Rhan Allanol Môr Hafren

Outer Bristol Channel

Arolwg Daearegol Prydain
CYNGOR YMCHWIL YR AMGYLCHEDD NATURIOL
British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

national museum wales
amgueddfa cymru

The Outer Bristol Channel Marine Habitat Study

Summary Document

Science Underpinning Sustainability

Providing Information for All

Noddir gan Lywodraeth Cynulliad Cymru
Sponsored by Welsh Assembly Government

Y Prosiect

Prosiect amlweddog oedd Astudiaeth o Gynefin Morol Môr Hafren Allanol (2003-2006), a oedd yn cyfuno arbenigedd daearegol, bywydegol, dehongliadol ac addysgiadol Arolwg Daearegol Prydain ac Amgueddfa Cymru mewn ardal â photensial o adnoddau agregau morol.

Dyma rai o'r deunyddiau a gynhyrchwyd drwy'r prosiect:

- Adroddiad Ymchwil Wyddonol sy'n cynnwys manylion am gynefinoedd gwely'r môr a bywyd anifeiliaid cysylltiedig

  The Outer Bristol Channel Marine Habitat Study *by* A.S.Y. Mackie, J.W.C. James, E.I.S. Rees, T. Darbyshire, S.L. Philpott, K. Mortimer, G.O. Jenkins & A. Morando. *BIOMÔR Reports* **4**: 500 pp.*

- DVD-ROM Rhyngweithiol o'r Prosiect yn rhad ac am ddim
- Arddangosfa Deithiol *Archwilio Gwely'r Môr*
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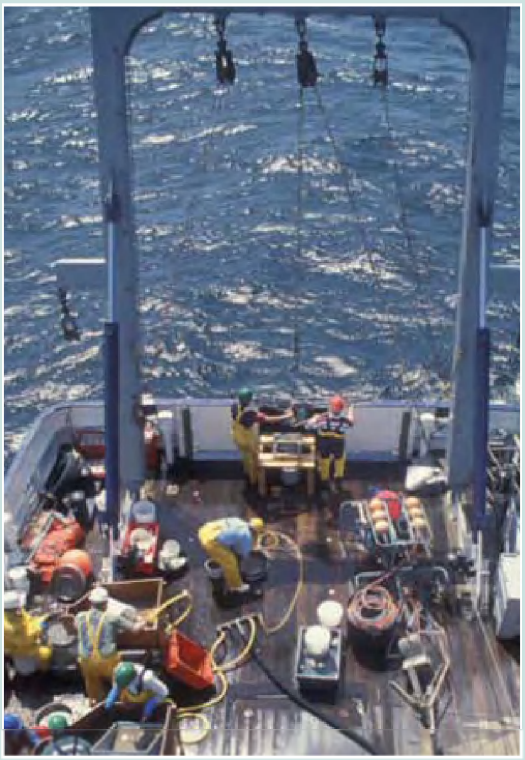
- CD-ROM Dwyieithog Addysgol Rhyngweithiol *Archwilio Gwely'r Môr* rhad ac am ddim
- Gwefannau: www.amgueddfacymru.ac.uk www.bgs.ac.uk www.marlin.ac.uk

Darparodd y Swyddog Allgymorth Morol yn Amgueddfa Genedlaethol Cymru wybodaeth a gweithgareddau mynediad agored i bawb a oedd â diddordeb yn y prosiect drwy gydol 2005-2006. Cynlluniwyd amrywiaeth o weithdai'n arbennig ar gyfer ysgolion i gyd-fynd â gofynion y Cwricwlwm Cenedlaethol.

Mae'r ddogfen yn rhoi trosolwg cryno o'r prosiect a'i ganfyddiadau gwyddonol.



** Ar gael am £8 (cost pecynnu a phostio)*

Cysylltwch â: obc@amgueddfacymru.ac.uk

The Project

The Outer Bristol Channel Marine Habitat Study (2003-2006) was a multifaceted project involving the geological, biological, interpretative and educational expertise of the British Geological Survey and Amgueddfa Cymru — National Museum Wales in an area with potential marine aggregate resources.

The project outputs include:

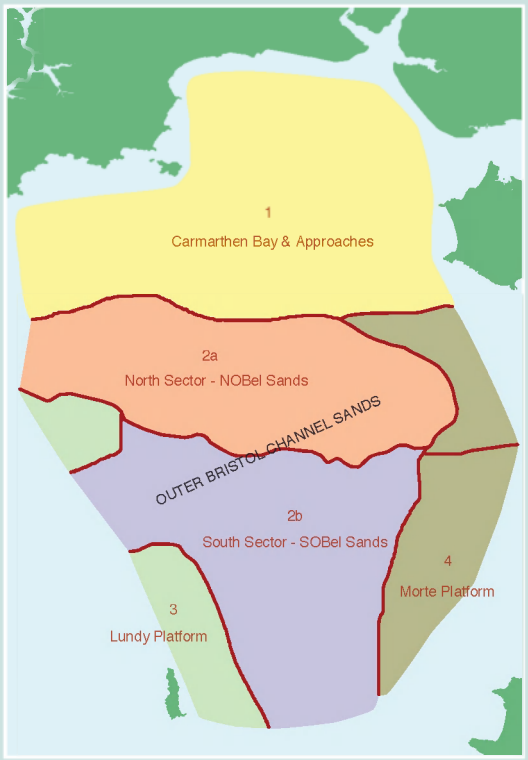
- Scientific research report detailing the sea bed habitats and associated animal life

  The Outer Bristol Channel Marine Habitat Study *by* A.S.Y. Mackie, J.W.C. James, E.I.S. Rees, T. Darbyshire, S.L. Philpott, K. Mortimer, G.O. Jenkins & A. Morando. *BIOMÔR Reports* **4**: 500 pp.*

- Free Interactive Project DVD-ROM
- Touring *Explore the Sea Floor* Exhibition
- Education & Outreach Report
- Free bilingual interactive educational *Explore the Sea Floor* CD-ROM
- Websites: www.museumwales.ac.uk www.bgs.ac.uk www.marlin.ac.uk

A Marine Outreach Officer based at the National Museum Wales provided open-access information and activities for all interested parties throughout 2005-2006. A variety of workshops for schools were tailored to the requirements of the National Curriculum.

This document provides a concise overview of the project and its scientific findings.



Using the results from the surveys, the Outer Bristol Channel study area was divided into four biologically and geologically distinct regions.

Drwy ddefnyddio canlyniadau'r arolygon, rhannwyd Môr Hafren Allanol yn bedwar rhanbarth gwahanol o safbwynt bywydegol a daearegol.

** Available in UK for £8 (to cover postage and packing)*

Contact: obc@museumwales.ac.uk

Funding & Support

Study funded by grants from:

• The Aggregates Levy Sustainability Fund (ALSF) in Wales (48%), administered by Welsh Assembly Government

• The Sustainable Land-Won and Marine Dredged Aggregate Minerals Programme (SAMP) in England (30%), administered by the Mineral Industry Research Organisation (MIRO) on behalf of the Office of the Deputy Prime Minister (ODPM)

Additional funding provided by:

• Amgueddfa Cymru—National Museum Wales (NMW)

• British Geological Survey (BGS)/ Natural Environment Research Council (NERC)

• The Crown Estate

• British Marine Aggregate Producers Association (BMAPA)

Additional data in kind from:

• British Geological Survey (BGS)

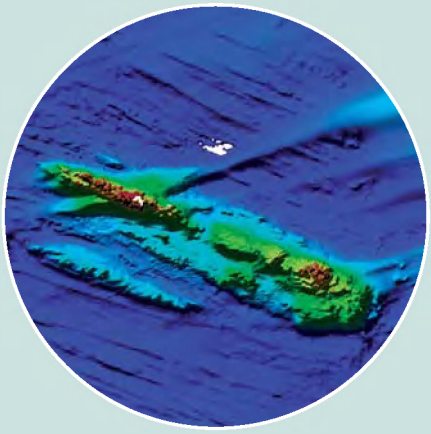
• Maritime & Coastguard Agency

• Hanson Aggregates Marine

• CEMEX

• United Marine Aggregates (UMA)

• Llanelli Sand Dredging Ltd



The study steering group included members from:

• Welsh Assembly Government

• Office of the Deputy Prime Minister (ODPM)

• Mineral Industry Research Organisation (MIRO)

• The Crown Estate

• British Marine Aggregate Producers Association (BMAPA)

• Amgueddfa Cymru—National Museum Wales (NMW)

• British Geological Survey (BGS)

• University of Wales Bangor (UWB)

• Countryside Council for Wales (CCW)

• Centre for Environment, Fisheries and Aquaculture Science (Cefas)

• Marine Conservation Society (MCS)

• Wildlife Trust of South & West Wales

• South Wales Sea Fisheries Committee (SWSFC)

• City & County of Swansea

• University of Wales Swansea

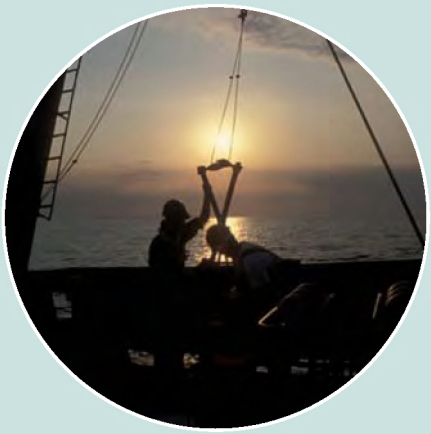
• Gower Society

• Hanson Aggregates Marine

• CEMEX

• United Marine Aggregates Ltd (UMA)

• Llanelli Sand Dredging Ltd



Aims and Objectives

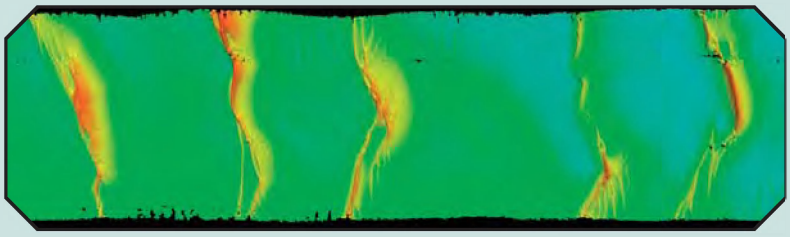
The principal objectives of the study were to:

• Undertake marine geophysical surveys, utilising multibeam, sidescan sonar and sub-bottom seismic reflection systems, and sediment, benthic fauna and video surveys using grabs, trawls, dredges and cameras

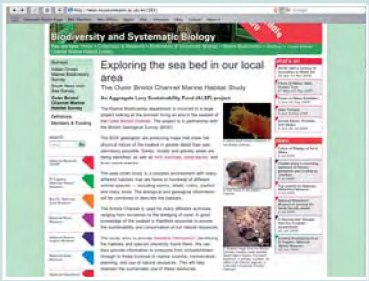
• Through co-operation with other organisations, actively seek to include within the study any multibeam, geophysical and biological data within the Outer Bristol Channel

• Integrate new and archive geophysical, geological and biological survey data to produce comprehensive interpretations of marine species, habitats and biodiversity distributions within the study area

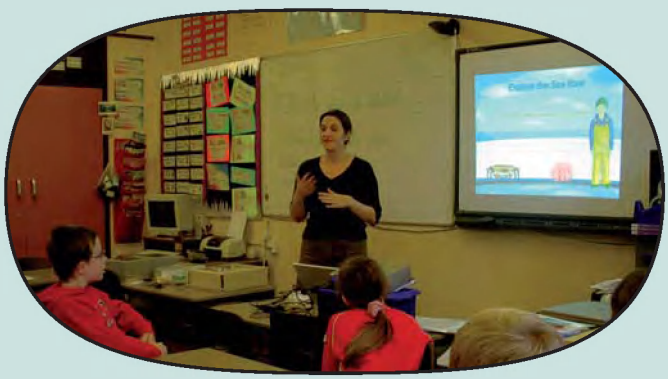
• Provide geophysical, geological and biological data as baseline criteria for the sustainable development of sea bed resources including fisheries, aggregates and offshore renewable energy, and to inform the planning and regulatory process with regard to marine conservation, and national and EU legislation.



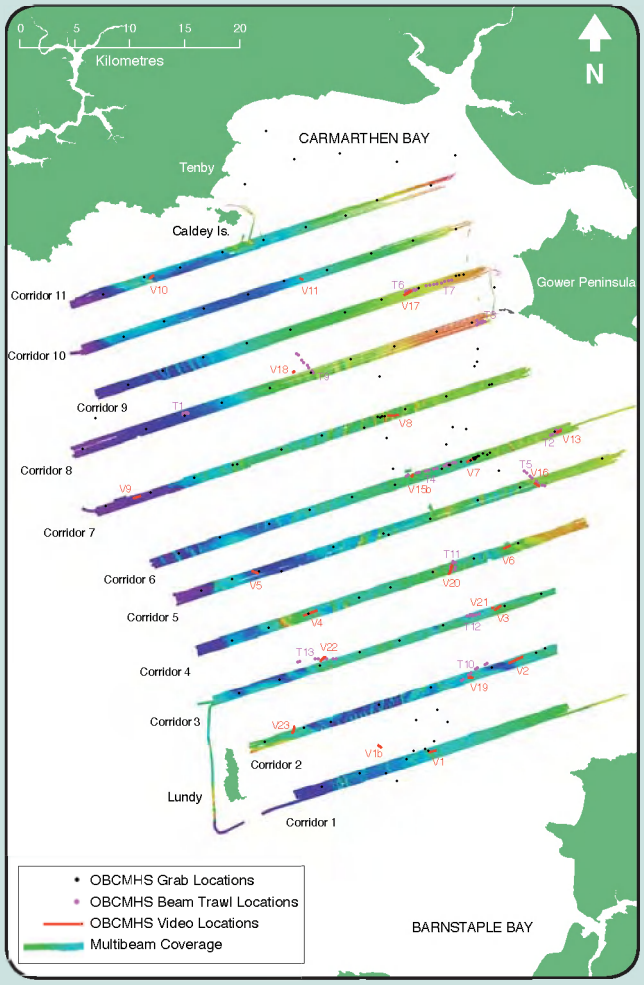
In addition to providing data and interpretations through maps, reports and scientific publications, the project aimed to make its results available to a wider audience through a bilingual multimedia CD-ROM, web pages, museum exhibition, and outreach awareness sessions at schools, colleges, societies and interest groups.



The study began in June 2003 and was completed in March 2006. Dissemination to the wider public, young and old, began in April 2005. This included not only the results of the study, but also basic generic information on the sea bed — including how we investigate it, what it is made of, what lives there, how we use its resources, how we protect it, and why the sustainable use of natural resources is important.



Survey Methods & Area Coverage

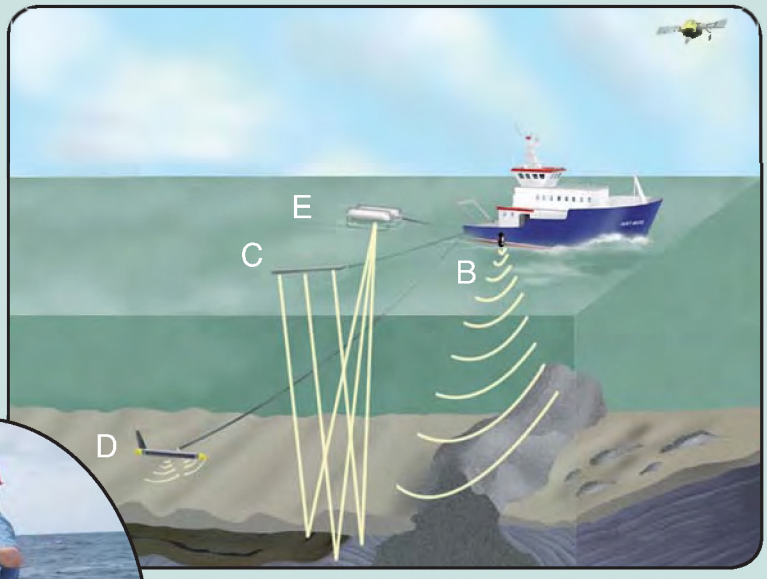


- 5 research cruises
- 148 grab stations including:
  - 137 macrofaunal stations
  - 142 sediment samples
- 23 Video tow locations
- 13 Beam Trawl box locations (53 tows)
- 2177 line km of multibeam data
- 1436 line km of sidescan data
- 330 line km boomer data

Geophysical Surveying

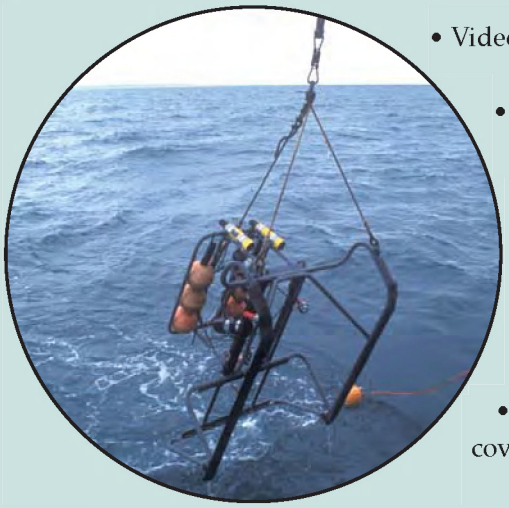
- Geophysical survey strategy based on eleven parallel corridors, 30 – 45 km long and about 5 km apart.
- Corridors surveyed by suite of three complimentary geophysical systems, multibeam (MBES), sidescan sonar (SSS) and sub-bottom profiling (boomer).

- MBES and SSS coverage across whole corridor up to km wide with single boomer line down centre.
- MBES (B) provides high resolution sea bed morphology. Good at mapping bedforms like sand waves and rock outcrops.
- SSS (D) provides indication of character of sea bed. Good at distinguishing fine and coarse sediment and small thin bedforms such as ripples, patches and streaks.
- Boomer (C & E) provides a profile of geology beneath the sea bed. Indicates form and thickness of sediment and rock at depth and relationship to sediments at the sea bed.

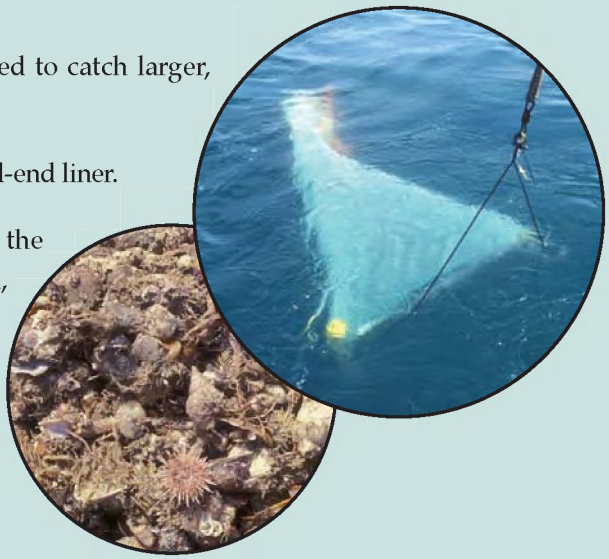


Biological Surveying

- Sea bed samples were collected using a 92 kg 0.1m^2 modified Van Veen grab.
- Three samples were taken from each site, two sieved (0.5 mm mesh) for macrofauna with the third used for particle size analysis (PSA).
- Where samples were small or incomplete they were combined as a qualitative sample. Additionally, a dredge was sometimes deployed to collect a representative sample of the macrofauna.
- The animals collected were identified to species level where possible.



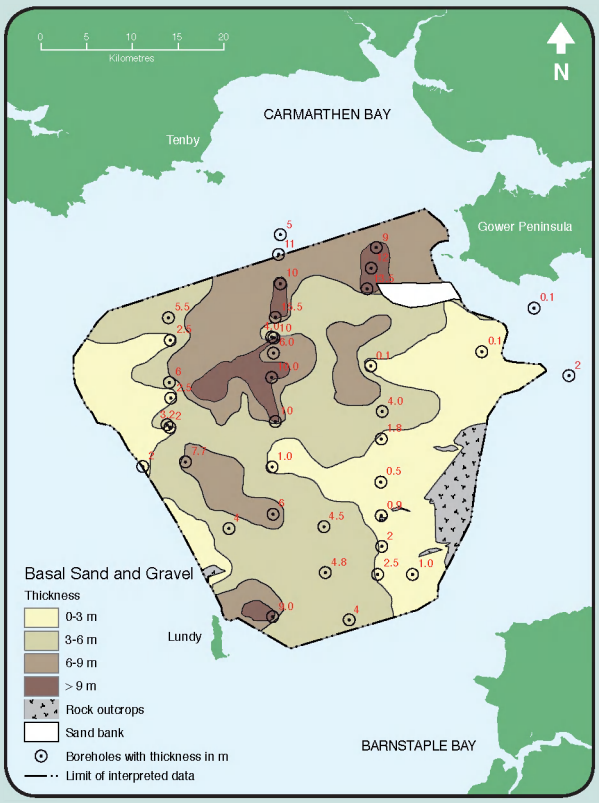
- Video and still film cameras were mounted together on a sledge.
- Photographs were taken at 42 second intervals. The number of interpretable sea bed images from each successful deployment was usually about 25 to 31 and had a field of view of approximately 45 cm across.
- The video system was mounted so as to view obliquely forward towards the same part of the sea bed as the still camera. Field of view for the video frame was about 60 cm across.
- Typically the gear was on the sea floor for 22 to 25 minutes. The distance covered by the sledge in this time was about 160 — 220 metres.



- A 2 m wide beam trawl with chain matrix ticklers was used to catch larger, more widely dispersed animals on the sea bed.
- This had a 10 mm diamond mesh and a 4 mm knotless net cod-end liner.
- Tows at about 1.5 knots were of 5 minutes duration with the gear on the bottom. Distances covered were up to 340 m, standardised to 250 m for analysis.
- In total, 53 tows were completed at thirteen locations.
- Animals were separately counted and weighed on board to species or the nearest higher taxonomic category.

Geology

The sea bed of the Outer Bristol Channel is a diverse mix of sediments and rock.



The distribution of sediments at and beneath the sea bed is associated with two major geological events:

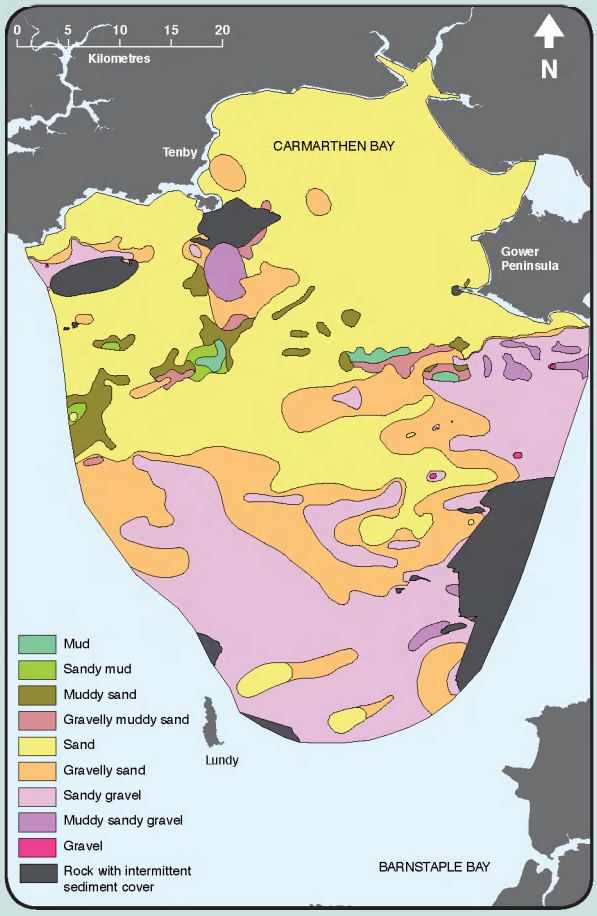
1. Glacial and fluvio-glacial when ice extended into Carmarthen Bay during Last Glaciation. Initially deposited **Late Pleistocene Sediments** subsequently overlain by **Basal Sand & Gravel**. Glacial maximum around 22,000 years ago with sea level at > -100 m.

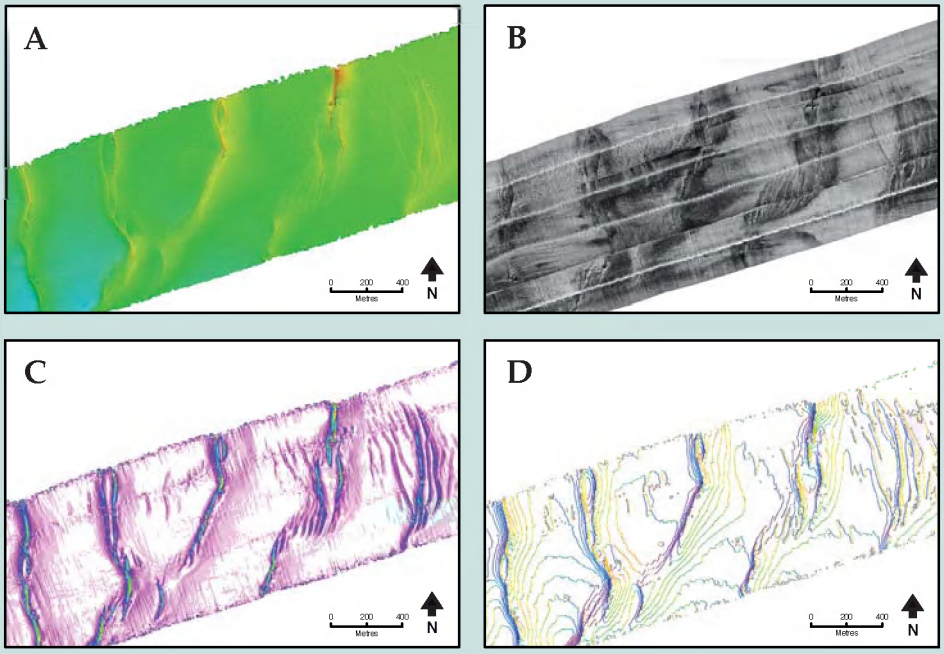
2. Sea level rise following Glaciation culminating in fully marine conditions by 5000 years ago. Tides and waves fashion mobile sandy sediments into an extensive **Sand Waves** unit.

- Distribution of sea bed sediments is derived from particle size analysis of 1591 grab samples.
- Sediments were mapped using the Folk classification system which is based on relative proportions of gravel, sand and mud in each analysed sample.
- Sediment analysis included:
  - Calcium carbonate content
  - Mean and median grain size
  - Sorting and skewness of grain size distribution
- Medium sand is the dominant mean and median grain size.
- Carmarthen Bay is a sink for fine sand.

From the results a simple two fold distribution of sediments can be drawn for the Outer Bristol Channel with:

- a northern half, including Carmarthen Bay and Approaches and the NOBel Sands, which is dominated by sand
- a southern half, comprising the SOBel Sands, Lundy and Morte Platforms where gravelly sediments are common and sand, although present, is less significant.





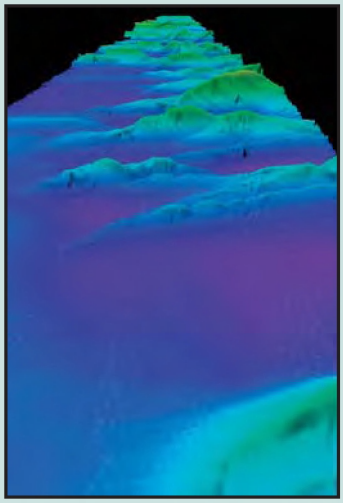
Corridor Data

A: Multibeam swath image

B: Sidescan sonar mosaic

C: Slope angle analysis

D: Slope aspect analysis



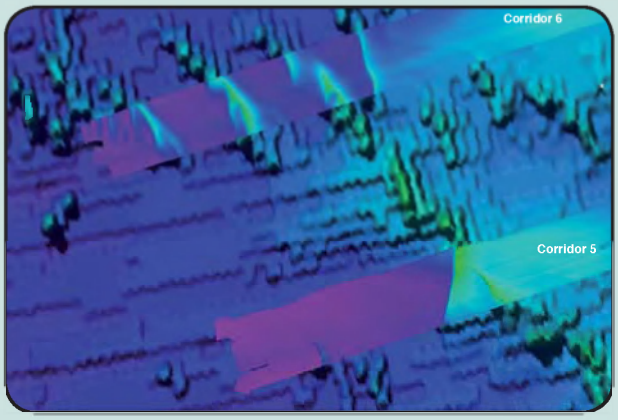
• Initiation of fully marine conditions has produced, in the Outer Bristol Channel Sands (OBEL Sands), one of the most significant sand wave fields on the UK Continental Shelf covering about 900 km^2.

• Northern sector – NOBel Sands – includes numerous sand waves > 10 m high with a maximum height of 19 m.

• Southern sector – SOBel Sands – has isolated sand waves on a gravelly substrate.

• Sand wave asymmetry is indicative of a net sand transport to west.

• Geophysical evidence indicates that sediment within the top metre surface of large sand waves is mobile but overall structure and position appears to be in a state of *in situ* equilibrium.



A comparison with bathymetric survey data from 1977 with study data collected in 2003 indicated that over a 26 year period:

• the number of large sand waves in the area has not increased or decreased

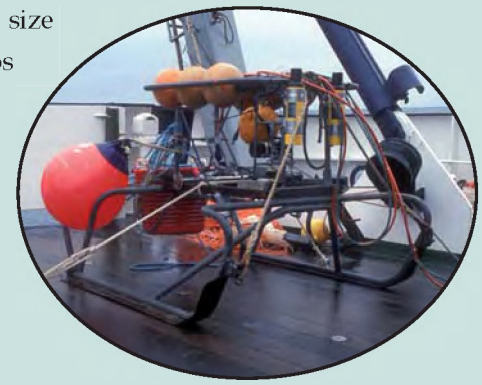
• position and orientation of large sand waves appears to have remained stable with no significant movement of crest lines and sand wave heights show only minor variations

• there appears to be no growth in sand wave development at the western end of the sand wave field.

Sea Bed Video & Photography

Primary aim: to provide ground truth information in support of the multibeam and sidescan sonar data.

The images also provide some *in situ* context for the sediment particle size analyses based on samples collected by grabs even though the photos only show the sea bed surface.



Relatively little fauna, other than colonies of hydroids, was usually actually visible. Nevertheless, the images help ecological interpretations of infaunal benthos samples.

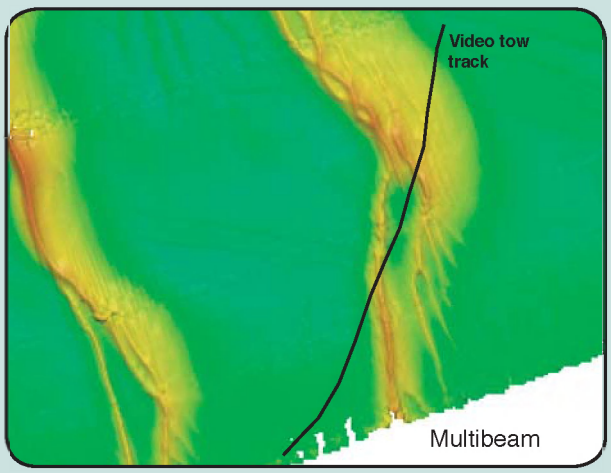
Ephemeral deposits of organic matter as flocs of 'marine snow' were a prominent feature not easily detected by other means.

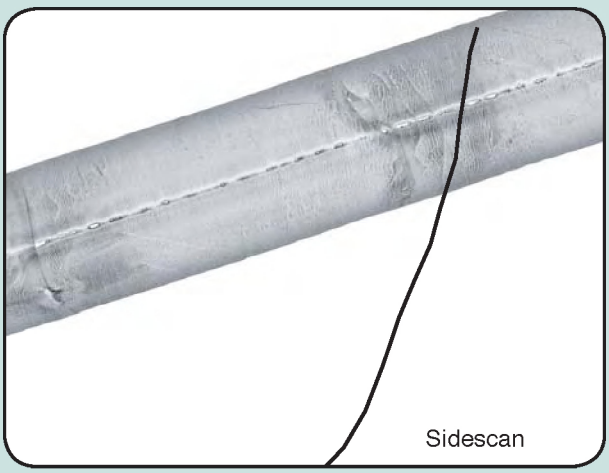
Photographs

- 8 successful tows, 219 still photographs in 2003
- 9 successful tows, 224 still photgraphs in 2005
- 2 failed tows due to high sea bed turbidity
- 1 failed tow due to an intense phytoplankton bloom obscuring the sea bed
- 4 failed tows due to camera malfunction

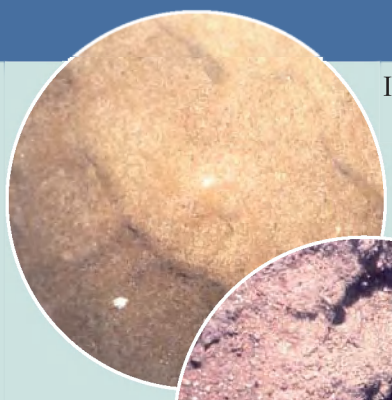
Video

- 2003: 11 tows with useable video
- 2005: 8 tows with useable video

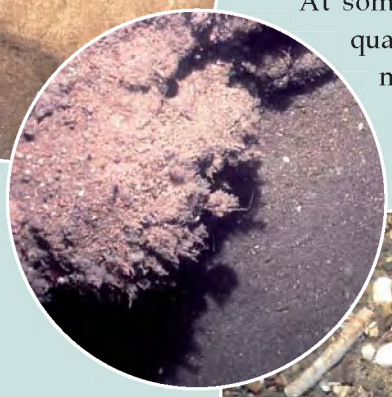




- Multibeam and sidescan images were available for most of the camera deployments.
- Tracks of the camera tows were overlaid on the multibeam and sidescan images.
- To allow some comparison with data on sediment grain size distributions and the benthic fauna, the locations of grab samples near to the camera tows were plotted.

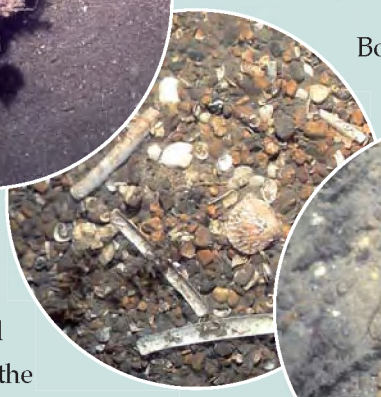


In 2003, work was undertaken over a neap tide period well after the end of the spring plankton blooms. Therefore, the sea bed was, in places, heavily coated with 'marine snow'.

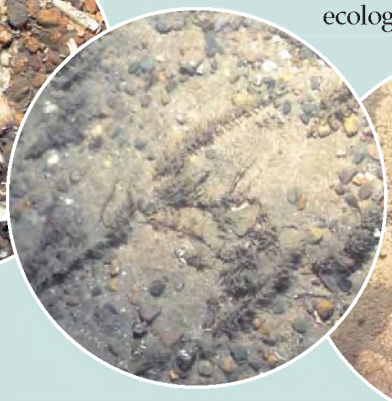


At some of the gravel and cobble locations where there were also quantities of hydroid / bryozoan 'turf', the epifauna having trapped more fine particles of sediment.

Sometimes it was difficult to determine whether there was a dusting of fine sand on the surface as well.



Both the deposition of 'marine snow' and the scouring effect of sand as bed load will have had important ecological influences.



Notable Observations

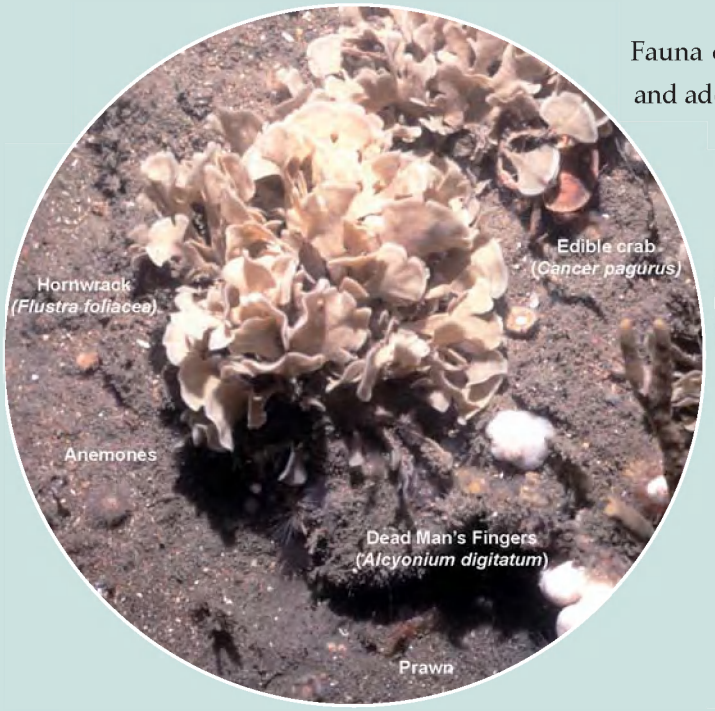
- Much of the SOBel Sands & Platforms appeared 'sand starved', with either no sand on the bed surface or with a patchy veneer covering a lag horizon of gravel and shell hash.

- On top of the sand wave ridges the minor ripples were irregular and the sand appeared loose.

- The superficial lag horizon appeared to be composed of gravel from a wide range of rock types

- Larger stones in the cobble and boulder size classes were rather rare.

- The lag horizon visible on the photographs often had numerous relatively intact bivalve mollusc shells lying on the surface.



Fauna captured by video & photographs could be identified and added to the overall species list for the area.

Biology

Bristol Channel Fauna

- 948 taxa ('*species*') recorded from all grab stations
- 812 taxa ('*species*') from quantitatively assessed stations
- Over 263,000 individuals identified

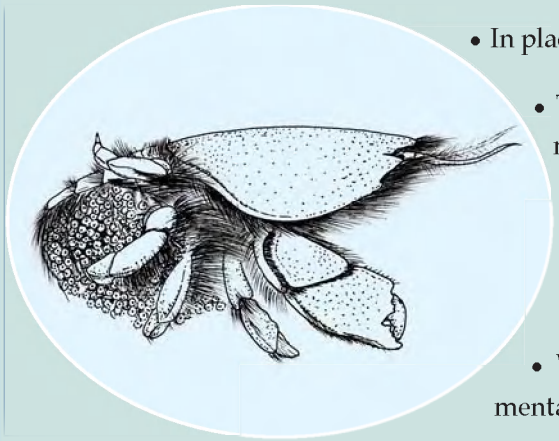
- Fauna comprised of 82% infaunal species, 18% epifaunal species

  38% Annelida (mainly Polychaeta)
  25% Mollusca
  14% Arthropoda
  <4% Echinodermata

- Epifauna comprised 47% Bryozoa (8% of total fauna) & 27% Hydrozoa (5% of total fauna).

- 5 macrofaunal assemblages were identified across the OBCMHS area, made up of various sub-assemblages.

- The assemblage groups were interpreted as representing 8 infaunal biotopes & 3 epifaunal biotopes.



- In places, up to 3 different biotopes occurred together.

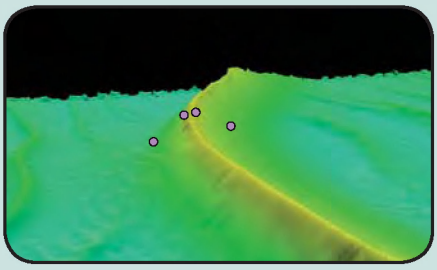
- The coarse sediment of the SOBel Sands and the mixed rock/sediment bottom of the Lundy & Morte Platforms were identified as supporting the highest biodiversity for the area.

- The distributions of macrofaunal assemblages showed good correlation with the distribution of bedforms & sediments.

- Water depth and sand & mud content were the primary environmental variables correlating with the faunal distributions.

Sand Waves

- The relationship of sand waves to faunal distributions was investigated relative to lee & stoss slopes, and steepness of slope.



- There was no signifcant effect on the fauna from any of the slope variables.

- Additionally, a transect across a large sand wave in the NOBel Sands showed no clear evidence that location on the sand wave influenced fauna composition in any major way.

Beam Trawls

To obtain a more complete view of the range of the benthic fauna in the offshore Outer Bristol Channel area, a limited amount of small-mesh Beam Trawl sampling was added to the project in May 2005.

Beam Trawl sample data sets can provide broad indications of the habitats and biotopes. They can also more efficiently capture the larger, more widely spaced epibenthic animals.

Across the 51 samples, 130 separate taxa were noted including 50 species not recorded from the grab samples.

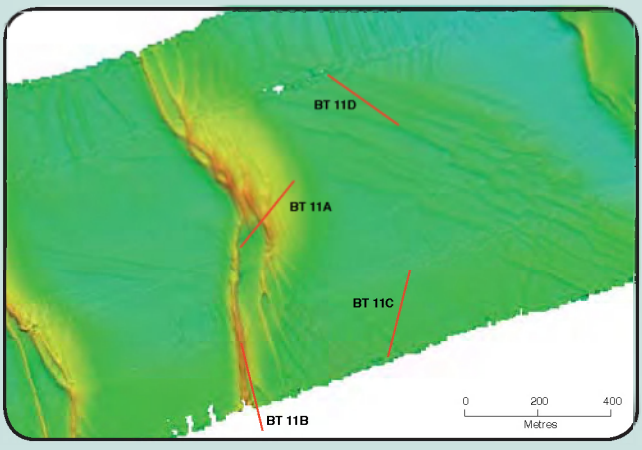
In broad terms, the range of species collected by the Beam Trawl was in keeping with expectations from the same types of grounds, at these depths, in this biogeographic region.

If the catch contained very large quantities of smaller organisms, random sub-sampling took place.

There were enough differences in the catches of the Beam Trawls to distinguish broad groupings indicative of the main faunal assemblages recognised from the grab samples.

Within some survey boxes, the catches on particular tows could be compared with the mosaic of sea bed features over which the trawls ran. The mosaics could be inferred from the multibeam and sidescan images for the same localities.

Even if the mosaics cannot be displayed at appropriate scales for sea area maps, let alone be separated for management purposes, knowledge of their existence can still be important.



Sea Bed Character, Bedforms & Habitats

The Sea Bed Character and Bedforms map is designed to indicate the dynamic, current driven nature of the sea bed through superimposing the distribution of the principal bedforms and features of sea bed morphology on to a characteristic substrate of sediment and rock.

It is primarily based on interpretation of the geophysical data comprising multibeam, sidescan sonar and boomer acquired in the eleven survey corridors, and the video and camera surveys undertaken for the study.

Physical Regions

Physical regions boundary

1. Carmarthen Bay & Approaches
2a. North Outer Bristol Channel Sands (NOBel Sands)
2b. South Outer Bristol Channel Sands (SOBel Sands)
3. Lundy Platform
4. Morte Platform

Bedforms

Sand waves < 10 m high
(Tick marks on lee slope of asymmetrical waves)

Sand waves > 10 m high

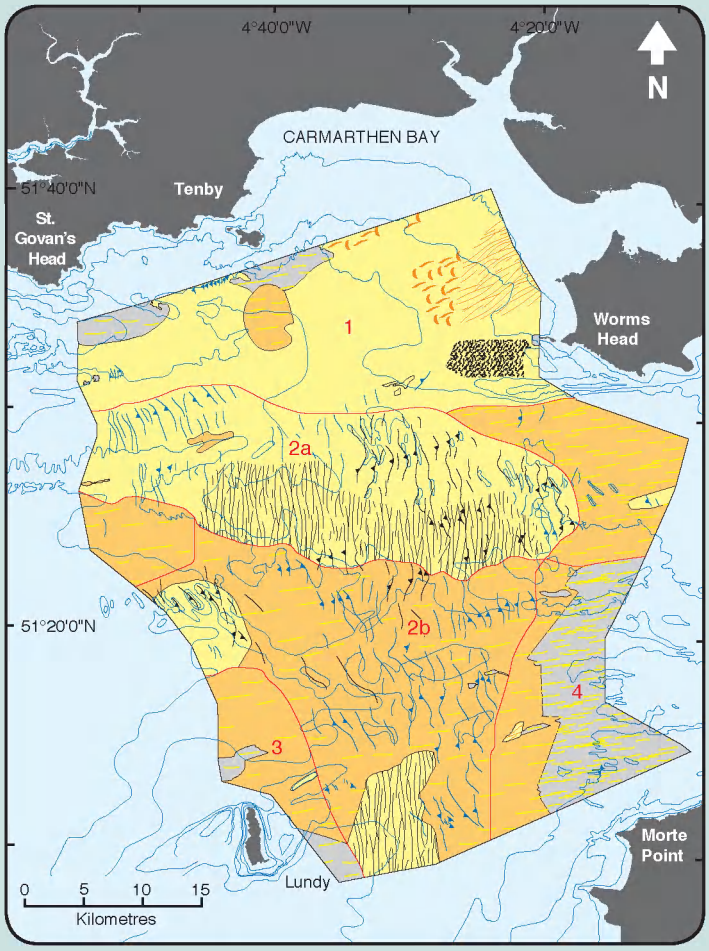
Bifurcating high frequency sand waves

Coarse sediment patches & ribbons

Megaripple field

Sand patches, ribbons & streaks

Shallow channels - infilled with shell & coarse sediment



Sea Bed Character

Sand - some muddy sand

Coarse sediment - gravelly sand, sandy gravel & gravel - some sand patches, ribbons & waves

Rock - may be covered in part by lag sediment including patches, ribbons & streaks of sand & gravel, occasional sand waves

Bathymetric contours (DigBath 250)

Additional data used to supplement the interpretation:

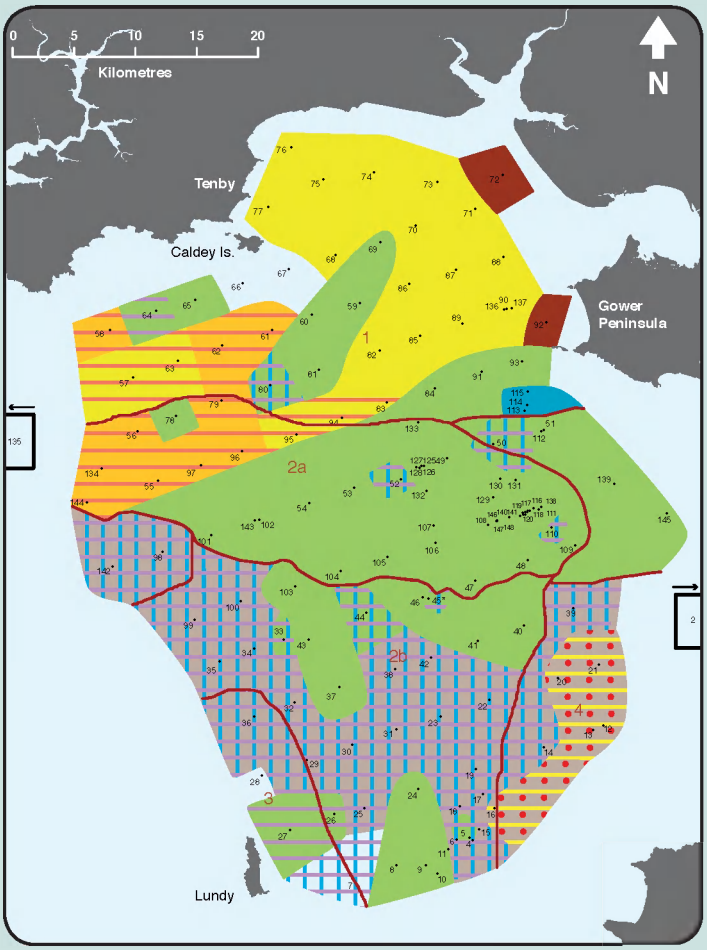
- UKHO single beam echo sounder data from 1977
- MCA data from a multibeam trial in 2002
- Folk classified sea bed interpretation based on 1591 samples
- Archive BGS geophysical & sediment data & interpretations

Bedforms were then superimposed on to the sea bed map as a series of symbols indicating form, position and other characteristics of sea bed morphology.

The Sea Bed Character & Bedforms map can be viewed as showing sea bed habitats.

Habitat: the area or environment where an organism or assemblage of organisms live

Biotopes



The biotope map of the Outer Bristol Channel was produced using the species assemblages recognised from the grab sampling data.

Some habitats supported multiple biotopes comprising infauna overlaid by epifauna, as well as biotope mosaics.

Epifaunal biotope overlays vary according to available suitable attachment surfaces and mobility of surface sand.

Boundaries were adjusted relative to the faunal assemblage maps with reference to the Sea Bed Character & Bedforms map.

A comparison of the sea bed character and macrofaunal maps show broad agreement between assemblages/biotopes and the sea bed types (habitats) associated with particular physical regions.

Biotope Code	Description (Full biotope definitions available at www.jncc.gov.uk/marinehabitatclassification)
Infauna	
SS.SSa.IFiSa.IMoSa	Infralittoral mobile clean sand with sparse fauna
SS.SSa.IFiSa.NcirBat	*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand
SS.SSa.IMuSa.FfabMag	*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand
SS.SSa.CMuSa.AalbNuc	*Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment
SS.SSa.OSa.OfusAfil	*Owenia fusiformis* and *Amphiura filiformis* in offshore circalittoral sand or muddy sand
SS.SCS.ICS.HeloMsim	*Hesionura elongata* and *Microphthalmus similis* with other interstitial polychaetes in infralittoral mobile coarse sand
SS.SCS.CCS.MedLumVen	*Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel
SS.SMx.OMx.PoVen	Polychaete-rich deep *Venus* community in offshore mixed sediment
Epifauna	
SS.SSa.IfiSa.ScupHyd	*Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral sand with cobbles or pebbles
SS.SBR.PoR.SspiMx	*Sabellaria spinulosa* on stable circalittoral mixed sediment
SS.SMx.CMx.FluHyd	*Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment

Biotope: an area with a distinguishable environment and organism distribution (biological assemblage + habitat)

Regional Synopsis

The study area covers approximately 2400 km^2 and in simple terms the sea bed has:

- a northern half which is dominated by sand and
- a southern half where gravelly sediments are common and sand, although present, is less significant

Rock is notable at the margins of the area in the northwest, southwest and southeast.

The Outer Bristol Channel has been divided into four physical regions:

Region 1 – Carmarthen Bay & Approaches

- dominantly smooth sea bed of fine to medium sand with some small ripples
- one main biotope in Carmarthen Bay grading into others in shallow and deeper waters; Helwick Bank fauna distinct
- low to moderate numbers of species, low epifauna numbers

Region 2 – Outer Bristol Channel Sands (OBel Sands)

2a. North Sector (NOBel Sands)

- extensive sand wave field of around 440 km^2; large sand waves in the east and an area of bifurcating high frequency sand waves in the south; sea bed generally medium sand
- one main biotope; low to moderate numbers of species; generally low colonial epifaunal presence

2b. South Sector (SOBel Sands)

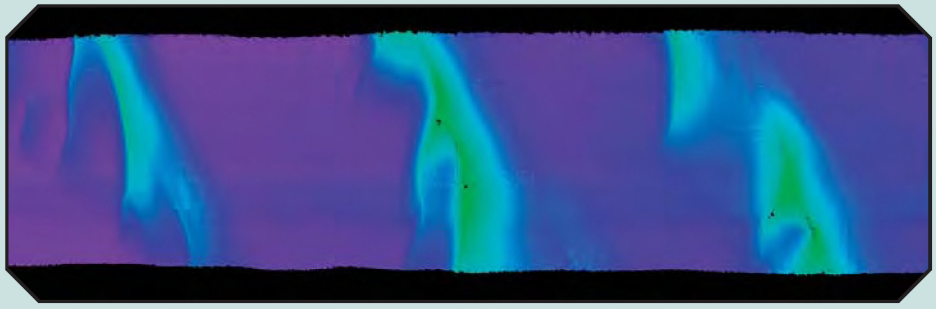
- field of isolated sand waves on relatively flat sea bed of gravelly sand and sandy gravel
- separate infaunal biotopes associated with sand waves (1) and coarse sediments (1 with 1 or 2 epifaunal overlays)
- coarse sediments with high species numbers and moderate to high colonial epifaunal presence

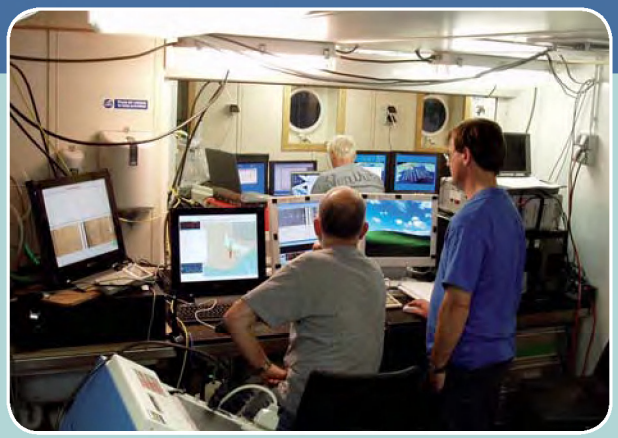
Region 3 – Lundy Platform

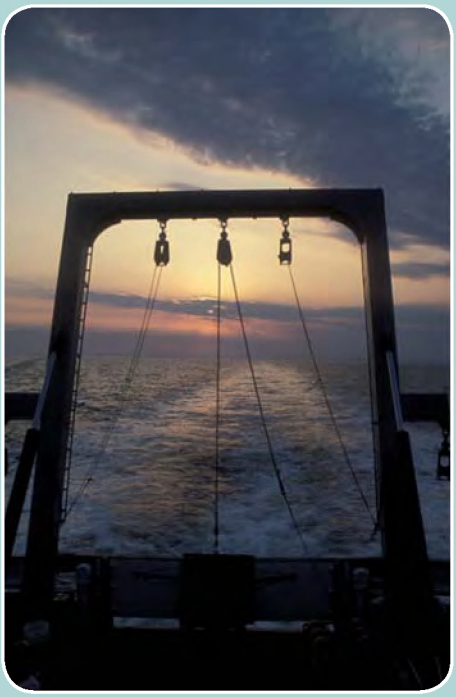
- coarse sediment pavement with rock outcrops, including Stanley Bank sand bank
- no dominant biotope; moderate to high species richness & variable number of colonial species, high on stony ground

Region 4 – Morte Platform

- coarse sediment pavement in the west and north with rock outcrops to the east
- one main infaunal biotope in coarse sediments and another occurring between rock outcrops (both with one or two epifaunal overlays); high species richness and abundance across region







Education & Outreach

Aims: to make the results of the study accessible to as wide an audience as possible and to provide information about the aggregate industry, science and the sustainable use of marine resources.

Exhibition

The touring exhibition includes videos, interactive activity units, scientific equipment and marine animal models.

The exhibition looks at:

- why and how the study was undertaken
- what discoveries were made
- how the results will be used

- National Waterfront Museum, Swansea (2005–2006)
- St Davids Visitor Centre, Pembrokeshire Coast National Park (July – November 2006, *see photos opposite*)
- National Museum Wales, Cardiff (January – March 2007)
- Bristol Museum (from October 2007)
- Other locations (2007-2008)

The project has provided a best practice educational case study for the National Museum Wales, British Geological Survey and external partner organisations.

Jane Davidson, Welsh Assembly Government Minister for Education and Lifelong Learning, Education programme celebration, 27 February 2006, Penclawdd Primary School

Workshops & Events

(September 2005 – March 2006)

- Delivered by a project Marine Education Interpreter & other outreach staff
- A wide range of events and activities programme for families and adults
- Outreach tailored to meet the needs of the audience and event
- Over 8000 people participated in workshops and activities
- Hands-on school workshops related to the National Curriculum
- 175 school sessions carried out
- Series of teacher sessions provided

Educational CD-ROM

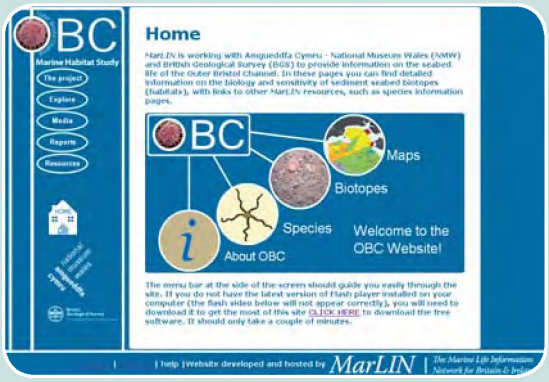
The free interactive CD-ROM was developed, in consultation with teachers, and trialed at Penclawdd Primary School.

Features include:

- information on habitats and marine life relating to industry, resource management and sustainability
- a virtual sea bed
- 5 interactive games within the activity zone
- a gallery containing videos and photos
- teachers pages with lesson plans and downloads
- 3800 copies distributed to the end of March 2006
- Requests continue to come in from throughout the UK and abroad

Websites

The following websites are hosting pages for the OBC project:



www.museumwales.ac.uk

- Collections & Research
- Marine Biodiversity Surveys

www.bgs.ac.uk

- All information and facilities available on the *Explore the Sea Floor* CD-ROM are hosted on the BGS website

www.marlin.ac.uk

- Site hosted and produced by The Marine Life Information Network (*MarLIN*)
- Information on sea bed animals and biotopes found in the Outer Bristol Channel

Aggregates: Science, Industry, Stewardship and Education

The outreach activities and partnerships with other organisations will develop and expand through 2006-2008 thanks to support from the Aggregates Levy Sustainability Fund (ALSF) administered in Wales by the Welsh Assembly Government, DEFRA's ALSF Grant Scheme administered by English Nature, The Crown Estate and Amgueddfa Cymru — National Museum Wales.

First published in 2006 by Amgueddfa Cymru - National Museum Wales, Cathays Park, Cardiff, CF10 3NP, Wales

Printed by: Henry Ling Ltd, The Dorset Press, Dorchester DT1 1HD.

Outer Bristol Channel

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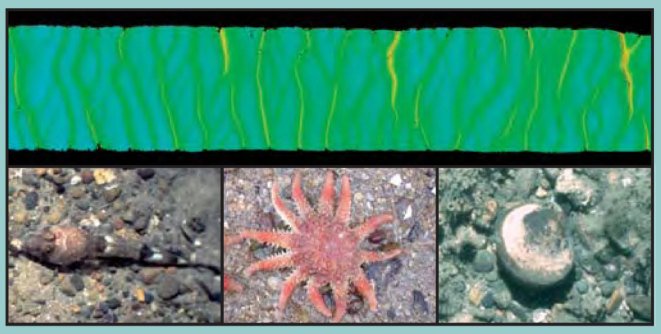

The Outer Bristol Channel Marine Habitat Study

A grant-aided multifaceted project involving the geological, biological, interpretative and educational expertise of the British Geological Survey and Amgueddfa Cymru — National Museum Wales in an area with potential marine aggregate resources.

Scientific Report

Project outputs include:

- Detailed research report & sea bed maps*
- Free Interactive Project and Data DVD-ROM*
- Touring *Explore the Sea Floor* Exhibition
- Education & Outreach Report
- Free bilingual interactive educational *Explore the Sea Floor* CD-ROM*
- Websites: www.museumwales.ac.uk
  www.bgs.ac.uk
  www.marlin.ac.uk

(*while stocks last)

Educational CD-ROM

A Marine Outreach Officer, based at the National Museum Wales, has provided information and activities for everyone including a variety of workshops for schools tailored to the National Curriculum.

Exhibition

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Office of the Deputy Prime Minister
Creating sustainable communities

THE CROWN ESTATE

BMAPA

miro
Mineral Industry Research Organisation

Websites

This document should be cited as:
A.S.Y. Mackie, J.W.C. James, E.I.S. Rees, T. Darbyshire, S.L. Philpott, K. Mortimer, G.O. Jenkins & A. Morando. 2006. *The Outer Bristol Channel Marine Habitat Study: Summary Document*. Amgueddfa Cymru — National Museum Wales, Cardiff. 20pp.

ISBN 0-7200-0577-9