

**TO ALL THE WORLD'S RESEARCHERS, CAMPAIGNERS,
CITIZENS, SCIENTISTS AND SHARK SUPER-FANS HELPING
SAVE OUR PLANET'S AMAZING SHARKS AND RAYS.**

N. C.

FOR TOBY, ELLIOTT, REX AND TED.

G. S.

First published 2023 by Nosy Crow Ltd
The Crow's Nest, 14 Baden Place, Crosby Row
London, SE1 1YW

Nosy Crow Eireann Ltd
44 Orchard Grove, Kenmare
Co Kerry, V93 FY22, Ireland

www.nosycrow.com

ISBN 978 1 83994 451 2

Nosy Crow and associated logos are trademarks
and/or registered trademarks of Nosy Crow Ltd.

Text © Nick Crumpton 2023
Illustrations © Gavin Scott 2023

Very special thanks to Helen Scales, Amani Webber-Schultz, David Shiffman,
Tristan Guttridge and Lucy Harding. – N. C.

The right of Nick Crumpton to be identified as the author and Gavin Scott
to be identified as the illustrator of this work has been asserted.

All rights reserved.

This book is sold subject to the condition that it shall not, by way of trade or otherwise,
be lent, hired out or otherwise circulated in any form of binding or cover other than that in
which it is published. No part of this publication may be reproduced, stored in a retrieval system,
or transmitted in any form or by any means (electronic, mechanical, photocopying, recording
or otherwise) without the prior written permission of Nosy Crow Ltd.

A CIP catalogue record for this book is available from the British Library.

Printed in China.
Papers used by Nosy Crow are made from wood
grown in sustainable forests.

1 3 5 7 9 8 6 4 2

CONTENTS

Introduction	4–5
Sharks haven't changed for millions of years	6–7
Sharks kill lots of people	8–9
Sharks don't look after their pups	10–11
Megalodon lives!	12–13
There's no point to sharks	14–15
Sharks are big	16–17
Sharks only live in tropical oceans	18–19
Nothing eats sharks	20–21
Sharks don't get on with other animals	22–23
Sharks have to keep moving to breathe	24–25
Sharks all look the same	26–27
Sharks aren't at risk	28–29
All sharks have large, pointy teeth	30–31
Sharks live in shallow seas	32–33
Shark fin soup is good for you	34–35
Sharks all hunt the same way	36–37
Sharks' super-smell is their strongest sense	38–39
All sharks lay eggs	40–41
The <i>Great white shark</i> is the fastest shark	42–43
All rays have stingers	44–45
Sharks aren't useful	46–47
Sharks are loners	48–49
Studying sharks is dangerous	50–51
All sharks are cold-blooded	52–53
Sharks aren't smart	54–55
We can't help sharks	56–57
We have discovered all the sharks	58–59
Our work is done!	60–61
Glossary	62–63
Index	64

INTRODUCTION

From wasps and bats to leeches and snakes, Planet Earth is home to a whole heap of animals that have a pretty bad reputation – and because of this, a massive number of humans are scared by them, try to avoid them, or even try to kill them!

But the worst reputation of any sort of animal we share the world with probably belongs to THE SHARKS. They are, according to a *huge* number of grown-ups, terrifying murderers. They are snaggletoothed meat-eaters intent on killing everything that swims, including – given half the chance – any soft-skinned humans that paddle into their watery realm . . .

But do they deserve this reputation? Are they *really* such marine menaces?

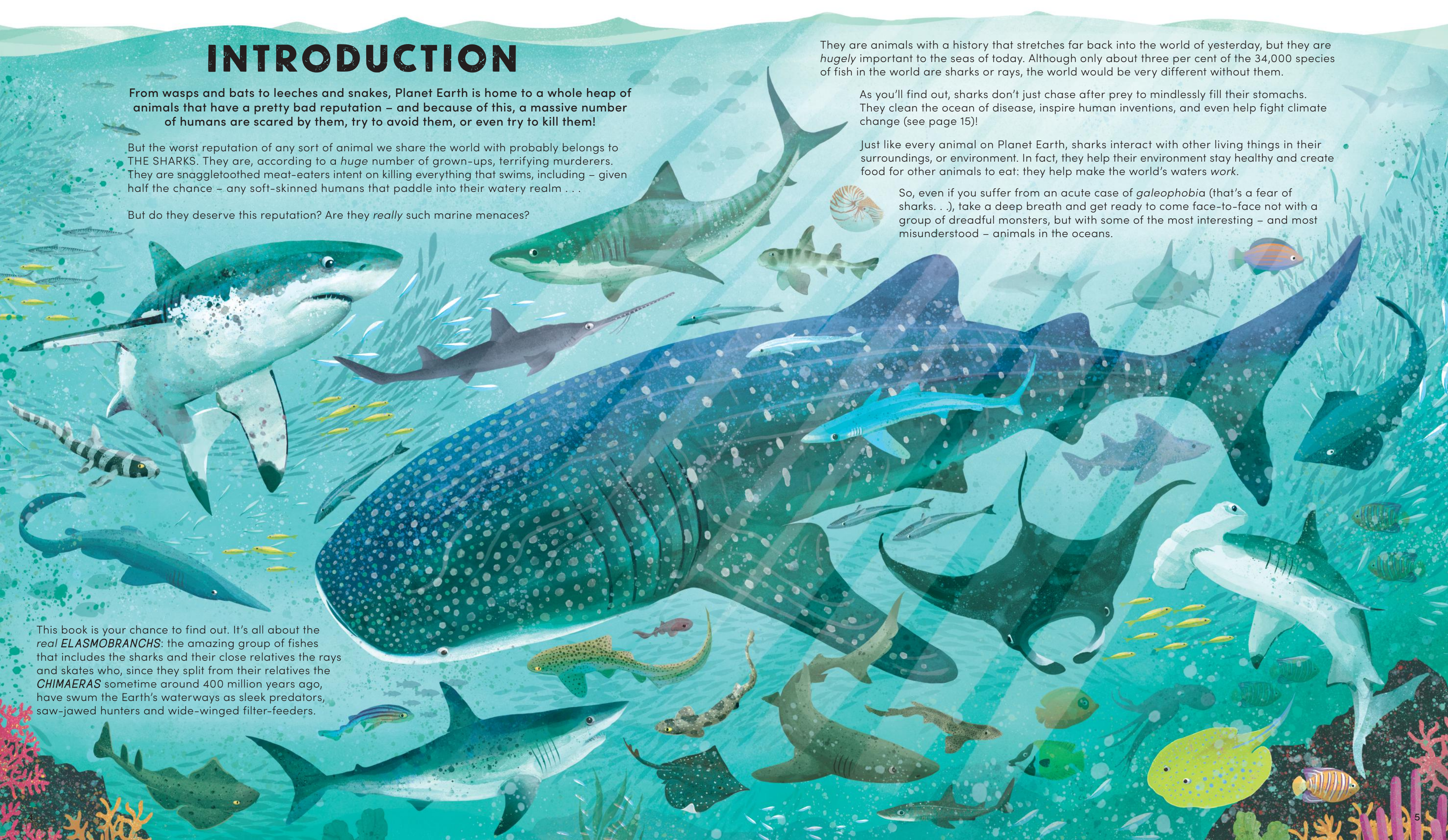
They are animals with a history that stretches far back into the world of yesterday, but they are *hugely* important to the seas of today. Although only about three per cent of the 34,000 species of fish in the world are sharks or rays, the world would be very different without them.

As you'll find out, sharks don't just chase after prey to mindlessly fill their stomachs. They clean the ocean of disease, inspire human inventions, and even help fight climate change (see page 15)!

Just like every animal on Planet Earth, sharks interact with other living things in their surroundings, or environment. In fact, they help their environment stay healthy and create food for other animals to eat: they help make the world's waters *work*.

So, even if you suffer from an acute case of *galeophobia* (that's a fear of sharks. . .), take a deep breath and get ready to come face-to-face not with a group of dreadful monsters, but with some of the most interesting – and most misunderstood – animals in the oceans.

This book is your chance to find out. It's all about the *real ELASMOBRANCHS*: the amazing group of fishes that includes the sharks and their close relatives the rays and skates who, since they split from their relatives the *CHIMAERAS* sometime around 400 million years ago, have swum the Earth's waterways as sleek predators, saw-jawed hunters and wide-winged filter-feeders.

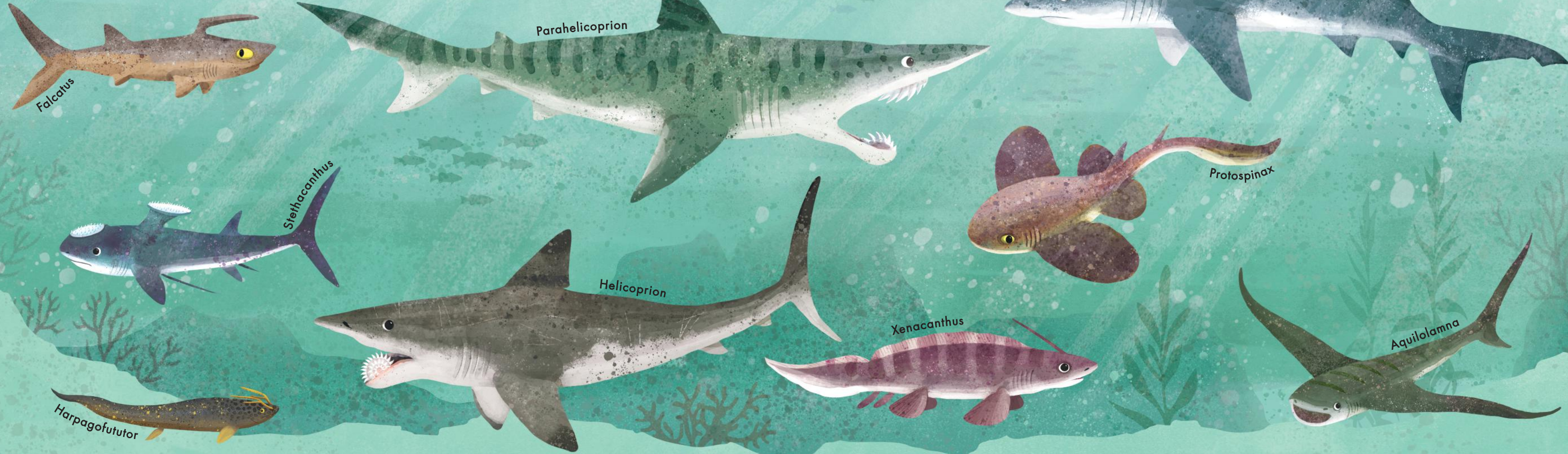


SHARKS HAVEN'T CHANGED FOR MILLIONS OF YEARS

WRONG!

It's true that the basics of 'what makes a shark' (like having a skeleton made of soft, bendy cartilage rather than hard bone) were found in the earliest sharks millions of years ago. But sharks have been around for such an incredible amount of time that a whole bunch of different-shaped sharks evolved as experiments on how to catch food, how to move and how to find mates. Not all of these species survive today but, *yikes*, there have been some pretty odd-looking sharks in the past . . .

So, sure, some sharks today, like the *SIX-GILLED SHARKS*, haven't changed a lot since the Jurassic period, but the enormously long history of shark evolution has meant that the fossil record is *full* of strange characters unlike anything alive today. And there are so many more still to discover . . .



CARBONIFEROUS PERIOD 359-299 MILLION YEARS AGO

The earliest sharks and their soft-skeletoned relatives (all together called the 'Chondrichthyes') shared the seas with the terrifying bone-toothed *PLACODERMS*. It wasn't until a huge mass extinction at the end of the Devonian period wiped these strange armoured fish from the water that sharks had a chance to take their place and evolve into many shapes and forms.

HARPAGOFUTUTOR was a slender, eel-like fish with antlers sticking out the top of its head! Male *FALCATUS* were adorned with a long spike that curved over their heads, possibly for attracting females. No one is sure how *STETHACANTHUS* used its spike-covered dorsal fin . . . did it use it during fights for food? Or did it help it attach to larger animals?

PERMIAN PERIOD 299-252 MILLION YEARS AGO

The Permian period was when things got a bit . . . *loopy*. Especially when it came to shark teeth. Palaeontologists weren't even sure how the spirals of teeth, called 'whorls', sat in the mouths of *HELICOPRION* and *PARAHELICOPRION* until just a few years ago. They now think that *HELICOPRION* used the whorl of teeth in its lower jaw to slash soft-bodied, squid-like prey animals whereas *PARAHELICOPRION* used its upper and lower teeth whorls to catch and eat harder prey.

TRIASSIC PERIOD 252-200 MILLION YEARS AGO

After the world suffered the largest mass extinction of all time at the end of the Permian period, sharks like the spike-headed, ribbon-finned *XENACANTHUS* made it through, while many others became extinct. There have been sharks in the seas longer than there have been trees on the land: they are true survivors, an evolutionary success story. But over 150 million years after they first began to appear, sharks faced a huge challenge.

JURASSIC PERIOD 200-145 MILLION YEARS AGO

During the Jurassic period, sharks evolved their lightning-fast, protruding jaws and began swimming faster. Most of the modern shark groups we know today evolved in the Jurassic period but some weird, ray-like sharks were also skimming across the seabed. The huge-finned *PROTOSPINAX* probably lived in a similar way to *GITARFISH* today, but didn't seem to be related to them . . .

CRETACEOUS PERIOD 145-66 MILLION YEARS AGO

Although sharks like *SQUALICORAX* were incredibly similar to those alive today, the waters of the Cretaceous period still held some surprises. In 2021, palaeontologists described *AQUIOLAMNA* – a long-finned, plankton-eating shark that flapped its way through the oceans while the *Tyrannosaurs* wandered the land above.

SHARKS KILL LOTS OF PEOPLE **WRONG!**

All sharks are predators. Every single one of the 500-ish species hunts and eats other animals in their watery world. Their prey can be anything from the open buffet of marine snacks the oceans have on offer, depending on the shark's particular tastes (see page 36), from octopus or clams to other, smaller sharks. But if a person was to enter that fishy habitat by, say, having a dip off a tropical coast, they'd find themselves on any predator's menu, right? After all, most fish and other aquatic animals are super-speedy and tricky to catch in comparison to splashing, paddling humans.

The truth is that *hardly anyone* ever gets attacked by sharks. Sure, there are occasional incidents, but the numbers are incredibly small when you think about how many people swim in the sea, all around the world, all year long.

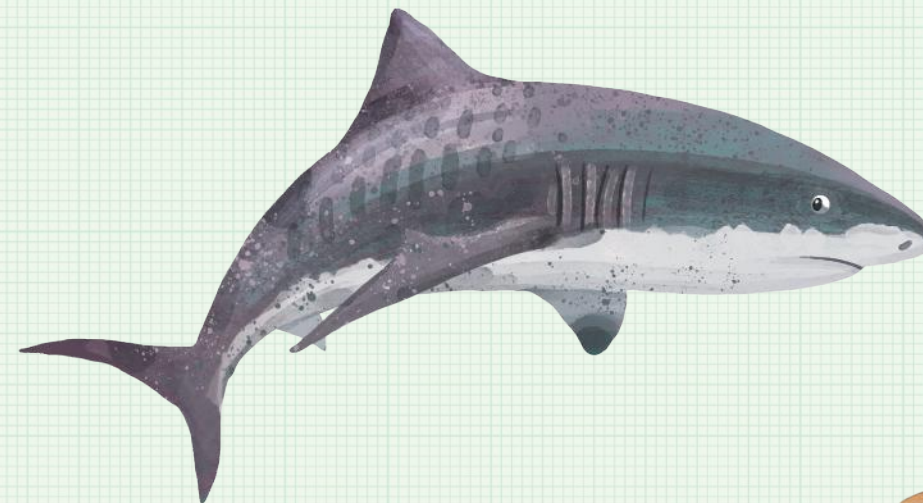
Humans swim around or near sharks much more than they realize – sharks just tend not to bother us when we're in the sea. And, besides, the majority of sharks are pretty small and wouldn't be interested in great big lumbering prey like people.

But some sharks can handle human-sized prey: and it's these species – like *TIGER* and *BULL SHARKS*, which are responsible for the few human deaths each year. It might be that these sharks occasionally mistake surfers and swimmers for floating prey that are a similar size to humans . . . like seals or turtles. Curious sharks first attack to get a taste rather than to kill, but unfortunately a taste-bite from a large shark can be lethal.

Let's take a look at the numbers . . . In 2021, only 73 shark bites or 'interactions' were recorded around the entire world – and that's about average for the number of incidents per year. Most of these were in the seas around the United States of America and Australia and, sadly, 11 of the people who were bitten lost their lives. But let's put this in context. That number is for an *entire year* around the *whole world*, although these were enormous tragedies for those people and their families.

11 people around the world. This number actually starts looking very small when we start looking at other animals that are dangerous to people like . . . cows. Incredibly, twice as many people (22 on average) are killed by cows every year *just in the United States of America*, while bees, wasps and hornets kill about 62 people each year, again, only in the USA.

SHARKS
(KILLED 11 PEOPLE WORLDWIDE IN 2021)



COWS
(KILLED 22 PEOPLE IN THE USA IN 2021)

BEEES, WASPS AND HORNETS
(KILLED 62 PEOPLE IN THE USA IN 2021)



SNAKES
(KILLED 50,000 PEOPLE WORLDWIDE IN 2021)



VIRUSES AND BACTERIA CARRIED BY MOSQUITOES
(KILLED 1 MILLION PEOPLE WORLDWIDE IN 2021)

Worldwide, snakes kill about 50,000 people each year, while the bacteria and viruses that mosquitoes carry cause over one million deaths in the same amount of time sharks kill 11 people.

So, the next time someone says that sharks are dangerous, just remind them to look out for cows, mind their feet in snake country, and to stock up on insect repellent next time they're on a hike . . .

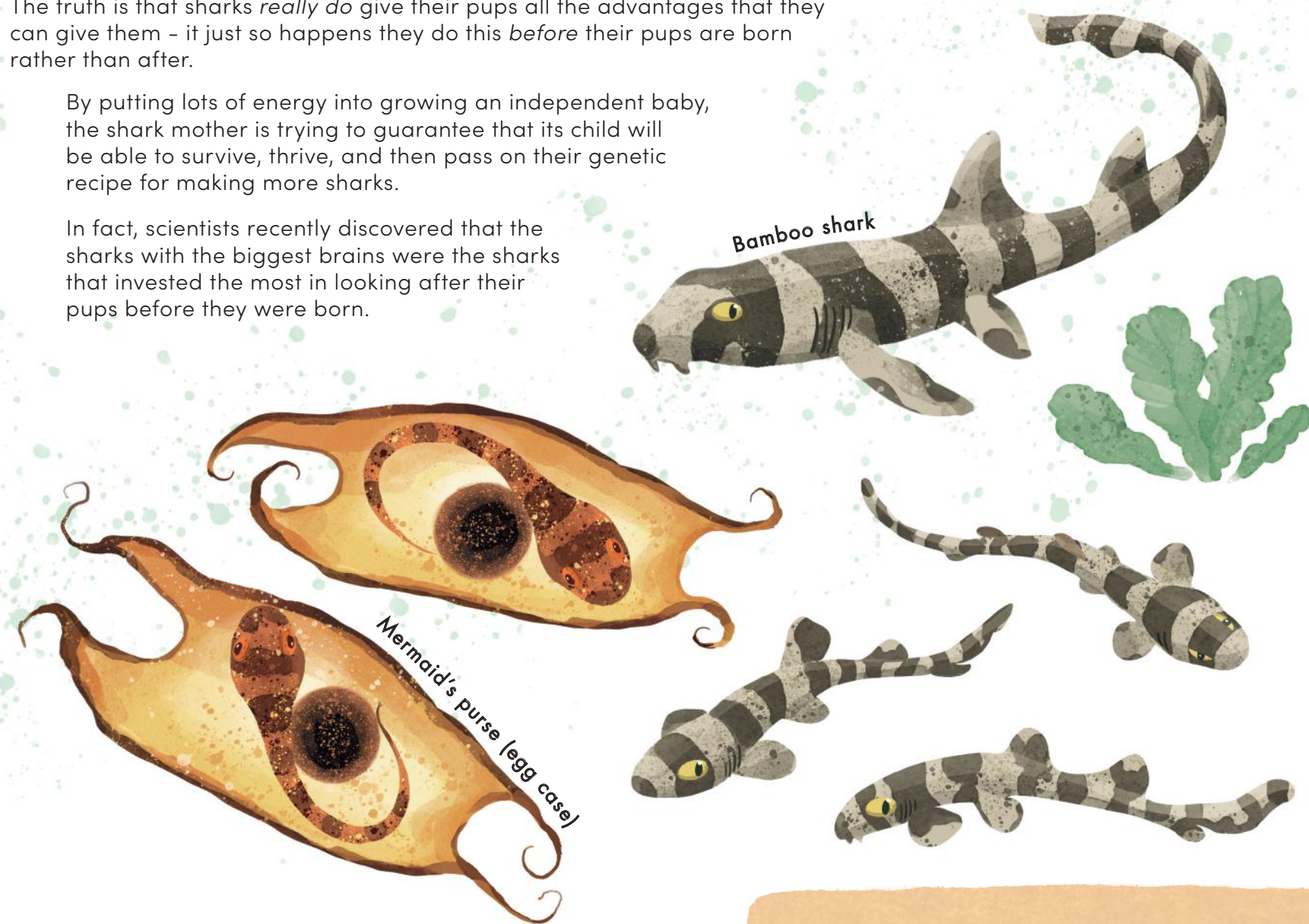
SHARKS DON'T LOOK AFTER THEIR PUPS **WRONG!**

From being fed to being pushed around in buggies, to having their nappies changed (all the time), little human babies need their parents to do almost *everything* for them. So when people look at sharks and see them swimming away after giving birth or laying eggs, leaving their young to fend for themselves, it can seem like sharks are pretty unloving parents and that they don't really look after their pups.

The truth is that sharks *really do* give their pups all the advantages that they can give them - it just so happens they do this *before* their pups are born rather than after.

By putting lots of energy into growing an independent baby, the shark mother is trying to guarantee that its child will be able to survive, thrive, and then pass on their genetic recipe for making more sharks.

In fact, scientists recently discovered that the sharks with the biggest brains were the sharks that invested the most in looking after their pups before they were born.



In order to deliver these ready-to-swim pups, sharks stay pregnant for a long time, usually for many months longer than humans, slowly sharing their energy with their pups and helping them grow. The *FRILLED SHARK* stays pregnant for *three and a half years!* Egg-laying sharks like *BAMBOO SHARKS* lay their eggs a little sooner, but these are laid with a large yolk sac that continues to provide food for the pup.

SHARK FACT!

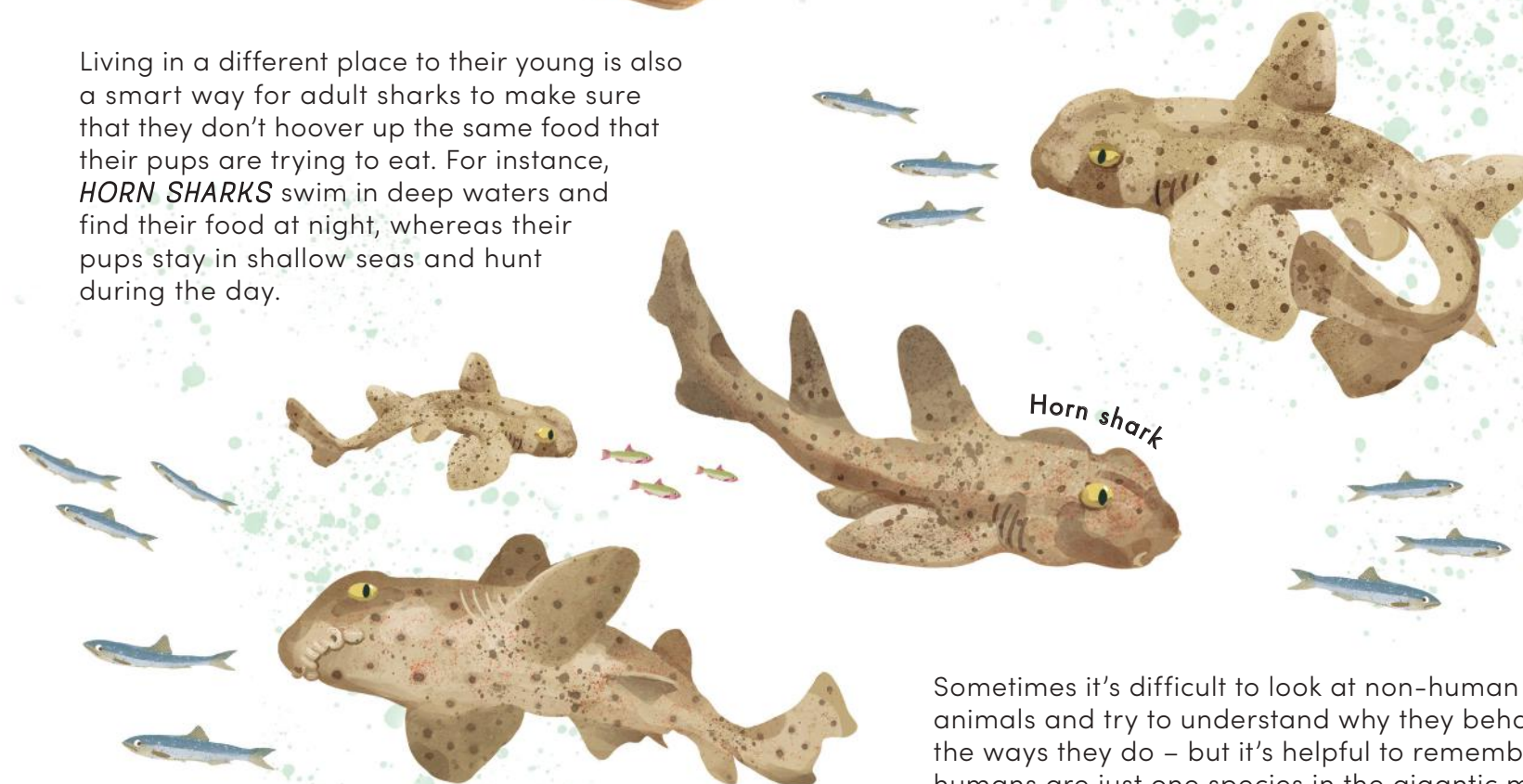
Although scientists still need to find out for sure, the enormously long-lived *GREENLAND SHARK* seems only able to become pregnant after it turns 100 years old, and then remains pregnant for something like eight years . . .

Spiral-shaped egg case



Choosing where to give birth is also a pretty important decision to make when looking after your pups, and *SCALLOPED HAMMERHEAD SHARKS* make sure to give birth in 'nurseries': safe areas in shallow coves where there is lots of food like tasty crabs, and shelter from larger predators that would love nothing better than to nibble on bite-sized pup-morsels. *PORT JACKSON SHARKS* even pick up their spiral-shaped egg cases in their mouths and gently hide them safely in between rocks to protect them from predators.

Living in a different place to their young is also a smart way for adult sharks to make sure that they don't Hoover up the same food that their pups are trying to eat. For instance, *HORN SHARKS* swim in deep waters and find their food at night, whereas their pups stay in shallow seas and hunt during the day.



Sometimes it's difficult to look at non-human animals and try to understand why they behave in the ways they do - but it's helpful to remember that humans are just one species in the gigantic mix of life on Planet Earth. What works well for people isn't necessarily the solution to life's big questions that the other millions of species have stumbled upon.

In their own ways, sharks really do look after their pups fantastically . . . After all, if they didn't, sharks wouldn't have been swimming around the Earth's oceans for the last 400 million years!

MEGALODON LIVES!

WRONG!

SPOILER ALERT! *MEGALODON* does NOT still live in the oceans today. It definitely, absolutely, positively does NOT still stalk prey in the deep.

Well . . . probably. But before we get to that . . . why was Megalodon such a big deal?

MEGALODON was a species of predator that lived in almost all the seas of the world up until three-and-a-half million years ago. It killed and ate other big animals with bites of its tremendous jaws – just like many of today’s sharks do.

But *MEGALODON* was a truly *gargantuan* animal. Palaeontologists don’t have its body bones to study (because cartilage doesn’t fossilise very well), but they do know that its teeth – which fossilise extremely well – grew up to 18 centimetres in length, and sat alongside 270 others in hyper-powerful jaws over three metres wide.

By scaling these measurements up, palaeontologists think fully grown *MEGALODON* (which could have lived up to 100 years) might have grown up to 20 metres long and had dorsal fins as tall as humans. Even its pups (which grew up in coastal nurseries with other *MEGALODON* babies) would have been as long as humans are tall!

Not only was it huge, *MEGALODON* was extremely fast for its size, and the deadly mix of its powerful jaws, huge frame and speedy swimming meant it was the top – or *apex* – predator of the world’s oceans. It didn’t just chase and eat fish, sea turtles and other sharks, it was a devourer of *whales*! This was a *big* fish that ate *big* mammals.

It’s hard to believe that such an incredible predator that once roamed Earth’s seas from the Americas to Australia succumbed to extinction but, after a 13-million-year run, that’s what happened. About three-and-a-half million years ago, *MEGALODON* simply stopped appearing in the fossil record.

As the climate cooled and sea levels dropped, *MEGALODON* could only live in isolated areas of warmer water. Not only that, but its main prey – the whales – became rarer. This led to extinction.

Megalodon

But there are those who say that the incredible *MEGALODON* must still be alive somewhere in the oceans – after all, the seas are huge places . . .

The thing is, there isn’t one single shred of evidence to show that they still exist. There aren’t any *MEGALODON* fossil teeth younger than three-and-a-half million years old, no evidence of whales being chomped by enormous jaws and no dung or scales dragged up in nets from the deep ocean.

The probability of even one enormous *MEGALODON* still living somewhere in the ocean is next to nothing! And for any species to survive, many of them must be alive at the same time in order to build the next generation . . . The seas, for all their mystery, just don’t contain any remaining *MEGALODON* according to any evidence humans have ever found.

Sorry, Meg-fans . . .