



Seashore - A Rocky Seashore Ecosystem

A rocky shore consists of rocky ledges with pools of salty water, boulders, pebbles and other non-living things such as air and sunlight. Living in this HABITAT is a COMMUNITY of hardy plants and animals; each species is specially adapted for coping with the harsh environment around it. The plants and animals interact with each other and with their habitat (the non-living surroundings) to form the rocky shore ECOSYSTEM.

Depending on its situation, a rocky shore may be in an exposed or sheltered area. Of all seashore habitats, the sheltered rocky shore is probably the best type to study, having very large numbers of species living there, and often in great abundance.

Rocky shore species have to be able to survive the continual cycle of changing tides which may leave them either high and dry or submerged in water for varying lengths of time. Spring tides (from the Old English word ?springen?, to rise) occur every two weeks at times of the full and new moon. The best time to study the shore is during these tides as they rise further up and drop lower down the shore than neap tides, which happen between spring tides.

Seashore life occurs in zones on the shore, according to how tolerant different species are of exposure to air and sunlight. Above the level of the highest tides is the splash zone, strongly affected by salt spray. The upper shore is not covered by every high tide, usually only those of spring tides. Very few species can tolerate the relatively dry conditions of the upper shore. Most seashore animals and plants live in the middle shore, the main area of the shore which is covered and uncovered by every tide. The lower shore is only exposed during the low tides of spring tides, and this is where many delicate species may be found ? those that cannot withstand much exposure.

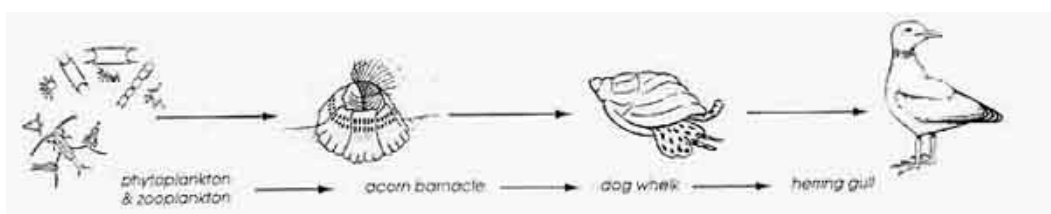
Animals that feed mainly on plants are called HERBIVORES and most seashore herbivores, like the limpet, feed on young seaweeds (algae). Others, for example zooplankton (microscopic animal life), feed on phytoplankton (microscopic plant life in the sea).

Animals that feed mainly on other animals are called CARNIVORES. They are often called ?predators?, and the animals they feed on are called ?prey?, e.g. a rock goby (type of fish) may eat a prawn, which in turn may eat small worms.

Animals that feed on both plant and animal material are called OMNIVORES. On the seashore many animals are omnivores because they feed by filtering both phytoplankton and zooplankton from the seawater, e.g. acorn barnacle.

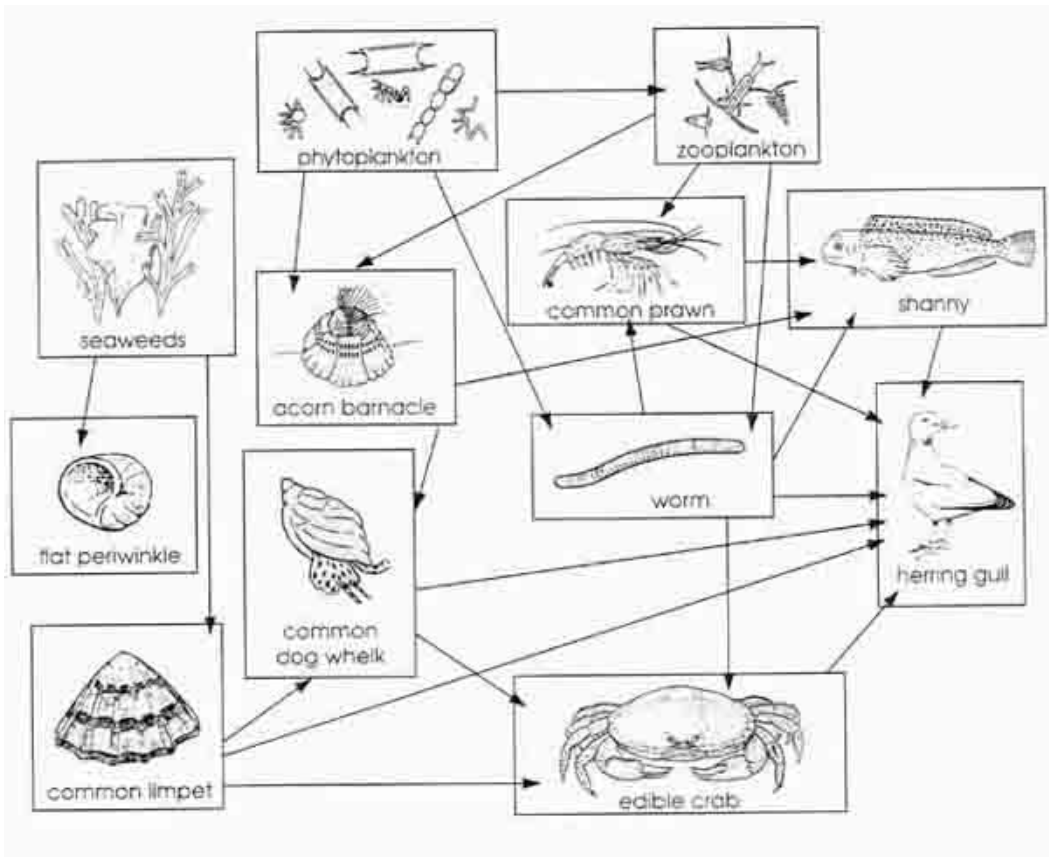
The animals in an ecosystem obtain the energy they need by eating plants ? or from other animals which have eaten plants. Where do the plants get their energy from?

When a herbivore eats a plant?. and then a carnivore eats the herbivore ?. the sequence of events is called a FOOD CHAIN. Each plant or animal is a link in a chain. The animal at the top of a food chain is often called a ?top predator? because it is not normally eaten by anything. In a rocky shore ecosystem there may be hundreds of food chains. Here is an example:-



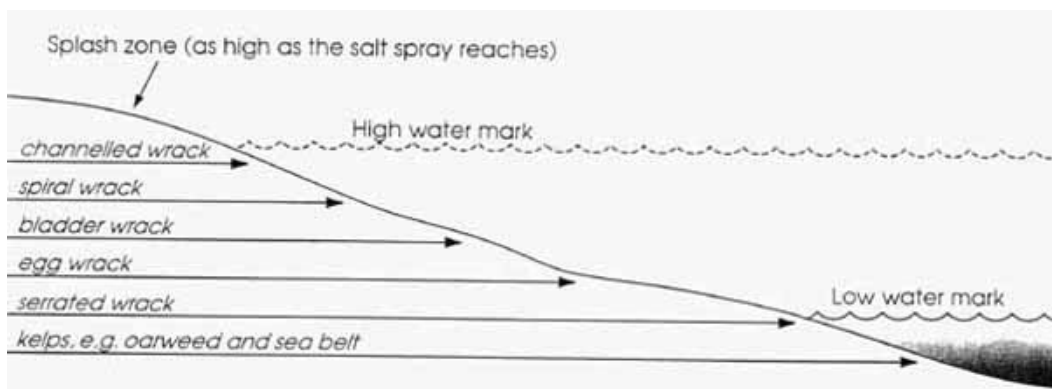
The dog whelk and the herring gull will eat other animals too. There are so many connections between food chains that we can think of every organism (plant or animal) as part of a complicated FOOD WEB rather than as a link in a straight chain.

ROCKY SHORE FOOD WEB



How many food chains can you find in this web?

Write some of them out below (remember that every chain begins with a plant)



The above seaweeds are the brown seaweeds which dominate the shore. Green seaweeds grow beneath them or near the high water mark. The reds, which need very little light, often grow in deeper rock pools and attached to the stalks of the large kelps. A few red weeds, such as coral weed, can survive in rock pools

higher up the shore and withstand periods of drying out.

ANIMALS OF THE ROCKY SHORE

As we have seen, the seaweeds of a rocky shore grow in different areas ? zones ? depending on their ability out of the water. The animals show a similar zonation, but because they can move around it is not so obvious. Like the plants, the animals are greatly influenced by the tide. Some species live almost as land animals around the high water-mark of spring tides, and others are only briefly exposed to the open air at the low water-mark of spring tides.



All the animals are adapted to feed and breed during the few hours when they are covered by the tide. When the tide is out, birds such as gulls and oystercatchers search the shore, probably amongst the seaweeds for animals.

Herring gull

Here are some of the more common animals you can expect to find on the rocky shore:-



Brittle star

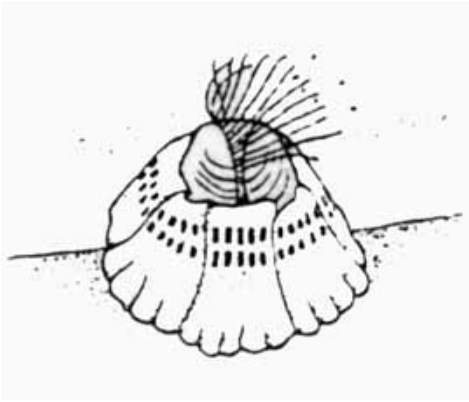
Brittle stars are not fish at all but are echinoderms, distantly related to sea stars. Some can swim but most crawl along the sea bed using their flexible arms. They usually have 5 arms covered with spines. Their name refers to how easily their arms will fall off when touched. It can also cast off an arm if it is injured. This isn't a problem for them as it can grow another arm within months and if the broken arm has a piece of the central disc attached, it can turn into a whole new brittle star!

They feed on plankton and detritus - decaying matter which they put in to their mouths, a hole which they also use to excrete from. In shallow water they are more active at night to avoid predators and will hide in dark c

revices in the day. They are often eaten by their relative the common star fish.



Hermit crab



The upper shore is usually dominated by barnacles, particularly the acorn barnacle. These crustaceans start life as tiny larvae floating in the sea with the plankton, and most come to rest in the intertidal area of a rocky shore, cementing themselves firmly to the rock. When exposed to the air, the barnacle closes its opening with a hinged trapdoor-like operculum ? this is made of two limy plates which join up with other plates to protect the body. When covered by the sea, the operculum opens and six pairs of feathery legs (the equivalent of other crustaceans' legs) appear and filter out particles of food.

Acorn barnacle

The barnacle thrives in exposed conditions high up the shore, but even here it is not safe from predators. It is the favourite prey of the dog whelk which wanders up from the middle shore to attack the barnacles. The whelk also attacks other molluscs, particularly the limpet, by either producing a shell-dissolving acid which makes a hole in the shell or by boring a hole through the shell using its rough, belt-like tongue. The flesh is then sucked out. If you find an empty limpet shell with a small, neat hole in it, this is the work of the dog whelk. The dog whelk itself may be attacked by crabs and herring gulls.

LIMPET LIFESTYLE??..

The limpets are perhaps the most well-adapted of all the marine snails for a life on the exposed rock surfaces. Each limpet has its own 'home' ? an exact spot on the rock where it stays when the tide is out.



On soft rock, the limpet grinds it with its shell to make an exact fit; on hard rock, the shell is ground down to fit

the rock's shape. This tight fit allows the limpet to trap a spoonful of water inside to stop it drying up. A strong foot muscle gets a firm grip on the rock, making it difficult for birds to prise off the limpet!

When the tide covers their rock, or in wet, cool weather, the limpets leave their base and wander about, grazing on young seaweeds which have started growing on the rock surface. Before the tide goes out, each limpet returns to its own 'home'.

Limpet

MORE MOLLUSCS??. Apart from the dog whelks and limpets, several other molluscs live in the intertidal zone. Molluscs of the rocky shore are mostly uni-valved (one shell) snails, whilst those of the sandy shore are mostly bivalves (two shells, such as a cockle). The bivalves can burrow down into the sand for safety, but the univalves, being unable to burrow into rock, have strong shells with an operculum (trapdoor attached to the foot muscle).

Up in the splash zone, the small periwinkle is found. It has a smooth, almost black, 4-6mm shell, and it is almost a land animal, eating lichens and being able to breathe air. However, the females have to release their eggs into the sea at high tides so the larvae can live amongst the plankton.

The larger rough periwinkle, with its deeply grooved shell, is well-adapted for surviving on the upper shore, although it cannot breathe atmospheric air as well as the small periwinkle. It is often found thriving in the middle shore too. Unlike the other sea snails, the rough periwinkle produces live miniature snails, so it is almost set for a life totally on the land!



The flat periwinkle, slightly larger than the rough, has a smooth shell ranging from white to black through shades of yellow, red and brown. It lives amongst the wracks of the middle shore, looking like the bladders (air-filled ?bubbles? on the fronds). The female sticks jelly-like egg masses underneath the fronds and one month later the baby snails chew their way out of the jelly.

Edible periwinkle

The edible, or common, periwinkle is the largest of the winkles, about 3.5cm with a more pointed shell. It lives all over the upper and middle shores, on bare rocks as well as beneath rocks and seaweeds.

Although the winkles are the most common molluscs on the middle shore, topshells may also be found here ? and on the lower shore too. The most common is the purple topshell, up to 2cm across with red-purple ?pyjama? stripes.

LIFE IN A ROCK POOL

A rock pool is like an attractive sea aquarium, an oasis at low tide for many animals and seaweeds. However, there are problems for the residents of a rock pool, particularly a shallow one. On a hot day, the sun will evaporate the surface water, making the water saltier than usual. When it rains the pool will become diluted. So a shallow pool on the upper shore will have less life than a deeper one on the middle or lower shore.

The best rock pools are those down on the shore, large and deep enough to prevent drastic changes in temperature on cold or hot days, ideally with overhanging areas and dark crannies. Such a pool will probably

be full of life, although not all of it will be easily visible. A smaller pool is easier to investigate to start with.

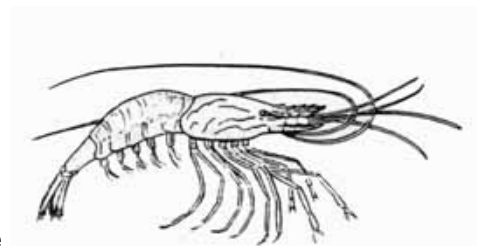
The beautiful sea anemones are seen at their best in the deeper pools. They are very primitive animals related to jellyfish, stuck to rocks by a slimy disc. They can move around a little but usually just stay put, waving their tentacles to attract small fish or crustaceans within range of their tentacles. When a small animal is seized and enfolded in the tentacles, stinging cells paralyse the prey and it is swept into the mouth to be digested by special juices.

The beadlet anemone is the most common anemone. It is usually a deep red colour with purple blotches marking the positions of the stinging cells. It may be found on the upper shore, left high and dry at low tide, looking like a blob of red jelly, its mouth opening firmly closed, with tentacles tucked inside. This helps it to retain moisture while waiting for the next high tide.

Another beautiful anemone you may find is the snakelocks anemone, which has a mass of long, colourful tentacles, usually green tipped with purple. Unlike the beadlet anemone, it cannot retract its tentacles so is only found in pools on the middle and lower shore.

The crustaceans you are most likely to come across in a rock pool are the shore crab, hermit crab and common prawn.

The shore crab does not easily dry out so it can live under stones and in cracks well up the shore, as well as in pools. Adult crabs are green, but the young can be red or yellow with white patches. The crabs feed on small animals, dead or alive.

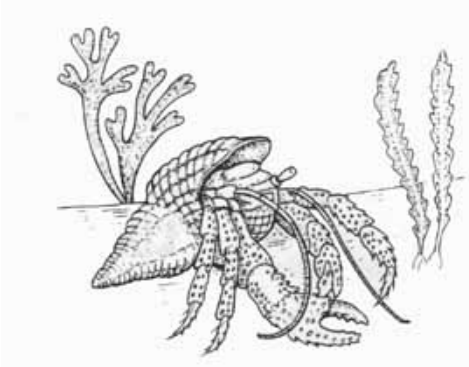


Unlike the familiar cooked prawn, a live prawn is not pink! The common prawn is a transparent greyish colour with coloured dots and lines visible inside. It has very long antennae and lives in rock pools on the lower shore. It may be seen swimming slowly along with its five pairs of swimming legs, tucking up its 10 walking legs to make the body more streamlined. If frightened it will suddenly shoot backwards and hide under the seaweed. The prawn scavenges for bits of seaweed and dead

creatures, as well as capturing small live prey.

Common prawn

The common hermit crab is well known for its habit of living in empty mollusc shells. The smaller crabs live in the pools on the lower shore and the larger ones are found out in deeper water. Unlike other crabs, the hermit crab does not have a carapace but has a soft, unprotected abdomen which it hides away in an empty winkle or whelk shell. Every so often, as the crab grows, it has to shed its outer skin-like shell. To do this it squeezes itself out of its adopted shell, moults, then returns to the shell. The crab is very vulnerable to attack by predators at this stage, because it often finds that its old shell is too small and a larger one has to be looked for!



The abdomen of the hermit crab is coiled so that it fits in the coils of a shell. The adopted shell is asymmetrical so the crab's right hand pincer is much larger than the left to enable it to close off the entrance to the shell when the crab is hiding inside. The walking legs are very strong to be able to carry both the crab and the shell. It walks slowly around the bottom of a pool scavenging for any dead plant or animal remains.

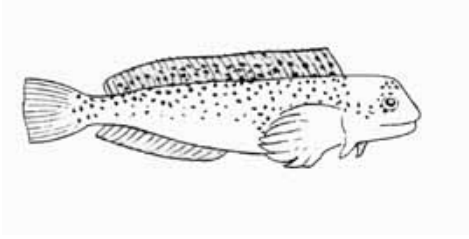
Hermit crab

The only vertebrate animals you are likely to come across living in a rock pool are a few species of fish. Rock pool fish may be permanent residents or just visitors stranded by the tide.

The fish you are most likely to come across from the upper shore downwards is the common blenny or

shanny. It has no scales but its body is protected by a thick layer of soft slime which helps it to slide amongst sharp rocks, and also helps to stop it drying out if stranded between tides on a drying beach. The shanny has a broad head with large eyes, and a dorsal fin which stretches almost from head to tail. Its colouring makes it difficult to spot when it is lying still on the bottom of a sunlit pool. Tough little teeth allow the shanny to crack open barnacles and even limpets.

You may find a goggle-eyed rock goby, which has two separate dorsal fins, hiding amongst seaweed as well as in pools.



Hidden away beneath a rock, or under a fringe of seaweed at the edge of a pool, may be a deep red fish called a rockling. This is a relative of the cod and it has barbs sticking out from its jaws. Both the goby and the rockling lie in wait for small animals, well camouflaged against their background.

Common blenny or shanny

PROTECTING THE SEASHORE

Seashore Conservation Code

When investigating a seashore it is important to remember that the welfare of the plants and animals must come first. If seaweeds are attached to rocks do not try to pull them off, just examine them where they are growing. Handle animals with great care, returning them to the place where they were found. Anemones and limpets are normally firmly stuck to rocks and any attempt to remove them may result in their death. Replace any large stones that are removed ? animals that live on the underside soon die if left exposed.

Pollution Problems

Seas and seashores are under continual threat from pollution. Here are some examples:-



Oil spills ??.. either accidental or deliberate (it is estimated that around 72% of oil pollution is deliberate and illegal), have a devastating effect on marine life, especially seabirds. Black tar-like oil washed up on a rocky shore would obviously completely destroy the entire community of living things. Chemicals used to disperse oil spills on a shore may effectively clean up the oil, but they can also cleanse the shore of life! The best policy for marine life is to physically remove as much oil as possible and leave the rest to degrade naturally. A rocky shore will recover much more quickly if chemicals are not used.

Sewage and litter ??.. also upsets seashore ecosystem, making them unsightly and perhaps contaminated. Some litter can be dangerous to wildlife.

Toxic chemicals and radioactive waste ??.. a cocktail of toxic chemicals have found their way into the sea over the years, affecting both marine and human life. For many years potentially deadly radioactive waste from nuclear power stations and other sources was disposed of in the sea, and beaches have been contaminated by accidental leakages from nuclear power stations.

INVESTIGATE ???? PICK A PROJECT!

1. Choose one of the above sources of pollution and find out as much as you can about it. What problems are caused by the pollutants? Who, if anyone, is responsible for cleaning up the pollution? Can you suggest what can be done to stop the pollution happening in the first place?

2. Holidaymakers make a big impact on beaches all over the world. Find out how tourism can affect seashore ecosystems. Can anything be done to reduce the problems?

Useful addresses to write to (please send a SAE with requests for information):-

Marine Information and Advisory Service MIAC, National Oceanography Centre, University of Southampton, Waterfront Campus, European Way, Southampton, SO14 3ZH.

www.noc.soton.ac.uk

Surfers Against Sewage Ltd, Unit 2, Wheal Kitty Workshops, St Agnes, Cornwall, TR5 0RD.

www.sas.org.uk

Marine Conservation Society, Unit 3, Wolf Business Park, Alton Road, Ross on Wye, Herefordshire, HR9 5NB.

www.mcsuk.org

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