UKSeaMap 2010

Project description

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http://www.jncc.gov.uk/ukseamap

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Background

The UKSeaMap project results were published in 2006, providing the first visualisation of seabed and water column features for the UK marine area (Connor *et al*. 2006). Building on the work of UKSeaMap, JNCC produced predictive maps of seabed habitat types using the European habitat classification scheme, EUNIS. This work was undertaken as part of the MESH[1] project and was completed in January 2008. The aim of the work was to deliver a consistent map predicting seabed types across north-west Europe.

In the UK Marine Bill, the UK Government's aim is "**to recover and protect the richness of our marine environment and wildlife through the development of a strong, ecologically coherent and well managed network of marine protected areas, that is well understood and supported by all sea users by 2012"**. Maps predicting seabed habitat types in the UK marine area will be used to develop this marine protected area (MPA) network. There is a clear need to integrate the findings of UKSeaMap and MESH to produce a single, high-quality map for this purpose. This work will be undertaken in the UKSeaMap 2010 project.

During 2009, updated physical and biological data will become available which will increase the confidence in the predicted habitat types. Although the predictive maps resulting from both UKSeaMap and MESH were derived from similar input datasets, the results they present have important differences; both in the concept of the units presented, and in the approach employed to derive these units (see Table 1). There is a clear need to present a single map predicting seabed type, particularly for use by Marine Protected Area (MPA) and marine spatial planning practitioners.

Aims of UKSeaMap 2010

1. Produce a new seabed habitat map using improved input physical data layers to predict EUNIS habitat types in the UK marine area, by February 2010
2. Create improved confidence layer based on reliability of input data, by February 2010
3. Update maps of topographic and coastal physiographic features originally produced by UKSeaMap, by April 2010
4. Publicise results of the work, including through the UKSeaMap webGIS on the JNCC website

The new maps will be generated from

- improved data input layers (environmental variables)
- improved biological data to build and test the classes in input data layers
- an improved predictive approach

[1]Developing a Framework for Mapping European Seabed Habitats; funded by INTERREG IIIB North-West Europe programme

Table 1: Main differences between initial UKSeaMap project, MESH and the new UKSeaMap project

	UkSeaMap (2004 – 2006)	MESH (2004 – 2008)	UKSeaMap (2009 – 2010)
Method & Resolution	Marine landscapes: seabed types + features (coastal physiographic & topographic) Vector Fine – 0.02° Coarse – 0.5°	Seabed types in EUNIS classification (level 3 & level 4) Raster 0.0025° (~300m at Thames)	Seabed types in EUNIS classification (level 3 & level 4) + features (coastal physiographic & topographic) Raster Fine – 0.0025° Coarse – 0.5°
Bathymetry	GEBCO (1')	GEBCO (1') SeaZone point soundings	GEBCO (0.5') SeaZone 30m DEM
Seabed substrate	4 Folk classes + rock	4 Folk Classes + rock	Undecided – likely to be more detailed than 4 Folk classes, depending on licence restrictions Improved regional rock layers (Defra contract with BGS)
Biological zones	**Rock** • Aphotic • Photic **Sediment** • Shallow • Shelf • Warm deep-water • Cold deep-water ***Based on*** • Light • Wave length • Depth • Temperature	**Biological Zones (rock & sediment)** • Infralittoral • Circalittoral • Deep circalittoral • Deep-sea ***Based on*** • Light • Wave length • Depth	**Biological Zones (rock & sediment)** • Infralittoral • Circalittoral • Deep circalittoral • Deep-sea ***Based on*** • Light • Depth • Wave period
Energy	**Tidal stress** • Weak • Moderate • Strong	**Tidal stress** • Weak • Moderate • Strong	**Bed shear stress (waves & tides)** • High • Medium • Low

Improve input physical data layers

Work is underway to develop biophysical data layers for Marine Protected Areas network planning and wider marine spatial planning purposes. This project is being carried out by ABPmer under contract to Defra, SG, JNCC, NE, CCW, WAG, SNH and NIEA[2]. Part of this project will deliver data layers for environmental variables which will be used to update UKSeaMap. Additionally, updated information on seabed substrate will be available in 2009 from British Geological Survey (BGS). Key datasets which will be improved are:

1. Bathymetry data used will be a combination of GEBCO 0.5' grid and the coastal SeaZone 30m DEM (2009 version) (see Table 1). Previously, only a GEBCO 1' grid was available.
2. SeaWiFS light data has an improved resolution from a 9km to a 4km grid.
3. UKSeaMap 2010 will use wave data from the Renewable Energy Atlas model CS3 model (12km resolution), which was used previously in UKSeaMap 2006. In UKSeaMap 2010, the wave data will be processed in a different way, with more extensive cleaning, for example to remove unrealistically steep waves. These wave data will be used both to determine the boundary between areas of the seabed disturbed by waves, and those which are undisturbed, as well as to model bed-shear stress caused by waves.
4. Maximum tidal current speed involved a combination of models from the Renewable Energy Atlas: CS20 (1.8km resolution), CS3 (12km resolution) & the North Atlantic (35km resolution).
5. The energy layer will consist of integrated tidal shear stress and wave shear stress data.
6. A new version of the BGS seabed sediments map (DigSBS 250K version 2) will include geophysical and sample data from more recent surveys. These data will be used to produce an aggregated version of the BGS map. The sediment data will be used both to construct a sediment layer and to calculate roughness to be included in the both the wave and tidal bed shear stress layers.
7. Improved regional rock data layers are being developed by BGS, funded by BGS, DOENI and Defra[3].This contract will produce regional layers showing presence of rock at or near the seabed surface. This will include rock and sediment greater than 64mm in size and will be incorporated into the UKSeaMap 2009 seabed substrate layer.

Increase biological relevance of predicted seabed types

The initial UKSeaMap report highlighted the lack of a detailed offshore marine habitat classification as a factor contributing to a generally lower level of confidence in offshore areas. Work to further develop the EUNIS classification scheme and the UK marine habitat classification in offshore waters will ensure that this and future predictive mapping exercises are not limited by the lack of appropriate classification units in the offshore area. UKSeaMap 2010 will take account of recent work in the offshore sections of the classification in order to predict more biologically relevant habitats.

The biological relevance some of the divisions used in the UK and EUNIS classification schemes (seabed sediments, biological zones, energy levels) will be tested using data from the Marine Recorder database. Benthic sample data have been added to this database since 2006; the new data will be used as part of the validation process. Divisions

[2] Contract Reference: SF 0254; MB102

[3] Contract Reference: SF 0255; MB103

and thresholds of particular interest are: the grouping of Folk classes to broad sediment types equivalent to EUNIS level 3; the boundary between areas of the seabed disturbed by waves and undisturbed areas; the threshold at which light reaching the seabed no longer supports kelp growth; and the distinction between high, moderate and low energy rock habitats.

Improve predictive approach

Tools will be constructed to ensure that the process for predicting seabed types is repeatable, enabling predictions at a UK scale and locally if more detailed datasets are available. Input data layers will be in raster format in order to reduce processing times compared to the vector approach used by UKSeaMap 2006. UKSeaMap 2006 used different cell sizes in some offshore areas, to reflect the reduced resolution of sediment and bathymetry data in these areas. A mixed raster approach will be used in UKSeaMap 2010 which will combine the results from a coarse resolution raster (0.5°) and a fine resolution raster (0.0025°) in the final map.

Input data layers will be produced with associated confidence layers. These confidence layers will show the probability that class selected for that grid cell is correct (e.g. 'high' energy, 'circalittoral' biological zone). Seabed habitat maps showing the most likely habitat for each grid cell will be constructed from the probability layers. The final map will also have an associated probability layer to show the overall level of confidence in the predicted seabed habitats. This method of confidence assessment is different from UKSeaMap 2006 which used point data to validate the seabed types produced.

Finally, the HABMAP approach used in the southern Irish Sea will be examined to see if it could be used at a UK scale. The HABMAP approach involved using biological data to create rules for the environmental conditions required for a biotope to exist. The rules were used to predict the coverage of seabed habitats and biotopes.

Final products

The UKSeaMap webGIS (www.jncc.gov.uk/UKSeaMap) will be updated in spring 2010 with the new input data layers, predicted seabed habitat map, an updated topographic and coastal physiographic features layer and associated confidence layers for each map. A final report on UKSeaMap 2010 will be published in April 2010, with a draft report published in February 2010. Leaflets and poster will be produced at the end of the project to publicise the results of the project.

References:

Connor, D. W., Gilliland, P. M., Golding, N., Robinson, P., Todd, D., & Verling, E. 2006. *UKSeaMap: the mapping of seabed and water column features of UK Seas*. Joint Nature Conservation Committee.

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Acronyms

ABPmer – ABP Marine Environmental Research Ltd

BGS – British Geological Survey

CCW – Countryside Council for Wales

Defra – Department for Environment, Food & Rural Affairs

DOENI – Department of the Environment Northern Ireland

EUNIS – European Union Nature Information System

JNCC – Joint Nature Conservation Committee

NE – Natural England

NIEA – Northern Ireland Environment Agency

SG – Scottish Government

SNH – Scottish Natural Heritage

WAG – Welsh Assembly Government