Shetland's origins

Our continents are not static but drift slowly over the Earth's surface, occasionally splitting apart or colliding as new oceans form or old ones shrink or vanish. 600 million years ago, Shetland was joined to Laurentia (proto America) and separated from Norway by an ocean called Iapetus. Shetland's rocks tell the story of how this ocean disappeared when Shetland and Laurentia collided with Norway and Europe. The heart of the Laurentian continent was made up of 2.5 billion year old gneiss rocks, some of which can be seen in Shetland today. As the continent eroded, thick layers of sediment - sand and mud - accumulated on the sea bed around its edge. When the two continents collided these sediments, now turned into rock, were crumpled and forced upwards to form a range of mountains like the present-day Himalaya. Most of Shetland is made up of rocks that once formed the roots of this mountain range.

The continental collision between 500-430 million years ago, created a super-continent whose desert interior occasionally held short-lived lakes. Heat from deep in the planet melted rocks deep in the crust and the molten magma forced its way up to the surface, creating volcanoes that spewed lava and ash onto the desert plains. About 300 million years ago, Laurentia and Scandinavia tried to drift apart again. A first attempt east of Shetland failed, but led to the deposition of several layers of sediment forming the North Sea basin, which now contains the oil fields. 60 million years ago the rift opening the Atlantic Ocean occurred west of Shetland leaving Shetland attached to Scandinavia and Europe.

Access Code

Shetland is famed for its natural beauty and wildlife. By following these simple guidelines you will respect the needs for those who rely on the countryside for their living whilst preserving the natural environment.

1. Use stiles and gates to cross fences and walls. Fasten all gates that you have opened.
2. Do not walk through fields of cultivated grass, as this is an important crop in Shetland.
3. If you have to cross cultivated land, do so by the edge of the field.
4. Avoid livestock and do not disturb them, especially during lambing time (mid April – mid June).
5. Whilst you may walk your dog you should keep it on a lead in the countryside, avoid livestock and be a responsible owner and pick up after your dog. Obey any notice forbidding dogs.
6. Do not litter or start fires.
7. Do not disturb nesting birds, especially those which nest on the ground.
8. Respect wildlife and refrain from picking flowers.
9. When parking on country roads, do not obstruct access roads or access to fields.
10. Take care when walking near cliff tops as the edge can be crumbly and dangerous.
11. Leave rocks as you find them, do not take geological specimens.

Geology

Shetland's landscape has been shaped over millions of years by rain, ice and waves. Weathering created soils that reflect the underlying geology and in turn influenced biodiversity, human settlement and agricultural practices. Archaeology reveals how our ancestors used different rocks for sustaining our landscape, wildlife, history, culture, and economy. This leaflet gives a taste of how geology has contributed to the Shetland we see today.

Shetland's highest point – Ronas Hill.

Walls Boundary Fault cuts through the cliffs at Ollaberry and is part of one of Europe's major tectonic features, the Great Glen Fault. On either side of the fault there are old mountains up to 100 km apart.

Geology

Shetland's landscape reflects the varying nature of the rocks beneath. The hard granite of North Roe resisted erosion better than the neighbouring rocks. Today it stands above its surroundings as a plateau capped by Shetland's highest point – Ronas Hill. Thick vertical bands of limestone running through the central Mainland were etched away by water millions of years ago to form the remarkable parallel valleys of Pettadale and Weisdale. Throughout Shetland the grain of the underlying geology can be seen in the North - South pattern of hills and valleys.

Only older valleys, carved by ancient rivers at a time when Shetland was part of a much larger land mass, run east and west across the grain of rocks. Perhaps the oldest of these cuts through the Cliff Hills at Quarff. First formed 400 million years ago, it was filled in with desert sands, and then re-excavated more recently by ice.

The tombolo at St. Ninian's Isle

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The island of Yell and parts of central Mainland are composed of Moine rocks. Originally laid down 1000 million years ago as thick layers of sand and mud in the sea on the edge of the American continent, they were metamorphosed when Scandinavia, Europe and America collided. Heat and pressure welded the grains of sand together to form quartzite and changed the mud to schist containing new minerals such as shiny flakes of mica and deep red grains of garnet.

By 800 million years ago when the Dalradian rocks began to be laid down sea animals with calcium carbonate shells had not evolved. The limestones in central Shetland were formed by bacteria and calcium combining with carbon dioxide from the atmosphere. This led to global cooling and ice ages. The limestones produce Shetland’s most fertile soils in the Tingwall and Weisdale valleys and were burnt to make fertiliser and lime for the building trade.

2.5 billion year old Lewisian gneiss, found in Northroo, is Shetland’s oldest rock - half the age of the Earth itself. Since it first formed it has been metamorphosed - heated, folded and recrystallised - many times by massive earth movements. Lewisian gneiss also occurs on the north west coast of Scotland and in the Outer Hebrides, including the Isle of Lewis, many times by massive earth movements. Lewisian metamorphosed - heated, folded and recrystallised - Northmavine, is Shetland’s oldest rock - half the age of the Earth.

Sullom Voe Oil Terminal

The granite upland of Shetland’s highest point - Ronas Hill - a rock made up of water-worn pebbles - show where mountain streams spilled onto the desert plain. Further south between Brindister and Quarff, similar rocks made of angular fragments, known as breccia, were once banks of scree that cloaked the mountainsides.

Meanwhile, deep in the crust, molten magma melted during the continental collision forced its way upwards. Some cooled and solidified before it could reach the Earth’s surface to form coarse crystalline rocks such as the granite of Ronas Hill.

A desert basin surrounded by high mountains lay at the heart of the new super-continent. To the north of Lerwick, beds of conglomerate - a rock made up of water-worn pebbles - show where mountain streams spilled onto the desert plain. Further south between Brindister and Quarff, similar rocks made of angular fragments, known as breccia, were once banks of scree that cloaked the mountainsides.

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Hot water trapped in the earth’s crust dissolved minerals from the rock. Escaping through fractures, the water cooled again and the minerals crystallised out to form hydrothermal veins which cross-cut Shetland’s rocks. Many contain interesting minerals and metal ores, but only one, at Sand Lodge, proved rich enough to be mined commercially for iron and copper ores.

As America drifted towards Scandinavia, most of the floor of the Iapetus Ocean sank into the Earth’s interior, but a fragment was trapped between the colliding continents (An ophiolite). The unusual serpentinite rocks of Unst and Fetlar are a relic of this vanished ocean floor, giving rise to a strange landscape of peat free rusty-brown crags, flower-rich heathland and bare gravel that supports rare plants. They also contain rare minerals such as chromite - a chromium ore, which was mined in Unst for over a century.

The rift that initially opened along the North Sea 300 million years ago is of major importance for Shetland. Marine sediment that slowly filled the rift contained remains of billions of tiny creatures that began to be laid down sea animals with calcium carbonate shells had not evolved. The limestones in central Shetland were formed by bacteria and calcium combining with carbon dioxide from the atmosphere. This led to global cooling and ice ages. The limestones produce Shetland’s most fertile soils in the Tingwall and Weisdale valleys and were burnt to make fertiliser and lime for the building trade.

The deformed conglomerate rocks at Funzie, in Fetlar were distorted by massive earth movements involving the explacement of the ophiolite, which stretched the pebbles into ‘cigar’ shapes.

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The unique Funzie conglomerate, found on the island of Fetlar

The fertile limestone grassland at Whiteness became wetter and for a few thousand years the desert basin became a lake, populated with aquatic life.

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Sand Lodge mine, Sandwick, which operated sporadically between 1790 and 1929

Where magma found its way to the earth’s surface, it erupted to form volcanoes. At Eshaness, the sea has carved away the flank of an ancient volcano exposing layer upon layer of lava and volcanic ash in the cliffs. Papa Stour too is formed of volcanic rock, but it is mainly pink rhyolite lava, rather than the dark purple andesite of Eshaness.

Layers of lava & volcanic ash along the Eshaness coastline

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