ACHANARRAS QUARRY
Site of Special Scientific Interest

SITE MANAGEMENT STATEMENT

Site code: 13

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdair air fad airson Alba air fad

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Purpose

This is a public statement prepared by SNH. It outlines the reasons the site is designated as a SSSI and provides guidance on how its special natural features should be conserved or enhanced. This Statement does not affect or form part of the statutory notification and does not remove the need to apply for consent for operations requiring consent.

We welcome your views on this statement.

This statement is available in Gaelic on request.

Natural features of Achanarras Quarry SSSI	**Condition of feature** (and date monitored)
Non-marine Devonian (the rock that surrounds the fossil fish)	Favourable, maintained (September 2015)
Silurian - Devonian Chordata (fossil fish)	Favourable, maintained (November 2006)

Description of the site

Achanarras Quarry Site of Special Scientific Interest (SSSI) is situated 2km west of the village of Spittal, Caithness. This is a site of international scientific importance due to the abundance and variety of fossil fish which were originally discovered when quarrying to extract flagstone. The Quarry is now disused and is a popular attraction for fossil enthusiasts.

The rocks of the site were laid down as sediment, predominantly mud and silt, during the middle stages of the Devonian period (398-385 million years ago) within a large inland basin known as the 'Orcadian basin' that stretched from present day Shetland and Orkney to the Moray Firth. At this time Britain lay between 20˚ and 30˚ south of the equator and had a warm, semi-arid climate. For long periods a lake existed in the Orcadian basin (Lake Orcadie) but it frequently varied in size.

Non-marine Devonian (the rock that surrounds the fossil fish)

The site at Achanarras contains rare exposure of the 'Achanarras Limestone Member', a sequence of thin layers of mud and carbonate-rich material, and its contacts with the silt-rich 'Upper Caithness Flagstone Group' above and 'Lower Caithness Flagstone Group' below. The Lower Caithness Flagstone Group records a shallow lake environment. This changes to a deep lake environment (transgression) represented by the Achanarras Limestone member. The Upper Caithness Flagstone Group represents the start of shallowing of the lake again (regression). The Achanarras Limestone Member is a valuable stratigraphic marker bed, which means that it can be correlated

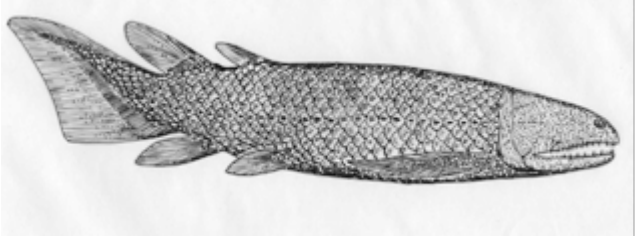
with other limestone outcrops throughout the Orcadian basin. This is important for studying how Lake Orcadie changed in depth and extent over time.

Silurian - Devonian Chordata (fossil fish)
The fossils at Achanarras are found in a distinct layer of rock called the 'Achanarras Fish Bed' which is found within the 'Achanarras Limestone Member' described above. This fish bed was deposited about 392 million years ago during the middle stages of the Devonian geological period when the land that is now Caithness was at the bottom of Lake Orcadie. The lake contained large numbers of fish. When fish died, their remains settled on the bottom of the lake where they were gradually covered by sediment and compressed. Over millions of years the sediments formed thick layers of rock and the fish remains became fossilised.

The irregular distribution of the fossilised fish suggests the environment was fluctuating and vulnerable to storms and changes in temperature or salt levels. Frequent algal blooms may have caused the removal of oxygen which may have led to mass fish mortality. A considerable amount of information on past environmental conditions, ecology and geography has been discovered through studying the sediments and the fossils they contain. The fossils themselves are important for understanding vertebrate evolution.

The well preserved representatives of at least sixteen species of fish have been identified at Achanarras - the most diverse assemblage of fossils in any of the equivalent Scottish sites. It also represents a "type locality" for two species of fish, *Rhamphodopsis threiplandi* Watson and *Palaeospondylus gunni* Traquair, which means that these species were first discovered and identified here.

Other specimens of particular interest include the recently discovered *Actinolepis* fossil fish. This is the first record of the species in Scotland and was found at Achanarras in 1998. It is very similar to specimens found in the Baltic area and strengthens ideas that these areas used to be connected. One of the more common larger fish found at Achanarras is *Dipterus*, a primitive lung fish which can be up to 40cm in length. A full list of fossil fish found at Achanarras is given in Annex 1. The only other animal to be discovered at Achanarras to date is a single, shadowy specimen of an arthropod called *Achanarraspis,* a relative of the horseshoe crab. Fossilised fragments of plants have also been found in the fish bed. The plants grew around the margins of the lake and were thought to have been washed into it where they became fossilised.

A lobe-finned fish *Glyptolepis* typical of the best-preserved fossils found at Achanarras	An interpretation of *Glyptolepis*
	

Monitoring of the site was undertaken in 2015. The Non-marine Devonian feature was in favourable condition having maintained the extent, composition and structure of the

deposits from previous surveys. The Silurian - Devonian Chordata (fossil fish) feature was also in favourable condition when it was formally monitored in 2006 and there were no significant changes in 2015. As well as the unquarried deposits being maintained, the fossil-rich spoil heaps were visible and accessible. The pool at the centre of the quarry restricts access to part of the site, but fossil-bearing strata are clear of the water in spoil heaps and easily accessible.

Past and present management

Achanarras Quarry started as a small farm quarry in 1870 and later was worked by the Thurso Flagstone Quarry company. By 1891 the fossil-bearing fish bed was exposed. The Quarry was not used in the early 20th Century but was worked for roofing 'slate' between 1959 and 1961. There was minor quarrying activity in the 1970s using wheeled wagons on rails, the remains of which can still be found at Achanarras. When the quarry was being worked, the water was drained from the pool using a siphon. The last time the water was drained was in 1980 for a scientific study of the distribution of fossils through the various layers of rock.

For the next 20 years collectors scoured the spoil heaps for fossils and it became increasingly difficult to find new specimens. In recent years, parts of the spoil heaps have been turned over periodically using a machine. This provides fresh material for collectors to search for fossils, and ensures that this internationally important site does not become overgrown.

The site has been owned by SNH or its predecessor bodies since 1981. Previously, a permit was required for collectors to remove fossils from the site, however as part of the Nature Conservation (Scotland) Act 2004, Scottish Natural Heritage have prepared the Scottish Fossil Code. The code sets out guidelines, advice and information allowing for the safeguard of Scotland's fossil heritage, ensuring that collecting is carried out in a responsible manner, and that collectors operate within the law. The permit system has therefore been discontinued and visitors do not require a permit as long as they comply with the Fossil Code.

On-site facilities were upgraded in 2008 to include an interpretive timeline trail from the car park and a new interpretive shelter within the quarry itself. For every three metres walked from the car park to the quarry, the visitor is taken back one million years until they reach 380 million years ago within the quarry. A new leaflet called the "Fossil Fish of Caithness" was produced in 2010. It can be also downloaded from our web site http://www.snh.gov.uk/ (type 'Fossil Fish of Caithness' into the Search box and follow the links).

The Quarry attracts geologists and fossil enthusiasts from all over the world and is also a valuable teaching resource for students of all ages.

Objectives for Management (and key factors influencing the condition of natural features)

We wish to protect the site and to maintain and where necessary enhance its features of special interest. We aim to carry out site survey, monitoring and research as appropriate to increase our knowledge and understanding of the quarry and its natural features.

The list of Operations Requiring Consent and the discussions on land management involved in the issuing of formal consents are intended to minimise the threat of any damage to the natural features.

1. **The quarry should be protected from inappropriate reinstatement, vegetation regeneration and unauthorised dumping** in order to maintain visibility and access to the fossil-bearing rocks. Turning over the spoil heaps periodically by machine will help to prevent the site becoming obscured by vegetation.

2. **Promotion of Achanarras Quarry as a research and educational resource and a visitor attraction**

We encourage research and educational visits, as well as visits by the general public. Promotion of the 'Scottish Fossil Code' will encourage people to collect responsibly and to manage collections in such a way that they will be useful to future generations. The Code also aims to enhance public interest in the fossil heritage of Scotland and promote this resource for scientific, educational and recreational purposes. The Scottish Fossil Code can be downloaded from our web site http://www.snh.gov.uk/ (type 'Fossil Code' into the Search box and follow the links).

Date last reviewed: 29 March 2016

Annex 1. List of fossil fish species found at Achanarras Quarry SSSI

Actinolepis sp.
Cheiracanthus murchisoni Agassiz, 1835
Cheirolepis trailli Agassiz, 1835
Coccosteus cuspidatus Miller, 1841
Diplacanthus (Rhadinacanthus) longispinus Agassiz, 1844
Diplacanthus striatus
Diplacanthus tenuistriatus Traquair, 1894
Dipterus valenciennesi Sedgewick and Murchison, 1828
Glyptolepis paucidens Agassiz, 1844
'*Holoptychius*' sp.
Homosteus milleri Traquair, 1888
Incertae sedis
Mesacanthus peachi Egerton, 1861
Osteolepis macrolepidotus Agassiz, 1835
Palaeospondylus gunni Traquair, 1890
Pterichthyodes milleri Miller, 1841
Rhamphodopsis threiplandi Watson, 1938