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.

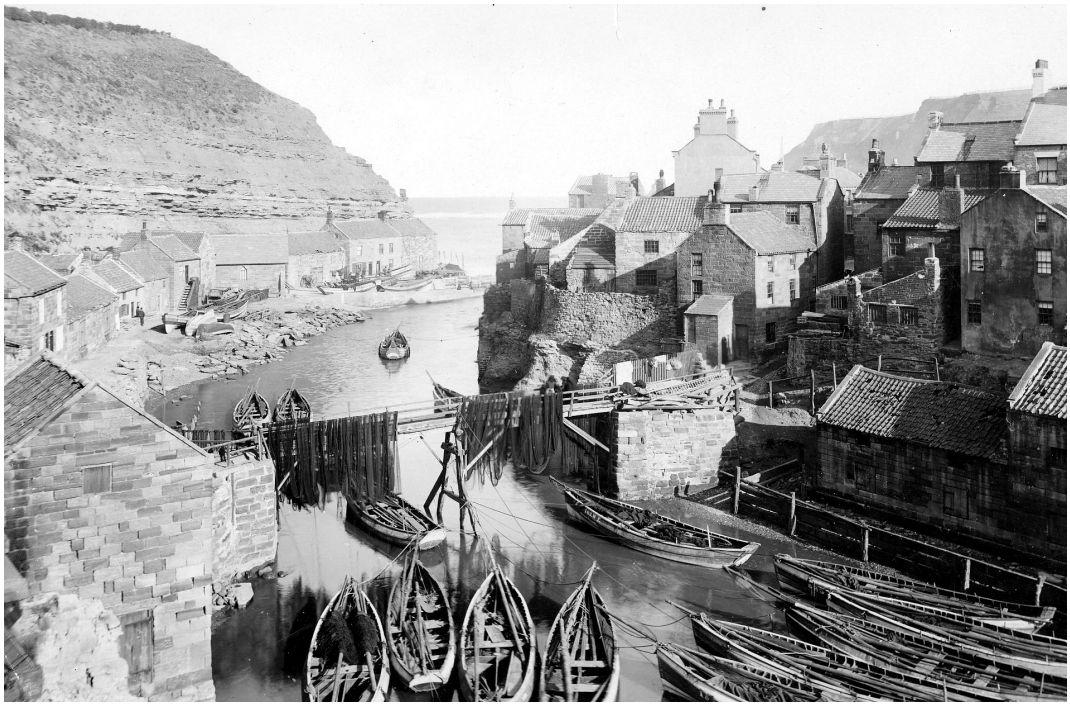

Figure 9.28. Fishing boats and nets at Staithes (© Whitby Museum)

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.

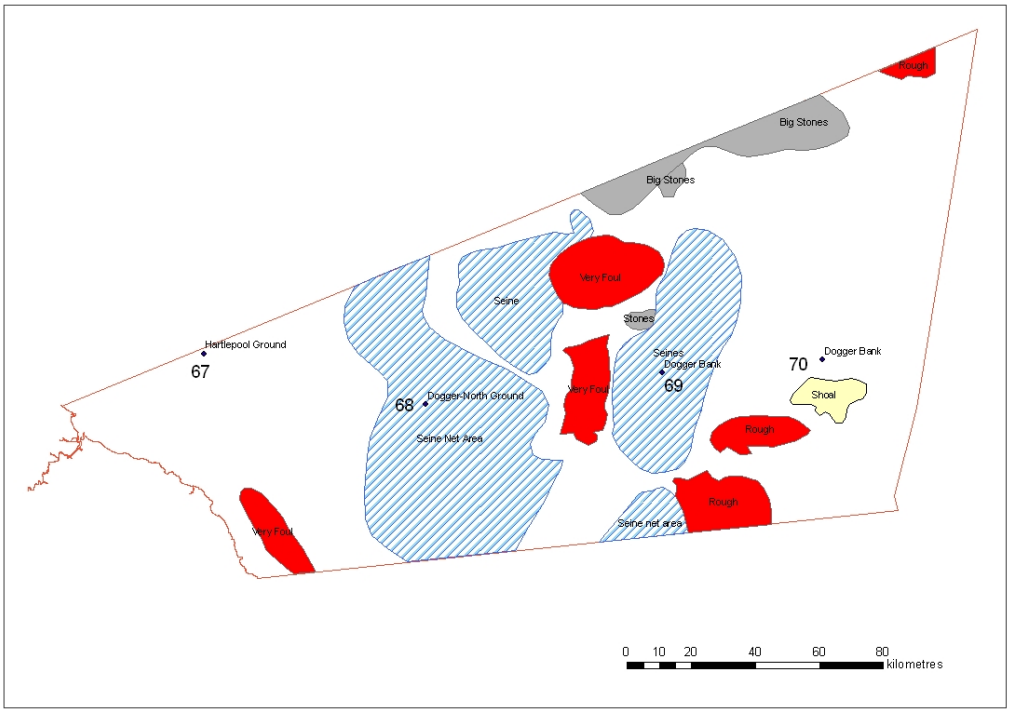

Figure 9.30. Detail digitised from Albert Close's Fishing Chart (1952)

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).

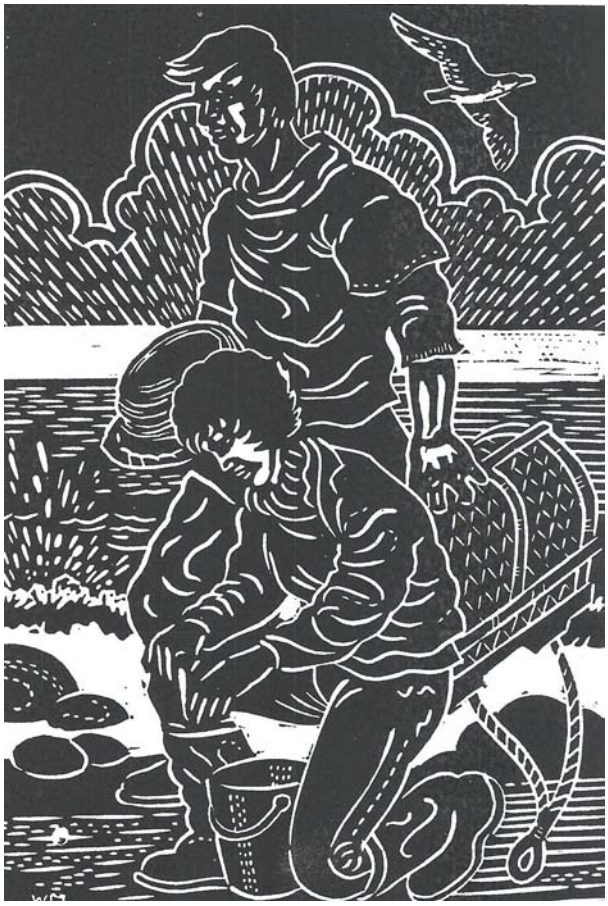

Figure 9.32. Linocut of a fisherman collecting 'flithers' from a rock (© Mel Whittaker)

'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).

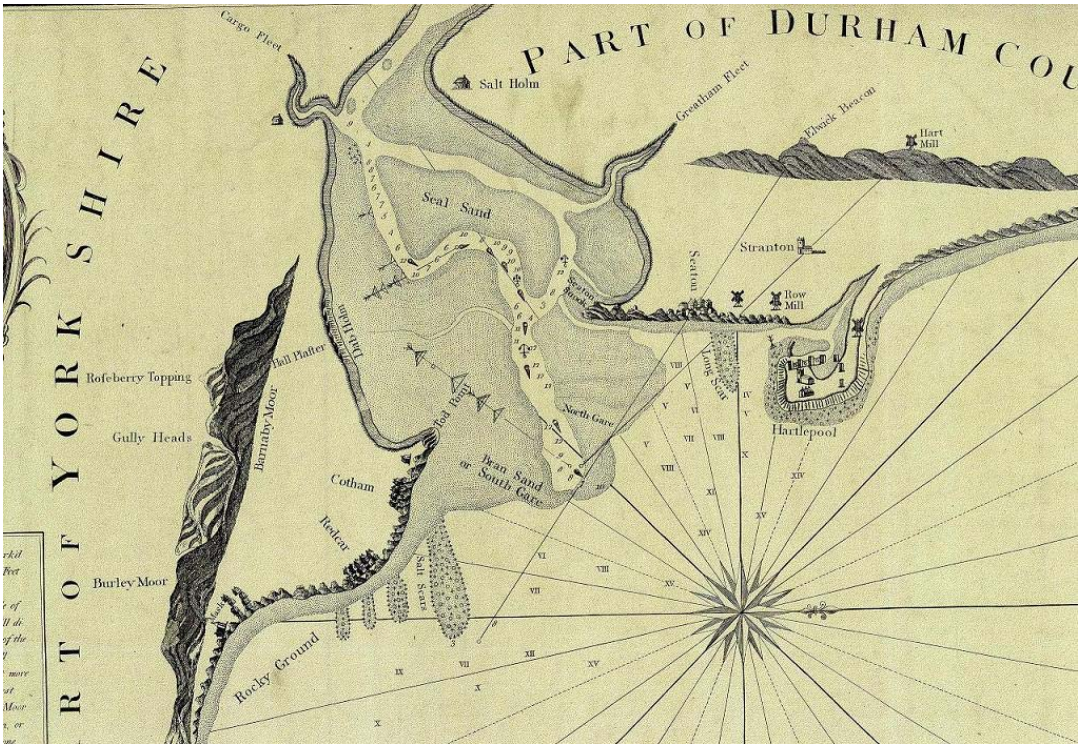

Figure 9.37. River Tees, Dobson (1802) (© UKHO)

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.

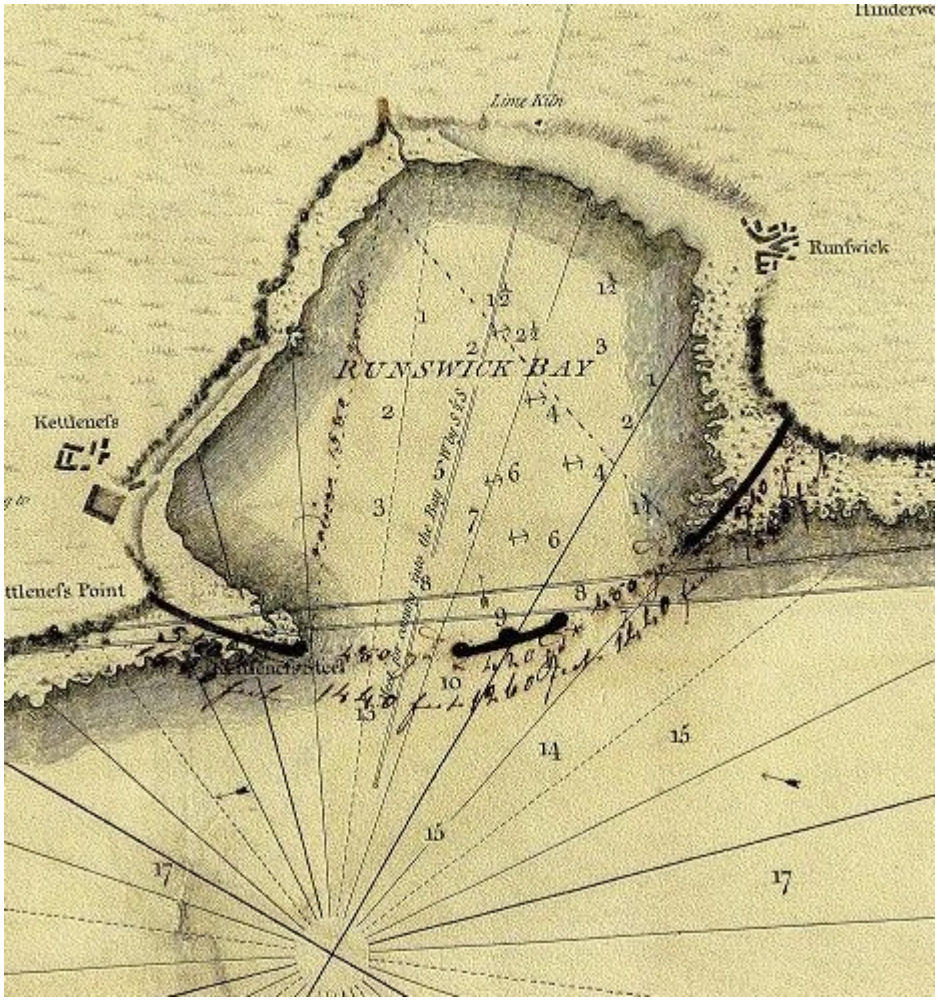

Figure 9.39. Historic anchorage areas charted at Runswick Bay, Pickernell (1791) (© UKHO)

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.

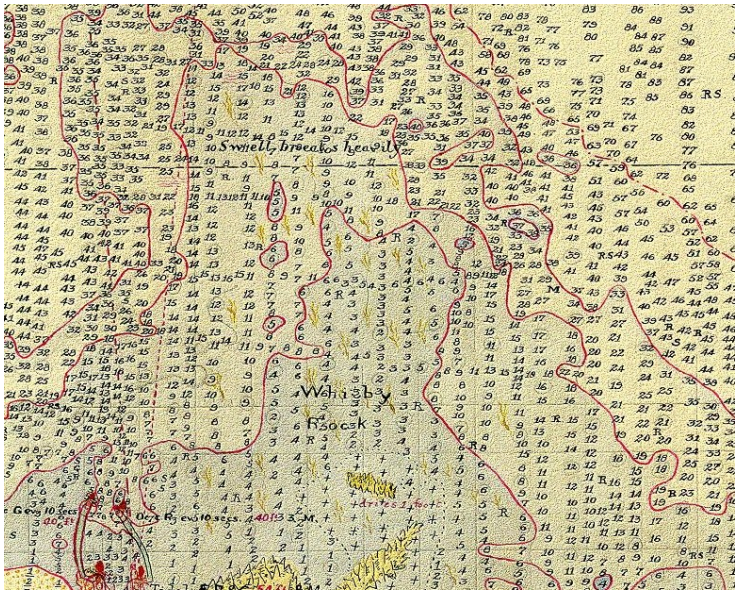

Figure 9.41. An extract from a historic chart recording an area where swell breaksheavily (Wyatt, 1932) (© UKHO)

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).

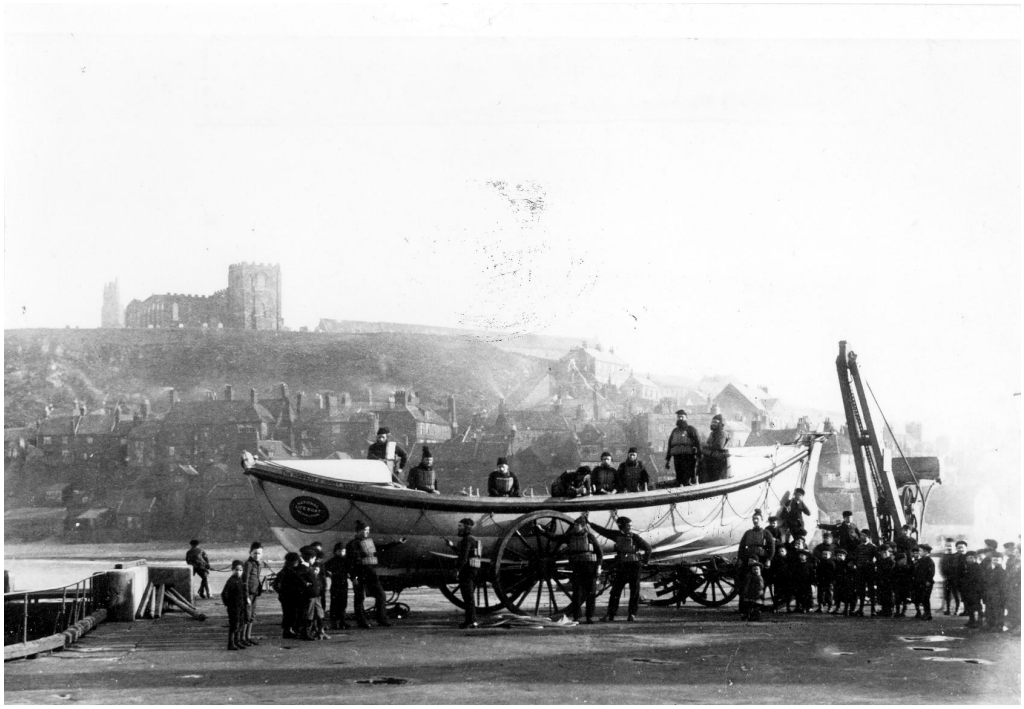

Figure 9.45. Whitby Life Boat *Robert & Mary Ellis* (1881-1909) (© Whitby Museum)

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.

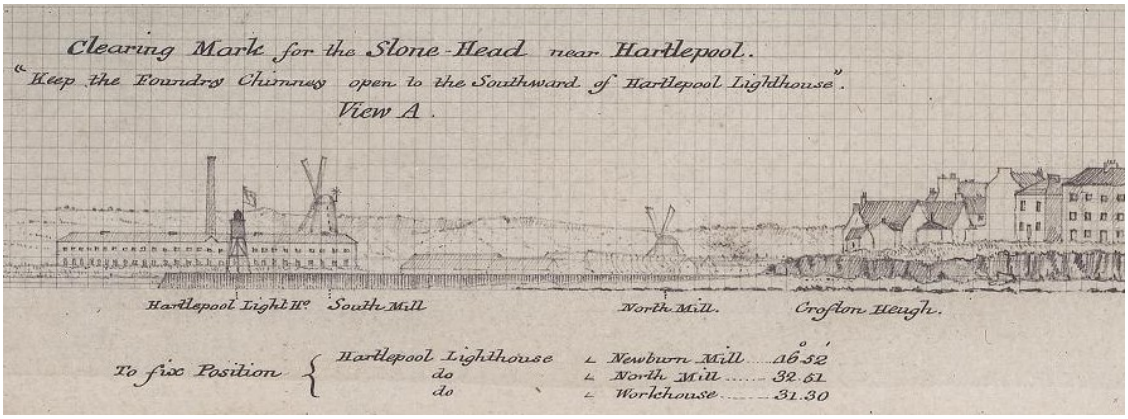

Figure 9.46. Coast profile (folio) for guiding sailors safely into Hartlepool (© UKHO)

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

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.'

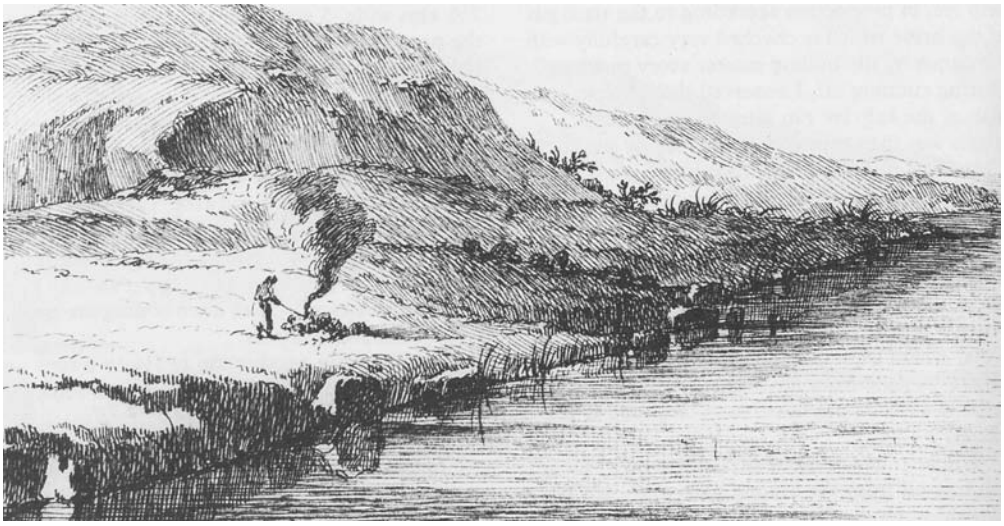

Figure 9.55. Kelp-burning at Staithes (© Science Museum)

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.

Sources

Publications:

Herring P, 1998. *Cornwall's Historic Landscape.* Cornwall Archaeological Unit, Truro

Petts, D and Gerrard, C, 2006. *Shared Visions: The North East Regional Research Framework for the Historic Environment.* Durham County Council