

Applicable standards

National Curriculum in England

Elements of the standards	Lessons						
	1	2	3	4	5	6	7
Biology							
• Living organisms may form populations of single species, communities of many species and ecosystems, interacting with each other, with the environment and with humans in many different ways.	✓	✓					
• Living organisms are interdependent and show adaptations to their environment.	✓	✓					
• Life on Earth is dependent on photosynthesis in which green plants and algae trap light from the Sun to fix carbon dioxide and combine it with hydrogen from water to make organic compounds and oxygen.	✓	✓					
Ecosystems							
• Some abiotic and biotic factors which affect communities; the importance of interactions between organisms in a community.		✓					
• The importance of biodiversity.	✓	✓					✓
• Positive and negative human interactions with ecosystems.		✓	✓		✓		✓
Working Scientifically							
• Using a variety of concepts and models to develop scientific explanations and understanding.				✓			
• Explaining every day and technological applications of science; evaluating associated personal, social, economic and environmental implications; and making decisions based on the evaluation of evidence and arguments.			✓				✓
Experimental skills and strategies							
• Planning experiments to make observations, test hypotheses or explore phenomena.			✓				
• Applying a knowledge of a range of techniques, apparatus, and materials to select those appropriate both for fieldwork and for experiments.			✓	✓			
• Making and recording observations and measurements using a range of apparatus and methods.			✓	✓			

GCSE Biology and Combined Science GCSE Specifications	Lessons						
	1	2	3	4	5	6	7
Element of AQA Combined Science: Trilogy							
• 4.7.1.1. Describe different levels of organisation in an ecosystem from individual organisms to the whole ecosystem and the importance of interdependence and competition in a community.	✓	✓					

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GCSE Biology and Combined Science GCSE Specifications (continued)	Lessons						
	1	2	3	4	5	6	7
Element of AQA Combined Science: Trilogy (continued)							
<ul style="list-style-type: none"> • 4.7.1.2. Students should be able to explain how a change in an abiotic factor would affect a given community given appropriate data or context. • 4.7.2.1. Levels of organisation – A range of experimental methods using transects and quadrats are used by ecologists to determine the distribution and abundance of species in an ecosystem. • 4.7.3.1. Students should understand that many human activities are reducing biodiversity. • 4.7.3.5 Students should be able to describe some of the biological consequences of global warming. • 4.7.3.6. Students should be able to describe both positive and negative human interactions in an ecosystem and explain their impact on biodiversity. 			✓				
				✓			
	✓		✓				
			✓				
	✓	✓			✓	✓	✓
Working Scientifically							
<ul style="list-style-type: none"> • WS1.4. Evaluate given information about methods that can be used to tackle problems caused by human impacts on the environment. • WS 2.7. Evaluate methods and suggest possible improvements and further investigations. • WS 3.5. Interpreting observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions. 					✓		
							✓
							✓
Element of AQA Combined Science: Synergy							
<ul style="list-style-type: none"> • 4.4.2.1. Describe different levels of organisation in an ecosystem from individual organisms to the whole ecosystem. • 4.4.2.2. Describe the importance of interdependence and competition in a community. 		✓					
	✓	✓					

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GCSE Biology and Combined Science GCSE Specifications (continued)

Element of AQA Combined Science: Synergy (continued)

	Lessons						
	1	2	3	4	5	6	7
<ul style="list-style-type: none"> • 4.4.2.3. Explain how some abiotic and biotic factors affect communities. 			✓				
<ul style="list-style-type: none"> • 4.4.2.4. Describe how to carry out a field investigation into the distribution and abundance of organisms in an ecosystem and explain how to determine their numbers in a given area. 				✓			
<ul style="list-style-type: none"> • 4.4.2.6. Describe negative human interactions within ecosystems and explain their impact on biodiversity. 	✓		✓				
<ul style="list-style-type: none"> • 4.4.2.7. Describe positive human interactions within ecosystems and explain their impact on biodiversity. 			✓		✓	✓	✓

Working Scientifically

<ul style="list-style-type: none"> • Biology AT3. Use transect line and quadrats to measure distribution of a species. 				✓			
<ul style="list-style-type: none"> • WS1.4. Evaluate given information about methods that can be used to tackle problems caused by human impacts on the environment. 					✓		
<ul style="list-style-type: none"> • WS 3.5. Interpreting observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions. 							✓

Element of OCR Twenty-First Century Science Combined Science B

<ul style="list-style-type: none"> • 3.3.4. Describe different levels of organisation in an ecosystem from individual organisms to the whole ecosystem. 	✓						
<ul style="list-style-type: none"> • 3.3.5. Explain the importance of interdependence and competition in a community. 	✓	✓					
<ul style="list-style-type: none"> • 3.4. Explain how some abiotic and biotic factors affect communities, including environmental conditions, toxic chemicals, availability of food and other resources, and the presence of predators and pathogens. 			✓	✓			✓
<ul style="list-style-type: none"> • 6.3.1. Describe both positive and negative human interactions within ecosystems and explain their impact on biodiversity. 	✓					✓	

Applicable standards

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GCSE Biology and Combined Science GCSE Specifications (continued)	Lessons						
	1	2	3	4	5	6	7
Element of OCR Twenty-First Century Science Combined Science B (continued)							
<ul style="list-style-type: none"> 6.3.2. Explain some of the benefits and challenges of maintaining local and global biodiversity. 							✓
Ideas about Science							
<ul style="list-style-type: none"> 1aS1. Suggest appropriate apparatus, materials and techniques, justifying the choice with reference to the precision, accuracy and validity of the data that will be collected. 				✓			
<ul style="list-style-type: none"> 1aS4. Suggest reasons why different decisions on the same issue might be appropriate in view of differences in personal, social, economic or environmental context, and be able to make decisions based on the evaluation of evidence and arguments. 					✓	✓	✓
OCR Gateway Science Combined Science A							
<ul style="list-style-type: none"> 4.1d. Describe different levels of organisations in an ecosystem from individual organisms to the whole classroom. 	✓	✓					
<ul style="list-style-type: none"> 4.1e. Explain how abiotic and biotic factors can affect communities. 			✓				
<ul style="list-style-type: none"> 4.1f. Describe the importance of interdependence and competition in a community. 	✓						
<ul style="list-style-type: none"> 6.1a. Explain how to carry out a field investigation into the distribution and abundance of organisms in a habitat and how to determine their numbers in a given area. 			✓	✓			
<ul style="list-style-type: none"> 6.1b. Describe both positive and negative human interactions within ecosystems and explain their impact on biodiversity. 	✓				✓	✓	✓
<ul style="list-style-type: none"> 6.1c. Explain some of the benefits and challenges of maintaining local and global biodiversity. 					✓	✓	✓

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GCSE Biology and Combined Science GCSE Specifications (continued)	Lessons						
	1	2	3	4	5	6	7
OCR Gateway Science Combined Science A (continued)							
Practical Skills							
<ul style="list-style-type: none"> • WS2c. Presenting observations using appropriate methods. • WS2d. Communicating the scientific rationale for investigations, methods used finding and reasoned conclusions. 				✓			✓
Edexcel Combined Science							
<ul style="list-style-type: none"> • 9.2. Explain how communities can be affected by abiotic and biotic factors. • 9.3. Describe the importance of interdependence in a community. • 9.4. Describe how the survival of some organisms is dependent on other species, including parasitism and mutualism. Interdependence of organisms. • 9.5. Core Practical: Investigate the relationship between organisms and their environment using fieldwork techniques, including quadrats and belt transects. • 9.6. Explain how to determine the number of organisms in a given area using raw data from fieldwork techniques, including quadrats and belt transects. • 9.9. Explain the positive and negative interactions within ecosystems and their impacts pm biodiversity. • 9.10. Explain the benefits of maintaining local and global biodiversity, including the conservation of animal species and the impact of reforestation. 			✓				
	✓	✓					
		✓					
				✓			
					✓		
		✓	✓				
						✓	
Working Scientifically							
<ul style="list-style-type: none"> • 1d. Explain every day and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments. • 1e. Evaluate risks both in practical science and the wider societal context, including perception of risk in relation to data and consequences. 						✓	✓
							✓

Lesson 1: How is coral reef biodiversity useful and important?

Overview

This lesson begins by establishing the aims of the unit. The students will use the information in this unit to select and justify a site for a Marine Protected Area (MPA) off the coast of Belize. This lesson will cover the importance of coral reefs, the so called 'rain forests of the sea', to a local community in Timor-Leste. Students develop their understanding of mutualism, biodiversity and how it is useful and important to us and the Earth as a whole.

Learning outcomes

- Say what a coral reef is and identify locations
- Outline the structure and scale of a coral reef
- Define the key terms 'mutualism' and 'biodiversity'.
- Explain the importance of biodiversity to resilience

Resources



Slideshow 1:

How is coral reef biodiversity useful and important?



Student Sheet 1a:

Coral reef scales card sort

Student Sheet 1b:

Coral and biodiversity summary



Answer Sheet 1b:

Coral and biodiversity summary



Video:

Welcome to Timor-Leste



360 Gallery:

The Great Barrier Reef



Activity:

Incredible edible polyps



Subject Update:

Learn more: Coral reefs

Subject Update:

Learn more: Why use 360VR in the classroom

Subject Update:

How to: Quick Start to 360VR in the classroom

Lesson 2: How can humans directly threaten reefs?

Overview

In this lesson students will develop their understanding of how humans present direct threats to biodiversity, and how to write a logical explanation. This idea is then developed further in the next lesson. The context of the lesson is how the villagers of Com could be harming their reef by using it.

Learning outcomes

- Describe the importance of all animals within the coral reef ecosystem
- Describe threats to the reef
- Define and use the terms 'overfishing', 'destructive fishing', and 'trophic cascade' correctly

Resources



Slideshow 2:

How can humans directly threaten reefs?



Student Sheet 2a:

Species card sort

Student Sheet 2b:

Reef uses

Student Sheet 2c:

Threats to reef information sheet

Student Sheet 2d:

Threats table



Subject Update:

Learn more: Human activity on the reef

Subject Update:

Learn more: Coral futures

SCHEME OF WORK

Lesson 3: How can humans indirectly threaten reefs?

Overview

In this lesson students will develop their understanding of indirect threats to coral reefs, such as climate change, which causes the sea temperatures to rise and coral bleaching to occur. The context of the lesson is how human activities outside of Com village could be harming the local reef.

Learning outcomes

- List human actions which can have an indirect impact on reefs
- Define and use the terms 'coral bleaching', 'sedimentation', 'turbidity' 'global warming' and 'ocean acidification' correctly
- Explain the cause and impact of a range of threats

Resources

**Slideshow 3:**

How can humans indirectly threaten reefs?

**Student Sheet 3a:**

Crown-of-thorns starfish information clues

Student Sheet 3b:

Coral threat activities

**Answer Sheet 3a:**

Crown-of-thorns starfish answers

Answer Sheet 3b:

Coral threat activities answers

Answer Sheet 3c:

Mark Scheme

**Activity Overview 3a:**

Sedimentation

Activity Overview 3b:

Ocean acidification

**Activity:**

Cloudy waters

Activity:

Ocean acidification in a cup

**Video:**

Underwater classroom: Coral bleaching

**Subject Update:**

Learn more: Corals in a high CO₂ world

Lesson 4: How do we decide which areas to protect?

Overview

The aim of this lesson is for students to develop their understanding of how to complete a transect and to investigate the impact of abiotic factors on distribution and abundance of biodiversity on reefs. The context of the lesson is the work of the XL Catlin Seaview Survey which aims to compile a global reef record using 360 imagery.

Learning outcomes

- Describe what a transect is
- Describe how to complete a transect
- Explain reasons for completing a transect

Resources

**Slideshow 4:**

How do we decide which areas to protect?

**Student Sheet 4a:**

Investigating information

Student Sheet 4b:

Investigation tasks

**Video:**

Snorkels and science

Video:

Seaview Science: Monitoring the reef

**Subject Update:**

About: XL Catlin Seaview Survey

SCHEME OF WORK

Lesson 5: How can we protect the reef?

Overview

In this lesson students will start of by looking at the life cycle on coral reefs and the importance of mangrove forests and sea grass to the biodiversity of coral reefs. Following that students learn what MPAs are and decide where they would locate the four different MPAs in Com. The context of the lesson is the proposal for a new community marine protected area in Com.

Learning outcomes

- Describe the need for a variety of habitats in the lifecycle of a species
- Give some examples of how to protect reefs
- Explain why the location of an MPA has been chosen and justify with ecological reasons

Resources

**Slideshow 5:**

How can we protect the reef?

**Student Sheet 5a:**

Threats and solutions card sort

Student Sheet 5b:

Map to sketch MPA

Student Sheet 5c:

Timor-Leste MPA

**Map:**

Timor-Leste Google Map

**Subject Update:**

Learn more: Conservation on the Great Barrier Reef

Subject Update:

How to: Create a placemark on Google Earth Pro

Subject Update:

How to: Open saved placemarks in Google Earth Pro

Lesson 6: How are members of the community affected by MPAs?

Overview

Following on from last lesson, students consider the impact of biodiversity protection methods on different groups of people by watching a series of stakeholder videos. They go on to prepare arguments for a debate in the next lesson. The context of the lesson is the proposal for a new Community marine protected area in Com and what different people think about this.

Learning outcomes

- Describe how different people use the reef
- Describe how an MPA would affect different stakeholders
- Explain why a stakeholder might be for or against an MPA on the reef
- Justify the decision to place an MPA in Com, Timor-Leste

Resources

**Slideshow 6:**

How are members of the community affected by MPAs?

**Student Sheet 6a:**

Stakeholders

Student Sheet 6b:

Preparing arguments

**Video:**

Stakeholder on the reef:
Community

Video:

Stakeholder on the reef:
Fishermen

Video:

Stakeholder on the reef:
Government

Video:

Stakeholder on the reef:
Local Tourism

Video:

Stakeholder on the reef:
Tourism Operator

Lesson 7: Which MPA proposal is the best?

Overview

Following on from last lesson, students have a debate from the perspective of the different stakeholders. After this students' will demonstrate their learning from lessons 5-7 by completing a long answer question evaluating two proposals for a new community Marine Protected Area in Com. The context of the lesson is to bring the learning from previous lessons together in order to help decide where the students might place their MPA in their final lesson.

Learning outcomes

- Describe positive and negative features of a proposed MPA
- Compare two proposed MPA giving positive and negative features of each
- Select the best site for the proposed MPA and justify your choice

Resources

**Slideshow 7:**

Which MPA proposal is the best?

**Student Sheet 7a:**

Long answer question

Student Sheet 7b:

GCSE style exam questions

**Answer Sheet 7a:**

Long answer question

Answer Sheet 7b:

GCSE style exam questions