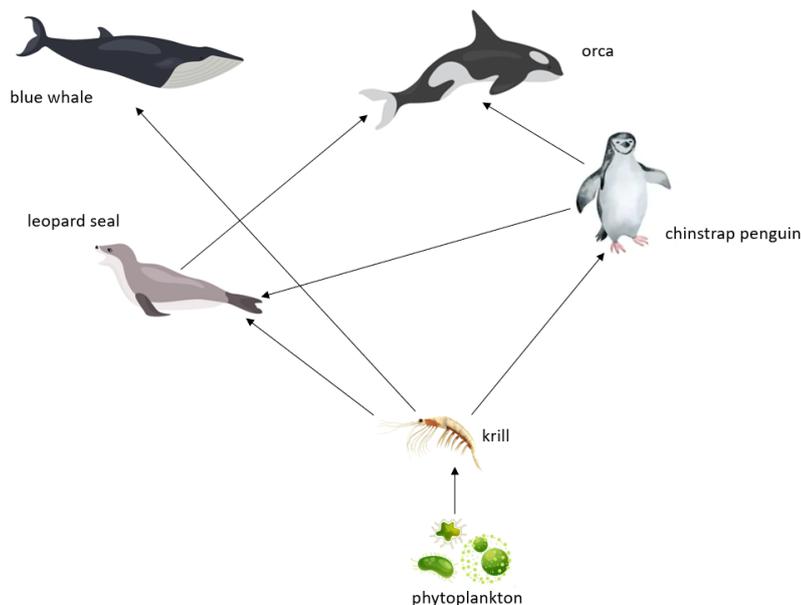
1. Starter activity

- Show the class the Oxford Sparks animation 'Seabird Monitoring' (see weblinks), which outlines the work of penguinologists working at The University of Oxford.
- Ask the students to write down one or two sentences that outlines why scientists want to monitor penguin populations.
- You may like to show them the Penguin Watch website and discuss how they can help with the project.

2. Main activity: Constructing a food web

- Give each student a copy of page 1 and 2 of the student worksheet.
- Ask them to read through page 1 and 2, and carry out task 1. They should cut out the cards from page 2 and arrange them on a sheet of A3 paper to form a food web, before connecting the organisms with arrows.
- Check their food webs.

Answer



3. Main activity: Use the food web

- Ask a series of questions to give students practice at interpreting food webs e.g.:
 - Name the producer (*phytoplankton*)
 - Why is krill a primary consumer? (*they eat the producer*)
 - Which organism is both a primary and secondary consumer? (*leopard seal*)
 - Which organisms are predators of penguins? (*orca and leopard seal*)
- Ask students to complete task 2 on page 1 of the student sheet.

Answer

During the period 1910-1970, the whale population was low. Fewer blue whales resulted in more food for penguins. Fewer orcas meant fewer predators of penguins. Therefore penguin population was high.



Between 1970-1990 whale population increased, and krill population decreased. Krill is food for penguins so with less food their population decreased. Also, with more blue whales there was even less krill and with more orcas there were more predators.

From 1990 onwards, whale population increased and krill population decreased further, so penguin population continued to decrease.

Note: Climate change is also a major threat to chinstrap populations, mainly because rising sea temperatures threaten the krill population (juvenile krill depend on sea ice (lots of plankton can be found on the underside of the ice) – warmer temperatures mean less sea ice, and therefore a lower recruitment rate of krill).

- Tell the students that this is what is happening – chinstrap populations are decreasing. However, the populations of some other penguin species are stable or even increasing. You can stretch the more able by asking them to come up with possible hypotheses to explain why. One reason is that other penguin species eat a more varied diet, so are less dependent on krill. Another possible reason is that other species that live alongside chinstrap are able to outcompete them for food.

4. Plenary

- Discuss why studying penguin population allows scientists to make predictions about the populations of other animals in the Antarctic food web. E.g., if chinstrap penguin population started to rise again, what could this show about orca/leopard seal/blue whale/krill population?
- Students may like to visit the Penguin Watch website and have a go at penguin counting for real to help out the researchers (click on the 'classify' tab in the top right corner). This can be done as a homework task.

Weblinks

Oxford Sparks animation, Seabird Monitoring: Witnesses in the Wild

<https://www.oxfordsparks.ox.ac.uk/content/seabird-monitoring-witnesses-wild>

Penguin Watch website

<http://penguinwatch.org>