Biodiversity of Coasts

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Contents

CASE STUDY:

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Glossary words

When a word is printed in **bold**, click on it to find its meaning.

What is biodiversity?

Biodiversity, or biological diversity, describes the variety of living things in a particular place, in a particular **ecosystem** or across the whole Earth.

Measuring biodiversity

The biodiversity of a particular area is measured on three levels:

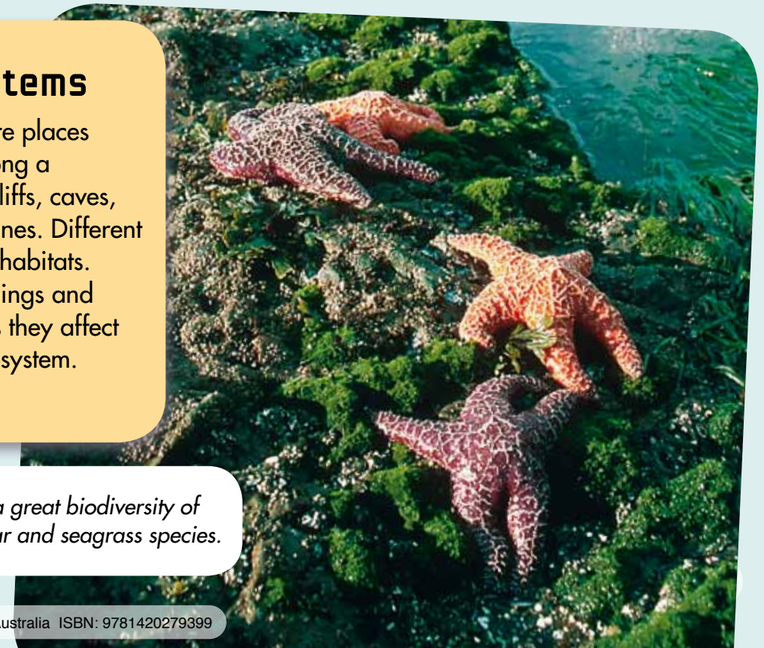
- **species** diversity, which is the number and variety of species in the area
- genetic diversity, which is the variety of **genes** each species has. Genes determine the characteristics of different living things. A variety of genes within a species enables it to **adapt** to changes in its environment.
- ecosystem diversity, which is the variety of **habitats** in the area. A diverse ecosystem has many habitats within it.

Species diversity

Species diversity changes from one habitat to another. Habitats such as rainforests and coasts have different levels of biodiversity. Within a coastal habitat, mussels and other shellfish cling to rocks close to the water's edge. Coastal grasses live above the high tide mark and seals rest on shore and hunt in the water. Some fish live entirely in rockpools.

Habitats and ecosystems

There are many habitats, which are places where animals and plants live, along a coast. Some coastal habitats are cliffs, caves, rockpools, heathland and sand dunes. Different kinds of **organisms** live in these habitats. The animals, plants, other living things and non-living things, and all the ways they affect each other, make up a coastal ecosystem.



Coastal habitats have a great biodiversity of species, such as sea star and seagrass species.

Biodiversity under threat

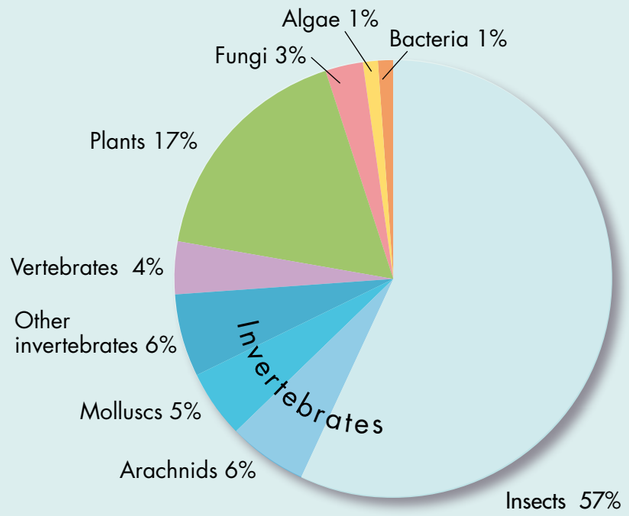
The variety of species on Earth is under threat. There are somewhere between 5 million and 30 million species on Earth. Most of these species are very small and hard to find, so only about 1.75 million of these species have been described and named. These are called known species.

Scientists estimate that as many as 50 species become **extinct** every day. Extinction is a natural process, but human activities have sped up the rate of extinction by up to 1000 times.

Did you know?

About 95 per cent of all known animal species are invertebrates, which are animals without backbones, such as insect, worm, spider and mollusc species. Vertebrates, which are animals with backbones, make up the remaining 5 per cent.

Known species of organisms on Earth



The known species of organisms on Earth can be divided into bacteria, algae, fungi, plant and animal species. Animal species are classified as vertebrates or invertebrates.

Approximate numbers of known vertebrate species

ANIMAL GROUP	KNOWN SPECIES
Fish	31 000
Birds	10 000
Reptiles	8 800
Amphibians	6 500
Mammals	5 500

Why is biodiversity important?

Biodiversity is important for many reasons. The diverse **organisms** in an **ecosystem** take part in natural processes essential to the survival of all living things. Biodiversity produces food and medicine. It is also important to people's quality of life.

Natural processes

Human survival depends on the natural processes that go on in ecosystems. Through natural processes, air and water are cleaned, waste is decomposed, **nutrients** are recycled and disease is kept under control. Natural processes depend on the organisms that live in the soil, on the plants that produce oxygen and absorb **carbon dioxide**, and on the organisms that break down dead plants and animals. When **species** of organisms become **extinct**, natural processes may stop working.

Food

We depend on biodiversity for our food. The world's major food plants are grains, vegetables and fruits. These plants have all been bred from plants in the wild. Wild plants are important sources of **genes** for breeding new disease-resistant crops. If these wild plants were to become extinct, their genes would be lost.

Medicine

About 40 per cent of all prescription drugs come from chemicals that have been extracted from plants. Scientists discover new, useful plant chemicals every year. When plant species become extinct, the chemicals within them are lost forever. The lost chemicals might have been important in the making of new medicines.

The potato plant

The potato plant is native to the Andes of South America. It was first taken to Europe in 1536 and, since then, potatoes have become the world's fourth most important food crop. To protect the potato's genetic diversity, the International Potato Centre in Lima, Peru, keeps more than 4500 varieties of potatoes as tiny plants in test tubes and cold storage.

Quality of life

Biodiversity is important to people's quality of life. Animals and plants inspire wonder. They are part of our **heritage**. Some species have become particularly important to us. If the tiger became extinct, our survival would not be affected, but we would feel great sadness and regret.

Extinct species

North America's passenger pigeon was one of the most common birds in the world. Flocks could be so dense and so large that they blocked out the sun as they flew by. Due to relentless hunting, the passenger pigeon population began to decline and then plummet. No more passenger pigeons were shot after 1900. On 1 September 1914, the last known passenger pigeon died at Cincinnati Zoo, in Ohio, the United States. When this species became extinct, the Earth's biodiversity was reduced.

Animal species such as tigers inspire people's wonder and imagination. This improves our quality of life.

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Coasts of the world

The coast is where the land meets the sea. A coast may have sandy beaches, rocky cliffs, stretches of swampy land or coves and inlets. More than 40 per cent of the world's people live within 60 kilometres of a coast.

The length of coastlines

The length of coastline throughout the world is estimated. There is somewhere between 500 000 and 840 000 kilometres of coastline. The difference in the estimates depends on how precisely all the twists and turns in a coastline are measured.

Countries with the most coastline

COUNTRY	APPROXIMATE LENGTH OF COASTLINE (kilometres)	PERCENTAGE OF WORLD TOTAL
Canada	243 800	29
Indonesia	54 700	6.5
Greenland	44 100	5.2
Russia	37 700	4.5
Philippines	36 300	4.3
Japan	29 800	3.5
Australia	25 800	3.1
Norway	21 900	2.6
USA	19 900	2.4
Total	**514 000**	**61.1**

Lengths of coastlines are difficult to estimate because of their many twists and turns.

People and coasts

More than 40 per cent of the world's population, about 2.68 billion people, lives within 60 kilometres of a coast. Many of the world's largest cities and many towns are built along beachfronts.

The large number of people living along coasts places enormous pressure on coastal **ecosystems** and biodiversity. In some coastal areas, the human population more than doubles when tourists arrive for summer holidays. As the population increases, more housing, ports and roads are needed. Pollution also increases.

The population of coastal areas around the world is expected to continue to increase in the future. This increase will have an impact on global coastal biodiversity.

Many tourists flock to coastal areas with sandy beaches during summer.

Turtles and urban development

When **marine** turtles hatch, they emerge from their sandy nest and make their way to the sea. This can be dangerous on a coast that is populated by humans. Streetlights can confuse the young hatchlings. They mistake the lights for moonlight on the water and sometimes head inland instead of out to sea. Pet dogs that are allowed to wander along turtle beaches prey on turtle hatchlings, too.

Coastal biodiversity

There are many types of coastal **habitats**, and different kinds of **species** are found in each of these habitats. Coastal habitats stretch several kilometres inland and out to sea.

Types of coast

There are three main types of coast. Each is a habitat for different species of animals and plants.

Rocky coasts

Rocky coasts have cliffs and rocky **outcrops** that jut into the sea. Rocky coasts are hammered by wild seas and are constantly being eroded. Hardy plants cling to cracks in the rock and many seabirds nest on the cliffs and outcrops, safe from **predators**.

Rocky coast

Tidal plain coasts

Tidal plain coasts are swampy places with **mudflats** and mangrove forests. Much of the coast is covered at high tide. At low tide, crabs emerge from their burrows to feed on the mudflats. Shorebirds such as sandpipers probe the exposed mud with their beaks, looking for worms and other invertebrates.

Tidal plain coast

Beach coasts

Beach and barrier coasts are sandy, with dunes covered by grasses and shrubs. Birds such as the hooded plover nest in the dunes and **marine** turtles come ashore to lay their eggs in the sand.

Beach coast

Coastal areas

The coast is not just the narrow area where the land meets the sea. It also includes the coastal zone and the continental shelf.

Coastal zone

The coastal zone is the area where both the land and the sea strongly affect each other. Salty winds that blow in from the sea may affect the types of plants that grow for several kilometres inland. Soil that washes into the sea from the land may affect marine animals and plants up to several kilometres out from the shoreline. Coral reefs can be killed when **silt** from the land smothers them. These areas are part of the coastal zone.

Continental shelf

The continental shelf is an area of seabed around a coast. The continental shelf has shallow sea. The shelf may extend 400 kilometres from the shoreline before it falls away to deeper ocean. Many species found in these shallow waters are not found further out to sea.

Seagrasses

Coastal waters are usually quite shallow. This means light penetrates to the seafloor, enabling seagrasses to grow. These flowering plants are the main food of dugongs. Seagrasses grow best in sheltered water, which is found in coastal inlets where waves are calmed by reefs and shorelines.

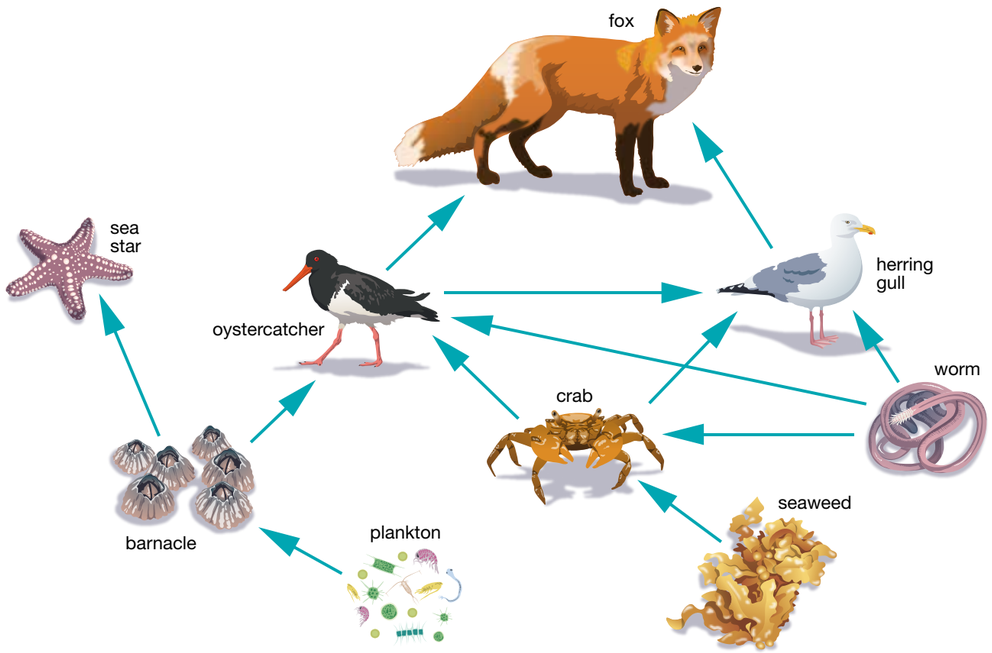
Soil builds up in a coastal zone, where a river meets the sea.

Coastal ecosystems

Living and non-living things, and the **interactions** between them, make up coastal **ecosystems**. Living things are plants and animals. Non-living things are rocks, sand and water, as well as the **climate**, temperature, tides and surf.

Food chains and food webs

A very important way that different **species** interact is by eating or consuming other species. This transfers energy and **nutrients** from one **organism** to another. A food chain illustrates this flow of energy, by showing what eats what. Food chains are best set out in a diagram. A food web shows how different food chains fit together.



This coastal food web is made up of several food chains. In one food chain, seaweed is eaten by crabs, which in turn are eaten by oystercatchers, who are eaten by foxes.

Other interactions

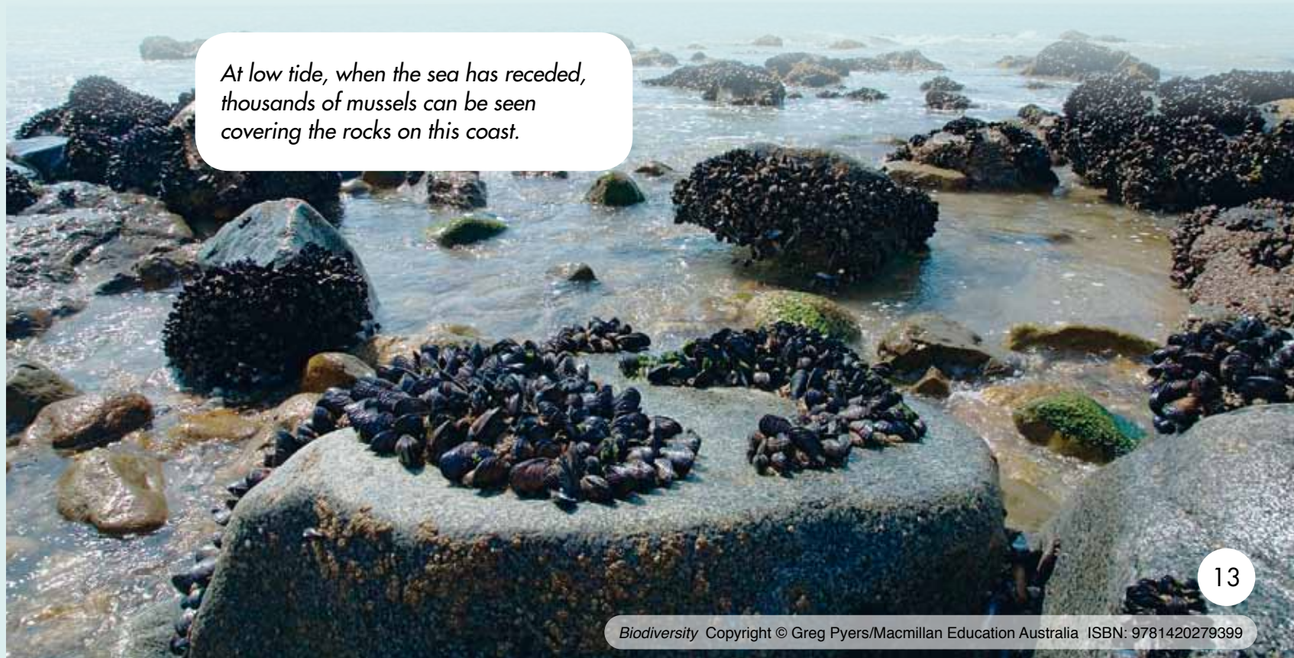
Living and non-living things on a coast interact in other ways, too. While they feed on shellfish, sea otters keep themselves anchored to one place on the sea surface by wrapping **kelp** around their bodies. The kelp is attached to the seafloor. Seaweed crabs thread pieces of seaweed through hooked spines on their backs. This provides them with camouflage, which hides them from **predators**, such as oystercatchers, that hunt in rockpools.

Tidal interactions

There are two high tides and two low tides every 24 hours or so. Tides are very important to the daily lives of coastal animals. At high tide, stingrays swim into shallow water to feed on snails and other animals. As the tide goes out, the stingrays swim back to deeper water. Animals such as barnacles open their shells at high tide to catch **plankton** from the water. At low tide, they are exposed and they must close their shells tightly to keep from drying out in the air.

Mussels

Mussels are most numerous on rocks that are covered at high tide and exposed to the air at low tide. Mussels cannot live above the high tide line because they would be unable to feed from the water. They are not numerous below the low tide line because there they are preyed on by sea stars.



At low tide, when the sea has receded, thousands of mussels can be seen covering the rocks on this coast.

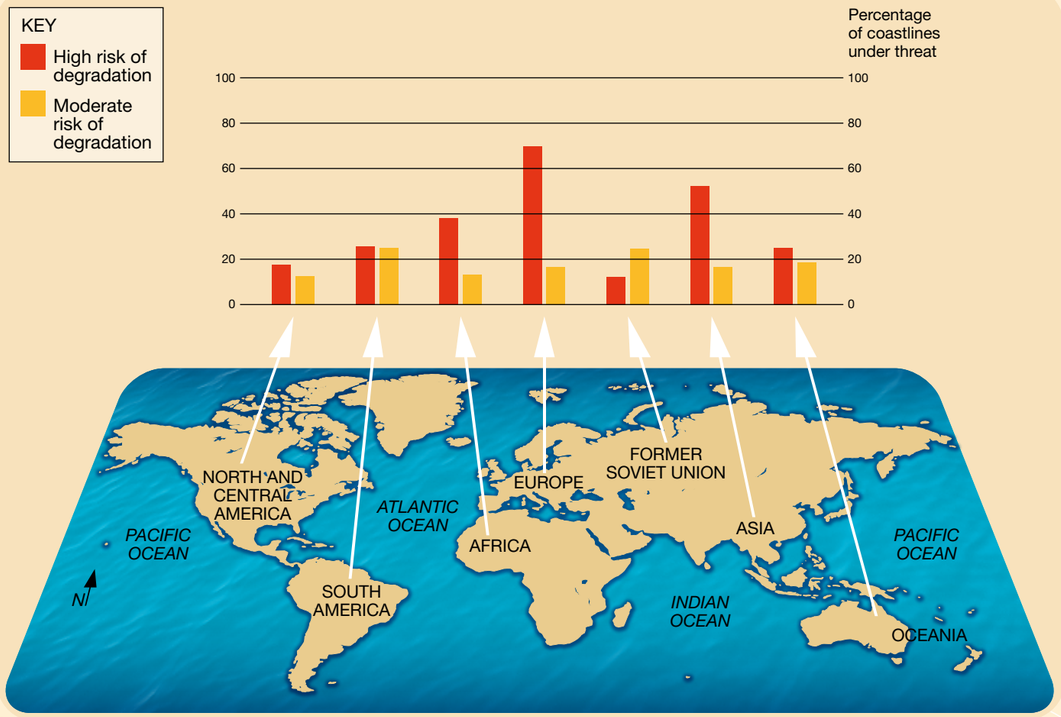
BIODIVERSITY THREAT:
Threats to coasts

Coastal biodiversity in many parts of the world is under severe threat due to human activities. Biodiversity is most at risk in coastal **habitats** such as mangroves and other coastal wetlands.

Human threats

Urbanisation, overfishing, land clearing, **invasive species**, changing **climate**, pollution, tourism and shipping all contribute to the loss of coastal habitat and biodiversity. About 34 per cent of the world's coasts are under severe risk of **degradation** from the effects of human activity. Another 17 per cent are at moderate risk. In Europe, 86 per cent of the coasts are classified at either high or moderate risk of degradation. In Asia, 69 per cent of the coasts are threatened.

Coastlines under threat



Mangroves

Mangroves are trees that grow in coastal **mudflats**. For many years, mangrove forests have been seen as swampy wastelands. They are dense, muddy and alive with insects. Mangroves, however, are vitally important for many reasons. They absorb vast amounts of **nutrients** that wash down from the land. When mangrove forests are removed to build roads, marinas, hotels and ports, these nutrients enter the sea and increase the growth of **algae**. Excessive algal growth can smother and kill corals. Mangroves also protect coastlines from huge waves caused by tropical storms. They are home to many animal **species**, such as **marine** fish that feed among their roots at high tide.

Loss of mangroves

Since 1800, more than half of the world's mangrove forests have been cleared. In 2007, less than 150 000 square kilometres remained of an original 320 000 square kilometres. Half of this loss occurred in the last 50 years. Mangrove loss is due mainly to shrimp farming, urbanisation, tourism, agriculture and the construction of roads and ports.

Did you know?

About 80 per cent of the world's 13 000 or more species of marine fish are coastal. These species need coastal habitats, such as mangrove forests, in which to breed. Coastal developments have resulted in many mangrove forests being cleared.

Many cities on the Gold Coast in Queensland, Australia, were originally built on mudflats and mangroves.

BIODIVERSITY THREAT: Urbanisation

Urbanisation poses many threats to coastal biodiversity. Towns and cities replace natural coastal **habitats**. Humans produce waste and engage in activities that can harm coastal animals and plants.

Building towns and cities

Coasts are the most urbanised places in the world. Traditionally, most trade has been by sea, so towns and cities have grown around ports. Many people like to live near the sea and many coasts have been urbanised as holiday houses are built. As the world's population increases, more and more of the coast is urbanised as roads, buildings, bridges and other town and city features are built.

The features of towns and cities replace the natural features of the coast, such as the native **vegetation**, wetlands and **mudflats**. Because of this, the biodiversity of the coast is changed. Many coastal animals and plants become endangered. Many are made extinct.

Urban waste

Where there are many people, much waste is produced. This waste includes **sewage**, oil and garbage. Sewage can cause the excessive growth of **algae**. Algae can smother coral reefs, which lie close to the coast. Oil washes down drains from streets and is poisonous to animals. Garbage, such as cigarette butts and plastic bags, can pollute the land and sea.

Stormwater is piped directly into the sea, carrying with it waste from towns and cities.

Human activities

Urbanisation leads to more people using a coast. Human activity often has a negative effect on coastal habitats and coastal **species**.

Human activities can increase **erosion** in coastal areas. The coast is constantly changing. Waves bring cliffs down and wind blows sand dunes inland. These natural changes take place over many years, and animals and plants usually have time to **adapt**. When humans disturb these natural processes, such as by erecting breakwaters or building on dunes, erosion speeds up.

Humans may scare away or cause the death of coastal species, too. A beach that is busy with many swimmers and bathers is not a suitable habitat for birds or turtles that might nest there. Beach-goers often bring their dogs with them. An unattended dog can kill nesting shorebirds.

Human activities have reshaped the Mediterranean Coast, such as at Riomaggiore in Italy.

BIODIVERSITY THREAT:
Invasive species

Invasive species are non-native **species** that spread in large numbers and dominate native species. The biodiversity of many coastal **ecosystems** around the world is under threat from invasive species.

Stowaways

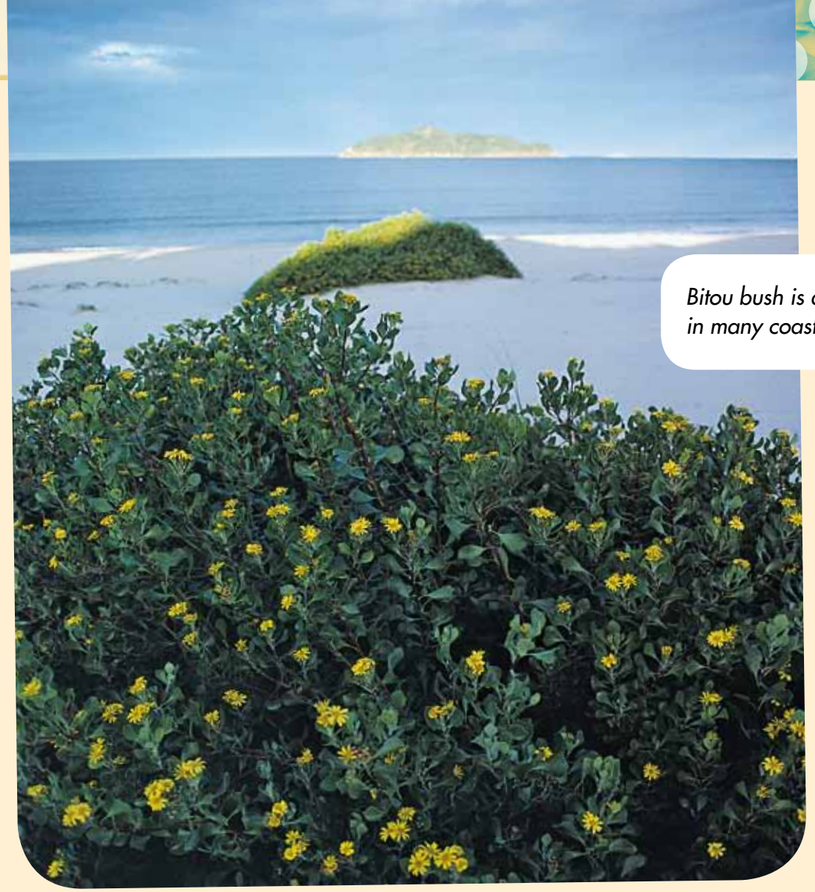
Many animal and plant species are carried from one part of the world to another, not deliberately, but as accidental stowaways in the **ballast** tanks of large ships. Many **organisms** in the ballast sea water are carried to foreign ports.

Before a ship takes on new cargo, its ballast tanks are emptied. The **marine** organisms that were carried in the ballast water enter the foreign sea. Many stowaway animals and plants die in the ballast tanks or soon after they are released in a foreign port. Others thrive in their new home and become serious pests. These organisms may thrive because their new environment is free of their natural **predators** or other species that compete with them for food. The new species may take over from local species and become invasive. Some of the local species disappear altogether.

Zebra mussels

Zebra mussels reached North American coastal waters around 1986. They arrived from Europe in ballast water carried by ships. Zebra mussels have caused enormous damage to North American coastal ecosystems. They grow in densities of up to 2 million mussels per square metre and crowd out native species.

A container ship often empties its ballast water in port as it takes on cargo.



Bitou bush is an invasive species in many coastal habitats.

Imported invasive species

Many invasive species have been released deliberately in coastal areas around the world. Between the 1940s and 1960s, a southern African coastal plant, the bitou bush, was planted in sand dunes along the south-eastern coast of Australia. This was done to control dune **erosion**. Since then, bitou bush has spread along the coast, smothering native plants as it goes. It is now a major pest that costs millions of dollars to control.

European flat oyster

The European flat oyster was deliberately introduced into the Atlantic Ocean near Maine, in the United States, so it could be harvested as food. It competes with local oysters. It can grow up to 20 centimetres and live up to 20 years.

BIODIVERSITY THREAT: Pollution

Pollution is a major threat to coastal biodiversity. Oil spills affect coastal **ecosystems** for many years. Cigarette butts and plastic litter washed from city streets choke and poison **marine** animals.

Oil spills

Crude oil is transported around the world in huge tanker ships. Occasionally, there is an accident and one of these ships spills its cargo. Oil is toxic. When spilled, it gets into the fur and feathers of animals and sticks there. The fur or feathers no longer keep the animal warm and the animal soon dies of cold. Birds with oil-soaked feathers cannot fly.

When an oil-affected animal tries to clean itself, it swallows the oil and is poisoned. The oil enters food chains, causing stunted growth in salmon and reduced life expectancy in birds and mammals.

Oil-covered seabirds are recovered from the sea after a coastal oil spill.

Exxon Valdez oil spill

One of the worst oil spills occurred in March 1989 when the tanker *Exxon Valdez* ran aground on the coast of Alaska. Forty million litres of crude oil were spilled. The spill affected thousands of kilometres of coastline. Within days, thousands of animals had died, including up to 500 000 seabirds, more than 1000 sea otters, 12 river otters, 300 harbour seals and 22 killer whales. Twenty years later, thousands of litres of oil remain in the sand and the oil still affects the coastal ecosystem.

Cigarette butts

Millions of cigarette butts are washed from city streets to the coast every day. Cigarette butts pollute the coast and kill wildlife. Birds and fish mistake butts for food and swallow them. The butts may block the animals' intestines. There are **toxins** in cigarette butts that poison animals, too.

Plastic litter

Millions of tonnes of plastic litter is washed up on the world's coasts every year. Discarded plastic shopping bags are blown or washed to the coast from city streets. Some plastic waste comes from ships. Plastics take many years to break down and are a serious threat to coastal wildlife.

Plastic pollution affects biodiversity when animals eat the waste or become entangled in it. A leatherback turtle may mistake a plastic bag for a jellyfish and swallow it. The bag blocks the turtle's intestines, and it starves to death. Many animals become entangled in plastic waste, such as shopping bags, and are unable to hunt or to evade **predators**.

Did you know?

Between 1999 and 2004, 200 marine turtles were found entangled in fishing nets at Cape Arnhem, northern Australia. Over two weeks in 2001, 600 fishing nets, 3000 floats, 4000 plastic bottles and 3000 thongs were collected from a nearby beach.

Marine turtles may become entangled in discarded plastic fishing nets.

BIODIVERSITY THREAT:
Climate change

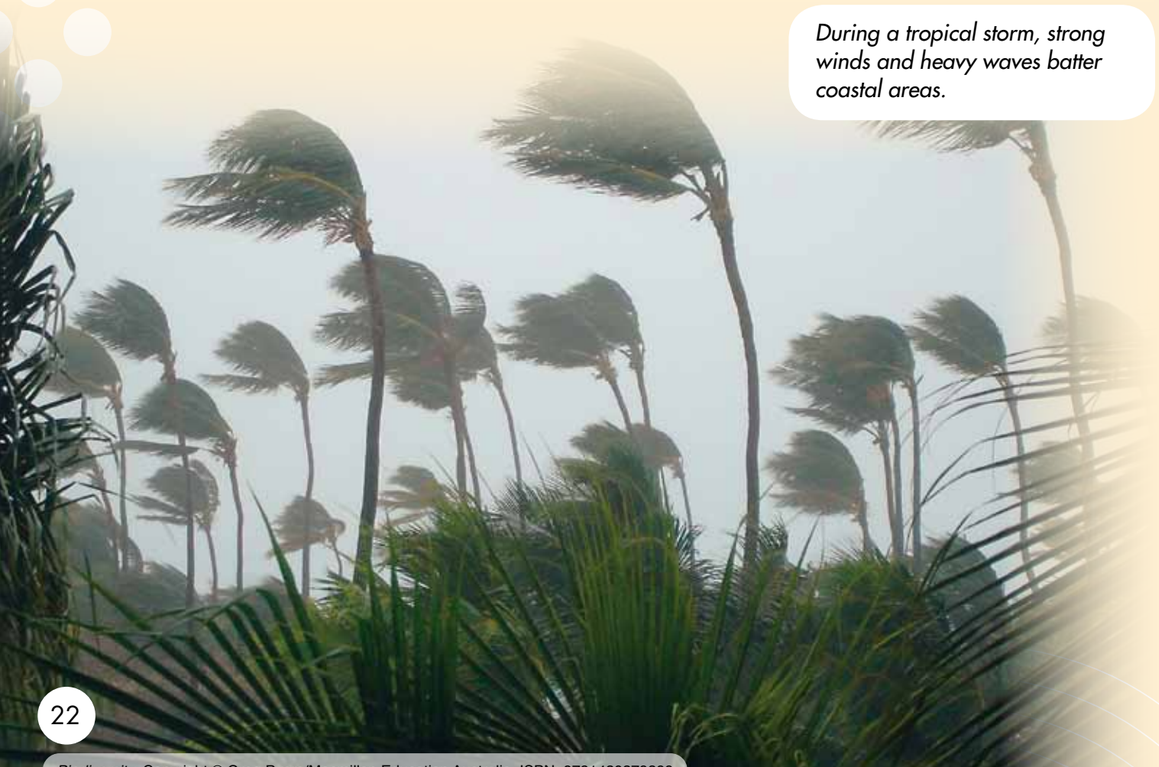
The world's average temperature is increasing in a process known as global warming. Global warming results in severe storms, rising sea levels and **climate** change. This climate change is threatening coastal biodiversity.

Global warming

Amounts of certain greenhouse gases, such as **carbon dioxide**, in the Earth's atmosphere are increasing. Greenhouse gases trap heat in the atmosphere, like glass traps heat in a greenhouse. An overall increase in temperature, called global warming, is causing changes to the climate. Some of these changes are affecting coasts.

Tropical storms

Cyclones, typhoons and hurricanes shape the coast. They whip up large waves, which flood coastal land, destroying **habitats** and crops, and causing soil **erosion**. Scientists predict that global warming will not cause more frequent storms, but it will cause more intense storms. The effects on coastlines will be more extreme.



During a tropical storm, strong winds and heavy waves batter coastal areas.

Rising sea levels

As the Earth's average temperature rises, the polar icecaps are shrinking. This causes sea levels to rise, threatening the future of many low-lying islands. Kiribati is a nation of low-lying islands in the Pacific. Many of its 95 000 people have had to relocate from the coast as the sea rises and intrudes on the land. Scientists predict that if sea levels continue to rise, Kiribati will be completely under water within 100 years.

Rising sea levels threaten the biodiversity of many coasts around the world. Low-lying coastlines are at greatest risk. When sea water floods over land, it brings salt with it. Many plants cannot tolerate the salt and are killed. Salt-tolerant plants, such as samphire and saltbush, replace these plants. This change in habitat leads to a change in the **species** of animals that can live in these places.

Low-lying Funafuti Atoll, in Tuvalu, is slowly being covered by the sea.

Tuvalu

Tuvalu is a Pacific island nation with a population of 11 000. Its islands make up an area of just 26 square kilometres. In recent years, some very high tides, called king tides, have been the highest in history. Waves have flooded roads and made the soil too salty to grow crops.

Scientists predict that within 50 years all Tuvaluans will have to be evacuated and the islands will disappear altogether. The effect on biodiversity may not be so severe. Land-living animals will lose their habitat, but **marine** species will have more habitat.

Coastal conservation

Conservation is the protection, preservation and wise use of resources. Sometimes, the human use of coasts results in conservation problems. Research, regulations and education are used to solve these problems and encourage coastal conservation.

Conservation problems

Coasts are very important to the many **species** that live in and around them. They are also very important to people. The beach at Cape Hatteras, in North Carolina, the United States, is used by turtles for nesting. It is also used by people for four-wheel driving. In situations such as this, the two uses pose a conservation problem.

The conservation of this coastal area is very important to the turtles' survival.

Research

Research surveys or studies are used to find out information about coasts, such as how coastal **ecosystems** work and how humans affect them. Research helps people work out ways to conserve coastal biodiversity.

At Cape Hatteras, loggerhead, flatback and green turtles nest along the beach. On a typical summer weekend, about 2000 vehicles are driven along the same beach by holiday-makers. Many people believe that this beach driving is harming the turtles. They argue that the turtles are disturbed by:

- collisions with cars
- the compacting of sand, which makes it too hard for hatchlings to dig themselves out of their nests
- night lights, which confuse the hatchlings
- wheel tracks in the sand, which block the hatchlings' way to the sea.

The US National Park Service manages the beach. They need to know how best to protect the turtles. To find out how to solve the problem, the National Park Service is conducting a scientific research study to find out how seriously beach driving affects turtles.

Regulations

Once a research study is done, regulations or laws are written. At Cape Hatteras, these regulations may be that beach driving is banned at night, between certain months or along certain sections of beach. National Park Service officers would patrol the beach, and penalties would apply to people breaking these regulations.

Education

Good conservation plans involve education. When people understand how their actions affect biodiversity, they are more likely to cooperate and obey regulations. At Cape Hatteras, beach drivers and other people need to know how they can help protect the turtles.

Some people believe that driving on this beach harms the turtles in the area.

CASE STUDY: The Mediterranean Coast

Humans began settling the coast of the Mediterranean Sea about 3000 years ago. Today, the human population is placing severe pressure on biodiversity.

The Mediterranean coast, which is the area surrounding the Mediterranean Sea, is shared by countries in Africa, Asia and Europe.

Tourism pressures

About 110 million tourists visit the coast of the Mediterranean Sea every year, doubling the local population. The tourists are mainly Europeans who travel to the coast for summer holidays. In some areas, such as the Costa Brava in Spain, the population can increase by ten times its normal size over the summer.

Tourism along France's Mediterranean coast is worth US$5 billion a year to the French economy. Spain earns even more from its coastal tourism. Because so much money can be made, **urban** development of the Mediterranean coast has continued at a fast pace. Wildlife **habitats** have been replaced with roads, buildings and golf courses. Experts predict that the total number of tourists to the Mediterranean coast may double to 200 million a year by 2025.

Negative effects of tourism

In 1998, the WWF (World Wide Fund for Nature) conducted a research survey of Turkey's Mediterranean coast. The survey found that tourism had seriously affected 40 per cent of the 2456-kilometre coastline. It found that half of the beach areas used by nesting **marine** turtles had been destroyed when sand was removed to make concrete for buildings and roads.

Threats to Mediterranean biodiversity

The drainage of wetlands has occurred for hundreds of years along many parts of the Mediterranean coast. The European side of the Mediterranean coast has lost much of its undisturbed habitat and biodiversity has declined. Today, there are very few wetlands left and the threat to coastal biodiversity is greater than ever.

The wetlands of the Mediterranean are vitally important habitats for **migratory birds**. Scientists estimate that up to 2 billion migratory birds, from 150 **species**, live for part of the year in the Mediterranean wetlands or use the wetlands as rest areas on their migrations to and from Africa.

Loss of these wetlands would be catastrophic for migratory bird species, as well as for the fish and other species that live and breed in the wetlands.

Did you know?

More than half of the 25 000 species of plants in the Mediterranean region are **endemic species**.

Dalmatian pelicans are migratory birds that nest and breed in Mediterranean wetlands.

CASE STUDY: The Mediterranean Coast

Threats to the African coast

On the African side of the Mediterranean Sea, the coast still has some undisturbed **habitat** where wildlife thrives, however, the threat from development remains. The Moulouya River estuary in Morocco is an important Mediterranean wetland. It is unaffected by tourism. This may change for there are plans to build a resort close to the estuary to attract tourists from Europe. Eighteen endangered **species** live in the estuary, including the Mediterranean monk seal and one of the rarest birds in Europe, the slender-billed curlew. An endangered flowering herb, *Spergularia embergeri*, is also found there.

The habitat of the critically endangered slender-billed curlew is threatened by a resort development.

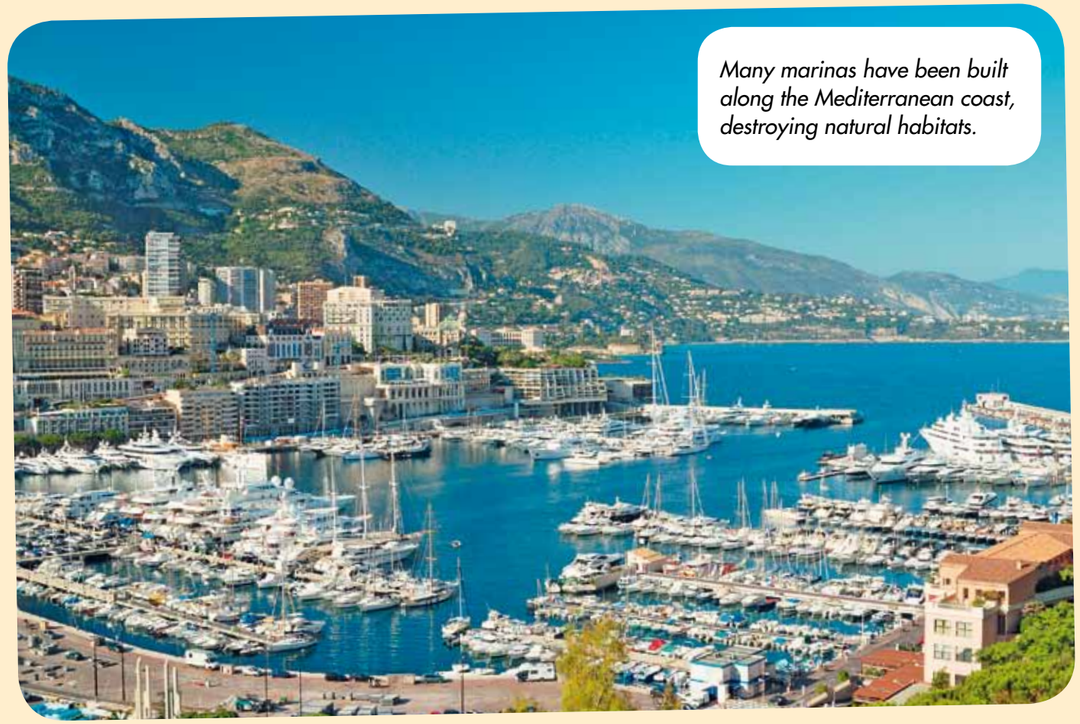
Protecting the Mediterranean coast

Some conservation groups believe that governments are too slow to act to save important habitats along the Mediterranean coast. These groups are taking action of their own. The Italian WWF organisation bought 200 square kilometres of habitat along the coast of Tuscany, in Italy. In France, Conservatoire du littoral has bought 500 kilometres of Mediterranean coast and wetlands.

Citizens and governments are also helping protect the coast. At the resort of Arene Cros, in southern France, residents' protests have stopped construction of hotels, apartments and a new marina for 1200 boats. The development threatened seagrass that is an important breeding habitat for fish.

Did you know?

In France in 2008, an opinion poll found that 80 per cent of people surveyed believed that greater government control of coastal development was needed.



Many marinas have been built along the Mediterranean coast, destroying natural habitats.

What is the future for coasts?

Human activities cause sudden, major changes to coasts. Most animals cannot cope with such rapid change. The future survival of coastal **species** depends on the creation of reserves where human activities are limited. The protection of coastal biodiversity requires action.

What can you do for coasts?

You can help protect the coast in several ways.

- Find out about coasts. Why are they important and what threatens them?
- Join a volunteer group that cleans up along the beach or replants coastal areas.
- Become a responsible consumer. Buy products that have minimal packaging and do not litter.
- If you are concerned about coasts in your area, or beyond, write to or email your local newspaper, your local member of parliament or another politician and tell them your concerns. Know what you want to say, set out your arguments, be sure of your facts and ask for a reply.

Useful websites

http://www.panda.org/what_we_do/where_we_work/mediterranean/about/marine/
This website gives information about how the WWF is helping protect marine and coastal diversity in the Mediterranean.

http://www.biodiversityhotspots.org
This website has information about the richest and most threatened areas of biodiversity on Earth.

http://www.iucnredlist.org
The IUCN Red List has information about threatened plant and animal species.

Glossary

adapt change in order to survive

algae simple plants without leaves

ballast sea water that is taken on board a ship to keep it weighted and stable at sea when it is not carrying cargo

carbon dioxide a colourless and odourless gas produced by plants, animals and the burning of coal and oil

climate the weather conditions in a certain region over a long period of time

degradation erosion and breakdown of the land

ecosystem the living and non-living things in a certain area and the interactions between them

endemic species species found only in a particular area

erosion wearing away of soil and rock by wind or water

extinct having no living members

genes segments of deoxyribonucleic acid (DNA) in the cells of a living thing, which determine characteristics

habitats places where animals, plants or other living things live

heritage things we inherit and pass on to following generations

interactions actions that are taken together or that affect each other

invasive species non-native species that spread through habitats

kelp type of large brown seaweed

marine of the sea

migratory birds birds that fly from one part of the world to another, and back, each year

mudflats areas of muddy shore that are left uncovered at low tide

nutrients chemicals that are used by living things for growth

organisms animals, plants and other living things

outcrops rock formations that are visible above the ground

plankton microscopic organisms that drift in the sea

predators animals that kill and eat other animals

sewage human and animal waste

silt fine sand, soil and other materials carried by water and deposited as sediment

species a group of animals, plants or other living things that share the same characteristics and can breed with one another

toxins poisons

urban of towns and cities

urbanisation the development of towns and cities

vegetation plants

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