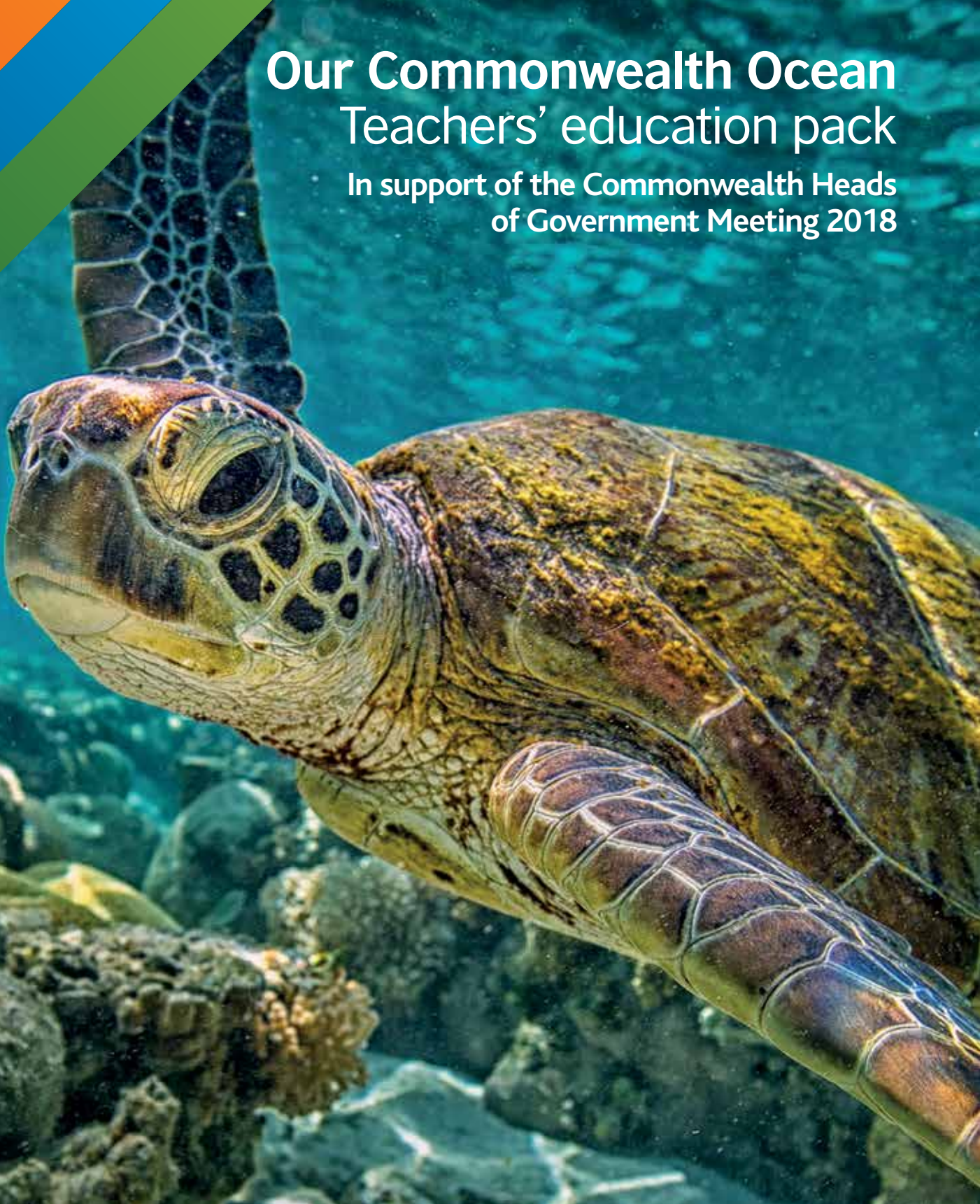


COMMONWEALTH CLASS

# Our Commonwealth Ocean Teachers' education pack

In support of the Commonwealth Heads of Government Meeting 2018



In partnership with





# Contents

Introduction	4
The ocean in your classroom	5



## Section 1: Ocean Literacy Principles

Ocean Literacy Principle 1: The Earth has one big ocean with many features	6
Ocean Literacy Principle 2: The ocean and life in the ocean shape the features of Earth	7
Ocean Literacy Principle 3: The ocean is a major influence on weather and climate	9
Ocean Literacy Principle 4: The ocean makes the Earth habitable	10
Ocean Literacy Principle 5: The ocean supports a great diversity of life and ecosystems	11
Ocean Literacy Principle 6: The ocean and humans are inextricably linked	12
Ocean Literacy Principle 7: The ocean is largely unexplored	13



## Section 2: Teacher Resources

Ocean Literacy Principle 1: Geography	15
Ocean Literacy Principle 2: Physics	16
Ocean Literacy Principle 3: Chemistry	17
Ocean Literacy Principle 4: Maths	18
Ocean Literacy Principle 5: Biology	19
Ocean Literacy Principle 6: Art	20
Ocean Literacy Principle 7: English	21



# Contents

<b>Section 3: Find out more</b>	22
Appendices	
Appendix 1: Ocean worksheet	23
Appendix 2: Seychelles food web	24
Appendix 3: Animal worksheet	25
Appendix 4: Environmental challenge cards	26



This education pack has been written by the Marine Biological Association and National Marine Aquarium.

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# Introduction

## Our vital ocean

The ocean is the largest liveable space on the planet and sustains countless plants and animals in a wide variety of habitats. Whether you have an ocean view or live miles from a coastline, you are inextricably linked to the ocean. The ocean is essential for all life on our blue planet. It regulates our global climate and is fundamental in providing the water and oxygen that we all need to survive. Billions of people depend on food from its waters and the growing list of medications derived from ocean biodiversity. Our homes are full of items that have been transported across the sea.

## What is ocean literacy?

As human populations increase and the negative effects on the marine environment also increase, never has there been a more crucial time for society to understand the science of our oceans. This knowledge and understanding of our ocean can be termed 'ocean literacy'.

Ocean literacy is defined as:

**'an understanding of the ocean's influence on us and our influence on the ocean'**

Ocean literate people can communicate about the ocean in a meaningful way. They are more able and more likely to make informed and responsible decisions regarding this invaluable asset.

The movement towards an ocean literate Commonwealth is backed by the United Nations.

## The ocean in your classroom

From books to the internet to television, there are many places where young people can find out about our oceans, and one of the most interactive and fun places to teach ocean literacy could be in your classroom. You could join teachers across the Commonwealth who are using the ocean as a hook to teach elements of their curriculum.

Whether your country's curriculum contains specific reference to the ocean or not, there are many ways this pack can inspire your students and engage them in learning. By thinking creatively about how you teach your curriculum, you could be pivotal in supporting a new generation of students who are ocean literate advocates for our natural world.

## Activities for your class

The National Marine Aquarium, Marine Biological Association and Defra (the Department for Environment, Food and Rural Affairs in the UK) have put together this pack to help young people learn about the ocean that connects all of us in the Commonwealth. As Ministers from the 53 countries of the Commonwealth meet to discuss global issues at the biannual Commonwealth Heads of Government Meeting, we would welcome your support in sharing these messages and materials with your classes.

The ocean literacy movement is growing rapidly across the globe and, to define this further, a set of **Ocean Literacy Principles** have been agreed across nations. This work began in 2002 when a group of ocean scientists and educational professionals began a collaborative process to develop a comprehensive framework to encourage the inclusion of ocean sciences in education. After a number of years, the Ocean Literacy Essential Principles and Fundamental Concepts were published. You can find out more about this movement at the following link: <http://oceanliteracy.wp2.coexploration.org/>

This education pack is designed for teachers of 11 to 14 year olds across the Commonwealth.

- Section 1 explains the seven Ocean Literacy Principles, bringing them to life.
- Section 2 gives ideas to help you build the topic of our ocean into a variety of curriculum subjects. Each Principle has a lead subject and additional suggestions for cross-curricular activities.

**This pack is intended to spark an interest in what you might be able to achieve in your classroom. We hope that the activity ideas and information presented about the ocean will become a valuable addition to your repertoire when teaching your curriculum area.**

The resources are designed to be flexible and adaptable for use in a variety of settings. There are links to curriculum subjects and Core Skills, Commonwealth Values, and Sustainable Development Goals, along with suggestions of activities that you could carry out with a national or international partner school.

However you use this pack, we hope it will enthuse your students about our oceans and excite and inform them about the world around them.

## SECTION 1: OCEAN LITERACY PRINCIPLES

### Ocean Literacy Principle 1: The Earth has one big ocean with many features

This principle explains the vastness and connectivity of the ocean. It can be a surprise to realise that a single drop of ocean water could make its way all around the world!

The ocean has no boundaries, but can be divided into geographical areas.

**Fun fact**

The ocean covers approximately 70 per cent of the planet's surface.



## SECTION 1: OCEAN LITERACY PRINCIPLES

### Ocean Literacy Principle 2: The ocean and life in the ocean shape the features of Earth

The ocean is connected to the freshwater ecosystem of lakes and rivers around the planet. All major watersheds in Earth drain to the ocean.

Rivers and streams transport nutrients, salts and sediment as well as pollution to the ocean.

Most of the Earth's water (97 per cent) is in the ocean and the ocean is an integral part of the global water cycle.

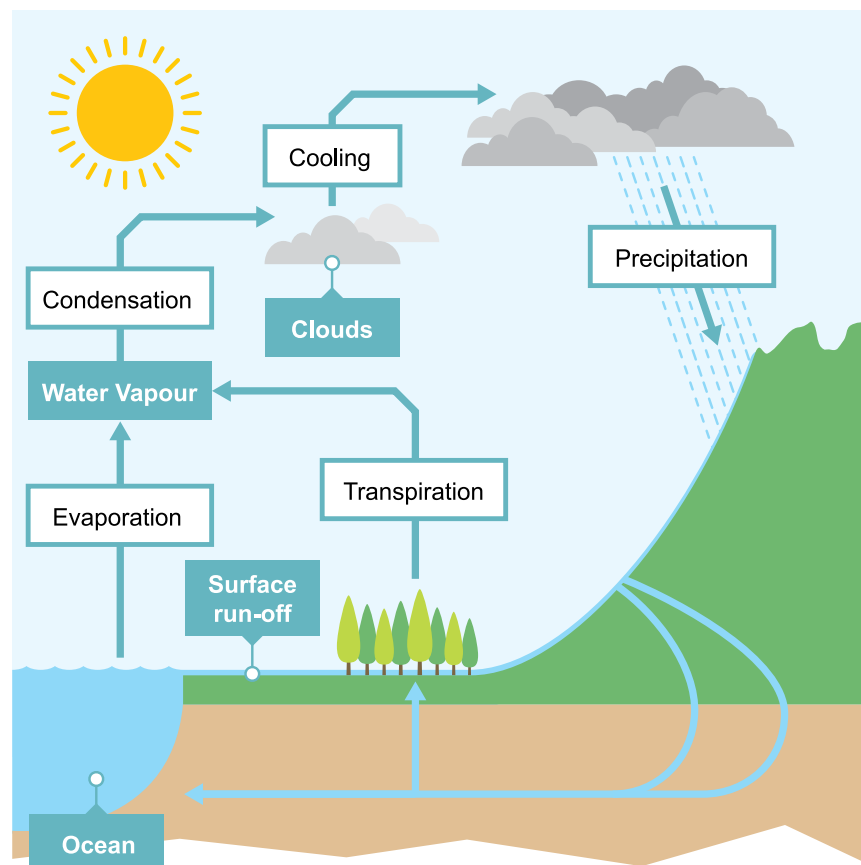
<https://www.bbc.co.uk/education/guides/z72v4wx/revision/3>

#### Action

A piece of litter dropped anywhere in the world could be transported by the ocean to any of our Commonwealth countries. At your school, try to encourage staff and students to reduce, reuse and recycle plastic waste. You could make posters to encourage this initiative. Or, investigate the amount of plastic packaging brought into school through actions such as school lunches and have a competition to see which teacher and class can reduce this amount by measuring the initial output and then repeating the activity a month later after your campaign.

If you are working with a partner school, you could compare your campaigns and results.

#### The water cycle

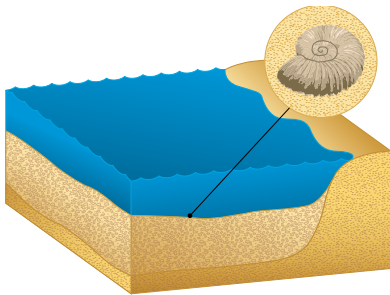




As the scope and sequence of the ocean literacy principles state: 'Many Earth materials and biogeochemical cycles originate in the ocean. Many of the sedimentary rocks now exposed on land were formed in the ocean.'

<http://oceanliteracy.wp2.coexploration.org/ocean-literacy-framework/principle-2-v2/>

Ocean life laid down the vast volume of siliceous and carbonate rocks.



The action of the ocean on the coastline can create many landforms.

### Action

As our climate changes, storms and extreme weather events are becoming more frequent and unpredictable. This is causing damage to our coastlines and affecting the lives of people who live there. Reducing the amount that we rely on fossil fuels will mitigate these effects, as this will reduce the amount of carbon released into the atmosphere. How can we encourage this movement in our schools and communities? Ask your students to find out more about The Paris Agreement on Climate Change and the Sustainable Development Goals.

You could also try out some of the investigations on renewable energy in the Commonwealth Class resource Renewable Energy – how can we keep the lights on? at <https://schoolsonline.britishcouncil.org/classroom-resources/list/renewable-energy-how-can-we-keep-lights>

If you are working with a partner school, you could exchange your ideas and results with them.

When placed under a microscope, you can see that sand from our beaches is made from tiny bits of animals, plants, rocks and minerals.

The movement of water through our ocean carries sand to our coastlines where it is then redistributed seasonally by waves, storms and coastal currents.





## SECTION 1: OCEAN LITERACY PRINCIPLES

### Ocean Literacy Principle 3: The ocean is a major influence on weather and climate

Oceanic and atmospheric processes control our climate and weather by dominating the Earth's water, carbon and energy cycles.

The National Oceanic and Atmospheric Administration in the U.S. state that more than 90 per cent of the warming that has happened on Earth over the past 50 years has occurred in the ocean.

The heat exchange between ocean and atmosphere can affect weather patterns, dramatically increasing the occurrence of heavy rains and drought.

The ocean plays an important role in the global carbon cycle.

Overall, the ocean is called a carbon 'sink' because it takes up more carbon from the atmosphere than it gives up.

#### Action

Climate change is causing our weather and climate to become more and more unpredictable. Try to encourage your school to use renewable energy for your electricity needs if possible. You could also encourage your students to become Energy Champions to help their school save energy and money and combat climate change. Groups could carry out activities such as checking if lights and whiteboards are left on in classrooms when people aren't using them and computers are turned off when not in use. They could make and award certificates to the most eco-friendly class or year group. If you are working with a partner school, you could swap ideas for energy conservation with them.



## SECTION 1: OCEAN LITERACY PRINCIPLES

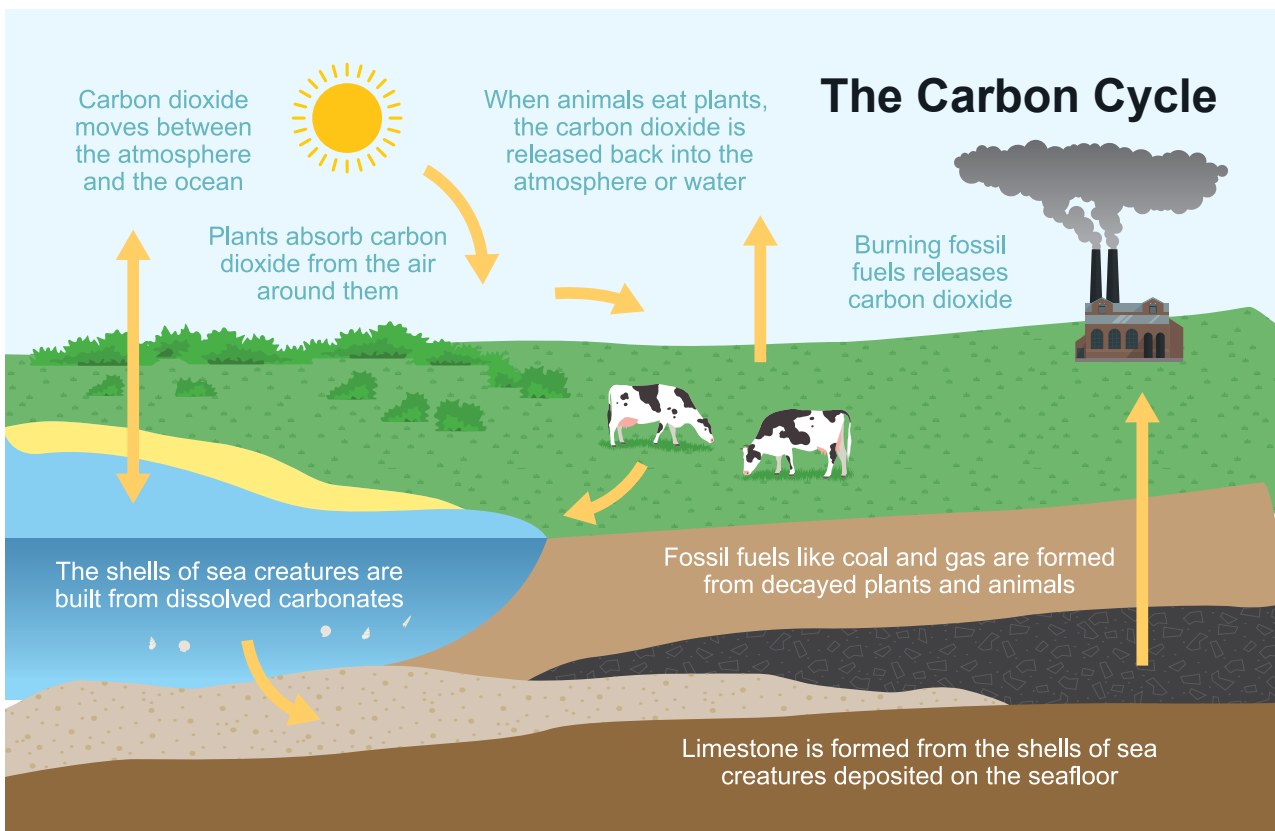
### Ocean Literacy Principle 4: The ocean made Earth habitable

The earliest evidence of life has been found in the ocean.

Most of the oxygen in our atmosphere originally came from phytoplankton – these are microscopic plants that float with the ocean currents. They produce oxygen by photosynthesis.

#### Action

Chemicals from agriculture can run into the ocean and cause huge outbreaks of harmful algae, wiping out the important plankton that gives us our oxygen. Make sure your schools is as green as possible - ask your students to think of ideas to reduce or limit pollution.



## SECTION 1: OCEAN LITERACY PRINCIPLES

### Ocean Literacy Principle 5: The ocean supports a great diversity of life and ecosystems

Most of the living space on Earth is in the ocean, with diverse and unique ecosystems from the surface all the way down to the very depths.

Ocean	Area million km <sup>2</sup>	%	Volume million km <sup>3</sup>	%	Mean depth km	Max depth km	Coastline km
Pacific Ocean	155.6	46.4	679.6	49.6	4.37	10.924	135,663
Atlantic Ocean	76.8	22.9	313.4	22.5	4.08	8.605	111,866
Indian Ocean	68.6	20.4	269.3	19.6	3.93	7.258	66,526
Southern Ocean	20.3	6.1	91.5	6.7	4.51	7.235	17,968
Arctic Ocean	14.1	4.2	17.0	1.2	1.21	4.665	45,389
<b>Overall</b>	<b>335.3</b>		<b>1370.8</b>		<b>4.09</b>	<b>10.924</b>	<b>377,41</b>

The ocean is extremely biodiverse and contains both the largest and smallest organisms on Earth.

Biological diversity, which in turn means the variety of life found on our planet. The ocean is full of animals, plants, fungi, bacteria, and other intertwined life forms within any ecosystem.

All of the vertebrate groups, apart from amphibians, are represented by species in the ocean.

There are thousands of species of invertebrates that can only be found in marine environments.

Just like on land, the ocean is home to many species of plant. They play a key role in supporting each marine habitat. This extends to life on land too – without the forests of kelp and phytoplankton there would be a huge deficit in oxygen that is consumed by humans.

Coral reefs and seagrass beds are the nurseries of the oceans and are biodiversity hot spots.



#### Action

Fish provide the highest percentage of protein in our diets however many other animals can be harmed by certain fishing techniques. Sharks, dolphins, turtles, sea birds and many other species are affected by large-scale ocean fishing and are often caught up in fishing nets. If your school prepares seafood for your students, ask your students to find out whether your caterers can ensure it is from sustainable sources. Find out whether there is any certified sustainable seafood available in your country and exchange your research with your partner school.

## SECTION 1: OCEAN LITERACY PRINCIPLES

### Ocean Literacy Principle 6: The oceans and humans are inextricably linked

The ocean affects  
EVERY human life.

#### Our Ocean provides us with so much...

##### Oxygen



The ocean produces around half of the oxygen that we breathe.

##### Climate and weather

The movement of cold and warm water in the ocean contributes to the weather and climate patterns around our planet.



##### Trade and transport



Over 90% of the world's traded goods are transported over the ocean, not to mention the millions of journeys made by people on passenger ferries.

##### Health and wellbeing



The ocean provides us with many recreational and cultural benefits that have been shown to improve our mental and physical health.

##### Food and household supplies

Many millions of people rely on fish as their main source of protein. Many more people inadvertently consume products from the sea on a daily basis in other household products. For example, did you know that seaweed is used as an ingredient in toothpaste?



##### Medicine

Many ingredients for medicines have been sourced from marine plants and animals.



#### Well-being

Research has shown that living or being on, in or near the ocean has many positive mental and physical well-being benefits to us. Research even shows that simply looking at fish in aquariums calms us down and helps to restore our brains.

#### Culture, heritage and religion

The role of the sea in human culture has been important for centuries. Can you find examples from stories, paintings and music in your culture that celebrate oceans?



## SECTION 1: OCEAN LITERACY PRINCIPLES

### Ocean Literacy Principle 7: The ocean is largely unexplored

The ocean is the largest unexplored place on Earth - less than five per cent of the ocean has been explored.

The HMS Challenger Expedition (1872-1876) was the first voyage around the world that used a variety of instruments to collect data about ocean life and the water surrounding it.

#### Action

We rely on the ocean for many of the resources that we use on a daily basis, and sometimes many of the products that we have used have travelled from far away countries. Ask your students to find out where everyday items in their food cupboards have come from, measure their journeys and try and find local alternatives to reduce their carbon footprint.

[www.challenger-society.org.uk/History\\_of\\_the\\_Challenger\\_Expedition](http://www.challenger-society.org.uk/History_of_the_Challenger_Expedition)

Madeleine Thompson of the Wildlife Conservation Society writes, 'On the 15th of August 1934, famed naturalist William Beebe set a record that captured the world's attention. In a small, steel submersible called the Bathysphere, he descended 3,028 feet into the ocean's depths off the coast of Bermuda'.

Rather than setting records, Beebe's interests lay with investigating the deep sea and its inhabitants and likened the deep sea to outer space. For further information visit: <http://blog.wcs.org/photo/2014/08/15/william-beebe-an-awed-human-being/>



Did you know that more people have been to the moon than the deepest parts of the ocean?

At 10.99 kilometres (6.83 miles), the Challenger Deep is the deepest known point on the seafloor. It is located in the Mariana Trench near Guam in the Pacific Ocean.

Only two manned submersibles have ever reached the Challenger Deep.

Today's underwater exploration technologies include platforms such as vessels and submersibles, observation and sensor systems, as well as a wide array of new communication and diving technologies. All of these advances allow us to build a better picture of the ocean and understand the effect that we are having.

### Action

Find out where your nearest beach is and which ocean it is part of. What sea creatures might you find there? Try and arrange to take your students to visit your nearest beach or aquarium and take part in activities such as rock pooling and plankton trawling. If you are working with a partner school, you could exchange information and photographs of your research and field trips.



## SECTION 2: TEACHING RESOURCES

### Ocean Literacy Principle 1: Geography The Earth has one big ocean with many features

**Curriculum links:** Geography, Science, English, Mathematics

**Core skills:** Digital literacy, Communication and collaboration

**Commonwealth Values:** Protecting the Environment, Importance of Young People in the Commonwealth, Sustainable Development.

**Sustainable Development Goal:** 14, Life Below Water

**Over two thirds of our planet is covered with water, so a good understanding of our great ocean and its many features is an essential part of any student's geography tool kit across the 53 countries of the Commonwealth.**

#### What you will need:

- Coloured pens
- Ocean worksheet (see appendix 1)

#### Activity Learning Objectives:

Students will be able to:

- name the five ocean basins
  - understand the principal characteristics of each
- understand movement of water around the world
- how this affects different ocean ecosystems.

#### Planet Earth, planet ocean activity:

The ocean covers a huge percentage of the Earth's surface, and each of the five ocean basins has its own unique features. Plate tectonics have pushed continents apart to make these basins.

This activity invites students to explore the different aspects of our oceans by researching the key features of each one.

Divide your students into groups and give each group an ocean to investigate. Ask them to research their ocean, completing the Ocean worksheet in appendix 1 to create their own fact file.

Being as creative as possible, each group should then make a presentation to represent their ocean and explain their findings to the rest of the class. This presentation could be in any medium – a Wikipage, slide show, a film or even a song, dance or rap!

#### Further work:

For further work and lesson ideas for other subjects visit: [www.national-aquarium.co.uk/education/lessonideas/](http://www.national-aquarium.co.uk/education/lessonideas/)

#### Other subject links for Ocean Literacy Principle 1:

**Maths** – research where the products that students use on a daily basis originate from (e.g. bananas from Cameroon) and plot the route on a world map to reach you. Find out average speeds of modern day shipping vessels to calculate how long it takes our goods to reach us from their original location.

#### Partner school activities:

If you are working with a partner school, you could exchange your fact files, research, writing and art work with one another.

## SECTION 2: TEACHING RESOURCES

### Ocean Literacy Principle 2: Physics The ocean and life in the ocean shape the features of the Earth

**Curriculum links:** Science, Geography, Maths

**Core skills:** Communication and collaboration, Digital literacy, Critical thinking and Problem solving

**Commonwealth Values:** Protecting the Environment

**Sustainable Development Goals:** 13, Climate Action. 14, Life Below Water. 15, Life on Land.

**Coastlines around the world are constantly changing; a continuous battle between the ocean and the land. This Principle refers to the fact that the movement of water around our coastal Commonwealth countries has shaped not only the features inside the ocean but also the land that we live on. This provides a great opportunity to understand the fundamental physics of waves, bringing a fun activity into your physics classroom.**

#### What you will need:

- Slinky toy
- Trays – we suggest a long, narrow tray but any will work
- Water
- A variety of substrate – the material usually found at the bottom of a marine habitat such as sand, pebbles, mud, or gravel.

#### Activity Learning Objectives:

Students will explore:

- different types of waves
- wave energy transfer
- types of ocean waves
- wave speed calculation as well as describing their affect on our Commonwealth coastlines.

#### Wave energy activity

Waves are the transfer of energy from one place to another, from a multitude of sources. There are transverse waves and longitudinal waves. Use a slinky toy to experiment with the two types of wave and to get students to infer that water waves are transverse waves.

In order to understand how waves affect our coastlines, it is important to understand the physics behind waves and their individual properties. Erosion, transport and deposition are constantly happening and with the increased frequency of ocean storms due to climate change, we need to understand these processes to protect our land.

#### Method:

- Ask students to work in small groups and select some sand or gravel (the substrate) and put it at one end of the tray.
- Fill the tray with water to a depth of around 2cm.
- Tip the tray back and forth, gently at first, to see what happens to the substrate.
- Reset the substrate and repeat the experiment, but tip the tray much more vigorously.
- Ask the students to compare the difference between gentle and forceful waves.
- Lead a group discussion to compare the different substrates.

This can then lead into a discussion about the vulnerability of different coastlines around the world and ways in which to protect them.

#### Further work:

For further work and lesson ideas for other subjects visit: [www.national-aquarium.co.uk/education/lessonideas/](http://www.national-aquarium.co.uk/education/lessonideas/)

#### Other subject links for Ocean Literacy Principle 2:

**Geography** – Using a geological map showing the rock types of your country, identify any areas that may be particularly prone to erosion. Can you find any stories in the news of wave damage to coastal properties? How could these homes be protected?

#### Partner school activities:

If you are working with a partner school, exchange photographs and results of your wave energy investigations.



## SECTION 2: TEACHING ACTIVITIES

### Ocean Literacy Principle 3: Chemistry The ocean is a major influence on weather and climate

**Curriculum links:** Chemistry, Geography, Citizenship

**Core skills:** Communication and collaboration, Critical thinking and Problem solving

**Commonwealth Values:** Protecting the Environment, Sustainable Development, Importance of young people in the Commonwealth, Recognition of the Needs of Small States.

**Sustainable Development Goal:** 13, Climate Action. 14, Life Below Water.

**Ocean Literacy Principle 3 has clear links to geography, with the ocean as a major driver for weather and climate. However, with the effects of climate change becoming more and more prominent, this is an interesting extension to put into any chemistry class.**

#### What you will need:

- Pre-prepared calcium hydroxide water (lime water)
- 6x test tubes
- 6x rubber bungs with tube
- 6x conical flasks
- disposable paper straws
- glass straws with connectors
- litmus paper (or alternative pH indicator)
- vinegar and bicarbonate of soda

Make sure that you take all relevant health and safety precautions.

#### Activity Learning Objectives:

Students will:

- Understand the effects of ocean acidification
- understand how the addition of carbon dioxide into our atmosphere has an adverse effect

#### Carbon factory experiment:

Global warming and climate change are affecting many ecosystems on the land and in the ocean, but what are the other unseen effects? The ocean is sometimes described as a carbon sink, since it absorbs more than one quarter of all carbon released into the atmosphere. Many animals such as shell-building animals and coral reefs use this carbon to build their shells and skeletons, but what happens when too much carbon goes into the ocean? This 'carbon factory experiment' allows students to re-enact the effect of adding too much carbon to our ocean, and the chemical reactions behind it.

#### Method:

- Half fill a test tube with lime water. Test the pH using litmus paper.
- Using a paper straw, blow into the lime water. The water should turn cloudy as calcium carbonate forms, which is used by many animals in the ocean.
- Pre-prepare the glass straws and connectors to make a u-shape tube going from the test tube to the conical flask.
- Now to build our carbon factories! Add vinegar and bicarbonate of soda into the conical flask to make a reaction, trapping it with a rubber bung. Attach your u-shape tube allowing the carbon dioxide from the conical flask to flow into the limewater.
- The limewater should return clear as carbonic acid is made. This reaction removes the calcium carbonate from the water affecting the shell-building animals and coral.

#### Further work:

For further work and lesson ideas for other subjects visit: [www.national-aquarium.co.uk/education/lessonideas/](http://www.national-aquarium.co.uk/education/lessonideas/)

#### Other subject links for Ocean Literacy Principle 3:

Citizenship – discuss the implications of a world with raised sea levels. Many of our Commonwealth countries such as the Bahamas, Maldives, Papua New Guinea and Kiribati are small island states, so could be severely affected. How will sea level change affect people and wildlife? Watch the Commonwealth Science film on Rising Sea Levels at: <https://schoolsonline.britishcouncil.org/classroom-resources/list/rising-sea-levels-how-do-we-stay-safe-sea-levels-rise> to see how one Commonwealth country is being affected by this issue and the steps that local school children are taking to protect their homeland.

#### Partner school activities:

If you are working with a partner school, exchange the results of your experiment and research. You could also discuss creative campaign ideas that could draw attention to the global problems caused by rising sea levels around the world.

## SECTION 2: TEACHING RESOURCES

### Ocean Literacy Principle 4: Maths The ocean makes Earth habitable

**Curriculum links:** Maths, Geography, Science, English, Citizenship

**Core skills:** Critical thinking and problem solving, Communication and collaboration, Creativity and imagination, Digital literacy.

**Commonwealth Values:** Sustainable Development, Protecting the Environment, Importance of Young People in the Commonwealth.

**Sustainable Development Goals:** 14, Life Below Water. 15, Life on Land.

**Life on Earth would not be the same without our ocean. Although we can use scientific principles to understand how important it is, sometimes we need to use maths to quantify this importance. Ocean Literacy Principle 4 shows just how important the ocean is for life on Earth and if we can use maths to find out how valuable its assets are then we can do more to protect it.**

#### What you will need:

- Stopwatch

#### Activity Learning Objectives:

Students will be able to:

- understand the importance of phytoplankton in the ocean for oxygen production
- use simple maths to calculate the exact number of breaths that they take that uses oxygen from phytoplankton.

#### Oxygen generator activity:

The phytoplankton *Prochlorococcus* is the most abundant photosynthetic organism on the planet, and scientists have discovered that it alone is responsible for the oxygen needed for one of every five breaths that we take. This activity allows us to quantify this amount by calculating the number of breaths that we take on average each day.

#### Method:

- Get your students to measure the number of breaths they can take in 30 seconds.
- Multiply this up until they can work out how many breaths they take in an entire day.
- Challenge them to calculate the total number of breaths they take in a day that come from *Prochlorococcus*.

#### Further work:

For further work and lesson ideas for other subjects visit: [www.national-aquarium.co.uk/education/lessonideas/](http://www.national-aquarium.co.uk/education/lessonideas/)

#### Other subject links for Ocean Literacy Principle 4:

**English** – invite your students to carry out further research into the importance of the ocean for life on Earth. Use the facts that they have gathered to write a journalistic report or make a short live action or animated film about this topic.

#### Partner school activities:

If you are working with a partner school, share your calculations and your journalistic reports or short films about the importance of oceans for life on earth.

## SECTION 2: TEACHING RESOURCES

### Ocean Literacy Principle 5: Biology The ocean supports a great diversity of life and ecosystems

**Curriculum links:** Biology, Geography, Citizenship, English, Personal, Social and Health Education

**Core skills:** Communication and collaboration, Citizenship, Critical thinking and Problem solving, digital literacy.

**Commonwealth Values:** Sustainable Development, Protecting the Environment

**Sustainable Development Goals:** 14, Life Below Water. 15, Life on Land.

**The ocean has many examples of different interactions and interdependencies, and this activity enables students to clearly understand ecosystem relationships as well as touch upon genetics and evolution.**

#### What you will need:

- Seychelles food web (see appendix 2)
- Animal worksheet (see appendix 3)
- masking tape or string
- environmental challenge cards (see appendix 4)

#### Activity Learning Objectives:

Students will be able to:

- Describe the connectivity of marine and terrestrial animals, and how all life on Earth is fully interconnected through one giant food web.
- Explain the different trophic levels of the food chain and the transfer of energy.

#### Classification and food webs activity:

Almost all life on Earth is dependent on photosynthetic organisms, not just on the land but also in the ocean. This dependency not only influences the direct connections from one trophic level to the next, but coastal waters are so closely interlinked with the land that there is a high connectivity between the two environments. This activity allows students to explore and visually represent the importance of caring for all biodiversity on Earth and in the ocean.

Start this activity by assigning one animal from the Seychelles food web to each student, and giving them a set period of time to research their animal. Use the animal worksheets on appendix 3 to ensure that they gather all of the correct information. Once all information has been gathered, the students can start making a life size food web. Place two producers at one end of the space and then starting with the consumers and working up the trophic levels, students should join into the food chain as representatives of their assigned animal. Energy transfer can be shown using tape or string.

Once the food web is complete, introduce the **environmental challenge cards** found in appendix 4 one by one. After each change, the students will be given the opportunity to hold a group discussion on whether the change will affect their animal, and the repercussions that will have on the rest of the food chain.

#### Further work:

For further work and lesson ideas for other subjects visit: [www.national-aquarium.co.uk/education/lessonideas/](http://www.national-aquarium.co.uk/education/lessonideas/)

#### Other subject links for Ocean Literacy Principle 5:

**Geography** – use the world map to identify other important areas of ocean biodiversity, in particular where this is closely interconnected with coastal environments and human impact.

#### Partner school activities:

If you are working with a partner school, share the outcomes of your food web activities and your thoughts about the role that zoos, aquariums and Ecotourism may have in protecting species and biodiversity

## SECTION 2: TEACHING RESOURCES

### Our Plastic Environment 6: Art The ocean and humans are inextricably interconnected

**Curriculum links:** Art and Design, Science, Geography

**Core skills:** Creativity and imagination, Communication and collaboration, Digital literacy.

**Commonwealth Values:** Importance of Young People in the Commonwealth, Protecting the Environment, Sustainable Development, Student leadership and personal development

**Sustainable Development goals:** 13, Climate Action. 14, Life Below Water. 15, Life on Land.

**All of the countries in the Commonwealth rely on the ocean in one way or another; whether it's the food we eat, the water we drink, or the goods that we use in our everyday life. The medium of art is one of the most powerful tools available for communication, using visually striking pieces to share facts, ideas and feelings. This activity allows students to use their creativity to help engage people with the importance of our ocean.**

#### What you will need:

- A2 paper
- drawing pencils
- a mixture of art mediums
- a selection of plastics - the plastic should be collected by the students prior to the activity. It should consist of the plastic that they use at home or at school.

#### Activity Learning Objectives:

Students will be able to:

- Fully understand the extent of the plastic pollution problem facing our oceans.
- Use their creativity to communicate the problem to others through the medium of art.

#### Classification and food webs activity:

Plastic pollution is one of the major problems facing the ocean at this point in time. Eight million tonnes of plastic a year ends up in our ocean, causing immense problems to the animals living there. However, the problem that plastic is causing is hard to communicate to society. Not only is the ocean hard to reach for some people, and difficult to see into, sometimes the images associated with plastic pollution can be quite upsetting. If you are able to, show your students some of the footage about this issue from the final episode of the BBC series Blue Planet II that showed the impact of human activity on marine life.

The following activity allows students to use a mixture of artistic mediums to represent the problem of plastic pollution. Dividing their page into two sections, one side should represent a healthy ocean and the other one that is affected by plastic. The twist? The animals and habitat can be drawn using pencils, and the general habitat can be decorated using any other artistic media (colouring pencils, oil pastels, watercolour etc.) but all of the animals depicted in the artwork should be decorated using the plastic that the students have collected!

#### Further work:

For further work and lesson ideas for other subjects visit: [www.national-aquarium.co.uk/education/lessonideas/](http://www.national-aquarium.co.uk/education/lessonideas/)

#### Other subject links for Ocean Literacy Principle 6:

**Citizenship** – discuss the implications of humans being responsible for the plastic pollution that is entering the ocean, and how it is part of our collective social responsibility to prevent further damage. Devise campaigns to encourage the use of refillable cups and water bottles and reduce the use of plastic straws in your community. You can find out how one Scottish village became plastic straw free after a campaign by local school children here: <http://www.bbc.co.uk/news/uk-scotland-highlands-islands-42439946>

#### Partner school activities:

If you are working with a partner school, take photographs of your artwork and create an online gallery of artwork from both schools. Share your ideas for campaigns to reduce the use of plastic in your communities.



## SECTION 2: TEACHING RESOURCES

### Ocean Literacy Principle 7: English The ocean is largely unexplored

**Curriculum links:** English, Art, Science

**Core skills:** Creativity and Imagination

**Commonwealth Values:** Importance of Young People in the Commonwealth

**Sustainable Development Goal:** 14, Life Below Water.

**Communication is a key part of any subject. Being able to inspire and engage people through the written or spoken word is an essential life skill. Use this activity to bring the ocean into your English class and explore how different genres of book can relate to and inspire different audiences.**

#### What you will need:

- books linked to marine exploration.

\*Students should be split into small groups and assigned books from the reading list below or others from your country that focus on marine exploration. Make sure you allow plenty of time to read them before the activity takes place.

#### Suggested reading list:

- The Coral Island – R.M. Ballantyne
- Kensuke's Kingdom – Michael Morpurgo
- Life of Pi – Yann Martel
- Edge of the Sea – Rachel Carson
- Treasure Island – Robert Lewis Stephenson
- Blue Planet - Andrew Byatt, Alastair Fothergill, Martha Holmes
- Jaws – Peter Benchley

#### Activity Learning Objectives:

Students will:

- review the effectiveness of different literacy styles to enthuse young scientists about ocean exploration.
- create their own short written piece.

#### Ocean Discovery Activity:

Less than five per cent of the ocean has been explored. And as the ocean comes under more pressure from humans to help sustain our lives, it is an invaluable asset for the future. Many books have been written about ocean exploration, from non-fiction documentary style pieces to science-fiction novels. This activity gives students the opportunity to review different literacy styles and their effectiveness to inspire the future scientists amongst us.

Divide students into small groups. Assign each group a different book about ocean exploration and give them a set amount of time to read the text. When this is complete, ask each group to identify the literary features used to inspire the reader about ocean exploration in the book and how successful they felt this to be. They can then present their work to the rest of the class, expressing and summarising their opinions. After the presentation, there should be time for questions from other students as part of a structured discussion and the written work could be made into a book for the school library.

#### Further work:

For further work and lesson ideas for other subjects visit: [www.national-aquarium.co.uk/education/lessonideas/](http://www.national-aquarium.co.uk/education/lessonideas/)

#### Other subject links for Ocean Literacy Principle 7:

**Art** – encourage students to use their imagination and pretend that they are on a deep-sea expedition in unknown waters. Using their knowledge of marine ecosystems, the students can invent their own animal that they have discovered in the abyss, writing details of each adaptation and how it helps them to survive.

#### Partner school activities:

If you are working with a partner school exchange your pieces of written work and perhaps add illustrations to the texts from each other's schools.

## SECTION 3: FIND OUT MORE

**We hope you have enjoyed exploring the ocean through these activities. Remember the oceans connect us all, so whatever positive steps we can make will help our oceans globally.**

To build on this pack, for further work and lesson ideas for other subjects visit:  
[www.national-aquarium.co.uk/education/lessonideas/](http://www.national-aquarium.co.uk/education/lessonideas/)


- Marine Conservation Society: <https://www.mcsuk.org/coolseas/foodWebs.html>
- UNESCO Ocean Literacy for All Tool kit: <http://unesdoc.unesco.org/images/0026/002607/260721E.pdf>
- College of Exploration: <http://oceanliteracy.wp2.coexploration.org/>
- Sea Change Resources: <http://www.seachangeproject.eu/resources#audience=educators>
- Ocean wise: <https://education.ocean.org/>
- Surfers against Sewage: <https://www.sas.org.uk/>
- The Wildlife Trusts: <http://www.wildlifetrusts.org/>
- UNESCO IOC: Ocean Literacy For all Report: <http://unesdoc.unesco.org/images/0026/002607/260721E.pdf>
- Blue Planet II: <http://www.bbc.co.uk/programmes/p04tjbtx>
- <http://www.bbc.co.uk/programmes/articles/1F1fcGGKPSWv3m7JdfBT5dv/get-involved-with-ocean-conservation>
- Commonwealth Science Class: <https://schoolsonline.britishcouncil.org/about-schools-online/about-programmes/commonwealth-class/get-involved/resources/royal-society>

The materials in Commonwealth Science Class, developed by the British Council and Royal Society, encourage young people around the world to take part in experimental science investigations and consider some of the long term global problems that scientists are working on, but have not yet solved.

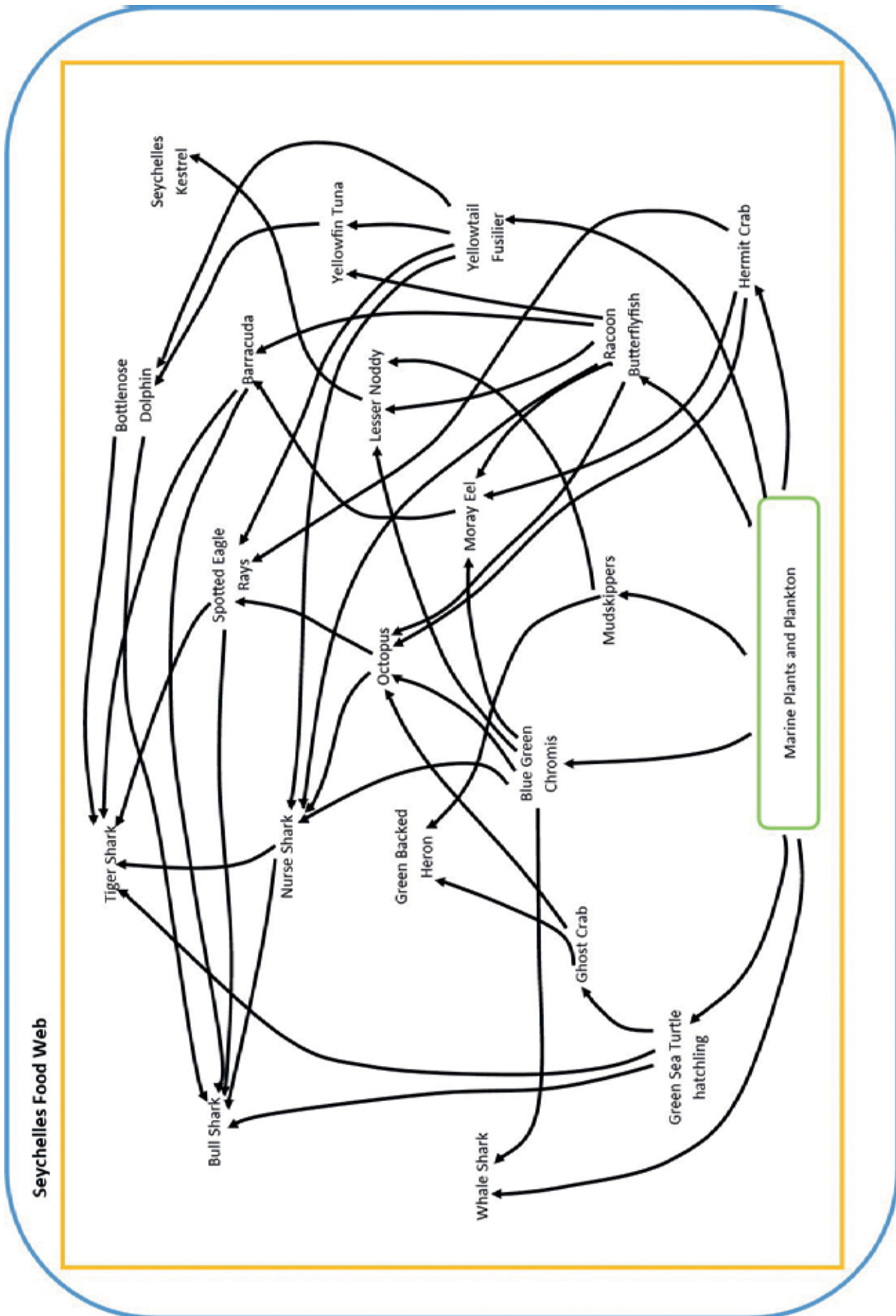
These resources are mainly from British based organisations, but please also look up local organisations from your Commonwealth country and your partner school's country.

# APPENDIX 1: OCEAN WORKSHEET

**Ocean Worksheet- Your ocean basin-** \_\_\_\_\_

<p>Ocean Area:</p>	<p>Ocean volume:</p>	<p>Label the oceans and shade in your ocean basin:</p> 	<p>Border countries:</p>
<p>Max depth:</p>	<p>Mean depth:</p>		
<p>Main geographical features</p>		<p>Other interesting facts:</p>	
<p>Charismatic animals:</p>			

## APPENDIX 2: SEYCHELLES FOOD WEB





## APPENDIX 3: ANIMAL WORKSHEET

<b>Animal Worksheet- Common Name-</b> _____		<b>Latin Name-</b> _____	
<b>Scientific Drawing:</b>	<b>Geographic Range:</b>	<b>Habitat and Ecology:</b>	<b>Life Cycle:</b>
	<b>Predators:</b>	<b>Prey:</b>	<b>Conservation Actions:</b>
<b>Ecological Threats</b>			

# APPENDIX 4: ENVIRONMENTAL CHALLENGE CARDS

## Environmental Challenge Cards -

Increased coastal development has caused lots of sediment to run into the water. There is less light available for photosynthetic organisms.

Climate change has caused the seas to warm. The coral reef habitat is damaged leaving no nursery habitats for juvenile fish.

Smaller marine organisms have been ingesting plastic polluted by toxins. These toxins have been passed up the food chain wiping out the top predators.

There has been a cargo ship incident nearby causing oils to leak into the surrounding water. The oil on the surface is harming seabirds.

**The Marine Biological Association**

A Royal Charter Organisation founded in 1884 to promote marine biology through research, education and communication. The MBA is the co-ordinator of the Horizons 2020 project Sea Change bringing Ocean Literacy to Europe.

**National Marine Aquarium (NMA)**

The NMA has the charitable mission of 'connecting us with our oceans'. This mission guides all of our work and ensures a focus on helping society to understand the science and research behind our oceans. We also operate the largest charitable public aquarium in the UK welcoming over 300,000 visitors per year, including 30,000 school students engaging with our innovative, curriculum linked Schools Programme.

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