

Defining Prospective Play Fairways over the Southern Flank of the UK Mid North Sea High *

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Abstract

Despite early interest in the initial stages of North Sea hydrocarbon exploration, the Mid North Sea High (MNSH) has exhibited limited prospectivity relative to the neighbouring basins of the North Sea Rift System (Central Graben and Outer Moray Firth) and Southern Permian Basin. Recently, a rejuvenation in interest has been driven by: a) the discovery of the Breagh and Cygnus Fields on the southern margin of the MNSH; b) better understanding of long-distance migration onto basement highs driven by recent discoveries in the Central and Viking Grabens; c) the acquisition of new 2D seismic data as part of the Oil and Gas Authority (OGA)'s Frontier Basins program; and d) the announcement of the 29th UKCS Licencing Round for which a large number of blocks over the MNSH were offered. This work integrates the new OGA 2D seismic with other 2D and 3D volumes and an extensive well database to draw conclusions on the structural development, subsidence history and prospectivity of the MNSH. The results provide the basis for understanding the extent of reservoir play fairways across this relatively underexplored region of the UKCS. In particular, the study has allowed the nature of the southern boundary of the MNSH to be defined and highlights the main controls on the petroleum systems that govern exploration success in the Triassic Bunter Sandstone Formation, Permian (Rotliegend Group) Leman Sandstone Formation, and at various stratigraphic levels in the Carboniferous. The work also highlights that the regional extent of reservoir facies, charge migration routes and trap formation timing remain key exploration risks over parts of the MNSH.

Discussion

The Mid North Sea High (MNSH) lies between the Northern and Southern Permian Basins and is transected to the northeast by the Central Graben. Exploration activity in and around the MNSH was primarily undertaken in the 1970s during the initial stages of North Sea hydrocarbon exploration but disappointing results led companies to focus on the more prolific surrounding basins. In the following years, occasional bursts of activity took place, but none replicated the success of other areas. However, the difficulty in characterizing and

determining the extent of the High itself means that the bounds of the northern and southern play fairways are poorly defined. Several recent discoveries have served to highlight this implying that a better understanding of the high's evolution may help to identify previously unrecognized plays. A recent rejuvenation in exploration interest in the MNSH has been driven by:

- The discovery of the Breagh and Cygnus Fields on the southern margin of the MNSH, located outwith their previously defined play fairways;
- A better understanding of long-distance migration towards basement highs driven by recent discoveries in the Central and Viking Grabens;
- The acquisition of new 2D seismic data as part of the Oil and Gas Authority (OGA)'s Frontier Basins Research Project;
- The announcement of the 29th UKCS Licensing Round for which a large number of blocks over the MNSH were awarded.

This work integrates the new OGA 2D seismic with other 2D and 3D volumes and an extensive well database to draw conclusions on the structural development, subsidence history, and prospectivity of the MNSH. The results provide the basis for understanding the extent of reservoir play fairways across this relatively underexplored region of the UK Continental Shelf. In particular, the study has allowed the nature of the southern boundary of the MNSH to be defined and highlights the main controls on the petroleum systems that govern exploration success in the Triassic Bacton Group (Bunter Sandstone Formation), Permian Rotliegend Group (Leman Sandstone Formation) and at various stratigraphic levels in the Carboniferous ([Figure 1](#)). The work also highlights that the regional extent of reservoir facies, charge migration routes and trap formation timing remain key exploration risks over parts of the MNSH.

This research is being carried out in the Applied Geoscience Unit at Heriot Watt University and is funded by the OGA as part of their Frontier Basins Research Project. All results will be open access with key deliverables including: seismic surfaces across the Mid North Sea High derived from the new OGA 2D survey; field and well summary sheets providing a 'quick look' database for explorers and; revised play maps for key plays of interest across the Mid North Sea High.

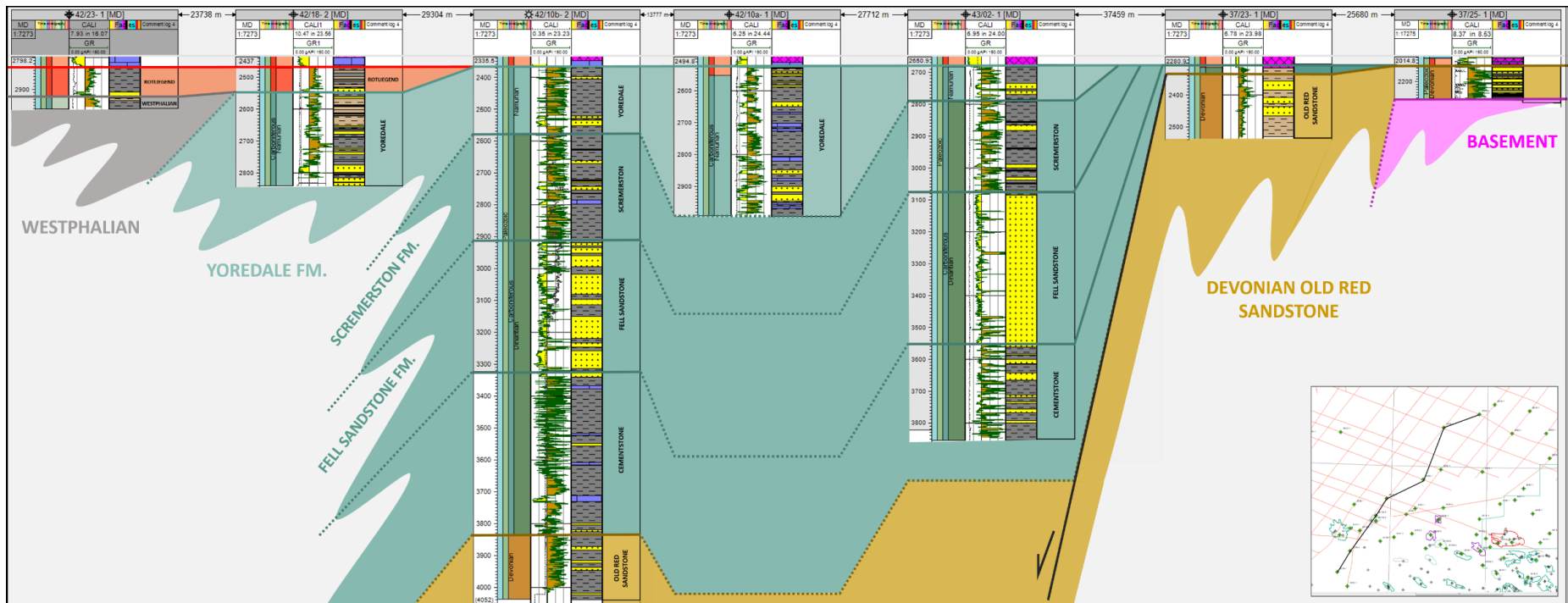


Figure 1. Well correlation panel highlighting the distribution of Upper Palaeozoic sequences from the the South Permian Basin northwards onto the Mid North Sea High.