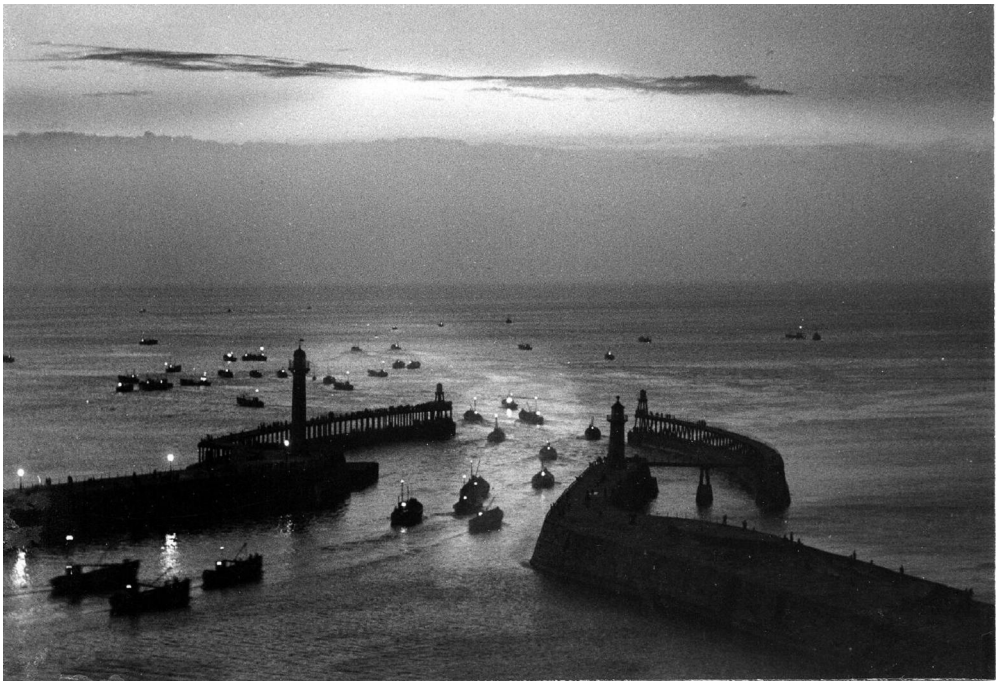
Report No: 2007R021

England's Historic Seascapes
Scarborough to Hartlepool and Adjacent Marine Zone

Historic Seascape Characterisation



Historic Environment Service (Projects)

Cornwall County Council

A Report for

England's Historic Seascapes, Scarborough to Hartlepool and Adjacent Marine Zone

Historic Seascape Characterisation

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March 2007

Report No: 2007R021

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Acknowledgements

This study was commissioned by English Heritage and carried out by the projects team of the Historic Environment Service (formerly Cornwall Archaeological Unit), Environment and Heritage, Cornwall County Council. Thanks to Dave Hooley, EH Characterisation Inspector, Virginia Dellina-Musgrave, EH Maritime Archaeologist (ALSF Adviser) and Fachtna McAvoy, EH Project Officer, for their support and guidance throughout.

We are grateful for the support and interest from Graham Lee (North Yorks National Park Archaeological Officer), Peter Rowe, Gary Green and Robin Daniels (Tees Archaeology), Neil Campling, Nick Boldrini, Stephen Toase and Gail Falkingham (North Yorkshire County Council), Christiane Kroebel, Mark Edwards and Mike Turver (Whitby Museum), David Pybus (Cleveland Potash Ltd), Dr Jim Innes (Durham University), Peter Murphy, EH Coastal Strategy Officer, Brian Barker (Northern Region Film and Television Archive), Fran Porritt and Suzanne Heywood (Arts and Media, Library and Information Service, University of Teesside), Charlotte Taylor (Hartlepool Arts, Museums & Events), Mike Shaw (Sutcliffe Gallery), Olivia Merrit (University of Bournemouth) and Dr Antony Firth (Wessex Archaeology).

Thanks also extended for the data provision and technical support from Alice Froggatt and Katherine Shier (English Heritage), Guy Hannaford, Ann Browne, Phillip Clayton-Gore and Elizabeth Rudd (UKHO), Lucy Connor (SeaZone), Mike Cain (Anatec), Paul Eastwood and Sara Carter (Cefas), Thomas Arculus and Bruna Catena (Crown Estate), and Brian Thynne (National Maritime Museum).

Within the Historic Environment Service, the Seascapes team was: Charlie Johns, Project Manager; Megan Val Baker, Project Officer; Bryn Tapper, GIS adviser and Peter Herring, theoretical and methodological adviser.

The views and recommendations expressed in this report are those of the Historic Environment Service projects team and are presented in good faith on the basis of professional judgement and on information currently available.

Cover illustration

Herring fleet putting to sea from Whitby in the 1950s (© Whitby Museum).

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Abbreviations and acronyms

ADS	Archaeological Data Services
ALSF	Aggregates Levy Sustainability Fund
AONB	Area of Outstanding Natural Beauty
BGS	British Geological Society
BMAPA	British Marine Aggregates Producers Association
CAU	Cornwall Archaeological Unit (now the HES)
CBA	Council for British Archaeology
CCC	Cornwall County Council
CEFAS	Centre for Environment, Fisheries and Aquaculture
DEFRA	Department of the Environment, Food and Rural Affairs
DTI	Department of Trade and Industry
EH	English Heritage
ESA	Environmentally Sensitive Area
EU	European Union
GIS	Geographical Information System
HER	Historic Environment Record
HES	Historic Environment Service, Cornwall County Council
HSC	Historic Seascape Characterisation
ICZM	Integrated Coastal Zone Management
JNCC	Joint Nature Conservation Committee
JPNAC	Joint Nautical Archaeology Policy Committee
MCZ	Marine Conservation Zone
MHW	Mean High Water
MMO	Marine Management Organisation
MPA	Marine Protected Area
MSP	Marine Spatial Planning
NGO	Non-governmental organisation
NMP	National Mapping Programme
NMR	National Monuments Record, Swindon
NNR	National Nature Reserve
RCHME	Royal Commission on the Historical Monuments of England

RCZAS	Rapid Coastal Zone Assessment Survey
SAHS	Scarborough Archaeological and Historical Society
SEA	Strategic Environmental Assessment
SMR	Sites and Monuments Record
SPA	Special Protected Area
SSSI	Site of Special Scientific Interest
UKCS	UK Continental Shelf
UKHO	United Kingdom Hydrographic Office, Taunton
WA	Wessex Archaeology
WWI	World War One
WWII	World War Two

1 Executive Summary

This report describes the results of a pilot project commissioned by English Heritage and undertaken by Cornwall County Council's Historic Environment Service (Projects) in 2006-7, to apply Marine Historic Landscape Characterisation, hereafter referred to as Historic Seascape Characterisation (HSC), to the coastal, inter-tidal and marine zones of North Yorkshire, Cleveland and Teesside, from Scarborough to Hartlepool, as part of England's Historic Seascapes project. Sponsored by the Aggregates Levy Sustainability Fund (ALSF), it is one of four pilot projects of varying coastal and marine contexts designed to test the methodology developed by Wessex Archaeology in Liverpool Bay. The pilot projects were undertaken concurrently and presage a nationwide marine characterisation programme.

The whole study area is an historic seascape altered, transformed and affected by human activities. Seeking an archaeological understanding of the historical and cultural development of the present marine, inter-tidal and coastal areas, this pilot project maps historic character and sea-use within a GIS, using historic charts, maps and associated documentary sources alongside modern marine data.

Source-led and guided by current terrestrial multi-mode Historic Landscape Characterisation (HLC) methodology (Aldred and Fairclough, 2003) it defines areas that share similar and repeating historic character as Historic Seascape Character 'Types', allowing historic trends and processes to inform and frame the broader sustainable management of change, through marine spatial planning, outreach and research projects.

To reflect the multi-dimensional or multi-layered nature of the marine environment (ie. the seabed, seafloor, water column and surface) a fine grid of cells, with tiered attributes, is used in this HSC to record the present and dominant historic character for each marine layer. (Inter-tidal and coastal areas, whose sources are those of the established terrestrial HLC, are captured as polygons.) From this database a single, conflated HSC layer is derived. To assist the wide variety of users of HSC, texts have been prepared for each HSC Type, describing different aspects of the historic character including identifying distinguishing attributes and principal locations; their constituent components, features and variability; the values and perceptions that people have of these areas; the research, amenity and education potential they offer; their present condition and forces for change affecting them, which in turn inform statements on their rarity and vulnerability allowing broad recommendations to be suggested for their management.

For the greater part of its southern length, the Scarborough to Hartlepool coastline is sheer, rocky and inhospitable. Capped by glacial tills, cliffs of Jurassic sedimentary rocks – in places mineral-loded and fossil-laden – are interspersed by narrow and steeply cut watercourses, some wooded, and by small sheltered bays and prominent headlands. Though comparatively safe when the wind blows offshore, it is treacherous in northerly and easterly gales, with hazardous 'scars' and shoals nearshore, as thousands of inshore wrecks bear testament. Further north in the sweep of Tees Bay and at the mouth of the Tees Estuary the coast is low and flat, once extensive tidal sand flats and saltmarsh, with some peripheral rough grazing but mostly reclaimed in the twentieth century for vast industrial complexes.

The central-southern North Sea, 'Doggerland', once formed a living landscape (Coles 1998), a low-lying landmass indented with rivers and inlets, and festooned with archipelagos, lagoons, wetlands and marshlands. As Holocene sea-levels rose, often imperceptibly but sometimes catastrophically, this landscape was submerged by *c*5000BC Late Devensian

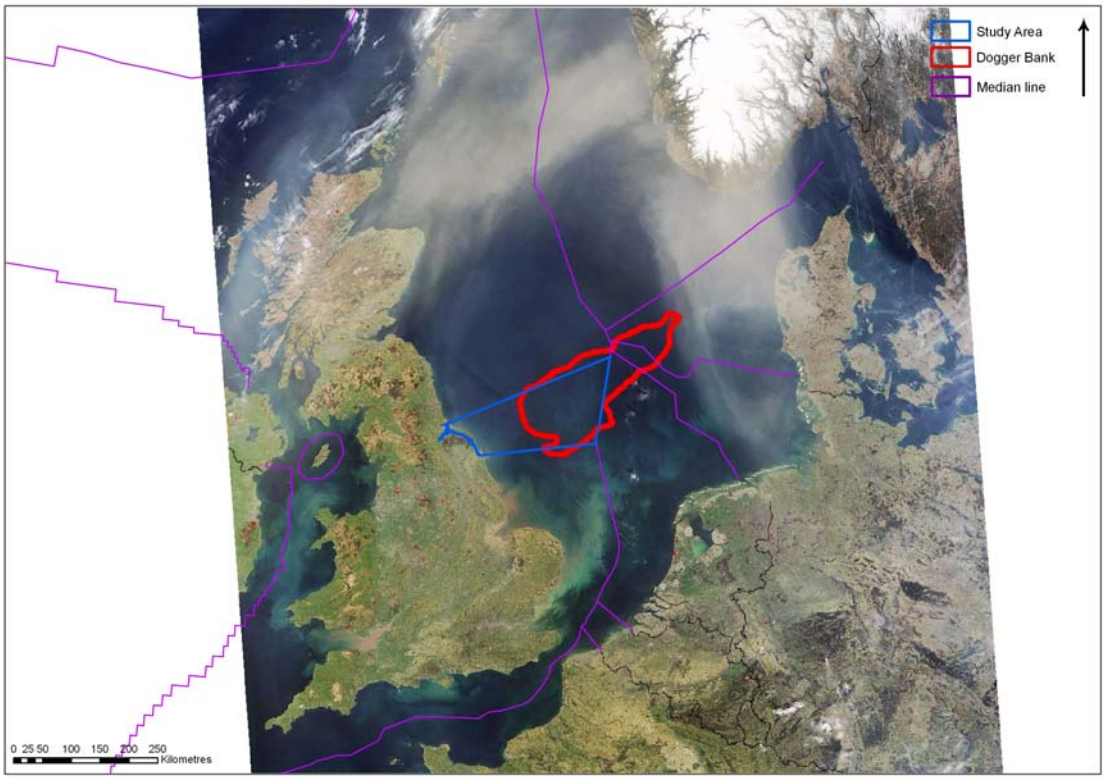

Fig 1 The Scarborough to Hartlepool Seascapes pilot area

sands and gravels hold potential for *in situ* Middle and Upper Palaeolithic deposits and Mesolithic palaeo-geographies are well known though imprecisely defined. Trawled seabed close to Dogger Bank has offered up numerous floral and faunal remains and the potential for further prehistoric landscapes, finds and environmental material is significant (Flemming 2004). The inter-tidal and estuarine sediments of the area also conceal palaeo-environmental deposits of considerable potential.

Historically the study area has been dominated by coastal trade, mineral extraction, ship building and fisheries. Throughout prehistory rivers, such as the Tees and Esk, have been important access points to and from the region's agricultural hinterlands, linking into wider North Sea networks of trade and communication. During the Roman and Anglo-Saxon periods these networks became highways of invasion, immigration and trade (Clarke 1985).

The important late medieval and early post-medieval coal and alum trades established early shipyards such as at Stockton and Whitby. In many places coastal mining for ironstone, alum, and jet and quarrying for building stone has left the cliffs and foreshore cut, tunnelled and rent whilst dredging has channelled and scoured rivers of accumulated sediment and cleared harbours of sand driven onshore. Since the 19th century the Teesside and Hartlepool Ports area has been one of the foremost industrial and commercial shipping centres in Britain, founded on coal, iron and shipbuilding, but later steel, chemical and hydrocarbon industries (Le Guillou 1975).

The fishing communities perched and tucked away on this coast traditionally farmed inshore waters: trapping for salmon, potting for shellfish and crustacea, and netting for seasonal

herring in distinctive local craft such as cobles, yawls and mules, with Scarborough, Whitby, Staithes and Hartlepool leading. They also sought distant offshore cod with long-lines, about Dogger Bank and further afield, before the advent of trawling methods and the late 19th century adoption of steamers heralded the era of extensive and intensive exploitation of pelagic and demersal fisheries (Frank 2002). Once internationally important fishing grounds are today in a state of remittance as strategies for conservation of fish-stocks limit seasons and catch size.

Settlements are generally dispersed excepting industrial Teesside. Historic areas and routes of navigation strike out from these ports and harbours, negotiating notorious local hazards, before immediately entering the open sea, warded by the numerous landmarks and navigation aids and by innovative life-saving institutions. Railways, tramways and road networks link mineral industry to the sea. Recreational spas, gardens, trails and links cluster about Victorian seaside resorts such as Scarborough and Redcar. Defensive military positions bristle on defensive headlands and eerie military listening devices dot the cliff tops.

Though modern impositions on this landscape, such as aggregate dredging, spoil dumping, hydrocarbon extraction, telecommunications cables and renewable energy industries, put pressure on historic seascape character they nevertheless reflect it and their interventions often offer opportunities to investigate and understand the historic environment further.

Throughout the past the North Sea has served more as a unifier than a barrier. The peoples living around its coasts exploited the sea as a means of trade and communication, and were linked closely together culturally, economically, and even politically.

The historic seascape is, however, a contested place. Various communities and interests, from particular localities and from particular opinion, have a concern in ongoing developments or activities that are potentially or actually damaging, diluting, distorting or destroying important or well-regarded features or character. HSC mapping and text helps place such positions and challenges in context, allowing debate about the present and future to be more properly grounded in an understanding of the past. It enables such debate to be welcomed and joined by the historic environment community, and by local people. It is a product and a process expressly designed and intended to facilitate discussion and dialogue about the sustainable management of the marine historic environment as a whole (Herring, 1998).

2 Introduction

2.1 Project background

In early spring 2006 the Historic Environment Service (Projects), Cornwall County Council (HES) successfully tendered to English Heritage to undertake the project to extend the application of Historic Landscape Characterisation (HLC) to the inter-tidal and marine zones and adjacent UK continental shelf in the Scarborough to Hartlepool pilot area as part of England's Historic Seascapes (Johns *et al* 2006). HES have termed this exercise Historic Seascape Characterisation (HSC).

The aim of the project was to apply HLC to a pilot area of the inter-tidal and marine zone, validating and, where necessary, building on an initial inter-tidal and marine HLC methodology developed for Liverpool Bay (Wessex Archaeology 2005). It is one of four separate pilots designed to ensure the initial method's validity in other main types of coastal and marine context. English Heritage hoped that the number and range of pilots would allow this phase of the Seascapes programme to expand the heritage projects sector's capacity to carry out research and other work in the marine and inter-tidal zone. A key role for the resulting robust characterisation methodology was to frame responses to aggregates extraction. Funding for this pilot application was therefore sought and secured from the Aggregates Levy Sustainability Fund (ALSF) (English Heritage Characterisation Team 2005, 2).

This marine and inter-tidal characterisation is designed to complement the current national programme of largely county-based HLC projects which, through desk-based GIS mapping and analysis, seek an archaeological understanding of the historical and cultural development of the whole of the present landscape. It will enhance English Heritage's capability to inform the sustainable management of change affecting the historic dimension of the environment, contextualising it and doing so in a manner compatible with analogous natural environment datasets. As in purely terrestrial HLCs, the project's analysis was of the present landscape and seascape, transcending and giving context to the otherwise predominantly point-data records of the coastal and marine historic environment (*ibid*, 2).

2.2 The study area

The project's characterisation methodology ultimately needed to have relevance to an extensive area comprising England's inter-tidal zone, its share of UK territorial waters and the adjacent UK Continental Shelf. Definition of the overall limits of such an area inevitably reflects administrative and practical constraints rather than any break in the continuum of the historic environment (English Heritage Characterisation Team 2005).

The landward limit of the Scarborough to Hartlepool and adjacent marine zone pilot project area extends to the OS-mapped level of Mean High Water (MHW). MHW was not however used arbitrarily to truncate character polygons: characterisation for this project continued above MHW to encompass the full physical extent of any polygons that reach that level from seaward. As a consequence this landward extension included all coastal polygons of maritime character (*ibid*).

The seaward limit of this pilot area was the limit of the UK Continental Shelf, here following the Median Line with Holland, as defined in the UK Continental Shelf Act 1964 as subsequently amended (*ibid*).

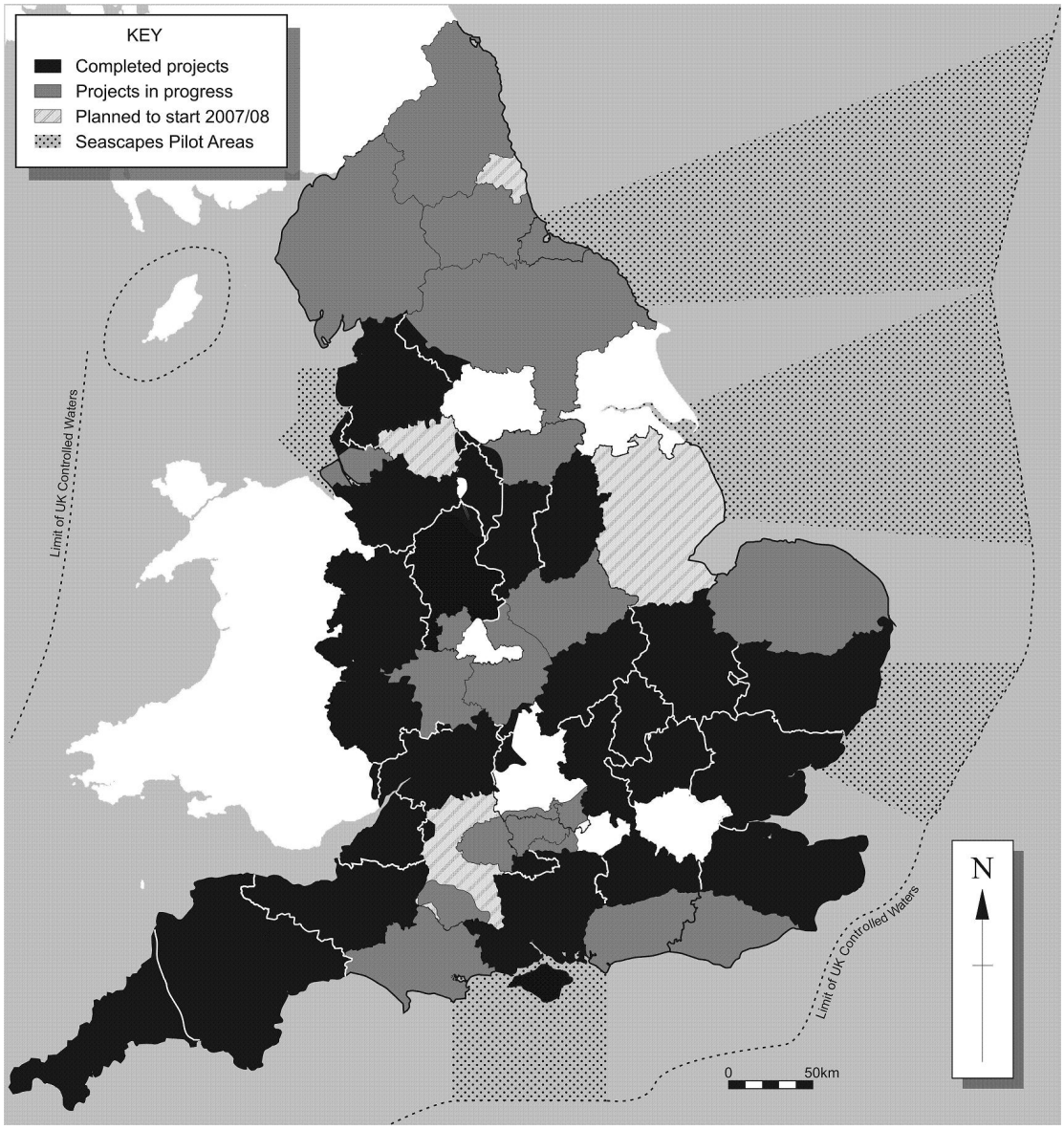

Fig 2 Progress of terrestrial Historic Landscape Projects 2007/08 and the Historic Seascapes Characterisation pilot areas (© English Heritage)

The southern lateral extent of this pilot area was determined by a line extending from the North Yorkshire coast at Yons Nab at 54°14' 35"N, 00°20' 22"W, eastward to the point where latitude 54° 20' 00"N intersects with the UK Continental Shelf Limit, where the Median Line defines the extent of UK territorial waters (*ibid*).

The northern lateral extent of this pilot area was determined by a line extending from the Hartlepool coast where the Crimdon Beck meets the sea at 54°43' 21"N, 01°14' 29"W, north eastwards to the point where latitude 55° 40' 00"N intersects with the UK Continental Shelf Limit, where the Median Line meets with Dutch Waters (*ibid*).

All estuaries within the project area were included to the Normal Tidal Limit along their rivers and tributaries (*ibid*).

2.3 Rationale

The project outlined in the EH Brief aimed to deploy, assess and, as appropriate, further develop in a radically different context the methodology for inter-tidal and marine HLC created in the initial pilot project focussed on Liverpool Bay (Wessex Archaeology 2005). Considerations involved in selecting such differing contexts for this and other pilot exercises included *inter alia* the need to ensure the piloting process results in a robust methodology to inform responses to marine aggregates extraction and, arising from that, the need to ensure it has been tested against the limits of the contrasting environmental and management complexities which it will need to accommodate. The Scarborough to Hartlepool project area was designed to ensure the methodology's validity in hard coastline contexts beyond those currently subject to aggregate licensing. The entirety of this pilot project area was characterised (English Heritage Characterisation Team 2005, 6).

2.4 Structure of the report

The first four sections of this report are introductory. Section 5 gives a brief background to the study area; coastal geology, the North Sea, a timeline and a chronologically ordered archaeological and historical summary. Section 6 is an overview of the Historic Seascape Characterisation products and an explanation of how these relate to the aims and objectives. Section 7 is a methodological review; Section 8 describes some practical applications of HSC. Section 9 contains the Character texts which complement the HSC GIS mapping. Section 10 contains Character Area descriptions and an explanation of the rational behind these. Section 11 is a comprehensive list of sources and references. Each of the Broad Character texts has its own list of references; this is to make the creation of html pages simpler. The HSC methodology developed by HES is presented in a separate report.

Fig 3 The Seascapes pilot areas: Red, Liverpool Bay; Blue, Scarborough to Hartlepool (HES), Withernsea to Skegness (MoLAS), Clacton to Southwold (Oxford Archaeology), Solent (Bournemouth University/Southampton University/Hampshire and Wight Trust for Maritime Archaeology)

3 Guiding principles of Historic Seascape Characterisation

This section describes the principles adopted by HES to guide the development of the Historic Seascape Characterisation (based on the principles of terrestrial HLC as set out in Clark et al 2004).

- Characterisation covers the whole landscape/seascape.
- It defines historic landscapes/seascapes through present-day landscape/seascape.
- It is built on a recognition that landscape/seascape is dynamic not static; it is the product of change and change will continue in the future. It does, however, assert that better informed change can be better guided.
- It recognises that all Historic Environment has value, and can be managed more or less appropriately.
- It brings an archaeological approach to the consideration of landscape/seascape.
- Landscape/seascape, rather than individual features, is its main source. Characterisation is about being comprehensive, not selective and viewing the whole (areas) rather than individual parts (sites). It is concerned with the commonplace and the locally distinctive.
- Although it is as objective as possible in its method, it provides a framework for understanding that can be read and used differently by a wide range of varying interest groups. Interpretation and perception of the HSC is as fluid as the interpretation and perception of the landscape/seascape it characterises. It is therefore capable of reflecting the world "as perceived by people".
- Sources used in preparing the HSC, and the confidence in interpretations are made explicit, giving greater transparency to the decision-making process.

4 Aims and objectives

The following have been extracted from the project brief and so reflect English Heritage's principal aims and objectives (English Heritage Characterisation Team 2005, 6-7).

4.1 Aims

- To apply and, if necessary, develop the new Liverpool Bay methodology in a different type of coastal and marine environment, a hard rock coastline (Scarborough to Hartlepool pilot area).
- To create a GIS-based characterisation of the historic and archaeological dimension in the present landscape of the inter-tidal and marine zones of the project area to the limit of the UK Continental Shelf.
- To ensure that the historic environment GIS-database for the project area can be readily integrated with analogous databases, including those for the natural environment.
- To create a framework of understanding which will structure and promote well-informed decision-making relating to the sustainable management of change and conservation planning affecting the historic environment in the inter-tidal and marine zones.
- To enhance and contextualise the Maritime Record of the National Monuments Record and those County HERs impinging upon the project area, with particular regard to providing landscape-scale contextualisation of results from the Rapid Coastal Zone Assessment programme where available.
- To structure, inform and stimulate future research programmes and agendas relating to the project area.
- To improve the awareness, understanding and appreciation of the historic dimension of the project area to professional and non-professional users of the database.
- To be a demonstration project in the development of a methodology for extending HLC to the breadth of environmental and management conditions in England's inter-tidal and marine zones and adjacent UK Continental Shelf.

4.2 Key objectives

- To deploy, assess and, as appropriate, develop the GIS-database structure created for the Liverpool Bay pilot area to enable it effectively to accommodate the distinctive qualities of the Scarborough to Hartlepool project area while retaining compatibility of the database with the interfacing or partly overlapping terrestrial characterisation databases.
- To produce a GIS-based HLC characterising the project area's landscapes in historic and archaeological terms, by means of:
    - identifying and gaining access to the range of data sources relevant to understanding the historic and archaeological dimension of the project area,

placing greatest emphasis on sources with consistent national coverage;

- using GIS polygons to define areas sharing similar historic character;
- defining polygons on the basis of combined shared values of dominant character attributes, with secondary attributes recorded in a consistent, structured manner;
- identifying trends and recurrent groupings among the attributes to define historic landscape types which will, together, encompass all of the polygons and reflect the differing historical processes in their formation.

- To record the sources and data-sets supporting each stage of the characterisation, to meet the needs of transparency and assist future updates against the initial benchmark characterisation;
- To analyse and interpret the HLC to produce preliminary syntheses from it;
- To assess present uses and potential for the HLC in informing sustainable management of change and spatial planning issues surrounding marine aggregates extraction in the project area;
- To assess present uses and potential for the HLC in informing broader sustainable management of change, spatial planning, outreach and research programmes;
- To produce an archive and a report reviewing the methodological validation, development and practical application of HLC in this project area and assessing the benefits of extending such characterisation more widely to the historic environment in the inter-tidal and marine zones to the limit of the UK Continental Shelf;
- To disseminate information on the progress and results of the project through professional and popular publications and other media.

5 The study area

5.1 Introduction

The modern environment of the North East Yorkshire, Cleveland and Teesside coastline and the North Sea is a synthesis of past and present environmental conditions. At Scarborough the Bridlington chalk gives way to cliffs of sandstone and brittle shale, intersected occasionally by wooded ravines whose becks discharge their peaty waters into the North Sea. Headlands are called *nab* or *ness*, inlets and bays are *wykes*, and numerous place names end in *–by*; unmistakable evidence of Viking settlement over a thousand years ago. Northwards from Whitby and the River Esk, the only estuary between the Humber and the Tees, extend precipitous cliffs rising to 200 metres (660 feet) at Boulby, before petering out beyond Saltburn into the sand dunes of Redcar and South Gare at the mouth of the River Tees. The coast is an inhospitable one, comparatively safe when the wind blows offshore, but treacherous in northerly and easterly gales (Frank 2002, 40).

5.2 Coastal Geology

It is one of the classic coastlines of British Geology, formed of sedimentary rocks laid down in the Jurassic with a capping of glacial tills from the Ice Age (Myerscough 1991, 7). Because of this the rocks are stratified, being composed chiefly of shales, sandstones and limestones, with iron mineral spread through the whole (Owen 1986, 2). Generally speaking the older rocks are to the north and progressively younger to the south. Folding and faulting are relatively minor but there is a major fault at Ravenscar, just south of Robin Hood's Bay. From the crumbling shale cliffs of Staithes to the 200m high cliffs at Boulby (the highest cliffs on England's east coast), the coastline exhibits a wide variety of rock types and coastal features associated with them.

The solid geology of Hartlepool Bay is composed of Permian and Triassic rocks. North of the Long Scar outcrop it comprises mainly well-bedded, granular, often oolitic dolomite rocks of the Roker Dolomite Formation; part of the suite of Late Permian carbonate rocks which form much of the County Durham coast. In the former area of The Slake and in Hartlepool Docks, however, is the Hartlepool Anhydrite, a crystalline rock of Late Permian age which originally more extensive, is now restricted to this part of Hartlepool Bay. South of the Long Scar the bay is composed of Triassic rocks of the Sherwood Sandstone Formation with mudstone inclusions are separated from the earlier, Permian rocks by the West Hartlepool Fault (Myerscough 1991, 7).

Large outcrops of limestone rock form Hartlepool Headland and West Hartlepool, with the Triassic sandstone outcropping at Seaton Carew and Long Scar. Hartlepool Bay and the Docks area occupy the depressions between. The coast to the south of Seaton Carew is mostly masked by sand dunes and sheets of sand. Between the rock outcrops, red stony till weathered blue-grey at the surface, flanks the Bay on the west. Between these topographic raised areas there are depressions filled with sands, silts, clays and peats. Submerged forest peat beds can be found in these deposits, often exposed after storms and episodes of tidal scouring. There are also palaeo-channels representing earlier postglacial drainage overtaken by sea-level rise and also filled with fine-grained organic and clastic sediments (*ibid*, 7).

The River Tees is a major landscape feature in eastern England, historically dividing the counties of Durham to the north and Yorkshire to the south. It rises on the eastern slope of Cross Fell in the Pennines, and flows eastwards for about 137km to the North Sea, between

Hartlepool and Redcar. At the mouth of the Tees Estuary the coast is low and flat. Once extensive tidal sand flats have now been reclaimed to create a vast industrial complex. Current drainage channels of the River Tees into the Bay are thus mostly concealed beneath industrial and residential development (Waughman 2005,1).

The coastline from Redcar to Staithes has some outstanding rock exposures and breathtaking scenery. Cliffs such as those at Huntcliff and Redcar dominate the view south from Hartlepool Headland. Calcareous Shales with thin limestones are well exposed at Redcar. To the south-east of Saltburn the coast changes rapidly to high irregular cliffs, cleft at intervals by narrow defiles and small valleys (Myerscough 1991, 7).

The rocks exposed in the section of coast between Staithes and Runswick Bay are those of the Lower Jurassic divided into Whitby Mudstone Formation, Cleveland Ironstone Formation and Staithes Sandstone Formation and Redcar Mudstone Foundation (*ibid,* 8).

At Staithes the rock formation consists of sandstones and sandy shales, exhibiting ripple marks and worm tubes indicating a shallow marine deposition. These give way to the shales and ironstones of the Cleveland Ironstone Formation, with the ironstone of economic importance and extensively mined. All these rocks contain abundant fossils such as ammonites, especially the ironstones (*ibid*, 8).

At Port Mulgrave the rocks of the Whitby Mudstone Formation appear mainly as shales, again containing many fossils including the remains of drift wood from monkey puzzle trees that sank into the original mud to be converted to black jet. Port Mulgrave was the main exporting terminal for Grinkle Ironstone Mine. At Runswick Bay, the rocks of the Whitby Mudstone Formation are also exposed, but not as clearly (*ibid*, 8).

A fault runs along the course of the River Esk; to the west of Whitby are sandstones of the Middle Jurassic Saltwick Formation, while to the east are exposed rocks of the Upper Lias and the Lower Jurassic, overlain by marine and then deltaic rocks of the Middle Jurassic which are mainly shales with frequent ammonite nodules. In the past the Alum Shale was worked for alum (as mordant for dyeing fabrics) and the upper part of the alum shales (Cement Shales) were exploited to make cement (*ibid*, 8).

The cliffs along this section are often unstable with erosion taking place along small faults and joints, often forming small caves, with roofs formed by tough calcareous sandstone known as The Dogger Formation. Above this the massive sandstones of the Middle Jurassic Saltwick formation appear in the cliff (*ibid*, 8).

At Saltwick Bay rocks of the Whitby Mudstone Formation are still exposed as shales with limestone concretions. Jet is common here also. At the back of Saltwick Bay can be seen the remains of large alum quarries in the Alum Shale and piles of burnt red shales left behind from the extraction process (*ibid*, 8). Research by Blaise Vyner has shown that levelled tracks and wharfs related to the alum industry here are also cut into the upper and middle foreshore (Dave Hooley Pers Com).

At Ravenscar Lower and Middle Jurassic rocks are exposed along the Peak Fault. The Middle Jurassic rocks here comprise the Scalby, Scarborough and Cloughton Formations. These beds of limestone and sandstones are rich in fossils and represent a marine invasion of the delta front. The Blea Wyke Sandstone Formation, normally absent in North East Yorkshire, is at its thickest here. It is absent elsewhere due to erosion (*ibid*, 8).

In Robin Hood's Bay can be seen the rocks of the Redcar Mudstone Formation of the Lower

Jurassic, with the oldest rocks of the Calcareous Shales exposed at the lowest tide levels. The cliffs of the Bay expose the sandy beds of the Staithes Sandstone Formation overlying the Redcar Mudstone Formation and these have produced a variety of cliff forms. Sea defences have been built here to protect part of the village from the rapidly crumbling cliffs (*ibid*, 9).

The coastline from Cloughton to Scalby exposes mainly rocks of the Middle Jurassic, with deltaic rocks interbedded with marine strata. The fossils found in these rocks are shelly, indicating shallow current-swept waters. The sequence abruptly finishes with further deltaic advances depositing the Gristhorpe Member containing a rich flora of plant fossils. Marine conditions return again with the Scarborough Formation, with shales, sandstones and fossil-rich limestones deposited in the reworked sediments of the delta front. Again deltaic conditions return with the deposition of the Scalby Formation, with shales, mudstones, sandstones and a tough quartoze sandstone known as 'Moor Grit' that forms the bulk of the higher heather moorland of the North Yorkshire Moors (*ibid*, 9).

Scarborough is dominated by Castle Hill, a promontory rising to nearly 100m above sea level. On either side of Castle Hill the cliffs are relatively low; sandy beaches run north and south. Castle Hill is made up of rocks of the Upper Jurassic faulted down against Middle Jurassic and isolated by erosion along the faults to produce the over-deepened valleys of the area. The bulk of the cliff is formed of the blue-grey shales of the Upper Oxford Clay Formation. South Bay is faulted up against the Upper Jurassic rocks of Castle Hill and exposes the deltaic rocks of the Scalby Formation with the 'Moor Grit' dominating the cliff above the shoreline, while at beach level marine rocks of the Scarborough Formation can be seen exposed (*ibid*, 9).

The Middle Jurassic rocks exposed at Scarborough continue south. Much of the cliff section from here to Cayton Bay is composed of glacial drift choking a pre-glacial channel. To the south the High Red Cliff exposes a sequence of Upper Jurassic rocks faulted against Middle Jurassics. At the southern end of the bay the cliffs contain plentiful fossils, especially oysters and ammonites. Above the cliffs are dominated by the Oxford Clay Formation over 30m thick and overlain by the Lower Calcareous Grit Formation; a thick series of calcareous sands. Further south, from High Red Cliff, marine beds of the Scarborough Formation rise out from the beach. These yield a rich marine fauna and over lying deltaic rocks of the Cloughton Formation, well displayed on the shores of Yons Nab and containing the national and internationally important Gristhorpe Member Plant Beds containing many drifted plant remains, including ferns, cycads and fruits, many of which are unique to this area (*ibid*, 9).

5.3 The North Sea

The southern North Sea Basin has developed as a result of a long and complex history of basinal subsidence punctuated by discrete episodes of uplift and widespread erosion. Lower Palaeozoic sediments are likely to be many kilometres thick beneath most or all of the southern North Sea. They were mildly deformed and intruded by granite plutons during the Caledonian Orogeny of Late Silurian to Early Devonian about 420 - 390 million years ago (Cameron *et al* 1992, 10).

On a smaller scale the seabed of the continental shelf is a relict of several glacial periods when large volumes of material were eroded from the adjacent mainlands and from the continental shelf itself. This material was then redeposited on the shelf or in the deeper waters on the adjacent continental slope. The modern sedimentary environment of the North Sea continental shelf is now dominated by very low sediment input and the reworking of the seabed by near-bottom currents (BGS 2001, 3).

Extreme changes from arctic to temperate climates have been the dominant control on sediment type and the overall very high rate of sediment input into the North Sea from approximately 800,000 years ago to the present day. The general effect of the repeated glaciations during the cold periods has been to keep the North Sea basin filled with sediments during a time when there was very rapid basin subsidence (*ibid*, 3).

The bulk of the modern seabed sediments comprise substrates that are more than 10,000 years old and have been reworked from till by currents that have been generated by tides and sea waves. The reworked sediments typically form large areas of seabed sand and gravel. Such sediments also form the large-scale sandbanks and ridges and smaller sand waves. These characterise much of the seabed topography in the southern North Sea and are of strategic environmental interest. The largest ridges and banks have formed sub-parallel to the dominant tidal currents and occur as open-shelf ridges, estuary-mouth ridges or headland-associated banks. Many of these near-shore sand banks are mobile, others show little evidence for long-term mobility except on the seabed where sand waves appear to indicate that there is modern clockwise circulation of sand around the Dogger Bank (*ibid*, 3).

The Dogger Bank is a very large shoal area in the central North Sea, with water depths less than approximately 30m. It is shallowest in the south-west where water depths are only 15m. The 'bank' is largely composed of a 42m thick formation of glaciolacustrine clays which were deposited adjacent to lobes of glacial ice during the last Ice Age. When the ice retreated 18,000 years ago the deposits were left behind as an upstanding plateau. As sea levels rose the Dogger Bank became an island which was probably not completely covered by water until *c*7,500 years ago. The presence of freshwater and saltmarsh peat beds and clays containing intertidal molluscs are evidence of former coastal environments around the margins of the 'bank' at that time (*ibid,* 25).

For all glacial periods there is potential for archaeological material deposited in sediments on the continental shelf, although no material much older that 100,000 years is likely to have survived the Wolstonian glaciation (*c*330,000BP to *c*135,000 BP) in the central and southern North Sea (Flemming 2002, 8). Most of the sands and gravels in the area are likely to be late Devensian in date (18000-10000BP) deposited after the melting of the ice sheets. At this time sea level was lower than at present and most of the North Sea was dry land. This submerged landscape is often known as 'Doggerland' (Coles 1998). Coles (1998; 1999) suggests that the Doggerland landscape represented a living space rather than merely a 'landbridge' connecting Britain to mainland Europe.

ALSF is currently funding a project by Birmingham University investigating 3D seismics as a source for mitigation mapping of the Late Pleistocene and Holocene depositional systems and palaeogeography of the southern North Sea. The project was designed primarily to support sustainable development of the Southern North Sea basin by providing detailed data, derived from 3D seismic studies, for the strategic management of marine resources for the purposes of aggregate extraction. This data will be used to generate detailed stratigraphic and deposition maps which may be used for planned exploitation programmes or to minimise damage from aggregate extraction in this unique environment. The project will generate materials and information that will benefit a broad swathe of ALSF stakeholders, regional, national and international policymakers (http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/North_Sea_Palaeolandscapes/project_outline/00_contents.htm).

5.3.1 Sea level

Current estimates are that over the next century the southern North Sea will experience a rise in sea level of up to 0.7m. This figure is made up of two components; the rise in global sea levels caused by warming of the oceans and melting of polar ice caps, and by tectonic regional subsidence estimated to be up to 2mm/year in the southern part of this area (BGS 2001, 27).

The increase in sea level will allow larger waves to reach the coast with less of their energy lost to friction with the sea floor, possibly leading to an increase in coastal erosion on undefended parts of the coast and a consequent increase in sediment yields to the shelf (although it is not proven that marine influences are the primary cause of cliff erosion). Coastal defences may be put under increased pressure and sandbanks in shallow water will be less effective in sheltering sections of coast which may also lead to increased coastal erosion (*ibid,* 27).

Changes in wave refraction might also occur. However these predicted changes may be substantially mitigated as part of a natural feedback in that increased sediment supply may nourish the sandbanks allowing crest heights to build in line with the rate of sea level rise (*ibid,* 27).

Coastal tidal flats (known along the north east coast as "scaurs") and beaches also provide an important natural defence that reduces the wave energy striking the cliffs. Sediment supply is critical to the maintenance of the elevation of sedimentary tidal flats in a scenario of increasing sea levels to maintain the degree of wave attenuation but less so for shaley and rocky scaurs. Where tidal flats are unable to keep pace with rising sea levels, rapid retreat of the coastline, loss of intertidal habitats and pressure on coastal defences can possibly result. On a more regional scale the shallow plateau of the Dogger Bank also plays a part in reducing wave energy from northerly storms (*ibid,* 27).

5.3.2 Seismic activity

Within the study area there is a seismically active area at a NW-SE tending zone running roughly from Flamborough Head and N and NE of Norfolk. This zone appears to be associated with further graben structures in the Southern North Sea Basin (Neilson *et al* 1986; BGS 2001, 39). This area has been clearly active in historical times. There was a major earthquake recorded at Scarborough on December 29th, 1737. An eye witness account published in the journal *Philosophical Transactions* described some of the events that occurred in Scarborough that day:

'the pier, intire as it was, moved sideways out of its place, and rose up about five yards in the air….The tide was out when this happened, and I was walking on the spaw till after 12 o'clock, when I saw the sands beginning to rise about half a foot…nobody came to any hurt' (Johnson 1737, 804-806).

This zone was also responsible for the strongest ever UK earthquake on 7 June 1931 (6.1 ML on the Richter Scale); which was felt over the whole of the UK and also around the coasts of other countries bordering on the North Sea (Neilson et al 1986; BGS 2001, 39).

5.4 Timeline

Characteristic	Conventional Period	Date	Monuments / characteristics
Hunter-gatherer	Lower Palaeolithic	c500,000-50,000	(Cave sites); hand axes
	Upper Palaeolithic	50,000-10,000 BC	(Cave sites/cave paintings); homo sapiens sapiens
	Mesolithic	10,000-4000 BC	Flint scatters, settlement sites, forest exploitation
First farmers and pastoralists	Early Neolithic	4000-3500 BC	Ritual monuments, stone axes, forest clearance, animal husbandry
	Late Neolithic-Early Bronze Age	3500-2500 BC	Henges, stone circles etc, barrows, mixed farming economy, log boats, cup and ring marked stones
Settled agriculture	Early Bronze Age	2500-1500 BC	Henges, stone circles etc, barrows, forest clearance, log boats, sewn-plank boats?
	Middle Bronze Age	1500-1100 BC	Round houses and field systems, log boats, sewn-plank boats?, long-distance seafaring and exchange
	Late Bronze Age	1100-800 BC	Sewn-plank boats?
	Iron Age	800 BC -AD 43	Hillforts, salt production
	Romano-British	AD 43-410	Villas, towns, forts, signal stations, roads, imported overseas goods, ironstone works
	Early Medieval	410-1066	Saxons and Vikings, small communities, isolated farms, abbeys, burghs, clinker-built boats, churches
	Medieval	1066-1540	Towns + markets; ports, castles; religious houses - priories etc; manors and moats; hamlets and long-houses, fisheries, shipping
	Post-medieval	1540-1750	Alum quarries, kelp-burning, fishing, ship building industry
Industrial	Modern	1750-2000?	Mines, iron & steel works ports, ship-building, fishing, whaling, railways, roads, urban expansion, military sites and fortifications, country houses, parks and gardens, recreational development, offshore gas & oil

5.1 Archaeological and historical background

This section sets out a chronological background, describing the various processes which occurred in different periods in time and which have had an impact on the present day landscape and seascape character.

5.1.1 Palaeolithic ((Lower Palaeolithic 500,000-300,000 BC, Middle Palaeolithic 300,000 BC - 50,000 BC; Upper Palaeolithic 50,000-8500 BC)

The Lower Paleolithic was the time of the hand axe-industries; by the Middle Paleolithic flake tools bere being made by the prepared-core technique. The technological changes of Middle to Upper Paleolithic transition have led some to speculate that human language first fully developed at this time.

Throughout the Palaeolithic much of Northern Europe was still covered with ice and the Seascapes area would have been far inland, part of the 'landbridge' that joined Britain and the continent. Sites of this period in North-East England are extremely rare. On Teesside there are records of finds of fossilised bones of Palaeolithic animals such as woolly rhino and mammoth but so far no evidence of human activity has been identified.

The sands and gravels within the marine area of the pilot study area are likely to be late Devensian (18,000 – 10,000 BP), deposited after the melting of the ice sheets from the end of the Devensian glacial maximum. There is some potential for *in situ* Lower and Middle Palaeolithic deposits below these sands and gravels; although the potential for Middle Palaeolithic remains is qualified due to general uncertainties about human occupation of the UK during this period. There is minimal potential for Early Upper Palaeolithic material (Northern France and Britain were largely uninhabited during and immediately after the Devensian glacial maximum 20,000 – 13,000 BP) but greater potential for assemblages of Late Upper Palaeolithic and Mesolithic material. This potential falls within the period between 13,000 BP and the most recent marine transgression, which probably occurs at around 5,500 BC Thereafter the archaeological potential is limited to maritime remains (cf Waughman 2005, 141-2).

5.1.2 Mesolithic (8500-4500 BC)

The north-east of England has a strong early Mesolithic representation, most clearly in the Vale of Pickering (eg Starr Carr) but also on the North York Moors. Environmental impacts, mainly through fire, were very significant in wetland edges. Early Mesolithic archaeological finds recovered from the submerged forest beds at Hartlepool Bay suggest that sediments from this period did exist here too, but may no longer do so unless lying concealed beneath deep beach sand. Other older sediments may still be located further to seaward beyond the low tide mark, as peat from further out in the Bay has occasionally been retrieved by trawling (Waughman 2005).

Pollen records of late Mesolithic date are available from The Slake and at a macroscopic level the evidence for burning within the Hartlepool Bay area is also strong. This pattern for forest exploitation fits the now widespread evidence for systematic burning of vegetation during the Mesolithic, prior to the longer-term, more extensive forest clearances. Proximity to the coast would have also allowed the development of more open conditions in some parts, where an increased amount of more scrubby vegetation might be profitably managed and exploited (*ibid* 2005).

Rising sea-levels have been the most important factor shaping the use of coastal areas. Huge transformations to coastal landscapes took place between *c*8000 BP and 5000 BP particularly, including changes in vegetation and available resources with a clear correlation after the Mesolithic between periods of negative sea-level tendency and human activity. These changes in environment would have affected patterns of exploitation, relationships with sites further inland and even the way in which these landscapes were perceived (Waughman 2005, 141-2). Coles suggests that the Dogger Bank may still have been an occupied island that survived for several centuries after being isolated by storm surges in the period between 7400 and 6500 BP (Coles 1998, 68-9).

5.1.3 Neolithic (*c*4500 BC to *c*2500 BC)

Pollen evidence from Hartlepool's submerged forest remains indicated a period of forest opening associated with the decline of elm and lime during this phase. The regional picture broadly accords with the Hartlepool evidence suggesting that there was no systematic tree clearance, rather a general slow reduction in tree cover under light human pressure. Not until 4543+/-70 years BP does evidence of a more extensive clearance occur in the Hartlepool area (Waughman 2005).

A period of falling or static sea-level at the start of this period was replaced around the time of the elm decline by rising sea-level, which would have allowed the development of new areas of wetland habitat and provided a new suite of available resources. Changes in hydrological conditions would have created a dynamic environment in which storm surge and flooding events caused successive scouring and deposition of sediments. Hartlepool Bay, for example, would have been a complex area of braided channels separated by sand banks, spurs and mudflats and fringed by marsh and reed swamp. Falling sea-level after c4700 years BP would have reduced the tidal influence on the palaeochannels, allowing them to become largely infilled with sediments on which new areas of freshwater wetlands could develop, while drier conditions in former areas of marsh and reed swamp would have encouraged the succession to willow and alder carr vegetation (*ibid*, 132).

Archaeological evidence for an agricultural economy in the coastal and inter-tidal zone during the late 6th and 5th millennia BP is very limited, although there is evidence to suggest that animal husbandry, hunting and fishing on the coastal margins were an important part of the economic regime during the first half of the 5th millennium BP (*ibid*, 133).

The later Neolithic until the early Bronze Age was a time of further fluctuating sea-levels, which eventually resulted in generally drier conditions. Whereas the earlier Neolithic economy may have revolved around large tidal inlets, the development of more terrestrial deposits above these silted up landscape features may have precipitated distinct changes in the pattern of land use and economy as more land and resources became available to local populations. It is within these more terrestrial deposits that the evidence for human activity in this period is found. The later Neolithic seems to have had a more mixed farming economy, but still at a small scale, with little impact upon the vegetation and only very ephemeral use of the wetlands (*ibid,* 134).

5.1.4 Bronze Age (2500 BC to c700BC)

During the Bronze Age human activity became more intense and diverse along the north-east coast. There is evidence that a reduction in tree cover for cultivation occurred, as well as animal husbandry and exploitation of marine resources although a decrease in the range of

evidence in wetland areas for the later Bronze Age may indicate that increasing wetness of the environment limited both accessibility of the wetlands and the range of available resources. By around 3250 years BP charcoal and pollen evidence are indicative of a mixed farming regime, suggesting that late Bronze Age populations were maintaining clearings in the forest, creating and managing woodland pasture and encouraging plant and animal food productivity while still exploiting wetland resources (Waughman 2005, 137-9).

Evidence of a significant late Bronze Age and early Iron Age settlement has been found om Scarborough Headland (Grenville *et al* 2000).

There is evidence for long-distance seafaring and exchange networks in the first half of the 2nd millennium BC alongside more local or regional activity. Van de Noort (2006) has suggested that sewn-plank boats were used in the North Sea in the Early Bronze Age for directional long-distance journeys aimed at the 'cosmological acquisition' of exotic goods: the crews' shared experiences of the journeys contributing to the formation of elite groups. In the Middle and Late Bronze Age sewn-plank boats seem to have been used for down-the-line exchange. De Noort lists the remains of ten sewn-plank boats that have so far been discovered, with a possible eleventh from Hartlepool's submerged forest (Van De Noort 2006, 273). In 1926, a log boat, dating from about 1600-1400 BC, was found in mud under 8 feet of water opposite Thornaby High Wood.

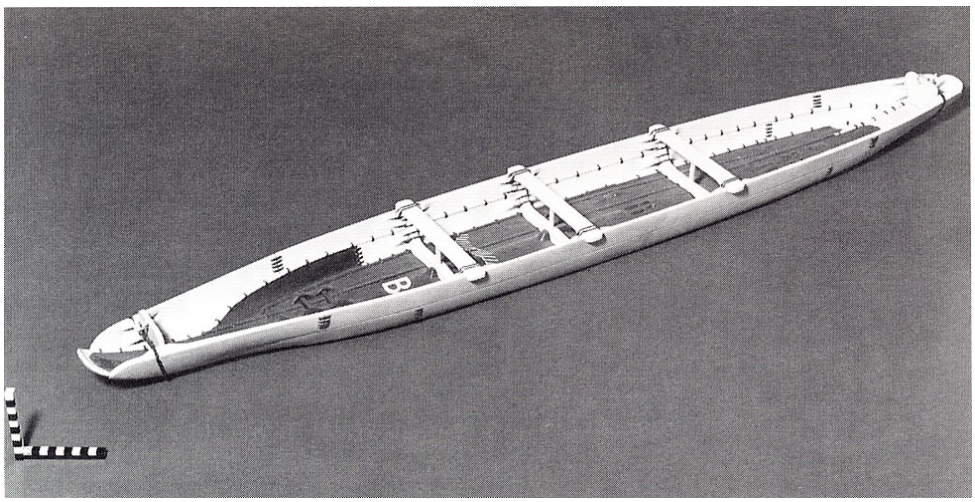

Fig 4 Reconstruction model of a Bronze Age sewn-plank boat (National Maritime Museum, Greenwich)

5.1.5 Iron Age (*c*700 BC – AD 43)

Iron replaced bronze in the manufacture of tools and weapons during this period. Iron Age people appear to have become increasingly territorial and defended their settlements from attack. The most distinctive monument type of the period is the hillfort. These forts usually defend a natural promontory with one or more series of ditches, banks and ramparts, and there was almost certainly one on the castle headland at Scarborough (Tees Archaeology, 2002; Scarborough Archaeological and Historical Society 2003).

From the Iron Age onwards there is very little archaeological evidence from the inter-tidal

zone along this stretch of coast. In Hartlepool Bay this reflects the final period of a positive sea-level tendency marked by marine inundation. Earlier terrestrial deposits here are succeeded by inter-tidal mudflats with calm estuarine conditions and a littoral environment inferred from the deposition of sands and silty sands, more like the present coastal conditions. What little evidence there is for possible human impact on the environment suggests an expansion of herbaceous pollen which may be attributed to continued human disturbance of the local woodlands. Low charcoal levels, however, suggest that burning did not play such a major role in tree removal at this time (Waughman *et al* 2005, 139).

Exploitation of the salt-rich waters of Britain's estuaries for salt production was also common during the Iron Age and Romano-British periods, starting at an even earlier date in some places. Scatters of charcoal and fragments of fired clay disturbed by a late Roman burial west of the former Slake may represent the debris from such salt production. The general lack of evidence for this around the Tees estuary, however, may be attributed, in part, to the difficulty in identifying fragments of briquetage amongst assemblages of excavated finds (*ibid*, 139).

5.1.6 Roman and Romano-British (AD 43 – 450)

The Romans invaded Britain in AD 43. They quickly seized the south of England and pushed northwards, reaching the Humber by AD 47. Roman rule brought great changes to many parts of the country. Towns such as York were developed, roads were constructed and goods from overseas were imported. The Romans seem to have had the north-east and Yorkshire under control by the reign of Hadrian, from AD 117 (Tees Archaeology, 2004).

At the time of the Roman invasion, Teesside and a large part of Yorkshire were occupied by the large tribe called the Brigantes and it is thought that the Tees Valley was occupied by a separately named pre-Roman tribe who formed part of the Brigantes A major centre of the Brigantes was cited at Stanwick St John, a few miles south of the River Tees, where it was speculated that, following a rebellion, the Brigantes may have made their last stand against Roman troops between AD 71 -74 (*ibid*, 4-7).

Archaeological evidence of settlement during the Roman period suggests that Teesside was quite fertile and densely populated with small agricultural settlements which had continued in use from the Iron Age, such as the sites at Thorpe Thewles and Catcote (*ibid*, 9, 12).

The presence of a wide range of imported goods from both the latest Iron Age and Roman contexts suggest that there was also a strong link with coastal trade. Luxury items such as pottery, glassware, olive oil and wine would have been imported from France, Germany and Spain in large ships. Exports from Roman Britain included grain, jet, lead and cloth (*ibid*, 27).

Transportation by sea was much quicker than by land. Imported items found at Seaton Beach suggest that it was once a thriving trading settlement, while Catcote was ideally situated for controlling the beach and may have been a regional trading centre utilising shipping along the coast (*ibid,* 13, 27).

Remains of ironstone workings from at least the Romano-British period are also still extant in many places along the cliffs and foreshore.

By the end of the 4th century, Britain's eastern coast was coming under attack from Germanic raiders; leading the Romans to build signal stations along the south and east coasts to warn against these attacks. The signal station at Saltburn was one of a line of five on the Yorkshire coast with others at Goldsborough, Ravenscar, Scarborough and Filey (*ibid*, 27).

5.1.7 Early Medieval period (AD 450-1000)

The Early Medieval period covers the era of Anglo-Saxon and Viking rule. Place-name evidence indicates that many of the major settlements of North East Yorkshire were formalised during this period. However, little seems to survive of the settlement sites although Anglo-Saxon cemeteries have been excavated at Saltburn and Norton. The Anglo-Saxons lived in small communities or isolated farms, with few towns of any size (Tees Archaeology 2000).

Throughout this period the North Sea served more as a unifier than a barrier. The peoples lining its coasts exploited the sea as a means of communication, and were linked closely together culturally, economically, and to some extent even politically. The 5th to the 9th centuries saw immense changes in the lands around the North Sea, beginning with the great movement of Germanic peoples from the continent to England, continuing with the adoption of Christianity by those same peoples, the formations of states under royal rule, and the resurgence of international trade and finally, the Viking incursions (Clarke. 1985, 45).

The 7th and 8th centuries were mainly ones of peace which allowed commerce to flourish and prosper and ports to develop into undefended urban complexes. For safety reasons, many ports of this period were situated at some distance from the coast, on rivers, inlets or deltas (Friel 2003*,* 13).

The Scandinavian Vikings first appeared in Western Europe as raiders of monasteries and towns. Their activities effectively disrupted trade between the British Isles and Europe in the 9th century, and may have been instrumental in the desertion of a number of formerly important ports. From the mid-9th century their colonisation of Britain began and by 881, Danelaw was established with York becoming a flourishing centre of international trade (Clarke 1985, 44). Legend has it that Scarborough was founded in 966 by Thorgils Skarthi, a hare-lipped Viking raider and poet who is thought to have established a fort there (Binns 1966, 9-15).

During this period, the best evidence for sea-travel around the British Isles, besides invasions and raids, comes from the activities of saints, priests and penitents. Missionaries had gone to Britain years before but the Saxon conquest of England had forced many of these Celtic Christians into hiding. St. Augustine's mission, carried out with varying success throughout the seventh century, aimed to bring these Christians back into the fold and convince the conquerors to become Christians themselves. The Synod of Whitby in 664 brought the practices of Iona and its Irish satellites into conformity with those of Western Europe and southern Ireland. King Oswiu of Northumbria summoned the synod, held at Saint Hilda's double monastery of Streonshalh (Streanoeshalch), later the site of Whitby Abbey (Friel 2003, 18).

5.1.8 Later Medieval period (1000-1500)

The Norman conquest of 1066 re-orientated England toward continental Western Europe and away from the Scandinavian world. The year 1066 saw the beginning of a new phase of war and conquest in the British Isles (Friel 2003, 49).

The first castle at Scarborough was built in 1135 and it developed into one of the most powerful castles in the north of England; the medieval town originating in a borough founded by Henry II in *c*1163 (Scarborough Archaeological and Historical Society 2003, 8). The founding of Scarborough was part of a much wider trend towards urban generation along the east coast of both Scotland and England during the medieval period as economic factors led to

the expansion of ports, some developing from pre-conquest towns and others planned as new towns on unoccupied sites (Pearson 2001, 87).

On the landward side, Teesside and the Yorkshire coast are geographically isolated by the North York Moors, so that it was natural to look to sea, rather than the land, for ease of transport. This also led to an intensive exploitation of the coastal strip as the moors prevented inward expansion. Shipping was important along the north-east coast in the medieval period when it supplied the domestic needs of villages, towns and abbeys with goods such as coal, fish and probably heavier goods that were difficult to bring by road. Scarborough, Whitby, Hartlepool, Stockton and Yarm were important medieval ports.

By 1300 England's east coast fisheries were a complex, highly regulated and widely dispersed industry the scale of which was immense by medieval standards. They were of international importance, supplying not only local demand but also supporting a major export trade. In Yorkshire, Hull was the principal trading port while Scarborough led in fishing, the main fishing trade concentrated on herring and cod. Towards the 15th century there was a trend away from inshore to distant-water fishing as a result of improved curing techniques that allowed vessels to stay at sea longer and so venture further. (Starkey *et al*, 2000, 19- 20).

5.1.9 Post-medieval period (1500-1700)

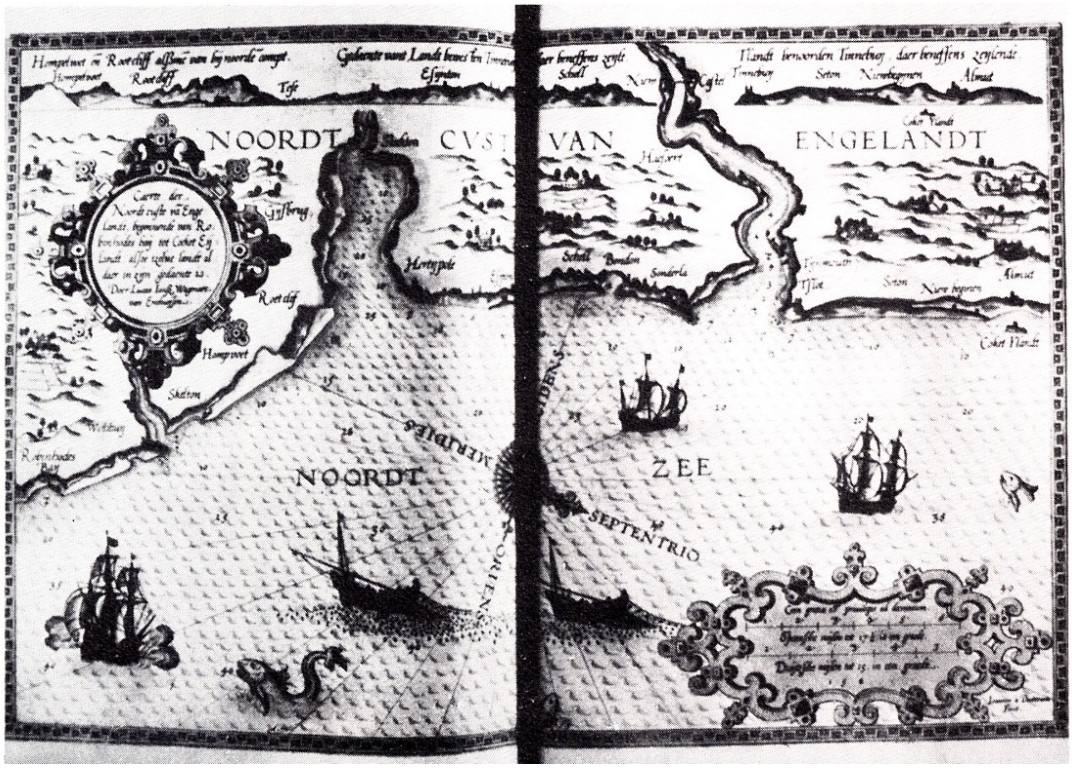

Fig 5 Dutch Herring busses off the English North Sea coast from the 'Spiegel der zeevaerdt' of Lucas Jansz, Waghenauer, 1584-85 (Vereeniging Rijksmuseum Nederlandsch Scheepvart Museum)

Fishing continued to be very important to the local economy, Whitby was described as 'a great fischer Toune' when Leland visited it in 1536 (Frank, 2002; 2), but by the early 17th century the English fishery was waning as a result of competition from foreign vessels, especially the Dutch herring fleets (Starkey *et al*, 2000; 49).

Alum was Britain's first chemical industry beginning in the early 1600s. Alum shales were quarried and processed at Guisborough, Sandsend and several other places for over 200 years, dramatically changing the landscape of this area. Salt extraction had been carried out since at least the medieval period, achieving peaks in the 15th, 16th and 19th centuries.

Shipyards and dockyards are evident from at least the medieval period and from the 15th century onwards, the North East shipping industry flourished with the rise of the coal and, later, the alum trades. Whitby and Scarborough became renowned for their high quality ships and shipwrights, although Whitby's shipbuilding declined from the 1830s due to the size limitations placed on it by the bridge.

Scarborough became Britain's first seaside resort following the discovery of springs in 1620 and its subsequent development as a spa (Wheatley 2000, 50).

5.1.10 Early Modern period (1700-1900)

Alum production required large quantities of fuel and every year vast fleets of colliers sailed from the Tyne and Wear bearing the produce of the coalfields of Northumberland and County Durham. Much of this collier fleet was owned at Whitby and Scarborough. Whitby's share grew steadily throughout the 18th century due mainly to the fact that at high tide it possessed one of the best harbours of refuge on the east coast. The emergence of Whitby as a highly skilled shipbuilding town was another factor which contributed to it's dominance of the shipping industry in this area. Many of the builders were also owners, and the careers of many Whitby seamen led them into eventual ownership as well. In times of war Whitby ship owners found another valuable source of income by hiring out their vessels to the state or to serve as transport for troops and equipment (White 2004, 103).

Whaling from Whitby began in 1753 and drew to a close in 1837. In the late 18th century Whitby had between ten and twenty vessels involved in whaling at any one time and more people involved in the trade than any other place in Britain, including Hull. Stockton, at this time the most important port on the Tees, also had a couple of vessels, and Scarborough had one ship.

There are many wrecks in the waters off the River Tees and North Yorkshire coasts. Most appear to derive from the early-modern period (1750-1900) of coastal trade and fishing.

The economy of north east Yorkshire was mainly agricultural prior to the mid 1830s and milling was among the earliest industries in this area. Windmills, being conspicuous landscape features, could often be viewed from the rivers and coast and frequently served as navigation landmarks.

In 1829 Middlesbrough was a small riverside farm when purchased by the Darlington businessman Joseph Pease, who developed the farm into a town and coal port. During the next 70 years the iron ore industry took off and Middlesbrough experienced one of the most extraordinary population explosions ever known in British history. Further north the new town of Seaham Harbour was also born, while Hartlepool was transformed from a fishing community into one of Britain's busiest ports.

The advent of railways in the early 19th century was of fundamental importance to the area's development. The original Stockton and Darlington railway was extended across the River Tees to Port Darlington (now Middlesbrough) in 1830, the first railway to built in the historic boundaries of Yorkshire the Whitby and Pickering Railway opened in 1836 and in 1845 the

York to Scarborough line was opened and by 1847 it was connected to the national railway system with lines to York and Hull.

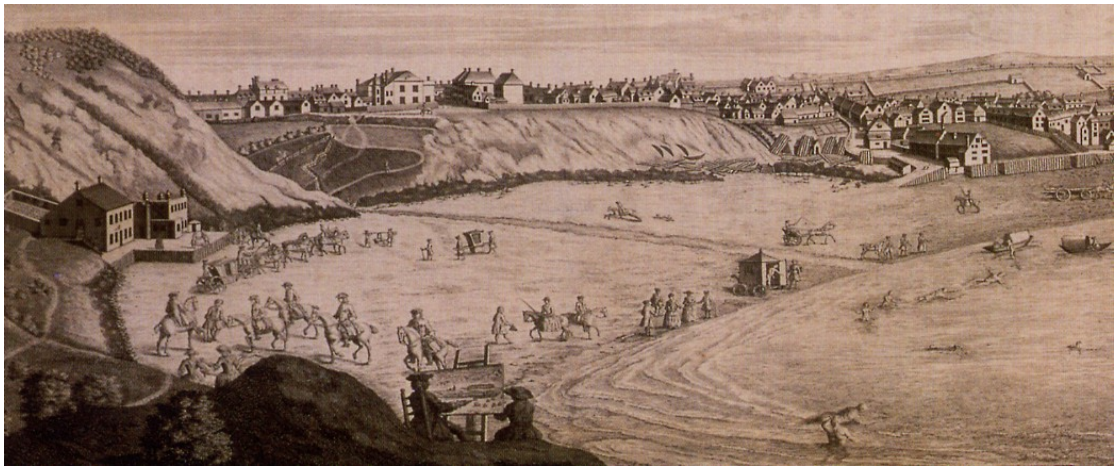

Fig 6 Detail from a 1735 engraving of Scarborough by John Setterington. It is the earliest known record of the use of bathing machines (North Yorkshire County Council. Scarborough Library Collections)

Scarborough had already been a spa and seaside resort for a hundred years or more but the introduction of railways fostered the development of the tourism industry, leading to great growth and development.

Between 1840 and 1860, trawling expanded dramatically, rapidly overhauling lining as the principal means of capturing white fish and by the mid-1870s, the expansion of the smack trawl fishery was nearing its peak. In summer, trawlers visited grounds off the Danish, German, Dutch and Belgian coasts. In winter, they mainly worked banks adjacent to the Dogger, including the Silver Pits and Botney Gut.

From about 1880 onwards the fishing industry was rapidly assuming its present-day character. Around Britain's coastline there were still thousands of small craft propelled by sail and oar; but in the Irish Sea, the Channel, and the North Sea, fleets of steam-powered trawlers were operating. By the outbreak of World War One, the last of Staithes yawls had stopped fishing, and a tradition that can be traced back, through documentary sources, nearly 1300 years came to an end.

Although used since the Bronze Age, jet mining was another important local industry which flourished during the 19th century, in particular in Whitby. Adits were cut into cliffs and hillsides and where the Jet Rock sank below the shoreline at high tide traces can also be seen where miners have dug away at the base of the cliffs.

5.1.11 Modern period (1900- present)

The industrial centre at Hartlepool made it a key target for Germany in World War One and the stretch of water between the Humber and the Tees was also a particularly dangerous place for shipping during that war, with at least 42 U-boats operating in the area. One hundred and twenty ships were sunk with torpedoes, over 100 by mines, as well as many more unaccounted losses. As well as attacking Hartlepool in December 1914, the German Navy also targeted Whitby and Scarborough.

In the first decade of the 20th century 'one quarter of the global output of the shipbuilding

industry was produced on the banks of the North East region's three principal rivers, the Tyne, Wear and Tees' (Hudson, 1989). After WWI trade inevitably declined, as did demands for shipping services and new ships. The onset of rearmament before WWII helped to revive the industry for a while, but the shipping and shipbuilding industries were severly damaged by bombing during the war itself. Many shipyards needed extensive overhauling, as did numerous ports and inland waterways, and merchant fleets suffered heavy losses. Reconstruction after the WWII fundamentally changed the traditional economic and transport patterns of the North Sea region. Nevertheless, coal and timber remained the most important North Sea cargoes well into the 1950s.

Principal locations of iron and steel works today include Tees and Cochrane Wharfs, Redcar and Skinningrove. Historically they were also located at Throston, Stranton, Coatham, Grangetown, Middlesbrough, Runswick Bay, and Seaton Carew.

Potash was discovered in north east England in 1939 and there is one potash mine operating in the study area, located at Boulby, opened by Cleveland Potash Ltd in 1973. It is currently Britain's deepest mine and is now also used for research into neutrino impacts on the earth.

Offshore, oil and gas industries have become a major economic activity in the North Sea since the late 1960s, providing energy and essential chemicals for the home, industry, and the transport system.

Nuclear power has been the main form of alternative energy production, but renewable energy production, although relatively small-scale at present, is becoming an increasingly important means of electricity production.

Modern fishing methods have greatly reduced many fish stocks to the point of extinction. Herring is no longer abundant in the North Sea; massive catches in the 1940s and 1950s took their toll and depleted stocks fell to a dangerously low level. If, as a result of bans and restrictions on fishing, the North Sea herring does recover it would require strict international legislation and the reintroduction of traditional methods of fishing to prevent them being decimated again. Restrictions on cod and plaice have caused the displacement of fishing activity away from traditional grounds and towards the oil and gas fields of the North Sea.

6 Historic Seascape Characterisation

Historic Seascape Characterisation (HSC) aims to provide an historic environment context for the traditional archaeological and historical resource, such as HERs. It offers a base survey that may better inform marine spatial planning and encourage the sustainable future use and management of the marine historic environment. It will improve understanding of the marine historic environment more generally, enabling it to be more fully involved in strategic debates about the future of the sea. HSC will also strengthen the sense of identity of those individuals and communities who either live by or make their living from the sea, giving them the confidence to engage in those debates.

The HSC for Scarborough to Hartlepool and the adjacent marine zone comprises GIS-based mapping that identifies the archaeological and historic trends and patterns in the area. These landscapes and seascapes are further explained by associated and linked texts, images and an HTML resource.

Source-led and guided by current terrestrial multi-mode HLC methodology (Aldred and Fairclough, 2003) the HSC GIS database defines and maps areas that share similar and repeating historic character as Historic Seascape Character 'Types' (see Figures 7.1 to 7.4 for present historic character and Figures 8.1 to 8.4 for previous historic character). To reflect the multi-dimensional or multi-layered nature of the marine environment (ie. the seabed, seafloor, water column and surface) a fine grid of cells, with tiered attributes, is used in this HSC to record the present and dominant historic character for each marine layer. (Inter-tidal and coastal areas, whose sources are those of the established terrestrial HLC, are captured as polygons.)

The importance of identifying the character at each of these levels is in the detail and consistency this information will provide to managers of the historic environment for each. Broadly material culture and character associated with the seabed and seafloor is easily mapped and can be allocated archaeological potential to a greater or lesser degree. The identification of activities (both historic and modern) within the water column and on the surface will help to infer likely archaeological potential, where there are gaps in our knowledge of the benthos, whilst also providing some indication of current sea-use and the associated threats (or benefits) these pose to the marine historic environment.

From this complex database a single, conflated HSC layer is derived. The derivation of a single HSC layer from the tiered database will be of broad strategic value and may provide a useful point of entry to the database for awareness-raising initiatives, but, as noted above, we may anticipate that most users of the HSC material will concentrate on the 'layer' that is most relevant to their immediate interests.

In addition to the HSC mapping, both present and historic, the user of the HSC would normally require a commentary. This would place the character mapping into its historical context; identify typical historic environment components; provide guidance on condition, forces for change, etc; and make reasonable and realistic recommendations. For the Scarborough to Hartlepool coast and adjacent marine zone this text has been applied to the Character Types and particularly to their present form (see Section 9). It has been organised systematically so that the reader is able to find their way around each Type, describing different aspects of the historic character including identifying distinguishing attributes and

principal locations; their constituent components, features and variability; the values and perceptions that people have of these areas; the research, amenity and education potential they offer; their present condition and forces for change affecting them, which in turn inform statements on their rarity and vulnerability allowing broad recommendations to be suggested for their management.

It must be emphasised that while the text is based on research undertaken for this project, it should not be regarded as definitive. There is no doubt that more detailed research and more sensitive awareness of threats and reasonable responses exists. The text presented here should be regarded as a starting point for more detailed work as needs dictate.

The historic seascape is a contested place. Various communities and interests, from particular localities and from particular opinion, have a concern in ongoing developments or activities that are potentially or actually damaging, diluting, distorting or destroying important or well-regarded features or character. HSC mapping and text helps place such positions and challenges in context, allowing debate about the present and future to be more properly grounded in an understanding of the past. It enables such debate to be welcomed and joined by the historic environment community, and by local people. It is a product and a process expressly designed and intended to facilitate discussion and dialogue about the sustainable management of the marine historic environment as a whole (Herring, 1998).

For professional users the HSC GIS-based database allows searching, querying and analysis of the various tiers of the marine historic environment depending on the users' specific request or area of interest. As well as being reflexive in this way it is also possible to derive new GIS layers from the main dataset, either as a conflated layer or wholly separate ones. It is hoped that the structure of the HSC will make it responsive at a number of geographic resolutions and levels of strategic planning.

The tiered, or 'nested' hierarchy of attributes and interpretation may be applied variously at least three levels. 'Sub-Character Type' is the finest and most detailed mapping in the HSC dataset, being the level at which most areas of land or sea are not readily divisible at the scale of mapping used. It is the base map from which the higher, more generic levels of character are derived. In terms of applications, this may be most useful for distinguishing and perceiving HSC at the very local level, and can be expected to be of high value when assessing the likely impact of particular developments. The next level identifies 'Character Types' which are functionally related groupings of 'Sub-Character Types'. They provide the baseline mapping for the descriptive and interpretative texts (Section 9). It is the standard level of HSC (equivalent to terrestrial HLC character types) and may be the most useful for distinguishing and perceiving HSC at the local to regional level. It may therefore be the level to which local and regional strategies can be attached. 'Broad Character Type' is the highest, most generic level of characterisation summarisation. It is the aggregation of Character Types, mapping blanket and generic seascapes. This may be the most useful for distinguishing and perceiving HSC at the regional to national level.

For the non-professional user the HSC is also available through map and text-based HTML pages which may be viewed on a stand alone computer, a local network or even across the internet with no specialist software required (only an Internet Browser is required). These pages comprise a brief introduction and over-view of the project but concentrate on presenting the mapped HSC and their attendant texts by way of image and text roll-over 'hyperlinks'. The image maps are derived directly from the conflated and derived HSC layer

rather than individual tiers.

More detailed method statements and technical descriptions can be found in the companion methodological report to this document, 'England's Historic Seascapes, Scarborough to Hartlepool and Adjacent Marine Zone: Historic Seascape Characterisation Method (Tapper *et al*, 2007).

Character Areas

Character Areas have been identified as another tier of the HSC, these are unique areas that local people may recognise and readily identify with (Figure 10.1). Each is briefly described in Section 10 of the report with short statements on geography, principal character types included and values and perceptions noted. Further information about the Character Areas can be found by correlating these areas against the Character Types mapping and identifying the particular Character Types covered and their attendant explanatory texts (Section 9).

Unlike the Liverpool Bay Seascapes pilot project, the Scarborough to Hartlepool pilot associated texts with the Character Types rather than unique Character Areas. As noted earlier, Character Areas were based to some extent, but not entirely on the Character Types, as a final tier or layer in the GIS. The rationale for this approach is explained more fully elsewhere (Herring 1998, 47) and is paraphrased here.

- The initial characterisation, being bottom-up, focused on identifying sub-character, character and broad character types in a hierarchy of scaleable perspective. As such, maps, documentary sources and images were used to identify repeating and similar seascapes rather than unique definable areas which are inherently less objectively defined than these Types.
- Unique areas, though simpler and perhaps more easily used by seascape managers, planners etc may in practice disguise the benefits of characterisation and the holistic understanding that it brings.
- By extension the definition of unique areas may also introduce notions and rankings of relative importance which may lead to a form de facto designation and consequent influencing of planning controls and targeting of resources. This would run counter to the philosophy of sustainability underlying characterisation.

7 Methodological review

In this section HES, with the benefit of hindsight, reviews the methodology that it developed for the Scarborough to Hartlepool HSC.

Overcoming issues of copyright and directly derived data, especially for digital datasets was a principal challenge of the project. The HSC database is required to be 'free' of others' copyright restrictions. The use of a fine grid (250m x 250m cells) enables distance to be put between the original data and the gridded and thus fuzzy representation of it without the data becoming incomprehensible (as might be the case if the original data shapes were over-simplified or deliberately distorted). Users are not able to securely derive the original shapes of copyrighted data from this gridded representation. Should precision be required, the source recorded in the dataset would signpost the user to the original material, ensuring that the bodies holding the copyright are properly consulted as appropriate. It may be supposed that this method will lead to a fuller use of the original material and so is of mutual benefit to both its originator and the HSC user.

The adoption of a grid to frame the HSC allows the dataset to be easily updated and amended as further information comes to light. The spatial correlation, or intersection, of existing datasets and information against grid cells, using GIS, makes this structure flexible. However, the 250m resolution grid constitutes a very large dataset, over 1GB in size with an excess of 400,000 individual polygons. Such a dataset is too unwieldy for use on a desktop GIS. Thus the derivation of a conflated HSC layer or layers is essential for practical use.

Although the grid-based method employed allowed the various levels of the marine historic environment to be characterised, any future characterisation needs to offset that advantage against the unwieldy nature of the dataset itself. This can be achieved through the query and analysis of the HSC attributes to produce derived Sub-Character, Character or Broad Character Type layers, or a conflated layer representing the area in a single map according to the users' requirements. It may also prove worthwhile investigating different resolution grids or grids that incorporate varying cell sizes depending on the level and or confidence he/she has in the original data.

Given the nature of the marine archaeological record, a more informed discussion relating the differences between Seascapes and Sea-use would be beneficial. Much of the characterisation, especially in the marine environment, is inferred. In terrestrial HLC this may be akin to using land-use as a proxy for landscape where landscapes cannot be readily identified morphologically. Greater discussion is required of the usefulness of proxy data for characterisation, for example the use of fishing intensity or shipping movement data as indicators of archaeological potential or indication of possible threats. There is a considerable interpretative leap taken when using proxy data for any given place or time-lapse as a model for general activity or indications of pressure on the marine historic environment. Instead of vessel sightings, definitive seismic data for beam trawling tracks and scars, for example, are one way whereby the quantitive and qualitative effects of this form of fishing could be measured and assessed.

Access to high quality seismic survey data for the seafloor is desirable, preferably already interpreted and analysed. This would not only help identify relatively modern impacts, such as trawling, pipeline laying and such like, but should also reveal successive seabed layers, identifying series of marine environmental processes and bedforms and potential for stratigraphic palaeolandscapes (eg. the 'North Sea Palaeolandscapes' project undertaken by University of Birmingham for English Heritage and funded by ASLF (http://www.arch-ant.bham.ac.uk/research/fieldwork_research_themes/projects/North_Sea_Palaeolandsca

pes/index.htm). In many ways this would provide an equivalent of the detailed topographical mapping which underpins terrestrial characterisation.

Further work in seascapes either directly or indirectly might be the use of 'viewsheds and lines-of-sight' to better inform and understand seascapes from the land, on the coast or from nearshore waters. Visual characterisation, as undertaken in Wales, can further inform the more intangible elements of the historic seascape character of the English Seascape projects and further help understand navigation routes and areas and the use of landmarks for navigation. It may be of particular use to emphasise the maritime use, and perspective of terrestrial landscapes and features.

8 Practical applications of HSC

8.1 Introduction

In a similar way to which Historic Landscape Characterisation has been successfully applied to a wide range of issues on land, Historic Seascape Characterisation will have a wide range of practical applications because it provides a comprehensive overview of historic seascapes. Like HLC it can promote a framework, a background understanding and a better informed starting point from which to consider issues and proposals. It can provide information, not judgements, allowing appropriate decisions to be made in the light of proposed change. HSC does not seek to answer every question about historic seascapes but it explains the seascapes' cultural, historic and archaeological attributes and the importance of change through time as a primary characteristic (cf Clarke *et al* 2004, 11).

The applications of HLC were discussed by Clarke *et al* (2004), and the potential applications of HSC by Wessex Archaeology (2006, 45-58). In this section we examine possible practical applications of HSC in the light of these documents and the recent Marine Bill White Paper (DEFRA 2007) under the broad headings:

- English Heritage Advice to the Marine Management Organisation
- Marine Aggregate Production
- Marine Planning
- Coastal Management
- Marine Protected Areas
- Partnership, Learning and Outreach

8.2 English Heritage advice to the Marine Management Organisation

The Marine Bill White Paper proposes a new Marine Management Organisation (MMO), which will deal with a range of functions including marine planning, licensing and enforcement that will together provide a holistic approach to marine management (*ibid*, 62).

The role of role of EH includes providing advice on the historic environment, included designated or scheduled sites in or on the seabed in the UK territorial sea adjacent to England. Beyond 12 nautical miles EH gives heritage advice on a voluntary basis. The MMO will look to EH for advice on these matters when discharging its functions (*ibid*, 145).

The MMO may also need access to appropriate heritage advice beyond 12 nautical miles in order top fulfil its functions and ensure that protection of the historic environment is given adequate consideration. The UK Government is considering the most appropriate mechanism to achieve this (ibid, 145).

In the formulation of appropriate marine heritage advice by EH, HSC would be the most appropriate starting point as it provides extensive coverage – for instance the marine zone of the Scarborough to Hartlepool area extends some 300 km from the shore, covering an area of some 35,000 km^2 - and can provide a good initial indication of the historic environment potential of an area and the historic processes that have shaped it, while providing a context for other datasets such as the UKHO or NMR wreck records.

Note: Sites of special historic or historic interest within 12 nautical miles will be protected through specific heritage mechanisms currently being considered by the Department for

Culture, Media and Sport (DCMS). The Government is aware of the challenges facing the protection of the underwater cultural heritage outside UK territorial waters (DCMS 2007, 43-48).

8.3 Marine aggregate production

In this section we consider how HSC might be applied to the process of applications for licences for marine aggregate production

The Crown Estate owns the mineral rights to the seabed extending to the edge of the UK continental shelf and issues consents for non-exclusive samples and licences for commercial aggregate extraction. To obtain a licence, companies that have been successful in a tender round run by The Crown Estate must at present go through a Government View procedure which includes the submission of an Environmental Impact Assessment (EIA). The Government View procedure is currently administered by Communities and Local Government (CLG – formerly the Office of the Deputy Prime Minister), but will be transferring to the Marine Fisheries Agency (MFA) on 1 April 2007. If the Government View is favourable, then the Crown Estate will issue a production licence. There are currently over 70 production licences in operation around Britain's coast producing approximately 22 million tonnes of material per annum

(http://www.thecrownestate.co.uk/40_aggregates.htm)

Government policies on marine mineral extraction are set out in *Marine Minerals Guidance Note 1* (MMG 1). MMG 1 states that all applications for dredging permission in previously un-dredged areas will require an EIA. The CLG can also ask the Applicant to provide such further information relating to environmental effects as might be reasonable. Among such information is a description of the aspects of the environment likely to be significantly affected by the proposed project. The application process is characterised by a series of consultation stages eliciting comments from organisations identified by the CLG (BMAPA/EH, 2003). English Heritage is one of the organisations consulted and provides curatorial advice with regard to appropriate archaeological mitigation.

The Marine Bill White Paper proposes to create a reformed marine licensing regime that will include all forms of dredging, including marine minerals dredging and currently unregulated forms of dredging. The changes are intended to simplify marine licensing processes and provide for a rationalised and more integrated approach (DEFRA 2007, 3, 41).

The Government propose that all the functions currently undertaken by DEFRA's Marine Consents and Environment Unit (MCEU) and the MFA, including regulation of aggregate dredging will be transferred to the MMO. The statutory nature conservation agencies and the MMO will be proactively collecting and collating data and information on the marine area and will provide it to developers where necessary to minimise the cost of undertaking EIAs.

HSC will have considerable benefits in informing the current 'Government View' system, although under the reformed licensing system this likely to be superseded by marine spatial planning in the short to medium term. At a Regional level HSC could be used in Strategic Environmental Assessments (SEAs) to identify sensitive areas and issues that could then be targeted by EIAs for specific licence applications.

The Scarborough to Hartlepool pilot area is the only one of the four Seascapes pilot projects which does not contain any current aggregate production licence areas. These tend to be further south in the North Sea, ranging eastwards from the Humber. Our project area was selected with the purpose of testing the HSC methodology on in a hard rock

coastline beyond those currently subject to aggregate licensing, because any method used in response to aggregate extraction must be applicable to all resources in all areas.

However it is understood that there are a couple of licence applications located further north (Mark Russell pers comm) and to demonstrate the role that HSC might play in the process we have explored the hypothetical scenario of an EIA for a marine aggregates extraction area on the periphery of the Dogger Bank at the southern margin of our study area.

The hypothetical extraction area might extend over three HSC Character Areas, Dogger Bank, Dogger Straits and Straits of Dogger – The Hills (Fig 10.1), which are characterised as areas containing the following Character Types: Extractive Industry (hydrocarbon), Fishery (trawling, netting and lining), Military Facility, Navigation Route and Area, Navigation Hazard, Palaeo-landscape and Telecommunications. In the HES method, each Type has an associated text covering criteria such as Historical Processes, Values and Perceptions, Condition and Forces for Change, Rarity and Vulnerability and present Recommendations. Rather than assigning an absolute 'value' to the Types this is designed to allow users to independently assess significance and sensitivity as a secondary process as and when they need to (see Section 9 for the Broad Character texts).

The locations of potential Palaeolithic or Mesolithic remains are mapped on the previous HSC marine GIS layer (Fig 8.1) and current areas of current activity on the present HSC marine GIS layer (Fig 7.1), which shows areas of fisheries, hydrocarbon extraction, navigation routes etc.

HSC would not be a stand-alone tool for advising on the mitigation for the licence application but would be used with other datasets such as wreck records from the NMR and UKHO and the results of the ALSF-funded 3D Seismics for Mitigation Mapping of the Southern North Sea project HSC would provide the context for these datasets and a good initial indication of the likely historic environment potential the licence application area. It can also assist in the designing of alternative extraction strategies to minimise impact on areas with high preservation potential and continue to permit responsible mineral extraction and development.

8.4 Marine Planning

In this section we consider two aspects of marine planning; in a nationwide context the proposed new system of marine (spatial) planning and in local or regional context routine Development Control /Planning Advice.

8.4.1 Marine Spatial Planning

'The Marine Bill will introduce a new system of marine planning. This will provide a strategic approach to the use of marine space and interactions between its uses. It will encompass all activities and deliver sustainable development by facilitating forward looking decision-making. Marine plans will guide decisions on licence applications and other issues, and provide users of the sea with more certainty' (DEFRA 2007, 3).

The aim is 'to create a strategic marine planning system that will clarify our marine objectives and priorities for the future, and direct decision-maker and users towards more efficient sustainable use and protection of our marine resources (*ibid*, 18).

The marine plans will cover the whole of UK waters and would need to represent the 3-dimensional of the marine environment by addressing the seabed and the area below it, the whole of the water column and area above it. The plans would exist from Mean High Water Springs (MHWS) to the fullest extent of the UK's marine jurisdiction (the UK

continental shelf and fisheries limits). Marine planning will thus overlap with the terrestrial planning system between MHWS and the Mean Low Water Mark (MLWM). It is likely that marine plans will be created gradually in a phased approach, in line with the available resource of the planning body and where it is felt plans are needed most or earliest. Plans would be reviewed on a regular basis (*ibid* 27).

A wide range of issues might feature in plans including:

Human activities and associated infrastructure

- Aquaculture
- Artificial reefs
- Bio-prospecting
- Carbon capture and storage
- Coastal land use
- Desalination
- Diffuse and point source contamination and discharges from marine, land and riverine outputs
- Diving – recreational and otherwise
- Dredging – different techniques, and for different purposes
- Drilling
- Dumping (eg disposal of dredged materials), sewerage and waste disposal (and associated infrastructure)
- Excavation and recovery of wrecks
- Fisheries
- Flood and coastal erosion risk management
- Marine historic assets, such as wrecks
- Military and defence activities, including aviation
- Mineral extraction
- Offshore housing, factories, airports and hubs for trans-shipping
- Oil and gas exploration, storage and production, including associated pipelines and cables
- Ports and navigation
- Recreational activities – including fisheries, boating, bathing, watersports and swimming
- Renewable energy (and associated interconnections)
- Salvage operations (eg following an emergency, or for dismantling structures
- (Sailing and use of hovercraft)
- Shipping activity, including shipping channels

- Submarine cables
- Tidal barrages
- Tourism
- Undersea mining

Natural resources, features and processes

- Biodiversity – including genetic, species, community and habitat diversity
- Climate change – adapting to and mitigating impact
- 'Circulation systems' and food chains
- Geological / morphological features
- Ecological and physico-chemical processes
- Designated sites for ecological or heritage purposes
- Habitats, breeding grounds, nurseries and migration routes
- Marine Conservation Zones
- Meteorological change – wind, wave and tide
- Nationally important and/or protected species
- Seas surface, water column, sea bed and beneath the sea bed
- Seascapes
- Sites of archaeological importance

There is clear potential for HSC to be deployed in marine spatial planning, in particular in the assessment of historic environment potential, guiding the development of strategies, guidelines and the attachment of status (designations) and zoning based on archaeological potential.

8.4.2 Development control / planning advice

Government policy towards archaeology in marine waters was set out in *England's Coastal Heritage* (English Heritage 1996) which stated that 'the principles set out in Planning Policy Guidance Note 16: archaeology and planning (PPG16) should be applied to the treatment of sub-tidal archaeological remains in order to secure best practice'. PPG 16 advises that the preservation of archaeological remains is a material consideration within the planning process and sets out a presumption in favour of the physical preservation of nationally important archaeological remains. Where preservation *in situ* is not justified, PPG16 states that it is reasonable to require the developer to make appropriate and satisfactory provision for excavation and recording.

The new version of the JNAPC *Code of Practice for Seabed Development* has recently been published. 'The Government is committed to sustainable development in which archaeology is given appropriate assessment and consideration. Within this context there is responsibility upon the developer to protect the UK's coastal and marine historic assets which may remain as archaeological material. The JNAPC Code, jointly developed by marine archaeologists and industry provides a framework within which the protection of these asserts as part of our cultural heritage, and he legitimate interests of maritime development can be reconciled.'

'A responsible approach to management of the cultural heritage is required under the European Convention on the Protection of the Archaeological Heritage (Valletta Convention) 1992. The Convention, which applies to European States, stipulates that the protection of the cultural heritage must form an integrated component of the planning process from its outset. On national or regional level, the Strategic Environmental Assessment (SEA) framework should set the context for the plan or programme and identify archaeological mitigation requirements to be addressed by Environmental Impact Assessment (EIA). Such information will then provide the basis for determining a planning consent by a local authority or other statutory consent by a government department.'

HSC could be utilised by developers (scoping studies), curators and archaeological contractors (desk-based assessments, briefs, and evaluations, recommendations for mitigation) in the same way that terrestrial HLC is currently used in Cornwall, to provide a good indication of the likely historic environment potential of any given area proposed for development, as well as giving context to NMR, SMR or HER records. The HSC Broad Character texts provide quick access to a synthesis of what is currently known to help better inform advice and comment on proposed mitigation schemes. Significance and sensitivity can be assessed independently when required as a secondary process using the Broad Character Texts.

8.5 Coastal management

This section discusses two aspects of coastal management; Rapid Coastal Zone Assessment Surveys and Shoreline Management Plans.

8.5.1 Rapid Coastal Zone Assessment Surveys

The latest rationale and methodology for RCZAS are set out in EH document *A Brief for English Heritage Rapid Coastal Zone Assessment Surveys* (Version 10: February 2007). RCZAS essentially comprise a discrete desk-based assessment of readily accessible sources, (Phase 1) either as the principal project deliverable or as a preliminary to field survey (Phase 2).

The first aim of the RCZAS is to provide heritage information which can be fed directly into DEFRA's Shoreline and Estuary Management Programme, at the levels of Plans, Strategies, and Schemes, thereby helping to ensure appropriate protection, or mitigation of damage, to historic assets.

The broad aims are to:

- provide an enhanced SMR/HER and NMR record for coastal heritage assets, to a nationally agreed common minimum data standard, in order to permit an improved curatorial response to strategic coastal planning or management initiatives at a national and regional level;
- provide a factual basis for the initial curatorial response to individual applications for commercial developments or schemes, in advance of more detailed evaluation and mitigation related to EIAs and/or planning applications;
- provide data which is compatible with the needs of other coastal managers, parallel coastal surveys, industry and researchers;
- provide an overview of coastal change from the Late Upper Palaeolithic onwards;
- provide an assessment of the degree and nature of threat to coastal historic assets which has regard to the models of future coastal change presented in DEFRA's *Futurecoast* study (2002), and relevant Shoreline Management Plans;
- provide a broad assessment of the likely archaeological potential and vulnerability of all stretches of the coast

- provide a sound basis for developing management and research priorities in respect of sites and areas of potential with different levels of importance and under different levels of threat.
- enhance public understanding and enjoyment of the coastal heritage.

So, in general, whilst the results of RCZAS are intended to support Shoreline Management Plans, HSC is intended to address the issues of Marine Spatial Planning. However the broad aims of HSC and RCZAS are comparable and complimentary in most instances instances; for example, although HSC does not include creating or updating individual NMR/local SMR monument records it can provide the context and background to these records; it can assist in formulating curatorial responses to commercial and planning applications, it provides an overview of coastal change and a good initial indication of archaeological potential and vulnerability as well as being a useful tool to enhance public appreciation of the coastal, inter-tidal and marine historic environment. HSC also contains useful bibliographies and the information gaps noted would help to identify research priorities.

The RCZAS for the Yorkshire Coast and Humber Estuary is currently in progress (cf Brigham 2006) and that for the North East coast is shortly to commence. It is anticipated that the results of the Scarborough to Hartlepool HSC will able to inform both these projects.

8.5.2 Shoreline management plans

Shoreline Management Plans (SMPs) aim to provide long-term policies for managing the coastline in a practical way, including a large-scale assessment of the risks associated with coastal processes and presents a framework to reduce these risks to people and the developed, historic and natural environment into the 22nd century (DEFRA 2001).

The Scarborough to Hartlepool pilot area lies within the River Tyne to Flamborough Head Shoreline Management Plan, which covers a distance of 150km. The first generation SMP was developed and adopted in the late 1990s. The coastline was divided into three separate SMPs: River Tyne to Tees Bay (sub-cell 1b), Tees Bay (sub-cell 1c) and Tees Mouth to Flamborough Head (sub-cell 1d). The plan has now undergone review and there was a 3-month public consultation period for the SMP2 between July and October 2006.

The responses to the consultation are being collated and assessed; discussion by the Project Management Group and Consultant will form an appendix to the final SMP2. This will then be reviewed. Once finalised, the draft will be submitted to the Coast Protection Authorities for adoption. This will be followed by a fourth and final round of stakeholders' meetings to disseminate SMP2. http://www.northeastsmp2.org.uk/

For this process the coast has been divided into a number of draft policy decision zone maps, those relevant to the pilot study area are reproduced below:

PDZ	Name	Location	Residual interaction
5	Tees Bay	Hartlepool Headland to Saltburn Scar	Offshore sediment transport. Continuation of special landscape area, SPA, SSSI. Local heritage value, socio-economic impact. Transport links
6	Skinningrove	Saltburn Scar to Hummersea Scar	Offshore sediment transport. Continuation of special landscape area. Regional commercial activity, socio-

PDZ	Name	Location	Residual interaction
			economic impact.
7	Staithes	Hummersea Scar to Sandsend ness	Offshore sediment transport. Continuation of National Park area. Regional socio-economic impact.
8	Whitby	Sandsend ness to Saltwick Nab	Potential offshore sediment transport. Continuation of National Park area. Regional socio-economic impact. Transport Links
9	Robin Hoods Bay	Saltwick Nab to Hundale Point	Potential nearshore sediment transport. Continuation of National Park area, SSSI and Heritage Coast Regional socio-economic impact.
10	Scarborough	Hundale Point to White Nab	Nearshore sediment transport. Continuation of National Park and Heritage Coast, SSSI. Regional socio-economic impact Transport links
11	Cayton Bay and North Cliff	White Nab to Filey Spa	Nearshore sediment transport. Local socio-economic impact Continuation of SSSI

English Heritage's guidance note *Coastal Defence and the Historic Environment*) stresses that 'the key to ensuring proper consideration of the historic environment within the shoreline management planning process is to ensure that adequate and properly interpreted information is integrated into all stages of the shoreline management plan' (2003, 7).

Currently SMPs consider only the 'special historic assets' in the historic environment to be affected by future coastal erosion etc, but there is nothing about area, types and characteristics. HSC (and HLC) can give that extra dimension. This will allow discussion of the historic environment in SMP reports to be on a par with that of the natural environment, where texts relate both to rare species that might be affected and habitats.

HSC is also able to provide the context of looking at the coast from seaward, rather than purely from a terrestrial perspective, and the opportunity of giving a landscape-scale perspective rather than identifying separate 'assets'. For the new round of SMPs, HSC can help in raising awareness of the archaeology which is present and may be impacted by various schemes.

HSC also could be used to model the likely impacts of new coastal development and infrastructure and to highlight of the human dimension of close inshore areas.

8.6 Partnership, Learning and Outreach

This section discusses the following examples of possible practical applications of HSC; Marine Conservation Zones (Partnership), Regional Research Frameworks (Learning) and Outreach.

8.6.1 Marine Conservation Zones

The Marine Bill White Paper provides proposals 'for new mechanisms that will supplement existing tools for the conservation of marine ecosystems and biodiversity. This will include a new approach to protected areas for important species and habitats (DEFRA 2007, 3).

The Government has a duty under European law to designate areas in our seas to protect small number of species and habitats considered of European importance and

consequently propose a parallel mechanism to designate and manage a new type of Marine Protected Area (MPA) which will be called Marine Conservation Zones (MCZs). These are intended to provide protection for species and habitats considered of national value that cannot be protected under European law (ibid, 65).

They will continue to develop a suite of Marine Objectives that will clarify what they want to achieve for marine ecosystems, including biodiversity and human activities within them. They do not propose giving these objectives a statutory basis due to their developing nature and the need for a flexible approach to the dynamic marine environment…they will form an integral component of marine plans and will therefore influence decision-making processes (*ibid*, 65-6).

In Lancashire and Suffolk HSC has been a recognised dataset helping to provide information with important uses including helping to identify the location and extent of former habitats for English Nature's Lifescapes initiative (Clark et al, 2004). In the marine zone HSC would be potentially useful in a similar way in helping the MMO and Natural England (formerly English Nature) to identify the location and extent of former habitats for MCZs and describing the historic processes that have helped to form semi-natural Character Types such as Cliff, Coastal Rough Ground, Dunes, Saltmarsh and Sandflats, Foreshore Woodland and Water.

8.6.2 North East and Yorkshire Regional Research Frameworks

In 1996, English Heritage's review document *Frameworks for our Past* identified the need for a greater emphasis on research within modern archaeology. The recommendation was for the formulation of Research Frameworks for each of the regions of England to provide a context and a common focus for archaeological work. Many local authorities have recognised that incorporating agreed research priorities in management and conservation plans and Written Schemes of Investigation enhances the credibility of the development control process. English Heritage (1997) note that frameworks should:

- Provide an infrastructure and means of validating the decision making inherent within the planning process;
- Assist in the formulation of priorities for the distribution of resources (on a national scale);
- Couple curation and research.

English Heritage (Olivier 1996, 5, fig 5) suggests that Research Frameworks should have three parts :

- *Resource Assessment* – a statement of the current state of knowledge and a description of the archaeological resource;
- *Research Agenda* – a list of the gaps in that knowledge, of work that could be done, and the potential for the resource to answer questions;
- *Research Strategy* – a statement setting out priorities and method.

Research frameworks for maritime archaeology in particular remain poorly developed for the study of shipwrecks and maritime landscapes. As such, the inclusion of the maritime landscape in regional research frameworks is seen as a high priority by English Heritage (Roberts and Trow 2002, 23).

The Scarborough to Hartlepool pilot study area is divided between the North East Region, which covers Northumberland, Durham and Teesside and the Yorkshire and Humber

region which covers Cleveland and the Yorkshire coast.

The North East Regional Research Framework have recently been published as a monograph (Petts and Gerrard 2006) which aims to provide a viable and realistic academic basis for undertaking research into the historic environment of the north-east of England (County Durham, Northumberland, Tyne and Wear and Teesside). It sets out a series of research priorities for the region as a whole to help provide structure to local commercially driven fieldwork and also to supply a sense of direction for all strands of future research.

A draft resource assessment has been completed for the Yorkshire and Humber Regional Research framework (Roskams and Whyman 2005), however maritime assessment was one of the areas specifically excluded from the brief for this project, because of time constraints and overall cost (S Roskams pers comm).

The North East Region research agenda and strategy for maritime and coastal archaeology divides the resource into two main categories; those remains found in off-shore contexts, but not inherently related to maritime activity (eg evidence of settlement found on sunken land) and remains of activity directly related to maritime that can be found both off-shore (eg wrecks) and on-shore (eg lighthouses). The resource can be further subdivided by features which can be characterised as on-shore (ie the beach between mean higher high water and mean lower low water) and off-shore. Each location has a distinct range of related research, management and conservation issues (Petts and Gerrard, 2006, 201).

The report provides a number of research themes/subjects and recommendations for further work. The principal themes are:

- Ship-building techniques;
- Wrecks;
- The changing coastline;
- Dune systems;
- Maritime infrastructure; and
- Submerged prehistoric landscapes.

HSC has particular potential to contribute to the following:

- Activities:
  - Increase awareness of the coastal and marine resource, by adding an area-based dimension focussing on the typical historical development of those areas;
  - Desk-based assessment;
  - SMR enhancement by contextualisation of existing point data;
  - Outreach.
- Requirements and opportunities:
  - Instigate training in maritime archaeology for region's archaeologists;
  - Democratisation of data.

Making HSC available to local curators then this would provide a significant step forward in improving access to the maritime information base.

8.6.3 Outreach

The project's main products are the GIS mapping, curated by the NMR, Swindon, and the reports, issued as hard copy and deposited in local authority historic environment services and also included on the English Heritage web pages. These allow users to access both mapping and text.

Care has been taken to ensure that the names of Character Types and their associated text

are jargon-free to ensure that as wide a range of audiences as possible can make full use of the material. The stakeholder meetings have enabled a range of future users of the material to be involved in its development; they will be already familiar with it when mapping and text become available.

An important use of HSC will be to act as a framework for Outreach and improved community understanding and access to the marine historic environment. HES have given many presentations on the Cornwall HLC which have met with much interest, enthusiasm and interactive discussion. This is largely because HLC contributes towards the democratisation of data by mapping and demonstrating the historic character of locally familiar landscapes not just designated areas.

HSC, and presentations of it to professionals and the wider public, will help raise the profile of the historic environment of the sea and shore. It will help develop a greater understanding that all is historic, and that heritage interests lie not just in the individual sites and wrecks, but also in the semi-natural aspects of the environment, those created or influenced by a range of human activities.

8.7 Users of HSC

- Landowners, especially the Crown Estate who own around 55% of the foreshore, approximately half of all estuary beds and tidal rivers and the seabed out to the 12 mile territorial limit The Crown Estate is committed to sustainable and long-term management of these unique assets.

- Curators: processing offshore or coastal planning applications and contributing to SEAs and EIAs - predictive modelling (sites and monuments), also impacts of coastal developments, identifying gaps in SMRs, HERs and local knowledge. Informing data collection policies etc

- Regional authorities: assisting strategic regional planning initiatives eg the archaeological components of Shoreline Management Plans, Maritime Historic Environment Action Plans (HEAPs), Integrated Coastal Zone Management (ICZM);

- Central government strategic planning: contributing particularly to the MMO and marine planning initiatives, licensing process and consents units of DEFRA and the DTI;

- Other agencies: English Heritage - Rapid Coastal Zone Assessments, Natural England (eg MPSa and MCZs), National Trust, National Parks, UKHO, local fisheries eg NESFC, the Environment Agency - SMPs

- Maritime researchers: exploring a wide variety of historical and prehistoric maritime themes; International, Regional and Local Research Frameworks

- Developers: concerned with coastal and offshore projects, needing to anticipate the impacts, and thereby the costs, of their proposals to ensure compliance with environmental legislation

- Archaeological contractors: consulting HSC at an early stage during archaeological and historic assessments to guide geophysical survey and feed into EIAs.

- Lecturers and teachers: assisting to develop schools projects linked to environment and archaeology and using HSC as a framework for Outreach and

improved community understanding and access to Marine Historic Environment, democratisation of data: benefits to all in doing so;

- General Public, especially coastal communities and coastal users

9 Historic Seascape Characterisation Types Texts

In addition to the HSC mapping (Figures 7.1 to 8.4), both present and historic, the user of the HSC would normally require a commentary. This would place the character mapping into its historical context; identify typical historic environment components; provide guidance on condition, forces for change, etc, and make reasonable and realistic recommendations. For the Scarborough to Hartlepool coast, this text has been applied to the Character Types, and particularly to their present form. It has been organised systematically so that the reader is able to find their way around each Type.

It must be emphasised that while the text is based on research undertaken for this project, it should not be regarded as definitive. There is no doubt that more detailed research and more sensitive awareness of threats and reasonable responses exists. The text presented here should be regarded as a starting point for more detailed work as needs dictate.

Figure 7.1 Present Historic Seascape Character (Marine)

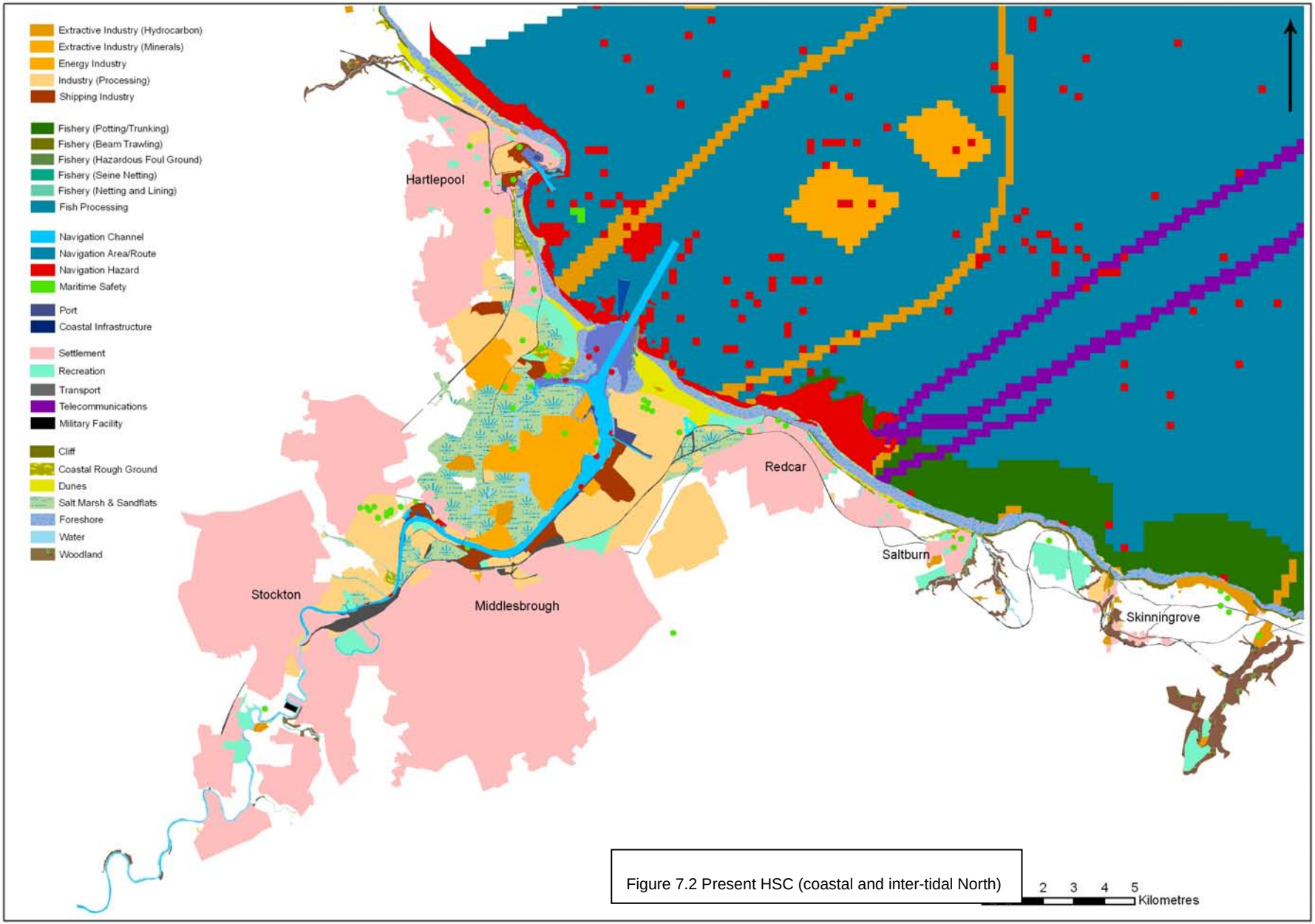

Figure 7.2 Present HSC (coastal and inter-tidal North)

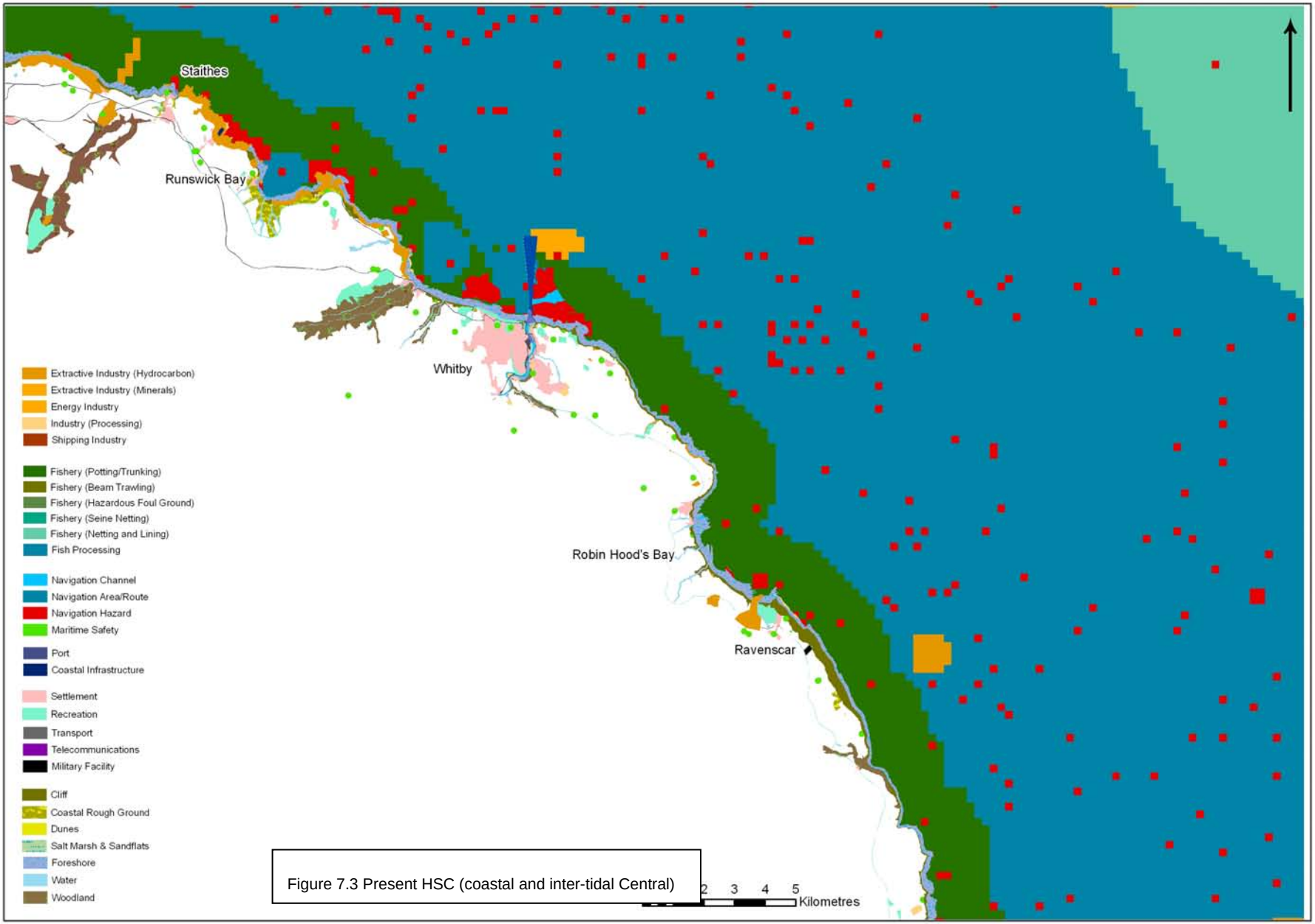

Figure 7.3 Present HSC (coastal and inter-tidal Central)

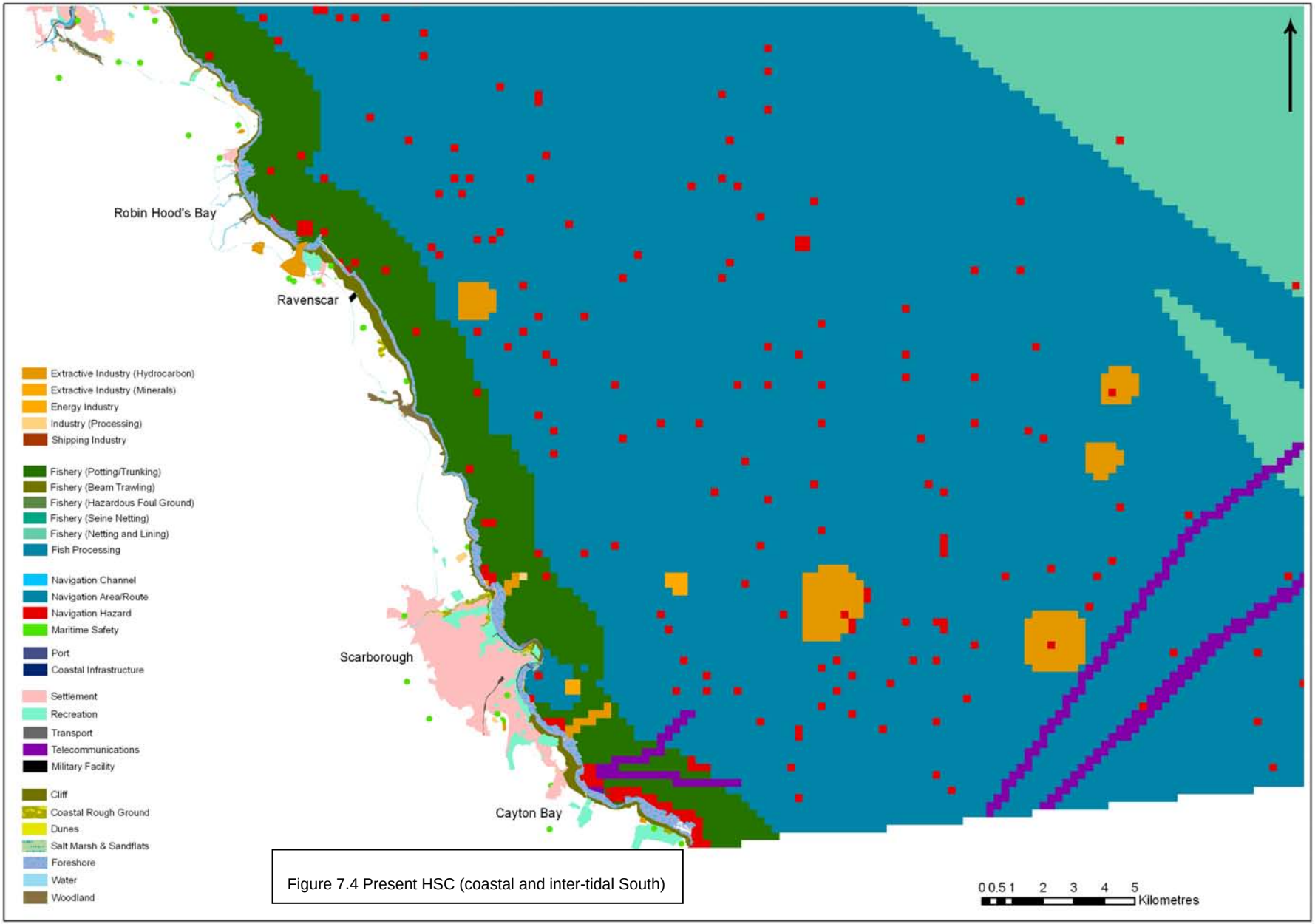

Figure 7.4 Present HSC (coastal and inter-tidal South)

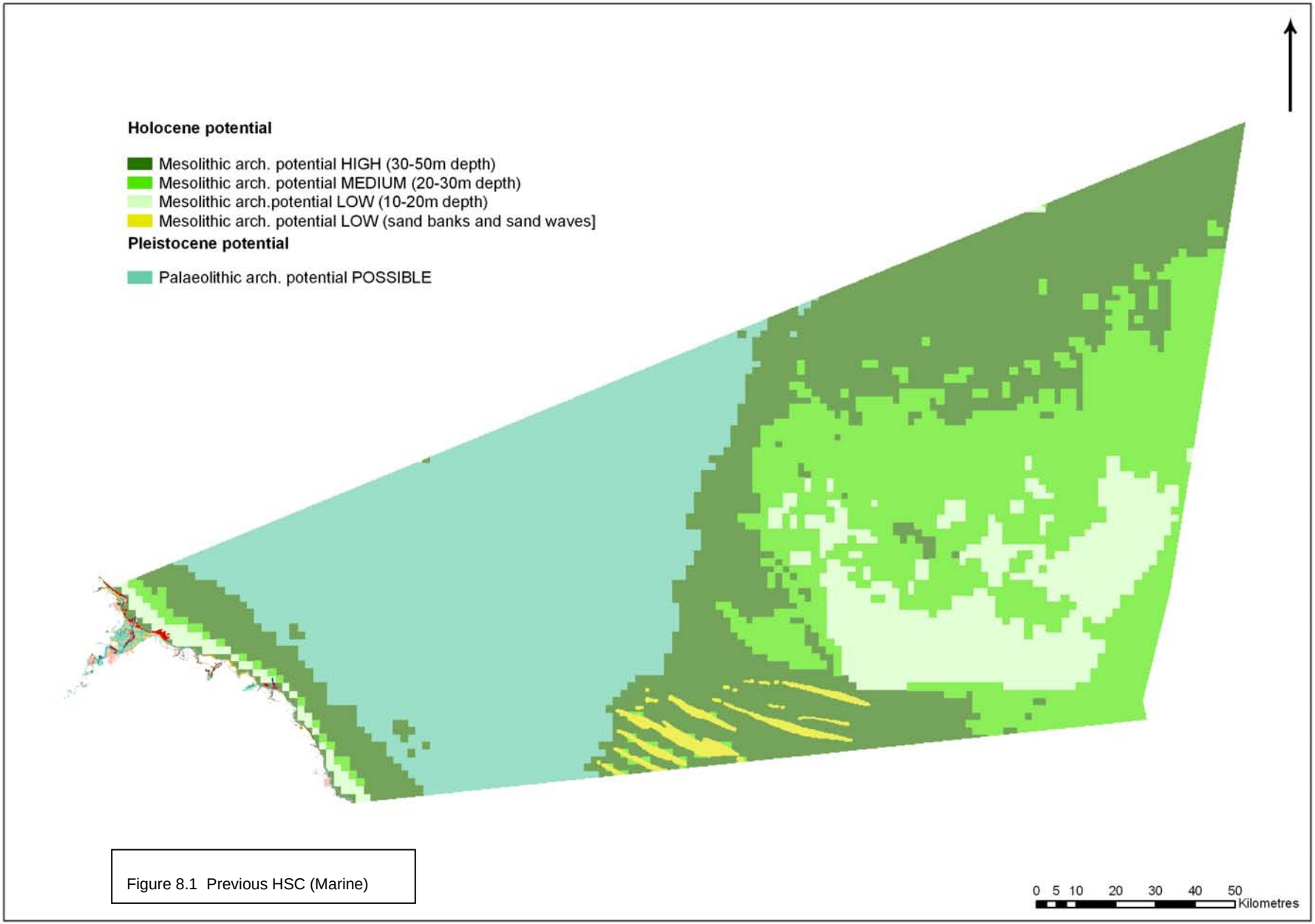

Figure 8.1 Previous HSC (Marine)

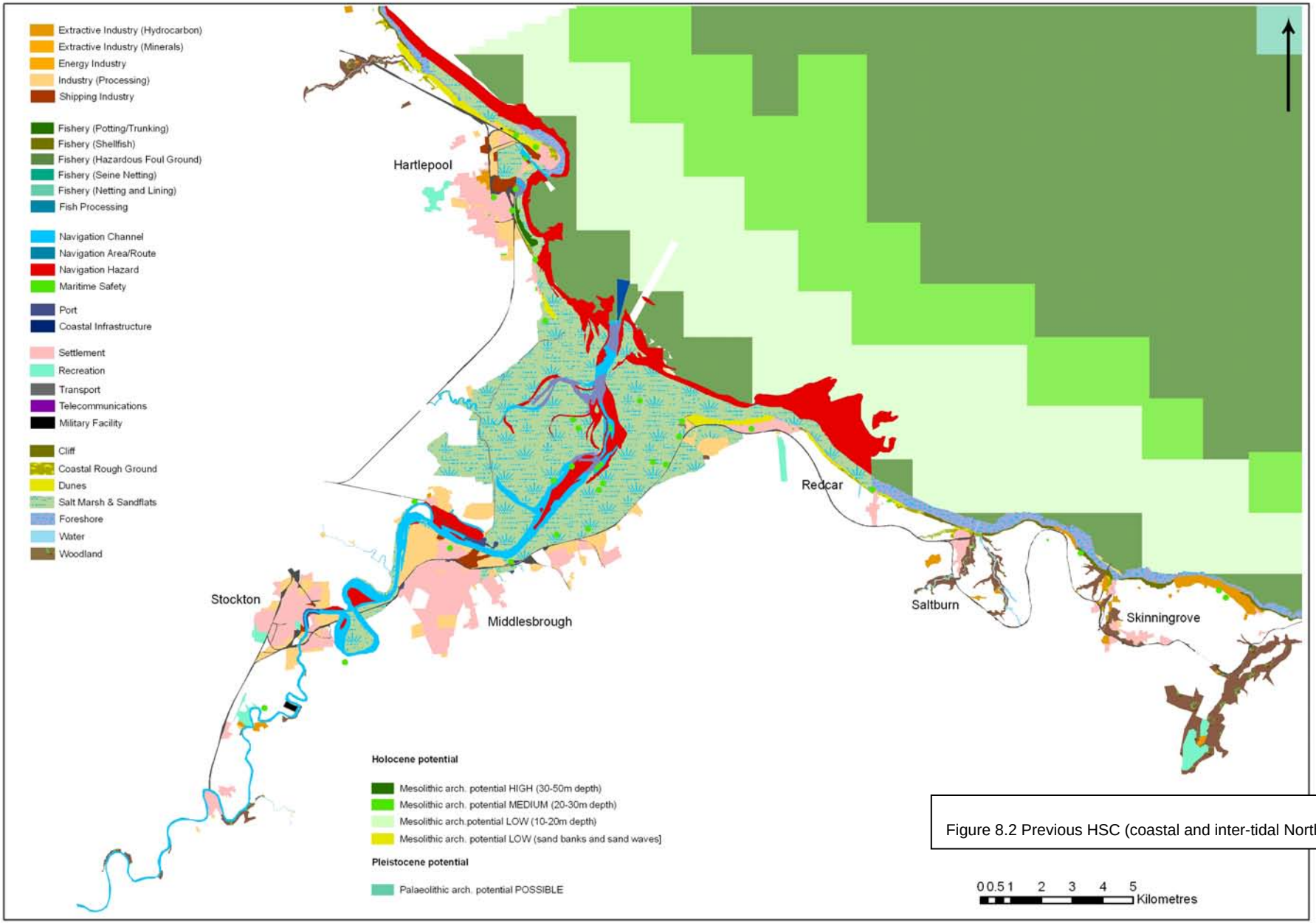

Figure 8.2 Previous HSC (coastal and inter-tidal North)

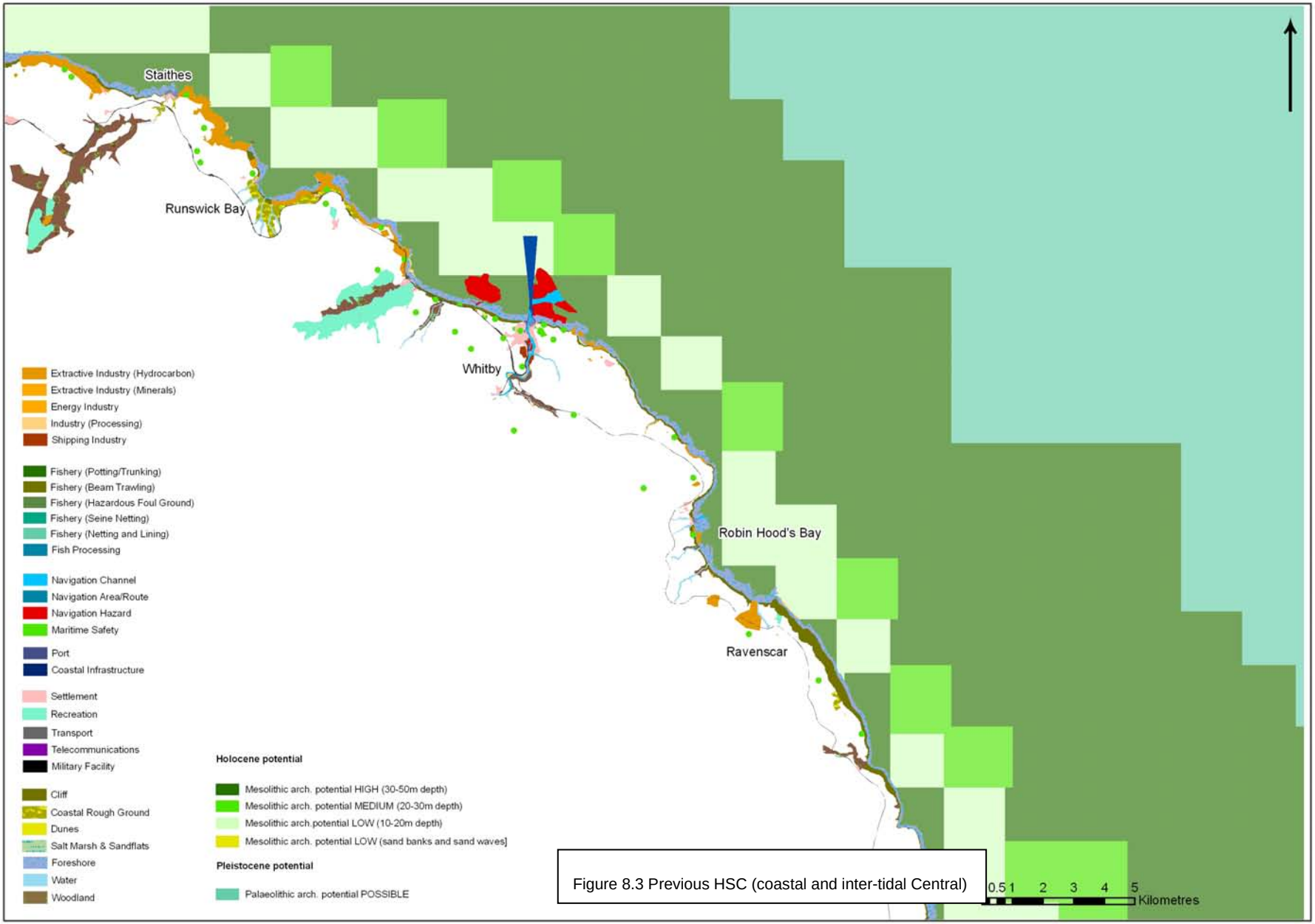

Figure 8.3 Previous HSC (coastal and inter-tidal Central)

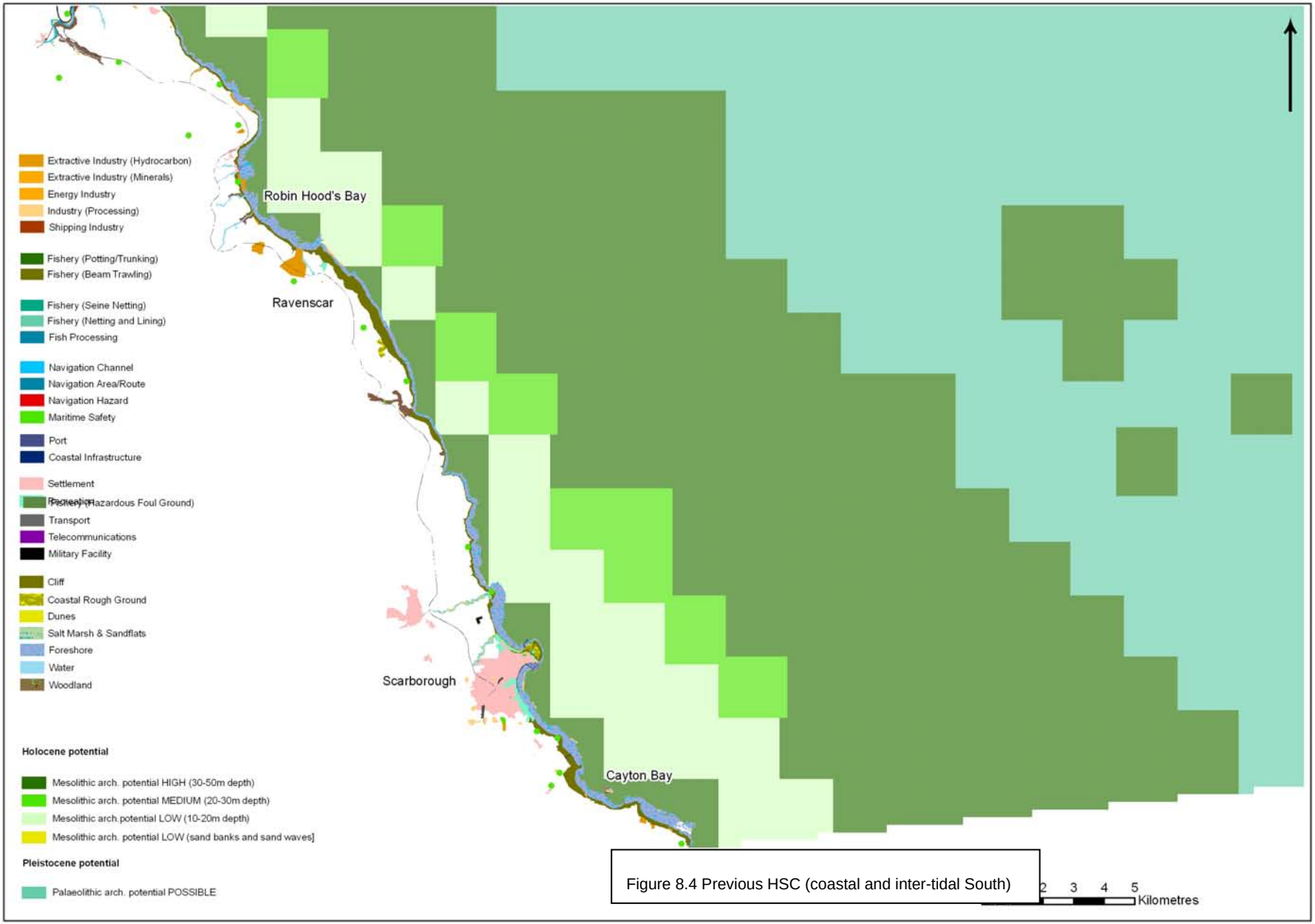

Figure 8.4 Previous HSC (coastal and inter-tidal South)

9.1 Industry

9.1.1 Extractive Industry (Hydrocarbon)

Introduction: defining/distinguishing attributes and principal locations

The Type Extractive Industry (Hydrocarbon) includes the following sub-types:

- Hydrocarbon Field (Gas);
- Hydrocarbon Field (Oil);

Components of this Type include:

- oil and gas fields - areas consisting of a single reservoir or multiple reservoirs all grouped on, or related to, the same individual geological structural feature or stratigraphic condition;
- sub-sea wells and wellheads;
- fixed platforms and drilling rigs;
- the oil and gas is transferred from its source by either pipelines or tankers;
- flotels - Specialist floating hotel vessels accommodating workers.

Principal hydrocarbon locations tend to be concentrated offshore in the east and south east part of the study area, to the south of Dogger Bank, and include the Tyne, Trent, Caister, Cleeton, Ketch, Munro, Murdoch, Boulton, Ravenspurn, and Schooner gas fields and the Fergus and Fife oil fields, with some pipelines and features also extending inshore to Tees Mouth and Redcar.

Historical processes; components, features and variability

The UK's offshore oil and gas originate from two sources. Firstly from subsidence and burial of marine limestones under thick accumulations of basin sediments approximately 140 million years ago which have generated gas from coal source rocks. Secondly oil and gas has also been generated from deeply-buried mudstone source rocks from approximately 65 million years ago. Thus commercial petroleum reservoirs occur in almost every sedimentary succession ranging in age from approximately 410-36 million years (BGS 2001).

This Type is usually an imposition onto other Types, as extractive industries and their components are determined by the location of their source. A number of other HSC Types will therefore have been altered by historical processes associated with the hydrocarbon extractive industries in this area. Rigs, pipelines and wells are likely to have disturbed Types such as wrecks, fisheries and palaeo-landscapes.

Oil and gas were the most important natural resources to be discovered in the UK during the 20th century. They provide energy and essential chemicals for the home, industry, and the transport system as well as earning valuable export and tax revenues to support the UK economy.

For centuries oil was either imported or small quantities were produced in Britain from shales. During World War One, when importing oil became more difficult, the Government encouraged companies to drill for oil. The first successes came in 1937 when an onshore gas field was found in Yorkshire. Oil was increasingly replacing coal as a fuel

across the world at this time. For safety and ease of unloading and storage, specialised oil terminals were developed in the interwar years, sometimes away from existing ports (Friel 2003, 268).

Not until the 1960s, however, was there an international agreement about ownership of mineral rights in the shallow seas outside the three mile limits of the countries around the North Sea (Hagland 1985, 270). In 1965 the Drilling Barge Sea Gem, situated 42 miles off the Mouth of the River Humber, was the first rig to find gas in the British North Sea sector. North Sea oil came on line in 1971 and was piped ashore at Teesside until 1975. Exploitation did not become economically feasible, however, until the world's second conference on the international law of the sea agreed that natural resources outside the 200 mile zone were the common inheritance of all mankind in 1974 (*ibid,* 269), and with rising oil prices in the 1980s.

Gas is the dominant hydrocarbon found in this area of the southern North Sea, with oil being more abundant further to the north in the central and northern North Sea areas. Around a third of the wellheads and subsea installations in this study area are abandoned, suspended, lifted or not currently in use.

Extraction in the North Sea's inhospitable climate and great depths requires sophisticated offshore technology. Consequently, the region is a relatively high-cost producer, but its political stability and proximity to major European consumer markets have allowed it to play a major role in world oil and natural gas markets. Five countries operate crude oil and natural gas production facilities in the North Sea: Denmark, Germany, the Netherlands, Norway, and the United Kingdom

By 2001, on the UK continental shelf, some 280 platforms (Figure 9.1) and 300 subsea completions were producing approximately 2.3 million barrels per day of oil and 100 million m3 per day of gas, involving the use of approximately 2000 chemical products (DTI 2001a).

Surviving remains will include abandoned well heads (and spoil from their sinking) and pipelines, but fixed platforms, drilling rigs and flotels will tend to have been dismantled or moved elsewhere when a field has been depleted.

Figure 9.1. British Petrol (BP) oil rig in the North Sea (©Hartlepool Arts & Museum Service)

Values and perceptions.

The male-dominated workforce is exposed to demands and constraints over and above those experienced in comparable jobs onshore. Employment peaked at 90,000 in the mid 1980s, with fluctuations in oil prices. Cost-reduction measures have included widespread down-manning (particularly on older platforms) and increased job insecurity. The boom years are now over. Because of the finite nature of hydrocarbons, the decline in this industry was always inevitable, and with increasing issues relating to the effect of using these resources on global warming, the attitudes towards this industry are invariably mixed.

An extract from an interview with oil rig worker Dennis Krahn, transcribed from an oral history project call 'Lives in the Oil Industry' carried out by the University of Aberdeen in partnership with the British Library Sound Archive (2000), gives a good insight into some of the perceptions of life on board an offshore rig:

'There's a rhythm on a drill rig. The same sounds occur. If I took a person that has worked on a rig and if I played a tape of sounds to them, they wouldn't have to see. They could tell what was happening. You've got the squeak, squeak, squeak of the drum brake. You can hear it squeak when you're drilling. And all these sounds would be as familiar and comforting to them as if you're in a town and you hear the bell of the church ring and the traffic start up in the morning. It is an atmosphere filled with sound. I've been on rigs that have shut down completely and the silence is ghostly, eerie, you feel a great void. They're quite unique sounds of almost a living, breathing thing. There are all different levels of passion for it. But I'm telling you only what I've seen and the people that I've remembered. It's a place of remarkable presence. But I'm always conscious that I cannot convey this even to my own family. It's very remote from people' (Krahn 2000, 39)

Research, amenity and education

The prospection for hydrocarbons has generated a wealth of detailed seismic data profiling the nature and form of the sea bed. This information may be invaluable to archaeologists seeking to research the palaeo-landscapes and archaeological potential of the North Sea. Prospection will have also entailed extensive geological and environmental research, particularly on the effects on offshore pollution. Greater dissemination of this research may aid in future archaeological and historical research into this area.

Development, components and perceptions have all been well documented, through newspapers, television, photographs, books and reports, etc. An oral history project, 'Lives in the Oil Industry', was begun in 2000 by the University of Aberdeen and the British Library Sound Archive. In their own words, oil workers discuss the skills, hazards and complexity of producing oil. Those being interviewed came from all parts of the industry and included offshore workers, people involved in platform construction work, management, unions, the legal, financial and political sectors as well as technical specialists such as geologists, engineers and flight crews. Others interviewed included people living in the areas of the UK that have been affected by the impact of the oil and gas industry. The scope of the project extends beyond Britain to contributors from continental Europe and the USA (Brotherstone and Manson 2002, 45).

Condition & forces for change

Output from the largest producers - the UK and Norway - has peaked and entered a period of long term decline. Nevertheless there are still almost 500 platforms and 10,000 kilometres of rigid and flexible oil and gas pipelines running between offshore production wells and terminals on land (DTI 2001a).

To minimise the risk of adverse impact on the marine environment during exploration and production, there is a range of legislation that ensures consistent environmental standards throughout the offshore oil and gas industry. DEFRAs 'Safeguarding our Seas' report (2002) recognises the vital role offshore oil and gas industry plays in meeting the economic and social needs of the UK and they are continuing to take steps to ensure that this is not at the expense of the marine environment. In liaison with the Department of Trade and Industry, they are currently carrying out *Strategic Environmental Assessments* (SEAs) of the entire United Kingdom Continental Shelf (UKCS) to ensure that future oil and gas licensing is carried out on a sound and informed basis. These SEAs are a process of appraisal through which environmental protection and sustainable development may be considered, and factored into national and local decisions regarding Government (and other) plans and programmes – such as oil and gas licensing rounds. Operators must also submit an Environmental Impact Statement (EIS) for all new offshore developments, or obtain a dispensation from this requirement. During each round of offshore licensing, Government Departments and their Agencies recommend appropriate conditions and restrictions on each block to minimise the potential environmental impact of exploration and production. Conditions cover a wide range of issues including impacts of drilling and seismic activity on fish, sea birds, marine habitats, interference with other sea users, and the formulation of drill muds.

Part of the Dogger Bank has been proposed as a draft Special Area of Conservation (dSAC). The Dogger bank dSAC includes areas of existing oil and gas activity.

Where possible, vulnerable structures such as wellhead clusters and valves are placed within a safety zone and provided with further protection such as a composite structure with a steel framework, designed with sloping sides to deflect trawls. Pipelines are either trenched or placed on the sea bed and are protected by the addition of a protective coating or by burial. Traditionally, pipelines of diameter less than 16 inches were buried for their own protection, while larger diameter pipelines were left on the sea bed and were unlikely to be seriously damaged. Even pipelines which are protected on the surface by rock dumping can also present a hazard to towed fishing gears. It is normal practice to apply for a safety zone at all sub-sea developments, but these are not marked with surface buoys. Without such visible markers, the offshore oil and gas industry is dependent on fishing vessels maintaining a safe distance from all sea bed structures (DTI 2001a).

Rarity and vulnerability

Oil and gas is only found in certain parts of the British mainland and territorial waters. Numbers of working installations are declining, but there will be permanent remains of several hundred in the North Sea.

Statutory protection for modern structures currently exists in the form of designated safety zones around them, the purpose of which is to protect the safety of people working on or in the immediate vicinity of the installation and the installation itself against damage. They also provide the additional benefit of protecting fishermen and other mariners by reducing the risk of collision with the installation and preventing loss of gear which can become snagged on underwater equipment.

Recommendations

Ensure that the sea is managed in an environmentally sustainable way. Legislation and Government recommendations should place conditions and restrictions on each licensed block to minimise the potential impact on natural and historic environmental features.

The new Marine Bill White Paper: A Sea For Change, has recently been published by DEFRA for consultation (15/03/2007) and its provisions on oil and gas exploration and exploitation recommend that the oil and gas sector should feature in and take account of marine plans when making licensing and consenting decisions. It suggests that 'any decisions made in the marine area, or that could have implications for the marine area, should be made in accordance with the shared UK marine policy statement and any relevant marine plan. When taking decisions, public bodies should have to review the content of the policy statement, in addition to the content of any relevant marine plan, to ensure that their proposed course of action is in accordance with both. They intend that bodies should act in accordance with the plan, a marine plan would not always be the only consideration, and at the time of taking a decision there would be a number of other relevant considerations the decision-maker would need to bear in mind, including:

- the results of any Appropriate Assessment or EIA undertaken as part of the decision-making process, which may reveal information that was not contained in plans;
- the marine environment is dynamic and changes, or new discoveries (eg oil & gas);
- may have taken place or have been made since plans were adopted;
- new, or changed statutory obligations;
- new government policies; or
- appropriate and effective ways to respond to emergency situations.

This is an approach that is already very familiar on land: the Town and Country Planning Act 199041, as amended by the Planning and Compulsory Purchase Act 200438, is an example of this approach working in practice' (DEFRA March 2007, 35-6).

The risk of damage to sites has to be balanced against the advantage of their discovery. This judgement depends on the monitoring and licensing of marine industrial processes, including acoustic surveys, coring, drilling, pipe-laying and maintenance and dredging. Industry should be encouraged to participate in joint projects that help with the conservation of submarine prehistoric sites and landscapes by ensuring that correct project design and mitigation is employed to ensure that the integrity of archaeological sites is not adversely affected.

Improved partnership working may be facilitated using the precedent of the BMAPA/EH Protocol for Reporting Finds of Archaeological Interest. The Protocol provides a mechanism for finds being made by the aggregate dredging industry, on the seabed, on board dredging vessels, and at wharves, to be recorded.

Oral history projects, such as the abovementioned project 'Lives in the Oil Industry', make a unique and vital contribution to identifying the values and perceptions associated with this character type. Further oral and sociological history projects of this kind should be encouraged for other areas.

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9.1.2 Extractive Industry (Minerals)

Introduction: defining/distinguishing attributes and principal locations

The Type Extractive Industries (minerals) includes the following sub-types:

- Alum works;
- Ironstone works;
- Jet works;
- Salt and potash works;
- Building stone quarries.
- Offshore spoil dumping grounds

This Type is usually an imposition onto other Types, as extractive industries and their components are generally determined by the location of its object. So mines and quarries can potentially be found in all Types, even Settlements or Semi-Natural Environments.

Most mines, quarries and works develop over some time and there are usually traces of earlier technologies, plant, dumps, etc, among the remains of the latest. In some types of site, particularly quarries, the earlier features may be partly devoured by later workings. Most extractive industries did not bother to remove traces of earlier features from the land they were exploiting. So fragments of earlier settlements and fields are also often found within industrial complexes.

A number of other HSC Types have been altered by historical processes associated with extractive industries in this area. Some woodland and coastal rough ground has developed on abandoned industrial ground, or derelict land. Some disused quarries have even been reused as military practice areas (eg Sandsend Alum Quarries). Certain parts of this study area have large extractive industrial complexes and these are interconnected by shared transport and processing infrastructure.

Historical processes; components, features and variability

Alum Works

The remains of alum workings can be found on the coast in this study area at Saltburn, Loftus, Boulby (Figure 9.2), Kettleness, Sandsend, Saltwick, Hawsker Bottoms, Brow Moor and Ravenscar.

Typical historical components include:

- quarries;
- steeping tanks;
- alum houses;
- storage and office buildings;
- reservoirs;
- waste tips, dumps, and spoil heaps;
- associated transport systems (such as tunnels, railways and harbours)

Alum was used as a dye fixative (mordant) for cloth. It was originally imported from Italy until 1605 when it was found in Cleveland shales (Frank 2002, 4) although there were

attempts at production in Dorset, Ireland and Lancashire.

The alum manufacturing process involved quarrying the relevant shale from outcrops on steep inland hillsides or coastal cliffs, roasting it in large heaps to produce a chemical reaction forming aluminium sulphate and to render it friable, obtaining the alum by soaking the roasted shale in water held in steeping tanks, then transferring the resultant solution to an alum house, where it was boiled and concentrated to a point where the alum would crystallise with the addition of an alkali solution of burnt seaweed (kelp) and human urine (Pickles 2002, 1). Alum works were generally built close to a water supply so that reservoirs could be built to supply the steeping tanks (Frank 2002, 124) but in many cases the water supply was constructed to supply the alum works. The manufacturing processing was very wasteful of raw materials, however, and the remaining calcined waste, soil and rock overburden, tended to be left close to the quarrying site, on beaches and cliff-tops where it survives to this day (White 2004, 121).

The manufacture of alum also required huge quantities of coal, which was shipped from Sunderland. As a consequence the alum industry provided the main stimulus needed for successful growth of the Whitby shipping industry (Frank 2002, 5-6). Little archaeological evidence has yet been found of the hundreds of ships engaged in the active business of this fetching and carrying, but there is an abundance of manuscript evidence that illustrates the interdependence of the alum and shipping industries (Buglass 2002, 89).

> Schofield, a late 18th century guidebook writer, would tell tourists that '*the works were well worth seeing, but advised filling the nose with a little tobacco to correct the effluvia on entering the boiling house'*. A later visitor spoke of sulphur fumes stopping the breath, a pestiferous effluvium, and wondered how '*any living creature could live and work in such and atmosphere'*. Mr Pennant described the vast heaps of alum and coal '*like small hills burning and others of volcanic-like clouds of sulphuric acid gas rising from calcining heaps'*. When, in 1627-8, a processing plant was briefly erected near the Tower of London, to work Yorkshire shales sent there due to war interruption of coal supplies, there were complaints of sickness, cattle not eating their pasture, dead fish, the stench of loathsome vapours and acid rain (Pybus 1991, 55).

With increased competition from new works elsewhere in the country from 1766, the alum industry in Yorkshire began to decline, the last two remaining works, at Kettleness and Boulby, ceasing production in 1871. Attempts were made to try to improve the works by applying new technologies such as hydraulic engines and the use of alternative sulphates, or by the sale of by-products, such as Epsom salt, 'Roman Cement' and fossils (Pickles 2002, 17). 'Within 50 years of the last works closing down, nature had reclaimed her own, and there is now little trace above ground of one of England's first large-scale industries but the overgrown quarries and crumbling walls and steeping pits' (Pickles 2002, 17).

The sites of former alum works are still all capable of interpretation to a greater or lesser degree. Features survive in all of them to indicate something of what went on. 'The quarries are all fairly similar, being crescent shaped with a spoil-heap at one or both ends, a stream usually coming into the quarry over the top at one end and with a floor of at least two levels, boggy in places. Where there is a single quarry, the site of the alum house is often near by. With multiple quarries, a combined alum house will probably be some way from them all and in either case will be nearer to roads, a river or the sea than to the quarry. Investigation of field and house names in the vicinity will reveal such gems as 'kelp house', 'kiln garden', 'alum house yard' or 'slam gutter'. Study of the early OS maps will add revealing detail of the days towards the end of the industry. A moor top may reveal

giant reservoirs of water now covered with heather. Discarded spoil and red burnt shale heaps still exist. Even an examination of the beach sand in some places will show that quite a high percentage of it is small particles of red shale from the alum works' (Pybus 1991, 55).

Figure 9.2. Remains of alum quarries at Boulby

Ironstone Works

The remains of ironstone workings can be found along the coast in this study area at Skinningrove, Staithes, Port Mulgrave, Staithes and Kettleness.

Typical historical components include:

- mines;
- quarries;
- bloom furnaces and slags;
- office and factory buildings;
- waste tips, dumps, and spoil heaps;
- associated transport systems (such as railways and harbours).

Iron ores are widely distributed throughout this area and scatterings of early bloom furnaces, have left traces of their slags throughout the region indicating that they have been worked since at least the Roman-British period (Owen 1986, 1). Along the coast the commercial ironstone seams also crop out from the sheer cliffs along the shore at various places. It was not until the early 19th century, however, that the Cleveland ironstone industry really took off.

Initially it was collected along the coast from the beaches and shipped to furnaces on

Tyneside until 1825, when the Stockton and Darlington Railway opened up the Cleveland ironstones with its ability to handle large quantities of mineral traffic. The ironstone was shipped into the River Tees and transferred to the railway (Owen 1986, 6-8). Port Mulgrave harbour was built at Rosedale Wyke in 1857 in order to transport the ironstone mined here and was entirely dependent on sea transport for supplies of fuel and limestone, and for the dispensing of pig iron (*ibid*, 12-13).

The Cleveland Ironstone industry peaked in 1885 and by 1918 the Cleveland ore-field had been producing a third of the nation's ironstone for 40 years. The economic downturn that followed WW1 and later government policies led to the eventual decline of the ironstone industry, the last mine closing in 1968. Remains of these ironstone workings are still extant in many places along the cliffs and foreshore today. Groundwater from ironstone mines has also discoloured many of the streams in this area, such as those at Saltburn and Skinningrove (Figure 9.3) and serves as another reminder of this once flourishing industry.

Figure 9.3. Skinningrove Beck discoloured by groundwater from the nearby ironstone mines

Jet Works

The remains of jet mining can be found along the coast in this study area at Loftus, Staithes, Runswick Bay, Kettleness, Lucky Dogs Point, Holms Grove, Stonecliff End, Overgate Cliff, Stoupe Bank, Rain Dale, and Goldsborough.

Typical historical components include:

- mines and adits (in both cliffs and foreshore);
- waste tips, dumps, and spoil heaps.

Jet is a type of fossilised wood, related to both coal and lignite, from an ancient tree similar to the modern araucaria or monkey-puzzle tree. Jet-bearing strata outcrop all along the

high cliffs of the east coast from Robin Hood's Bay to Saltburn. At Whitby itself, the jet rocks lie under the sea from where fragments may be washed up on the beaches in the area (Muller 1991, 34).

Jet has been worked here from at least the Bronze Age to make amulets and jewellery (McMillan 1992, 6). The Romans and Vikings made great use of it too, making items such as jewellery, hair pins, spindle whorls and knife handles (Muller 1991, 35). It was not until the 19th century, however, that the jet industry boomed, with demand for jet ornaments increasing rapidly as a result of Queen Victoria's predilection for jet after Albert's death and as the 19th century progressed the ship building and whaling industries at Whitby were gradually replaced by a flourishing jet industry (Frank 2002, 11).

> Sir George Head describes the work of the jet miners in 1835:
>
> *"A man very often not only works alone all day in such a gloomy state of confinement, but reaches his solitary dungeon without assistance, merely by the perilous expedient of a rope rove round a stake fixed on the summit of the cliff: by rope he lets himself down, and at the end of his day's work pulls himself up again"* (White 2004, 124).

Jet was mined all over the North York Moors area (but not at Whitby). Adits were cut into cliffs and hillsides but no explosives could be used for fear of damaging the fragile substance. Sometimes the cliffs were terraced for greater safety. This was done at the Far Jetticks towards Robin Hood's Bay. Where the Jet Rock sank below the shoreline at high tide, it was possible at the right state of the tide to do a certain amount of underground mining (McMillan 1992, 20).

Figure 9.4. Whitby Jet Museum

The industry collapsed, however, as quickly as it had risen. Changing taste and supplies of cheaper substitutes such as vulcanite or glass attacked its economic base and by the early

twentieth century the industry had dwindled. It is as a small craft industry, capable of meeting demand from the available supply of rough jet, that it survives today, although antique jet commands high prices (White 2004, 124). The jet industries heritage also attracts many visitors to the area, in particular Whitby (Figure 9.4).

At Great Broughton, in 'The Jet Miners' Inn' a poem reads:

"Ah! Black as jet, but long ago
In dignity and lace,
The ladies wore around their necks
A flash of ebon grace.
But oh! To-day Great Broughton mourns,
Still waves the merry corn,
The beer flows at Jet Miners' Inn,
But jet's no longer worn.
Still fashions change, mayhap some day
Again the craft will thrive,
And Yorkshire jet will ring the earth,
Black, flashing and alive."

(McMillan 1992, 20).

Potash and Salt Works

Potash was discovered in northeast England in 1939 in a borehole drilled by the D'Arcy Exploration Company to test for oil and gas (David Pybus pers comm). Potash is used worldwide in virtually every major agricultural industry. It is well suited for application as a fertilizer on grain crops such as corn, as well as soybeans, oil palms, coffee, sugar cane, cotton, fruit and vegetables. While the majority of potash production goes into fertilizer, it is also used in commercial and industrial products - everything from soap to television tubes. There is one potash mine operating in this study area, located at Boulby, opened by Cleveland Potash Ltd in 1973 (Figure 9.5). Potash occurs here at depths between 850m and 1,400m, the deepest workings in Britain.

Typical historical components include:

- mines and exploration boreholes;
- office and factory buildings;
- associated transport systems (such as railways, roads, ships and docks).

Potash is found within the sedimentary strata above the Permian evaporates in this area. The depth involved can prevent underground exploration and trial mining in some places.

To transport the potash, a ship/road/rail terminal was constructed at Tees Dock. The potash deposit is worked using a variation of a mining technique known as room and pillar: this system allows for areas to be extracted (rooms) leaving pillars to support the workings. Since 2003 a system for pumping tailings slurry into worked-out areas up to 1km from the core operation has also been in operation.

The ore is refined to separate potassium chloride from the salt. Following impact crushing and rod milling salt and impurities are removed by flotation while the overflow is classified

and treated by flotation. Waste products include the discharging of clays and salt into the North Sea. The mine site at Boulby also produces salt for winter road maintenance and has recently been used as a suitable site for neutrino research.

Figure 9.5. Cleveland Potash Mine, Boulby

Extraction of salt from seawater has taken place in this region from at least the medieval period. In Billingham salt making may have had very early origins as an ancient salter's track ran through this area, north to Wearmouth and south to Whitby. Salt exploitation was not specifically mentioned in documentary evidence for this area, however, until the year 1290 when a certain Robert de Brus (grandfather of Robert the Bruce King of Scotland) granted a salt pan in Hart village to Sir John Rumundebi. Large salt pans were used in the production of salt through the evaporation of sea water. The salt pan granted by De Brus may have been located at Cowpen near Billingham as this is known to have been an important centre of the salt making industry in the 14th century (Rowe 2000, 26).

An early account of salt making at Coatham near Redcar describes the working of salt pans:

"And as the Tyde comes in, yt bringeth a small wash sea-cole which is imployed to the makinge of salte, and the Fuell of the poore fisher Townes adjoininge; the oylie sulphurousness beinge mixed with the Salte of the Sea as yt floweth , and consequently hard to take fyre, or to keepe in longe without quenchinge, they have a Meanes, by makinge small vaults to passe under the hearthes, into which by foresetting the wynde with a board, they force yt to enter, and soe to serve insteede of a payre of bellowes, which they call in a proper worde of Art, a Blowecole." (Rowe 2000, 26).

The process of making salt was by perpetual boiling and reboiling (often up to eight times)

of sea water in huge shallow salt pans made of lead. Salt making continued in the area in the later part of the fourteenth century. The local salt making industry achieved great heights in the 15th and 16th centuries when Greatham became a salt making centre and when 'Salt De Greatham' was famed throughout the land. By 1650 the centre of salt making in Britain had moved to South Shields. Large scale exploitation of salt did not return to Greatham until 1887 when the salt was extracted in the form of brine extracted from 1000 feet below the earth by Mr Casebourne, a cement manufacturer, boring for rock salt. Boreholes were also sunk at Marsh House Farm by the Hartlepool Salt Company by 1889. The salt here lay at a depth of about 900 feet in a bed 82 feet thick and was extracted as a brine solution and pumped to the surface. In 1894 the Greatham Salt and Brine Company by George Weddell were established and were later purchased by the famous salt-making company Cerebos in 1903. The extraction site at Marsh House Farm was recorded in 1993 by the Royal Commission on the Historic Monuments of England (Rowe 2000, 26).

Office and factory buildings were usually set up adjacent to the extraction sites and brine reservoirs were built. Although some buildings still remain, most are either disused or have been reused for other industrial purposes. Salt was exploited by brine pumping on the Teesside until 2002 and remains of these reservoirs and extraction sites can still be seen, but most works have completely vanished, apart from remains such as the concrete pads and steel pipe shaft heads of the brine pumps. Numerous salt-mounds resulting from the accumulation of ash and silt from boiling re-enforced brine also survive at Seaton Common, Greatham Creek and Salthome (Rowe 2000, 26).

Another chemical extracted from this area was magnesite. The magnesite works at Hartlepool are now being dismantled but were once used in the process of extracting magnesium from limestone by sea water process. The Plant, started in about 1937, played a role in World War II and then rapidly expanded after the war. During the war years it was used for aircraft components and incendiary bombs - train-loads of lime were brought into the plant and mixed with the magnesium. Situated here on the Hartlepool coast meant it was close to the sea for the extraction of the magnesium as well as being on train lines for limestone delivery. The export of the purified magnesium was also then handled by the trains for use in making the aircraft and incendiary bombs.

Anhydrite, also known as dry gypsum, was also extracted at Billingham in the 1920s and 1930's, for use in the production of fertilisers. The mine at Billingham was 700ft deep and consisted of miles of grid-like subterranean streets.

Stone Quarries

The remains of disused stone quarry workings can be found along the coast in this study area at Preston-on-Tees, Loftus, Staithes, Robin Hood's Bay and Ravenscar.

Typical historical components include:

- quarries and pits
- waste tips, dumps, and spoil heaps
- associated transport systems (such as railways, roads, ships and docks)

Another of North Yorkshire's most significant exports was stone for building, in particular sandstones. As well as being workable this stone had the virtue of hardening as it weathered and of resisting the effects of immersion, so it was useful in harbour works. It is mainly found in and around Whitby and was used to construct most of Whitby Abbey. Possible early sources are quarries on the cliff edge above The Scar and in the Abbey

House area.

'One of the main sources for sandstone, however, was Aislaby, three miles to the south west of Whitby. The quarry here has recently been re-opened, but in its day its products were sent from Whitby to build Margate and Ramsgate piers, the foundations of London and Waterloo bridges, Covent Garden market and London Docks, to quote just a few examples. Whitby piers were built from the same stone. These blocks, like all those that came from the quarry to the stone wharf in the upper harbour, were carried on wagons pulled by oxen. In 1834 a Whitby Stone Company was formed, with its wharf at Boghall. It was a product from cuttings for the new railway to Pickering, the works for which had uncovered many different building stones; these were brought down by inclined plane from the quarries at Lease Rigg and thence by rail to Whitby for shipment' (White 2004, 132).

The local magnesium limestone has also been exploited for use as a building stone and as a lime mortar. Quarrying of limestone appears to have started quite early, particularly in Hartlepool, with many of the quarries already abandoned at the time of the 1st edition (1856-61) OS survey. Some quarries in use in the 1850s had already gone out of use by the 1890s. Others continued to prosper and some, such as Hart Quarry, are still in use today for extracting dolomite aggregate. Limestone from the excavation of the docks at Hartlepool was also used for building purposes (Rowe 2000, 24).

Sand and gravel extraction is another local industry, but is perhaps the most poorly documented. This is not surprising as extraction of local glacial sand and gravel requires no particular engineering and can be simply dug open cast from small shallow quarries. In most cases the quarries themselves were small circular pits less than 20 metres in diameter. They are often sited on cliffs away from the towns (eg Widdy Head and Raindale Slack) suggesting that they were exploited by individual farmsteads for local construction needs. In most cases the pits have been backfilled and taken back into agriculture. It is interesting to note that the pits often show on aerial photographs and have in fact been misinterpreted as prehistoric or later enclosures. Larger, and potentially more industrial scale pits, have been noted at Newton Bewley and Claxton (Rowe 2000, 26).

Values and perceptions.

Complex feelings are generated by industrial remains, to a great extent dependent on people's closeness (in terms of both space and time) to the industries. For many they are reminders of past employment and great days in North Yorkshire's history, when it was the hub of British alum quarrying, ironstone and jet mining.

Many are still inspired by the remains: industrial history and archaeology are rapidly growing interests in North Yorkshire. Indeed many of them now have designated status that protects them to varying degrees

Research, amenity and education

Although industrial archaeology has dominated the study of the post-medieval period, archaeological recording (survey and excavation) has only recently been applied in a systematic way to 19th and 20th century industrial sites and landscapes in North Yorkshire and the potential for discovering important features, recording, interpreting and presenting them is considerable (Petts and Gerrard 2006, 189).

Sites at Boulby and Peak have undergone long-term archaeological excavation and alongside consolidation work undertaken by the National Trust, has helped to reveal and understand this complex process (White 2004, 126). Loftus and Kettleness works have

been extensively surveyed by English Heritage (together with some of the inland works). Individual complexes can be researched in great detail and there remains much to be done in terms of documenting particular works.

Most histories have as yet been technical or economic (eg mine yields). More work could be done on the social background of North Yorkshire extractive industries, in both the medieval and modern periods.

Industrial 'heritage' is a rapidly expanding element of the North Yorkshire tourism industry. It needs to be sensitively handled as the sites are potentially hazardous and competent and responsible people should be involved. Education involving children more in their area's industrial past will only continue to increase with bodies like The North York Moors National Park, local authorities and the National Trust all engaged in promoting the presentation of industrial monuments and landscapes.

Condition & forces for change

All the relict industries in this area, such as alum quarries, ironstone and jet mines, are now disused, but many are still visible in the landscape today, although most have now become overgrown by scrub and woodland or are now barely distinguishable from the natural areas of the rocky foreshore and coastal slope.

Condition varies considerably. Some sites have been almost entirely destroyed, others are virtually intact, left with most features except equipment still in place (eg Sandsend and Boulby Alum quarries), but most have seen some depredation, usually before North Yorkshire entered the post-industrial age and these features were recognised as meaningful by people living beyond their immediate neighbourhood.

In some areas, such as cliffs and rocky foreshores, industrial complexes from the medieval period or beyond can survive in excellent condition. Elsewhere, derelict land has been gradually tidied-up by farmers or expanding housing developments and in certain areas the remains of early industry have been either damaged or destroyed by cliff falls or by later or still active workings.

Where a complex survives well then so does its internal coherence. Being very mechanistic, extractive industry sites can be disentangled so that each element can be seen in relation to others. When elements have been removed the whole pattern can, however, be difficult to understand. Decay of structures will continue apace if they are not consolidated. Active sites continue to expand, while there remain commercially viable markets for their products.

Extractive industry (minerals) remains form some of the most distinctive landscapes along the North Yorkshire coastline, including the spectacular cliff alum workings, as well as the many semi-derelict or overgrown industrial buildings, yards, lanes, and tramways. 'The effect of this heavy industrialisation is often so great that in some cases we may not even recognise the magnitude of the scale. Whole cliffs have been changed beyond recognition. Access ways to the shore and landing places have altered the shape of the coastline. At Ravenscar, for example, the former alum works are intercut by a railway line, a brickworks, and an inclined plain from a ganister quarry on the moor above, all confused by landslips and coastal erosion' (White 2004, 122).

In addition the more indirect effects extractive industry has had are often not appreciated, such as the development of certain towns, and the generation of wealth.

Rarity and vulnerability

In terms of rarity, extractive industries (minerals) can, of course, exist only where their resource lies. Jet mines and alum works are nationally confined to North Yorkshire whereas ironstone mines can be found in other parts of Britain.

Continually rising awareness of the value and importance of industrial remains will make them increasingly less vulnerable. Many sites are now designated areas, especially AONBs and SSSIs (mainly the cliff sites).

Many of the surviving alum working sites are regarded as of national importance, both in terms of helping to understand the development of the industry and to protect the most important remains (Lee 2002, xi).

Natural recolonisation of chalk and limestone quarries has led to the development of attractive and species-rich communities in many parts of the United Kingdom. These communities have a basic similarity in floristic composition wherever they occur, but they also show a great deal of individual variation resulting from differences in the location, history and variability of the quarry itself and in the nature of the surrounding habitats. The interest of old quarries may be enhanced by the presence of individually rare or local species and especially by their refuge status in relation to the loss of semi-natural calcareous grassland in the district. It is suggested that some sites play an important role in wildlife conservation and that this factor should be considered in any programme of land reclamation (Davis, 1979). Indeed many such quarries have now been designated as SSSIs by virtue of this.

Recommendations

Grants for consolidation and presentation should be encouraged. Statutory protection of the most important sites and complexes should be extended. Archaeological recording and historical research will help raise the sites' profile within local communities. Developers, working in partnership with English Heritage, County Councils and Archaeological Research Services, should be encouraged to make provision, prior to carrying out work, for archaeological investigation work to be undertaken.

As in other regions, the archaeology of ironstone mining of all periods remains seriously under-recorded, and in many cases has probably gone unrecognised. The potential for finding any early mining remains should be a priority for development control in any applications within historic iron mining areas, and for archaeological recording of any sites/landscapes where its existence is suspected (Petts and Gerrard 2006, 223).

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9.1.3 Energy Industry

Introduction: defining/distinguishing attributes and principal locations

The Type Energy Industry includes the following sub-types:

- Oil refineries;
- Gas refineries;
- Power stations;
- Renewable energy installations.

Within this study area the Type energy industry tends to be confined to the region in and around Teesside.

Oil and gas refineries at Greatham, Seal Sands, Port Clarence and Tees Dock are sprawling industrial complexes with extensive piping running throughout, carrying streams of fluids or gas between large chemical processing units. Oil is refined into more useful petroleum products, such as gasoline, diesel fuel, asphalt base, heating oil, kerosene, and liquefied petroleum gas. Gas is stored, canistered or piped onwards to provide heating, lighting and energy for both homes and industry

One nuclear power station operates in the area, Teesside Power Station, at the mouth of the Tees estuary near Hartlepool.

Historical processes; components, features and variability

Typical historical components include:

- large, sprawling industrial complexes (including extensive piping, storage units, etc);
- cooling towers, chimneys;
- distribution depots and customer service centres;
- associated transport systems (such as railways, roads, ships, docks and tanker terminals).

The North Sea oil and gas industry has become a major economic activity since the late 1960s. The north east coast plays an important role in providing infrastructural support and there are a number of oil and gas installations on the North East coast, including terminals, storage facilities, refineries and tanker terminals. This is partly responsible for the relatively high shipping densities in the surrounding coastal waters (DTI, 2002).

These installations tend to have been built on large tracts of reclaimed land along the River Tees. The first attempt at land reclamation on the Tees was carried out early in the 18th century, when some embankments were built to protect Coatham Marshes from the sea. Considerable tracts of land were also reclaimed at Mandale and Jenny's Mill island, by the Tees Navigation Company, early in the 19th century (Le Guillou 1975, 48). The largest areas of reclaimed land before 1890 resulted from what were known as the Saltholme and Greatham reclamation.

The work had to be undertaken during neap tides and on occasions up to 600 men, and horses worked frantically 'to beat the tide' (Le Guillou 1975, 50).

A witness describes the reclamation scene on the river as:

"… on a dark stormy night, the gloom heightened rather than dispersed by lurid flares here and there, in whose glow the swarf workers seemed like demons, the howling of the wind and the dark of the water fitfully broken by the hoarse cries of the men and the shrieking and snorting of the busy locos combined to produce a weird effect more easily imagined than described …"

(Le Guillou 1975, 50).

'The reclamation projects at Saltholme and Greatham, together with smaller ones at Portrack Lake and Haverton Hill totalled 2523 acres. The Tees Conservancy Commissioners embarked upon further reclamation schemes in the 1890s; five additional miles of training wall were built together with the construction of High Water embankments. By 1906, the total acreage of reclaimed foreshore had been increased to 2800' (Le Guillou 1975, 50-51).

In the 1960s, while the coalmines and railways were closing with huge consequences for the communities they supported, oil and gas refineries were opening at the mouth of the Tees. From 1964 to 1968 three oil refineries were built here to supply the chemical industry and also local demand for fuels for heating and transport.

Natural gas from land-based reservoirs has been utilised to provide heating and lighting since the late 18th century (Figure 9.6). When, from the late 1960s and early 1970s, safer, cleaner, natural gas began to be extracted from the North and Irish Seas, there was a national conversion programme from 'town' gas to natural gas. Most gasworks became surplus to requirements, some being reused as local distribution depots, others being rebuilt as customer service centres or sold for redevelopment, many - in full or in part - have lain derelict and contaminated by the former manufacturing processes.

Figure 9.6. Gas works, River Esk (© Sutcliffe Gallery (www.sutcliffe-gallery.co.uk)

The Tees is now one of Britain's most industrialised river estuaries with a dramatic and seemingly endless landscape of chimneys and towers. Most notable are the giant chemical complexes, the oil refineries, the steel works and the nuclear power station (Figure 9.7) to the north of the river. Seal Sands are now only half their 19th century size, having been largely reclaimed for the site of an oil refinery and chemical works.

Figure 9.7. Teesside Nuclear Power Station

Values and perceptions.

Because of the finite nature of hydrocarbons, the decline in this industry was always inevitable, and with increasing issues relating to the effect of these resources on global warming, the feelings with regard to this industry are invariably mixed. The use of nuclear power is also becoming increasingly controversial because of the problems of storing radioactive waste for indefinite periods, but also in relation to the potential for possibly severe radioactive contamination by accident or sabotage, and the possibility that its use could indirectly lead to a proliferation of nuclear weapons. Renewable sources of energy may be perceived as benign, symbols of hope. Energy complexes are generally highly visible features in the landscape and often contribute significantly to levels of noise, smell and activity; they can be expected to engender strong feelings.

The area is important for its wildlife and the partly industrialised Seal Sands on the north bank of the Tees are the winter home to thousands of wildfowl and waders. Seals may also be regularly seen 'basking' in their 'man–made' or semi-natural surroundings.

Research, amenity and education

As this is a relatively recently developed Type, the extent of archaeological and historical research on the development of both the Type itself and also its typical components is fairly limited. Decommissioning of plants may allow opportunity for some research to be undertaken, with previous historic character Types possibly still well-preserved beneath

these complexes in some cases. It is known that considerable extents of these industrial areas are founded on reclaimed land, often drained saltmarsh and mudflats, and infilled from the late 19th century onwards. These buried deposits may have considerable potential for preserving palaeo-environmental material as well as artefacts and features associated with estuarine environments. Public amenity is limited due to health and safety restrictions.

There has been a lot of recent interesting work being carried out on off-shore archaeology. Work such as Birmingham University's research into North Sea palaeo-landscapes is extremely important. It aims to better understand the early landscape of areas now covered by water. Whilst of undoubted inherent importance, this research also has clear implications for resource management. With policy trends towards the expansion of renewable energy, there is inevitably going to be a greater push towards wind power, particularly in off-shore locations where more consistent winds are available and there is likely to be less opposition from local interest groups. However, this HSC project and the work at Birmingham serves as a useful reminder that such projects need to remember that seabeds are as much historic landscapes as on-shore locations. As such it is encouraging to see that COWRIE (Collaborative Offshore Wind Research Into The Environment), an company set up by the Crown Estate to raise awareness and understanding of the potential environmental impacts of the UK offshore windfarm programme, has just published a guidance note for best practice in survey, appraisal and monitoring of the historic environment during the development of offshore renewable energy projects in the United Kingdom.

Condition & forces for change

Increasing concerns relating to the finite nature of hydrocarbons and the effect burning these resources has on global warming will place increasing pressure on that sector of the energy industry. Nuclear power has been the main form of alternative energy production. Renewable alternatives are fast becoming a preferred choice and there appear likely to be significant changes in the generation of energy in the study area.

Potential sources of renewable energy of relevance to this area include wind, wave and tidal power. A proposition has already been made for a potential offshore wind farm with thirty wind turbines to be sited at Tees Mouth. The Tees Valley's status as a UK centre for the development of new, cleaner energy technologies has received a major boost in recent years and has acquired an option to participate in what would be the UK's first complete clean coal power generation project. As fossil fuels run out and we seek to replace them, hydrogen may be a suitable replacement. It would seem that the Tees Valley is well placed to take advantage of the move towards the 'hydrogen economy' as it is already home to the largest hydrogen system in the UK.

Rarity and vulnerability

These sites may be under threat considering that the hydrocarbon industry is on a downturn. It is important to manage these sites following their abandonment to prevent secondary pollution to the surrounding environment.

Recommendations

There may be limited scope for archaeological recording following the abandonment and/or redevelopment of these sites, particularly if it can be shown that there is archaeological or historical potential for buried remains.

Coastal and seabed developments of any sort have the potential to have significant effects

on the archaeological sites and materials that make up the historic environment and this needs to be considered during the course of any such development.

Renewable energy is an essential element of the Government's programme of action to tackle climate change, and their aim is that 10% of our electricity is generated by renewable sources by 2010 and 20% by 2020. Through the Marine Bill, they aim to facilitate the achievement of this target by simplifying the licensing process for marine renewable energy installations (DEFRA March 2007, 57).

COWRIE's (2007) recently published guidance notes for best practice in survey, appraisal and monitoring of the historic environment during the development of offshore renewable energy projects in the United Kingdom suggest a number of general principles that are applicable to sites and materials likely to be affected by coastal or offshore developments. These are:

- The use of the precautionary principle, the aim of which is to prevent damage to sites and material by proactively putting in place protective measures, rather than having to attempt to repair damage after it has occurred
- The assumption that archaeological sites should be subject to as little disturbance as possible, and should preferably, be preserved *in situ*
- The requirement, where preservation *in situ* is not practicable or reasonable, for disturbance to be offset by appropriate and satisfactory provisions to mitigate the effects of disturbance
- The requirement to create and deposit an accessible archive of the results of all archaeological investigations to ensure the 'preservation by record' of this non-renewable resource

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9.1.4 Processing Industry

Introduction: defining/distinguishing attributes and principal locations

The Type Processing Industry includes the following sub-types:

- Production areas;
- Sewage and water works.

Principle locations include Hartlepool, Teesside, Redcar, Middlesbrough, Ruswarp, Whitby, Hawsker Bottoms, Saltburn and Scalby.

Historical processes; components, features and variability

Production areas

Components of the sub-type production areas include:

- iron and steel works;
- timber yards;
- brick, tile and clay works;
- potteries;
- mills;
- lime kilns;
- cement works;
- roperies;
- engine and boiler works.

Iron and Steel Works

The iron and steel industries have formed a significant part of the history and character of Cleveland and the River Tees for more than 160 years. Tees Estuary is ideally suited for this industry due to its proximity to the rich iron ores of the North York Moors and the fuel from the Durham coalfields, plus its ports allow easy export of the products. Middlesbrough's skyline is dotted with symbols of its steel and chemical industries; however, it was coal and iron in the 19th century that transformed the area from farmland and marshland to one of Victorian Britain's fastest growing towns. This dramatic increase in Middlesbrough's population first developed in the 1830s, following the birth of the town's coal industry and the 1840s, when Middlesbrough's iron ore industry took off.

Local smithies manufactured basic hand tools and machinery, along with fittings and fixtures such as gates and railings, as well as carrying out repairs. These rarely survived following industrialisation; when mass production of the smith's wares became possible. In Hartlepool there is evidence of this former industry (eg Hart Smithy) (Rowe 2000, 28).

The early iron ore was mainly from coastal exposures and most of this was shipped to Newcastle to be made into iron (Pybus Pers Com). By 1840 the first rolling mill and foundry had been built at Middlesbrough. Good quality ore was supplied from Grosmont near Whitby, but supplies were inadequate and transportation difficult. It went by sea, river and rail to Witton Park for smelting and the pig iron was then taken back by rail to blast furnaces at Middlesbrough to be made into iron. Ironstone was also being shipped from Skinningrove by 1848, but transport still remained a problem.

The iron industry does not appear to have developed as fully in Hartlepool as in Middlesbrough, Stockton and East Cleveland, presumably because of its remoteness from the ironstone mines themselves. Principal amongst the Hartlepool works was Seaton Carew Ironworks (Rowe 2000, 28).

By 1877, however, Cleveland was in crisis, as its ironstone was found to be rich in phosphorous and thus unsuitable for making the new Bessemer steel. The 'Eston Steelworks' were described as 'the largest and most advanced steel making plant in the world' (http://www.pancrack.tv/subject.html) and began mining suitable ore in Spain. In 1879 a way was found of making steel with Cleveland ironstone and this revolutionised steel-making throughout the world. The post-war boom saw Britain's premier steel-making centre remaining on the Tees and by 1967 it became part of the nationalised British Steel Corporation. British Steel later became CORUS and has since been taken over by TATA, now making around 3.5 million tons of steel a year.

Principal locations of iron and steel works today include Tees Wharf and Cochrane Wharfs on the Teesside, Redcar (Figure 9.8), Skinningrove. Historically they were also located at Throston, Stranton, Coatham, Grangetown, Middlesbrough, Runswick Bay, Egglescliffe, South Bank, North Ormensby, Port Clarence, and Seaton Carew.

Figure 9.8. Teesside Works, Redcar, seen from South Gare

Timber Yards

Before iron ore could be properly handled, timber was 'the most essential raw material in almost all human activities' (Bruijn 1985, 127). In the second half of the seventeenth century all sorts of timber were in great demand; for naval and merchant ships, for pit-props in the Durham coalfields, and for the house-building industry, particularly after the Great Fire of London in 1666. In addition, English forests were shrinking. For all these reasons the import of timber into England from Norway and the Baltic Sea trade increased enormously (Bruijn 1985, 133).

Timber yards are typically large complexes of saw mills and ponds. The yard of Robert

Launder and Co Ltd alongside the Timber Dock in Hartlepool (Figure 9.9) was established in 1853 and was in use until the 1980s . The Stranton Saw Mills, founded in 1878 and also in Hartlepool, are still in use as a timber yard. Other sites, such as the Baltic Saw Mills, opened in 1872, are in use for mixed light industry. Creosote works often accompanied timber yards, such as the Greenland Creosote Works at Cleveland Road which opened in the mid-1880s and continued in use until 1964 (Rowe 2000, 37).

Figure 9.9. Timber being unloaded from a ship at Hartlepool (©Hartlepool Arts & Museum Service)

Principal historic locations include Hartlepool, Middleton, Stockton-on-Tees, Swainson Dock and Seaton Carew. Raff yards are also located at Whitby.

Brick, Tile and Clay Works

Brick and tile works are a poorly documented but very early industry, dating back as far as the Romano-British period, having been introduced by the Romans. Transport in bulk of building materials such as bricks and tiles over long distances was rare before the age of canals, railways, roads and heavy goods vehicles. Before this time they were generally made as close as possible to their point of intended use. Bricks were often used even in areas where stone was available, for reasons of speed and economy. The buildings of the Industrial Revolution in Britain were largely constructed of brick and timber due to the unprecedented demand for rapidly and cheaply built accommodation for local workers. Although houses are now mainly built using a mixture of concrete blocks and other materials, many are skinned with a layer of bricks for aesthetic appeal. Clay is a

predominant geological mineral for most of north Yorkshire deriving mainly from the glacial dposits. As such clay exploitation in this area is relatively ubiquitous with transport costs dictating the approximate spacing between brick and tile works.

There are very few surviving remains of the many brick and tile works shown on the 1st edition OS map survey of 1857 in this area. Some remains can still be found at Tilery Farm, Throston (Figure 9.10). It is named 'Brick Garth' on the 1840 Tithe Survey suggesting that it was in operation from at least this period, but had gone out of use by the 2nd edition OS survey in 1898. Typical components of these works were rectangular tile kilns built of red bricks with fire brick floors and tunnel-vaulted roofs (Rowe 2000, 22).

Figure 9.10. Tilery Farm, Throston (© Tees Archaeology)

There are no active brick, tile or clay works in this area and survival of remains tends to be poor. Historical locations included Yarm, Stockton-on-Tees, Port Clarence, North Lackenby, Hart Warren, Middlesbrough, Eston, Preston Park, Egglescliffe, Lofthouse (now Loftus), Boulby, Goldsborough, Upgang and Scarborough. Clay works tended to be restricted to Billingham and South Stockton

Potteries

Clay was also a useful material for the local pottery industry. In 1825 William Smith opened his Stafford Pottery at South Stockton followed in 1860 by his brother James' factory at Stockton, called the North Shore Pottery. Other potteries included the Ainsworth's white and printed ware pottery of North Stockton and the Harwoods Norton Pottery which specialised in the so-called 'Sunderland Ware'**.** A pottery was also started by William Smith in 1880 at Cliff House, Hartlepool, but closed in 1897. Waste pieces from this pottery can still be found in quantity around the town. The quantity of waste was a real problem for most potteries and it was often given away for use as an aggregate. At the time the Cliff Factory closed it was said that the waster pile stood fifteen feet in height. A selection of some of the more decorative wares from this factory is on display at the Museum of Hartlepool (Rowe 2000, 37).

Historic potteries are recorded at Stockton-on-Tees and Hartlepool. Scarborough was also an important pottery-making centre in the Medieval period; kilns being situated along

Castle Road, where the natural glacial clay was particularly suitable for making pots. The distinctive Scarborough Ware was used extensively in the town and by most of the villages but was also traded abroad through the port. It has been discovered at archaeological excavations in Scandinavia and the Low Countries and pieces have even turned up in Iceland. After the Scarborough pottery industry ended in the fourteenth century, the townsfolk obtained their earthenware from potteries in Ryedale and around the Humber Basin. Much was imported from the North Sea, the Low Countries, Germany and even Spain (Scarborough Archaeological and Historical Society 2003, 44).

Mills

The economy of north east Yorkshire was mainly agricultural prior to the mid 1830s and milling was amongst the earliest industries in this area. Windmills, being conspicuous landscape features, could often be viewed from the rivers and coast and frequently served as navigation landmarks. Windmills are mentioned in Hart in 1314 and at Elwick in 1606. A disused windmill at Hart was one of the last to operate, closing in 1915. The remains of West Hartlepool Mills, which opened in 1847, can also still be seen, now converted into a bar and nightclub (Rowe 2000, 32). Watermills, although no longer operational, can be found along the many streams and rivers within this area, either as ruins or converted into dwellings. Streams and rivers had leats taken off them from at least medieval times to work the water mills used in grinding grain.

Figure 9.11. Greatham Mill (© Hartlepool Arts & Museum Service)

Historically mills were located at Hartlepool, Greatham (Figure 9.11), Thornaby, Billingham, Teesside (Normanby Wharf), Saltburn, Staithes, Skeleton, Stranton, Loftus, Whitby, Ruswarp, Stainacre, Hinderwell, Scalby Mills, Scarborough and Cayton Bay.

Lime Kilns

As well as being used for building stone, limestone was also burnt and mixed with sand to produce lime mortar. Lime burning kilns were in use from the medieval period and an example dating to the late 13th century was excavated at Hart in 1972-3. That kilns were

established in Hart in the medieval period suggests a very early date for the beginning of many of the quarries in this area. Individual kilns are shown on the 1st edition OS maps but it is likely that they soon went out of use with the boom of cement manufacture in the 1860s and the increased use of cheaper South American imported lime.

Lime kilns were commonly situated in the floor of the quarry itself, as can be seen at Hart and Dyke House. Other kilns were built at the cliff base, for example along the north sands of Hartlepool Headland. The kilns would have been loaded from the top and their location on quarry floors or cliff edges would have allowed the load to be dropped in from a higher point rather than being hoisted up. The kilns at Hartlepool headland probably exploited lime blasted directly from the cliff face (Rowe 2000, 24).

Limestones are absent between Redcar and Ravenscar – the lime kilns operating in these areas providing agicultural and constructional limes were opering with limestoines usually transported as ballast in returning ships from the south of England and often were colliers and alum ships (Pybus Pers Com).

Lime kilns have been recorded at Throston, Hartlepool, Middlesbrough, Ruswarp, Saltburn, Saltwick Bay, Skinningrove, Staithes, Runswick Bay, Upgang, Cloughton, Hawsker Bottoms, Burniston and Scalby.

Cement Works

Modern hydraulic cements began to be developed from the start of the Industrial Revolution, driven by three main needs: hydraulic renders for finishing brick buildings in wet climates, hydraulic mortars for masonry construction of harbour works etc, in contact with sea water, and the development of strong concretes. In Britain particularly, good quality building stone became ever more expensive during a period of rapid growth, and it became a common practice to construct prestige buildings from the new industrial bricks, and to finish them with a stucco to imitate stone. Hydraulic limes were favoured for this, but the need for a fast set time encouraged the development of new cements. The use of concrete in construction grew rapidly from 1850 onwards, and was soon the dominant use for cements.

In Hartlepool, the earliest cement works established was the Warren Cement Works set up in 1852. The company capitalised on the large amounts of chalk ballast dumped by colliers returning from the Thames estuary. This site was long-lived, eventually closing in 1939. The works have since been reclaimed and levelled as a sports pitch (Rowe 2000, 24).

In c1795 Parker patented his Roman Cement, so-called because of its superficial resemblance to the cement used by the Romans. It was a particularly fast setting hydraulic cement based upon the calcinations and crushing of limestone nodules found in the upper portion of the Jurassic shales and now know as "cement shales". Initially the nodules were a waste from the alum mining process but following the closure of the alum mines at Sandsend the cement industry there developed a simple mining process of adits in the backs of the alum quarries.

Cement works have been recorded at Preston-on-Tees, Throston, Hartlepool, Loftus and Sandsend.

Roperies

From the Medieval period, ropes were constructed in rope walks, very long buildings or yards where strands the full length of the rope were spread out and then twisted together to form the rope. Cable length was thus set by that of the walk; ropes over 300 yards long could be made, as short ropes had little value on tall ships which required ropes to be long, relatively uniform in diameter, and strong.

There is perhaps less evidence for rope making than one might expect in the major ship-building ports in this area. A ropery opened at Hart Warren, Throston in 1855 consisted of a linear rope walk with a turning house at the eastern end. This had developed into the 'Wire Rope Works' by 1897 when the walk was shown replaced with a linear building on the same site (Rowe 2000, 37). Rope making associated with Stockton's role as a shipbuilding centre was an industry of significance judging from the importing of 1,178 tons of hemp into the town in 1825.

There were also five roperies working at Whitby in the early 19th century, all on the fringes of the town because of the need for long straight alleys for the rope-walks. The two largest were on the east side, one on the cliff-top above Boulby Bank, 440 yards long, and one running parallel to Spital Beck (White 2004, 95) (Figure 9.12).

Figure 9.12. Spital Ropery, Whitby (© Whitby Museum)

Engine and Boiler Works

The development of ports and the coming of the railways led to an increased demand for ship and locomotive engines and other complex machinery. This was initially dealt with on a small scale by local ironworks and smithies but by the late 19th century separate engine works begin to emerge, for example William Grey's engine works at Central Dock, Hartlepool. This became known as the 'Central Marine Engine Works' and provided for the engineering needs of Grays Shipyards until 1961 (Rowe 2000, 21).

Historically engine works were located at Middleton, Middlesbrough and Stockton-on-Tees.

Sewage and Water Works

Components of the sub-type sewage and water works include:

- sewage treatment works;
- water treatment works;
- sewage pipelines;
- diffusers;
- outfalls;
- pumping stations;
- reservoirs.

Sewage outfalls and pipelines are located at North Sands (Hartlepool), Redcar Sands, Cornelian Bay, Cattersty Sands, Saltburn (Figure 9.13), Scalby Ness Sands. Pumping stations can be found at Killerby Cliff, Redcar, Bran Sands, Seaton Carew, Hartlepool, Scalby Mills and South Cliff (Scarborough).

Figure 9.13. Disused sewage pipeline on the foreshore at Saltburn

Sewage from residences, institutions, and commercial and industrial establishments is either treated close to where it is created (in septic tanks or onsite package plants and other aerobic treatment systems), or collected and transported via a network of pipes and pump stations to a municipal treatment plant. Their objective is to produce a waste suitable for discharge or reuse back into the environment.

Expansion of the towns and villages in this area during the 19th century also meant that water supplies needed to be rationalised. Previously water had been obtained from local wells and springs. Where wells and springs were too brackish, as at Hartlepool, water was transported from elsewhere by carts. Water works, including two water towers, were established at Hartlepool in the floor of Dyke House Quarry, where a number of wells were set up at existing spring heads. The only remains left of this site today, however, are the iron wave-effect railings (Rowe 2000, 30). Water works are also located at Ruswarp and Scarborough.

Reservoirs (20th century water bodies retained by built dams) are primarily located in uplands or in steep river valleys. They were mainly built in the second half of the century to ensure plentiful supply for domestic, agricultural (irrigation), and industrial use. The largest reservoirs within this pilot area can be found at Ruswarp by the River Esk (manily constructed to provide a head of water for Ruswarp Mill), Scaling Dam near Loftus and at Harlepool (Hart Reservoirs) by the River Tees. The reservoirs at Hart (Figure 9.14) were built in 1865 and survive in particularly good condition but only supply the Magnesia Works at North Sands (Rowe 2000, 30) but which has since closed. Other reservoirs include Lockwood Beck Reservoir and Randymere Reservoir. There are also many smaller, usually early 20th century reservoirs, not all of which, because of size, are able to be expressed in this HSC. Every alum works has a water supply network based on reservoirs and open or buried channels for the water to be routed to where it is needed. These supply networks are generally un-recognised.

Figure 9.14. Hart Reservoir, Hartlepool (© Tees Archaeology)

Some reservoirs are public amenities, generally built on land obtained by compulsory purchase and are very important as the most visible component of a major engineering feat of the 20th century, reflecting the sophistication, complexity and stability of a society that could bring piped water to virtually every household. Reservoirs are generally functional in design and components often include pumping stations, water treatment works, and associated workers cottages. Secondary uses of reservoirs include recreational activities such as sailing, fishing, or water skiing, such as at Scaling Dam.

Values and perceptions.

Processing areas, as places of work, are full of meaning. They are also regarded as functional, noisy, smelly and so detracting from the beauty of an area.

Sewage and water works are also functional and often smelly, accepted as essential public amenities. Opposition to new works and pipelines is increasing, for aesthetic, environmental and heritage reasons.

Reservoirs are highly valued by local populations who use them for leisure activities.

Research, amenity and education

Processing areas have plenty of potential for undertaking historical and archaeological research. Some features, such as mills and limekilns may be suitable for presentation – amenity value.

Historical research of reservoirs may throw light on the methods of selection of sites. Archaeological information can be gleaned from their shorelines and, with more sophisticated planning constraints, there will be greater opportunities to undertake detailed recording in advance of any future reservoirs. Although not directly related to the historical landscape, the amenity potential of reservoirs is great, not only for fishing and water sports but also as wildlife havens

Condition & forces for change

Historic windmills are being preserved for their historic value in some places. With increasing environmental concern, and approaching limits to fossil fuel consumption, wind power has regained interest as a renewable energy source but it is not feasible to reconstruct old fashioned windmills so this statement is irrelevant here.

Large reservoirs are carefully maintained and survive well but many smaller reservoirs are not so well tended and there is specific legislation to ensure risks to the public and workforce are minimised. The features they inundate, however, often do not. The reservoirs and ancillary features will be in good condition, being maintained, but other historical features will generally be in poor condition.

Rarity and vulnerability

Some processing areas may be nationally or regionally rare. But few if any will be protected.

Reservoirs are most important as an amenity and as a dramatic contributor to landscape character.

Recommendations

'All forms of leats, mill races and broader water management in the region require further research' (Petts and Gerrard 2006, 224). Numbers of unimproved mills are now very low; consider with care any further applications for conversion or improvement. The Windmill Hotel in Mill Street, Scarborough, stands as a splendid example of how redundant heritage buildings can be put to modern use without spoiling their appearance.

'This region's long tradition of metalworking, including iron and steel making, and non-ferrous manufacture also needs further research in order to gain a better understanding of these metalworking processes, in particular those carried out on domestic or craft scale' (Petts and Gerrard 2006, 224).

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9.1.5 Shipping Industry

Introduction: defining/distinguishing attributes and principal locations

The Type shipping industry includes the following sub-types:

- Dockyards;
- Shipyards;
- Boatyards.

Components of this Type include:

- docks (wet and dry):
- basins;
- wrecks;
- wharfs, quays, jetties and slipways;
- warehouses, offices, depots and travelling cranes;
- dockworkers cottages;
- associated transport systems (such as railways, roads, tramways).

Principal dock and basin locations today include Middlesbrough, Hartlepool, Haverton Hill, Teesside and Seaton Carew. There is a dry dock still in operation at Teesside. There is also a boatyard at Middleton, although this is generally used for boat storage and maintenance rather than shipbuilding.

Historically shipbuilding yards and dockyards were located at Scarborough, Whitby, Stockton-on-Tees, Thornaby-on-Tees, Middleton and Hartlepool.

Historical processes; components, features and variability

Evidence for prehistoric and early medieval vessels in the British Isles is sparse, due primarily to the perishable nature of the materials from which they were constructed. But it is probable that log boats (canoes made from hollowed out tree trunks) and skin boats were common, and were used in these periods, as ferries, fishing boats, trading vessels and even for war (Friel 2003, 22). A number of log boats have been found in the north east region, such as that found in 1926, dating from about 1,600 – 1,400 BC, located in mud under 8 feet (2.4m) of water opposite Thornaby High Wood (NMR site 26887).

Ships and boats made from wooden planks leave more archaeological remains, but few early medieval examples have been found in the British Isles. The most famous is undoubtedly the Sutton Hoo ship, discovered in an Anglo-Saxon burial mound near Woodbridge in Suffolk. Investigation has shown that it was double-ended and clinker built, the hull built up from a shell of overlapping planks, fastened at the edges by nails (Friel 2003, 24). 'Double-ended hulls, in which stem and stern resemble each other, were commonplace until the later medieval period. Old English (the language of the Anglo-Saxons) had over thirty different words for different types (or uses) of ships or boats, plus fifty more that may have been poetic in character' (Friel 2003, 24).

It is difficult to find evidence of established shipyards in medieval England. The location of shipbuilding sites seems to have been rather haphazard and the sites themselves were rudimentary, although it is known that ships were being built in simple docks by at least the 1330s. These were holes dug in the ground by a waterway, with the water kept out by an earthen dam. The ship was built inside. When completed, the dam was broken down and

the ship was floated out at high tide.

Accounts from between the late 13th and early 15th centuries make it clear that shipbuilding was still based on clinker construction. Seagoing ships of any size in Britain were clinker-built until the late 15th or early 16th century. The ancient double-ended hull form was widespread until the 14th century, when vessels that were asymmetrical, with stems and sterns of different shape, gradually supplanted it. This change appears to have followed the introduction of the stern rudder, which first appeared in the 12th century and eventually supplanted the side or quarter rudder and, more importantly, was probably better suited to deep-hulled merchant ships.

As well as shipwright and smith craftsmen, a number of other kinds of worker were also involved in shipbuilding. 'These included clenchers and holders, and from the 1340s there were caulkers, who filled the gaps between planks with waterproofing materials. In earlier periods this job seems to have been done by shipwrights and it is not clear why a separate trade should have emerged. However it was to remain a part of the shipbuilding trade for as long as wooden sea-going vessels were built' (Friel 2003, 77-78).

'During the Viking era there is very little evidence for specific types of ships used in England. In some areas local wooden shipbuilding traditions may have been completely replaced by Scandinavian ones. As late as the 1290s the technical terminology used by shipwrights in Newcastle and York had a distinctively Scandinavian flavour when compared with that used in East Anglia or further south. The basic type of Viking ship had a clinker-built, double-ended hull with a deep keel. It was steered by a rudder and carried a single square sail' (Friel 2003, 45).

Changes in European shipping during the 15th century owed much to the influence of the skeleton-built Portuguese caravels. Skeleton construction involved nailing hull planks to a pre-erected skeleton of strong frames; the planks did not overlap, but were laid against each other, giving the hull a smooth exterior.

'Other 15th century shipping changes included the introduction of two- and three-masted ships and a sharp decline in the numbers of large ships. The latter may have been due to the cessation of the Gascon wine trade while the export of cloth, England's other main sea trade, only required small vessels. Merchant ships of more than 100 tons were not common again in England until the late 16th century, when they were constructed for long-distance bulk trade and for war' (Friel 2003, 80-82).

Shipbuilding on the Tees dates back to the Medieval period, but it was in the second half of the 19th century that the industry first achieved a position of significance (Le Guillou 1975, 85). In 1837 the first ship was launched from Hartlepool. The original yard was at the headland and sections of each ship had to be transported across town, lifted over the town wall and assembled on Middleton Sands where a yard was eventually established. There were various other early 19th century shipbuilding businesses in Middleton, such as Bloomers Yard and John Winspear's Yard, and at Jackson and Swainson Dock. The 1860s saw the establishment of a shipyard at Hartlepool's West Harbour, known locally as 'the Harbour Yard' (Rowe 2000, 20).

In the 1870s, shipbuilding provided a market for manufactured iron and by 1883 promised 'to be one of the most prosperous trades in the district' (Le Guillou 1975, 85). At this time, between the Wear and Esk (which includes the ports of Sunderland, West Hartlepool, Stockton, Middlesbrough and Whitby) there were over 90 vessels in construction. The total tonnage built on the Tees remained between 40-50,000 tons annually, and when it is realised that 35 vessels went to make up the figure of 43,953 tons in 1896 it can be appreciated just how small the ships were. Conditions in the industry greatly improved at

the turn of the century when, once again, the trade press spoke of the prospects of the district depending largely on shipbuilding (Le Guillou 1975, 85-6). In 1920 work began on the construction of a new village and dock facility at Graythorpe, which ultimately took the work away from the existing yards at West Hartlepool and Middleton. The last ship to be built in Hartlepool was William Gray and Co.'s steel liner '*The Blanchland*' which left port in 1961 (Rowe 2000, 20).

Whitby also has a long history of shipbuilding. 'On the foreshore on both sides of the River Esk, and on staithes and mudflats from Dock End to Larpool, a steady stream of ships were built and launched from the 17th century onwards (Figure 9.15). Sizes varied from fishing vessels and trading sloops of 20-30 tons up to ship-rigged vessels of 500-600 tons, limited only by the width of the bridge which divided the harbour into two parts. In a peak year more than a dozen ships might be up on the stocks at the same time. In the 18th century a dry docks was built at Green Lane on the east side of the harbour' (White 2004, 95).

> *'At the entrance of a little nameless river, scarce indeed worth a name, stands Whitby, which, however, is an excellent harbour, and where they build very good ships for the coal trade, and many of them, too, which makes the town rich'*
>
> Defoe: 'A Tour through England and Wales' (1724).

'Probably the best known of Whitby's shipbuilders was Thomas Fishburn, who built the *Endeavour, Resolution* and *Adventure*, which were acquired by the British Admiralty and used by Captain Cook on his voyages of discovery. These were by no means exceptional vessels, but were chosen because they were of rugged construction, capable of being beached and relatively new. Cook himself was of course familiar with their qualities, having served his apprenticeship in Whitby vessels' (White 2004, 92).

Many were sturdy coal vessels in which Whitby specialised. 'They were 'coal cats' or 'collier brigs', bluff in the bow and flat in the floors for maximum capacity and designed to take the ground safely while unloading their cargos on exposed beaches. Others were timber ships, bringing back a cargo of shipbuilding timber and tar from the Baltic. As demands changed so did the ships. Whalers, specially strengthened for battles with Artic ice; privateers, armed against French and American ships; transports, built for maximum load capacity in the wars with France; convict ships, off to New South Wales, Van Diemen's Land and Norfolk Island; emigrant ships, with quarters for the hungry and penniless families leaving to start a new life in the colonies of Australia, New Zealand or Canada; all these had their turn and Whitby could build them all. When steam propulsion became established paddle steamers were added to the repertoire. The shipbuilding industry also made a successful transition to iron when that replaced wood and again when steel replaced iron' (White 2004, 89).

Figure 9.15. Barbara, Whitby (1860) (© Whitby Museum)

But Whitby's shipbuilding days eventually became numbered because of the size limitations placed on it by the bridge. A dramatic reduction in the number of shipyards took place in the 1830s with a downturn in trade and again in the 1860s when the market for wooden vessels dried up. Screw steamers were built in Whitby in 1864 and became the stock in trade of Turnbull's Yard until the last was launched in 1902. During the last few years of large shipbuilding several vessels in excess of 5,600 tons were launched at Whitby. Eventually large shipbuilding ceased altogether at Whitby because the County Council would not widen the bridge (White 2004, 89-90). Smaller shipbuilding continued until the 1980s before closing for a few years. One company has subsequently re-started small shipbuilding. There has been a continuity of coble building with one producer remaining (Pybus Pers Com).

As well as places to load and unload goods and supplies, docks are also areas where ship repair and maintenance take place. Wooden ships required frequent attention to the caulking between the planks, and, in the days before wire rigging, the heavy hemp rope needed regular adjustment and replacement. When ships were in harbour for any length of time it was usual to 'rig down' – to send down the topmasts and spars and to renew standing rigging. Dry docks are particularly suitable for the purpose of ship repair, as ships can be floated in on a high tide and propped. When the tide falls the dock gates can be closed and the ship left dry for work to be carried out on the hull. Winter was the usual time for such work, when much shipping was laid up and necessary repairs could be carried out. Constant wear and tear on wooden hulls meant a steady demand for dry dock facilities (White 2004, 96). Supplying the shipbuilding and repair industry was a large body of specialist producers - block, mast and pump makers, ships carpenters, riggers, rope and twine manufactures, sailcloth manufacturers, painters, sail-makers, and timber and raff merchants (White 2004, 94).

Shipping was important along the northeast coast of England in the medieval period when it supplied the domestic needs of villages, towns and abbeys with goods such as coal, fish and probably heavier goods that were difficult to bring by road. The development of the alum trade acted as a major spur to growth in the shipping industry (Frank 2002, 4). Alum

production required large quantities of fuel and every year vast fleets of colliers sailed from the Tyne and Wear to the Thames bearing the produce of the coalfields of Northumberland and County Durham. Much of this collier fleet was owned at Whitby and Scarborough. Whitby's share grew steadily throughout the 18th century due mainly to the fact that at high tide it possessed one of the best harbours of refuge on the East Coast. The emergence of Whitby as a highly skilled shipbuilding town was another factor which contributed to Whitby's dominance of the shipping industry in this area. Many of the builders were also owners, and the careers of many Whitby seamen led them into eventual ownership as well. In times of war Whitby ship owners found another valuable source of income by hiring out their vessels to the state or to serve as transport for troops and equipment (White 2004, 103).

In the 19th century steamships gradually replaced sailing ships for commercial shipping. This was a time of great industrial and economic development in north east England. Many new demands on transport were made, and these could be more readily met by steam-powered vessels, especially from the 1840s when iron hulls and the screw propeller were introduced. As numbers of routes and sailings across the North Sea increased, so too did the size of the ships and ports which served them. By 1914 ships had become larger, faster, more comfortable, and more efficient, using only a quarter of the fuel of a ship in the 1840s, and sailing more frequently and with more passengers and more cargo (Pearsall 1985, 200).

In the first decade of the 20th century 'one quarter of the global output of the shipbuilding industry was produced on the banks of the north east region's three principal rivers, the Tyne, Wear and Tees' (Hudson, 1989). World War One saw shipbuilding geared to building and repairing warships and merchantmen. Trade inevitably declined, however, as did demands for shipping services and new ships. The onset of rearmament before World War Two helped to revive the industry for a while, but the shipping and shipbuilding industries were severly damaged by bombing during the war itself. Many shipyards needed extensive overhauling, as did numerous ports and inland waterways, and merchant fleets suffered heavy losses. Reconstruction after World War Two fundamentally changed the traditional economic and transport patterns of the North Sea region. The transition from steam to motor propulsion, increasing competition and growing demands for efficiency, specialisation and cost reductions in North Sea trade were particularly noticable after 1945.

With a shortage of many of the essential raw materials required for shipbuilding, especially steel, very few new ships designed for North Sea trade were made in the early post-war years. Gradually the situation in the shipbuilding industry improved. Shipping of traditional North Sea cargos, such as coal, ores, fish and timber, resumed, although certain changes of a quantitative nature took place. Transport of coal declined due to a drastic fall in production; a consequence of increased domestic and industrial use of oil and gas. Expansion in the iron and metal industries, however, led to an increased demand for transport of aluminium and ferrous products. The fishing industry was modernised and made more efficient. In addition came the transport of general cargo and products like cars and agricultural machinery. Nevertheless, coal and timber remained the most important North Sea cargoes well into the 1950s.

During the 1950s, competitive problems in the shipbuilding industry were becoming evident in Britain and it was brought under state control. As a result shipbuilding industries in the north east contracted. Shipping became more specialised, demanding special types of ships, cargo handling, and regularity which only liners or long-term charters could offer. A tonnage limit was gradually imposed and in response to this *Paragraph* ships, which had specified tonnages but whose loading capacities were as great as possible, were introduced

in 1951 (Thowsen 1985, 247-55). This decline was further fuelled by competition from cheaper vessels built in German and Asian shipyards and, although dry-cargo ships, tankers and ferries still play a significant part in the shipping industry of north east England, few traces now remain of the shipbuilding industry that once thrived here (Thowsen 1985, 258). Six shipyards closed in the 1960s, including the William Grey at Hartlepool (1961) and five in the 1970s, including the Furness Yard at Haverton Hill near Stockton in 1979 (Figure 9.16). The regions last remaining shipyard closed in 1993.

Figure 9.16. Haverton Hill Shipyard (©Hartlepool Arts & Museum Service)

In November 2003, four redundant US Naval ships arrived in England without some of the permissions necessary for their dismantling, and were docked in Hartlepool. There was significant interest in their arrival from media and Non-governmental Organisations (NGOs). Friends of the Earth publicised the event, portraying the ships as placing the environment and public at risk and decisions made by a number of regulators were challenged in the Courts and the media. The Environment Agency imposed licence conditions to prevent their dismantling and to ensure that their presence does not cause pollution to the environment. Hartlepool Borough Council eventually rejected the application for dismantling here in October 2006.

Values and perceptions.

With very few surviving features from the once thriving shipbuilding yards, shipbuilding seems to be regarded as a 'lost' or 'forgotten' industry. Dockyards are still significant components of ports in this area and for many they are reminders of past employment and great days in North Yorkshire's history. In some cases docks are adopting new roles as recreational facilities such as marinas or as coastal and maritime heritage centres (eg Hartlepool's Historic Quay).

In view of its heavy involvement with shipping it is not surprising that this stretch of the northeast coast produced a number of important marine artists. One of the most notable family of painters was the Weatherhill family from Whitby. Henry Redmore of Hull (1820-

87) painted marine scenes along the East Coast including some very fine paintings of ships off Whitby. In later days the photographs of Frank Sutcliffe show the period of changeover from sail to steam, including many veterans of the age of sail. Carvings on the backs, seats and book-rests of the box pews in Whitby Parish Church also show over forty representations of ships, from small sloops to brigantines and steamships, serving to illustrate the range of shipping to be seen in Whitby in the 18th and 19th centuries. They also show the large part shipping played in Whitby's communal consciousness, since graffiti of other subjects in the parish church are few in comparison (White 2004, 109).

Research, amenity and education

Whereas coalmining has become the focus for community history, there has been less interest in the history and surviving remains of the region's shipyards (Petts and Gerrard 2006, 191).

Documentation of the shipbuilding industry in this area is relatively good, with many surviving historic maps, charts and photographs and numerous publications and TV documentaries having been produced on the industry. Further study of this industry is urgently required and this abundance of information will help inform it.

There are also depictions of boats aplenty in medieval art – on the Bayeux Tapestry, for example, and in stained glass and manuscript illuminations. The Bayeux Tapestry contains a particularly telling shipbuilding scene in which trees are felled and planks selected, the shipwright checks the lines of the ship by eye and other craftsmen set to work with axes and augers. Often, though, contemporary images of ships are hard to interpret. They can be out of scale and biased towards the depiction of planked ships. Contemporary documentary records of shipbuilding are also rare, with little written evidence for the construction of the bulk of the private merchant and fishing fleet. Archaeology is now therefore the main way we can build up an accurate picture of this most essential feature of medieval life (Milne, 2001).

Condition & forces for change

The Hartlepool shipbuilding industry no longer has surviving features on the ground. The docks where ships were once built have now become a marina, attracting small sailing vessels from all over the world. A funfair now stands where the shipyard used to be on the sands at the foot of the castle mound at Scarborough.

Rarity and vulnerability

The shipbuilding industry in this area was of national, indeed international importance, and the ships from the north east were integral to the international trade links of the British Empire and other globalising institutions (Petts and Gerrard 2006, 191).

Because the industry has now almost completely disappeared, any surviving elements are rare.

Recommendations

Further archaeological research into all surviving remains of shipbuilding in the north east is recommended. This should include not just a record of shipyards themselves, but associated industries and facilities, such as engine makers and design and testing facilities. There is still also a surviving, but inevitably diminishing, workforce who used to be directly involved in the ship-construction industry, and there is scope to combine research into the historic remains of shipbuilding with a detailed programme of oral history (Petts and

Gerrard 2006, 191).

Further study of the products of these shipyards is also required and may be facilitated by researching the many 19th and 20th century wrecks along the coast of this region. The research potential offered by the regular diving of well-preserved steel wrecks should be harnessed and 'the retrieval of artefacts from them better regulated and recorded' (Petts and Gerrard 2006, 191).

This region's distinctive ship types, such as cobles, smacks and colliers, should be further researched, using sources such as early pictures, graffiti and tombstones in addition to any archaeological remains that are found (Petts and Gerrard 2006, 201).

Further archaeological research into this type is recommended. Archaeological surveys have the potential to yield important information on above and below-ground archaeological features. The conservation of any remains recovered is also important. Additionally there is great potential for the presentation of the history of the shipping industry together with any surviving remains.

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9.2 Coastal infrastructure

9.2.1 Port

Introduction: defining/distinguishing attributes and principal locations

The Type Port includes the following sub-types:

- Port administration and regulation areas;
- Landing places;
- Piers;
- Quays;

Components of this Type include:

- landing stages, wharfs, jetties, pontoons, slipways, terminals;
- cargo-handling equipment, storage facilities;
- custom areas, quarantine areas;
- pilot stations, small craft facilities;
- wrecks;
- lighthouses, batteries;
- associated transport systems (such as railways, roads, tramways).

A port is a facility for receiving ships and transferring cargo to and from them. Some ports, such as Scarborough or Whitby, have facilities particularly suitable for landing and distributing fish. Often processing facilities will be located very close by. Harbour pilots, barges and tugboats are frequently used to safely manoeuvre large ships in tight quarters as they approach and leave ports. The presence of deep water in channels or berths, the provision of protection from the wind, waves and storm surges and access to intermodal transportation such as trains or trucks are critical to the functioning of ports.

Principal port locations within this study area today include Hartlepool, Tees, Whitby and Scarborough. Remains of specialised port facilities are also found at Skinningrove and Port Mulgrave.

The more modern ports are much more compact than the historical ports. The administrative area of Newcastle extended to include the port of Whitby. The port of Whitby extended from Saltburn to Peasholm (just north of Scarborough). The adjacent port of Scarborough was part of the port of Hull (Pybus Pers Com).

Historical processes; components, features and variability

'As settlement and centralized political control became more established in the 7th and 8th centuries, the first English towns began to appear, and a significant number of them were sea and river ports' (Friel 2003, 25). The growth of ports was not just occurring in England: ports, of course, had to trade with other ports in order to grow and this period is marked by the development of settlements on both sides of the North Sea and English Channel, with the Germanic word-element *wic,* meaning 'trading place', incorporated into their names (eg Runswick and Saltwick, as well as *Lundenwic (London), Eorforwic (York)*). On the other side of the sea these included *Sliaswich* (Schleswig, now in Germany), and Wijk-bii-Duurstede (at the mouth of the Rhine in Holland). All were either sited on navigable rivers or in good coastal harbours. A *wic* or *wyke* is also a place on the shoreline where a boat can be landed and there is a way up from the foreshore. However, not all port names incorporated the *wic* element and coin finds scattered around the coast suggest that trading

went on in all sorts of places (Friel 2003, 25-6).

'During the 8th century sea trade, and the prosperity that went with it, operated as a major engine of economic growth in England. The growth of ports was generally stimulated deliberately by local rulers and from the earliest times, it seems, government was involved in trade in some way. The link between trade and wealth underpinned its regulation and protection' (Friel 2003, 27).

Customs are the duties, tolls, or imposts imposed by the sovereign law of a country on imports or exports and are enforced by customs agencies, establishments, or procedures. The accounting entities of medieval English customs ports were based around a major head port and its creeks or lesser ports where trade revenue was collected. Custom ports' administrative authority often encompassed large areas, for example the customs port of Newcastle stretched as far as Whitby (Friel 2003, 71). By about 1000 the English government had developed a relatively complex list of harbour dues charged on merchandise reaching ports. Foreign merchants also paid dues according to where they came from (*ibid*).

Figure 9.17. Former custom house, Scarborough

Imposition of customs duties also gave rise to smuggling. The term itself is thought to have derived from either the early English word *smuckle* or the Scandinavian word *smuggla*, both of which mean 'to hide' or 'to creep'. Throughout the 18th and early 19th centuries this black economy flourished as a constituent part of everyday life along this part of the north east coast. Luxury goods which attracted high rates of duty, such as spirits, silks and tobacco, found a ready market in the local towns and ports. Smuggling activities were as individual as the ports and harbours in which they developed, dependent on trade patterns, coastal traffic and the areas they serviced (Smith 1994, 8). Cobles, the traditional fishing boats of the Yorkshire coast, were renowned for their use in smuggling. During the heyday of smuggling there were hundreds of cobles sailing the inshore waters from every port, harbour or bay and most were involved in the smuggling trade (Smith 1994, 37).

In 1729 a head customs officer from London wrote the following regarding smuggling along the north east coast:

'…the ports are prosperous, with well-tended quays and coal, fish and northern trade figuring large in the Revenue. At the coasts the allom business is very considerable and causes much trouble to the collector. The surveyor, Wm Selby is of good experience and makes much influence on the smuggling trade, which to all accounts in the port is increasing on the coasts…to the south is the most hazardous district, Robin Hood's Bay, where running of goods is commonplace, its people show a strong disregard for his Majesty's Revenue…and to the north, where there is a goodly trade in coal and stone and some frauds are committed. The Colltr has remarked on the number of foreign ships that use the coasts to unship cargoes…an armed cruiser would prevent such insults to the fair trade…' (Smith 1994, 37).

Quays or wharfs (structures built along or at an angle from the shore of navigable waters) were necessary components of ports that enabled ships to lie alongside them to receive and discharge cargo and passengers. Wharves along rivers were generally served by craft small enough to get through the bridge arches carrying coastal shipments or cargos off-loaded from bigger ships. 'Creeping waterfronts' often formed, as silt and rubbish build up against the waterfront and it became difficult for larger vessels to tie up, so that a new quay had to be built further out into the water in order to provide sufficient depth of water.

The names of some of the quays and wharfs, such as Fish Wharf, advertised some of the commodities that passed through them. Medieval cargo-handling in most ports was rudimentary. Most unloading was probably handled using blocks and tackles attached to a ship's yardarm, or by porters (the forerunners of dockers) tramping up and down gangways. It is apparent that most medieval ports were little more than creeks, too small and too poor to be able to afford or need harbour facilities. If ports could grow, they could also decline. Sometimes physical factors were the cause, such as silting up of estuaries, storms and flood damage. Some ports were destroyed by wars, raiding, and abandonment (Friel 2003, 70-71).

Piers also form essential components of ports, for use as landing places, promenades or to protect or form a harbour. Piers range in size and complexity from a simple lightweight wooden structure to major structures extended over a mile out to sea. Lightweight piers are supported by widely spread piles or pillars allow tides and currents to flow almost unhindered, whereas the more solid foundations of a quay or the closely-spaced piles of a wharf can act as breakwaters, and are consequently more liable to silting. The term pier is principally associated with the image of a Victorian cast iron pleasure pier but many also function as port landing places and as harbour breakwaters.

In the 11th and 12th centuries, vessels of small enough draught could go to the ports of Coatham, Billingham or Portrack - 'the harbour of trading vessels' (Le Guillou 1975, 2). Yarm had become the principal port of the Tees by the 12th century. In 1400 a bridge was built there and remained the lowest crossing point for next 400 years (Le Guillou 1975, 2-3). 'By the mid-17th century Stockton had become the most important port, surpassing Yarm and even Hartlepool, with the Customs House being moved there from Hartlepool. Access to agricultural and industrial (especially Dales' lead) hinterlands gave it an advantage over other coastal ports. The principal trade was English coasting which continued throughout first quarter of the 18th century, but there was also growing importance as a port for foreign trade with Baltic and Low Countries. By the mid-18th century Stockton was firmly established as the leading port of the north-east after Hull but was already beginning to feel the adverse affects of the river's shortcomings, in particular the problems

of navigation. Dales' lead was again being directed toward York and Hull and products from Lake District counties were going to Newcastle for shipment' (Le Guillou 1975, 6-9). There were a number of smaller ports that were also used such as Coatham, Dabholme, Cargo Fleet (Caldecoates), Portrack, Newport and Billingham. As many of the larger ships could not get up the river goods were transferred to smaller ships at these ports.

The port at Hartlepool (Figure 9.18) has been important since the medieval period, when the Bishop of Durham used it to import his supplies of food and wine. But the harbour fell into serious disrepair and silted up, even having crops grown on it. Its importance as a port increased again with the Industrial Revolution at the end of the 18th century, when there was an increased demand for coal. There were collieries a few kilometres inland from Hartlepool and the coal had to be carried from the collieries to ships at Stockton-on-Tees, and then taken to London. In 1833 a railway was constructed at Port Clarence, to the south of Hartlepool. This enabled coal to be transported more easily to Hartlepool and a new harbour was soon built, opening in 1835. By 1850 there were eighteen collieries shipping coal from Hartlepool. The channel into the harbour had a tendency to silt up, however, and so many improvements such as dredging and repairs to the piers were required over the years. In 1862 the port at Hartlepool was ranked as England's fourth largest port, after London, Liverpool and Hull (Rowe 2000, 10).

Figure 9.18. Hartlepool Harbour and Docks (1960) (©Hartlepool Arts & Museum Service)

The harbour at Whitby naturally divides into an upper and a lower half. The upper harbour was used as a safer anchorage in storms, for laying up ships over winter and for shipbuilding. The lower harbour (Figure 9.19) was not a safe mooring before the present piers were completed because of the deep swell that could enter the harbour. In good weather much shipping would lie off Whitby Roads, the area to the west of the harbour mouth, waiting for the tide. Especially deep-laden vessels could also lie here awaiting unloading into lighters. Nevertheless the lower harbour was satisfactory in good weather and was used by many fishing boats. In the upper harbour two large mud banks, High and

Low Bell, were exposed at half ebb. However, recent changes in the harbour and the building of new wharves have rearranged the channel of the Esk and moved the mud banks around. A considerable tract of land has been recovered from the harbour over the last two centuries and buildings and car parks now cover the former Walker and Langborne Sands at the end of Bagdale, where shipbuilders once worked. Fish were generally landed from fishing boats onto various staithes rather than quays. Whitby Stone Company had a wharf near Bog Hall for the convenience of loading its heavy cargos and there was some quayage on the east bank of the river above the bridge, but otherwise Whitby's shipping acted as a carrier between other ports, putting in at Whitby only for repairs or laying up. A succession of piers have been built here since the 16th century as an attempt to protect the harbour from north-westerly gales, to reduce swell and to prevent the blockage of the river mouth by the longshore drift of sand. Even today, however, the harbour needs constant dredging to maintain the deep water channel (White 1993, 46).

Figure 9.19. Whitby Harbour (© Dave Hooley)

One of the main components of the development of shipping and shipbuilding at Whitby is the administrative boundaries that run along the middle of the river; the west side of Whitby is actually in the township of Ruswarp, while much of the eastern side is in the township of Whitby and under a much more restrictive regime initially regulated by the abbey and after the Reformation by the lord of the manor. The burgess pier (on the east side of Whitby) was constructed in medieval times but the burgesses were constrained by the abbot and never flourished. Latterly the lord of the manor imposed higher shipbuilding and port dues and hence much of the development of the port of Whitby was not in Whitby in what is now known as the west side of Whitby where dues were significantly lower or absent. The acts of parliament for the construction of piers at Whitby are more numerous than those of Scarborough and give valuable insights into the development of the port (Pybus Pers Com).

The history of Scarborough's harbour can be traced back to at least medieval times, and is 'a history of an almost constant struggle to improve and maintain the quays and piers, which are vulnerable to attack by sea and to decay' (Waters 2005, 28). Henry III granted

Scarborough the right to construct a new port 'with timber and stone' in 1252 (*ibid*). Ships could then safely sail in and out at both low and high water. The harbour was paid for by tolls, or quayage, imposed upon both sea-borne trade and fishing. The once flourishing import and export trade at Scarborough saw groceries coming from London and coal from Newcastle, while ships from the Baltic brought timber and cloth. Wines and spirits arrived from other continental ports. Some of Scarborough's chief exports included farm produce and salted fish (*ibid*).

Recent excavations at Scarborough have uncovered evidence of the medieval harbour area. Domestic refuse was deliberately dumped to consolidate land behind the quay. This helped support the quay wall, protecting Scarborough's early waterfront from the North Sea tides, and allowed land to be gradually reclaimed from the sea's grasp for building. Mooring rings have also been found in the basements of properties along Quay Street, suggesting the location of an earlier harbour. The Old Pier was rebuilt in 1565 but very little was improved in the harbour until the 1700s, when Acts of Parliament paved the way for major construction. Today, although Scarborough still functions as a fishing port, boats also provide sightseeing trips for visitors and locals (Figure 9.20) and leisure boats moor in the basin between East Pier and Vincent's Pier. If ships need repairing, the dry dock grid, visible at low tide and located on the inside wall of Vincent's Pier, allows ships to rest out of water and undergo maintenance (Scarborough Archaeological and Historical Society 2003, 21).

Figure 9.20. Old Harbour, Scarborough

Today these ports are still important elements of the UK economy and form the focus for many of the major shipping routes of the North Sea. In 2000, Tees and Hartlepool was the largest port in the North East region and the second largest in the UK. The Tees and Hartlepool port authority includes the ports of Middlesbrough, Billingham, Redcar and Hartlepool and is responsible for handling 11.7% of the UK's foreign and domestic oil and gas traffic and 6.8% of the UK's non-oil traffic. The large amount of foreign and domestic traffic handled by Tees and Hartlepool port and the regular ferry services from the port of Tyne, ensure that the density of ships in and around these ports is significant (currently 5,000-20,000 ships per annum) (DTI, 2002).

Surviving historical remains will include ruined quays, wharfs, jetties, mooring rings, chain and rope-worn bollards, batteries, lighthouses, rotting hulks of wrecked or abandoned boats, old customs houses, and former waterfronts.

Values and perceptions.

Ports are appreciated by both visitors and locals alike. Although some of these ports are now used by pleasure boats and just a few fishermen, people can easily imagine ranks of large sailing boats moored to the piers and quays at ports like Scarborough and fleets of fishing boats filing out of Whitby. Hartlepool and Tees are still valued as active ports and are fundamental to the employment of many people living in the area.

Smuggling is perceived as an exciting and romantic aspect of the history of this coast, with its suggestion of hidden contraband, secrecy, and suspicion, although the reality of the risks and unpleasant penalties were often far from it.

Research, amenity and education

Generally document-based histories of ports and harbours are plentiful, as well as work on coastal wrecks, but there is still much that can be learnt from the further study of harbours and their material remains, both extant and ruined. Specifically much needs to be done on the ports of this study area. Knowledge of levels of investment into structures, together with their capacity, mode of use, etc, can inform maritime histories. The potential for using visits to harbours to illustrate local history courses in schools and in further education is as great as the potential they have to inspire historians and writers.

Condition & forces for change

Many of the ports along this stretch of coast are still in use and have long, complex histories, often having been built up and modified over many centuries. A few are now abandoned and ruinous, serving as a reminder of some of the once thriving industries in these parts. Others may survive inland from the existing wharves.

Forces for change include neglect and reuse for other activities (eg marinas).

Rarity and vulnerability

Many of the features associated with the alum, coal, jet, ironstone, shipbuilding industries will be particular to this stretch of coast and therefore nationally rare. Some of the historic structures are protected as Listed Buildings.

Recommendations

Sustainable uses should be found for any surviving structures; reuse should incorporate as much of extant structures as possible. Abandoned and ruinous historic features should be taken into consideration during any proposed development. If necessary and where sustainable, resources should be put to the consolidation of important remains that are vulnerable to damage from natural weathering.

The recently published Marine Bill White Paper: A Sea of Change (March 2007) highlights that the current approach to authorising marine works in or near port or harbour areas 'is complicated and often archaic – some of the legislation dates back two centuries or more' (DEFRA March 2007, 59). It recommends that wherever possible a straightforward and consistent system of regulation applies in future. 'Antiquated rules and complicated

provisions are particularly prevalent in local harbour acts and it is important that local navigational provisions should meet modern regulatory standards' (*ibid*). Out of date local rules need to be modernised to also include operations outside harbour areas as well as works within them where they are all part of the port infrastructure or operations. This will 'reduce the overlap of harbours and environmental legislation and the duplication of licensing….Where local powers to control the environmental or navigational impacts of works in a port or harbour are in place and effective, they should not be changed' (*ibid*).

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9.2.2 Sea Defences

Introduction: defining/distinguishing attributes and principal locations

The Type Sea Defences includes the following sub-types:

- Breakwaters;
- Groynes;
- Sea walls;

Components of this Type can include:

- lighthouses, lights, lifeboat stations;
- mooring posts and rings, bollards, ladders;
- military defences (such as pillboxes, batteries, gun emplacements);
- fishermen's huts.

A sea defence can be defined as a structure protecting a harbour or beach from the destructive force of sea waves and from flooding. They are in place in some form or another at almost all the coastal settlements and other vulnerable areas along this stretch of coast.

Historical processes; components, features and variability

Coastal management or coastal defence is used throughout the world for many different purposes, but predominantly to reduce coastal erosion and flooding. There are many techniques of coastal management including 'hard' and 'soft' construction and planning approaches. Hard construction is the more traditional response to erosion and involves the construction of structures which stop wave energy reaching the shore, or absorb and reflect the energy. These have often caused problems themselves, such as increasing erosion elsewhere, and soft construction techniques have become more popular because of this. These techniques involve promoting natural systems such as beaches and salt marshes which protect the coast, and are usually cheaper to construct and maintain than hard construction techniques, and may be self-sustaining.

Breakwaters usually consist of large rocks piled or placed at the foot of cliffs, often supplementing native stones of the beach. They absorb wave energy and hold beach material but tend to be unpopular as they are unsightly. Longshore drift is not hindered, they have a limited lifespan and are not effective in storm conditions. They also reduce the recreational value of a beach. Boulders and rocks can also be wired into mesh cages (gabions) sometimes at cliffs edges or protruding at a right angle to the beach like a large groyne. When the seawater breaks on the gabion, the water drains through leaving sediment; also the rocks and boulders absorb a moderate amount of the wave energy. In some cases enormous concrete blocks and natural boulders are sunk offshore to alter wave direction and to reduce the energy of waves and tides. The waves break further offshore and therefore reduce their erosive power.

The most significant breakwater in this study area is the South Gare Breakwater, which extends outwards from Tees Mouth. This was opened in 1888, its construction prompted by the wrecking of over 60 ships near the mouth of the River Tees. The purpose being 'improving and protecting the navigation of the River Tees, and affording shelter and refuge to shipping of the north-east coast' (Le Guillou 1975, 47). A tramway was used to bring in nearly 5 million tonnes of slag from the local steelworks for its construction. It was 2.5 miles long and took 25 years to build (*ibid*). At the opening of the South Gare a

time capsule was placed inside the foundation stone and contains copies of local newspapers for that day and a scroll with the names of all the Tees Commissioners. Other breakwaters can be seen at Whitby, Robin Hood's Bay, Staithes, and the Heugh at Hartlepool. Boulder breakwaters are in place at Scarborough (providing additional defence for East Pier as well as all around the headland and Marine Drive to North Bay) (Figure 9.21).

Figure 9.21. Breakwater at Scarborough

Groynes are wooden, concrete and/or rock barriers or walls at right angles to the sea. Beach material builds up on the updrift side, where littoral drift is predominantly in one direction, creating a wider and a more plentiful beach, therefore enhancing the protection for the coast because the sand material filters and absorbs the wave energy. However, there is a corresponding loss of beach material on the downdrift side, requiring that another groyne be built there. Moreover, groynes do not protect the beach against storm-driven waves and if placed too close together will create currents, which will carry sand material offshore. Groynes are extremely cost-effective coastal defence measures, requiring little maintenance, and are one of the most common coastal defence structures. Groynes are increasingly viewed as detrimental to the aesthetics of the coastline, and face strong opposition in many coastal communities however the converse is true in this region with popular opinion much in favour of them. Groynes are the most dominant form of sea defence at Marske Sands (Figure 9.22) and Redcar Sands. One is also in place on Black Rocks in Scarborough's South Bay. Relic groynes can be found at Sandsend while the ones at Whitby have been removed.

Figure 9.22. Groynes at Marske Sands

Sea walls, usually of concrete and/or stone, tend to be built at the base of a cliff or beach, or used to protect a settlement from eroding. Seawalls aim to resist and reflect the energy of the waves back out to sea, and for this purpose are often curved which also deflects sediment, and adds greatly to the power of backwash. As a result, the same result will happen akin to those of destructive waves. Furthermore, sometimes the reflected wave or energy helps the rapid depletion of the attached beach. In some cases, sea walls have caused the loss of so much beach material that the base of the sea wall has been exposed and undermined. Sea walls are the most traditional methods used in coastal management within this area and good examples can be found along the Heugh headland at Hartlepool, Runswick Bay, Sandsend (Figure 9.23), Whitby and at Robin Hood's Bay.

Figure 9.23. Sea wall defence at Sandsend (© Whitby Museum)

Values and perceptions.

Sea defences are most often seen as essential for the preservation of the settelments along this inhospitable North Sea coast, and for the safety of the people who live in them. Some of the more recent sea defences are viewed by some to have had a detrimental effect on the picturesque character of some of the smaller fishing villages in the area.

Research, amenity and education

Sea defence has been undertaken in England for many centuries and as such some early coastal defence systems the focus of historical and archaeological interest (Fulford *et al* 1997, 190).

Condition & forces for change

The main forces for change are the unending battle with the sea, exacerbated by the effects of the climate change (more storms and rising sea-levels). Sea defence policy is also a major force for change and changes in such policy have produced significant alterations in the types and locations of the sea defences being implemented, particularly arising from the recognition of the need for sustainability (Dave Hooley Pers Com).

With coastal erosion threatening seaside communities, natural habitats, historic environments and Britain's future development opportunities, coastal defence is now high on the agenda. In response to this Defra have made significant progress in understanding and mapping coastal processes through the development of Shoreline Management Plans (SMPs). These provide a large-scale assessment of the risks associated with coastal processes and present a long term policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner.

In addition the current Environment Agency policy on sea defences involves strategic planning to make decisions about maintaining and building new flood defences, as well as raising public awareness of people living in vulnerable areas. They also advise local, regional and central government on the building of sea defences and the impacts they will have on the environment.

Archaeological remains can be affected by construction and maintenance operations, as well as by the indirect impact of the defences. In Hartlepool Bay patterns of sand movement and accumulation have changed in recent years with the growing extent of the sea defences so that now there are substantial depths of modern beach sand covering the underlying deposits of peat and clay, which formerly were exposed from time to time (Waughman 2005, 42).

Rarity and vulnerability

Not rare and therefore not designated, but often vulnerable.

Recommendations

Many operating authorities have adopted the Shoreline Management Plans (SMPs) recommendations as a basis for production of individual strategic plans, monitoring programs and studies for all or part of their coastline. These first generation SMPs are now due for review to ensure full account is taken of latest information and future challenges.

Consider aesthetics and historic character, as well as the effect they are likely to have on

archaeological remains, when developing future sea defences.

Managed retreat is one favourable action which may counter the effect of sea defences on archaeological remains. The benefits of managed retreat include the re-submergence of deposits which were formally periodically wet, providing an enhanced environment for preservation of fragile, organic material, and increased deposition of material on the surface of sites, providing protection against mechanical weathering (Fulford *et al* 1997, 192*)*.

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9.3 Fishing and Mariculture

9.3.1 Fishery

Introduction: defining/distinguishing attributes and principal locations

The Type Fishery includes the following sub-types:

- Seining;
- Netting and Lining;
- Beam Trawling;
- Shellfishing;
- Hazardous Fishing Grounds.

Sea fishing is both an ancient and unique activity. Though defying classification either as industry, agriculture or transport, it exhibits characteristics of all three (Starkey *et al*, 2000; 9). Historically, of the huge variety of fish populating northern seas, two species – cod and herring – and their close relations, figured heavily in north-west European fisheries. Herring and related types are 'pelagic', and mainly caught in the upper layers of the sea. Such fish are normally taken during their spawning season, when they shoal in great numbers on breeding grounds. In contrast, cod, like haddock, hake, whiting, and many flat fish species mainly live on or near the seabed. Such 'demersal' fish are caught most of the year round.

Pelagic and demersal fisheries have each evolved distinctive characteristics. Herring, for example, were normally taken by drift netting, in which curtains of nets trap fish by the gills as their shoals swim through, or in purse shaped nets called seines. Baited hooks on hand or long lines have, until comparatively recently, been the most important means of taking demersal species, although stationary nets on the sea bed have sometimes been used. Later, these techniques lost ground to various forms of trawling in which bag-shaped nets were dragged along the sea floor (Starkey *et al* 2000, 10).

Pelagic fisheries, such as Herring, tend to be located off the east coast and demersal fisheries, such as Cod and Haddock, are located further offshore around the Dogger Bank (Starkey *et al*, 2000; 19). Historically, however, every part of the North Sea can be considered a fishery, or having been fished in one way or another, from at least the medieval period, if not before. The early fisheries tended to be inshore, farmed by small craft staying out for short periods. However offshore fisheries were also farmed but it was not until the improvement of fish curing techniques in the medieval period and the age of steam, in the 19th century, that extensive and intensive fishing took place.

Today the main North Sea demersal fisheries target a mixture of roundfish species (cod, haddock, and whiting) or flatfish species (plaice and sole). Pelagic fisheries mainly target herring and mackerel. These are all predominantly for human consumption, although a proportion of the pelagic fisheries are used for fishmeal and fish oil production. There are also industrial fisheries for sandeel, Norway pout and sprat which are used in the production of fishmeal. Besides these finfish fisheries there are also fisheries for the crustaceans *Nephrops*, *Panadalus borealis* and brown shrimp. Norway, Denmark, UK and The Netherlands are the major North Sea fishing nations.

Historical processes; components, features and variability

Without doubt fishing has been an integral part of human activity since prehistory. Little direct evidence is known about prehistoric fishing activity or techniques in the area. However Mesolithic archaeological sites discovered in Danish coastal waters provide a useful analogy. Most known sites are submerged settlements and almost every one had one or more fish weirs associated with it. The largest recorded is perpendicular to the former shore at the small island of Nekselø. Extending over a distance of 250m, it consists of vertical poles up to 150mm wide to which up to 4m high wickerwork panels were tied. The panels were made of perfectly straight sticks of coppiced hazel (Fischer 2004, 27).

Medieval fishing and fisheries

By 1300 AD England's east coast fisheries were a complex, highly regulated and widely dispersed industry the scale of which was immense by medieval standards. They were of international importance, supplying not only local demand but also supporting a major export trade. The main fishing centres were generally distinct from the main trading ports. In Yorkshire, Hull was the principal trading port while Scarborough led in fishing. A wide variety of species was caught, including ling, whiting, haddock, plaice, thornbacks, skate, hake, mackerel, dogfish and pollack. However the main fishing trade concentrated on herring and cod; the former proliferated off the east coast and the latter were known to congregate about Dogger Bank (Starkey *et al* 2000, 19).

The North Sea, Norwegian coast, and Baltic were all known to English fishermen by the early 14th century, and Iceland became familiar at the beginning of the 15th century. However it is probable that inshore fishing grounds were the most frequently exploited at this time. Herring contracts of the time generally refer to unloading fish after fishing for one or two nights, but only rarely after three. Common practice was to land catches quickly at seasonal stations for immediate salting and barrelling. By the 15th century there was a trend away from inshore to distant-water fishing as a result of the improved curing techniques that allowed vessels to stay at sea longer and so venture further. England and Wales were integrated into a network of European trade routes stretching from the Baltic to the Mediterranean, within which fish was an important commodity *(ibid* 2000, 20).

More is known about fishing seasons than about precise grounds. Records of fishing tithes for Scarborough indicate that they were paid according to the type of vessel used, the species of fish caught, or area worked. They reveal an all year round business. In winter, 'deep sea' herring were sought, as were inshore species from boats and cobles, and lobster, which were taken in Lent and summer. By the summer, skate, cod, and coastal herring fishing took place, the latter beginning in late summer and extending through autumn Herring and cod fairs took place during the autumn, the busiest at Scarborough and Great Yarmouth. Scarborough Fair lasted 98 days, from 24 June to 29 September (*ibid* 2000, 19).

In the early 14th century hundreds of ships are recorded as landing herring at Scarborough during each year's season. Individual cargoes were modest, usually 0.5 to 1.5 lasts – 5,000 to 15,000 fish – worth between 10s and 60s. In Scarborough's peak year 1304-5, 237 foreign landings brought 355 lasts of herrings – 810 tonnes or 3,550,000 fish – worth £444. In 1321, at the height of herring season from June to October , around 630 ships paid quayage dues, at least half of which, and possibly two thirds 315-420 – were English. The English boats came from all over – the majority from Lincolnshire, East Anglia and Kent, but others came from as far away as Devon and Cornwall. Many foreign vessels also fished, Flemish and French in particular. Dutch boats are recorded as having landed salt, herring and other fish at Hartlepool between 1326 and 1333 and between 1303 and 1311, foreign fishermen landed an average of 21 lasts of herring a year at Whitby, worth £44

(*ibid*, 20-21).

Whitby was described as 'a great fischer Toune' when Leland visited it in 1536 (Frank 2002, 2). According to Burghley, writing in the 1570s, the east coast was fished by the Dutch and French. English and Dutch rights to fish anywhere and use each others ports had been agreed by Elizabeth I in 1596, though the outcome was the Dutch take-over of the English coastline (Starkey *et al* 2000, 35).

The English fishery was waning by the early 17th century as a result of competition from foreign vessels, especially the Dutch herring fleets. In 1609 foreigners were prohibited from fishing in all the fisheries off the coasts of Britain and Ireland, unless they bought licences: the seas were no longer free (*ibid* 2000, 49).

Figure 9.24. Old fishing boat etching, Hartlepool (1702) (©Hartlepool Arts & Museum Service)

The Herring Fisheries, 1750-1970s

The most important herring grounds were in the North Sea where fishermen followed the shoals down the east coast, starting at the Shetlands in late winter and ending in the waters off East Anglia in the following autumn. The autumn fishery off Yarmouth, which lasted until St Andrew's Day (30 November), was the culmination of this great annual migration of ships and men, attracting 'all the herring-fishermen of England', including those of 'the North-counties beyond Scarborough' who came in poor 'little boats, called Five-men cobbles' (Frank 2002, 132). The Dutch possessed Europe's largest commercial herring fisheries from the 17th century to mid-18th century although during the 19th century the Scottish herring fishery rose to pre-eminence.

Around the 1830s, there was a resurgence in the Yorkshire coastal fisheries. In 1834, Whitby harbour was said to be busier than ever, with boats visiting from as far afield as Cromer, Hastings and Yarmouth. By the 1836 season, some 400 vessels were reported to be engaged in the Yorkshire herring industry.

'In the 19th century Staithes yawls ventured as far north as Aberdeen and vessels from Scarborough and Filey continued fishing down to Yarmouth. Off the Yorkshire coast the main herring season was in August and September, harvest months in the agricultural calendar. By the 1870s Yorkshire harbours were packed in the late summer months with vessels come to share in the herring harvest. Zulus and fifies from the Moray Firth lay alongside stately East Anglians, together with boats from Cornwall's Mount's Bay and from the Isle of Man, and the local fleets too. By 1880 more than two hundred boats were fishing for herring off Whitby; and in 1885 it was reported that over 80 boats came from Cornwall alone, their home ports being mainly Penzance, Mousehole, Fowey, St Ives and Newlyn (Figure 9.25). A few fished the off-ground with the bigger Staithes yawls, venturing as far as 60 miles from land, but usually the fishing ground was three to seven miles off Whitby.' (Frank 2002, 133).

In late mid–late 18th century the government, concerned at the state of the English fishery took measures to support and improve it, giving money inducements to craft that could rival the Dutch. By c1800 80 vessels based themselves at Great Yarmouth and Lowestoft (down from 205 in 1760), measuring between 45 and 50 tons, and half of them had sailed from bases in Yorkshire (Starkey *et al* 2000, 64).

Figure 9.25. Cornish herring boats at Whitby (© Whitby Museum)

'The demise of the herring fishery at Whitby has been, by some, attributed to a series of poor seasons … however a more likely reason was the state of the harbour. Principal complaint was the insufficiency of water in the harbour at ordinary times for the accommodation of such boats as hail from Yarmouth, Lowestoft and Penzance … thus cargoes off load at Hartlepool or Scarborough' (Frank 2002, 147). By August 1885, 91 fewer fishing boats used the port than in the same month the previous year. Scarborough maintained its primacy as the chief Yorkshire herring port up to the outbreak of war in 1914. Between the wars, herring fishing on any scale virtually disappeared at Whitby, and was at a low ebb all along the Yorkshire coast. There was a boom again in the 1940s and 1950s as Scottish boats fished off Yorkshire but this was short-lived (Frank 2002, 147-9). The change to round-the-year trawling and seine-netting contributed to the serious depletion of herring stocks in the North Sea (Frank 2002, 88).

The Line and Trawl Fisheries in the Age of Sail

On the Yorkshire coast, Scarborough, Staithes, Robin Hood's Bay, Flamborough and Runswick deployed fleets of three-masted luggers, each over 50ft in length, which were fitted out to follow the great-line fishery for cod and ling off the Dogger Bank. Voyages typically lasted from Monday to Friday. A proportion of the catch was then dry salted on the shore, and later sold for consumption, much going to inland towns and cities, supplying York, Leeds, Bradford, Halifax, Thirsk and Malton. By the 1780s, Manchester was receiving supplies, and some even went as far as Liverpool. Exports provided a further valuable outlet. Some went to the West Indies and Ireland, but the major markets were in northern Spain and the Mediterranean. Towns such as Bilbao, Santander, La Coruña and San Sebastian were important to the Yorkshire trade in 1820.

In 1817 Staithes was by far the biggest fishing station on the Yorkshire coast. Out of 28 five-men boats, 14 belonged to Staithes, six to Runswick, five to Robin Hood's Bay and three to Scarborough. At the same time, there were between 250-300 smaller cobles (Figure 9.26), of which 70 belonged to Staithes, 35 to Runswick and 35 to Robin Hood's Bay. Ord writing in 1846 notes 'The fishery of Staithes – especially in cod, haddocks and herring – is very important, being the main branch of commerce and chief support of the place (Frank 2002, 18).

Figure 9.26. Whitby sailing coble (Lily WY185) (© Whitby Museum)

The changes that transformed the offshore fishing industry between the 1840s and 1870s were revolutionary. Yorkshire coast ports enjoyed a considerable expansion of inshore fishing and also of increased offshore line fisheries. The two most notable areas of expansion were the herring and trawl fisheries. (Starkey *et al* 2000, 94). The key factor was the construction of the railway network, which radically transformed markets and distributions. The demand for fresh food had been growing since the early 18th century. The Stockton-Darlington railway line was extended to Middlesbrough in 1830, and the isolated Whitby to Pickering railway was fully operational by 1836. Many of the fishing communities from Whitby southwards were linked to the network by 1845.

Long-lining and netting

In long-line fishing a number of strings, each consisting of a main line (Figure 9.27) with baited hooks on branch lines called snoods are connected end to end and placed on or just off the seabed with an anchor and marker buoy at each end. Vessels engaged in this fishery are typically small inshore vessels, 10m or less, generally operating on grounds near their home port.

Figure 9.27. A fisherwoman fetching in the lines at Whitby (© Sutcliffe Gallery (www.sutcliffe-gallery.co.uk))

Netting is predominantly carried out in two ways, using set nets and seine nets. Set nets are walls of netting up to 3m high and 70m long used singly or as a series joined end to end moored on the sea bottom. Fish are caught either by gilling or entanglement. As with long-lining, netting is confined for the most part to inshore vessels.

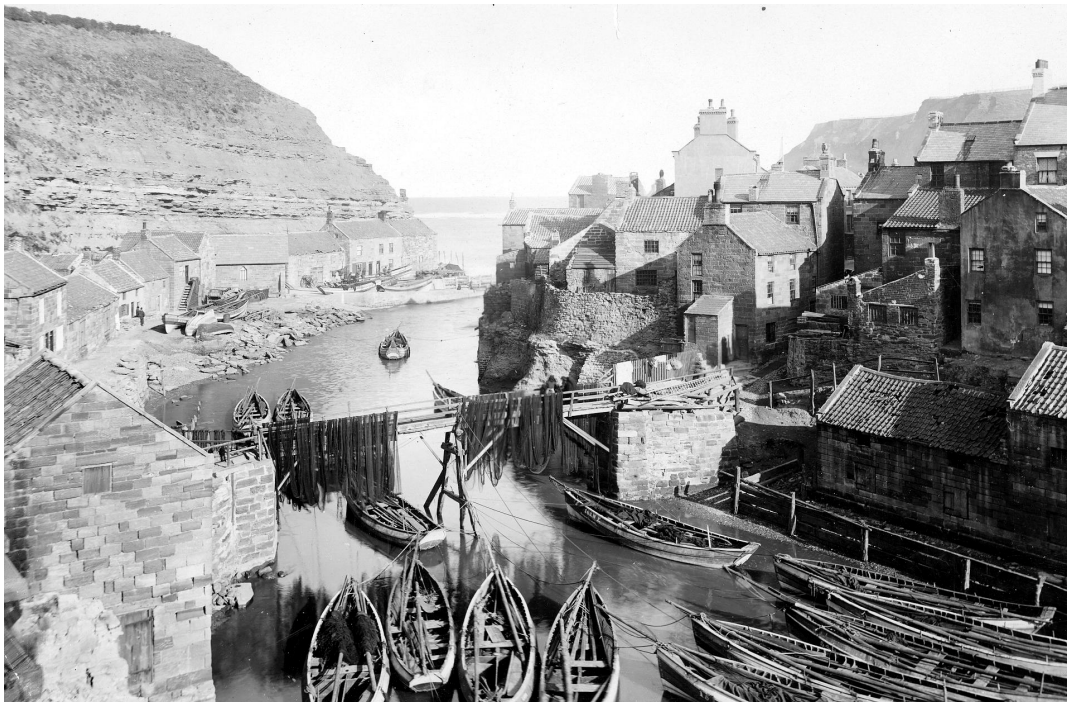

Figure 9.28. Fishing boats and nets at Staithes (© Whitby Museum)

Seining is carried out for demersal and pelagic species. Fish are 'herded' into the path of the net as the gear is hauled. Seining for Pelagic species uses purse seiners that capture shoaling fish that aggregate into large, dense concentrations near the surface by surrounding the shoal with a deep curtain of netting supported at the surface by floats. The net is then pursed under the shoal by heaving on a wire that runs through rings attached to the bottom edge of the net. Seine net vessels range from 12 to 30m whilst purse seiners range from 30 to 60m in length.

Historically long-lining for white fish from cobles was the most common activity, forming the backbone of the fisherman's year. A typical year for a sailing coble or mule began about the second week in October with the winter line fishing. A single line might have between 300 and 500 hooks; so, with each man having two lines, a three-man coble could fish up to 3000 hooks in a single night (Frank 2002, 95). This method alone was used up to the end of February, when it was carried on alongside potting for crabs and lobsters.

Boats often had both herring nets and long lines on board and engaged in netting and overing. This involved catching small spring herrings in the nets to use as bait on the big over hooks. Springtime lasted a month or six weeks and then the cobles started driving (drift-netting) for herrings. In August, however, most Whitby boats followed the main herring fishery to East Anglia which lasted through to the end of September or October, when the winter line fishing came around again (Frank 2002, 86). This basic pattern seems to have remained unchanged from at least the 1650s until the mid-19th century (Starkey *et al* 2000, 92).

'The lines are shot across the tide, left on the bottom for several hours, usually during the time of a tide's ebbing or flowing, say six hours. While the lines are shot one man keeps a lookout, the other two wrap themselves in the sail and go to sleep in the bottom of the coble. Each man has three lines, each line 200 to 240 fathoms, 240 to 300 hooks to each line are tied or whipped to a length of twisted horse hair called 'snoods', each about two and a half foot long, fastened to the line 5ft apart. When the lines are baited they are regularly coiled up on oval piece of wickerwork like the bottom of a clothes basket, called by Yorkshire fishermen a 'skep', at Hartlepool in Durham a 'rip'. The lines are baited by wives and children before the coble proceeds to sea, all are fastened together and when each is 240 fathoms the length of the whole is nearly two and a half miles. An anchor and buoy are at the end of each man's set of lines, or four anchors and four buoys to each coble's entire line. The buoys at the extremities are tarred dogskin, inflated like bladders with pole and flat, intermediate buoys are usually cork. The anchors are large stones, as an iron anchor is liable to get fast among rocks' (Frank 2002, 88-9).

Trawling

A number of trawling practices have been and are still employed in this area of the North Sea. Bottom Trawling is the most widely used method. Trawl nets are funnel shaped, with sides extended forward to form wings to guide fish into the funnel. The net is held open horizontally and floats attached to the upper edge of the net mouth provide lift. Weights distributed along the lower edge (ground rope) ensures good contact with the sea bottom and disturbs the fish for catching. Trawlers range in size from small inshore vessels of less than 10m to large factory ships 60m or more.

The main device used was the beam-trawl, taking its name from the beam of wood (usually elm) keeping the net mouth open. Beam length varied from 36ft (11m) to 50ft (15.2m), while the triangular, purse-shaped net was up to 100ft (30.5m) long. The beam itself ran over the sea-bed on stirrup-shaped runners (known variously as shoes, heads, or irons) which had the effect of keeping the beam itself about three feet above the sea-floor and allowing the lower part of the mouth of the net to funnel and billow out behind it. This lower edge was attached to the ground rope. When the trawl was in motion, the fish disturbed by the ground rope are caught in the net as it passes. However the trawl also bagged anything else in the way as it swept by, and it was this feature which constituted the core of the traditional inshore fishermen's complaints against trawling. This fishing method is widely used by Dutch, Belgian and English fishermen for species such as sole and plaice (Frank 2002, 21-22).

Shellfish trawls, for species such as *Nephrops* or shrimps, differ very little from whitefish gear apart from being generally more lightly rigged. Scallop dredges consist of a ruggedly constructed triangular steel frame and tooth-bearing bar, behind which a mat of linked steel rings is secured. A heavy netting cover joins the sides and back of this mat to form the bag in which the catch is retained. Scallops, which usually lie in sand or fine gravel, are raked out by the teeth and swept into the bag.

In the mid-18th century trawling in English waters was mainly confined to stretches off the south west and south east coasts. Devon sailing trawlers worked out of Brixham and Plymouth, while Barking was the centre for craft trawling in the Thames approaches. Though the Barking fleets tended to limit their trawling activities to the Southern Bight of the North Sea, the Torbay smacks took the lead in opening up other grounds further up England's eastern seaboard. In the summer of 1831, two southern smacks worked the Yorkshire coast grounds and landed their catches at Scarborough (Starkey *et al* 2000, 73-4).

Between 1840 and 1860, trawling expanded dramatically, rapidly overhauling lining as the principal means of capturing white fish. This led to the rise of the new fishing ports of Hull and Grimsby. In 1840, the two Humber ports possessed no more than a handful of

smacks between them, but by 1880 there were almost a thousand sailing from the estuary.

By the mid-1870s, the expansion of the smack trawl fishery was nearing its peak. Sailing trawlers had opened up much of the North Sea, trawling intensively to a depth of 30 fathoms [*c*55m] or more. In summer, they visited grounds off the Danish, German, Dutch and Belgian coasts. In winter, they mainly worked banks adjacent to the Dogger, including the Silver Pits and Botney Gut.

The widespread introduction of bottom and beam trawling had a revolutionary impact on the fishing industry in Britain as a whole. By the last quarter of the 19th century the dynamic sector of the English fisheries was North Sea trawling. The primacy of line fishing in Yorkshire's coastal villages was being challenged and by the mid-1870s, Scarborough supported a fleet of around 40 specialist trawling vessels, and at least 40 dual – even triple – purpose boats; that might go drifting and/or lining in other seasons. These vessels joined the fleets sailing out of Hull and Grimsby, but they also ranged right across the North Sea to the coasts of Holland and Denmark. From the 1880s as steam propulsion and other technological advances enhanced their range and productivity, trawling increased further (Starkey *et al* 2000, 94-5).

> The remarkable development of the Humber ports was due to the accidental discovery, in 1843 or thereabouts, of Silver Pits. At the southern end of the Dogger Bank, and due east of Flamborough, was a deeper area marked on the Admiralty chart 'Outer Silver Pit'. One exceptionally severe winter trawling was tried there on chance: 'soles were found during that very cold season in almost incredible numbers; the nets were hauled up 'bristling with fish trying to escape through the meshes', and such enormous catches were made as the most experienced fishermen had never before thought possible. Thereafter, the development of Hull as a fishing station was rapid. From 40 trawlers in 1845 the numbers grew to 270 by 1863 and by 1877 440 smacks were registered there (Frank 2002, 20).

The central factor of such impressive growth was undoubtedly the introduction of trawling as an entirely new method of catching fish. Trawling was destroying spawn and fry, with a consequent depletion of fish stocks; and the trawl-smacks were interfering with the gear of the inshore fishermen, so taken together, the livelihoods of traditional inshore fishing communities were being threatened. The worst affected stretch of coastline in England was that between Berwick and the Humber, which includes the Hartlepool to Scarborough stretch (Frank 2002, 21-22).

Trawling had created a fishing industry, with its own socio-economic pyramid – a small group of owners speculating at the top, and a large number of workers at the bottom. It had its own national market, brought by the railways, telegraphic communication, the use of ice, and later, refrigeration. Against this kind of highly organised and powerful set of interests, the small scattered fishing communities, using traditional methods (partly out of preference and partly because of lack of capital), and operating on a communal basis within essentially local or regional economies, stood little chance in a situation of 'free' competition (Frank 2002, 25).

The effect of trawling on long-lining can be seen from the minutes of evidence submitted to the Sea Fisheries Commission when it met at Staithes in 1863. Professor Huxley, one of the commissioners, is questioning Richard Verrill, a fisherman for 48 years:

> [Q]. When do you shoot your lines during these months [November to March]?
>
> [A]. We shoot them about six miles off, from that to ten; then we change the ground. There is hard rocky ground for seven, eight or ten miles and then we come into soft ground again. That is the place that they can trawl over with their smacks.
>
> [Q]. Do you prefer setting your lines on the hard or soft ground?
>
> [A]. The hard ground; the bait will lie longer there.
>
> [Q]. The smacks cannot come there, can they?
>
> [A]. No …
>
> [Q]. Do they come over soft ground?
>
> [A]. Yes; it is there that the damage is done.
>
> [Q]. Have they ever carried away your lines?
>
> [A]. No.
>
> [Q]. Are there in a season's fishing many complaints of lines being carried away by trawlers?
>
> [A]. There is soft ground here that runs about a quarter of a mile in breadth to four miles in length, and they put their trawls in that and drag them along; if we have our lines there they take them away altogether. In point of fact we dare not put them down there now owing to the trawling (Frank 2002, 101-2).

From about 1880 onwards the fishing industry was rapidly assuming its present-day character. Around Britain's coastline there were still thousands of small craft propelled by sail and oar; but in the Irish Sea, the Channel, and the North Sea fleets of steam-powered trawlers were operating (Figure 9.29). In 1891 the first steam screw-trawler fished off Iceland and the era of modern distant-water fishing had begun (Frank 2002, 32).

Figure 9.29. Steam Drifters leaving harbour, Hartlepool (©Hartlepool Arts & Museum Service)

The following extract comes from Albert Close's Fisherman's Chart of 1952, compiled from first hand evidence from fishermen of the North Sea. It provides a good indication on how these grounds were perceived by the men who worked them (Figure 9.30):

Area 67: The NW of Area 67 is good for Dabs, Haddock, and Cod in July; catchy for Seine-Nets, and in the north boulders are picked up. Whitby Fine Ground is fairly good and clean. It is rough as a rule for 10 miles offshore, and strewn with wrecks. For 15 miles off shore from Scarborough to Hartlepool is stony ground.

Area 68. All of Area 68 is good for all kinds of fish. The south half of Brucey's Garden is good for Seine-Nets. Off it's South end, from about Lat. 54.47 to 54.33 for about 14 miles West of the southern Rough of Dogger-Bank, is catchy, but trawlers, and some Seine-Nets work it. On its west edge it is catchy in 35-40 fathoms. The ST Huxley found Jan, Mar, May, June, July and Oct good months. The Western half of this area, as far north as Lat 54.45 is reported stony ground, and smaller stones in the middle of the Eastern half, extending right across to Lon 2 and from then about NE by N for another 80 miles. It averages about 120 miles in width.

Area 69: Area 69 is good for Plaice, Haddock and Cod, but rough in places. Trawlers work all over it. Seine-nets work off the West edge in 28-32 fathoms, as marked, and in between the roughs on the Dogger. In the Dogger Bight is a good Plaice ground May to Nov. Curly weed bad May to July, Mar, May, June, July and Sept. are considered good months for general fishing. Trawlers report the easternmost Rough is little more than gravel, with a few stones. The 18 fathom shoal is a small pinnacle, with 40 fathoms on the north edge. It is rich round the foot of the shoal. A strip of stony ground, averaging about 15 miles wide runs right across the centre of this area, and in the north for 10 miles to the west of Lon 2 as far north as about 55. 10. It continues into Areas 61 and 70.

Area 70: Area 70 is good, with patches of Roughs. Jan to Oct best. Fish: Cod, Plaice and Haddock. Good for Seine-nets clear of the roughs. Curly Weed is bad in the north of area May to Sept. The northern half of this area reported stones. These extend in a NNW direction fro 40 miles by about 10 miles wide, from the SE corner of Area 61 to about Lat. 55.45.

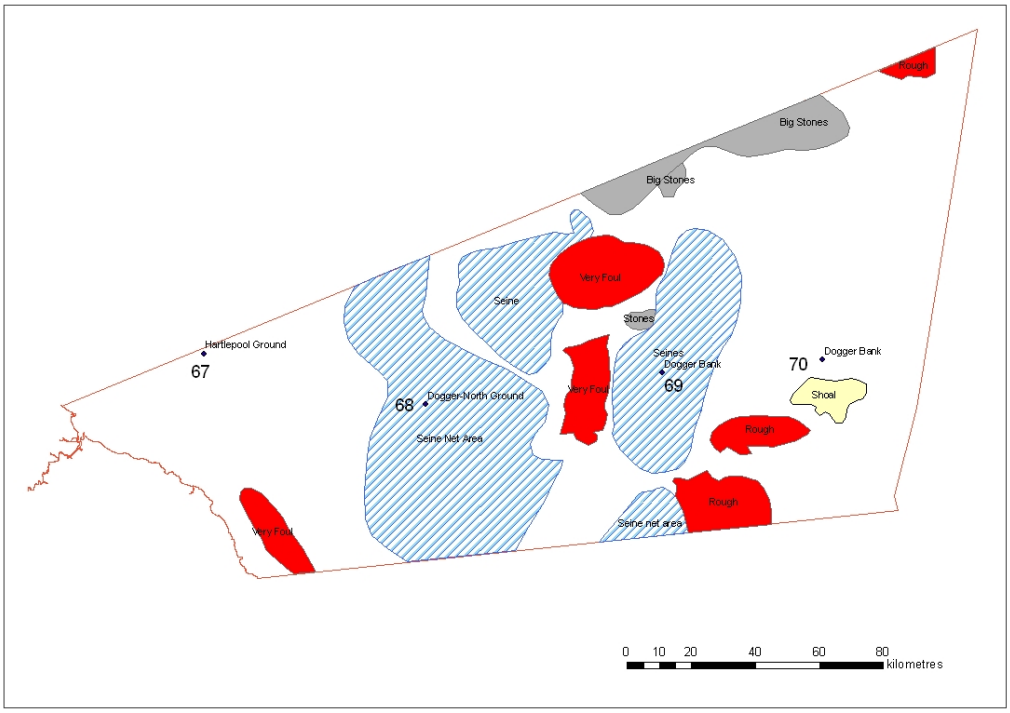

Figure 9.30. Detail digitised from Albert Close's Fishing Chart (1952)

In 1909, a local observer wrote of Staithes: 'The lads are all going down the mines and inland to the big towns, for the line fishing is poor indeed'. By the outbreak of World War One, the last of Staithes' yawls had stopped fishing, and a tradition which can be traced back, through documentary sources, nearly 1300 years came to an end (Frank 2002, 37).

'Fixed engines, Jazzing, Blashing and Driving'

Salmon and sea trout were so prolific in the River Esk in the 1770s that part of the catch was exported by ship to London to be sold. But by 1817 they were 'very scarce, the quantity being much diminished since the establishment of the in-land (Littlebeck) alum works' (Frank 2002, 124). The closure of the Littlebeck alum works, however, allowed the Esk to purify itself and it has remained ever since one of the most important salmon rivers in England. The great quantity of fish which annually aggregate off the harbour mouth waiting to go upstream to spawn has created an important sea fishery. Tees Bay, Scarborough and, particularly, Filey and Bridlington bays all are, or have been, excellent salmon grounds (Frank 2002, 124).

One salmoning technique was known as 'fixed engines' where the end of the net is left at the water's edge (often weighted to prevent movement and therefore known as sand-fishing) and pulled out to form a hook into which the salmon are caught.

Jazzing was peculiar to Whitby where coblemen, after a storm, would catch, at the entrance to Whitby harbour, the salmon as they attempted to move upstream to spawn (Frank, 2002; 126).

Blashing, for sea trout, involved casting nets, at night in calm conditions, on the seaward side of the trout which had come in with the tide to lie in pools close to the shore beneath the rugged cliffs then making as much noise as possible (blashing) the fishermen would drive (using long sticks to slap the water's surface) the startled trout seawards and into the nets (Frank 2002, 126-7).

Trunking and Potting

Trunks and pots are small traps baited with fresh or salted bait and set on the sea bed in coastal waters to catch lobsters, crabs and *Nephrops*. The frames, constructed from wood, metal or plastic, are netting covered with an entrance through one or both sides, or through the ends. A laced slit in the netting allows baiting and removal of catch.

Historically the taking of crabs and lobsters was carried on in both summer and winter, but usually beginning at the end of March, when the weather became more settled, going on to July. It was undertaken mostly by the elder fishermen (Figure 9.31). Before about 1850 the method used was called trunking, a form of fishing which had virtually died out by the 1860s. A trunk comprised an iron hoop to which was attached a net bag. A two-man coble normally had a fleet of 24 trunks. The fishing ground was rarely more than a mile offshore and almost invariably on a rocky bottom. The depth of water ranged from a few feet up to ten fathoms, the maximum at which trunks could be effectively sunk, but usually they were shot at a depth of three fathoms. They were shot mainly at night, but fished by day if there was a swell which stirred up the sea-bed making the water cloudy, such conditions being known as crab swell. 'Clear water by night, cloudy water by day' – this was the maxim when trunking (Frank 2002, 110-11).

Figure 9.31. Staithes-man with pots (© Whitby Museum)

The Yorkshire coast is one of the best crabbing grounds in Britain. The introduction of pots round about 1850 and the expanding national market, created by the railways, had profound economic consequences. There was an over-fishing crisis and consequently a serious depletion of crab and lobster stocks. Potting is still an important activity for Yorkshire coblemen and the crews of some of the smaller keel-boats. Whitby alone accounts for about thirteen per cent of the national catch of crabs and lobsters (Frank 2002, 113-6).

> The shore (except at the entrance of Scarborough Pier and some few other places) is composed of covered rocks, which abound with lobsters and crabs, and many other kinds of shellfish: Beyond these rocks, there is a space covered with clean sand, extending, in different places, from one to three or four miles. The bottom, from hence, all the way to the edge of the Dogger-Bank is a scarr, in some places very rugged and cavernous; in others smooth and overgrown with variety of marine plants, corallines, &c. some parts again spread with sand and shells, others, for many leagues in length, with soft mud and ooze, furnished by the discharge of the Tees and Humber' (Hinderwell, *History and Antiquities of Scarborough*, 1769) cited in (Frank 2002, 100).

Mariculture

There is limited mariculture in the study area although the area of Cockle Gait, near Haverton Hill, in the River Tees was farmed for cockles in the early part of the 19th century. A modern shellfishing area exists along the coast from Scarborough Bay to Cayton Bay extending to about a kilometre offshore.

Mariculture is the cultivation of marine species within coastal waters and includes shellfish farming, finfish farming and algae cultivation. Shellfish farming is the only form of mariculture activity currently undertaken in this area. In the UK, shellfish for human consumption must be harvested from designated production areas. In 2000, there were 112 shellfish farm sites active in England producing 6,718 tonnes of shellfish with an estimated value of £4.5 million (DTI 2001, 28).

Baiting

Fisherwomen played a vitally important role in the fish production process, their work carried out largely at home. Their main responsibility was to gather and prepare the bait for the long-lines. The scale of this work was enormous. Once the men had sailed, wives, sisters and daughters went down onto the bleak, exposed scaurs typical on the rocky Yorkshire coast to prise the limpets off the rocks, gathering them in wicker baskets called swills. Often if bait was exhausted in one area the women would travel great distances, round trips of up to 30 or 40 miles (48-64 km) to acquire bait from other sources, eg Staithes women are recorded as having walked to Robin Hood's Bay on such a search (Frank 2002, 165).

By far the most popular and effective bait were mussels which once they had been gathered needed to be skaned (skeined)– the removal of the soft part, the actual bait, from the shell. A crude guide, for a single night's fishing the number of hooks to be baited for the crew of the three man coble ranged from a minimum of 2600 to a maximum of 3360. The yawls and mules, larger boats, used an even greater quantity of bait; and given that long-lining was the dominant mode of fishing from the Humber to the Forth, until the advent of trawling, it was obvious that prodigious quantities of bait were used every year (Frank 2002, 165).

Unsurprisingly bait became increasingly difficult to obtain. Increased landings of fish by trawlers had the effect of depressing the market with the consequence that line-fishermen were having to double the quantity of their gear in an attempt to achieve the same financial return with consequential upsurge in demand for bait. This shortage of mussels saw growing reliance on limpets (called in local dialect 'flithers') (Frank 2002, 157).

'Flither was the name given by North East Coast fishermen to their preferred baitstuffs (Figure 9.32). When a fisherman, or his wife, goes out flithering, it's a limpet that may come off the rock but a flither that goes in the basket. A limpet would be discarded. This is because there are separate species of limpets on a rocky shore, something that is apparent only to those dealing with them….Poor-quality bait is orange or red in colour. Bait which catches fish is grey….In order to distinguish between the two, fishermen named the preferred bait 'flithers' and the poor stuff 'limpets' (Whittaker 1999, 103).

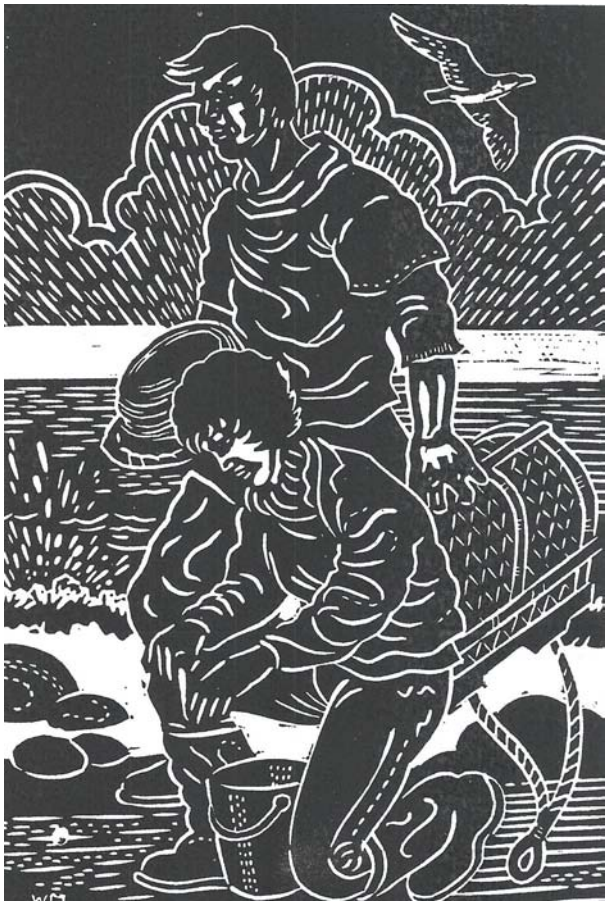

Figure 9.32. Linocut of a fisherman collecting 'flithers' from a rock (© Mel Whittaker)

'Cuvvining' was yet another important form of gathering. 'Cuvvin' is the local dialect word for the edible winkle (at Staithes they are called 'checkers'). These were gathered on the rocky scaur[s] and sold to local shellfish dealers (Frank 2002, 200).

Whaling

Whaling from Whitby began in 1753, when the *Henry and Mary* and the *Sea Nymph* sailed for Greenland. It drew to a close in 1837. There was 'never a trade so colourful, so crude, so fulfilling, and so destroying' (Dykes 1980, 6).

With the increasing oil demand for industry, whalebone for corsets and umbrellas, and seal skins for clothing and fashion, the number of vessels involved in whaling multiplied rapidly, and by the late 18th century Whitby had between ten and twenty, a few locally built. In the peak years Whitby had proportionately more people involved in the trade than any other place in Britain, including Hull. At the time of the first national census in 1801 the greatest number of whaleships to leave in one season was twenty. Stockton, at this time the most important port on the Tees, also had a couple of vessels, and Scarborough had one ship.

Figure 9.33. A whalebone arch stands at Whitby, commemorating the once large whaling industry (© Dave Hooley)

'The whaleships returned to Whitby in late summer or in autumn. The ships were still greasy and most of the men burned brown. Crowds would gather and longshoremen would descend upon the ships to remove the casks of oozing blubber, the boiling of which took place in four yards, two at each side of the river, and would have the town stinking with a peculiar, oppressive, and lingering smell. The blubber that they brought back had to be rendered into oil, the whalebone cleaned, cut and shaped, and finally all the produce had to be taken to the 'manufactories', either by coaster, or by horse and cart' (Dykes 1980, 7).

One of the most famous whaleships from Whitby was *The Esk*. The Captain was William Scoresby, junior, aged 26, a local man, son of a famous whaling father, and himself an unusual combination of whaling captain and scientist, collecting material for his superlative two-volume work on whaling and the Arctic, which was published in 1820 (Dykes 1980, 10).

Polar bears were sometimes killed for food during whaling expeditions and cubs would be captured and kept on deck in a barred barrel or fastened to a point and fed whale meat. Back in England the animals would be sold to fairs and zoos. William Scoresby captured one such cub on one of his voyages on *The Esk*, training it to be led on a lead like a dog. Back in Whitby, however, the animal, confused by the noises and the movement and smells, broke free from the ship and ran into the town. Eventually the bear was cornered by a great mass of men, women and children with guns, pitchforks and dogs. Fortunately, Captain Scoresby arrived before anyone was hurt or the animal killed, and added to his reputation by pushing through the crowd, walking up to the bear – which licked his hand with its long rough, tongue – tying a length of rope around its neck, and leading it away. Soon afterwards the animal was taken to London's Tower Zoo (Dykes 1980, 10).

Making ends meet

From the 1780s to the late 19th century the Yorkshire coast fishing industry was a story of cyclical change and adaptation with periods of plenty and prosperity interspersed with times of dearth and decline. Dual economies, in which effort was alternated seasonally between landward agriculture or industry, and the sea, were widespread (Starkey *et al* 2000, 81). Within the area there were many shifts in the relative importance of different fisheries and fishing stations. Along the 110 miles of seaboard between the Humber and the Tees there were more than twenty settlements containing at least a few individuals who fished. Most were specialist fishermen, but farmers may have also worked as part-time fishermen and in the 19th century some men worked in the iron mines in winter and went fishing in summer. The pattern, it seems, was that, as alternative employments became available during periods of prosperity, fishing as an occupation declined. Conversely, when the local economy slumped, men resorted to fishing as their chief means of subsistence (Frank 2002, 2). This suggests that while fishing was regarded as the least favoured option, it also served as a vital lifeline.

During times of hardship many fishermen would walk the rocky scaurs along the coast as the tide went out in search of jet, sea coal, firewood, or anything washed up by the sea which could be converted into money. At Whitby this was simply called 'beachcombing', but at Runswick and Staithes it was known as 'ploagin' (Frank 2002, 191).

Shipwrecks afforded other ways of augmenting fisher-family incomes, especially when saleable goods could be salvaged; and since one of the main north-south shipping lanes from Tyne, Wear and Tees passed close to Whitby wrecks occurred frequently.

Other part-time jobs taken by fishermen in times of bad weather included 'bush beating' on the moors for shooting parties, 'game-driving', baiting, and potato-gathering or 'tatie-picking'. 'Gathering' was another activity, harvesting fruits of the hedgerow and fields. Another secondary income, in this case illegal, was poaching game from local estates (Frank 2002, 196-8).

Values and perceptions.

Modern fisheries are increasingly coming to the attention of the wider general public with the concern that there is over fish stocks and sustainable practice. Fishing communities livelihoods are intimately tied to the productivity of the seas. Today in Staithes it is possible still see local women wearing the traditional bonnet or fishermen in their ganseys, the heavy, oiled wool jersey with its locally distinct pattern. These small coastal settlements perched or tucked behind headlands and steep cliffs are particularly reminiscent of an era gone by.

Story and superstition are still commonplace. Even today some local fishermen will not put to sea if, while going down to their boat they meet a woman or someone mentioned a pig!

Modern perceptions of fishing are often that it is now destructive of fish stocks and the sea-bed. But it is also still seen as an important element in the local economy in many places. There are deep cultural attachments associated with fishing, especially in Whitby, Staithes and Scarborough.

Research, amenity and education

Trawling provided one of the first indicators of the wealth of the submerged prehistoric archaeology of the North Sea. Trawling and dredging have recovered material that otherwise would have gone undetected, and have raised the public and professional profile

of pre-inundation archaeology.

There is considerable potential for further research into the history of fishing, particularly its early development and the numerous catching, storing and processing techniques employed. Such research could inform strategies for sustainable fisheries, using the historic environment to identify patterns, trends and materials used. The potential for social and economic research also exists.

Condition & forces for change

The fisheries represent the 'farming use of the sea' and we know more about their practice rather than the exact locations of specific areas of activity. Some fishing practices will impact on physical remains more than others – the obvious distinction being between the more damaging trawling methods and less damaging pelagic netting and long-lining methods. The material evidence left by trawling activities includes, most noticeably, the trawl scars on the seabed itself. The destructive tracks tear and break up the surface of the seabed as they sweep for fish. Whilst on the one hand this offers an opportunity to recover otherwise missed archaeological artefacts, on the other it clearly disturbs deposits and features.

Gear and nets often become snagged on the rocky bottom and on obstructions and wrecks. Nets, lines, hooks, anchors not to mention the vessels themselves, are lost or abandoned. These features occur more frequently in those areas identified as 'hazardous foul grounds', being 'catchy, 'sharp' or 'rough'. Any survival of objects, however, depends on materials used and prevalent environmental conditions.

Cumulatively, modern fishing methods have greatly reduced many fish stocks to the point of extinction. Herring is no longer abundant in the North Sea; the massive catches of the 1940s and 1950s took their toll with fleets of vessels, taking fish, big and small indiscriminately, and depleted stocks fell to a dangerously low level (Frank 2002, 152).

Countless millions of nutritious herring have in the past been spread on the land as manure; dumped back, dead, in the sea, or, latterly have been consigned to pet-food factories. If, as a result of bans and restrictions on fishing, the North Sea herring does recover there will have to be strict international legislation to prevent them being decimated yet again (Frank 2002, 154).

The effects of fisheries in the North Sea are widespread and ecologically important, and the removal of target species impacts the whole North Sea ecosystem. At present, 30 - 40 % of the biomass of commercially exploited fish species in the North Sea is caught each year. There is concern about the stocks of herring, cod, haddock, whiting, saithe, plaice and sole which are close to or outside Safe Biological Limits. Catch levels for many fish stocks are almost certainly not sustainable (DTI 2001).

Both the restrictions on cod and plaice have caused the displacement of fishing activity away from traditional grounds and towards the oil and gas fields of the North Sea. There is some evidence of a slight increase in beam trawl activity in the Central and Northern SEA2 regions, since the gear was first used in the southern North Sea during the 1960s. This may have implications for the safety of both the fishing vessels and underwater structures associated with the hydrocarbon industry when they come into contact (DTI 2001).

Further causes of decline has been pollution in rivers, and the construction of weirs and other obstructions that have denied access for spawning fish (DTI 2001).

Rarity and vulnerability

The Fisheries of the North Sea have a long and complex history and contribute a distinctive and important aspect in the history of British fisheries. Traditional fishing practices such as long-lining have been declining since the advent of trawling. Generally fisheries are in a period of remittance, quotas and restricted fishing grounds impacting on the scale, range and sustainability of the mid-late 20th century industry. Important archaeological finds associated with wrecks, inshore fishing and coastal potting areas may further inform the nature and finer details of the history of this industry. Medieval and earlier, prehistoric practices are likely to have left evidence as yet uncovered.

Archaeological sites and wrecks are likely to be vulnerable to erosive environmental marine processes and the longer the submergence the greater the deterioration. Any lost gears or other equipment made from organic material would rapidly break down, although metal fittings and such like may still be evident.

Intrusive offshore industries may also impact on the material culture left by fishing in the same way they impact on palaeo-landscapes and wrecks.

Recommendations

Continued control over exploitation of fish stocks is necessary if they are to be sustained. This has obvious implications for the people whose livelihoods depend on the fruits of the sea. Understanding historic practices and their impact on the fishing resource may contribute to the long-term sustainability of sea fisheries.

Consumer pressure might encourage more sustainable fishing practice. For example, the Marine Stewardship Council has accorded the British South-West mackerel hand-line fishery the status of 'sustainable fishery', since, it is suggested, 'growing numbers of consumers will only purchase products from fisheries that do not damage stocks or the marine environment (Fishing News, 7 Sept 2001).' (Frank 2002, 217)

'One possible solution that suggests itself is the revival of line fishing, which with improved marketing, might secure a premium for the fishermen, since line-fishing is both conservation-friendly and provides better quality fish.' (*ibid*, 218).

Remains of historic fisheries survive in a variety of conditions. Archaeological assessment should be undertaken for any extensive development in this part of the North Sea.

The European Union's Common Fisheries Policy (CFP) was adopted in 1983, with the objective of ensuring that declining fish stocks are exploited responsibly - protecting the environment and the interests of the fishing industry and consumers. The CFP imposes a regime of equal access for vessels from all member states in the EU's exclusive fishing zone, 200 nautical miles (370.4km) from its coastline. Within this zone, member states have a 12-mile (19.3km) zone around their own coastlines within which their own fishing vessels have exclusive rights. Atlantic and North Sea fish stocks are sustained through a system of Total Allowable Catches (TACs), which are divided into national Quotas. However, these systems are notoriously difficult to enforce.

The UK needs to devise a protocol for reporting archaeological and biological finds made during trawling, similar to that already opperative in the Neatherlands (Dutch trawlers report around 10 tons of artefacts such as mammouth bones each year from the North Sea). Perhaps a scheme like that already in operation by the British Marine Aggregate Producers Association (BMAPA) and English Heritage (EH), who have co-operated in developing a protocol for reporting finds of archaeological interest to an implementation archaeological service to facilitate use of the Protocol by the marine aggregate industry. In

addition operators are encouraged to strictly observe a jointly developed code of practice that includes mapping of the seabed prior to dredging in order to establish the positions of any wrecks and debris and the potential for submerged prehistoric landscapes.

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9.3.2 Fish processing

Introduction: defining/distinguishing attributes and principal locations

The Type Fish Processing includes the following sub-types:

- Fish markets;
- Fish processing areas;
- Fish storage sheds,

Components of this Type include:

- fish quays and wharfs;
- storage sheds;
- ice house;
- fish drying, salting and barrelling areas.

Fish processing facilities are principally located in the fishing harbours and ports of Scarborough, Whitby, and the fishing towns of Robin Hood's Bay, Staithes and on South Gare Breakwater.

Historical processes; components, features and variability

The preservation, storage and sale of the fish landed at the various fishing ports and harbours have long been vital components to the fishing industry in this area. Ancient methods of preserving fish included drying, salting, pickling and smoking. All are still used today, but the more modern techniques of freezing and canning have taken on greater importance. Almost every Yorkshire coastal community salt-cured fish in the 18th century (Starkey *et al* 2000, 93). A proportion of the catch of cod and other species from the deep-water grounds of the North Sea was dry salted on the shore, and later sold for consumption in south European markets, especially in Spain, or sent coastwise to ports along the east coast of England. Though the Yorkshire coast was the largest English producer of salt dried cod in the late 18th century, its output was dwarfed by that of Shetland. This was partly because much of the Yorkshire catch was sold fresh to inland towns and cities, notably in the West Riding of Yorkshire, and even to Manchester. Although Shetland's output was higher, its quality was poorer (Starkey *et al* 2000, 72-73).

Most herring was preserved in salt or ice. Scottish fisherwomen followed the Scottish fishermen who caught and landed herring, and were an annual sight on this coast (Figure 9.34). Primarily working in teams of three accompanied by two male coopers they moved from harbour to harbour gutting and salting the herrings as they came in.

> Dr W. Hodgson (1957), in his book *The Herring and its Fishery,* describes the work of the Scottish fisher lasses:
>
> *'It used to be a great attraction watching the girls and admiring the skill with which they yielded the short gutting knife, making an incision in the throat of the fish and withdrawing the gill and long gut in one neat stroke'*

Figure 9.34. Herring Lassies (1930s) (© Whitby Museum)

After salting or icing the fish were packed into barrels, generally by men. When the barrel was filled, paper, straw or sackcloth provided a covering which was then fastened with a hoop. The barrels were then bought up by wholesalers and middlemen and dispatched by rail. Not all herring were preserved in this way, however. A substantial number were kippered using woodsmoke. Kipper houses were established at Tate Hill Pier at Whitby in 1832, and the interior of one of these was clearly illustrated in an 1838 painting by the artist Mary Ellen Best. In kippering the fish are split, gutted, washed, dipped in brine and fixed to sharp hooks on battens running up the roof of the kipper house. When the space is full oak chips and sawdust are set to smoulder on the floor below. All holes and doorways are blocked and the fish are steeped for 12 hours in the thick smoke. Kippering preserves the fish for long periods as well as giving it a good flavour. Even today in Whitby, Fortune's Kipper House in Henrietta Street still uses this traditional method (White 2004, 116).

Fisherwomen played vitally important roles in the preparation and preservation processes of the fishing industry. Their work was carried out to a large extent inside the home itself. The women's chief responsibility was to prepare (and very often, gather, too) the bait. The scale of this work was enormous. Prodigious quantities of bait were used every year. Once gathered the limpets ('flithers') or mussels had to be taken home and skaned, removal of the soft part, the actual bait, from the shell. Caving (clearing the line of old bait, seaweed, and other rubbish) was also done at home (Frank 2002, 156-7, 165-8).

Ice was another important preservation method for keeping fish fresh and was one of the primary factors which enabled fishermen to venture further offshore and expand their catches. In the past, fishing vessels were restricted in range by the simple consideration that the catch must be returned to port before it spoils and becomes worthless. The development of refrigeration and freezing technologies transformed the commercial fishing industry: fishing vessels could be larger, spend more time away from port and therefore access fish stocks at a much greater distance. Refrigeration and freezing also allow the catch to be distributed to markets further inland, reaching customers who previously would have had access only to dried or salted sea fish. An ice house is still in operation on Scarborough's West Pier.

An additional component of fishing is adequate preservation and storage facilities for both the fish and the fishing equipment (nets, lines and pots). Fish houses and sheds have been

recorded at Scarborough, Whitby and Staithes. Fishermen's sheds are still used today in some places and can be found on West Pier at Scarborough, informally at Skinningrove and on South Gare Breakwater (Figure 9.35).

Figure 9.35. Fish sheds, South Gare Breakwater

At the weekends the nets of many of the boats were often taken to a field and spread out to dry, whilst others suspended their nets on a pole high above the deck and extending across between the two masts. Others took their nets for treatment to the 'barking coppers' – the cotton nets needed to be treated against bacterial action and the usual method was to soak them in a solution of cutch, a process known as barking (Tindale 1987, 81).

Around the 1830s, with the introduction of steam packets and increased interest in herring from the French, domestic merchants also began to recognise the fishery's potential, and expansion of shore-based support for the industry really took off from the autumn of 1833 with the formation of the Whitby Herring Company. As early as the summer of 1834, Whitby harbour was said to be busier than ever, with boats visiting from as far afield as Cromer, Hastings and Yarmouth (Starkey *et al* 2000, 93). Until then, fishermen had sold their catches themselves, without the intervention of a salesman, using a method akin to the Dutch auction.

The procedure adopted at Hastings in the early 19th century and outlined below was typical of scenes all round the coast of England. The catch was sorted into heaps on the beach according to species, and the fisherman would stand behind one of the heaps holding a pebble in his hand. When the potential buyers had assembled, he shouted out a price which, as everyone knew, was more than the fish were worth. So, progressively lowering the price, he simultaneously lowered his arm until someone among the crowd accepted the price named, whereupon the fisherman dropped the pebble and the sale was concluded. It was the custom on the north-east coast for the buyer at this point in the proceedings to cry out 'Het!', which he believed to be the contraction of 'I'll have it', or, as it would be pronounced in those districts, 'I'll hev it' It was an expression used at Hartlepool, north of the Tees; and at Flamborough (Frank 2002, 174).

Figure 9.36. Fish Quay, Hartlepool (© Hartlepool Arts & Museum Service)

The fish market was of considerable importance to the economy of these fishing communities, being the means by which the fishermen sold their catch to the dealers and middlemen. There have, of course, always been fishermen who have sold some or all of their catch direct to the public, as they still do on Redcar Sands. These fish markets took place either at specific market places (eg at Scarborough, Whitby, and Redcar) or on the wharfs and quays upon which the fish were landed (eg Fish Quay at Hartlepool, Figure 9.36) (White 2004, 118-9). There was always a race to be the first to reach the fish market after a catch was made in order to obtain the top prices for the fish. An army of buyers usually awaited at the markets on the piers and wharfs (Tindale, 1987:80).

Annual fish fairs (eg at Scarborough or Staithes) afforded not only the opportunity to sell fish, but also to express the spirit of community in a more or less uninhibited fashion. Crews were re-arranged, family differences patched up, half-yearly accounts settled, quarrels resolved, and matrimonial matches made (Frank 2002, 205). During late medieval times Scarborough was an important venue for tradesmen and was host to a huge forty-five day fish fair held on the sands, starting 15 August. People from all over England, and even some from the continent, came to Scarborough to engage in business. The traditional 'Scarborough Fair' no longer exists but a number of low key celebrations take place every September to mark the original event. This fair is commemorated in the famous song '*Scarborough Fair'* (Scarborough Archaeological and Historical Society 2003, 43).

Values and perceptions.

The cumulative effects of the life lived by fisher men and women were frequently ill-health and premature death. They had to endure irregular hours, exposure to bitter weather and stormy seas, and much standing, lifting and carrying of heavy burdens. It was a style of life accepted sometimes consciously and by choice, but often fatalistically and with a sense of inevitability (Frank 2002, 172).

There is still a sense of continuity within some of these communities of kippering, salting and curing.

Research, amenity and education

Well documented in terms of paintings and historic photographs, eg Frank Sutcliff's collections, although these do tend to romanticise what was essentially hard life and a dangerous industry.

Condition & forces for change

As more modern techniques of fish preservation, such as freezing and canning, have taken on increasing importance, so the facilites where these processes are carried out have tended to move away from the quaysides and the piers, and instead fish is often transported straight from the boats to factories elswhere.

Where old facilities do survive, some are either still in use or are being re-used for other purposes, others in ruins; Listing and conservation should be a priority.

Rarity and vulnerability

Remains tend to be fairly rare. Some of the historic structures are protected through being designated Listed Buildings.

Recommendations

Because of their rarity, any surviving remains would therefore benefit from Listing or Scheduling. Involving local communities in any restoration or preservation activities would encourage appreciation and understanding of these facilities.

Further historical and archaeological research would improve understanding and raise awareness of this Type. Sustainable uses should be found for any surviving structures; reuse should incorporate as much of extant structures as possible. Abandoned and ruinous historic features should be taken into consideration during any proposed development.

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9.4 Navigation

9.4.1 Navigation Channel

Introduction: defining/distinguishing attributes and principal locations

This Type includes the following sub-types:

- Navigable river channel;
- Dredged channel or area.

This Type is usually found where active management has been undertaken in order to maintain the accessibility of a stretch of water for safe passage. It has close associations with the Types Navigation Area/Route and Navigation Hazards.

Components of this Type include dredged channels, such as the Tees Estuary and entrances to the harbours at Hartlepool and Whitby. Increased trade along the north-east coast, particularly from the 19th century onwards, saw greater volumes and larger vessels seeking access to what had been traditionally hazardous and restricted river and estuary channels. Industrialisation forced port authorities to improve and maintain navigation access by dredging, the spoil often dumped out to sea. Creating channels also involved the reclamation of adjacent land, sand banks and saltmarsh, and the construction of retaining walls (also see Energy Industry).

Navigation channels also take the form of rock cuts, such as 'the Sledway' passage at Whitby. In the ironstone and alum producing areas many smaller cuts, now almost indiscernible on the foreshore, would have allowed vessels to dock and load. Several of these also have remains of piers and/or staithes structures associated with them. Other cuts would have allowed landing places for the small and distinctive fishing craft of North Yorkshire, the 'coble'.

Historical processes; components, features and variability

Navigable river channels are included in this Type as they have long been used for ship, boat or barge transport. Medieval and post-medieval river traffic brought life and busy activity to the banks of rivers, such as the Tees and Esk. Quays and wharves fronted riverside villages with warehouses, industrial furnaces, processing factories etc serving industrial and agricultural hinterlands. From at least the medieval period ferries criss-crossed the rivers, linking banks, A medieval ferry route existed at Hartlepool and a 19th century route is recorded across the Tees, prior to the Transporter Bridge being built.

In this Type the River Tees, and in particular the estuary itself, has undergone the most radical dredging, realignment and maintenance (Figure 9.37). Between 1762 and 1853 'the sea had by steady steps advanced upon the Tees Estuary and the Bar was now upwards of a mile westerly" than it had been … in previous years'. It was even something of a misnomer to speak of the main channel to the river because there were at least three different channels, each pursuing an erratic course to the sea: 'they were of an erratic nature too, these channels, and given to suddenly picking up their bed and moving to a fresh position without the slightest warning' (Le Guillou 1975, 2).

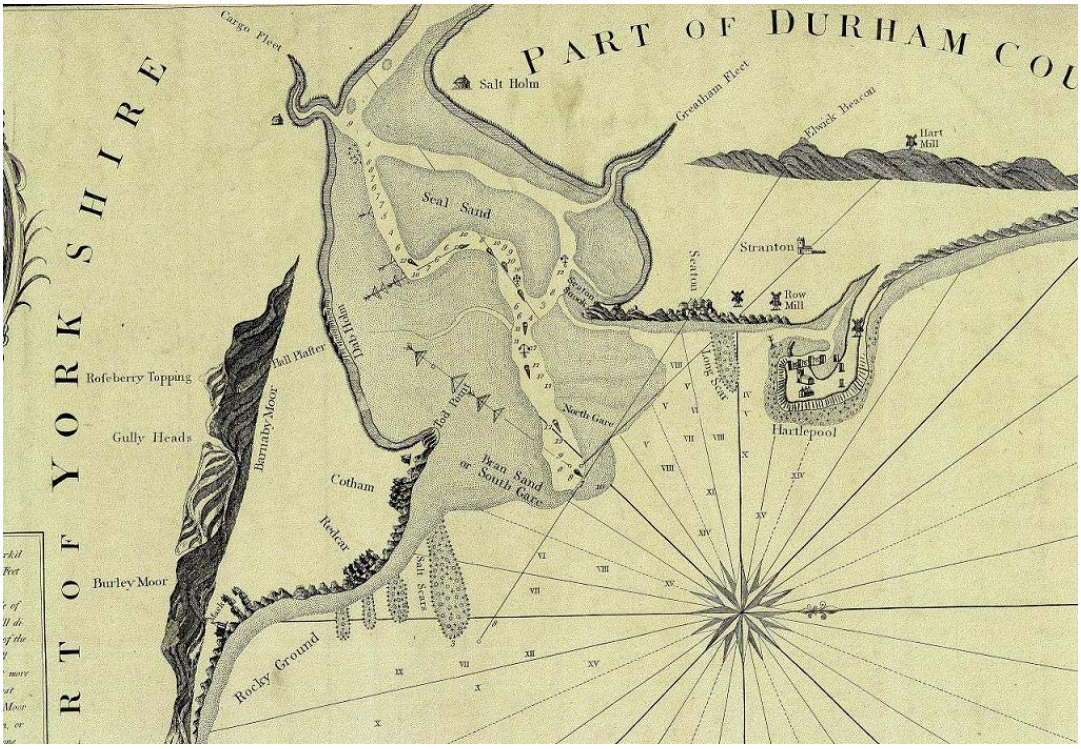

Figure 9.37. River Tees, Dobson (1802) (© UKHO)

In May 1808 an Act of Parliament created the Tees Navigation Company. In 1828 the Company made the 'navigable cut from the east side of the Tees near Portrack into the said river near Newport'. It was about 1100 yards (1005m) long, 250 yards (228m) wide and 16 feet (4.9m) deep and shortened the journey to the sea by three quarters of a mile (1.2km) (Le Guillou 1975, 17).

In the mid-1820s the Tees Navigation Company extended its dredging activities; forced by developments which had resulted in the opening of the Stockton to Darlington Railway and the gradual growth in coal shipments from the Railway Company's staithes at Stockton. Ships of only 150 tons or under could be handled at those staithes – 'if of a larger class, they had to be laden up at the 9th buoy by means of the keels' – largely because of the number of shoals in the river, one of the most formidable of which was at an island called 'Jenny Mill', a little distance above Blue House, 'where it was not uncommon to see 5 or 6 ships laying from not having water over the shoal'. An old dredger was acquired by the Tees Navigation Company and, slowly, the shoal at Jenny Mill, was removed altogether, as was a major one at Newport (Le Guillou 1975, 15).

Middlesbrough Dock was officially opened for business in 1842. It has an area of 9 acres of water service and is entered by a channel rather more than a quarter of a mile in length. There is a capacity for 150 sailing vessels of large size and in moderate spring tides there is 25 feet of water in the dock and 19 in the channel' (Le Guillou 1975, 24).

'30th June 1852, An Act for the Conservancy, Improvement and Regulation of the River Tees, the Construction of a Dock at Stockton, the Dissolution of the Tees Navigation Company, and other Purposes" received Royal Assent. This Act was probably the most important single decision affecting the fate of the river Tees – at least until 1967 (Le Guillou 1975, 30).

By the Act, the Commissioners were granted a number of powers …

> "[they could] cleanse, scour, cut, dig, open, deepen, straighten, and otherwise improve any part, thereof, and the Banks, Shores, Cuts, Canals, Channels, Streams, Water Courses, havens, Creeks, Bays, Inlets, and other Parts thereof, so far as the Tide flows and reflows and may remove and destroy any Rocks, Shoals, Shallows, Mud and Sand Banks and other obstructions therein … and may construct, alter, and repair any Jetties, Dams, Mounds, Groins, Embankments, and other Works, Machinery, Apparatus, and Conveniences, and may do all such things as the Commissioners from time to time think necessary and expedient for any of the Purposes of this Act'".

In 1852, there were three or four channels along which the Tees flowed from Middlesbrough to the sea, not one of which was satisfactory from the point of view of navigation. A number of reports on the river arising from surveys carried out by the Admiralty engineers, all pointed out that the river would tend to clear itself by scouring if it was properly channelled. The Tees Commissioners closed all but the South Channel by sheet-piling backed up with slag. The remaining channel was 'defined' by the gradual construction of retaining walls, beginning with those at Billingham and over a period of 18 or 19 years over 20 miles (32km) of 'Tidal Walls' were constructed, made of 1,356,000 tons of slag material (waste material from the nearby ironstone blast furnaces) (Le Guillou 1975, 41).

Dredgeing is another common feature of Navigation Channels (Figure 9.38). The River Tees has been constantly dredged since 1853 when the first 'Bag and Spoon' dredgers came into operation, with 70, 5352 tons of material being dredged between 1854-77. The object of all this dredging was to 'secure a depth of fourteen feet (4.3m) at low water from the sea up to Middlesbrough, and 12 feet (3.6m) from Middlesbrough to Stockton' (Le Guillou 1975, 38-39).

Figure 9.38. Dredging taking place at Whitby Harbour

At Whitby in the 1850s there were constant complaints about the silted state of the harbour, and until it was dredged in the 1870s, it seems that a vessel carrying any more

than 60 tonnes of cargo had difficulty sailing from the port (Owen, 1986).

The long stretch of coastline from Scarborough to the Tees consists almost entirely of cliffs with only a few breaks that offered scope for landings where fishing boats could be drawn up the beach. The major exceptions are Scarborough, Whitby & Tees Mouth. Minor ones are Staithes and Port Mulgrave (Lewis 1991, 156).

Along the Yorkshire coast there are many place-names with references to 'wyke'. A wyke is a place on the shoreline where a boat can be landed and there is a way up from the beach. Examples include Sandsend Wyke, north of Whitby. These sites may offer further poyential for archaeological features.

Values and perceptions.

Navigation channels and dredged areas are an important part of any working port or harbour. Dredging craft can often be found moored ready for service and many are shared between coastal communities. For mariners the importance of maintaining a safe draught is imperative to their livelihoods and safety.

Research, amenity and education

The history of navigation channels and dredging is an important aspect of the history of navigation generally. Many former navigable river channels are now lost, buried beneath industrial development, such as in the Tees Estuary. They may offer potential for associated features if buried securely in context, such as wrecked craft, wharves, pilings, jetties, artefacts and even palaeo-environmental evidence. A Neolithic stone axehead was dredged from the River Tees in 1892, about a mile from the mouth (NMR: 27762).

There is limited use for amenity usually because the channels are actively worked, nevertheless small boats, anglers and similar will make use of the water.

The educational potential of this Type is considerable. The River Tees in particular would not have become the industrial port it is unless dredging in the 19th century allowed vessels to navigate up its further reaches. History has shown that as dredging cleared the river and estuary for navigation so the focus of trade and industry moved gradually downstream, from early centres like Yarm and Stockton to Middlesbrough today.

Condition & forces for change

Dredging will obviously have impacted on the archaeological potential of the Tees and Whitby (Esk) rivers in particular. Prehistoric finds have been revealed by dredging activity but it is likely that far more has been lost than recovered. Today many of the dredged channels will have minimal archaeological potential in themselves although the dumped spoil taken from them may have redeposited potential. The dredging effort has not been consistent or very vigorous at Whitby, however, and there is a high probability that the historical river banks are still preserved under subsequent structures (Pybus Pers Com). The dumped material may also smother artefacts, wrecks or palaeo-landscapes making any further investigation virtually impossible, emphasising the need to use area-based studies like this HSC when licensing designated dumping grounds.

Survival of river channels is generally fairly good even though most components are no longer used or have been developed by industry. Quays and wharves were substantial structures and survive well and are still the foci of activities, even when no longer used. They are open spaces towards which roads, streets and lanes run. Bollards, warehouses, lime- kilns, etc, often also survive and are clearly related to them.

The dumping of most forms of industrial waste at sea has been prohibited since 1994. The bulk of the material eligible for sea disposal now comes from port and navigation channel operations, as well as coastal engineering projects. Dumping of dredged materials can, nevertheless, introduce contaminants to the marine environment (DTI 2002). Whitby dredging is unlikely to introduce contaminant to the marine environment as there is no industry producing contaminated sediments needing dredging therefore only delaying the transport of the material to the marine environment. The Tees is different as the sediments there contain many industrial contaminants and even display the chronological history of the industrial development of the upper Tees valleys since roman times (Pybus Pers Com).

Rarity and vulnerability

This is an important Type as it has a wide variety of well-preserved components from the early modern period onwards. In those areas that are continually dredged today there is little archaeological potential however there may be remnants of historic dredging activity in some places, eg Whitby.

Recommendations

Navigation channels and dredged areas usually have a negative impact on existing archaeological remains although any material is likely to have been lost very early in the dredging activity, given its history in this area.

The archaeological potential and secondary impacts of dredging and dumping need to be assessed prior and during any further works.

Many features, cuts, rutways, coble landings and 'wykes', etc, exist along the North Yorkshire part of the coast and would benefit from detailed survey and recording.

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9.4.2 Navigation Routes and Areas

Introduction: defining/distinguishing attributes and principal locations

The Type Navigation Routes and Areas include the following sub-types:

- Navigation routes
- Anchorage areas
- Harbours and harbour administration areas
- Restricted navigation areas and shipping and ferry routes

This Type identifies areas of navigation activity as opposed to those areas that have been actively dredged or managed and in this sense the archaeological potential, apart from known wrecks, is inferred rather than certain.

From the 18th until the mid-20th centuries, the territorial waters of the British were three nautical miles (5.6km) wide. Originally, this was the length of a cannon shot, hence the portion of the sea that could be defended from the shore. Today territorial water extends to 12 nautical miles (22.2km) from the shoreline and is regarded as sovereign territory.

The coastal and offshore waters of Britain have been navigated since prehistory. It seems likely that early mariners circulated round the periphery of the North Sea, rather than directly across it, such as over the Dogger Bank. Linear routes are essentially an early-modern invention. Nevertheless the whole area can be considered to comprise 'navigation areas and routes', both historic and modern, to a greater or lesser degree. Historically vessels generally 'coasted', that is, hugged the coastlines they were navigating on their journeys. This is likely to be true for most craft up to the 14th century and even later into the early modern period. The distribution of wrecks clearly demonstrates this tendency with the overwhelming majority being recorded within 12 or so miles (20km +) of the coast in this HSC mapping. More ephemerally distributions of artefacts lost or thrown overboard can indicate anchorages, shipping routes or battle sites.

Historic anchorage areas occur all along the coast though usually in sheltered bays or in the lee of headlands (Figure 9.39). Vessels and craft mooring in these areas will have dropped anchor potentially disturbing or revealing archaeological material on and within the seabed. Associated artefacts and debris, from all periods though most likely from the post-medieval onwards, may also be found including the anchors (stone weights or cast metal) or other artefacts lost or cast overboard and dumped. Some anchorage areas may also have been dredged or cleared of sediment to provide enough draught for safe harbour. Principal historic anchorage locations include Hartlepool Bay, Tees Bay, Mouth and Estuary, off Skinningrove, Staithes, Sandsend, Whitby and Scarborough Bay.

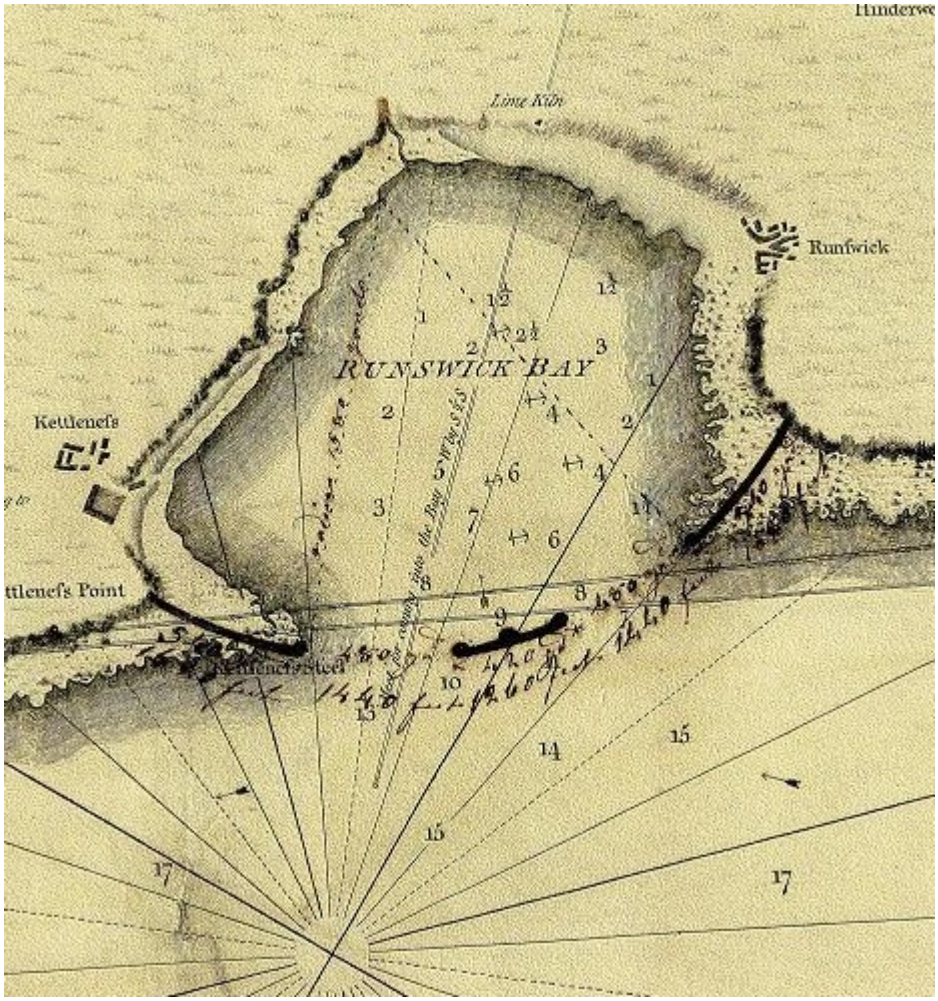

Figure 9.39. Historic anchorage areas charted at Runswick Bay, Pickernell (1791) (© UKHO)

Other landing places are also found, small cuts for landing cobles, such as at North Bay Scarborough, or for docking and loading for ironstone such as at Saltburn. The place names 'wykes' and 'goits' may also indicate a former use as a landing place. See also page 68 for a better account of the place name element.

Today Tees and Hartlepool is the largest port authority in the North East and the second largest in the UK, including the ports of Middlesbrough, Billingham, Redcar and Hartlepool. At the beginning of the 21st century port traffic was in excess of 51 million tonnes (9% of UK total). There is a major oil and gas terminal on Teesside as well as an oil refinery and tanker terminal and in 2000, Tees and Hartlepool was responsible for handling 11.7% (32.4 million tonnes) of the UK's foreign and domestic oil and gas traffic and 6.8% (19.1 million tonnes) of the UK's non-oil traffic. Tees and Hartlepool was visited by a total of 5,214 ships in 1999 and of these, the majority were tankers (1-20,000 tonnes) and cargo vessels (1-20,000 tonnes). Tees and Hartlepool also received a relatively large number of vessels over 100,000 tonnes - 30% of the UK's total number of large dry cargo vessels and over 10% of the UK's total number of large tankers (DTI 2002).

The large amount of foreign and domestic traffic handled by some of the ports in the region, and the regular ferry services, means that the density of ships in and around these ports is significant (5,000-20,000 ships per annum). Offshore areas of the region experience lower shipping pressures of between 1-5,000 ships per annum. The main shipping routes are plied by oil and shuttle tankers between the Teesside oil terminal and other ports in the UK and Europe (DTI 2002).

Modern ferry routes include the Newcastle to Ijmuiden and Rosyth to Zeebrugge crossings.

'From Tinmouth to the Teese or Hartlepoole the course is south south-east eight or nine leagues. Hartlepoole is a Peere or Head, behinde it at lowe water you may lye drie with your ship. Right south from it the Teese goeth in, it is a great wide and deepe river and reacheth in west southwest, with fourteene eighteene or nineteene fathome water, and there is nothing in the way that can hurt or hinder you, you must sayle in through the middle of the chanel and ancker before the castle of Wisten. In the innermost part of this hauen, that is before the towne of Stockton, it is but foure fathome deepe.'

'From Teese to Scarborowe the course is southeast and by east 11 leagues. Betweene them both lyeth Whiteby, which is a Peere or Tyde hauen, which at lowe water is drie, so that as then you may there lie drie. On the east side thereof there shooteth off a stone banck, which you must shunne. If you will goe into Whitby you must sayle in betweene the two beacons, till you come betweene both the lands. Betweene Whttbye and Scarborowe lyeth Robbenhoods baye: it is a faire rode for a south southwest and west windes, there you may ancker at seven or eight fathome. Skarborowe hath two peeres or heads, you may go behinde them at high water, and at lowe water lye drie; you must sayle in south from them.'

[transcription of a description of 'England, from north of Newcastle to Yarmouth' in 'The Light Of Navigation' by William Johnson 1620. Original documents held at National Maritime Museum, London.]

Historical processes; components, features and variability

Historically in the absence of metalled roads and railways, rivers and the sea provided the easiest means of transport. There is evidence for long-distance seafaring in the first half of the 2nd millennium BC alongside more local or regional activity. Ten sewn-plank boats have been found in the British Isles hinting at the existence of long-distance exchange networks during the Bronze Age. Three boat fragments have been found at North Ferriby, in the intertidal Humber and more recently a single boat-fragment has been recovered from Kilnsea on the East Yorkshire coast. A possible eleventh plank boat is represented by a 'wooden lid' found in 1969 in the submerged forest of Hartlepool (Van De Noort 2006, 267).

The sewn-plank boats of the Bronze Age remain unique to Britain and it is likely that this type of craft was used principally for seafaring. They are usually built of oak planking with bevelled edges, the planks stitched or sewn together with withies of yew, with cleats and transverse timbers provided rigidity to the hull. It has been estimated that these craft were crewed by about 20 individuals. Their distribution appears to show a distinctive and significant pattern, especially when compared to the locations of log-boats of prehistoric date. Whereas the log boats are predominantly located on inland rivers all the sewn-plank boats have been found within coastal and estuarine environments, or in the lower reaches of rivers near estuaries (*ibid*, 267).

A log-boat of possible prehistoric date was found in *c*1852 during construction of the railway at Yarm (NMR: 874047) and a possible prehistoric dugout canoe was also found in the 19th century in Middlesbrough (NMR: 874059).

This area of the North Sea was almost certainly traversed by vessels during the Iron Age and Romano-British periods. Indeed a number of Roman Signal stations along the North Yorkshire coast are testament to the importance of navigation and communication at that time. In the Tees Valley finds demonstrating trade and exchange have been found. Luxury Roman items imported included pottery and glassware whilst grain, jet, lead and cloth were exported. Seaton Carew is likely to have been a prime trading settlement (Tees Archaeology, 2004).

Between the 5th century and 9th century the North Sea was a highway of invasions and immigration but mostly trade. The withdrawal of Roman control from Britain left an administrative and defensive disorganisation that was quickly exploited by successive waves of people, initially Germanic (the Jutes, Angles and Saxons) but later including Scandinavians and traders from the Baltic and Mediterranean. England's eastern seaboard was at the forefront of these changes. The ships used were probably of the open, clinker-built type propelled by oars and without sail. Unfortunately little is known of the size or carrying capacity of the ships in use at the time of the main Anglo-Saxon immigration. It is also difficult to estimate the numbers of ships needed to transport people or accurately identify the sea-routes most favoured, although coastal routes with the shortest possible open-sea crossings were most likely (Clarke, 1985).

The arrival of Roman Catholic Christianity in the late 6th century saw a new phase of contact between Britain and continental Europe. Political stability stimulated commercial activities and the 8th and 9th centuries saw the greatest resurgence of European trade since the fall of the Roman Empire. Much of this trade relied on water transport and urban settlements began to grow up along rivers and close to coasts. Merchants journeyed from the Rhine in their cogs to trade goods in the British Isles and documentary sources record Frisian merchants in York in the 8th century (Clarke, 1985).

The sea routes of the Vikings contrasted to those taken by the Anglo-Saxons and give an indication of their improved ship-building techniques. The basic design was an open, clinker-built vessel which could be propelled both by oars and sail. Modifications of the hull shape and the addition of a sail meant that by the 9th century the Viking ship was capable of sailing long distances on the high seas and not limited to coasting. The North Sea shipping routes of the 11th century involved great distances. The Northern route ran from west Norway between Bergen and Stavanger to the Shetlands and thence via the Western Isles and down the Irish Sea to the French Atlantic coast, or more rarely down the east coast of Britain to the Humber. The southern route ran from Denmark, through Limfjord and down the coast via the Frisian Islands and the Rhine delta to the Thames Estuary. (Binns 1985, 50). There was variety however in the types of craft used by the 'Vikings' including merchantmen, warships, coasters and it would be easy to imagine similar types of vessels plying the North Sea in the 9th century, some carrying raiding soldiers, some carrying passengers who were to colonise, others coming peacefully, laden with goods for exchange in markets such as York (Clarke 1985, 45).

Most of the routes followed by the English mariners in the medieval period involved either a comparatively short journey across open sea or coastal sailing. Medieval coastal shipping and coastal trade flourished despite the threat from piracy and warfare. The only route that required long-distance oceanic navigation, using a magnetic compass, was the Icelandic cod trade. England's trade with Iceland appears to have begun in the early 1400s and was first developed by east coast ports but later dominated by Hull and Bristol (Friel 2003, 67).

It was during the later medieval period that the north-east coal trade began to rapidly expand alongside that of the alum industry. Coal was being shipped from Newcastle from at least the early 1290s and probably earlier. Some of the coal was unloaded in both the east and south coast ports of England, the rest went to Scotland, Holland, Zeeland, Flanders and France. Newcastle customs accounts of the period 1377-91 suggest that much of the export trade at this time went in ships from Holland, Zealand, Flanders and the Baltic. It is likely that the vessels engaged mainly plied coastal waters (Friel 2003, 68).

Piracy was endemic in medieval Europe. The dividing line between pirate and sea trader was sometimes blurred or non-existent. It was often the case that the people who committed piracy were often also traders in their own right and usually the same people

that medieval governments relied on when waging naval war. Part of the problem lay in the distinction between piracy and privateering. Privateers were individuals licensed by a government to attack the ships of state enemies. Piracy was a civil, not a criminal offence in England until the 16th century, despite the fact that piracy was essentially theft, often accompanied by threats and violence or sometimes murder (Friel 2003, 82-3).

The River Tees provided an important trade route from the 11th and 12th centuries onwards. There were at least three different main channels, however, each pursuing an erratic course to the sea: 'they were of an erratic nature too, these channels, and given to suddenly picking up their bed and moving to a fresh position without the slightest warning' (Le Guillou 1975, 1). Navigation from Stockton to Yarm was possible only for vessels of 60 tons or less; even then four tides were often necessary to complete the journey (*ibid*, 2-3).

Whitby's share of ships grew steadily throughout the 18th century due mainly to the fact that at high tide it possessed one of the best harbours of refuge on the East Coast. Even in 1696 Whitby was said to be able to hold '500 sail of ships' and up to one hundred vessels were known to have entered on one tide alone. As many as 600 are said to have passed Whitby in one day in 1846 (White 2004, 103).

In the days of sail getting a ship into or out of a harbour could be one of the most difficult and dangerous parts of the voyage. Most larger vessels put out boats to tow them down harbour by oar, while capstans and rubbing strips on the piers were used for warping vessels out. Coming in it was equally bad, for ships often had to enter narrow gaps between piers. Frequently, if the tide was running across the gap, they would misjudge it and hit the end of the pier or run aground. In the harbours themselves there were other obstacles such as bridges and it was common for ships to foul their rigging or topsails on these. The arrival of paddle steamers made things much easier, however, since they were independent of the wind and could tow sailing vessels in and out of a harbour in relative safety. Thereafter paddle steamers carried out dual work, acting as tugs in the harbour and carrying parties of holiday-makers out to sea or along the coast when this was more profitable (White 2004, 107).

By the mid-19th century the trade of the Tees began to reflect more and more the characteristics and trends of the industries on its banks. As the exports of coal tended to fall after 1850, those for iron and (later) steel increased rapidly. Middlesbrough's pig iron exports easily surpassed those of any other UK port averaging over 100,000 per month during the Edwardian period. Scotland remained Tees-side's best coastwise customer, whilst the leading foreign markets were Germany and Holland, Belgium, France, Italy, North America, Scandinavia and the Far East (Le Guillou 1975, 91).

By the First World War, the River Tees ports were handling a considerable volume of trade; besides the shipments of pig iron and steel, large quantities of coal, coke, manufactured iron and steel for railway bridges and shipbuilding machinery, and engines of all varieties were exported. Pipes and tubes, heavy forgings and steel castings, steel wire, salt, chemicals, sulphate of ammonia were all manufactured products which benefited from the sound navigational channel provided by the Tees. Into the river came large quantities of foreign ores (iron, manganese and chrome), iron and steel, chemicals and chemical products, timber and various building materials. There were very few UK ports that did not have vessels in the coasting trade with the Tees, and an extensive foreign trade was carried on with most countries throughout the world. Considerable trade markets had grown up with places as far afield as India, Japan, South America, Australia and Africa (Le Guillou 1975, 90).

The stretch of water between the Humber and the Tees was a particularly dangerous place

for shipping during WWI, because up to 42 U-boats operated in this area. Between them they sank no less than 120 ships with torpedoes, over 100 by mines and many more that are suspected. At least another 80 merchant ships were also lost between the Tees and the Tyne (Young 2000, 19).

Since WWII North Sea shipping has been dominated by six nations: Denmark, Norway, Sweden, the Netherlands, Germany and Britain. In terms of tonnage the importance of North Sea shipping has however declined both relatively and steadily since the mid 20th century (Thowsen, 1985). Shipping engaged in ocean transport may be divided into short sea and deep sea trades. Of all short sea trades the North Sea trade may be considered among the most important and representative, serving one of the world's most densely populated and industrialised areas. The North Sea trade is predominantly *small-ship trade* (craft no smaller than 100 gross tons and no larger that 2000 gross tons) (Thowsen, 1985).

Ships employed in North Sea shipping are, more than any other vessels in the ocean-going merchant fleet, closely linked with the export and import industries of the country of registration (Thowsen, 1985).

Today the main shipping routes off this area of the North East coast are plied by oil and shuttle tankers between the Teesside oil terminal and other ports in the UK and continental Europe. The movement of bulk cargoes between Tees, Hartlepool and continental Europe as well as the ferry routes from Tyneside to northern Europe are also major shipping routes (DTI 2002).

Values and perceptions.

Most people, viewing from land, are unlikely to directly perceive the scale of navigation and shipping that goes on offshore. Most vessels will only be perceived as small specks on the horizon (Figure 9.40). Inshore fishing activity and leisure craft however will be more readily perceived as they sail in and out of the harbours and ports along the coast, the most direct link between the coastal communities and their ties to the sea. Specific areas will be known to fishermen as being particularly rich fishing grounds for lining, netting or potting and wreck sites will be favoured by anglers and recreational divers alike.

Figure 9.40. Perception of the coastal shipping lane viewed from Marske Sands

Nevertheless for some the sea will always hold special meaning and evoke important feelings of sense and place, often encouraging creative and artistic responses. In the past it was equally, if not more so, the case. In prehistory long-distance journeys may have been essential for aspiring members of the elite classes, a rite of passage during which the necessary 'foreign knowledge' was accumulated. The sea may have acted as a liminal space, a long-distance journey where one would disappear from view and enter different worlds was a leap of faith. The activity of seafaring would have had the power to create specific social identities, binding crews into closely knit groups. When understanding long-distance exchange and its socio-political significance the process of navigating and the product traded were indivisible (Van De Noort 2006, 284).

Historically the North Sea has served as a unifier rather than a barrier. The peoples living around its coasts exploited the sea as a means of communication and were linked closely together culturally, economically and to some extent even politically (Clarke, 1985).

Research, amenity and education

There is considerable potential for further research into possible unknown and undocumented wrecks from various periods dating back to the Iron Age or earlier throughout the North Sea. This may be initially documentary-led followed and corroborated by targeted field work.

Current research sponsored by English Heritage, 'England's Historic Shipping' (Wessex Archaeology, 2002) aims to identify historic routes and courses taken by vessels, out of ports and harbours, as a means of identifying those areas of likely archaeological potential for wrecks and associated material culture resulting commercial shipping activity.

Condition & forces for change

Inevitably navigation practice and areas change through time as vessel construction, type and size evolve. Navigation areas and routes can be expected to reflect the dominant industries, fishing and recreational activities of any given time and place. As such, documenting these activities is key to understanding the navigation areas and routes associated with them.

Tees Bay is now dominated by huge tankers and ships associated with the hydrocarbon, steel and chemical industries. A restricted navigation area and harbour administration areas traffic the shipping in and out of the estuary.

Wreck conditions vary considerably depending on the materials and construction techniques used for the original craft. Local environmental conditions also impact considerably on the survival state of wrecked vessels. Anchoring by large craft may impact on any archaeology resting on the seabed. Un-seaworthy vessels also represent a considerable threat to the marine natural and historic environment with pollution and lost cargoes potentially damaging.

Some areas will be less favoured for navigation and can be expected to have less potential for wreck archaeology. Obviously obstructions, underwater rocks and areas of swell will be hazardous under certain conditions.

Rarity and vulnerability

Wrecks are numerous in the waters off the River Tees and North Yorkshire coasts. Most derive from the early-modern period (1750-1900) of coastal trade and fishing. Further

offshore they become increasingly dispersed although clusters occur in some areas over foul grounds and off the Dogger Bank in particular.

Recommendations

The distribution of wrecks clearly shows that the principal areas of navigation activity were and are coastal waters. As such there should be a presumption that wrecks and associated material will be present in any area on the seabed in the coastal waters out to approximately 12 nautical miles.

The products of this HSC project also aim to play a role in public awareness raising, in order to engage people with the scale of navigation and shipping that goes on offshore and that often goes unnoticed from an onshore perspective.

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9.4.3 Navigation Hazards

Introduction: defining/distinguishing attributes and principal locations

The Type Navigation Hazards includes the following sub-types:

- Caution Areas (bars, shoals, sand banks, scars and scarps, drying areas);
- Obstructions (including exposed rocky coastlines with rocky outcrops, under water/awash rocks, maritime debris, fisherman's fasteners);
- Dangerous wreck clusters and non-dangerous wreck clusters (vessels or aircraft);
- Natural marine conditions (areas of heavy swell and breaking waves, prevailing winds).

Historic navigation hazards are difficult to map with any precision although essentially this is the purpose of nautical and maritime charts. Major navigation hazards have figured on the earliest Admiralty charts and are mentioned in sailing directions for the North East. Earlier charts obviously contain less detail and use less accurate survey methods to record features instead tending to depict those hazards that mariners most need to be aware of and which are most easily identifiable. Modern charts depict far more information and are a valuable source of mapping.

As with Type Maritime Safety the majority of the features associated with this Type are typically found on or immediately adjacent to the coast, although wrecks can be found throughout the study area. Historically the rocky North Yorkshire coast and the Tees Estuary have been notoriously dangerous areas to navigate, especially given the few and far between places of refuge. The submerged scaurs and awash-rocks that are strewn along the foreshore and inter-tidal areas, and the shoals, sandbanks and drying areas associated with the estuary are all exacerbated by the tempestuous nature of the North Sea itself. Often problems were associated with strong easterly winds driving waves and sediment onshore creating bars that obstructed harbours, rivers and other access.

Areas of natural swell are associated with shallow waters, particularly over rocks as at Whitby (Figure 9.41), or are found over the surface of the top of The Dogger Bank, in depths of 10m or so.

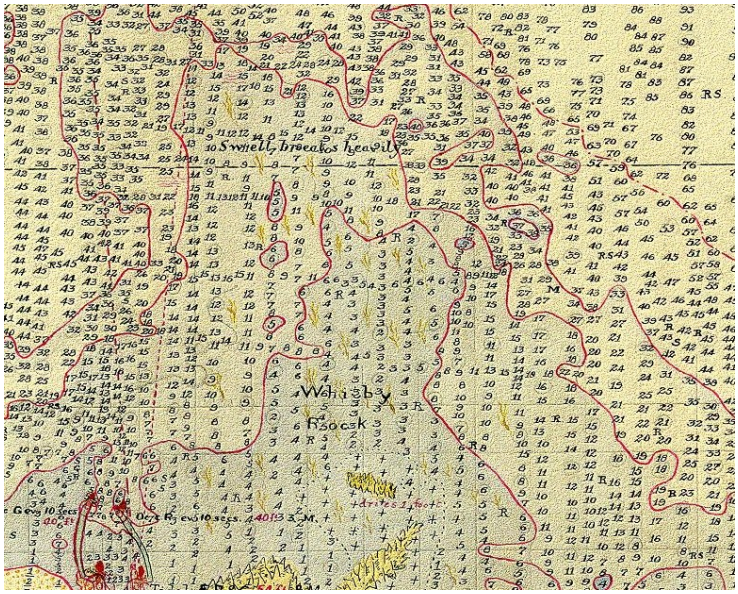

Figure 9.41. An extract from a historic chart recording an area where swell breaksheavily (Wyatt, 1932) (© UKHO)

Historical processes; components, features and variability

Mariners have been faced with the unfavourable and often treacherous conditions of the North Sea since prehistory. As a result of the relatively limited nautical knowledge and means of navigation, maritime activities in this region focused on coastal navigation.

As urbanisation and trade increased through the Medieval to Early Modern periods the southern part of the North Sea evolved into the busiest maritime area in the world. Consequently in comparison with other regions quite a high number of vessels have been lost in this area (Figure 9.42). Over 3000 known wrecks, including almost 20 aircraft, have been recorded in the study area, the majority within 12 miles (19.3km) of the coast. The wrecks that fall within 10m of water have been generically categorised as dangerous as they present a greater threat to current shipping and fishing vessels than those in deeper waters. The majority of wrecks are recorded from the 18th century onwards and this is probably due to the better survival and materials used. Earlier vessels may be present but the lack of documentary sources, such as Lloyd's Register, makes it difficult to assess. Undoubtedly however there is archaeological potential for craft from prehistory and the medieval periods being found in the area. Survival also depends largely on localised marine conditions, whether the site is covered, scoured or damaged by other activities such as trawling, anchors dragging or interference from divers and others. More ephemerally distributions of artefacts lost or thrown overboard can indicate anchorages, shipping routes or battle sites.

Figure 9.42. Wrecked fishing vessel on Whitby Beach (© Whitby Museum)

Historically the Tees Estuary and River were particularly hazardous. Even after Trinity House had marked the approaches of the Tees with wooden buoys in the early 16th century, it was very difficult to establish the correct deep water channel. At least three navigable channels are known from historic UKHO charts and it was the changing nature and locations of these that presented sailors with their greatest problems. The situation was compounded/caused by an extensive bar, seven miles long, running from Hartlepool to Redcar, two miles (3.2km) out into Tees Bay. The extent of this bar varied considerably according to weather conditions and the whole character of the Tees would change as a result of prevailing strong winds. Easterly winds tended to raise the level of the bar causing the depth of water at the bar to vary, although the average at low water spring tides was

about 8 or 9 feet (2.4 – 2.7m). Dramatic changes to the very course of the channel both up to and over the bar, took place throughout the centuries (Le Guillou 1975, 1).

> 'Between Hartlepool and the Tees lies a dangerous rock called the Long-scars, close by the Shore; come no nearer than five or six Fathom Water. A League and a half from the Tees lies Hartlepool, upon a Point lying out almost like an island; the Harbour lieth in a Bight to the Southward of the Town, within a Head which is dry at low water'
>
> *The English Pilot of Northern Navigation, 1752 (sailing directions) (Whitby Museum)*

Before the Tees was dredged, to reach Stockton or Yarm, both important Medieval ports, vessels had to proceed slowly up river; as there was no clear or unobstructed channel and extensive deposits of sand and stones occurred frequently in depths of water as shallow as two feet (0.6m). Groups of 'trackers' were often used to tow vessels through the Mandale Bottoms, a three-miles-long (4.8km) stretch of the river shaped like a horseshoe. Because of the very uncertain nature of the river at this section, larger vessels found it preferable to unload their cargoes at the warehouses built at Cargo Fleet, present day Middlesbrough (Le Guillou 1975, 3). The place name element 'fleet' is likely to refer to fleets of cargo ships coming up the river to moor here.

> To sail into Hartlepool:
>
> 'About two Leagues to the Northward of Hartlepool lie two Rocks about a mile from the Shore, the greatest called the *Dogger,* shews like the Bottom of a Vessel, always above Water: the other called the Boot is less, and hath seven Feet upon it at low Water.'
>
> *The English Pilot of Northern Navigation, 1752 (sailing directions) (Whitby Museum)*

Dredging in the 1850s resulted in a small increase in river depths, but the major obstacles were removed in the 1870s, especially the 8th and the 9th buoy scarps. The former obstacle was described as 'a rock of lias which lay across the river, and formed a bar, stopping the influx of the flood and obstructing the ebb'. Clay was dredged from the scarp area in 1873 but in the following year rock boring machinery was used at times of low water (Le Guillou 1975, 40).

Further south landing a coble at Robin Hood's Bay was particularly hazardous. The boat had to be steered along a submerged channel with rocks on each side. Posts were used as marks. However, because of the headland, Bay Ness or North Cheek, it was sometimes possible to land at Robin Hood's Bay when Whitby was stormbound. There was no harbour at Robin Hood's Bay, and, except in very fine weather, boats had to be dragged up the slipway onto dry land (Frank 2002, 88).

At Whitby the physical obstacle which loomed largest in the fears of fisherfolk was the harbour bar. In a northerly or easterly gale it is still one of the most dangerous hazards on the east coast, even though the channel is nowadays dredged regularly. In the early 1900s however, it was silted up to such an extent that, 'we used to row in – maybe an hour's flood – and we used to touch the sand with our oars'. For the fishermen in their cobles, and for their families on shore, the bar came to dominate their lives:

'In them days there was no Extensions; there was only the lighthouses, the two piers, and it was all open sea. It was allus the danger zone. They never bothered if they got ower t'Bar. They allus called it: 'I wish they were ower t'Bar'. Ower there, and then they were all right, because it usedt o break and swamp them.' (Frank 2002, 187).

A contributory factor to Whitby's decline as a fishing port was the state of the harbour. So bad was it at times that 'vast deposits of sand and mud impeded the channel, making it sometimes impossible for fishing boats to reach the quays and discharge their cargoes'. In March 1900, the Dock End (the usual landing place for herrings), was described as a 'stinking cess pool, and a very great eyesore' (Frank 2002, 36-7).

To sail into Whitby:

'There is a Rock lies off Whitby, called Whitby Rock, (or by some Whitby Chambers,) the Marks to avoid it going to the Northwards of it, are to bring Whitby Steeple open to the Northward of the South Point of the Harbour; and to run along by it, you must keep the South Point of Robin Hood's Bay clear off the Land of Whitby.

From Whitby to the Tees, the Coast lieth WNW and W by N, about seven Leagues; between them both lie Huntcliff-Foot and Rock-cliff; Hunt-cliff Foot is a high Hill lying on the Sea-Side about 4 Leagues to the Eastward of the Tees. Next to that is Red Care, it is a Cliff of such red Earth, that when the Sun shines against it, it sheweth like a red Cloth; there are two very good Marks to know the Coast by. Close to the Southward of the Mouth of the Tees lie three Ledges of Rocks, called the Salt-Scars, about half a League ENE into the Sea, which are very foul and stony, and are dry at low Water: Upon the North-Side they are very flat, so that you may sound them in five, six, or seven Fathom; but on the South-Side are so steep, that coming near to them and sounding in 13 or 14 Fathom you shall be upon them before you can heave the Lead again.'

The English Pilot of Northern Navigation, 1752 (sailing directions) (Whitby Museum)

Values and perceptions.

Navigation hazards are readily perceived by those who know. They loom large in people's consciousness due to the danger associated with them. Often unfortunate tales and myths will cling to these areas like flotsam and jetsam evoking old rhymes and song.

In an ironic way the whole creation, maintenance and draughting of Admiralty Charts and other navigation devices has been due to the hazards and dangers of the sea. It is about what to miss rather than where necessarily to sail, this is epitomised by the use of Chart Datum (as opposed to Ordnance Datum) as the reference for all soundings, which is the lowest depth of water.

Research, amenity and education

Current research undertaken by Bournemouth University, 'Mapping Navigational Hazards as Areas of Marine Archaeological Potential' (commissioned by English Heritage, funded by ALSF) offers a methodology for identifying and mapping areas of maritime archaeological potential, specifically where high potential for shipwreck losses coincide with areas of high preservation potential (Merritt *et al*, 2006).

Boat anglers have an obvious reason to be interested in shipwrecks, because fish are usually found in heavy concentrations around large wreck-sites. The seabed in general has huge vast plains of rather flat featureless submarine scenery and any large stationary object such as a wreck, provides shelter, food and protection for many various species of fish

(Young 2000, 10). Indeed wrecks are often seen as beneficial sites of increased biodiversity by marine ecologists.

Shipwrecks attract divers for a multitude of reasons. Those usually found in depths of more than 60m are usually beyond the reach of most amateur sport-divers (Young 2000, 10). Wrecks have the most obvious educational potential as they represent the most iconic use and dangers of the sea. Although largely prosaic in their loss they nevertheless conjure up evocative images of adventure, piracy and Davy Jones' locker.

Condition & forces for change

Many thousands of vessels have come to an untimely end along this part of north-east coastline over the past few centuries. However, until the late 1800s, the vast majority were built of wood and usually disintegrated within hours of sinking (Young 2000, 11). Most wrecks surviving today will be constructed of hard woods or metal. Many are only known from documentary references. Prevalent marine conditions will also affect the degree of survival especially the covering by sediments or scouring by currents.

Natural hazards such as banks, shoals, rocky outcrops, etc, are subject wholly to natural erosional processes although the rate and extent may be influenced by man-made activities or constructions that change the normal marine conditions. The changing nature of sand banks and shoals means that archaeological material may be covered or embedded within such bedforms and may only be revealed by seismic survey.

Dredging and beam trawling may impact upon known seabed obstructions and unknown wrecks. This would take the form of both direct damage to wreck structure contents and setting, and the destabilisation of sites resulting in renewed corrosion and decay. There is also some potential for impact upon discrete items of ship-borne debris. Encounters with wreck material are likely to damage suction gear and/or contaminate the dredged material, however, not much of this happens along the coast (Wessex Archaeology, 2002).

In 2000 a joint initiative was launched to help raise awareness of the issues surrounding wreck diving in the UK and to ensure the best possible wreck diving practices are observed by recreational divers. The awareness campaign itself was the culmination of many years' work with other interested parties, including the Maritime and Coastguard Agency, Ministry of Defence and archaeological groups (including the Nautical Archaeology Society and the Joint Nautical Archaeology Policy Committee), to clarify the issues and find ways to disseminate information.

Rarity and vulnerability

Wrecks are numerous in the waters off the Tees and North Yorkshire coasts. Most derive from the early-modern period (1750-1900) of coastal trade and fishing. Further offshore they become increasingly dispersed although clusters occur in some areas over foul grounds and off the Dogger Bank in particular.

Within the context of the Merchant Shipping Act 1995 'wreck' refers to 'flotsam, jetsam, derelict and lagan found in or on the shores of the sea or any tidal water. It includes ship, aircraft or hovercraft, parts of these, their cargo or equipment. It may be of antique or archaeological value such as gold coins, or a yacht or dingy abandoned at sea, or items such as drums of chemicals or crates of foodstuffs' (Definition from the Receiver of Wreck).

Under the Protection of Military Remains Act 1986, shipwrecks and all aircraft that have crashed in military service were designated as war graves and imposes restrictions on their exploration and marine salvage. The Ministry of Defence (MoD) has powers to protect

vessels that were in military service when they were wrecked. The MoD can designate named vessels as 'protected places' even if the position of the wreck is unknown.

Recommendations

Navigation hazards, whether natural or man-made represent an important archaeological resource. There may be a link between the occurrence of natural obstacles and the presence of wrecked craft, lost gear or accumulated archaeological deposits. Local sedimentary conditions will also indicate whether there is preservation potential for materials.

The known and potential archaeological resource of ship and aircraft wrecks, and other forms of historic maritime material, as identified by the prior desk-based studies require corroboration by data derived from geophysical and geotechnical surveys. Side-scan sonar surveying is the pre-eminent method for identifying wrecks (Wessex Archaeology, 2007). Recent initiatives such as the North-East England Maritime Archaeology Research Archive will provide a basis for the deposition of any new information.

Since most of the known wrecks from this region are of post-medieval date or later, any medieval wrecks identified should be the focus of detailed recording (Petts and Gerrard 2006, 201).

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9.4.4 Maritime Safety

Introduction: defining/distinguishing attributes and principal locations

The Type Maritime Safety includes the following sub-types:

- Navigation Aids (Sea) (including buoys, beacons and lights);
- Navigation Aids (Land) (including lighthouses, fog stations, landmarks (eg churches, beacons, chimneys, hills), daymarks, topmarks, distance Marks and lights);
- Safety Services (including coastguard stations, lifeboat stations etc).
- Quarantine areas

For obvious reasons and as with Character Type Navigation Hazards the majority of the features associated with this Type are typically found on or immediately adjacent to the coast. Historically the rocky North Yorkshire coast and the Tees Estuary have been notoriously dangerous areas to navigate. The submerged scars and awash rocks that are strewn along the foreshore and inter-tidal areas, and the shoals, sandbanks and drying areas associated with the estuary are all exacerbated by the tempestuous nature of the North Sea itself.

This Type has close associations with Types Navigation Channel and Navigation Area/Route. The entrance to estuaries and rivers, submerged hazards and foul areas are demarcated by tracks of posts, buoys, lights, beacons, bells and topmarks. The sites of some navigation aids have a long history being continually represented on Admiralty charts and maps such as the 'Fairway Buoy' in Tees Bay, the 5th and 9th Buoys in the Tees entrance, the buoys marking the Long-Scar between the estuary and Hartlepool and the Salt Scar at Redcar, and those at the entrances to Staithes, Whitby (marking the hazardous Whitby rocks) and Scarborough.

Landward, numerous landmarks were used to sight and survey and navigate from, often providing the basis for maritime charts, triangulation and folios (hand drawn profiles of the coast with prominent features annotated). Lighthouses can be found on the Heugh, Hartlepool and in the entrance to the harbour itself, at South Gare, Whitby and Scarborough.

A further aspect of maritime safety are the coastguard and lifeboat stations and lookouts dotted strategically along the coast. Coastguard stations can be found at Scarborough, Robin Hood's Bay, Saltburn, Staithes, and Redcar. Lifeboat stations can be found at Scarborough, Runswick Bay, Whitby, Redcar, River Tees, Seaton Carew and Hartlepool.

Some areas of the sea itself are 'restricted navigation areas' (see Type Navigation Area/Route) and are in place to facilitate navigation in and out of areas (eg Tees Bay) whilst others are exclusion zones for safety reasons, for example around offshore oil or gas installations.

Historical processes; components, features and variability

The sea has always presented mariners with danger, not only the inherent ones, storm conditions, obstacles and hazards but also those posed by invaders. Conversely it has also brought opportunities, to farm, trade, export and import, emigrate or immigrate. Roman signal stations along the south and east coasts were built to warn against attacks. A line of five was built along the Yorkshire coast at Saltburn, Goldsborough, Ravenscar, Scarborough (Figure 9.43) and Filey (Tees Archaeology, 2004).

Figure 9.43. Reconstruction drawing by Alan Sorrell of the Roman signal station at Scarborough Castle (© English Heritage)

In antiquity celestial navigation was most often used when out of sight of land using the sun, moon, stars and planets as reference points (Polaris was used in the northern hemisphere). Dead reckoning will also have been used - estimating current position based upon a previously determined position, or fix, and advancing that position based upon measured speed, time, heading, as well as the effect of currents or wind. The magnetic compass was known from the 12th century, if not earlier. An equally, if not more important device was the sounding lead, a solid lump of lead attached to a marked line that made it possible to measure the depth of the water under a ship – the sounding. The other common medieval instrument was the sandglass, first developed in the Mediterranean in the 13th century and used to time a ship's run on a certain point of sailing or to time watches. All of these instruments were in use by the 14th century. Navigational instruments improved in the 15th century with the development in southern Europe of astrolabes, quadrants and cross-staffs, which were all devices used to measure the altitude (angle in the sky) of heavenly bodies, such as the sun, above the horizon. This made it possible to calculate latitude, a crucial step for transoceanic navigation. Despite many attempts however, the determination of longitude had to wait until the development of Yorkshireman John Harrison's chronometer in the late 18th century. Sea-charts were first developed in 13th century Italy, but were probably not used in northern Europe until the 16th century. The earliest known English sea-chart dates from the 1530s.

Prior to 1600 it is likely that navigation lore was learnt by heart and by experience, and was seldom put into writing because few medieval mariners could read. Sailing directions, which told the mariner what tides would run at such and such a point or which headland followed which, probably first developed as oral mnemonics which the sailor committed to memory. The earliest written sailing directions in English date from the 15th century. Called a 'rutter', such documents appeared in print form in the 16th century (in England in 1528), often with small maps or pictures of stretches of coastline.

Sailing directions relied in part on the recognition of coastal features, such as headland shapes, church spires, and other landmarks. At night, of course, such features disappeared, so in some places rudimentary lighthouses were erected, usually maintained by religious houses eg Whitby Abbey's Rose Window. Some lights were funded by local shipping tolls and at least thirteen lighthouses are thought to have existed in medieval England (Friel 2003, 85-6).

To sail into Hartlepool:

'There is a Beacon stands upon a Ledge of Rocks, which you must leave on your starboard Side, and so sail right in with the Pier-head; there is a Sand called the Ganble, which you must be careful to avoid, by keeping as near the Pier as you can. There is good anchoring in the Road to the Southward of the Town, in four, five or six Fathom Water.'

The English Pilot of Northern Navigation, 1752 (sailing directions) (Whitby Museum)

The marking of sea channels with buoys and poles, so that mariners could avoid shallow water, was also practiced in medieval England, but very little is known about it. The evidence for seamarks becomes much clearer in the 16th century, with the appearance of buoyed channels laid and maintained by organizations such as the Trinity House of Deptford. Founded in 1514, Trinity House survives today as the body responsible for lighthouses and other navigation features in England and Wales (Friel 2003, 87).

Trinity House had marked the approaches of the Tees with wooden buoys in the early 16th century but it was not until 1839 that lights were placed in the river for the first time. There were two towers erected north of Seaton and two on Seal Bran Sands, one floating light at the entrance to the river, 11 fixed and one large light in the channel itself (Le Guillou 1975, 19).

Directions to sail into the Tees:

'There are two Gully-heads that stand upon Barnaby Moor, keep them a Sail's Breadth open, which will bring you to the fifth Buoy; but now there are better Marks, for whether you come from the Northward or Southward, take Care to keep off so far as to keep clear of the Salt-scars [Redcar] on the South, or the Long-scars [Hartlepool] on the North of the Tees, till you come before the River, and then stand in, till you bring the two Capes or Beacons which stand on the Sand on the Yorkshire Side, both in one, and run in with them so, it will bring you to the first Buoy called the Outer Buoy, and from thence about WSW from you, you may see the second Buoy, and from the Second Buoy you may see the third; leave all the first three Buoys on the starboard Side going in, and from the third you may see a fourth Buoy, which you must leave on the starboard Side going in, and when you come up as high as the Beacons on the N. Side which stands a little more than half a Cable's Length to the Northward of the Channel, you may come to an Anchor, and if you go to Portrick or Stockton, you must take a Pilot. You may come in at half Flood, if your Ship draw not above 12 feet, and for greater Draught more Tide proportionable.'

The English Pilot of Northern Navigation, 1752 (sailing directions) (Whitby Museum)

The use of landmarks to guide ships safely along the coast and into ports and harbours is another common aspect of maritime safety and probably the oldest method of navigation. These can be either natural (such as hills or prominent landscape features eg Roseberry Topping (it was once used by sailors out at sea as an indicator of changing weather)), or man-made features such as church spires and chapels (even the windows such as the Rose Window at Whitby Abbey), windmills, beacons, chimneys, cooling towers, lighthouses (Figure 9.44), masts, trig stations and towers. Prehistoric monuments may also have served this purpose as the great barrow at Snape, Suffolk indicates (Friel 2003, 13).

Figure 9.44. Lighthouse at Vincent's Pier, Scarborough

This coast also saw some of the earliest developments in the institutional provision of life-saving facilities. Early coastguard stations, rocket posts and lifeboat stations are shown on all editions of the OS maps.

Many of the lifeboats along this coast were manned by local fishermen, principally because they knew the local water better than others but also because it was often their kindred or members of their community that were in danger. Whitby's first lifeboat was acquired in 1802. In 1822 this boat was replaced by two new ones. These early lifeboats carried out many rescues over the years; they were all of the pulling variety, relying on oars (Figure 9.45). In the wild conditions that tended to prevail on this coast when their services were called on, it required very powerful oarsmen to thrust though the mountainous seas.

> Of all the instances dealt with by Whitby lifeboats none is better known than the tragedy that struck on 9th February 1861. In the words of the Rev. William Keane, writing to *The Times* newspaper that day:
>
> 'We have had a fearful storm today. Half a mile of our strand is already strewn with several wrecks; a new lifeboat launched a few months ago was manned by the finest picked seamen of Whitby. Five times during the day they have braved the furious sea and five times returned from vessels in distress. A sixth ship was driven behind the pier. The men, exhausted though they were, again pulled out, but, before they had gone fifty yards, a wave capsized the boat. Then was beheld by several thousand persons, within almost a stones throw but unable to assist, the fearful agonies of those powerful men, buffeting with fury of the breakers till, one by one, twelve of thirteen sank, and only one was saved. There were ten widows, forty-four fatherless children and two dependants left' (White, 2004, 110).

Eventually motor lifeboats were introduced and, in recent years, the inshore lifeboat, an inflatable boat which can travel fast in shallow water to rescue people trapped by tide or victims of pleasure boat accidents, has become increasingly important (White 2004, 110-12).

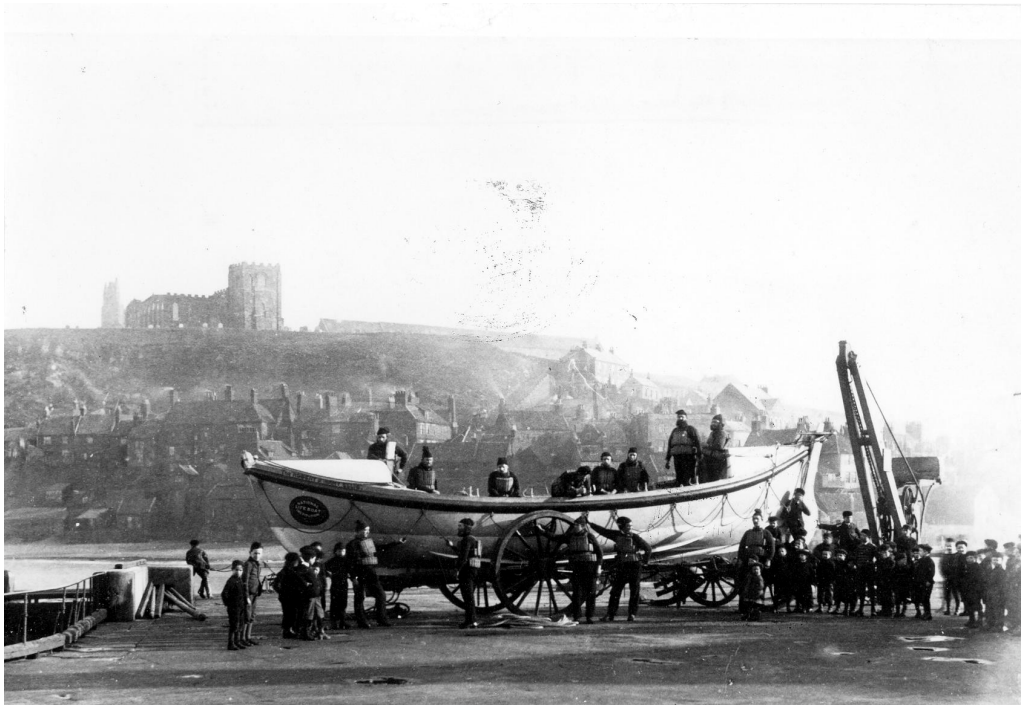

Figure 9.45. Whitby Life Boat *Robert & Mary Ellis* (1881-1909) (© Whitby Museum)

Pilotage, the guiding of ships into harbour by a local experienced sailor, has been a feature of maritime safety from at least the medieval period and remains a vital function today. Pilots are recorded for the Tees in 1752 (Friel 2003, 87).

Values and perceptions.

Maritime safety features are an obvious and easily recognised part of any coastline or shoreline. Lighthouses, beacons, and daymarks are iconic monuments bridging the boundary between land and sea. However some sites are less obvious, church spires and towers, buildings and other monuments that were not designed with maritime safety in mind but were utilised nevertheless. These monuments can be seen in a new light once viewed from a maritime perspective.

Navigation aids out at sea, such as buoys, lights, and beacons, are perhaps less obvious to anyone who does not sail although in the darkness they obviously have a more visual impact. However those that employ sound, fog horns and bells have an immediate, if not somewhat ominous pitch immediately alerting the unwary to dangers ahead.

Coastguard and lifeboat stations are an integral part of any coastal community often being manned by members of that community.

Research, amenity and education

There is considerable documentary evidence and research for this Type which would lend itself to archaeological fieldwork, not only in landscape terms and perceptions but also in terms of the history and chronology of monuments and features that no longer exist.

The use of landmarks and navigation aids greatly facilitated the development of surveying techniques and the drafting of maritime charts and coast profiles (folios) (Figure 9.46). Many of the early charts identify features that no longer exist (windmills in the study area for example) and they may be the only mapped record available constituting an important resource for landscape as well as seascape studies.

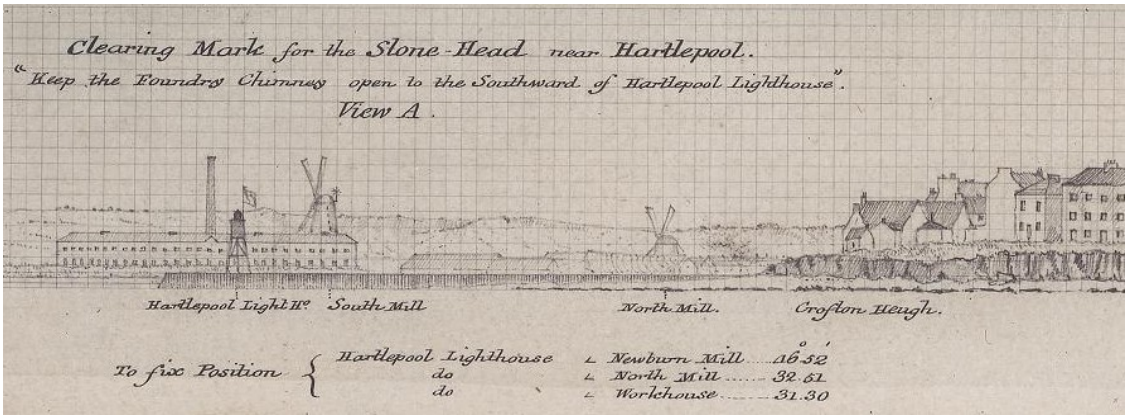

Figure 9.46. Coast profile (folio) for guiding sailors safely into Hartlepool (© UKHO)

Condition & forces for change

Navigation aids, particularly those at sea, are often replaced and renewed. Nevertheless, their mooring sites may still hold evidence of successive use, for example fixings, piles and other materials used to anchor these features to the seabed.

Terrestrial markers are increasingly becoming obsolete as radio, satellite navigation, digital marine charts and seismic technologies replace traditional methods of navigation. Similarly the automation of lighthouses has seen the people who operated and lived in these features replaced. Question marks have been raised about the relevance of lighthouses at all in an era of GPS (global positioning system) position-finding.

Rarity and vulnerability

Navigational aids are vulnerable firstly to the elements themselves, due very often to their necessary location but also to neglect. As technology surpasses traditional methods so the monuments and features associated with these methods also become redundant. Many features have already disappeared and may be discernible through the archaeological and documentary records only.

Recommendations

Navigation aids bridge the gap between land and sea and as such are fundamental to understanding the human-use of the sea. Given their under-representation it would be beneficial to research, document and map these features whether topographical, man-made or accidental. The latter in particular offer a new perspective to our understanding. Plotting the location and development of coastguard stations along the coast would also give valuable information about the development of hazards and preventative methods for coastal trades of all types (Mark Newman Pers Com).

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9.5 Semi-Natural Environment

9.5.1 Cliff

Introduction: defining/distinguishing attributes and principal locations

The Type Cliff includes the following sub-types:

- Bare cliffs;
- Precipitous vegetated cliffs.

Typical components of this Type include:

- military defences (eg pillboxes, anti-tank cubes, signal stations, fortifications, radar stations);
- maritime safety services (eg coastguard lookouts);
- navigation aids (eg lighthouses, fog stations, landmarks);
- industrial extraction and processing sites (eg quarries, mines, lime kilns, railway tunnels).

Historical processes; components, features and variability

The cliffs along this stretch of coast provide some outstanding exposures and breathtaking scenery. They are formed of sedimentary rocks laid down in the Tethyen ocean of the Jurassic and Cretaceous periods with a capping of glacial tills from the Ice Age. From this manner of formation the rocks are stratified, and are composed chiefly of shales, sandstones and limestones, with iron mineral spread through the whole (Owen 1986, 2).

Cliff-tops have been utilised since prehistory, as areas of summer grazing, sources of fuel, military lookouts and as navigational aids. These agricultural, domestic, military and navigational uses continued through the medieval and post-medieval periods and into the first decades of the 20th century.

Looking out from cliff-tops to the sea have been, from at least the 16th century, generations of military men, coastguards (and excise men or smugglers), and fishermen. Military sites found on cliff-tops include look-outs, pill-boxes, batteries, radar stations, castles and forts. There are also coastguard look-outs and lighthouses. The cliffs at Scarborough are dominated by Castle Hill, a cliff promontory rising to nearly 100m above sea level upon which Scarborough Castle is situated, as well as a former site of a Roman signal station (Figure 9.47). Roman signal stations were also sited at other cliff-top locations along this coast, at Kettleness, Goldborough, Ravenscar and at Huntcliff and purportedly at Whitby.

Figure 9.47. Aerial view of the remains of the Roman signal station at Scarborough Castle (© English Heritage/Skyscan)

There is a long tradition of religious houses being located on remote coastlines, and this coastline is no exception with the remains of Whitby Abbey situated high up on the cliff-top overlooking Whitby town (Figure 9.48) and St Hilda's Church located on the Heugh headland at Hartlepool. This is primarily due to the fact that monasteries were closely involved with exploiting marine resources and foreign trade.

Figure 9.48. Whitby Abbey (© Dave Hooley)

From the crumbling shale cliffs of Staithes to the 200m (660 feet) high cliffs at Boulby (the highest vertical cliffs in England), the cliffs can be seen to exhibit a wide variety of rock types and coastal features associated with them. To the south east of Saltburn the coast

changes rapidly from the low-lying cliffs and sand dunes at Hartlepool and Tees Mouth to high irregular cliffs, cleft at intervals by narrow defiles and small valleys. From Staithes to Port Mulgrave these give way to the shales and ironstones of the Cleveland Ironstone Formation, with the ironstone being of economic importance and extensively mined. All these rocks contain abundant fossils such as ammonites, especially the ironstones and alum shales. Of further economic importance, especially in the Victorian times, is the Jet Rock in the cliffs at Port Mulgrave, Sandsend and Saltwick Bay where the shale rocks of the Upper Lias are exposed along the cliffs and also contain many fossils.

From at least the 17th century the shale in these cliffs was worked for alum as can be seen at Sandsend, Boulby, Loftus, Peak, Stoup Brow, Saltwick Bay and Kettleness. The upper part of the alum shales was exploited to make cement and so are called the Cement Shales.

Around the turn of the 19th century, learned societies devoted to natural history, science, literature and philosophy were springing up all over Britain. It was also a time when the new science of geology was becoming a popular subject, new theories were being propounded and spectacular finds were being made. Amongst these discoveries were large skeletons of fossil marine reptiles found along the Yorkshire coast largely as a result of excavating industrial quantities of alum shale. The first reptile to be reported from the area was a marine crocodile. The Gentleman's Magazine of 1759 was given a description of the 'Skeleton of an Allegator found in the Allom Rock near Whitby, January 3, 1758'. It was discovered by Captain William Chapman (Osborne 1998, 29).

A poster advertising the exhibition of a Plesiosaur fossil found near Whitby in 1841 read:

'A splendid and very valuable fossil '"Pleiosaurus Dolochodeirus" recently found in Whitby Cliffs. This unparalleled organic specimen of so extraordinary an animal measures 15 feet in length, and 8 feet 5 inches across the fore paddles. The neck is 6 feet 6 inches long, exclusive of the head.

Among the multiplicity of fossil petrifications discovered in the neighbourhood of Whitby, this by far surpasses all, even the famed crocodile in the Whitby Museum; indeed it is questioned whether any fossil remains were ever discovered equal to that of this wonderful species of the Plesiosaurus tribe…' (Osborne 1998, 180).

The alum quarrymen uncovering these large skeletons sold them as curiosities to other parts of Britain. Certain citizens of Whitby, under the Rev George Young, became concerned that whilst these curiosities were being found locally they were being lost to Whitby and this concern spurred them on to form the Whitby Literary and Philosophical Society in 1823 with the prime purpose to set up a Museum.

The alum quarries have significantly altered the cliffs, in some places beyond former recognition, and as a result in places, they are often unstable and prone to collapse (Figures 9.49 & 9.50). Natural erosive forces are also responsible for the discovery of many prehistoric and Roman remains, exposed as a result of these falls. For example a hoard of Bronze Age socketed axes was found scattered on the beach at Scalby Ness after a cliff fall in 1916 and a Neolithic stone axe was found in the Scarborough Castle Dykes in 1950. Flint scatters have also been found along the cliff-tops here, for example at Hart Warren just north of Hartlepool.

Figure 9.49. Cliffs altered by alum quarrying at Sandsend

Cliff erosion also takes place along small faults and joints, often forming small caves, some of which were probably utilised for the smuggling notorious along this stretch of coast in the 18th and early 19th centuries.

Figure 9.50. Cliff erosion at Boulby

The generally accepted theory that the cliffs along this stretch of coast have eroded up to three miles in some places, based on the assumption that cliffs erode at an average rate approximately 30ft per century or 10cm per year (Agar 1960, 409-428), has recently been challenged by Cleveland Potash Ltd. Their research with Durham University (Department of Geography) has been looking at coastal processes at what is arguably a higher resolution than elsewhere in the UK or beyond, taking advantage of newly available monitoring technology. The work includes the historic and contemporary land-surface deformation, the development of a subsidence model for predictive use, the scale and extent of historical activity, and cliff development, evolution and recession. This research has identified rates of cliff retreat an order of magnitude lower than previous estimates, with relatively ancient cliffs remaining in similar positions in the post glacial period. Work is continuing developing this research agenda with efforts being made to identify underlying mechanisms for cliff erosion, and extending contemporary monitoring data to the long term evolution of the coastline (David Pybus pers comm).

Values and perceptions.

Much visited, mainly via the Cleveland Way coastal path, and much loved. Most people would probably be surprised to learn how much human activity took place on these cliffs up to the early 20th century. As the boundary between the sea and the land cliffs have considerable psychological and mythic meaning and value for many people. Buildings and structures relating to watching the sea (eg lighthouses, military installations) dot the cliff-line and observant visitors will always be able to see some historic features, even on the wildest, most windswept stretch.

The rocks outcropping along these cliffs have long provided a fertile stamping ground for successive generations of geologists and fossil collectors. The interesting rock outcrops here and the spectacular fossils contained within them were the basis of many theories propositioned by the likes of James Hutton ('the father of modern geology') and William Smith and George Young. In this respect the cliffs here may be considered of significant value in terms of their contribution to the development of modern geology.

> *A local legend goes that when St Hilda first came to Whitby, then just a collection of fishing huts, she found the place infested with snakes. Such was her power that, with a wave of her hand, she turned them all to stone. This myth no doubt grew from the great quantity of fossil ammonite 'snakestones' that were found everywhere in the rocks of the cliffs and on the beaches around Whitby. They were so abundant that the town put them on its coat of arms* (Osborne 1998, 296).

Research, amenity and education

In addition to their pioneering work on cliff development, evolution and recession, Durham University and Cleveland Potash have also mapped detailed extents of massive coastal landslides from Saltburn to Whitby. Instabilities as a result of the Alum works are suggested to have caused most of the recent landslides. Present day processes have been monitored using high resolution terrestrial laser scanning and digital photogrammetry. These high resolution techniques have identified 0.5 million individual rock fall events to date. The research is now analysing the nature of this rock fall activity in order to create a predictive model for analysing scenarios of future change. So far it appears that no one particular environmental control dominates coastal erosion, with a significant degree of preparation required in order for large changes to the coastline to be induced. The Failure

Erosion Model in development attempts to identify these thresholds with respect to future anticipated changes (David Pybus pers comm).

Archaeological and historical research has also been carried out on alum, jet, ironstone and other industries that took place in this Type, as well as on the Roman signal stations, prehistoric flints, smuggling/excise activities. The geological history of these cliffs has also been extensively researched.

In terms of amenity cliffs are frequently visited by walkers, climbers, etc, and there is potential here to enhance their understanding, appreciation and enjoyment of the heritage they encounter.

Condition & forces for change

There will continue to be gradual erosion by the sea and the more longer-term threat of sea-level rise. Human forces for change include the construction of sewerage schemes and coastal defences. As well as the construction itself, the movement of water and sediments can damage historical and archaeological remains.

Rarity and vulnerability

Much of this cliff line falls within Sites of Specific Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSARs, as well as being designated as a Heritage Coast from Scarborough to Saltburn and as part of North York Moors National Park.

The late Roman signal stations at Huntcliff, Goldsborough, Ravenscar and Scarborough are celebrated cliff-top features of this north east coast, but some are being eroded away. Part of the signal station at Scarborough has been lost through cliff erosion. As sites become more dangerous they are made less accessible to the public.

Recommendations

This Types importance lies in its research and amenity potential and in its high value for local people.

The potential existence of buried archaeological features within cliffs should be considered when dealing with cliff falls and proposed developments.

Careful maintenance of extant features should be encouraged and, if they are protected, statutory constraints should be enforced. The active recording of features and thus their preservation should also be promoted as this is more sustainable manner than building and maintaining sea walls, etc, to prevent their loss (David Pybus Pers Com).

More research into this Type is required and good management will be made easier through the production and implementation of integrated management plans.

Both natural and historical interests should be fully considered. As well as protecting vulnerable but important remains, plans should aim to improve the interpretation of this Type and thus increase public enjoyment of it.

With regards to Roman signal stations, English Heritage have highlighted a number of considerations involved in managing these sites, including coastal defence, transport, tourism, agriculture, public and private property interests and ecology, as well as the archaeological value of the monument itself (Fulford *et al* 1997, 179).

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9.5.2 Dunes

Introduction: defining/distinguishing attributes and principal locations

Components of the Type Dunes include:

- Military defence structures (anti-tank cubes, batteries, minefields, pillboxes, trenches and weapons pits);
- Recreation facilities (caravan and chalet parks, golf links);
- Ecclesiastical buildings (chapels, cemeteries).

Dunes are a localized habitat, principally located in the northern section of the study area, lining the River Tees and the coastal areas surrounding Teesmouth, at Marske-by-the-Sea, Redcar, Warrenby, Coatham, Seaton and West Hartlepool (Hart Warren).

Historical processes; components, features and variability

Dunes are areas of blown sand and shell deposits along low-lying stretches of shoreline. Locally they are sometimes called warrens (eg Hart Warren and Warrenby), presumably because of historical landuse (rabbits and other game). Marram grass holds together the seaward sides of dune complexes while more mixed plant communities and dune-pastures have developed on sheltered lees and lower dune-slopes. This apparently natural habitat has been influenced and affected by human activity, mainly through summer grazing of farm animals, and can be regarded as semi-natural. The marram grass itself has been introduced to some dunes to aid stability.

Within most of the dunes in this area are abandoned military structures, including anti-tank cubes, batteries, minefields, pillboxes, trenches and weapons pits. There is also the potential for important prehistoric and medieval features and complexes buried beneath Dunes.

The dunes themselves are post-glacial creations. An important historical feature of the development of dunes is the succession of sand movements and stabilizations; a stabilised land surface may be used for pasture, cultivation and settlement before being sealed by a further sand blow, the surface of which may in due course become stabilised and again used for pasture, cultivation and settlement.

In the second half of the 20th century, extensive caravan and chalet parks (eg Warrenby) and golf courses (eg Seaton Carew Golf Links) have been established on sand dunes in this area, considerably altering their character (Figure 9.51). People have been attracted by the long sandy beaches which edge most dunes since the later 19th century.

Figure 9.51. Cleveland golf links and caravan park

Ecclesiastical structures and features are also found in this type, for example the remains of St Sepulchre chapel at Warrenby and the old Hartlepool cemetery at Hart Warren.

Values and perceptions.

Most dunes are regarded as exciting wildernesses often tainted by modern caravan/chalet/golf course developments. Few people appreciate how the dunes fitted into local farming economies.

Research, amenity and education

Potential for research and documentation is reasonable. Archaeological sites possess considerable potential. Dunes are likely to contain well-preserved and well-stratified prehistoric and medieval settlements and fields and to have the best survival of bones, both animal and human. The study of dune formation and local environmental/climate history will be important as will the study of the more recent use made of dunes by local farming communities.

Potential for amenity and education research is good. Recreation has thus far used dunes mainly as adjuncts to desirable beaches or as bunker-filled golf courses but there is potential for encouraging the appreciation of the dunes themselves; their flora and some of the military and earlier sites within them.

Condition & forces for change

Sand dune systems are complex entities prone to instability and sudden, large-scale shifts. This may have important consequences for recognising, dating, and conserving archaeological sites in these areas (Petts and Gerrard 2006, 203).

The main threat to dunes appears to be from the expansion of recreation facilities. Most

dunes are now fairly stable, thanks to the planting of marram grass. There is little likelihood of loss to agricultural expansion, road provision or housing.

Rarity and vulnerability

The dunes from Seaton Carew to Redcar are designated Sites of Special Scientific Interest (SSSIs), as well as being part of a Special Protected Area (SPA). North Gare Sands are also a National Nature Reserve (NNR).

Dunes are generally rich in buried archaeological remains. These are usually well-preserved, the dunes being non-acidic, and may date back to the Bronze Age or earlier. As such they are of the highest importance. Industrial and early recreation sites survive well. Dunes are themselves relatively rare formations, but the prehistoric and medieval features found within and beneath them and some of the industrial and military remains found on them may be very rare. Surviving features tend to be isolated and unrelated except when in industrial/recreational complexes.

Recommendations

Further research on the geomorphology of sand dunes should be a priority. Dune formation and destruction can be rapid; there is a need to ensure regular resurvey of dunes for archaeological remains, particularly after major storm events (Petts and Gerrard 2006, 203).

Excavations may reveal earlier phases and sand blows expose sections showing layers of old land surfaces interspersed with layers of sand; vividly demonstrating time-depth.

Historical and archaeological sites can be more closely studied and carefully presented as a means of raising awareness of the historical element of what is often perceived to be a natural environment.

The combined ecological and historical value of dunes should be borne in mind when considering expansion of recreation sites or the developments and presumptions should be made in favour of conserving these important places. The continued monitoring of dunes is important.

Petts and Gerrard (2006) recommend that 'a regression map showing changing patterns of sand dune distribution, based on Ordnance Survey maps and aerial photographs, should be constructed. This may indicate areas of rapid change and significant stability and should be supplemented by a campaign of coring and palaeo-environmental investigation' (Petts and Gerrard 2006, 203).

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9.5.3 Foreshore

Introduction: defining/distinguishing attributes and principal locations

The Type Foreshore includes the following sub-types:

- Sandy foreshore;
- Rocky foreshore.

Components of this Type include

- kelp and kelp harvesting areas;
- shellfish and bait gathering areas;
- industrial extractive remains (rutways, ironstone and jet mines);
- sewage outfalls and pipelines;
- sea defences (groynes, breakwaters);
- military defence structures (anti-tank cubes, batteries, minefields, pillboxes, trenches and weapons pits);
- landing places (quays, jetties, access tracks for carts);
- potential buried palaeo-landscapes;
- fossils;
- recreational fishing areas.

Historical processes; components, features and variability

Foreshore comprises the sandy, silty or rocky areas running from low-water mark to the cliff and can contain important archaeological remains either at its surface (eg quays, breakwaters, industrial workings) or buried beneath it (eg old land surfaces, overwhelmed quays).

What are now often desolate foreshores were once thronged by seaweed gatherers, bait gatherers (known as 'flither pickers'), coal ships being unloaded (Figure 9.52), jet miners, ironstone miners and fossil collectors. There would have also been numerous fishermen drying their nets, the poorer people gathering driftwood for fires and sandstone for scrubbing floors, and the children picking up coal spilt on the beaches where colliers berthed (White 2004, 122). Bait digging occurs mainly during the winter months (September to March), while collection of bait from rocky shores is mainly done during summer months. Periwinkle picking, both for local consumption and export, also takes place on rocky shores throughout the year. Collection of lobster and crabs is mainly carried out in the summer months.

Figure 9.52. Coal being unloaded from the *Diamond of Scarbrough*, Sandsend beach (© Whitby Museum)

Common rights to bait, crabs, and lobsters still exist and local Acts apply to people collecting a variety of materials. There is no single body that regulates these activities, and management is usually achieved through voluntary agreements and codes of conduct which are promoted through local or national representatives (DTI. 2002, 31).

Most human activities which have left remains in this Type are connected with maritime affairs but there will also be prehistoric remains from the Bronze Age or earlier, when land that is now inter-tidal was dry ground. So there will be remains of 'submerged forests' (former soils with plant macro-fossils preserved in them eg at Hartlepool (Figure 9.53)) and, potentially at least, the remains left by people who lived and worked in and around these forests. Buried prehistoric land surfaces will contain palaeo-environmental evidence (eg macro- and micro-fossils, pollen), as well as human artefacts. Palaeo-environmental evidence can relate to an area's vegetational history or to the processes of submergence and coastal or estuarine change.

Figure 9.53. Peatbed and log exposed at Hartlepool beach (© Hartlepool Arts & Museum Service)

Most features, of course, will relate to the use of the coasts and estuaries for fishing, shipping and industry. Some will still be used (eg quays, piers) but many will be abandoned or ruined, visible only as low footings of walls or lines of rotting timbers. Piers, jetties, sea-defences and breakwaters are the more substantial of these. Wrecks or hulks of ships and boats survive on rocky headlands. Industrial remains include rutways (Figure 9.54) and partly submerged shafts (and the footings of jetties serving them).

Figure 9.54. Rutways cut into the foreshore at Saltburn

Bait for the long lines was gathered on the foreshore, mainly by wives and children. The preferred bait was mussel, although if these were unobtainable limpets served as an alternative. Other baits included whelks, 'paps' or a type of large sea anemone, razor-shells, sand worms (lug worms), nereid worms, sand eel and squid occasionally, scallops (or queenies brought up and back by trawlers) (Frank 2002, 98). Also there were large hermit crabs (in Whelk shells) used in the 1950s and 60s called 'Telpies' (David Pybus Pers Com).

Once the men had gone off fishing, wives, sisters and daughters went down onto the bleak, exposed scaurs prising the limpets off the rocks and gathering them in wicker baskets called swills (Frank 2002, 157). Often if bait was exhausted in one area the women would travel great distances, round trips of up to 30-40 miles to acquire bait from other sources, eg Staithes women sometimes travelled all the way to Robin Hood's Bay. Once the bait had been gathered the flithers or mussels had to be skaned, the soft part, the actual bait, removed from the shell. Skaning and the baiting of the hooks themselves was done in the home (Frank 2002, 165-6).

Kelp was also extensively harvested from the foreshores along this coast. From the early 17th century, the word kelp was closely associated with soda and potash (important chemicals in the alum industry) which could be extracted from burning seaweed. The seaweeds used included species from both the orders *Laminariales* and *Fucales*. The word kelp also directly refers to these processed ashes. Seaweeds have also been collected for use as fertiliser as they are nutrient-rich and alkaline.

We can perhaps gain an insight into the kind of life lived by the kelpers in along this north-east coast from John Gunn's description of the kelpers in Orkney in 1908, in his book *The Orkney Book* :

'When the gales sweep up from north or west, tearing from its deep sea-bed the red-ware, of which the long supple stems are known as "tangles". Should the wind freshen to a gale during the night, the diligent kelper is up and out before the first glimmer of dawn. Buffeted by the wind and lashed by the stinging spray, he peers through the darkness, watching for those shadows against the white surf of the breaking waves which he knows to be rolling masses of seaweed and wrack. He is armed with a "pick", an implement resembling a very strong hayfork, but with the prongs set, like those of a rake, at right angles to the handle. With this pick, struggling often mid-thigh deep in the rushing waters, he grapples the tumbling seaweed and drags it up to the beach, out of reach of the waves. For the wind may change, and the "brook", as he calls a drift of weed, if not secured at once, may be carried out to sea again, or even worse, to some other strand where it will be lost to him. Of course, the winds and waves often do this work alone, and pile the tangles in huge, glittering rolls along the beaches'. He concludes, however, that 'on the whole the kelper's lot is not an unhappy one. His work lies in pleasant places, and it is eminently healthy, and his days, as a rule, are long in the land and on the sea'

After being cut, the seaweed was carted up from the shoreline and dried on an area of beach or coastal grassland. It was then burned in large trenches, often stone-lined, for four to eight hours. The men would then beat the weed into a mass using long-handled iron mallets or hooks known as 'kelp irons'. This was covered with stones and turf, to protect it against moisture, and left to cool overnight. The following morning the pieces of kelp ash were broken into lumps and transported by ship to where it was required. The practice afforded landlords huge incomes and it was so lucrative that in some areas it was not unheard of for all the people of an estate to be set to work on the seaweed, much to the detriment of the land. The alum industry only accounted for 4% of the national kelp trade which was badly affected by the increasingly available chemical industry by-products

There was a short period of recovery when a process for extracting iodine from the kelp ash was discovered but this was short-lived. By the mid-20th century, it was confined to a few places in the Outer Hebrides.

R. R. Angerstein illustrated (Figure 9.55) and wrote of kelp burning at Staithes in his illustrated travel diary (1753-55):

'A great deal of kelp is burnt at Staithes. This is used in precipitation of alum brine. Kelp is burnt from a plant which grows on rocks by the sea, underwater at high tide but easily accessible when the tide is low. The leaves of the plant are thick, bulbous and very large, and the plant is firmly attached to the rock. It is cut, laid on the beach to dry and burnt in a small oven built of loose stones in a circle. The best time to burn kelp is from 15th April to the end of August. Children and old women are also employed in burning fern ash. Having a regard for its high salt content, this could also be used for precipitation of alum boiling, but it would be dearer here than kelp. The reason of the low price of Staithes kelp compared with the Scottish product is that in Scotland they are able to burn the kelp on the rocks. Here at Staithes it must be burnt on the ground where sand and other contaminants get into it.'

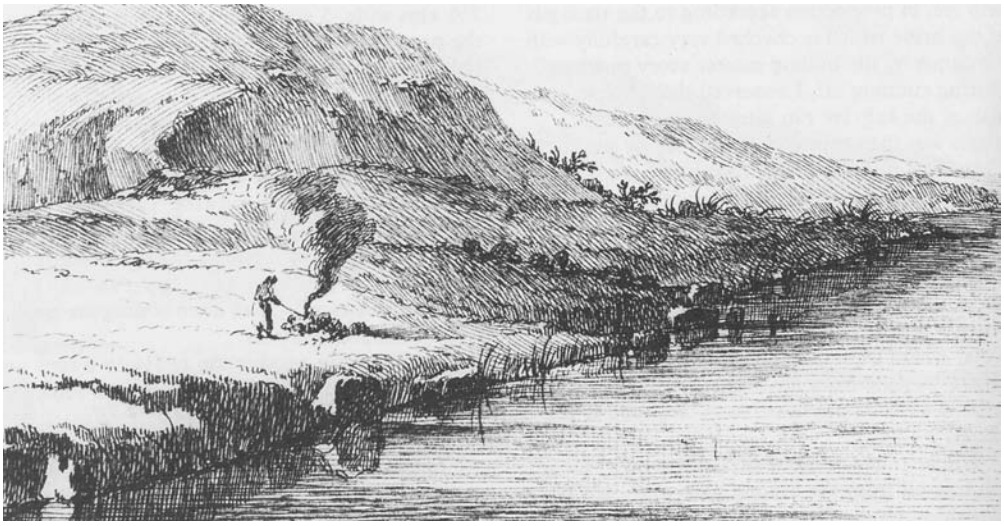

Figure 9.55. Kelp-burning at Staithes (© Science Museum)

Another component of the foreshore is coastal infrastructure, such as ports, harbours and sea defences. Archaeological remains on the foreshore can be affected by the construction and maintenance of this infrastructure, as well as by the indirect impact of the defences.

The foreshore is also a valued place for recreation activities such as fishing, sunbathing and sea-bathing.

Values and perceptions

The coast has seen continuous activity since early prehistory, but it has often been viewed from either a purely terrestrial setting or a purely marine environment. Foreshores, however, were regarded as distinct areas, neither land nor marine, with the intertidal area frequently being ignored.

The ruined remains of quays and breakwaters, and the existence of buried land surfaces, will not normally be known about but rotting hulks of wooden boats will be eerie landmarks for many.

The recreational use of the foreshore is highly valued by many, often being associated with holiday time, rest, relaxation and fun. Many also value the foreshore as a place to conduct their hobbies, interests and even their jobs, eg dog walking, kite surfing, beachcombing, painting, and writing.

Research, amenity and education

Surveys, such as those carried out by Buglass (2002) at Hole Wyke and New Gut dock, have provided the opportunity to integrate a range of archaeological features to produce a better overall picture of this Type. Hole Wyke, in particular, illustrates the evolution from the use of open beaches in the early years of the alum industry, through jetties and stages, to complex systems of tramways and tunnels (Buglass 2002, 106).

At Hartlepool flints, animal bones, and wooden stakes have been found during fieldwork on the foreshore. Excavations of stratified deposits on the beach at Seaton Carew have uncovered what appears to be a Neolithic or Bronze Age fish trap. Such finds suggest that this is an area of special significance (Fulford *et al* 1997, 154).

Further archaeological and historical work on the kelp, baiting, and recreation activities should be encouraged.

Condition & forces for change

In Hartlepool Bay patterns of sand movement and accumulation have changed in recent years with the growing extent of the sea defences so that now there are substantial depths of modern beach sand covering the underlying deposits of peat and clay, which formerly were exposed from time to time (Waughman 2005, 142).

There will continue to be gradual erosion by the sea. Human forces for change include the construction of sewerage schemes and coastal defences. As well as the construction itself, the consequent movement and shifting of water and sediments can damage historical and archaeological remains. Treasure-hunting and some forms of fishing can also be very damaging.

Rarity and vulnerability

The foreshore from Scarborough to Saltburn is part of the area designated as a Heritage Coast.

Recommendations

Further palaeo-environmental work should seek to fill significant gaps in the sequences already obtained and there are a number of areas of great potential, for example the 19th century docks at Hartlepool where the initial construction appears not to have destroyed the earlier deposits, also along watercourses and buried channels inland, and beneath former dune systems where prehistoric and Roman deposits may have been sealed by the accumulating sand dunes (Waughman 2005, 142).

The potential existence of buried features along foreshores should be considered when dealing with proposed developments. The good maintenance of extant features should be encouraged and if they are protected statutory constraints should be enforced. More research into this Type is required and good management will be made easier through the production and implementation of integrated management plans. Both natural and historical interests should be fully considered. As well as protecting vulnerable but important remains, these plans should aim to improve the interpretation of this Type and

thus increase public enjoyment of it.

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9.5.4 Woodland

Introduction: defining/distinguishing attributes and principal locations

Although woodlands are not an obviously maritime type, they have been included where they come down to the water's edge in tidal rivers, and on the coast where they have been established on the cliffs and former coastal rough ground, often to minimise erosion.

The Type Woodland includes the following sub-types:

- Semi-natural woodland;
- Ancient woodland;
- Plantations.

Components of this Type include:

- banks, tracks and paths;
- drainage ditches;
- fences.

This type comprises mainly the remnants of traditionally managed woodlands, usually found in the steep-sided valleys extending inland from rivers or coves, or in some cases via tributaries. It also incorporates ancient woodland and plantations. Many of the ancient woods have been replanted in the later twentieth century with conifer plantations.

Historical processes; components, features and variability

The term ancient semi-natural woodland is applied to those woodland areas which are considered to have been in existence from at least AD 1600, and which remain to the present day without having been cleared at anytime for uses other than wood or timber production. There is an assumption made that if a wood was present in the medieval period it has probably always been there, having developed after the last Ice Age.

The surviving ancient woodlands will have been managed and have formed important elements of the working landscape for many centuries, probably from prehistoric times. Certainly, medieval farmers and craftsmen will have exploited them as pasture grounds (underwood), sources of fuel, coppice wood and timber. Neighbouring mining regions will also have had a close relationship with woods, again from at least the medieval period, needing both timber and charcoal (for smelting).

Woodlands, whose early medieval distribution predominantly in the steeper valleys was probably established in later prehistory, were gradually lost to agricultural clearing and enclosure on the less steep valley sides from the later medieval period into the 19th century. Few valleys, however, lost their tree-cover entirely and often formed estate and parish boundaries (the stream or river usually being the precise bound).

Streams and rivers that run through woodlands often have leats taken off them from at least medieval times to work the water mills used in grinding grain.

Some 18th and 19th century country houses used the opportunities presented by already wooded slopes to establish ornamental parks and gardens in these valleys (eg Mulgrave Estate).

Conifer plantations generally form simple landscapes, blocks of firs and pines planted in rows, often on parallel banks created by deep chisel ploughs, and separated by fire breaks

and access tracks. There are also usually drainage ditches and fences and some have picnic areas.

In the replanted older woodlands, remains of pre-conifer features often survive, often in fragments, such as earlier wood-banks and tracks. Woodlands replacing ancient broadleaf woods tend to have less rectilinear edges and therefore are more sympathetically moulded into the local topography and character.

Values and perceptions.

Those extensive dark woods on the riverside have the effect of isolating the water from the surrounding, more domesticated landscape.

Plantations are sometimes viewed as looming presences which most people know have either obscured or damaged more beautiful, more ecologically varied, and more historically important blocks of the landscape. Some have public access and are appreciated by those who visit. Children enjoy their darkness and there are some ecological benefits (although most would accept that these are outweighed by habitat loss).

Research, amenity and education

Woodlands and communications networks will repay historical and archaeological research especially if they concentrate on their roles in relation to the surrounding farmland and local industries. Woodlands have been particularly neglected in recent years and are therefore likely to contain well-preserved remains.

Access to certain woodlands could be increased and the presentation of their historical aspects improved. On the whole though, the constraints of topography and property boundaries make presentation of features in this Type rather difficult.

Plantations have more potential for amenity than education.

Condition & forces for change

Woodlands in this region are generally of a small size although in many cases, are significant landscape features, particularly in the upland valleys and coastal areas. The woodlands here are particularly important habitats for key species such as red squirrel and dormouse. Major issues are the cessation of traditional management, sheep grazing, lack of regeneration, invasion of non-native species, coniferisation and Dutch elm disease.

Woodland is also increasingly becoming neglected. There is, however, increasing pressure for the replanting of woodland. If this is guided by an understanding of the known or likely sites of earlier woodlands, this should be a relatively benign force for change. A recent change of policy by the Forestry Commission now favours restructuring plantations through their gradual transformation from conifer to broad-leaf.

Most of the woodland in this study area has pockets of recognised Ancient Woodland.

Rarity and vulnerability

The coherence of its components is good as is evidence for time-depth and the Type contributes much to general landscape character. Semi-natural ancient woodlands are also considered to be of great importance for wildlife because they have had a long time in which to acquire a diversity of species and to form stable floral and faunal communities.

Plantations are of importance in terms of contribution to the present landscape character

and amenity value. Overall, however, their historical value is now quite low.

Recommendations

Relatively little is known about varying patterns of woodland management and forestry techniques in the north east. Basic research should be carried out to establish historic patterns of woodland (Petts and Gerrard 2006, 216).

Encourage retention of broad-leaved woodland. There is potential for replanting broadleaf woodland on the steeper slopes of the valleys in this study area and on those of their tributaries. Such a process of replanting will not only enhance the historic landscape character of the valleys but will also improve their biodiversity, and help reduce the velocity of water throughput.

The spread of conifer plantations should be constrained on historically more important Types, in particular Cliffs and Coastal Rough Ground. The development of a county strategy to guide the location and form of new plantations could be useful, as well as introducing more variety, particularly via broadleaf trees, and especially in the plantations established in more ancient woods.

There is an increasing commitment to returning plantations on Ancient Woodland Sites (PAWS) back to native woodland; this may have implications for historic land use. Any programme of PAWS restoration would benefit from archaeological survey in advance (Petts and Gerrard 2006, 216).

Petts and Gerrard (*ibid*, 216) also recommend that a project should be encouraged to explore the relationship between industry and the demand for wood.

Enhancing public enjoyment of woods to which the public has access could be done by undertaking historical/archaeological research and installing discreet interpretation boards.

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9.5.5 Coastal Rough Ground

Introduction: defining/distinguishing attributes and principal locations

The Type Coastal Rough Ground includes the following sub-types:

- Rough ground;
- Scrub.

Typical components include:

- military defences (eg pillboxes, anti-tank cubes, Roman signal stations, fortifications, radar stations);
- prehistoric and Roman sites, finds and field systems (flint scatters, barrows, coin hoards, settlements);
- maritime safety services (eg coastguard lookouts);
- navigation aids (eg lighthouses, fog stations, landmarks);
- industrial extraction and processing sites (eg quarries, mines, limekilns);
- Recreational facilities (eg caravan and chalet parks, golf links).

Coastal rough ground is defined as the unenclosed sloping ground beyond enclosed fields but above precipitous cliffs that runs along most stretches of the Yorkshire coast (Figure 9.56).

Figure 9.56. Coastal Rough Ground at Marske

The semi-natural habitats here are, to a considerable extent, the product of thousands of years of human activity, particularly summer grazing and extractive industry. Now almost entirely neglected; very little grazing. Long distance coastal footpaths run through the Type which is therefore quite busy in the summer months.

Historical processes; components, features and variability

The scrubby vegetation on most coastal rough ground has developed after several decades of neglect. Until its abandonment by farmers, vegetation would generally have been herb-rich rough grassland.

Archaeological sites are generally less varied than in upland rough ground as this has always been strictly marginal land.

Prehistoric components of this Type include flint scatters and ritual/ceremonial sites such as barrows.

Military sites are often found on this type, including look-outs, pill-boxes, batteries, radar stations and forts. There are maritime safety sites such as coastguard look-outs, daymarks and lighthouses.

Coastal rough ground would have previously been dependent on other neighbouring Historic Landscape Types, principally medieval and post-medieval enclosures. As summer grazing and fuel grounds, it formed an essential element of the mixed farming landscape.

Values and perceptions.

Much visited, mainly via the coastal paths, and much loved. Most people would probably be surprised to learn how much human activity took place on coastal rough ground up to the early 20th century (Herring, 1998). This is probably regarded rightly as one of the most 'natural' Types along the Yorkshire, Teeside and Hartlepool coasts. As the boundary between the sea and the land, the coastal rough ground has considerable psychological and mythical meaning and value for historically-aware people.

It is from the buildings and structures found on coastal rough ground that relate to watching the sea (lighthouses, military installations, beacons etc) that the watchers would have passed messages along to neighbouring military installations, to neighbouring coastguards, excise men or to local seine fishing boat crews. Many of their sites survive and these flickering communications can be reconstructed in the minds of imaginative visitors.

Observant visitors will always be able to see some historic features, even on the wildest, most windswept stretch.

Research, amenity and education

Research and documentation of this Type is increasing. There are, however, long stretches for which historical documentation and research are still vague.

Survey, excavation and analysis of the well-preserved archaeological sites has already yielded valuable information and will continue to do so.

Potential for amenity and education is great. There are very few unspectacular coastlines. The semi-natural vegetation is itself of interest to many people, supporting insects, birds and mammals. Many people visit the more famous archaeological sites (eg Scarborough Castle) and could be encouraged, where safe, to visit more.

Many interest groups already make use of this Type: walkers, artists, writers, historians. There is great potential for further presentation of any coherent and well-preserved historical remains to the public.

Condition & forces for change

Survival is generally good as most coastal rough ground has been difficult to improve

agriculturally but as this is increasingly neglected, many archaeological sites are becoming obscured by dense vegetation.

There are few forces for negative change beyond a minimal encroachment by farmers and an expansion onto certain cliffs of recreation facilities (eg caravan/chalet parks at Cayton Bay). Continued neglect of coastal rough ground for grazing will lead to the gradual submergence of less visible archaeological remains beneath a vegetation community which becomes annually less varied and more dominated by one or two vigorous species.

The use of coastal rough ground by long-distance walkers will continue to increase and so the place will become more widely valued; there are some problems of erosion but with careful management these can be contained.

Rarity and vulnerability

This Type is subject to numerous protective designations, such as SSSIs, SPAs, SACs and RAMSARs, as well as being part of the Heritage Coast that extends from Scarborough to Saltburn and of the North York Moors National Park.

This Type is of considerable importance. Its rare and well-preserved archaeological features survive in understandable complexes where time-depth is clearly visible. The Type is highly valued by both local people and visitors and has good potential for research and presentation.

Recommendations

Safeguarding this Type is potentially difficult because the neglect of cliff grazing has lasted for longer than most people's memories. The re-introduction of grazing may then be challenged as modern improvement of what is perceived to be natural landscape. Reintroducing cliff grazing should be encouraged, however, as this would facilitate the management of surviving historic and archaeological remains. Further loss of Coastal Rough Ground to agriculture (eg ploughing to cliff-edges), recreation and other development should be resisted.

The good maintenance of extant features should be encouraged and if they are protected statutory constraints should be enforced. More research into this Type is required and good management will be made easier through the production and implementation of integrated management plans. Both natural and historical interests should be fully considered. As well as protecting vulnerable but important remains, these plans should aim to improve the interpretation of this Type and thus increase public enjoyment of it.

Closely control further expansion of sea and river side settlements. Identify and secure key features.

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9.5.6 Salt Marsh and Sandflats

Introduction: defining/distinguishing attributes and principal locations

This Type includes the following sub-types:

- Salt Marsh;
- Sandflats;
- Mudflats.

Historical processes; components, features and variability

Salt marshes are common along areas of coastal rough ground in this area. They are a type of marsh that is a transitional zone between land and salty or brackish water (eg, sloughs, bays, estuaries). It is dominated by halophytic (salt tolerant) herbaceous plants. Historically, salt marshes have been used for grazing or have sometimes been treated as 'wastelands', along with other wetlands. The tide is the dominating characteristic of a salt marsh. The salinity of the tide defines the plants and animals that can survive in the marsh area. They usually are developed on a sinking coastline, originating as mud flats in the shallow water of sheltered bays, lagoons, and estuaries, or behind sandbars.

The salt marsh serves as a sediment sink, a nursery habitat for fish and crustaceans, a feeding and nesting site for waterfowl and shorebirds, a habitat for numerous unique plants and animals, a nutrient source, a reservoir for storm water, an erosion control mechanism, and a site for aesthetic pleasures. Appreciation for the importance of salt marshes has led to legislation aimed at their protection.

Salt marshes are one of the most biologically productive habitats on the planet, rivaling tropical rainforests. This is partly due to the daily tidal surges that bring in nutrients, the natural chemical activity of salty (or brackish) water, the tendency of nutrients to settle in roots of the plants there, and the tendency of algae to bloom in the shallow unshaded water.

Coatham Marsh (Figure 9.57) is used by over 200 species of bird, including heron, coot and kestrel which are present throughout the year. In winter large flocks of Lapwing, Teal, Widgeon and Shovelar can be seen. Many of the old street names of nearby Warrenby echo the importance of this area for birds, names included Snipe Street, Teal Street and Wigeon Street. Skylark, lapwing and meadow pipit thrive on the insect-rich coastal grasslands.

Inter-tidal mudflats and sandflats are also encompassed in this Type. These are generally located in tidal estuaries and can contain important archaeological remains either at surface (eg quays, breakwaters, wrecks) or buried (eg old land surfaces, overwhelmed quays). Most human activities that have left remains in these areas were connected with maritime affairs but there may also be prehistoric material from when land that is now inter-tidal was dry ground.

Figure 9.57. Coatham Salt Marsh, Warrenby

Values and perceptions.

Salt marshes are highly valued ecologically with many important species of fauna and flora thrive or at least survive in them. Many are now nature reserves or have been given national or county nature conservation designations (eg Coatham Marsh). As yet, they have not been given much attention by historians or archaeologists despite contributing much to our understanding of past communities' full and varied use of their landscape.

Research, amenity and education

Survey, excavation and analysis of the well-preserved archaeological sites has already yielded valuable information and will continue to do so. Archaeological research of the coastal peat bogs has also been carried out and should continue in light of the important palaeo-environmental information these contain.

Potential for amenity and education is great. The semi-natural vegetation is itself of interest to many people, supporting insects, birds and mammals.

Relatively little research has been undertaken on the palaeo-environmental potential of studying profiles taken from salt marshes. Further historical analysis of the uses made of these marshes and wet areas can be expected to yield useful information.

Presentation of any coherent and well-preserved historical remains to the public should be made wherever possible.

Condition & forces for change

Survival is generally good as most marsh and estuarine areas have been difficult to improve agriculturally but as this is increasingly neglected except for wildfowling and some grazing; some archaeological sites are becoming obscured.

In the past, substantial areas of saltmarsh have been reclaimed as agricultural land and for urban development, but they are now accorded a high level of protection. There is growing interest in restoring salt marshes, through a process of managed retreat. Conversely, many of these areas are under threat from 'coastal squeeze', excelerated by rising sea levels and increased wave energy and storminess.

Rarity and vulnerability

This Type is subject to numerous protective designations. The Wetlands at Seaton Sands and Greatham Creek are recognised as wetlands of international importance (RAMSAR sites) for wintering wildfowl and waders and as a result are designated as Special Protection Areas (SPAs). Seal Sands are also designated as a National Nature Reserve (NNR).

Waterfowl that winter on estuaries are vulnerable to land claim and other developments that would disturb or damage the existing ecology of these sites. Other human influences, such as recreational disturbance, commercial exploitation of shellfish and worms, and oil and industrial pollution, are also potentially damaging to the conservation interest of estuaries.

Recommendations

Further agricultural improvements to salt marshes by draining, while increasingly achievable with modern machinery, should be discouraged. This would ideally be done by raising farmers' awareness of the value of the Type, but if necessary might be achieved either by designation and protection or through developing financial disincentives (eg through agri-environmental schemes).

It appears reasonable to suggest that there should be positive encouragement for re-establishing lowland marshes, where feasible, alongside the main rivers and their tributaries. This may be expected to further reduce input of nutrients into the river systems and have considerable benefits in terms of biodiversity and historic landscape character.

Continued palaeo-environmental research on the mudflats and sandflats should inform our understanding of their recent as well as medieval and earlier development. The potential existence of buried features in these areas should be considered when dealing with proposed developments.

The good maintenance of extant features should be encouraged and if they are protected statutory constraints should be enforced. More research into this Type is required and good management will be made easier through the production and implementation of integrated management plans. Both natural and historical interests should be fully considered. As well as protecting vulnerable but important remains, these plans should aim to improve the interpretation of this Type and thus increase public enjoyment of it.

Closely control further expansion of sea and riverside settlements. Identify and secure key features.

Sources

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9.5.7 Water (fresh)

Introduction: defining/distinguishing attributes and principal locations

The Type Water (fresh) includes the following sub-types:

- Watercourses (streams, non-navigable rivers);
- Springs;
- Ponds;
- Lakes.

Watercourses, running from the high moors inland, frequently dissect the coast along this shoreline. Numerous springs and ponds are also dotted along the cliffs on this stretch of coastline.

Historical processes; components, features and variability

In Yorkshire streams and brooks tend to be named 'becks' (eg Staithes Beck), a Middle English word that comes from the Old Norse *bekkr*. All tend to share similar characteristics of being fast flowing, oxygen rich, rain-fed and relatively unpolluted. These rich waters attract many kinds of flora and fauna (Figure 9.58).

Figure 9.58. Ducklings on the bank of the River Esk

Apart from shelter, a good supply of freshwater has always been a key factor in settlement patterns and this holds true along this coastline, where settlements have grown up along the rivers and streams or close to springs.

Recent evidence from dried up channels of major rivers like the Thames suggests that prehistoric burial in rivers and lakes may have been the normal funeral rite in later Bronze Age and Iron Age Britain.

A description of the River Esk, reproduced from the Yorkshire Weekly Post by Tom Bradley (1988):

'One of the most striking features of the Esk, considering that it is little over twenty miles in length from source to mouth, is its wide proportions in the lower reaches. This is not just in the estuary, but above the ordinary reach of the tides, which rarely flow beyond the weir at Ruswarp….The Esk gathers strength from the high hills and mountains which enfold it in the whole length of its course, and the high moorlands and mountainous districts which border on Eskdale all drain into the river whose estuary forms Whitby Harbour..' (Bradley 1988, 3)

Watercourses have often been utilised to facilitate industry (eg corn mills, alum works, etc). Conversely settlement and industry can have detrimental effects on freshwater supplies, such as sewage contamination or waste from ironstone mines (that has discoloured many of the streams in this area).

Rivers and streams have also long been popular for recreation activities such as boating and angling (Figure 9.59).

Figure 9.59. Boating at Ruswarp, River Esk (© Whitby Museum)

Angling on the Esk is highly regarded, with salmon, sea trout and brown trout being abundant.

'If you stand at Whitby Station any night when the freshets are on and see train after train disgorge its small contingent of anglers, each with a string of salmon thrown over his shoulder or a heavily-laden fishing bag, you will be satisfied that catches are made in actuality, and not in the corner of one's favourite smoke-room with an imaginative rod and line and a whiskey-inspired cast of flies' (Bradley 1988, 24)

The water in some parts of this study area is also renowned for being rich in beneficial minerals. In 1626 a stream of acid water was discovered running down from one of the cliffs to the south of the town of Scarborough. The medicinal benefits of the water were

soon discovered and by the 1690s the wells were famous and Scarborough had made its first steps not only as a Spa town but as the original English seaside resort. The strong mineral content of the water is readily apparent in the staining caused to the stone, the reason why the waters were originally discovered as they trickled over the rocks and stones somewhere near this site.

Values and perceptions.

Anglers will always value those rivers where they had success. Most people will appreciate the beauty and the wildlife value of the water bodies.

Research, amenity and education

They have a high recreational value.

Condition & forces for change

Water supply is for the most part a matter for inland areas, but there are particular concerns at the coast about the discharge of water and sewage, and the maintenance of water quality.

The effect of water quality (pollution) on archaeological resources may be a factor for the preservation of terrestrial, inter-tidal, and submerged archaeological sites. Pollution alters the chemical composition of water and soil, often making them more acidic and thus more likely to damage any archaeological remains they come into contact with. However, very little research has been carried out on water pollution and its effect on archaeological sites (Fulford *et al* 1997*, 206).*

Throughout the region, the Environment Agency (EA) has prepared a series of Local Environment Action Plans (LEAPs) for the major river catchments (i.e. Tees, Wear and Tyne). The aim of the Plans, is to identify, prioritise and cost environmentally beneficial actions which the EA and partners will work together to deliver. This will be achieved by focusing attention of interested parties in planning for the future for the environment of a specific area and establishing an integrated plan of action for managing the local environment over five years

Rarity and vulnerability

The Esk in particular is of regional importance for the quality of its salmon and trout fishing.

Recommendations

More historical work could be done on the development of freshwater fishing.

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9.5.8 Palaeo-landscapes

Unlike the other Types in this section that discuss present character, this Type is only recorded as 'Previous Character' in the HSC database, yet its archaeological importance necessitates that it is described and explained in the same level of detail.

Introduction: defining/distinguishing attributes and principal locations

The Type Palaeo-landscapes includes ancient landscapes and palaeo-environmental deposits now submerged beneath the sea or buried deep in the muds and silts of estuaries and rivers; it also includes submerged forests exposed in the study area's intertidal zone.

There is evidence for human activity across Britain and mainland Europe for the last 700,000 years. For all glacial periods there is potential for archaeological material deposited in sediments on the continental shelf, although no material much older that 100,000 years is likely to have survived the Wolstonian glaciation (*c*330,000BP to *c*135,000 BP) in the central and southern North Sea (Flemming 2002, 8). Most of the sands and gravels in the area are likely to be late Devensian in date (18000-10000BP) deposited after the melting of the ice sheets. At this time sea level was lower than at present and most of the North Sea was dry land. This submerged landscape is often known as 'Doggerland' (Figure 9.60, Coles 1998), referring to a time when Britain was still connected to the Continent (*c*9000-6400BC). Crudely, this palaeo-landscape might equate to the 120m bathymetric contour which marks the global lowstand during the last glacial maximum 18,000 year ago.

Across the central and southern North Sea there is submerged archaeological potential for Pleistocene flora and faunal remains. Early or Lower Palaeolithic potential is minimal but there is greater likelihood of Middle and Later or Upper Palaeolithic remains. Holocene deposits may hold Mesolithic archaeological potential, both *in situ* and in secondary contexts. The Dogger Bank was isolated and inundated by *c*5500BC and after that the archaeological potential is purely maritime.

> 'Around 10,000BC, with rising temperatures and sea-levels, Doggerland must have offered an increasingly attractive environment for human settlement. Periglacial tundra was replaced by more temperate grassland with shrubs, and this in turn was gradually colonised by trees, first by birch, willow and hazel, later pine, oak, alder and elm. As climate and fauna changed, so did the animal resources available. The big game of open grassland – mammoth, red deer, aurochs, wild horse – may have once attracted Late Palaeolithic hunters to Doggerland. But as the temperatures rose, as river systems and wetlands developed, and the trees advanced and woodlands thickened, a wide range of mammals, fish and wildfowl must have lived in the varied environments created' (Gaffney, 2006).
>
> 'Doggerland had a coastline of lagoons, marshes, mud-flats and beaches. It was probably the richest hunting and fishing grounds in the whole of Europe. Grahame Clark, the excavator of Star Carr, believed that Doggerland had been the heartland of the northern Mesolithic culture' (Mithen 2003, 150).

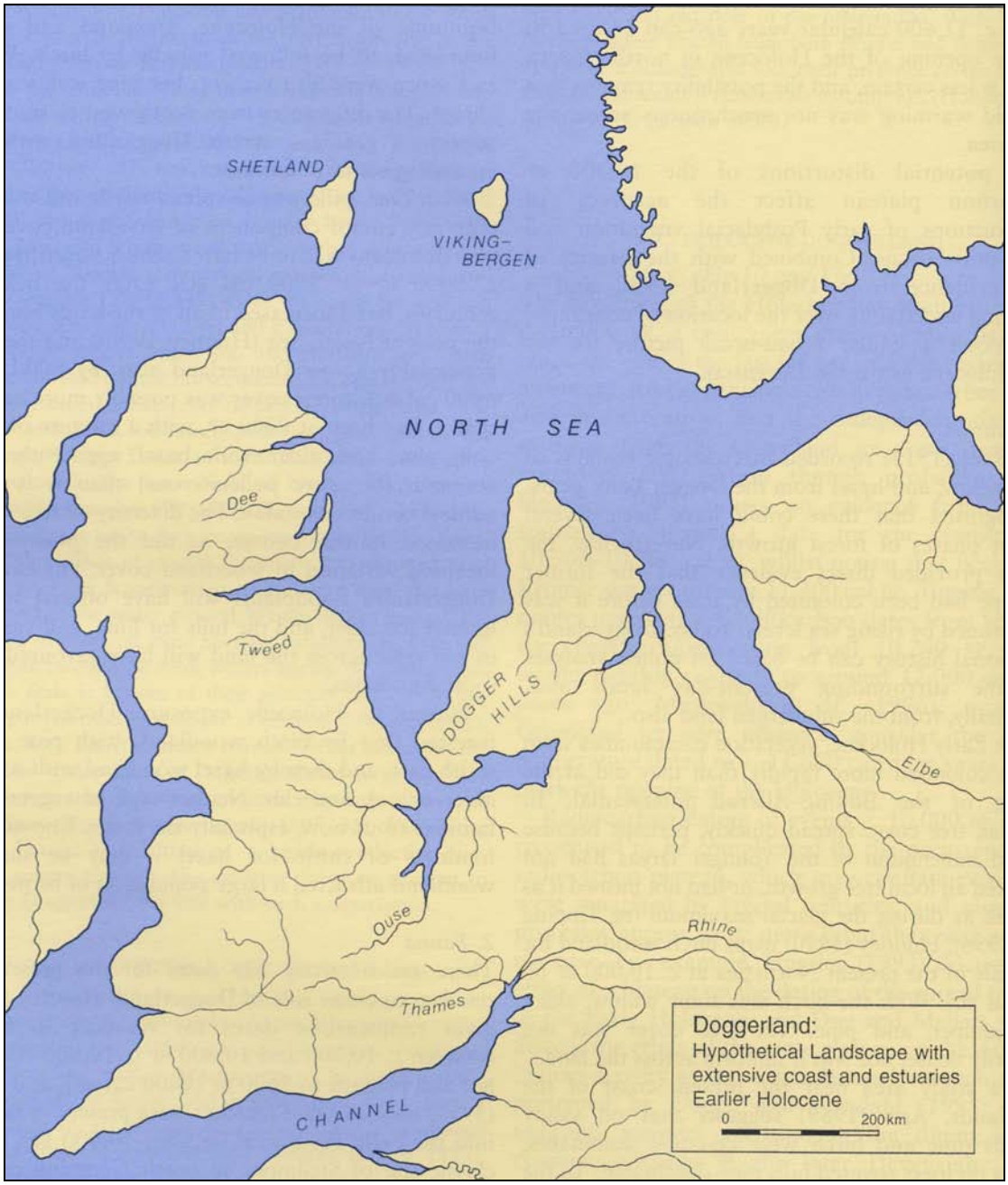

Figure 9.60. Doggerland in the earlier Holocene (© B.J. Coles and S.E. Rouillard)

A number of areas of the central and southern North Sea have particular archaeological potential. Generally banks that have pre-Holocene cores or are not modern marine sand bedforms could have once formed headlands, promontories, or islands. Closely spaced banks would have narrow channels between, places that would have provided both shelter and good fishing. Depending upon the precise gradients and topography, low ground adjacent to higher ground is likely to be archaeologically productive.

Areas of particular potential include those favourable for occurrence and preservation of submerged prehistoric sites. Principally these include:

- 'Fossil' estuaries and river valleys.
- The flanks of submerged banks and ridges proven to have peat layers, or which are likely to have peat layers.
- Valleys, depressions, or basins with wetland or marsh deposits.

- Wetlands, estuaries, nearshore creeks, intertidal mudflats and peat deposits.
- Low gradient beaches with constructive onshore wave action.
- 'Fossil' archipelago topographies where sites were sheltered by low-lying islands as the sea level rose.
- Deposits of sediments formed within, or washed into rocky gullies and depressions.
- Cliff coasts of unconsolidated glacial drift which may contain artefacts which are eroded onto the shore (the rocky Yorkshire coasts present such potential).
- Caves and rock shelters in re-entrant bays, fossil erosional shorelines, submerged rocky shores protected by other islands (Flemming 2004, 15).

The most recognisable named area is Dogger Bank, the large raised platform consisting of Devensian pro-glacial lake deposits and glacial moraine, mostly patches of gravel and formations of calcareous sands with peat infilling glacial depressions; all overlying Pleistocene sediments. BGS (1990) sediment maps describe Holocene sediments 5-20m thick on the south-east flank of Dogger Bank, while most of the surface of the Bank is covered by 1m thick Holocene deposits. A palaeo-environmental core recovered from the Bank records a diamicton surface overlain by a thin silt peat that grades into over 4m of sand silt. Saltmarsh foraminifera and pollen taxa have shown these sediments to have formed under predominantly inter-tidal conditions though with some freshwater influence. The top of the peat is dated to 8140±50BP at -31.06m OD (Shennan *et al* 2000, 303).

A great deal of Pleistocene faunal material (including mammoth and rhinoceros teeth) has been recovered and reported by fishermen from this area of the North Sea. Many of the bones are in a bad state of preservation, probably as a result of prolonged subaerial exposure prior to inundation. Many human artefacts, mammal remains and peat deposits have also been dredged and reported from locations reported as The Dogger Bank. However beyond the general location of these areas, little is known about their stratigraphic context or spatial patterning.

A more likely environment for the origin and preservation of archaeological materials would be the vast lagoon or sea basin which existed to the south of Dogger Bank from 8000-7000 years BP. In the Mesolithic period occupation was more likely in the lower valleys, settlements would have been in the lee or shelter of ridges and headlands, not on the tops, although hunting could have taken place on the higher ground. The lowland of marshes and coastal wetlands would have provided Mesolithic people with rich and varied resources (Flemming 2002, 18).

The shallow sea basin, about 90 nautical miles (167 km) in diameter was connected in the north-west to the open North Sea by a narrow channel, now the Outer Silver Pit. While artefacts and archaeological deposits left on the upper surface of Dogger Bank are likely to be exposed by present currents and wave action (very severe, breaking waves in 10m) it is probable that there are far more relicts originally abandoned on the shore of this shallow sea, in the area now at a depth of about 40m. The rising sea would have had very little destructive force until the water was tens of metres deep, and strong tidal currents were developing. Whitehead and Goodchild (1909) describe the recovery of peat deposits or 'moorlog' by fishermen, especially on the north side of the basin, on the flanks of Dogger Bank itself (Flemming 2002, 33).

The area close to the Yorkshire coast was subjected to ice erosion during the Devensian, and although there are few thick sediment layers which might contain archaeological materials, a submerged forest is known in the waters just south of Hartlepool. Early

Mesolithic worked flints have been excavated from the peat beds associated with the forest. It is likely that there is further potential along this stretch of coast to and within the Tees Estuary itself and further south along to Redcar. In Danish waters submerged forests are recorded down to a depth of c30m. The oldest ones date to c9000BP. Even older ones may be found much deeper in the North Sea. Such remains have been identified by seismic surveying in a filled-in river valley at a depth of 45-50m in the eastern part of the Dogger Bank (Fischer 2004, 29).

A number of Mesolithic artefact scatters and Neolithic finds are recorded along the coastline between Hartlepool and Scarborough often eroding from cliffs, beaches, dunes and the foreshore but also turned-over on the farmland on the cliff-tops. Excavations at Howick, just north of this project area, have found remains of a Mesolithic hut site and an Early Bronze Age cist cemetery located on a modern cliff edge, and have forced a rethink of the scale and nature of Mesolithic settlement in north-east England, as well as the relationship between this and other regions around the North Sea Basin. Flint scatters have also been found at Hart Warren just north of Hartlepool. The submerged forest at Hartlepool-Seaton Carew also revealed later Neolithic remains including flint artefacts, human remains and a fish trap (Tees SMR). Similar finds have been found at Redcar Beach, and on the cliffs south to Easington. A tree trunk with an oval, charcoal lined cavity was recovered from lake deposits, probably dating to the Neolithic, in the Berwick Hills area of Middlesbrough (NMR: 27607) and a presumed Neolithic cranium was dredged from a bed of peat in the River Tees at Newport (NMR: 26871). Further south at Biller Howe, west of Robin Hood's Bay, a multi-period (Mesolithic to Early Bronze Age) flint site is recorded and a Neolithic stone axe was found in the Scarborough Castle Dykes. A Palaeolithic settlement, flint scatter and hearth was discovered and excavated at Seamer Carr. This area also showed continued use or re-use during the Mesolithic with a settlement discovered at Kilerby Carr, both sites just south of Cayton. The famous Mesolithic site of Starr Carr lies only a short distance south and west in the Vale of Pickering.

There are also, however, distinct areas of the North Sea that may be considered of limited archaeological potential. The deepest ice-scour valleys and the deep valleys of the major rivers crossing the central floor of the southern North Sea are likely to have provided appealing habitation areas after the retreat of the ice, but these valleys are now usually filled with thick Holocene deposits and modern marine sands, such as the banks and sand waves of the area known as The Hills, south-west of Dogger Bank. Further archaeological and sedimentological research on this problem using sub-bottom profiling and seismic mapping might be worthwhile, but there is little chance of artefacts being exposed on or near the surface (Flemming 2002, 19).

Historical processes; components, features and variability

The Holocene period, after the last Ice Age, has seen the North Sea area transformed, but the north-east coast of England relatively little changed.

At the start of the Holocene the North Sea coastline ran from the area of the Norwegian Trough to a western embayment, inundated well before 10,000 years BP, extending south to the latitude of Flamborough Head. The coastline of north-east England was only a little further east of the present-day coast (Shennan *et al* 2000, 308). By 9000 years BP the western embayment had pushed south, to off Spurn Point, and then east to produce a shallow estuary to the south-west of Dogger Bank, the Strait of Dogger. The earliest sea-level index point from the river Tees shows the coastline of northern England very close to the present, with tidal waters extending into the estuary (Shennan *et al* 2000, 309).

The palaeo-geography of 8000 years BP indicates that the North Sea was then connected to the English Channel via a narrow strait east of Norfolk and west of Texel (now in the Netherlands). The Dogger Bank became cut off from the European mainland during high tides (Shennan *et al* 2000, 309). By 7500 BP the coast of northern Europe ran directly from eastern England to Denmark. It was deeply incised with estuaries that led into narrow-sided valleys that in turn wound their way between gently rolling hills. The channel separating north Norfolk from mainland Europe was only 5-10m deep at mid-tide and the channel between the Dogger Bank and mainland Europe was less than 5m below MSL in parts. (Shennan *et al* 2000, 309-10).

By 7000 years BP the Dogger Bank was only exposed at low tide and by 6000 BP it was submerged at all stages of the tide and the western margins of the North Sea were either close to or inland of the present coastline (Shennan *et al* 2000, 310-11). From 5000 years BP to the present relative sea-level increased gradually in the western North Sea south of the River Tyne, but rose above present levels to the north (Shennan *et al*, 2000; 311). Even during the periods of most rapid relative sea-level rise, especially during the early Holocene in the southern North Sea, coastal and saltmarsh vegetation communities formed temporarily during coastline retreat (Shennan *et al* 2000, 317).

The Doggerland landscape represented a living space rather than merely a 'landbridge' connecting Britain to mainland Europe (Coles 1998; 1999). In many ways the topography of the Danish archipelago is analogous with the low relief of the central North Sea. It is possible to envisage the rising sea penetrating river valleys, inlets and creeks into marshes, and separating low islands only 30m high in places (Flemming 2004, 18). The variation in rate of sea-level rise, standstill and fall combined with local topography, meant that land loss probably occurred in fits and starts. Deeply incised Pleistocene river valleys would have gradually infilled with no perceptible change for decades or even centuries during the early Holocene. However these periods of minimal change may have occasionally been followed by periods of continual or dramatic change.

Archaeological evidence from Denmark indicates that settlements are the most numerous type of submerged site likely to be found and this may also be true for the British areas of the central and southern North Sea floor. The majority of Mesolithic sites on the South Scandinavian sea floor were originally located close to water – rivers, lakes, and especially the sea – often sited along the seashore itself right next to places where people could exploit the resources immediately available. Hunting kill sites, flint quarries, flint-knapping sites, settlements, camps, shell middens, charcoal from fires, and shelters, tend to cluster round shorelines, estuaries, lagoons, headlands and promontories (Flemming 2002, 8). Most submerged settlements along internal Danish shorelines had one or more fish weirs, structures that would have had to be repaired and replaced frequently. Fishing using wood-built weirs has been practised in the Danish archipelago until the beginning of the 20th century and almost identical constructions are known from the Mesolithic, the largest one recorded is located perpendicular to the former shore at the small island of Nekselø, extending over a distance of 250m. It consists of vertical poles up to 150mm wide to which up to 4m high wickerwork panels were tied. The panels were made of straight sticks of coppiced hazel (Fischer 2004, 27).

'The Mesolithic coastal dwellers of Doggerland began to see their landscape change - sometimes within a single day, sometime within their lifetime, sometimes only when they recalled what parents and grandparents had told them about lagoons and marshes now permanently drowned by the sea. An early sign of change was the ground became boggy, when pools of water and then lakes appeared in hollows as the water table rose. Trees began to drown while the sea remained quite distant. Oak and lime were often the first to go, alder normally the last, surviving until sea water was splashing its roots and spraying upon its leaves. High tides became higher and then refused to retreat. Sandy beaches were washed away. Coastal grasslands and woodland became salt marsh – land washed daily by the sea which saturated the soil with salt. Only specialised plants could survive such as the edible samphire and cordgrass that provided a home for an assortment of fleas, bugs and midges. Herons, avocets and spoonbills soon came to feed where, not long before, woodland birds had flourished. The North Sea invaded Doggerland. Marine waters worked their way into valleys and around the hills; new peninsulas appeared, became off-shore islands and then disappeared for ever' (Mithen 2003, 151).

Once sea levels rose beyond the confines of river valleys large areas of the landscape would have 'suddenly' flooded over distances of hundreds of metres or kilometres. Catastrophic events like this would have had a dramatic impact on individual perceptions and communal memory of the landscape during the Mesolithic (Chapman and Lillie 2004, 67). One such catastrophic episode, the Storegga slide, occurred about 6000BC when a massive sub-marine landslide in the Artic Ocean midway between the coasts of Norway and Iceland caused a series of immense tidal waves, tsunamis that must have devastated the low-lying coasts of Doggerland.

'Mesolithic people may have heard the distant rumblings … water from the northern North Sea would have rushed into the space vacated by the landslide. People on land would have noticed that the sea receded, probably as far as the eye could see, in a matter of tens of minutes. They may have thought that the newly revealed shellfish and stranded fish represented an amazing bonanza! The seawater, piled up in the depression, then began to flow out again as a series of massive waves travelling at 20-30m per second on shallow coasts. Four or five waves would have hit the coast over two or three hours, each separated by a strong backlash as water flowed back to sea. Any coastal settlements would have been flooded without warning; indeed the water depth would have been many metres, and people and animals would have been drowned. Coastal and estuarine areas, resources and people would have been devastated' (Edwards, 2005).

Many of the settlement sites also include organic-rich midden deposits including fragments of wickerwork, log boats, discarded tools and food remains; habitation areas with hearth remains, flint knapping workshops and graves. Votive sites from the Neolithic are also common phenomena in the Danish archipelago, usually found close to the present shore, typically in protected areas such as fjords or narrow straits. The types of finds most frequently seen are late Neolithic flint daggers, flint axes, shaft-hole axes and pottery (Fischer 2004, 27-28).

Dogger Bank was the location of a major First World War naval battle that took place on 24 January 1915, between squadrons of the British Grand Fleet and the German High Seas Fleet.

Values and perceptions.

Today the submerged landscapes of the North Sea offer tantalising glimpses of a drowned culture, lost and somewhat mysterious yet full of potential for further understanding, a link to a period before Britain became an island, but one not widely known to public perception.

In recent times this area of the central North Sea will be recognised as being covered by BBC Radio 4's Shipping Forecast, for the sea areas 'Tyne' and 'Dogger' and the Inshore Waters forecasts for 'Berwick on Tweed to Whitby' and 'Whitby to The Wash'. The Shipping Forecast is provided by the UK Meteorological Office on behalf of the Maritime and Coastguard Agency. It is broadcast four times a day and consists of reports and forecasts of weather for the seas around Britain. Its unique, distinctive name means it has a wide iconic appeal even to those not solely interested in nautical weather.

Some will always associate Dogger Bank with the First World War naval battle. Similarly Dogger Bank may be remembered as the site of the UK's strongest earthquake measuring 6.1 on the Richter scale. Taking place on 7th June 1931 its epicentre was on the Bank, about 60 miles (96.6km) from the coast of England and its effects were reported throughout Britain and even in Belgium and France.

Research, amenity and education

The palaeo-landscapes and submerged prehistoric settlements of the central North Sea are important for at least four reasons.

- The potentially rich preservation of organic materials. Peat deposits on the Dogger Bank are important as they provide both an archaeological resource of palaeo-environmental evidence and also clear evidence that marine transgression has not totally removed all traces of the former land surface(s) (Wessex Archaeology, 2002).
- They inform important parts of the settlement patterns of coastal regions and understanding their nature and extent might allow estimations of late Pleistocene and early Holocene human population size and distribution.
- They may represent a more varied array of subsistence, manufacturing, and ceremonial activities than the adjacent inland sites from the same regions. Submerged sites on the Danish sea floor are numerous, well-preserved, technically within easy reach and easily predicted topographically. In many cases they represent fundamental aspects of culture, the traces of which cannot be found above present sea level (Fischer 2004, 31).
- They inform our understanding of the timing, manner and direction of early post-glacial Mesolithic settlement of the present British Isles.

The location of Mesolithic settlement sites means there is a premium on accurately identifying the shorelines and rivers at each date, and especially those shorelines where sea-level was locally constant for hundreds or thousands of years, relative to local land (Flemming 2002, 8). The low gradients of the North Sea floor were associated with a complex indented coastline of low-lying islands and marshes during the last marine transgression. This terrain produced similar topographies to the Danish archipelago, which is proven to be the location of over 2000 submerged Mesolithic sites (Flemming 2005, 18).

Prospective sites, to be considered for high resolution geophysical survey and mapping include:

- Depressions, large lagoons, channels (eg the extensive shallow depression south of Dogger Bank, and through the Outer Silver Pit; the area SW of Dogger Bank known as The Hills).
- Palaeo-coastlines, headlands, bays, coastal lagoons (eg. Dogger Bank).
- Modern coastlines including caves and cliffs (eg. The Yorkshire cliffs, and other

cliff coasts of Northumberland and East Anglia are important erosional features with artefacts occasionally being revealed. Recent research has also mapped the presence of surviving palaeo-cliff-falls (see David Pybus pers comm, pg 135 of this report).

- Present inter-tidal mudflats and wetlands (eg Tees Estuary).
- Lee of islands and archipelagos (eg Tees Bay and Estuary).
- Estuaries, wetlands, marshes, peat (eg Tees Estuary) (after Flemming 2002, 19).

Sites that are buried to a sufficient depth of sediment have a far greater chance of surviving *in situ*. Conversely however, this reduces the possibility of their discovery compared to exposed material. Recently exposed material may also have the advantage that the spatial relationships between artefacts are not too disturbed (Westley and Dix 2006, 209).

If the archaeological deposit is buried under 5 to 10m of mud or sand, it will not be discovered, except in very unusual circumstances. Thus the final requirements for survival and discovery are:

- Low net modern sediment accumulation rate so that the artefacts are not buried too deeply.
- No fields of sand waves or megaripples over the site.
- Ideally, a slight change in oceanographic conditions so that the site is being gently eroded to expose deposits when visited by archaeologists (Flemming 2002, 12-13).

Geophysical and geotechnical survey methods can be used in combination to address prehistoric deposits. Bathymetric survey, using single beam or multibeam systems, can be used to establish the basic framework for gauging the presence of prehistoric material. The height of the seabed, in conjunction with secondary sources relating to sea-level rise, sets the broad parameters for when an area of seabed might have been exposed, and therefore inhabitable (Wessex Archaeology, 2007).

Current research, such as the 'North Sea Palaeo-landscapes' project, undertaken by the University of Birmingham, has employed high resolution marine seismic data to analyse the seabed stratigraphy of an area the size of Wales in the central North Sea. Geophysical survey may have considerable potential for reconstructing palaeogeography below the low water mark and thereby identify the locations most likely to have been occupied during prehistory. The advantage of seismic data is that it can penetrate through recent sediments to the underlying bedrock geology identifying series of superimposed original land surfaces and features such as river channels, lakes, basins and marine estuaries. The detailed results from studies like this will allow better models of archaeological potential and their attendant threats to be assessed.

British Geological Survey maps, and their associated cores, are also be an essential tool for assessing the archaeological potential and sensitivity of areas of the sea floor. They provide classification of surface sediments by grain size, thickness of active marine sediments, as well as the thickness of Holocene deposits and other information on tidal currents and marine bedforms.

Condition & forces for change

The survival or destruction of an archaeological deposit, whether originally inland or on the coast depends on the local topography within a few hundred metres or a few kilometres of the site. Although other factors apply, for example normal subaerial erosion processes, the critical period for survival of palaeo-landscapes is the time when the surf

type starts to impact, and the ensuing few hundred years as the sea level rises and shallow coastal waters break over the site. Factors favourable for survival include the following:

- Very low beach gradient and offshore gradient so that wave action is attenuated and is constructional.
- Minimum fetch so that wave amplitude is minimum, wavelength is short, and wave action on the seabed is minimum.
- Original deposit is embedded in peat or packed deposits to give resistance and cohesion during marine transgression. Modern marine sands, sand waves, and sand sheets, cloak many of the archaeological strata, but movement of these deposits, or periodic erosion can expose sites.
- Where deposits are in cave or rock shelters; roof falls, accumulated debris, concretions and conglomerations all help to secure the archaeological strata.
- Local topography comprising localised shelter from dominant currents, wind fetch and surf type at the time of transgression (Flemming 2002, 12).

Archaeological material deposits are likely to have undergone considerable taphonomic changes following initial deposition. 'They may be covered by metres of marine sediments which protect them indefinitely, or they may been eroded by ice, worn by rivers, battered and scattered by surf action, eroded by bottom action of storm waves, eroded by tidal currents, be chemically altered, or disturbed by trawling, dredging, entrenching or drilling' (Flemming 2002, 12).

Along the foreshores of the study area Holocene deposits are likely to be irregularly preserved and it may be difficult to achieve a clear picture of past environmental processes and human activity. Furthermore erosion will have certainly reduced the spatial extent of the sediments available for analysis and truncated many profiles so that many records of past events will have been destroyed (Waughman 2005, 127). Developmental pressures along the coastline, such as sea defences, port and harbour constructions or offshore industry related structures such as pipelines, cables or hydrocarbon drillings may all impact on the survival of such remains.

Archaeological material exposed in the inter-tidal zone (of the coastlines of the past) is likely to have been moved about by wave action and therefore is unlikely to survive in primary contexts. Secondary and tertiary assemblages are likely to be far more common occurring as patches of material sorted by size and type (Westley and Dix 2006, 209). Conversely, however, modern eroding foreshores are also the sites most likely to reveal palaeo-landscapes (eg Hartlepool submerged forest).

In many areas of coastal waters, worked flints, artefacts and other material are often directly visible on the seabed as a result of erosion. Breaking waves during the transgression of the sites in prehistoric times probably caused part of this erosion but modern erosion will have contributed too. Down to at least a depth of 10m many sites are presently being worn away by waves and currents. This erosion is probably exacerbated by pollution, which kills underwater vegetation thus further exposing the sea floor (Fischer 2004, 25).

There is potential for aggregate dredging activity to significantly impact any *in situ* assemblages of Upper Palaeolithic and Mesolithic date within the Dogger Bank palaeo-valleys and associated slopes but, due to subsequent erosion, less potential on adjacent higher ground.

Trawling and beam trawling in particular may also have detrimental impacts on buried palaeo-landscapes or artefacts revealed on the sea-bed. However a balance needs to be

struck between the advantage of discovering archaeological evidence and the disadvantage of its possible destruction.

Rarity and vulnerability

No known statutory heritage protection is currently afforded to the palaeo-landscapes of the North Sea. Submerged Palaeolithic and Mesolithic sites are relatively rare in Britain and as such they should be regarded as of national, even international importance and wherever possible left undisturbed.

Prehistoric landscapes and artefacts, however discovered represent a nationally and internationally important archaeological resource. Finds are relatively rare and often imprecisely located.

Natural erosion seems to be the biggest threat, but with increased likelihood of off-shore aggregate extraction, oil and gas drilling and the construction of offshore windfarms, there is a growing need for further research into palaeo-landscapes (Petts and Gerard 2006, 203).

Recommendations

Understanding the prehistoric archaeology of the north-west European Continental Shelf is an essential part of understanding the prehistory of Europe.

Submarine prehistoric sites can survive with sufficient integrity to provide evidence for settlement patterns, working sites, fish weirs, hearths, food remains, craft and burials. Those within 5-15m depth can be studied and excavated using scuba-diving techniques or surface supplied air diving.

Where off-shore peat deposits do exist, their potential for environmental data should be explored. The British Geological Survey and commercial cores, which have been archived, are an important though untapped resource (Petts and Gerrard 2006, 203).

Consideration should be given to the potential impacts of the hydrocarbon industry, aggregate dredging and pipeline-laying operations on submarine prehistoric archaeological remains. The role of offshore industry is also potentially beneficial, since industrial work can reveal the presence of submarine prehistoric sites. The risk of damage to the sites has to be balanced against the advantage of discovering sites. Projects and initiatives supporting the recording, voluntary or otherwise, of recovered archaeological material are imperative.

Commercial activity off-shore is likely to be the main source of information about off-shore prehistoric remains. Dialogue could profitably be initiated with the region's fishermen in order to record any archaeological material they may have recovered in order to protect the marine historic environment and increase the fishing industry's awareness of it. A protocol for reporting finds of archaeological interest already exists within the marine aggregates industry (BMAPA/English Heritage) and could be followed as an example, as indeed already exists in the Netherlands.

Cooperation with offshore industries might also lead to the sharing with archaeologists of survey results, including data from swathe bathymetry, side-scan sonar and conventional shallow sub-bottom profiling, and coring and sampling of sub-sea sediments (Petts and Gerrard 2006, 203).

The North Sea is an area that historically has brought people together, the focus of interactions between many of the countries bordering it. As such it is important that research, management and outreach be coordinated internationally. By extension the adoption of legislation, regulation and standards that can improve joint working is

desirable.

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9.6 Communication

9.6.1 Transport

Introduction: defining/distinguishing attributes and principal locations

The Type Transport includes those main communication lines that are sufficiently large in area or significant in impact to be mapped in this HSC:

- Roads (generally only A and B roads);
- Railways;
- Airfields.

Historical processes; components, features and variability

Clearly, the communications infrastructure of the study area is largely needs driven, but the locations established and routes taken are determined by a complex of factors including geographically determined ones (eg topography) and tenurial ones. Roads have largely developed over centuries, with most of the main thoroughfares having been established by at least the later medieval period. The main exceptions are the modern by-passes. In the study area the east-west valleys all along the coast have presented significant obstacles to the roads which mainly run north-south and there are important fording and bridging points across the rivers.

Railways utilising steam traction were the major transport innovation to transform the lives of the majority of people in Britain during the 19th century. Railways had been in operation for around 200 years prior to this but had utilised either horse or gravity as motive power together with stationary engines to provide the mechanical power as necessary at inclines. In the early 19th century various fundamental technical developments were made by British engineers, particularly Richard Trevithick, George Stephenson and his son Robert Stephenson, and led to the development of the steam locomotive. Expansion was rapid and led to the extension of the original Stockton & Darlington railway in 1825, the first operational steam railway to be built in the world. This was extended across the River Tees to Port Darlington (now Middlesbrough) in 1830. In 1836 the Whitby and Pickering Railway was constructed. Whilst changes were later made in sections of these railway routes they are still recognisable from Eaglescliffe across the River Tees to Middlesbrough and along the Esk Valley Line through Grosmont to Whitby.

In 1845 the York to Scarborough line was opened to a mixed reaction from the coast town, which was already a watering place and seaside resort with over 100 years of experience of receiving visitors drawn by health reinvigoration or pleasure reasons. Yet Scarborough has continued to maintain its position as a major British seaside resort throughout the railway age and into the modern era. Scarborough station remains as 'a splendid working example of a terminal station with a roof supported on a central row of iron columns' (Morfin 1991, 166-7). By the end of 1847 Scarborough one of the largest towns on the Yorkshire coast, had been connected to the expanding national railway systems with lines to both York and Hull (*ibid,* 166-7).

The railway from Whitby was extended to Saltburn in 1882. This involved massive engineering works, including cuttings and tunnels in the unstable alum shale, and steep gradients. It was extremely scenic, with views out over the cliffs and from high viaducts such as those at Sandsend (White 2004, 150) (Figure 9.61).

Figure 9.61. Building Sandsend Railway (1882) (© Whitby Museum)

The Whitby to Saltburn Railway provided access to intermediate points along the coast, such as Sandsend (Figure 9.62), Hayburn Wyke and Staithes. A short-lived scheme existed in the 1890s to lay out the high exposed cliff at Peak as a holiday resort, henceforth known as Ravenscar. The railway was the only practicable access, but was often impassable in winter. Over 1,500 pliots were laid out and and some sold before the sceme finally foundered with the onset of the First World War (White 2004, 150).

Figure 9.62. Locomotive train, Sandsend viaduct (1950s) (© Whitby Museum)

The main line of the Stockton & Darlington Railway is still operational but many of the ancillary lines have been abandoned and are now simple earthworks or have been reused as footpaths, some still with traces of sleepers and railbeds (Figure 9.63). Railways too are

now old enough to have evidence for time-depth. When travelling by train people can see abandoned halts and viaducts. A number of important early bridges still survive eg Whitby Bridge.

Figure 9.63. The former railway line at Ravenscar, now reused as a footpath

With motor traffic, roads previously rutted by horse-drawn carriages were resurfaced (Waters 2005, 21). Roads running along medieval and earlier lines display considerable evidence for time-depth: variously aged associated structures and furniture (toll-houses, wayside pubs and other services, bridges) alongside them. The integrated, almost organic approaches that older roads make to medieval settlements also nicely signify their age and underline the inextricable linkage between the historic and natural environments. The rapid expansion of the road network has also had a profound effect on the landscape of the 20th century. Pre-WWII motoring remains include garages, petrol stations, and road signage (Petts and Gerrard 2006, 194).

Trams were also a popular means of public and industrial transport (Waters 2005, 11). Cliff lifts were constructed to carry passengers up the face of steep cliffs (eg at Scarborough and Saltburn (Figure 9.64)) (Waters 2005, 17). They are popular with visitors who do not want to climb the alternative routes by steep steps, footpaths or roadways.

Figure 9.64. The cliff lift at Saltburn

Values and perceptions.

Cars now travel where once only walkers strolled, thus roads are for many people the outdoors they see most of, and the place from which passengers in particular (but also some drivers) appreciate many other HSC Types. Regular travellers develop particular affection or dread of particular bends or views. Railways provide more leisurely and elevated views over the historic landscape.

Access to cars has fundamentally changed patterns of contemporary life, including the spread of out-of-town shopping and leisure centres, the decline of local shops and the design of housing, with varying degrees of local impact (Petts and Gerrard 2006, 194).

Research, amenity and education

There has been extensive work on the 19th century railway network in this area, but little of note so far on 20th century railways, particularly for the period following the end of steam power. Nor has the impact of the many miles of new road constructed yet been assessed, nor the recording of its related infrastructure, for example bus shelters, petrol stations and road signage. In general it is only the earliest examples of such remains that have been researched or protected (Petts and Gerrard 2006, 189).

Much more useful research can be undertaken on early long distance routeways. Considerably more work has been done on railways although much of this is very particular and related to the mechanics and organisational detail. More could be done on the social and economic impact of railways in this area.

Communications are largely facilitators for the appreciation of other parts of the historic landscape but they do possess many interesting and beautiful features themselves. Bridges and viaducts may be the most dramatic but stations, roadside services and other infrastructure are also important and interesting elements in our landscape.

The new outstation of the National Railway Museum at Shildon (Co. Durham) offers the potential for important collaborative projects on the rail system of the north east (Petts and

Gerrard 2006, 194).

Condition & forces for change

Railways are an important aspect of the more recent heritage in this area, though the 20th century saw an on-going reduction in the extent of the network and the removal of trackside infrastructure (Petts and Gerrard 2006, 189).

Long-term continuities in the communication structure of this region have been little explored, yet the basic network of roads here appear to show significant levels of consistency over history (Petts and Gerrard 2006, 225).

This Type's importance lies as much in the way it takes people into and through the wider historic landscape as in the railway and road features themselves. In addition, the disused railway lines now provide good routes for public access along the coast, complementing the coastal footpaths.

The railways survive well, whether still operational or abandoned like some of the minor branches.

Roads are regularly upgraded and early features are often removed or obscured but the routes of most in the study area have not been significantly altered and travellers still experience the historic landscape from broadly the same line (if not at the same speed in some cases) as their medieval and early modern predecessors.

Construction of communication routes at or near the coast frequently involves major engineering projects, such as the building of roads in difficult or unstable coastal environments (eg Marine Drive, Scarborough), or of bridges across river estuaries. New projects may be necessitated not only by increased traffic to the coast, but also by the changing configuration of the coastline, rising sea-levels, or coastal defence initiatives. The direct impact of such projects, as on dryland, will be the removal or disturbance of archaeological remains in the areas of coast or foreshore affected by the route, and by associated construction operations. In addition, construction may also have indirect effects as a result of alterations to existing patterns of drainage, water flow in rivers, or tidal currents, thus creating the possibility of removal or exposure of sites through erosion (Fulford *et al* 1998, 205).

A Transport and Works order-making procedure has now been introduced, administered by the Department of Transport (DoT). Applications for orders must include an environmental statement and must notify Natural England and the Department of National Heritage if the work may affect an area covered by the restriction of wrecks act, and English Heritage if the work may affect a Scheduled Monument (Fulford *et al* 1998, 205-6).

Rarity and vulnerability

The Stockton & Darlington Railway was the world's first operational steam railway and should be considered of international importance.

The mundane nature of some of the surviving communication resources, coupled with constant redevelopment mean, however, that this infrastructure is increasingly threatened.

Recommendations

Retain main-line railways. Try to retain historic lines in future road improvements so that roads retain their integrity in the landscape. Bear in mind the importance of views over the

historic landscape/seascape when designing changes to roads.

The relationship between prehistoric communications and Roman roads is poorly understood and further research into this could prove valuable (Petts and Gerrard 2006, 225).

The extent of the survival of transport-related features should be assessed in order to evaluate the threat to the resource and to direct further research and management decisions (Petts and Gerrard 2006, 192).

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9.6.2 Telecommunications

Introduction: defining/distinguishing attributes and principal locations

The Type Telecommunications includes the following sub-type:

- Submarine cables
- Submarine power cables

Modern telecommunications systems still require the use of submarine cables in addition to satellites. British Telecommunications plc is the principal body laying and operating submarine communications cables around the UK (English Heritage 1997, 204).

There are two principal cables routes that pass through the study area. One set (PANGEA1) run from the foreshore between Redcar and Marske and follow a north-easterly route to Denmark. Another set (UK-GER6 and TGNNEUROPE) run out from Filey before sweeping north into the central part of the area before separating, one continuing towards Denmark, the other veering east over the Dogger Bank to Germany. Two redundant cables are recording lying in Cayton Bay.

Historical processes; components, features and variability

The growth in Internet use and the development of e-commerce has seen a huge increase in global electronic data transmission over recent years. Cable numbers are increasing as a result of this increased traffic with many now traversing the North Sea to link the UK with mainland Europe. In general, most of the cables are trenched to a depth of 40-90cm with rock-dumping used to anchor cables as a last resort. However, older redundant cables are more likely not to be trenched (DTI 2002).

Figure 9.65. The laying of a cable in the River Esk (© Sutcliffe Gallery (www.sutcliffe-gallery.co.uk)

The cables in the study are modern impositions onto other types. However some cables in UK waters are of historic importance offering important insights into the early development of telecommunications in the 20th century.

Values and perceptions.

The presence of submarine telecommunications cables in the marine environment is likely to go largely unnoticed. However for the millions of users of the internet and phones, their importance cannot be underestimated. There is unlikely to be any direct appreciation of the potential damage, or indeed potential for discovery of archaeological features during cable laying, entrenchment and maintenance.

Research, amenity and education

Works undertaken during cable laying and or maintenance offer an invaluable opportunity to further investigate the archaeological potential of any routes. There is also the opportunity to mitigate against possible damage. Numerous archaeological projects from around UK waters have demonstrated that important palaeo-environmental evidence can be unearthed during such works, deposits rich in pollen taxa and macrofossils that inform our knowledge of the evolution of past environments and landscapes and marine transgressions.

The amenity and education value of telecommunications are obvious.

Condition & forces for change

Telecommunication cables are a modern imposition on to other Types. Archaeological impacts may arise from preliminary survey work, laying and maintenance of cable, and removal of disused cables. Preparatory investigation may involve intrusive survey of the sea bed, disturbing and exposing archaeological deposits, though also providing detailed knowledge of sea bed conditions. Cables are replaced fairly regularly as technology moves on. Laying the cables involves burying them where they cross the foreshore and in shallow waters, potentially destroying archaeological remains. In deeper water submersible ploughs, running on tracks or skis and towed by surface vessels, are used for trenching, laying cable, and subsequent inspections, and the use of such machinery could damage sites on the sea bed (English Heritage 1997, 204).

Trawling and anchoring regularly, though infrequently, cause breaks in cables. Maintenance work can also disturb underlying archaeological remains. Disused cables are retrieved, though in one case Cable and Wireless were asked by the National Trust to leave a cable because of its heritage value. Recovery operations would certainly disturb archaeological sites on the line of a cable (English Heritage 1997, 204).

Rarity and vulnerability

The laying of telecommunications cables is likely to increase although the development of wireless technology will inevitably lead to the redundancy of many routes in time. Some cables of historic importance may be left for posterity.

Recommendations.

Although operators must submit plans of proposed works to the Secretary of State for approval, who in turn must be satisfied that people with proprietary interests in the waters

or land are adequately advised and compensated for any loss or damage arising from the works, environmental assessment is not required for submarine telecommunication cables (English Heritage, 1997; 204). This situation could be reconsidered to enable a form of planning process to be instituted.

Trenching and burying in inter-tidal and marine environments would benefit from archaeological mitigation or failing that, recording.

CPA (Coastal Protection Act) consent is normally needed before a cable can be laid on or under the seabed, and for its subsequent maintenance and removal, if those operations could have navigational impacts. However, certain operators of electronic communications networks can carry out a limited range of works in the waters of the UK territorial sea without such consent (DEFRA March 2007, 60). The recently published Marine Bill White Paper: A Sea of Change (March 2007) highlights that these tidal works powers 'provide a duplicative consenting process with no material benefit for either operators or regulators' (*ibid*). It proposes to 'repeal the provisions of the Telecommunications Act 1984 that allow for consent under that Act instead of licensing under general marine rules. The environment, marine heritage, or other legitimate uses of the sea will remain fully protected. Where an assessment of the environmental and navigational impacts of such works is needed, it will be carried out under the reformed licensing regime' (*ibid).*

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9.7 Military

9.7.1 Military Defences

Introduction: defining/distinguishing attributes and principal locations

The Type Military Defences includes the following sub-types:

- Anti-tank defences;
- Artillery;
- Fortifications;
- Anti-landing features.

Components of this Type include:

- batteries and gun emplacements
- castles and forts
- moats and dikes
- town walls and gates
- minefields
- pill boxes
- battlefields and sites of battles
- naval warships and submarines (including wrecks)

Military coastal defences can be found all along this stretch of coast, although they tend to be most densely concentrated around the main ports, in particular around the Tees and Hartlepool.

Historical processes; components, features and variability

'The north east, perhaps more so than any other region in Britain, has a long history of violence and conflict. From the Roman period onwards it has been an important border zone, and its east-facing coast has been seen as a vulnerable flank, open to attack from both elsewhere in Britain and from across the North Sea' (Petts and Gerrard 2006, 211).

Preventing attacks of a seaborne nature was all but impossible in a pre-industrial society. The Romans built military lookouts (signal stations) along this stretch of coast at Scarborough, Goldborough, Ravenscar and Huntcliff for this purpose. Scarborough's military lookout was subsequently built upon and used for defensive purposes by the Saxons. The first substantial stone-built castle in this area was also built at Scarborough, founded by William le Gros around 1136 and was further strengthened and rebuilt when it was seized by Henry II in 1154.

When the Vikings began attacking the east coast in the late 8th century, there was generally no warning until their sails appeared over the horizon. Although some beacon systems did exist to alert those living inland (chains of fire beacons set on hilltops within sight of each other), it was impossible to concentrate naval forces to intercept a fleet already in sight of the shore. However destroying a fleet already known to be on its way was a possibility (Friel 2003, 35).

'The Norman Conquest of 1066 saw the beginning of a new phase of war and conquest in the British Isles, re-orientating England toward continental Western Europe and away

from the Scandinavian world' (Friel 2003, 49). Naval expeditions mounted from England were rare in the 12th century. A rising in 1297, led by William Wallace in Scotland, severely damaged the English forces and their Scots supporters, and was followed by an invasion of Northern England and a temporary revival of a Scottish Kingdom. In 1318 the Scots and Flemish attacked the East coast of England. Sea power was of critical importance for the re-supply of English land forces. The defeat of England by the Scots in that episode was, in part, due to the failure of English Kings and commanders to secure their seaborne supply-lines (Friel 2003, 53).

'In the late 13th century the naval defence of England was divided into the Northern and Western Fleets, the Northern normally covering the coast from Thames to Scotland and the Western covering the seaboard from the Thames to Bristol. The naval expedition, the sea patrol and the coastal raid were the commonest types of naval operations that English ships undertook in the medieval period' (Friel 2003, 57).

Large-scale naval battles were very uncommon during the medieval period, however, and all of those in the Hundred Years War took place near the coast. Instead, attacking a fleet in an anchorage or a restricted waterway, or intercepting a fleet passing close to the coast was favoured. It was not until the addition of shipboard guns that sea battles became more common as a form of naval warfare. Shipboard guns were used in small numbers by the English and others from the 1330s, but they were essentially small anti-personal weapons. Even Henry V's biggest gun-armed ship only had seven cannon (Friel 2003, 58).

'Defensive castles were appearing on ships by the late 12th century. These were at first rather makeshift-looking structures. Medieval sea battles were normally resolved by boarding actions. Over the course of time castles became a normal part of the structure of some vessels, particularly warships, although many medieval merchant men may have sailed without them' (Friel 2003, 80). The numbers of guns on ships increased markedly in the second half of the 15th century, however, but these were still fairly small-calibre weapons. By the late 15th century large warships had multi-stage castles as a matter of course, a change perhaps mainly dictated by the massive increase in the number of guns carried by large combatants. However, most warships did not carry large guns until the 16th century (*ibid*).

The Dogger Bank has been the site of several naval actions. During the War of American Independence, a Royal Navy squadron fought a Dutch squadron on 5th August 1781 in the Battle of Dogger Bank. During the Russo-Japanese War, Russian naval ships opened fire on British fishing boats in the Dogger Bank incident on 21th October 1904, mistaking them for Japanese torpedo boats. In the First World War, the area saw the Battle of Dogger Bank (1915), a naval engagement between the Royal Navy and German ships which were intending to shell the Yorkshire coastal towns of Scarborough, and Whitby and the town of Hartlepool in County Durham.

By the 20th century the impact of warfare on the United Kingdom was enormous. For the fifty years prior to the First World War, Britain's defences had been concentrated on the protection of her naval bases, given that the main defence of the country was considered to rest in the Royal Navy. Military structures were confined largely within the ports and the garrison towns, although some fortification of vulnerable expanses of coastline was carried out. The army served principally overseas in the protection of the Empire.

A massive reorientation of Britain's defences occurred in the first decade of the 20th century, from seeing France as the chief enemy, to Germany. The industrial centre at Hartlepool made it a key target for Germany in World War One (WWI). The first German offensive against Britain was mounted at Hartlepool on the morning of 16th December 1914, when units of the Imperial German Navy bombarded Hartlepool, West Hartlepool,

Whitby and Scarborough with a total of 1150 shells, killing 137 people and wounding 592. Two coastal defence batteries at Hartlepool returned fire, firing 143 shells, damaging three German ships including the armoured cruiser SMS *Blücher*. Scarborough Castle received its last great assault during WWI, when two German warships bombarded the town causing a great deal of damage and destroying both the barracks and the coastguard station. Shells also damaged some of the walls and blew a large hole in the castle keep (Waters 2005, 7). There was also serious damage caused to Whitby Abbey during this episode.

Germany also attacked the Home Front with unrestricted submarine warfare, which sank many merchant ships carrying supplies to Britain. In 1917 the Germans almost succeeded in starving Britain out of the War. The existing South Gare Marine Club was a sub-marine mining establishment between 1887 and 1922, housing submariners who helped to defend the mouth of the River Tees by electrically-fired underwater mines (Figure 9.66). The establishment had a fortified boundary wall which used to house quick-fire guns. The wall and its gun slits are still visible from Paddy's Hole.

Figure 9.66. Former sub-marine mining establishment on South Gare (now South Gare Marine Club)

The stretch of water between the Humber and the Tees was also a particularly dangerous place for shipping during WWI, because at least forty-two U-boats operated in this area during this time. Between them they sank no less than 120 ships with torpedoes, over 100 by mines and many more that could not be accounted for. At least another 80 merchant ships were also lost between the Tees and the Tyne during that conflict (Young 2000, 19).

The surprise attacks on Scarborough, Whitby and Hartlepool during WWI caused outrage throughout the country. An army recruitment office set up in Scarborough did a roaring trade after posters appeared in all three towns (Figure 9.67). One proclaimed:

'Men of Yorkshire, join the new army and help avenge the murder of innocent women and children in Scarborough, Hartlepool and Whitby. Show the enemy that Yorkshire will exact a full penalty for this cowardly slaughter. ENLIST TODAY' (Waters 2005, 72).

Figure 9.67. Army recruitment poster for WWI (© Imperial War Museum)

At the onset of World War Two (WWII) Britain was ill-prepared to defend against an expected invasion by Germany and the fortification of the east coast on a serious level at this time stems from that, the result being a government policy that was to turn Britain into a fortress. The War Office correctly guessed that the Germans would attempt a landing in the south and south-east of England. However, major diversionary raids elsewhere could not be ruled out and, as a result, near enough the whole of Britain was fortified. Beaches were to be made impenetrable. Scaffolding was erected on most beaches

so that landing craft could not land on a beach. Behind the scaffolding were placed thousands of mines. Behind the mines was barbed wire and behind the wire were more land mines. Finally, yet still on the beach, were anti-tank blocks - 13 ton concrete blocks designed to impede the movement of the tanks. Behind the beach area, pill boxes were built to house machine guns and to create a killing field.

In order to bolster defences, earlier fortifications were reused, such as the Heugh Gun Battery at Hartlepool. In addition, large numbers of pillboxes and antitank obstacles were hastily constructed, particularly along those parts of the coastline where the threat of landings was highest. Much attention was paid to defending the broad, firm sandy beaches to the north and south of the River Tees. Pillboxes, barbed wire and minefields were erected, supported by a range of anti-tank obstacles, including ditches, iron rails, wooden posts and railway sleepers (Green 2006, 4).

Figure 9.68. Anti-tank defences now incorporated into the sea wall at Sandsend

The steelworks and the port at Teesmouth were vital during WWII for the supply of steel for war machinery. This made the South Gare once again a prime target for enemy attack. The site was heavily defended with a wide range of defensive structures including barracks, gun batteries and range-finding towers. To protect other valuable industrial complexes in the Tees Valley, a number of Night Bombing Decoy sites were also constructed. The remains of some structures are still visible here today. At the end of South Gare and near

to Fishermen's Crossing, mounds mark the location of the Pasley Battery which housed large breech loading guns and the 6-inch Battery. These guns were only ever fired once in anger at a German plane, which was seeking to mine the mouth of the Tees and were removed after the war.

Minefields were also laid in many parts of the North Sea during WWII. The vast majority of historic minefields in the North Sea have now been cleared as a result of an extensive mine clearance effort since WWII.

Values and perceptions.

Both public and official opinion has now largely turned against the idea that these military works are an eyesore and inconvenience in the landscape to be removed without consultation wherever possible. Now, they are seen as part of the overall historic legacy of the landscape, and, in the case of the Second World War, of particular significance in terms of their place in the front line of the fight for freedom.

Research, amenity and education

The military remains of World War One and World War Two have been one of the most active areas of research for special interest groups in recent years. The larger coastal defence batteries from World War One are well known, although there has been less work on the more ephemeral remains from 1914-18, such as practice trenches, early industrial sites and damage from enemy action. In general, the remains of the 1939-45 conflict have attracted the greatest interest, reflecting both the greater number of surviving features and the fact that action is still within living memory of some members of the population (Petts 2006, 190).

A result of an increased public interest in surviving military remains was the Defence of Britain Project (DOB) (1995-2002), which ran under the auspices of the Council for British Archaeology. It has sought to record what survives of the multiplicity of military structures erected during the last momentous century. The main purpose of this work is to inform the responsible heritage agencies, at both local and national level, so that the long process of decay and destruction can be halted and individual surviving structures evaluated for future preservation. There is still much information in private hands, however, that was not submitted to this project and remains to be explored.

While military structures such as pillboxes are well represented in the archaeological record, civilian defences are rare. To address this problem, and to commemorate and celebrate the 60th anniversary of the end of World War Two, Tees Archaeology joined forces with Hartlepool Arts & Museums Services and Redcar & Cleveland Museums Services, to launch 'Dig for History' Project, which was a public appeal for information on an often-overlooked archaeological aspect of World War Two – the 'Home Front'.

Although many sites are on private property, a number of military sites are accessible to the public.

Condition & forces for change

Military remains from World War One are a fast disappearing resource. Although events from this war may not have had the same impact on the region's environment as those of World War Two, there are still many surviving remains, ranging from the batteries at Hartlepool, to rifle ranges and practice trenches, but these features are often ephemeral, and in many cases their origins have been forgotten (Petts and Gerrard 2006, 190).

Along the beaches and scattered through the dune systems there are still the remains of many of the WWII pill boxes and gun emplacements. Sadly, many of these are suffering from the effects of time, neglect and vandalism, and from loss to coastal erosion. In West Coatham the gun emplacements that were located here are now only visible as an area of raised ground and a spread of rubble. Other recognisable WWII structures which survive today include reinforced concrete anti-tank cubes, eg at Hart Warren, North Gare Breakwater and at Sandsend.

The few historic minefields that remain uncleared in the North Sea are considered safe for surface navigation, although a real danger of encountering unexploded historic ordnance still exists with regard to anchoring, demersal trawling or any form of submarine or seabed operations. Conventional and chemical munitions may also still be encountered at sea. Collectively these may include buoyant mines, seabed (ground) mines, torpedoes, depth charges, bombs, missiles, artillery shells and gas cylinders. These munitions are dangerous and sensitive, particularly to shock or vibration, even if they have been in the water for many years. These weapons are sometimes picked up in trawls, or as a result of other seabed operations, particularly dredging, often in waters comparatively distant from where they were laid, fired, dropped or dumped.

Rarity and vulnerability

Some of the historic structures are protected through being Listed Buildings or Scheduled Monuments.

Recommendations

The DOB project highlights the value of selecting significant examples that survive in good condition, and preserving them for their historic importance and their potential educational value. In the latter regard, many defence structures that have good public access could undoubtedly be set out with information boards, and become part of 'heritage walks', so that their place in our history, and in our landscape, can be more readily understood. This would also raise consciousness about 20th century archaeology generally.

Further local studies would also prove valuable, using documentary resources together with detailed field work that might also build in a programme of oral testimony - elderly inhabitants of an area may well have many memories of the defence works and the soldiers manning them, particular in towns and villages that were nodal points and anti-tank islands, and if so these need to be collected before the WW2 generation dies out completely (Petts and Gerrard 2006, 211).

A more detailed analysis for the setting of fortified sites would prove beneficial, as would a survey of the re-use of earlier sites by later defences and an analysis of the impact of changing military technology on the design and location of fortifications (Petts and Gerrard 2006, 211). The recovery, analysis and conservation of navel vessel wrecks are also of great importance (Petts and Gerrard 2006, 211).

Detailed modelling of networks of signal stations and beacons for all periods is also likely to be a productive line of research, both for exploring the inter-visibility between known sites and as a predictive tool to locate gaps in the distribution of known sites (Petts and Gerrard 2006, 211).

There is now a growing business in 'heritage tours' looking at military sites of WWII. At present it is mainly confined to places associated with the British and American air forces, but important points of the defended landscape such as groups of pillboxes, anti-tank

obstacles and coastal forts would also be valuable additions to itineraries (Foot 2000).

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9.7.2 Military Facilities

Introduction: defining/distinguishing attributes and principal locations

The Type Military Facilities includes the following sub-types:

- Military practice areas;
- Military bases;
- Military dumps;
- Military airfields;

Components of this Type include:

- army bases and barracks;
- radar bases and listening posts;
- firing/rifle ranges;
- naval docks and bases
- submarine bases and exercise areas
- RAF bases.

Historical processes; components, features and variability

During WWI the Defence of the Realm Act enabled vast tracts of land to be requisitioned for camps, airfields, munitions production, and storage. Half a million men were stationed in Britain as a home defence force, and coastal defences were greatly extended. Although much of the training of the army took place across the Channel, or on the other battle fronts, some troops practised the construction of fieldworks for trench warfare, the distinctive scars of which can still be found today.

At the outbreak of WWII, under the Defence Regulations, the power to requisition and make use of land was given to service and civil departments alike, and, in 1944 at the peak period of the militarisation of the landscape, some 11½ million acres (4.6 million hectares) was under some form of military control.

The closest large-scale military base to the study area is RAF Fylingdales in the North York Moors National Park. There are several designated military Practice and Exercise Areas (PEXAs) at sea within this study area which are in use or available for use by the Ministry of Defence for practice and exercises with or without the use of live ammunition. These include RAF practice areas, submarine exercise areas and firing danger areas.

On land in the past musketry and artillery practice took place at designated firing ranges. Ranges once existed at Thornaby, Saltholm and at Scarborough Castle. Today, however, such practice areas tend to be located within military bases themselves.

Within this study area barracks (military houses) were formally located at Scarborough Castle and at Scalby Mills, and there is still the remains of a Zeppelin listening post at Boulby (Figure 9.69) and a radar base at Ravenscar. A WWII radar station was also located at Kettleness while it was superseded by a Rotor Type radar at East Barnby in 1950s, but closed after a fire in the 1960s.

Figure 9.69. Remains of a Zeppelin listening post at Boulby

The existing South Gare Marine Club is the site of a former WWII submarine base. This was a sub-marine mining establishment between 1887 and 1922, housing submarine mariners who helped to defend the mouth of the River Tees by electrically-fired underwater mines.

Values and perceptions.

Although consisting of fairly small pockets of land, the Type dominates the areas where it exists, both physically and, through security devices like fences, psychologically.

Research, amenity and education

As defence installations, active modern components are generally secret, but military features from earlier periods have received considerable attention from military historians. As an instance of the nation state impact at local level, military installations have considerable historical importance. The inherently competitive nature of warfare means that features change more rapidly in this sphere of human activity than most others and there is scope for much detailed archaeological research. While operational, there will be little or no potential for amenity use but once decommissioned, military sites have considerable potential, being dramatic, exotic and disturbing sites.

Condition & forces for change

Military installations are normally impositions by the State on a landscape for national strategic reasons and interaction with other Types is minimal beyond service relationships (victualling, recreation, some accommodation). Some of these features form well-known landmarks.

The modern components, being in use, will be well maintained but, as these are active installations, the condition of earlier features may be impaired. As noted above, earlier

features are vulnerable to alteration or removal by changes in current installations. The armed forces do take their responsibilities to historic buildings seriously. Defence cuts at government level threaten the existence of current installations. Decommissioning may involve the removal of dangerous or sensitive features.

Unless re-using earlier military sites (eg Scarborough Castle) the evidence for time-depth is confined to features (eg hedges and tracks) captured within secure fencing and not obliterated.

The impact of military activity on archaeological sites is linked to the level of use of those sites. Direct impacts are a product of construction, and operations such as the use of tracked vehicles, trench digging, and explosions. All of these activities can bring about the removal, disturbance or exposure of archaeological remains, and the artillery and bombing ranges could also have a significant impact on the inter-tidal and sub-tidal zones. A special problem identified by the Ministry of Defence (MOD) is the disposal of litter, rubble, spoil, and military equipment. The excavation of pits to dispose of rubbish may result in intrusion into, and extraction and exposure of archaeological material (Fulford *et al* 1997, 199).

Rarity and vulnerability

This Type contributes to landscape character disproportionately to its scale and has considerable research and amenity potential once installations are decommissioned.

As military installations have become more centralised, they have become rarer.

Recommendations

MoD landscape managers should be informed of the historic importance of the bases and there should be close consultations on decommissioning to ensure the best possible re-use of these important complexes.

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9.8 Settlement

Introduction: defining/distinguishing attributes and principal locations

The Type Settlement includes the following sub-types:

- Cities;
- Towns;
- Villages;
- Hamlets.

Built-up areas from larger hamlets upwards; includes urban industrial estates and also small areas of open land if surrounded by built-up land.

The coastal region of this study area is predominantly rural along much of its length and contains sparsely populated areas with scattered small towns and villages. Areas of dense population are associated with the industrial centre of Teesside, as well as the ports of Whitby and Scarborough.

Historical processes; components, features and variability

A complex Type with numerous historical trajectories contributing to its present form.

The locations of the villages along this coast, with their concern for shelter from the storm and a safe haven for boats, leave little doubt that the first settlers here were seafarers. Staithes, Runswick, Robin Hood's Bay (Figure 9.70) and Scarborough all hug the northern end of their bays to huddle in the lee of the headlands. Freshwater was another prime consideration and several fishing settlements grew up where becks and rivers entered the sea (Frank 2002, 43).

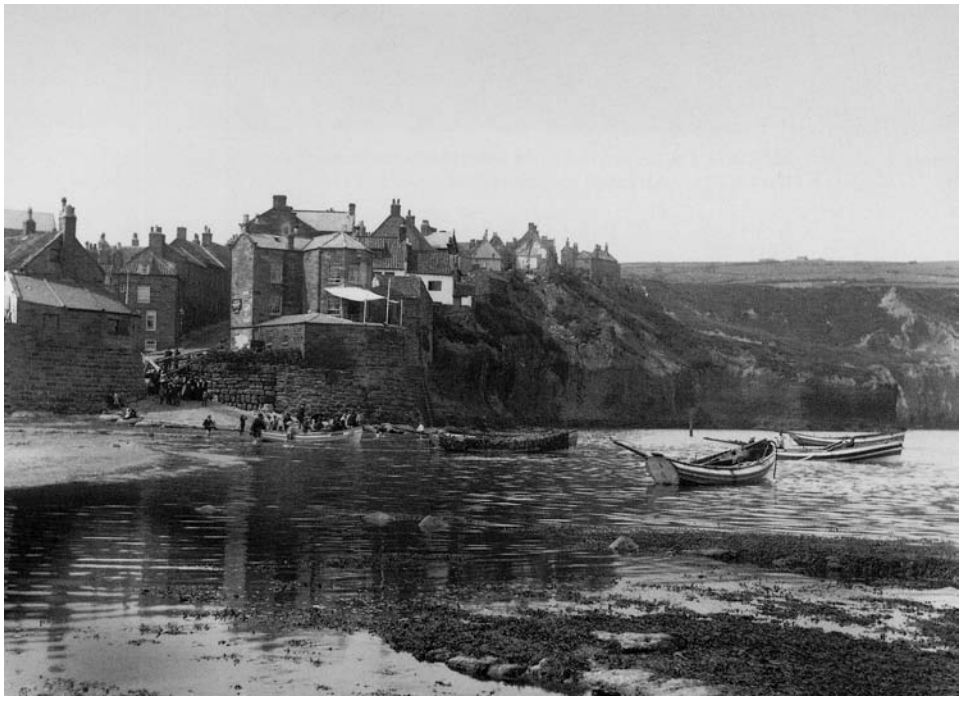

Figure 9.70. Robin Hood's Bay (© Sutcliffe Gallery (www.sutcliffe-gallery.co.uk))

In the fishing villages houses tend to be built as close as possible to the waterside, Staithes

being an extreme example (Figure 9.71). This was largely so that the fisherfolk could be constantly near to their boats, the principal wherewithal of their livelihood. At Whitby the fishing community lived in the narrow streets by the harbour (Frank 2002, 44).

Figure 9.71. Staithes (© Sutcliffe Gallery (www.sutcliffe-gallery.co.uk))

The fishing village of Runswick is 'a singular rookery of cottages built with only walking space between them, one above another in the cliff side, clinging to the face of the treacherous cliff like a colony of martins' (Frank 2002, 47) (Figure 9.72). This close proximity to the sea and cliffs meant that these settlements were often prone to disasters. At Runswick portions of the cliff are noted to have been occasionally 'shooting' and houses were often dislocated or wholly demolished, and instances are said to have occurred of houses slipping down entirely, together with their bases, and taking up a fresh position below (Frank 2002, 48).

Figure 9.72. Runswick Bay (© Sutcliffe Gallery (www.sutcliffe-gallery.co.uk))

Runswick and Staithes were predominantly fishing villages, but elsewhere, as at Whitby and Scarborough, the fishing community was only part of a larger population. Fisherfolks' homes were working places as well as dwellings. It was there that most of the gear was made, mussels and limpets were shelled, and lines cleaned and baited (Frank 2002, 54)

Until the end of the WWII many settlements lacked basic, modern, sanitary amenities. A great many, too, were tenement buildings erected in the second half of the 18th century to accommodate the influx of labour to work in the shipyards, graving docks and ironstone mines (Frank 2002, 47).

Many rural settlements will have their origins in the Early Medieval period, or even earlier, but most extant buildings (except churches) are post-medieval or modern. Virtually all rural settlements large enough to be included in this Type have extensive later 20th century housing estates at their edges.

The long and complex histories of these settlements have produced a wealth of historical and archaeological features. Clearly some settlements will be simpler than others, notably the post-medieval industrial and harbour villages but all will have a variety of building types, ages and styles, different sectors for residence, commerce, industry, storage, recreation, burial and ceremonial. Some will also have military remains (from medieval castles to 20th century pillboxes). Most settlements will have rich subsurface remains with the footings of buildings and features of medieval or even earlier date.

Medieval coastal towns and villages tended to have had harbours and fishing populations, while others on tidal rivers (often now silted) were trading centres. These medieval settlements were small, with towns of just three or four main streets and small resident populations.

In the post-medieval period, settlements grew slowly until the 18th century when increased mining activity led many to expand more rapidly and the growing commercial activity caused some others to follow. Several new towns and industrial villages also grew up along the coast as a result. Without the development of ironstone mining many of the small villages we see today in East Cleveland would not have been formed. The housing in these small communities was normally provided by the mine owners who also built schools, hospitals, chapels and occasionally Working Men's Clubs. The houses were often built in terraces and were usually two up, two down with an allotment to the rear of the house. The closeness of the houses created a special bond between the families who would all make their living out of the pits. A number of terraced houses can still be seen in many of the villages today.

The alum works also needed local workers and by the 18th century the original coast road running from Staithes to Skinningrove was dotted with hamlets for these workers, at Boulby, Streethouses, Upton and Micklow (Chapman 2002, 74). It has also been suggested that the development of the alum industry in the Whitby district was the catalyst which began the conversion of Whitby from a minor fishing station with a modest hinterland into the major Georgian port that it became (Pybus 1991, 54).

By as late as 1801 Middlesbrough was still only a small farm of twenty five people. In 1830 Stockton and Darlington Railway line was extended to Middlesbrough, making the rapid expansion of the surrounding towns and ports inevitable. By 1851 Middlesbrough's population had grown from 40 people in 1829 to 7,600 and it was rapidly replacing Stockton as the main port on the Tees. Today Middlesbrough has a population of over 150,000 and is undoubtedly the heart of the Teesside conurbation and the modern 'Capital' of the area. An old Teesside proverb had proven true;

'Yarm was, Stockton is, Middlesbrough will be' (*).

More recently, from at least the late 19th century (or earlier in the case of Scarborough (Figure 9.73)), some coastal settlements have developed to serve the tourism industry. Most were extant harbour or fishing settlements. Some however, such as Ravenscar, represent a failed attempt to turn such settlements into coastal resorts. From the 1960s onwards the increasing cheapness and more attractive climatic conditions offered by the package holiday to the Mediterranean and beyond appeared to spell the demise for many seaside towns, athough many are now beginning to reinvent and re-launch themselves.

In the 20th century, virtually all settlements in this Type expanded through the provision of housing estates for local families and new residences for a growing population of retired people and people wanting second or holiday homes. Many settlements are largely residential now, most of their original industrial, harbour and commercial functions having died, their original cores now dwarfed by 20th century expansion.

There is an abundance of material remains of the last three hundred years in most towns and the street plans, market places, and surviving medieval buildings (eg castles and churches) take people back a further four or five centuries. Street names may also reveal now lost features or activities (eg Far Jetticks, Friarage Field, Iron Scar, Whale Hill) and the steady trickle of discoveries of artefacts and features encountered during developments and roadworks in towns reminds observant dwellers of the richness of their town's past.

Figure 9.73. Scarborough, South Bay, overlooked by Scarborough Castle on the headland

Values and perceptions.

The majority of settlements along this stretch of coast are hamlets, villages and towns, the city of Middlesbrough being an exception. There is little that is cosmopolitan (except,

perhaps in Scarborough and Whitby) and much that is strictly functional. The hamlets and rural settlements along this coastline are highly valued by both local people and visitors. Their organic layouts are interesting and satisfying to either live in or pass through, and the numerous 17th century or older buildings add beauty and antiquity to the places.

The mining and fishing communities are remembered nostalgically as having been special kinds of places, where it was safe to leave the door unlocked for your friends just to pop in and say hello. Everybody knew everybody and it made the community a safe place to live in.

To many of the painters, writers and photographers who, from the 1880s onwards, flocked to the Yorkshire coast the jumble of houses, red pantiled roofs one atop another, and the maze of courts, steps and yards of the fishing *quartiers* were merely picturesque, although some had a proper appreciation of the problems of living in such cramped and often overcrowded dwellings (Frank 2002, 50).

> In his novel *The Nagars of Runswick Bay*, J.S. Johnson (1973) has left a detailed impression of fisherman's cottages at Runswick Bay:
>
> *'As most of these cottages were built on the steep hillside, they consequently only had windows which looked towards the bay, and many of these were very small. Being built in these positions and having open coal fireplaces many of them smoked when the wind was in a certain quarter, further adding to the family's discomfort. One or two I often went into during the day were so dark I had to stand still when I first entered until my eyes became accustomed to the gloomy darkness'*

The decline of the commercial centres of many towns, as out-of-town superstores take their toll, is perceived by most people as a negative force for change, removing traditional businesses and gradually removing the meaning from these places.

Research, amenity and education

The extent to which wider patterns of settlement have been studied varies immensely. Whereas sociologists and historical geographers have researched patterns of urban regeneration, there has been less exploration of the architecture and landscapes destroyed and created as part of this process. Many smaller settlements have also seen tremendous change over the course of the 20th century, although not on the scale of urban centres. Lack of work on villages reflects an absence of research on the 20th century rural landscape generally (Petts and Gerrard 2006, 190).

In rural settlements, extant buildings and the layout of surviving features will repay close study and, in addition, there will inevitably be a wealth of sub-surface settlement remains, some dating back into later prehistory. The study of various kinds of documents will also shed considerable light on settlements.

These coastal towns and villages are important elements of North Yorkshire's tourist industry, often as seaside resorts or refuges on rainy days. Many have historical features (eg churches, castles and bridges) which are displayed to visitors and some have interpretative leaflets or booklets to guide people around. There is, however, still considerable potential for a discreet, unobtrusive presentation of the past in most towns. This can be aimed as much at towns' inhabitants, particularly children, as at visitors and will have the benign effect of increasing peoples' awareness of the historical value of their homes.

Condition & forces for change

Although settlements have continued to change right into the late 20th century, as places which are hubs of human activity are bound to do, the layouts and historic fabrics of most are relatively well-preserved. There was minimal bombing damage in World War Two, except at Hartlepool, and most towns' main streets have essentially 19th century or earlier frontages with relatively few disfiguring, modern, standardised shop windows and signs. Towns like Scarborough and Whitby are particularly well-preserved.

Where layouts have suffered little change, there is a good likelihood that subsurface remains are also well preserved. Rural settlements are also generally well preserved, with modern developments usually lateral expansions from an historic core rather than replacements.

The good survival of street plans in most towns allows earlier organisations to be easily understood. Clearly over the centuries since most towns were established foci of activities have shifted but it is usually possible to work out sequences of relationships of features. At Scarborough, for example, the medieval castle still dominates the town but other, later features, built or created in relation to it, have formed nuclei for other streets and buildings.

In towns, the condition of historic buildings, streets and layouts is generally good. Subsurface features can also be expected to survive well. Rural settlements are also fairly well-preserved where modern developments have avoided their historic cores.

Being the places where people live and carry out much of their business, settlements have always changed more rapidly than most other elements of the landscape and will no doubt continue to do so. The accommodation of new means of transport (road, rail) is a key area for large scale, often damaging change, both within towns and also in their immediate surroundings.

Town centres are vulnerable to piecemeal facelifts by competitive businesses keen to attract customers, and residential districts are most at risk from certain forms of home improvement, most notably at present by the replacement of windows, doors and roofs by standardised plastic and asbestos materials.

The character of towns is being most fundamentally changed by the construction of new housing, often in the form of estates of virtually identical houses whose architecture does not always appear to have its roots in Yorkshire traditions.

Rural settlements are most vulnerable to insensitive conversions from agricultural or industrial to purely residential accommodation; the creation of mini-suburbs in the countryside and the draining of historical meaning and distinctiveness.

Rarity and vulnerability

Many settlements contain historically and architecturally important structures which are registered Listed Buildings and receive statutory protection. Conservation Areas also exist in most towns, usually in the historic cores. Local Plans reinforce these planning controls. The Sites and Monuments Record for towns is being gradually improved but requires a systematic reassessment of urban archaeological remains. Some settlements will fall within areas covered by broader designations.

Towns and villages are of high importance as features of the landscape, having a wealth and great variety of historical and archaeological components, demonstrating considerable time-depth and contributing much to the areas appearance and character. There is also enormous potential for further historical research and educational amenity use.

Recommendations

The use of Conservation Areas to control planning in towns and rural settlements should be retained and extended.

Regulations concerning replacement elements such as windows, doors and roofs should be enforced.

The loss of historic landscape at the edge of towns and rural settlements should be carefully considered when dealing with plans for edge developments (housing/industrial estates, bypasses etc).

Historic layouts and features, for example buildings relating to commercial, social and religious concerns, are very important for maintaining links with settlements' origins and development and for enhancing local distinctiveness. They should be explicitly identified and preserved.

Development in towns should respect traditional layout of streets, open areas and burgage plots. Large developments, such as in-town car parks, which over-ride and obliterate historic town/village features should be discouraged and careful consideration given to alternative proposals and sites. Full Extensive Urban Survey (EUS) of the area's larger settlements should be carried out in conjunction with the completion of the HLC in this region.

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9.9 Recreation

Introduction: defining/distinguishing attributes and principal locations

The Type Recreation includes the following sub-types:

- Holiday Parks;
- Parks & Gardens;
- Dive Sites;
- Angling Sites;
- Seaside Entertainment;
- Sports Facilities;
- Coastal Heritage;
- Marinas.

Tourism is an important source of income and employment for the coastal region within this study area, and includes Scarborough – 'Britain's first seaside resort' (Waters 2005, 51). The coastline, with its small villages and fascinating and beautiful range of scenery – from high cliffs and deep clear water to sandy coves and pretty fishing harbours, attracts many tourists in pursuit of open-air leisure activities. These include walking, bird watching, sunbathing, golfing, climbing, camping and wildfowling, as well as popular water sport activities such as sea bathing, sailing, diving, windsurfing, angling, water and jet-skiing. Visiting coastal heritage sites is also becoming increasingly popular, with Scarborough and Mulgrave castles and the Abbey at Whitby attracting many tourists (DTI, 2002).

Historical processes; components, features and variability

Dr Robert Wittie is said to have unintentionally launched Scarborough as Britain's' first real seaside resort after he published a booklet called *Scarborough Spaw* in 1660 and advocated its medicinal 'cistern' waters as a cure for virtually everything. An impressive spa building was eventually erected to cater for the mass influx of people who visited the springs here. In 1737 the spa was attracting around a thousand visitors per annum (Waters 2005, 51).

> The spa water did not impress everyone, however. The following conversation between Samuel Weller and John Smauker is recorded in a local guidebook of 1880:
>
> *'Have you drunk the waters Mr Wellers?'*
>
> *'Yes'* replied Sam.
>
> *'What did you think of 'em sir?'*
>
> *'I thought they was particularly unpleasant'.*
>
> *'Ah! You disliked the Killybeate taste perhaps?'*
>
> *'I don't know about that – I though they had a very strong flavour o' warm flat irons!'*
>
> (Waters 2005, 51).

Many visitors still use the spa and frequent the surrounding area with its hillside walks and

gardens. Others now choose to sample the delights to be found further along the bay where funfair rides, amusement arcades, public houses and other enjoyments of a modern seaside resort attract the majority of today's crowds (Waters 2005, 56) (Figure 9.74).

Figure 9.74. Luna Park fairground South Bay, Scarborough

Numerous hotels were also erected and form a familiar component of these seaside towns. Holbeck Hall Hotel at Scarborough achieved world-wide fame in 1993, when the unstable cliffs upon which it was built gave way, taking with them the hotel and much of the garden area below. Today the site is just a green slope where the mudslide has become grassed over (Waters 2005, 45).

The Promenade Pier in Scarborough's North Bay, constructed between 1866-8, was another recreational facility intended to cash in on the lucrative tourist trade in this area. By 1889 this iron-built pier had become rusty and unsightly and was refurbished with shops, a café, ladies cloakrooms and retiring rooms. In the winter of 1905, however, a destructive storm caused irreparable damage to it and the pier was dismantled (Waters 2005, 34).

Outdoor swimming pools were another, once familiar, sight at both Scarborough and Hartlepool (Figure 9.75) in the early 1900s. Scarborough had outdoor pools at both the North and South Bays. Today most of these pools have become derelict, either having been grassed over or left to ruin and barely distinguishable from the rocky foreshore. One pool still remains in use at Scarborough, and is one of the few remaining outdoor pools left in the country (Waters 2005, 87).

Figure 9.75. Hartlepool outdoor swimming pool (©Hartlepool Arts & Museum Service)

Such pools were seen as a modern-day replacement for the 'health-giving' dips in the sea which first became popular with the aristocracy, but later with everyone, after doctors advised that sea bathing was a health-giving pastime. Males were advised to bathe for five minutes before breakfast while women, children and invalids should bathe more often but only for two minutes each time. It was common, even in the 1800s for men to bath without clothing, while women wore specially adapted frocks. The invention of 'bathing costumes' developed from crude alterations to ordinary clothing whose design progressed to specially designed gowns and swimwear (Waters 2005, 36).

Other well-loved coastal amenities include beach donkeys (Figure 9.76), aquariums, pleasure gardens and parks. The cliff gardens and parks, with their picturesque walkways, boating lakes, fountains, flowerbeds and bowling greens, were appreciated for their peace and tranquillity. The Valley gardens at Scarborough were described in 1928 as 'one of the beauty spots' and were, before modern traffic, a quiet place of solitude where families would gather to feed the swans and to picnic on the benches provided nearby. These gardens were often based on foreign themes, such as the Italian Gardens that were built close to the spa or the oriental garden at Peasholm Park. Today these parks and woodlands continue to be maintained by the local council authorities, with dedicated staff to care for all the flora and fauna to be found there (Waters 2005, 80).

Figure 9.76. Beach Donkeys at Sandsend (© Whitby Museum)

In 1845 the York to Scarborough line was opened. Scarborough was already a watering place and seaside resort with over 150 years of experience of receiving visitors drawn by health reinvigoration or pleasure reasons and has continued to maintain its position as a major British seaside resort throughout the railway age and into the modern era. Various tourist visitor markets are attracted and catered for here, from the family day trip visitor to those moving to the Yorkshire coast on retirement as well as the business conference delegate and the overseas student (Morfin 1991, 167).

Another popular pastime is the collection of fossils, in particular in the 18th and 19th centuries. The alum measures are rich in fossils and ammonites have been turned up in profusion. From the mid-18th century larger marine fossils were also recognised, including teleosaurs, ichthyosaurs and plesiosaurs. These were in great demand by collectors, and the fears for the loss of some of the best specimens led to the founding of Whitby museum in 1823 (Pickles 2002, 17).

Change has been continuous over the years at these seaside towns, as the taste of their visitors have changed. Just after the Second World War, however, Scarborough began to develop itself as a major 'modern' leisure resort. The North Bay became popular for those wishing to avoid the crowds of South Bay, who were disparagingly termed the 'candy-floss and lollypop brigade' (Waters 2005, 90-1).

The 20th century also saw the development of the heritage industry. A 'heritage coast' classification scheme was initiated in 1972 to protect coastline of special scenic and environmental value from undesirable development and the whole of this stretch of coastline is designated as a Heritage Coast. Coastal heritage sites and facilities, such as the abbeys (eg Whitby Abbey), castles (eg Scarborough, Figure 9.77), cathedrals and churches, the countryside (eg North York Moors National Park), historic houses, Roman remains and museums, are increasingly being used to promote tourism in this region.

Figure 9.77. Scarborough Castle (© Dave Hooley)

Local people also developed their own recreational activities such as keeping racing pigeons, whippet racing, horse racing, cricket and football (Waters 2005, 96).

The chalet and caravan parks mainly comprise late 20th century standard structures served by simple concrete-block ancillary buildings and tarmac or concrete drives. Theme Parks vary in form and extent but most have late 20th century concrete-block buildings and many essentially temporary features. Some golf courses also were established in the 19th century, but most are relatively modern. They are usually landscaped, with many earlier historical features removed or damaged (eg field boundaries). Clubhouses and ancillary buildings are usually modern concrete-block structures. All recreation sites have extensive car parks.

Until the later 20th century recreation in this area has had a seaside bias. The more recent trend toward 'quality' tourism has encouraged more visitors to visit 'heritage' sites and explore inland landscapes.

The increasing popularity of sailing and other water-sports has led to a recent proliferation of marina developments along this stretch of coast. Most of the ports and docks now serve as mooring areas for private yachts and pleasure boats, indicative of this new leisure industry (Waters 2005, 65). Marinas exist at Scarborough (Figure 9.78), Whitby, Hartlepool, and along South Gare.

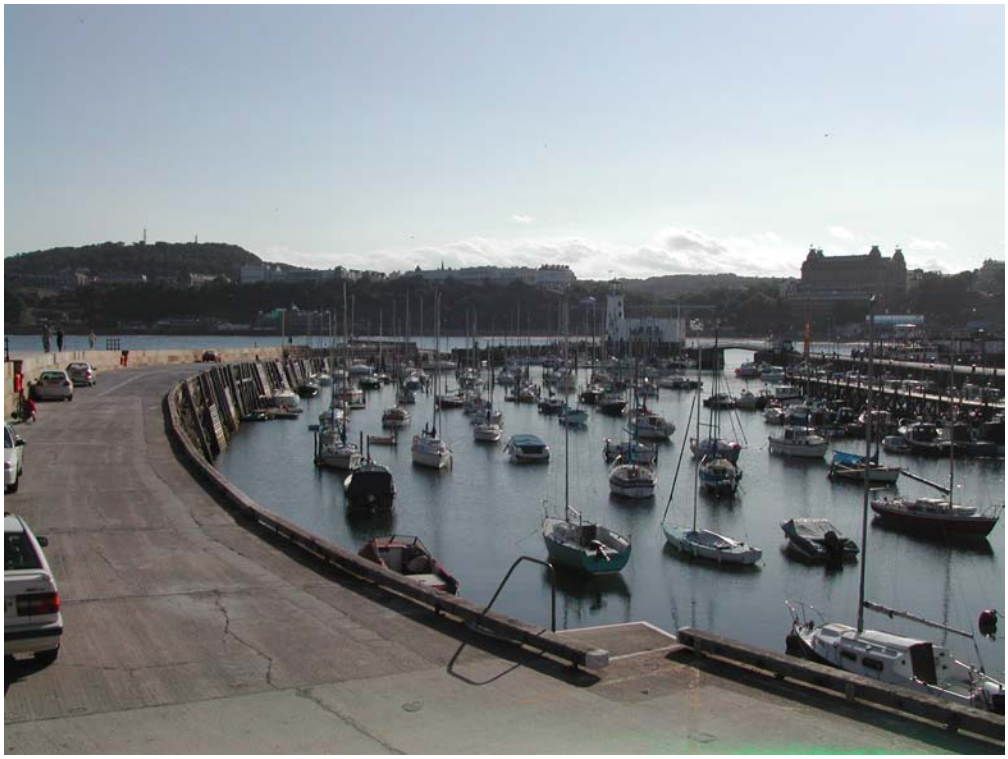

Figure 9.78. The marina at East Harbour, Scarborough

Other valued recreational activities include angling and diving. Recreational sea angling ranks as 'one of the most popular leisure activities in the British Isles' (North Eastern Sea Fisheries Committee 2006, 5). Important centres for charter boat fishing include the ports of Whitby and Scarborough. Since the early 1990s, however, the charter angling industry has gone through a period of slow decline, attributed mainly to falling North Sea fish stocks, in particular cod species, as well as an increase in the number of private vessel

owners. Nevertheless, alternative species such as sea bass, tope and pollack are increasing in abundance throughout the region and may provide new opportunities for the charter angling industry and anglers alike (North Eastern Sea Fisheries Committee 2006, 5).

Popular foreshore angling venues include Staithes (famous for its cod and its lobsters which thrive in this rocky, kelp filled area), Port Mulgrave (with its deep gully within casting distance of the pier at high tide and the scar beyond the breakwater at low tide) and Runswick Bay (a good venue for winter cod). Sandsend has good fishing from the beach, the car park, the scar or the cliffs; Upgang is a snag free and productive area for fishing, especially during summer and Whitby is renowned for its pier fishing and its cod, with one of the largest cod ever landed on rod and line around the British coast caught here in 1992 (56lbs 6ozs). Saltwick Bay is a sandy beach which gives way to rock and slate scar at either end; Robin Hood's Bay is also renowned for its cod, which are attracted by its impressive scar and many kelp filled gullies; and Hayburn and Cloughton Wykes both known for their ability to throw up some very good cod fishing, and Cayton Bay is a large sea fishing venue good on either the rocks or the clean sand.

With regards to diving, the North Sea is one of the world's best areas for wrecks as there are hundreds if not thousands and many of them are unknown and little dived. As a result there are many diving clubs along the north east coast. Founded in 1960, Scarborough Sub Aqua Club is one of the longest established scuba diving clubs in England. Other Sub Aqua Clubs exist at Whitby and Hartlepool.

Values and perceptions.

Much of the charm of this coast lies in the wide variety of pursuits suited to those who prefer leisure and pleasure rather than the more hectic and mainstream attractions of some other seaside resorts. This applies to both locals and visitors alike.

Ambivalence is perhaps more pronounced here than in any other Type. Some people loathe recreation sites, not just because they are seen as blots on the landscape but also because they are the physical manifestations of the annual invasion of tourists bringing unwanted values, cars and noise to the county. For many people, recreation sites represent Yorkshire's real economy, and security for the future. Visitors who have enjoyed glorious summer holidays develop deep affection for these sites.

A description from Seas & Shores of England, Edmund Vale, 1936:

'The individuality of the North Sea is striking. The tide is peculiar. The atmosphere, both in the actual and the poetic sense, is very different from that on the other coasts. The north-easter is the prevailing wind. It is a land of perishing winters, bracing springs, torrid summers, and amazingly colourful autumns. And you can see a rainbow over the sea at sunset which you cannot do on the other coasts.

As to the poetic kind of atmosphere, it is conveyed through many subtle hints to the eye and ear – the red tiled roofs, the distinctive fishing-craft, the churches, the ubiquitous fig tree, and the local accent.

And the folklore of this part is augmented equally and oppositely by the losses suffered through coastal erosion, and also by the amazing finds to be had on the seashore, amber, jet, cornelian, agate, bones of primeval elephants, stone coffins. These losses and finds have fostered a tradition of church bells heard ringing under the waves, of cities seen in the deeps on still days, with dim figures moving in their seaweed tangled streets, of bearded, hairy mermen caught by fishermen in their nets' (Vale 1936, 85).

Other attractions to this area come from the legends that have come to be associated with certain places, such as the famous monkey-hanging legend that is connected with Hartlepool:

> *In former times, when war and strife*
> *The French invasion threaten'd life*
> *An' all was armed to the knife*
> *The Fisherman hung the monkey O !*
> *The Fishermen with courage high,*
> *Siezed on the monkey for a French spy;*
> *"Hang him !" says one; "he's to die"*
> *They did and they hung the monkey Oh!*
> *They tried every means to make him speak*
> *And tortured the monkey till loud he did speak;*
> *Says yen "thats french" says another "its Greek"*
> *For the fishermen had got druncky oh!*
>
> *(http://www.thisishartlepool.co.uk/history/thehartlepoolmonkey.asp)*

Whether it is true or not, people in Hartlepool love the story. Even the local rugby team bears the proud nickname, the Monkeyhangers. Which is strange, because, for a long, long time after the supposed event, people from neighbouring towns used the tale to mock Hartlepool and its inhabitants, and Hartlepudlians were often on the receiving end of the jibe: 'Who hung the monkey?'. In 2002 H'Angus the Monkey, the mascot of the town's football team, was also elected mayor of Hartlepool after a victory by the team.

The use of some of these places as settings in fictional literature also attracts many visitors, such as Bram Stoker's most famous novel, the vampire tale *Dracula* published in 1897, which had many parts of it set around the town of Whitby, where he was living at the time.

Mina Murray's Journal

24 July. Whitby.--Lucy met me at the station, looking sweeter and lovelier than ever, and we drove up to the house at the Crescent in which they have rooms. This is a lovely place. The little river, the Esk, runs through a deep valley, which broadens out as it comes near the harbour. A great viaduct runs across, with high piers, through which the view seems somehow further away than it really is. The valley is beautifully green, and it is so steep that when you are on the high land on either side you look right across it, unless you are near enough to see down. The houses of the old town-- the side away from us, are all red-roofed, and seem piled up one over the other anyhow, like the pictures we see of Nuremberg. Right over the town is the ruin of Whitby Abbey, which was sacked by the Danes, and which is the scene of part of "Marmion," where the girl was built up in the wall. It is a most noble ruin, of immense size, and full of beautiful and romantic bits. There is a legend that a white lady is seen in one of the windows. Between it and the town there is another church, the parish one, round which is a big graveyard, all full of tombstones. This is to my mind the nicest spot in Whitby, for it lies right over the town, and has a full view of the harbour and all up the bay to where the headland called Kettleness stretches out into the sea. It descends so steeply over the harbour that part of the bank has fallen away, and some of the graves have been destroyed.

In one place part of the stonework of the graves stretches out over the sandy pathway far below. There are walks, with seats beside them, through the churchyard, and people go and sit there all day long looking at the beautiful view and enjoying the breeze.

I shall come and sit here often myself and work. Indeed, I am writing now, with my book on my knee, and listening to the talk of three old men who are sitting beside me. They seem to do nothing all day but sit here and talk (Stoker 1897, 69).

Research, amenity and education

Although the tourism industry has had a profound impact on the area's recent economy, infrastructure and social structure, the potential for meaningful and relevant research of the Recreation Type itself is limited. Nevertheless, work on this aspect of North Yorkshire's history should be encouraged, not least because future developments may be better predicted and planned for with the benefit of a fuller understanding of tourism's history. The Type is, of course, an amenity for many people; although it also reduces the amenity value of certain stretches of coastline for others.

The Dig, Dive and Discover project which took place at Hartlepool from April to September 2006, funded by the Heritage Lottery Fund's 'Young Roots' initiative, aimed to make young people more aware of their local heritage and enable them to share it with the community. In this project, Hartlepool Sea Cadets were encouraged to explore Hartlepool's rich maritime heritage, in particular looking at shipwrecks. The Cadets worked together with Hartlepool Diving Club, Hartlepool Reference Library and The Nautical Archaeology Society (north east). They also attended a web design workshop at Hartlepool College of Further Education where they learnt how to publish the story of their project on the web. The story appeared in the local press and on local radio and television.

The north east Nautical Archaeology Society (NAS) recently carried out a pilot study looking at material recovered from wrecks by sports divers and recorded hundreds of objects from only three or four dive clubs (Petts and Gerrard 2006, 201).

Another initiative by the NAS is the 'Adopt a Wreck' programme and awards scheme, which is part of a wider 'Dive with a purpose' scheme to encourage divers and others to

appreciate and preserve our underwater heritage. The hope is that groups will look at a site more closely, and take on a minimum level of stewardship, monitoring how the site changes over time.

There is also a clear opportunity for substantial community involvement in the recording of sports and leisure sites.

Condition & forces for change

Recreation at the coast is an increasingly significant and varied element of leisure activity, whether for tourists or for local residents. Tourism is now one of England's most important industries. Increasing cheapness and more attractive climatic conditions offered by the package holiday to the Mediterranean and beyond has increasingly spelled the demise for some of these seaside towns, however, although many are now beginning to reinvent and re-launch themselves.

With the rise in available leisure time and the active promotion of the tourist industry in recent years, pressure for access to the coast has grown. The leisure industry also requires development to provide appropriate facilities such as roads, footpaths, car parks and hotels. The effects of tourism on archaeological remains derive partly from such development, and partly from the activities of tourists, and may have a damaging impact on archaeological remains, resulting in the physical removal or disturbance of sites (Fulford *et al* 1997: 188).

Leisure activities themselves have varied impacts on archaeology. Activities such as walking, riding, cycling, biking or off-road vehicles all create increased erosion, threatening archaeological remains through exposure, disturbance or removal. Attempts to manage them through the provision of defined areas such as marked footpaths may have a mitigating effect, but the attraction of many of these activities is the free use of open country. Many of the most attractive locations are the most vulnerable, such as sand dunes, and these are also likely to be archaeologically important. At the other extreme, some activities will have little or no impact. Swimming, surfing or windsurfing will have little effect beyond human pressure on the foreshore. Jet-skiing and the use of power boats will generate wash which could cause erosion in more confined locations. Diving itself may be archaeologically harmless, but provides the opportunity for interference with archaeologically important remains (Fulford *et al* 1997, 188).

Recreation facilities along this stretch of coast receive no specific protection, although being generally found on the coast they do often fall within designations such as SSSIs, SPAs, SACs, RAMSARs, Heritage Coasts and National Parks and Nature Reserves. Recreation itself, however, is regulated by local and harbour authorities and by recreational groups.

Ranks of chalets and caravans, masses of parked cars, the startlingly neatly trimmed fairways and greens of golf courses, together with their visitors make these prominent features of the landscape today, particularly in the summer months of the main tourism season. Some caravan parks and camping grounds, however, can almost vanish in the winter. Most chalet/caravan and theme parks obliterate earlier historical features but golf courses often retain fragments of field systems or ancient woodlands in their landscaping, although the coherence and legibility of these features is reduced by their fragmentation. Golf courses are still being created and chalet/caravan parks expanded. Theme parks are also still being established.

Sites which would once have been ignored, such as World War II defensive structures and post-war industrial remains, are now being carefully recorded and are increasingly being

seen as an important part of the region's heritage, enjoyed by visitors and locals alike.

Rarity and vulnerability

Within the Type, gradual refurbishment and updating threatens some early features. Constraints on conspicuous development along this coast are beginning to exert control on the locations and forms of Recreation complexes

Recommendations

The continued expansion of the Type should be controlled as a principal concern is that other more important Types are imposed upon and either damaged or destroyed by it. At present, the greatest threats are from golf courses and caravan parks. Their construction usually involves the dismantling of existing landscape features in the creation of new ones. Screening (trees or shrubs) around camping and caravan parks will lessen their impact on neighbouring historic seascape character Types.

Diving clubs dive many of the unknown wrecks and could potentially provide local archaeologists and historians with a wealth of new and valuable information on these sites. Such collaboration is on the increase and further detection, registration and research of objects from the submarine cultural heritage should be encouraged. Continued awareness among sport divers as to the historical and archaeological value of the regions wrecks must be promoted. Such initiatives as the Dig, Dive and Discover project at Hartlepool and the NAS 'Adopt a Wreck' scheme should also be encouraged elsewhere, serving as a valuable way in which to build peoples awareness of their local heritage and enable them to share it with the community.

Public presentation and interpretation of the heritage encountered when pursuing recreational activities should be provided where appropriate.

Petts and Gerrard (2006) point out that 'there are whole classes of sites relating to sports and leisure in the 20th century which have remained relatively little researched in this region, including public houses, cinemas, and bingo halls….It is particularly important to ensure that remains related to regionally distinctive leisure activities, such as quoits (the throwing of horseshoes at a pin in the ground), pigeon racing and greyhound racing, are preserved. There is also a need for a better understanding of nationally popular sports, such as football, cricket and tennis' (Petts and Gerrard 2006, 195).

The rise of foreign travel has had an adverse affect on this region's coastal resorts, such as Redcar, Saltburn and Seaton Carew. Further work could usefully define and describe the novel elements of their landscape (Petts and Gerrard 2006, 196).

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10 Character Areas

Character Areas have been identified as another tier of the HSC, these are unique areas that local people may recognise and readily identify with (Figure 10.1). Apart from those that are offshore, they have generally not been developed directly from the HSC mapping. Consequently they contain a range of HSC Types. Each Character Area is briefly described below, with short statements on geography, principal character types included and a range of values and perceptions noted, although these are necessarily limited (due to lack of research and unfamiliarity with local opinions and feelings. These can and should be elaborated on by those with greater knowledge and understanding. Further information about the Character Areas can be found by correlating these areas against the Character Types mapping and identifying the particular Character Types covered and their attendant explanatory texts (Section 9).

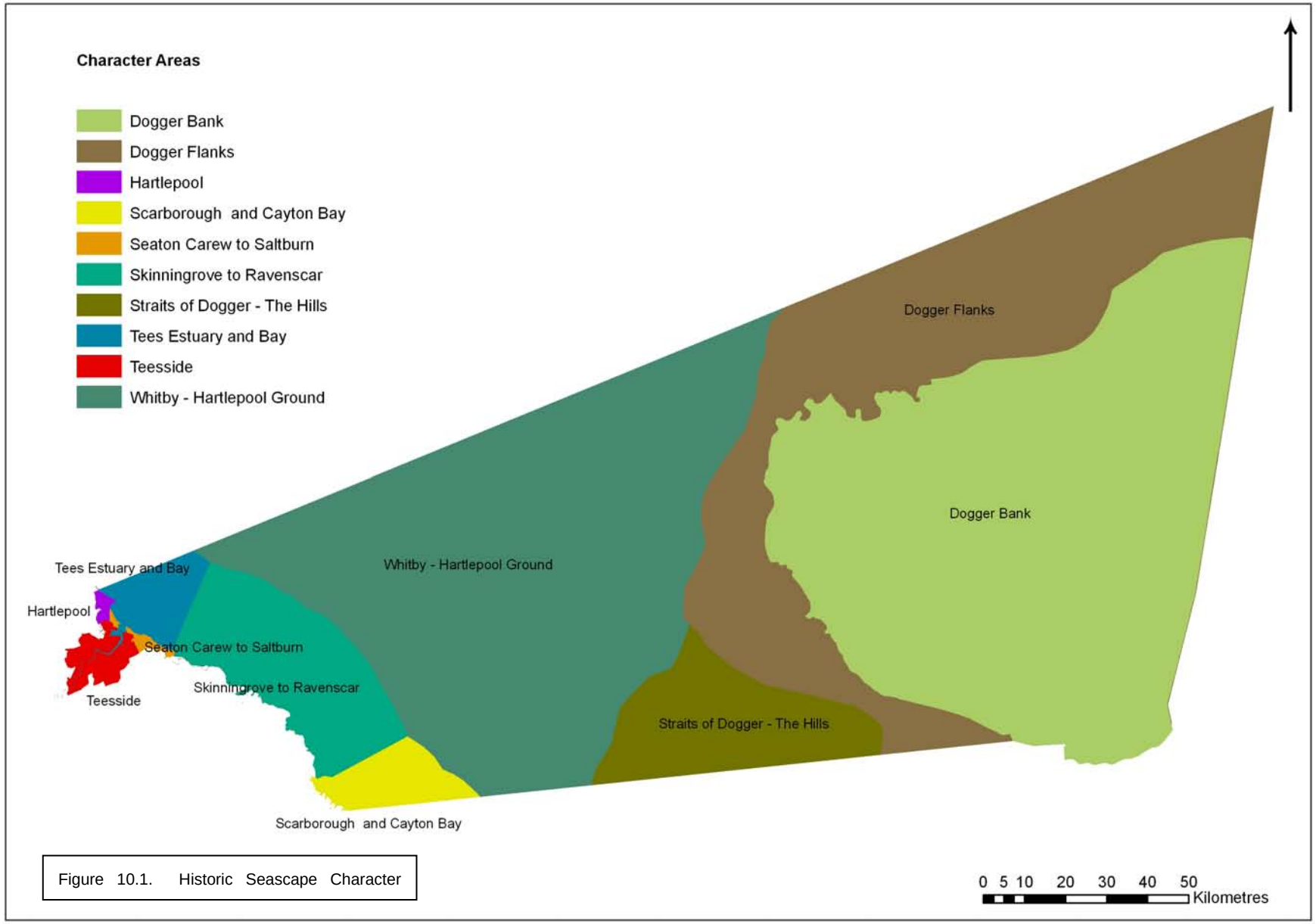

Figure 10.1. Historic Seascape Character

10.1 Hartlepool

The Hartlepool Character Area extends from the rocky limestone headland known as the Heugh southwards towards the seaside resort of Seaton Carew. It is principally urban, dominated on its seaward side by industrial docks and processing areas. Recreational facilities are becoming important, with many of the docks and harbours now adopting new roles as marinas or as coastal and maritime heritage centres (eg Hartlepool's Historic Quay, Figure 10.2).

Figure 10.2. The *Trincomlalee* on display at Hartlepool's Historic Quay, Jackson Dry Dock

Early Mesolithic archaeological finds, as well as a possible Bronze Age sewn-plank boat, have been recovered from the submerged forest beds in Hartlepool Bay. Prehistoric flint scatters have also been found at Hart Warren, as well as flints, animal bones, and wooden stakes from the foreshore.

Hartlepool was an important medieval fishing port and large scale salt exploitation took place here in the 15th, 16th and 19th centuries. Local magnesium limestone was exploited for magnesite and for use as building stone and lime mortar in the 19th and early 20th centuries. Milling was also important, with windmills documented at Hart from 1314. The iron industry did not develop as fully in Hartlepool as it did nearby in Middlesbrough, Stockton and East Cleveland.

Hartlepool's importance as a port increased with the industrial revolution at the end of the 18th century, when there was an increased demand for coal; a new harbour was built here in 1835. During the 19th century shipbuilding yards and dockyards were built, establishing Hartlepool as a major port and shipbuilding centre (Figure 10.3), alongside that of the Tees Ports.

Figure 10.3. Hartlepool Docks (1960s) (©Hartlepool Arts & Museum Service)

The industrial centre made Hartlepool a key target for Germany in World War One. By the onset of World War Two major military defences, such as batteries, pillboxes and anti-tank obstacles had been established along the headland and foreshore. Nevertheless Hartepool town still suffered extensive bombing damage.

Lighthouses stand on the Heugh headland and at the entrance to Hartlepool's harbour (Figure 10.4), where there is also a lifeboat station. St Hilda's Church also serves as a conspicuous landmark aid for navigation.

Figure 10.4. Hartlepool Lighthouse (©Hartlepool Arts & Museum Service)

Among the myths associated with Hartlepool is the famous one in which the people of the town hanged a monkey during the Napoleonic Wars, believing it to be a French spy. Whether true or not, people in Hartlepool love the story. Even the local rugby team bears the proud nickname, the Monkeyhangers. This is strange because for a long time after the supposed event, people from neighbouring towns used the tale to mock Hartlepool and its inhabitants, and Hartlepudlians were often on the receiving end of the jibe: 'Who hung the monkey?'. In 2002 H'Angus the Monkey, the mascot of the town's football team, was also elected mayor of Hartlepool.

For more information see the detailed HSC Character Types Texts (Section 9) for:

- Coastal Rough Ground
- Dunes
- Foreshore
- Maritime Safety
- Military Defences
- Navigation Area
- Port
- Processing Industry
- Recreation
- Saltmarsh and Sandflats
- Sea Defences
- Settlement
- Shipping Industry
- Transport

10.2 Tees Estuary and Bay

The name of the River Tees is thought to originate from the time of the Celtic speaking Ancient Britons whose language was similar to present day Welsh. Its name may be related to the ancient Welsh '*Tes*' meaning 'sunshine and heat' and is likely to mean 'the boiling, surging water'. 'Boiling' is perhaps a description of the many waterfalls and rapids found in the upper part of Teesdale (www.northeastengland.talktalk.net).

The River Tees, rising on the eastern slope of Cross Fell in the Pennines, is a major landscape feature, historically dividing the counties of Durham to the north and Yorkshire to the south. It enters the North Sea between Hartlepool and Redcar where the coast is low and flat. Formerly extensive tidal sand flats have now been reclaimed to create a vast industrial complex (Waughman 2005, 1).

From east to west we find Anglo-Saxon places of settlement, betrayed by names ending in 'ton' or 'ham' as at Billingham and Norton. In 1984 archaeologists unearthed Anglo-Saxon remains at Norton on Tees. To the Anglo-Saxons, the Tees was a dividing line between their sub-kingdoms of Bernicia and Deira, but also unified the two as the Kingdom of Northumbria. The Vikings settled the whole Tees valley naming their streams 'becks', their waterfalls 'forces' and gave their settlements names ending in 'by' like Thornaby and Stainsby (www.northeastengland.talktalk.net)

The Normans also made the Tees a boundary and William the Conqueror's Domesday Book of 1086, did not survey the north side of the Tees. Throughout the early Middle Ages the Scots were a constant threat to the peace of the Tees. Hartlepool was usually their ultimate goal, a busy port and a rich source of plunder. In 1139 the north side of the Tees was given to the Scots by King Stephen and for eighteen years the river formed the border between England and Scotland (www.northeastengland.talktalk.net)

The River was an important trade route from the 11th century onwards; before the

development of metalled roads and railways it provided the easiest means of transport. Medieval and post-medieval river traffic brought life and busy activity to the river banks; quays and wharves fronted the riverside villages, with warehouses, industrial furnaces, processing factories etc serving industrial and agricultural hinterlands. Ferries criss-crossed the river, linking banks, prior to the Transporter Bridge being built in 1907 (Figure 10.5).

There were, however, at least three different main channels, each pursuing an erratic course to the sea. Navigation from Stockton to Yarm was possible only for vessels of 60 tons or less and even then four tides were often necessary to complete the journey (Le Guillou 1975, 2-3). The river, in particular the estuary itself, has undergone the most radical dredging, realignment and maintenance. In the mid-1820s the Tees Navigation Company extended its dredging activities; forced by developments which had resulted in the opening of the Stockton to Darlington Railway and the gradual growth in coal shipments from the Railway Company's staithes at Stockton. In 1828 the Tees Navigation Company made the 'navigable cut from the east side of the Tees near Portrack into the said river near Newport' (Le Guillou 1975, 17). Many of the Tees former navigable river channels are now lost, buried beneath industrial development. As dredging cleared the river and estuary for navigation so the focus of trade and industry moved gradually downstream, from early centres like Yarm and Stockton to Middlesbrough today.

Figure 10.5. Middlesbrough Wharf (©Hartlepool Arts & Museum Service)

Increased trade along the north-east coast, particularly from the 19th century, saw greater volumes and larger vessels seeking access to what had traditionally been hazardous and restricted river and estuary channels. By the mid-19th century Tees trade reflected the industries on its banks. As coal exports fell after 1850, those for iron, and later steel, increased rapidly.

By the First World War, the River Tees ports were handling considerable volumes of trade; large quantities of pig iron and steel, coal and coke, and engines of all varieties were exported. Pipes, heavy forgings and castings, wire, salt, and chemicals were all manufactured products that benefited from the sound navigational channel provided by the Tees. In came large quantities of foreign ores (iron, manganese and chrome), iron and steel, chemicals and chemical products, timber and various building materials. Very few UK ports did not have vessels involved in coasting trade with the Tees, and an extensive

foreign trade was also carried on with places as far afield as India, Japan, South America, Australia and Africa (Le Guillou 1975, 90). The Tees Estuary is ideally suited for the iron and steel industries: proximity to the rich iron ores of the North York Moors and fuel from Durham's coalfields; its ports allowed easy export of the products.

This industrialisation forced port authorities to improve and maintain navigation access by dredging (Figure 10.6), the spoil often dumped at sea. Creating channels also involved reclamation of adjacent land, sand banks and saltmarsh, and the construction of retaining walls.

Figure 10.6. Bucket dredger, Tees Estuary (©Hartlepool Arts & Museum Service)

Tees Bay was a particularly dangerous place for shipping during WWI, with up to 42 U-boats operating between the Humber and the Tees. Between them they sank no less than 120 ships with torpedoes, over 100 by mines and many more that are suspected. At least another 80 merchant ships were also lost between the Tees and the Tyne (Young 2000, 19).

Today oil and shuttle tankers run between the Teesside oil terminal and other ports in the UK and continental Europe. Tees Bay is now dominated by huge tankers and ships associated with the hydrocarbon, steel and chemical industries. A restricted navigation area and harbour administration areas guide the shipping in and out of the estuary (Figure 10.7).

Figure 10.7. An oil tanker being piloted into Teesmouth by tugs

Wrecks are also numerous. Most derive from the early-modern period (1750-1900) of coastal trade and fishing. The Tees Estuary has been notoriously dangerous to navigate. Submerged scaurs and awash-rocks along the foreshore and in inter-tidal areas, and the shoals, sandbanks and drying areas associated with the estuary are all exacerbated by the tempestuous nature of the North Sea itself.

Even after Trinity House had marked the approaches of the Tees with wooden buoys in the early 16th century, it was very difficult to establish the correct deep water channel to navigate. At least three navigable channels are known from historic UKHO charts and it was the changing nature and locations of these that presented sailors with their greatest problems. The situation was compounded by an extensive bar, seven miles long, running from Hartlepool to Redcar, two miles (3.2km) out into Tees Bay. The extent of this bar varied considerably according to weather conditions and dramatic changes to the very course of the channel both up to and over the bar, took place throughout the centuries (Le Guillou 1975, 1). Being an actively managed navigable river channel, Tees Estuary and Bay continue to be frequently dredged in order to maintain their accessibility and safe passage.

To the north of Redcar, the entrance to the Tees estuary is clearly marked on the coast by the pier breakwaters on either side of the river estuary. These are the half mile long North Gare and the two and a half mile long South Gare (Figure 10.8). The Gares were built following a great storm in 1861 in which 50 vessels were wrecked on the sand bars between Redcar and Hartlepool. Both Gares are under the management of the Tees and Hartlepool Port Authority and the South Gare is the site of a Coastguard station which monitors the busy shipping activity of the estuary.

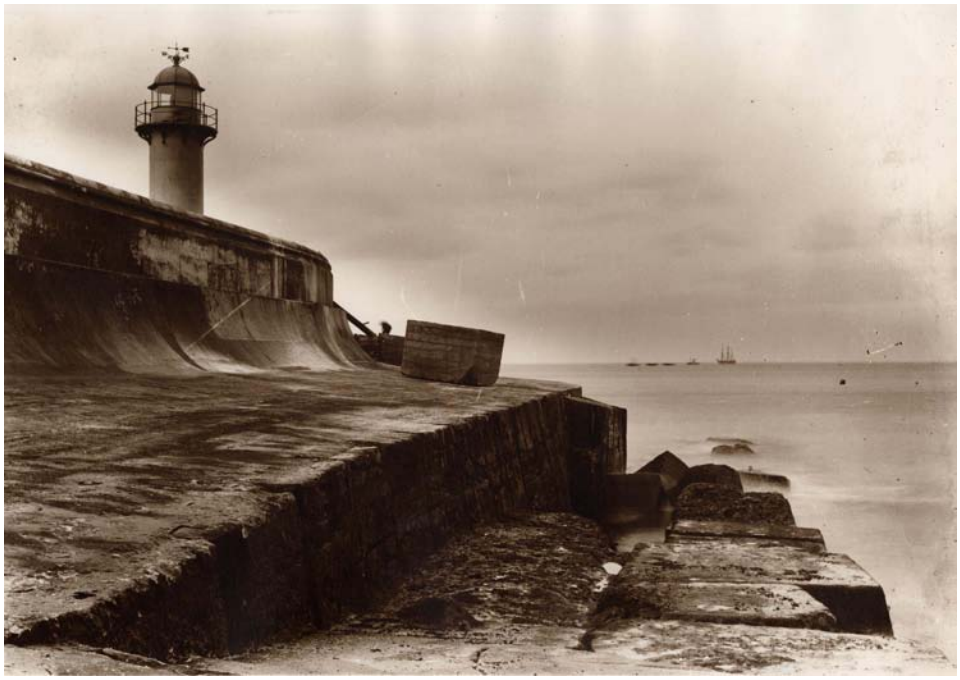

Figure 10.8. South Gare Lighthouse (©\ Hartlepool Arts & Museum Service)

Telecommunication cables are another characteristic of Tees Bay, extending from Redcar and Marske and following a north-easterly route across this area to Denmark

Despite being one of Britain's most industrialised river estuaries, the Tees is surprisingly important for its wildlife. Seal Sands, now only half its original size due to land reclamation, is still the winter home to thousands of wildfowl and waders. The Wetlands at Greatham Creek are recognised as wetlands of international importance (a RAMSAR site) for wintering wildfowl and waders and as a result is designated as a Special Protection Area (SPA). Seal Sands are also designated as a National Nature Reserve (NNR).

For more information see the detailed HSC Character Types Texts (Section 9) for:

- Extractive Industry (hydrocarbon)
- Extractive Industry (minerals)
- Fishery (netting, lining, potting and trunking)
- Maritime Safety
- Navigation Area and Route
- Navigation Channel
- Navigation Hazard
- Ports
- Telecommunications

10.3 Teesside

Teesside is essentially industrial and urban in character, with sprawling hydrocarbon and steel complexes and a nuclear power station dominating the riverside at Tees Mouth, and the sprawling and now seemingly interconnected settlements of Middlesbrough, Stockton-on-Tees, Thornaby-on-Tees, Billingham and Yarm.

The banks of the River Tees have a long history of human occupation. A log-boat of possible prehistoric date was found in *c*1852 during construction of the railway at Yarm (NMR: 874047) and a possible prehistoric dugout canoe was also found in the 19th century in Middlesbrough (NMR: 874059).

The settlements of Middlesbrough, Yarm and Stockton date back to at least the medieval period. As late as 1801 Middlesbrough was still only a small farm of twenty five people, but in 1830 the Stockton and Darlington Railway line was extended to here, making the rapid expansion of the surrounding towns and ports inevitable. By 1851 Middlesbrough's population had grown from 40 people in 1829 to 7,600 and it rapidly replaced Stockton as the main port on the Tees.

Stockton, Billingham and Norton all have Anglo-Saxon names, with the typical Anglo-Saxon place name endings 'ton' and 'ham' meaning farm, or homestead. The three places along with Thornaby on the opposite side of the Tees are all part of the Borough of Stockton-on-Tees. Thornaby's name, ending in 'by', indicates a Viking settlement and is one of a number of 'by' names on the south side of the river, which are virtually absent from the north bank. Of the three Anglo-Saxon settlements on the north side, Stockton is now the most substantial, but Billingham and Norton were once the main centres, especially in Saxon times (www.northeastengland.talktalk.net).

As at Hartlepool, extraction of salt from seawater has taken place in this area from at least the medieval period. In Billingham an ancient salter's track ran through this area, north to Wearmouth and south to Whitby. Cowpen near Billingham is known to have been an important salt making centre in the 14th century (Rowe 2000, 26) and in the 15th and 16th centuries Greatham was too. By 1650 the centre of British salt making had moved to South Shields and large scale exploitation did not return to Greatham until 1887 when salt in the form of brine was extracted from 1000 feet below the earth (Rowe 2000, 26).

Development of industry and commerce on the River Tees was still in its early stages in the 17th and 18th centuries and was concentrated in little market towns like Yarm, a place later succeeded by Stockton as the main port on the Tees. Industry boomed in the Victorian age and gave Teesside a common industrial heritage, unifying the north and south banks of the river with a single identity. Middlesbrough's pig iron exports easily surpassed those of any other UK port, averaging over 100,000 tons per month during the early 20th century. Scotland remained Tees-side's best British customer, whilst the leading foreign markets were Germany and Holland, Belgium, France, Italy, North America, Scandinavia and the Far East (Le Guillou 1975, 91).

Port Clarence at the northern terminus of the famous Transporter Bridge of 1907 (Figure 10.9) owes its origin to the development of the Clarence Railway here between 1828 and 1833. This linked coal mines in south Durham with coal staithes on the River Tees. Port Clarence then rivalled the newly born port at Middlesbrough on the opposite side of the Tees (www.northeastengland.talktalk.net).

Figure 10.9. Middlesbrough's Transporter Bridge (©Hartlepool Arts & Museum Service)

Discovery of iron ore in the Cleveland Hills prompted the building of Teesside's first blast furnace in 1851. As demand grew more blast furnaces were opened in the vicinity of Middlesbrough and by the end of the 19th century Teesside was producing about a third of the nation's iron output. By the 1870s, steel, stronger and more resilient, was in greater demand and the Tees rapidly became known as 'the Steel River'. The expanding iron and steel industries spurred on the growth of Middlesbrough with a population of 19,000 in 1861 increasing to 40,000 only ten years later. The residents of this early town came mainly from neighbouring Yorkshire and the North East, but later from Cheshire, Ireland, Scotland, Wales and some European countries.

At the turn of the century Middlesbrough's population had risen to 90,000 and it must have been hard to believe that only seventy years earlier the town did not exist. Today Middlesbrough has a population of over 150,000 and is undoubtedly the heart of the Teesside connurbation and the modern 'Capital' of the area.

The steelworks and the port at Teesmouth were vital during WWII for the supply of steel for war machinery. This made them a prime target for enemy attack. The area was heavily defended with a wide range of defensive structures including barracks, gun batteries and range-finding towers. To protect other valuable industrial complexes in the Tees Valley, a number of Night Bombing Decoy sites were also constructed.

The Tees estuary is now dominated on either side by the large areas of reclaimed land called Seal Sands on the northern bank and Bran Sands on the southern bank, both now largely used for industry. Seal Sands is the site of an Oil Refinery and a Chemical Works. The area is traversed by pylons, wires and undulating pipelines, and is populated with oil tanks and gantries, cooling towers and chemical storage globes, behind security fences (Argyle *et al* 1985, 167). The two hundred and twenty mile long EKOFISK oil pipeline has its terminus at Seal Sands by which oil and gas liquids are piped ashore from the Ekofisk oilfield for processing at one of the largest plants of its kind in the world. Today oil

exporting is one of Teesside's most important industries.

For more information see the detailed HSC Character Types Texts (Section 9) for:

- Coastal Rough Ground
- Dunes
- Energy Industry
- Extractive Industry (minerals)
- Foreshore
- Maritime Safety
- Navigation Area
- Navigation Channel
- Navigation Hazard
- Port
- Processing Industry
- Recreation
- Saltmarsh and Sandflats
- Settlement
- Shipping Industry
- Transport
- Water (fresh)
- Woodland

10.4 Seaton Carew to Saltburn

The coast to the south of Seaton Carew is mostly masked by dunes and sheets of sand. Submerged forest peat beds can be found in deposits here, often exposed after storms and episodes of tidal scouring. There are also palaeo-channels representing earlier postglacial drainage overtaken by sea-level rise and also filled with fine-grained organic and clastic sediments. The coastline from Redcar to Staithes has some outstanding rock exposures and breathtaking scenery such as the cliffs at Huntcliff and Redcar.

Seaton Carew, Redcar, Marsk-by-the-Sea and Saltburn-by-the-Sea are typical seaside resorts, with their long stretches of sandy beaches and dunes, golf courses, caravan parks and recreational piers, promenades and seaside amusements. To the west of these towns and their beaches the industrial complexes at Middlesbrough and Teesside dominate their skylines (Figure 10.9), as does the passage of shipping in and out of the Tees on their seaward sides.

Figure 10.9. Redcar Sands with Teesside Works in the background

Seaton Carew is sandwiched between the industrial complex of Seal Sands and urban Hartlepool and is the coastal resort for Stockton and Hartlepool and is named after a Norman French family called Carou (Figure 10.10). Like many coastal places on this coast it was a small fishing town that grew in the eighteenth and nineteenth centuries with the rising popularity of health resorts. Seaton was especially popular in the bathing season with members of the Quaker fraternity from Darlington. The nearby nuclear power station and the neighbouring chemical industries of Seal Sands do not seem to harm the sea-side resort atmosphere of the town (www.northeastengland.talktalk.net)

Figure 10.10. Seaton Carew promenade (©Hartlepool Arts & Museum Service)

Situated between Seaon Carew and Redcar is the South Gare Breakwater. 'Like the still centre of a whirlpool, South Gare is a place of peace and solitude at the tip of a huge industrial area. Oil tankers and cargo ships pass on their way into the Tees estuary, factories belch smoke all around, but the desolate dunes of South Gare are a haven to

many shore birds. Towards the tip of the promontory is a harbour for fishing vessels, and near it, in a dell amoung the dunes, there is a collection of green-painted fisherman's huts. A yacht club, the South Gare lifeboat station and the Tees coastguard tower complete the scene' (Argyle *et al* 1985, 167).

Redcar is situated at the mouth of the River Tees. The place-name element 'car' derives from the Viking *Kjar,* marshland. Described as a 'poore fishing toune' in 1510, Redcar was for many centuries overshadowed by its neighbour Coatham which held a market and fair from 1257. The extension of the railway to Redcar from Teesside in 1846 brought industry and tourists to Redcar's doorstep and the town quickly expanded and soon absorbed Coatham. Like nearby Saltburn, Redcar is still frequented by day trippers in search of the scent of the sea but the biggest attraction is undoubtedly the Race Course which the town has grown around. Redcar is also the home of the world's oldest lifeboat, *The Zetland*, displayed in the museum of that name in King Street. It had worked at Spurn Head until it was bought by Redcar fishermen in 1802. Although fishing vessels and tractors (for hauling the boats down to the sea) line Redcar promenade (Figure 10.11), notices warn against eating polluted shellfish from the foreshore (www.northeastengland.talktalk.net).

Figure 10.11. Redcar Sands and promenade

Marske-by-the-Sea was once a small fishing village consisting of one street of thatched white wash cottages. The place-name is a Scandinavian pronunciation of the English word marsh. In 657 AD Abbess Hilda came to Marske, or 'Mersc', and settled where Spoutbeck joined the sea at Spoutbeck Chine, now the Valley Gardens. The Stockton and Darlington Railway was extended to here in 1865 to transport the iron ore from Marske and New Marske to the new town of Middlesbrough. In the First World War Marske-by-the-Sea's population greatly increased due to the army camps and Marske Aerodrome which was built as a training camp for the Royal Flying Corps. The main Hangers have just been demolished to make way for a new housing estate. In the Second World War Marske was once again invaded by the Royal Artillery and many more who were camped in the area. Today Marske-by-the-Sea is slowly losing its identity, becoming an urban District of Redcar (www.marskebythesea.co.uk/).

Saltburn can trace its history to at least 369 AD, when the Romans built a signal station at Huntcliff in the later days of the Empire, when there was danger of barbarian coastal raids. It was one of a series of signal stations protecting the Yorkshire coast. The Anglo-Saxons settled in the 5th century, naming a local stream '*Sealt-Burna'* meaning the salty stream, perhaps from its salty water or because of the salt-like alum found in the neighbourhood. Vikings three centuries later changed the names of all local burns to becks. The settlement on the Salt Burn retained its name, but the stream became the Skelton Beck. The little fishing village of Saltburn was famed for smuggling and fishing until 1860, when the Stockton and Darlington Railway was extended to the site and Henry Pease of Darlington set about the development of the Victorian coastal resort of Saltburn-by-the-Sea. Today Saltburn-by-the-Sea remains a quiet fishing haven and resort which retains an air of faded Victorian grandeur (www.northeastengland.talktalk.net) (Figure 10.12).

Figure 10.12. Saltburn's seafront and pier

Competition from package holidays to the Mediterranean and beyond has increasingly spelt the end of seaside towns, although numerous redevelopment works suggest they are now beginning to reinvent and re-launch themselves.

For more information see the detailed HSC Character Types Texts (Section 9) for:

- Cliff
- Coastal Rough Ground
- Dunes
- Extractive Industry (minerals)

- Fish Processing
- Foreshore
- Maritime Safety
- Navigation Area
- Navigation Hazard
- Port
- Processing Industry
- Recreation
- Saltmarsh and Sandflats
- Sea Defences
- Settlement
- Transport
- Water (fresh)
- Woodland

10.5 Skinningrove to Ravenscar

To the south-east of Saltburn the coast changes rapidly to high irregular cliffs, cleft at intervals by narrow defiles and small valleys (Myerscough 1991, 7). From the crumbling shale cliffs of Staithes to the 200m high cliffs at Boulby (the highest cliffs on England's east coast), the coastline exhibits a wide variety of rock types and coastal features associated with them. The River Esk, entering the sea at Whitby, has the only estuary between the Humber and the Tees, and is one of only a few breaks along this stretch of coast that offers scope for landings where fishing boats can be drawn up the beach.

A number of Mesolithic artefact scatters and Neolithic finds are recorded along the coastline here, often eroding from cliffs, beaches, dunes and the foreshore but also turned-over on the farmland on the cliff-tops.

The locations of the villages along this coast, with their concern for shelter from the storm and providing a safe haven for boats, leave little doubt that the first settlers here were seafarers. Staithes, Runswick and Robin Hood's Bay all hug the northern end of their bays to huddle in the lee of the headlands.

Fishing has been an important element of the economy here since at least the medieval period. The fishing ports of Staithes, Robin Hood's Bay and Runswick Bay deployed fleets of three-masted luggers, which were fitted out to follow the long-line fishery for cod and ling off the Dogger Bank, as well as smaller cobles for inshore fishing.

In the fishing villages houses tend to be built as close as possible to the waterside, Staithes being an extreme example (Figure 10.13). This was largely so that the fisherfolk could be constantly near their boats, the principal wherewithal of their livelihood. At Whitby the fishing community lived in the narrow streets by the harbour (Frank 2002, 44). Runswick and Staithes were predominantly fishing villages, but elsewhere, as at Whitby, the fishing community was only part of a larger population.

Figure 10.13. Staithes (© Sutcliffe Gallery (www.sutcliffe-gallery.co.uk))

Whaling from Whitby began in 1753 and drew to a close in 1837. In the late 18th century Whitby had between ten and twenty vessels involved in whaling at any one time (Figure 10.14) and more people involved in the trade than any other place in Britain, including Hull.

Figure 10.14. Whitby whaling ships (© Sutcliffe Gallery (www.sutcliffe-gallery.co.uk))

Between 1840 and 1860, trawling expanded dramatically, rapidly overhauling lining as the principal means of capturing white fish and by the mid-1870s, the expansion of the smack trawl fishery was nearing its peak. In summer, they visited grounds off the Danish, German, Dutch and Belgian coasts. In winter, they mainly worked banks adjacent to the Dogger, including the Silver Pits and Botney Gut.

From about 1880 onwards the fishing industry was rapidly assuming its present-day character. Around Britain's coastline there were still thousands of small craft propelled by sail and oar; but in the Irish Sea, the Channel, and the North Sea, fleets of steam-powered trawlers were operating. By the outbreak of World War One, the last of Staithes' yawls had stopped fishing, and a tradition which can be traced back, through documentary sources, nearly 1300 years came to an end (Frank 2002, 37).

The character of this area has been shaped by these fishing ports and activities that take place along this stretch of coast, as well as by the alum, ironstone and jet industries that have been established here over the centuries.

From at least the 17th century the shale in these cliffs was worked for alum, as can be seen at Sandsend (Figure 10.15), Boulby, Loftus, Peak, Stoup Brow, Saltwick Bay and Kettleness. The upper part of the alum shales was exploited to make cement and so are often called the Cement Shales. The effect of this heavy industrialisation was often so great that in some cases whole cliffs have been changed beyond recognition. Access ways to the shore and landing places have also altered the shape of the coastline. With increased competition from new works elsewhere in the country from 1766, the alum industry in Yorkshire began to decline, the last two remaining works, at Kettleness and Boulby, ceasing production in 1871.

Figure 10.15. Former site of Sandsend Alum House

Shipyards and dockyards are evident from at least the medieval period and from the 15th century onwards, the north east shipping industry flourished with the rise of the coal and, later, the alum trades. Alum production required large quantities of fuel and every year vast fleets of colliers sailed from the Tyne and Wear to the Thames bearing the produce of the coalfields of Northumberland and County Durham. Much of this collier fleet was owned at Whitby. Whitby's share grew steadily through the 18th century due mainly to the fact that at high tide it possessed one of the best harbours of refuge on the East Coast (Figure 10.16). The emergence of Whitby as a highly skilled shipbuilding town was another factor which contributed to its dominance of the shipping industry in this area. But Whitby's shipbuilding days eventually became numbered because of the size limitations placed on it by the bridge. A dramatic reduction in the number of shipyards took place in the 1830s with a downturn in trade and again in the 1860s when the market for wooden vessels dried up.

Figure 10.16. Dock End, Whitby (1880s) (© Whitby Museum)

From Staithes to Port Mulgrave the Cleveland Ironstone Formation has been extensively mined, at Skinningrove, Staithes, Port Mulgrave (Figure 10.17) and Kettleness. The village of Skinningrove was built to house the men who worked the iron mines at the head of the valley. Though the mines have closed, steel works have taken their place and the stream is permanently stained with the rusty colour of iron ore waste (Argyle *et al* 1985, 162). Specialised industrial port facilities to transport the ironstone were built at Skinningrove and Port Mulgrave.

Figure 10.17. Port Mulgrave, now disused

Although jet had been used since the Bronze Age, jet mining was another important local industry which flourished during the 19th century, in particular at Whitby, Port Mulgrave, Sandsend and Saltwick Bay. Adits were cut into cliffs and hillsides and where the Jet Rock sank below the shoreline at high tide traces can also be seen where miners have dug away at the bases of the cliffs.

Another of North Yorkshire's most significant exports was stone for building, in particular sandstones. As well as being workable this stone had the virtue of hardening as it weathered and of resisting the effects of immersion, so it was useful in harbour works. It is mainly found in and around Whitby and was used to construct most of Whitby Abbey. Stone was also sent from Whitby to build Margate and Ramsgate piers, the foundations of London and Waterloo Bridges, Covent Garden Market and London Docks, to quote just a few examples.

Potash was discovered in north east England in 1939. A potash mine was opened at Boulby by Cleveland Potash Ltd in 1973 and is currently Britain's deepest mine, as well as also being used for research into neutrino impacts on the earth.

The more indirect effects of extractive industry include the development of certain towns, and the generation of wealth. In the post-medieval period, settlements grew slowly until the 18th century when increased mining activity led many to expand more rapidly and the growing commercial activity caused some others to follow. Several new towns and industrial villages also grew up along the coast as a result. Without the development of ironstone mining many of the small villages we see today in East Cleveland would not have been formed. The alum works also needed local workers and by the 18th century the original coast road running from Staithes to Skinningrove was dotted with hamlets for these workers.

Many of the relict industries in this area, such as alum quarries, ironstone and jet mines, are still visible in the landscape today, although most are now either overgrown by scrub and woodland or are barely distinguishable from the natural areas of the rocky foreshore.

Military facilities include a zeppelin listening post at Boulby and a radar base at Ravenscar. A WWII radar station was also located at Kettleness while it was superseded by a rotor type radar at East Barnby in 1950s, but closed after a fire in the 1960s.

Navigation aids and maritime safety contribute significantly to the character of this area. Lighthouses are situated at Whitby Harbour, coastguard and lifeboat stations at Robin Hood's Bay, Staithes (Figure 10.18), Runswick Bay and Whitby.

Figure 10.18. Staithes lifeboat station

All the coastal settlements along this inhospitable stretch of coast are protected by various sea defences, including sea walls and breakwaters.

The use of some of these places as settings in fictional literature also attracts many visitors, such as Bram Stoker's most famous novel, the vampire tale *Dracula* published in 1897, which had many parts of it set around the town of Whitby, where he was living at the time.

Tourism is now the dominant industry in this area, with its rich fishing and industrial heritage, as well as Whitby Abbey and the Cleveland Way (Figure 10.19), attracting many visitors each year. Foreshore angling is another popular recreational activity and particularly favoured venues include Staithes, Port Mulgrave, Runswick Bay, Sandsend, Saltwick Bay, Robin Hood's Bay and Whitby. Whitby is renowned for its pier fishing and its cod, with one of the largest cod ever landed on rod and line around the British coast caught here in 1992 (56lbs 6ozs).

Figure 10.19. The Cleveland Way, a popular coastal walk that runs through this area

A 'heritage coast' classification scheme was initiated in 1972 to protect coastline of special scenic and environmental value from undesirable development and the whole of this stretch of coastline (with the exception of Whitby) is designated as a Heritage Coast.

For more information see the detailed HSC Character Types Texts (Section 9) for:

- Cliff
- Coastal Infrastructure
- Coastal Rough Ground
- Extractive Industry (minerals)
- Fishery
- Foreshore
- Maritime Safety
- Military Defences
- Military Facility
- Navigation Area
- Navigation Channel
- Navigation Hazard
- Port
- Processing Industry

- Recreation
- Saltmarsh and Sandflats
- Sea Defences
- Settlement
- Transport
- Water (fresh)
- Woodland

10.6 Scarborough to Cayton Bay

Scarborough is dominated by Castle Hill, a promontory rising to nearly 100m above sea level. On either side the cliffs are relatively low; sandy beaches run north and south. Much of the cliff section from Scarborough to Cayton Bay is composed of glacial drift choking a pre-glacial channel. At the southern end of the Scarborough Bay the cliffs contain plentiful fossils, especially oysters and ammonites. Further south, from High Red Cliff, marine beds rise out from the beach and yield a rich marine fauna. Overlying deltaic rocks, well displayed on the shores of Yons Nab, contain the nationally and internationally important Gristhorpe Member Plant Beds containing many drifted plant remains, including ferns, cycads and fruits, many of which are unique to this area.

Although Scarborough is now predominantly recreational in character, it also has a long history of military activity and as a principal east coast fishing port.

Scarborough is a place name mentioned in Viking sagas. The word 'borough' derives from the Viking word 'Borg' meaning 'stronghold' and so Scarborough is thought to mean Skarthi's stronghold. According to the 'Kormaksaga' two Viking brothers called Thorgils and Kormak went harrying in Ireland, England and Wales and established a stronghold called Scarborough on the English east coast. Thorgils was known to his brother by the nickname 'Hare Lip', or in the Viking language 'Skarthi'. The brothers Kormak and Thorgills were in the service of King Harald Grafeld, who was king of Norway from 960-965AD. This suggests the Viking foundation of Scarborough dates to around the mid tenth century.

The Vikings were not the first to settle at Scarborough, however. There may already have been an Anglo-Saxon settlement on the site and there was certainly a Roman signal station here. Scarborough's military lookout was subsequently built upon and used for defensive purposes by the Saxons. The first substantial stone-built castle in this area was also built at Scarborough, founded by William le Gros around 1136 and was further strengthened and rebuilt when it was seized by Henry II in 1154. Scarborough Castle received its last great assault during WWI, when two German warships bombarded the town causing a great deal of damage and destroying both the barracks and the coastguard station. Shells also damaged some of the walls and blew a large hole in the castle keep (Waters 2005, 7). The castle still dominates the town today, but other, later features, built or created in relation to it, have formed nuclei for other streets and buildings (Figure 10.20).

Figure 10.20. Scarborough Castle

Scarborough also played an important role as one of England's major east coast fishing ports. In winter, 'deep sea' herring were sought, as were inshore species from boats and cobles, and lobster, which were taken in Lent and summer. By the summer, skate, cod, and coastal herring fishing took place, the latter beginning in late summer and extending through autumn. In the early 14th century hundreds of ships are recorded as landing herring at Scarborough during each year's season. In Scarborough's peak year 1304-5, 237 foreign landings brought 355 lasts of herrings – 810 tonnes or 3,550,000 fish – worth £444. Herring and cod fairs took place during the autumn, the busiest at Scarborough (Scarborough Fair), lasting 98 days, from 24 June to 29 September (Starkey *et al* 2000, 19).

Scarborough maintained its primacy as the chief Yorkshire herring port up to the outbreak of war in 1914. Between the wars, herring fishing on any scale virtually disappeared. There was a boom again in the 1940s and 1950s as Scottish boats fished off Yorkshire, but this was short-lived (Frank 2002, 147-9). The change to round-the-year trawling and seine-netting contributed to the serious depletion of herring stocks in the North Sea (Frank 2002, 88). Modern perceptions of fishing are often that it is now destructive of fish stocks and the sea-bed. But it is also still seen as an important element in the local economy and culture at Scarborough (Figure 10.21).

Figure 10.21. Fishing vessels moored in Scarborough's Old Harbour

Dr Robert Wittie is said to have unintentionally launched Scarborough as Britain's' first real seaside resort after he published a booklet called *Scarborough Spaw* in 1660 and advocated its medicinal 'cistern' waters as a cure for virtually everything. An impressive spa building was eventually erected to cater for the mass influx of people who visited the springs here. In 1737 the spa was attracting around a thousand visitors per annum (Waters 2005, 51).

Scarborough also had outdoor pools at both the North and South Bays in the early 1900s. The northern one still remains in use and is one of the few remaining outdoor pools left in the country (Waters 2005, 87). Other well-loved coastal amenities include aquariums, pleasure gardens and parks. The cliff gardens and parks, with their picturesque walkways, boating lakes, fountains, flowerbeds and bowling greens, were appreciated for their peace and tranquillity. These gardens were often based on foreign themes, such as the Italian Gardens that were built close to the spa or the oriental garden at Peasholm Park. These parks and woodlands continue to be maintained by local council authorities, with dedicated staff caring for the flora and fauna (Waters 2005, 80) (Figure 10.22).

Figure 10.22. St Nicholas Gardens, Scarborough

In 1845 the York to Scarborough railway line was opened, encouraging further growth of the tourism industy here. Just after the Second World War Scarborough began to develop itself as a major 'modern' leisure resort. The 20th century also saw the development of the heritage industry.

Some golf courses were established in the 19th century, but most are also relatively modern. Recreation in this area has tended to have a seaside bias until the later 20th century, where a more recent trend has been toward 'quality' tourism and has encouraged more visitors to visit 'heritage' sites and explore inland landscapes. Many visitors still use the spa and frequent the surrounding area with its hillside walks and gardens. Others now choose to sample the delights to be found further along the bay where funfair rides, amusement arcades, public houses and other enjoyments of a modern seaside resort attract the majority of today's crowds (Waters 2005, 56) (Figure 10.23). Chalet and caravan parks were developed at Cayton Bay in the late 20th century.

Figure 10.23. Scarborough sea front, South Bay

Other valued recreational activities include angling and diving. The numerous wrecks in this area make it a popular spot for diving and Scarborough Sub Aqua Club is one of the longest established scuba diving clubs in England, founded in 1960.

As at Redcar, Saltburn and Seaton Carew, the rise of foreign travel has had an adverse affect on this area's coastal resorts, but with the increasing popularity of sailing and other water-sports, harbours are beginning to adapt to these changes and adopt new roles as marinas (Figure 10.24) and maritime heritage centres.

Figure 10.24. East Harbour Marina, Scarborough

For more information, see the detailed HSC Character Types Texts (Section 9) for:

- Cliff
- Coastal Rough Ground
- Extractive Industry (hydrocarbon)
- Extractive Industry (minerals)
- Fishery (netting, lining, potting and trunking)
- Fish Processing
- Foreshore
- Maritime Safety
- Navigation Area and Route
- Navigation Hazard
- Port
- Processing Industry
- Recreation
- Saltmarsh and Sandflats
- Sea Defences
- Settlement
- Telecommunications
- Transport
- Water (fresh)

10.7 Whitby and Hartlepool Grounds

This character area covers the deeper offshore waters between the coast and the Dogger Bank, the area of deepest water in the HSC study area.

During the medieval period the area comprised internationally important fishing grounds particularly for herring and cod, respectively caught by nets and long lines. The fishing communities perched and tucked away on this coast traditionally farmed inshore waters: trapping for salmon, potting for shellfish and crustacea, and netting for seasonal herring in distinctive local craft such as cobles, yawls and mules, with Scarborough, Whitby, Staithes and Hartlepool the leading towns.

> The following extract comes from Albert Close's *Fisherman's Chart* of 1953, compiled from first hand evidence from fishermen of the North Sea. It provides a good indication of how these grounds were perceived by the men who worked them:
>
> **Area 67**: The NW of Area 67 is good for Dabs, Haddock, and Cod in July; catchy for Seine-Nets, and in the north boulders are picked up. Whitby Fine Ground is fairly good and clean. It is rough as a rule for 10 miles offshore, and strewn with wrecks. For 15 miles off shore from Scarborough to Hartlepool is stony ground.
>
> **Area 68**. All of Area 68 is good for all kinds of fish. The south half of Brucey's Garden is good for Seine-Nets. Off it's South end, from about Lat. 54.47 to 54.33 for about 14 miles West of the southern Rough of Dogger-Bank, is catchy, but trawlers, and some Seine-Nets work it. On its west edge it is catchy in 35-40 fathoms. The ST Huxley found Jan, Mar, May, June, July and Oct good months. The Western half of this area, as far north as Lat 54.45 is reported stony ground, and smaller stones in the middle of the Eastern half, extending right across to Lon 2 and from then about NE by N for another 80 miles. It averages about 120 miles in width.

However, offshore fisheries were also farmed, but it was not until the advent of trawling methods and the late 19th century adoption of steamers that heralded the era of extensive and intensive exploitation of both pelagic and demersal fisheries. The worst affected stretch of coastline in England was that between Berwick and the Humber, which includes the Hartlepool to Scarborough stretch (Frank 2002, 21-22).

'In the 19th century Staithes yawls ventured as far north as Aberdeen and vessels from Scarborough and Filey continued fishing down to Yarmouth. Off the Yorkshire coast the main herring season was in August and September, harvest months in the agricultural calendar. By the 1870s Yorkshire harbours were packed in the late summer months with vessels come to share in the herring harvest. Zulus and fifies from the Moray Firth lay alongside stately East Anglians, together with boats from Cornwall's Mount's Bay and from the Isle of Man, and the local fleets too. By 1880 more than two hundred boats were fishing for herring off Whitby; and in 1885 it was reported that over 80 boats came from Cornwall alone (Figure 10.25), their home ports being mainly Penzance, Mousehole, Fowey, St Ives and Newlyn. A few fished the off-ground with the bigger Staithes yawls, venturing as far as 60 miles from land, but usually the fishing ground was three to seven miles off Whitby.' (Frank 2002, 133)

Once internationally important fishing grounds are today in a state of remittance as strategies for conservation of fish-stocks limit seasons and catch size.

Figure 10.25. Cornish Herring Luggers leaving Whitby (© Whitby Musum)

The coastal and offshore waters of Britain have been navigated since prehistory although it is likely that early mariners circulated round the periphery of the North Sea, 'coasting', by hugging the coastlines rather than sailing directly across it. Linear routes are essentially an early-modern invention. Nevertheless the whole area can be considered to comprise 'navigation areas and routes', both historic and modern, to a greater or lesser degree.

Wrecks are numerous in the waters off the River Tees and North Yorkshire coasts. Most derive from the early-modern period (1750-1900) of coastal trade and fishing.

For more information see the detailed HSC Character Types Texts (Section 9) for:

- Extractive Industry (hydrocarbon)
- Fishery (trawling, netting and lining)
- Military Facility
- Navigation Area and Route
- Navigation Hazard
- Palaeo-landscapes
- Telecommunications

10.8 Straits of Dogger (The Hills)

The Hills are a series of sand banks, topped with extensive sand waves, and deep narrow channels, orientated north-west south-east, lying on the south-west edge of Dogger Bank. The area constituted part of the submerged 'Doggerland' and was probably inundated sometime around 7000BC, before which it may have formed a series of promontories and headlands with deeply incised channels often favoured by Mesolithic hunters and gatherers. The banks themselves are likely to have limited archaeological potential although the channels may offer more despite being filled with thick Holocene deposits and modern marine sands. Submarine prehistoric sites may survive with sufficient integrity to provide evidence for settlement patterns, working sites, fish weirs, hearths, food remains, craft and burials although they are likely to be deeply buried or survive in secondary and tertiary contexts.

The area has been extensively fished, historically by long lines and nets but in recent times by extensive and intensive beam trawling. The area is also used as a Military Practice Area by submarines exercising in the deep channels.

For more information see the detailed HSC Character Types Texts (Section 9) for:

- Extractive Industry (hydrocarbon)
- Fishery (trawling, netting and lining)
- Military Facility
- Navigation Area and Route
- Navigation Hazard
- Palaeo-landscapes
- Telecommunication

10.9 Dogger Flanks

The Dogger Flanks skirt the Dogger Bank, encompassing the area between the 20-50m contours. This area is likely to offer considerable archaeological potential, relative to the top of the Bank itself, and prehistoric sites may survive with sufficient integrity to provide evidence for settlement patterns, flint working sites and fish weirs together with palaeo-environmental evidence such as peat deposits and submerged forests remains.

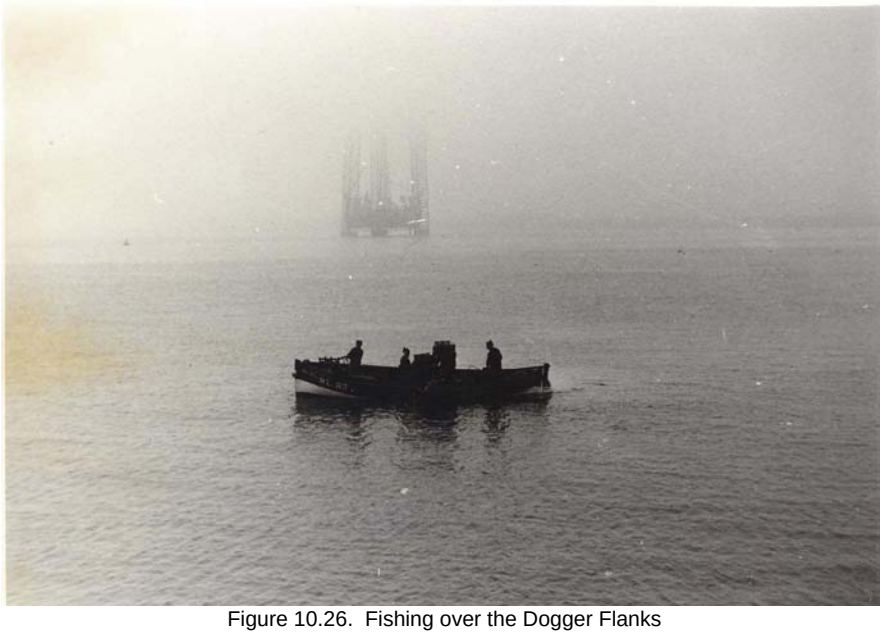

Figure 10.26. Fishing over the Dogger Flanks

While artefacts and archaeological deposits left on the upper surface of Dogger Bank are likely to be exposed by present currents and wave action (very severe, breaking waves in 10m) it is probable that there are far more relicts originally abandoned on the shore of this shallow sea in the area now at a depth of about 40m. The rising sea would have had very little destructive force until the water was tens of metres deep, and strong tidal currents were developing. Whitehead and Goodchild (1909) describe the recovery of peat deposits or 'moorlog' by fishermen, especially on the north side of the basin, on the flanks of Dogger Bank itself (Flemming 2002, 33).

> 'The Mesolithic coastal dwellers of Doggerland began to see their landscape change - sometimes within a single day, sometime within their lifetime, sometimes only when they recalled what parents and grandparents had told them about lagoons and marshes now permanently drowned by the sea. An early sign of change was the ground became boggy, when pools of water and then lakes appeared in hollows as the water table rose. Trees began to drown while the sea remained quite distant. Oak and lime were often the first to go, alder normally the last, surviving until sea water was splashing its roots and spraying upon its leaves. High tides became higher and then refused to retreat. Sandy beaches were washed away. Coastal grasslands and woodland became salt marsh – land washed daily by the sea which saturated the soil with salt. Only specialised plants could survive such as the edible samphire and cordgrass that provided a home for an assortment of fleas, bugs and midges. Herons, avocets and spoonbills soon came to feed where, not long before, woodland birds had flourished. The North Sea invaded Doggerland. Marine waters worked their way into valleys and around the hills; new peninsulas appeared, became off-shore islands and then disappeared for ever' (Mithen 2003, 151).

For more information see the detailed HSC Character Types Texts (Section 9) for:

- Extractive Industry (hydrocarbon)
- Fishery (trawling, netting and lining)
- Navigation Area and Route
- Navigation Hazard
- Palaeo-landscapes

10.10 Dogger Bank

The Dogger Bank is a very large shoal area in the central southern North Sea, with water depths less than 30m. It is shallowest in the south-west where depths are only 10-15m and areas of natural swell are common.

From at least the medieval period long line demersal fisheries have centred on and around the Dogger Bank with craft sailing from Scarborough, Staithes, Robin Hood's Bay, Flamborough and Runswick taking cod, ling and haddock. From the late 19th century the area has been extensive trawled, for demersals and flat fish.

Modern fishing methods have greatly reduced many fish stocks to the point of extinction. Herring is no longer abundant in the North Sea; massive catches in the 1940s and 1950s took their toll and depleted stocks fell to a dangerously low level. If, as a result of bans and restrictions on fishing, the North Sea herring does recover it would require strict international legislation and the reintroduction of traditional methods of fishing to prevent them being decimated again. Restrictions on cod and plaice have caused the displacement of fishing activity away from traditional grounds and towards the oil and gas fields of the North Sea.

Further offshore wrecks become increasingly dispersed although clusters occur in some areas over foul grounds and off the Dogger Bank in particular.

The Bank comprises Devensian pro-glacial lake deposits and glacial moraine, mostly patches of gravel and formations of calcareous sands with peat infilling glacial depressions; all overlying Pleistocene sediments. The top of the peat is dated to 8140±50BP at -31.06m OD (Shennan *et al* 2000, 303).

Across the central and southern North Sea there is submerged archaeological potential for Pleistocene flora and faunal remains. Early or Lower Palaeolithic potential is minimal but there is greater likelihood of Middle and Later or Upper Palaeolithic remains (including mammoth and rhinoceros teeth). Holocene deposits may hold Mesolithic archaeological potential, both *in situ* and in secondary contexts (Figure 10.27). Many human artefacts, mammal remains and peat deposits have also been dredged and reported from locations reported as The Dogger Bank. However beyond the general location of these areas, little is known about their stratigraphic context or spatial patterning. The Dogger Bank was isolated and inundated by *c*5500BC and after that the archaeological potential is purely maritime.

The Doggerland landscape represented a living space rather than merely a 'landbridge' connecting Britain to mainland Europe (Coles 1998; 1999). In many ways the topography of the Danish archipelago is analogous with the low relief of the central North Sea. It is possible to envisage the rising sea penetrating river valleys, inlets and creeks into marshes, and separating low islands only 30m high in places (Flemming 2004, 18). The variation in rate of sea-level rise, standstill and fall combined with local topography, meant that land loss probably occurred in fits and starts. Deeply incised Pleistocene river valleys would have gradually infilled with no perceptible change for decades or even centuries during the early Holocene. However these periods of minimal change may have occasionally been followed by periods of continual change, or dramatic change.

> 'Around 10,000BC, with rising temperatures and sea-levels, Doggerland must have offered an increasingly attractive environment for human settlement. Periglacial tundra was replaced by more temperate grassland with shrubs, and this in turn was gradually colonised by trees, first by birch, willow and hazel, later pine, oak, alder and elm. As climate and fauna changed, so did the animal resources available. The big game of open grassland – mammoth, red deer, aurochs, wild horse – may have once attracted Late Palaeolithic hunters to Doggerland. But as the temperatures rose, as river systems and wetlands developed, and the trees advanced and woodlands thickened, a wide range of mammals, fish and wildfowl must have lived in the varied environments created' (Gaffney, 2006)
>
> 'Doggerland had a coastline of lagoons, marshes, mud-flats and beaches. It was probably the richest hunting and fishing grounds in the whole of Europe. Grahame Clark, the excavator of Star Carr, believed that Doggerland had been the heartland of the northern Mesolithic culture' (Mithen 2003, 150).

Figure 10.27. Doggerland in the Late Holocene (© B.J. Coles and S.E. Rouillard)

Today the submerged landscapes of the North Sea offer tantalising glimpses of a drowned culture, lost and somewhat mysterious yet full of potential for further understanding, a link to a period before Britain became an island, but one not widely known to public perception.

In recent times this area of the central North Sea will be recognised as being covered by BBC Radio 4's Shipping Forecast, for the sea areas 'Tyne' and 'Dogger' and the Inshore Waters forecasts for 'Berwick on Tweed to Whitby' and 'Whitby to The Wash'. The Shipping Forecast is provided by the UK Meteorological Office on behalf of the Maritime and Coastguard Agency. It is broadcast four times a day and consists of reports and forecasts of weather for the seas around Britain. Its unique, distinctive name means it has a wide iconic appeal even to those not solely interested in nautical weather.

Some will always associate Dogger Bank with the First World War naval battle. Similarly Dogger Bank may be remembered as the site of the UK's strongest earthquake measuring 6.1 on the Richter scale. Taking place on 7th June 1931 its epicentre was on the Bank,

about 60 miles (96.6km) from the coast of England and its effects were reported throughout Britain and even in Belgium and France.

There are two principal cables routes that pass through the study area. One set (PANGEA1) run from the foreshore between Redcar and Marske and follow a north-easterly route to Denmark. Another set (UK-GER6 and TGNNEUROPE) run out from Filey before sweeping north into the central part of the area before separating, one continuing towards Denmark, the other veering east over the Dogger Bank to Germany. Two redundant cables are recording lying in Cayton Bay.

For more information see the detailed HSC Character Types Texts (Section 9) for:

- Extractive Industry (hydrocarbon)
- Fishery (trawling, netting and lining)
- Military Facility
- Navigation Area and Route
- Navigation Hazard
- Palaeo-landscapes
- Telecommunications

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11.1.1 Modern UKHO Admiralty Charts

Chart 1612-5, Scarborough Bay, 1:10,000.

Chart 1612-6, Scarborough Harbour, 1:5000.

Chart 129, Whitby to Flamborough Head, 1:75,000.

Chart 134. River Tees to Scarborough, 1:75,000.

Chart 152, River Tyne to River Tees, 1:75,000.

Chart 266, North Sea Offshore Charts, Sheet 11: Dogger Bank, 1:200,000.

Chart 268, North Sea Offshore Charts, Sheet 9. 1:200,000.

Chart 1191-0, River Tyne to Flamborough Head, 1:200,000.

Chart 1612-1, Runswick Bay, 1:25,000.

Chart 1612-4, Whitby Harbour, 1:7500

Chart 1612-9, Approaches to Whitby, 1:25,000.

Chart 2566-1, Tees Bay, 1:25,000

Chart 2566-2, Continuation of the River Tees, 1:20,000.

Chart 2566-3, Hartlepool Bay, 1:10,000.

Chart 2567, Approaches to Tees Bay, 1:200,000.

11.1.2 Historic UKHO Charts

Date	Title	Surveyor	UKHO Chart Ref.	UKHO Shelf ref.
1762	River Teese	Dobson	A50	Qf
1791	Yorkshire Coast, Robin Hood's Bay to Runswick Bay	Pickernell	i73/1&2	Pu41
1802	River Tees (1762 corrected 1802)	Dobson	D611	Qf
1815	Hartlepool to Redcliff	Thompson	F11	Df
1824	River Tees	Edgeworth	H274	Og*
1830	Flamborough Head to Robin Hood's Bay		H23, H24	15c
1839	Tees Bay	Hewett/Brooks	L1704	3a
1839	Staithes	Calver	L4151	Qf
1843	Scarborough	Calver	L6160	Oi*
1847	Scarborough (Same as L6160 but with an 1847 update)		L3803	Dl
1851	Plan for Navel Station & Asylm Harbourb at Redcar		L4587	

	Longitudinal section of engineering of Tees River.			
1852	Chapman's Cut 1808 to Bamblett's Bight (Cockel's Gat)	Beaufort	L8801	35c
1852	River Tees Plan		L8802	15c
1853	Seaton Carew to Redcar to Stockton		L9763	13e
1854	Plans for improvements to Scarborough Harbour		L262	
1858	Tees Bay	Calver	L9526	
1874	Tees Bay		A3918	40l
1875	East Coast	Imray	A5594	
1885	Tees Estuary	Tees Conservancy	A9275	49a
1891	Hartlepool to Redcar (Tees Bay)		B400	at TNA
1891	Tees to Redcar	Maxwell	B3636	Dn
1894	Whitby	Triton	B4784	Qi
1897	Skinningrove to Marske	Triton	B6288	7d
1901	Scarborough	Triton	B8195	Dn
1914	Whitby		C5589	
1914	Whitby	Triton	C5588	Oa
1929	Tees Bay (from 2567)	HMS Fitzroy	n	Ou
1930	Tees Bay	HMS Fitzroy	E3390	8a
1931	Scarborough		H23 H24 10	
1931	Runswick Bay to Robin Hood's Bay		f2	15c England Folio
1932	England East Coast. Whitby	HMS Fitzroy	E3972	18
1932	Hartlepool Bay	HMS Fitzroy	E3970	
1932	Whitby	HMS Fitzroy	E3971	Oh
1955	England East Coast. River Tees and Tees Bay		E9862	31m
1963	Tees Bay to Whitby		K4023/1-2	Kn
1967	Whitby Harbour		K5171	Folio 61
1974	Whitby		K6962	Folio 67
?	East Coast: Scarborough to Hartlepool	D&E Steel	B605/1	
1838/1853	Tees Bay	Slater/Calver	D9526	
1849 and 1857	Stockton to the Sea	Johnston	D3198	Ag1
	Burlington Bay (Scarborough & Hartlepool) - use for illusting report	Grenville Collins	B900	Historical Press
	Huntcliff to Sandsendness		H24 10 f2	15c

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12 Project archive

The HES project number is **2006022**

The project's documentary, photographic and drawn archive is housed at the offices of the Historic Environment Service, Cornwall County Council, Kennall Building, Old County Hall, Station Road, Truro, TR1 3AY. The contents of this archive are as listed below:

1. A project file containing site records and notes, project correspondence and administration and copies of documentary/cartographic source material (file no 2006022).
2. Digital photographs stored in the directory ..\Images\Sites\Seascapes Scarborough to Hartlepool 2006022
3. This report held in digital form as: G:\CAU\HE PROJECTS\SITES\MARITIME\SEASCAPES SCARBOROUGH TO HARTLEPOOL 2006A6022\REPORT\FINAL REPORT\SCARBOROUGH_HARTLEPOOL_HSC_FINAL_REPORT.DOC