

Rockall Continental Margin

Exploration and the search for hydrocarbon resources

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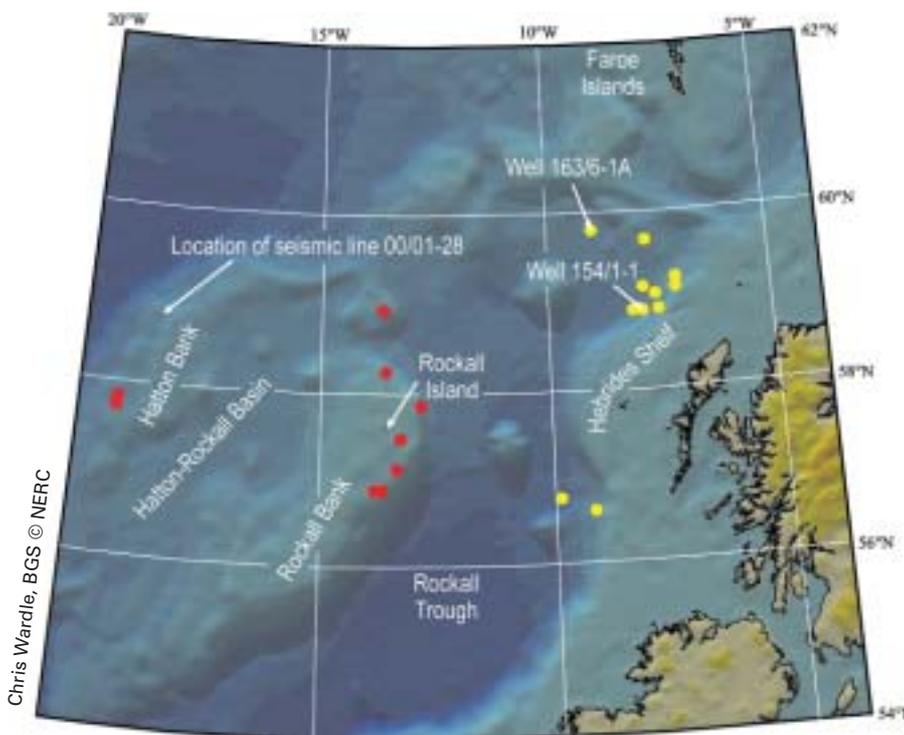
The North Sea has proved to be a bonanza for UK oil and gas production. However, most of the large fields there have probably now been found so the oil exploration industry has started to look more seriously at the western side of Britain — the Atlantic Margin. Several discoveries (such as the Clair, Foinaven, Schiehallion, Solan, Strathmore and

Victory fields) have been made west of Shetland although not all are economically viable at the present time. Furthermore, in the same general area, oil was discovered (in 2001) in only the third offshore well to be drilled in Faroese waters. Exploration between Shetland and the Faroe Islands is likely to yield further discoveries in the next few years.

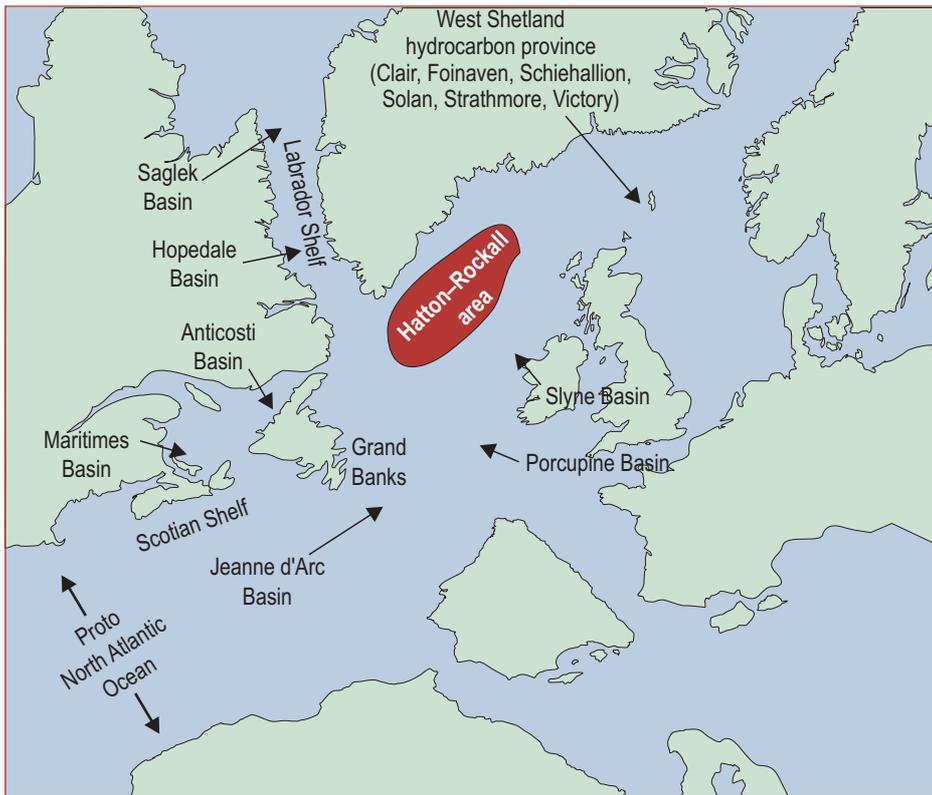
Farther south, to the west of Scotland, exploration has continued at a much slower pace. Only eleven wells have been drilled so far in UK waters (the first one, 163/6-1A, in 1980 was a stratigraphical test well) and all have been located on the eastern side of the Rockall Trough. In 2000, Enterprise Oil made a gas discovery in well 154/1-1, but much more significant was an announcement of a hydrocarbon discovery in Enterprise well 12/2-1 drilled in 2002 in Irish waters just south of the median line with the UK. This may give a huge boost to new exploration in the Rockall Trough just at a time when many companies were on the point of withdrawing from the area.

“... the oil exploration industry has started to look more seriously at the western side of Britain ...”

As part of its commitment to investigate the geology under the sea bed around the UK, the BGS is undertaking a long-term survey programme that covers the UK designated area west of Scotland which is known as the Rockall Continental Margin. This extends for a thousand kilometres into the North Atlantic Ocean (*see below*). The Rockall survey programme commenced in 1992, and is currently co-funded through the BGS Science Budget, the Department of Trade and Industry and a number of oil companies. Since the start of the project, nearly 19 000 kilometres of new seismic, gravity, magnetic and bathymetry data have been collected, over 250 short sea-bed cores have been obtained and 14 continuously cored shallow boreholes have been drilled. Numerous laboratory studies have also been undertaken. These include biostratigraphy, petrography, organic, inorganic and isotopic analysis, heavy mineral identification and measurement of physical rock properties. Desk studies undertaken include several data compilations, gravity and magnetic modelling, seismic reprocessing and the identification of natural oil seeps from satellite data. The deep water to the west of Scotland has required innovative thinking, and this has resulted in several ‘firsts’ being achieved in terms of drilling technology and geological discoveries.



Bathymetry map of the Rockall Continental Margin, west of Scotland, showing the location of the ten commercial wells (yellow dots) drilled in the UK Rockall Trough. The BGS boreholes on Rockall and Hatton Banks (red dots) are the most westerly holes drilled in the UK offshore designated area.



Chris Wardle, BGS © NERC

Distribution of the continents before the full opening of the North Atlantic Ocean (approximately 140 million years before present). The Hatton–Rockall area is surrounded by numerous sedimentary basins that are Mesozoic or older. Most have proven hydrocarbon discoveries, which suggests it may be worthwhile to explore this area more fully.

The area west of Rockall island is still frontier territory and is not well understood. However a pre-rift continental refit of the circum-North Atlantic region shows that, prior to break-up, the Hatton–Rockall area was surrounded by numerous Mesozoic (and older) basins many of which have been the target for hydrocarbon exploration (see above). Of these, the Jeanne d’Arc Basin, beneath the Newfoundland Grand Banks shelf, has proved to be the most prolific with many hydrocarbon discoveries. Circumstantial evidence therefore suggests that the Hatton–Rockall area may also have potential for hydrocarbon discoveries in the future.

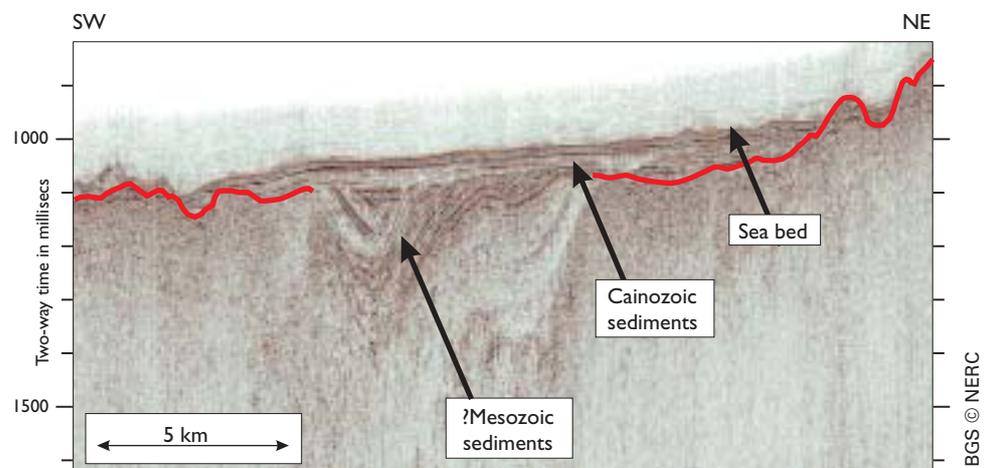
In 1998, 1999, 2000 and 2002, the BGS conducted geophysical surveying and drilling operations west of Rockall in order to investigate the geology here. Early results confirm that the area suffered massive volcanism during the early Cainozoic (at about 56–54Ma) when lavas were extruded from several huge volcanoes and other local sources. The layer of lavas, which is deeply

buried beneath the Hatton–Rockall Basin but is much closer to the sea bed on Hatton and Rockall Banks, largely obscures seismic reflections from the

deeper geology. However, on Hatton Bank, BGS surveys and drilling have revealed areas where the lavas are absent (due either to non-deposition or to subsequent erosion) allowing Mesozoic sedimentary basins to be imaged on seismic data. These basins cover several thousand square kilometres and have been affected by tectonic activity, which has created possible structural hydrocarbon traps.

“... the area west of Rockall may yet become the UK’s most remote oil province ...”

Furthermore, modelling of gravity data suggests that these basins continue beneath the lavas, and the BGS is working with Edinburgh University and commercial sponsors to improve seismic imaging beneath the volcanic rocks. This remains one of the key technological challenges for exploration in these frontier areas. Numerous suitable source rocks have been proved on the Atlantic Margin of the UK and Ireland. If similar rocks are present on Hatton Bank or in the Hatton–Rockall Basin, and the timing of the geological events required to produce a hydrocarbon accumulation has been in the correct order, then the area west of Rockall may yet become the UK’s most remote oil province.



BGS © NERC

BGS high-resolution seismic line 00/01-28 acquired across part of Hatton Bank. The red line marks the top of the layer of early Cainozoic lavas. Where the lavas are absent, the folded, possible Mesozoic succession is imaged on the seismic data. Modelling of gravity and magnetic data suggests there is a significant development of this older succession beneath the lavas.