

## **ESEF Cymru “Floating Classroom”**

**4.30 pm – 6.50 pm, 7 November 2006  
National Museum of Wales**

ESEF Cymru met at the National Museum of Wales to discuss Earth science and the ‘Floating Classroom’. Sustainable development is at the heart of the Welsh Assembly Government’s work. Environmental education for sustainable development, fieldwork and outdoor learning are keys to Earth science education.

Presentations were given by

Dr Chris Wooldridge (Degree Scheme Coordinator, Marine Geography, Cardiff University)

Dr Nicola Rimington (Estuarine & Coastal Scientist,  
Countryside Council for Wales)

Dr Andrew Mackie (Marine Biodiversity Section Head, Department of Biodiversity & Systematic Biology, National Museum Wales)

Ceri James (Marine, Coastal and Hydrocarbons,  
British Geological Survey)

Lara Murphy (Marine Biodiversity, National Museum of Wales)

Ian Selby (British Marine Aggregate Producers Association)

The coast and seas around Wales are a resource whose potential is not fully recognised. The presentations will highlight projects relevant to ‘the floating classroom’: illustrating challenges, advantages and educational options for bringing the importance of the science of the sea to a wider audience. Biodiversity and sustainable development, aggregate extraction (current and future) in the Severn Estuary and Bristol Channel will be addressed, with an overview of what is happening and where. The Welsh Assembly's policy context for future aggregate extraction is also important as there are several existing licences and applications, and there is an urgent need to examine the potential cumulative effects of extracting sand from this area on the designated sites.

**1. Dr Chris Wooldridge**, [TWYNTYLE@aol.com](mailto:TWYNTYLE@aol.com), the Senior Lecturer and Degree Scheme Coordinator for BSc Marine Geography in the School of Earth, Ocean and Planetary Sciences, Cardiff University is a career academic who has maintained close professional links with marine industries, particularly in ports and shipping. He is the Science Coordinator for the European EcoPorts Foundation (the Environmental Research and Development Unit for European sea ports). He holds the Certificate of Competence, Yachtmaster Offshore, and is Skipper of the School's recently acquired Research Vessel.

Chris started his presentation with a few reminders of the importance of the sea: no country is independent of sea transport to sustain and maintain their economy; a fifth of all oil and gas comes from the sea; 71% of our geology and geography is underwater; 90% of trade from the UK is transported via the sea; more than 350 large ships are lost at sea each year; there are about 200 shipwrecks on the Goodwin Sands.

Ten years ago, the *Sea Empress* was grounded near Tenby, polluting waters and raising awareness of environmental issues in the area. Environmental science, the principles, concepts and themes can be taught using the sea as our natural laboratory. Until the 1960s much of what was reported about the sea was inferred from studies of the land and coasts. Now teaching can be carried out offshore. There are opportunities across the curriculum including studies of admiralty charts which are different from ordnance survey maps. The world's coastline forms a significant 440 km barrier, but taking students offshore and showing them the coast from a different perspective, they can see how different our coastline looks and see geological structures that are not observable from the land.

The recently equipped national research vessel has all the necessary navigational equipment enabling research led initiatives including 3D mapping of the seabed. Students are encouraged to 'have a go', they can monitor, sample survey and map, gaining an understanding of scale and structure, working as a team and learning important lessons including respect for each other and respect for the sea. These are transferable skills for careers, making the most of field work and sea-time.

**2. Dr Nicola Rimington:** [n.rimington@ccw.gov.uk](mailto:n.rimington@ccw.gov.uk) completed her degree in Geology and Oceanography at Southampton University in 1995, and moved to Cardiff in 1996 to work on her PhD: Depositional History of Sands on the Amazon Fan, which she completed in 1999. Since then Nicky has been working for the Countryside Council for Wales as an Estuarine and Coastal Scientist. Her work now includes advising on marine aggregate extraction applications and policy, development of Shoreline Management Plans and other cases which have the potential to affect the coast, such as the Severn Barrage.

Nicola Rimington used maps to illustrate the complexity of the Severn Estuary. Overlaying maps showing physical parameters including: sedimentary cover and thickness; bed rock features and ripples; sand wave height, direction and period; tidal information such as current, speed etc. Using these parameters, the Estuary was divided into 49 cells, each with characteristic sand transport features. Physical data, constraints etc. are used to dictate policy for each sedimentary environment for Welsh Assembly license applications. As a result of this, the Welsh Assembly is encouraging the aggregates industry to move further offshore.

A study of the habitats of the Severn Estuary, which include: Salt marsh, mud flats, sand banks, reefs and sea grass beds, has required an understanding of the complexity, effort and reliance on Earth science data. The Severn Estuary also supports a range of species, including migratory birds and fish species many of which are associated with sites of special scientific interest. The 'biotope' (the substrate and the animals that live in them) is also studied.

The movement of sand banks has been studied an impact assessment undertaken by the Severn Estuary aggregates working group looking at shorter term licenses, smaller areas, analysis of old data and wave modelling e.g. at shoreline to ascertain whether coastlines are affected.

**3. Ceri James:** [jwcj@bgs.ac.uk](mailto:jwcj@bgs.ac.uk) is a principal marine and coastal geologist with the British Geological Survey. His main interests are in characterising the nature of the sea bed in terms of its sediments, bedforms and geology, and the processes which impact and control the sea bed environment. Recently his focus has been on the relationship between geology and biology, and the mapping of marine habitats.

He has worked on aspects of the sea bed geology of Wales since 1984 and compiled sediment and bedform maps and interpretations for the whole of the Irish Sea, as well as the marine habitat study in Outer Bristol Channel. His current work in Wales includes a multibeam and geophysical survey in the Inner Bristol Channel around Flat Holm, Steep Holm and Culver Sand.

Ceri's presentation introduced the methodology and outcomes of the 3-year *Outer Bristol Channel Marine Habitat Study* (OBCMHS) (2003 – 2006). The principal objectives of the study included undertaking marine geophysical surveys using multibeam, side scan sonar, sediment and benthic fauna, and video surveys using grabs, trawl, dredges and cameras. Using the results from the surveys, the Outer Bristol Channel study area was divided into four distinct physical regions. Survey data from earlier studies was integrated with the study's geophysical, geological and biological data and this will provide baseline criteria for sustainable development of marine resources, and to inform the planning and regulatory process.

Features highlighted in the presentation included sand waves with a maximum height of 19 metres (equivalent in height to more than four double-decker buses) in the northern sector of the study which is dominated by sand; the sand wave fields (sand waves generally <10-14 metres high) cover an area of 400km<sup>2</sup>, an area so large that it could fit two 'Gowers' within it. The sand waves are generally asymmetrical and facing towards the west. A comparison of a multibeam corridor survey in 2003 across the sand wave field with a single beam survey carried out in 1977 showed that the position of the large sand waves had not changed; although the ebb and flow of the tides was moving sand across the surface of the sand waves with each tide.

A concise overview of the project and its scientific findings can be seen in the OBCMHS Summary Document.

**Dr Andy Mackie:** [andrew.mackie@museumwales.ac.uk](mailto:andrew.mackie@museumwales.ac.uk) is a marine biologist with worldwide experience investigating the structure and diversity of benthic invertebrate communities and specialises in the taxonomy and systematics of the Polychaeta (Annelida) – worms that live in seabed sediments. His early work experience involved carrying out baseline monitoring studies around oil and gas fields in the North Sea. Since joining the National Museum of Wales in 1984, he has established the Marine Biodiversity Section at the forefront of marine seabed biodiversity assessment and mapping in waters around Wales.

An internationally recognised expert in the taxonomy and systematics of the polychaete worms that so often dominate the seabed sediments, Dr Mackie has published numerous scientific papers describing new species and reviewing species identities. He has also written about sampling methods and re-designed the sampling equipment used.

Andy is joint project leader of the multidisciplinary *Outer Bristol Channel Marine Habitat Study* (OBCMHS) with Ceri James (British Geological Survey).

Andy's presentation gave more detail about the multidisciplinary approach of the OBCMHS surveys; integrating biological and geological data. Three cruises involved biological work, with 148 grab stations (mainly biological specimens and sediments). Videos and other methods provided more than 830 species, mainly polychaete worms, then arthropods, molluscs etc. Cluster analysis gave 5 groupings of species, each associated with seabed features such as sands, gravels or stone sea bed. Both quantitative and qualitative analysis was undertaken, adding data to previous work. The faunal assemblages were found to correspond well with the sea bed character and bedforms map, and a biotope map was produced. The relationships between fauna and the environment were investigated and variables, including depth, sand, and mud, were used to 'explain' the faunal distributions. The final report (approx 500 pages) is in press.

**Lara Murphy:** [lara.murphy@museumwales.ac.uk](mailto:lara.murphy@museumwales.ac.uk) is an environmental education provider who specialises in marine education.

Lara has been involved in developing and delivering education programmes for a wide audience on a number of different projects. She is the Marine Education Interpreter at Amgueddfa Cymru - National Museum Wales and develops and delivers the 'Explore the Sea Floor' Education and Outreach programme that arose from the *Outer Bristol Channel Marine Habitat Study*.

Lara briefly outlined some of the education and outreach projects aimed to make the results of the study more accessible to as wide an audience as possible and to provide information about the aggregates industry, science and the sustainable use of marine sources. Workshops, events and relevant websites were discussed, and the contents of a free interactive bilingual CD-ROM described.

The CD-ROM includes 'the virtual sea bed' where the user acts as the scientist, taking part in the gathering and interpretation of data etc. The CD-ROM was developed in consultation with teachers and trialled at Penclawdd Primary School. More than 5,000 CD-ROMs have been distributed FREE. During the academic year (2005 – 2006), the School Workshop programme has reached 88 schools, delivering 226 workshops on topics such as classification, mapping and sustainability.

Teacher sessions are also organised, during which 10 – 20 teachers develop lesson plans that they then take back to schools (with follow-up support from the education and outreach team). Public events have included visits to shopping malls, working with families and attending festivals such as the surf festival in Devon. More than 10,000 people have taken part directly in the outreach programmes (not including CD-ROM users and museum visitors). The project was to have been a 12 month project, but has received funding for a further 2 years to extend the delivery into England, and network with others, sharing best practice and ideas with complementary marine education projects.

**4. Dr Ian Selby:** [ian.selby@hanson.biz](mailto:ian.selby@hanson.biz) is the Operations and Resources Director for Hanson Aggregates Marine Ltd. and is representing both Hanson and the British

Marine Aggregate Producers Association (BMAPA) (pronounced Bee Mappa), the trade association for the marine aggregates industry. Ian is a marine geologist by training, with more than 20 years experience in the marine sector on a variety of marine projects around the world, from contaminated sediments to diamonds to marine aggregates.

At the moment he is responsible for looking after the operations of Hanson's 9 dredgers and Hanson's applications and dredging permissions around England and Wales – working in detail on the Nash bank (off shore, half way between Swansea and Cardiff). He would also like to declare an interest in the Swansea Bay coast, which he considers is one of the loveliest stretches of coast he knows. His particular favourite is Merthyr Mawr – he's been visiting for over 25 years as a result of the lure of a good Welsh girl.

Ian gave the industry perspective. The key message being that we all need minerals and that they must be mined or quarried from where they occur. The decisions are not easy, but if sand and gravel are not dredged from the seabed, then the option for Wales is to recover them from the land.

66% of the sand used for the last 50 years has come from the Nash Sands. No environmental effect has been shown and no evidence has been found, yet dredging will cease in 2010 due to the lack of approved licence applications. This source will need to be replaced if demand for sand and aggregates (constituents of concrete) continue to rise. With more people living alone, and the recycling of concrete difficult (course and fine-grained sands can't be replaced by secondary (recycled) aggregates).

With planners and legislation encouraging industry to work further offshore and in smaller areas, and for some licenses to be declined for future exploration and dredging, it may be that offshore dredging becomes less likely. On shore, glacial sands can be found in the Uisk Valley and the Vale of Glamorgan, areas of outstanding natural beauty. On shore sands need further processing, while offshore sands, washed naturally by the tides, are pure and can be used without waste.

Because of the concerns about climate change, the economy will be carbon driven and proximity of supply to demand will be encouraged. At the moment, dredging is carried out by small dredgers (1,000 – 2,000 tonnes); they work locally and catch every tide. Using local ports and local infrastructure, the dredged sands and gravels are stored in piles that are further washed by rain, removing soil content.

Ian referred to the aggregates industry as mature, benign and a low-risk business. The Nash Bank is 13km long and 1km wide, the crest snakes and is 10 – 20m thick. Dredging takes place on the western end (furthest off-shore) and not the east and the bank is locked into place by the tides. The industry makes a social contribution, delivering to ports that include deprived communities, providing 2,000 direct jobs and 50,000 related jobs. Ian ended by saying 'we are not destroying Wales – we are building it!'

**Note:** Ian and Ceri were two of the speakers who gave a presentation 'Gaining a resource or losing a beach? – marine aggregates and sandbank dredging' to the All-

Party Parliamentary Group for Earth Sciences in the House of Commons, in January 2002. The third speaker was Alan Brampton, HR Wallingford Ltd.

End  
Cally Oldershaw  
12 November 2006