

Key Stage 5 Worksheet

Earth LIVE Lessons: Why Sharks Matter?



What is it about?

In this video, marine conservation biologist and researcher Dr David Shiffman from Arizona State University talks about:

- Shark biology
- Shark ecology
- Threats to shark survival

Watch the video here:

[www.youtube.com/
watch?v=REkG27DJ1_Y](https://www.youtube.com/watch?v=REkG27DJ1_Y)

Open the file in your
web browser to click on
the links.

Some key facts:

- There are more than 1000 species of sharks and rays, and more are discovered all the time.
- Shark fossils date back more than 400 Million years and they have outlived dinosaurs and many other species.
- Sharks weigh up to 11 tonnes and species exist that are just 8 inches long and up to 40 feet long.
- 143 species of shark are under threat, listed by the International Union for Conservation of Nature (the group who monitor extinction and threats to wildlife) from 'vulnerable' to 'critically endangered'. Read more about it [here](#).
- Most sharks are cold blooded but Great Whites are partially warm blooded.
- The Basking shark is Britain's largest fish (and the second largest in the world). It can grow up to 11 metres long and weigh up to 7 tonnes - about the size and weight of a double-decker bus. Read more about it [here](#).
- Sharks have a sensory organ on their nose tip that senses electrical fields emitted by animals nearby – they use it for hunting and it is called the 'ampullae of lorenzini'.
- Read more about it [here](#).
- Something to watch? Check out biologist Lizzie Daly diving with Sharks [here](#) and discussing shark sanctuaries and the positive impact they have on numbers.

Background

Sharks, along with skates, chimaeras and rays, are **cartilaginous fish**, with a skeleton made from cartilage rather than bone. Cartilage is less dense, more flexible, and heals faster than bone.

Sharks are able to sense electric fields (*electro-reception*) and use magnetic fields (*magneto-reception*) to find prey and to navigate. Electro-reception enables sharks to detect animals hidden in the sand as they can detect the electric field emitted by their prey. Magneto-reception helps sharks to navigate using the Earth's magnetic field, an advantage in the ocean where there are few landmarks to use to get around.

Most fish reproduce by spawning, whereby the female lays eggs and the offspring develop outside of her body. This is less energetically expensive for the mother than producing live young (like mammals do), so most fish have a large number of offspring, but most do not survive.

Sharks, however, have multiple different modes of reproduction. Although some sharks **do lay eggs**, others are viviparous (give birth to live young), and in some species, the young develop inside eggs within the mother's body – a phenomenon only observed in sharks and called **ovoviviparity**. Some species can also undergo parthenogenesis, a process by which the mother shark produces young genetically identical to herself (clones).

Compared to other fish, sharks:

- Have relatively few young at a time,
- give birth relatively infrequently
- and give birth late in life,

This means their populations recover more slowly from overfishing than other fish species do and this is a contributing factor to their endangerment.

The most severe threat to shark populations is unsustainable fishing (overfishing) for their meat and fins, and bycatch, i.e. accidental capture of sharks in fishing nets. Sharks may also, to a lesser extent, be affected by climate change and plastic pollution.

Sharks are an important part of a healthy ocean ecosystem, with ocean predators helping to maintain the balance in the food web by controlling the numbers of their prey.

This lesson also explores some lesser-known species of shark (there are more than 400!). It includes their key morphological and behavioural adaptations. These include critically endangered river sharks; Thresher sharks, which use their long tail as a whip to stun their prey; filter-feeding Basking sharks, which can be found off the coast of the UK; and the Mega-mouth shark, which lives in the dark depths of the ocean and possesses glow-in-the-dark outer gums to attract its prey to swim into its mouth.

Find out more about it

- Dr Shiffman is available to respond to questions on social media (@WhySharksMatter).
- **Find out more** about how sharks help to create a healthy ocean ecosystem
- Technologies such as “pingers” and “turtle excluder devices” are being developed to help prevent bycatch of dolphins, porpoises and turtles. **Find out about** how smell is being used to deter sharks from fishing nets.
- Explore which fish and other seafood sold in the UK comes from sustainable and unsustainable fisheries in the **Marine Conservation Society’s Good Fish Guide**
- Explore which sharks, and other species, are critically endangered on the **IUCN Red List**
- Discover more **behavioural adaptations** of sharks.

Questions

Interactive: Click on box to start typing

How does the reproductive biology of sharks cause their populations to recover more slowly from overfishing?



As well as the five standard senses, what additional senses do sharks possess and how do they use them?

What morphological and behavioural adaptations do different species of sharks possess, and how do these help them to survive in their particular habitats?

Exercises

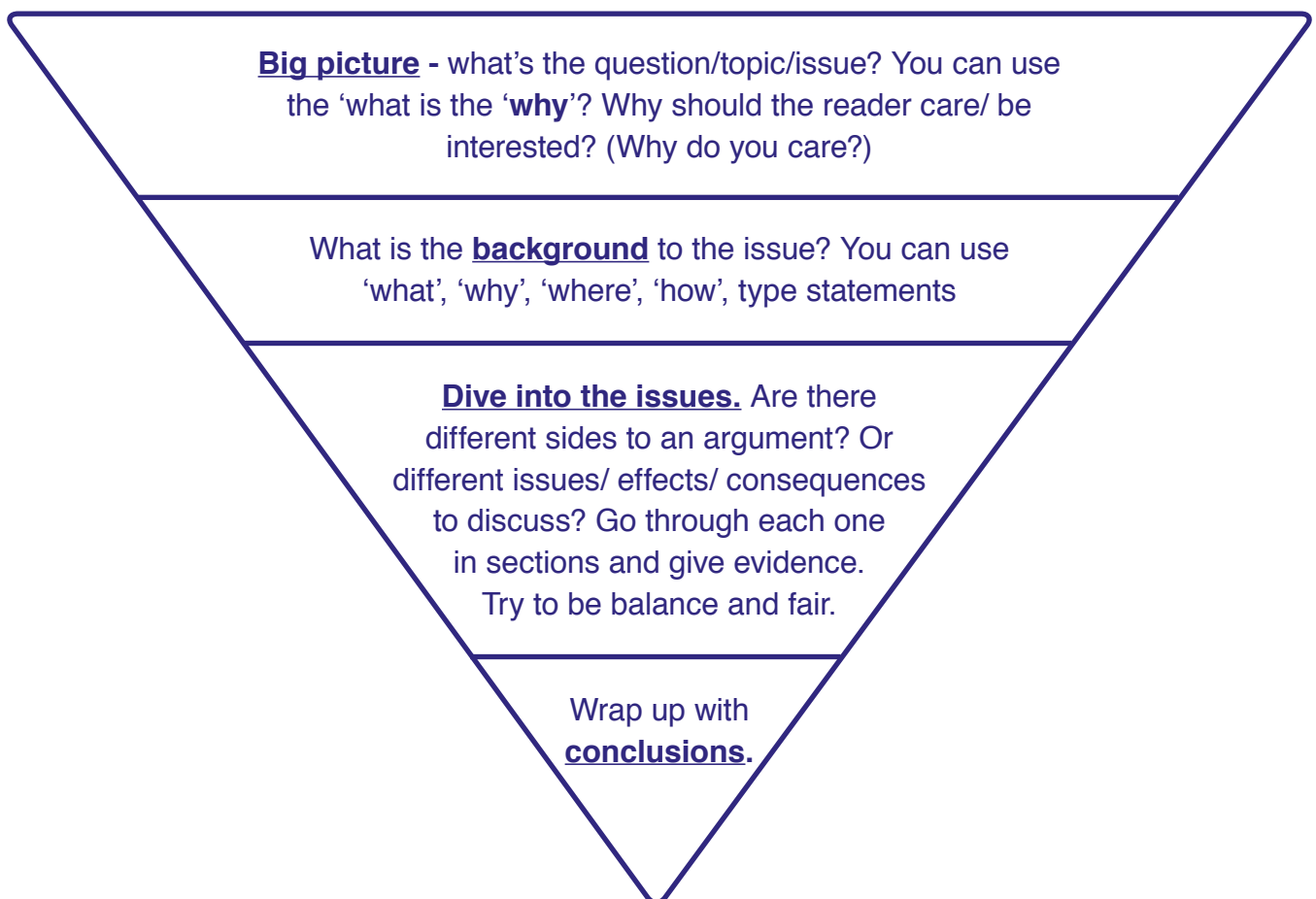
As you start to think about your post A Level education you are likely to be asked to explore topics in more depth, and write more essays. This is a great way to practice!

Question 1. Considering the specific biology and ecology of sharks, what technological or procedural adaptations could be made to fishing equipment, or fish practices, to reduce shark bycatch?

Question 2. Consider the ethics around shark tourism. What advantages and disadvantages are there, for shark conservation, to shark diving experience?

Essay writing tool

A great way to sketch out an essay is to use a 'pyramid'. Here's an example of an essay pyramid:



For teachers and home schoolers

Links to Science in the National curriculum for Wales (KS5)

AS Biology: Basic Biochemistry and Cell Organisation: Genetic information is copied and passed on to daughter cells [(e) the differences between mitosis and meiosis, including that mitosis produces genetically identical daughter cells whereas meiosis produces non-identical daughter cells] – the role of mitosis and meiosis in the different reproductive strategies of sharks (egg formation and parthenogenesis).

AS Biology: Biodiversity and Physiology of Body Systems: All organisms are related through their evolutionary history [(a) the classification of organisms into groups based on their evolutionary relationships and that classification places organisms into discrete and hierarchical groups with other closely related species] – the classification of sharks and the morphological differences between cartilaginous fish and bony fish.

AS Biology: Biodiversity and Physiology of Body Systems: All organisms are related through their evolutionary history [(n) the different types of adaptations of organisms to their environment including anatomical, physiological and behavioural adaptations] – the adaptations of sharks in general (e.g. electroreception and magnetoreception), and the adaptations of different species to catch prey in different parts of the ocean (e.g. in the dark depths).

A2 Biology: Energy, Homeostasis and The Environment: Population size and ecosystems [(a) populations and the way in which they grow - a simple quantitative treatment including immigration, emigration, birth and death rates; (h) the transfer of biomass from plants to animals including trophic levels, efficiency of transfer; gross and net production and pyramids of biomass] – the importance of sharks as predators in maintaining functioning ocean food webs, and the factors affecting shark population recovery.

A2 Biology: Energy, Homeostasis and The Environment: Human impact on the environment [(a) the reasons for species becoming endangered and causes of extinction; (d) the increased human pressures on the environment including the need to achieve sustainability by changes in human attitudes and making informed choices] – the threats to sharks and the ocean more widely (including climate change and plastic pollution), and the differences between the management of sustainable and unsustainable fisheries.

A2 Biology: Energy, Homeostasis and The Environment: The nervous system – how the electrical activity within prey animals enables sharks to detect them via electroreception, and how this sense works.



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