Biodiversity

Subject links:
Science, Geography

Age: 14-16

Curriculum links:
Ecosystems, Biodiversity, Interdependence, Adaptations, Human impact, Coastal management

Ocean Literacy Principles:
4. The ocean made the Earth habitable
5. The ocean supports a great diversity of life and ecosystems

Aim:
Pupils will gain a general understanding and appreciation of the wide variety of species and habitats found in our coastal waters around the UK.

Learning Objectives:
Main lesson:
- Define the terms: biome, ecosystems, biodiversity and species.
- Identify key marine habitats found in the UK.
- Name at least two marine species found in the UK and be able to explain how they are adapted to their habitat.
- Understand how species are connected to form an ecosystem.

Extension activities:
- Research and report on a coastal management case study.
- Explore the diversity of plankton in a creative way.

Sustainability Goals:

Resources provided:
- Biodiversity Fact File
- Biodiversity PowerPoint
- Habitat biodiversity worksheet
- Food web resources

Step 1 Background

Biodiversity is a broad term meaning the variety of plant and animal life found in the world or in a particular habitat. Biodiversity refers to diversity within species, between species and within an ecosystem. The ocean is highly diverse and is home to 50-80% of all life on earth. The majority of this diversity is found in productive shallow seas.

Step 2 Set the Scene

Use the Biodiversity PowerPoint to introduce the topic of biodiversity and the relevant terms. There are suggested questions for students within the notes section of the PowerPoint.

Step 3 Activities

Activity 1 - Marine habitats in the UK

Use the images and notes in the PowerPoint to explore key marine habitats. After introducing the habitats, split the class into small groups of 3 or 4 and allocate a habitat to each group. Provide each group with a laptop and complete the habitat worksheet making notes on: habitat location, the physical and biological characteristics of their habitat, and the diversity of animals and plants living there. Students should then present their findings back to the class.

Recommended websites:
Record of species and their biological features – Marlin
Easily-accessible habitat and species information – The Wildlife Trust Living Seas
Marine Habitat Classifications - https://mhc.jncc.gov.uk/

Resources required: Biodiversity PowerPoint, Laptops, Habitat biodiversity worksheet

Activity 2 - Marine species in the UK

Use the PowerPoint to introduce some key charismatic and important species that are found in UK seas. Share facts provided in the notes section of the PowerPoint.

The last species to be introduced is the Angel shark, a critically endangered species found in Wales. Students should use the electronic book to gain knowledge of angel sharks, their anatomy, their distribution and threats before completing the quiz at the end of the book.

Resources required: Biodiversity PowerPoint, Laptops, Angel Shark E-book

Activity 3 - Biodiversity & interdependence

Use the PowerPoint to introduce the term 'biodiversity' and why biodiversity is important.

To highlight how species are interdependent, play the food web game. Cards and instructions are provided to highlight to the students how animals in the ocean are all interconnected, and how pressure on one animal can cause pressure on several parts of the food web. Explain to students that the game is just a snapshot of a possible food web and that, in the wild, food webs are more complicated and species' diets often vary depending on their location.

After you have completed the game, students should complete the food web worksheet.

Resources required: Biodiversity PowerPoint, Food web resources, 6 balls of string/wool

Extension activity ideas

ReMEDIES Seagrass Project

ReMEDIES is an EU LIFE funded project bringing together a collection of conservation organisations to restore seabed habitats in South West England, with a focus on seagrass beds. The project's website is full of useful information about the ecology of seagrass, threats to the habitat and restoration.

Students should use information on the website to create a restoration case study. Students should include information on what species live in seagrass beds, how they're an ecologically-important habitat and how human interactions with this habitat can have both positive and negative effects. Students could present their case study in a variety of ways, such as a presentation, a news article, scientific report, habitat infographic or a campaign for protection.

We would love to see examples of your students' work. You could share it on social media, tagging @mcsuk **#SaveOurSeabed**, or send it straight to our education team at education@mcsuk.org.

Resources required: Save our seas website

Diversity of plankton

Looking at plankton samples under a microscope is a fantastic activity for exploring the diversity of living things. Students are always fascinated by the amount of life invisible to the naked eye, and the amount of life that can be seen in such a small area.

Useful websites:
Some amazing facts about plankton – Devon Wildlife Trust
How to build a plankton net and examples of freshwater plankton – University of Delaware
Video showing how to make a phone microscope and sample puddle water – Gross Science
ID guide for marine plankton (Page 52-59) – Centre for microbial oceanography

Resources required**:** Plankton net (or create using tights, string, tape and plastic bottle), microscope and slides, Petri dishes, pipettes, magnifying glass

The incredible diversity in shapes, sizes and patterns of plankton makes it a fantastic subject to focus on to create an art piece. Students could take inspiration from the artwork suggested below to create their own plankton artworks.

Plankton inspired buttons Plankton inspired painting Plankton inspired photography

Step 4 Reflect

Test students' understanding of the terms biome, ecosystems, habitats, species, interdependence, and biodiversity. Ask students to describe a UK marine habitat and species found in within it. Ask students to describe how species are interdependent and how human interactions can alter ecosystem dynamics.

Step 5 Follow up

Our Ecosystem Services lesson highlights how a healthy ocean is vital for our survival by exploring the many crucial direct, indirect and ethical services our ocean provides us with.

Biodiversity Fact File

Biodiversity

Biodiversity is a broad term meaning the variety of plant and animal life found in the world or a particular habitat. Biodiversity refers to diversity within species, between species and within an ecosystem.

The ocean covers over 70% of the earth's surface, and is home to an incredible diversity of life. An incredible 50-80% of all life on Earth can be found in the ocean, and the majority of this diversity is found in productive shallow seas.

© Silas Baisch
via Unsplash

Basking shark
© Pixabay

The UK is an island nation surrounded by the sea. We define the word 'coast' as the area where land meets the sea. The UK has around 7,723 miles of coastline, with sandy bays, rugged shores, caves and cliffs. Beneath the waves are varied landscapes of undersea cliffs, caves, plains and dunes.

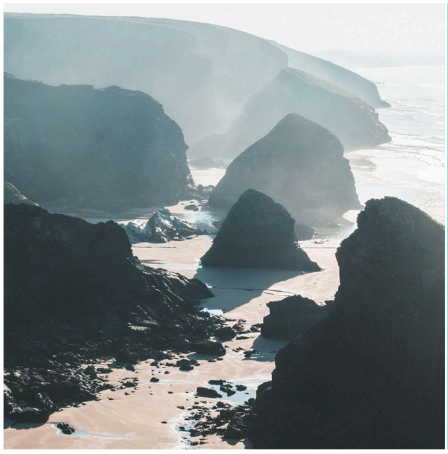
Our corner of the ocean - the North East Atlantic – is home to some of the most colourful, fascinating and beautiful marine life in the world. Our coastal seas host a range of habitats, like colourful reefs, kelp beds, rockpools and seagrass meadows, which provide sanctuary to thousands of plants and animals.

The biodiversity of species in our seas is extraordinary, from microscopic bacteria to enormous whales. Several giants of the underwater world are found in UK waters, including leatherback turtles and the world's second-largest fish, the basking shark.

MARINE CONSERVATION SOCIETY

Biodiversity Fact File

UK seas



England is surrounded by four seas: the North East corner of the Atlantic Ocean, the Irish Sea, the English Channel and the North Sea.

Welsh seas support internationally-important populations of seals and dolphins, and the many cliffs and islands along the coastline are home to globally-important seabird colonies.

Scotland has an astonishing 13% of Europe's seas and 62% of the UK's.

Definitions

Biome – An area of our planet with similar climates, landscapes, animals and plants. In the ocean we have five main biomes: Atlantic Ocean, Pacific Ocean, Indian Ocean, Southern Ocean, and the Arctic Ocean.

Ecosystems – A natural environment in which plants and animals interact and interconnect. Ecosystems are influenced by biotic factors, like the plants and animals living there, and by abiotic factors, including climate, sediment and water.

The term 'ecosystem' is used broadly to describe these interactions between biotic and abiotic factors in an environment. A small pond and the whole ocean are both examples of ecosystems.

Habitat – The natural home or environment in which an animal, plant or organism lives. A habitat contains all an organism needs to survive such as food and shelter. A microhabitat is a small area within a larger habitat which is home to a species.

Species – A group of living organisms consisting of similar individuals that share common characteristics and are capable of interbreeding.

Population - A group of individuals belonging to the same species living in a geographical area.

Adaptation – The process of evolutionary change in which an organism becomes suited to its environment.

MARINE CONSERVATION SOCIETY

Biodiversity Fact File

Context examples

Biodiversity is important for ecosystem health. An ecosystem with greater diversity is much more likely to recover from damage from external factors, compared to an ecosystem with little diversity.

To put all of this into context, let's take the coast of Wales as an example.

North Atlantic Ocean

The **ocean biome** would be the North Atlantic. You can see the British Isles on the right side of this image.

Welsh coastline

Along the west coast of Wales is a large area called Cardigan Bay.

Dyfi Estuary

Within the bay are a diverse range of **ecosystems**. The Dyfi Estuary is an example of one of the ecosystems.

Saltmarsh habitat

Within the estuary ecosystem are several **habitats** including saltmarsh, intertidal mud flats, and underwater mud.

MARINE CONSERVATION SOCIETY

Biodiversity Fact File

Lugworm casts

It's possible to go further still and refer to smaller **microhabitats**. In a saltmarsh, for example, the microhabitat for a marine worm would be its burrow, whereas the microhabitat for a coastal bird would be its nest at the top of the saltmarsh.

Lugworm

In the UK there are several **species** of worms that live in saltmarsh mud, including sand mason worms and species of lugworms and ragworms.

Ragworm

The ragworm *Hediste diversicolor* is well **adapted** to estuaries and can tolerate ranging salinities. It has adapted to this muddy environment by living in a burrow to hide from predators. It has adapted to feed without having to leave its burrow and be spotted by predators. The ragworm spins a mucus web that sits at the entrance to their burrow and traps small plants and animals, and it then consumes the whole web. In winter, it digs deeper into the mud to escape cooling temperatures.

Habitats and species in the UK
Please see the Biodiversity PowerPoint for information and images of the key habitats and species found in the UK. Information for each image can be found in the notes section of the PowerPoint.

MARINE CONSERVATION SOCIETY

Biodiversity

Name: _____

_____

What is the name of the marine habitat?

_____

_____

Where along the UK coastline can this habitat be found?

_____

_____

What are the physical characteristics of the habitat?

_____

_____

_____

_____

Name two species of animals that live in the habitat and describe how they are adapted to the habitat

Species: _____

Adaptation feature: _____

_____

_____

_____

Species: _____

Adaptation feature: _____

_____

_____

_____

Name one species of plant or algae that live in the habitat and describe an adaptation feature

Species: _____

Adaptation feature: _____

_____

_____

_____

Draw a sketch of the habitat and include annoated labels of species of plants and animals and ecologically important features of the habitat

Food web game instructions

1. Move to an open space, like a school hall or outside. Explain that together you're going to make a marine food web. Ask if students know what a food web is (a connection of food chains).
2. Stand in a large circle and hand out the food web elements cards to some students (there are 14 cards so won't be enough for one each).
3. Draw attention to the smaller text showing where the organism gets its energy. Remind children this is really important for the game.
4. Start with the sun, and ask who gets their energy from the sun (plankton and seaweed). Explain that these are producers. Connect these to the sun using seperate peices of string.
5. Now ask who gets their energy from seaweed, and link with string.
6. Work through one food chain at a time, using a different length of string for each food chain.
7. Explain that the creature at the end of the food chain is a predator.
8. Continue until all food chains are complete This will form a visual food web.

This activity should take no more than 10 minutes. If you have time then complete extension activity.

Food web game instructions

EXTENSION

1. Ask students what they think might happen to the food web if one of the animals disappeared, for example, if mussels were overfished. Then remove mussels (person holding shellfish lets go of string).
2. Children should identify the impact of this loss, i.e. animals feeding on mussels would have less food, possibly impacting their numbers. Those students holding cards that eat mussels should then be removed by letting go of the string.
3. Observe how this has impacted the web. Discuss how creatures that mussels feed on may increase in number because of lack of prey.
4. Explain that each element within a food web can affect the others.

Human

Eats whelk, edible crab, mussels, flatfish and seaweed

Orca

Eats otter

Seal

Eats flatfish

Flatfish

Eats mussels

Mussels

Eats plankton

Whelk

Eats hermit crab and mussels

Hermit crab

Eats seaweed

Otter

Eats urchin

Urchin

Eats seaweed

Edible crab

Eats worm, mussels and seaweed

Worm

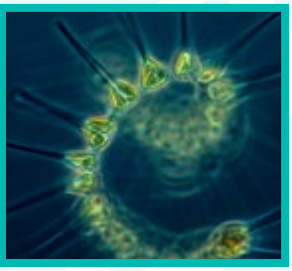
Eats whelk, edible crab, flatfish and seaweed

Basking shark

Eats plankton

Plankton

Gets energy from the sun

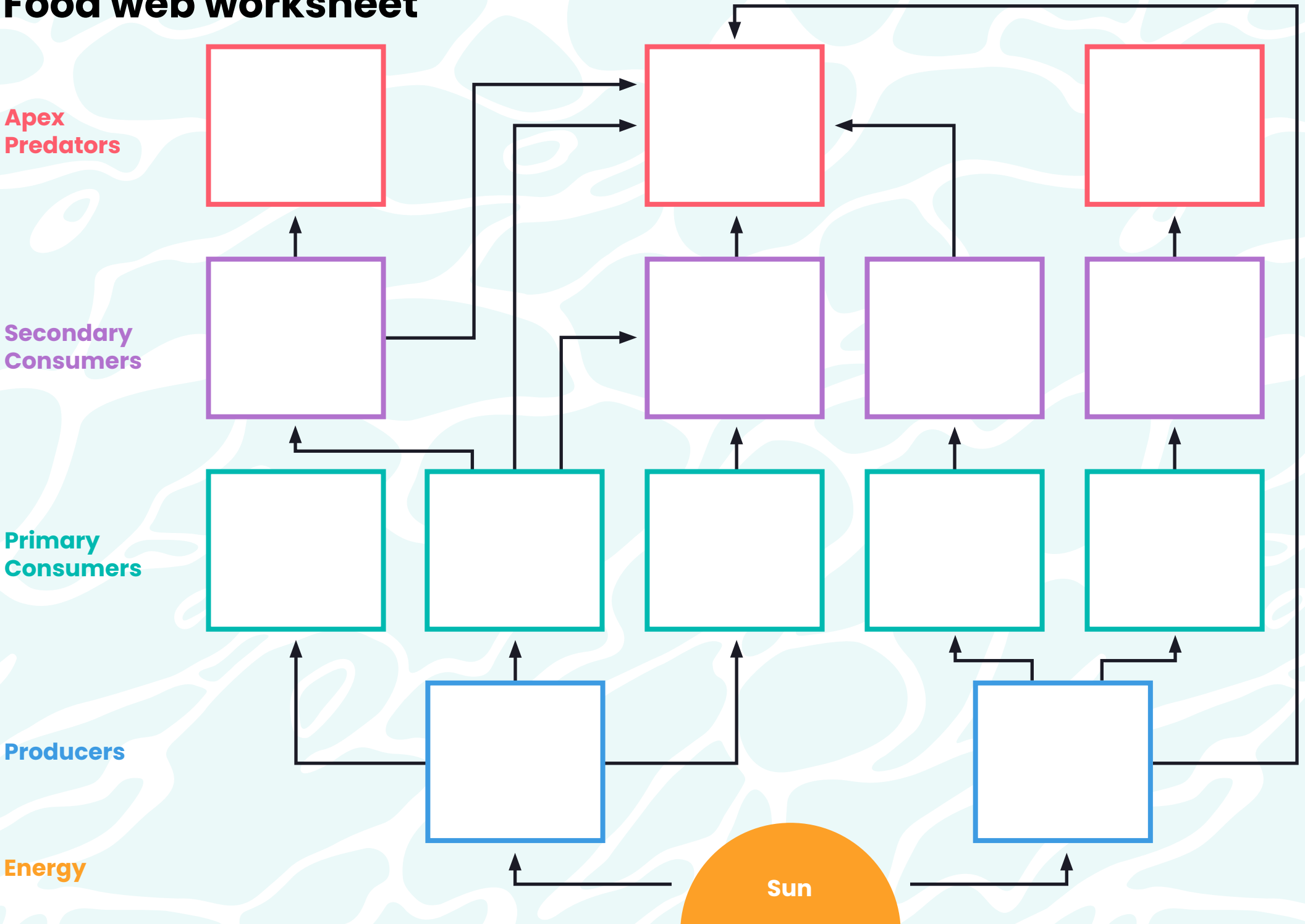


Seaweed

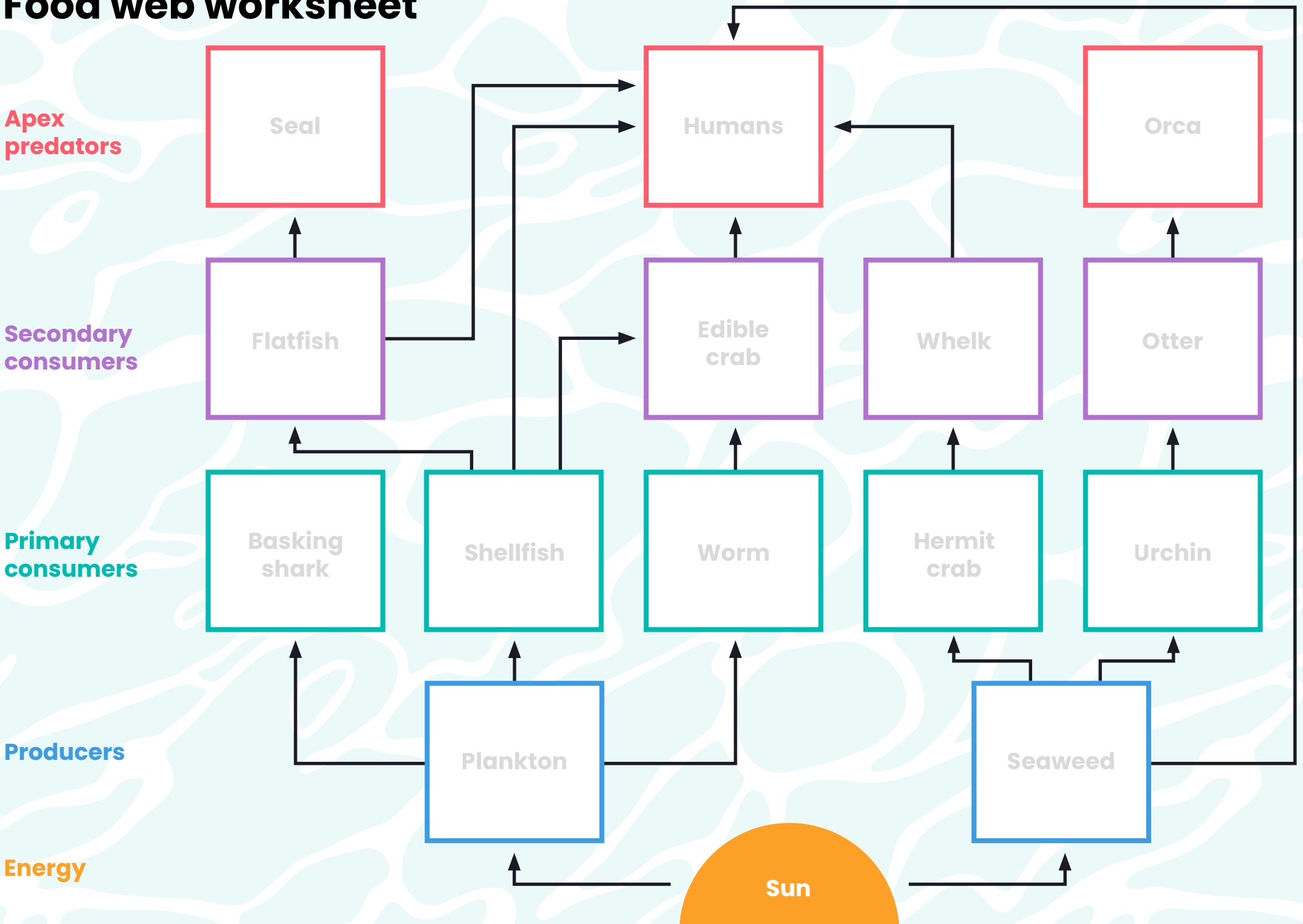
Gets energy from the sun

Flatfish, mussles, edible crab - Paul Naylor; Basking shark - Peter Bardsley; Whelk - Ria Tan

Food web worksheet



Food web worksheet



Curriculum Links - England

Key Stage 3

Science

Interactions and interdependencies

Relationships in an ecosystem

- The interdependence of organisms in an ecosystem, including food webs and insect pollinated crops.
- How organisms affect, and are affected by, their environment, including the accumulation of toxic materials.

Genetics and evolution

Inheritance, chromosomes, DNA and genes

- Changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction.
- The importance of maintaining biodiversity.

Geography

Human and physical geography

- Understand how human and physical processes interact to influence, and change landscapes, environments and the climate; and how human activity relies on effective functioning of natural systems

Key Stage 4

Science

Ecosystems

- Levels of organisation within an ecosystem.
- Some abiotic and biotic factors which affect communities; the importance of interactions between organisms in a community.
- Organisms are interdependent and are adapted to their environment.
- The importance of biodiversity.
- Positive and negative human interactions with ecosystems.

Geography

Place: processes and relationships

- Knowledge and understanding of the UK's geography.

People and environment: processes and interactions

- Global ecosystems and biodiversity – An overview of the distribution and characteristics of large scale natural global ecosystems. For two selected ecosystems, draw out the interdependence of climate, soil, water, plants, animals and humans; the processes and interactions that operate within them at different scales; and issues related to biodiversity and to their sustainable use and management.

Curriculum Links - Wales

Progression Step 4

Science

The world around us is full of living things which depend on each other for survival

- I can describe the interdependence of organisms in ecosystems and explain how this affects their chances of survival
- I can explain how the environment can lead to variation and adaptations within organisms which can affect their chances of survival

Humanities

Our natural world is diverse and dynamic, influenced by processes and human actions

- I can describe and explain the distinctive features of places, spaces and landscapes at a variety of scales, in my locality and in Wales, as well as in the wider world, along with the processes at work in them

Progression Step 5

Science

Being curious and searching for answers is essential to understanding and predicting phenomena.

- I can evaluate contemporary issues that affect the planet and biodiversity

The world around us is full of living things which depend on each other for survival

- I can explain how variation of organisms within a changing environment leads to natural selection which drives evolution.
- I can evaluate the factors which affect the development and health of organisms.
- I can explain how biological processes and control mechanisms enable organisms to function, develop, reproduce and survive.

Humanities

Our natural world is diverse and dynamic, influenced by processes and human actions

- I can explain and analyse the wide range of interrelationships and interdependencies between the human actions and physical processes that shape places, spaces, environments and landforms over time.
- I can give comprehensive explanations for the distinctive features of places, spaces and landscapes at a variety of scales in my locality and in Wales, as well as in the wider world, along with the processes at work in them.

Curriculum Links - Scotland

Third-Fourth Level

Science - Third Level

Biodiversity and interdependence

- I can sample and identify living things from different habitats to compare their biodiversity and can suggest reasons for their distribution

Science - Fourth Level

Biodiversity and interdependence

- I understand how animal and plant species depend on each other and how living things are adapted for survival. I can predict the impact of population growth and natural hazards on biodiversity

Social Sciences – Third Level

People, place and environment

- I can identify the possible consequences of an environmental issue and make informed suggestions about ways to manage the impact
- I can investigate the climate, physical features and living things of a natural environment different from my own and explain their interrelationship

Social Sciences - Fourth Level

People, place and environment

- I can develop my understanding of the interaction between humans and the environment by describing and assessing the impact of human activity on an area

Senior phase

Environmental Science – National 4

Living Environment

- Interdependence, adaptation for survival; the impact of population growth and natural hazards on biodiversity; and the nitrogen cycle and the environmental impact of fertilisers

Environmental Science – National 5

Living Environment

- Investigating ecosystems and biodiversity
- Interdependence
- Human influences on biodiversity

Geography – National 4

Physical Environments

- Location of landscape type; formation of key landscape features; land use management and sustainability

Human Environments

- Issues in changing urban and rural landscapes

Geography – National 5

Physical environments

- Landscape types

Natural regions

- Use and misuse of these environments by people