



SSC DIVE IN! SEAWEED





WELCOME!

Hello, and welcome to “SSC Dive In!”. Packs of resources providing some seaside fun directly into family homes and classrooms.

This pack’s theme: Seaweed

Seaweeds are plant-like organisms that are found all around the coasts of Scotland. Seaweeds come in many different colours, shapes and sizes and different species are found in bands at different levels of the shore.

Dive into this pack to discover more about this important part of marine habitats.

Inside this pack:

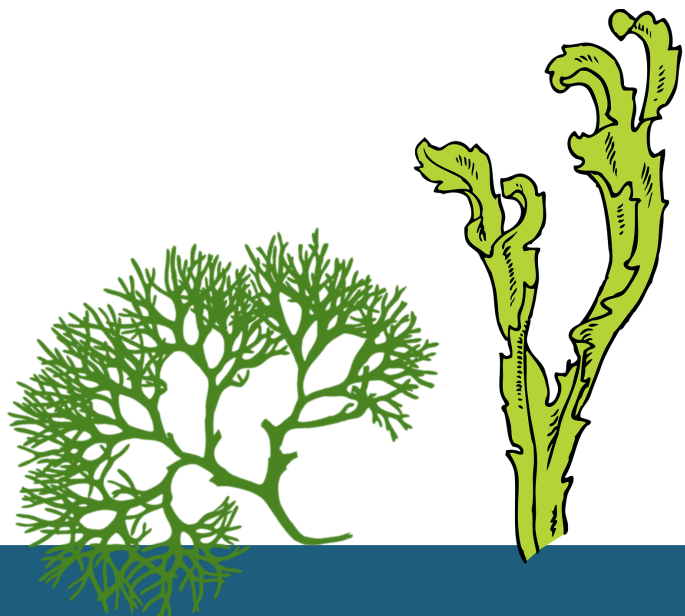
- **Fact file: Seaweeds**
- **Discovery sheets: Species information**
- **Guest Blog: Big Seaweed Search**
- **Blog: How people use seaweed**
- **Seaweed Wordsearch**
- **Craft instructions: Seaweed Pressing**
- **Spotter Sheet: Identify some key species**
- **Glossary**

We’d love to hear from you! If you’ve had fun having a go at activities, experiments and crafts, let us know. Any comments or pictures can be sent to marineengagement@seabird.org. More resources available on our [website](#).

Enjoy using our packs and want to see more? The Scottish Seabird Centre is an environmental conservation and education charity. Every penny we raise helps us deliver our important education and conservation work. If you enjoy using our resources and would like to support our work, please consider making a donation to the our [JustGiving page](#). Thank you.

We hope you enjoy diving in to the pack!

Scottish Seabird Centre Learning Team



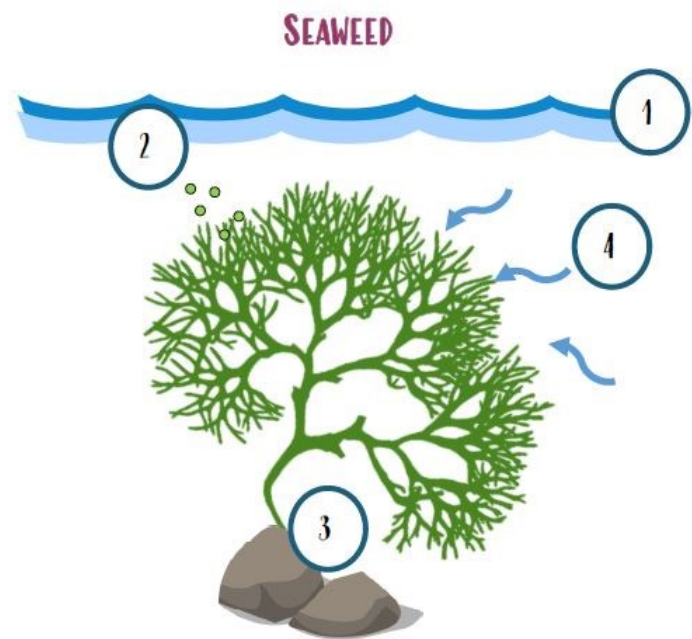
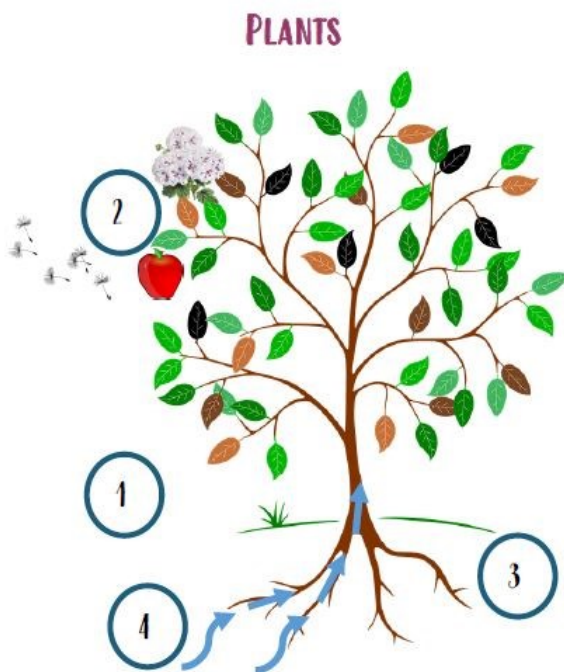
Hint: The meaning of words in **purple** can be found in the Glossary at the end of the pack. Words in **blue** contain links to websites.

FACTFILE

SEAWEED

WHAT IS SEAWEED?

Seaweeds are organisms that live in the sea and make food from sunlight. Though they make food in the same way and look similar to the plants, seaweeds are different to plants in a number of ways:



1 Most plants grow on land or in freshwater environments (e.g. rivers and ponds).

2 Plants produce flowers, seeds and fruit.

3 Plants have roots that grow into sand, mud or soil.

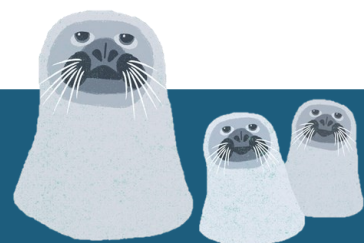
4 Plants take up water and nutrients from the soil through their roots and transport them through their bodies in special **tissues**.

Seaweeds only grow in the sea, or very close by on the seashore.

Seaweeds produce **spores**.

Seaweeds don't have roots. They attach to the surface of rocks and other hard surfaces using a structure called a **holdfast**.

Water and nutrients simply flow into the bodies of seaweeds from surrounding seawater.





FACTFILE

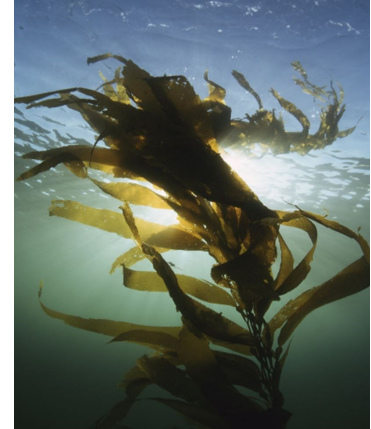
SEAWEED

HOW DO SEaweEDS MAKE FOOD?

Seaweeds have a **pigment** inside their bodies called 'chlorophyll' (pronounced "claw-row-phil").

Chlorophyll uses energy from sunlight to transform carbon dioxide (a gas) and water into sugar. Seaweeds then use the sugar as food.

This process is the same way plants make their food on land and is called **photosynthesis** (pronounced "photo-sin-the-sis").



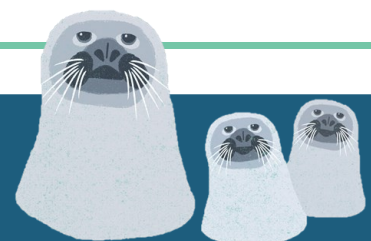
HOW MANY TYPES OF SEaweED ARE THERE?

Believe it or not, there are over **650** different species of seaweed found around our coasts in the UK!

Scientists group these into 3 different colour groups— the reds, browns, and greens. The different colours in seaweeds are caused by special **pigments** that give their bodies different shades of colour.

Colour groups can be misleading though, as some brown-looking seaweeds can actually be from the red group.

How many different shades of reds, browns, and greens can you see in the picture below?



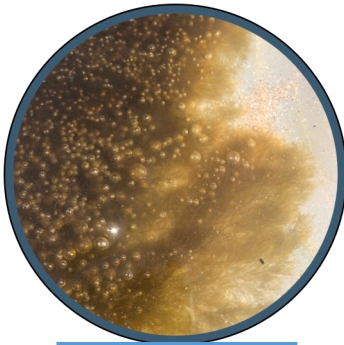


FACTFILE

SEAWEED

WHAT DOES SEAWEED LOOK LIKE?

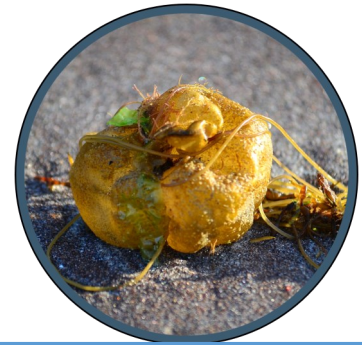
As well as different colours, seaweeds come in a huge variety of different shapes, sizes and texture.



Some are fluffy



Some look like leaves



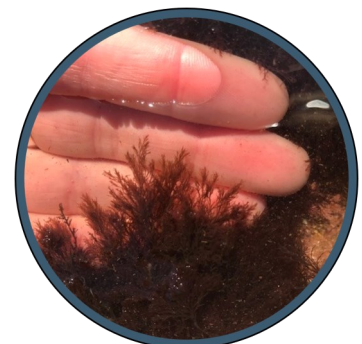
Some look like inflatable balls



Others look like hair



Some are big and floppy



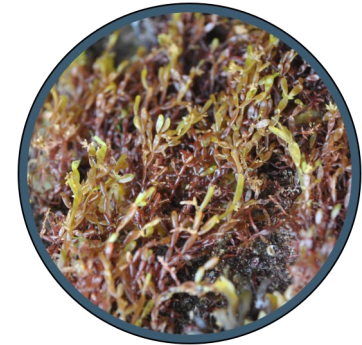
Others are fine and delicate



Some are small and bushy



Others cover rocks in a large, thin layer that looks like a sheet



One species even looks like tiny chains of sausages!

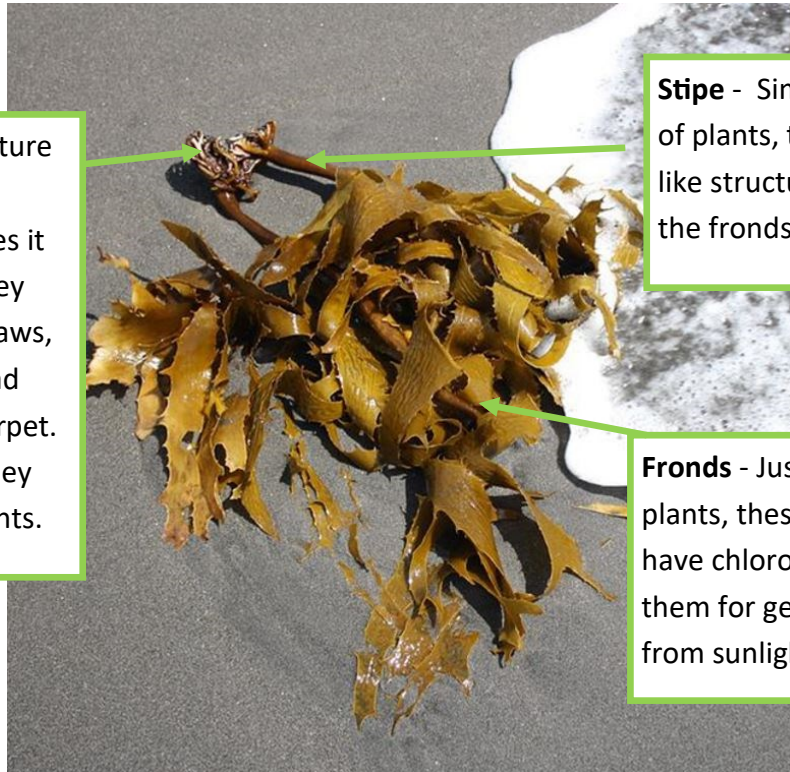


FACTFILE

SEAWEED

Though seaweeds look very different to each other, all seaweeds have a similar structure:

Holdfast - The structure at the base of the seaweed that attaches it to a hard surface. They can be shaped like claws, discs, or simply spread along a rock like a carpet. Unlike plant roots, they do not absorb nutrients.



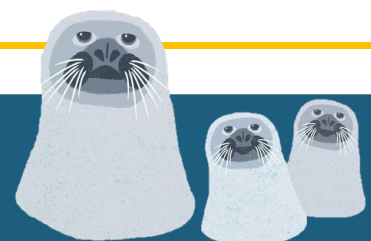
Stipe - Similar to the stem of plants, this is a trunk-like structure that supports the fronds of the seaweed.

Fronds - Just like leaves on plants, these food factories have chlorophyll inside of them for generating energy from sunlight.

FUN FACT!

The tallest seaweed in the world is the giant kelp found off the coast of California, America. This huge seaweed can grow up to 52m long—that's similar to 10 giraffes stacked on top of each other!

It lives in cold, clear waters and forms large forests that provides habitat for thousands of other species. Watch young divers learn more about this amazing species [here](#).





FACTFILE

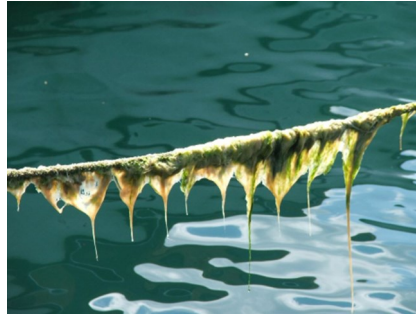
SEAWEED

WHERE DO SEaweEDS GROW?

Anywhere there is access to salt water, sunlight and a hard surface to grow on. This can be on natural materials such as rocks, pebbles and shells of animals.



Or man-made structures, such as sea defences, ropes, and boats (old and new).



Around the coast, [rocky shores](#) are perfect places for seaweeds as there is plenty of access to all the things they need. However, seaweeds that grow here need to be able to survive the tide going out twice a day. Remember, seaweeds need salt water to survive, so being exposed to air at low tide puts them at risk of drying out. To cope, species have evolved some incredible adaptations, such as covering their fronds in a mucus that acts as a sunscreen, or curling up their edges to prevent water loss.

Most seaweeds grow at depths of 0-40m. This is because sunlight only reaches so far down in the ocean and seaweeds can't produce food when there's no sunlight.

Rockpooling is a great way to explore the rocky shore and discover the amazing world of seaweeds yourself. Click [here](#) to watch a video containing lots of useful hints and tips!





FACTFILE

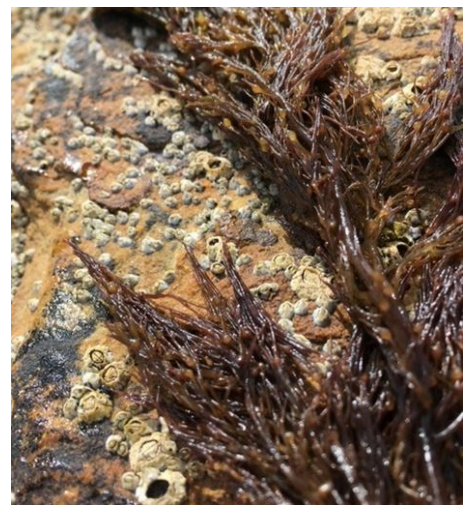
SEAWEED

HOW DO SEaweEDS REPRODUCE AND SPREAD?

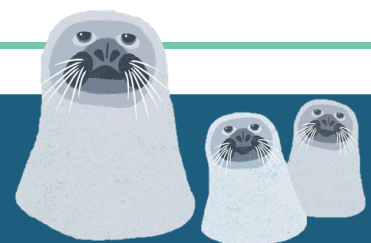
There are different ways seaweeds reproduce and spread around the ocean.

Some seaweeds reproduce in a similar way to trees but, instead of seeds, they have tiny **spores** that are released into seawater. Spores that are ready to become adults settle onto a hard surface and grow into the seaweeds we see on the seashore.

At certain times of the year, these seaweeds have inflated tips, rough bobbly bits, or small cream/orange-y sacs growing in their fronds (like the bottom left photo). These are the tell tale signs that a seaweed is in the process of creating spores or is nearly ready to release them into the sea.



However, some species don't even need spores to spread. A species called wireweed can grow a new individual from fragments of other adults. For example, a piece of wireweed that gets caught in a fishing net can be transported somewhere else, fall off, and form a new bit of wireweed! This makes wireweed very good at spreading.





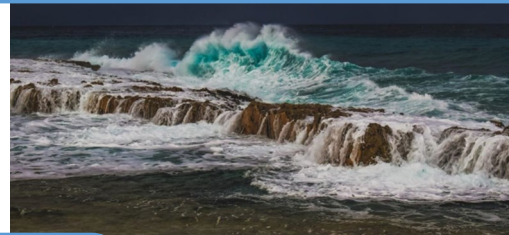
FACTFILE

SEAWEED

WHY IS SEAWEED IMPORTANT?



Big areas of seaweed, especially kelp forests, create a natural barrier, protecting land from storms.



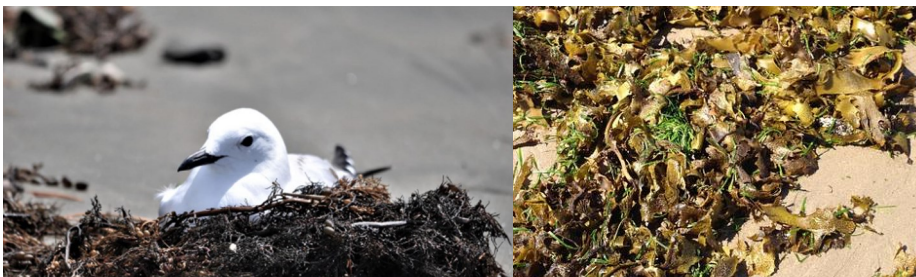
During photosynthesis, seaweed turns carbon dioxide into oxygen. This removes carbon dioxide from the atmosphere, which helps reduce global warming, and also provides animals with the oxygen to breathe.



Seaweed is at the bottom of the food chain, meaning lots of animals depend on it for food.

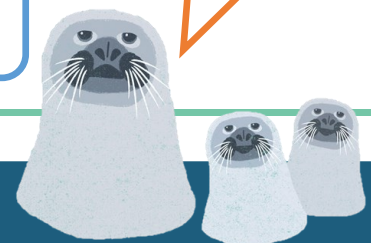


Seaweed provides shelter for lots of other species. Species hide amongst the fronds, live on their surfaces, and even lay eggs on them.



Seaweed is also important for people too. Find out why in our blog on page 20.

Washed-up bits of seaweed are an important source of food and shelter for animals on beaches. Seabirds also use it for nesting material.





FILM

KELP FORESTS OF SCOTLAND'S WEST COAST

Scotland's seas are home to huge areas of kelp forest. The best way to see them is to dive but, at the Scottish Seabird Centre, we have a virtual reality system which allows visitors to experience a virtual kelp forest without getting wet!



NatureScot (legally known as Scottish Natural Heritage) also have a wonderful virtual dive over a kelp forest. Click [here](#) or on the box below to see this animation of seaweed and marine animals.



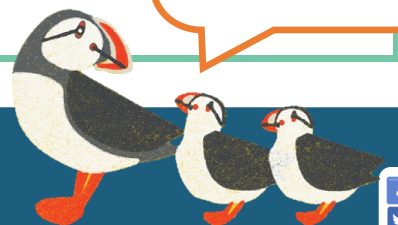
WATCH THE VIDEO AND SEE IF YOU CAN ANSWER THE FOLLOWING...



- The canopy of this kelp forest covers the same sized area as which city?
A) Edinburgh B) Stirling C) Aberdeen D) Glasgow
- What species of seal appears in the video at the end?
A) Grey seal B) Harbour seal C) Ringed seal

The answers are...

1. D
2. B





GUEST BLOG



BECOME A SEAWEED SURVEYOR WITH THE MARINE CONSERVATION SOCIETY AND THE NATURAL HISTORY MUSEUM!

By Caitlin Godfrey, Shellfish Engagement Officer, Marine Conservation Society

There are over 650 seaweed species in the UK! Seaweeds play an essential role in our oceans. They create underwater habitats that provide food and shelter for marine animals and are used in many household items such as cosmetics, medicines and food. By surveying seaweeds together, we can build a better understanding of how **climate change** is impacting the species along our coastline.

Seaweeds are really useful for spotting the impacts of **climate change** in our oceans. They can indicate three important changes that are happening in our seas:



1. **Sea temperature rise** – over the past 40 years Britain has seen a 2°C increase in the sea surface temperature. This means that seaweeds that like colder waters are moving further north and warm-water seaweeds are expanding their range.
2. **Non-native species** – some seaweeds that we see on our shores didn't originate here, but arrived due to human activity or environmental change. An example is wireweed (*Sargassum muticum*). They can cause problems by out-competing native seaweeds for food, light or space.
3. **Ocean acidification** – the amount of carbon dioxide in our atmosphere is increasing. Nearly half of this is absorbed by the sea, which over time changes the pH balance in the water, making it more acidic. Lots of ocean species, like seaweeds, struggle to grow in these conditions.





The Big Seaweed Search is a joint citizen science programme between the **Marine Conservation Society** and the **Natural History Museum**. The data we collect is used by Professor Juliet Brodie, a seaweed research scientist at the Natural History Museum.

There are **14 different seaweeds** to spot and record. They are listed in our guide, available to download [here](#). Complete a Big Seaweed Search in 5 simple steps and become a seaweed scientist:



1. Select your survey area

You will need a 5 metre-wide plot (about five adult paces) that runs from the top of the beach to the sea. It is best to hunt for seaweed at low tide, when most species will be out of the water. You can check the tide times where you are at www.tidetimes.co.uk.

2. Take a picture of your survey area

Take a picture of your survey area with your **back to the sea**, looking towards land. This helps scientists to understand the conditions of the shore.

3. Get seaweed spotting!

Carefully explore your area for seaweed and record what you find. Remember, you are only looking for the 14 species listed in the guide. Don't record any seaweed that isn't **attached** to a surface, as it could have drifted from elsewhere. **The most important bit** - take a picture of each seaweed species you find **and** a picture of where it attaches to a surface.

Note the seaweed abundance on your recording form – band-forming (uninterrupted band right across the width of your plot), patchy (large patches which don't fully cover the width of your plot) or sparse (small patches).

4. Enter your results

Report your findings at www.bigseaweedsearch.org. Enter your data, telling us where you were, what you found and upload your pictures.





TOP TIPS

- Don't rely too much on the colour of the seaweed – brown seaweeds sometimes look green and vice versa, and colours may vary a lot from almost black to yellow!
- Search thoroughly through seaweeds to make sure you don't miss any smaller species hiding underneath.
- Check rockpools for species, this is particularly where **calcified crusts** might be found.
- Seaweeds don't have roots, but **holdfasts** which are root-like structures that stick onto rocks and other surfaces.



Stay safe when seaweed hunting:

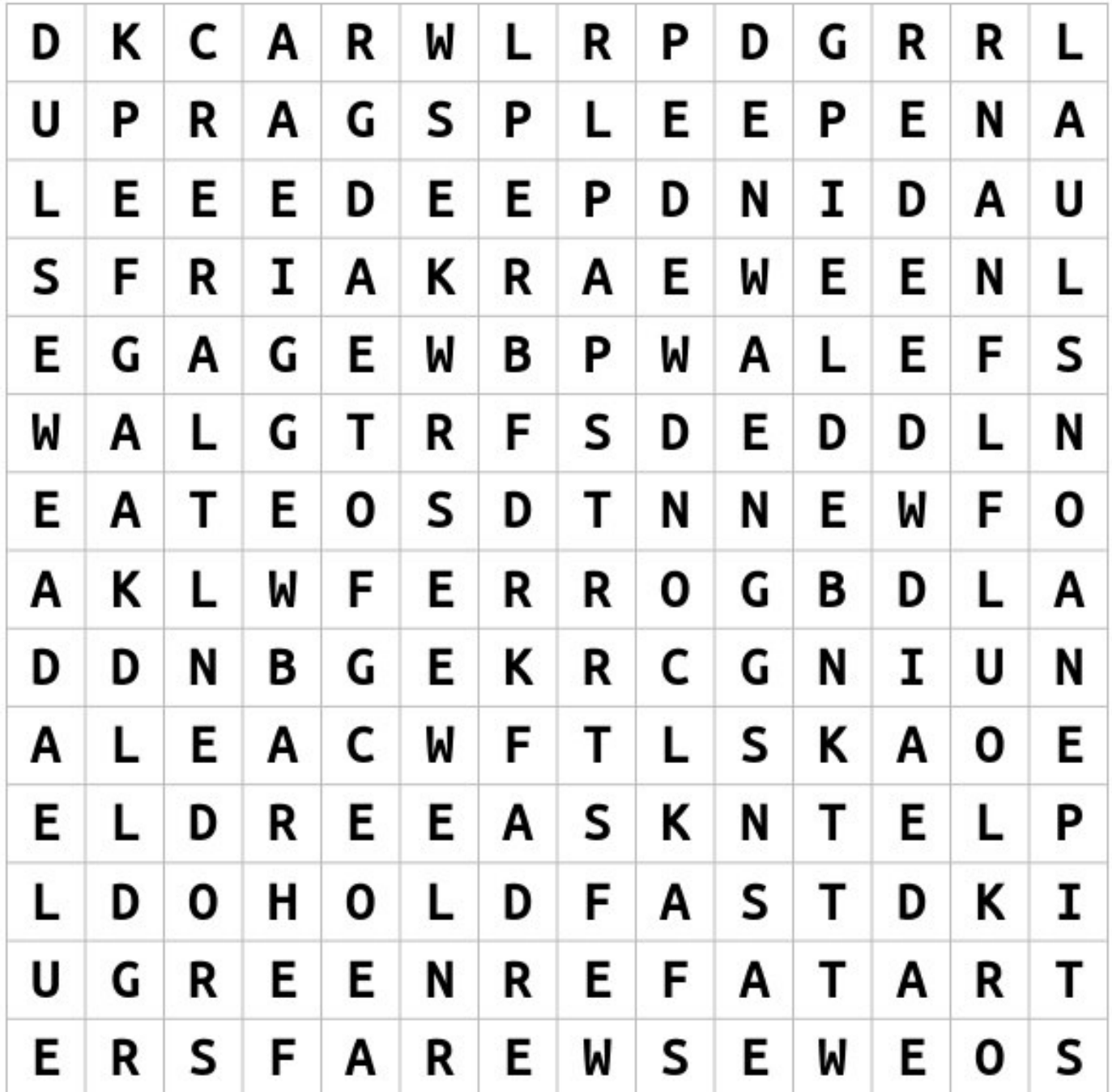
- Wear sturdy footwear and walk carefully, look out for slippery rocks
- Dress for the weather – bring sunscreen and a rain coat
- Don't survey in bad weather – stormy or windy weather can be dangerous
- Wash your hands after touching seaweeds
- It is safest to search on a falling (and not a rising) tide
- Be aware of the tide coming in and make sure you know how you will return to the shore





PUZZLE

SEAWEED WORDSEARCH



Can you find the words below in the word search?

SEAWEED

ALGAE

GREEN

BROWN

KELP

HOLDFAST

STIPE

FROND

DULSE

WRACK

SEAWEED



Sea Lettuce

ULVA LACTUCA

SIZE: 180-600 mm in length

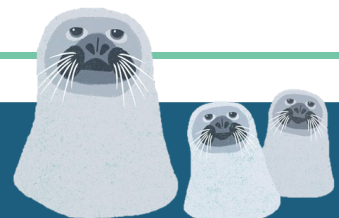
LOCATION: Upper and middle shore

WHAT DOES IT LOOK LIKE?

A thin green **alga** with a broad, crumpled frond that is translucent and sheet-like yet tough. Limp in appearance on the rocks when the tide is out, sea lettuce takes on a more delicate, floaty appearance when covered in water. It is attached to the rock via a small hold-fast.

FUN FACTS:

Sea lettuce is rich in iodine and vitamins A, B and C and is used in salads and soups in parts of northern Europe and Asia.



DISCOVER

SEAWEED



Oar Weed

LAMINARIA DIGITATA

SIZE: Up to 1.5 metres

LOCATION: Oar weed is found along the low shore, down to depths of 20m. It only becomes fully exposed at very low tides.

WHAT DOES IT LOOK LIKE?

The plant is attached to rocks by a branched, root-like structure called the 'holdfast'. At the other end of the stem (or 'stipe') is the broad and leathery blade or frond of the plant which is subdivided into up to 12 fingers and is olive-brown in colour.

FUN FACTS:

Oar weed is one of the large seaweeds collectively referred to as 'kelp'. Kelp beds are an important habitat, providing shelter for many other marine creatures including worms, brittlestars, sea urchins and fish.

Kelp is used extensively for a wide range of human uses including food, as fertiliser, in cosmetics, as a food seasoning and a source of chemicals. As an important micro-habitat for many other marine creatures it is important that seaweed harvesting is undertaken in a **sustainable** way.



SEAWEED



Bladder wrack

FUCUS VESICULOSUS

SIZE: Up to 1 metre long

LOCATION: Bladder wrack can be found amongst rocks on sheltered and exposed shores. This seaweed tends to form a band below another seaweed species called spiral wrack.

WHAT DOES IT LOOK LIKE?

This seaweed is a dark olive brown colour. Bladder wrack takes its name from the pairs of almost spherical air bladders that are found along the length of their fronds, often in pairs along the stem. The air bladders give the bladder wrack buoyancy allowing it to float upright underwater and to exchange gases and nutrients with the seawater.

FUN FACTS:

Bladder wrack is robust to environmental changes and can tolerate changes in temperature and light. It is important for promoting **biodiversity** as it provides a surface and shelter for various species including the tube worm and surface grazing snails.



SEAWEED



Spiral wrack

FUCUS SPIRALIS

SIZE: up to 40cm long

LOCATION: Spiral wrack can be found amongst rocks on sheltered to moderately exposed shores all around Scotland, forming a band below channelled wrack.

WHAT DOES IT LOOK LIKE?

It is a pale olive brown seaweed with swollen greenish reproductive structures at the tips that resemble inflated air sacs. The fronds are often twisted, giving this seaweed its name.

FUN FACTS:

Found on the upper shore, this species can tolerate drying out and it spends up to 90 percent of the time out of the water. To survive, it curls up to conserve moisture and produces mucus to help it stay moist.

This seaweed can help to mitigate the effects of **climate change** by improving ocean acidification and deoxygenation. It is also efficient for storing carbon.



SEAWEED



Gutweed

ULVA INTESTINALIS

SIZE: The tips are typically between 100-300mm long and 6-18mm in diameter.

LOCATION: Found on the upper to lower shore on rocks, pebbles, mud and in rock pools.

WHAT DOES IT LOOK LIKE?

In the summer it is bright to dark, grassy green in colour, and gradually decays through the year, forming masses of bleached white fronds by the end of the year. Gutweed grows from a small disc-shaped base. It has long, thin, unbranched fronds with unrounded tips.

FUN FACTS:

Gut weed can grow in fresh or salty water. It may form large floating mats if it becomes detached from its disc shaped base in stormy weather or after being grazed upon. The gas trapped in its tubular fronds helps keep it buoyant and makes it look like intestines, hence the name.





BLOG

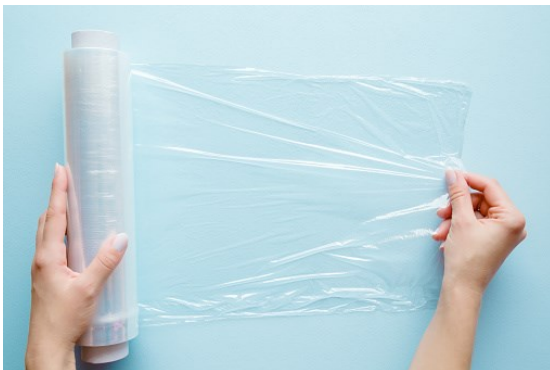
HOW PEOPLE USE SEAWEED

People have made use of seaweed for thousands of years in many different ways. Seaweed has long been an important food source across the world, including here in Scotland. As well as being eaten by itself and used in salads and soups, seaweed can be flaked and used as a seasoning in place of salt. The dark outer layer of some sushi rolls is a seaweed called nori. Nori is used a lot in Japanese cuisine, adding a salty flavour to many seafood dishes.



Seaweed extracts can be used in small amounts in a wide-range of foods, from sweets, jelly and ice-cream, to sauces and dressings. Sometimes described as a 'super food', seaweed can be a good source of vitamins and minerals and has a number of health properties. And its not just humans that eat seaweed, it can be used as an animal feed too for sheep, horses and cattle.

A huge range of non-food products also make use of seaweed. It can be found in some toothpastes, shaving foams, make-up, skin products and fabric dyes. Industrial products like paint, adhesives, gels and explosives also make use of seaweed-derived ingredients. Farmers can also use seaweed as a fertiliser for enriching soil.



New uses for seaweed are being explored all the time. Excitingly, seaweed could help with some environmental challenges. Something to expect to hear more of in the future is edible food packaging made from seaweed. Many manufacturers are exploring this as an alternative to plastic packaging.

Please note: Foraging for seaweed can be great fun but take care to collect them away from any potential sources of **pollution**. Always keep an eye on the tides when out on the beach.



SPOTTER SHEET

SEaweEDS

This is a guide to help you identify some of the common seaweeds on Scottish rocky shores. Use the circles provided to mark which species you spot. See definitions of body parts on next sheet.

OARWEED

Laminaria digitata



A species of kelp growing to 1.5m. It has a flexible, smooth stipe and multiple fronds which are thick, leathery and olive-brown. Only found on the low shore, often forming a dense canopy near the low tide mark.

CUVIE

Laminaria hyperborea



A kelp similar to oarweed except growing to 3m with a rigid, rough stipe often covered with other seaweeds. Only found at the bottom of the low shore. Commonly, only the top of the kelp can be seen, appearing above the surface at low tide.

SUGAR KELP

Saccharina latissima



Similar coloured kelp to other species, also growing to 1.5m. Distinguishable from other kelps by a single, crinkled frond shaped like a leather strap. Stipe is short and flexible. Only found on the low shore, particularly in pools.

SAW WRACK

Fucus serratus



A flat, green-brown seaweed on the lower shore, growing to 65cm. Easily distinguishable from other wrack species by its forked ends and serrated edges, giving the species its saw-like appearance.

EGG WRACK

Ascophyllum nodosum



A long (1.2m), yellowish-brown wrack of sheltered shores. Gets its name from the large egg-shaped air bladders within its fronds. Often has tufts of a red seaweed (*Polysiphonia lanosa*) growing on its surface. Forms dense layers in the mid shore.

BLADDER WRACK

Fucus vesiculosus



A species of wrack with characteristic air bladders, commonly occurring in pairs, in its fronds. Greenish-brown in colour, though can appear darker. Can form dense beds in the middle shore, growing up to 80cm long.

CHANNELLED WRACK

Pelvetia canaliculata



A small species of wrack that forms clumps on the upper shore. Green-brown in colour and grows to 12cm. So called because of its ability to curl its fronds inwards to form a channel, making the species very tolerant to dry conditions.

SPIRAL WRACK

Fucus spiralis



Only found on upper parts of sheltered shores. Fronds tend to twist spirally downwards, giving the species its name. Swollen, greenish reproductive structures form at tips resembling inflated air sacs. Grows to 20cm.



SPOTTER SHEET

SEaweeds CONTINUED

GUTWEED

Ulva intestinalis



Bright green, stringy seaweed found in sheltered estuaries, brackish lagoons and upper shore rockpools. Aptly named due to its long, membranous tubed fronds. Grows to 75cm and can form carpets over rocks.

SEA LETTUCE

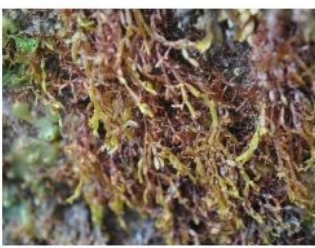
Ulva lactuca



Flat, bright green, lettuce-like seaweed that grows in rockpools on the upper and middle shore. Fronds are broad, membranous, with tattered edges. Can grow to 40cm, though fronds crumple-up making it hard to distinguish exact size and shape.

BUNNY EARS

Lomentaria articulata



A delightful bright red seaweed of the low shore. Also called 'sausage weed' due to its divided and constricted fronds resembling strings of sausages! The ends split into two, giving the appearance of ears. Small, reaching a maximum of 10cm long.

DULSE

Palmaria palmata



Flat, reddish-brown seaweed that favours moderately exposed shores. Grows to 40cm. Fronds are broad and tough, often divided into finger-like shapes. Attaches via a small disc-shaped holdfast. Often found growing on the stipes of cuvie.

CORAL WEED

Corallina officinalis



A bushy seaweed that resembles a small, pink fern. Grows to 10cm in wet areas low down the shore or rockpools. Though classified as a red seaweed, a layer of calcium carbonate (the same material that makes up shells) makes it appear chalky-pink in colour with white tips.

LAVER

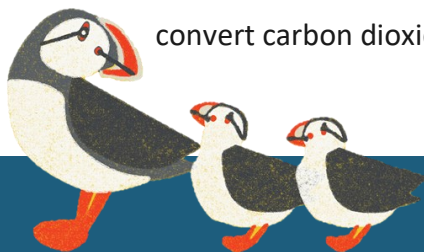
Porphyra spp.



Renown for being the main ingredient in the Welsh delicacy, 'laverbread'! There are different types of laver but all have thin, membranous fronds that form clumps or films across the surface of rocks. Colours vary from purply-brown to yellowish-green. Grows to 50cm in length.

BEGINNER'S GUIDE TO SEaweED STRUCTURE:

- **Holdfast** – The structure at the base of the seaweed that attaches it to a hard surface. They can be shaped like claws, discs, or simply spread along a rock like a carpet. Unlike plant roots, they do not absorb nutrients.
- **Stipe** – Similar in function to the stem of plants, this is a trunk-like structure that supports the fronds of the seaweed.
- **Fronds** – The leaf-like food factories, containing the molecule 'chlorophyll' which uses sunlight to convert carbon dioxide and water into sugars.

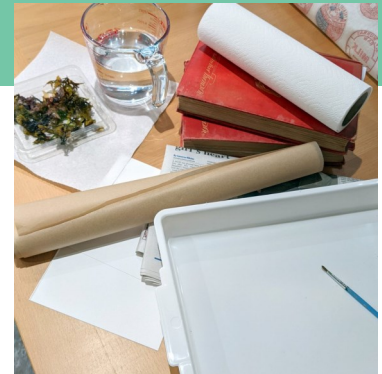




CRAFT

SEAWEED PRESSING

The many shapes and colours of seaweed can be used to create some beautiful art. Choose a variety of smaller, more delicate seaweeds for this drying and pressing activity.



WHAT DO I NEED?

- Samples of seaweed
- Kitchen roll
- A deep tray
- Baking parchment
- Heavy paper like watercolour paper
- Paint brush
- Fresh water
- Heavy books

1



Gather some seaweed samples, making sure that there is no wildlife living among them. At home, rinse your seaweed in fresh water.

2



Fill your tray with water and submerge a sheet of heavy paper at the bottom of the tray.

3

Float your seaweed over the paper and move it into the arrangement that you would like to preserve.



4

Carefully lift out the paper with the seaweed in place on its surface. Gently pat it dry with some kitchen roll.

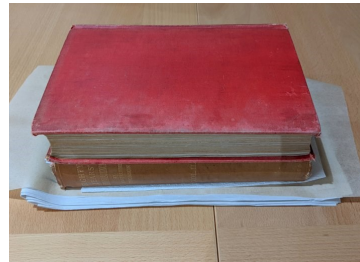


5



Use a paint brush to fan out the small fronds of your seaweed to ensure as much detail as possible will be preserved.

6



Place a piece of baking parchment over the seaweed, put a layer of kitchen roll or newspaper on either side of the paper and place all the layers between heavy books.

Check your pressed seaweed each day. If it feels wet, you can change the paper layers. Once the seaweed is completely dry, you can remove it. Remember that small, fine seaweeds will dry more quickly than larger, thicker pieces.

TOP TIP: You could use your dried seaweed to make a greetings card or a piece of art for your wall.





PUZZLE

WORDSEARCH SOLUTION



DISCOVER

GLOSSARY

ALGA

A simple, non-flowering plant which is usually aquatic. Seaweed is an example of an alga. The plural of alga is 'algae'.

BIODIVERSITY

The variety of species or environments on the planet. The more variety, the healthier the planet.

CALCIFIED CRUSTS

Edges hardened by calcium carbonate (a chemical compound).

CLIMATE CHANGE

Change in temperature and weather across the Earth that can be natural or caused by human activity.

HOLDFAST

The structure at the base of the seaweed that attaches it to a hard surface. They can be shaped like claws, discs, or simply spread along a rock like a carpet. Unlike plant roots, they do not absorb nutrients.

PIGMENT

A substance whose presence in the tissues or cells of animals or plants colours them.

POLLUTION

Something harmful that gets into the air, a water source or soil.

SPORE

A spore is a cell that certain fungi, plants and bacteria produce. Spores are involved in reproduction (the creation of new life).

SUSTAINABLE

Use of resources in such a way that they will not run out or become too scarce.

TISSUES

A mass or layer of cells, usually of one kind, that perform a special function and make up the basic structural material of an animal or plant.