DYNAMIC COASTS
BEACHES AT RISK: Key Stage 3 Resource Pack

Introduction and Coastal Habitats Summary

Beaches At Risk

Beaches At Risk (BAR) is an Anglo-French project that brings together geomorphologists, geologists, ecologists, coastal managers and users from both sides of the channel. By sharing expertise and knowledge and with data from new research, BAR is providing information that will highlight the importance of effective beach management for coastal defence, dune rehabilitation, and tourism and biodiversity conservation. It will identify beaches suffering greatest erosion on both the Channel coasts, assess their susceptibility to predicted sea level rise and increased storminess, identify nature conservation sites that may be lost or damaged as a result, and identify the risks for coastal management.

Beaches At Risk project area.

About this Education Pack

The worksheets within the pack are designed to suit education both inside the classroom and on field trips. The pack also complements and covers Key Stage 3 of the National Curriculum and contains a practical matrix showing how each activity is linked in. Although the BAR project area covers both the British and French sides, field trips in this education pack are designed for British coast of the project.

The pack contains an introduction to BAR, information and background information on all of the coastal habitats within the BAR project area, useful sites to visit and links to extra resources. It also contains a risk assessment for teachers to use for activities and field visits, and a matrix which links the activities to Key Stage 3 of the National Curriculum. There are 28 worksheets with teachers' notes, which can be used both in the field and in the classroom.

The pack has been produced as PDF files that teachers can download from the BAR website at any time.

http://www.geog.sussex.ac.uk/BAR/

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HEALTH AND SAFETY – refer to your school's health and safety policy.

Before Your Visit.
It is recommended that before organising a field trip you make a preliminary visit to ensure the chosen location suits your students' needs and abilities. Some sites have facilities such as visitor centres, toilets and cafés and access for people in wheelchairs. However, large groups may have to phone ahead. It is worth noting that on certain sites guided tours can be arranged, although pre-booking will be essential. Please refer to the Places to Visit section for contact details of key sites. If appropriate, ensure you have the correct tide times for the area you are visiting. If you plan to study the lower shore, it is advised you arrive on site approximately one hour before low tide and be aware that once the tide turns it can come in rather quickly.

Your party must have insurance to cover your own potential liabilities and appropriate adult : pupil supervision ratio. It is also recommended that you fill out a risk assessment before visiting the site. A general coastal visits risk assessment has been provided for teachers to either complete or use as a reference.

Students must remain under the teachers' control at all times and teachers remain responsible for the students during site visits and guided tours. Teachers are also responsible for all First Aid arrangements and must carry the necessary First Aid Kits and a mobile telephone.

Food
Visitors should bring food and drink appropriate to the length of the visit and the season.

Equipment
Students should bring clipboards and writing instruments.

Clothing
It is important that visitors bring suitable clothing with them. Windproof and waterproof coats and sturdy shoes are appropriate all year round. In summer, hats, sunscreen, and plenty of water are necessary. In winter, hats, gloves and warm clothes will make a visit to the exposed beach much more comfortable.

COASTAL HABITATS SUMMARY

Chalk Cliffs
The area covered by the BAR project holds a huge resource in terms of coastal biodiversity, having six of the habitats listed as a priority under the UK Biodiversity Action Plan. Possibly the best known habitat is the chalk cliffs. Large stretches remain undefended, and have been designated as Sites of Special Scientific Interest, (SSSI) for both their biological and geological interest. The cliffs contain seams of flint. These seams eventually become the pebbles on the beach. In some areas, erosion has created a chalk shelf at the base of the cliff. Deep gullies in the shelf are rich in marine wildlife. The BAR area also supports sandstone cliffs, which are different in nature but equally important from both an ecological and geological point of view. Unfortunately, some cliffs have been protected or reinforced with concrete, preventing natural coastal processes and damaging natural habitats.

As cliffs are exposed areas of rock, they are seemingly hostile areas to colonise. However, they provide an important niche for several species. A few hardy species of plants can survive, either on cliff tops or in the small amounts of soil which build up on ledges. Hoary Stock persists in the BAR area despite massive coastal development which has restricted it to a few sites on the south coast. Thrift is a typical coastal plant, growing in densely packed cushions to protect itself from the wind. The soft sandstone rocks are important for solitary bees and wasps which burrow into the rock.

Our cliffs have significant ornithological interest with breeding populations of Kittiwakes and Fulmars nesting on narrow ledges in the chalk. There are breeding populations of Peregrine Falcons around Peacehaven and the Seven Sisters and Sand Martins nest in the sandstone cliffs.

Saltmarshes
Saltmarshes are a saline wet area often found in estuaries and sheltered low-lying coasts. The habitat is periodically inundated by the sea. The type of vegetation found depends on how high the level of the land is and thus how often it is covered by the tide.

Glasswort is the first coloniser, being able to survive inundation by seawater during most high tides. Higher up the shore, the land is flooded less frequently, allowing species such as Sea Purslane and Sea Aster to establish. Sea Spurreys and Sea-lavenders are found on the highest levels of the marsh where the least amount of flooding takes place.

Saltmarsh has an exceptionally high conservation value in its own right, but it is equally important for the communities which it supports. As well as being rich in invertebrates, saltmarsh is particularly important for birds. It provides a high tide roost for waders like the Redshank which feed on the adjacent mudflats. It also provides a rich feeding ground for birds like ducks and geese which graze on the vegetation. It is used as a nesting habitat for waders, gulls and terns, and passerine birds feed on the seeds.

Saltmarsh also acts as a very effective form of natural coastal defence, absorbing the energy of the waves. Unfortunately, it is declining rapidly around the country at an estimated rate of 100 hectares every year, largely because of rises in sea level, coastal defence and land reclamation.

Sand Dunes
Sand dunes develop behind wide sandy beaches that dry out at low tide. Strong winds blowing onshore pick up the sand and carry it away, depositing it in small mounds at the back of the shore forming embryonic dunes. These are liable to be washed away by storm waves and also remodelled with every change in wind direction, but, if they survive long enough, they start to become colonised by plants, e.g. Marram, that are specially adapted to the difficult growing conditions. These plants help to stabilise the sand with their extensive root systems and also trap further supplies of sand amongst their leaves and stems. In this way the original mounds of sand grow progressively higher until eventually the dunes become ‘fixed’ and form a rich dune grassland which will eventually support species such as orchids. The plants in turn attract invertebrates providing food for higher animals like the Common Lizard.

Sand dunes occur at only a few sites on the Sussex and Kent coasts because the dominant beach material is shingle, rather than sand. The biggest dune areas are at Camber Sands and Sandwich Bay, where particularly wide sandy beaches are uncovered at low water.

The French Channel coast presents a striking contrast. Wide sandy beaches are common, and shingle scarce. Where the beaches are backed by low ground and not chalk cliffs, extensive dune systems have developed. From the Somme estuary north to the Belgian border, 53% of the coastline is fringed by sand dunes. Some of these dune areas started forming a thousand years ago, and the dunes reach heights of 35 m or more. The older dunes are well wooded, unlike those of Sussex and Kent. Growing in the dune slacks are a great variety of rare and interesting plants.

Saline Lagoons

These are bodies of water which tend to form behind sand or shingle ridges. They are fed either by overtopping of waves, or by percolation of seawater through the sand or shingle. Because of this, they range in salinity from sea water to freshwater. Species that live in these habitats have to contend with very harsh conditions. Hot sun may evaporate the water increasing the salt concentrations in the lagoon. Alternatively, heavy rain can dilute the salt content. Species that live in lagoons therefore have to be highly specialised, and are therefore seldom found anywhere else.

Saline lagoons are particularly important for invertebrates. This rich invertebrate life in turn means they are important for feeding and roosting birds, particularly waders and terns.

Vegetated Shingle

Vegetated shingle beaches probably form the most important habitat within the BAR project area. Most of the shingle around the coast forms fringing beaches; where the shingle is within reach of the waves and remains highly is mobile. Where shingle is thrown beyond the reach of the waves, it begins to build up, and some specialised plants can start to become established.

Beaches like this are rare globally; outside north-west Europe, they are found mainly in Japan and New Zealand. There are about 5000 hectares of vegetated shingle in the UK, more than 80% of which is at just two sites: Rye Harbour and Dungeness.

Shingle beaches are harsh environments. There is hardly any soil, very little freshwater, strong winds, salt spray and sometimes complete inundation by the sea, burial or even the loss of whole ridges during big storms. A few plants have developed special adaptations to survive these conditions. The communities that develop depend on the amount of finer materials mixed in with the shingle, and on how much freshwater there is. The classic pioneer species on the seaward edge include Sea-kale *Crambe maritima*, Yellow Horned-poppy *Glaucium flavum*, Babington's Orache, *Atriplex glabriuscula*, Sea Beet, *Beta vulgaris*, and Sea Campion *Silene uniflora*; such species can withstand exposure to salt spray and some degree of burial or erosion. Further from the shore, where conditions are more stable, more mixed communities develop, leading to mature grassland, lowland heath, moss and lichen communities, or even scrub.

Shingle is also important for animals. Birds like Terns and Ringed Plover nest on shingle, laying their highly camouflaged eggs amongst the pebbles. Some invertebrates are shingle specialists, e.g. the caterpillar of the rare Toadflax Brocade Moth is found almost exclusively on shingle at a few sites in East Sussex and Kent. There are several spiders which are only found on shingle beaches and a completely new species of fly was recently found living deep within the beach at Rye Harbour.

Coastal Processes

Unfortunately, coastal areas face many threats. These are often associated with development and coastal defence. These prevent the natural movement of beaches and also stop coastal habitats from retreating landwards as a response to sea level rise. This has created a phenomenon known as coastal squeeze.

One of the problems associated with the defence of chalk cliffs is that flint no longer erodes out of them, preventing the addition of new material to the beach. This is compounded by the development of piers, marinas and jetties which stick out and stop the shingle from moving along the coast. In this way, developments in one area can have significant impacts on beaches much further along the coast.

Through research work undertaken by the BAR project it has been found that flint shingle is not as durable as originally thought. Even when the pebbles have been rounded by the sea, they continue to erode. The life expectancy of flint shingle in the surf zone may be less than 200 years, which means that within the 50 year lifetime of many coastal protection schemes, as much as a quarter of the volume of beach shingle could disappear unless replenished.

Natural undefended coastal systems are dynamic and coastlines change over time. Recognising this is the first step towards solving many of the problems which threaten coastal habitats.