
Marine Permian of England

D.B. Smith, Honorary Senior Research Fellow in Geology, University of Durham, UK

GCR Editor: L.P. Thomas

Chapman & Hall

London, Glasgow, Weirheim, New York, Tokyo, Melbourne, Madras

Published by Chapman & Hall, 2–6 Boundary Row, London SE1 8HN

Chapman & Hall, 2–6 Boundary Row, London SE1 8HN, UK

Blackie Academic & Professional, Wester Cleddens Road, Bishopbriggs, Glasgow G64 2NZ, UK

Chapman & Hall GmbH, Pappelallee 3, 69469 Weinheim, Germany

Chapman & Hall USA, One Penn Plaza, 41st Floor, New York NY10119, USA

Chapman & Hall Japan, ITP-Japan, Kyowa Building, 3F, 2–2-1 Hirakawacho, Chiyoda-ku, Tokyo 102, Japan

Chapman & Hall Australia, Thomas Nelson Australia, 102 Dodds Street, South Melbourne, Victoria 3205, Australia

Chapman & Hall India, R. Seshadri, 32 Second Main Road, CIT East, Madras 600035, India

First edition 1995

© 1995 Joint Nature Conservation Committee

Typeset by Columns Design & Production Services Ltd, Reading

Printed in Great Britain at the University Press, Cambridge

ISBN 0 412 61080 9

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 of licences issued by the appropriate Reproduction Rights Organization outside the UK. Enquiries concerning reproduction outside the terms stated here should be sent to the publishers at the London address printed on this page.

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.

A catalogue record for this book is available from the British Library Library of Congress Catalog Card Number: 94–70931

Printed on permanent acid-free text paper, manufactured in accordance with ANSI/NISO Z39.48-1992 and ANSI/NISO Z39.48–1984 (Permanence of Paper).

Contents

Acknowledgements

Access to the countryside

Preface

1 The Permian marine rocks of England Geological setting

2 North-west England

Introduction

Barrowmouth Beach Section, Saltom Bay

3 North-east England (Durham Province)

Introduction

Trow Point (South Shields) to Whitburn Bay

Fulwell Hills Quarries (mainly Southwick Quarry)

Hylton Castle Cutting

Claxheugh Rock, Claxheugh (Ford) Cutting and Ford Quarry

Dawson's Plantation Quarry, Penshaw

Humbledon Hill Quarry

Tunstall Hills, Sunderland; Maiden Paps and the Tunstall Hills (Rock Cottage Exposure)

Tunstall Hills (south-east end) and Ryhope Cutting

Gilleylaw Plantation Quarry

Seaham

Stony Cut, Cold Hesledon

High Moorsley Quarry

Hawthorn Quarry

Horden Quarry

Blackhalls Rocks

Trimdon Grange Quarry

Raisby Quarries

4 North-east England (Yorkshire Province)

Introduction

River Ure Cliff, Ripon Parks

Quarry Moor

Newsome Bridge Quarry

Micklefield Quarry

South Elmsall Quarry

Bilham Quarry

Cadeby Quarry

Ashfield Brick-clay Pit, Conisbrough

New Edlington Brick-clay Pit

Wood Lee Common, Maltby

References

Glossary

Index

Acknowledgements

The author is pleased to acknowledge the help of Dr A.H. Cooper, Dr M.R. Lee, Dr N.T.J. Hollingworth, Mr J. Pattison and Mr T.H. Pettigrew, each of whom read part or all of the early versions of the text and made many helpful comments and suggestions. Thanks go to Dr W.A. Wimbledon who did some early editing work and to Dr L.P. Thomas who edited the completed volume and drafted the 'conclusions' sections. Thelma Smith cheerfully undertook the task of typing the first draft and most of the subsequent early amendments and additions.

Sincere thanks are also due to the GCR Publication Production Team: Dr D. O'Halloran, Project Manager; Neil Ellis, Publications Manager; Valerie Wyld, GCR Subeditor and Nicholas D.W. Davey, Scientific Officer (Editorial Assistant). Their efficiency and good humour was a constant source of comfort and encouragement. Diagrams were drafted by Lovell Johns Ltd.

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 or that a right of way exists. 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 in no way 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:

English Nature, Northminster House, Peterborough PE1 1 UA.

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

Countryside Council for Wales, Plas Penrhos, Ffordd Penrhos, Bangor, Gwynedd LL57 2LQ.

Preface

This book is concerned almost wholly with a diverse suite of carbonate rocks that were formed near the margins of shallow tropical seas during the last 5–7 million years of the Permian period (300–251 Ma). These unique rocks, collectively known as the Magnesian Limestone, have been studied for more than 160 years and the names of some of the early workers — Geinitz, Murchison, Phillips, Sedgwick, Sorby — would grace any geological hall of fame. Despite this formidable assault, and the efforts of a host of later workers, the Magnesian Limestone still retains many of its secrets.

Permian marine rocks crop out on both sides of the Pennines, but those of the Zechstein Sea to the east are by far the thicker and more varied, and in these lie all but one of the sites selected for special protection. Detailed accounts of the rocks in 26 such sites form about half of this book and the normal and special features of these sites are compared, contrasted and placed in their mutual context in the remainder of the book. The sites were selected according to a range of criteria, including uniqueness, representativeness, historical importance and suitability for teaching purposes and research; most are inland quarries but a few are in the unrivalled coastal cliffs of classical County Durham where the main difficulty lies in deciding what not to select. Some sites, especially the coastal cliffs at Blackhalls Rocks, Seaham and between South Shields and Sunderland are worthy aspirants to World Heritage status.

The rocks at the sites selected for protection, in conjunction with those at other exposures and with information from boreholes, reveal much of the dynamic history of the late Permian seas in northern England. They suggest initial creation of the seas by catastrophic flooding of sub-sea-level inland drainage basins (themselves perhaps the product of differential subsidence accompanying post-Variscan crustal cooling and attenuation) and a subsequent complex history of basin filling against a background of ?glacially-triggered sea-level oscillation. Evidence of at least four major sea-level changes is fundamental to the widespread recognition of four main cyclic rock sequences in each basin, the first two of which together filled much of the original basin whereas the others were formed mainly in space created by continuing episodic subsidence. In north-east England, especially, the late Permian rocks of the first and second cycles display clear evidence of formation in a wide variety of nearshore tropical environments including sea-marginal subaqueous slopes, shelves, lagoons and reefs. They have, in addition, been altered both chemically and physically during deep burial and re-emergence, the most spectacular effects being the creation of a bewildering and unique range of calcite concretions that are famous world-wide. Finally, almost all the carbonate rocks at almost all the listed sites bear evidence of the former presence of calcium sulphate crystals and patches, and many of the coastal cliffs vividly demonstrate the disruptive dislocation caused by the dissolution of formerly interbedded thick anhydrite (and probably some halite) deposits.

[References](#)