Environmental Training Resource Workbook

Beach and Coast

for South Wales Outdoor Activity Providers Group (SWOAPG)

www.swoapg.org.uk

Provided by

Nature's Work

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This document has been created to give outdoor practitioners a combination of activities to use with groups whilst running adventure activities along the coastal environment and also some resources to aid their own knowledge and understanding of the coastal environment, in particular looking at the rocky shore environment.

Through this booklet the opportunity to develop a deeper connection to the natural world is offered through greater environmental awareness and understanding.

Contents

Introduction to rocky shores:

Rocky shores, by definition, occur where land and sea meet on a hard substratum. Where there is a considerable tidal range, the shore has an intertidal zone which is subject to cycles of immersion and emersion. Although the habitats and communities under consideration in the present report are often referred to as intertidal, they do not always conform to the strict definition of the term. Biological communities occupying shore levels that experience both exposure to the air and wetting by the sea are described as littoral.

Much of the community structure seen on rocky shores reveals the strong direct or indirect influence of physical factors. Clear **vertical zonation** patterns exist along the **emersion gradient** particularly on sheltered shores. The dominant mid-shore species in the UK change gradually from fucoids on **sheltered shores** to barnacles or mussels on **exposed shores**. However, rocky shores are also characterised by intense biological interactions including **competition** for space and **grazing** and **predation** which create free space. These interactions do much to shape the community from setting the limits of the vertical distributions of many species to affecting the persistence of species assemblages. It must be emphasised, however, that the direction and intensity of biological interactions is strongly influenced by the underlying physical gradient as well as offshore factors which, for example, have a strong effect via recruitment regime.

Vertical Zonation

Tides are the rise and fall of sea levels caused by the combined effects of the gravitational forces exerted by the Moon and the Sun and the rotation of the Earth. Some shorelines experience two almost equal high tides and two low tides each day, called a semi-diurnal tide.

The majority of species found in the littoral zone are of marine origin. For these species, stress increases with shore height. It is usually true that higher shore species are more tolerant of the emersion stress than species found at lower shore levels. Physiological, behavioural and morphological adaptations allow high shore species to survive periods of emersion.

An early and quite useful attempt to characterise the main zones seen on rocky shores was made by Stephenson and Stephenson (1949). The Stephenson's identified three main zones common to many shores around the world.

- The upper zone, called the **supralittoral fringe** (also described as the littoral fringe by Lewis, 1964), is mainly characterised by lichens, cyanobacteria and small grazing snails, the periwinkles.

- The much broader **midlittoral (eulittoral) zone** exists in the midshore and is dominated by suspension feeding barnacles and mussels.

- The narrow, low shore **infralittoral fringe** is dominated by red algae and kelps, species that usually extend into the permanently immersed sublittoral zone.

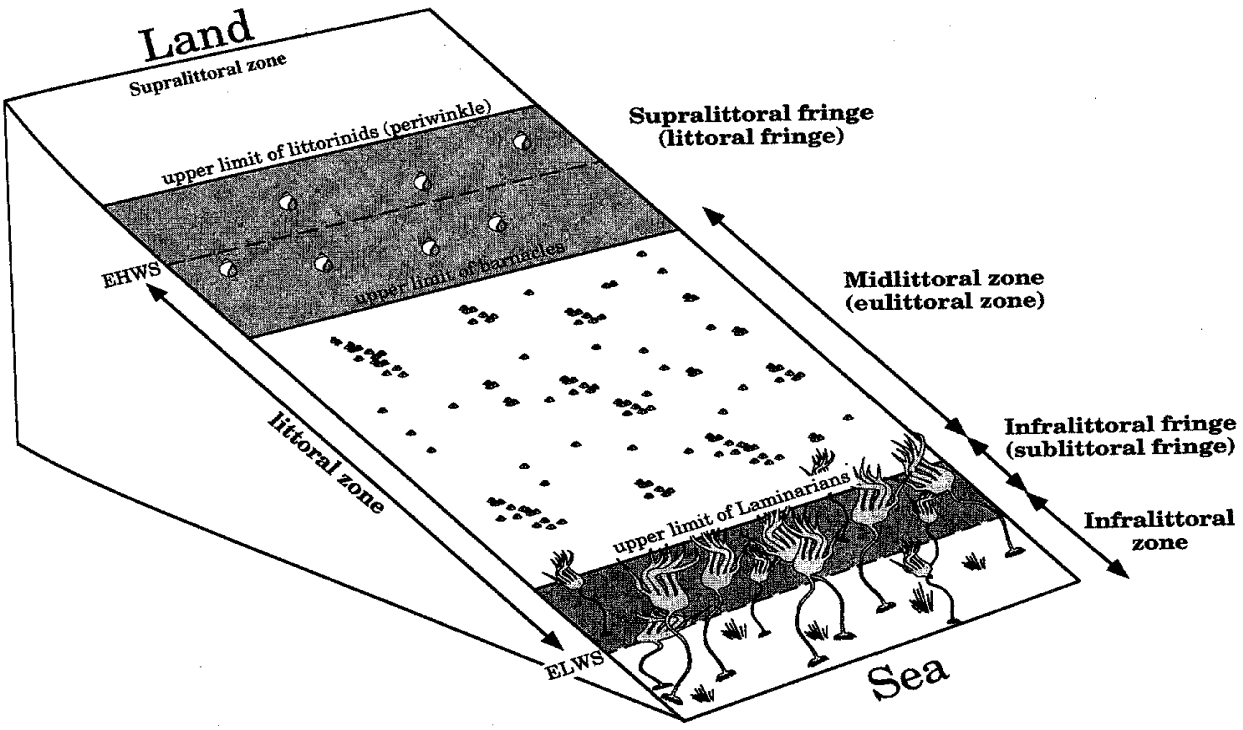


Fig 1: showing zones associated with the rocky shore

Wave action / exposure

The other major physical factor that controls what can live on a shore is wave action. Exposed shores have lots of wave action and sheltered shores have little. Below are a few diagrams explaining the main effects from a biological perspective. Coastal features are also affected by coastal processes that occur such as from transportation and deposition.

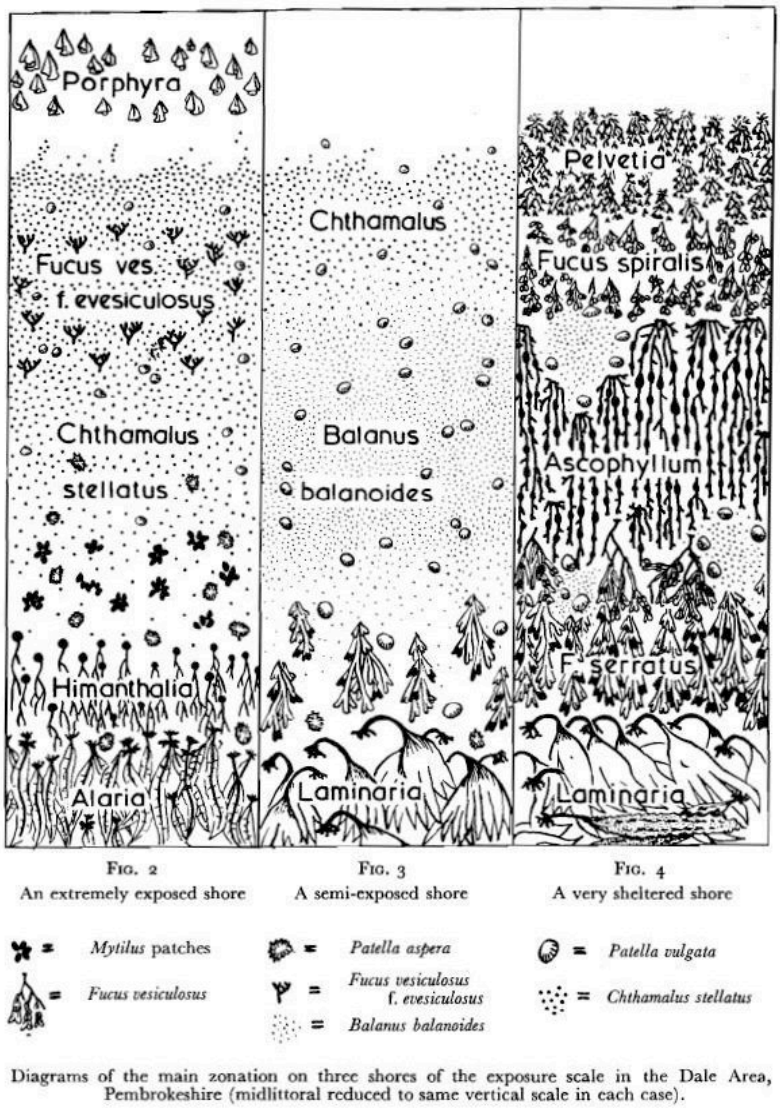


Fig 2: showing rocky shore organisms found on 3 different wave action regimes and levels of exposure.

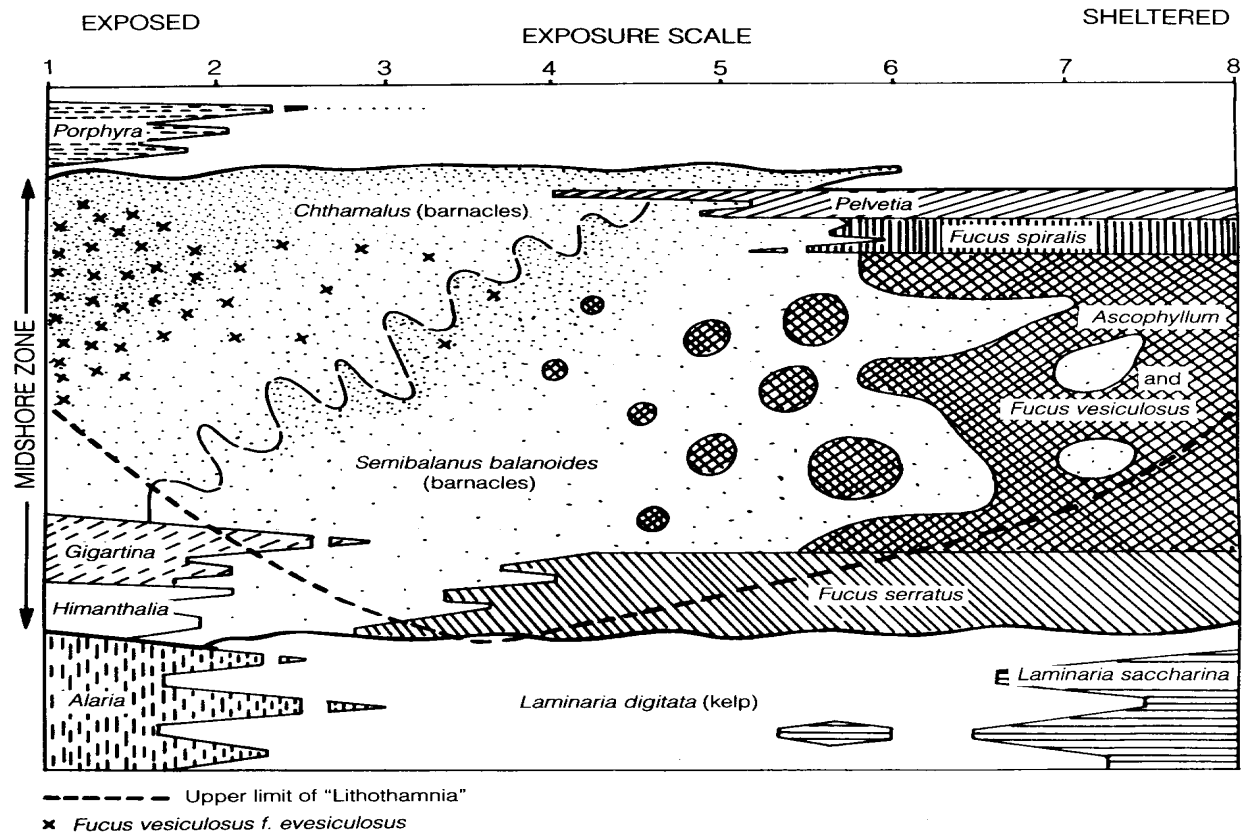


Fig 3: a pictorial stylised representation of the effect of wave action on living organisms on a rocky shore

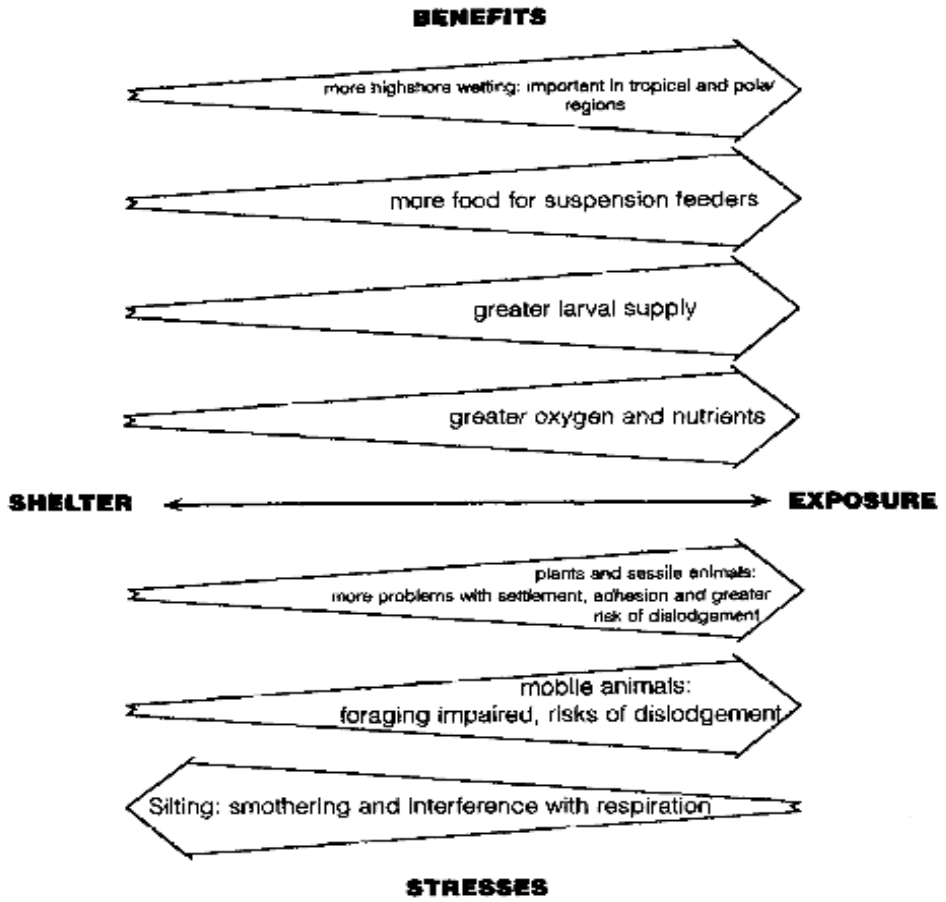


Fig 4: diagram showing stresses and benefits caused by level of wave action

Other environmental (abiotic) factors affecting life on rocky shores

Temperature
The sea remains at a more steady temperature than the land. All the common shore organisms are poikilothermic that is they cannot regulate their own temperature. As the shore becomes hot metabolism speeds up, consuming limited resources, as the shore cools, metabolism slows down. Temperature may be a factor limiting the distribution of some species:-

Periwinkles		**Survival time hours at 40˚c**
Small	*Melaraphe neritoides*	14.5
Rough	*Littorina saxatilis*	9.5
Edible	*Littorina littorea*	11.5
Flat	*Littorina littoralis*	4.5

Topshells		**Survival time hours at 5˚c**
Toothed	*Monododonta lineatum*	20
Purple	*Gibbula umbilicalis*	16
Grey	*Gibbula cineraria*	3
Painted	*Calliostoma zizphinum*	2

Desiccation
Water may be lost by evaporation, excretion or osmosis. Some shore organisms are highly adapted to minimise water loss by, for example, having an impermeable shell, e.g.

Periwinkles were placed in a drying condition at 18˚c for 1 week

Species	% weight loss	% killed by this treatment
Small winkle	26	0
Rough winkle	40	10
Edible winkle	70	70
Flat winkle	80	80+

Among seaweeds the higher shore weeds are much more desiccation tolerant than those on the lower shore. Channel wrack survives being dried by 60% of its weight. By contrast kelp dies if it dries by 20% of its weight.

Salinity
The sea usually has about 34 parts / thousand of salt. Hot sunny days or heavy rain may alter the salinity of rock pools. This presents many animals with osmotic difficulties.

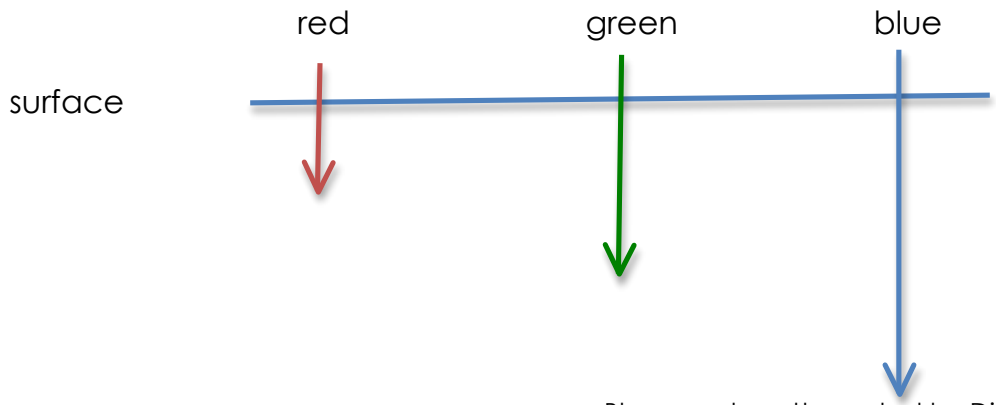
Beadlet anemones withdraw their tentacles to reduce surface area, snails become inactive, crabs and shrimps osmoregulate by means of antennal glands.

Oxygen
Oxygen may be used up by organisms which live in small bodies of water. Animals which remain in dry places at low tide must conserve moisture and so cannot

expose large breathing surfaces. Animals such as barnacles respire anaerobically when exposed.

Light

The amount of light which reaches plants decreases with depth. Therefore plants tend to float up towards the light, some using structures such as air filled bladders. The quality of light also changes with depth



Blue may be attenuated by Dissolved Oxygen Matter (hence coastal waters can look green)

The seaweeds can be split into 3 groups on the basis of their pigments although chlorophylls are present in all three:

Green seaweeds	as land plants
Brown seaweeds	fucoxanthin
Red seaweeds	phycoerythrin & phycocyanin

Biological (biotic) factors affecting organism distribution on rocky shores

Competition for space

Interspecific: Seaweed growth tends to exclude barnacles, their larvae cannot establish where weed is brushing the rocks. Barnacle species compete for space. Cthamalus is temperature tolerant and so will survive higher up the shore than Semibalanus. At the shore level where both species are present Semibalanus grows on top of Cthamalus.

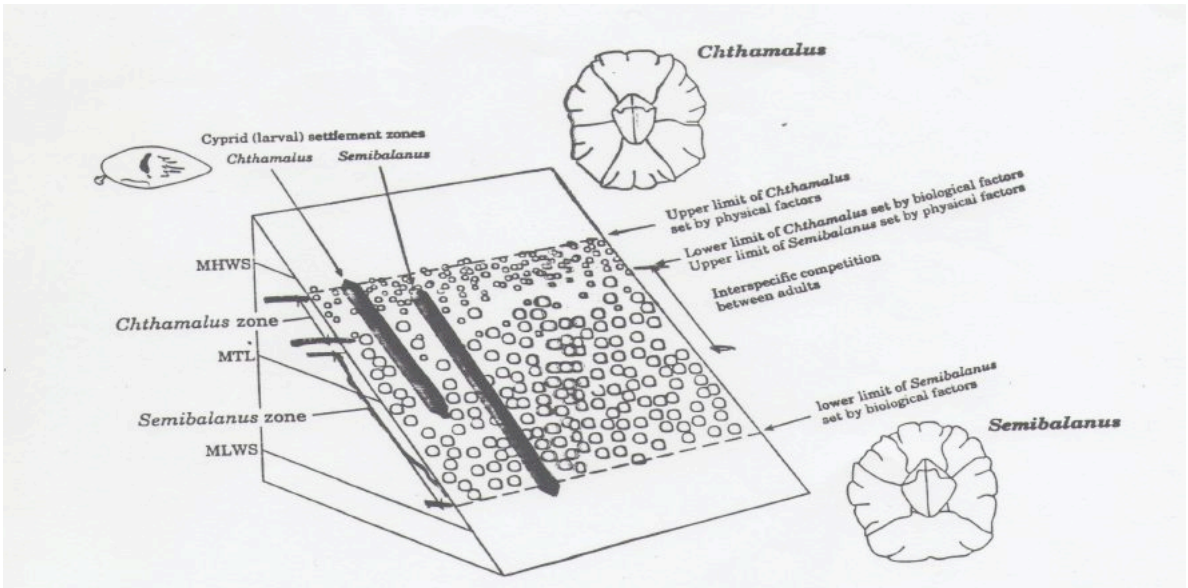


Fig 5: showing how the 2 species of barnacle interact when sharing the same habitat

Intraspecific: Barnacles grow very close together and therefore compete with one another for space.

Growth rates & grazing

The distribution of seaweed is related to grazing pressure. Toothed wrack will grow at all shore levels but is grazed faster than it grows above the lower middle shore. Higher shore weeds fail to establish on the lower shore due to grazing and slower growth rates.

The green alga Enteromorpha grows will on limpets in pools, these surfaces are wet and not grazed by the limpets themselves.

Predation

On the lower shore fish and crabs are important predators. Higher up the shore birds are more important. Dogwhelks are prominent predators.

Life cycles of selected species

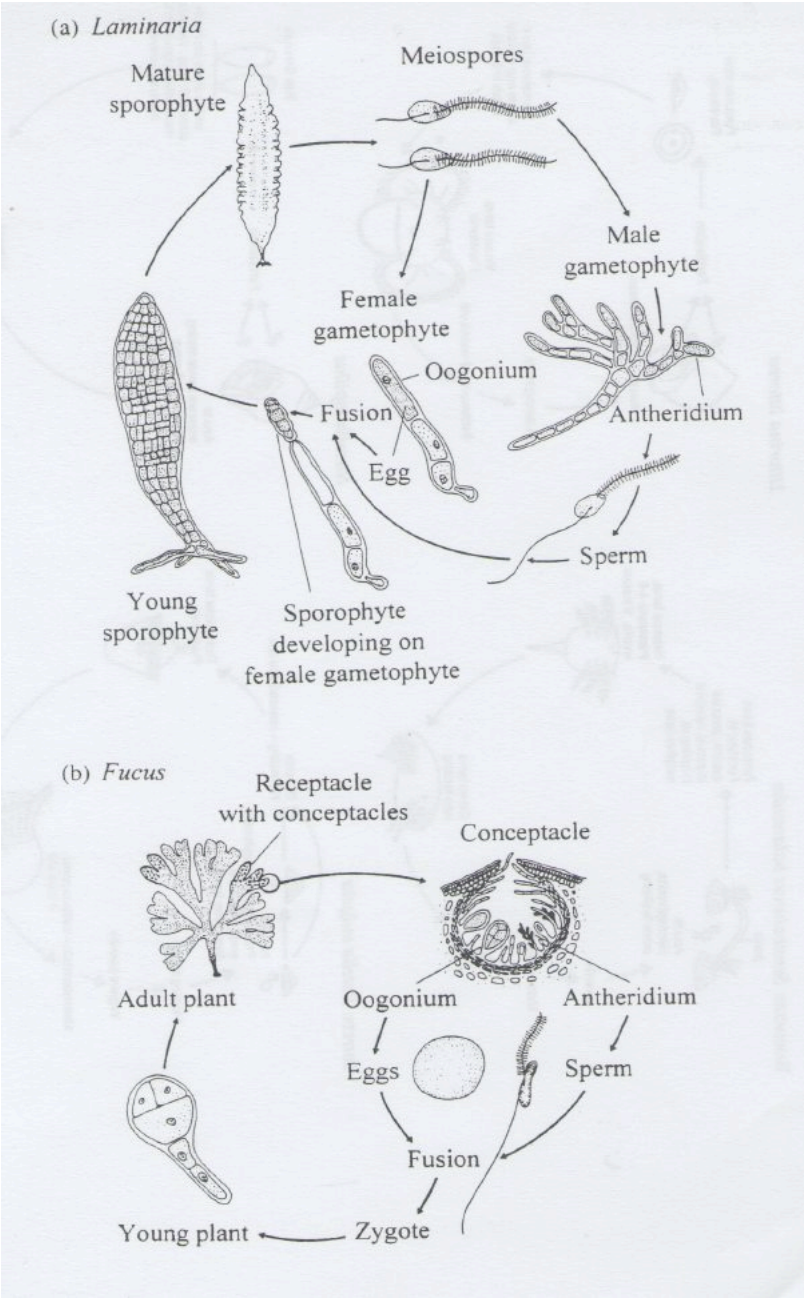


Fig 6: showing the life cycle of Oar weed (Laminaria) and bladder wrack (Fucus). Both go through an alternation of generation phase, where they reproduce sexually and then asexually

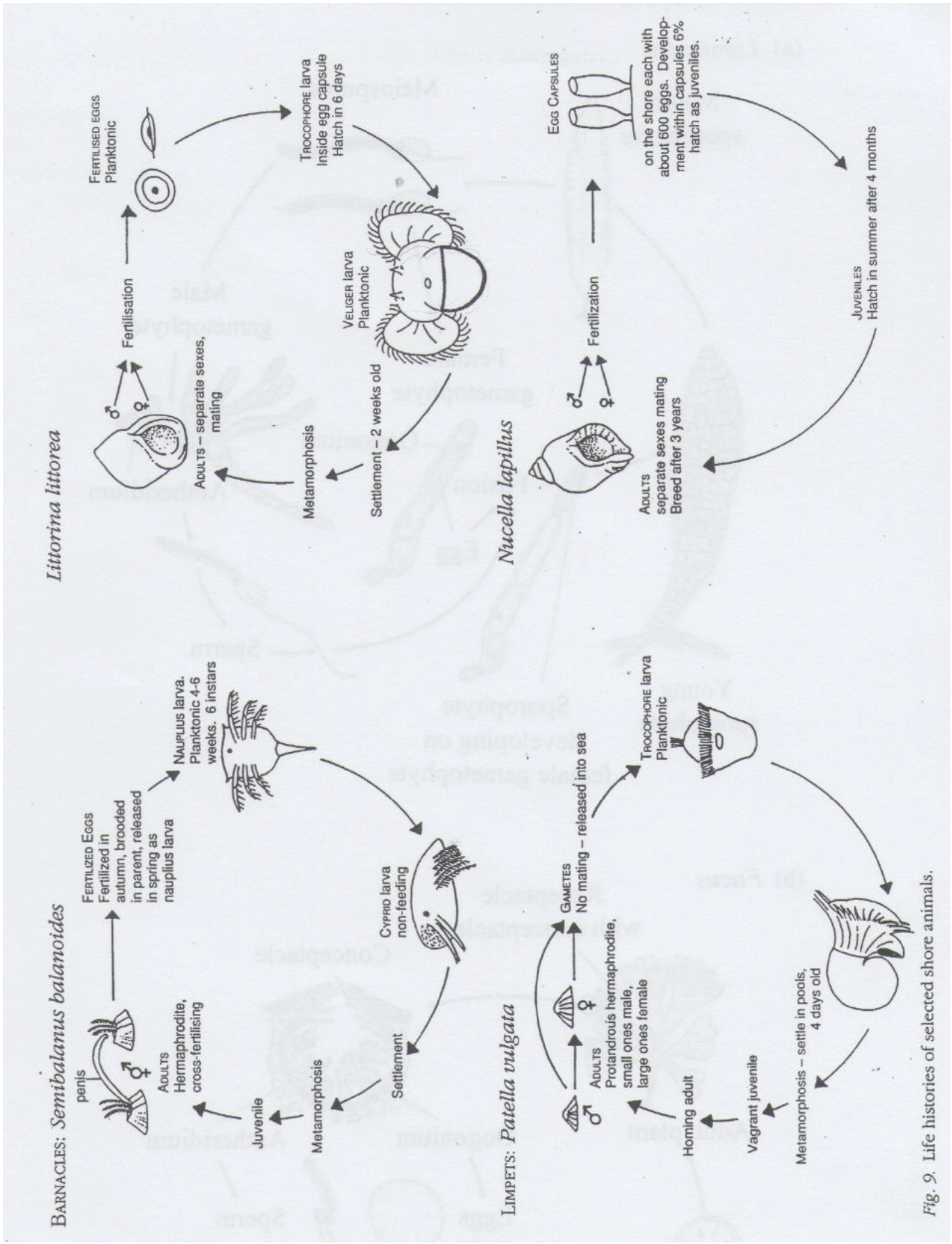


Fig. 9. Life histories of selected shore animals.

Fig 7: Showing the life cycles of 4 different shore animals. The diversity of reproductive strategy is highly evolved and specific and the timing an synchronised nature or releasing sperm often uses tides and the moon as a trigger. Some species have internal reproduction others external, also some have internal development others external. Its all fascinating

Eco-bingo

This activity can be used as an icebreaker, to connect previous knowledge and understanding of environmental issues and to encourage a positive attitude towards the environment.

Find someone who…….

Has been inspired by nature	Has watched the sunrise from a beach	Has ever been birdwatching	Can explain tides	Has been to a marine nature reserve
Knows the common name for *Fucus vesiculosus*	Can name 3 topshells	Has eaten edible winkles	Can tell you a use for a seaweed	Can name 3 coastal habitats
Knows what a neap tide is	Has swum naked in the sea	Can name a marine mammal, native to the UK seas	Can smile	Can name 5 seabirds

Notes on activities

These activities can be used on their own or could lead into further investigations or interactions with the group. With the activity leaders on the training session get them to come up with their own ways of using these cards. My approach is often to stimulate and guide and then to allow the creativity and imagination to flow.

Activity 1 - **Eco-bingo**

This activity is a great icebreaker and is useful for getting to know names. It also puts an environmental slant on and is useful for developing environmental awareness. It is simple to do, ensure everyone has a sheet and pen. The rules are that each person must find a new person for each statement (where practical). I often have a little gift for the first 'full house' but its more fun than serious bingo!!

If there are any ambiguities or people not knowing what something is then I run through some of the answers at the end.

Activity 2 - **Seaweed Discovery Card**

The group do not have to have any prior knowledge to coastal habitats or species for this activity so it is a great activity for discovering what is out there. It is structured so they have self-discovery and it is designed so they do not feel pressured to know anything before hand. The activity could then be used so that cards are swapped and people can look for someone else's seaweed using the description and drawing.

It can be used as a starter activity or done on its own it depends how it is used and what the desired learning outcomes are.

Activity 3 - **Top Trumps**

The top trump design is a means of the individual exploring the shore to find a suitable species to draw and learn about. It is similar to the previous activity but focused on animals. It could be used so that individuals create their own set therefore removing any bias in the categories.

Activity 4 - **Beach survey**

Talk to group about the sea as an environment. The cause of tides, patterns of tidal movement, effects and impacts. With reference to the shore describe high and low water and the period of immersion / emergence from the sea. Define inter-tidal zones such as; splash zone, upper shore, middle shore, lower shore, sub littoral zone.

This introduces the group to an investigation. Define zones, mark these out with ranging poles or other distinct objects – cones etc.

The group then have a set time in order to collect animals from within a particular zone (if tide is on the flow start with lower shore). Hand out collecting trays or buckets. Gather after the set time and look at what has been found. Introduce the concept of a hypotheses. What will happen to the distribution / abundance / diversity / types of organisms found at the next level. Repeat at each zone

Resources: Marker poles, buckets, collecting trays, hand lenses (if available)

You may also choose to create a formal 'Field study' for which a GCSE / AS level study in zonation follows.

Investigation: The zonation of littoral organisms on a rocky shore ecosystem

Learning objectives: during the session you will be covering:
- Patterns of zonation down a rocky shore
- Discover how these changes are related to the environmental factors
- Use a variety of activities to encourage and support learning outside the classroom (LOtC)

Aim:
- To investigate vertical distribution of littoral flora and fauna at Plas Menai
- To explain their distribution by looking at the biotic and abiotic factors and gradients present.

Concepts:
Measuring environmental conditions
Tides
Hypothesis testing

Zonation
Distribution and abundance
Environmental gradients
Periods of emersion

Hypothesis: (relate a biotic factor to an abiotic factor)

Nature's Work

Data recording sheet - Rocky shore animals

Phylum	Common name	Latin name	Lower shore	Mid shore	Upper shore	Splash zone
Porifera	Breadcrumb sponge	*Halichondria panacea*				
	Purse sponge	*Grantia compressa*				
Cnidaria	Beadlet anemone	*Actinia equina*				
	Sea fir	*Obelia spp*				
Annelida	Serpentine tube-worm	*Pomatoceros sp.*				
	Spiral tube-worm	*Spirobis sp.*				
Mollusca	Common limpet	*Patella vulgaris*				
	Dog whelk	*Nucella lapillus*				
	Rough periwinkle	*Littorina saxatalis*				
	Flat periwinkle	*Littorina littoralis*				
	Edible periwinkle	*Littorina littorea*				
	Small periwinkle	*Melaraphe neritoides*				
	Mussel	*Mytilus edulis*				
	Painted topshells	*Caliostoma zizphinum*				
	Grey topshell	*Gibbula cineraria*				
	Toothed topshell	*Monodonta lineata*				
	Purple topshell	*Gibbula umbilicalis*				
Arthropoda	Crab	*Various spp*				
	Barnacle	*Various spp*				
	Sand hoppers	*Various spp*				
Bryozoa & Echinoderm ata	Brittle star	*Ophiolithrix spp*				
	Sea mats	*Various spp*				
	Springtails	*Ligia oceanica*				
	Star fish	*Asterias rubens*				

Nature's Work

Data recording sheet - Rocky shore algae & lichens

Phylum	Common name	Latin name	Lower shore	Mid shore	Upper shore	Splash zone
Algae Chlorophyta (green seaweeds)	Sea lettuce	*Ulva lactuta*				
	Sea hair	*Cladophora spp*				
	Sea grass	*Enteromorpha spp*				
Algae Phaeophyta (brown seaweeds)	Channel wrack	*Pelvetia canaliculata*				
	Spiral wrack	*Focus spiralis*				
	Bladder wrack	*Fucus vesiculosus*				
	Bladderless wrack	*Fucus vesiculosus var linearis*				
	Serrated wrack	*Focus serratus*				
	Egg wrack	*Ascophyllun nodosum*				
	Thongweed	*Himanthalia elongata*				
	Oarweed	*Laminaria digitata*				
	Sugar kelp	*Laminaria saccharina*				
Algae Phodophyta (red seaweeds)	Rock leaf	*Lithophyllum spp*				
	Laver	*Poryphyra spp*				
	Dulse	*Palmaria palmate*				
	Carrageen	*Mastocarpus stellatus*				
	Irish moss	*Chondrus crispus*				
	Pepper dulse	*Laurencia pinnatifida*				
	Coral weed	*Corallina spp*				
	(associated with Egg wrack)	*Polysiphonia lanosa*				
Lichens	Sea ivory	*Ramalina siliquosa*				
	Grey / black jam	*Lecanora spp*				
	Grey / white jam	*Ochrolechia parella*				
	Orange power	*Caloplaca marina*				
	Yellow leaf	*Xanthoria parietina*				
	Black tuft	*Lichina pygmaea*				
	Black paint	*Verrucaria maura*				

Activity 5 - **Exposed v sheltered shore**

A neat way of discussing wave action and exposure on the shore is to compare a high energy with low energy rocky shore environment. Not only will there be different coastal features such as wave cut platforms, undercut cliffs / notches, stacks, stumps, caves and arches but also a significantly different set and combination of shoreline organisms. Wave action has a major effect on plants and animals settling, establishing and surviving the high energy environment. Also where the wave action is low there will be significant seaweed (algal) growth and this will affect animals being able to settle.

This activity is more dynamic whilst say coasteering. Get the group to identify the wave energy / exposure scale as an activity. There are notes on exposure in the workbook.

Activity 6 - **Stimulus Cards**

A structured approach to stimulating our perceptions of a familiar or unfamiliar environment is to use a set of stimulus cards. These consist of focusing questions or tasks which can guide us towards noticing elements of the landscape which we might otherwise miss, or encourage us to think about our surroundings more deeply in relation to wider issues. Some encourage expression of feelings, others judgements and analysis. There is not necessarily a correct answer to any of these stimuli.

Activity 7 - **Marine Nature Reserves**

An activity designed to get people thinking about conservation and protecting the natural marine environment. It is particularly useful after exploring the coast and bringing a few ideas together. People work in small groups and follow the prompts on the activity sheet. Knowledge is not the issue here but attitude and possible behaviour change as an outcome.

The group come up with their own boundary / area which they can define or outline with natural objects or a mark in the sand. The 'reserve' could be a large boulder in the middle of the sandy beach or an interesting feature etc.

The group then discuss the issues of their reserve and then in turn the groups introduce their reserve to the others. It can stimulate quite interesting debates and raise awareness. Below is some info on MNRs in the UK if anyone asks about the real ones!!

The concept of Marine Nature Reserves (MNRs) was brought about and designated by the British government. They are created by statute (under the Wildlife and Countryside Act 1981) to conserve marine flora and fauna and geological features of special interest, while providing opportunities for study of the systems involved.

Probably the best known is Lundy Island, designated an MNR in 1986. The only other ones formally designated are Skomer Island and Strangford Lough. However, there are also numerous informal marine nature reserves, with no special statutory protection. Examples include Purbeck and St Georges Island.

Activity 8 - **Beach Art**

Andy Goldsworthy makes direct contact with nature and experiences materials in much the same way as a climber may get to know the qualities of the rock on which they climb.

Land art is a method of encouraging exploration of the local environment by choosing and using natural materials to create a piece of art in the outdoors. The creation can be a sculpture, pattern or design. Land art can be used as a short session to encourage environmental awareness at the beginning or end of a session. Photos can often trigger imagination and spark creativity during the introduction to this activity.

Choose an area with plenty of natural resources / materials and where disturbance to sensitive areas is minimised, e.g. a shoreline, old quarry or woodland. Materials can be fixed by gluing with spit, weaving with grass or balancing. Their work can become part of the landscape. The task can be individual or collective. N completion, encourage a visit to the natural gallery.

Nature's Work

Seaweed Discovery Card

Drawing of your seaweed

What will you call your seaweed?
Describe it:
shape
size
smell
feel
colour

Artists name:

What type of habitat does it like?

How common is it?

abundant	common	frequent	occasional	rare

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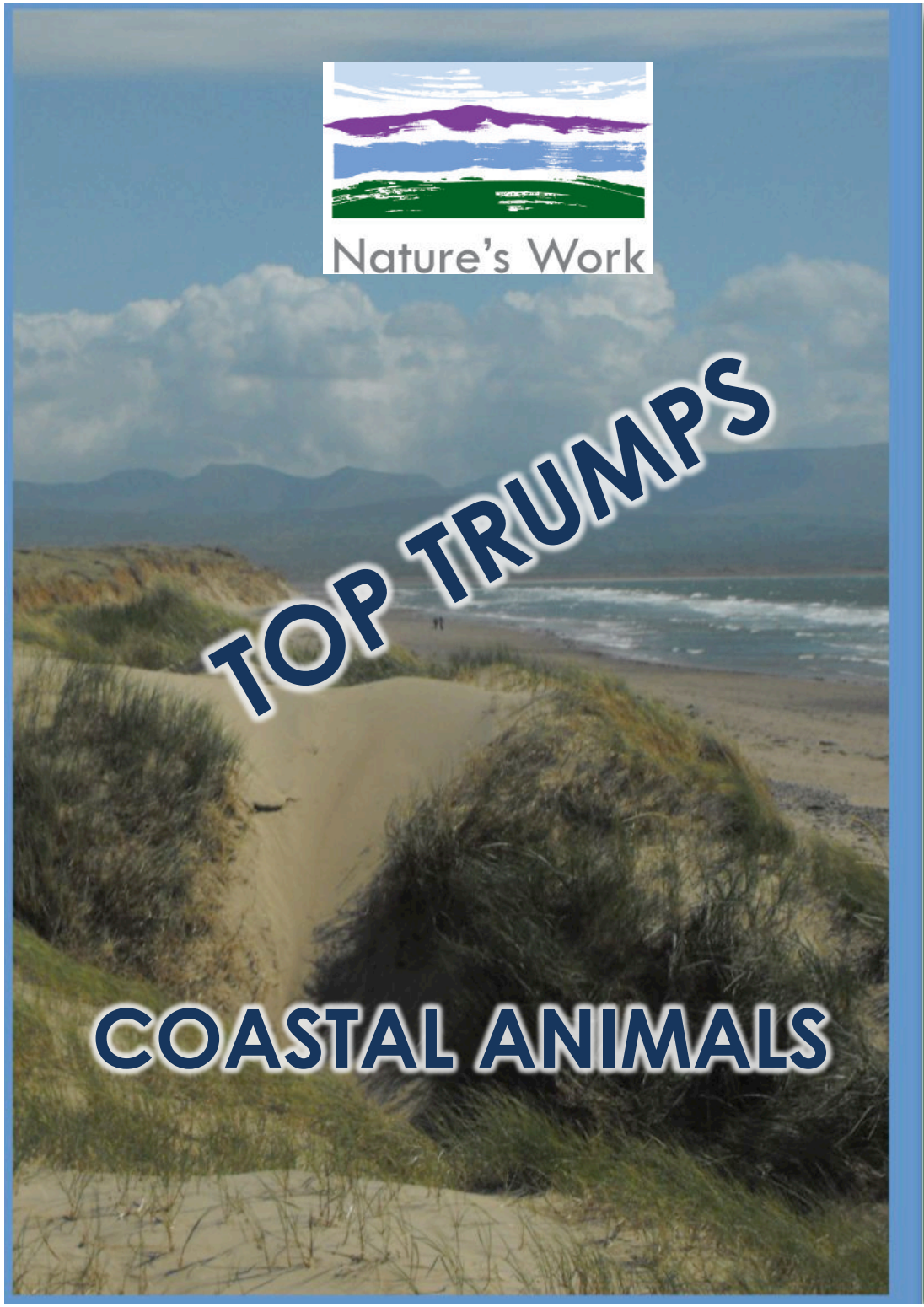

Animal name

Drawing:

Time out of the sea: 1 - 5

Speed: 1 - 5

Size: 1 - 5

Abundance: 1 - 5

Strength: 1 - 5

Defences: 1 - 5

Attractiveness: 1 - 5

Nature's Work

Exposed v sheltered shores

Aim: To find and investigate animals found in areas of high and low wave action

Find as many different species in the given time. Think about their shape, size, colour and any other key features to help you identify them.

Animal Species	**Photo**	**Sheltered shore** (tick ✓ if present)	**Exposed shore** (tick ✓ if present)	**Adaptations**
Barnacle				
Limpet				
Edible winkle				
Flat winkle				
Dog whelk				
Top shell				
Crab				
Sea anemone				

Nature's Work

Plant Species	Photo	Sheltered shore (tick ✓ if present)	Exposed shore (tick ✓ if present)	Adaptations
Channel wrack				
Spiral wrack				
Egg wrack				
Bladder wrack				
Toothed wrack				
Green seaweed				
Red seaweed				
Kelp				
Orange lichen	*Xanthoria*			
Yellow lichen	*Caloplaca*			
Green lichen	*Ramalina*			
Black lichen	*Verrucaria*			

Face North, the east, then South, then West. In which direction would you take a photo if you wanted to epitomise what it is

Find 2 processes in the landscape (physical, ecological or human) which might be contributing to global environmental change

Which areas in this landscape might experience erosion?

Which features in this landscape might be the result of past processes?

Imagine you had been dumped in this area. What clues in the landscape tell you which country you are in?

Would you describe the present human use of this landscape as mainly sustainable or unsustainable?

How might the view in front of you have looked:

10,000 years ago

100 years ago

10 years ago?

Chose 3 words which epitomise this location

What evidence can you find that present-day physical processes appear to be acting upon this landscape?

Close your eyes and listen to the first 3 sounds. What are they? Which are a result of human activity and which from nature?

What clues can you see in the landscape that may tell you what rock type you are on?

What natural hazards can you identify in this landscape?

How will this view look in 100 years?

If you had to pass the night here, what hazards or discomforts might you encounter?

What three things would you like to conserve in this landscape?

What features in this landscape would you like to change or remove?

What changes might you see in this landscape in six months' time?

Observe the landscape around you over the next five minutes. What events take place?

Marine Nature Reserve

Aim:
To explore the environmental, social and economic issues influencing Marine Nature Reserves (MNR).

Objective:
To create a special area and develop a plan for its future

Ideas to discuss:

- A name for your area
- What are your aims for the MNR
- What are its special qualities and features
- How will you protect the reserve
- What permissive activities are allowed
- Areas of conflict
- How will you promote the MNR

Nature's Work

Environmental art
(from Cooper, G. 1998 Outdoors with young people)

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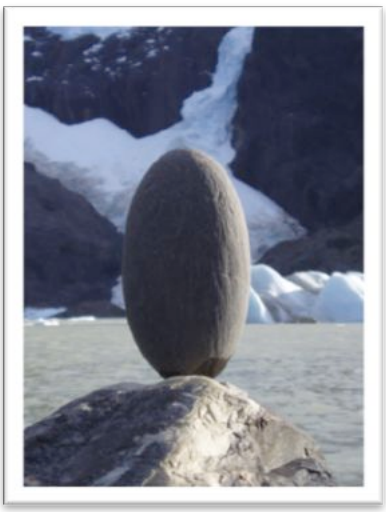
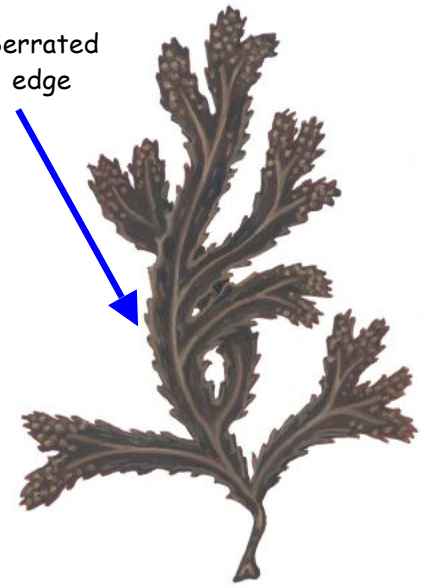
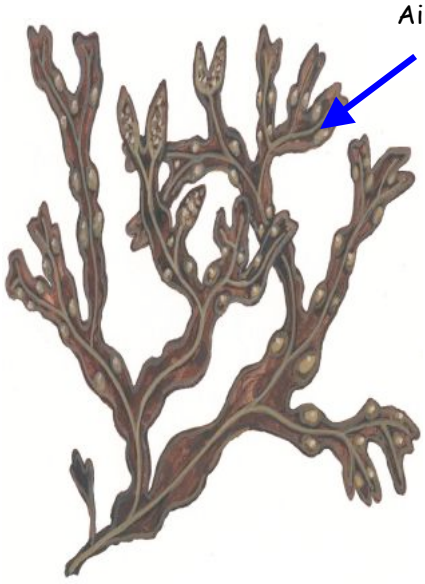


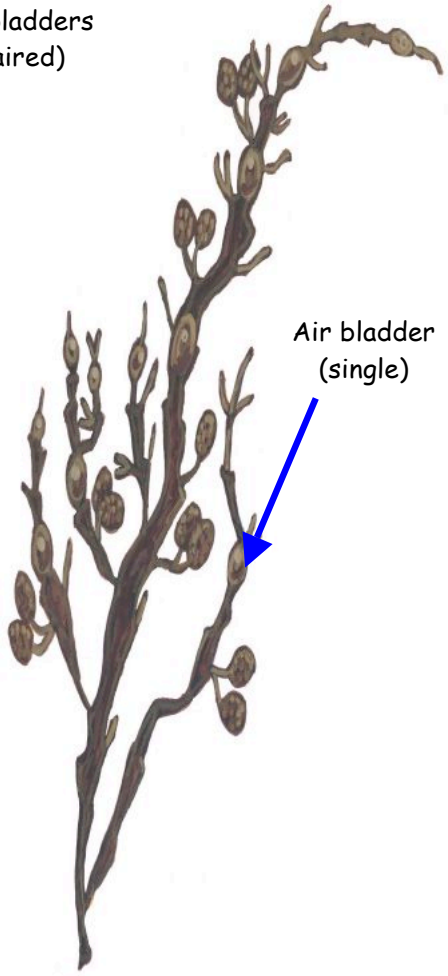
COMMON ROCKY SHORE ALGAE



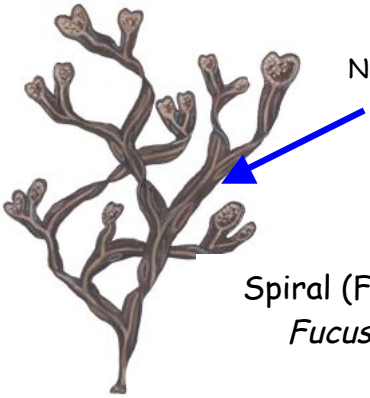
Saw (Serrated) Wrack
Fucus serratus



Bladder Wrack
Fucus vesiculous



Egg (Knotted) Wrack
Ascophyllum nodosum



Spiral (Flat) Wrack
Fucus spiralis

BROWN ALGAE

Sea Lettuce
Ulva spp.

GREEN ALGAE

Gut Weed
Enteromorpha intestinalis

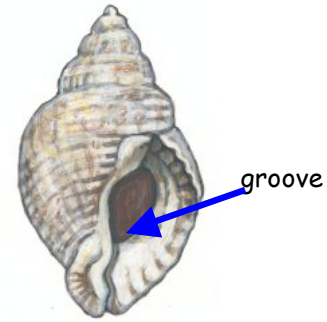
Irish Moss (Carageenan)
Chondrus crispus

Coral Weed
Corallina officalinis

RED ALGAE

FSC
BRINGING ENVIRONMENTAL UNDERSTANDING TO ALL

COMMON ROCKY SHORE ANIMALS



Dog Whelk
Nucella lapillus

Limpet
Patella spp.

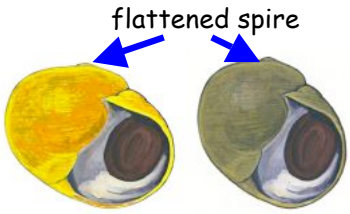
Do NOT remove from the rocks

Edible Mussel
Mytilus edulis

WINKLES: ear-shaped operculum, no mother of pearl

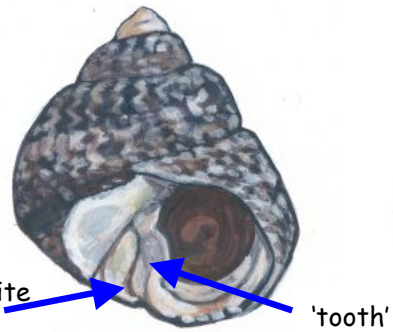
Edible Winkle
Littorina littorea

Rough Winkle
Littorina saxatilis agg.



Flat Winkle
Littorina obtusata/fabalis

TOPSHELLS: circular operculum, mother of pearl



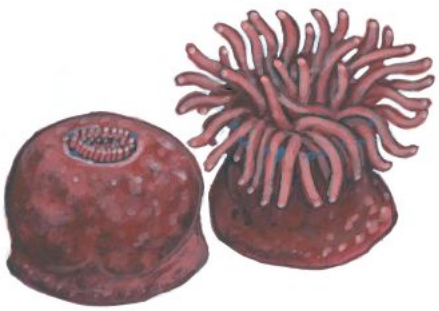
Common Topshell
Osilinus lineatus

Purple Topshell
Gibbula umbilicalis

Grey Topshell
Gibbula cineraria

Barnacle spp.

Chiton
(coat of armour shell)



Beadlet Sea Anemone
Actinia equina

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GASTROPOD MOLLUSC FACT SHEET

Dog Whelk – *Nucella lapillus*

Egg cases

Habitat: open rock - middle and lower shore
Diet: carnivore – predates barnacles and mussels
Ecological requirements:
* fairly intolerant to high temperature,
* fairly intolerant to fluctuating salinity
* fairly intolerant to desiccation
* fairly tolerant to wave action
Reproduction: Separate sexes. Internal fertilisation. Lays egg cases in crevices on rocks Juvenile snails emerge from egg cases onto surrounding rock

Edible Winkle – *Littorina littorea*

Habitat: wide range of habitats at all shore levels
Diet: herbivore/detritivore – micro-algal film, fine green & red algae, detritus
Ecological requirements:
* tolerant to range of temperatures,
* tolerant to fluctuating salinity (not freshwater)
* fairly tolerant to desiccation
* intolerant to wave action
Reproduction: Separate sexes. Internal fertilisation. Planktonic larvae.

Flat Winkle – *Littorina obtusata/fabalis*

Habitat: middle to lower shore levels on brown seaweeds
Diet: herbivore– brown algae (*Fucus spp. and Ascophyllum nodosum*)
Ecological requirements:
* fairly tolerant to range of temperatures
* fairly tolerant to fluctuating salinity (not fresh water)
* intolerant to desiccation
* intolerant to wave action
Reproduction: Separate sexes. Internal fertilisation. Lays egg masses on brown seaweed. Juvenile snails emerge from eggs onto seaweed.

Rough Winkle – *Littorina saxatilis* agg. (4-5 species or sub-species)

Habitat: middle to upper shore levels on rock (often in crevices or empty barnacle shells)
Diet: herbivore/detritivore– micro-algal film, detritus
Ecological requirements:
* fairly tolerant to range of temperatures
* tolerant to fluctuating salinity (not fresh water)
* fairly tolerant to desiccation
* tolerant to wave action
Reproduction: Separate sexes. Internal fertilisation. Some sub-species lays egg masses in rock crevices. Juvenile snails emerge from eggs onto the rocks. Other sub-species 'brood' their eggs inside the shell and young emerge from the female onto the rocks (=ovovivipary).

Purple Topshell – *Gibbula umbilicalis*

Habitat: middle to lower shore levels in rock pools and on rock
Diet: herbivore/detritivore – microalgal film, detritus
Ecological requirements:
* fairly intolerant to high temperature
* tolerant to fluctuating salinity (not fresh water)
* intolerant to desiccation
* fairly tolerant to wave action
Reproduction: Separate sexes. External fertilisation. Planktonic larvae

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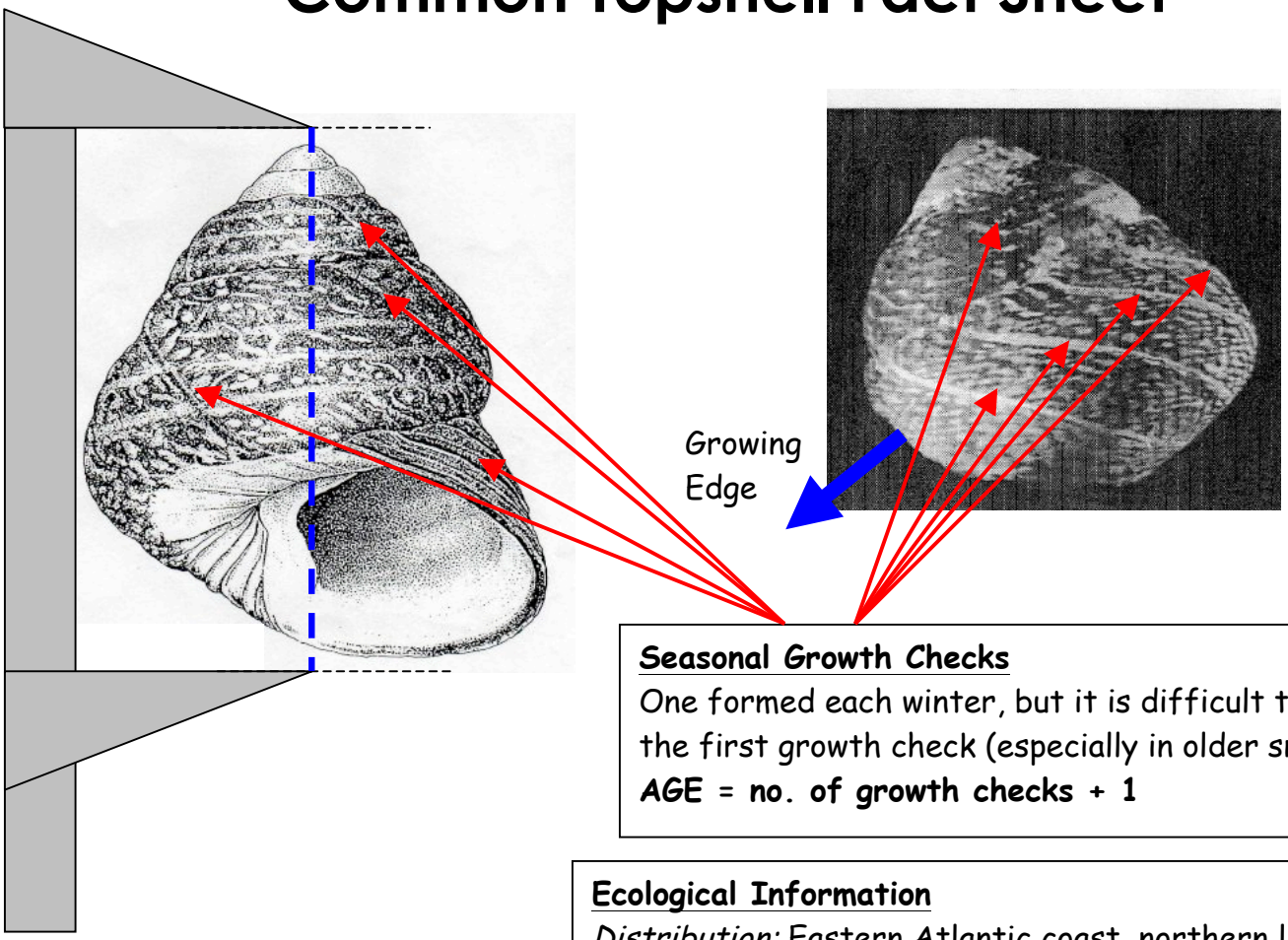
Common Topshell Fact Sheet



Seasonal Growth Checks

One formed each winter, but it is difficult to see the first growth check (especially in older snails).

AGE = no. of growth checks + 1

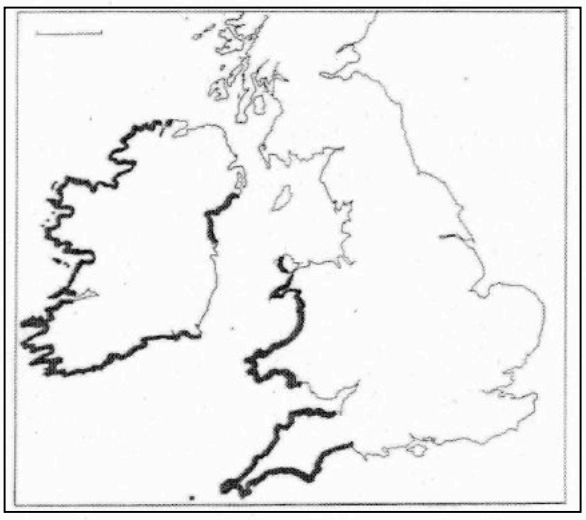


Fig 1. the distribution of *Osilinus lineatus* around the British Isles - based on a map in Lewis (1964).

Ecological Information

Distribution: Eastern Atlantic coast, northern limit in south west of British Isles (Fig 1)

Habitat: open rock in middle and upper shore (young snails in rock pools or under stones).

Diet: herbivore – grazing on micro-algal film

Ecological requirements:

- tolerant to high temperature,
- intolerant to low temperature
- older/larger snails tolerant to desiccation
- tolerant to fluctuating salinity (not freshwater)
- intolerant to heavy sediment loads
- fairly tolerant to wave action

Reproduction: Separate sexes. External fertilisation. Short-lived planktonic larvae. Settlement of juvenile snails onto shore in late summer.

Alternative Names:

Common (or Toothed) Topshell .

Scientific name: *Osilinus lineatus* (previously: *Monodonata lineata, Trochocochlea lineata*)

Take a walk along the coast and help us to monitor the effects of climate change and invasive species on our seaweeds

All about seaweeds

Seaweeds are a marine group of simple plant-like organisms called algae. Extracts from seaweeds are used in many everyday products, including foods, shampoos, cosmetics and medicines. You can find seaweeds at any time of the year.

Seaweeds are at the bottom of the marine food chain. They have the same role that plants do on land – turning the sun's energy into food whilst removing carbon dioxide from the air. Many animals rely on seaweeds for food and shelter. This chart will help you to identify 12 seaweeds that we would like to find out more about.

Although only small, limpets are one of the main predators of seaweed.

Why seaweeds?

The distribution of seaweeds around Britain's shores is changing. Many species are responding to climate change and rising sea levels. Wireweed, an invasive species first recorded in the UK in 1973 from the Isle of Wight, is now found on shores throughout southern England and is spreading north.

By taking part in **The Big Seaweed Search** and returning your results to us, you can help to monitor the effects of invasive species and climate change on the UK's marine life.

How to do the survey

This survey is easy and fun. All you have to do is go for a walk along your chosen seashore! We want to survey **living** seaweeds, so choose a shore that has some **rocks**. On sandy beaches seaweeds are washed up by the tide and are dead. Walk along the shore and note down which of these 12 seaweeds you see. For each one, answer the questions on the back of this guide.

Unlike land plants, seaweeds have no branches and leaves, but instead they have **fronds**. Looking at the shape and colour of the fronds will help you to identify the seaweed. Some fronds have a ridge running down the centre called a **mid-rib** and some have air-filled bubbles called **bladders**.

maximum length, but can be much shorter

Egg Wrack *Ascophyllum nodosum*

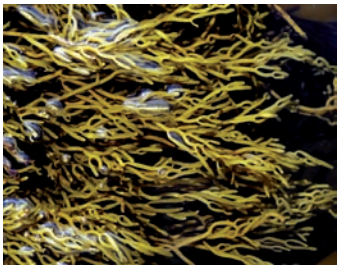
Has single large (1-5cm) egg-shaped air bladders along the length of its strap-like fronds. Each bladder represents one year of growth. 1.5m

Bladder Wrack *Fucus vesiculosus*

Has round air bladders (like bubblewrap) usually in pairs either side of the mid-rib. 1m

Bifurcaria bifurcata

Forked ends



Rounded branches that fork in two towards the end. Seen in rock pools. 50cm

Channelled Wrack *Pelvetia canaliculata*

Fronds are rolled lengthwise to form a channel. May have bumpy v-shaped swellings at end of fronds. Can dry out completely to become black and crispy. 15cm

Spiral Wrack *Fucus spiralis*

Distinct rim

Fronds flattened with straight edges and a mid-rib. Often grows spirally twisted. May have bumpy v-shaped swellings at end of fronds that usually have a distinct rim. 70cm

Toothed Wrack *Fucus serratus*

Toothed edges

Fronds flattened with toothed edges and a mid-rib. 1.5m

Next is the limpet count! Limpets are animals with shells (or molluscs) that eat seaweed. Pick any spot on your seashore where there is seaweed. Time yourself for **1 minute** and record how many limpets you can find within a 3m radius of where you are standing.

Take care

Do the survey with a friend who can help if things go wrong and take a mobile phone with you (but be aware that in remote places there may be no reception).

Check tide tables. It is safest to visit the seashore when the tide is falling. Make sure you don't get cut off by the tide and avoid crossing deep gullies between rocks.

Rocks may be slippery and sharp. Wear suitable footwear.

If you touch the seaweeds, make sure you wash your hands before eating.

Dabberlocks *Alaria esculenta*

The large, narrow, slightly wavy fronds have a distinctive mid-rib and are often torn. 5m

Sugar Kelp *Saccharina latissima*

A large crinkly frond with wavy edges. Looks similar to Dabberlocks but has no mid-rib. 4m

Thongweed *Himanthalia elongata*

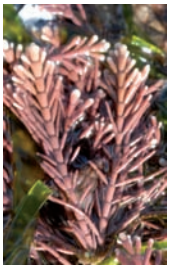
'Buttons'

Starts growing as a small 'button' from which long, narrow, flattened straps develop. No air bladders. 1.5m

Wireweed *Sargassum muticum*

Fronds divide into many branch-like and leaf-like sections. Can have round structures like baubles on a Christmas tree. 4m

Red seaweeds *Corallina* species



A stiff, finely-branched coral-like pink seaweed made up of many tiny segments.

Green seaweeds *Ulva* species

Out of water

Underwater

Bright green, delicate, lettuce-like fronds.

Now answer these questions

Where are you?

Write down the name of the beach, the nearest road, or a detailed description of where you are. Take a photo if you can (try to include a landmark). Write down today's date.

What is your seashore like?

Is it: **a** almost all rock; **b** almost all sand or mud with just a few rocks; **c** somewhere in between.

Is it: **a** sloping; **b** almost flat.

What seaweeds have you found? Whenever you spot a new type of seaweed, record the following...

Is it: **a** underwater in a rock pool; **b** out of the water on a rock.

How much of it is there? **a** lots – it is covering most of the nearby rocks; **b** not very much – I can just see one or two pieces; **c** somewhere in between.

Take a photo of each species if you can.

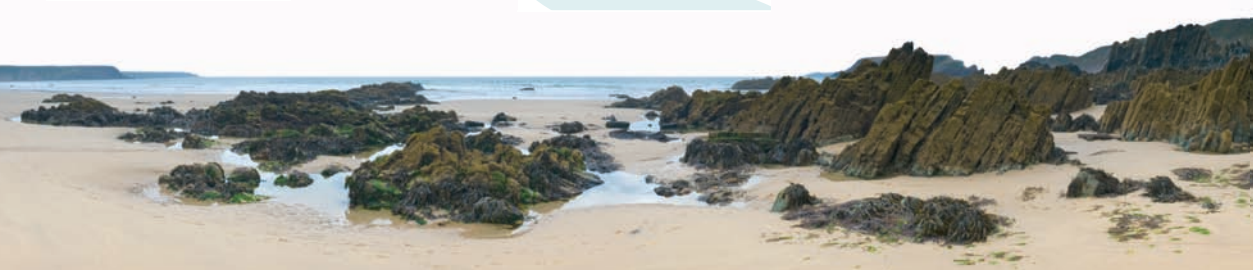
How many limpets did you find in 1 minute?

Now send us your results! It is really important that you tell us which seaweeds you have seen today. By sending us your results, you will be helping to track the invasive Wireweed and adding to important research into how climate change is affecting our marine life. You can fill in your survey results on our website **http://www.nhm.ac.uk/seaweeds** or post them to The Big Seaweed Search, Department of Botany, Natural History Museum, Cromwell Road, London. SW7 5BD. **Thank you!**

The British Phycological Society encourages all aspects of the study of algae. Algae are a large and diverse group of simple organisms. They include tiny plankton that float in ponds, rivers and the sea, the green slimy coatings that you find on damp rocks and in fish tanks, and the seaweeds you commonly find on the seashore.
www.brphycsoc.org

Open Air Laboratories (OPAL) is an exciting initiative that aims to get everybody involved in exploring, studying but most of all enjoying their local environment. OPAL will be running a programme of events and activities until the end of 2012.
www.OPALexplorenature.org

Developed by the British Phycological Society, Natural History Museum and Field Studies Council. Photographs by Juliet Brodie, Mike Guiry (www.AlgaeBase.org), Lucy Carter, Francis Bunker and Christine Maggs.



SWOAPG Environmental Charter

A commitment from activity and adventure education providers to the sustainable use of the Brecon Beacons National Park and SWOAPG South Wales operating area.

What is the Environmental Charter?

The Environmental charter is a commitment from activity and adventure education providers for the sustainable use of the Brecon Beacons National Park and SWOAPG South Wales operating area. All members of SWOAPG, who have signed up to the Environmental Charter, make a commitment to work with Landowners and Environmental Organisations to keep the Charter relevant and effective in conserving all of the activity sites they use.

Most of the areas we use as providers are privately owned, and the SWOAPG Environmental Charter encourages groups to show respect and consideration for local residents and other users, as well as citizenship, to the activity sites that are visited.

As SWOAPG Members:

- We recognise that use of the natural environment carries with it a responsibility to encourage those in our care to learn some thing of the countryside's special qualities and the ways in which it can be looked after.
- We make a commitment to good practice for the sustainable use of the countryside.
- We always carry out activities in a manner which maintains good relationships.

For more information on the Environmental Charter or any information regarding the SWOAPG please visit: www.swoapg.org.uk

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