

10. NATIONALLY-IMPORTANT MARINE EARTH HERITAGE AREAS

276. The Review of Marine Nature Conservation Working Group requested that the Pilot investigate the rationale for Earth heritage conservation in the marine environment, and to recommend the most appropriate means of conserving nationally-important marine geological and geomorphological sites.
277. In the terrestrial environment the purposes of conserving geological and geomorphological sites are considered to be:
- i. to conserve sites which are the international type examples of an important aspect of geology, and which, therefore, underpin geological science globally;
 - ii. to conserve the most important aspects of a country's Earth science heritage for future generations;
 - iii. to provide a resource for education, training and research in the Earth sciences;
 - iv. to conserve a cultural and recreational resource;
 - v. to support environmental forecasting by enabling the study of natural processes as they have operated in the past and as they continue to operate today.
278. The approach taken in the selection of terrestrial Earth science sites in the UK is explained in Ellis *et al.* (1996) for Great Britain and Enlander (2001) for Northern Ireland. There are three main components to the series of nationally-important Earth science sites, namely:
- i. sites of international importance;
 - ii. sites having unique, rare or exceptional features;
 - iii. sites representative of an important aspect of the country's earth science heritage.
279. In selecting a series of representative sites for Great Britain, the country's Earth science heritage was subdivided into 100 'blocks' (selection categories) covering various aspects of stratigraphy, palaeontology, Quaternary geology, geomorphology, igneous petrology, structural and metamorphic geology, and mineralogy. For each block, one or more networks of sites were identified in order to illustrate the range of important geological or geomorphological aspects of the block. In Great Britain some 3,000 individual sites were identified using this method, and the reasons for selection and descriptions of the sites are being published in some 40 volumes of the Geological Conservation Review (GCR).
280. Existing conserved terrestrial sites extend only down to low water mark. Little attention has, hitherto, been paid to Earth science features in the marine environment. There is as yet, no rationale for the conservation of Earth science features below low water mark, and the marine Earth science site information that exists remains dispersed and disparate.
281. Consideration of the purposes identified under paragraph 277 above for terrestrial sites in terms of their applicability to the marine environment leads to a number of preliminary conclusions. Firstly, to date, marine sites have contributed relatively little to the global understanding of Earth science because they have been only researched only in a very limited way. Secondly, the difficulty of access limits the use of marine sites for education, training and research. The same is true of the use of marine sites as a cultural or recreational resource, except through remote means such as television or video. Marine sites certainly will contain some elements of the country's earth heritage that are either not expressed on land, or are less well expressed on land (e.g. features

such as gas seeps, sand volcanoes, and iceberg plough marks); also marine sites have present and potential value for the conservation of present-day natural submarine of geomorphological processes, and of improving understanding of how such processes operated in the past.

282. The threats from human activities to marine geological and geomorphological features are largely confined to significant dredging and dumping activities and from engineering works. For most of these, effective present day controls exist but are not applied directly for Earth heritage conservation purposes because important sites have not been identified.

283. In order to develop a rationale for marine geological and geomorphological conservation, the Pilot commissioned the University of Wales, Bangor, to review this issue and to reach conclusions.

Conclusions of the review

284. The main conclusions from the review were as follows:

- i. the premise that there is a need to preserve our Earth heritage for future generations, and in doing so, maintain the resources necessary for continued and future research, applies to the marine environment as much as it does terrestrially;
- ii. any programme of marine Earth science conservation must be developed in parallel with, or be preceded by, an in-depth and wide-ranging data compilation exercise. This should include the use of the BGS offshore geological and geomorphological database currently being prepared by the Geophysics and Marine Geoscience group at BGS, Edinburgh;
- iii. the identification of a series of nationally-important Earth science sites should be carried out solely from the viewpoint of their Earth heritage and Earth science value, irrespective of the nature of the implementation measures subsequently taken to ensure their conservation;
- iv. because access to marine sites is inherently difficult, there is a need for data, information and materials relating to those sites to be made accessible;
- v. threats to marine Earth science sites can take a variety of forms e.g. dredging operations, changes to the water dynamics, spoil or sediment disposal, and engineering works of various kinds. A programme of marine Earth science conservation would need to be undertaken in close partnership with the relevant human activity sectors;
- vi. the method of using GCR blocks for site selection, as applied to terrestrial earth heritage conservation, is applicable to the marine environment, but a number of additional blocks covering marine geomorphology are likely to be needed;
- vii. where existing conserved geomorphological sites span the terrestrial, intertidal and marine environments, there is a strong case for extending the terrestrial sites to encompass the marine component of the site;
- viii. for non-geomorphology blocks, there is a possibility that sites occurring in the marine environment will fill in gaps in the existing site coverage. Because of the relative lack of knowledge about the significance of marine geological exposures, it is not possible to estimate the potential significance of this contribution at the present time;
- ix. in the selection of sites, numerical grading according to evaluation criteria is desirable to achieve transparency and objectivity in the site selection process. Sites could change their grading value over time as a result of new research or change in condition;

- x. sites which do not rely for their survival on the operation of marine processes can be conserved effectively by the regulation of human activity in the area in which they occur. For active geomorphological sites, there is a need also to secure the continuation of the marine processes which support them by exerting control over human activities also in adjacent areas.
- 285 Following receipt of these conclusions, the Pilot further commissioned the University to implement their recommendations in relation to the Irish Sea, and insofar as was possible, develop a list of nationally-important geological and geomorphological areas for the Irish Sea. The University tested out their conclusions on the Irish Sea, using data from various sources, including the British Geological Survey offshore regional reports, which summarise the offshore geology and geomorphology over the UK Continental Shelf, and also data available through the Internet Geoscience Data Index.
286. The method used was to try and identify areas in the following categories:
- i. nationally-important marine areas equivalent to the existing conserved terrestrial Earth science sites;
 - ii. where nationally-important areas are dependent on natural marine processes, both the areas themselves and wider zones within which the natural processes operate;
 - iii. areas which, irrespective of whether they contain GCR-equivalent sites, represent distinct characteristic submarine geological or geomorphological situations (these are called ‘Geotopes’).
- 287 For the identification and evaluation of possible areas, categories i) and ii) were taken together, and assessment in the context of the relevant existing GCR block or newly proposed thematic block. Geotope areas were identified in the context of five proposed categories namely: i) estuarine systems, ii) longshore systems, iii) island archipelago systems, iv) tidal strait systems, and v) shelf-slope systems.
- 288 Assessment was carried out on the basis of scoring the area against i) scientific value of the area, ii) threat status, iii) conservability; a scoring system was devised to ensure that the assessment was both objective and transparent. ‘Scientific value’ encompassed the qualities of overall importance, uniqueness/exceptionality, representativeness, existing and potential research status, educational value and historical interest. ‘Threat status’ was assessed on the basis of the likelihood of human activities damaging the area, either if undertaken on or close to it, or also if undertaken at a distance (e.g. by disrupting sediment supply to an active process site). ‘Conservability’ included an assessment of the relative intactness (or, conversely, degradation) of the area, the relative ease or difficulty of managing the site to retain its value, and the relative ability (or inability) of the site to repair itself, if damaged.
- 289 Candidate areas were identified from the available data. These were:

Existing GCR sites extending below low water

Luce Sands, Dumfries & Galloway	Newborough Warren, Anglesey
Solway Firth (North Shore),	Solfach, Gwynedd
Annandale & Eskdale, Dumfries	Porth Neigwl, Gwynedd
& Galloway	Morfa Harlech, Gwynedd
Cree, Dumfries & Galloway	Morfa Dyffryn, Gwynedd
Upper Solway, Cumbria	Ynyslas, Ceredigion
Walney Island, Cumbria	South Pembroke Cliffs, Pembrokeshire
Ainsdale, Merseyside	
Tywyn Aberffraw	

New marine areas

The Menai Strait	Pingo north west Anglesey
Sarn Badrig (and/or other sarnau), Cardigan Bay	Scour Mats main channel west of the Isle of Man
Southern Irish Sea Linear Troughs and Incisions	Roche Moutonnees west of Isle of Man
Muddy Hollow Holocene Deposits, Tremadoc Bay	Tidal Scour Cauldrons west of Anglesey
Morfa Dinlle	Periglacial Polygonal Patterned Ground north of Anglesey
Submerged Drumlins, Morecambe Bay	Canyon Formations Mull of Galloway
Gallows Point Hollow, Menai Strait	18 Gravel Reefs within Cardigan Bay
Cold Seeps, Muddy Hollow, Tremadoc Bay	2 Gravel Ridge/Patches North of Anglesey
Isle of Man Banner Banks	Inactive Tidal Sand Ridges west of South Wales Peninsula
Lune Deep, Morecambe Bay	Linear Sand Streaks on Smooth Gravel Beds, St Georges Channel
Large Mega-Ripples north of Holyhead	Giant Sand Waves within Cardigan Bay
Hard Rock Geology north west of Holyhead	Irish Sea Mounds, North western Irish Sea near main channel
Irish Sea Cold Seeps	
Moribund Tidal Sand Ridges northeast Isle of Man	

- 290 Applying the assessment method, and using the available information and data, candidate areas were identified, briefly described, evaluated, and a recommendation relating to each was formulated. The outcome of this work will be made available online at www.jncc.gov.uk/irishseapilot.
- 291 Areas selected as nationally-important Earth heritage areas by this process will fall into one or other of the following main groups:
- i. marine extensions of existing coastal geological or geomorphological protected sites;
 - ii. prospective geotopes adjacent to existing geological or geomorphological protected sites;
 - iii. prospective inshore, and also offshore, nationally-important geological or geomorphological areas, including those where the protection of supporting natural processes is required.
 - iv. prospective inshore, and also offshore, geotopes.
- 292 Identifying effective and appropriate means of ensuring the practical conservation of nationally-important areas identified through this process will need further consideration, but it is very probable that the conservation of those areas can be incorporated within the measures proposed for the conservation of marine landscapes (including strategic and spatial planning, and environmental assessment), and by measures taken to protect the network of nationally-important biodiversity areas. Indeed, areas which are nationally-important for their geology and geomorphology could simply be incorporated into the network of marine areas.

Recommendations

293. The following recommendations are made in relation to nationally-important marine earth heritage areas:

R22 Nationally-important areas for geology and geomorphology in the marine environment should be identified from present knowledge, and measures taken to conserve them which are proportionate and relevant to likely threats from human activities.

R23 To the extent practicable, conservation measures taken should be integrated with those taken for the conservation of biological diversity.

R24 Data, information and materials relating to nationally-important earth science sites should be made widely accessible.