96 S. E. MEMOIRS OF THE GEOLOGICAL SURVEY, ENGLAND AND WALES. THE GEOLOGY OF THE OOLITIC AND LIASSIC ROCKS TO THE NORTH AND WEST OF MALTON

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THE GEOLOGY

OF THE

OOLITIC AND LIASSIC ROCKS

TO THE NORTH AND WEST OF MALTON.

(EXPLANATION OF THE QUARTER SHEET 96 S.E. OF THE ONE-INCH GEOLOGICAL SURVEY MAP OF ENGLAND AND WALES.)

BY

C. FOX-STRANGWAYS, F.G.S.

THE LISTS OF FOSSILS REVISED BY

R. ETHERIDGE, F.R.S., PRES. G.S.

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NOTICE.

The formations described in this Memoir are the same as those of which Mr. Strangways gave an account in the Explanation of Quarter Sheets 95 SW. and SE ; with the exception that in the district comprised in 96 SE. the Lower Cretaceous (Neocomian) clays, and the Portland Beds are absent, and the three great divisions of the Lias are present. The Lower Lias is however not seen at the surface, being concealed by superficial deposits.

The whole has been mapped and described by Mr. Strangways with his usual accuracy.

ANDREW C. RAMSAY,

Director-General.

20th August 1881.

Q 6486. Wt. 2848.

NOTICE.

The tract of country comprised in Quarter Sheet 96 SE. of the Geological Survey Map of England and Wales, of which this Memoir is an Explanation, was surveyed by Mr. C. Fox-Strangways, under the superintendence of Mr. H. H. Howell, District Surveyor.

The rocks described by Mr. Strangways are those lying to the north and north-west of Malton, and mostly belong to the Upper and Middle Oolites; a very small area being occupied by the Chalk on the eastern side of the map, and the Liassic strata occurring in the south-western corner.

The chief point of interest in the Memoir seems to be the remarkable change, both in character and development, of the Middle Oolites in the northern region of Pickering and Helmsley, and in the southern region of the Howardian Hills.

The lists of Fossils have been revised by Mr. Etheridge.

MS. Coloured Copies of the Six-Inch Geological Survey Map of this area are deposited, for reference, in the Geological Survey Office.

H. W. BRISTOW,
Senior Director.

Geological Survey Office,
28, Jermyn Street, S.W.,
17th August, 1881.

THE GEOLOGY

OF

THE OOLITIC AND LIASSIC ROCKS

TO THE NORTH AND WEST OF MALTON.

Introduction.

The outcrop of the rocks in the northern part of the map is really a continuation of that to the east, in 95 S.W., and consequently this pamphlet should be read in conjunction with the one describing that sheet.

The area contained in the map is 216 square miles, and includes the western end of the great hollow known as the Vale of Pickering. The principal towns are Malton, Pickering, Kirkby Moorside and Helmsley, which are situated on the flanks of the valley just where the hills begin to rise on either side. There are also nearly 40 villages of considerable importance situated within the map, besides several smaller hamlets.

Nearly the whole of the area is drained by the river Rye and its tributaries, the waters of which enter the Derwent on the eastern edge of the map, and then flow south through the gorge below Malton. The south-west corner, including an area of about 13 square miles, is drained by the little river Foss, which enters the Ouse at the City of York.

The physical features of the district may be said roughly to assume the shape of a horseshoe, the most elevated ground ranging along the north, west, and south sides of the map, while the centre is either comparatively flat or occupied by hills of but slight elevation, and as we shall show presently, the various groups of strata follow the semicular form of the hills.

The most elevated areas are the Moors in the north-west corner, which exceed 1,000 feet in height; while the level of the Derwent, where it leaves the map a little south of Malton, is not more that 50 feet above the sea.

The rocks coming to the surface in this district mainly belong to the Upper, Middle and Lower Oolites; besides these a very small patch of Chalk, which forms the north-west corner of the Yorkshire Wolds, enters the map on the eastern side, and the Liassic rocks are found in the south-west corner.

Geological Formations.

The following are the geological formations which occur in the district :—

Table of Formations.

Recent and Post Glacial	Alluvium. Warp and Lacustrine Clay. Sand and Gravel.
Glacial	Boulder Clay and Gravel.
Upper Cretaceous	White Chalk. Red Chalk.
Upper Oolite	Kimeridge Clay.
Middle Oolites	Upper Calcareous Grit. Coral Rag and Upper Limestone. Middle Calcareous Grit. Lower Limestone. Passage Beds. Lower Calcareous Grit. Oxford Clay. Kellaways Rock.
Lower Oolites	Cornbrash. Upper Estuarine Series. Scarborough or Grey Limestone Series including the "Brandsby Roadstone." Middle Estuarine Series. Millepore Series, including the "Whitwell Oolite." Lower Estuarine Series, with beds of Hydraulic Limestone. Dogger.
Lias	Upper Lias. Middle Lias. Lower Lias.

The Lias.

The Liassic Rocks occupy a small portion of the south-west corner of the map, covering an area of about eight square miles; they are much obscured by Boulder Clay and Gravel, and are apparently somewhat faulted, from which causes the mapping of the lower portion is rather uncertain.

The Lower Lias.—Except quite the uppermost portion, these beds are not seen anywhere in this district, being buried by a great thickness of Boulder Clay and Gravel, which in wells between Stillington and Brandsby has been proved to have a thickness of about 20 yards. Judging from neighbouring areas it probably consists of dark blue shales with ironstone bands and doggers in the upper part, and hard bands of limestone full of fossils in the lower.

These beds occupy the low ground south of Brandsby, but are only exposed in a few drains near Stearsby and Skewsby. The thickness of the Lower Lias in this neighbourhood we have at present no means of estimating.

The Middle Lias.—This portion of the Lias consists in the main of sandy shales and sandstones with calciferous doggers full of fossils, of which the principal are *Rhynchonella tetrahedra Avicula inæquivalvis, Exogyra Maccullochii, Pecten æquivalvis, Cardium truncatum, Hypopodium, Isocardia, Myacites*, etc. Above this is a greater or less thickness of soft shale with bands of ironstone doggers.

These beds have a thickness of about 70 feet, and being considerably harder than either the beds above or below, form a well marked terrace along the hillside from Brandsby eastwards; west of Brandsby they are depressed by a fault and crop out in the low ground, but are only obscurely seen west of Britton Wood.

Around the hill at Crayke the Middle Lias also forms a fairly well marked terrace; the beds are seen at a few places, and are also proved in the numerous wells about the village.

The Upper Lias.—This consists of shales somewhat harder than those of the Lower Lias, but softer than the beds of the Middle Lias, above which it usually rises in a steep bank, and from either of which it is easily distinguished.

The thickness of the Upper Lias is about 80 feet; it forms a steep clayey bank along the hillside east of Brandsby, but west of that village it has not been seen anywhere, being entirely concealed by Boulder Clay.

An outlier of these shales occurs on the hill at Crayke; they are exposed in the roadside immediately below the Castle, and there is also a faulted portion to the south where the lower part with *Inoceramus dubius* is seen on the side of the road leading to Easingwold.

There must also be an inlier of Upper Lias below the Oolite north of Wiganthorpe, brought up by the great east and west fault near that place; although the beds here are not really seen in situ their presence is inferred by the boggy ground and springs below the Dogger beds of the Inferior Oolite at Swinsey Carr near Wiganthorpe.

LOWER OOLITES.

The principal portion of the Lower Oolites which crops out in this map is that in the south west, forming a portion of the Howardian range of hills. The Upper Estuarine beds also crop out in the bottom of the valleys of the Rye, Riccal, and Hodge Beck, but they occupy a very small area in this map, and really belong to larger spreads that outcrop on the moors to the north, and which will be treated of in describing that country.

The lithological character and thickness of this southern portion differs considerably from that described in the east and north,