SHOUT OUT FOR SHARKS

EDUCATION PACK

PART 1

SHARK FACTS: ASK THE EXPERTS
WHY DO SHARKS NEED OUR HELP?

BITE-BACK
SHARK & MARINE CONSERVATION

FirstNews EDUCATION

TEACHER NOTES

Key questions

- Why do sharks need our help?
- What are the main reasons sharks are under threat?
- What role do sharks play as keystone species in the marine ecosystem?
- Why is shark conservation so essential?

Learning objectives

- To build up knowledge and understanding of shark populations around the world
- To find out sbout the different threats sharks face
- To learn about the role sharks, as keystone species, play in the marine ecosystem
- To find out about shark conservation projects

The children are tasked with finding out why sharks need our help. They need to build up a picture of the current state of shark populations in the world's oceans. They will work out what different threats there are to sharks and why their numbers are decreasing.

Four interviews with shark and marine experts are provided for this research:

1. **Steve Backshall**, wildlife presenter and naturalist
2. **Helen Czerski**, oceanographer
3. **Megan McCubbin**, zoologist, shark researcher and wildlife presenter
4. **Graham Buckingham**, Bite-Back co-founder

An **'Info check' discussion question sheet** is provided for each of the experts, plus a **'Research Summary'** sheet for pulling together information to answer the key questions.

Pupils could be divided into groups. Each group can be given a different expert to investigate. Children read the interviews, use the 'Info check' sheet to check their understanding of what they have found out from the expert. They then summarise what they have found out to answer the key questions to feed back their findings to the rest of the class. A wider understanding will be built up as the information from all the experts is put together. Collect the findings together as a class and talk through the findings.

Alternatively, all pupils could work through each of the interviews in order to develop their understanding of the key questions. A class plenary could then be used to pull all the findings together.

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EXPERT: STEVE BACKSHALL

Steve Backshall swimming alongside an oceanic whitetip shark

A grey reef shark killed just for its fin.

All photos Getty unless indicated

> "Our ocean's most ancient and alluring predator"

We spoke to the legendary wildlife presenter and naturalist Steve Backshall to get his view on the wonder of sharks, the charity Bite-Back and what we can all do to help improve the image of sharks.

● How long have you been involved with Bite-Back?

For about eight years. To me they are a very important charity because they're homegrown and have gone all the way: rattling the cages of people at the top of the tree in government and heading towards changing **legislation**. It's proof that anyone can make a difference, which I think is amazing.

● Sharks often have a bad image. What can we do to change that?

They are an animal that has been demonised and yet there are so few people actually harmed by sharks around the world. It's a balance that needs to be **redressed** and it's something that we all can play a part in doing. So, every single time you see a newspaper print 'Demon shark spotted in British waters!' and it's a harmless basking shark, then it's up to us to say to that newspaper 'No, that's factually incorrect, you can't say things like that.' Every time they talk about a 'Man-eating Great White Shark spotted in the middle of the North Atlantic!' well, there are no people in the North Atlantic, so how can it possibly be a man-eating shark? It's about the type of language that's used in the **media.**

Shark fin soup is a traditional dish popular in several Asian countries, in particular China. It was once only served to Chinese Emperors, but is now in high demand.

● What's the reality of how dangerous humans are to sharks through fishing?

Greenland sharks can live for over 500 years.

It's possible we take a **quarter of a billion** sharks [from the ocean] every single year. About 73 million of those are targeted deliberately for their fins. The rest are taken as **bycatch**. They're taken both for their meat and by fisheries targeting high-value food fish, like tuna and swordfish, so vast numbers of sharks are taken accidentally. As animals that live for a long time and take a long time to mature, it's really significant if you take out large amounts of the population, particularly if they're **pre-breeding age** which a lot of them will be.

● How many species of shark are under threat of extinction?

There are only about 480 different species of shark around the world. Of those, around half are listed as vulnerable, endangered or critically endangered. A lot of the others are **data deficient**, which means we simply

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don't know. Sawsharks are right on the cusp of extinction and it's likely that if we haven't lost them already, we will in my lifetime.

● What do you think a world would be like without sharks?

First of all, as someone who loves sharks, I think that our oceans would be a far poorer place without its most ancient and alluring predator. Secondly, there is growing evidence that as soon as you take a **keystone species** out of an environment there are always knock-on effects: the massive increase in things like jellyfish or urchins, [for example], which may then have negative effects on seagrass or kelp, which then affects everything that lives in that environment.

Sharks do not have bones. Their skeletons are made of cartilage, the flexible material found at the end of your nose.

● How much do we still have left to find out about sharks and the oceans?

A huge amount! We're only just beginning to develop technologies that follow them throughout their lives. For all of human history we've only been able to investigate them when they're dead – when they're caught on fishing lines – or from the very, very small amount of science that's been done in the top 20 metres of the ocean. So very few species of sharks have been filmed doing even the simplest things like mating, giving birth, or even naturally feeding. There are elements to their behaviour that we just assume based on studying the stomach contents of dead animals, and that's not enough, it's not a decent way of understanding the genuine life history of an animal.

Reef sharks and lemon sharks circle a school of horse-eyed jacks at Tiger Beach in the Bahamas.

● Where's the best place in the world to see sharks?

There are now a number of shark sanctuaries around the world, places where it is illegal to fish for sharks. Of those, the easiest to see sharks from is the Bahamas in the Caribbean. You can see around 30 species of sharks with ease and some iconic species can be found really close to the shore.

Most sharks are predators, but the two biggest sharks in the world – the whale and basking – are plankton eaters.

One in four shark species is listed as threatened, including the great white, the oceanic whitetip, the hammerheads, the thresher and the whale shark.

The basking shark is the largest fish found in UK waters, and the second largest fish in the world.

● Is it possible to see sharks in the waters around the UK?

There are growing [tourist] industries looking for blue sharks particularly, off the west coast – the Celtic Deep in Wales and off the coast of Cornwall. Basking sharks are much more difficult to predict, but that's one of the world's great shark encounters – right here in our seas.

● How do you feel when you come face-to-face with a shark underwater?

It depends what kind of shark it is! I've dived with around a hundred different kinds of shark and diving with a catshark in Scottish seas could not be a more different

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encounter from diving with whale sharks in the Azores! Then with some of the larger, predatory sharks, like bull sharks, tiger sharks or great whites, huge amounts of care and forethought need to go into any diving you undertake with those animals. They're all so different!

● So, sharks aren't eating humans all the time! What do they actually like to eat?

It very much depends on the species. Basking sharks are filter feeders, feeding on plankton. A great white shark might feed on two-tonne elephant seals. One type of rough shark feeds exclusively on the eggs of **chimaeras** and then there are others that will suck conch snails out of their shells. They're remarkably diverse and that's not surprising because they've been around for well over 400 million years.

Steve Backshall with the sharks at Sea Life London Aquarium at an event demonstrating that their fearsome reputation is often misplaced.

A great white shark doesn't need to eat every day and can go three weeks or more between big meals.

Shark pregnancies can range from five months to 3.5 years (frilled shark), depending on the species, but some sharks lay eggs.

● What's the best shark fact you know?

Most shark species can be hypnotised by flipping them on their back. I've done it!

● What can *First News* readers do to help sharks and make a difference?

The first thing I would say would be to connect to Bite-Back, they're really good at putting the right information in the hands of kids and mobilising them to get involved in projects. Also, as I've said, I think that one of the biggest things we can all do is to try to change the image of the shark, and that's something that any youngster can do. The moment your teacher talks about 'demon monster sharks' you can say 'Hang on a second! Have you heard of the tasselled wobbegong? Or the Port Jackson shark or the epaulette shark that walks across dry land to get to different tide pools? Did you know there are baby sharks that live in the **mangroves**, only as big as my palm, that are hiding there because they're so nervous and shy?' All of a sudden, you start to set things right.

A pygmy shark is one of the smallest sharks in the world, measuring just 25cm.

GLOSSARY

bycatch – Fish and other sea creatures caught unintentionally by commercial fisheries when fishing for other types of fish

chimaeras – Also known as ghost sharks, chimaeras are closely related to sharks, rays and skates. Just like these relations, their skeletons are made of cartilage

data deficient – A species is described by the IUCN (International Union for Conservation of Nature) as Data Deficient (DD) if there is not enough information to know its risk of extinction

kelp – Flat, brown seaweeds found in colder seas

keystone species – A species that is critical to the survival of other species within an ecosystem

legislation – Laws passed by a government

mangroves – Tropical trees that grow in coastal waters with their tangled roots visible above the ground (and water)

media – Communication channels that provide large numbers of people with news, information and entertainment, such as newspapers, television, radio and magazines

naturalist – A scientist who studies the plants, animals and other living things in the wild

pre-breeding age – Young animals that have not developed to adulthood and are not yet able to reproduce

quarter of a billion – 250,000,000 – two hundred and fifty million

redressed – To set right a situation that is unfair or unbalanced

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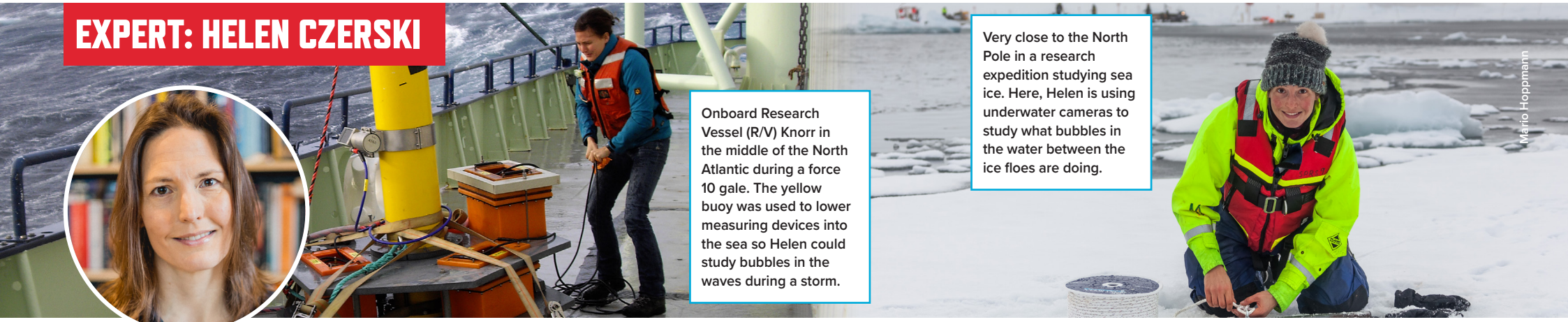
EXPERT: HELEN CZERSKI



Onboard Research Vessel (R/V) Knorr in the middle of the North Atlantic during a force 10 gale. The yellow buoy was used to lower measuring devices into the sea so Helen could study bubbles in the waves during a storm.

Very close to the North Pole in a research expedition studying sea ice. Here, Helen is using underwater cameras to study what bubbles in the water between the ice floes are doing.

Mario Hoppmann

"The sensory masters of the ocean"

Helen Czerski is an **oceanographer** – a scientist who studies the sea – a TV presenter and the author of fascinating books explaining why science is scintillating! We spoke to her about her job (yes, she really is a bubble expert) and why sharks matter to the sea.

● Could you tell us about your work as an oceanographer?

People think of the ocean as a great big pond where fish live, but actually it's an engine, a machine that's doing things all the time. Oceanographers look at how **currents** work, how the wind pushes on the ocean and how things get carried around.

The ocean has a great big surface – just like your lungs – where gases are exchanged with the atmosphere, which is how the ocean breathes. When the surface of the ocean is flat and calm, this exchange happens quite slowly, but when you get a big storm and you get lots of bubbles and **turbulence**, that's like the ocean taking a deep breath and that's what I study – the physics of breaking waves and bubbles in big storms. It's important for understanding climate change and how global change affects our oceans.

> Sharks have the largest brain of any fish

● What's your favourite part of your job?

Being out at sea. When you're on a ship you don't normally have internet access, you've just got a team of highly motivated people who are all there to do a job. We typically go out on a ship for a month or two. Your ship becomes your floating home, while the ocean is your laboratory.

● How are our oceans changing?

They are changing in a lot of ways and the culprit is mostly the climate. We think about damage to our oceans being in terms of plastics and pollution, but the more serious changes are because the Earth is warming up. All of the carbon dioxide we're putting into the atmosphere is trapping energy on the Earth. Most of that extra energy, about 90% of it, ends up in the ocean, which is warming up too.

Over most of the global ocean, the top layer gets heated by the sun, so it kind of floats on top of cooler water underneath. They can mix up sometimes, which lets **nutrients** from below come up to the sunlight and that's where you get lots of life. We have the equivalent of rainforests in the ocean! As we warm up the oceans, that warm lid gets stronger, which makes it harder for the top part of the ocean to mix with the bottom part. That's a problem because then you can't get all of the nutrients from underneath.

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Global warming doesn't just heat everything up, it changes the ocean's patterns, like its currents. This might change which places gets very warm or very cold weather, or where the sea level rises. The ocean is the big engine that runs Planet Earth, but we're shifting its patterns and that's the problem of climate change.

What would scientists like to find out about sharks in particular?

Sharks have survived six mass extinctions and outlived the dinosaurs but overfishing could now wipe out key species in our lifetime.

Like any open ocean creature, sharks are difficult to study because they move! Reef sharks will tend to have a local area where they'll hang out, but sharks like the great white can go a very long way in a day. Part of the problem with all fish is that they're tricky to tag because the signals don't travel underwater. This makes tracking very difficult with big ocean predators. Whales come to the surface so a tracker could get a signal then, but sharks go very deep and tend not to come to the surface, so it's hard to find out where there are! We're getting better at it but, for example, shark mating is still pretty much a big mystery.

Is fishing the biggest threat sharks face from humans?

I would say, it's a mixture of things. **Shark finning** is a terrible thing that still happens, **overfishing** is a problem and there is no doubt that sharks get caught in fishing nets. Humans are taking the fish that the sharks eat and changing the ocean environment. There may be noise pollution from boats, chemical pollution in the water and warmer temperatures. We're making the whole environment more difficult to live in, so there are fewer animals that survive, both the big ones and the little ones that the big ones eat. If you overfish in a breeding ground, you can knock out an ecosystem quite easily, but then the other stresses don't let them recover. It's a lot of different things all at once.

A tiger shark and a big cat tiger show their predator teeth. What's your reaction to these two photos?

There are more than 480 species of sharks. The largest, the whale shark, can grow to the size of a single decker London bus. The smallest, the pygmy shark, is the length of a pencil.

Why do people fear sharks so much?

It's not just because of their big teeth, because tigers have big teeth too! People like tigers because they've got big eyes and they're fluffy, it doesn't mean you'd get anywhere near a tiger! Humans have a very deep-seated distrust of anything that's smooth-skinned and has eyes that don't blink, like a shark. They are predators, they're not our friends, they're just animals getting on with it, but they do need our protection. We should think of sharks as the tigers of the ocean.

Why are sharks important?

They are part of an ecosystem. For example, sharks tend to feed out in the open ocean, but when they come in towards reefs, they poo. This sounds trivial, but poo is fertiliser and studies have been done showing that sharks are an important way for nutrients from the open ocean to get into the reef. It's not just that sharks sit at the top and eat everything else, they help to shape the ecosystem and they are highly mobile, which means they can do these things that other species can't.

Sharks are found in all the world's oceans, from tropical shallows to the deepest open ocean and even under the Arctic ice.

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A tiger shark has 48 identical teeth, shaped a bit like a can opener, ideal for piercing the shells of turtles, crabs, and taking chunks from big prey.

● What would a world without sharks be like?

It would fundamentally change the structure of the oceans' ecosystems. To some extent we've already done it. Shark populations in many places aren't nearly as healthy as they used to be and in other places they've been almost completely wiped out. Sharks should be the jewel in the crown of an ocean ecosystem and we are damaging their environment.

● What do you love about sharks?

Sharks are the sensory masters of the ocean. They have extremely good eyesight and an exceptional sense of smell. Quite a lot of sharks can tell the direction of a smell because they have a nostril on each side that they can use in a directional way to tell if there is more of a smell over there or on the other side. They can sense electrical fields and vibrations in the water very easily, they're extremely powerful swimmers and they really do know their environment very well.

● What can young people do to help to protect the oceans and the sharks in them?

The biggest thing by miles is to get rid of fossil fuels. It sounds a long way from a shark, but the biggest stress on all ocean ecosystems is climate change, the changes we're making in the environment.

I know young people are very scared and anxious about what older generations have done to the world, but there is stuff that can be done. Think about how much energy you use, how much stuff you use, where the stuff goes when you've finished with it. Nature endlessly recycles. Shark poo becomes something else and when that something else dies or poops, something else will use that for something, that's the way nature works. We humans don't do that, we don't make things out of our waste. Fundamentally the system needs to change and we CAN do it.

The fastest shark: check out the tail on this mako shark

A mako shark has a crescent-shaped tail that optimises thrust and minimises drag, enabling it to burst through the water at 30mph. The **shortfin mako** is the fastest shark, clocked at speeds of 40mph.

Caribbean reef sharks

GLOSSARY

currents – The continuous flow of seawater from one location to another, both horizontally and vertically. This movement is caused by wind, tides and differences in water temperature and salinity

nutrients – Substances that living things need to grow and be healthy

oceanographer – A scientist who studies the sea

overfishing – Catching too many fish from an area of sea. Species die out in this region because not enough fish remain to breed and recover their numbers

shark finning – Catching sharks, removing their fins and throwing the shark back into the sea

turbulence – Violent or unsteady movement of air or water

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EXPERT: MEGAN MCCUBBIN

Megan swimming with lemon sharks in the Bahamas

"I want to prove people wrong about sharks"

We spoke to the zoologist, shark researcher, TV presenter and all-round wildlife enthusiast Megan McCubbin to find out why she is shouting from the rooftops to let everyone know why sharks are such amazing animals.

● Could you tell us a little about your work and what it involves?

First and foremost, I'm a zoologist, but I wear a lot of different hats! I call myself a science communicator as I think that pretty much covers it all. My role really is to try to get people excited about wildlife, in the way I am.

● How did you get into that area of work?

I was really fortunate to have grown up around wildlife. My childhood was spent out and about in the New Forest. When I was old enough, I took on volunteer placements. I knew that getting hands-on experience was equally as vital as the qualifications. I focussed a lot on big cats and, at the Wildheart Sanctuary on the Isle of Wight, I was really lucky to have a close relationship with tigers that were rescued from the circus. I became fascinated with predators – I wanted to understand how they function in the ecosystem and why they're so important. From there, I went to work with rescued bears in China and then to the **Bimini Shark Lab** in the Bahamas, where I fell in love with the marine environment, in particular sharks. I continued my studies and expected to be a **field scientist** but during lockdown my stepdad [wildlife photographer and TV presenter, Chris Packham] and I stared the Self-Isolating Bird Club where we broadcast an hour every day talking about wildlife – just to cheer ourselves up really, but our online community began to grow. Then I started wildlife TV presenting and writing books about it, which is all really fun!

> Adult female sharks are usually bigger than males and their skin can be three times as thick.

● What is it about sharks that you find fascinating?

I always like an underdog. I like an animal that's misunderstood because there's so much potential work to be done. I'd never seen a shark before I went to Bimini and I didn't really know what to expect, but the moment you put your head under the waves and you're in their world, all of those **stereotypes** about sharks being terrifying, man-eating predators just fade away. You see them for what they are, which is these incredibly intelligent, curious animals. You feel like you're in a different universe and it's just the most beautiful thing to see and to experience. I want to prove people wrong about sharks and shout about them from the rooftops for being the amazing animals that they are.

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● Why do you think people fear sharks so much compared to other predators like tigers?

It's the fear of the unknown, I suppose. Very few people actually spend a lot of time in the water. People are always surprised that there are 40 different species of shark in UK waters. Some are here all year round and some come and go, but we've got lots of different sharks. I was off the coast of Cornwall with blue sharks a couple of months ago and there are smaller things like dogfish and catfish, plus different types of fish and coral reefs. I also don't think some of the **media** helps, in the way that sharks are spoken about in **clickbait** terms, describing them as man-eating killers. It's so far away from the reality. I think a certain Hollywood movie [*Jaws*] didn't help either and a few others that have come after it. I love those movies, but I look on them as fiction, like Marvel, because it's not at all accurate.

Sharks can smell in stereo because each nostril detects smell independently. This means they can work out precisely where a smell is coming from.

● Could you tell us more about the research into shark personalities that you worked on?

As an intern in Bimini, I was helping two French scientists (Jean-Sebastien Finger and Félicie Dhellemmes) who are both really interested in personality. Obviously, animals have personalities – I have two poodles who are full of it! – but from a scientific point of view it's quite hard to prove. The study was to try to understand **juvenile** lemon sharks. A lot of pregnant female sharks come to give birth on Bimini because it's covered in **mangroves**, which provide protection. Young sharks nestle amongst the mangroves until they're old enough to migrate off on their own. While they're in the mangroves, the lemon sharks are quite social. We were trying to understand how their personalities change the way they use that environment. We'd place something the sharks had never seen before into the water, like a rubber donut, and record their reactions to it. The scientific definition of personality is consistent differences in behaviour over time and we use the terms 'bold' or 'shy'. The bolder sharks would be up exploring the new object immediately, whereas the shy ones would be on the outer edges, as far away as they could possibly get from it. We started to notice that they grouped together in personality types. There's a lot more we don't understand and it's so much more than just being bold or shy, but it was such an interesting study.

Studying juvenile lemon sharks at the Bimini Shark Lab

● Why is that research important?

It's about making people realise that there's a lot more to sharks than just teeth and fins. People wouldn't ever imagine being able to relate to a shark, but perhaps they could if the messaging was right, and that might go some way to protecting sharks.

Sharks have no swim bladder and have to constantly swim to stop themselves sinking to the bottom.

● What are the main threats sharks are facing around the world?

Well, where to start? A big issue is **shark finning**, which is horrific and definitely needs to be looked at, but it's not the biggest threat. The biggest threat is sharks being overfished as **bycatch**. Probably more than a hundred million sharks are killed by **commercial fisheries** every year. These huge **trawler nets** are put into the ocean without a second thought for what else they're catching, and the number of sharks that are caught as bycatch is huge. They're thrown back in dead, or if they're alive they die after being put back in.

● Why do sharks die after being put back into the water?

Sharks build up a lot of lactic acid when they're stressed. It's similar to how we build up lactic acid when we exercise and then we feel sore for a few days afterwards, but they build up lactic acid a lot faster than we do. Hammerheads in particular are very susceptible to stress. The build-up of lactic acid in their bodies means the

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survival rate after being thrown back in after an incident like being caught on fishing gear is very low. Hardly any survive that, and even if you see the shark swimming off strongly, in a few hours it's likely to be dead.

> "Sharks have been in the waters for 450 million years. They've been around for much longer than trees!"

● Why is shark conservation so essential to the world?

This is such an important one. Sharks have been in the waters for 450 million years. They've been around for much longer than trees! There are a few species of shark that have been unchanged for 150 million years. **Evolution** sometimes takes a long time, but sometimes it takes a surprisingly short time, and for an animal to remain unchanged for 150 million years, it has to be doing something right! It has to be perfectly built for its environment because otherwise it would naturally change over time, but these sharks have stayed exactly the same. They're an **apex predator,** right at the top of that food chain and they make the oceans healthy. Without sharks the ocean **ecosystem** would certainly collapse. They regulate the prey species below them and clean up the ocean. You can't have a healthy ocean without sharks. They are a fundamental to our oceans and oceans are fundamental to life.

● So, what would a world without sharks be like?

It's very difficult to say exactly what that would look like. Scientifically speaking, we'd need statistical analysis, but from a personal perspective the world would be a lot dimmer. The shining jewel of **biodiversity** wouldn't be there. The chances are that, to begin with, fish numbers would start to rise massively, but that creates disease and then the whole ecosystem just fails. Once those fish populations have boomed and then plummeted, communities that live on the coast and depend on fishing wouldn't be able to survive. I'm not talking about big commercial fisheries, I'm talking about people who fish to feed their families. It's counterintuitive in a way. You imagine taking this massive predator out would help fish numbers, but it would be entirely the opposite. So, it would be a broken ecosystem that many humans would struggle to live alongside.

An adult lemon shark swimming above the sea grass at the Tiger Beach

> A Port Jackson shark lodges its spiral-shaped eggs among rocks and in crevices to keep them safe from predators.

● What can young people do to help sharks and make a difference?

I think the best thing they can do to help sharks is to talk about them, to enthuse other people about how amazing they are and if they can, get in the water and try to see one in the wild. Spend a bit of time in the ocean and get to know it. If you don't live close to the water, look online and do some research into sharks. Don't believe what everybody else tells you to believe, find out what sharks are like for yourself... and then tell all of your friends how amazing sharks are! Another thing you can do, if you're in the supermarket and your parents are buying fish, look where that fish is coming from. Try to buy fish more **sustainably** and more seasonally. Really look at what's going into the shopping basket. Use your voice and don't be afraid to tell your parents what's fine to eat and what's damaging the ecosystem.

> Humans kill 73 million sharks every year for their fins; equivalent to two every second.

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● What's the best shark fact you know?

An amazing shark fact is that they have a sixth sense! It's impossible to imagine what having a sixth sense is like as we only have five – we can touch, taste, see, hear and smell, but sharks can detect the electric pulse of living things around them through sacks of jelly that are in their noses and on their **lateral line**. It's how they detect their food. It's why hammerheads have their hammer shaped head. They've got all these jelly-filled sacks, called the Ampullae of Lorenzini, which can detect electromagnetic fields. A hammerhead uses its head like a metal detector to scan for prey. It's so sensitive that if you're in the water swimming with sharks they can actually detect your heartbeat! If I'm in the water with sharks, I'm never nervous but I always get really excited and I have to remind myself to calm down because they can sense my heartbeat.

● What advice would you give *First News* readers who'd like to follow in your footsteps and work in zoology and conservation one day?

Number one would be to start volunteering in your spare time to get as much practical experience as you can. I started volunteering at my local wildlife hospital when I was about ten years old. So, get to know your local volunteer groups, contact nature charities that might be around you. That could be The Wildlife Trust or RSPB, and get talking to people about it. Number two, depending on your age and with consent and help from your parents, social media can be great when it's used in the right way. It can connect you with other like-minded people and help you to make contacts that could really help when it comes to your future career. If there's a zoologist or scientist out there that you really admire, you could ask your parents to get a message out to them on social media. It may build some long-term relationships that can help you in your career goals.

A thresher shark uses its long tail, nearly the same length as its body, like a whip to stun its prey.

GLOSSARY

apex predators – The predators at the top of the food chain that are not eaten by any other animals within that ecosystem

biodiversity – The number of different plants and animals in an ecosystem – a high level of biodiversity is a sign of a healthy environment

Bimini Shark Lab – A research station located in Bimini, in the Bahamas where scientists and students study the biology of sharks and rays, and the role they play in the marine ecosystem

bycatch – Fish and other sea creatures caught unintentionally by commercial fisheries when fishing for other types of fish

clickbait – Sensationalised or misleading headlines that are written with the purpose of attracting attention and to shock, in order to make people click on links to open particular webpages

commercial fisheries – Businesses that make money from catching fish and other seafood from the marine environment

ecosystem – All the living things in an area and they way they affect each other and the environment

evolution – The way in which a species of animal or plant slowly change over many generations to make them better adapted, and more successful, in their environment

field scientist – A scientist who conducts ecological research and surveys in the natural environment, rather than in a laboratory

juvenile – A young person, animal or plant

lateral line – A system of sense organs just under a fish's skin that enable it to detect movements in the surrounding water

media – Communication channels that provide large numbers of people with news, information and entertainment, such as newspapers, television, radio and magazines

mangroves – Tropical trees that grow in coastal waters with their tangled roots visible above the ground (and water)

personalities – The characteristics and patterns of behaviour that an individual person or animal has

stereotypes – Ideas that many people have about something which are often untrue

trawler nets – Large nets, usually in the shape of a bag or cone, that are dragged through the water by a boat to catch the fish living there

zoologist – A scientist who studies animals

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EXPERT: GRAHAM BUCKINGHAM

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> "Sharks are remarkable creatures that play a crucial role in the marine ecosystem"

Graham Buckingham set up the shark and marine conservation charity Bite-Back in 2004. We spoke to him to find out more about why he became a spokesperson for sharks and his mission to keep sharks in our oceans.

What inspired you to set up Bite-Back?

The more I grew in confidence as a **scuba diver**, the more I wanted to see a shark. But, despite choosing dive locations with names like 'shark reef', 'shark alley' or 'shark bay', there just weren't any sharks to be found. Curious to know why, I did a lot of research into sharks and discovered, to my horror, that they were being killed in their millions, predominantly for **shark fin soup**. At that moment it occurred to me that a bowl of soup was the reason I wasn't getting to see sharks on my dives, and I realised that if I could stop people from selling or eating shark products I might, one day, get the underwater encounter I dreamed about.

With the help of friends, I launched Bite-Back with the goal of making Britain's restaurants shark fin-free. Over the years our ambitions have expanded to include ending the UK trade in all shark products and addressing the way sharks are portrayed in the media.

> Sharks have a sixth sense: they can sense tiny electrical currents made by other creatures, a skill which helps them detect their prey.

Shark fins for sale in a fish market

WHY DO SHARKS NEED OUR HELP?

● What are Bite-Back's biggest achievements so far?

When I launched the charity in 2004 there were 63 UK restaurants with shark fin soup on the menu. One by one we contacted them and convinced 57 of these restaurants to stop selling the controversial dish. That's a massive 90% drop.

Elsewhere we've successfully campaigned to educate retailers and supermarkets to take endangered fish off their shelves. This includes prompting Asda to stop selling mako and thresher shark steaks. Up until that point, they were selling 100,000 portions of shark every year. We even got Iceland Foods to stop selling blue shark steaks and health food shop Holland & Barrett to take shark cartilage capsules out of their 580 stores.

● What is Bite-Back's next big aim?

Ever since we exposed how it was possible for any adult to bring 20kg of shark fins through **Customs** without breaking the law, we've been campaigning to make this loophole illegal. Having inspired huge support, there's currently a bill going through Parliament to ban the import and export of shark fins. We're going to keep the pressure up until the moment that King Charles signs a document to make this law.

● Sharks have had a bad image for a long time (certainly since the 1970s when *Jaws* was released). How is Bite-Back changing that?

The way that sharks are portrayed in films, in the news and in books is always as a menacing, man-eating monster. And yet, typically, fewer than 10 people die from shark bites a year. The reality is that British cows kill more people than all the sharks in the world combined, but there's no hysteria about how deadly cows are.

A whale shark typically feasts on over 20kg of tiny plankton every day. It is sieved through five sets of gills on either side of its head.

A diver finds a finned hammerhead shark on the seabed

For these reasons we've been working hard to educate and encourage the media to report shark encounters accurately. In most cases, the truth behind the story is simply that someone spotted a shark near a swimmer or near a boat and, while nothing actually happened, the **clickbait headline** seems to tell a totally different story.

I think our campaign has prompted more people to acknowledge the tired **stereotypes** that are all too often written in shark-related stories. And that's important, because if you only believe what you read in the paper or see on screen about sharks then you'll have missed the point; that sharks are remarkable creatures that play a crucial role in the **marine ecosystem** and yet they're at risk of extinction.

● Why are sharks such an important part of the marine ecosystem?

Sharks are **apex predators** at the top of the food chain, which means that they have very few natural predators themselves. Carnivorous sharks feed on a variety of fish, molluscs, crustaceans and even mammals like seals and dolphins that sit beneath them in the food chain. This means that sharks help regulate the populations of these groups. This way, these groups never get so big that they snap up their own prey too fast. This pattern is repeated down the food chain. The danger is that, if too many sharks are killed too quickly, it will allow populations of their prey to grow out of control and topple the balance of the oceans. And that could cause havoc to life on Earth.

An oceanic whitetip shark uses its long pectoral fins (the ones on the sides of its body) like wings to glide through the water and save energy.

WHY DO SHARKS NEED OUR HELP?

● Can you explain the ways in which commercial fishing causes problems for different shark species?

Overfishing is the biggest problem facing the oceans. Right now, too many boats are catching too many fish too quickly – and nature simply can't keep up. Lots of sharks and big fish, like swordfish and marlin, take years to mature and have few offspring, while other fish, such as mackerel, breed quickly. Sadly, it's the big fish that appear most frequently on fish counters and in restaurants, so the fish we choose makes a difference too.

Bycatch is the name given to fish that are caught but either aren't the target species or aren't the fish the boat has a licence to catch. So, if a boat sets out to catch tuna with a big net or a longline and 'accidently' catches sharks, turtles or dolphins, then these species are considered 'bycatch'. Despite all the technology on board a fishing boat these days, it's still impossible to catch only the target species, which means there's lots of waste as dead fish are simply thrown back into the sea.

Shark finning is the action of cutting the fins off a living shark and throwing the body overboard to die. The reason fishermen keep the fins but discard the body is because they're extremely valuable, unlike the meat. It's the marine equivalent of killing an elephant for its tusks.

Shark fin soup was first served at banquets hosted by Chinese emperors 800 years or so ago. It was created as a demonstration of extravagance and, over the years, it's become a symbol of status and wealth at weddings and celebrations in the Far East. Now, millions of people around the world are wealthy enough to order this expensive soup as a treat or show off to friends. It's like a fairy tale story of an ancient emperor has created an ecological catastrophe.

A bowl of shark fin soup

In the past few decades, the popularity and price of the dish has peaked and has prompted fishermen to hunt sharks in huge numbers just for their valuable fins. And since the fins are worth so much more than the shark meat, the fishermen keep the fins and dump the shark.

Bizarrely though, the shark's fin has no taste of its own. It's made up of a series of **cartilaginous** fingers that run the length of the fin, and it's these strands of gristle that are added to the soup for texture alone.

A great white shark is counter shaded, which means it is grey on the top half and white underneath. This provides natural camouflage from above and below.

● What are the other main threats facing sharks, and how serious are they?

Even if sharks aren't necessarily eating plastic first hand, the prey they eat is likely to be contaminated with plenty of it. In some parts of the world, seawater contains seven times more microscopic plastic particles than **plankton**, and that's how plastic enters the food chain. So, if every meal a shark eats has plastic in it, it could be consuming a life-threatening amount of plastic in just a matter of years.

At the same time, more chemicals and toxins have entered the oceans and continue to be dumped at sea. These are absorbed by marine creatures up and down the food chain, ultimately reaching the big predatory fish too.

Elsewhere in the world, important mangroves and estuaries – safe places for sharks to grow up – are disappearing as they become developed for prawn farming or bulldozed to make way for beach resorts or housing.

And finally, we can't talk about conservation without considering climate change. When it comes to the oceans, changes in the climate affect the shark's entire habitat in terms of weather patterns, water temperature, sea level, ocean chemistry, currents, coastal erosion and the frequency of storms that can crush coral reefs. Ultimately, the shark's food supply, migration patterns, distribution, reproduction and relationships with other parts of the food chain are all disrupted, with possible major consequences to the survival of sharks.

WHY DO SHARKS NEED OUR HELP?

What would a world without sharks be like?

The answer to this question should terrify everyone because the consequences could be catastrophic for life on Earth. First, we must bear in mind that the oceans produce more than 60% of the oxygen we breathe. Remove sharks from the oceans and the way the oceans operate could change completely. And that means it could alter the levels of oxygen in the atmosphere.

Industrial fishing using huge trawling nets

Can you share a shark fact that you think people should know?

Every year more people die taking selfies than from shark attacks. That's something to think about next time you take a snap with your friends!

If you could be a shark, which one would it be?

I've always found hammerhead sharks to be mesmerising. They're big and imposing and since their eyes are far apart, they have great vision. They use the wide spread of electro receptors in the hammer like a metal detector to scan the seabed for stingrays and other prey. When they find a stingray, they use that wide head to pin prey to the floor and then capture it with a set of teeth that have serrated sides, like a saw.

What's the best way for young people to get involved with Bite-Back?

We're always looking for shark ambassadors who can share their knowledge and enthusiasm for sharks so that others can understand their importance and why we need to protect them.

What else could young people do to help to protect sharks?

Tell us if you see shark products for sale anywhere, whether that's at a fishmonger, in a restaurant or at a health food store. Together we can help encourage the business to stop. And keep an eye on your local newspaper too, because we want to stamp out bad journalism around sharks. Again, by inspiring newspapers to be more factual, we can help more people understand the truth about why we need to help our shark friends.

The sad truth is that, because so many people fear sharks, it's hard to raise money for shark conservation. So, we'd love it if anyone could host a fundraising event that communicates the importance of sharks too.

GLOSSARY

apex predators – The predators at the top of the food chain that are not eaten by any other animals within that ecosystem

biodiversity – The number of different plants and animals in an ecosystem – a high level of biodiversity is a sign of a healthy environment

cartilaginous – Made of cartilage, a strong, flexible material that forms the bendy bit of your nose and ears. It is the tissue that forms the skeleton of sharks and rays

clickbait headline – Sensationalised or misleading headlines that are written with the purpose of attracting attention and to shock

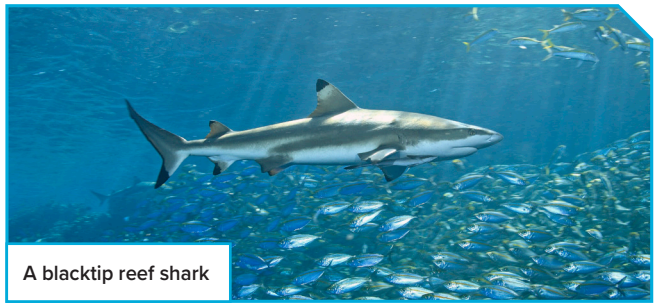
Customs – The place where people arriving from a foreign country have to declare goods they are bringing with them. Government officials who work here make sure that no illegal goods are brought in, and that any taxes required are paid for bringing in goods from abroad

marineecosystem – All the living things in an area and the way they affect each other and the environment

media – Communication channels that provide large numbers of people with news, information and entertainment, such as newspapers, television, radio and magazines

plankton – Tiny plants and animals that float and drift in the sea. They are an important part of the food chain as lots of sea creatures feed on them

stereotypes – Ideas that many people have about something, which are often untrue

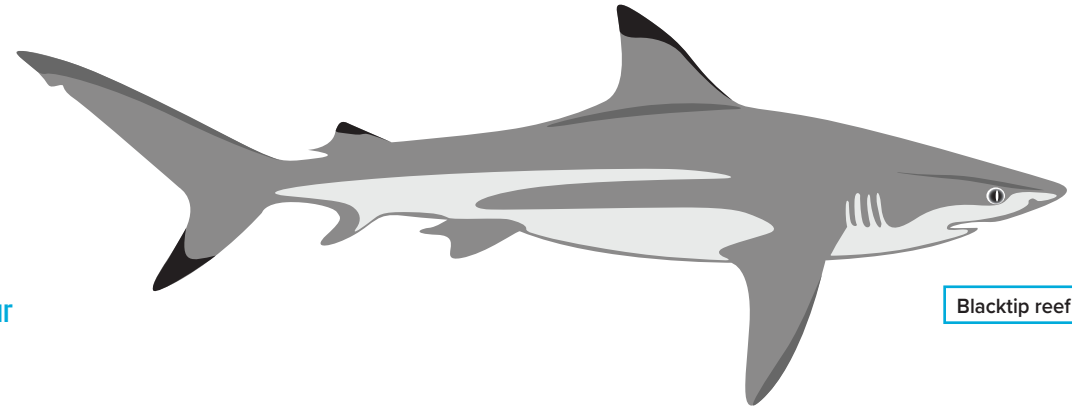


A blacktip reef shark

EXPERT: STEVE BACKSHALL

Why do sharks need our help? Investigate and find out what is happening.

Read through and discuss what you find out from this expert. Use the following questions to help you with your research and to develop your knowledge.



Blacktip reef shark

Steve's job

- Steve is a well-known TV presenter. What is his area of expertise?

Shark knowledge

- Why does Steve say that humans know so little about sharks and their behaviour?
- How many species of shark are there around the world?
- What three species of shark does Steve mention that can be found in seas around the UK?
- Steve says shark species have very diverse diets. What examples does he use to explain this?
- Steve describes sharks as "our ocean's most ancient and alluring predator". Find three of the large predator shark species he talks about.
- How long have sharks been on Earth?
- What can an epaulette shark do?
- And, what happens to most species of shark if you flip them onto their backs?

Threats to sharks

- How many sharks do humans kill every year?
- How many sharks are killed for just their fins every year?
- What is bycatch and why is this responsible for killing so many sharks?
- Why is it such a problem that so many young sharks are killed?
- How does the media add to problems for sharks?

Shark conservation

- How many shark species are currently endangered?
- What does it mean that many species of shark are keystone species?
- What wider problems would there be for marine ecosystems if sharks became extinct?

Take action for sharks

- Why is Steve Backshall so impressed with the work of the conservation charity Bite-Back?
- Make a list of all the different actions Steve says that young people could do to help sharks.

EXPERT: HELEN CZERSKI

Why do sharks need our help? Investigate and find out what is happening.

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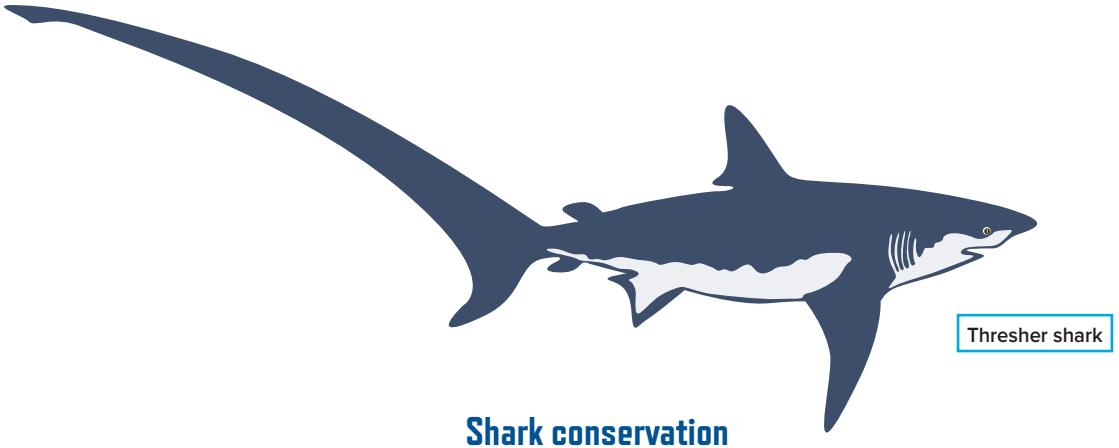

Thresher shark

Helen's job

- Helen is an oceanographer. What does that mean?
- What's Helen's area of expertise?

Understanding how the global ocean works

- Helen says the ocean is an **engine** and like our **lungs**. How is it like both an engine and lungs?
- How do these comparisons help us understand Earth's oceans?
- How is climate change affecting the temperature of the oceans?
- Which layer of the ocean is most affected?
- What do cold water currents bring up from the deep ocean to the warm surface layer that are vital for living things to grow there?

Shark knowledge

- Why are sharks so difficult to study?
- Why are they more difficult to study than whales?
- How do sharks bring nutrients from the open water to 'fertilise' coral reefs?
- What can sharks do that Helen thinks makes them remarkable creatures?

Threats to sharks

- What features of sharks does Helen think people don't find appealing?
- Why does Helen think we should think of sharks as 'the tigers of the sea'?
- What does Helen say about the state of shark populations around the globe?
- List all the problems that Helen tells us sharks face.
- Which problem does Helen think is the most serious?

Shark conservation

- Why does Helen think that doing more to protect sharks will help the marine ecosystem?
- Why does Helen think that humans need to learn to recycle in the same way as nature?

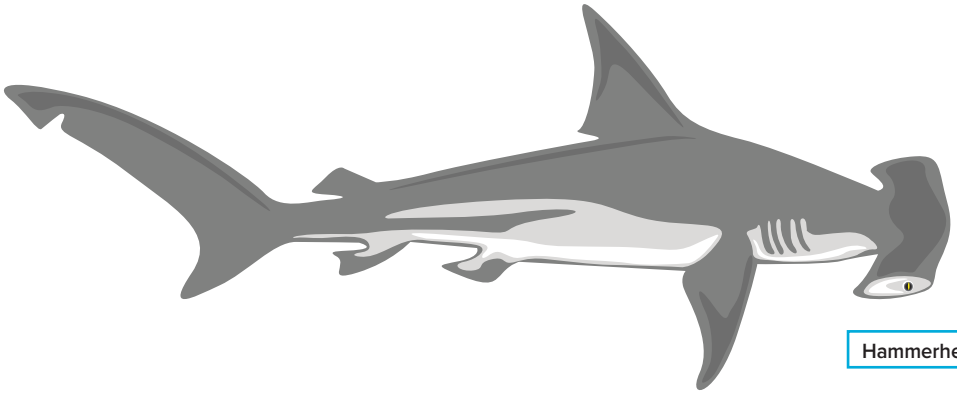
Take action for sharks

- What does Helen think is the most important thing we need to do to protect sharks?
- How does Helen think young people can help?

EXPERT: MEGAN McCUBBIN

Why do sharks need our help? Investigate and find out what is happening.

Read through and discuss what you find out from this expert. Use the following questions to help you with your research and to develop your knowledge.



Hammerhead shark

Megan's expertise

- Megan is a zoologist. What does that mean?
- As well as studying, how did Megan learn more about animals when she was younger?
- Megan says she 'became fascinated with predators' as she grew up. What did she study:
  - ☐ tigers
  - ☐ bears
  - ☐ sharks
- How did Megan find out she loved getting other people excited about nature during lockdown?

Shark knowledge

- How many species of shark does Megan say live in the seas around the UK? Can you name some of the ones she talks about?
- Megan tells you about her pets to illustrate that animals have personalities. What pets does she have?
- Where is the Bimini Shark Lab?
- What species of shark did Megan study when she was investigating shark personalities at the Bimini Shark Lab?
- Why are the mangroves in Bimini a good place to study young lemon sharks?
- How are young lemon sharks in the mangroves similar to children in a school playground?
- What is one of Megan's favourite shark facts that she shares?

Threats to sharks

- What does Megan say about **shark finning**?
- What is **bycatch**? How many sharks die every year due to this?
- Why don't sharks tend to survive if they are thrown back into the sea after being caught in fishing gear?
- Megan says the media adds to the problems for sharks. How do they make the situation worse?

Shark conservation

- Why does Megan compare sharks to trees?
- Most sharks are apex predators. What does this mean?
- What does Megan say would happen to the ocean ecosystems without sharks?

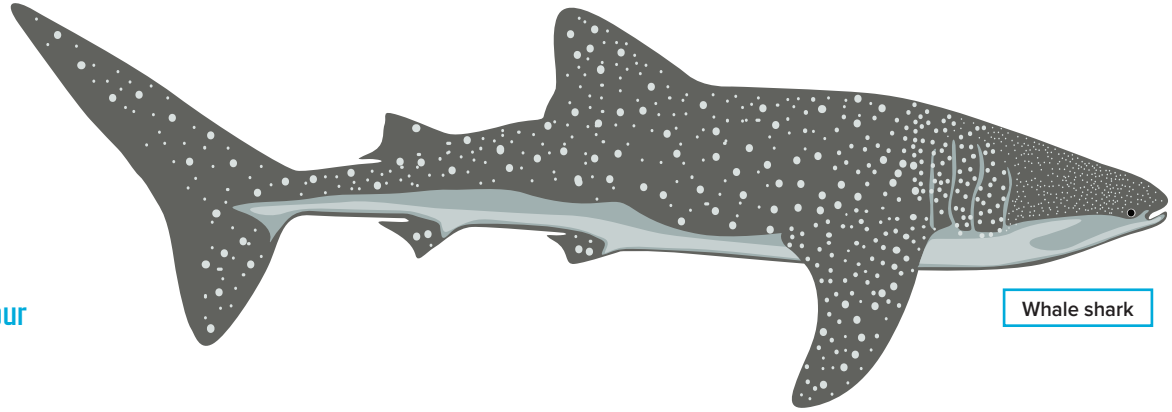
Take action for sharks

- Make a list of all the different actions Megan says young people could do to help sharks.
- Why does Megan think taking action is urgent?

EXPERT: GRAHAM BUCKINGHAM

Why do sharks need our help? Investigate and find out what is happening.

Read through and discuss what you find out from this expert. Use the following questions to help you with your research and to develop your knowledge.



Whale shark

Graham's expertise

- What conservation charity did Graham set up with friends in 2004?
- What problem did Graham identify that made him set up this marine conservation charity?
- What were his plans and ambitions for the charity's campaigning? What did they want to change?
- How do you know Graham is now an expert on UK law about what shark products can be sold in the UK?

Shark knowledge

- Graham says most sharks are apex predators. What does that mean?
- How do apex predators keep their marine ecosystem healthy for all life within it?
- What material are the fins and skeleton of sharks made from?
- What parts of our bodies are made from this material?
- Why does Graham compare a hammerhead shark to a metal detector?

Threats to sharks

- How has the media helped to give sharks a bad reputation?
- What are the three main problems that commercial fishing causes for shark populations?
- How does each of these cause problems for sharks?
- What is the origin of shark fin soup?
- Why do shark fins now sell for such a lot of money?
- What do you think shark fin soup would be like to eat?
- What other products have shark fins been used in?
- Identify all the other threats to sharks that Graham talks about.

Shark conservation

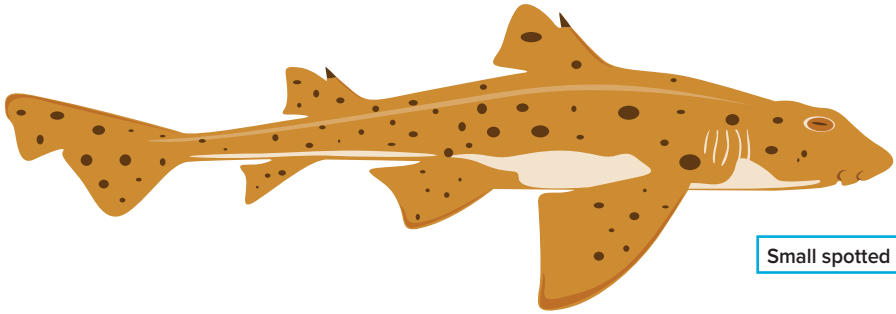
- How do many sharks help to regulate the populations of other species in the ocean?
- What are the dangers to the wider marine ecosystem if sharks become extinct?
- How would this ultimately cause problems for humans too?

Take action for sharks

- How has the charity changed restaurant menus?
- What have supermarkets changed due to Bite-Back campaigning? Why was their campaigning with Asda so successful?
- What did Bite-Back persuade the health food shop Holland & Barrett to stop doing?
- What law is Bite-Back campaigning to be introduced in the UK?
- What campaigning work does the charity do with the media?
- Make a list of all the different actions Graham says young people could do to help sharks.

RESEARCH SUMMARY

Why do sharks need our help? What do you find out from the expert? Make a summary.



Small spotted shark

Expert:

Area of expertise:

What is the current state of shark populations?

What are the main threats to shark populations?

Why is shark conservation so essential? What role do sharks play in the ecosystem?

Make a list of fascinating facts you find out about shark biology.