

Excursion Guide to the Geology of East Sutherland and Caithness Nigel Trewin and Andrew Hurst (editors). Dunedin Academic Press Ltd. Edinburgh, 2009. ISBN 978-1-906716-01-1, Paperback, £14.99.

The north eastern margin of the Scottish mainland has long been an area to excite the interest of geologists, both amateur and professional. Whether it is the possibility of examining coastal exposures of Jurassic rock sequences around Brora, equivalent to those from which North Sea oil is won, or the opportunity to collect outstanding fossil specimens from the world famous fish beds of Caithness, this sparsely populated region area continues to attract geological field parties from across the UK and further afield.

This second edition of the East Sutherland and Caithness excursion guide, produced by the Aberdeen Geological Society and again edited by Nigel Trewin and Andrew Hurst, is a timely and invaluable field companion for those either planning to lead geological trips, or those intending to visit on holiday, who wish to gain an insight into the landscape and geology of this remote area. The format of the guide builds on the strengths of the first edition, published in 1993. It provides well structured itineraries with clearly focused topics of investigation for each excursion and now benefits considerably from the extensive use of full colour illustrations, both as sketch maps and photographs, of many of the most interesting and important features encountered. On a purely practical note, the change in profile of the guide to a more elongate form, with rounded edges to pages, makes it a much more user-friendly field companion than its predecessor, as it fits neatly into the map pocket of most waterproof jackets. This, as most visitors to Caithness and Sutherland, will know, is no small matter, as the area commonly experiences 'four seasons in a day' weather even in high summer.

The guide structure will be familiar to those who are devotees of the earlier edition. The Editorial Introduction gives a brief background to some of the more notable geological features of the district as well as general advice on how the field visitor should behave, where to stay, geological exhibits that can be visited etc. Much more detailed information, together with guidance on specific aspects of access limitations, such as tidal constraints (important for the many coastal localities) walking distances, parking locations, expected duration of each excursion, and hazards (such as steep slippery slopes) are given at the beginning of most excursion itineraries. Further practical (locality specific) guidance is to be found within each itinerary. It is a pity that expected travel times (by car or coach) from the suggested field-base centres of Helmsdale, Brora and Golspie (for 'East Sutherland') and Wick and Thurso (for Caithness) are only given sporadically, as these play a major role in determining the correct scheduling of a prolonged excursion. I must admit that I regret the repositioning of the Excursion Localities map from its position on the back cover on the first edition (which made it easy to consult in the rain) to page 37; perhaps it could have been printed on the inside of the front or back covers.

An overview of the geology of the area is given in the first chapter on Geological History. This is much shorter than that given in the first edition, although it covers all of the topics dealt with by its predecessor. It is however fully updated with an impressive integration and distillation of the findings of both early and up-to-the-minute geological research across the area. This is also reflected in the extensive

reference list, with 40 newly published works cited since the 1993 edition was published. Indeed, in the absence of an up to date Regional Guide or geological memoirs for the area, this work would be my first point of reference for answering most general questions on the bedrock geology or economic geology of the area. That being said, there are some notable shortcomings; the Quaternary geology of the region is covered in just over one page and, apart from a minor mention in the final chapter (Excursion 6 ~ Kildonan Gold) it is barely described in the remaining 190 pages. Likewise, topics such as the hydrogeology of the region, or its overall structural evolution are barely mentioned. This is perhaps a function of the stratigraphical treatment of the rock sequences. This plays to the authors strengths, which are undoubtedly in their consummate knowledge of the sedimentary rock successions. They acknowledge this, particularly in relation to the pre Devonian 'Basement' rocks, by referring the reader to the forthcoming new edition of the guide to Moine geology (Strachan *et al*, in press).

Inclusion of up to date information on the Beatrice Oilfield is a welcome addition to the overview as, on a clear day, its production platforms can be seen some 30 km offshore from the A9 between Brora and Wick. This, together with comparisons of the character of individual stratigraphical units of the onshore basin-margin Jurassic sequences with their offshore equivalents, broadens the economic relevance of geological field excursions in East Sutherland area to a potential new readership.

There are several notable errors and omissions in the illustrations within the Geological History chapter. The most notable and confusing of these are the transposition of figures 9 and 10. The former has its caption as 'Stratigraphy and lithofacies of the Triassic and Liassic rocks' when it in fact shows the Bathonian and Oxfordian succession; Figure 10 shows the Trias and Lias, but is captioned Bathonian and Oxfordian. This not only confuses the reader but, because the figures occur in their apparently correct order in the guide, the surrounding text (which deals correctly with the successions in ascending stratigraphical order) is completely mismatched with illustrations. This appears to be a simple mix up of apparently similar stratigraphic columns, but it should have been noticed in the final proof. More minor, but nevertheless irritating, is the labelling of two faults as 'LF' and 'SBF', with no explanation, on the inset map of Figure 8, which shows the major brittle structures within the Inner Moray Firth Basin. A simple addition to the figure caption would have rectified this, as would a change to the misleading caption to Figure 3, which includes the initiation of the Orcadian basins and deposition of the Lower Old Red Sandstone but is captioned as dealing with pre-Devonian events. It immediately faces Figure 2 which shows the Lower ORS as lower Devonian in age. The lack of 'ma.' after any of the time intervals quoted in Figure 2 will also confuse the amateur reader; I would also have liked a time scale plotted against the basic stratigraphic framework in Figure 2. This would allow the reader to visualise the time intervals represented by various stratigraphic units.

Space precludes a detailed chapter by chapter evaluation of each excursion itinerary or locality, so I will make some general points highlighting some of their strengths (of which there are many) and my quibbles (of which there are few). Each excursion itinerary begins with a clear statement of its purpose i.e. what the reader will be examining and access details (times, distances, hazards). This is usually clear and concise and is followed by general introduction to the geology, which in most

instances is sufficient to place the excursion in context. The majority of the excursions have more than one itinerary, which also have their own introductory remarks. In many cases this leads to some repetition, but it has the great advantage of enabling a mix and match approach to tailoring timings or topics for specific parties. This approach is followed rigorously for the early excursions to the Triassic and Jurassic, where individual excursions and the relatively closely spaced localities make calculations of timings and distances comparatively straightforward; it tends to be less precise with the more widely spaced mixture of inland and coastal outcrops.

The types of errors present in the first chapter are apparently absent from the remainder of the text, which is well organised, clearly and carefully written and generally well illustrated. Each locality is given a six figure National Grid Reference, and in many instances, hints on how to find elusive exposures. For example, the 'Access' section for Itinerary 2.1, for the Brora Coal and Brora Arenaceous formations between Brora and Strathsteven (p 52) states 'Localities 1 and 2 require low tide, and sand and seaweed cover frequently obscures large areas of outcrop'; this type of detail can save much wasted time and effort when leading a field party.

The use of coloured photographs to show particular structures of interest, as exemplified in the excursions to the Old Red Sandstone localities in Caithness is very impressive; I would have liked some for the Triassic Lower Jurassic of Golspie (Excursion1) and a few more for Excursion 2 (the Bathonian to Oxfordian of the Brora area).

The description and paleoenvironmental interpretation of the sedimentary sequences, of individual sedimentary and tectonic structures, fossil assemblages, and of the evolution of the sedimentary basins through time provides a compelling picture of the dynamic earth movements, erosive and depositional events that have resulted in the distribution of the rocks as we see them today. It has left me with a much better understanding of many localities that I have visited, and pointed out several features that I had missed. That, for me, is the function of a good excursion guide, which this undoubtedly is. I have no hesitation in recommending it to any geologist who plans to visit this unique part of Scotland, as an excursion leader or simply as a tourist. It may even encourage me to have a go at gold panning in the Kildonan Burn the next time I pass through Strath Halladale.

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Reference

Strachan, R. A., FRIEND, C., ALSOP, G.I. & MILLER, S. (eds.). In Press. *A Field Guide to the Moine geology of the NW Highlands*. Edinburgh and Glasgow Geological Societies.