

# The Rocky Shore

## Background Information

### What is the Seven Sisters Shoreline like?

The shoreline at Cuckmere Haven comprises a long sweeping bay of vegetated shingle, sandwiched between the cliffs of Seaford Head in the west and the Seven Sisters to the east.

The vegetated shingle is so called because it supports a variety of plants, such as sea kale, yellow horned poppy and viper's bugloss, that have adapted to living in this harsh, exposed environment.



**Yellow Horn Poppy**



**Sea Kale**



The cliffs extend out to sea, with a long tongue of chalk running out eastwards from the Seven Sisters and Beachy Head to the Meridian Line in the middle of the Channel. This underwater chalk cliff has been subjected to erosion and cut back by waves, forming a platform running from Seaford Head to Beachy Head. This has been planed off by wave action to give a level surface, which contains rock pools, steps and runnels into which the tide is channelled. At low tide these rock pools are visible at the base of the Seven Sisters.

## **What lives along the shoreline?**

Living along the shingle and in the rock pools is a community of plants and animals, especially adapted for coping with the difficult conditions presented by this environment. The species that survive here have to be able to survive the continual cycle of changing tide, which leaves them either exposed to air and sun or submerged in water for varying lengths of time.

The shore is divided up into zones that run parallel to the sea. Different plants and animals have specially adapted to living in these different zones. Life is very tough in this environment and presents a number of problems that the animals living there have to overcome.

### **The Intertidal Zone**

This area lies between the highest and lowest points reached by the tide.

Life in this area can be divided up into different zones depending on how tolerant the species living there are to exposure from the sun and air.

### **The Splash Zone**

This lies above the level of the highest tides but is affected by sea spray.

### **The Upper Shore**

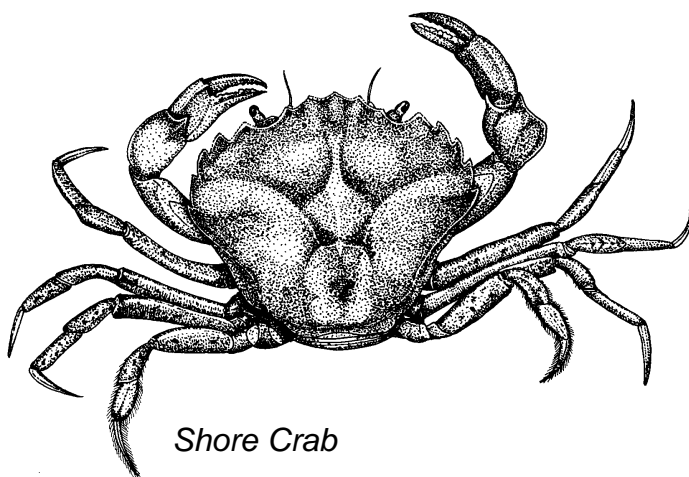
This area is only covered by the highest and lowest tides, that is Spring Tides, which occur every two weeks at the time of the full or new moon. Very few animals can tolerate the dry conditions here.

### **The Middle Shore**

Most seashore animals live in the middle shore, which is covered and uncovered by every tide.

### **The Lower Shore**

This area of the shore is only exposed during Spring tides. It is home to animals that cannot tolerate exposure to sunlight.



*Shore Crab*

### **What are the problems of living in the Intertidal Zone?**

The main problem of living in the tidal zone, compared with living in the sea or on the land, is that sometimes plants and animals are completely covered in water and sometimes completely uncovered. To survive they have to adapt in a number of ways.

### **How do animals breathe in the intertidal zone?**

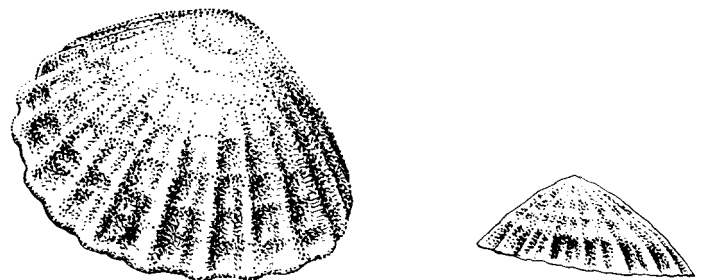
The methods of breathing in and out of water are obviously different. Most of the rocky shore animals found at the Seven Sisters are gill breathers, absorbing oxygen from the surrounding water. The gills therefore need to be kept wet. When the tide goes out many of the animals found here move into the rock pools, whilst others trap water under or in their shells.

For example, mussels, which can be found on the rocks, are bivalves, having two shells that can be pulled closed using a specially adapted strong muscle. Threads join the mussel to the rock and siphons suck in water and food and then squirt out water and waste.

Acorn Barnacles, which cover the rocks at the Seven Sisters, withdraw into their shells, closing the opening with a hinged trap door or operculum. They have hard shell plates that stick to the rocks. When covered by the sea, the operculum opens and six pairs of feathery legs appear which filter out particles of food.

The Common Limpets which can be seen everywhere on the rocks, grind a place into the rock with their shells, making a perfect fit, allowing them to trap a drop of water inside their shells to prevent them drying out when the tide is low. They lift up their shells to let in fresh oxygen that has been absorbed into the water around the gills. When the tide is in, barnacles leave their shells and wander about grazing on young seaweed.

The Rough Periwinkle can absorb oxygen from the air cavity in its body wall, which is acting like a lung.



*Limpets*

## **How do plants and animals along the rocky shore overcome the problems of drying out?**

This is a major problem when the tide is out and animals and plants have adapted in different ways.

Some move into rock pools, some hide under damp seaweed, whilst others seek damp shady crevices. Some animals and seaweed lose large amounts of water and regain it when the tide comes in.

In some seaweeds, the frond (the main leaf like part of the plant) collapses when out of water and opens wide again when submerged. Others are tough and leathery and can withstand drying out. Some seaweed like Bladderwrack has a mucous coating to prevent loss of moisture.

Anemones withdraw their tentacles to retain moisture and again are covered with mucous.

Blennies, small fish, which inhabit the rock pools at the Seven Sisters, can be found hiding between rocks and in crevices to prevent drying out.

## **How does seaweed produce its food?**

Seaweed, in common with higher plants, produces its food by photosynthesis. It is therefore restricted to the shore and shallow and surface waters where there is adequate light.

Lack of light is a problem that seaweed has to overcome. The red and brown seaweeds do this because they contain red and brown pigments that are more efficient at trapping the light that filters down through the seawater. They contain chlorophyll but it is masked by other pigments which are able to utilise the light at the blue and green end of the light spectrum which penetrates deeper into the water than red light which only penetrates the surface layers of the sea.

Seaweeds do not have roots, absorbing all they need for photosynthesis; water, carbon dioxide and minerals through their fronds. At low tide therefore, photosynthesis stops.

## **How do plants and animals overcome the problems of wave action and currents?**

Waves and tides can dislodge plants and animals if they are not able to secure themselves tightly to their habitats. Different organisms have evolved different methods of overcoming this problem;

Limpets and Periwinkles have a strong, muscular foot with which they hold on to rocks.

Anemones fasten to rocks using a sticky, muscular disc.

Seaweeds do not have roots: they adhere to rocks with a 'holdfast'.

## **What are the other problems of living in a rock pool?**

**Changes in Temperature** - the temperature of the sea is fairly constant but rock pools and seashore temperatures change very rapidly.

**Changes in Salinity**- the salinity of rock pools changes due to water evaporation on hot days and the amount of rainfall, which decreases the level of salt in the water.

## **How do animals find food in the intertidal zone?**

Animals here on the rocky shore adapt to finding food in different ways. There are a number of different types of feeders.

### **Filter Feeders**

Some animals have structures that have been adapted for catching small particles of food.

Anemones fire tiny barbed harpoons tipped with poison into their prey, paralysing it.

Acorn barnacles have 6 pairs of feathery legs which filter out food from the sea water around them. Feeding is limited to the time the barnacle is submerged.

Sponges have chambers through with a continual flow of water is maintained by cells with beating hairs in the atrium (internal chamber) Sea water and food enters through the ostia (small holes) and is expelled through the osculum (one large hole). As it passes through food is filtered out and passed to other cells for digestion.

### **Grazers**

Herbivores eat plant material, seaweed or microscopic algae.

Limpets 'lick' algae of rocks using their tongues (radula) which are tough and abrasive and often leave scars on the rocks.

Periwinkles also have abrasive tongues that they use to scrape away at larger plants.

Velvet swimming crabs feed on seaweed using their pincers to pull the seaweed towards their mouths.

### **Scavengers**

These live on whatever they can find and include crabs and prawns.

The Shore Crab has pincers that are adapted for getting flesh out of shells.

The Cushion Star inverts its stomach and feeds on decaying seaweed and dead invertebrates.

### **Predators**

These feed off other animals.

The Dog Whelk attacks limpets. It produces an acid that makes a hole in the limpet shell and then using its tongue bores into the limpet to suck out the flesh.

The Cushion Star climbs on top of a mussel, grips each side with its tube feet and pulls the two halves of its shell apart. It then pushes its stomach out of its mouth and between the two parts of the mussel shell. Having secreted an enzyme it can then digest the inside of the mussel and suck up the resulting liquid.

Sea Urchins have five sharp teeth to 'bite' chunks out of seaweeds.

Edible Crabs hunt for sea snails and use their strong pincers to crush open the shells.

Blennies, small fish that live in the rock pools, have hard teeth and bony plates in their mouths which bite barnacles off the rocks.

### **How do animals and plants avoid being eaten?**

To protect against being eaten sea creatures are often well camouflaged like limpets and crabs, or they are good at hiding like blennies under rocks or in crevices. They can also be well protected like mussels, crabs, whelks, and hermit crabs. Some like limpets rely on being difficult to get off rocks. Others taste unpleasant like some fucoids (brown seaweed) which produce chemicals like sulphuric acid and polyphenols to deter grazers. Others, like 'Coral Weed', have tough, sometimes calcareous cell walls that make them unpalatable.

### **How do animals along the shoreline move?**

The animals found along the shore move in different ways.

Swimming is a fast method of getting around but means the animal is limited to rock pools when the tide is out. Some slide on a muscular foot which is slow but ensures they are adhered to the rock on which they live and are therefore less likely to be knock off by a wave. Crabs walk sideways, enabling them to squeeze into rocky holes. Prawns can flick their tail fins to move backwards when disturbed, thereby confusing their predators.

### **How do creatures on the rocky shore grow?**

Most creatures on the rocky shore have a shell or carapace (exoskeleton) so they need to overcome the problem of not being able to stretch as they grow. Limpets secrete new shell material around the outer edges of their shells creating lines of growth. Crabs form a new shell under the old one, which is then shed (moulting). The new shell is soft for the first few days and is made larger by the animal pumping itself up with seawater. This allows room for the gradual growth of tissues. During the process of moulting the crab is vulnerable to attack from predators.

