
British Lower Jurassic stratigraphy

M.J. Simms Department of Geology, Ulster Museum, Belfast

N. Chidlaw Department of Earth Sciences, University of Bristol

N. Morton School of Earth Sciences, Birkbeck, University of London

and

K.N. Page School of Earth, Ocean and Environmental Science, University of Plymouth

with contributions from P. Hodges (Department of Geology, National Museums and Galleries of Wales, Cardiff) M.J. Oates (BG Group plc, Reading) N. Trewin (Department of Geology and Petroleum Geology, University of Aberdeen)

GCR Editor: R. Gallois

Joint Nature Conservation Committee

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

First edition 2004

© 2004 Joint Nature Conservation Committee

Typeset in 10/12pt Garamond ITC by JNCC

Printed in Great Britain by CLE Print Limited on Huntsman Velvet 100 gsm.

ISBN 1 86 107 495 6

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

Apart from any fair dealing for the purposes of research or private study, or criticism or review, as permitted under the UK Copyright Designs and Patents Act, 1988, this publication may not be reproduced, stored, or transmitted, in any form or by any means, without the prior permission in writing of the publishers, or in the case of reprographic reproduction only in accordance with the terms of the licences issued by the Copyright Licensing Agency in the UK, or in accordance with the terms and licences issued by the appropriate Reproduction Rights Organization outside the UK. Enquiries concerning reproduction outside the terms stated here should be sent to the GCR Team, JNCC.

The publisher makes no representation, express or implied, with regard to the accuracy of the information contained in this book and cannot accept any legal responsibility or liability for any errors or omissions that may be made.

British Geological Survey and Ordnance Survey copyright protected materials

1. The copyright of materials derived from the British Geological Survey's work is vested in the Natural Environment Research Council (NERC). No part of these materials (geological maps, charts, plans, diagrams, graphs, cross-sections, figures, sketch maps, tables, photographs) may be reproduced or transmitted in any form or by any means, or stored in a retrieval system of any nature, without the written permission of the copyright holder, in advance.

2. To ensure that copyright infringements do not arise, permission has to be obtained from the copyright owner. In the case of BGS maps this includes both BGS and the Ordnance Survey. Most BGS geological maps make use of Ordnance Survey topography (Crown Copyright), and this is acknowledged on BGS maps. Reproduction of Ordnance Survey materials may be independently permitted by the licences issued by Ordnance Survey to many users. Users who do not

have an Ordnance Survey licence to reproduce the topography must make their own arrangements with the Ordnance Survey Copyright Branch, Romsey Road, Southampton SO9 4DH (Tel. 023 8079 2913).

3. Permission to reproduce BGS materials must be sought in writing from the Intellectual Property Rights Manager, British Geological Survey, Kingsley Dunham Centre, Keyworth, Nottingham NG12 5GG (Tel. 0115 936 3331).

4. The National Grid is used on diagrams with the permission of the Controller of Her Majesty's Stationery Office, Crown copyright licence no. GD 27254X/01/00.

Recommended example citations

Simms, M.J., Chidlaw, N., Morton, N. and Page, K.N. (2004) *British Lower Jurassic Stratigraphy*, Geological Conservation Review Series, No. 30, Joint Nature Conservation Committee, Peterborough, 458 pp.

Chidlaw, N. (2004) Wotton Hill. In *British Jurassic Stratigraphy* (M. J. Simms, N. Chidlaw, N. Morton and K.N. Page), Geological Conservation Review Series, No. 30, Joint Nature Conservation Committee, Peterborough, pp. 192–6.

Contents

Acknowledgements

Access to the countryside

Preface N.V. Ellis

1 British Lower Jurassic stratigraphy: an introduction

Introduction M.J. Simms

The establishment of the Jurassic System and the stages of the Lower Jurassic Series K.N. Page

Radiometric dating and the base of the Jurassic System M.J. Simms

Chronostratigraphy in the Jurassic System K.N. Page

Outcrop, subcrop and structural framework of the Lower Jurassic Series in Britain M.J. Simms

Palaeogeography M.J. Simms

Climate and sea level M.J. Simms

Lithostratigraphical framework for the Lower Jurassic Series of Great Britain M.J. Simms

Biostratigraphy of invertebrate macrofossils and microfossils M.J. Simms and P. Hodges

Event stratigraphy in the British Lower Jurassic Series M.J. Simms

GCR site selection M.J. Simms

2 The Wessex Basin (Dorset and central Somerset) M.J. Simms

Introduction

Pinhay Bay to Fault Corner and East Cliff Dorset

Cliff Hill Road Section, Dorset

Blue Anchor–Lilstock Coast, Somerset

Hurcott Lane Cutting, Somerset

Babylon Hill, Dorset

Ham Hill, Somerset

Maes Down, Somerset

3 The Mendip and South Wales massifs M.J. Simms

Introduction

The Lias Group of South Wales

Lavernock to St Mary's Well Bay, Glamorgan

Pant y Slade to Witches Point, Glamorgan

Marginal and fissure facies of South Mendip

Viaduct Quarry, Somerset

Hobbs Quarry, Somerset

Condensed facies of the Radstock Shelf

General introduction

General description

Bowldish Quarry, Bath and north-east Somerset

Kilmersdon Road Quarry, Bath and north-east Somerset

Huish Colliery Quarry, Bath and north-east Somerset

General interpretation

General conclusions

Fissure deposits or 'neptunian dykes'

Cloford Quarry, Somerset

Holwell Quarries, Somerset

Leighton Road Cutting, Somerset

4 The Severn Basin

Introduction M.J. Simms

Hock Cliff, Fretherne, Gloucestershire M.J. Simms

Blockley Station Quarry, Gloucestershire M.J. Simms

Robin's Wood Hill Quarry, Gloucestershire M.J. Simms and N. Chidlaw

Alderton Hill Quarry, Gloucestershire M.J. Simms

The Cotswold Cephalopod Bed Member and the Bridport Sand Formation N. Chidlaw and M.J. Simms

General description

Interpretation

Wotton Hill, Gloucestershire N. Chidlaw

Coaley Wood, Gloucestershire N. Chidlaw

Haresfield Hill, Gloucestershire N. Chidlaw and M.J. Simms

5 The East Midlands Shelf

Introduction M.J. Simms

Newnham (Wilmcote) Quarry, Warwickshire M.J. Simms

Conesby Quarry, North Lincolnshire K.N. Page

Napton Hill Quarry, Warwickshire M.J. Simms

Neithrop Fields Cutting, Oxfordshire M.J. Simms

Tilton Railway Cutting, Leicestershire M.J. Simms

6 The Cleveland Basin

Introduction M.J. Simms

Redcar Rocks, Redcar and Cleveland K.N. Page

Normanby Styre Batts–Miller's Nab (Robin Hood's Bay), North Yorkshire K.N. Page

Castlechamber to Maw Wyke, North Yorkshire K.N. Page

Miller's Nab to Blea Wyke, North Yorkshire K.N. Page

Staithes to Port Mulgrave, North Yorkshire K.N. Page

Boulby Quarries, Redcar and Cleveland K.N. Page and M.J. Simms

Whitby to Saltwick, North Yorkshire K.N. Page

7 The Moray Firth Basin

Introduction M.J. Simms

Dunrobin Coast Section, Highland N.H. Pewin

8 The Hebrides Basin

Introduction N. Morton

Ob Lusa to Ardnish Coast, Isle of Skye, Highland N. Morton

Hallaig Shore, Isle of Raasay, Highland N. Morton

Cadha Carnach, Isle of Raasay, Highland N. Morton

Prince Charles' Cave to Holm, Isle of Skye, Highland N. Morton

Rubha na' Leac, Isle of Raasay, Highland N. Morton

Aird na h-Iolaire, Isle of Mull, Argyll and Bute N. Morton

Boreraig to Cam Dearg, Loch Eishort, Isle of Skye, Highland M.J. Oates

Allt Leacach, Loch Aline, Highland M.J. Oates

References

Glossary

Fossil index

General index

Acknowledgements

Work began on selecting sites for the Lower Jurassic Stratigraphy part of the Geological Conservation Review more than a quarter of a century ago; in fact it was one of the first GCR subject 'Blocks' to be tackled by the GCR unit of the Nature Conservancy Council (NCC). Although some of the Lower Jurassic site reports that were drafted for the NCC during the site selection phase in the late 1970s and 1980s are not accredited in the GCR archive, it is known that several experts were consulted and involved both in GCR site selection, and report preparation, at that time including Philip Copestake, Tony Hallam, Phil Palmer, David Whiteside and Desmond Donovan. The authors of the present volume are indebted to these workers, and indeed to all of those who made a contribution to this early phase of the evaluation of British Hettangian–Pliensbachian sites for the GCR.

Although the majority of sites were selected for the GCR in the 1980s, since that time re-evaluation and more recent proposals have been translated into a revised GCR site list, as represented by the text presented here. So whereas some original GCR sites were re-evaluated and found wanting, others have been added to the GCR list. Thanks go to all of those who have helped in this updating work. Undoubtedly some readers will lament the exclusion of their favourite site, but stratigraphy, like any other science, is an ever-developing pursuit with new discoveries being made, and geological models subject to ongoing modification such that some sites increase in research value. Therefore, it is possible that further sites worthy of conservation will be identified in future years.

My own obsession with the Lias Group (often to the neglect of my school work) began in the early 1970s as new estates and pipe-trenches exposed the fossiliferous clays near my home. By the mid-1980s I had the opportunity to indulge my passion still further through my PhD research on Lower Jurassic echinoderms. My first involvement, albeit fleeting, with the Geological Conservation Review was a little earlier, in 1982, when I accompanied David Whiteside on a site assessment visit to Newnham (Wilmcote) Quarry. I have only a vague memory of the quarry but much clearer recollections of the decrepit state of Dave's Morris Traveller! Fifteen years later, in 1998, I was contracted to prepare the final manuscript for the Lower Jurassic Stratigraphy GCR and was encouraged by JNCC to subcontract sections of the work to several others with appropriate areas of expertise; their names now appear as authors where they have written or substantially contributed to the site account. Many others have been generous with their help both during the preparation of this volume and on matters Liassic over many years prior to it. They have provided access to specimens in museum and private collections; responded to reprint requests; commented on earlier drafts; and, in particular, allowed the use of

unpublished data and images. In alphabetical order they are; Nigel Ainsworth, Mark Barron, David Batten, Mike Benton, Brian Beveridge, Ian Boomer, John Callomon, R.A. Chadwick, Roger Clark, Roy Clements, B. Constable, Richard Cooper, Philip Copestake, Charles Copp, Pete Crowther, Micky Curtis, Desmond Donovan, Pete Doyle, Murray Edmunds, Paul Ensom, Mark Evans, Bruce Farrer, Ramues Gallois, Jean Guex, Tony Hallam, Ian Harding, Hans Hess, Steve Hesselbo, Roger Hewitt, Andrew Highton, Pete Hodges, Neville Hollingworth, Michael Howarth, Hugh Ivimey-Cook, Dick Jefferies, Andy Johnson, Cris Little, Jim Marshall, Christian Meister, Chris Moore, Phil Palmer, Chris Paul, Philip Powell, Hugh Prudden, Alastair Ruffell, Jon Radley, C.R. Scotese, Andrew B. Smith, David Sole, Mike Sumbler, Mike Taylor, Paul Taylor, Hugh Torrens, Charlie Underwood, Gavin Wall, Geoff Warrington, Graham Weedon, Paul Whalley, Paul Wignall and Bill Wimbleton. To any others I may inadvertently have omitted, my apologies.

Others have helped over the past 5 years with the technical and editing side. Particular thanks must go to Neil Ellis, a man of infinite patience and calm. Thanks also to Emma Durham, Anita Carter and the rest of the GCR Unit, to Susanne White and the staff of J S Publications for their preparation of the final figures, and to Ramues Gallois for editing the entire volume.

Finally I should like to dedicate this volume to the memory of Professor R.J.G. (Bob) Savage, 1927–1998, an inspirational teacher to so many budding palaeontologists at Bristol University, myself included.

Mike Simms, January 2004

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, research 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 the 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 around 100 categories covering the entire range of the geological and geomorphological features of Britain.

This volume, describing the British Lower Jurassic rocks of Great Britain, is the 30th to be published in the intended 43-volume GCR series. Not only does it contain the descriptions of key localities that will be conserved for their contribution to our understanding of the stratigraphy of rocks of this age, but also provides an excellent summary of the palaeontological and sedimentological features, and palaeogeographical significance to be found in them, and it outlines the research that has been undertaken on them. The book will be invaluable as an essential reference book to those engaged in the study of these rocks and will provide a stimulus for further investigation. It will also be helpful to teachers and lecturers and for those people who, in one way or another, have a vested interest in the GCR sites: owners, occupiers, planners, those concerned with the practicalities of site conservation and indeed the local people for whom such sites are an environmental asset. The conservation value of the sites is mostly based on a specialist understanding of the stratigraphical, palaeontological and sedimentological features present and is therefore, of a technical nature. The account of each site in this book ends, however, with a brief summary of the geological interest, framed in less technical language, in order to help the non-specialist. The first chapter of the volume, used in conjunction with the glossary, is also aimed at a less specialized audience. This volume is not intended to be a field guide to the sites, nor does it cover the practical problems of their ongoing conservation. Its remit is to put on record the scientific justification for conserving the sites.

This volume deals with the state of knowledge of the sites available at the time of writing, in 1998–2003, and must be seen in this context. Stratigraphy, like any other science, is an ever-developing pursuit with new discoveries being made, and existing models are subject to continual testing and modification as new data come to light. Increased or hitherto unrecognized significance may be seen in new sites, and it is possible that further sites worthy of conservation will be identified in future years.

There is still much more to learn and the sites described in this volume are as important today as they have ever been in increasing our knowledge and understanding of the geological history of Britain. This account clearly demonstrates the value of these sites for research, and their important place in Britain's scientific and natural heritage. This, after all, is the *raison &etre* of the GCR Series of publications.

N.V. Ellis, GCR Publications Manager June 2003

[References](#)