

Ceri James (BGS) and **Andrew Mackie** (National Museum of Wales) describe how marine habitats in the Outer Bristol Channel have been surveyed to ensure that the benefits of any future exploitation of sea-bed resources can be weighed against the potential environmental impacts.

Bristol Channel habitat study

Informed policy and decision making when planning offshore developments requires knowledge of the current physical state of the marine environment. This includes the morphology, geology, biology and sediments of the sea bed. Such baseline information is essential for the strategic management and sustainability of the physical and biological resources, as well as the conservation of biological diversity. Further, responsible stewardship requires an understanding of the way the marine environment functions and how it might respond to human activity.

The BGS and the National Museum Wales (NMW) are undertaking a marine habitat study with the aim of addressing the lack of regional-scale biological and geological data for the Outer Bristol Channel. This is an area that may have marine aggregate resource potential in the future.

The study includes marine geophysical surveys combined with sediment and sea-bed fauna surveys. In conjunction with archive data, the study aims to produce



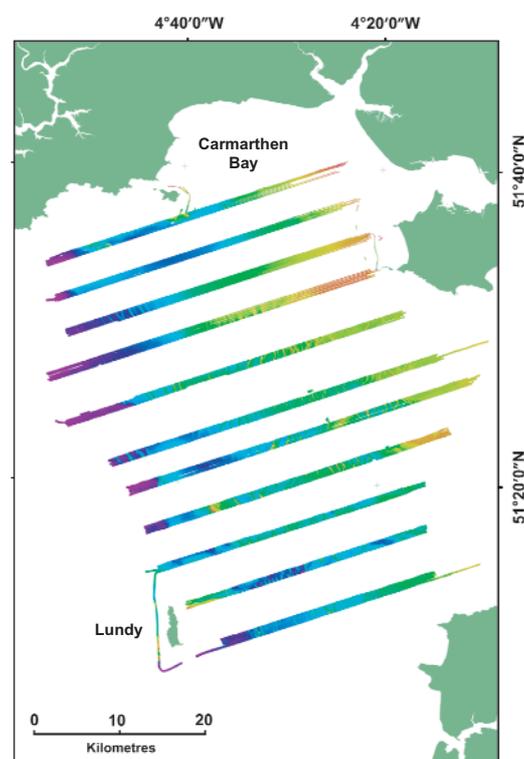
An image of the sea bed showing sand and gravel with hydroids attached to gravel.

comprehensive interpretations of marine habitats, species, and biodiversity in the study area.

The area covers approximately 2400 km² of the sea bed from Carmarthen Bay in the north to Lundy Island 60 km to the south. Within the central part of the area the sea bed reaches depths of 50 to 60 m. The Bristol Channel is noted for having one of the highest tidal ranges in the world, with a maximum tidal range of 14.8 m at Avonmouth at the eastern end of the estuary. Within the study area the maximum range is greater than 7 m. It is an area of strong tidal currents and open to Atlantic swells from the south-west. This has made survey conditions very challenging.

A primary aim of the study was to gather high-resolution data on the character and nature of the sea bed through deployment of multibeam

and high-speed digital sidescan systems. The principal scientific interest was a large sand-wave field in the central part of the area. Unfortunately funding was not sufficient to multibeam the entire area, therefore the survey strategy adopted was designed to maximise



Location of the multibeam survey corridors in the study area.

coverage of the major bedforms, habitats and biotopes. The survey plan consisted of eleven one-kilometre-wide corridors with complete multibeam and sidescan coverage. The survey corridors were 25 to 40 km long with centre lines spaced 5 km apart. They were aligned roughly parallel to the predominant tidal stream and at right angles to the regional trend of the sand- wave crest lines. Depending on water depth, each corridor comprised at least five survey lines of multibeam and sidescan.

The first geophysical survey was undertaken in 2003 on the RV *Prince Madog* using a Reson 8101™ multibeam and simultaneous running of an Edgetech MP-X™ multipulse sidescan. This sidescan was adopted to enable the survey to be conducted at speeds of seven knots. A second survey was conducted in 2004, again with a Reson 8101 but this time using a Klein 5000™ multibeam sidescan, running at speeds of seven knots. On both surveys a boomer seismic reflection system was planned to run down the centre line of each corridor to provide information on the geology below the sea bed.

Combining the multibeam and sidescan data has allowed bed forms to be mapped on both a small and large scale. The high-resolution sidescan data have revealed smaller-scale wave forms (megaripples) superimposed on the sand waves and indicated the physical processes that are maintaining the form of the sand waves.

Ground truthing of the geophysical data included grab sampling at 136 stations

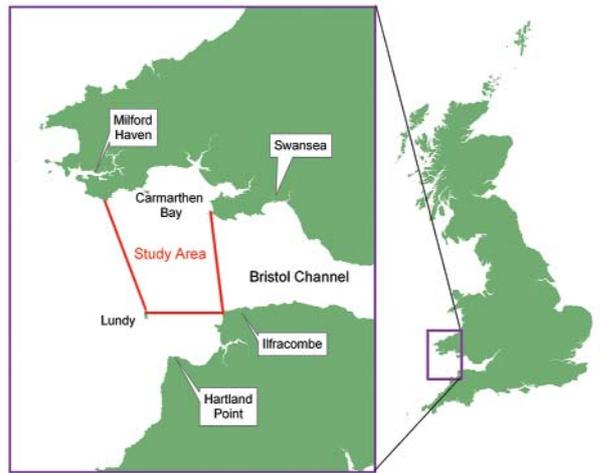
along the survey corridors, 2 m beam trawls at 11 sites and 23 camera tows for video and still images of the sea bed. These have been analysed for the invertebrate animals living on and within the sea-bed sediments.

The survey strategy and framework based on a corridor approach is an appropriate and practical approach to providing data and interpretations at a regional scale, especially in areas with well-developed bed forms.

The study is a three-year programme, planned to end in March 2006. The outputs include outreach activities led by a dedicated education facilitator, a bilingual (English-Welsh) CD-ROM (see article on page 16), a travelling exhibition, scientific reports and web-based resources. The last mentioned include pages hosted on the BGS and NMW websites, plus an integrated presence on the Marine Life Information Network (MarLIN) site.

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The principal support for the study comes from the Aggregate Levy Sustainability Fund for Wales,



Location of the Outer Bristol Channel marine habitat study.

administered by the Welsh Assembly Government, and the Sustainable Land Won and Marine Dredged Aggregate Minerals Programme of the Office of the Deputy Prime Minister. This has been augmented by funding and resources from the host organisations (BGS/NERC and NMW), together with contributions from the Crown Estate and the British Marine Aggregate Producers Association. The Maritime and Coastguard Agency and Llanelli Sand Dredging Ltd have also provided data.

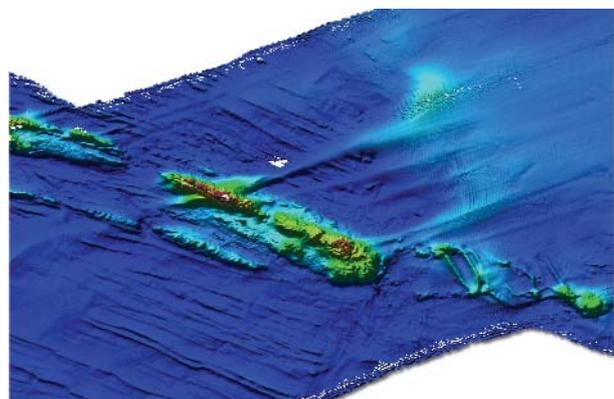
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Sand wave: sidescan mosaic draped on multibeam surface.



Horseshoe Rocks: dolerite intrusion.