

My First Library of Knowledge

Ocean Life



 Orpheus

First published in 2006 by Orpheus Books Ltd.,
2 Church Green, Witney, Oxfordshire, OX28 4AW

Copyright © 2006 Orpheus Books Ltd.

Created and produced by Rachel Coombs,
Nicholas Harris, Sarah Hartley and
Emma Helbrough, Orpheus Books Ltd.

Text Emma Helbrough

Consultants Drs John and Margaret Rostron

Illustrated by Betti Ferrero, Ian Jackson, Ray
Grinaway, Peter Dennis, Gary Hincks, David Wright
and Jim Channell

All rights reserved. No part of this book 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 the copyright owner.

ISBN 1 901323 XX X

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

Printed and bound in Singapore.

CONTENTS

4 THE WORLD'S OCEANS

6 THE OCEAN FLOOR

8 COASTS, WAVES AND TIDES

10 SEASHORE LIFE

12 CORAL REEFS

14 FISH

16 SHARKS

18 OCTOPUSES AND SQUID

20 WHALES AND DOLPHINS



22 OCEAN MIGRATION

24 DEEPWATER LIFE

26 ARCTIC WATERS

28 OCEAN EXPLORERS

30 UNDERSEA ARCHAEOLOGY

32 INDEX



INTRODUCTION

MORE than two-thirds of the Earth's surface is covered by ocean waters. They are home to many different kinds of animals. Most ocean life is found close to the surface, where sunlight can pass through the water. Below 200 metres, very little light gets through. Only a few creatures can live in the dark, near-freezing depths of the ocean.

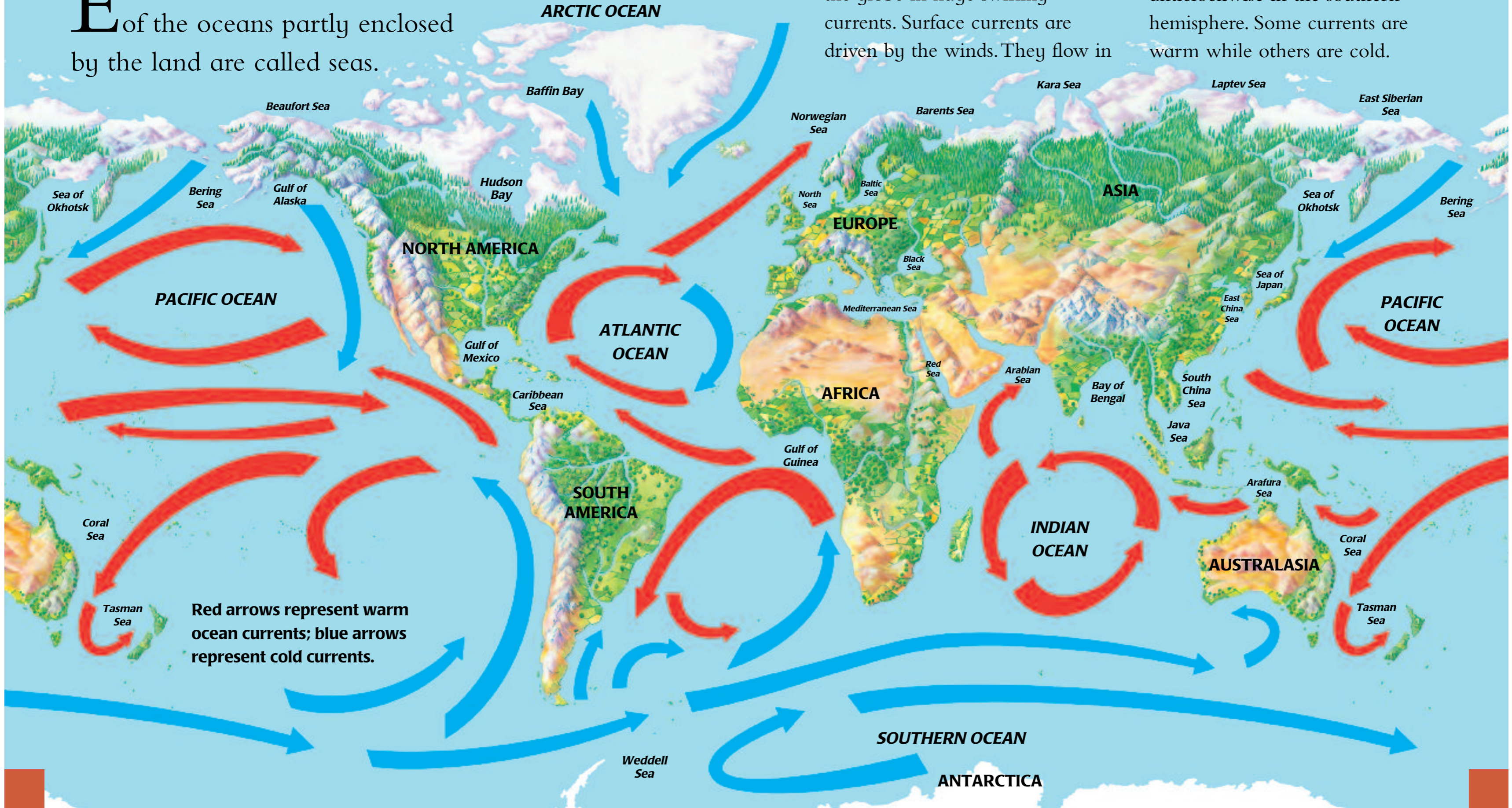
THE WORLD'S OCEANS

EARTH has five oceans. Areas of the oceans partly enclosed by the land are called seas.

OCEAN CURRENTS

The ocean waters move around the globe in huge swirling currents. Surface currents are driven by the winds. They flow in

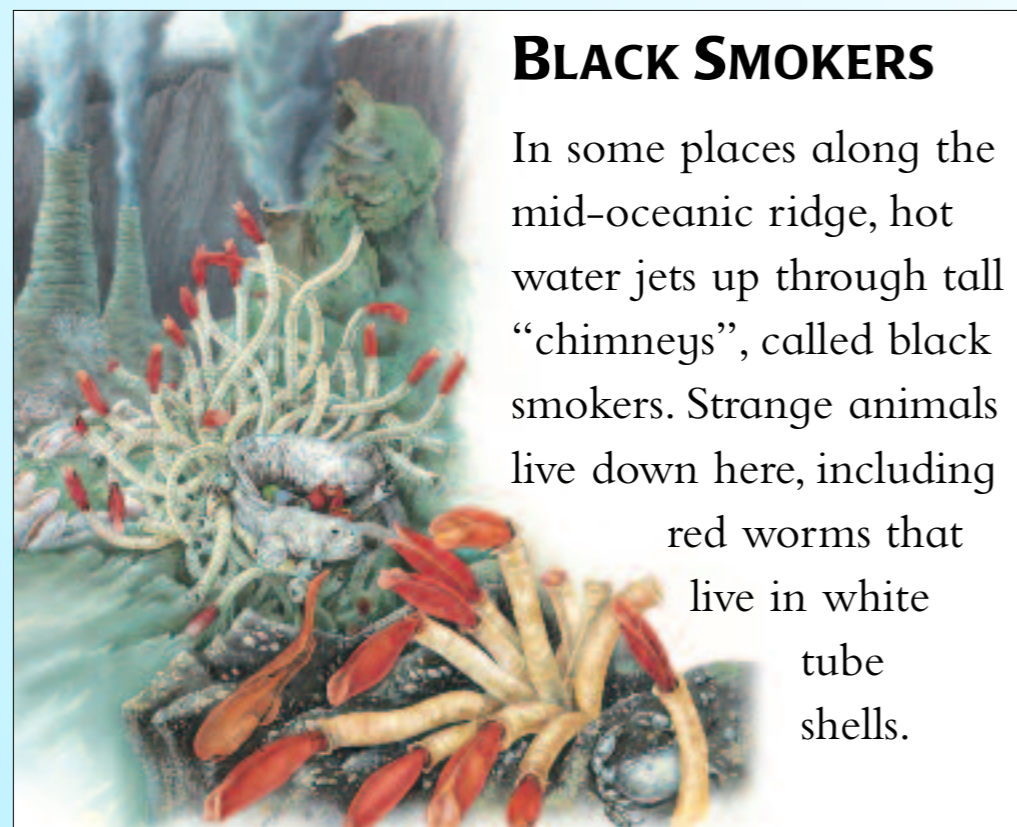
roughly circular patterns: clockwise in the northern hemisphere and anticlockwise in the southern hemisphere. Some currents are warm while others are cold.



THE OCEAN FLOOR

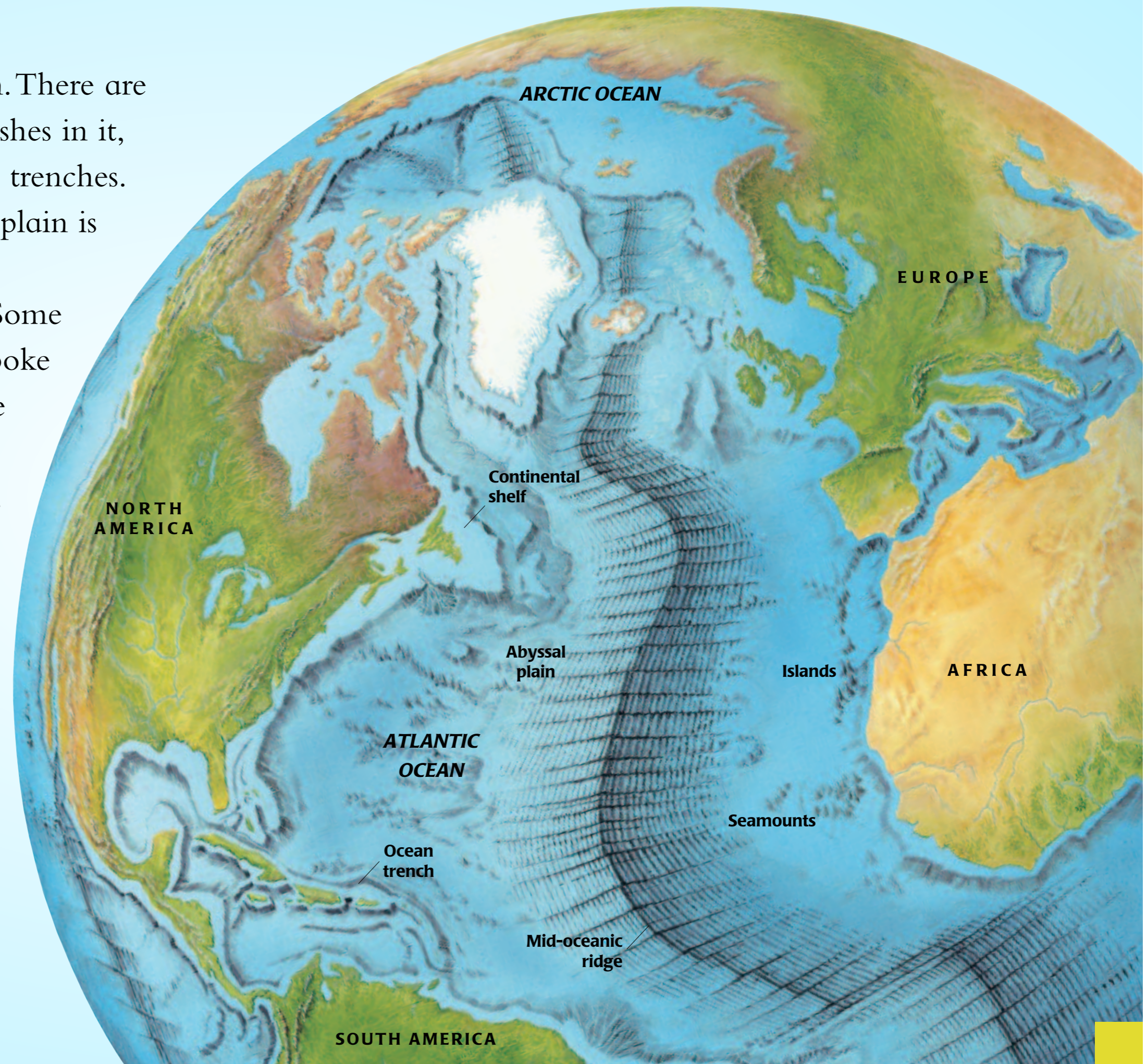
BENEATH the ocean waters there are vast plains and long mountain ranges. Skirting the land, there is a ledge called the continental shelf. From here, the ocean bed slopes down to the abyssal plain. A long, jagged ridge runs down the middle of the

abyssal plain. There are also deep gashes in it, called ocean trenches. The abyssal plain is dotted with mountains. Some high peaks poke up above the waters to form islands.



BLACK SMOKERS

In some places along the mid-oceanic ridge, hot water jets up through tall “chimneys”, called black smokers. Strange animals live down here, including red worms that live in white tube shells.



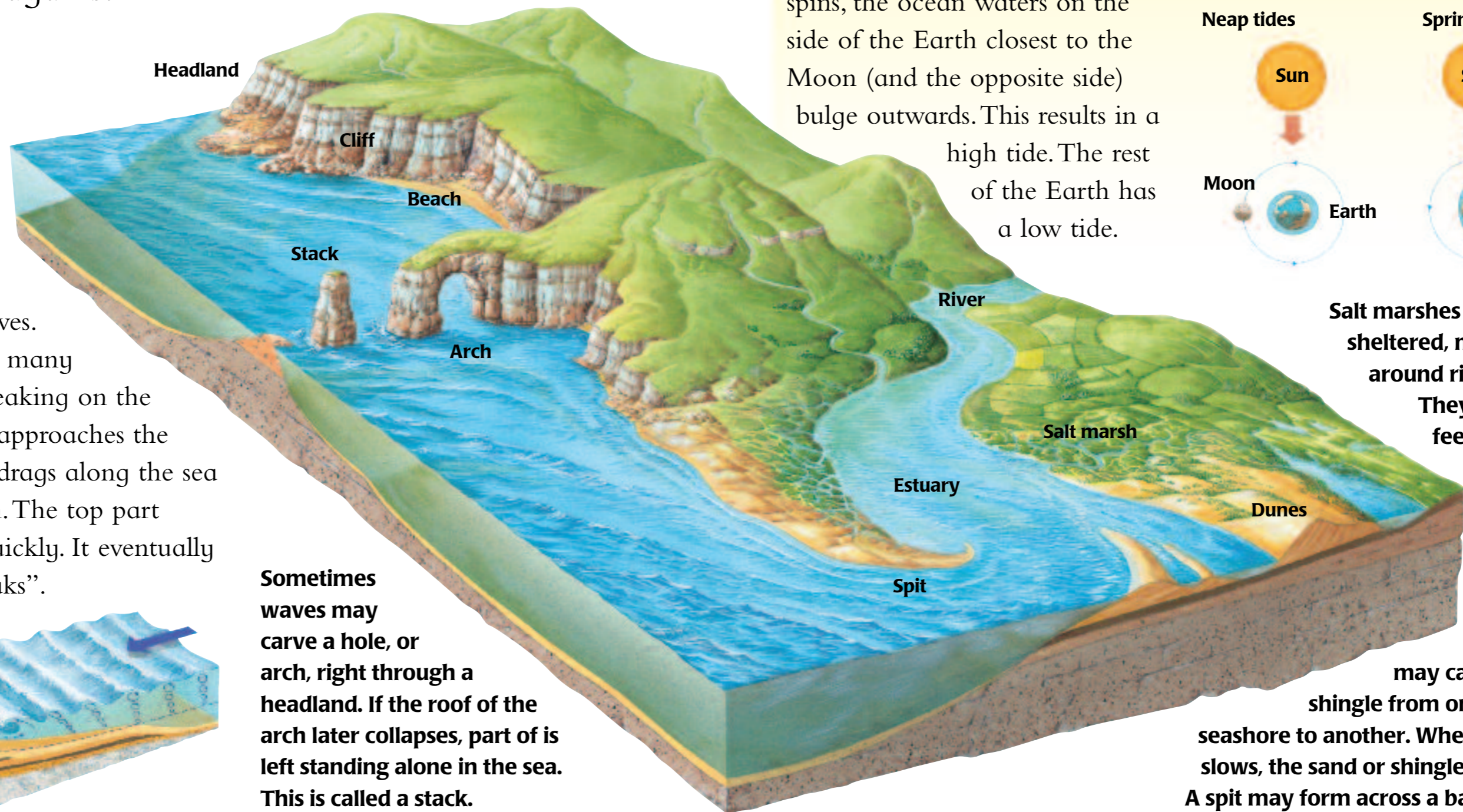
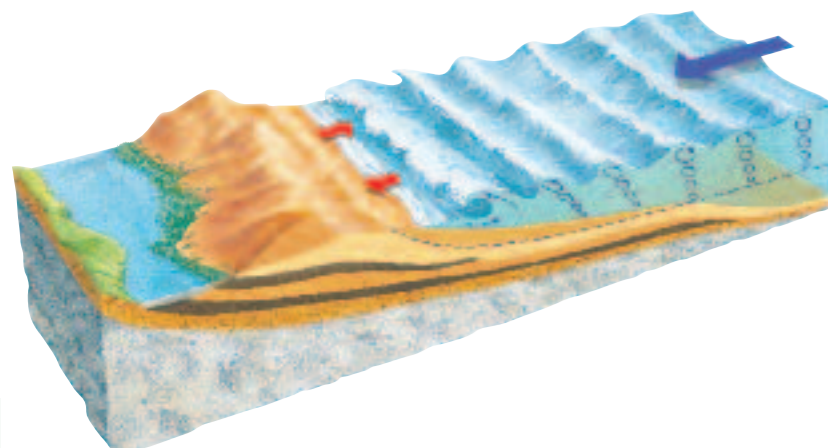
COASTS, WAVES AND TIDES

THE OCEAN meets land at the coast. Some coastlines are shaped by the action of waves crashing against

them, wearing away the rocks. Along others, sand and shingle are piled up in beaches or mudflats.

WAVES

When the wind blows across the surface of the sea, it turns the water over and over in circles. These are waves. Waves can travel for many kilometres before breaking on the seashore. As a wave approaches the shore, its lower part drags along the sea bed, slowing it down. The top part continues moving quickly. It eventually topples over or “breaks”.

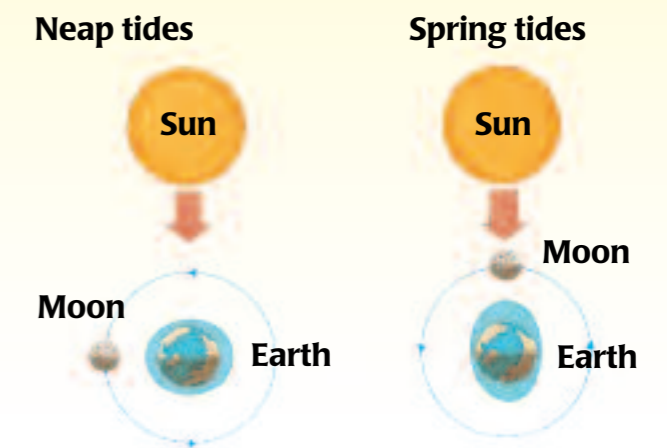


Sometimes waves may carve a hole, or arch, right through a headland. If the roof of the arch later collapses, part of it is left standing alone in the sea. This is called a stack.

TIDES

Sea levels rise and fall twice a day. This pattern is known as the tides. They are caused by gravity: the attraction that a large object (in this case, the Moon) can have over something else. As the Earth spins, the ocean waters on the side of the Earth closest to the Moon (and the opposite side) bulge outwards. This results in a high tide. The rest of the Earth has a low tide.

When the Sun and Moon line up, the Sun’s gravity increases the pull. This results in extremely high and low tides (spring tides). When the Sun and Moon are at right angles, the extremes are at their lowest (neap tides)



Salt marshes form close to sheltered, muddy shores around river estuaries. They provide rich feeding grounds for birds and other wildlife.

Sea currents may carry sand and shingle from one part of the seashore to another. When the current slows, the sand or shingle is laid down. A spit may form across a bay or estuary.

SEASHORE LIFE

SEASHORE life must be able to survive the tides (see page 9). They are covered by salt water when the tide comes in, and left out in the open air when the tide goes out again.

Some animals burrow into the sand or mud, where they can stay cool and moist. On rocky shores, limpets attach themselves to rocks. They keep moisture under their shell to stop drying out.

Oystercatchers use their long beaks to probe through the sand and rock-pools in search of food.



Oystercatcher

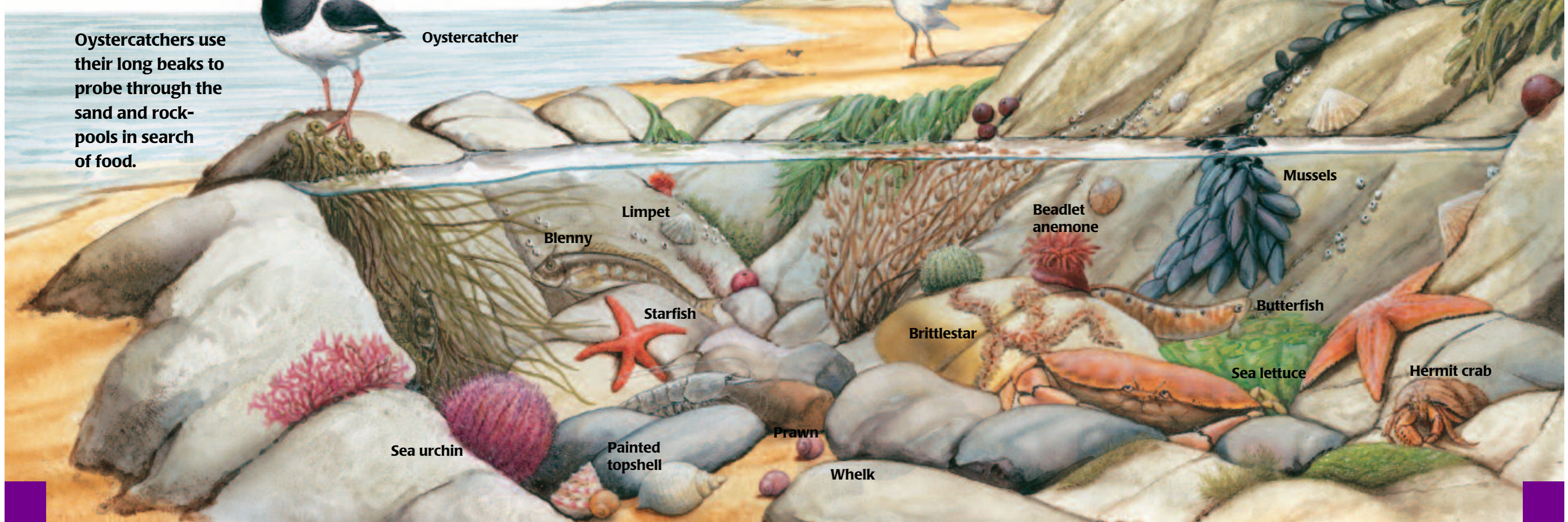
SEAWEED

Seaweeds do not put down roots into the ground like plants. Instead, they attach themselves to rocks. Some kinds stay moist even after the tide has gone out. They provide small animals with cool, damp shelter from the sun while the tide is out, as well as a source of food.

Fish, anemones, starfish, sea urchins and other marine life may survive in rockpools at low tide. Gulls will take almost any food they find on the seashore.



Herring gull



Blenny

Limpet

Starfish

Sea urchin

Painted topshell

Prawn

Whelk

Brittlestar

Beadlet anemone

Mussels

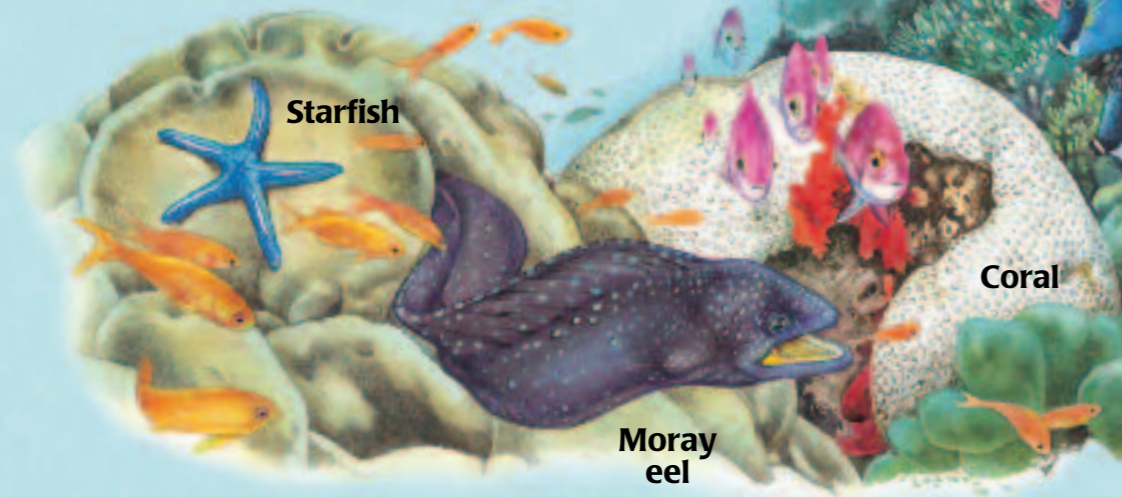
Butterfish

Sea lettuce

Hermit crab

CORAL REEFS

CORAL grows in shallow, warm waters in tropical regions. Over many years, huge banks of coral, called reefs, build up just below the waves along rocky coastlines.



WHAT IS CORAL?

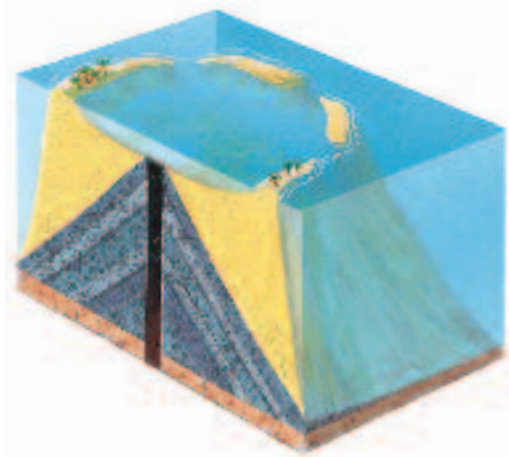
Coral is made from the skeletons of tiny animals called polyps. They live together in vast numbers. Different kinds of polyps make coral in all shapes and colours. Some look like fans, feathers or flowers. One type is shaped like a brain!

CORAL REEF WILDLIFE

Coral reefs are rich with wildlife, including fish, starfish, clams and sea slugs. Some fish feed on the plentiful tiny plants and animals, called plankton, that float in the nearby waters. Others, such as the parrotfish, eat the coral itself. Sharks and barracudas prey on the smaller fish that live close to the reef. The moray eel hides in wait for a passing fish or octopus.

ATOLLS

Some coral reefs form rings, called atolls. The coral builds up around the edges of sea volcanoes. Over time, the volcanoes sink below the ocean waters.



FISH

THERE are two main types of fish: sharks and their relatives, and bony fish. They range in size from several metres to less than one centimetre.



Zebra lionfish

The colourful striped body of the zebra lionfish warns its enemies that its spines are equipped with deadly venom.



Long-horned cowfish

Long-horned cowfish eat crabs and shrimp. To uncover them, they blow jets of water into the sand.

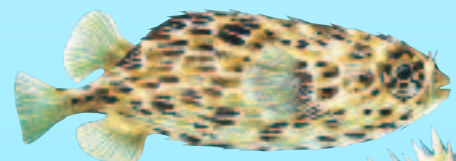


Conger eel

The conger eel, which grows up to 2.7 m long, has a scale-less body.

PROTECTION

Some fish swim about in large groups, called shoals, for protection from predators. Others hide amongst rocks and seaweed. Many have no need to hide at all, as they are poisonous. Their bright markings warn others not to eat them.



Porcupine fish inflate their spiny bodies like a balloon to scare off predators.



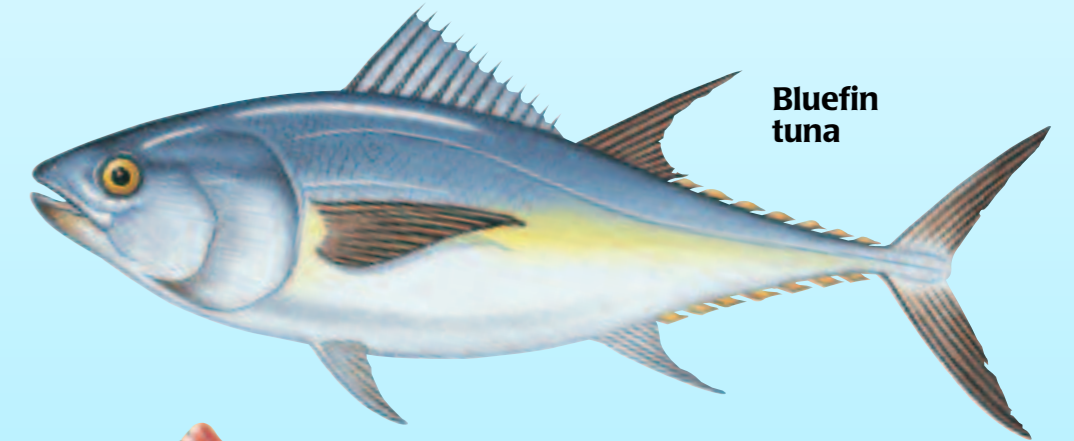
Porcupine fish

LIVING UNDERWATER

Many fish, like the tuna (*below*), have streamlined bodies with fins, a tail and a coat of overlapping scales. They breathe using gills. They draw water, which contains oxygen, into their mouths. When they pump it out through slits in the sides of their head, their gills absorb the oxygen. Most fish lay thousands of eggs in the water, although many of them are eaten by predators before they hatch.



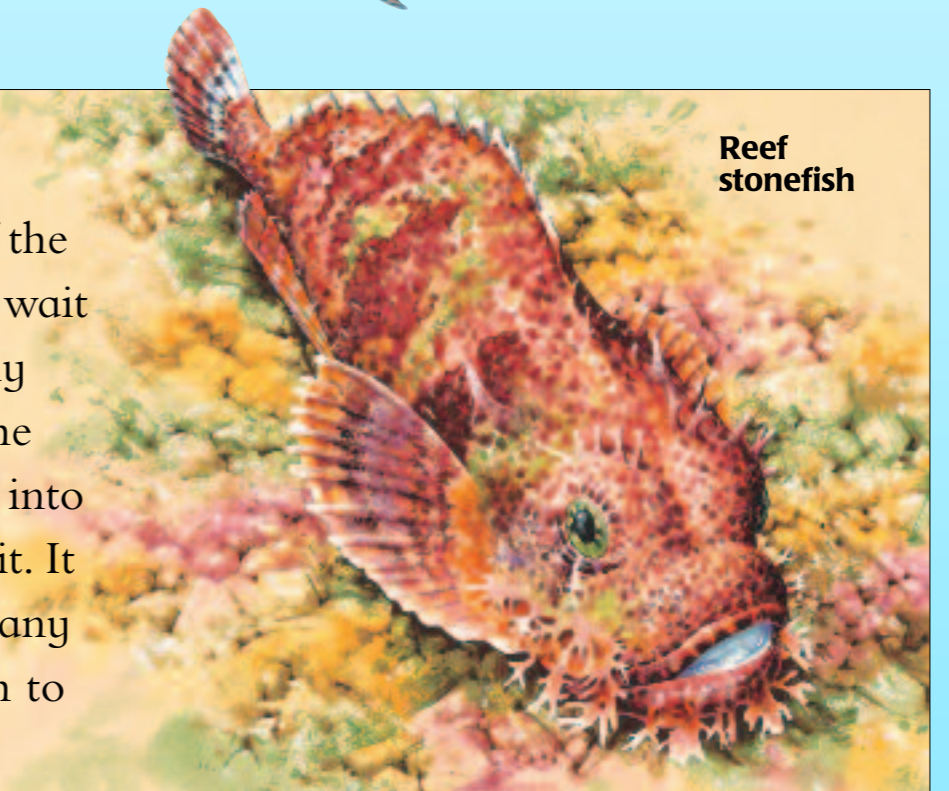
The female seahorse lays her eggs into a pouch on the male's belly for safe-keeping



Bluefin tuna

UNSEEN KILLER

The stonefish is one of the deadliest fish. Lying in wait on the sea bed, perfectly camouflaged among the stones, it injects poison into anything that touches it. It can injure or even kill any person unlucky enough to step on it.

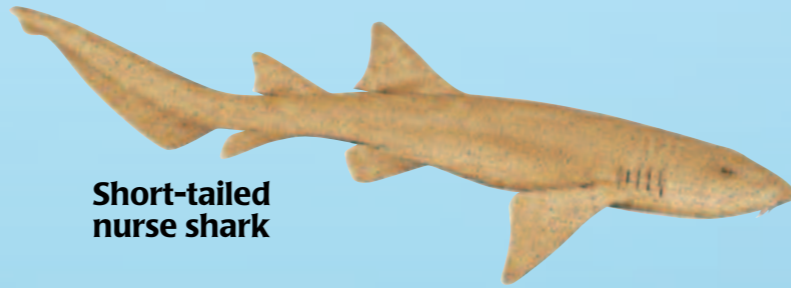


Reef stonefish

SHARKS

THERE are more than 350 different kinds of shark. Some, such as the great white, are fierce predators. Besides other fish and squid, they also hunt turtles and mammals such as seals. Whale sharks and basking sharks are gentle giants that feed only on plankton.

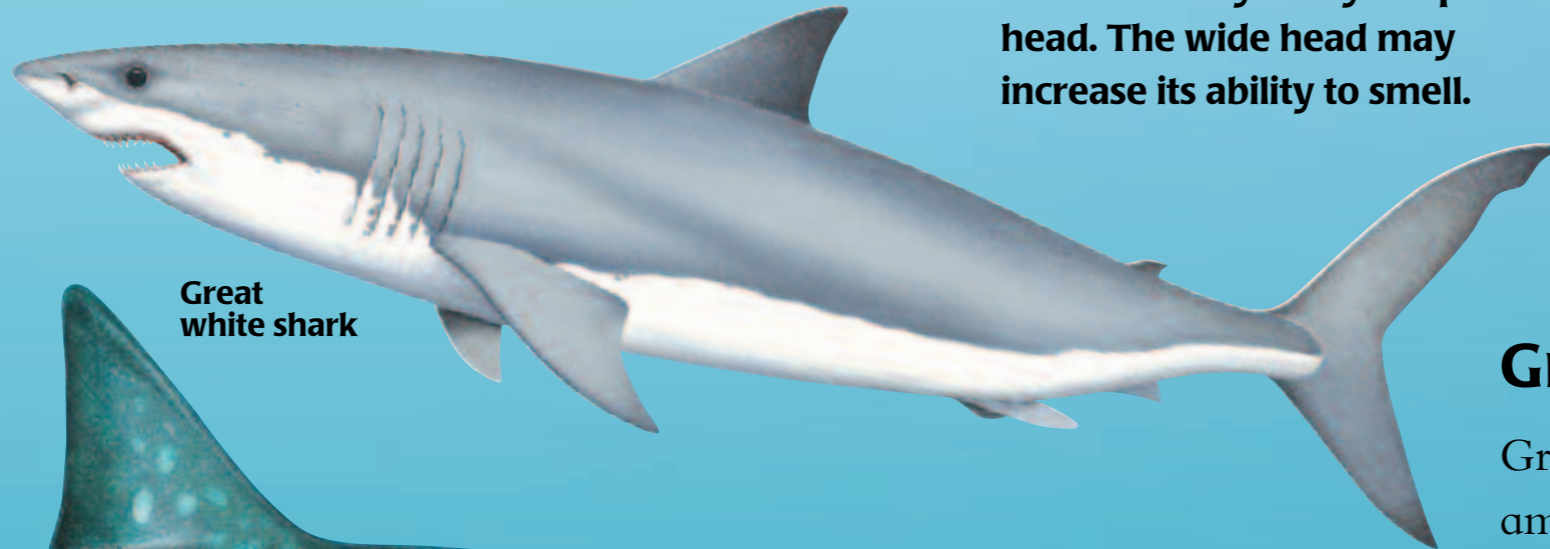
16



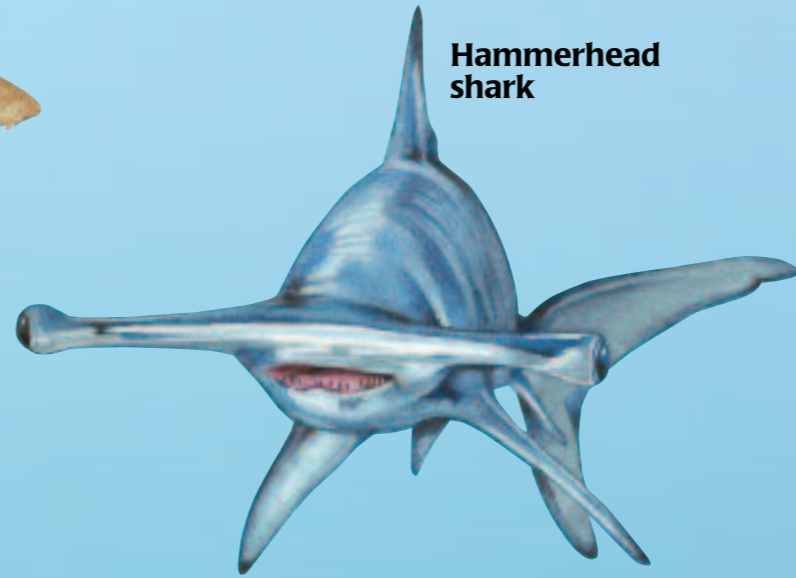
Short-tailed nurse shark

SKIN AND BONES

A shark's skin feels like sandpaper. It is covered by tiny, teeth-like scales. Sharks do not have any bones in their bodies. Instead, their skeletons are made of tough, flexible gristle or cartilage.



Great white shark



Hammerhead shark

The hammerhead's nostrils and eyes are found on either side of its very oddly-shaped head. The wide head may increase its ability to smell.

17

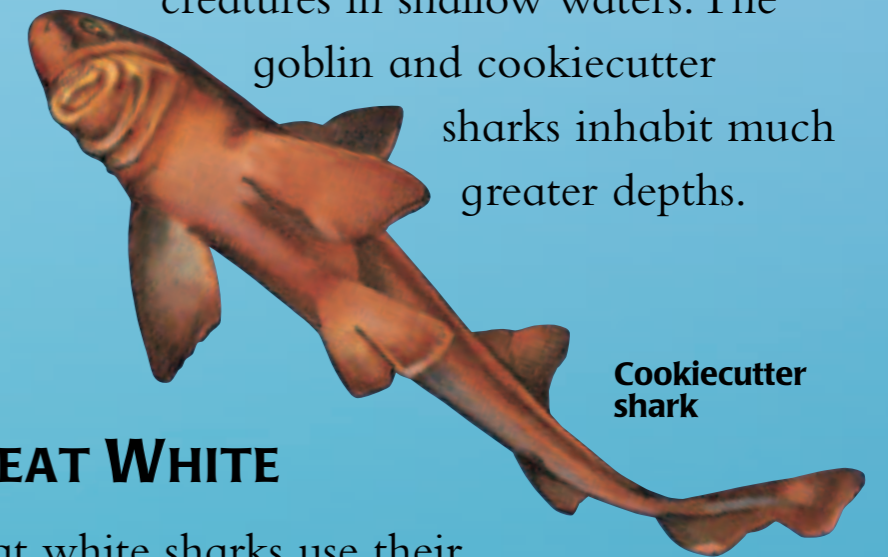


Sawshark

Sawsharks have a long snout with sharp teeth along each side. They use it to rake up crabs from the sea bed.

SMALL SHARKS

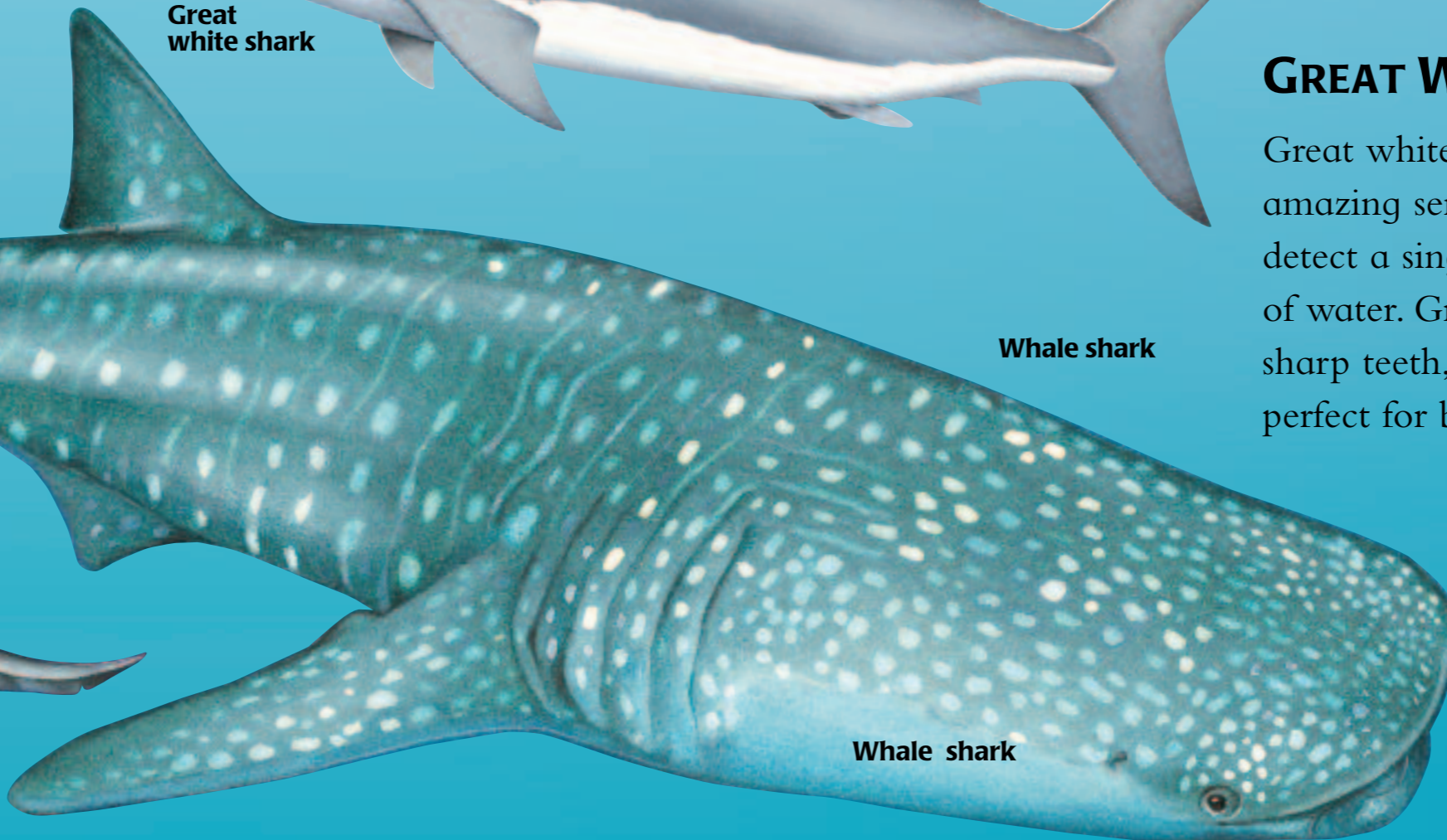
Most kinds of shark are small. The nurse shark feeds on bottom-dwelling creatures in shallow waters. The goblin and cookiecutter sharks inhabit much greater depths.



Cookiecutter shark

GREAT WHITE

Great white sharks use their amazing sense of smell to find prey. They can detect a single drop of blood in a vast amount of water. Great whites have up to 3000 razor-sharp teeth, arranged in several rows. They are perfect for biting off chunks of flesh!



Whale shark

Whale shark

Whale sharks are the world's largest fish. They can grow to over 15 m long. Despite their great size, they are harmless to humans. They eat only small fish and plankton.



Goblin shark

OCTOPUS AND SQUID

TO SCARE off predators, octopus and squid can change their colour in seconds. They are the most intelligent of all

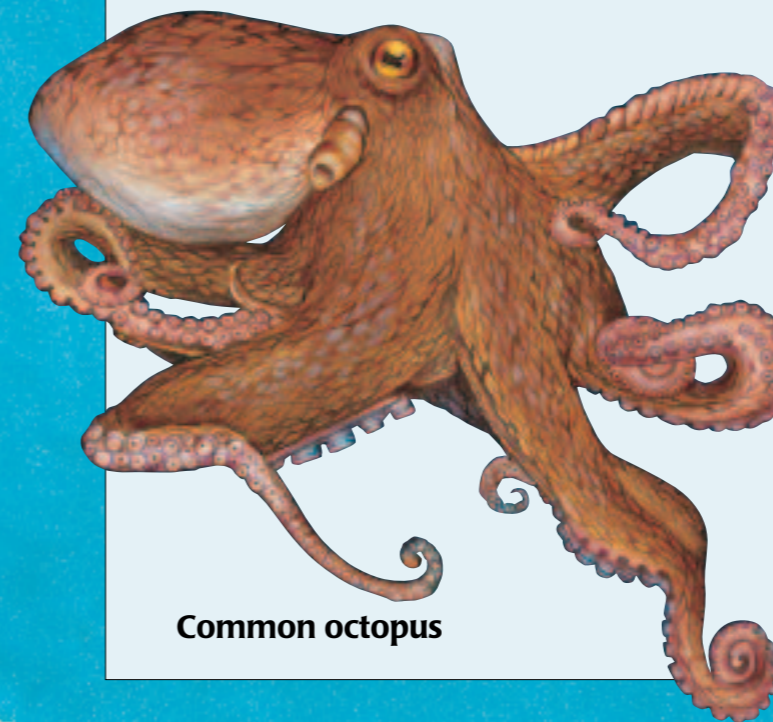
invertebrates (animals without backbones). Octopus and squid are molluscs, related to shellfish, snails and slugs.

ARMS AND TENTACLES

Octopus and squid use their long arms for gripping, touching and tasting. Suckers along the underside of these arms help them to grip prey and force it into their beak-like mouth.

JET PROPULSION

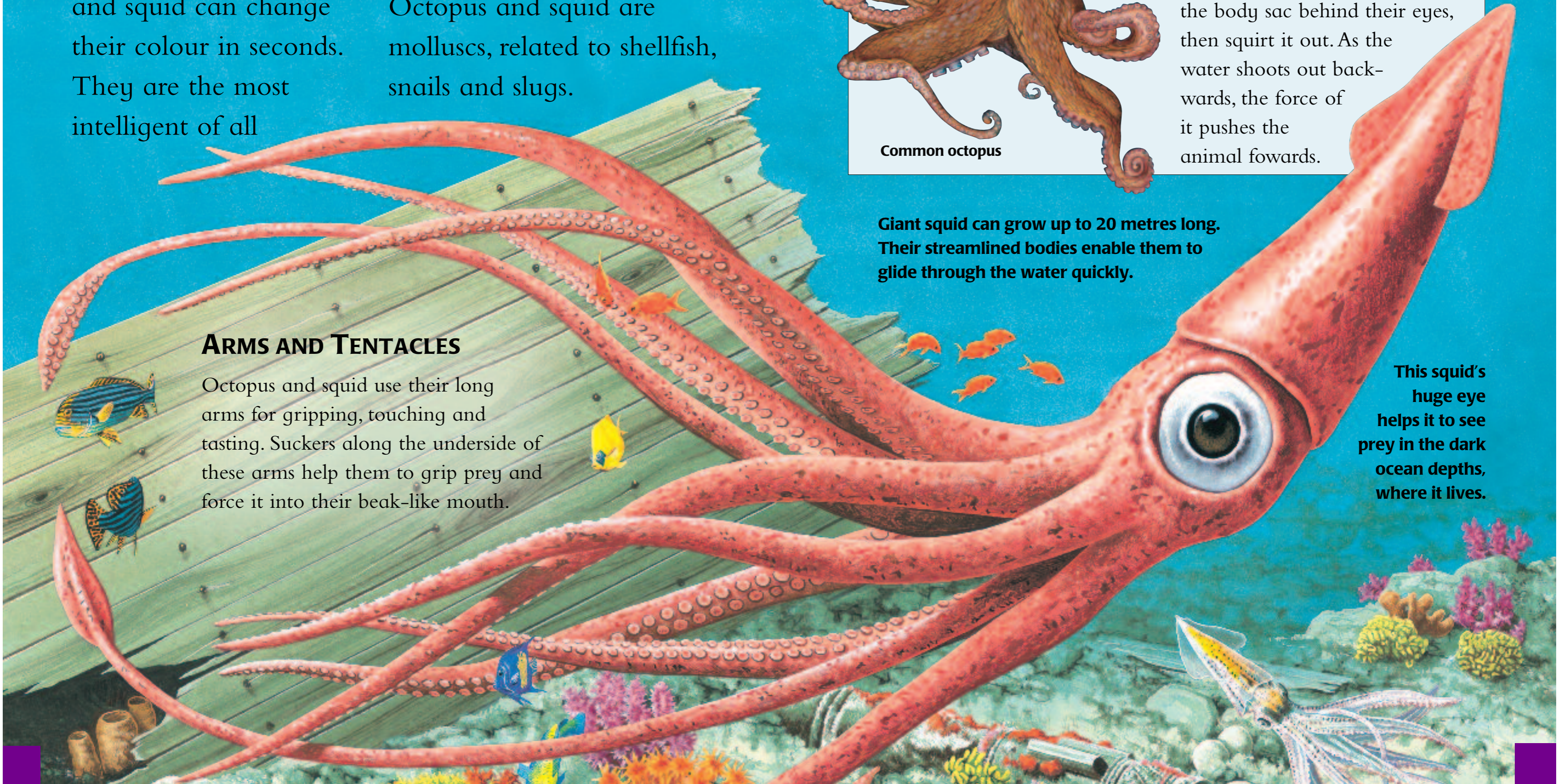
To make a quick escape, octopus and squid may use jet propulsion. They suck water into the body sac behind their eyes, then squirt it out. As the water shoots out backwards, the force of it pushes the animal forwards.



Common octopus

Giant squid can grow up to 20 metres long. Their streamlined bodies enable them to glide through the water quickly.

This squid's huge eye helps it to see prey in the dark ocean depths, where it lives.



WHALES AND DOLPHINS

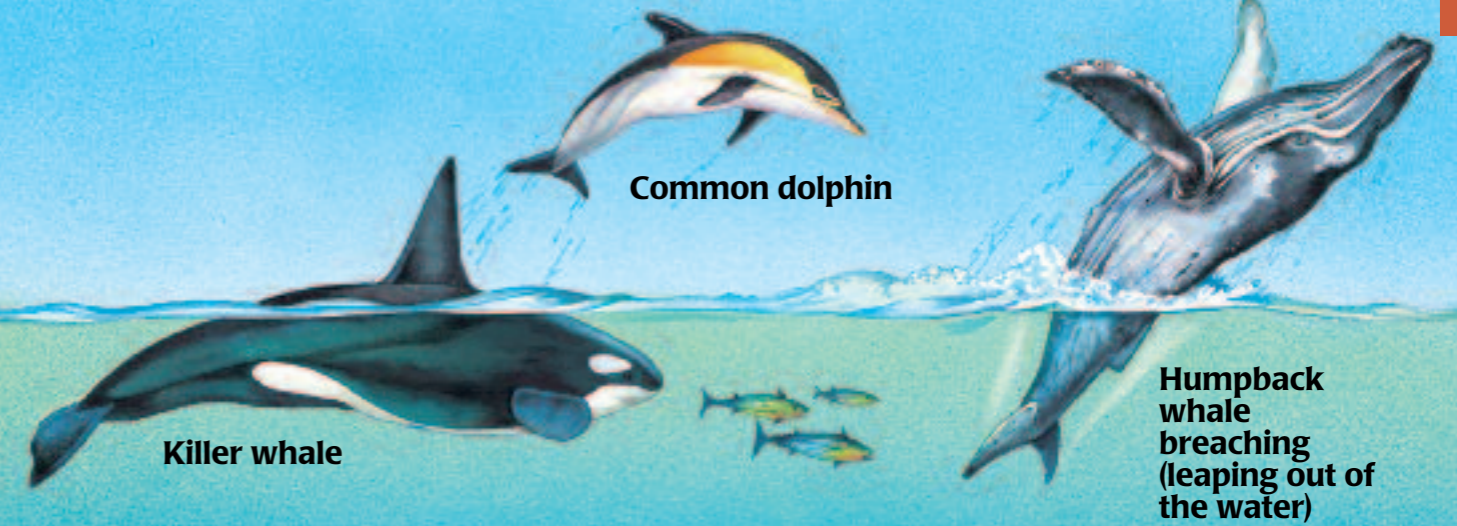
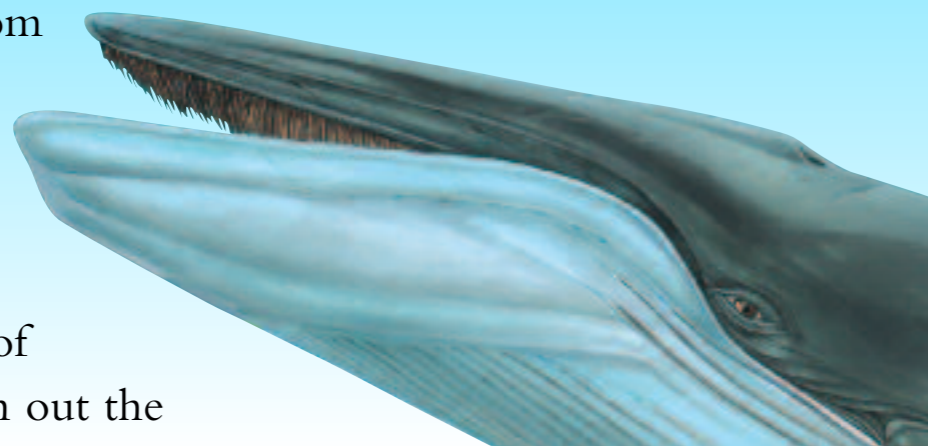
WHALES, dolphins and porpoises are marine mammals. They breathe through lungs, so, unlike fish, they must regularly rise to the surface for air. They breathe through the holes on top of their heads called blowholes.

Many dolphins live in groups called schools. They call to each other using squeaks and clicks. They hunt fish and squid near the water's surface. Dolphins often leap out of the water. This may be to alert other dolphins to the presence of food.

BALEEN WHALES

Some whales do not have teeth. Instead, they have baleen plates: bristle-fringed plates that hang from their upper jaw. Baleen whales, such as humpbacks and blues, feed by gulping mouthfuls of seawater. They push out the

water through their baleen plates, leaving behind tiny creatures, called krill, which they swallow.



Killer whale

Common dolphin

Humpback whale breaching (leaping out of the water)

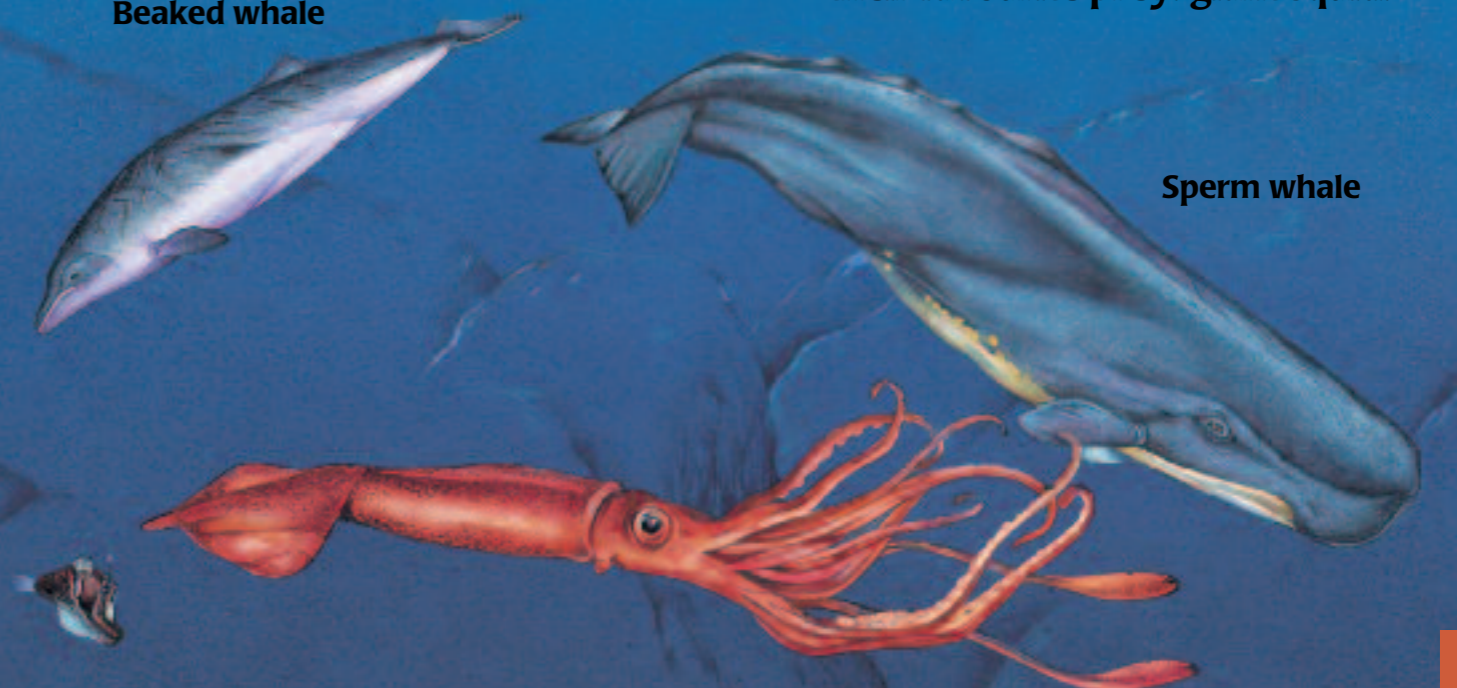
Blue whales are the largest animals on Earth. They can grow to over 30 metres long. Their tongue alone weighs as much as an elephant.



Blue whale

Sperm whales dive deeper than any other whales. They can hold their breath for more than an hour. They dive down in search of their favourite prey: giant squid.

Beaked whale



Sperm whale

OCEAN MIGRATION

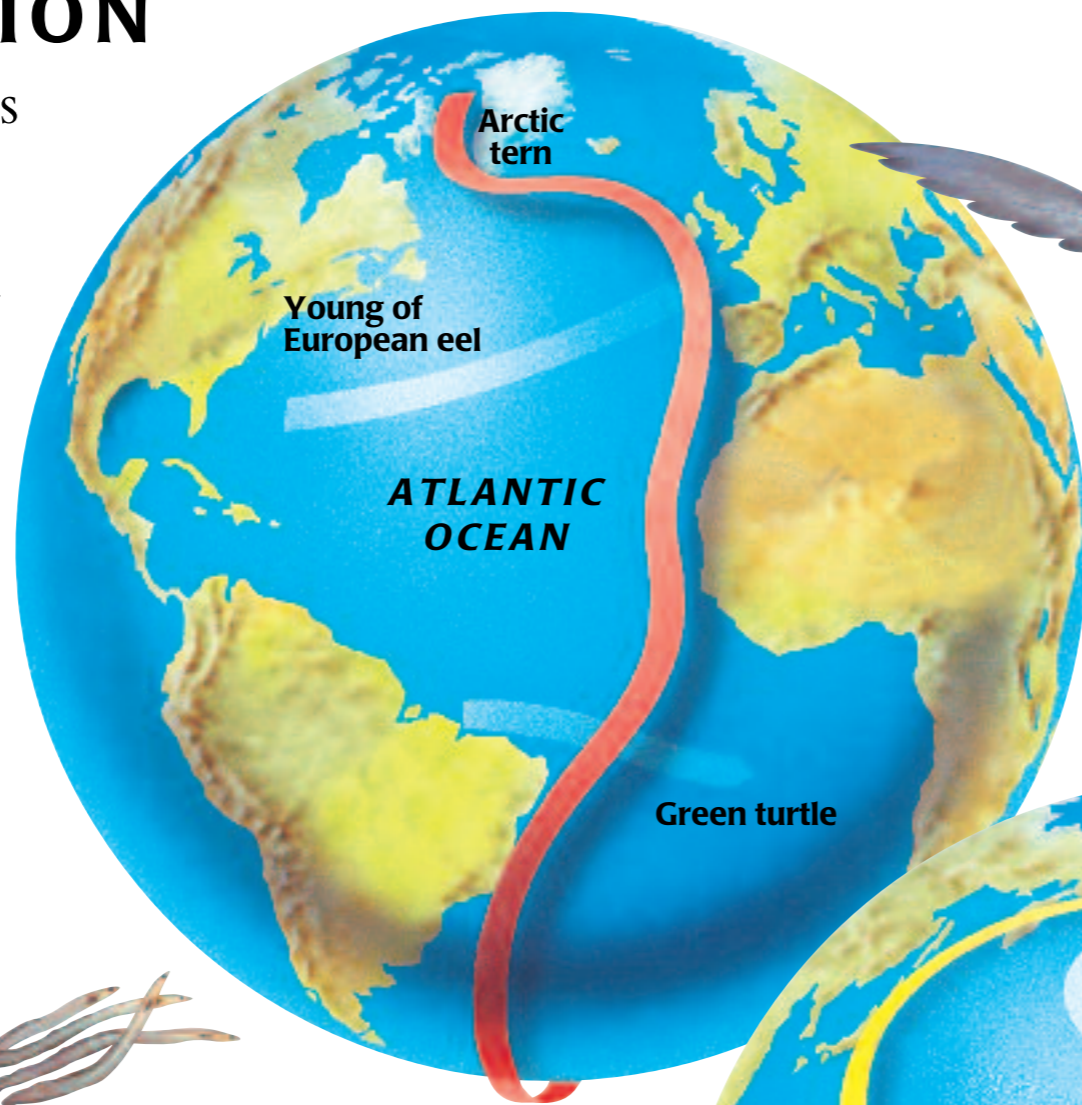
MANY marine animals make incredibly long journeys each year to breed in a safe spot or to reach rich feeding grounds. The grey whale, for example, spends the summer feeding in Arctic waters. It swims south in winter to breed off the Mexican coast.

The young of European eels swim across the Atlantic to lay their eggs.

Green turtle



Green turtles feed off Brazil but swim across the Atlantic Ocean to lay their eggs on Ascension island.



European eels



Wandering albatross



Grey whale

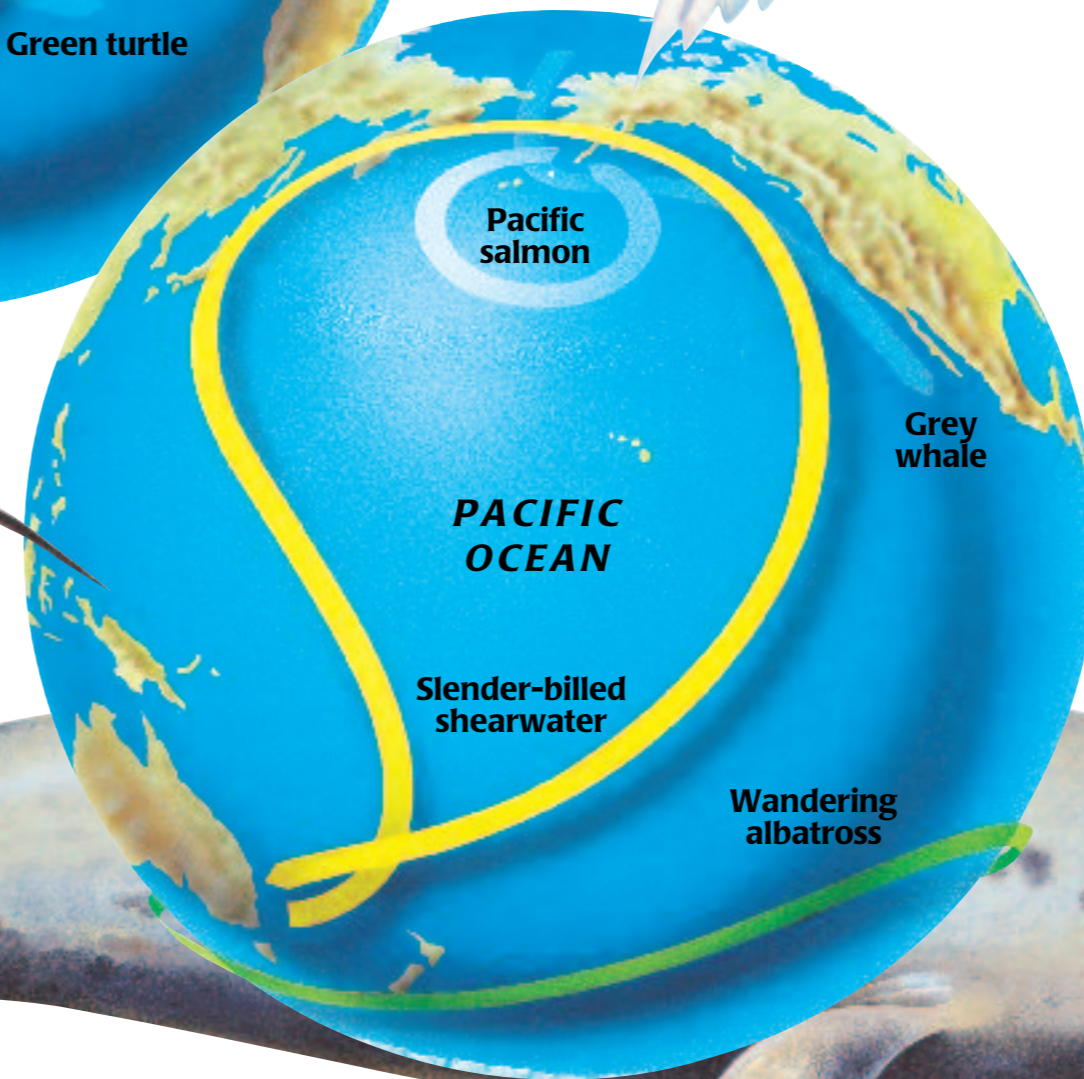
BIRDS

Arctic terns breed in the Arctic during the summer. Then they fly to the Antarctic at the opposite end of the Earth, a distance of 13,000 kilometres, to spend the southern summer feeding. The wandering albatross also circles the world, but around the Southern Ocean where the distance is shorter. The slender-billed shearwater, makes a seven-month journey around the north Pacific Ocean each year.

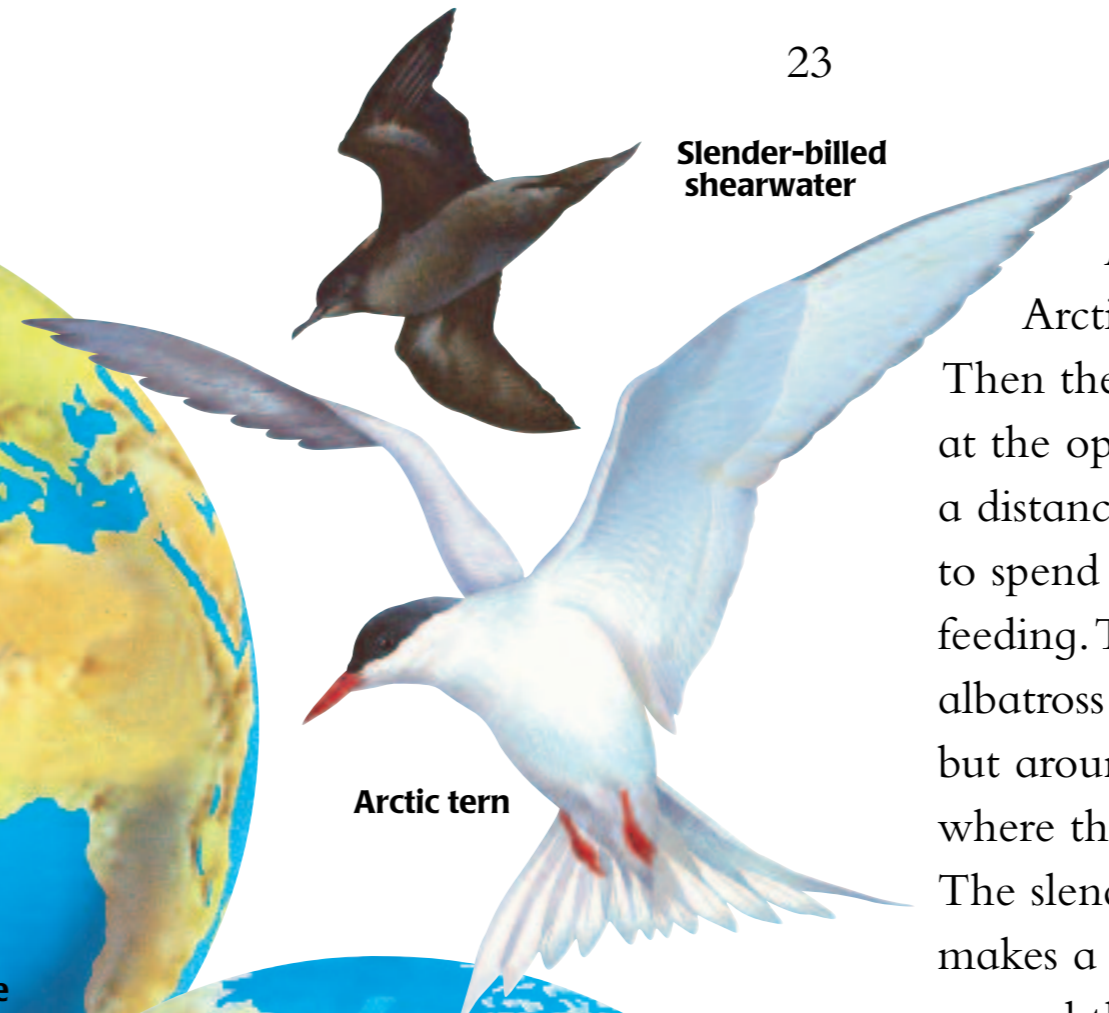
Pacific salmon



Pacific salmon travel thousands of miles out to sea and back to their "home" rivers, where they swim upstream to breed.



Slender-billed shearwater



Arctic tern

Pacific salmon

PACIFIC OCEAN

Slender-billed shearwater

Wandering albatross

Grey whale

DEEPWATER LIFE

DEEP in the oceans, below about 200 metres, very little light gets through. Here in the “twilight zone” it is dark and cold. Only a few animals can survive these conditions. Some, like the hatchetfish, travel to the surface every night to feed. Others eat dead animals or plants that sink down from above, or prey on each other. Many deepwater creatures have long teeth, large mouths, and glowing parts to lure their prey.

MAKING LIGHT

Some sea creatures are able to make light inside their bodies. This is called bioluminescence. Some creatures make light to see or to attract prey towards them. Others use light in their defence. For instance, when comb jellies are attacked, they produce a bright light which temporarily blinds their attacker. This gives them a chance to escape.



ARCTIC WATERS

MUCH of the Arctic Ocean is covered by a thick layer of floating ice all year round. In summer, when Arctic waters are teeming with tiny animals and plants, fish, seals, whales and sea birds hunt for their food.

WALRUSES AND SEALS

Walrus and seals have a thick layer of blubber under their skin to keep them warm. Their flippers make them excellent swimmers and divers. Walrus search the sea bed for crabs and shellfish to eat. Male walrus use their tusks as weapons when fighting over females.



Walrus



Polar bear

POLAR BEARS

Polar bears spend most of the year on floating ice, where they hunt seals. They have a thick, white waterproof coat which camouflages them against the ice. Their strong claws and hairs on the soles of their feet give them a good grip as they roam the ice alone. Polar bears are expert swimmers and can swim for hours at a time without needing to rest.

Bearded seal



Narwhal



NARWHALS

Narwhals are related to whales and dolphins. They feed on squid, crabs and fish. The males have a long tusk, actually a tooth growing out of their top lip. It is not clear what this tusk is for, but it may be used like a sword for fighting over females.

Submersible exploring
a shipwreck

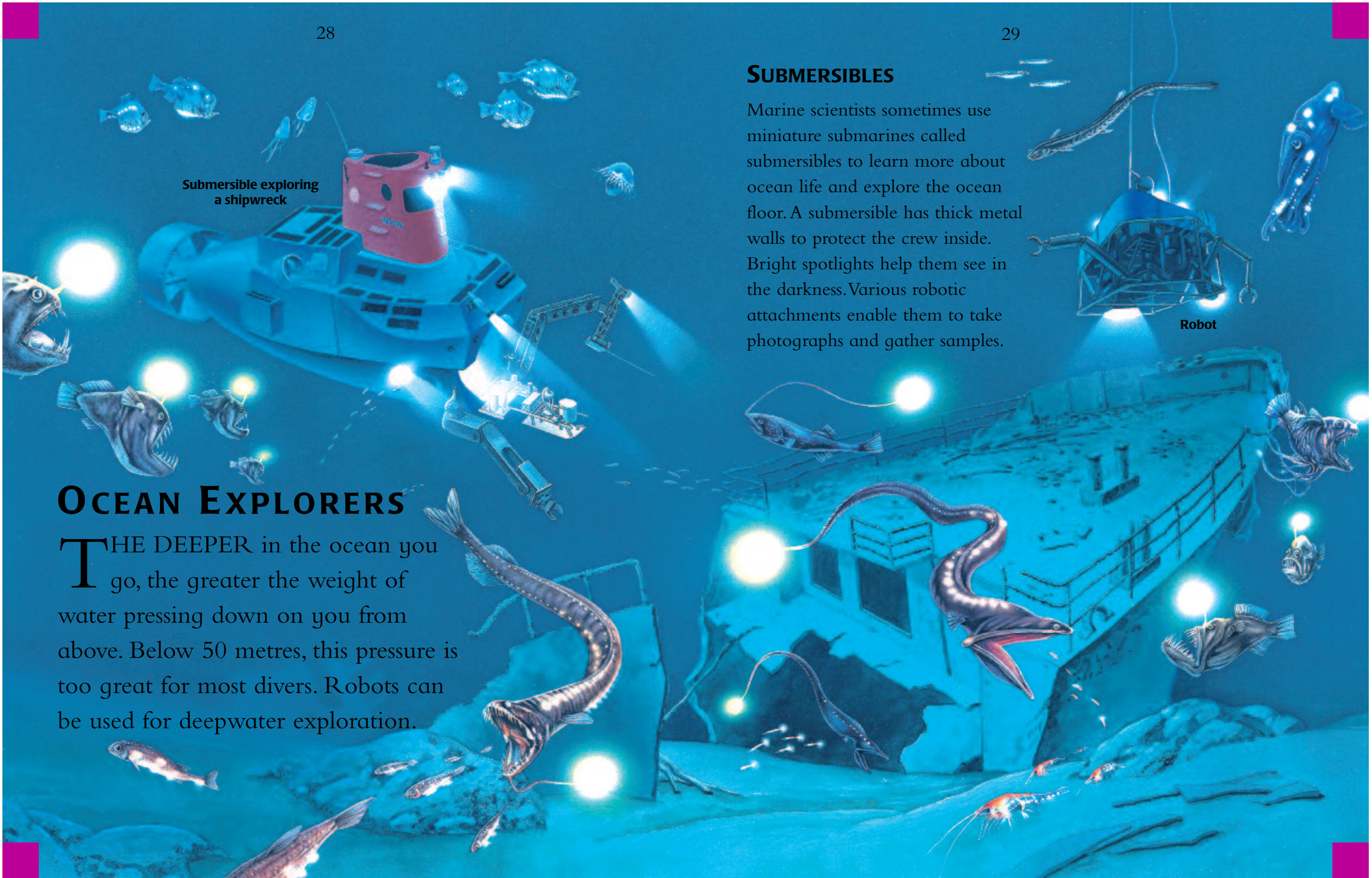
SUBMERSIBLES

Marine scientists sometimes use miniature submarines called submersibles to learn more about ocean life and explore the ocean floor. A submersible has thick metal walls to protect the crew inside. Bright spotlights help them see in the darkness. Various robotic attachments enable them to take photographs and gather samples.

Robot

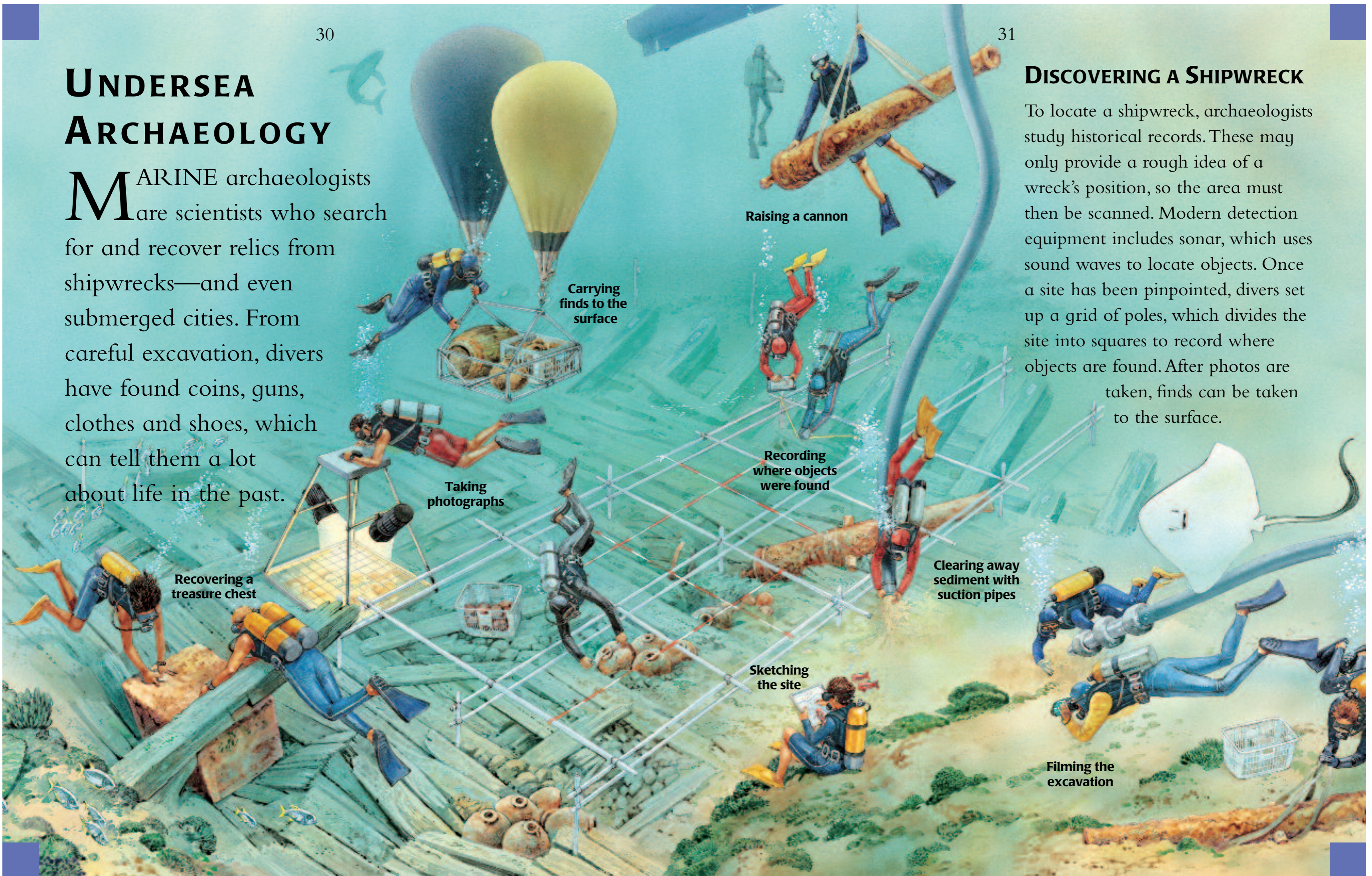
OCEAN EXPLORERS

THE DEEPER in the ocean you go, the greater the weight of water pressing down on you from above. Below 50 metres, this pressure is too great for most divers. Robots can be used for deepwater exploration.



UNDERSEA ARCHAEOLOGY

MARINE archaeologists are scientists who search for and recover relics from shipwrecks—and even submerged cities. From careful excavation, divers have found coins, guns, clothes and shoes, which can tell them a lot about life in the past.



DISCOVERING A SHIPWRECK

To locate a shipwreck, archaeologists study historical records. These may only provide a rough idea of a wreck's position, so the area must then be scanned. Modern detection equipment includes sonar, which uses sound waves to locate objects. Once a site has been pinpointed, divers set up a grid of poles, which divides the site into squares to record where objects are found. After photos are taken, finds can be taken to the surface.

Raising a cannon

Carrying finds to the surface

Taking photographs

Recording where objects were found

Recovering a treasure chest

Clearing away sediment with suction pipes

Sketching the site

Filming the excavation

INDEX

A

abyssal plain 6-7
 albatross, wandering
 22-23
 anglerfish, deepsea 25
 arch 8
 archaeology, marine
 30-31
 Arctic Ocean 4, 7, 22-23,
 26-27
 Atlantic Ocean 4, 7, 22
 atolls 12

B

barracuda 13
 beaches 8
 bear, polar 27
 bioluminescence 24-25
 birds 9, 10-11, 23, 26
 black smokers 6
 blenny 10
 blowholes 20
 breaching 21
 brittlestar 11
 butterflyfish 11
 butterflyfish 12

C

clam, giant 13
 coasts 8-9, 10-11, 12
 comb jelly, red 24-25
 continental shelf 6-7
 coral 12-13
 coral reefs 12-13
 cowfish, long-horned 14
 crab, hermit 11
 crabs 17, 26-27
 currents 4-5, 9

D

divers 28, 30-31
 dolphin, common 21
 dolphins 20-21
 dragonfish, black 25

EF

eel,
 conger 14
 European 22

 gulper 25
 moray 12
 egg laying,
 in fish 15, 22
 in turtles 22
 estuaries 9
 fish 10-17, 20, 24-27
 flashlight fish 25

GH

gills 15
 gravity 9
 grouper 13
 gull, herring 11
 hatchetfish 24-25

IJ

ice 26-27
 Indian Ocean 5
 invertebrates 18
 islands 6
 jellyfish 24

KL

krill 20
 lanternfish 24
 limpet 10
 lionfish, zebra 14
 loosejaw 25

MN

molluscs 18
 Moon 9
 mudflats 8-9
 mussels 11
 napoleonfish 12
 narwhal 27

O

oceans,
 birds of the 9, 10-11,
 23, 26
 deepwater life in the
 24-25
 exploration of the 28
 floor of the 6-7, 29
 glowing creatures in
 the 24-25
 migration routes
 across the 22

 of the world 4-5
 wildlife of the 10-27,
 29
 octopus 13, 18-19
 common 19
 oystercatcher 10

PR

Pacific Ocean 4-5, 23
 parrotfish 12-13
 plankton 13, 16, 25
 polyps 13
 porcupinefish 14
 porpoises 20
 pressure 28
 rays 13
 ridge, mid-oceanic 6-7
 robots 28-29
 rockpools 10-11

S

salmon, Pacific 23
 salt marshes 9
 salt water 10
 sawshark 17
 sea anemone 11
 sea lettuce 11
 sea slug 13
 sea urchin 10-11, 13
 seahorse 15
 seal, bearded 27
 seals 16, 26-27
 seamounts 7
 seas 4-5
 seashore life 10-11
 seaweed 11, 14
 shark,
 cookiecutter 17
 goblin 16-17
 great white 16-17
 hammerhead 17
 reef 12
 short-tailed nurse
 16-17
 whale 17
 sharks 13, 14, 16-17
 shearwater, slender-billed
 23
 shellfish 10, 18, 26

shipwrecks 28-31
 shrimp 25
 sonar 31
 Southern Ocean 5, 23
 spit 9
 sponge, tube 12
 squid 18-19, 20, 27
 deepsea 25
 giant 19, 21
 vampire 25
 stack 8
 star-eater, black 25
 starfish 10-11, 12-13, 24
 stingray 12
 stonefish, reef 15
 submersibles 28-29
 Sun 9
 surgeonfish 12

T

tern, Arctic 23
 tides 9, 10-11
 treasure 30
 trench, ocean 6-7
 tuna, bluefin 15
 turtle, green 12, 22
 turtles 16
 twilight zone 24

V

viperfish 25
 volcanoes 12

W

walrus 26
 waves 8
 whale,
 beaked 21
 blue 20-21
 grey 22-23
 humpback 20-21
 killer 21
 sperm 21
 whales 20-21, 26-27
 baleen 20
 whelk 11
 winds 5, 8
 worms 6