
The Old Red Sandstone of Great Britain

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GCR Editor: L.P. Thomas

Published by the Joint Nature Conservation Committee, Monkstone House, City Road, Peterborough, PE1 1JY, UK

First edition 2005

© 2005 Joint Nature Conservation Committee. ISBN 1 86 107 543 X

Typeset in 10/12pt Garamond ITC by JNCC. Printed in Great Britain by CLE Print Limited on Huntsman Velvet 100 gsm.

A catalogue record for this book is available from the British Library.

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Recommended example citations

Barclay, W.J., Browne, M.A.E., McMillan, A.A., Pickett, E.A., Stone, P and Wilby; P.R. (2005) *The Old Red Sandstone of Great Britain*, Geological Conservation Review Series, No. 31, Joint Nature Conservation Committee, Peterborough, 393 pp.

Stone, P. and Barclay, W.J. (2005) Red Point. In *The Old Red Sandstone of Great Britain* (W.J. Barclay, M.A.E. Browne, A.A. McMillan, E.A. Pickett, P. Stone and P.R. Wilby), Geological Conservation Review Series, No. 31, Joint Nature Conservation Committee, Peterborough, pp. 74–8.

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Acknowledgements

Compilation of this volume began in 2000, in a jointly funded contract between the British Geological Survey (BGS) and the Joint Nature Conservation Committee (JNCC). The volume describes sites in Old Red Sandstone strata originally selected for the Geological Conservation Review in the 1980s by the former Nature Conservancy Council, under the guidance of Dr W.A. Wimbledon, under the heading of the Non-marine Devonian GCR 'Block'.

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.

The project was managed by N.V. Ellis for JNCC and M. Smith for BGS. Diagrams were drafted by J S Publications. Photographs were scanned by Caroline Adkin and Jayne Kmiecik (BGS Keyworth) and F. McTaggart (BGS Edinburgh). The volume was seen to press by the JNCC on behalf of the Countryside Council for Wales, English Nature and Scottish Natural Heritage. We thank the JNCC GCR Publications Editorial and Production Team of Neil Ellis (GCR Publications Manager), Emma Durham and Anita Carter (Production Editors).

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Access to the countryside

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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

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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](#)