
The Old Red Sandstone of Great Britain

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Contents

Acknowledgements

Access to the countryside Preface N.V. Ellis

1 Introduction to the Old Red Sandstone of Great Britain W.J. Barclay

Introduction

GCR site selection

Scope

History of research

Old Red Sandstone palaeogeography

Stratigraphical framework for the Old Red Sandstone

2 The Orcadian Basin

Introduction P. Stone

Shetland

Orkney

North-eastern Scottish mainland

Melby: Matta Taing to Lang Rigg, Shetland P. Stone

Footabrough to Wick of Watsness, Shetland P. Stone

Easter Rova Head, Shetland P. Stone

The Cletts, Exnaboe, Shetland P. Stone

South Stromness Coast Section, Orkney E.A. Pickett

Taradiff Bay to Newark Bay, Orkney E.A. Pickett

Greenan Nev Coast, Eday, Orkney E.A. Pickett

South Fersness Bay, Eday, Orkney E.A. Pickett

Yesnaby and Gaulton Coast Section, Orkney E.A. Pickett

Old Man of Hoy Coast, Orkney E.A. Pickett

Bay of Berstane, Orkney E.A. Pickett

Red Point, Caithness P. Stone and W.J. Barclay

Pennyland (Thurso–Scrabster), Caithness P. Stone

John o'Groats, Caithness W.J. Barclay

Wick Quarries, Caithness P. Stone

Achanarras Quarry, Caithness P. Stone

Sarclat, Caithness P. Stone

Tarbat Ness, Ross and Cromarty P. Stone

Dun Chia Hill (Loch Duntelchaig), Inverness-shire D. Stephenson

Tynet Burn, Moray W.J. Barclay and N.H. Trewin

Den of Findon, Gamrie Bay and New Aberdour, Aberdeenshire W.J. Barclay

Rhynie, Aberdeenshire W.J. Barclay, P. Stone and N.H. Trewin

3 The Midland Valley of Scotland and adjacent areas 3

Introduction M.A.E. Browne and W.J. Barclay

The Toutties, Aberdeenshire M.A.E. Browne and W.J. Barclay

Dunnottar Coast Section, Aberdeenshire M.A.E. Browne and W.J. Barclay

Crawton Bay, Aberdeenshire R.A. Smith

North Esk River, Aberdeenshire R.A. Smith

Milton Ness, Aberdeenshire W.J. Barclay

Aberlemno Quarry, Angus M.A.E. Browne

Tillywhandland Quarry, Angus M.A.E. Browne

Whiting Ness, Angus M.A.E. Browne

Tay Bank, Perth and Kinross M.A.E. Browne and W.J. Barclay

Glen Vale, Fife M.A.E. Browne and W.J. Barclay

Wolf's Hole Quarry, Stirlingshire M.A.E. Browne and W.J. Barclay

Auchensail Quarry, West Dunbartonshire M.A.E. Browne and W.J. Barclay '

Siccar Point to Hawk's Heugh, Scottish Borders M.A.E. Browne and W.J. Barclay

Largs Coast, North Ayrshire A.A. Monaghan

North Newton Shore, Isle of Arran S.L.B. Arkley

4 Southern Scotland and the Lake District A.A. McMillan

Introduction

Palmers Hill Rail Cutting, Scottish Borders

Pooley Bridge, Cumbria

5 The Anglo-Welsh Basin

Introduction WJ. Barclay

Porth-y-Mor, Anglesey J.R. Davies

Devil's Hole, Shropshire W.J. Barclay

Oak Dingle, Tugford, Shropshire W.J. Barclay

The Scar, Herefordshire W.J. Barclay

Cusop Dingle, Herefordshire-Powys D.J. Hawley

Sawdde Gorge, Powys P.R. Wilby

Pantymaes Quarry, Powys W.J. Barclay

Heol Senni Quarry, Powys W.J. Barclay

Caeras Quarry, Carmarthenshire W.J. Barclay

Craig-y-Fro Quarry, Powys W.J. Barclay

Abercriban Quarries, Powys W.J. Barclay

Mon y Waen, Powys W.J. Barclay

Duffryn Cwannon, Powys W.J. Barclay

Craig-y-cwm, Torfaen W.J. Barclay

Ross-on-Wye, Royal Hotel, Herefordshire W.J. Barclay

Wilderness (Land Grove) Quarry, Gloucestershire W.J. Barclay

Lydney, Gloucestershire P.R. Wilby

Albion Sands and Gateholm Island, Pembrokeshire W.J. Barclay

Little Castle Head, Pembrokeshire W.J. Barclay

West Angle Bay (North), Pembrokeshire P.R. Wilby

Freshwater West, Pembrokeshire W.I. Barclay and B.P.J. Williams

Freshwater East-Skrinlde Haven, Pembrokeshire W.J. Barclay

Llansteffan, Carmarthenshire W.J. Barclay

Portishead, North Somerset P.R. Wilby

Glenthorne, Devon P.R. Wilby

References

Glossary

Index

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This volume is the combined work of the 14 authors listed on the title page. W.J. Barclay was responsible for the collation and editing of the individual contributions, as well as the compilation of the volume. Since submission of the initial drafts to JNCC in 2002, a number of exciting new discoveries and newly published research in the Old Red Sandstone necessitated the updating of the original manuscripts. L.P. Thomas acted as the GCR editor and B.P.J. Williams reviewed the volume. We are grateful to both for their forbearance, support and encouragement. In the course of his review, Prof. Williams became an enthusiastic participant in the project, both contributing to site descriptions and greatly improving the volume as a result of his unique country-wide expertise in the Old Red Sandstone. He also recommended some additional sites for inclusion as potential candidates for protected status. In addition to the BGS contributors (Sarah L.B. Arkley, M.A.E. Browne, J.R. Davies, A.A. McMillan, Alison A. Monaghan, Elizabeth A. Pickett, RA. Smith, D. Stephenson, P. Stone and P.R. Wilby), D.J. Hawley (University of Swansea) and N.H. Trewin (University of Aberdeen) provided important contributions.

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Access to the countryside

This volume is not intended for use as a field guide. The description or mention of any site should not be taken as an indication that access to a site is open. Most sites described are in private ownership, and their inclusion herein is solely for the purpose of justifying their conservation. Their description or appearance on a map in this work should not be construed as an invitation to visit. Prior consent for visits should always be obtained from the landowner and/or occupier.

Information on conservation matters, including site ownership, relating to Sites of Special Scientific Interest (SSSIs) or National Nature Reserves (NNRs) in particular counties or districts may be obtained from the relevant country

conservation agency headquarters listed below:

Countryside Council for Wales, Maes-y-Ffynnon, Penrhosgarnedd, Bangor, Gwynedd LL57 2DW.

English Nature, Northminster House, Peterborough PE1 1UA.

Scottish Natural Heritage, 12 Hope Terrace, Edinburgh EH9 2AS.

Preface

There is such a diversity of rocks, minerals, fossils and landforms packed into the piece of the Earth's crust we call 'Britain' that it is difficult not to be impressed by the long, complex history of geological change to which they are testimony. But if we are to improve our understanding of the nature of the geological forces that have shaped our islands, further unravel their history in 'deep time' and learn more of the history of life on Earth, we must ensure that the most scientifically important of Britain's geological localities are conserved for future generations to study and enjoy. Moreover, as an educational field resource and as training grounds for new generations of geologists on which to hone their skills, it is essential that such sites continue to remain available for study. The first step in achieving this goal is to identify key sites, both at national and local levels.

The GCR, launched in 1977, is a world-first in the systematic selection and documentation of a country's best Earth science sites. No other country has attempted such a comprehensive and systematic review of its Earth science sites on anything near the same scale. After over two decades of site evaluation and documentation, we now have an inventory of over 3000 GCR sites, selected for 100 categories ('Blocks') covering the entire range of the geological and geomorphological features of Britain. This volume is the 31st to be published in the intended 42-volume GCR series. It documents the results of a survey of Old Red Sandstone sites in Great Britain that was begun in the 1980s by the former Nature Conservancy Council, and revised between 2000 and 2002 by the present authors.

The rocks of the Old Red Sandstone were the sedimentary deposits of the Caledonian (Laurussian) continent, which formed by the amalgamation of the Lower Palaeozoic continents of East Avalonia, Laurentia and Baltica during the Caledonian Orogeny. The rocks are almost entirely of non-marine, terrestrial facies and as such are unfossiliferous, in contrast to their marine equivalents to the south in Devon. However, they locally preserve the fascinating remains and traces of the earliest animals to crawl onto dry land, breathe air and take wing, and the first fishes to appear in abundance, as well as the earliest plants. The rocks range from the Mid-Silurian (c. 428 million years) to Early Carboniferous (about 360 million years), but are predominantly Devonian in age. In Great Britain, they formed mainly in three areas, the Orcadian Basin, the Midland Valley of Scotland and the Anglo-Welsh Basin. Smaller basins include the Turriff Basin, the Rhynie Basin (internationally renowned for its early plants and insects), the Border Basin in southern Scotland and the Mell Fell Trough in the Lake District.

The Orcadian Basin is one of the great, classic lacustrine successions of the world, and of both immense academic interest and economic importance as a hydrocarbon source. The magnificent exposures in the cliffs and foreshore of Caithness, Orkney and Shetland are well represented in the GCR sites selected. The Old Red Sandstone of the Midland Valley of Scotland comprises a predominantly red-bed succession of Lower and Upper Devonian strata, much of it deposited in separate basins in a strike-slip regime. The GCR sites selected represent the range of sedimentary environments present. Whereas the Orcadian Basin and those in the Midland Valley of Scotland were rift basins within the Caledonian orogen, the Anglo-Welsh Basin was outside it for much of the Late Silurian and Early Devonian, the succession forming on alluvial plains on the margins of the marine basin to the south.

The volume describes sites in Old Red Sandstone strata originally selected for the Geological Conservation Review for the Non-marine Devonian GCR 'Block'. In addition to these, a number of sites were identified as being worthy of GCR status in the course of compilation of this volume, both at the start of the work and as a result of reviewing the draft text. These are referred to in the present volume as 'potential GCR sites'. Although these potential GCR sites have not yet been confirmed as GCR sites for the Non-marine Devonian (Old Red Sandstone) GCR 'Block', many have been selected independently for other GCR 'Blocks', and so are already established GCR sites, but for other reasons, such as

palaeobotany or palaeoichthyology, and are referred to as 'potential ORS GCR sites'. The palaeontological credentials of these sites are to be found in volumes 9 and 16 of the GCR Series (Cleal and Thomas, 1995; Dineley and Metcalf, 1999). Furthermore, some sites selected for the Non-marine Devonian GCR Block are in Old Red Sandstone red-bed facies of Silurian age and are therefore included in the Silurian Stratigraphy GCR volume (volume number 19 of the GCR Series: Aldridge *et al.*, 2001). Old Red Sandstone igneous rocks are described in the volume on Caledonian igneous rocks (Stephenson *et al.*, 1999).

Most of the sites identified for the Geological Conservation Review are now designated as Sites of Special Scientific Interest (SSSIs) by the appropriate country conservation agencies (the Countryside Council for Wales, English Nature and Scottish Natural Heritage).

This volume records the scientific justification of conserving sites, but does not deal with site management details. The descriptions of the sites are necessarily technical, but are written to a format that allows access to the non-geologist, particularly in the 'conclusions' section of each account. A glossary of some of the technical terms is also aimed at improved ease of understanding to the nonspecialist.

We hope that readers will appreciate that this volume presents an eclectic selection of Old Red Sandstone sites from many more potential candidates, with the aim of identifying the best GCR and potential GCR sites at the time of writing. As such, it brings together much widely scattered data and aims to ensure that the sites are documented in a systematic fashion and conserved for future examination and research. However, as new research is carried out, scientific discoveries at existing sites, as well as at new localities, will add to the rich treasure of knowledge that is described in this volume. We hope that this book will help to provide a stimulus to future research of these fascinating non-marine Devonian Old Red Sandstone rocks.

N.V. Ellis (GCR Publications Manager) and W.J. Barclay (British Geological Survey) April 2004

[References](#)