A detailed painting of a massive, curling ocean wave. The wave is rendered in various shades of blue, from deep, dark blues in the troughs to lighter, almost white blues in the foam and spray. The texture of the water is highly detailed, showing the swirling and churning of the sea. The wave is set against a plain, bright white background, which makes the blue of the water stand out prominently. The overall composition is dynamic and powerful, capturing the raw energy of the ocean.

Oceans  
of the  
World



# Contents

A World of Water .....	4
Currents and Tides .....	6
The Coasts	
<i>Settlements</i> .....	8
<i>Protecting the Coasts</i> .....	10
<i>The Changing Coasts</i> .....	11
Exploring the Unknown .....	12
Beneath the Surface .....	14
Harvesting the Oceans	
<i>Fishy Food</i> .....	18
<i>A Salty Harvest</i> .....	20
Farming the Oceans .....	22
Planting a Seed .....	24
Mining for Oil .....	26
Oceans of Fun .....	28
Glossary .....	30
Index .....	31
Discussion Starters .....	32

# Features



## FAST FACTS



How do oceans carry an object from one country to another? See for yourself on page 6.

Do you know that the *Titanic* sank in 1912 and the wreckage wasn't found until 1985? Turn to page 13 to discover who finally found the sunken ship.

## PROFILE



## WORD BUILDER



What do the words *salary*, meaning a worker's pay, and *salt* have in common? Turn to page 21 to find out.

One of the world's most valuable jewels is grown in the ocean. Find out which one in **Planting a Seed** on page 24.

## IN FOCUS

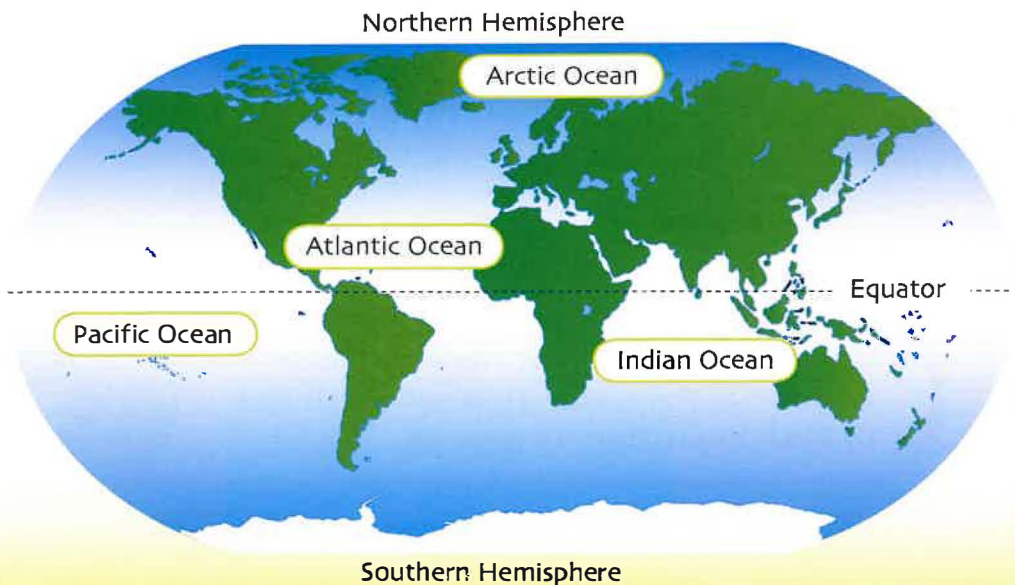


# A World of Water

Earth may be the name of our planet but more than two-thirds of its surface is covered in water. There are four large areas of salt water called oceans—the Pacific, the Atlantic, the Indian and the Arctic—and many smaller areas called seas. The Pacific Ocean is the largest and deepest. It covers 32 per cent of Earth's surface.

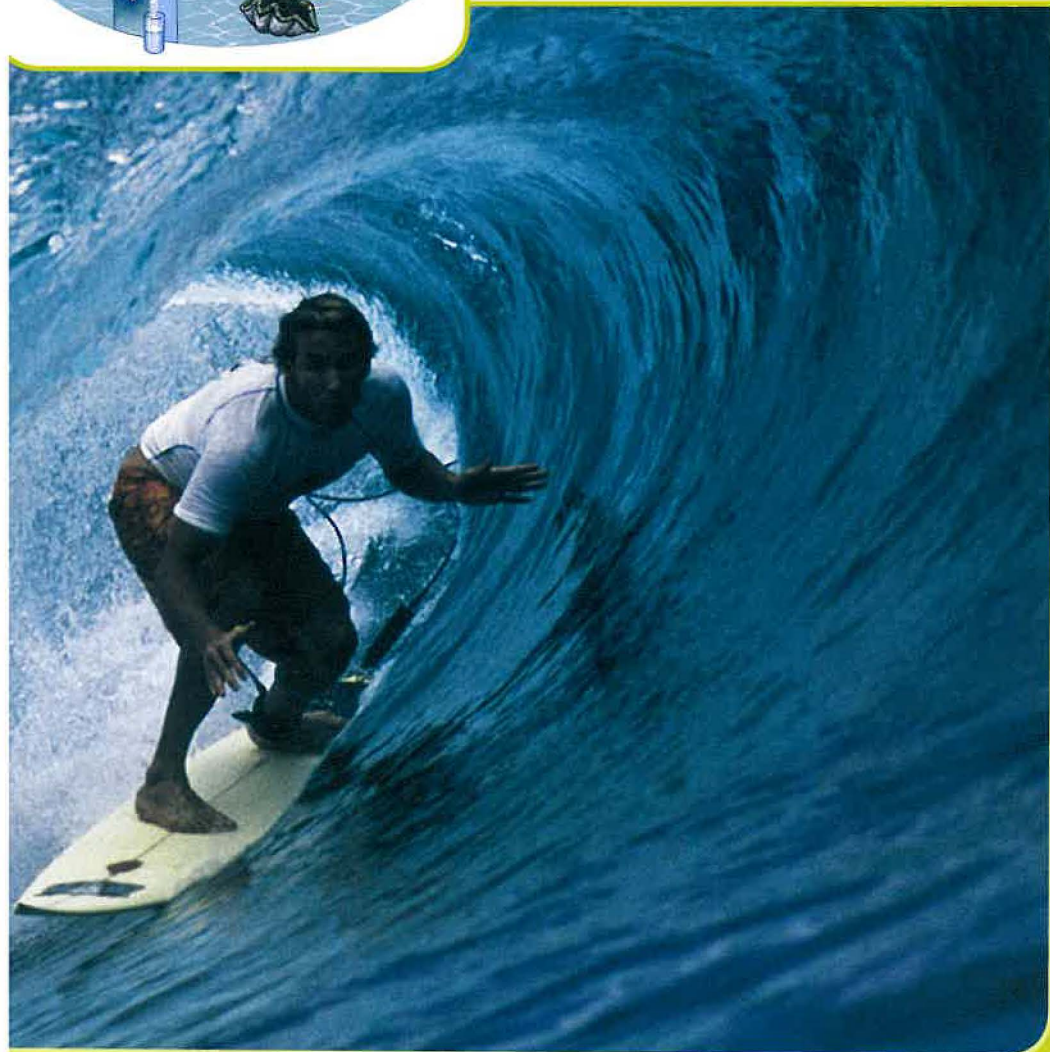
Oceans affect air temperature and supply moisture for rain. They provide us with food, **resources** and a vast watery world to explore and study.

## Oceans of the World





Almost all the water on Earth is salt water. Less than 3 per cent is fresh water and most of this is frozen in ice caps and glaciers. Only about 1 per cent is in rivers, lakes and underground channels.

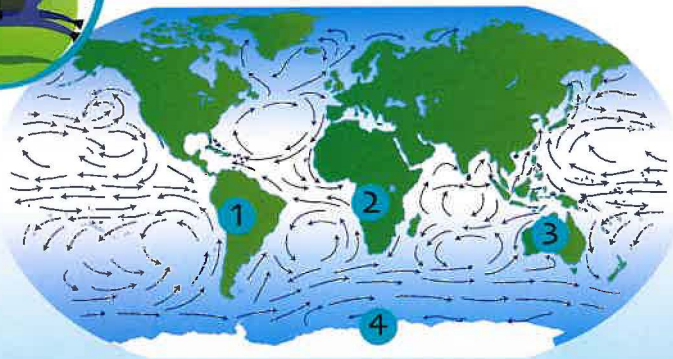


# Currents and Tides

Ocean movement is caused by currents and tides. Currents are large moving streams of water caused by winds blowing on the surfaces of the oceans. Warm water is sometimes moved to colder parts of the world by large circular currents and cold water is sometimes moved to warmer parts of the world.



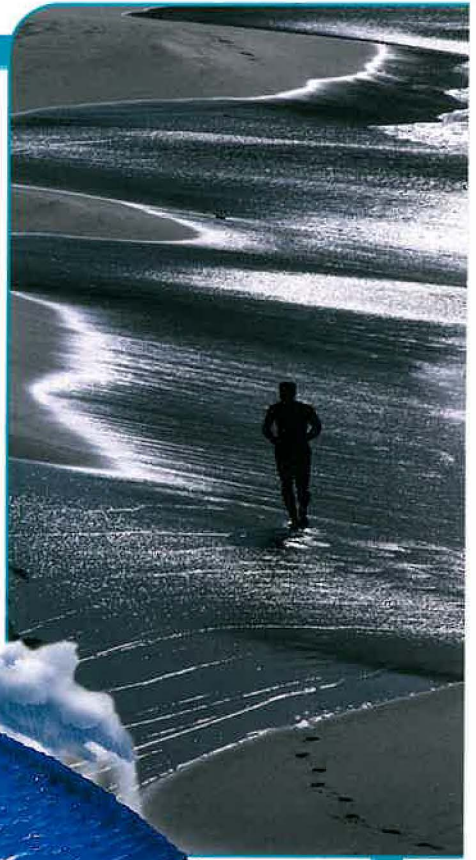
## Currents of the World



In an experiment, twenty bottles were thrown from a ship that was travelling between South America and Antarctica. It took over two years for ocean currents to carry the bottles to Australia and New Zealand. Can you find the currents between South America and Australia on the map above?



Tides are caused by the pull of the moon on Earth. As the moon orbits Earth the oceans are drawn to it. Every six hours the sea rises. This is called high tide. Six hours later it falls again at low tide.

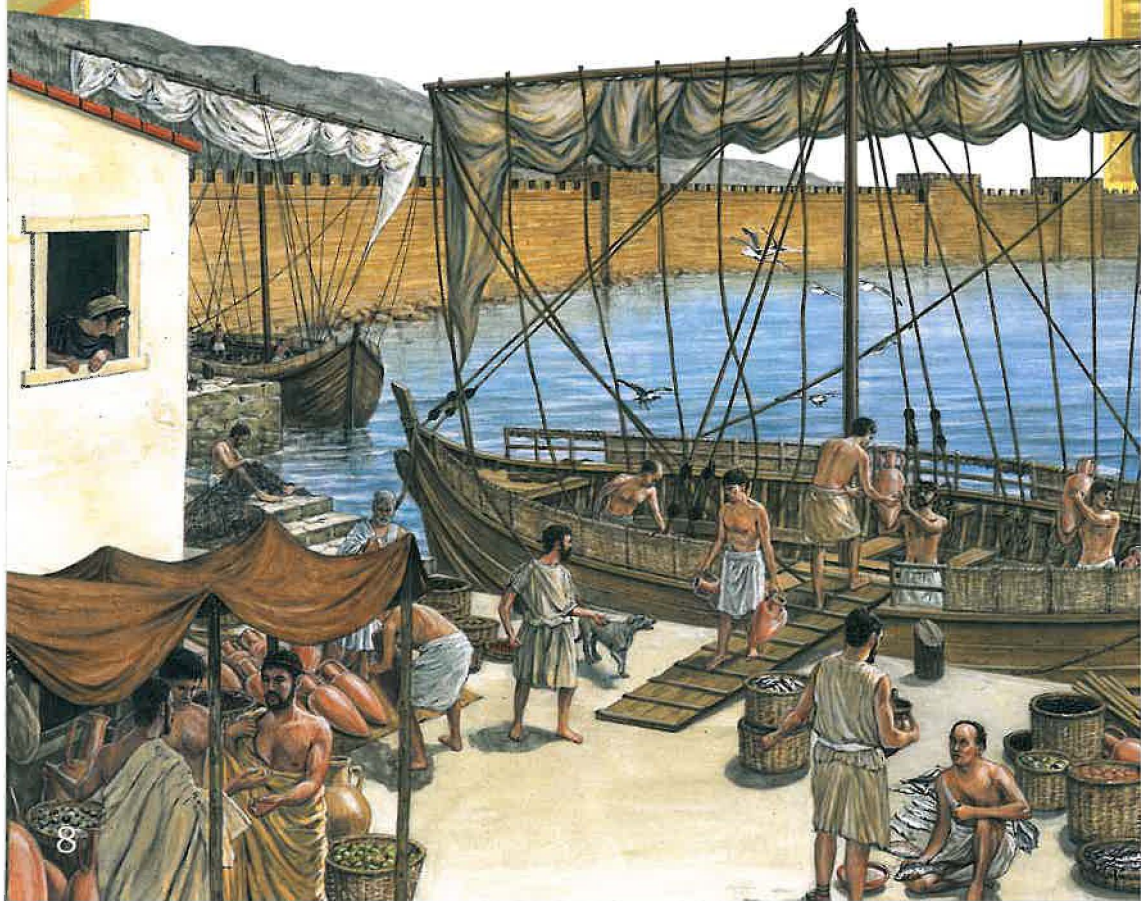


- ① South America
- ② Africa
- ③ Australia
- ④ Antarctica

# The Coasts

## Settlements

For thousands of years people have settled along the coasts of oceans and seas. Shipping was the main way of getting goods to other countries. Traders often made long and dangerous journeys. They travelled to many parts of the world to trade goods.

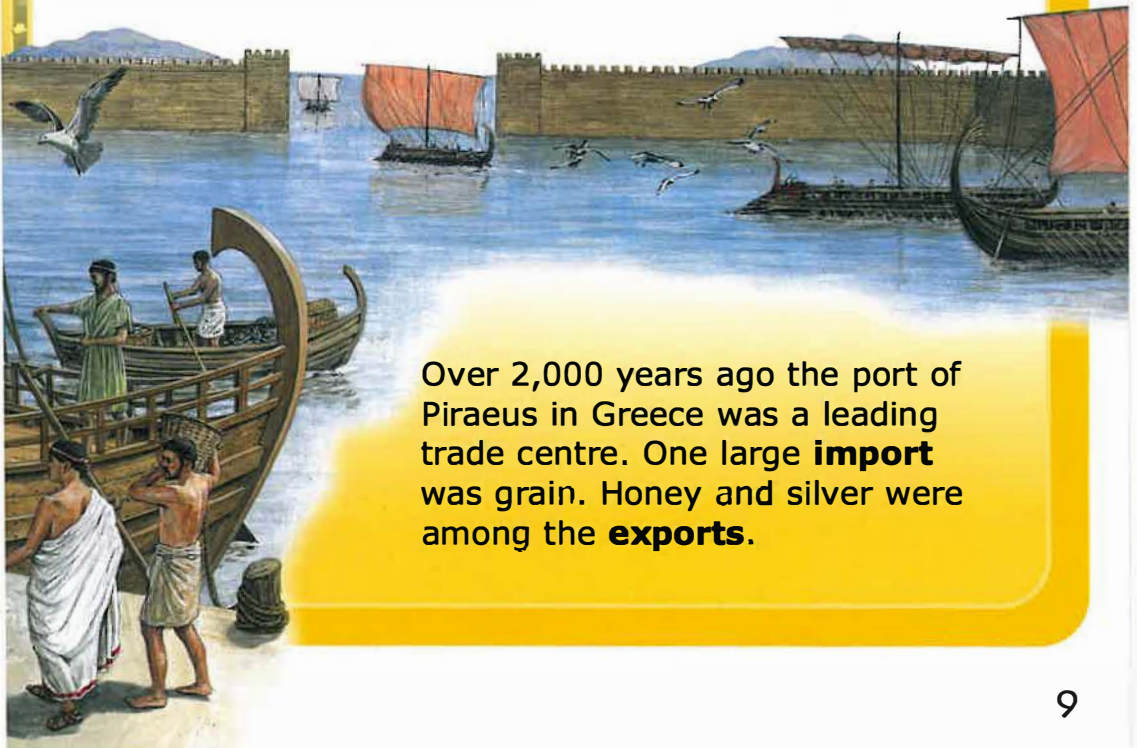




Today more than half the world's population lives on or near coasts. Many people live in large cities with ports. Some ports are in natural harbours formed by bays or the mouths of large rivers. Others are in harbours that have been specially made.



The city of San Francisco, USA is built on land by a natural harbour.



Over 2,000 years ago the port of Piraeus in Greece was a leading trade centre. One large **import** was grain. Honey and silver were among the **exports**.

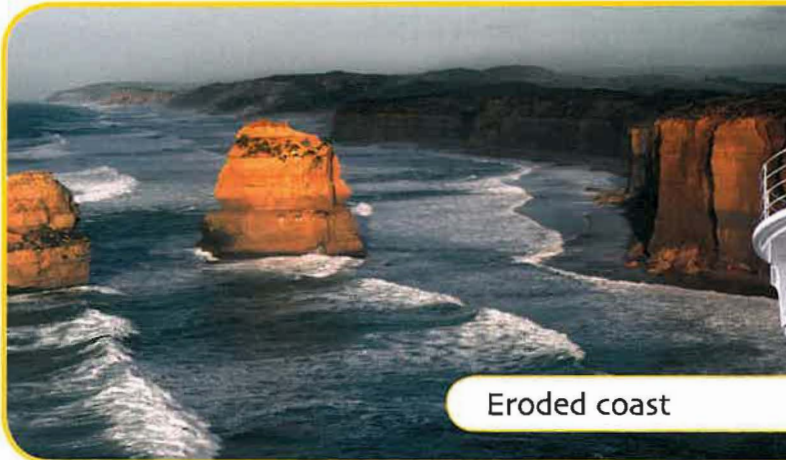
## Protecting the Coasts

Many countries make laws to protect their coastal resources, especially fish. Most countries control an area of ocean from their coasts and out to sea for 370 kilometres. Agreements are made and treaties are signed to protect coastal waters around the world.



## **The Changing Coasts**

Coasts are always changing shape. Powerful waves break down rock, and strong winds and sea currents carry rock and sand out to sea or to other parts of the coast. Some coasts are worn away while others are built up.



Eroded coast

Lighthouses are found on coasts around the world. They are used to guide ships, warning of land, rocks or reefs near the coast. Lighthouses look different and have different signals. This is so sailors can use the location of a lighthouse to help work out their ship's position in an ocean.



# Exploring the Unknown

Today's high-tech research ships and submersibles make it possible for scientists to go deeper and learn more about oceans than ever before. The scientists study sea animals, currents and the land that makes up the ocean floors. They study how oceans affect climate and weather around the world.

Most submersibles carry one or two people and are attached to a research ship. Robot submersibles explore very deep waters and narrow places where people cannot go.



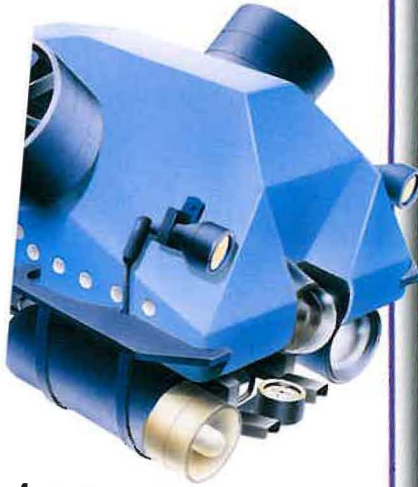
Research ship



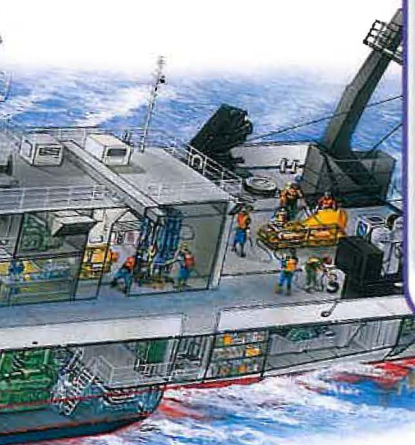
## DR ROBERT BALLARD

Dr Robert Ballard is a scientist and ocean explorer at Woods Hole in Massachusetts, USA. Many of his expeditions have led to great discoveries. Some of these are:

- (1973–74) a huge underwater mountain range in the Atlantic Ocean larger than any mountain range on land
- (1977) underwater hot springs and strange animal life never seen before off the coast of Ecuador in South America
- (1979) black smokers, or underwater volcanoes, off the coast of California in the United States
- (1985) the wreckage of the ship *Titanic* which sank in 1912 after hitting an iceberg in the Atlantic Ocean



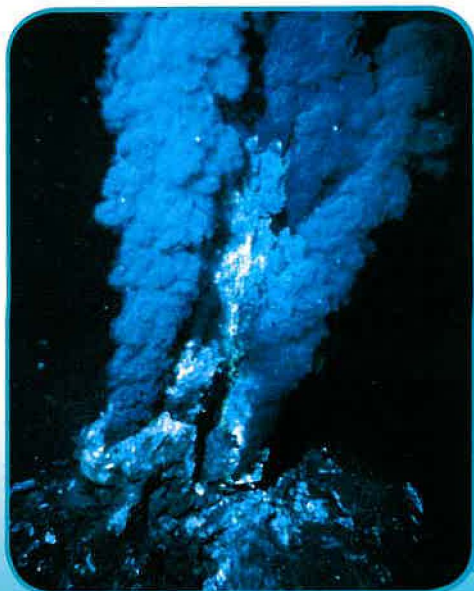
A submersible was sent inside the wreckage of the *Titanic* to take photos.



# Beneath the Surface

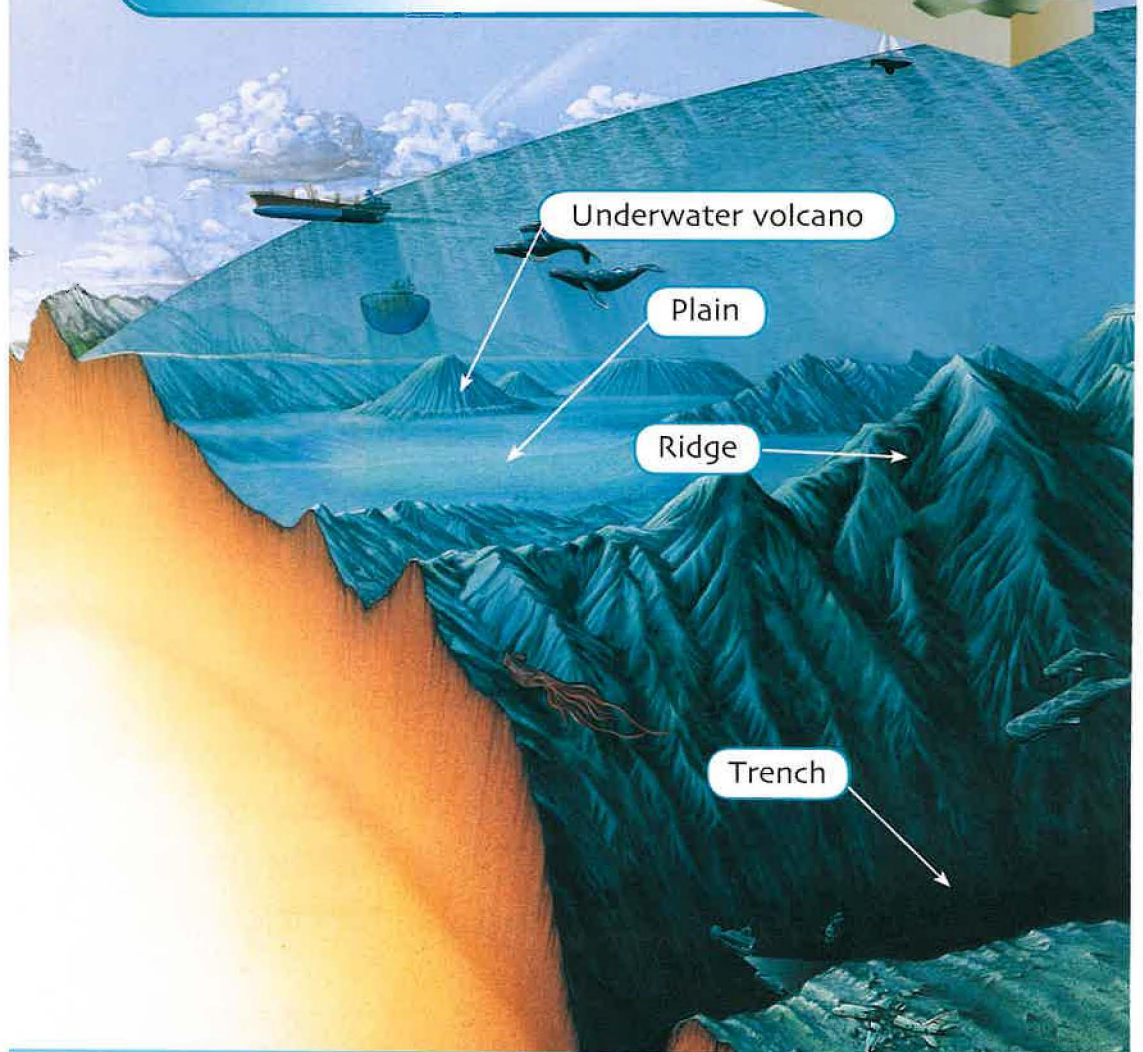
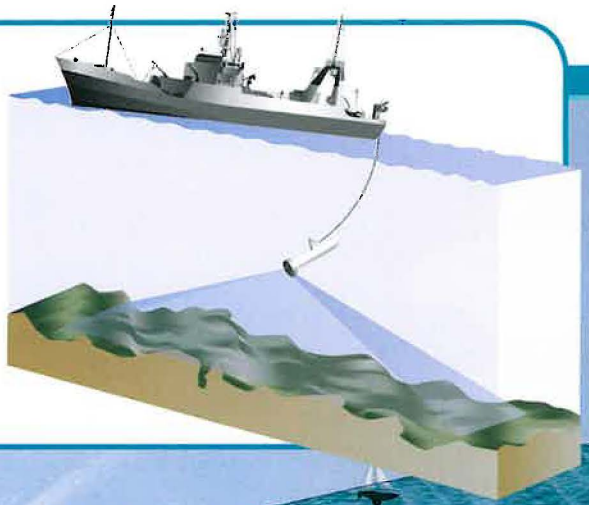
Beneath the surface of the ocean lies land that is similar to land above sea level. It has volcanoes, valleys, slopes, plains, trenches and ridges. The largest ocean trench is more than 10,000 metres below sea level. It's deeper than the height of Mount Everest, the highest mountain on land.

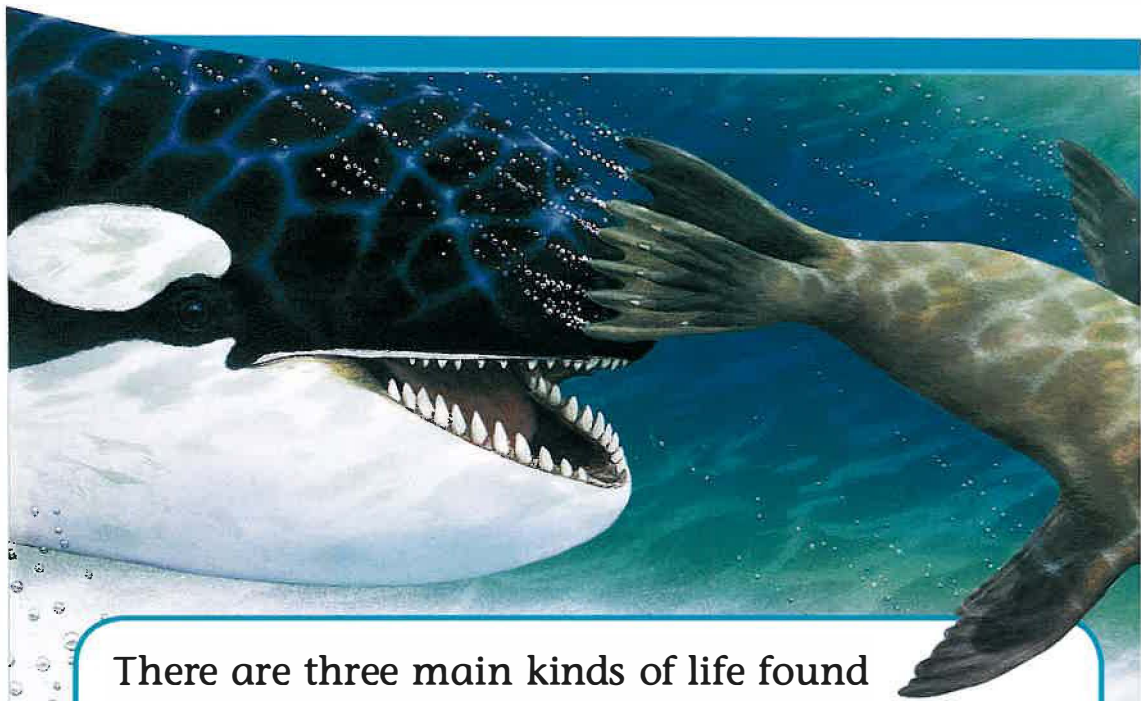
Scientists use sound waves to measure underwater land formations. By measuring how long it takes sound waves to bounce back to their instruments, scientists can make maps of ocean floors.



Using submersibles scientists can find black smokers on ocean floors. The smokers spurt hot water and black smoke.

Underwater maps are made by using a mapping tool called GLORIA. GLORIA uses sound waves to take measurements of ocean floors.

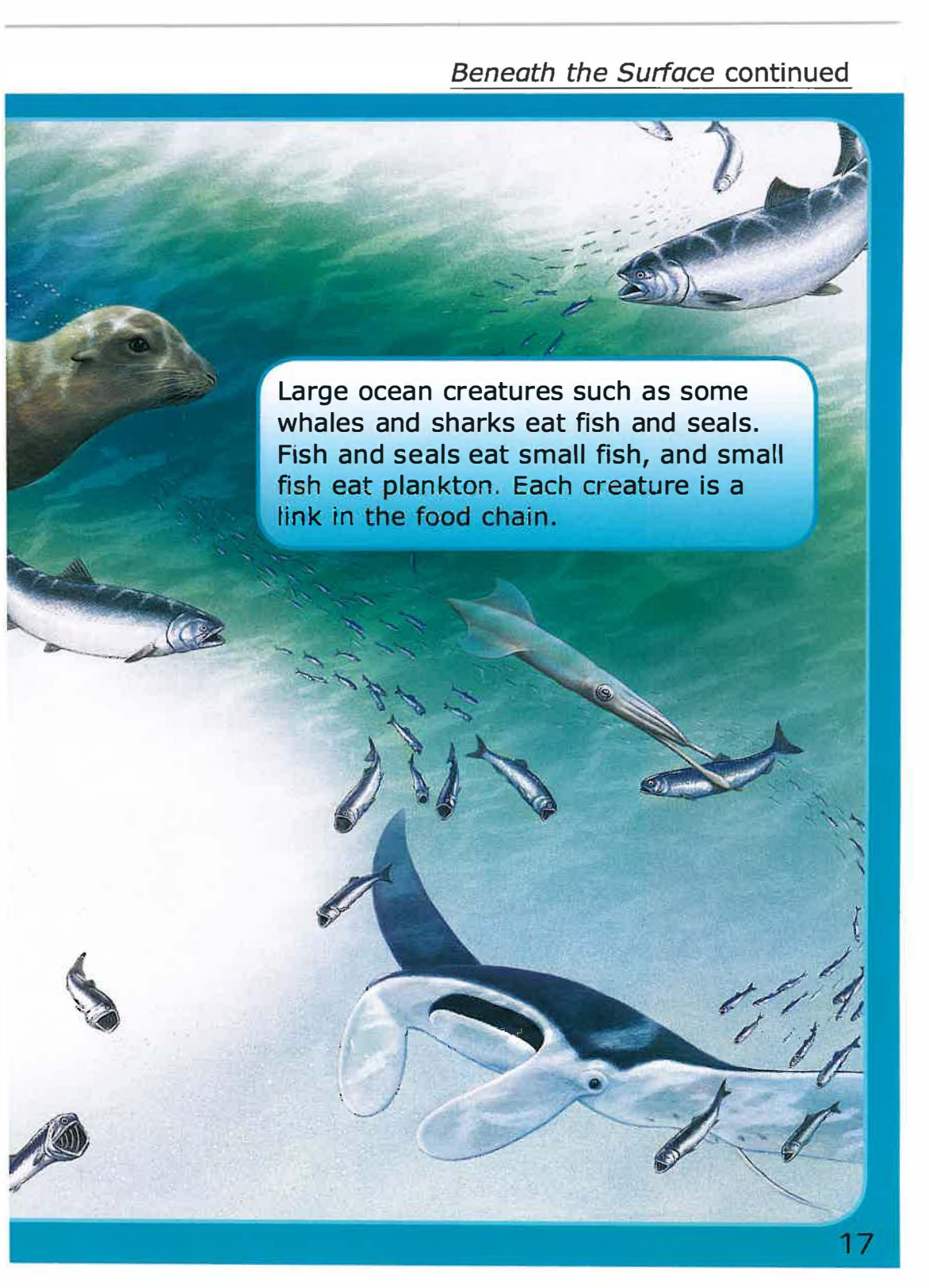




There are three main kinds of life found in the oceans. Tiny plants and animals that drift in the currents are called plankton. There are animals that swim such as fish and whales. Finally there are creatures that live on or near ocean floors such as worms and sponges.

The oceans provide food for all the creatures living in them. Each creature feeds on plants or other animals and is like a link in a chain. This is called a **food chain**. A change in just one link affects all the other creatures in the chain.





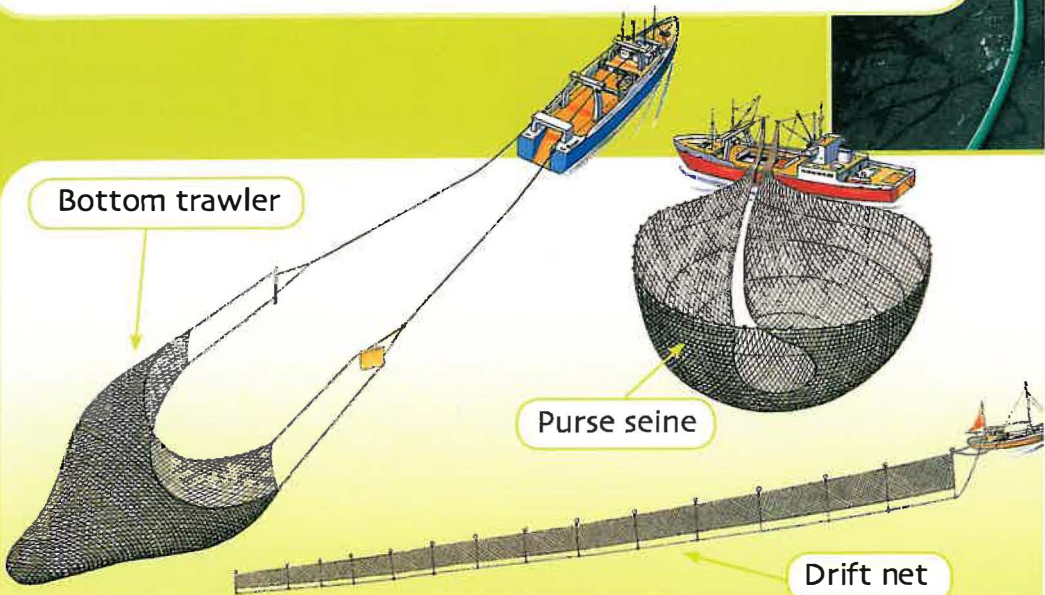
Large ocean creatures such as some whales and sharks eat fish and seals. Fish and seals eat small fish, and small fish eat plankton. Each creature is a link in the food chain.

# Harvesting the Oceans

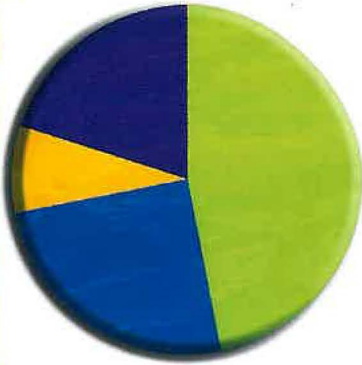
## Fishy Food

Fish are an important source of food for many people. As the world's population increases fishing businesses grow and provide food and jobs for millions of people.

Most saltwater fish are caught in waters near coasts. These areas are known as **commercial fishing zones**. Large fishing boats use different kinds of nets to catch fish. Many fishing boats have equipment on board to prepare their catches for sale.



## Where Are the World's Fish Caught?

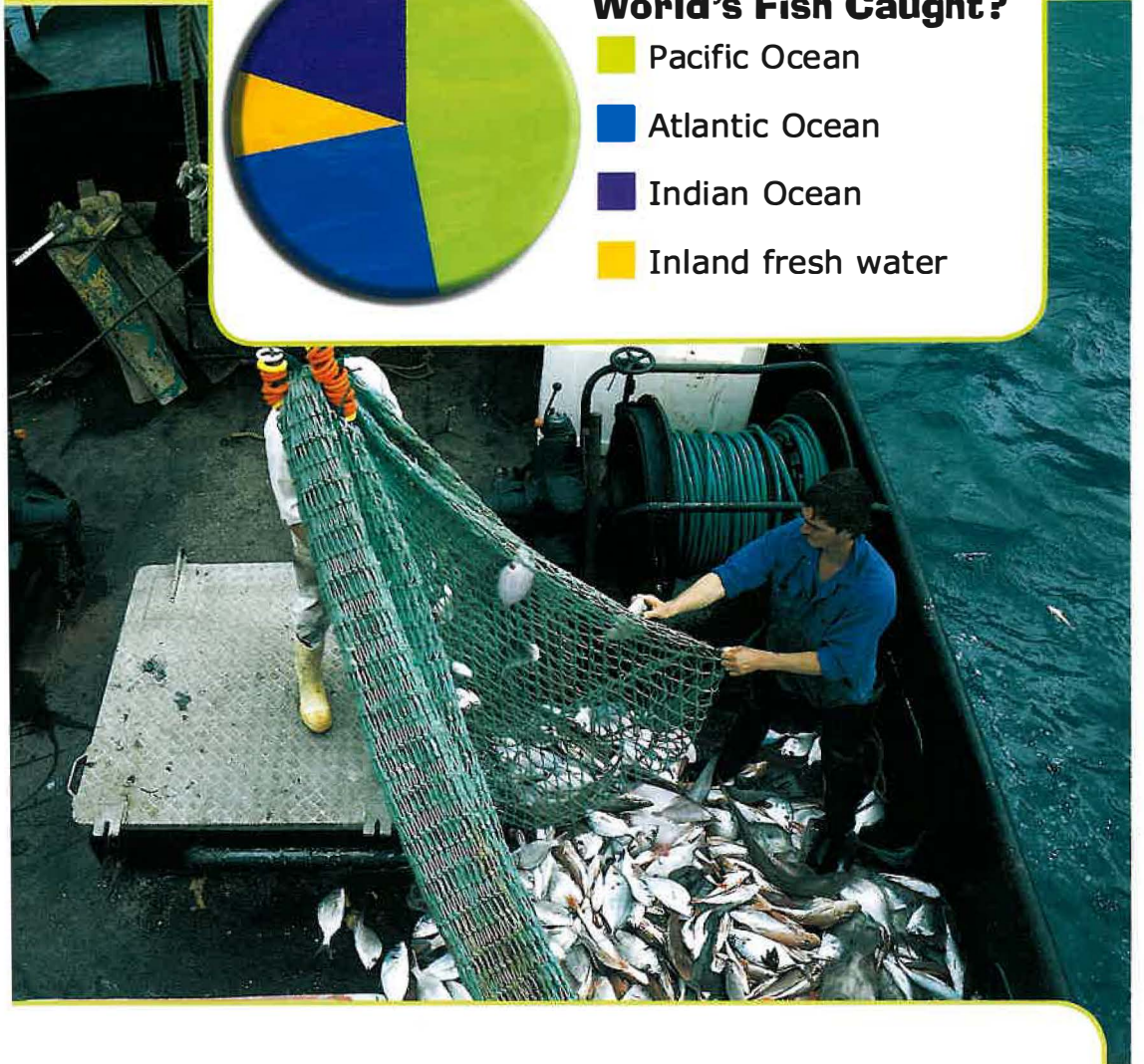


■ Pacific Ocean

■ Atlantic Ocean

■ Indian Ocean

■ Inland fresh water



## Drift-Net Fishing

A drift net is a rectangular net measuring up to 4 kilometres long. Drift nets have been banned in oceans since 1993.

Drift nets catch many fish, but they also trap and kill creatures such as dolphins, seals, turtles and whales. Other nets such as bottom trawlers and purse seines are still used.

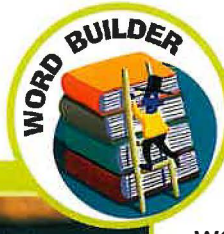
## A Salty Harvest

Around the world over 200 million tonnes of salt are harvested every year. The source of all salt is brine, or salty water, from oceans and seas. Even salt found underground was formed by the **evaporation** of oceans millions of years ago.

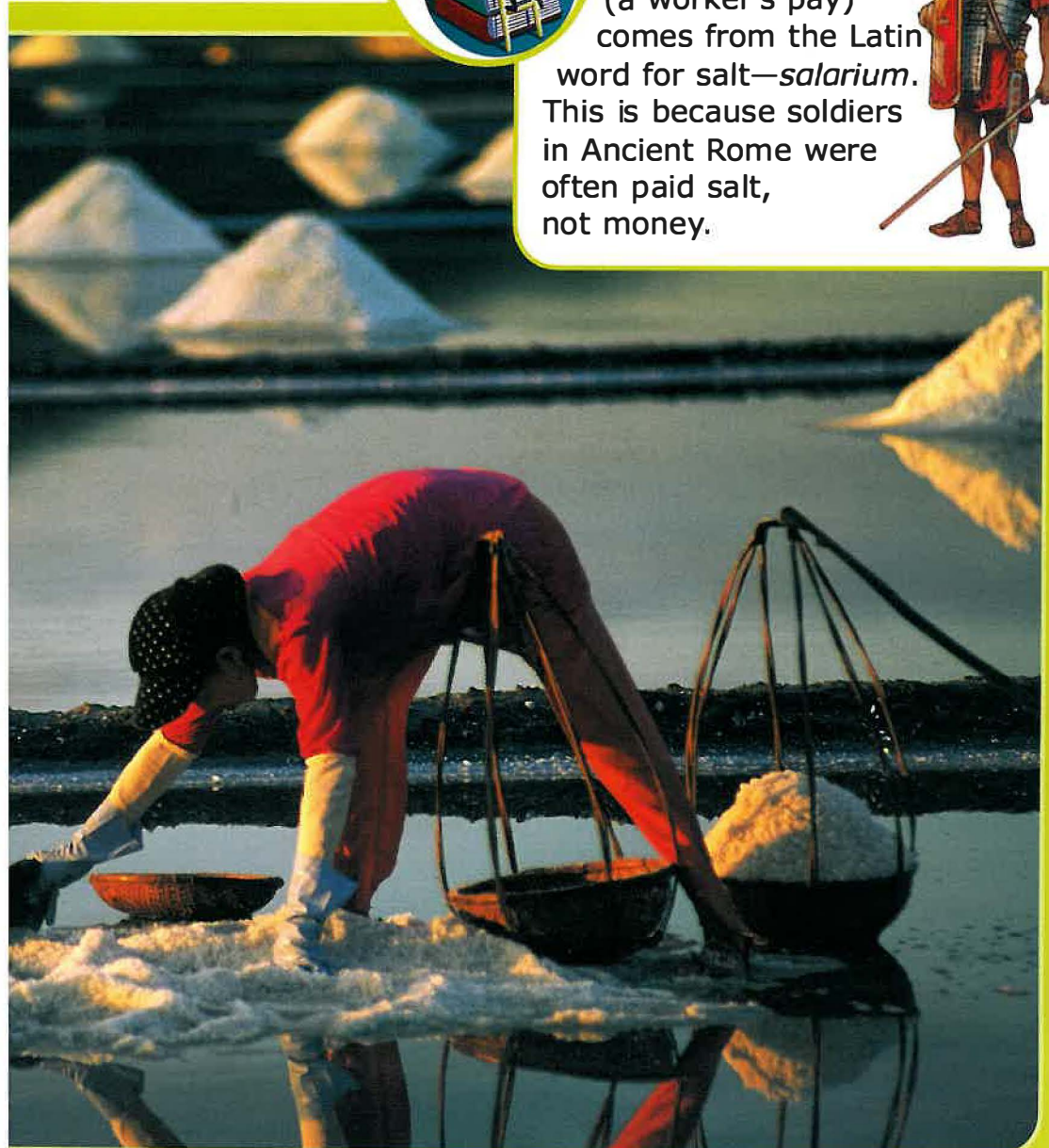
The chemical industry uses most of the world's salt harvest to produce chemicals. Only 4 per cent of the total salt harvest is eaten in food!



Salt is harvested by evaporating salt water in places where there is plenty of sunshine.

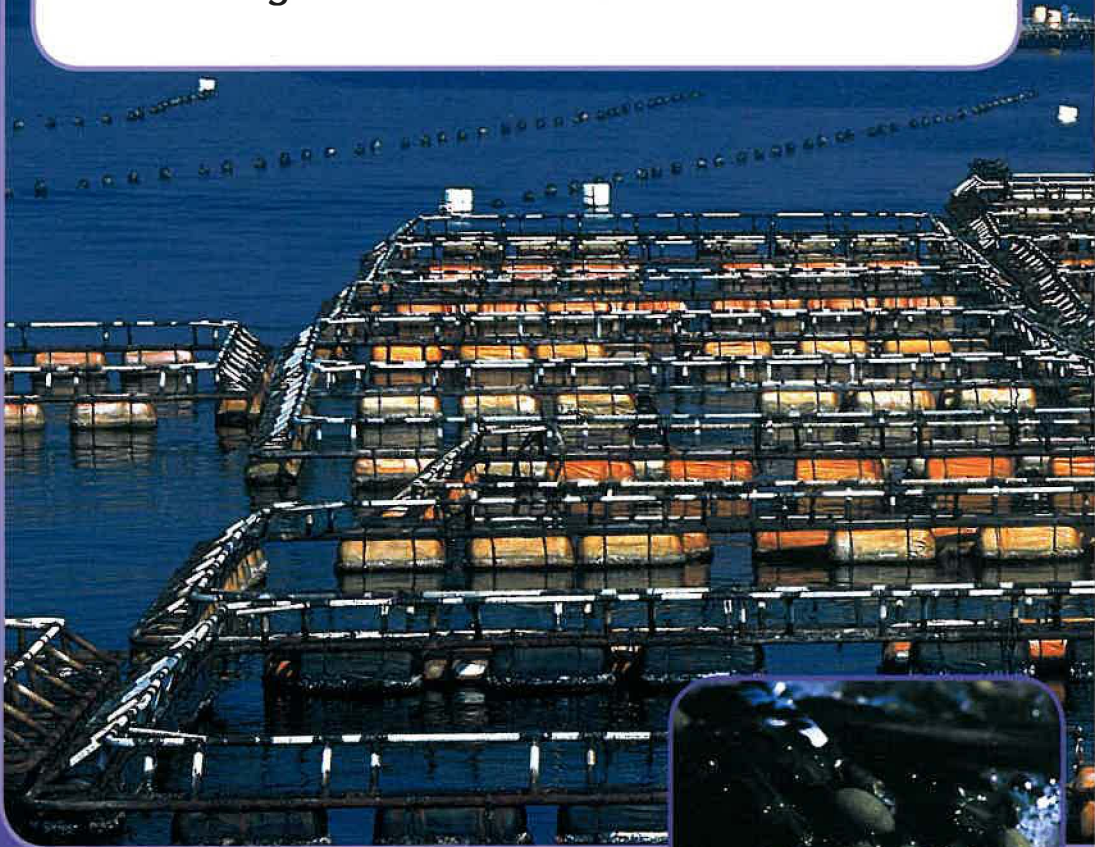


The word *salary* (a worker's pay) comes from the Latin word for salt—*salarium*. This is because soldiers in Ancient Rome were often paid salt, not money.



# Farming the Oceans

Some coastal areas are set up as “sea farms”. The Chinese have been fish farming for thousands of years. Seaweed and shellfish such as oysters, shrimps and mussels are also often grown and harvested on “farms”.



Oyster farm



Oyster farms are usually found in waters that are rich in algae—an oyster's natural food. Oysters are grown in trays or on sticks. They are usually harvested after they have been growing for 18 months to 3 years. Almost all oysters that are sold as food come from oyster farms.



There are about 7,000 kinds of seaweed! Seaweed has many uses and is rich in vitamins and minerals. Seaweed is an important ingredient in Japanese food called sushi.



# Planting a Seed

A pearl is a valuable jewel that grows inside the shell of an oyster. Today, most pearls are grown in ocean farms along warm coastal waters. To grow a pearl, a tiny piece of another kind of shell is placed inside a three-year-old oyster. The oyster is then returned to the sea. The pearl grows as layers of a substance called nacre build up around the piece of shell.

1



2



3




4



- 1 A tiny piece of shell is placed inside each oyster.
- 2 The oysters are returned to the sea.
- 3 The oysters are cleaned regularly.
- 4 A valuable pearl is harvested.

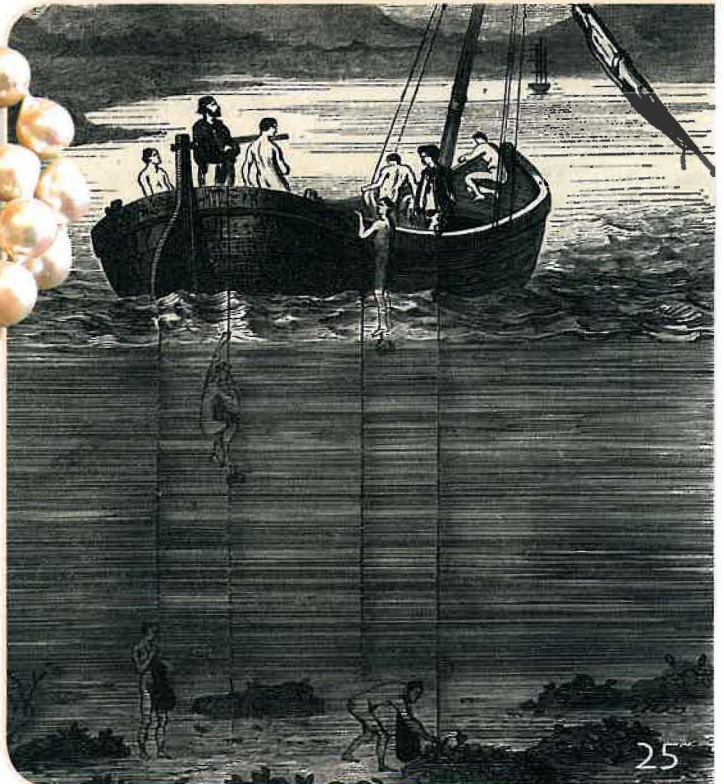




The oysters are moved and cleaned twice a year to make sure they have the best growing conditions. When the shells are opened between one and three years later, only about one in every twenty oysters contains a pearl.

## *Diving for Pearls*

Long ago pearls were gathered by divers who were tied by ropes to a boat. The divers had to hold their breath because there was no breathing equipment then.

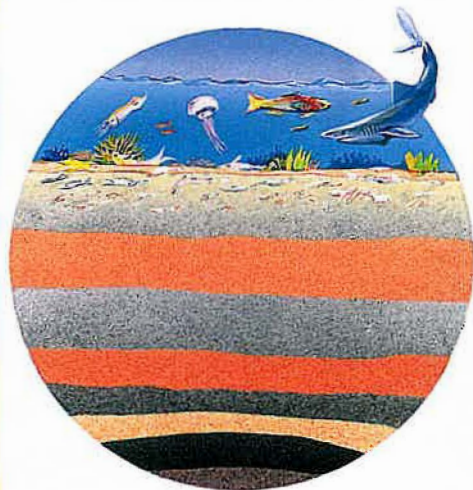


# Mining for Oil

One of the most valuable resources from the ocean is oil. Oil is used to generate nearly half the energy used in the world. Oil is found deep underground—on land and at sea. Huge offshore oil platforms, or rigs, are used to explore beneath the ocean floors for oil.

Up to fifty different wells can be drilled from a single platform to collect millions of barrels of oil each day. Most offshore oil rigs are used for about twenty-five years.





## What Is Oil?

Oil is made when dead plants and animals sink to the bottom of the ocean. Over thousands of years the dead matter is buried and squashed between layers of rock. The pressure from the rock slowly turns the dead matter into oil.

Hundreds of workers live on an oil rig for weeks at a time. A helicopter is often used to take workers to and from an oil rig.

# Oceans of Fun

Oceans can be fun for people of all ages. There are many ocean sports to take part in. Near the coast people can swim, surf, windsurf and waterski. Further out in the ocean people can go deep-sea fishing and diving.

Exploring different parts of the ocean is also fun. A coastline can be packed with shells, rocks and small creatures such as crabs. A shallow reef can have beautiful coral and fish of many colours.





## Fun on the Water

Waterskiing is a fast exciting sport. Waterskiers race across an ocean's surface behind a speedboat, twisting and turning. In a strong wind a windsurfer can also be quite speedy. Sailing can be a much slower relaxing activity or a serious sporting race.

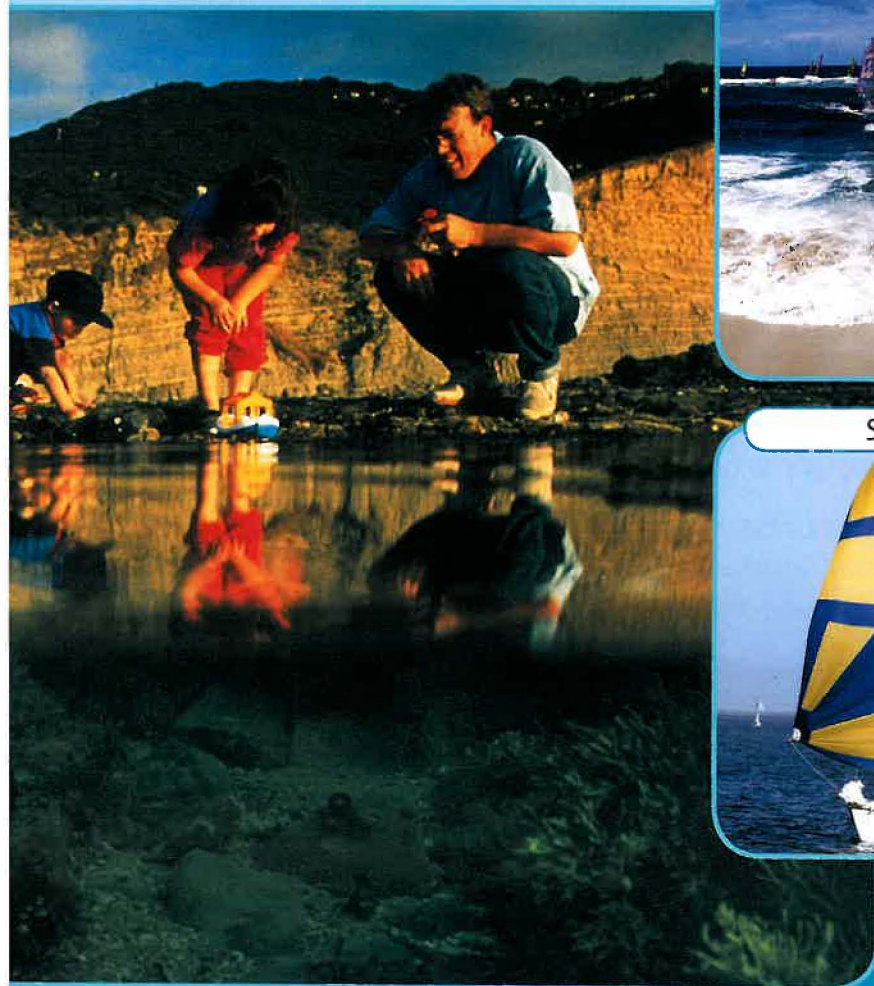
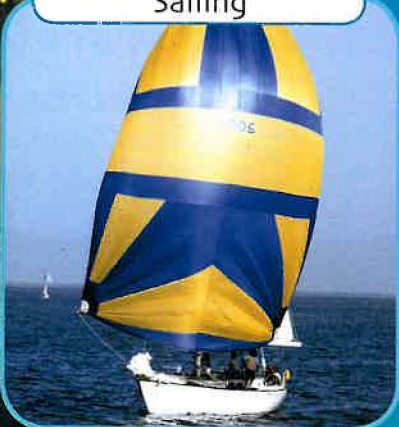
### Waterskiing



### Windsurfing



### Sailing





# Glossary

**commercial fishing zone** – an area of ocean where fish are caught for the purpose of selling

**coral** – a hard stony substance that is found in shallow parts of warm oceans. Coral is made up of the skeletons of tiny sea creatures.

**evaporation** – the process in which a liquid changes into a vapour or a gas. Water evaporates when it is boiled.

**export** – a product that is sold and sent to another country

**food chain** – a pathway of food supply. In the ocean a food chain starts with plankton that is eaten by some kinds of fish. These fish then become food for other kinds of fish.

**import** – a product that is bought from another country

**resource** – something from nature that is available for people to use. Ocean resources include fish, salt, shellfish, seaweed and oil.

**submersible** – a small submarine that can go as deep as 11 kilometres beneath an ocean's surface

**treaty** – a written agreement between two or more countries, often about trading and cooperation

# Index

coasts	8-11, 22, 28
currents	6
drift nets	18-19
farming	22-25
fish	10, 16-19, 22, 28
food chains	16-17
harbours	9
lighthouses	11
ocean exploration	12-15, 26, 28
ocean floors	12-16, 26
oil	26-27
oysters	22-25
pearls	24-25
plankton	16-17
salt	20-21
salt water	4-5, 20
seaweed	22-23
settlements	8-9
sports	28-29
tides	6-7





# Discussion Starters

**1** Oceans can be great fun when you're swimming, fishing, boating or surfing. However, there are also dangers. What dangers should you be aware of when you're swimming or when you're boating? What kind of safety equipment would you need on a boat?

**2** Drift-net fishing has been banned around the world because large drift nets trap and kill many sea creatures needlessly. Do you agree or disagree with this ban? Why do you think other nets can still be used?

**3** There are many different ways to study an ocean. Some scientists study what happens on the surface of an ocean, some study life in an ocean and others study the floor of an ocean. Which part of an ocean would you most like to study? Why?