

### Rocky Shore Investigation

This session will focus on the ecology of our rocky shores. As an island nation with one of the longest coastlines of any European nation, these are incredibly important habitats to us. Including our islands, we have nearly 20,000 miles of coastline in the UK, with much of this being rocky shore habitat.

#### Learning Objectives

1. Understand the environmental gradients present in the intertidal zone
2. Identify and classify some common species found in rocky shore habitat
3. Describe different adaptations that allow animals and algae to survive here
4. Experience a fieldwork session and observe key sampling techniques
5. Collect data on the abundance and distribution of species on the rocky shore

Curriculum	Level	Specification	Curriculum links
England & Wales	AS / A Level	AQA Biology	3.4.5 Species and taxonomy 3.5.3 Energy and ecosystems 3.7.4 Populations in ecosystems
		OCR Biology A	Module 1 – Development of practical skills in biology Module 4 – Biodiversity, evolution and disease Module 6 – Genetics, evolution and ecosystems
		OCR Biology B (Advancing Biology)	Module 1: Development of practical skills in biology Module 3: Cell division, development and disease control
		Edexcel Biology A (Salters-Nuffield)	Topic 4: Biodiversity and Natural Resources Topic 5: On the Wild Side
		Edexcel Biology B	Topic 3: Classification and Biodiversity Topic 10: Ecosystems
		WJEC Biology	Unit 3 Energy, Homeostasis and the Environment Unit 5 Population size and ecosystems
		Eduqas Biology	Component 1 Energy for Life Component 2 Continuity of Life

England & Wales	GCSE	AQA Biology	4.6 Inheritance, variation and evolution 4.7 Ecology
		OCR Biology A (Gateway Science)	B 4.1 Ecosystems B6.1 Monitoring and maintaining the environment
		OCR Biology B (Twenty First Century Science)	B3: Living together- food and ecosystems
		Edexcel Biology	Topic 9: Ecosystems and material cycles
		Edexcel International GCSE Biology	4 Ecology and the environment
		WJEC Biology	Unit 2: Variation, Homeostasis and Micro-organisms
		Eduqas Biology	Topic 6 Ecosystems
Scotland	Advanced Higher	SQA	Field Techniques for Biologists <ul style="list-style-type: none"> <li>· Health and safety</li> <li>· Sampling of wild organisms</li> <li>· Identification and taxonomy</li> </ul> Investigative Biology <ol style="list-style-type: none"> <li>1. Scientific principles and process</li> <li>2. Experimentation</li> <li>3. Reporting and critical evaluation of biological research</li> </ol>
	National 5	SQA	Life on Earth <ol style="list-style-type: none"> <li>1. Ecosystems</li> <li>2. Distribution of Organisms</li> <li>3. Photosynthesis</li> <li>4. Energy in Ecosystems</li> <li>5. Evolution of Species</li> </ol> Apparatus and Techniques Skills for Learning
	National 4	SQA	Multicellular Organisms Life on Earth

Ireland	AS / A Level	CCEA	Unit AS 2: Organisms and Biodiversity Unit AS 3: Practical Skills in AS Biology Unit A2 1: Physiology, Coordination and Control, and Ecosystems Unit A2 3: Practical Skills in Biology
	GCSE	CCEA	Unit 1.7 Ecological relationships and energy flow Practical 1.6 - use quadrats to investigate the abundance of plants and/or animals in a habitat Unit 2: Body Systems, Genetics, Microorganisms and Health Unit 3 Practical Skills
	International Baccalaureate	Biology SL and HL	Topic 4: Ecology Topic 5: Evolution and Biodiversity

For all Awarding Organisations, the content is also aimed at developing depth in students' practical and investigation skills.

### Pre-lesson

Please advise your students to work through the handout as preparation for the Live Lesson. This element, referring to the ArcGIS Story Map, card sort and slideshow, will introduce them to the fieldwork location, common rocky shore species and the abiotic and biotic factors experienced by organisms living in this intertidal habitat. Students will have the opportunity to submit questions to be answered during the Live Lesson.

Encourage your students to use the fact file to research the study location. The fact file contains key background information on the live lesson's location including its geographical location, the abiotic conditions and potential impacts of climate change. There are discussion questions for your students to complete.

Please visit <https://encounteredu.com/cpd> for guidance on using these Live Lessons and Teacher Resources during school closures.

Lesson Steps	Resources
1) Starter Activity – Match the plankton larvae to their adult stage.	Plankton Match
1) Why do so many marine species live on the rocky shore? Students discuss what it means to be marine and consider the advantages of living on the rocky shore.	PowerPoint Pre-course Student Handout
2) Tides – Students consider the challenge that tides pose to organisms living on the rocky shore and interpret tidal graphs	Pre-lesson Student Handout Gallery of rocky shore species
3) Environmental variables on the rocky shore – What abiotic and biotic factors may pose challenges for organisms on the rocky shore and how may these impacts change with height up the shore.	PowerPoint
4) ArcGIS Story Map – Introduction to the fieldwork location and species we will focus on in the Live Lesson	ArcGIS Story Map – link can be found in PowerPoint and in the detailed notes below Pre-lesson Student Handout
5) Introduction to the Fieldwork: Aim, hypothesis and identification of the independent variable, dependent variable and control measures.	PowerPoint Pre-lesson Student Handout Fieldwork Data Sheet
6) Submit questions for the Live Lesson	Pre-lesson Student Handout

### Lesson step detail:

#### Starter activity: Plankton Match

ANSWERS 1 = b, 2 = e, 3 = c, 4 = d, 5 = a

#### 1-3. PowerPoint presentation

Student should use the PowerPoint to guide their learning. They should summarise their notes on the pre-lesson handout.

#### Further information for teachers

Slide 2 - Slide 2 introduces students to the aim and objectives of the pre-course lesson and the live lesson.

Slide 3 - Rocky shores are very diverse ecosystems, most species living there are marine species. What does it mean to be marine? Marine organisms need salt water for feeding (e.g. filter feeding), to extract oxygen for respiration, reproduction (release gametes for external fertilisation), competition (to exploit a new niche) and predation. Marine organisms have adaptations to cope with different abiotic and biotic conditions. Encourage your students to consider this question: Why do so many marine species live on the rocky shore, rather than in the ocean?

Slide 4 - Many marine species live on the rocky shore because they are highly productive areas. The advantages are listed in the blue boxes on this slide.

Due to shallow water, rocky shores have increased light availability compared to deeper water. They also have higher numbers of mineral ions which are washed down by rivers to the coast and arrive daily upon the tide. These factors lead to increased levels of photosynthesis and therefore increased production. There is a constant food supply on the rocky shore (producers), predominantly macroalgae (seaweeds). Macroalgae have adapted to develop holdfasts (an anchor like root structure) which enable them to cling to the rock in rough seas. However, despite these advantages, the organisms living on the rocky shore have to cope with a number of challenges relating to tides.

Students should analyse the tidal graphs.

Slide 5 - Environmental variables on the rocky shore. The shore can be split into different zones, these zones are created by the temporal changes during tidal cycles. The higher up the shore the longer the period of emersion. Emersion is the time spent above the waterline. The opposite is Immersion – the time submersed underwater.

#### 4. ArcGIS Story Map

Develop students understanding of the fieldwork location by exploring the Story Map



<https://bit.ly/fieldworkliveRS>

Students should summarise the key points of their research on their pre-lesson handout.

### 5. Introduction to the fieldwork

After reading the information on the Story Map, students will be familiar with the investigation aim and fieldwork techniques that will be covered during the Live Lesson. Students can continue the PowerPoint Slideshow and develop their understanding of Independent Variable, Dependent Variable and Control measures of the investigation. (Slide 8 and 9)

### 6. Questions before the Live Lesson

Students should be encouraged to consider any questions they would like to ask during the live lesson. Students should submit these questions to their teacher before the live lesson.

### During the live lesson

There are two handouts your students should have nearby during the live lesson:

1. Their completed 'pre-lesson preparation' handout.
2. The 'live lesson handout', during the live lesson student will record data and note observations here

The Live Lesson will include a site introduction with an orientation and recap of the Investigation Aim. Key facts from the Story Map will be reviewed and risk assessment considered. Three species will be introduced, and key features and adaptations will be used to identify them using an ID key. Competition between the species will be discussed and how their abundance varies with height above sea level on the rocky shore. Data will be collected, and students will estimate abundance using a SACFOR scale. Limitations of methods used will be reviewed followed by a live question and answer session.

### Post-lesson webinar

The post-lesson webinar will support you to develop your student's understanding in fieldwork follow up. Covering data presentation methods (including kite diagrams, histograms and research posters), data analysis and interpretation, with reference to ecological concepts.

### Additional resources

Please share these additional resources with your students. To broaden their understanding of rocky shore ecology and fieldwork methodology.

### Further information



[www.biology-fieldwork.org/a-level/diversity/marine/introduction](http://www.biology-fieldwork.org/a-level/diversity/marine/introduction)

An FSC website: setting up a biological investigation and discussion on zonation on the rocky shore.

[www.theseashore.org.uk](http://www.theseashore.org.uk)

An FSC website: an introduction to the rocky shore and differences in sheltered and exposed shores, fact files on a number of species and further reading on other coastal environments such as salt marshes and sand dunes.

[www.marlin.ac.uk](http://www.marlin.ac.uk)

MarLIN (The Marine Life Information Network) information on the biology of species and the ecology of habitats found around the coasts and seas of the British Isles.

### Case studies

[www.welshwildlife.org/livinglandscapes/limpets-at-frenchmans-steps-pembrokeshire](http://www.welshwildlife.org/livinglandscapes/limpets-at-frenchmans-steps-pembrokeshire)

Case study of limpets in Pembrokeshire following an oil spill and later an increase in dogwhelks due to the ban of the anti-fouling paint TBT. An easy read considering the impact on the limpet population and age structure following some big environmental disasters.

### Projects to get involved with

(Please follow government guidelines as to when it is safe to participate in such events)

[www.mba.ac.uk](http://www.mba.ac.uk)

The Marine Biological Association is one of the world's longest-running societies dedicated to promoting research into our oceans and the life they support. Explore what it means to be ocean literate, discover citizen science projects to get involved with or become a Young Marine Biologist.

[www.mcsuk.org](http://www.mcsuk.org)

The Marine Conservation Society is the UK's leading marine charity. They work to ensure our seas are healthy, pollution free and protected. Their website has information about topical marine issues, good fish guides and campaigns to get involved in such as beach cleans and single use plastic challenges.

[www.seachangeproject.eu/resources](http://www.seachangeproject.eu/resources)

Ideas of small changes we can make in our everyday lives to reduce our impact on the seas.

[www.bigseaweedsearch.org.uk](http://www.bigseaweedsearch.org.uk)

Take part and contribute to real scientific research from the Natural History Museum and the Marine Conservation Society. Search for seaweeds and help us better understand and protect this vitally important habitat.

[www.pmnhs.co.uk](http://www.pmnhs.co.uk)

Porcupine Marine Natural History Society are an informal society interested in marine natural history

