Broad Character: Navigation
Character Type: Navigation Hazard
National Perspective

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Navigation Hazards includes the following Sub-types:

- Wreck hazard
- Drying hazard
- Maritime debris
- Rocky outcrops
- Shoals and flats
- Submerged rocks
- Water turbulence
- Hazardous water

This Character Type relates to areas that contain serious risks to shipping or smaller craft which could lead to damage or complete loss of a vessel. Such risks may be directly related to sea-floor features such as wrecks and other debris and obstructions, drying areas, submerged rocks, shoals, banks and sandwaves, or they may be indirect, including the implied hazardous water in the water column and surface above such seafloor risks. Strong marine currents and their responses to seafloor and coastal topography can also pose serious hazards from water turbulence.

In marine levels, some care is needed to distinguish the location of the hazard from its implications at other levels. As an example, submerged rocks and wrecks pose direct hazards on the sea floor but they also imply 'hazardous water' in the water column and sea surface above and around them. Some rocks and wrecks will project well into the water column in their own right, and some will break the surface, again with hazardous water around them.

Wrecks become dangerous in shallow water when they are either exposed and/or found less than 10m below the sea-level (based on UKHO definition). Therefore, wreck hazard focuses on the area of the hazard, which may include a single wreck or a cluster of wrecks. From the perspective of HSC, wrecks have greatest relevance from their roles as hazards to navigational activity, or as indicators of areas and routes of past navigational, naval or trading activity.

Drying hazards are areas variously submerged but also subject to exposure above the sea surface at various states of the tide, thus forming a grounding hazard to safe passage of shipping. On modern charts these may be indicated by heights shown above chart datum. Historic charts commonly show detail of drying areas or sandbanks as surveyed at the time the chart was produced. Historic drying areas include sandbanks exposed in the past but the location and extents of such areas' exposure at low tide levels are highly susceptible to change due to the mobility of sediments.

Maritime debris refers to an area deemed hazardous due to a predominance of recorded obstructions and fouls not known to be associated with a wreck.

Rocky outcrop refers to an area dominated by rocks rising from the general level of the seabed and breaking the sea surface at some or all states of the tide, posing a risk for navigation.

Shoals and flats are shallow areas of sandbanks, shoals, bars and spits as surveyed at the time the chart was produced. These areas are highly subject to change and they are generally exposed at low tide due to the mobility of sediments.

Submerged rocks are areas dominated by rocks rising above the general level of the seabed, but not breaking the surface of the water at any state of the tide, posing a risk for navigation.

Water turbulence refers to areas of the water column and/or sea surface characterised by heavy swell, strong currents and tidal races which pose a risk for navigation.

Hazardous water refers to areas of the water column and/or sea surface above various sea-floor hazards and in a buffered zone around them. Such hazards may include wrecks, submerged rocks, shoals and flats.

Navigation hazards, past or present, are often difficult to map with precision despite this essentially being the prime purpose of nautical and maritime charts. Major navigation hazards have figured on the earliest Admiralty charts and are often mentioned in historic sailing directions. Early charts inevitably contain less detail and use less accurate survey methods, focussing instead on highlighting approximate areas of the most notorious hazards and those most easily identifiable. However, some early foreign charts (e.g. the Portolan charts and *Waggoners*) contained a high level of navigational detail, allowing a more comprehensive characterisation of this Character Type. Modern charts depict more accurate and precise information. The majority of areas associated with this Character Type are typically found along the coast or close inshore. Although wrecks have a much wider overall distribution, their highest densities are also found in inshore waters.

The accuracy of the charts evolved along with improvements in surveying and charting techniques and the frequency of their application. Before the creation of the Admiralty as an official hydrographic branch in 1795, only a small number of independent surveyors such as Greenville Collins and Murdoch Mackenzie undertook surveys covering substantial areas of English waters in a standardised manner (Merritt *et al* 2005).

Throughout English waters, some areas are themselves typically characterised as 'hazards' for navigation such as Goodwin Sands (off the coast of Kent in the English Channel), the Needles (Isle of Wight) or the Western Rocks of the Isles of Scilly. Historical navigation hazards were represented in nautical and maritime charts, showing the mobility of sandbanks and how they significantly changed through time.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- Historic and modern sandbanks and sand ridges
- Bars, shoals, scars and scarps
- Wrecks and obstructions
- Rocky areas, including exposed rocky coastlines with rocky outcrops, underwater/awash rocks, and maritime debris
- Wreck clusters
- Areas of heavy swell and breaking waves, prevailing winds, and tidal range amongst others

Historically, the sea has been perceived as a dangerous place, with good reason, due to being a relatively alien environment for human survival and with sometimes unpredictable behaviour nature but also due to various human factors. Sea voyages have often resulted in ship losses. Some of the factors contributing to these losses, including some deliberate sinkings, are:

- poor design or failure of the ship's equipment or excessive pressure on the hull
- instability, due to poor design and improperly stowed cargo, amongst others
- navigation errors and other human errors, leading to collisions (with, for example, another ship, rocks and icebergs) or running aground
- bad weather

- warfare, piracy, mutiny, or sabotage including: guns, fire, torpedoes, depth charges, mines, bombs and missiles
- accidental fire
- overloaded with cargo
- intentional sinking (scuttling) to form an artificial reef
- use as a target ship for training or testing weapons
- as a blockship to create an obstacle to close a harbour, river, etc. against enemy ships
- scuttling to prevent a ship from falling into an enemy's hands (e.g. the *Graf Spee*)
- to destroy a derelict ship that poses a menace to navigation
- as part of an insurance fraud

Especially from mid 18th century onwards, the development of shipbuilding techniques has contributed to reduce some of the unwanted occurrences listed above. The creation of nautical and maritime charts has helped enormously to improve and keep updated the knowledge of previously poorly areas as well as their 'hidden' hazards, providing tools to enable safer navigation.

Navigation hazards were more frequently charted after the 1800s as the Hydrographic Office was established as a sub-department of the Admiralty in 1795 and issued its first officially published Admiralty chart in November 1800 (http://www.nationalarchives.gov.uk/records/research-guides/admiralty-charts.htm). These charts were continually updated and corrected to avoid navigational hazards.

VALUES AND PERCEPTIONS

Navigation hazards have always been a preoccupation for sailors, but it took experience to fully reciognise the character of many such hazards. Whether the hazards were exposed or hidden depended on the time that sailors approached the harbour (i.e. either at low or high tide). These hazards became visible in people's consciousness due to the danger associated with them. Very often, tales and myths were associated with them, evoking rhymes and songs. For example, the area around Harwich Haven is particularly notorious and Nelson is reputed to have said that in terms of navigation the Thames estuary is one of the worst areas around the UK, being as "tricky as a tiger" (Bowskill 1998, 159).The reputation of Gunfleet Sand alone is illustrated by a poem, 'L'Envoi', written by Rudyard Kipling.

Sandbanks are often named and well-known by the general public for a variety of reasons. For example, Kentish Knock, on the approach to the Thames Estuary is remembered for the battle named after it, as well as for being the first home of Radio Caroline.

The creation of nautical and maritime charts generally expressed and recorded the knowledge of the surveyed area but they also represented a tool for recording hazards and other dangers associated with the sea and keeping them updated.

Wrecks were fatal for many but also highly dramatic events for those who lived to tell the tale and add to the local heritage of stories about dangers on the high seas. They are now also perceived as a recreational opportunities, with the many wrecks of the region being dived upon by amateur dive groups and professional organisations.

Many wrecks are also valued for their addition to habitat diversity in their areas. For similar reasons wrecks are also valued by the fishing community as they attract certain prey species.

RESEARCH, AMENITY AND EDUCATION

Through the Aggregates Levy Sustainability Fund (ALSF) distributed by English Heritage, Bournemouth University undertook the 'Mapping Navigational Hazards as Areas of Marine Archaeological Potential' project. The project developed a methodology for identifying and mapping areas of maritime archaeological potential by characterising areas exhibiting trends in ship losses due to environmental, structural and meteorological navigational hazards, which have been described in historical sources such as charts and pilotage documents (Merritt *et al* 2005, 2007).

Wrecks serve as important habitats for aquatic life since they act as artificial reefs which increase biodioversity in their areas. In this sense, wrecks are often seen as beneficial by marine ecologists. Therefore, further collaborative work between marine biologists and archaeologists would be beneficial to enable a deeper understanding of species living in wreck sites, how they contribute to the wreck preservation, and contextualising this information within broader sea dynamics.

Wrecks can also be used as useful tools for amenity and educational initiatives. Shipwrecks often attract divers. 'Respect Our Wrecks' is a campaign which educates divers about preserving our common underwater cultural heritage, whilst also demonstrating the environmental value of those sites. Wrecks provide opportunities for divers to explore and egage with the past and by respecting them, present and future generations can enjoy and learn from them (http://www.projectaware.org/english/global_initiatives/respect_our_wrecks.aspx). Wrecks are therefore not only recreational tools but also educational ones, allowing a more comprehensive understanding of the different uses and dangers of the sea. In terms of formal education, wrecks can provide excellent cross-curricular case studies on which to base investigations covering a range of curriculum subjects.

There may also be a link between the occurrence of sea-floor obstacles and the presence of wrecked craft, lost gear or accumulated prehistoric or historic deposits. Environmental conditions will also indicate whether there is potential for preservation of prehistoric or historic materials.

CONDITION AND FORCES FOR CHANGE

This Character Type is and will increasingly be affected by projected direct and indirect changes due to global warming and sea level change. Variations on sediment distribution and oceanographic conditions (e.g. sea level, wave height and direction and storminess), which are difficult to predict with accuracy (BGS 2002), will certainly affect this Character Type. The response of the coastline to scenarios of climate change was considered by a consortium led by Halcrow Maritime working on a DEFRA-funded project called 'Futurecoast'. Futurecoast provides predictions of coastal evolutionary tendencies, which are to be considered in the updating of Shoreline Management Plans (SMPs) and other strategic plans targeted at determining broad-scale future coastal defence policy throughout the open coast shoreline of England and Wales (http://www.halcrow.com/html/our_projects/projects/futurecoast.htm)

The preservation of wrecks will depend, amongst other factors, on the construction materials and the natural environment where they wrecked. For example, exposed wooden components will generally decay quickly. In general, wooden parts of ships that survive are those that were buried in silt or sand soon after sinking. An example of this is the Mary Rose (Portsmouth Historic Dockyard). Steel and iron, depending on their thickness, may retain the ship's structure for decades. As corrosion takes place, sometimes helped by tides and weather, the structure collapses.

Climate change impacts on, for example, water temperature, are already changing the microclimate where wrecks are located and hence their preservation. At national and regional levels**,** there are also records of casualty losses which are generally known from documentary references. These casualty records show the potential of wrecks in an area but do not necessarily show their existence (e.g. casualty records at the National Monuments Records (NMR). Today's prevalent marine conditions will also affect the degree of survival of wrecked vessels and casualty losses, especially regarding sediments movements or scouring by currents.

Physical hazards, such as banks, shoals and rocky outcrops amongst others, are subject to a broad range of influences including erosional and accretional processes. However, their rate of change and extent may be influenced by human-made activities or constructions that change the marine conditions. The changing nature of sandbanks and shoals means the character of the landscape/seascape is in continuous change. This changing character may reveal material remains that are regularly or sometimes only rarely exposed before being covered again (as for example in the Protected Wreck *Stirling Castle*, off Kent). Some features and remains may be more or less permanently embedded within such bedforms and will only be revealed after seismic survey (e.g. see Gaffney *et a*l 2007).

Sea dredging and beam trawling may seriously affect seabed obstructions and wrecks, whether known or unknown. This would take the form of both direct damage to wreck structures, contents and setting, and the destabilisation of sites resulting in renewed corrosion and potential decay (Val Baker *et al* 2007). The Aggregates Levy Sustainability Fund (ALSF) distribution by English Heritage to a range of coastal and marine projects has demonstrated that collaboration between regulators, the heritage sector and the aggregates industry can be very positive in promoting environmentally friendly extraction, helping enable more effective conservation of the historic environment and the cultural legibility of its character for present and future generations (see Dellino-Musgrave 2007).

RARITY AND VULNERABILITY

Navigation hazards are an integral part of the cultural seascape character of many areas of our coasts and seas, expressed directly through their records on charts and by prompting of highly visible maritime safety installations. But they are also present culturally in the vast store of myths, legends, traditions and stories of the sea and its dangers that pertain to most coastal communities and are a strong element in local distinctiveness that holds an attachment for their inhabitants and an appeal to visitors. In the dynamic coastal and marine environment, navigational hazards will always be present and while their risks may be diminished by modern navigational aids, they will not disappear. Their positive and negative contributions to local distinctiveness will inevitably continue.

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