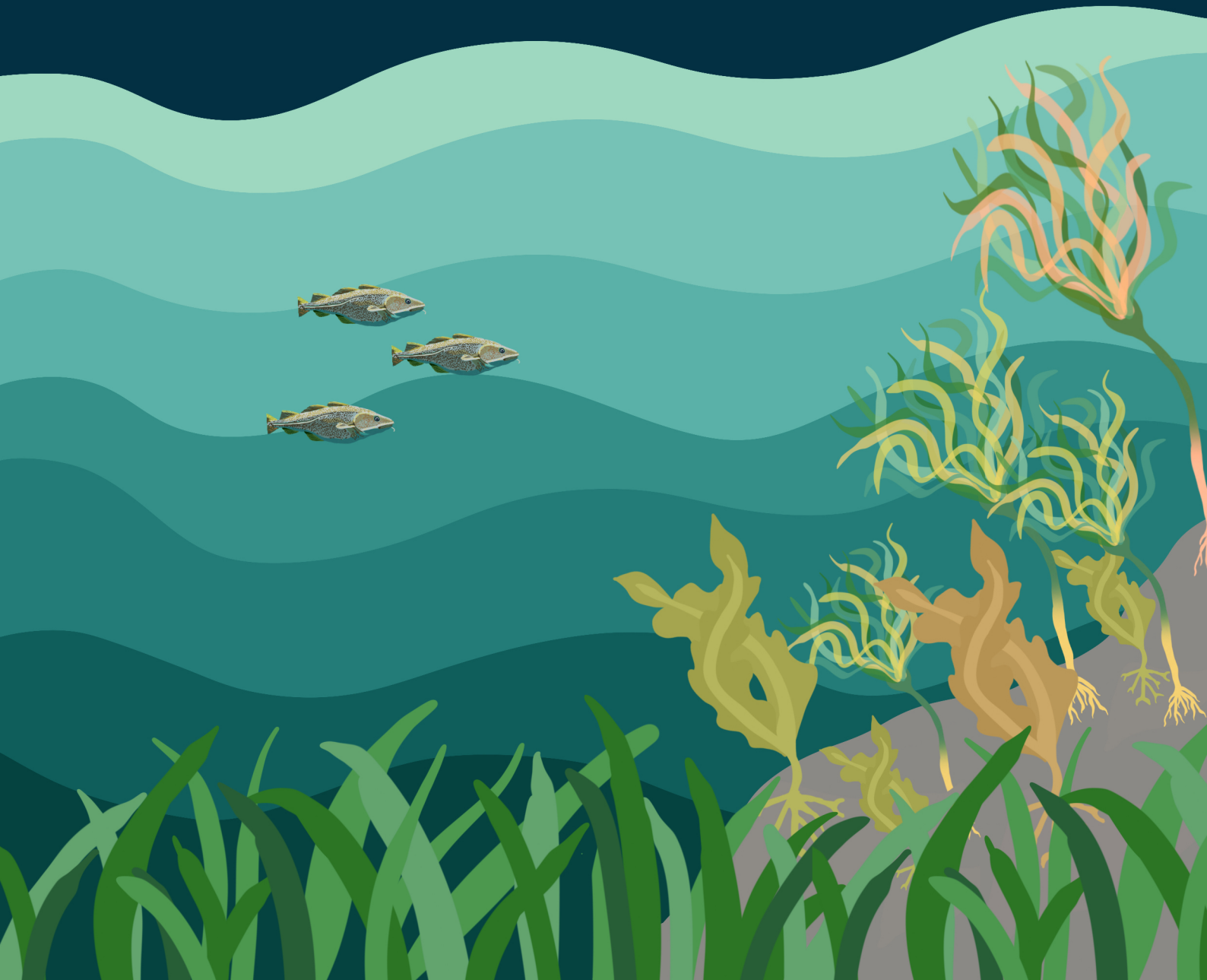
PROJECT SEAGRASS

REPRODUCTION
ACTIVITY GUIDE
AGES 11-14



OVERVIEW

This activity guide introduces the topic of plant reproduction. Within this guide are five activities: firstly, to help understand plant's reproduction structure, followed by activities to understand processes of sexual and asexual reproduction.

KEY INFORMATION

- Indoor and outdoor activity
- Individual and group activity
- Time – 2 hours
- Teacher presentation, practical, workbook

- **Lesson Objective:** Flower structure and reproduction in plants
- **Curriculum links:** Science

LEARNING TIPS

Many of these activities can be easily adapted for the outdoors, especially in beach settings. For example, students can draw plant or cell structures in the sand and use different sized pebbles or other natural debris for the flower component.

INTRODUCTION

Plant reproduction is a very important process because it is how new plants are produced! There are two types of reproduction: sexual and asexual reproduction. Sexual reproduction produces new plants which are genetically very different – like siblings, which have the same parents but their own unique genetics. Asexual reproduction is when a plant produces a

clone of itself, something that humans cannot do – we are not clones of our parents!

KEY WORDS

Reproduction – the process by which plants and animals make new offspring

Sexual – reproduction involving both male and female cells. Offspring are a combination of the male and female

Asexual – reproduction involving clone cells from one plant

Clone – an exact copy

Pollination – when male and female plant cells combine in the process of sexual reproduction

Dispersal – the spreading of seeds or pollen over a wide area

Rhizome – a plant stem that grows underground

Pollination is the process which happens through sexual reproduction, where female and male sex cells meet, pollinate, and create a seed. On land, pollination is aided through animals and through the wind. Bees are a common pollinator, but animals such as birds and even primates are also crucially important pollinators! In the marine environment, pollination is aided through currents and wind but interestingly, also through small critters like crabs, which help spread pollen underwater!

After pollination occurs and the seeds mature, they leave the plant and drift in ocean currents until they settle somewhere new to grow. Similarly, on land a seed falls from a tree and is taken by the wind to a new destination.

However, the challenge does not end there! For plants to grow well, they must outcompete other nearby plants for light, water, space, and nutrients. This means that the seeds must settle in an area that is far enough away from other growing plants to succeed!

In asexual reproduction, no pollen is produced! Instead, plants like seagrass sprout new growth from special structures called rhizomes, which are stems that grow horizontally, along underground before developing stems that grow vertically, upwards. Seagrass can reproduce via both sexual (genetically different plants) and asexual (identical plants) reproduction!

Flower –
produce seeds where new plants will grow. The flower is usually colourful for attracting insects

Root –
the part of a plant which attaches it to the ground or to a support, typically underground, conveying water and nourishment to the rest of the plant via numerous branches and fibres

Stem –
transports nutrients like water and glucose all around the plant

Seeds –
when male and female sex cells meet, they reproduce and mature into seeds

Leaf –
site of photosynthesis

Blade –
a flattened structure that is resembles a leaf

Float –
a hollow, gas-filled structure that helps the seaweed float

Stipe –
a stem-like structure, not all seaweeds have these

Holdfast –
acts as an “anchor” and attaches to a surface (e.g., a rock)

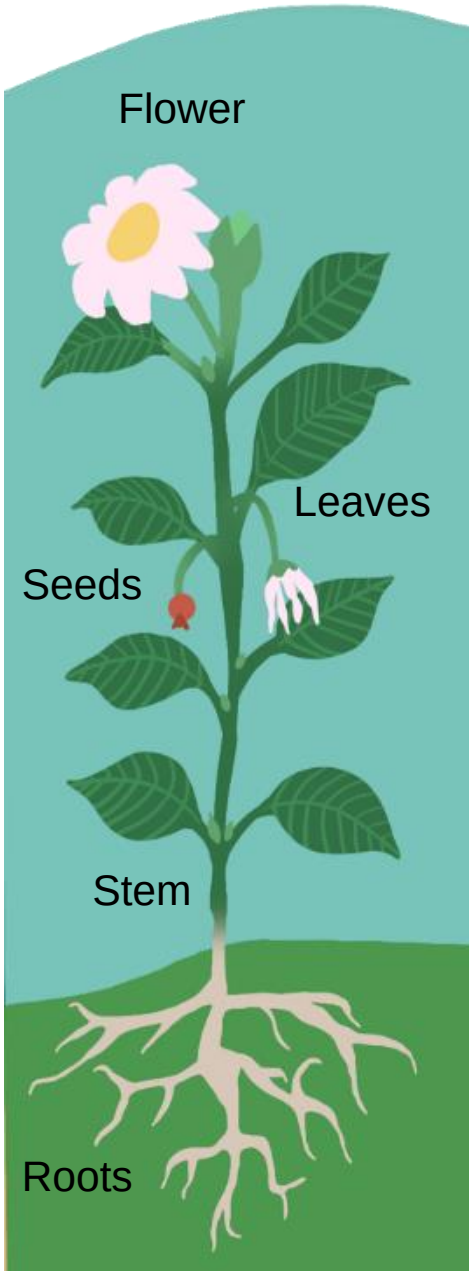
ACTIVITY 1:

1) Discuss with students what a plant/algae structure looks like. First, use a questioning approach to draw out answers and anything students may already know. Discuss key structures and the roles that these structures play.

YOU WILL NEED:

Some cuttings for labelling and drawing:

Key structures of plants
Flower – Make sure to mention that flowers produce male and female sex cells and that insects, like bumblebees, are attracted to flowers because they are very colourful!
Root – Discuss with students why they think that the roots of a plant are underground? This allows these special structures to absorb water and nutrients from the soil to the rest of the plant via numerous branches and fibres.
Stem – Ask students why they think stems are important? This structure is used to transport water and nutrients around the plant and is also the backbone of the plant, meaning that this is how the plant stands up straight!
Leaf – Make sure to ask students why leaves are important beyond reproduction… The leaf of a plant is the site of photosynthesis, which is how a plant is able to make its own food!
Seeds – Seeds are essential to plant reproduction! Discuss how when male and female sex cells meet, they reproduce and mature into seeds. These seeds then have the big responsibility of finding a suitable area for the new plant to grow.

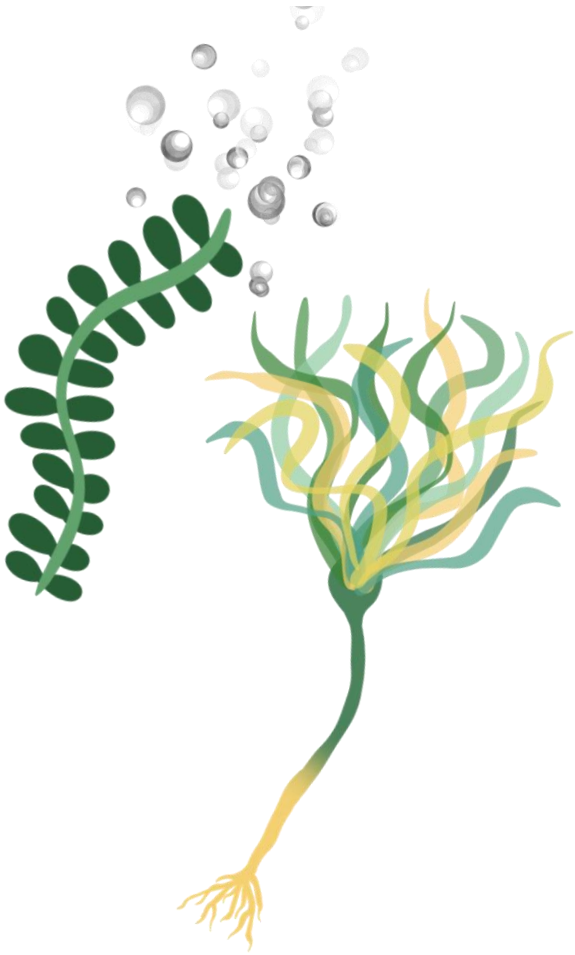


2) Now that students are familiar with the structure of a plant, have them look at real plants/algae and draw them. We recommend a jade tree (*Crassula ovata)* for the terrestrial plant, and seagrass (*Zostera marina*) for the marine plant (remember that seagrass only flowers from around June – early August in the UK).

3) At the end, highlight to the students that the flower is the most important structure for reproduction. Discuss whether marine plants and terrestrial plants differ slightly? If so, how?

ACTIVITY 1 ANSWERS:

- Terrestrial plants get plenty of air, so they usually have stomata on the bottoms of their leaves.



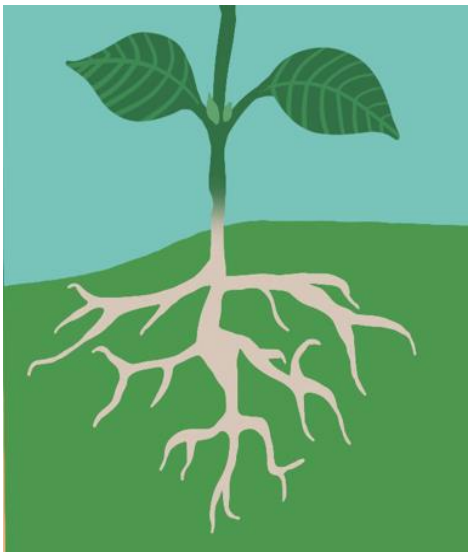
- Plants that float on the surface of the water have their stomata on top of their leaves, where they have access to air.

- Plants that live completely under water gather carbon dioxide from the water.

- When they release oxygen, you can see tiny air bubbles gathering around them.

- Plant roots drink water and nutrients from the environment.

- Aquatic plants have plentiful water to drink, but nutrients may be scarce; the opposite is true for terrestrial plants.

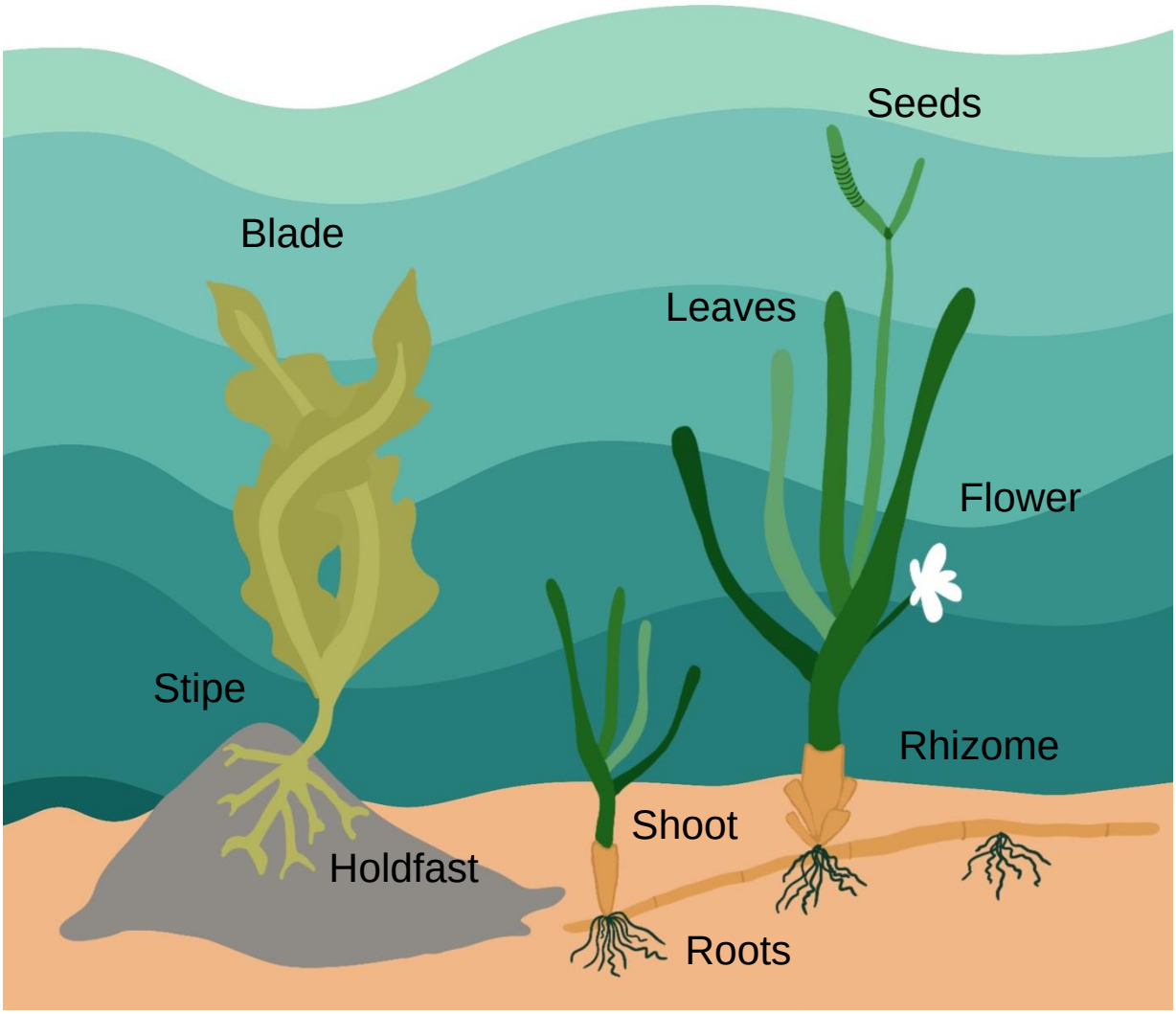


- Terrestrial plants' roots change shape to compensate for what the plant is trying to get from its environment.

ACTIVITY 2:

Students may ask if seagrass is the same as seaweed. They are not the same at all! To start off, **seagrass** is an **angiosperm** (a flowering plant), whereas a **seaweed** is a **marine algae**. Seagrass is more related to the plants that we find in our gardens! Just like these plants, seagrass can photosynthesise and have structures such as roots, stems, leaves and produce flowers and seeds. Seaweed do not have roots, stems, leaves, or flowers. They do however, like plants, use the green pigment chlorophyll to photosynthesise.

Seaweeds, like seagrass, need salty or brackish water to survive, with plenty of sunlight and a surface to attach themselves to (like rocks). Instead of roots, seaweeds have a holdfast and are usually found on rocky shores rather than sandy seabed.



Firstly, discuss the structure of a seaweed with students. Drawing out answers may be more difficult than discussing the anatomy of a plant, so if no answers are drawn out, ask students what job they believe certain structures do.

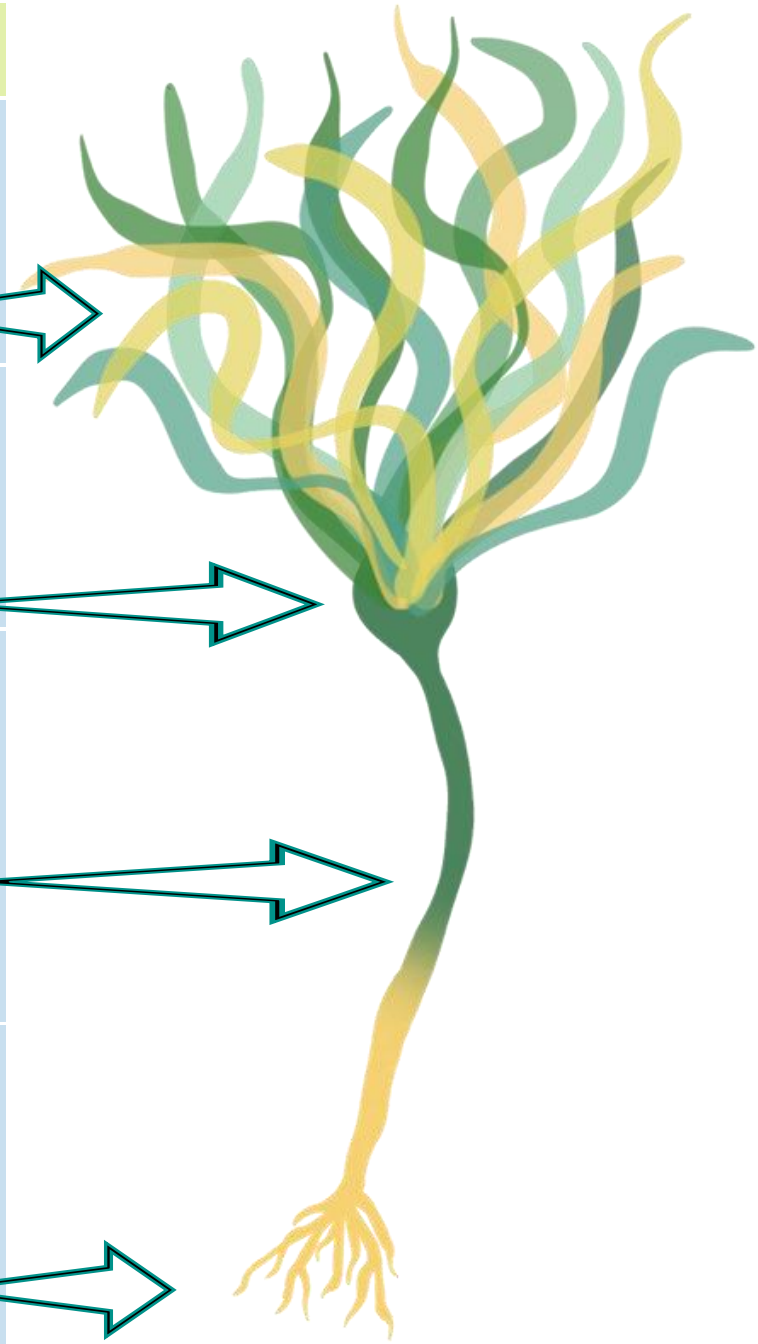
Key structures of a seaweed

Blade – These are flattened structures that resemble leaves. Ask students why they believe these structures are flat? This is in order to maximise photosynthesis efficiency!

Float – This is a hollow, gas-filled structure that helps the seaweed float. Why would the seaweed need to float? To get enough sunlight to photosynthesise!

Stipe – A stem-like structure, not all seaweeds have these. Why might some seaweed not have this structure, ask students what the benefit of this may be… Stipes are only needed in larger seaweed, like kelp, to make sure that they have structure. Smaller seaweeds do not need the same support!

Holdfast – Why are holdfasts important? They act as an “anchor” and attaches to a surface (e.g., a rock). This means that the seaweed is safely secured and will not drift away in the currents.



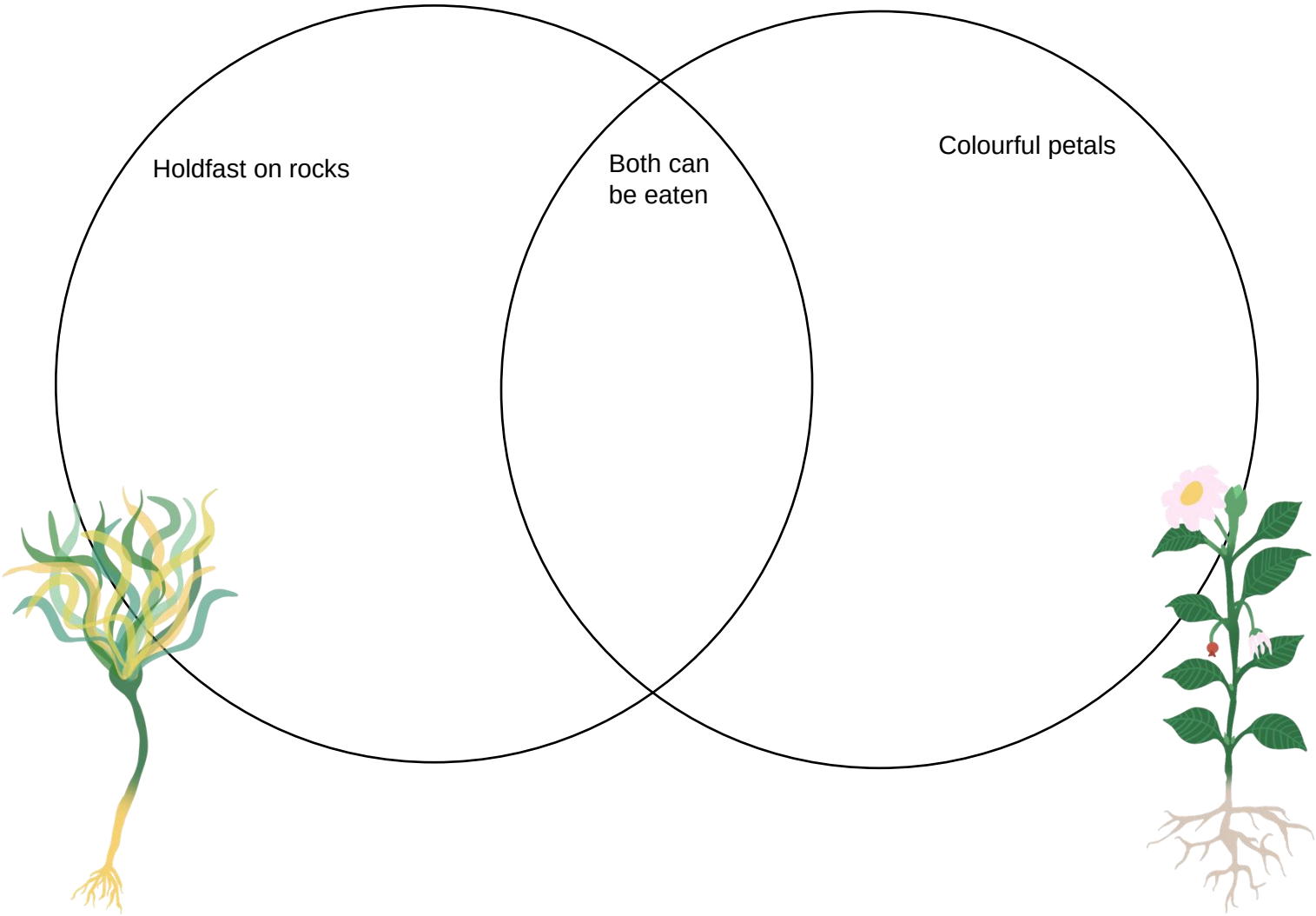
Seaweed Reproduction

Like plants, seaweeds have two types of reproduction – sexual and asexual reproduction! Sexual reproduction is where male and female sex cells meet and create new, genetically different seaweeds. Asexual reproduction happens when a seaweed breaks into little pieces and directly into new algae (that is actually a clone of the parent seaweed)!

1) Give students/groups of students one type of seaweed (we recommend kelp if possible) and one flowering plant. Have students compare the differences and similarities between the seaweed and a flowering plant.

2) Discuss: what structures does a plant have that a seaweed does not? Do they differ in colour? Do they feel different? Can they do the same processes (e.g., photosynthesis – yes, they can).

3) Have students put their knowledge to the test by completing the Venn diagram, which highlights the key differences and similarities of both structures:

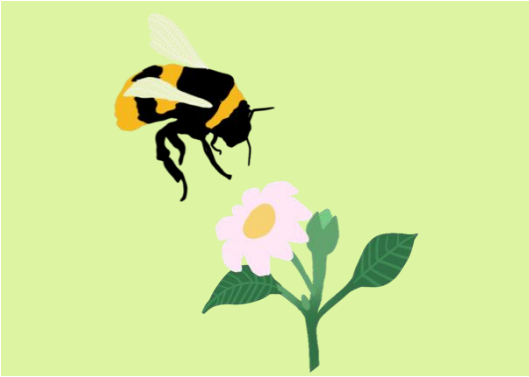


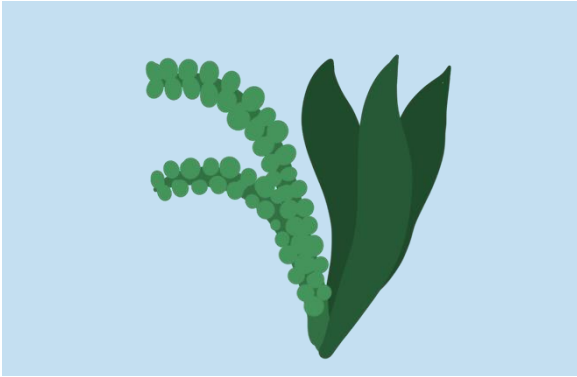
ACTIVITY 3:

During plant reproduction, pollen grains need to move from one flower to another. How do they do this? **Pollination!** Insects can pollinate flowers, and so can the wind or water. Plants are adapted to be pollinated either by animals or by the wind:

YOU WILL NEED:

Real terrestrial and aquatic plants (keep in water tank) or use plant ID books as a backup





Feature	Insect pollinated	Wind pollinated
Petals	Large and brightly coloured to attract insects	Small, often dull green or brown, no need to attract insects
Scent and nectar	Usually scented and with nectar	No scent or nectar
Number of pollen grains	Moderate – insects transfer pollen grains efficiently	Large amounts – most pollen grains are not transferred to another flower
Pollen grains	Sticky or spiky – sticks well to insects	Smooth and light - easily carried by wind without clumping together
Anthers	Inside flower, stiff and firmly attached – to brush against insects	Outside flower, loose on long filaments – to release pollen grains easily
Stigma	Inside flower, sticky – pollen grains stick to it when an insect brushes past	Outside flower, feathery – form a network to catch drifting pollen grains

The pollen then germinates. Eventually, this matures into a seed. When this seed is fertilised, flowers develop into a fruit. In seagrass, the fruit remains on the plant and does not surrond the seed like typical fruits that students will be familiar with (e.g., an apple).

Discuss some key pollinators – birds, insects, weather. Discuss why the role of these factors are important. Answers could be that they help our food grow, help our medicine grow, helps with climate change, helps create our oxygen and clean our air…Have students draw a plant and the different ways of dispersal, e.g., wind, bees, animals:

ACTIVITY 4:

YOU WILL NEED:

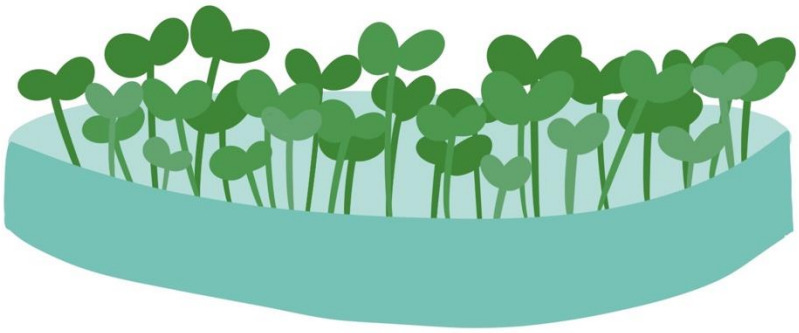
Cress seeds

Petri dishes (or small yogurt pots)

Kitchen roll

1) Cress grows quickly, making it great at showing what conditions plants need to grow – light, water, and air!

2) At the start of the week, set up four petri dishes (or tubs/plates) with a layer of kitchen roll at the bottom and a thin layer of seeds sprinkled on the top. Each of these will be put in different conditions. Half will be exposed to sunlight, such as a window ledge, and half will be kept somewhere dark. Half will have the kitchen roll soaked in tap water, and half will be kept dry. So, the dishes will be set up as follows: light/damp, light/dry, dark/damp, dark/dry.



3) Leave these for at least 3 days (the longer the better) and then have the students identify the differences between how the cress has grown. Think how this could affect a plant such as seagrass, which has very specific growing conditions. What conditions do you think seagrass likes best?

- Too dark? There is not enough light for photosynthesis. Why is this a bad thing? The plant cannot make the food that it needs in order to survive!
- Too little water? The plant is not receiving enough nutrients which would affect how the plant grows. This will also affect photosynthesis too!

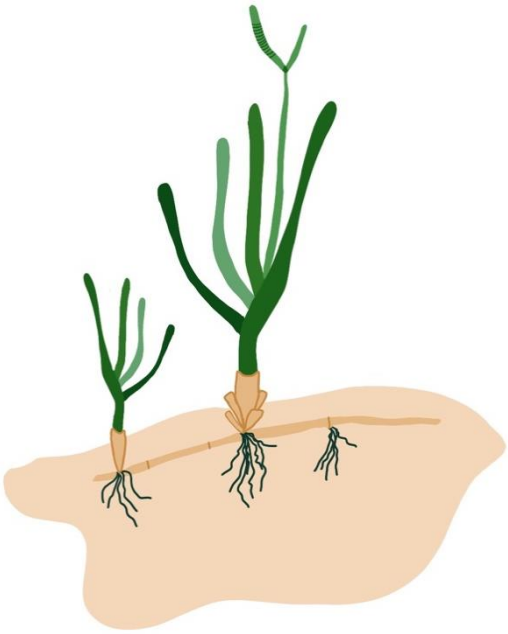
ACTIVITY 5:

YOU WILL NEED:

- Any succulent (we recommend *Crassula ovata*)
- Empty toilet/kitchen rolls
- Cutting board + knife
- Seed tray + cactus compost
- Sand + fine grit
- Clear plastic bags.

As well as producing seeds, seagrass can also reproduce by extending rhizomes and creating “clones”. These are hard to see, but you can demonstrate asexual reproduction by having the students create leaf cuttings. If the teacher has access to a spider plant, this is also a very good way to show rhizomes and can be used instead. This requires a healthy, young, but fully-grown plant (e.g., a jade plant *Crassula ovata*). Avoid damaged, diseased leaves, or those affected by pests. If possible, try and take leaf cuttings in spring to early summer.

1) Cut leaves should be left for 1–2 days to “callus” – where sections of the leaves thicken before potting.
2) Put individual leaves into pots filled with ¾ depth with 2 parts cactus compost to 1-part fine grit (if struggling to find either, sand will also work!).
3) Top with some more fine grit.
4) Try not to cover the cuttings.
5) Place them in a warm position with good light.
6) Keep compost just slightly moist – cutting will be prone to rot if left too wet.
7) Keep cuttings around 20°C in a well-lit room. Protect from direct sunshine (close to a windowsill will be fine!).



BONUS ACTIVITY:

Instead of using plastic pots, have students get creative and make their own biodegradable plant pots out of toilet/cardboard rolls (e.g., https://www.instructables.com/Biodegradable-toilet-paper-roll-pots/) which will help get the creative juices flowing and reduce our plastic use!

Please note that these plants are not as fast growing and so are unlikely to show significant results instantly. Instead, they can be taken home or to the classroom and checked every few days to see if any progress is being made! If you want to show results during the trip/ lesson, it may be a good idea for the teacher to create a couple of leaf cuttings prior to the trip/ lesson.

FUN FACT!

Did you know that in warmer countries, primates and bats are important pollinators! Very different to your average bumblebee.