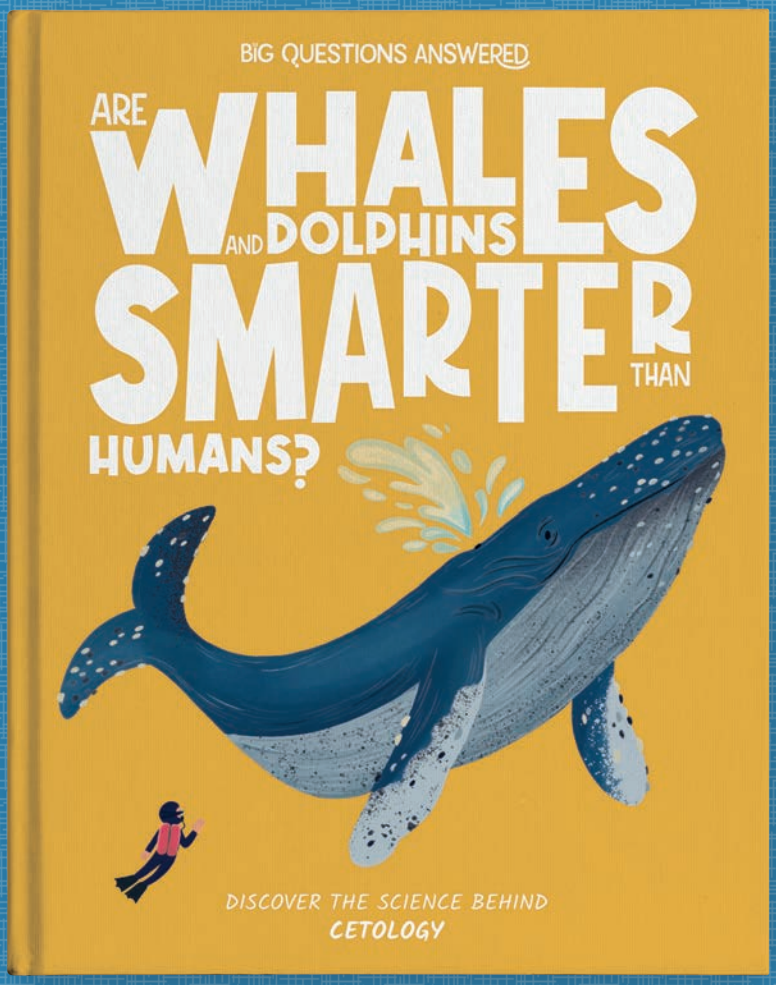
THE BIG QUESTIONS ANSWERED®

TEACHERS' & PARENTS' RESOURCES

Full of thought-provoking questions and fascinating extra information to accompany this book!



CONTENTS:

INTRODUCTION

NOTES FOR TEACHERS, HOME EDUCATORS AND PARENTS

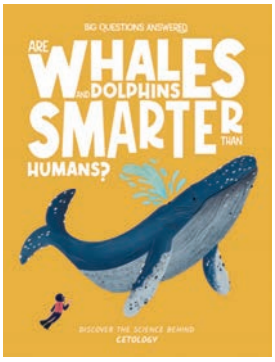
Inspire children's natural curiosity, improve literacy, and have fun learning about different sciences with The Big Questions Answered. Each book in the series is accompanied by a selection of fantastic, **FREE** downloadable resources.

Our **Teachers' and Parents' Resources** booklets are full of ideas for discussions, extra facts, and links to hands-on activities – all great ways to help children explore each field of science and the key topics surrounding them.

Our **Young Scientists' Activity Packs** are a real bonus. They're full of soft-learning, fun activities, all subtly linked to the field of science, that will encourage independent learning. Visit the 'Kids' Zone' to find out more.

Don't forget, on the website you can also download our **'Meet the Scientist' pages** – there's one to accompany each book – and sign up to our newsletter to follow what's coming up next for The Big Questions Answered. Download all these and more at: **www.thebigquestionsanswered.com**

Are Whales and Dolphins Smarter Than Humans? book



Young Cetologists' Activity Pack

KEY CURRICULUM TOPICS

The resources related to *Are Whales and Dolphins Smarter than Humans?* tie in with key curriculum topics including:

- Animals, including humans
- Creative writing and literacy
- Living things and their habitats
- Use of everyday materials
- Working scientifically
- Sound

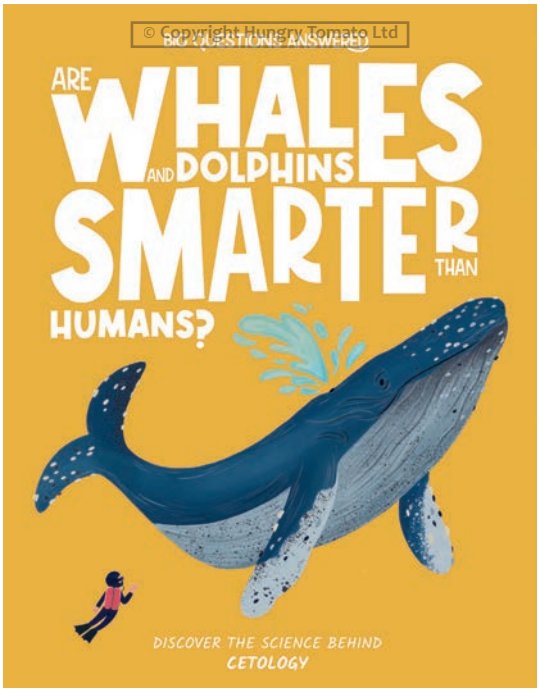
The most relevant topics are indicated throughout this guide.

ARE WHALES AND DOLPHINS SMARTER THAN HUMANS?

This book explores the extraordinary world of cetology by uncovering how clever these marine mammals really are. As well as covering key facts as to what makes whales and dolphins so smart, the book also explores the unique ways that dolphins hunt, the incredible ways that whales help our planet stay healthy, and the impressive ways these creatures communicate and live alongside each other.

PRE-READING QUESTIONS

Engage in discussion about the general topic of cetology with the suggested questions below.



- **What do you already know about whales and dolphins?**
- **Where have you seen whales and dolphins in the wild?**
- **How smart do you think whales and dolphins really are?**

UNDERWATER LANGUAGE: SCENE 1

The material for this scene can be linked to curriculum topics, including: working scientifically; living things and their habitats; animals, including humans; sound.

Introduce children to the topic of whales and dolphins with discussion about the discovery of dolphins communicating in their own language.

DISCUSSION PROMPTS

- **What do you think dolphins sound like when they communicate?**
Information overleaf

- **What do you think dolphins might talk about?**
Encourage children to discuss what dolphins might communicate with each other, such as food, threats, other dolphins, and so on.

- **What tool do scientists use to listen to underwater animals communicating?**
Information overleaf

ACTIVITY

Corresponding activity on page 3 of the activity pack: 'Dolphin Discovery' is a creative writing activity that encourages children to imagine they are a scientist listening to the conversations of dolphins for the very first time!

UNDERWATER LANGUAGE: SCENE 1

RELEVANT INFORMATION

Keywords that you may want to pull out and explain have been put into bold.

WHAT DO YOU THINK DOLPHINS SOUND LIKE WHEN THEY COMMUNICATE?

Dolphins communicate using a variety of sounds.

These include clicks for **echolocation**, which sound like sharp, tapping noises, as well as whistles, which are long sounds similar to human whistles or musical notes.

They also use pulsing sounds for social chats, creating a mix of clicks and whistles that can sound like squawks and chirps.

When they feel threatened or excited, dolphins may make louder sounds that are like screams or barks.

HYDROPHONE

A **hydrophone** is an underwater microphone used to record and listen to sounds in water.

This tool is used by scientists to study the **vocalizations** of marine animals.

It changes the energy from the sounds into **electrical signals**, which allows scientists to listen and record what they are hearing underwater.

Hydrophones were used to listen to dolphins communicating for the first time!

CETOLOGISTS START THEIR RESEARCH: SCENE 2

The material for this scene can be linked to curriculum topics, including: animals, including humans; living things and their habitats.

Introduce children to the science of cetology and who cetologists are. Encourage them to discuss what marine mammals cetologists study, and why.

DISCUSSION PROMPTS

- **What is a mammal?**
  Information overleaf

- **What is a cetacean?**
  Information overleaf

- **What does a cetologist do?**
  Information overleaf

ACTIVITY

Corresponding activity on page 4 of the activity pack: 'Exploring the Depths' is a creative drawing activity that encourages children to imagine themselves alongside some of the biggest mammals in the world!

CETOLOGISTS START THEIR RESEARCH: SCENE 2

RELEVANT INFORMATION

Keywords that you may want to pull out and explain have been put into bold.

WHAT IS A MAMMAL?

Mammals are **warm-blooded** animals that produce milk to feed their young, and they grow hair or fur.

Whales and dolphins are types of mammals, and so are humans!

Other examples of mammals include dogs, sheep, lions, and camels.

WHAT IS A CETACEAN?

Cetaceans are marine mammals that include whales, dolphins, and porpoises.

WHAT DOES A CETOLOGIST DO?

Cetologists study whales, dolphins, and porpoises.

Cetologists spend a lot of time out at sea, using special tools and techniques to learn about different cetacean **species**.

By observing cetaceans in their **habitats**, cetologists can see how they behave with each other, how they communicate, and can also follow them and learn more about their **migration routes** and feeding patterns.

This helps them notice when **populations** are falling, understand why this is happening, and find ways to protect these incredible animals.

IMPRESSIVE PROBLEM-SOLVING: SCENE 3

The material for this scene can be linked to curriculum topics, including:
animals, including humans; living things and their habitats.

Introduce children to how impressive whales and dolphins are with their ability to problem-solve, by focusing on how dolphins use bubble netting.

DISCUSSION PROMPTS

What do you think the dolphin is doing in this scene?
Information overleaf

What other ways do you think dolphins and whales use their problem-solving skills to hunt?
Information overleaf

ACTIVITY

Corresponding activity on page 5 of the activity pack: 'Fin-tastic Dolphin Tactics' is an engaging activity that encourages children to decide whether the statements are true or false.

IMPRESSIVE PROBLEM-SOLVING: SCENE 3

RELEVANT INFORMATION

Keywords that you may want to pull out and explain have been put into bold.

BUBBLE NETTING

In the scene, the dolphin is using a **hunting technique** called "bubble netting".

This technique is used by whales and dolphins.

It involves swimming in a circle around a **shoal** of fish, blowing bubbles. These bubbles create a net around the fish, which shocks them and keeps them in one place. This means prey is much easier to catch!

STRANDING

Intentional stranding is a technique used mostly by orca whales.

It involves them swimming straight towards the shore and **beaching** themselves for a moment. Orca whales do this to hunt for unsuspecting seals on the shore. To get back into the water, they must wiggle and thrash their bodies around.

TAIL-SLAPPING

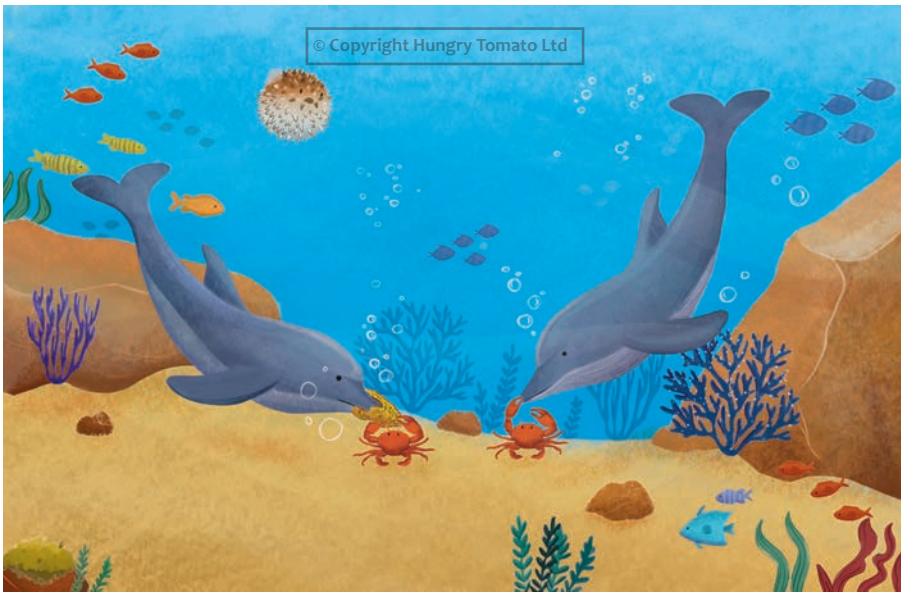
Tail-slapping is a **ruthless** hunting technique, where whales will use their tails to slap or flip their prey.

This is usually done in one quick motion, to startle the prey and make it easier to hunt.

USING TOOLS: SCENE 4

The material for this scene can be linked to curriculum topics, including: everyday materials; animals, including humans; living things and their habitats.

Introduce children to how whales and dolphins use their intelligence to use tools, by focusing on the habits of Shark Bay dolphins.



DISCUSSION PROMPTS

- **What are sea sponges?**
  Information overleaf

- **Why do you think dolphins use sea sponges as tools when they hunt?**
  Information overleaf

- **What sharp objects might dolphins be protecting themselves from?**

Engage children in a discussion about what might be found on the ocean floor that might be harmful to dolphins, such as crab claws, sharp pieces of coral, rocks, and so on.

ACTIVITY

Corresponding activity on page 6 of the activity pack: 'Dolphins DIY' is a fun activity where children must spot the 10 differences between the two images of dolphins' problem-solving.

USING TOOLS: SCENE 4

RELEVANT INFORMATION

Keywords that you may want to pull out and explain have been put into bold.

WHAT ARE SEA SPONGES?

Sea sponges are actually animals!

They can be found on the ocean floor, and come in all shapes and sizes.

Some look like sponges, but they can also look like tubes or long cups.

Sea sponges can **adapt** to whatever **environment** they live in, and they often become homes for other animals too, such as small fish.

WHY DO YOU THINK DOLPHINS USE SEA SPONGES AS TOOLS WHEN THEY HUNT?

Thanks to their impressive problem-solving abilities, bottlenose dolphins in Shark Bay, Australia, have found a clever way of using tools to help them hunt.

They take sea sponges and wear them on their noses, like small protective gloves!

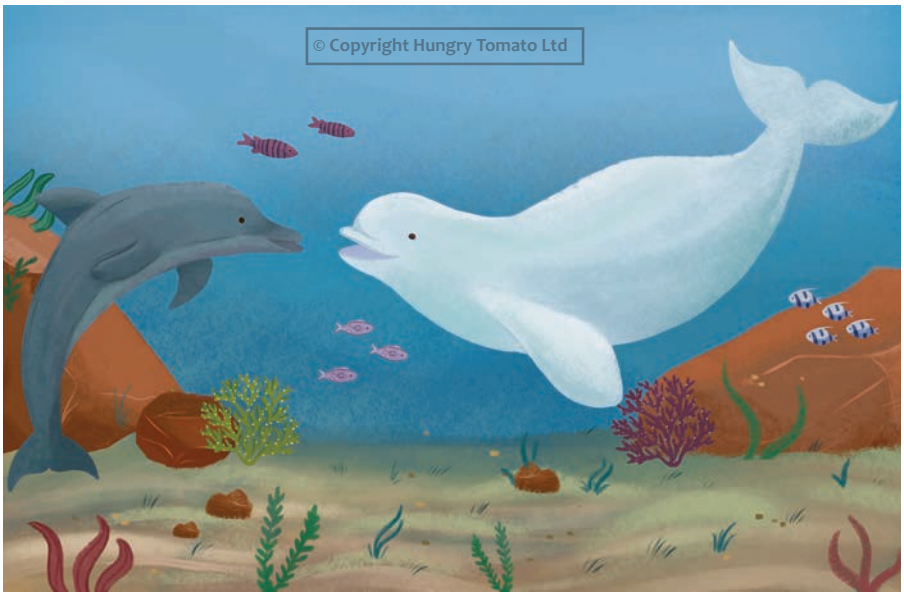
This helps them to keep their noses from harm on the seafloor, such as from sharp rocks, jagged parts of coral, and even the claws of cheeky crabs!

By wearing the sea sponges, dolphins are able to dig into the sand for fish, and other **prey** that live on the ocean floor.

CHATTING AWAY AT SEA: SCENE 5

The material for this scene can be linked to curriculum topics, including:
animals, including humans; living things and their habitats; sound.

Introduce children to how whales and dolphins communicate, focusing on the impressive communication skills of the beluga whale.



DISCUSSION PROMPTS

- **What is a beluga whale?**
  Information overleaf

- **How do beluga whales communicate?**
  Information overleaf

- **If you could speak the language of dolphins and whales, what would you say?**
  Engage in a fun discussion about what children might want to ask whales and dolphins about, such as what they get up to each day, what they eat, what lies at the bottom of the ocean, and so on.

ACTIVITY

Corresponding activity on page 7 of the activity pack: 'Dolphin Chatter' is a fun decoding challenge where children must decipher what the dolphins are trying to say to them!

CHATTING AWAY AT SEA: SCENE 5

RELEVANT INFORMATION

Keywords that you may want to pull out and explain have been put into bold.

BELUGA WHALES

A beluga whale is a **unique**-looking cetacean, with its white skin and round head.

They can be found in the cold waters of the **Arctic**!

They mostly feed on the different types of fish found in these icy waters, as well as crabs and shrimp.

They are very **sociable** animals, and are often very friendly towards humans, too!

Beluga whales are typically the size of a small bus!

HOW DO BELUGA WHALES COMMUNICATE?

Beluga whales are known for being very noisy animals!

They communicate using a variety of different **sounds**, such as chirps, whistles, and clicks.

They also use **body language** to communicate in their **pods**, by rubbing up against each other to show affection or to be playful.

CAN YOU REMEMBER WHEN?: SCENE 6

The material for this scene can be linked to curriculum topics, including: animals, including humans; living things and their habitats.

Introduce children to the amazing memory skills of blue whales, including their ability to remember long migration routes across the world.

DISCUSSION PROMPTS

- **What is migration?**
Information overleaf

- **Why do whales migrate?**
Information overleaf

- **Who do you think would have a better memory – you or a blue whale?**
Engage in a fun discussion around what animal would have a better memory, a human or a blue whale! Encourage children to provide their reasoning.

ACTIVITY

Corresponding activity on page 8 of the activity pack: 'Wonderful Whale Facts' is an engaging activity that encourages children to do their own research on a species of whale, dolphin, or porpoise.

CAN YOU REMEMBER WHEN?: SCENE 6

RELEVANT INFORMATION

Keywords that you may want to pull out and explain have been put into bold.

MIGRATION

Migration is when animals move from one place to another.

For whales, migration usually means moving from one ocean to another. Whales can swim for thousands of miles on their migration **routes**!

Migration usually happens at specific times of the year, depending on the **species**.

Whales are known for their long migrations, but other animals migrate, including all sorts of birds, and butterflies too.

WHY DO WHALES MIGRATE?

Whales migrate for all sorts of reasons.

Some choose to migrate to find food as the seasons change.

For example, some whales might travel to colder regions in the summer so they have better opportunities for hunting **prey**.

In the winter, some whales choose to swim to warmer regions to **mate** and have their babies.

The warm water allows their babies to grow strong and healthy. The long trips are a great way for adult whales to stay fit and healthy, too.

FAMILY COMES FIRST: SCENE 7

The material for this scene can be linked to curriculum topics, including:
animals, including humans; living things and their habitats.

Introduce children to the similarities between human and whale family life, and why community is so important for whales and dolphins.

DISCUSSION PROMPTS

- **What type of whale do you think is coming to the surface in this scene?**
  Information overleaf

- **Can you think of any similarities between whale families and human families?**
  Information overleaf

ACTIVITY

Corresponding activity on page 9 of the activity pack: 'Lost at Sea' is a maze activity where children must help the baby sperm whale return back to its family.

FAMILY COMES FIRST: SCENE 7

RELEVANT INFORMATION

Keywords that you may want to pull out and explain have been put into bold.

SPERM WHALE

Sperm whales are one of the largest whales on our planet. They are also the largest **predators** in the world!

They are most recognisable by their very large heads, particularly their foreheads!

Sperm whales can be found in all deep oceans around the world.

When they hunt, sperm whales will often deep dive to lower levels of the sea in search of squid and sharks to eat.

They can dive for about 45 minutes before they have to **resurface** to breathe. However, the longest recorded dive for a sperm whale was over 2 hours!

SIMILARITIES BETWEEN WHALE AND HUMAN FAMILIES

Despite the size difference and their underwater homes, whale families are not so different from our own families!

Whales live in close social groups called **pods**, similar to our own family groups.

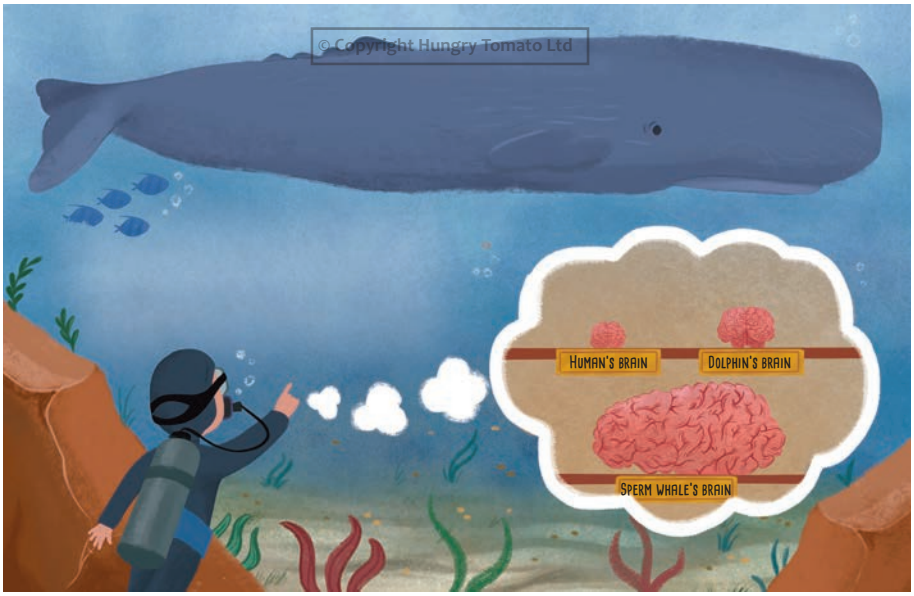
Whales are known to have close relationships with other whales, just like we do with our own family and friends.

Each group of whales will have their own ways of communicating with each other that is specific to them, just like we might have a particular way of talking with our friends or family.

BIG BRAINS: SCENE 8

The material for this scene can be linked to curriculum topics, including:
animals, including humans; living things and their habitats.

Encourage children to discuss whether brain size is related to whale intelligence, alongside learning about the different parts of a whale.



DISCUSSION PROMPTS

- **Can you name the different parts of a whale?**
  Information overleaf

- **How big do you think a whale brain can grow?**
  Information overleaf

- **If you had a brain the size of a whale, what do you think you could do differently?**
  Engage in discussion about how brain size might change how you might think and act.

ACTIVITY

Corresponding activity on page 10 of the activity pack: 'Whale Anatomy' is an engaging activity where children are encouraged to label the unique parts of a whale.

BIG BRAINS: SCENE 8

RELEVANT INFORMATION

Keywords that you may want to pull out and explain have been put into bold.

PARTS OF A WHALE

Flipper
Flippers are like the 'hands' of a whale. They are wide and flat, and are used to help whales swim.

Blowhole
The blowholes are the holes on top of a whale or dolphin's head that it uses to breathe when it comes to the surface of the water.

Most **cetaceans** have two blowholes, but a few, such as sperm whales and most dolphins, only have one.

Dorsal fin
A dorsal fin is the fin located on the ridge on the back of a whale. These fins help whales balance while swimming.

Flukes
A whale's tail is also known as flukes. A fluke is either side of a whale's tail, so whales have two – a left fluke and a right fluke.

Flukes are extremely important for changing direction, communication, and for swimming through the water with ease.

THE BIGGEST BRAIN

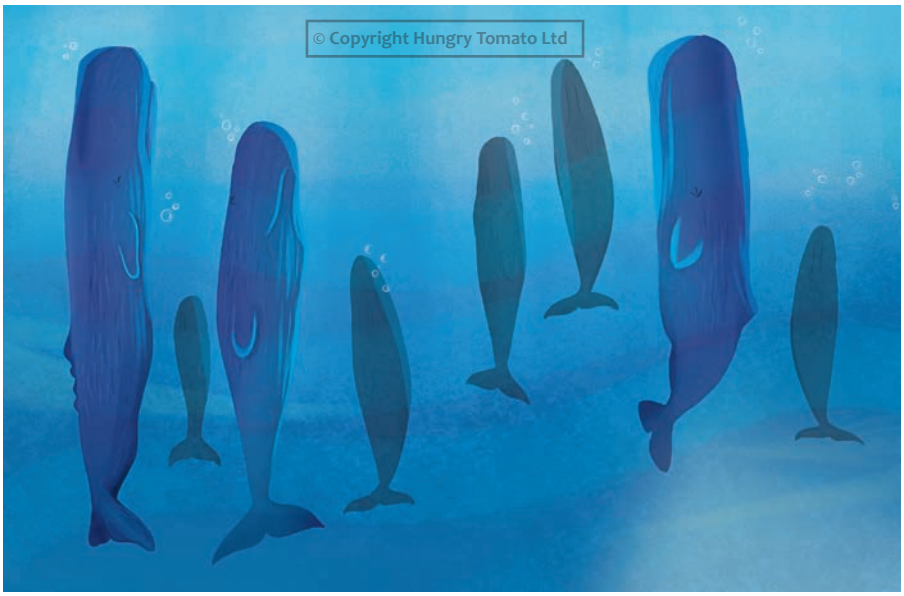
Sperm whales have the biggest brains of all the cetaceans.

On average, sperm whale brains are five times heavier than human brains!

SLEEPING EXPERTS: SCENE 9

The material for this scene can be linked to curriculum topics, including:
animals, including humans; living things and their habitats.

Introduce children to the incredible way that whales sleep underwater, and focus on the unique position sperm whales take when they rest.



DISCUSSION PROMPTS

- **Why do you think these sperm whales are sleeping vertically?**
  Information overleaf

- **How often do you think whales sleep?**
  Information overleaf

- **How do whales sleep underwater?**
  Information overleaf

ACTIVITY

Corresponding activity on page 11 of the activity pack: 'Bedtime in the Blue' is a creative drawing activity where children are encouraged to draw a variety of whales and dolphins to keep the singular sperm whale company while it rests.

SLEEPING EXPERTS: SCENE 9

RELEVANT INFORMATION

Keywords that you may want to pull out and explain have been put into bold.

SLEEPING WHALES

All whales need to rest, but different **species** sleep in different ways.

For example, sperm whales only need to sleep for 7% of the day, which is less than 2 hours! However, Orca whales will need more. They spend around 5 to 8 hours sleeping each day.

These impressive mammals usually break up their sleeping time into short naps throughout the day, so they can still return to the surface to breathe.

Whales have a very impressive skill – they can turn half their brain off when they sleep, while the other half stays awake! This is called **unihemispheric sleep**.

Whales can choose what side of their brain they turn off so that they are making sure they can get the sleep they need and still stay awake and on the lookout for danger!

WHY DO YOU THINK SPERM WHALES SLEEP VERTICALLY?

Sperm whales have a very unusual and **unique** way of sleeping. They sleep vertically! This means they sleep upright in the water, with their head facing up to the surface.

This spooky sleeping position allows sperm whales to save energy, as well as to make sure they can reach the surface of the water quickly and with less effort.

CURIOUS CREATURES: SCENE 10

The material for this scene can be linked to curriculum topics, including: animals, including humans; living things and their habitats.

Introduce children to how curious whales and dolphins are about exploring the world around them, including being interested in humans!

DISCUSSION PROMPTS

- **What is breaching?**
  Information overleaf

- **What might whales think about us? Do you think they are curious about humans?**
  Engage children in a fun discussion about how whales might perceive humans, and whether it is similar to how we might perceive them.

ACTIVITY

Corresponding activity on page 12 of the activity pack: 'Making Whale Friends' is a creative writing activity that encourages children to write about how they would feel about meeting a whale in the wild.

CURIOUS CREATURES: SCENE 10

RELEVANT INFORMATION

Keywords that you may want to pull out and explain have been put into bold.

BREACHING

Breaching is when a whale or dolphin breaks through the **surface** of the water, often by jumping or raising their blowholes above the water.

Whales and dolphins use breaching as a way to communicate with each other.

When more than half the body of a whale appears, it is called a **full breach**.
When half or less of the body appears, it is a **half breach**.

The splash and sound created by breaching often travels long distances underwater, helping these **cetaceans** communicate with others that may be far away.

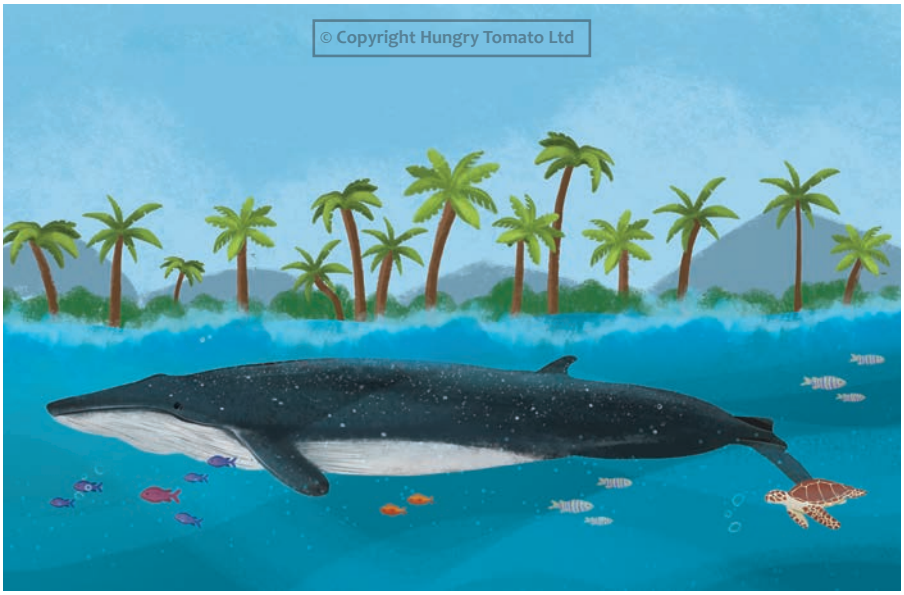
Tail and flipper slapping are other ways that these animals use sound to communicate.

Humpback whales are known for their impressive breaching, often launching themselves high into the sky!

IMPACT ON OUR PLANET: SCENE 11

The material for this scene can be linked to curriculum topics, including: everyday materials; animals, including humans; living things and their habitats.

Introduce children to the impressive way that whales positively impact our planet, including how they help to tackle climate change.



DISCUSSION PROMPTS

What is oxygen?
Information overleaf

What is carbon?
Information overleaf

How do whales keep our planet healthy?
Information overleaf

ACTIVITY

Corresponding activity on page 13 of the activity pack: 'Whales Helping the World' is a fill in the blanks activity where children are encouraged to complete the whale-related sentences by adding the correct key words from the list provided.

IMPACT ON OUR PLANET: SCENE 11

RELEVANT INFORMATION

Keywords that you may want to pull out and explain have been put into bold.

OXYGEN

Oxygen is an invisible **gas** in the air that plants and **plankton** produce, and people and animals need to breathe.

Scientists believe that most of the oxygen in the world comes from below the waves!

CARBON

Carbon is one of the ingredients in **carbon dioxide**, a gas linked to rising temperatures on Earth.

Carbon dioxide is very harmful for our **environment**, and is one of the main causes of **climate change**.

HOW DO WHALES KEEP OUR PLANET HEALTHY?

Whales play a vital role in keeping our world healthy.

For example, whales help to combat climate change. They do this by eating **phytoplankton**!

When whales eat phytoplankton, they absorb the carbon dioxide from the ocean and produce 50% of the oxygen we breathe.

Scientists call this process a '**whale pump**'.

When whales poop, feed, and dive from the water's surface to the depths of the ocean, they are unknowingly taking part in a whale pump.

Whale pumps help essential **nutrients** to be spread across the ocean, helping other animals to thrive.

TERRIFIC TEAMWORK: SCENE 12

The material for this scene can be linked to curriculum topics, including: animals, including humans; living things and their habitats.

Learn about how whales and dolphins work together to survive and thrive in our oceans, and why teamwork is so important.

DISCUSSION PROMPTS

- **What are predators?**
  Information overleaf

- **What are prey?**
  Information overleaf

- **Why do you think teamwork is important for whales and dolphins to survive?**
  Information overleaf

ACTIVITY

Corresponding activity on pages 14-15 of the activity pack: 'Wonder Whale Saves the Day' is a comic strip activity that encourages children to draw images to match the storyline provided.

TERRIFIC TEAMWORK: SCENE 12

RELEVANT INFORMATION

Keywords that you may want to pull out and explain have been put into bold.

PREDATORS

A predator is an animal that hunts other animals for food.

Most **cetaceans** are predators, although there are some exceptions! Despite its size, the blue whale is not a predatory animal.

PREY

Prey is an animal that is hunted by another for food.

Prey are hunted by predators, such as whales and dolphins!

When scientists know what different animals eat and how they interact with the world around them, they create a **food chain**.

WHY DO YOU THINK TEAMWORK IS IMPORTANT FOR WHALES AND DOLPHINS TO SURVIVE?

Teamwork is **essential** for many **pods** of whales and dolphins to survive.

When whales and dolphins hunt, they often work together which helps them catch the prey they want. By working together, they can make sure everyone in their pods are fed!

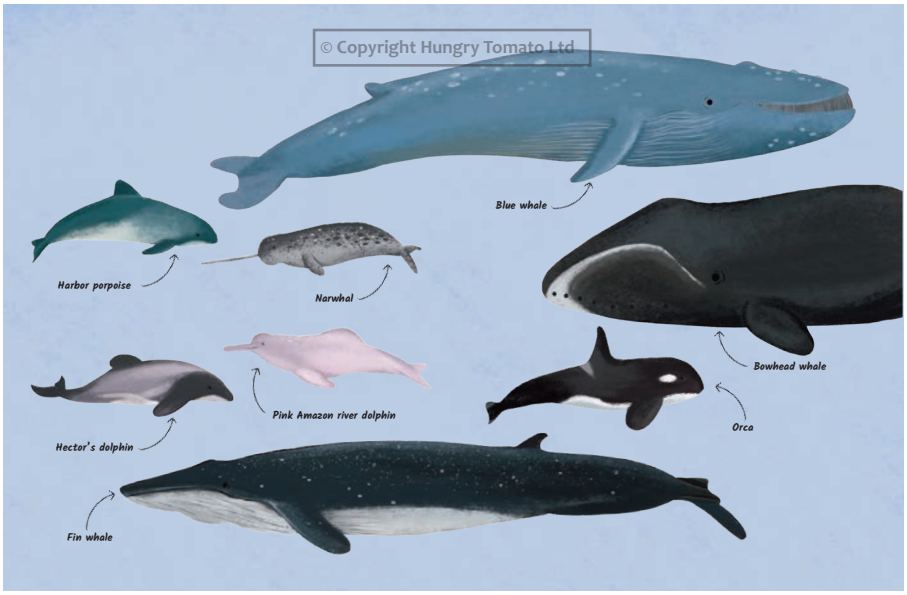
Teamwork is also useful for fending off predators. If a pod of dolphins feels threatened by a larger predator, such as a shark, they will group together to make sure every dolphin is safe.

Whales use teamwork when they are raising their young, too. Some **species**, such as sperm whales, will babysit and take care of each other's young. They even help each other give birth by staying by the mother's side for support.

ALL SORTS OF CETACEANS: SCENE 13

The material for this scene can be linked to curriculum topics, including: animals, including humans; living things and their habitats.

Engage children in reflective discussion about the intelligence of whales in comparison to human intelligence, as well as their thoughts and feelings on the study of whales and dolphins as a whole.



DISCUSSION PROMPTS

- **What is your favourite cetacean from this scene?**

Encourage children to pick and choose their favourite cetacean and explain why it is their favourite.

- **What do you think the smartest cetacean is?**

Engage children in discussion about what they think is the smartest cetacean, and why. Information overleaf.

ACTIVITY

Corresponding activity on page 16 of the activity pack: 'Whale-y Great Words' is a word search activity that encourages children to search for whale-related words in the scramble of letters.

ALL SORTS OF CETACEANS: SCENE 13

RELEVANT INFORMATION

Keywords that you may want to pull out and explain have been put into bold.

THE SMARTEST CETACEANS

Bottlenose dolphins

Bottlenose dolphins are considered one of the smartest animals in the world, not just in the ocean!

They are known for their quick **ability** to learn new things, their impressive **problem-solving** skills, and for even showing emotions such as **empathy**, **grief**, and **joy**.

Dolphins also have excellent memories. Cetologists believe they have the longest social memory of a non-human species.

Orca whales

Orca whales are best known for using their intelligence to **hunt prey**.

These skilled **predators** learn very specific hunting techniques to help them hunt prey in their environments. For example, orca **pods** that feed mostly on seals will have specific ways of working together to hunt and eat seals.

Orcas are ruthless hunters. They have learnt that if many of them swim at a seal resting on an iceberg, they can create small waves that knock the seal off into the water, ready for the orcas to eat!

Pilot whales

A study by cetologists in 2014 discovered that pilot whales have more **neurons** in their brains than any other mammal in the world, including humans!

This research suggests that pilot whales are much more clever than scientists originally realised. Studies are still being carried out to figure out how clever they really are.

POST-READING QUESTIONS

Engage in discussion about the journey taken throughout the book and the facts that were uncovered.

- **Were you surprised to learn how clever whales and dolphins are?**
- **Did anything else in the book surprise you?**
- **What's the coolest thing you've learnt from this book?**
- **Which do you like best, whales or dolphins?**

ACTIVITY

Corresponding activity on page 17 of the activity pack: 'Write Your Own Cetology Story' is a creative writing activity which encourages children to write a story about cetology, using three key prompt words.

THE BIG QUESTIONS ANSWERED

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