Deltas

SITES AND TRAPS FOR FOSSIL FUELS

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Preface

Deltas, with their economic, political and scientific importance, have long fascinated and attracted Man's attention. The term 'delta' was coined by Herodotus in approximately 450 BC for the triangular-shaped sedimentary body at the mouth of the River Nile. Today, the concept of a delta, its morphology and its controlling processes, are almost as numerous as the people who work on such systems.

This volume, of 23 papers on many aspects of modern and ancient deltaic sedimentary systems, will be useful to researchers as well as teachers and students alike. The well-balanced content of the book should prove particularly attractive to those who seek a detailed state-of-the-science overview of this large and ever-expanding subject area.

The international meeting from which this volume resulted was convened at the Geological Society of London, Burlington House, Piccadilly, from 21 to 22 April 1987, in order to fill the gap in publications on deltaic systems since the flurry of conferences on deltaic sedimentation took place in the early and mid-1970s. We felt that significant advances have been made in our understanding of deltas and yet not collated into a useful reference source, and a timely forum was long overdue to enable workers to disseminate this knowledge. The two-day meeting included 27 papers and eight posters covering modern and ancient deltas in marine to freshwater environments. Topics included processes, facies models, petroleum-, gas- and coal-related deltaic environments, together with general case studies. The meeting attracted about 180 speakers and delegates from Germany, France, Norway, Canada, Italy, Denmark, the USA and Britain. The delegates were warmly welcomed by Professor Alec Smith in his role as Vice-President of the Geological Society. Dr John Hudson stepped in at the eleventh hour to provide a superb after-dinner speech at the conference dinner.

Following the two days of plenary sessions, there were two successful two-day field trips, one led by Professor Trevor Elliot to the Westphalian of N Devon and the other led by Professor John Collinson to the Namurian of the Pennines. At the weekend following the field trips, there was a one-day core workshop in Edinburgh, organized by Stuart Brown and Philip Richards (British Geological Survey, Edinburgh), to examine the Jurassic Brent cores from the northern North Sea. This was so popular that an additional workshop had to be organized for the following day (Sunday) to cope with demand.

We would like to thank the following companies for their generous sponsorship of the meeting and this publication: Britoil plc, BP Petroleum Development Ltd, Chevron Exploration North Sea Ltd, Clyde Petroleum plc, Enterprise Oil plc, Esso, GAPS Geological Consultants, LASMO Exploration & Production UK Ltd, Neste Oy (Exploration), Norsk Hydro, North Sea Sun Oil Co. Ltd, Occidental International Oil Inc., Occidental Petroleum (Caledonia) Ltd, Robertson Research plc, Teredo Oils Ltd, Texas Eastern North Sea Inc., Total Oil Marine, Tricentrol Oil Corp Ltd and UNOCAL Ltd.

We also wish to thank the Royal Society and the Geological Society of London for their financial support of the meeting. The abstract volume was published by British Gas plc and we thank them for their generosity.

Our thanks to Barbara Afergan, Cherry Walker and Mark Wilkinson for helping us in the many essential operational/administrative tasks on the days of the conference. Sue Button is thanked for last minute drafting of diagrams, and the efficient secretarial staff at the Geological Society and at Leicester University are thanked for their help. Naturally, we thank the authors and the referees of the manuscripts for providing us with the material for this book. Finally we thank our families for their support during the production of this volume.

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Deltas: sites and traps for fossil fuels

M. K. G. Whateley & K. T. Pickering

This volume does not aim to review deltas, nor to provide a comprehensive reference source, but merely to highlight some of the recent advances in our knowledge of deltas and their economic significance. The discursive papers by Elliott and Alexander consider the definition of a delta and emphasize the wide spectrum of deltaic and associated deposits. Syvitski and Farrow describe fan deltas in fjords, with their rugged topography and dynamic history of basin infilling as analogues for small hydrocarbon-bearing submarine fans. Ito adds a further dimension to our knowledge of fan deltas and how they relate to water depth in the receiving basin.

A section of the book is devoted to subsurface and geophysical techniques. Cowan considers the porosity evolution of Carboniferous fluvio-deltaic sandstones, and illustrates the importance of understanding poroperm development in these economically attractive reservoirs. The Bristow and Myers combination papers describe how detailed gamma-ray logging, using a potassium, thorium, uranium scintillometer, can be used to distinguish lithofacies associations in a Namurian deltaic succession. This offers the possibility of adding to our already expanding knowledge on facies associations and brings the detailed correlation of surface with subsurface exposure using petrophysical logs. In this respect, Selley's contribution on reservoir prediction using rotational dipmeter patterns complements the previous authors' contributions.

The third section of the book is based around general case studies of various deltaic systems. Sestini provides a review of the sedimentary and tectonic history of the Nile Delta, and Okazaki and Masuda describe Quaternary deltas from palaeo-Tokyo Bay. Pedersen describes the fine-grained sediments in a fluvially dominated lacustrine delta in a volcanic province of W Greenland and highlights the need for provenance studies to understand poroperm and source rock potential better. Siedlecka, Pickering and Edwards document the oldest deltaic system described in this book, from the late Precambrian, N Norway, where wet-sediment deformation is also common. Harris discusses the sedimentology of a Middle Jurassic lagoonal delta system in the Hebrides off NW Scotland. Papers on Irish Carboniferous deltaic deposits are presented by Martinsen and Pulham. The former deals with styles of wet- or soft-sediment deformation on a Namurian delta slope, whilst Pulham considers the internal structure and architecture of sandstone bodies within the Upper Carboniferous deltaics of County Clare, also containing superb examples of sediment liquefaction and fluidization.

Petroleum- and gas-related case studies form the fourth part of this volume. Flint, Stewart and van Reissen describe the reservoir geology of a lacustrine delta in a Tertiary intermontane basin of the Sirikit oilfield in Thailand and their work shows how important relatively areally restricted basins can be in considerations of oil resource potential. Helland-Hansen, Steel, Nakayama and Kendall investigate sandstone geometry by computer modelling of the Brent Group. This review of the Brent Group is complemented by the papers by Brown and Richards, and Livera, who describe facies associations of formations within the Brent Group. Brown and Richards mainly describe the northern limit of progradation of the Brent Delta, whilst Livera concentrates on sandbody geometry of the Ness Formation.

The final section covers the coal-related case histories in deltaic settings. Haszeldine describes the relationship between depositional controls of coal and coal-bearing strata and climate and structural setting, and points out the need for integrated sedimentological and palaeobotanical studies to enable us to understand fully the relationships between coal and its enclosing sediments. Scott makes similar points, but also shows that modern peat-forming ecosystems require more detailed investigation in order to provide better modern analogues for many ancient coal-related delta systems. Whateley and Jordan consider a thick Tertiary coal deposit in Sumatra, Indonesia, whose geometry appears to be strongly influenced by fan-delta lobes which built out into a lake, the coal forming in interlobe areas. The final paper by Read describes the relationship between subsidence and deposition of fluvio-deltaic environments in the Namurian, Midland Valley, Scotland.

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