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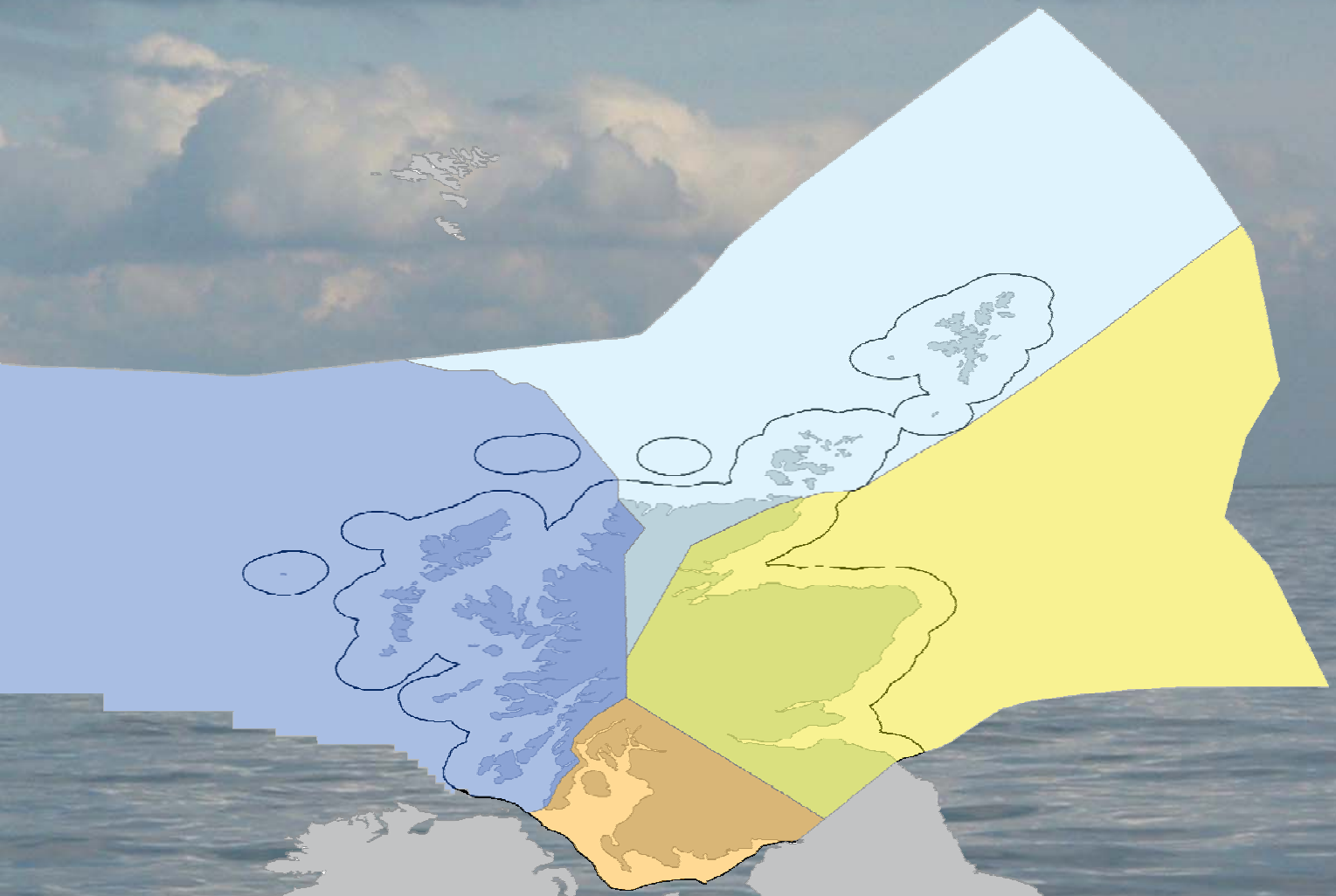
Characterising Scotland's Marine Archaeological Resource



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CHARACTERISING SCOTLAND'S MARINE ARCHAEOLOGICAL RESOURCE

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CHARACTERISING SCOTLAND'S MARINE ARCHAEOLOGICAL RESOURCE

1 INTRODUCTION

1.1 PROJECT BACKGROUND

1.1.1 Historic Scotland (HS) has sought to use resources available under the provisions of the Protection of Wrecks Act 1973 in a more wide ranging manner than before. In particular to address a need to better understand the nature of Scotland's marine archaeological heritage, with respect to managing and protecting that heritage. This includes many elements not previously examined under the marine archaeological services contract.

1.1.2 Previously the emphasis for management and protection of the resource has centred on specific statutorily designated shipwrecks. There has been a change of emphasis stemming from a recognition of the potential richness of Scotland's marine archaeological heritage (HS/BEFS 2009).

1.1.3 There is now an awareness of the variety of that resource. The purely marine archaeological resource can be broadly categorised as consisting of four main elements:

- Shipwrecks;
- Marine infrastructure;
- Aircraft wrecks;
- Submerged prehistoric landscapes.

The existence of spot-finds of material potentially associated with any of these elements should also be noted. The presence of a number of types of archaeological asset, including a large onshore coastal archaeological heritage, for example onshore lighthouses, but also vessels on inland waterways and the prehistoric and early historic log boats known in Scotland, that relate to the marine archaeological heritage is noted: the characterisation of these resources falls outside of the remit of this project.

1.1.4 The advent of statutory marine planning in Scotland through the Marine and Coastal Access Act 2009 and Marine (Scotland) Act 2010 provides an opportunity to encourage sustainable economic growth for the coasts and seas around Scotland while affording protection to the full scope of the nationally important marine archaeological resource. A series of data enhancement projects have been commissioned in response to these changes: in England these have included the Assessing Boats and Ships Project (Wessex Archaeology 2011a).

1.1.5 As part of this overall process the Scottish Government has issued *Scotland's Marine Atlas.* The cultural heritage section of the atlas is based on the ABP Mer report *Review of the Economic and Environmental Data for Scotland's Coastal and Marine Cultural Heritage* (ABP Mer 2010). This report has concentrated on cultural

heritage with respect to its aspect as an actual and potential revenue generator and a general consideration of the environmental impacts on and deriving from cultural heritage, particularly with regard to its role as an economic asset.

1.1.6 The Scottish Marine Historic Environment Data Audit has also been undertaken (WA 2011b). This project was designed to identify pre-existing sources that could be used to enhance the coastal and marine historic environment record. Such enhancements will allow a better understanding of the likely impacts of development in marine and coastal environments on cultural heritage and therefore allow better informed decisions to be made with respect to marine planning.

1.1.7 Under the Scottish legislation it is possible to designate Historic Marine Protected Areas. From 2011-15. Historic Scotland will work with Scottish Natural Heritage, Marine Scotland and Joint Nature Conservation Committee on the Scottish Marine Protected Areas project. Historic Scotland will focus on:

- review/transition of the existing designated wrecks to the new designation;
- transition of the Scapa Flow scheduled wrecks and consideration of other sites within the Scapa Flow complex;
- identification of other priority sites and areas.

1.1.8 In order to properly manage and protect the marine archaeology of Scotland, the nature of that resource needs to be understood in such fashion that the relative significance of particular archaeological assets can be assessed. There are various approaches to the assessment of significance. The Historic Scotland approach for scheduling of monuments, and indeed designation of marine historic assets requires that the asset be gauged by virtue of intrinsic, contextual and associative characteristics. Context can include other comparable surviving examples of the asset type.

1.1.9 In considering the range and scope of marine archaeology currently afforded statutory protection in Scotland and possible priorities for the future, *Towards a Strategy* (HS/BEFS 2009) pinpointed the need to consider non-shipwreck related material but also to broaden the collection of protected wreck sites: 'the existing designated wreck resource displays a marked imbalance in favour of large post-medieval armed merchant and warships of trans-European origin and, arguably, insufficient recognition of the remains of vernacular, indigenous craft of all periods which were important to the maritime history of Scotland….our collection of designated marine assets should reflect what is most important about the history of Scotland and the sea'.

1.2 AIMS AND OBJECTIVES

1.2.1 Although many aspects of the Scottish marine archaeological resource are unknown there has been considerable research undertaken by university academics, independent researchers and a variety of government and third-sector bodies. Since 1996, the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) has been adding maritime data to the National Monument Record of Scotland (NMRS) and aspires to enhance the quality of this record over time. Some local authority archaeology services have also integrated maritime records within their Sites and Monuments Records (SMRs) or Historic Environment Records (HERs).

1.2.2 The purpose of this project is to provide an overview of the known marine archaeological resource in order to inform marine heritage designation within the Scottish Marine Protected Areas project as well as informing marine planning processes. The work may also help to enhance the quality of the RCAHMS database and regional SMRs/HERs, and promote wider understanding of the Scottish marine archaeological resource by adding information. This should be of value for research purposes.

1.2.3 The key aim of the project is therefore to assess and characterise the known marine archaeological resource of Scotland. In presenting an analysis of this data, the project will seek to highlight key aspects of the resource, and in particular, to draw out a) aspects of the non-shipwreck resource, and b) where shipwrecks are concerned, sites which illustrate the Scottish dimension, for example through place of build, or function.

1.2.4 One of the objectives of the project, to assess for data quality purposes a sample of entries for located sites in the marine section of the NMRS and the supporting secondary sources, has already been completed (WA 2011c), and the findings of this assessment have been used in the analysis presented in this report.

1.2.5 The other objectives are:

- To compare the collated record with relevant published historical and archaeological interpretations and enhance database information where possible.
- To interpret the resulting record, drawing out significant aspects by asset type, period, and function; highlighting survival of non-shipwreck related sites, and where shipwrecks are concerned, sites of apparent interest that illustrate the Scottish dimension.
- To present a report and database setting out the results of the study, suitable for dissemination.

1.3 SCOPE OF REPORT

1.3.1 This report seeks to provide an understanding of the located marine archaeological asset record through interrogation of all the records from the NMRS that were classified as maritime, the records in the NMRS for infrastructure in a marine setting, principally sea-washed lighthouses, and any other assets in the NMRS found in a fully marine (i.e. not intertidal) environment. The NMRS classification of maritime sites essentially relates to maritime transport (including flight over the sea). As noted above (see 1.1.3) there are a wide range of coastal assets that relate to the maritime environment that were not classified as maritime in the NMRS. These assets are therefore not considered in this report. The NMRS records are supplemented by the records in the National Register of Historic Vessels (NRHV) of registered vessels recorded as being in Scotland, and Scottish built vessels recorded in the NRHV elsewhere in the UK. Interrogating these records has allowed the characterisation of the located marine archaeological resource.

1.4 STUDY AREA

1.4.1 The area studied is shown in Figure 1. The notional area comprises all of Scotland's territorial waters (0-12 nautical miles) and the Scottish Offshore Waters (12- up to 200 nautical miles from the coast). The effective area is delimited by the

geographical extent of maritime records in the NMRS. These are generally (but not exclusively) below the mean low water springs tide level. In order to analyse the shipwreck records the study area has been broken down into regions based on the Marine Protected Area regions devised by the JNCC/Scottish Natural Heritage consisting of:

- East Scotland
- East Scotland (Territorial)
- North Scotland
- North Scotland (Territorial)
- West Scotland
- West Scotland (Territorial)
- South West Scotland (Territorial)
- Far West Scotland
- Far West Scotland (Territorial)

1.4.2 For the purpose of this study these regions have been combined to produce areas that contain useful numbers of records:

- East Scotland
- North Scotland
- West Scotland (incorporates Far West region)
- South West Scotland

2 METHODOLOGY

2.1 DATA SOURCES

2.1.1 A copy of the maritime component of the NMRS database was supplied by RCAHMS. Each record was further checked against Canmore in order to assess the record in terms of quality of location. Where a record was found to have an arbitrary location or a tentative location with no corroborating evidence of location, the record was removed from the project database.

2.1.2 The records were also checked in conjunction with Canmore for duplicate records of the same vessel. Where a duplicate was found, the vessel designation was assigned to the record with the strongest evidence of identity and the other location was classed as a located but unidentified wreck. Where the records could not be discriminated between, the vessel designation was arbitrarily assigned to the first of the records, the second being classed as a located but unidentified wreck. This procedure was followed to prevent biases entering the analysis phase with regard to

the different fields of data recorded, without necessitating the complete removal of a located wreck record.

2.1.3 The data received was incorporated into database tables. Different tables have been used for different classes of marine archaeological resource, based on the contents of the NMRS database. The tables created for the assessment are: shipwrecks, aircraft, spot finds and infrastructure. No table was created for submerged prehistoric landscapes as no records relating to this category were found in the maritime section of the NMRS. The categories are relatively self-explanatory. With regard to marine infrastructure there are some potential overlaps with the shipwreck asset class: infrastructure may include pontoons and concrete barges. The distinction between asset classes has been made on the basis of whether assets appear to have been intended to serve in a fixed position: those that were have been assigned to the infrastructure class for the purposes of the project The database is compatible with the project GIS. The fields employed in the database are described below (see 2.2).

2.1.4 The data from the NMRS has been supplemented from a number of secondary sources. These consist of: *Off Scotland: A Comprehensive Record of Maritime and Aviation Losses in Scottish Waters* (Whittaker 1998), *Shipwrecks of the Forth* (Baird 1993), *Shipwrecks of the West of Scotland (Baird 1995), The Wrecks of the North of Scotland* (Baird 2003) and Volume 4 of *Shipwreck Index of the British Isles* (Larn and Larn 1998). A more detailed assessment of these sources is given in 3.1.

2.1.5 Once the supplemented data had been entered into the project database the shipwreck data was divided into the regions given above (see 1.4.2) in a GIS, and a field to identify region added. The other data fields were not so divided, as there were insufficient records to make such an approach useful.

2.2 DATA FIELDS

2.2.1 In order to allow the marine archaeological resource to be characterised, the data contained within the NMRS entries and associated secondary sources has been broken down into information categories that enable thematic queries to be made. This set of fields is based on one successfully applied by Wessex Archaeology in a characterisation study in the process of completion for English Heritage 'Assessing Boats and Ships.' (Wessex Archaeology 2011). The main data groupings fall under the headings Build, Use, Loss, Survival and Investigation, hence this scheme is referred to as the 'BULSI' framework. These headings cover both the asset in its period of use but also as a feature of the contemporary seabed and in historical and archaeological records. Such records may be in the form of contemporaneous documents or the results of modern investigations, whether undertaken specifically for archaeological purposes or for other reasons, for example the surveys undertaken by the Hydrographic Office.

2.2.2 The data fields used for the shipwrecks database table are illustrated by the following table:

Build	Construction	Date Built
	Dimensions	LxBxD; Tonnage; Object Material
	Propulsion	Propulsion
	Distribution	Where Built
Use	Themes	Type; Cargo
	Distribution	Registration Place; Nationality; Departure; Destination
Loss	Cause	Manner of Loss
	Distribution	Location; Lat Long; Associated Named Location, Parish
Build	Associated People	Builder
Use	Associated People	Master; Crew; Owner
Loss		Associated Monuments
Loss		Crew Lost
Survival		Evidence; General Descriptive Text
Investigation		NMRS entry number, data quality

Table 1. Fields Used In Database Table for Shipwreck Assets

2.2.3 A simplified set of fields using similar criteria was proposed for non-shipwreck assets, illustrated below:

Asset formation	Construction	Date Built
	Dimensions	LxBxD; Object Material
	Distribution	In situ? Origins
Use	Site type/themes	Site type; Function
	Distribution	In situ? Origins
Deposition	Cause	Manner of deposition, intent of deposition.
	Date of deposition	Period: Date
	Distribution	Location; Lat Long; Associated Named Location
Build/formation	Associated People/Organisation	Builder, cultural affinities
Use	Associated People/Organisation	Owner/operator, cultural affinities
Loss		Associated Monuments
Loss		Human remains
Survival		Intact deposits to dispersed artefacts.
Survival		Related Archives
Investigation		Type of investigation; Related Event Records

Table 2. Fields Used In Database Table for Non-Shipwreck Assets.

2.2.4 Where a record holds no information for a particular field the entry 'unknown' or '0' has been made for alphabetic or numeric data types respectively.

2.3 DATA QUALITY

2.3.1 A frequent issue when dealing with marine archaeological asset records is that of the accuracy and reliability of the position given for the asset location. With regard to shipwrecks, the issue of the accuracy of the location given is not of direct concern for this study. All that is required is that the location of the shipwreck is sufficiently reliable that a wreck is thought to actually exist and that some sort of instrumental fix has been taken on the location. Of the 1584 wreck records in the study area in the NMRS database 1341 were found to conform to these criteria. The other 237 records are regarded as 'casualties', that is recorded shipping losses without adequate location data, rather than 'wrecks' and are not considered further. A further 6 records were removed as they were found to fall outside of Scottish waters.

2.3.2 Where the results are grouped historically the groupings employed for national statistics are Pre-1700, 1700-1799, 1800-1849, 1850-1913, 1914-1918, 1919-1938, 1939-1945 and post-War. For regional analyses the very small numbers of vessels dating to before 1850 requires that the age groupings before this date need to be aggregated. The uneven lengths of these time spans reflect the available records and the need to take account of the impacts of the world wars on patterns of ship use and loss. Where the data concerns the origin of a vessel, records have been classed by build period. Where the data concerns the activity of a vessel during the vessel's final voyage records have been classed by loss period.

2.3.3 The number of non-shipwreck assets is small in comparison: 27 records for aircraft, 43 records for infrastructure, and 37 records for spot finds. The numbers are too small to make analysis on a regional basis useful. These asset classes will therefore be discussed in 3.2 to 3.4.

2.3.4 The total number of located assets is 1448. This compares with a total of maritime entries in the NMRS of 19447. The remaining records are mainly 'casualty' entries, that is, entries recording the loss of a vessel in an approximate region, with a few other records of poorly located finds and nearly 600 loss records of aircraft with only very approximate locations. As such located assets consist of approximately 7.5% of all maritime records in the NMRS.

2.3.5 In order to characterise the marine archaeological resource it is necessary to be able to identify different assets, at least to type. For shipwreck assets the potential to identify specific ships exists. Such identification then allows the connection of the physical remains to a potential wealth of documentary evidence, particularly from the mid nineteenth century onwards (Dobson 1997).

2.3.6 The key source of data for the located wreck records in the NMRS are the records of the UKHO. The identification, as opposed to the location, of shipwrecks is not a principal concern of the UKHO, except where this may have bearing on navigational safety (e.g. potentially dangerous cargoes). As such the process by which the UKHO identifies wrecks is a variable one, and it is often unclear how a particular wreck has been identified. General experience of dealing with UKHO identifications suggests that identifications are of a reasonable standard of reliability, and are generally left unidentified or are suitably qualified in the record.

2.3.7 As part of this project the NMRS shipwreck records have been classified by the likely level of reliability of identification. For the purposes of the project different levels of reliability of identification within NMRS have been devised. These different levels are:

- Positive Identification,
- Corroborated,
- Single source,
- Unidentified.

2.3.8 Positive identification is where a vessel's name or registration details have definitely been recorded from a wreck, whether at the time of loss, or subsequently e.g. through the recovery of a registration plate by a diver. Corroborating identification is usually an additional source concerning the identity of a wreck, usually by a local

informant, often a harbourmaster, in addition to a main source, most often UKHO records.

2.3.9 The numbers of different levels of identification are tabulated below:

Positive Identification	Corroborated	Single source	Unidentified
49	150	468	671

Table 3: Frequency of different levels of identification. Total number of records: 1341

2.3.10 These numbers indicate a relatively low level of positive identification of located wrecks. This may make the identification of a given wreck of low reliability. This is not an insuperable problem with respect to the characterisation of the marine archaeological resource, where the use of the data in aggregate should overcome errors of identification at the vessel-specific level.

2.3.11 The data from the NMRS has been supplemented from a number of secondary sources (see 2.1.4). The authors of all these compilations make clear the potential deficiencies in their primary sources with regard to the issue of location. The problems of the identification of particular wrecks tend to be less clearly understood in these publications. In particular the issue of establishing the connection between physical remains and a documented entity is never fully explored, although both Baird and Whittaker particularly raise the problem of censorship of losses in newspaper reports in the World Wars. As identifications are all based on positive identifications, or through the UKHO identifications, this should not be a further issue for this study.

2.3.12 The various publications, particularly by Larn and Larn (1998), seem to have availed themselves of a very wide range of documentary evidence. Other than references to older records being less reliable or complete (Larn and Larn 1998, Whittaker 1998), there are few attempts at source criticism with regard to the accuracy and reliability of the wide range of sources used. Most comments on the issue are at a general level by Larn and Larn and Whittaker. Issues of record reliability tend to be addressed at a more record-specific level in Baird's publications. The possibility of inaccurate entries in official and semi-official documentation is not addressed in any of these works.

2.3.13 The proportion of wreck records that have no information, as a result of having no identification and little investigation beyond recording of location, amounts to a little over 40% of all the shipwreck assets in Scottish waters. In particular data fields this proportion becomes higher, varying from just under half of the records to around two-thirds.

2.3.14 Many of the records with no further information, particularly without a ship identification, are derived from dive guides. Although many of the data fields are 'unknown' in terms of published sources it is probable that much information on these shipwrecks exists within sports diving communities.

2.4 ANALYSIS

2.4.1 As noted above (2.2), entering the data into the separate fields tabulated above allowed for the data to be queried on a thematic and regional basis. Certain of the themes tended to emerge in the process of compiling the descriptive statistics, notably shipbuilding, trade and naval activity. The theme of migration was selected

on the basis of its frequent occurrence in the historical literature in order to interrogate the data on a specific issue. The theme of fishing emerged in part from the data itself, but was strongly influenced by issues noted in the historical literature relating to the relatively complex, and often interlocking, economic and ecological aspects of the different fisheries over time.

2.4.2 The different fields used in the database have each had some very basic descriptive statistics calculated for them in the form of frequency counts and percentages.

3 RESULTS

3.1 NATIONAL PATTERNS: SHIPWRECKS

3.1.1 The records described below are in the project database. The full quantitative description of the data is tabulated in the appendices. The distribution of assets is shown in Figures 4-7, with the position of all the assets named in the report shown in Figure 12.

3.1.2 A significant characteristic of the shipwreck assets is the range of build dates. The earliest known build date is 1641 *Swan* (Canmore ID **80637**), although 2 of the vessels (*El Gran Grifon* and the Kinlochbervie wreck, Canmore IDs **3857** and **194560**) must predate that and the Mingary Castle Wreck probably predates 1641 (Canmore ID **167515**). It should also be noted that there are no Scottish built or owned vessels in the maritime section of the NMRS dating to before 1812, with the possible exception of the Mingary Castle wreck. The latest build date was 1950.

3.1.3 The bulk of the build date records lie in the period 1850-1950 (491 records out of 511 records with build dates), with 42% of build dates accounted for between 1900 and 1919 (See Figure 1). The distribution of build dates probably reflects a variety of influences on the dataset, including increases in shipbuilding during the period, changes in building technology, increases in maritime activity, rates of loss and increased recording. The various causes will be examined in the relevant sections below.

3.1.4 Although there is a concentration of build dates after 1850, there are 28 known wrecks that were built prior to that year. These are tabulated below: where only the loss date is known, the wreck has been assigned to a period on that basis.

16th Century	17th Century	18th Century	1800-1849
1	8	7	12

Table 4. Shipwrecks with pre-1850 build dates.

3.1.5 The range of build dates, their concentration between 1850-1950 and particularly between 1900-1919 means that the shipwreck asset class in Scottish waters as currently located and identified is highly constrained in terms of its historical character. Although this does allow the asset to be characterised with respect to a relatively few trends and key events (see below) it does mean that much of Scottish maritime history is either poorly represented or not represented at all.

3.1.6 The predominance of vessels from the period 1850-1950 in part reflects the improved levels of recording and locating wrecks that marked increasing official concern with navigational safety from the mid nineteenth century onwards. In addition, the surveying methods used will tend to favour the discovery of metal

vessels that are more likely to stand proud of the sea bed and present a navigational hazard. This is in part reflected by UKHO records only being associated with a minority of wrecks with loss dates before 1870, but becoming the main source after that date. This in turn probably in part reflects changes in shipbuilding technology from this period onwards, with more ships being metal, and therefore forming a greater hazard on navigational routes and also being more amenable to detection with geophysical equipment.

3.1.7 The purpose of the UKHO in assisting with navigational safety may have also biased the data in another way: both reports to the UKHO and surveys for the UKHO are likely to be concentrated within the main navigational routes. Vessels lost off these routes are less likely to have been noted by passing vessels or discovered in surveys conducted for hydrographic purposes, and therefore less likely to be included in UKHO records.

3.2 NATIONAL PATTERNS: INFRASTRUCTURE

3.2.1 There are 43 records relating to marine infrastructure in the maritime section of the NMRS, or that are in offshore settings (there are considerably more records concerning maritime infrastructure onshore in the main part of the NMRS).

3.2.2 The asset type with the highest number of records is lighthouses: there are 15 records of this type. These generally date to the 19th century. There are 2 records on the Isle of May, for the current lighthouse, and its predecessor, built in the 17th century, the earliest permanently manned beacon in Scotland.

3.2.3 Other asset types include: mooring stages (6 records); dolphins (a type of mooring stage) (2 records), and pontoons (5 records) for ship berthing; floating cranes (2 records) for loading and unloading vessels; and floating docks for ship repairs (2 records).

3.2.4 Most of the infrastructure elements appear to be in civilian settings, but there are a number of records relating to military uses: defence booms (4 records), an acoustic range for torpedo and submarine testing, a pontoon that is part of a weapons range and a dolphin that forms part of the old naval facility at Rosyth.

3.3 NATIONAL PATTERNS: SPOT FINDS

3.3.1 There are a total of 36 records that are classed as 'spot finds'. The largest single group of these are anchors, accounting for 15 records. These are generally undated, metal anchors. A group of stone anchors have also been located at Sicar Point, East Lothian, of which a portion at least were recovered (Goudie 2005, Canmore ID **151710**). The next most common group of records are those relating to ships' armaments in the form of cannons, cannon balls and in a single case, a torpedo. These account for 7 records. Finds of glass and pottery of the Medieval and post-Medieval periods account for a 3 further records. These may indicate the presence of a wreck, but may as easily be the result of items being disposed of overboard from vessels.

3.3.2 There are only 2 prehistoric items in the NMRS maritime data that have been found in a marine environment. There is a bronze spearhead, dredged from the Firth of Forth in 1916. Such an item may be the result of an accidental loss, but the later prehistoric practice of depositing metalwork in bodies of water should also be noted. The other prehistoric item is a Neolithic stone axe head of Irish origin recovered during scallop dredging in Loch Indaal (Canmore ID **294089**). The reconstructed

sea-levels in the area indicate that the area of the find would have been inundated by the Neolithic (Brooks *et al.* 2008). Given the good condition of the axehead, which would tend to preclude natural water transport, this find probably is probably the result of an overboard loss from a boat, or perhaps even a wrecking event. A Bronze Age gold torc, dredged up by scallop fishermen in The Minch off the Shiant Islands, is also in the NMRS but does not have a maritime classification and therefore was not included in the original database provided (Canmore ID **84440**). As with the bronze spearhead accidental loss is possible, but the later prehistoric practice of deliberate deposition of valuable items in water should also be remembered. A single find of a stone axe head that is currently not in the NMRS is discussed below (see 3.5.2).

3.4 NATIONAL PATTERNS: AIRCRAFT WRECKS

3.4.1 There are a total of 27 records of aircraft wrecks in the maritime section of the NMRS. Of these, 11 records are identified to type, though tentatively in some cases. All of the types are military aircraft and all but 1 of the types are allied aircraft. Only 3 records have loss dates associated with them, but all the identified types are from World War II. Aircraft wrecks appear in all the characterisation regions, with particular concentrations in the Moray Firth and the Firth of Clyde. This probably reflects the reality of allied aircraft operations, including training, over Scottish waters during World War II. The aircraft wreck assets may well represent the type of aircraft involved in maritime operations rather than all aircraft operations: it is noticeable that the aircraft mainly consist of seaplanes, dive bombers and marine adapted variants. Future examination of located but unidentified aircraft wreck sites and discovery of currently unknown sites may be expected to largely consist of military losses dating from World War II. Military aircraft wrecks as early as World War I are highly unlikely to be found due to both the extremely fragile nature of early aircraft rendering survival unlikely and the very limited nature of military aircraft deployment in Scotland during this era. The potential for the discovery of remains of both military and civilian aircraft wrecks for the interwar period is higher due to the increasingly robust airframes employed and the increase in aircraft building and use. A small number of post-war aircraft may also be encountered, but those of historical interest are likely to be of similar types to those of World War II.

3.5 NATIONAL PATTERNS: SUBMERGED PREHISTORIC LANDSCAPES

3.5.1 There are no records in the maritime section of the NMRS that relate to submerged prehistoric landscapes. Despite this it is clear from modelling of sea-level change that there is the potential for such assets to exist around many parts of the Scottish coast.

3.5.2 The absence of such records in the NMRS largely reflects how recently research interests in submerged prehistoric landscapes have developed, particularly in a Scottish context. There are currently research projects under way in Orkney and the Outer Hebrides prospecting for submerged prehistoric material. Dredging in Lerwick Bay in Shetland has produced a stone axe, from an area that has also produced much waterlogged wood, which may be evidence of submerged woodland, including a sample identified as birch and radiocarbon dated to 5670-5550 BC (Melton 2011).

3.6 NATIONAL PATTERNS: NATIONAL REGISTER OF HISTORIC VESSELS

3.6.1 The vessels registered on the National Register of Historic Vessels (NRHV) constitute a different set of ship assets. Not all are necessarily maritime: the register includes boats built to work on inland waterways. Comparison with the shipwreck

assets in the NMRS provides a useful extra perspective when addressing the survival of vessel remains as shipwrecks and the processes by which the documentary record of these remains has been formed.

3.6.2 There is a total of 68 vessels built in 1950 or earlier on the register that are principally based in Scotland – while some are stationary, or even ashore, others are working vessels, and may not always be in Scottish waters. Of these 17 were built in Scotland. Most of the rest were built in England. Out of a total of 931 principally based in other part of the UK, 51 vessels were built in Scotland.

3.6.3 Across the UK vessels built by 15 Scottish shipbuilding firms are included on the register, with only 8 of these firms represented by vessels based in Scotland. The Scottish shipbuilders not represented in the Scottish section of the NRHV tended to specialise in building leisure craft, particularly yachts.

3.6.4 Vessel types in Scotland are divided into passenger craft (10 vessels), which are mainly pleasure boats, but include the clipper, *City of Adelaide*, fishing boats (21 vessels), cargo ships (1 barque and 1 steam coaster), military (2 vessels), research (1 vessel) and service vessels (14).

3.6.5 The category of service vessels is rather disparate and includes 3 life boats, a dredger, an icebreaker, 3 puffers, a police launch, a seaplane tender, 2 pilot vessels and 2 lightships.

3.6.6 It should be noted that not all the vessels have a connection to Scotland either in terms of their construction or their historic working life. Some have simply been acquired for museums or for use as leisure craft in Scottish waters after their main working life was elsewhere in Britain or overseas.

3.6.7 The principal variation between the NRHV vessels and the shipwreck assets is that the shipwreck assets tend to cover a wider size range. In particular the shipwreck assets that have been identified tend to be larger than the vessels on the NRHV. This probably reflects trends that tend to complement each other: one being a probable bias in detection and recording in the UKHO (3.6.8) and the other reflecting the economics of ship ownership (3.6.9).

3.6.8 The NMRS record is probably biased by the UKHO legacy effect away from the smaller vessels, particularly wooden ones, as these are harder to detect with marine geophysics and are less likely to present a significant navigational hazard. The existence of these boats in the archaeological record is indicated in the NMRS where 'boats' graveyards', such as that at Bowling (NMRS Site **NS47SW 8002**) and Aberlady (NMRS Site **NT48SE 8027.08**), have been recorded by the RCAHMS. In addition, there is likely to have been greater economic motivation at the time of sinking toward the identification of larger vessels for the purposes of salvage and insurance than smaller vessels.

3.6.9 Because the majority of the NRHV vessels are in private ownership, the vessels represent choices by individuals and separate institutions in terms of the vessels selected for preservation. There is a tendency for practical reasons of berthing space and the economics of boat restoration and running for the vessels to be the smaller ones. However other factors may include individual aesthetic choices, and the requirements for vessels that are suitable for use as recreational craft.

3.6.10 As these vessels are generally of smaller size, there seems to be a tendency for more of them to be built of wood than is the case with the vessels in

contemporaneous shipwreck records. This, combined with their size does make them a useful corrective with regard to the types of vessels that are represented in the NMRS, where identified smaller and wooden vessels are relatively rare.

3.7 REGIONAL PATTERNS: EAST SCOTLAND

3.7.1 This area covers the entire eastern coast of Scotland from the border to Dunnet Head. The land bordering the North Sea includes much of Scotland's best agricultural land, and this is reflected in the relatively high number of medieval settlements, many of which were also small trading and fishing ports. Earlier shipbuilding in Scotland tended to be concentrated in this region, including the dockyards and harbour built for James IV at Pool of Airth and Newhaven. Much of Scotland's fishing industry has been based at ports in the region, both those specialising in herring, such as the ports in Fife, or white fish, such as Aberdeen.

3.7.2 Once the wreck records within the NMRS that have unsatisfactory location data are removed from consideration, 485 located wrecks are known in the East Scotland region (see Figure 2). This is the largest number of wreck records in any of the regions used in the study. This a result of both the relative size of the region, but also the density of records in particular areas, particularly the Firth of Forth and the area between Rattray Head and Kinnaird Head in Aberdeenshire. These areas of higher record density probably reflect both areas of greater maritime activity, particularly around the Forth, and of greater navigational hazards, particularly in the case of the of the Aberdeenshire coast.

3.7.3 The known build dates for the vessels in the assessment area range from 1841 to 1948, with a total of 132 wrecks having known build dates. The absence of earlier vessels does not reflect an absence of earlier maritime activity: a number of historically significant ports lie within this region. In 1800 Aberdeen would have seen the landing of the second highest tonnage of cargo in Scotland as registered for customs (at 24, 081 tons). Other significant ports in the region listed for the purposes of customs include Alloa, Anstruther, Bo'ness, Dunbar, Dundee, Kirkcaldy, Leith, Montrose, Perth and Prestonpans. Ports in the East Scotland region would have accounted for approximately 55% of the registered tonnage landed in Scotland that year. (Moore 2008: 498-499).

3.7.4 The absence of records of earlier wrecks is probably in part an inheritance effect from the UKHO record on the NMRS (see 3.1). In addition, the waters in this region tend to be relatively silty, with poor visibility, leading to them being less attractive to divers, whose interest has been instrumental in the location of earlier wrecks in other parts of Scotland (Martin 1998). Some areas of dense historic shipping in the region are found in areas where relatively rapid sediment deposition occurs, for example the Firths of Forth and Tay. In these types of environment the potential for the existence of buried evidence of earlier activity, whether in the form of vessels or submerged prehistoric land surfaces should be borne in mind, particularly with respect to developments on the seabed or capital dredging projects.

3.7.5 The decade with the highest number of build dates is 1910-1919 with a total of 42 vessels. This period coincides with the recorded period of highest production by the British shipping industry (Lorentz 2009).

3.7.6 The place of building is known for 97 of the vessels. The main ports and areas of construction over the whole date range are tabulated below:

Aberdeen	Rest of East Scotland	Eastern England	Clyde
9	11	33	16

Table 5: Main Locations of construction and numbers of records of construction., East Scotland

There are perhaps fewer records from the Clyde than might have been expected considering the dominance of the Clyde shipyards over shipbuilding during the most of the period under consideration (Lavery 2001, Hewitson 2004). This feature of the records may be explicable in terms of the vessel types (see below). In broad terms, the vessels are smaller types: the Clyde shipbuilding industry tended to dominate in the production of larger vessels (see 3.11).

3.7.7 Foreign built vessels constitute 16 of the records. Helsingor, in Denmark, is the only foreign place of build with more than a single vessel associated with it, which has 2 records.

3.7.8 The place of registration is known for 105 vessels, including 1 too small to be registered at the time. The main locations of registration are tabulated below.

Aberdeen	Rest of East Scotland	Eastern England	London
12	16	23	13

Table 6: Number of records for main locations of registration, East Scotland.

The 13 vessels registered in London have loss dates that cluster in the world wars, and may not be indicative of usual patterns of registration and shipping loss across the period. The distribution of ports of registration reflects the role of the North Sea fisheries, and of the coastal trade. Trade across the North Sea is also reflected: of the 18 foreign registrations 16 are for ports on the North Sea or Baltic, with the most registrations at Copenhagen (4).

3.7.9 The vessel type can be identified in 102 records, although one of the types is the rather broad 'steamship'. This is the type with the most records (74). These generally appear to be cargo carrying vessels – cargo types other than ballast are given for 58 of these vessels. The next most frequent type is the trawler, with 27 records. Together with other types this means that fishing vessels in total account for 40 records. This last figure is not purely a reflection of the role of the fishing industry within the study area: 18 of the vessels were trawlers requisitioned for military service in the World Wars, and the majority of these were registered in England.

3.7.10 The relatively high frequency of trawlers, even allowing for those that were lost in the region while on naval duty, probably reflects the increasing importance of trawling as a fishing method, particularly based within the assessment area. Aberdeen was a major centre in the growth of trawling in Scottish waters, and by the later nineteenth century Aberdeen accounted for over half the white fish catch landed in Scotland (Coull 2008a). The earliest known trawler wreck within the NMRS lies in this region: the *Empress,* built in 1890, lying off Aberdeen (Canmore ID **101782**). Other methods of fishing were also important: the 8 drifters, used in the herring fishery, that are recorded in the region come from all but the earliest and latest build periods. In addition, there are a number of hulks in the ships graveyard at Aberlady that may also be associated with this fishery (see 3.12).

3.7.11 As well as the 18 trawlers requisitioned in the world wars, there are 28 naval vessels in the region. These vessels were all lost in World War I and World War II: none of the earlier wars Britain or Scotland were involved in are represented in the wrecks in this region. All the surface vessels (an aircraft carrier, 4 cruisers, 5 destroyers and a variety of other small vessels) are British. A number of submarines, including 2 mini-submarines have been located, 3 of which are German, 5 are of unknown origin and 5 are British (including the mini-submarines). Given patterns of activity and knowledge of losses of British submarines the submarines of unknown origin are probably mostly or all German. The British submarine wrecks include K4 and K17 (Canmore IDs **120577** and **120576**) lost in the 'Battle of May Island', a training accident that occurred in early 1918. The 2 mini-submarines are thought to have been originally used as training craft and then used as targets for weapon testing in 1946 (Canmore ID **114354**).

3.7.12 Barges constitute 13 records. None of them have build dates, but evidence of loss dates tends to suggest these are concentrated toward the later three periods. Most of the barges are found near the ports that sit on the firths and estuaries, reflecting their role in carrying cargoes in more sheltered waters.

3.7.13 The number of sailing vessels is relatively small, consisting of 3 schooners, a barque, a ketch and a lugger. The earliest was the schooner *Duncan Dunbar* built in 1841, but is recorded as being badly broken up (Canmore ID **147438**)

3.7.14 Types of vessels that have associations with the East Scotland region in terms of shipbuilding, the whaler and the clipper, have not been found. Whalers were frequently built at Dundee, and Peterhead was Scotland's main whaling port from the later 19th century (Sanger 2008). Aberdeen shipyards built, and contributed a number of design innovations, to clippers (Hewitson 2004).

3.7.15 Cargoes are given in records for 93 ships, though the total records of different cargoes is larger, reflecting the presence of mixed cargoes. Ballast forms the cargo in 14 records. Coal forms all or part of the cargo in 24 records. This reflects the essential nature of this fuel during the whole date range, the role of the coastal trade in carrying it, and also the role of the Fife coal fields and Methil as a specialised coal port. General cargo, a catch-all term which covers cargoes consisting of a variety of different elements, often in small quantities, reflects the non-specialised aspect of trade, particularly in coastal and short-distance trade (e.g. across the North Sea). The prevalence of this trade is reflected in it forming the second largest non-ballast cargo category. The cargoes carried on the transoceanic routes tended to be more specialised (e.g. grain from Buenos Aires, cocoa and grain from Port Harcourt in Nigeria).

3.7.16 The cargoes (together with route information) also occasionally illustrate regional or local specialisms. Looking at all the cargo and route information in NMRS, cargoes of raw material that can be tied into local industrial and commercial specialisations appear. These include: jute and flax destined for Dundee and the coarse textile industry based there; cast and pig iron to Grangemouth for use in the local steel industry; and wheat into Leith, which historically has handled high volumes of grain importation. This last can be tied into the construction of the grain elevator at Imperial Dock.

3.7.17 The ports of departure and destination are known in 92 records in the region, and the port of departure or destination is known in 6 further records. Of these routes 50 have their origin or destination in the East Scotland region, at 18 different places. Routes between Scottish ports constitute 23 of the records, those within UK waters

(often with a port in Scotland) 26 records. These routes are shown in Figure 6. A total of 39 records for international routes are recorded, 18 having an origin or destination within Scotland and 19 having an origin or destination elsewhere in the UK.

3.7.18 Of the routes around Scotland, Methil is recorded jointly most often as port of origin or departure (10 records) reflecting the importance of that port for the shipping of coal and the importance of coal in the coastal shipping trade (Lavery 2001). Grangemouth is the other most frequently recorded port (10 records), reflecting the role of cargo vessels in moving bulk raw materials, partially finished materials and manufactured goods. Aberdeen and Leith are also significant ports in terms of number of records (7 and 5 respectively). Surprisingly few records note Dundee as the port of origin or destination (2). Most other ports have single records, exceptions being the naval facilities at Invergordon (3) and Rosyth (2).

3.7.19 In all the routes recorded in the region, 26 involve ports in the northern part of the English east coast, approximately twice as many as routes involving ports elsewhere in the UK, including London. Of the international ports 20 records are for those on the North Sea or Baltic, with 12 elsewhere. The effective interconnectedness of the North Sea as an economic province is demonstrated by this pattern of routes, as well as the records of build place and registration place (see 3.2.7 and 3.2.8). Of the vessels without recorded routes, it should be noted that a number are trawlers, and therefore quite likely to have been sailing a circular route from their home port (Hewitson 2004).

3.7.20 Naval vessels involved in patrol or minesweeping duties (such as the requisitioned trawlers) would also often have 'circular' routes to and from a home base. The naval component to routes should also be noted in another aspect: naval bases or harbours with a significant naval role are listed as places of departure or destination in 10 records, the places being Scapa Flow, Rosyth and Invergordon. The vessels in question are often not warships, but civilian vessels engaged in the movement of supplies.

3.7.21 The cause of loss is known for 131 vessels. Of the loss causes, 56 are due to military action, 4 are deliberate sinkings that are not directly hostile (scuttling, target practice) and 75 are accidental losses, though some of these have occurred in wartime, and in a particular case, that of the HMS Argyll (Canmore ID **121118**), as a result of operating under wartime conditions, where the extinguishing of lighthouses lead to increased navigational hazards. Average annual accidental losses can be calculated for the various periods. The records for the pre-1850 period are too sparse to produce statistics.

1850-1913	1914-1918	1919-1938	1939-1945	post-War
0.33	1.80	1.05	2.00	1.00

Table 7. Average annual rate of accidental loss for each loss period, East Scotland.

The very much lower figure for 1850-1913 is probably a result of relatively poorer recording of wrecks. The significant difference between the figures for the world wars and more recent peacetime eras may reflect a number of effects resulting from wartime conditions. One such effect is the reduction in navigational aids, particularly lighthouses, which did not operate during wartime in order to deny their use to enemy vessels and aircraft. A second effect is the change to initially unfamiliar routes as many ports in continental Europe were closed and the convoy system was

adopted in both world wars. A third effect would have been the high numbers of relatively inexperienced crews and officers due to the expansion of the Royal Navy and the consequent conscripting of many experienced merchant navy personnel through the Royal Naval Reserve, and the much increased rate of loss of experienced seamen as a result of enemy action.

3.7.22 Of the 75 records noting accidental loss, 32 were due to stranding, 19 foundered, 16 were involved in collisions, 4 were due to fire or explosion and 4 were abandoned.

3.7.23 The losses to military action in the period 1914-1918 amount to 27, with the main cause of loss being due to mines (16 losses).There were 5 losses to torpedo attack, 4 were captured and scuttled, 1 vessel was shelled and 1 was rammed. By contrast, during World War II, for which period there are 42 records noting losses to military action, the predominant pattern of loss was to aircraft attack, which claimed 20 vessels. Torpedo losses amount to 11 records, as do losses to mines. This change indicates changing capabilities and strategies between the World Wars, with the introduction of aircraft capable of operating at distances and with accuracies sufficient to realistically target shipping. Losses attributable to direct U-boat attack show similar figures but a tactical change: these attacks were made solely by torpedo in World War II.

3.8 REGIONAL PATTERNS: NORTH SCOTLAND

3.8.1 This area covers the coast of Scotland from Dunnet Head to Cape Wrath, an area of rocky shores including very few ports or harbours. It also incorporates the Northern Isles, an area historically rich in maritime activity. The region was strategically important as it was located on the 'north-about' route round Scotland which was particularly important during the era of sailing vessels. Key ports exist at Lerwick, Stromness and Kirkwall. The fast currents of the Pentland Firth would have presented a navigational hazard, as would the many reefs and skerries around the Northern Isles, particularly around Shetland. The natural harbour at Scapa Flow in Orkney formed a focal point of British naval activity in the first half of the 20th century.

3.8.2 Removing the wreck records within the NMRS that have unsatisfactory location data leaves 262 located wreck records in the North Scotland region (see Figure 3).

3.8.3 The known build dates for the vessels in the assessment area range from 1661 to 1949, with a total of 145 wrecks having known build dates. These dates only reflect those that have definite, historically corroborated dates. Other wrecks are known to be of earlier construction either through the provision of a historical *terminus ante quem,* such as the *El Gran Grifon,* recorded as being wrecked in 1588, or the Kinlochbervie wreck, thought on the basis of archaeological evidence to date to the late 16th or early 17th century (Martin 1998, Robertson 2004). These earlier vessels, small in number in comparison to later periods, but relatively large in number in comparison with other regions, are sufficiently differently in character in comparison with the later wreck resource, and as such will be dealt with separately here, even though some of the themes will be addressed again later when dealing with the later wreck assets in the region.

3.8.4 Most of the vessels are not Scottish, or British, vessels, and are often associated with very long distance voyaging, or with particular atypical events: protection against Turkish privateers in the case of the *Wrangles Palais* (Canmore ID **71037**) or the Spanish Armada in the case of *El Gran Grifon* (Canmore ID **3857**). As such they are not representative of the majority of maritime activities in the North

Scotland region in the period before 1850, in which local transport, trade and fishing are likely to have formed the bulk. This is not to argue that their presence does not reflect the broader realities of the periods in which they were wrecked. The presence of foreign warships does reflect the relatively hazardous nature of seafaring at the time, in terms of both warfare and piracy. The presence of East Indiamen from the Netherlands, Denmark and Sweden also reflects the role the seas to the north of Scotland played in international trade.

3.8.5 Routes through the Northern Isles were frequently preferred on long distance voyages, for example Dutch vessels sailing to Dutch possessions such as Batavia, to those going south through the North Sea and along the English Channel. These latter routes were relatively busy, and the bordering countries frequently at war: Britain and France were at war for over half the 18th century, and England and subsequently Britain was at war with the Netherlands on 6 occasions between 1650 and 1810. This rendered shipping vulnerable to attack by naval forces and privateers, even if the vessel came from a country that was not at war at that time (Davidson 2005). The Dutch East Indies Company (VOC) automatically used the north about route during any of the frequent periods during which the Netherlands and France were at war (WA 2011). Although the 17th and 18th centuries were politically and militarily unsettled in Scotland, as they were throughout most of Europe, the relative impact of a series of conflicts on the shipping routes through the region was less than that on routes through other areas. As such the 'north about' routes through the North Scotland region played a pivotal role in international trade during this period.

3.8.6 Although there are more pre-1850 wreck records in this region than for any of the other regions, the pre-1850 era still presents relatively few records in comparison with later eras. The number of early wrecks located and identified is largely the result of interest by divers, including professional archaeologists, treasure-hunters and amateurs, with archaeologists often working in response to the activities of treasure-hunters (Martin 1998).

3.8.7 As a result of the activities of treasure hunters and recreational divers the record of pre-1850 shipwrecks tends to be biased towards warships and large armed merchantmen. This partly reflects particular interests (often financial: all the East Indiamen were carrying bullion in one form or another), but also the relative visibility of these types of wreck sites, where the larger size of the vessels and the presence of cannon, makes these types of sites easier to detect. The greater motive for these vessels to be looted also tends to mean they are preferentially protected by legal designations, particularly the Protection of Wrecks Act 1973.

3.8.8 This region also includes Scapa Flow. This has a notable effect on the inventory of wreck assets in the region: it has created a large concentration of wrecks in the area. The scuttling of the German High Seas Fleet in Scapa Flow is well known. But a large number of other vessels were also scuttled at the beginning of both world wars. This was undertaken to block or restrict passages to Scapa Flow for defensive purposes. Many of the vessels were from other parts of Britain, or even foreign vessels seized as prizes, and have no prior connection with Scottish waters. Although the scuttling of these vessels is a part of the wartime activity of the region, the individual histories of these vessels often do not relate to the region. As such these vessels have been excluded from consideration when looking at patterns of building and use of vessels in the region for the purpose of this study. Scapa Flow's significance in connection with the navy is more fully considered in 3.15.8.

3.8.9 The decades with the highest number of build dates are 1900-1909 and 1910-1919 with a total of 21 vessels in each decade. This period coincides with the recorded period of highest production by the British shipping industry (Lorentz 2009).

3.8.10 The place of building is known for 70 of the vessels, excluding scuttled vessels. The main ports and areas of construction over the whole date range are tabulated below:

East Scotland	Irish Sea	Eastern England	Clyde
12	4	20	8

Table 8 Numbers of records of construction by main places of construction. North Scotland.

3.8.11 None of the vessels were built within the North Scotland region. There are perhaps fewer Clyde built ships than might have been expected considering the dominance of the Clyde shipyards over shipbuilding during the most of the period under consideration (Lavery 2001, Hewitson 2004). This pattern of construction regions, particularly the vessels from Ireland or north-western England) reflect the predominant maritime activity in the region. The vessel types are mainly those engaged in small scale trading and most importantly fishing. Fishing vessels from Ireland and north-western England, notably the fishing port of Fleetwood, Lancashire, were highly active in the region.

3.8.12 Foreign built vessels constitute 17 of the records. The only foreign places of build with more than 1 vessel associated are Kiel, Danzig and Hamburg, and even these have only 2 records each. The records of places of build can be divided into those on the North Sea (12 records) and those elsewhere (5 records).

3.8.13 The place of registration is known for 75 vessels. The main locations of registration are tabulated below.

Aberdeen	Rest of East Scotland	Eastern England	London
8	11	10	6

Table 9: Number of records for main locations of registration, North Scotland.

3.8.14 The records of vessels registered in London have loss dates that cluster in the world wars, and may not be indicative of usual patterns of registration and shipping loss across the period. There are only 2 records of registrations in the region: 1 each at Lerwick and Kirkwall. The pattern of registrations reflects the role of the North Sea fisheries, and of trade moving along the east coast. Trade across the North Sea is also reflected: in the 30 foreign registrations 28 are for ports on the North Sea or Baltic, with the most registrations at Gothenburg (6) and then Bergen (4).

3.8.15 The vessel type can be identified in 141 records. This includes 38 scuttled vessels, which will not be considered further. Steam ship is the type with the most records (47). These generally appear to be cargo-carrying vessels – cargo types are given for 36 of these vessels. The next most frequent type is trawler, with 20 records. Together with other types this means that fishing vessels in total account for 26 records. This last figure is not purely a reflection of the role of the fishing industry within the study area: 4 of the vessels were trawlers requisitioned for military service in the World Wars. The original registration of these vessels is unknown, but in other regions they were predominantly registered in English ports.

3.8.16 The registration places of the fishing vessels suggests that although the fishing grounds in the region were important, much of the fishing was undertaken from ports outside of the region: the most frequent recorded registration place for the trawlers was Aberdeen. This may in part be a reflection of issues regarding the representation of smaller wooden fishing vessels in the wreck record, which is suggested by comparison with the National Register of Historic Vessels (see 3.10 below). The majority of the rest of the trawlers come from fishing ports in eastern England.

3.8.17 As well as the 4 trawlers requisitioned in the world wars, there are 36 naval vessels in the region. These include 3 pre-1850 warships, whose presence has been discussed above (3.3.3-3.3.5). Of the remaining vessels, 12 records are of German warships (4 battleships, 5 cruisers, 3 destroyers) of the High Seas Fleet, scuttled by their crews in Scapa Flow in 1919. The majority of these are scheduled monuments, with one entry on the AMAAA 1979 schedule for 4 of the cruisers and another entry for 3 of the battleships. The other vessels were all lost in World War I and World War II: All but 1 of the remaining surface vessels (3 battleships, 1 cruiser, 3 destroyers and a variety of other small vessels) are British. A number of submarines have been located, 4 of which are German, 3 are British and 1 is of unknown origin. Of the British vessels, HMS Royal Oak (Canmore ID **102373**), HMS Vanguard (Canmore ID **103004**) and HMS Hampshire (Canmore ID **102221**) are designated as controlled places under the Protection of Military Remains Act 1986.

3.8.18 Barges constitute 6 records. None of them have build dates, but evidence of loss dates tends to suggest these are concentrated toward the later 3 periods. The barges are found near the ports in the more sheltered harbours in Orkney and Shetland.

3.8.19 The number of sailing vessels is small relative to the total number of vessels, but high relative to other regions. There are 12 pre-1850 vessels tabulated below

Type	Name	Canmore ID
East Indiaman (Dutch)	*Lastrager, Kennemerland, De Liefde*	**213917, 1401, 102891**
East Indiaman (Danish)	*Wendala*	**213898**
East Indiaman (Swedish)	*Drottingen, Svecia*	**206700, 102233**
Warship	*El Gran Grifon, Curacao, Wrangels Palais*	**3857, 213926, 71037**
Pink	*Estavfii*	**213937**
Barque	*Ayrshire*	**213280**
Craft	*Eva*	**3687**

Table 10: Pre-1850 Sailing Vessel Wrecks, North Scotland

Although the warships and East Indiamen are relatively well known types, the other sailing vessels may constitute valuable evidence for other, less well studied, varieties of earlier vessel, in particular those more engaged in activities at a local or regional scale.

3.8.20 Scotland was closely involved in the whaling industry, particularly in the earlier Arctic phase. Dundee was a noted early centre of whaling and later of whaler construction and Peterhead was latterly the main whaling port in Scotland, though most of the main east coast ports were involved. The wreck of the Black Boy, (Canmore ID **290900**) may be of significance in this connection. In the NMRS the wreck is listed as a whaler, which would make it unique as the only one identified in Scottish waters. The record is problematic: the location of the wreck is not clearly known and it is unclear that the vessel actually was a whaler: its last use was as a coal hulk in the whaling industry. The presence of wreck associated with the whale fishery in Shetland is interesting: although many Shetlanders were served as crewmen on whalers, the direct involvement of Shetland in the whale fisher was relatively limited. A whaling station was set up in the early years of the 20th century, barely lasting 25 years in service before closing due to the over-exploitation of the North Atlantic whale fishery (WA 2011).

3.8.21 Cargoes are given in records for 66 ships, though the total records of different cargoes is larger, reflecting the presence of mixed cargoes. Ballast forms the cargo in 10 records. Coal forms all or part of the cargo in 8 records. This reflects the essential nature of this fuel during the whole date range and the role of the coastal trade in carrying it. General cargo reflects the non-specialised aspect of trade. Given the dominance of Orkney and Shetland in terms of this region's wreck assets, the relatively high frequency of general cargoes ought not to be surprising as a very wide range of goods would have to have been brought into the islands by sea, including virtually all manufactured goods. Surprisingly, however, the routes of these cargoes generally do not include ports anywhere in the region.

3.8.22 The ports of departure and destination are known in 62 records in the region. Of these routes 13 have their origin or destination in the North Scotland region, at least 6 different places (there are 2 records simply recorded as 'Shetland' and Orkney'). Routes between Scottish ports constitute 9 of the records. These routes are shown in Figure 9. Routes within UK waters (potentially with a port in Scotland) are found in 6 records. A total of 47 records for international routes are recorded, 11 having an origin or destination within Scotland and 12 having an origin or destination elsewhere in the UK.

3.8.23 Of the routes around Scotland, Lerwick and Kirkwall are recorded jointly most often as port of origin or departure (3 records each) reflecting the importance of these ports for the movement of goods into Shetland and Orkney. All other ports have a single record. A route not found was one connecting the Faroe Islands: most routes from Faroe to other parts of the world would have passed through the region, making the absence of relevant shipwreck records notable.

3.8.24 In all the routes recorded in the region, 22 involve ports in Scandinavia and Iceland. This contrasts with 13 ports in England, of which only 1 route had a port within the North Scotland region. Most ships moving to or from English ports through the region were involved in international trade, much of it transatlantic. There are 24 records, over half, for vessels moving between non-UK destinations. The overall impression is of a region important to international shipping as part of a series of long distance routes, but without long distance routes actually connecting to ports within the region. The pattern of routes described here covers all the route records throughout the period of for which there are dated shipwreck records. Therefore it can be seen that there are some similarities with those noted for the pre-1850 wrecks, in that the region was important in terms of international shipping routes. What changed in the period after 1815 was the reason. Whereas the shipping of the

16th to 18th centuries made use of routes through the region in part to avoid routes in greater danger military and privateering activities, the continued importance of these seaways after 1815 and the end of the Napoleonic Wars marks an unusual period of peace and stability within Europe. The consequent economic growth occurred in previously relatively economically poor countries, particularly in Scandinavia, stimulating a considerable growth in maritime trade that used the seaways in the region.

3.8.25 Of the vessels without recorded routes, it should be noted that 26 are fishing vessels, mostly trawlers, and therefore likely to have been sailing a circular route from their home port, particularly those involved in the demersal fisheries (Hewitson 2004). By contrast, vessels fishing for pelagic fish, specifically herring, would often come to fish off Shetland, landing their catch at numerous shore stations on Shetland (Coull 2008b). Although Shetland developed a significant herring fleet, many of these vessels would have come from other parts of the UK to participate in the Shetland herring fishery. This fishery developed as a major enterprise from 1880 until the disruption of the herring trade through the world wars, the Depression and the effective partition of the Continent during the Cold War progressively removed the main markets for herring. Demersal fisheries, which had been the mainstay of fishing based in the North Scotland region before the herring boom, returned to dominance as the herring market collapsed (Coull 2008b). Although more limited in numbers, the seasonal migration of women to work in fish processing occurred northwards to Shetland as it did southwards from mainland Scotland to herring ports down the east coast of Britain (Bochel 2008, Coull 2008b).

3.8.26 Naval vessels involved in patrol or minesweeping duties (such as the requisitioned trawlers) would also often have 'circular' routes to and from a home base. The naval component to routes should also be noted in another aspect: Scapa Flow being the port of departure or destination in 3 records. Of these vessels 1 is a supply vessel; the other 2 are naval vessels, including the HMS Hampshire, mined in 1916 *en route* to Russia with the loss of most of the crew and passengers, including the Chief of Imperial Staff Lord Kitchener.

3.8.27 The cause of loss is known for 151 vessels, of which 40 were scuttled at Scapa Flow. Of the loss causes (scuttling excepted), 42 are due to military action, and 69 are accidental losses, though some of these have occurred in wartime. Average annual accidental losses can be calculated for the various periods. The records for the pre-1850 period are too sparse to produce statistics.

1850-1913	1914-1918	1919-1938	1939-1945	post-War
0.13	3.20	0.60	1.85	0.60

Table 11 Average annual rate of accidental loss for each loss period, North Scotland.

The significantly lower figure for 1850-1913 is probably a result of poorer recording of wrecks. The significant difference between the figures for the world wars and more recent peacetime eras may reflect a number of effects resulting from war conditions, as noted in other regions (see e.g. 3.7.21).

3.8.28 Of the 66 records noting accidental loss, 50 were due to stranding, 2 foundered, 10 were involved in collisions, 3 were due to fire or explosion and 1 was abandoned.

3.8.29 The losses to military action in the period 1914-1918 amount to 27, with the main cause of loss being mines (11 losses). Torpedo losses account for 8 records, 3 were captured and scuttled, 3 vessels were shelled and 1 was rammed. During World War II, for which period there are 15 records noting losses to military action, aircraft attack claimed 7 vessels, torpedo attacks amount to a further 7 records, with a single loss attributed to depth charging. This change indicates the changing capabilities and strategies between the world wars, with the introduction of aircraft capable of operating at distances and with accuracies sufficient to realistically target shipping. Losses attributable to direct U-boat attack reflect both strategic and tactical changes. There is a significant reduction in the number of losses attributable to U-boat attack in the region in World War II in comparison to World War I, due to the greater concentration of U-Boat attacks in the mid Atlantic, partly to avoid Allied aircraft attack (Macintyre 1956). U-boat attacks are solely by torpedo in World War II, as opposed to a mixture of attack tactics employed in World War I, including surface attacks. This change reflects a response to the greater vulnerability of surfaced submarines to aircraft detection and attack, and an earlier move to unrestricted submarine warfare by the German navy in World War II.

3.9 REGIONAL PATTERNS: SOUTHWEST SCOTLAND

3.9.1 This region is dominated by the Clyde and its firth, which has provided a major route of communication from prehistory. The dominance of the Clyde can be seen by comparing the distribution of wrecks there and in the Solway, the northern portion fo which also falls within the region. Navigation through the Firth of Clyde has always presented hazards, and problems of navigating the river led to the construction of ports and dockyards closer to the sea at Port Glasgow, Greenock and Gourock. The pre-eminence of Glasgow and the Clyde in shipbuilding in the late 19th and early 20th century has great historical significance, and has had a major impact on the archaeological record, both in this region and throughout Scottish waters. The region faces the Irish Sea, and would have been on the main routes for vessels sailing from Ireland, the Isle of Man and north western England.

3.9.2 A total of 282 located wrecks are known in the Southwest Scotland region, once the wreck records within the NMRS that have unsatisfactory location data are removed from consideration (see Figure 6).

3.9.3 Although the total number of wrecks in the region is not as high as that in other regions, this actually reflects the relative size of the region. Examination of the distribution of wrecks around the Firth of Clyde reveals one of the densest areas of wrecks in Scotland's waters, comparable to that in the Firth of Forth.

3.9.4 The known build dates for the vessels in the Southwest Scotland region range from 1795 to 1950, with a total of 110 shipwrecks having known build dates. The absence of earlier vessels does not reflect an absence of earlier maritime activity: a number of historically significant ports lie within this region. In particular Glasgow was an important port form the medieval period and rose to pre-eminence in the 18th century largely as a result of the tobacco trade (Hewitson 2004). Navigation of the Clyde was problematic, but this lead to the foundation or upgrading of ports lower on the Clyde, such as Port Glasgow and Greenock (Lavery 2001). By 1800 Greenock was landing the highest tonnage of cargo in Scotland as registered for customs (at 36, 253 tons), and Port Glasgow the third highest tonnage (11, 331 tons): together these 2 ports accounted for approximately a third of the registered tonnage landed that year. (Moore 2008: 498-499). These 2 ports dominated foreign trade in the region: only Ayr, Campbeltown, Dumfries, Irvine and Portpatrick handled foreign trade in

addition to the Clyde ports, and only Ayr and Dumfries handled more than 1000 tons in a year. Ports in the region that only handled coastal trade consisted of Kirkcudbright, Rothesay, Stranraer and Wigtown (Moore 2008). In the early years of the 19th century Ardrossan and Troon became specialist coal ports (Lavery 2001).

3.9.5 The decade with the highest number of build dates is 1900-1909 with a total of 21 vessels. This period approximately coincides with the recorded period of highest production by the British shipping industry (Lorentz 2009).

3.9.6 The place of building is known from 46 of the shipwreck records. The main ports and areas of construction over the whole date range are tabulated below:

Glasgow	Other Clyde	Eastern England	Irish Sea
7	11	8	5

Table 12: Numbers of records of construction by main areas of construction, South West Scotland.

It is possible that the larger proportion of Clyde built vessels in this region than in others reflects as much the relative importance of the Clyde in large scale trade using larger vessels than the presence of the shipbuilding industry itself.

3.9.7 Foreign built vessels constitute 9 of the records. None of the ports contributes more than a single record. Of these, 5 are from continental ports on the North Sea, 3 of which are in Germany.

3.9.8 The place of registration is known for 101 vessels. The main locations of registration are tabulated below.

Glasgow	Irish Sea	Eastern England	East Scotland
31	18	8	7

Table 13: Number of records for main locations of registration, Southwest Scotland.

3.9.9 The vessel type can be broadly identified in 148 records. The most frequently occurring type is steamship with 63 records. These generally appear to be cargo carrying vessels – cargo types other than ballast are given for 36 of these vessels. The next most frequent type is trawler, with 17 records. With other types of fishing boats this means that fishing vessels in total account for 26 records. This last figure is not purely a reflection of the role of the fishing industry within the study area: 2 of the vessels were trawlers requisitioned for military service in World War II.

3.9.10 The relatively high frequency of trawlers, even allowing for those that were lost in the region while on naval duty, probably reflects the increasing importance of trawling as a fishing method (Coull 2008a). Although fishing vessels were operating in the area, all were registered in ports outside of the area, with the most frequent registration port for trawlers being Fleetwood in Lancashire (4 records). Other fishing vessels of all types come from north eastern England and eastern Scotland.

3.9.11 As well as the 2 trawlers requisitioned in the world wars and 2 other requisitioned vessels, there are 18 military vessels in the region. These vessels were all lost in the 20th century. The majority of these vessels are submarines (11 records). It should be noted that the identification of some of these vessels as submarines is perhaps

questionable: 3 of the records are duplicates of other records with more convincing identifications, leading to the possibility that some of these records are inaccurate not just in terms of identifying specific submarines, but also in terms of vessel type. The submarines, where identified, consist of both British and German vessels. The British submarine HMS Vandal (Canmore ID **119151**) is one of the wrecks in the region. This submarine was lost during sea trials shortly after commissioning. The wreck is protected under the PMRA 1986. Despite a major anti-submarine escort group being based on the Clyde the only wreck connected to the significant role played by the region in convoy activity during World War II, is that of HMS Dasher (Canmore ID **102679**), an escort carrier that sank after an internal explosion in 1943. This wreck is a controlled place under the PMRA 1986. The other vessel potentially related to this activity is a seaplane tender, possibly involved in attending to seaplanes involved in anti-submarine activities. Other naval auxiliary vessels consist of a degaussing barge, used to reduce the magnetic field of naval vessels in order to reduce the efficacy of magnetic mines, and a target craft. The only warship wreck apart from HMS *Dasher* is that of the *Variag*, a Russian cruiser that had been decommissioned and was on its way to be scrapped on the Clyde when it stranded. The other military vessels are 2 landing craft wrecks.

3.9.12 The sailing vessels consist of 5 barques, 1 brigantine, 1 lugger, 5 schooners, and 3 smacks. Most of these vessels were built in the period 1850-1913, with a few dating to the pre-1850 period, notably the brigantine, *Derwent* (Canmore ID **102697**), which was built in 1795.

3.9.13 There are 2 types of vessels that have local associations with the area in terms of shipbuilding, the steam paddle ship and the puffer. Examples of both do exist as wrecks within the region. The use of paddle steamers was pioneered by shipbuilders on the Clyde and they continued in use, particularly for early tourist trips, considerably after the advent of the screw propeller (see 3.9.18). One of the best examples is the wreck of the *Iona I*, (Canmore ID **102456**). This vessel was built and successfully run for many years as a passenger steamer along the Clyde. She was subsequently bought to act as a blockade runner to take supplies to the Confederate states during the American Civil War. After conversion for this task the *Iona I* was lost as a result of a collision with another vessel on its first voyage in its new role. The wreck locations of 5 other paddle steamers are known in the region.

3.9.14 The puffers are also a type closely associated with the Clyde as their area of build: the single puffer with a known build place was built at Bowling, though registered in Liverpool. There are 4 records of puffers within the region: it should be noted that not all the vessels of this type are recorded as such within the NMRS: some are classified as steamships. Where condition is known, the examples in the region are generally not in good condition. The puffers were closely associated in their use with the West Scotland region. One of the best shipwreck examples of the type is located in that region (see 3.10.15).

3.9.15 Cargoes are listed in records for 72 ships, though the total records of different cargoes is larger, reflecting the presence of mixed cargoes. Ballast forms the sole cargo in 14 records. General cargo account for 15 records. Most of the general cargoes are moving relatively short distances, moving through the Irish Sea. The prevalence of this trade is reflected in it forming the largest non-ballast cargo category. By contrast the cargoes carried on the transoceanic routes tend to be more specialised - notably whisky from Glasgow to Sydney and Trinidad. Coal forms all or part of the cargo in 13 records. This reflects the essential nature of this fuel during the whole date range and the role of the coastal trade in carrying it.

3.9.16 The cargoes (together with route information) also occasionally illustrate regional or local specialisms, such as loads of iron ore, nickel ore and limestone being delivered to Glasgow, presumably for use in the steel industry.

3.9.17 Passengers are listed as the principal 'cargo' in 5 records. These records reflect a variety of different patterns of passenger movement: including short distance pleasure cruises to Rothesay, a characteristic leisure activity in Glasgow in the late 19th and early 20th century; a coastal voyage from Liverpool to Glasgow, an important element of passenger transport before the later dominance of the railways; and a long distance voyage from Glasgow to New York. In the last example it may be speculated that this relatively large complement of passengers (220) and the date (1858) may in fact mean that this was a voyage that most were undertaking as emigrants (see 3.14).

3.9.18 The ports of departure and destination are known in 53 records in the region, and the port of departure or destination is known in 2 further records. Of these routes 41 had their origin or destination in the Southwest Scotland region, at 15 different places. Routes between Scottish ports constitute 15 of the records, within UK waters (potentially with a port in Scotland) 25 records. A total of 16 records for international routes are recorded, 14 having an origin or destination within Scotland and 2 having an origin or destination elsewhere in the UK. There are no records of international routes not involving a destination or departure from the UK, probably largely a reflection of the coastal topography of the Firth of Clyde, making it an unlikely route for vessels on long distance routes outside of the UK, in contrast to the North Scotland region.

3.9.19 Of the routes around Scotland, Glasgow is recorded most often as port of origin or departure (5 records), followed by Rothesay (3 records), Greenock and Gourock (2 records each). The other ports have only a single record each. The dominant role of the Clyde as a navigational route in the region is apparent in the distribution of records. Of the 25 records of routes within Scottish waters, there are only 2 ports that are not on the western coast of Scotland.

3.9.20 In all the routes recorded in the region, 15 involve ports in Ireland, 10 ports on the north western coast of England and 3 in Wales, emphasising the importance of voyages across the Irish Sea, which effectively formed a maritime economic province, an impression strengthened by the place of registration records (see 3.4.8). Of the international ports, 7 records are for the Americas, compared with 3 on the North Sea or Baltic. Other international ports include those in the western Mediterranean (3 records), probably again demonstrating the use of the Irish Sea as a route.

3.9.21 A number of the vessels without recorded routes are trawlers, and therefore quite likely to have been sailing a circular route from their home port (Hewitson 2004). As technology improved, these might come from considerable distances, with 1 record in the post-War period of a Russian trawler. By contrast, vessels fishing for pelagic fish, specifically herring and mackerel, had a longer tradition of long distance voyages, following migrating shoals over considerable distances, often landing catches far from their home ports. Although the quantities of herring landed in the region were relatively small, the good rail connections around the Clyde from the later 19th century made it an important area for the supply of fresh (as opposed to cured) herring for domestic markets (Coull 2008b).

3.9.22 The cause of loss is known for 129 vessels, including 24 abandoned on shore or intertidal settings at ships graveyards at Bowling and Newshot Island, both on the

Clyde. Excluding these losses, 16 losses are due to military action, 3 are deliberate scuttlings, and 86 are accidental losses, though some of these occurred in wartime. Average annual accidental losses can be calculated for the various periods. The records for the pre-1850 period are too sparse to produce statistics.

1850-1913	1914-1918	1919-1938	1939-1945	post-War
0.67	0.50	0.76	2.14	1.60

Table 14 Average annual rate of accidental loss for each loss period, Southwest Scotland.

Similar to other regions the lower figure for 1850-1913 is probably a result of poorer recording of wrecks. The low figure for 1914-1918 is anomalous in comparison to other regions and is difficult to account for. The difference between the figures for 1939-1945 and more recent peacetime eras may reflect wartime changes that have been suggested above with respect to other regions (see 3.8.24). In particular, the massive increase in traffic to Glasgow, as a result of the virtual closing of the Port of London due to bombing, would have meant that many ships masters would have had little or no experience of navigating the Clyde and its approaches, potentially leading to more strandings. This change in normal shipping patterns also caused short term transhumance, as a few thousand dockworkers from London were redeployed to Glasgow to assist in cargo handling.

3.9.23 Of the 85 records noting accidental loss, 41 were due to stranding, 11 foundered, 29 were involved in collisions and 4 were due to fire or explosion.

3.9.24 The losses to military action in the period 1914-1918 amount to 13 records, with the main cause of loss being torpedo attack (11 losses). Other losses are: 1 by depth charge and 1 by capture and scuttling. By contrast, during World War II there are 2 records noting losses to military action, 1 to torpedo attack and 1 to depth charge attack. This change indicates the changing capabilities and strategies between the World Wars. Although aircraft capable of operating at distances and with accuracies sufficient to realistically target shipping had been introduced this region would have been at the range limits of most German aircraft, and the necessity of flying over mainland Scotland would have made loss rates unacceptably high. The reduction in losses to U-boat attack in this region reflects the longer operational range of World War II U-boats and the necessity of avoiding areas with high concentrations of aircraft and specialist anti-submarine vessels that were available in World War II.

3.10 REGIONAL PATTERNS: WEST SCOTLAND

3.10.1 The many islands together with the heavily indented coastline and mountainous terrain of the mainland has meant that sea transport has been of paramount importance within the region from earliest times. Although the region may not have been exposed to the full impact of international wars in the way that some of the other regions were, the turbulent history of the region means that maritime conflict and warfare were frequent, with some of the best known shipwrecks in Scottish waters, such as the *Swan* (Canmore ID **80637**), the result of this aspect of the region's history.

3.10.2 Removing the wreck records within the NMRS that have unsatisfactory location data leaves 302 located wrecks are known in the West Scotland region (see Figure 7).

3.10.3 The known build dates for the vessels in the assessment area range from 1641 to 1948, with a total of 123 wrecks having known build dates. The build date of 1641 is the earliest documented build date for any of the wreck assets in Scottish waters. It should be noted that 3 other wreck sites may predate this by virtue of their known or probable loss dates. Only a single site, near Mingary Castle falls within the West Scotland region, and is relatively close to the 2 sites with the earliest documented build dates, both in the Sound of Mull. The Mingary Castle wreck is thought to have been lost in 1644. The absence of earlier vessels does not reflect an absence of earlier maritime activity. The deeply indented coastline and the many island of the region would mean that sea transport was one of the main methods of travel in the region since prehistory. Distinctive boat building traditions from the early Medieval period are recorded, as is the provision of ships as part of vassalage, in distinction to the usual provision of mounted troops (Martin 2009).

3.10.4 The 17th century vessels in the region tend to be associated with particular military and political events, and are therefore not completely representative of patterns of maritime activity in the region. Even allowing for the frequently turbulent nature of society in the region during the 17th century, these vessels represent larger scale interventions from outside of the region, and do not reflect the other maritime activities that would have occurred in the region. Although there are no major trading ports in the region, on a par with those found in the East Scotland and Southwest Scotland regions, a number of historically significant small ports lie within this region, including Oban, Stornoway, Tobermory Ullapool and Fort William. These ports mainly handled coastal trade, though small quantities of foreign trade also came through the ports (Moore 2008).

3.10.5 The decade with the highest number of build dates is 1910-1919 with a total of 30 vessels. This period coincides with the recorded period of highest production by the British shipping industry (Lorentz 2009).

3.10.6 The place of building is known for 88 of the vessels. The main ports and areas of construction over the whole date range are tabulated below:

Clyde	East Scotland	Eastern England	Irish Sea
18	5	26	13

Table 15: Numbers of records of construction by main areas of construction, West Scotland.

3.10.7 Vessels built abroad include 12 at continental North Sea ports and 3 from the USA. This pattern of moderate numbers of vessels from disparate shipbuilding regions differs from the pattern in the other regions, where either a single shipbuilding region are a number of geographically close regions tend to dominate.

3.10.8 The place of registration is known for 100 vessels. The main locations of registration are tabulated below.

Clyde	West Scotland	Irish Sea	East England
23	8	21	11

Table 16: Number of records for main locations of registration, Southwest Scotland.

3.10.9 Foreign registrations are mainly in North Sea or Baltic ports (18 records), with 2 records ports in the USA.

3.10.10 The vessel type can be broadly identified in 174 records. The most frequent type is the steamship, with 80 records. These generally appear to be cargo carrying vessels – cargo types other than ballast are given for 49 of these vessels. The next most frequent type is the trawler, with 27 records. With other types such as drifters this means that fishing vessels in total account for 39 records. This last figure is not purely a reflection of the role of the fishing industry within the study area: 6 of the fishing vessels were requisitioned for military service in World War II. There are 8 records of paddle steamers, the highest number of records of this wreck type in any of the regions of Scottish waters. These wreck sites include the wreck of the *Comet,* (Canmore ID **102442**) which was used on the world's first commercially successful steamboat service (Lavery 2001). Although this is a potentially important wreck, it is unclear how much of the vessel survives: the engine was recovered shortly after the *Comet* was wrecked as part of a salvage operation and is now in the Science Museum in London.

3.10.11 The relatively high frequency of trawlers should be noted. Although fishing vessels were operating in the area, all were registered in ports outside of the area, with the most frequent registration port for trawlers being Fleetwood in Lancashire (4 records). Other types of fishing vessels come from north eastern England, East Scotland and continental ports on the North Sea.

3.10.12 As well as the 6 fishing vessels requisitioned in the world wars and 2 other requisitioned vessels, there are 16 military vessels in the region. The earliest of these vessels are small warships dating to the 17th century, and have been discussed above (3.3.5-6). The other vessels are losses relating to the world wars. The only surface ships consist of a minelayer, a minesweeper and 3 landing craft. There are 2 midget submarines and 6 submarines recorded in the region. The midget submarines are British vessels lost during training. Of these one is known to be a Welman 10 (Canmore ID **121262**), and the other has been suggested to be a Chariot (Canmore ID **121263**) (Baird 1995). The loss of the midget submarines during training means that the wreck sites are actually in their original use contexts. Only 2 other min-submarines are known in Scottish waters (see 3.7.10). The build place is known for 5 of the submarines. All of these are of German construction, although HMS Graph had been captured and was in British service at the time of its loss.

3.10.13 The sailing vessels consist of 3 17th century warships and a single late 16th/early 17th vessel near Kinlochbervie (all protected under the PWA 1973), 1 East Indiaman, 3 barques, 1 ketch, 1 lugger, 1 schooner, 1 smack and 7 other vessels simply classified as 'craft' or 'ships'. Other than the warships, the Kinlochbervie wreck and East Indiaman, all the dated sailing vessels were built in the period 1850-1913.

3.10.14 The puffer as a vessel type has associations with the region. These small cargo vessels played an important role in the transport of goods to the Western Isles and more remote areas of the Western Highlands. A good example of the type, the *Logan*, is known in the region, (Canmore ID **119296**). It should be noted that not all puffers in the NMRS are designated as such: the *Logan* is one of the vessels simply classified as a steamship.

3.10.15 Cargoes are given in records for 94 ships, though the total records of different cargoes is larger, reflecting the presence of mixed cargoes. Ballast forms the sole cargo in 18 records. Coal forms all or part of the cargo in 19 records. This reflects

the essential nature of this fuel during the whole date range and the role of the coastal trade in carrying it, but also its value as an export: most of the coal cargoes leaving Glasgow and moving through the region were sailing for ports in continental Europe. General cargo is recorded in 18 records: this reflects the non-specialised aspect of trade, particularly in the coastal trade. Most of the general cargoes were moving relatively short distances through the Irish Sea. The prevalence of this trade is reflected in it forming the largest non-ballast cargo category. The cargoes carried on the transoceanic routes tended to be more specialised, whether raw materials coming being imported (ice being shipped from Porsgrunn to Stornoway) or exported (railway locomotives from Greenock to Halifax, Nova Scotia).

3.10.16 The ports of departure and destination are known in 74 records in the region, and the port of departure or destination is known in 2 further records. Of these routes 22 have their origin or destination in the West Scotland region, at 16 different places. Routes between Scottish ports constitute 25 of the records, those within UK waters (potentially with a port in Scotland) 13 records. A total of 42 records for international routes are recorded, 10 having an origin or destination within Scotland and 28 having an origin or destination elsewhere in the UK. There are 4 records of international routes not involving a destination or departure from the UK.

3.10.17 Of the routes around Scotland, Glasgow is recorded most often as port of origin or departure (6 records), followed by Stornoway and Port Ellen (3 records each), and Bunessan, Irvine and Troon (2 records each). The other ports have only a single record each. The dominant role of Glasgow as a port on the western seaboard is apparent in the distribution of records. This would appear to be as part of a fairly local pattern of movement: of the 25 records of routes within Scottish waters, there are only 2 ports that are not on the western coast of Scotland.

3.10.18 In all the routes recorded in the region, 6 involve ports in Ireland, 16 ports on the north western coast of England, 4 in Wales, and 1 on the Isle of Man, emphasising the importance of links to the Irish Sea, which effectively forms a maritime economic province. Of the international ports 23 records are for the Americas (it should be noted that many of these are vessels simply passing through the region without docking), compared with 11 on the North Sea or Baltic and 4 on the North Atlantic/Arctic Sea. Other international ports include those in Africa (3 records) and the Indian Ocean (2 records).

3.10.19 The cause of loss is known for 137 vessels. The cause types are: 29 to military action, 2 vessels scuttled, and 101 accidental losses, though some of these occurred in wartime. Average annual accidental losses can be calculated for the various periods. The records for the pre-1850 period are too sparse to produce statistics. There are 8 records of loss causes that have no date.

1850-1913	1914-1918	1919-1938	1939-1945	post-War
0.46	1.80	0.62	3.43	3.00

Table 17 Average annual rate of accidental loss for each loss period, West Scotland.

The lower figure for 1850-1913 may be a result of poorer recording of wrecks, as has been suggested for the other regions. The significant difference between the figures for the world wars and the interwar era may reflect the changed operating conditions during war that have been suggested above with respect to other regions (see 3.8.24) The high post-War figure is exceptional in comparison to the other

regions, and is difficult to account for: simple explanations in terms of a single catastrophic event are not borne out by the date of loss data.

3.10.20 Of the 101 records noting accidental loss, 86 were due to stranding, 3 foundered, 8 were involved in collisions and 4 were due to fire or explosion.

3.10.21 The losses to military action in the period 1914-1918 amount to 15, with the main cause of loss being torpedo attack (9 losses). Other vessels were lost to mines (3 records), shelling (2 records) and 1 was captured and scuttled. During World War II there are 15 records noting losses to military action, the cause of loss being aircraft attack (2 records), shelling (2 records), mines (3 records), torpedo (4 records) and depth charge attack (4 records). This change indicates the changing capabilities and strategies between the World Wars. Although aircraft capable of operating at distances and with accuracies sufficient to realistically target shipping had been introduced this region would have been at the range limits of most German aircraft, and the necessity of flying over mainland Scotland would have made loss rates high. The reduction in losses to U-boat attack in this region reflects the combination of longer operational range of World War II U-boats allowing them to attack in the mid-Atlantic and the necessity of avoiding areas with high concentrations of aircraft and specialist anti-submarine vessels that were available in World War II, and which would have concentrated in the region as part of the Atlantic convoy system (Macintyre 1956).

3.11 NATIONAL THEMES: SHIPBUILDING

3.11.1 Prior to the introduction of steam power, and particularly of metal construction, the shipbuilding industry in Scotland was small, both in terms of the overall capacity of the industry and the size of the vessels produced. Vessels constructed tended to be traditional vernacular boat designs, principally for fishing (Johnman 2008).

3.11.2 The majority of shipbuilding occurred on the east coast, between Aberdeen and the Forth, although the first recorded fully commercial shipyard was opened at Greenock on the Clyde in 1711 (Johnman 2008). With the establishment of the herring fishery on the east coast a prolonged period of innovation in design for vessels engaged in the herring fishery began in the boatyards of the east coast, particularly in Fife.

3.11.3 A number of shipyards were established on the Clyde in the early 19th century, initially building wooden vessels, but by the 1840s these yards were usually working in iron. The screw propeller was rapidly adopted from the 1850s in the Clydeside industry (Johnman 2008). The volume of shipbuilding on the Clyde increased by a factor of 6 over the period 1853 to 1895, partly as a result of local innovation and the rapid adoption of technical innovations from elsewhere.

3.11.4 Shipyards in other areas of Scotland also developed innovative designs and often specialised. Ship designers in Aberdeen made significant improvements to the design of clippers (originally an American vessel type). The absence of clippers from the identified shipwrecks probably reflects the relatively short part of their operational lives they would have spent in Scottish waters in comparison to other vessel types such as coastal trading vessels and trawlers. Dundee specialised in the construction of whalers, and building on this experience, polar exploration vessels, an example of which, *RSS Discovery*, is on the NRHV and berthed as Dundee. It is unknown whether the single identified whaler in the shipwreck record was built in Dundee (see 3.8.20).

3.11.5 It has been noted above in each of the different regional results that the relative dominance of the Clyde area in terms of vessels produced is lower than might be expected, and that this may reflect variations in vessel types produced. This can be illustrated by comparing the numbers and average tonnages of vessels from Glasgow and Aberdeen. Glasgow accounts for 25 build records, as opposed to 19 from Aberdeen. But the average tonnage derived from the shipwreck records varies considerably: the average tonnage for vessels built in Glasgow is 2825, whereas that for Aberdeen is 398. Over half of the build place records for Aberdeen are for fishing vessels, as opposed to less than a sixth for Glasgow.

3.11.6 The shipbuilding industry on the Clyde was undertaken in more places than just Glasgow. The combined count of Clyde built records is 68. The average tonnage of the Clyde built vessels in the wreck record is 2537. The only comparable number of build records in the NMRS for an area is that of Teeside in northeast England, which contributes 45 records, with an average tonnage of 4236.

3.11.7 The Clydeside shipbuilding industry also provides most of the variety in the Scottish built ships in the wreck record. Except for drifters, all of the varieties of vessel built in Scotland have a build record on Clydeside. In addition, some of the varieties are only found being built on Clydeside, including all the records of paddle steamers and metal warships.

3.11.8 Despite the relatively large proportion of Clyde-built vessels in the record, the figures are comparable to expectations based on historical knowledge of the shipbuilding industry. In 1895 28% of the world's tonnage of new shipping was launched on the Clyde; in 1913 the figure was 18% (Johnman 2008). The proportion of tonnage from the Clyde shipbuilding industry from wreck records of known weight and build place is 20%.

3.11.9 In comparison, the wreck records indicate a tendency for other Scottish shipbuilding ports to produce small to middle sized steam ships and fishing vessels. Production of fishing vessels is particularly notable on the east coast of Scotland. Not all the specialities of the Scottish shipyards are to be found in the shipwreck record. Currently there are no clippers known in the shipwreck record, although preserved examples of Scottish built clippers exist: the *City of Adelaide*, noted above and the *Cutty Sark*, currently undergoing restoration in London. The wide variety of different herring drifters may not be fully represented (or are, simply combined under the heading of drifter). A single whaler has been recorded, but its build place is unknown.

3.11.10 Increases in shipbuilding, both in terms of numbers of vessels and overall tonnage of shipping built occurred globally over the period 1850-1950. Within that period British and specifically Clydeside ship building flourished in the late 19th and early 20th centuries. Although the contribution of British shipyards to global shipping tonnage declined both in relative terms and later in absolute terms, the global trend has generally been towards increasing shipping tonnages being built and being in use (Johnman 2008). Despite this there is a reduction in the number of wreck assets built after 1910-1919.

3.11.11 The large number of wrecks of ships built during 1900-1919 may also reflect changes in patterns of maritime activity, as does the previous growth in the number of shipwrecks. The increased rate of shipbuilding was in response to demands for more ships as volumes of trade increased over the 19th and 20th centuries. The patterns of that trade changed over the period. In particular, the volume of coastal trade halved between 1913 and 1928 with increasing amounts of goods being

moved from fewer, larger ports by rail throughout Britain, partly as a response to attacks on coastal shipping in World War I (Moore 2008). (see 3.13.7) Although the total tonnage of ships entering British ports probably increased in the period after World War I, the number of vessels probably decreased as a result of the decline in the coastal trade, and a number of smaller ports would certainly have seen a reduction in trade (Moore 2008).

3.12 NATIONAL THEMES: FISHERIES

3.12.1 Fishing has been a subsistence activity in Scotland since prehistory, and continued as such in many coastal areas into the post-Medieval period. The date at which commercial fisheries in Scottish waters began is debateable, but it has been put as early as the 12th century in Orkney (Simpson *et al.* 2005). Commercial herring fishing is recorded in the Firth of Clyde from the 15th century, with the open seas herring fishery being dominated by the Dutch from this time to the 18th century, using characteristic vessels called 'busses' (Coull 2008b). From the later 18th century commercial fishing expanded, particularly the herring fishery for export, which received government subsidies and quality control. Despite this varied history, no wrecks of fishing vessels have been identified that were built before 1881. The earliest vessel is a drifter, followed by the earliest record of a trawler, built in 1890. Both vessels were lost in the East Scotland region.

3.12.2 Herring was the principle commercial fishery around Scotland from the late 18th, and it continued to be important, particularly for export until World War I, when markets in continental Europe were lost and never recovered (Coull 2008b). Historically the East and North Scotland regions would have been the areas where this fishery was most important. The herring fishery is represented in the shipwreck assets by the drifters, vessels specifically built for this fishery. There are 14 records of vessels of this type, half of them in the East Scotland region. In addition, 8 of the vessels in the Aberlady ship graveyard appear to be sailing drifters (Canmore IDs **268127-268134**). This collection of late 19th century fishing vessels has been scheduled. These records in part reflect the economic orientation of this region towards the North Sea. There are 6 drifters from the East Scotland region in the Scottish section of the NRHV, including specialist local variants from Fife: Fifies and Zulus. There is only 1 drifter wreck recorded in the North Scotland region which is perhaps less than might have been expected given the importance of the Shetland herring fishery (Coull 2008b). Vessels on the NRHV help to illustrate this importance: 2 herring drifters built in Lerwick are included in the Scottish section of NRHV.

3.12.3 The Shetland herring fishery and the East Anglian herring fishery both generated high demand for seasonal labour in processing the fish for curing and packing. This caused large scale temporary migration from Scotland. The migrants were largely young single women. Those in Shetland tended to stay at particular shore stations for the duration of the fishing season, with so many Scots staying at Gremista, near Lerwick in Shetland, that it was nicknamed 'Scotland Point' (Bochel 2008). Those working on the east coast were more mobile, shadowing the progress of the herring fleet southwards down the English coast (Coull 2008b). The majority of those following the fleet seem to have used rail transport, in contrast to many of the seasonal migrants elsewhere in Scotland (see below).

3.12.4 White fish had been caught commercially, usually to be sold cured, since the medieval period. The advent of trawling combined with the building of the railways allowed the domestic fresh white fish market to expand greatly in the later 19th century (Coull 2008a). As has been noted above, Aberdeen became Scotland's

most important port for white fish, but the trade was widespread and important, as can be seen from the large number of records for trawlers from all round Scotland: 78, including 2 requisitioned trawlers registered in Scotland.

3.12.5 Given the disparity in the relative importance of the trade in herring and white fish (herring landings were at least 80% greater in 1913) the predominance of trawlers over drifters appears anomalous. Possible explanations include the relative dominance of white fishing after the collapse in the cured herring market at the outbreak of World War I, trawlers spending more time in Scottish waters, in comparison with much of the herring fleet that spent considerable periods fishing off East Anglia, and possibly the generic use of the term 'trawler' to mean a fishing boat: it is conceivable that some of the reports of sunken trawlers may include other types of fishing vessels.

3.12.6 The whale fishery in the north Atlantic and Arctic, referred to as the 'northern fishery,' was also exploited by vessels from Scotland, tentatively developing from the 17th century, growing to a significant force in whaling by the beginning of the 19th century. The principal Scottish ports involved initially were Aberdeen and Dundee, with Peterhead becoming perhaps the most important Scottish whaling port by the mid to late 19th century (Sanger 2008). From the last part of the 19th century the impact of overexploitation on the northern fishery brought a rapid decline in the whaling industry in Scotland. A single shipwreck record that is potentially of a whaler has been found in Scottish waters (3.8.20). Little is known about the vessel, some of the records referenced on Canmore suggest that the vessel is in poor condition. The relative scarcity of this vessel type may be explicable in the pattern of use: most whalers would have spent most of their time at sea outside of Scottish waters, thereby minimising the chance of such vessels sinking off Scotland's coast.

3.13 NATIONAL THEMES: TRADE

3.13.1 The main shipping routes derived from the shipwreck asset data, mostly concerning trade, are shown in Figure 11. The varying line thicknesses attempt to depict the relative frequency with which the different route components occur in the shipwreck record in the NMRS.

3.13.2 King David I encouraged Scottish merchants to engage in foreign trade during the 12th century, and the creation of royal burghs was in part an attempt to both stimulate and regulate such trade (Moore 2008). Those royal burghs that tended to prosper through the medieval period were those that attracted foreign trade (Hewitson 2004). The volume of trade in which Scottish merchants engaged slowly increased, with much foreign trade of Scottish goods being undertaken in Scottish owned vessels from the 15th century onwards (Moore 2008).

3.13.3 Despite the historical evidence, there is no definite evidence in the shipwreck records of maritime trade with Scotland until 1812. Earlier vessels engaged in trade are known in the shipwreck records, but despite being lost in Scottish waters these vessels were not trading to Scottish ports. For the most part they are East Indiamen, from the Netherlands, Denmark and Sweden, sailing for destinations in the Indian and Pacific Oceans.

3.13.4 That the East Indiamen wrecks are all found in the North Scotland region points to a finding of the regional characterisations. Some regions have trade directed at them; others have it simply passing through. It is particularly true of the North Scotland region that vessels engaged in international trade that were lost in the region were simply moving through the area, rather than trading with it. This is also partly true of

the West Scotland region. By contrast the East Scotland and Southwest Scotland regions both have international trade occurring at ports within the area of the respective regions.

3.13.5 The Southwest Scotland and East Scotland regions can effectively be seen as principally participating in particular economic provinces. In the case of Southwest Scotland, this is the Irish Sea, and the main economic activity was trade. Further links to the Irish Sea as a route were formed through fishing: trawlers from north western England, particularly the port of Fleetwood, occur among the shipwreck assets in the region. Other areas were also engaged by trade: some to the West Scotland, particularly the Western Isles, and some to the Americas, although more of the trade to the Americas is simply passing through the region, *en route* from other parts of Britain or northern continental Europe.

3.13.6 The East of Scotland principally participated in the economic province of the North Sea, both in terms of foreign trade to continental ports on the North Sea and Baltic, but also to ports on the north eastern coast of England. The participation in this province from the East Scotland region also involved fishing, particularly for herring, but also white fish. Other areas bordering on the North Sea were also engaged in fishing as well as trade: a number of ports found in the wreck records for ports of departure/destination for trading vessels are also the build ports or registration ports for fishing vessel wrecks located in the East Scotland region.

3.13.7 The coastal trade played an important part in the Scottish maritime economy, but declined due to increased transport of goods by road and rail. This decline was in part stimulated by World War I and German attacks on the coastal trade, particularly in the North Sea (Moore 2008). This change in the pattern of trade is not reflected in the shipwreck asset records. No secular trend can be seen in the records in any of the regions in terms of numbers of voyages for coastal trade as a percentage of total voyages with known ports of destination and departure. Any such decline would be likely to have an attenuated impact on the records of the North Scotland and West Scotland regions. The coastal trade in these regions is dominated by moving goods to and from the Northern and Western Isles respectively and therefore would have been less affected by changes in the land transport infrastructure of the British mainland.

3.13.8 The relationship between maritime activity and rail transport was not necessarily purely a competitive one. As well as situations where rail transport was not feasible, such as carrying goods and passengers between the islands and the mainland, rail transport was important in facilitating maritime activities, particularly in the rapid distribution of highly perishable goods such as fresh fish.

3.13.9 The recorded cargoes are highly disparate, but a number of trends can be seen. The single most frequently recorded cargo is coal (61 records). It was carried over a variety of distances, by a variety of different types of vessels. The variable scale of the trade can be seen by the lowest and highest gross registered tonnages among the vessels recorded as losses with cargoes of coal: 27 and 2888 respectively. The smaller vessel was carrying coal from Glasgow to the Western Isles; the larger vessel from Burntisland in Fife to London. The earliest Scottish vessel in the shipwreck records, the *Caledonia* (Canmore ID **202257**) was carrying a cargo of coal when it sank in 1812. The ubiquity of coal as a cargo reflects the concentration of records in the 1850-1950 period, when industrialisation led both to great demands for the use of coal in industry and stimulated the use of coal as a domestic fuel. The economies of the developed world were largely coal driven over this period. The

process of this changing can also be detected in the shipwreck records, with the first shipwreck recorded to have been carrying oil recorded in 1916.

3.13.10 The second most commonly listed cargo is 'general', with 57 records. This reflects the practice of carrying relatively small loads of a variety of goods. This approach has been argued to be associated with coastal trade rather than transoceanic trade, and particularly with 'tramp' steaming, where small cargoes of specific goods can be sold wherever there is a suitable market and replenished with different local goods (Gould 2000). This argument does not appear to be completely borne out by the shipwreck records: many general cargoes are recorded on transoceanic routes.

3.13.11 Other trends in the shipwreck data can be related to the economic changes that Britain was undergoing during the period 1850-1950. Industrialisation was accompanied by population growth that outstripped Britain's agricultural capacity during this period. Imports of food, animals and animal fodder account for 21 records. The only exported 'foodstuff' from Britain is alcohol, particularly whisky (4 records), including one of Scotland's most famous wrecks SS *Politician* (Canmore ID **102481**). The absence of cured fish as an export is notable, considering the importance of the fishing industries and the trade in cured herring.

3.13.12 Other imports include raw materials (other than coal) and partly processed materials for industrial processes, such as jute, nickel ore and pig iron (22 records). Exports include a variety of manufactured goods (5 records). This pattern is consistent with Scotland's role as part of Britain's manufacturing base.

3.14 NATIONAL THEMES: MIGRATION

3.14.1 Migration is a central issue in Scotland's maritime history. Migration could mean permanent emigration, usually either to North America or Australia, but it might also mean short term migration of a few years' duration, or even seasonal migration (Moore 2008). Seasonal migration by sea was common from the Hebrides and even parts of the western Highlands, particularly with the advent of the steamship, beginning as early as the 1820s (Meek 2009). Young women working in the herring industry in the Northern Isles (see above) often travelled direct from the Hebrides to the Northern Isles (Meek 2009). This variety of migration is difficult to detect in the shipwreck records. Many of the vessels involved would have been small, relatively general purpose vessels. Unless such a vessel was lost while actually carrying large numbers of migrant workers, which is relatively unlikely as such journeys would only have formed a small proportion of those undertaken, and this fact was recorded, the connection of such vessels with the transport of migrants is unlikely to be apparent.

3.14.2 A similar issue surrounds the movement of short term or permanent emigrants (the division of the categories is not easy: one form of migration might easily change into the other according to the migrant's circumstances). Despite high numbers of emigrants, reaching 23,000 per annum in the 1870s, leaving from Clydeside (Moore 2008) there are no unequivocal records of an emigrant ship in the shipwreck record. The vessels involved in the early stages of emigration, typically carrying migrants from the Western Highlands and Western Isles to Glasgow, would be as problematic to identify in the shipwreck records as those carrying seasonal migrants. Only 1 loss is recorded as being a transoceanic passenger vessel, the *New York* (Canmore ID **115279**), carrying 220 passengers (Baird 1995). It seems likely that a steamship carrying this number of passengers to New York at this date (1858) was at least carrying a proportion of emigrants. Another vessel that would have been involved in, albeit relatively limited, emigration would have been the *City of Adelaide*, on the NRHV, currently located at Irvine.

3.14.3 Accounts concerning migration with regard to maritime or transport history tend to concentrate on migration from Scotland's rural areas – urban areas tend to be mentioned principally as ports of departure. Significant immigration into Scotland's urban centres, both from the Scottish Islands, and from areas beyond Scotland, notably Ireland and Italy, also took place during the period from which most of the shipwreck records date. Such migrations are as difficult to spot in the shipwreck record as the migrations of those leaving Scotland.

3.15 NATIONAL THEMES: NAVAL ACTIVITY

3.15.1 Specialised sailing warships started to appear in north western Europe from the 15th century (Kemp 2000). James IV started building a navy sufficient to project Scottish power beyond home waters, including galleys and a small number of 'great ships', the first of which was launched in 1505. After his death in 1514, this navy fell into disuse: at least one of the great ships, *The Great Michael*, was sold. Scotland had virtually no permanent naval vessels from around the middle of the 16th century until the late 17th century, when three small men of war were commissioned from English shipyards in 1696. During the later 17th century Scotland was obliged to levy set numbers of seamen to man English Royal Navy vessels (Lavery 2001).

3.15.2 There was some naval activity in Scottish waters, reflected in the wrecks of the *Swan* and *Dartmouth* (Canmore ID **102424**) in the Sound of Mull and by Mingary Castle (Canmore ID **167515**). These wrecks reflect at least some of the main aspects of the naval activity around Scotland, the playing out of national conficts through local feuds (the Mingary Castle wreck), supporting the suppression of resistance to centralised authority (the role of the Swan) and attacks on centres of Jacobite activity (the Dartmouth). Naval patrols around the coast would also have been common until some time after the 1745 rebellion, looking to intercept or ward off vessels sailing in support of the Jacobites and their foreign allies.

3.15.3 After the suppression of the Jacobites, naval activity would have been restricted to patrols during various wars, particularly against France. During periods of war vessels operating in convoy would have passed through Scottish waters, as would their potential attackers: Sir Walter Scott records seeing an American naval vessel in the Pentland Firth, probably attempting to intercept a convoy to Russia (Graham 2007). Levels of naval activity would, however, have been minor in comparison with the those based in England and engaged principally against France, Spain and the Netherlands.

3.15.4 After the ships of the Royal Scottish Navy were absorbed into the English Royal Navy to form the British Royal Navy at the Act of Union, the Royal Navy had relatively little in institutional terms to do with Scotland. No naval vessels were built in Scotland until the mid 19th century, partly a reflection of Scotland's poorly developed shipbuilding industry until the advent of first steam propulsion, and then metal hulled ships (Moore 2008).This situation is reflected in the wreck record, where there are no positively identified Scottish built warships until *HMS Argyll* (Canmore ID **121118**), launched at Greenock in 1904, and wrecked in 1915.

3.15.5 Naval rivalry with Imperial Germany led to naval strategists identifying the desirability of establishing a naval base on the northern North Sea. Rosyth was selected and work began in 1909. The base was not complete at the outbreak of World War I, although elements of the Home Fleet were based there and further up the Forth: *HMS Campania* (Canmore ID **96655**), the first aircraft carrier in the world was based there and lost after it dragged its anchor and collided with another vessel. This wreck is protected under the PWA 1973.

3.15.6 As a result of Rosyth being unfinished at the beginning of World War I, Scapa Flow was adopted as a base, and became the main base for the Home Fleet until after World War II (Lavery 2001). Additional Naval facilities were improved at the anchorage of Invergordon during World War I, and on the Clyde in terms of protected anchorages near Greenock, principally for anti-submarine convoys, and the construction of new naval bases at Faslane and Gareloch. These were mostly used for troop and equipment shipping, during World War II. Loch Ewe also had facilities built, and was an important point for the marshalling of convoys.

3.15.7 Traces of these naval facilities are not always immediately apparent in the shipwreck records. This is partly due to a lack of available route information for warships. Cargo ships servicing these bases are noted, however, often delivering fuel and sometimes transporting other goods such as munitions and medical supplies.

3.15.8 The place in which the shipwreck assets most clearly relate to naval activity is Scapa Flow. Scapa Flow had been an anchorage used by the Home Fleet during its annual tour round Britain in the later 19th century. As the hurriedly selected base for the Home Fleet, the anchorage needed significant improvement. The aspect of improvement that has left the clearest trace in the shipwreck records is the large number of obsolete ships brought from all over Britain and scuttled as blockships in many of the narrower channels for defensive purposes. This was undertaken in both World War I and World War II. In restricting the channels the main purpose was to make it more difficult for enemy vessels, particularly submarines, to penetrate the anchorage. Boom defences, some shore fixed, some operated by auxiliary vessels were also put in place: the probable wreck of one of the boom defence vessels, HMS Strathgary, of World War I has been located (Canmore ID **102243**). In some instances enemy vessels were caught in these defences: U116 (Canmore ID **102250**) was caught in the shore-controlled mine field that formed part of the defences and sunk. These defences were not fully capable of preventing such attacks. An attempted attack in 1914 by U-18 ended with the submarine sunk by being rammed by an armed trawler as it attempted to leave Scapa Flow having found the capital ships of the Home Fleet were not in the anchorage. In 1939 the veteran battleship HMS *Royal Oak* (Canmore ID **102373**) was sunk with heavy loss of life by a U-boat that had penetrated Scapa Flow. The wreck is protected under the PMRA 1986. This sinking led to further attempts to control access to the base, initially by sinking more block ships, well represented in the shipwreck record, and then by the construction of the Churchill Barriers.

3.15.9 The naval vessels at Scapa Flow represent the largest accessible concentration of warship shipwrecks in European waters, and possibly in the world: only a few locations in the Pacific have similar numbers of military wrecks.

3.15.10 The sinking of blockships has potentially created a significant resource in terms of sunken vessels. The shipwreck records contain 20 blockships from World War I and 17 from World War II. It should be noted, however, that the majority of the records indicate that the vessels are in poor condition, having been dispersed with explosives in order to reopen blocked channels at the cessation of hostilities.

3.15.11 Shipwrecks are not the only asset class that reflect Scapa Flow's naval history. The boom defence in Clestrain Sound is one example (Canmore ID **102325**). Other elements of infrastructure recorded in the area include a pontoon and a 'dolphin', a type of mooring stage.

3.15.12 There are no located aircraft wrecks within Scapa Flow, but there are a number of recorded losses of aircraft, particularly associated with World War II.

3.15.13 Although they lie outside of the remit of the report, it is worth noting the range of coastal military installations for the defence and running of Scapa Flow that are in the NMRS, particularly those built during Rearmament and WWII.

3.15.14 It is perhaps ironic that most of the best known warships associated with Scapa Flow are not British (the exception being *HMS Royal Oak*), but German. The NMRS has records of 12 shipwrecks, the scuttled remains of the Imperial German High Seas Fleet that had been interned at Scapa Flow at the end of World War I. Of these, 4 cruisers (Canmore IDs, **102301**, **102314**, **102315**, **102307**)and 3 battle ships (Canmore IDs, **102305**, **102311**, **102310**) are scheduled monuments protected under the AMAAA 1979.

3.15.15 Shipping in wartime does not purely involve naval vessels, nor is simply about engagements between naval vessels. Scotland's role in the convoy systems of the world wars should also be noted, and is evidenced in the shipwreck record by vessels associated with the defence of convoys, such as the escort carrier HMS *Dasher* (Canmore ID **102679**), now protected under the PMRA 1986, and the destroyer HMS *Ludlow* (Canmore ID **102112**), and the merchant vessels being protected, such as the tanker *Gretafield* (Canmore ID **101970**) torpedoed in convoy HX18 (one of the North Atlantic convoys), or *Ashbury* (Canmore ID **101961**) that ran aground in convoy WN67, one of the convoys between the Clyde and Methil or the Forth.

3.15.16 It is worth noting that despite Scotland's involvement in many conflicts (including internal ones) the wreck record only contains losses to military action associated with the world wars. While the earlier wrecks of the Wrangels Palais and the wrecks in the Sound of Mull and at Mingary Castle were engaged in naval activity at their time of loss, their losses are attributed to accidental causes.

4 CONCLUSIONS

4.1 DATA QUALITY

4.1.1 The current inventory of marine archaeological assets is dominated by a single asset class: shipwrecks. This reflects 2 main effects:

- The historic effect of an emphasis on shipwreck archaeology: aviation archaeology and the study of submerged prehistoric landscapes are comparatively recent disciplines;

- The probable real frequency of different classes of marine archaeological assets.

In addition, the inheritance effect of UKHO records forming the core of the maritime section of the NMRS will have tended to mean that not only are the records dominated by shipwrecks, but that they are dominated by the wrecks of the period after 1850. The main criteria for categorisation as 'maritime' in the NMRS is involvement with maritime transport: there may be some records of assets in marine settings that are not strictly 'maritime' and may not have been found in the course of the work and therefore have not been included within the study. The actual number of surviving shipwreck assets, known and unknown, probably exceeds the number

of assets in the other main classes. Submerged prehistoric archaeological sites are most likely to date to the Mesolithic, a period mostly characterised by relatively low population densities and a generally ephemeral material culture. There are likely to be exceptions to this in some regions: Orkney may also have submerged Neolithic sites, and given the extensive use of stone building for both domestic and monumental sites on the islands, such sites might be quite substantial. Aircraft wrecks essentially date to a particular short period of history (World War II) and are often fragile, so total numbers of surviving sites will be relatively low.

4.1.2 The small number of records of infrastructure in the maritime section of the NMRS examined for this study reflects the location of the majority of marine infrastructure in onshore coastal locations. The NMRS has a considerable number of records of such records, e.g. for onshore lighthouses.

4.1.3 Shipwreck assets are dominated by vessels from the period 1850-1950. Relative to the historically recorded shipping of the era operating in Scottish waters, the shipwreck records are probably biased toward vessel types that spent more time in Scottish inshore waters or were frequent users of Scottish ports, such as fishing vessels and coastal traders, as opposed to vessel types that spent longer proportions of their operational times out of Scottish waters and perhaps visited Scottish ports less often, such as vessels engaged in long distance trade or whalers.

4.1.4 The bias towards the period 1850-1950 reflects 3 effects:

- The inheritance effect of the UKHO records forming the core of the shipwreck records of the NMRS, due to the increasing role of the UKHO in recording wreck positions as part of their duties;
- The greater ease with which metal ships, forming an increasing part of shipping from the 1850's, are detected and the greater hazard that they present to shipping, resulting in greater visibility in the record;
- A preservation bias, as these are the most recent wrecks, and that the metal construction of many of the vessels will give greater durability as an upstanding structure;
- The record may also reflect more ships being built and operating in Scottish waters in this period than any previous period of history;

4.1.5 Although the majority of vessels are either of Scottish origin or engaged in activities centred on Scotland, vessels engaged in international activities are also part of the marine archaeological assets within Scotland's seas.

4.1.6 This last point is reflected in the shipwreck assets that are protected by law, particularly those protected under the Protection of Wrecks Act (1973). These vessels tend to be warships or armed merchant vessels, and of these, with the exception of *HMS Campania,* date to the 17th century. Vessels built in Scotland and engaged in activities more typical of the maritime history of Scotland are very poorly represented in the current PWA designations.

4.1.7 A significant proportion of shipwreck assets have very little information recorded about them in published or official sources. It may be anticipated that many of the records will be enhanced in the future, as well as previously unknown shipwrecks added to the record.

4.1.8 Many of the shipwrecks with little published information available have been visited by recreational divers. It is likely that considerable amounts of information about these assets exist within the recreational diving community.

4.2 THE MARINE ARCHAEOLOGICAL RESOURCE

4.2.1 The marine archaeological asset record does give some insight into maritime activity around Scotland, particularly in the period 1850-1950. There are a number of types of asset that are effectively missing or poorly represented in the marine record. Key types of asset include:

- Submerged prehistoric landscapes
- Small vernacular vessels of all periods
- Wooden vessels of all periods
- Scottish built, registered or owned vessels pre-1812
- All vessels pre-16th century.

There are probably some limited coastal or terrestrial assets that partly relate to these types, for example old land surfaces being exposed through coastal erosion or found during coring such as in the Montrose Basin (Smith and Cullingford 1985) in the case of submerged prehistoric sites, and in the case of pre-16 century vessels the small number of Viking ship burials known in Scotland, including Scar on Orkney and Ardnamurchan, as well as the log boat finds, the remains of a possibly medieval vessel unearth during excavations in Perth in 1828 and fragments of Norse vessels recovered from Eigg and Skye (Mowat 1996).

4.2.2 As the potential for the existence of submerged prehistoric landscapes has only been identified relatively recently it is not strange that very little evidence has been of this type of asset has been recorded to date. The growing awareness of this class of asset and the increasing development of the seabed, particularly with regard to offshore renewable energy and the associated infrastructure this industry will require means that it is highly likely that significant evidence will be recovered in the near future.

4.2.3 Such development, as well as other more traditional exploitation of marine resources, are going to result in further discoveries of marine archaeological sites. These discoveries will probably result over time in the discovery of sites that belong to the missing categories above. Given Scotland's long maritime history it is unlikely that such sites do not exist.

4.2.4 Although there are no Scottish built or registered vessels before 1812, there is a significant international assemblage of early modern sailing vessels within Scottish waters, including East Indiamen and warships. Of the 16 wrecks in this category 6 are already protected under the PWA 1973. Of particular note is the well preserved lower part of a wooden vessel on Fuday, in the Sound of Barra, probably of Dutch origin, dating from 1500-1650, and exhibiting a number of features of interest in the evolution of ship building in north-western Europe (Canmore ID **128643**). Such vessels can have particular value as they often have relatively few documents associated with their construction, and so they are often the only effective source of information about the shipbuilding techniques of the time.

4.2.5 The first well dated Scottish built vessel with a recorded wreck location is a steam powered vessel PS *Comet* (Canmore ID **102442)**, one of the world's first commercially successful steam driven passenger vessels. In addition a well preserved vessel of late 18th or early 19th century date, possibly the *An Dubh Gleannach,* found at Galmisdale Bay, Eigg, with possible associations to the Gaelic poet Alasdair McKinnon (Canmore ID **213713**) is known. There are also the wrecks of many sailing vessels built after this date in Scottish waters. Even in the early to mid 19th century documentary evidence for shipbuilding techniques used on specific vessels are not necessarily very comprehensive, particularly for smaller vessels. Such wrecks are an important resource in understanding the later evolution of shipbuilding. Notable examples include *Elizabeth McClure* (Canmore ID **112892**), built in 1848, *Duncan Dunba*r (Canmore ID **147438**), built in 1841 and *Zouave* (Canmore ID **147359**), built either in 1856 or before 1824.

4.2.6 There is also a significant resource of later commercial sailing vessels, particularly schooners and barques, many of the latter being metal hulled. Although this class of vessel is sometimes regarded as a technological dead-end in the face of the competition from steam power, these vessels formed an important element in the merchant fleet, both for international and coastal trade and should therefore be considered of historical importance. Many of the examples appear to be broken up, and in other cases the condition is unknown. One example that may be in better condition is *Lady Isabella* (Canmore ID **112255**), an iron hulled barque built in 1882 in Dumbarton and registered in Glasgow.

4.2.7 Relatively few of these later sailing vessels appear to have been built in Scotland. This perhaps reflects the speed with which the shipbuilding industry in Scotland developed, and the use it made of new technologies, often developed in Scotland. The shipbuilding industry on the Clyde is well represented in the marine archaeological resource in Scottish waters, and given its international predominance in the later 19th and early 20th centuries is also likely to be well represented in the marine archaeological resource of many other countries. Examples of ships built at various points on the Clyde whose wrecks are recorded as being in relatively good condition include: the iron hulled steamship *Kintyre* (Canmore ID **102741**), built 1868 the steel hulled passenger ship *Rowan* (Canmore ID **101680**) built 1909, HMS *Breda*, a requisitioned steam yacht, (Canmore ID **102671**) built 1912, and *Clan Mackinlay* (Canmore ID **101995**) built in1918. Paddle steamers and puffers, ship types with particularly strong connections with the Clyde and the west cost of Scotland, are also represented, with *Iona I* and *Logan* already noted as good examples.

4.2.8 The Sicar Point anchors (Canmore ID **151710**) have been noted above. Although isolated finds are known around Scotland's coastline, this group probably constitutes the oldest notable assemblage of offshore artefacts currently known in Scottish waters. The survival of this assemblage is a good example of the type of material that could be preserved elsewhere in Scottish waters.

4.2.9 The very large number of shipwrecks with a recorded location but little or no further information has already been noted. It is likely that much information about such sites already exists among sea-users, particularly the recreational diving community. Outreach and engagement with sea-users may provide an effective means of enhancing our knowledge of the surviving resource and its significance. Such engagement would not only improve our understanding with regard to shipwrecks: the aircraft wreck record is also likely to be considerably enhanced in this way.

4.2.10 Currently there is little direct archaeological evidence representing submerged prehistoric sites around Scotland's coast. Where relative sea-level change models exist, they are based on palaeoenvironmental data, and artefacts such as the stone axe-head found during dredging on Shetland strongly suggest that such landscapes do survive. The potential for submerged landscapes to contain well preserved early prehistoric material should be noted: although the evidence for such sites is less readily apprarent to the untrained observer, with relatively low-levels of outreach and engagement sea-users can be primed to look for such evidence as they go about their own activities: the successes of the BMAPA recording protocol employed for marine aggregate dredging in English waters demonstrates this (e.g. WA 2011).

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APPENDIX I
BUILD PLACE

Build Place	Build Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Aberdeen		7	1	1			
Alloa				1			
Barrow-in-Furness		2	2		1		
Belfast		2	1				
Beverley		2	1				
Birkenhead		1					
Bowling		1					
Bremen		1					
Burntisland				1			
Christiania		1					
Clydebank		1					
Dundee		1	1	1			
Fredrikstad			1				
Glasgow		5					
Govan		1					
Grangemouth		1					
Greenock		1		1			
Grimsby		1					
Hamburg			1				
Hartlepool		1					
Helsingors		1	1				
Hessle		1					
Hoostland			1				
Hull		2	1				
Irvine		1					
Kolding				1			
Leith		3	1				
Maryport			1				
Middlesbrough		2					1
Nantes		1					
New York				1			
Newcastle-Upon-Tyne		3					1
Paisley		2					
Peterhead						1	
Philadelphia			1				
Pictou					1		
Porsgrunna		1					
Port Glasgow		2	1				
Portsmouth				1			
Renfrew		1					
Selby		3	1				
South Shields		1	2	1			
Stettin			1				
Sunderland		6	1	1			
Troon		1					
Tvedestrand		1					
Tyneside			1				
Wallsend-On-Sea			1				

Build Place by Build Period, East Scotland.

Build Place	Build Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Aberdeen		6	1		1	1	
America (unspecified)				1			
Amsterdam	1						
Archangel	1						
Baltimore					1		
Barrow-in-Furness		2					
Belfast		2					
Beverley			1				
Bremen		1		1			
Bremerhaven		1					
Buckie			1				
Campbeltown			1				
Chatham		1					
Cherbourg				1			
Clydebank			1				
Copenhagen		1					
Danzig		1	1				
Devonport		1	1				
Dublin				1			
Dundee		3					
Elbing			1				
Elswick		1					
Eyemouth		1					
Germany				1			
Glasgow		7	1				
Gothenburg				1			
Govan			1				
Grangemouth		1					
Greenock		1					
Hamburg			4				
Hartlepool		1					
Helsingors		1					
Helsinki				1			
Hill-on-Tees				1			
Hull		3					
Kiel		1	5	1			
Landskrona						1	
Lubeck				1			
Middlesbrough				1			
Newcastle-Upon-Tyne		2					
North Shields		1	1				
Oscarshamm		1					
Paisley		1					
Port Glasgow		2					
Quebec	1						
Rostock							1
Rotterdam	1						
Sestri Ponente	1						
South Shields	3						
Stettin		1					
Stockholm							1
Stockton-on-Tees		1					
Sunderland		4	2	1			
Troon		1					

Wallsend-on-Tyne			1				
West Hartlepool		9			1		
Wilhelmshaven			2				
Wilmington		1					
Total							

Build Place by Build Period, North Scotland

Build Place	Build Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Barrow-in-Furness					1		
Beverley		1					
Birkenhead				1			
Bowling		2	1				
Bremen			1				
Campbeltown		1					
Clydebank		1					
Dublin				1			
Dumbarton		1					
Dundee		3					
Flensburg				1			
Glasgow		5	1	1			
Gothenburg					1		
Greenock		1					
Hoboken					2		
Kerity		1					
Maryhill		1					
Middlesbrough		1		1			
Newcastle-Upon-Tyne		1					
Paisley		1					
Philadelphia		1					
Port Glasgow		1	1				
Renfrew		1					
Rothesay		1					
Rutherglen		1					
Selby					1		
South Shields		1	1				
Southampton		1					
Sunderland		1					
Westerbroek						1	
Wilhelmshaven					1		
Workington		1					
Total							

Build Place by Build Period, South West Scotland

Build Place	Build Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Aberdeen			1				
Alloa		2					
Baltimore					1		
Barrow-in-Furness		3					
Belfast		3		2			
Bergen		1					
Beverley				1	1		
Bowling			1				
Carlskrona		1					
Cork		1					
Cram		1					
Dublin		1					
Dumbarton		2					
Flushing			1				
Glasgow		4	1		1		
Gothenburg		1					
Govan			1				
Grangemouth				1			
Greenock	1	2					
Hamburg					1		
Haverton Hill				1			
Helsinfors		1					
Hoboken		1					
Kiel					2		
Liverpool		1					
Mediterranean							1
Middlesbrough		3	2				
Minnesota				1			
Nantes		1					
Newcastle-Upon-Tyne		5	2	1			
Northwich					1		
Osaka				1			
Port Glasgow	2	2		1			
Portsmouth	1						
Renfrew		1					
Shiedam				1			
Selby				1			
Sjotorp		1					
South Shields			1	2			
St Monan's				1			
Stornoway				1			
Sunderland		3	1				
Tampa			1				
Vegesack			1				
Wales		1					
Wallsend-on-Tyne			1				
Waterhuizen				1			
Wivenhoe			1				
Total							

Build Place By Build Period, West Scotland

APPENDIX II
VESSEL TYPE

Vessel Type	Build Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Aircraft Carrier		1		1			18
Balloon Barrage Vessel							1
Barge							13
Barque		1					1
Boat							10
Bucket Dredger	1						1
Craft		2	1	2	1		250
Cruiser		4					
Destroyer		2	1	1			1
Drifter		2					6
Fishing Vessel							4
Ketch		1					1
Landing Craft							2
Lighter							1
Lugger			1				
Midget Submarine					1		
Minesweeper		1					
Motor Torpedo Boat							1
Passenger Vessel							2
Patrol Boat							2
Schooner	1	1		1			1
Ship		2		1			5
Smack							1
Speedboat							1
Steamship		38	5	11	1		21
Submarine		1	3		1		6
Tank Barge							1
Tanker		3		3			1
Target Craft							3
Trawler		12	12	1	1	1	
Tug			1				
Yacht			1				

Vessel Type by Build Period, East Scotland

Vessel Type	Build Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Barge			1				6
Barque	1	3					
Battleship		3	4				1
Craft		4		1			81
Crane barge							1
Cruiser			5				
Destroyer			7				
Drifter		1	1				1
East Indiaman	6						
Fishing Vessel							2
Hulk							1
Minesweeper		1					
Motor Vessel				4			1
Motor Torpedo Boat							4
Paddle Steamer		1					
Passenger Vessel		1					
Pink	1						
Schooner		2					
Sloop				1			
Steamship		28/48	2/3	12/16	2		3
Submarine		2	3				2
Tank Barge							
Tanker		1	0/1	0/1			0/1
Target Craft							
Trawler		8	4	3		1	4
Warship	3						1
Whaler		1					1
Yacht							1

Vessel Type by Build Period, North Scotland

Vessel Type	Build Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Aircraft Carrier					1		
Barge							6
Barque	1	4					
Brigantine	1						
Craft		1		1			121
Crane barge							
Cruiser		1					
Degaussing Barge							1
Dredger							1
Drifter		2					1
Fishing Vessel							1
Landing Craft					2		
Lifeboat							5
Lighter		2					
Lugger		1					
Motor Fishing Vessel		1		1			3
Motor Vessel		1	1			1	1
Paddle Steamer	1	2					
Paddle Tug		1					1
Puffer		1		1			2
Schooner	1	3					1
Sea Plane Tender							1
Ship							1
Smack		3					
Steamship		42	5	7	1	1	7
Submarine			1	2	2		6
Suction Dredger		1					
Target Craft							1
Trawler		4	2	2			2
Tug		1					2
Yacht		2					

Vessel Type by Build Period Southwest Scotland

Vessel Type	Build Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Barge				1			5
Barque		2					1
Boat							1
Craft		1	1				120
Drifter		2					3
East Indiaman	1						
Ferry							1
Fishing Vessel							1
Hulk		2					2
Ketch		1					
Landing Craft					3		
Lighter							0
Lugger		1					
Midget Submarine					2		
Minelayer					1		
Minesweeper		1					
Motor Fishing Vessel		2		1			3
Motor Vessel				1		1	
Oiler			1				
Paddle Steamer	3	4					1
Puffer							1
Schooner		1					
Ship			3				1
Smack		1					1
Steamship		36	12	13	5		14
Submarine					3		3
Tanker		1		2	1		
Target Craft		1					
Trawler		3	4	2	2		16
Tug		1					
Warship	2						
Yacht		1					

Vessel Type by Build Period West Scotland

APPENDIX III
CARGO TYPES

Cargo Type	Loss Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Ballast		1	3	4	5	1	
Coal	1	7	7	4	5		1
Construction		1				2	5
Copper					1		
Crude Oil			2				
Sugar				1			1
Cast Iron		2		1			
Ore					1		
General		4	2		7		
Passengers		1					
Pit Props		1					
Groundnuts			1		1		
Herring			1				
Jute			1				
Potatoes				1			
Wood				2	1		
Grain			1		4		
Zinc					1		
Munitions					2		
Fuel Oil					5		
Aircraft parts					1		
Ice					1		
Petrol					1		
Aviation Spirit					1		
Cocoa					1		
Fish					1		
Government/Military Stores					2		
Paper					1		
Fertiliser						1	
Pulpwood					1		

Cargo by Loss Period, East Scotland.

Cargo Type	Loss Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Ballast		2	2	1	5	2	
Coal		1	6	1	3		
Construction	1				1		
Alumina			1				
Crude Oil					1		
Cast Iron	1						
Ore					1	1	
General	6		3	2	1		
Passengers		1					
Barrels			1				
Salt			1				
Herring		1		1			
Phosphate			1				
Wood		2			1		
Grain			2		2		
Copper				1			
Fuel Oil			1				1
Aircraft parts					1		
Petrol					1		
Oilcake			2				
Wood Pulp					1		
Mail				2			
Cotton Seed			1				
Guano			1				
Flax							1
Scrap Metal					1	1	1
Specie/Plate	6						
Lead ingots	1						
Flour			1				
Cotton			2				

Cargo by Loss Period, North Scotland.

Cargo Type	Loss Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Ballast		7	2	3	3		
Coal		7	1	3	1	1	
Construction		4	1	1			2
Frozen Meat			1				
Sugar		1				1	
Cast Iron		1					
Ore		2				1	
General		11	1	1	2		1
Passengers		5					
Charcoal		1					
Wood		1	1				
Cattle						1	
Railway Track		1					
Chemicals		1		1			
Mail		1					
Whisky		2					1
Sacks					1		
Medical Supplies					1		
Esparto Grass		1					
Tobacco					1		

Cargo by Loss Period, South West Scotland

Cargo Type	Loss Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Ballast		5	3	4	5	1	
Coal		5	3	3	2	3	3
Construction		1		1		3	
Agricultural Supplies		1	1				
Non-Fuel Oil			2				
Cast Iron					1		
Ore		1	1				
General		8	1	1	7		1
Passengers	1	1	3				
Locomotives		1					
Salt		1				1	
Dried Fish					1		
Railway Track		1					
Wine		1					
Wood		2					
Grain		1					
Steel					1	1	
Troops			1				1
Fuel Oil			1		1	1	
Munitions					1		
Cattle		3					
Petrol					1		
Oilcake					1		
Frozen Meat					1		
Fish		1					
Mail		1					
Pottery		1					
Ice		1					
Flax			1				
Dolomite					1		
Specie/Plate	1						
Rubber/Latex					1	1	
Military Supplies					3		
Copper					1		
Zinc					1		
Nuts					1		
Cocoa					1		
Whisky					1		

Cargo by Loss Period, West Scotland.

APPENDIX IV
ROUTES

Port of Departure	Port of Destination	Loss Period						
		Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Aberdeen	Methil				1			
Aberdeen	Sunderland			1				
America	Invergordon					1		
Amsterdam	Leith		1					
Antwerp	Grangemouth				1			
Aruba	Grangemouth					1		
Ballina	Methil				1			
Banff	Mickle Ferry				1			
Bathurst	Aarhus			1				
Blyth	Belfast					1		
Blyth	Christiania			1				
Bombay	London					1		
Buenos Aires	London					1		
Burntisland	London			1				
Chittagong	Dundee			1				
Clyde	Firth of Forth			1				
Curacao	Invergordon					1		
Dundee	Leith						1	
Dysart	Aberdeen				1			
Eyemouth	Granton		1					
Ghent	Scrabster						1	
Goole	Aberdeen				1			
Goole	Gothenburg			1				
Grangemouth	Hamburg		1					
Grangemouth	Inverness					1		
Grangemouth	Ipswich					1		
Grangemouth	Norrkoping		1					
Grangemouth	Rosyth					1		
Grimsby	Fredrikshald		1					
Hamburg	Methil				1			
Hull	Aberdeen		1			1		
Hull	Belfast					1		
Hull	Reykjavik					1		
Immingham	Aarhus					1		
Invergordon	Aberdeen		1					
Inverkeithing	London		1					
Ipswich	Leith			1				
Kirkwall	Aberdeen					1		
Leith	Baltimore					1		
Leith	Danzig		1					
Leith	London		1					
Libau	Grangemouth							
London	Auckland					1		
London	Leith					2		
London	Philadelphia					1		
Lossiemouth	Methil					1		
Methil	Bridgwater					1		
Methil	Buckie					1		
Methil	Holm					1		
Methil	New York			1				
Methil	Unknown			1				
Middlesbrough	Grangemouth		2					
Montreal	Leith			1				
Montreal	Newcastle					1		
Montrose	Weymouth				1			
Narvik	Tees					1		

North Shields	Skein			1				
Port Arthur	Unknown			1				
Port Harcourt	Hull					1		
Queensferry	Sunderland				1			
Reykjavik	Hull					1		
Ridham Dock	Burntisland				1			
Rosyth	Aberlady Bay						1	
St Johns	Ridham Docks					1		
San Juan	Tees					1		
Scapa Flow	Invergordon					1		
Scapa Flow	Rosyth					1		
Seaham	Aberdeen			1				
Stockholm	Hartlepool					1		
Sunderland	Banff		1					
Sunderland	Burghead		1					
Sunderland	Portmahomack				1			
Tees	Copenhagen					1		
Thurso	Methil				1			
Transgrund	Grangemouth				1			
Tyne	Boston		1					
Tyne	Scapa Flow			2				
Unknown	Cromarty	1						
Unknown	Dundee		1					
Unknown	Grimsby			1				
Unknown	Scapa Flow					2		

Route by Loss Period, East Scotland.

Port of Departure	Port of Destination	Loss Period						
		Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Adelaide	Vaksdal					1		
Archangel	Brest			1				
Archangel	Dundee							1
Archangel	Kronstadt	1						
Arendal	Brest			1				
Aruba	Nyborg					1		
Ayr	Kirkwall					2		
Balta Sound	Lerwick				1			
Baltimore	Skein			1				
Bengal	Gothenburg	1						
Bergen	Glasgow					1		
Bergen	Liverpool			1				
Britain	St Lawrence River					1		
Calcutta	Leith					1		
Copenhagen	Tranquebar	1						
Curacao	Invergordon							
Dundee	Archangel		1					
Fraserburgh	Siglufjord			1				
Galveston	Christiania			1				
Galveston	Gothenburg			1				
Gothenburg	Taltal				1			
Hamburg	Montreal				1			
Hillswick	Burra		1					
Hommelvik	Ellesmere Port					1		
Iquique	Rotterdam			1				
Kirkwall	Lerwick				1			
Leith	Kirkwall			1				
Lerwick	Tyne					1		
Lisbon	Cadiz	1						
Llannelly	Kristianssand			1				
London	Liverpool					1		
Methil	Haugesand			1				
Methil	Lerwick			1				
Montreal	Newcastle							
Murmansk	Reykjavik					1		
Narvik	Ardrossan					1		
Narvik	Immingham					1		
Newcastle-Upon-Tyne	Slimstad			1				
New York	Ayborg			1				
New York	Copenhagen			1				
New York	Stockholm				1			
Norway	Hull		1					
Paysandu	Copenhagen			1				
Quebec	Liverpool		1					
Rotterdam	Odda					1		
Sarpsborg	Methil					1		
Savannah	Helsingborg			1				
Savannah	Randers			1				
Scapa Flow	Belfast			1				
Scapa Flow	Russia			1				
Scapa Flow	Sullom Voe					1		
Shetland	Amsterdam	1						
Southampton	Shetland			1				
Swarback Minns	Firth of Forth			1				
Texel	Batavia	2						
Texel	Goersee	1						

Tyne	Baltimore					1		
Vancouver	Leith					1		
Workington	Tyne					1		

Route by Loss Period, North Scotland.

Port of Departure	Port of Destination	Loss Period						
		Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Ayr	Sligo		1			1		
Belfast	Ayr		1					
Belfast	Fleetwood			1				
Belfast	Liverpool			1				
Campbelltown	Workington					1		
Dundalk	Ardrossan				1			
Girvan	Creetown				1			
Glasgow	Adrishaig		1					
Glasgow	Baltimore					1		
Glasgow	Belfast		1					
Glasgow	Buenos Aires		1					
Glasgow	Dublin				1			
Glasgow	Hamburg		1					
Glasgow	Limerick		1					
Glasgow	Malaga		1					
Glasgow	Nassau		1					
Glasgow	New York		1					
Glasgow	Oban		1					
Glasgow	Rothesay		1					
Glasgow	Stranraer		1					
Glasgow	Sydney		1					
Glasgow	Tonsberg		1					
Glasgow	Trinidad		1					
Greenock	Campbeltown		1					
Greenock	Gourock		1					
Gourock	Rothesay		1					
Gourock	Unknown		1					
Irvine	Brodick		1					
Irvine	Larne		1					
Liverpool	Clyde		1					
Llandulas	Glasgow		1					
Liverpool	Freetown					1		
Londonderry	Cardiff		1					
Londonderry	Glasgow						1	
Manchester	Glasgow		1	1				
Maryport	Carsethorne		1					
Maryport	Londonderry		1					
Mediterranean	Clyde					1		
Montreal	Glasgow					1		
Neponi	Glasgow		1					
Newport	Glasgow			1				
Newry	Ayr					1		
Oran	Glasgow		1					
Oxelosund	Glasgow						1	
Quebec	Greenock		1					
Rothesay	Falkirk		1					
Rosyth	Firth of Clyde					1		
St Kilda	Fleetwood				1			
Strangford	Silloth		1					
Troon	Larne				1			
Ullapool	Glasgow					1		
Unknown	Clydebank					1		
Wemyss Bay	Rothesay		1					
Workington	Glasgow		1					

Route by Loss Period, Southwest Scotland.

Port of Departure	Port of Destination	Loss Period						
		Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Archangel	Belfast			1				
Ardrossan	Port Ellen						1	
Aruba	Nyborg					1		
Ayr	Port Ellen					1		
Badachro	Unknown		1					
Barry	London					1		
Barry Dock	New York			1				
Bathurst	Liverpool					1		
Belfast	Middlesbrough		1					
Belfast	Rosyth				1			
Belfast	Warkwarth				1			
Buenos Aires	London					1		
Bunessan	Stranraer		1					
Cadiz	Christiansand		1					
Calcutta	Dundee					1		
Cardiff	Sandefjord		1					
Clyde	Northumberland				1			
Copenhagen	Baltimore		1					
Fleetwood	Stornoway			1				
Gareloch	Oban		1					
Glasgow	Gothenburg		1	1	1			
Glasgow	Inverness	1						
Glasgow	North Uist		1					
Glasgow	Port Ellen		1					
Glasgow	Randers		1					
Glasgow	Rhyns of Islay		1					
Glasgow	St Petersburg		1					
Glasgow	Western Highlands		1					
Goole	Belfast					1		
Greenock	Halifax		1					
Greenock	Inverness		1					
Halifax	Liverpool			1				
Halifax	London					1		
Iceland	Copenhagen		1					
Irish Sea	Scapa Flow					1		
Isle of Man	Glasgow						1	
Irvine	Port Ellen						1	
Kyle of Localsh	Stornoway				1			
Larne	Goole						1	
Liverpool	Blyth				1			
Liverpool	New Orleans					1		
Liverpool	New York			1				
Liverpool	Portree		1					
Liverpool	Scapa Flow			1				
Liverpool	Stettin		1	1				
Liverpool	Sydney					1		
Liverpool	Varberg					1		
Loch Broom	Glasgow				1			
Lochmaddy	Portree		1					
London	Bathurst					1		
London	Mombasa					1		
London	New York					1		
Manchester	Freetown					1		
Montreal	Glasgow		1					
Montreal	Ipswich					1		
Montreal	Liverpool		1					
Ness	Stornoway		1					

Netherlands	Batavia	1						
New Caledonia	Glasgow			1				
New York	Glasgow			1		1		
New York	London					1		
New York	Shellhaven					1		
Penarth	Unknown			1				
Pepel	Tees					1		
Philadelphia	Liverpool			1				
Port Arthur	Britain			1				
Porsgrunn	Stornoway		1					
Port Dinorwic	Fraserburgh		1					
Reykjavik	Ardrossan					1		
Russia	Manchester			1				
Scapa Flow	Barry			1				
St Johns	Liverpool		1					
Stornoway	Irvine		1					
Tiree	Larne				1			
Troon	Bunessan						1	
Troon	Skye						1	
Tyne	Hampton Road					1		
Tyne	Wabana					1		
Unknown	Scarinish					1		
Workington	Bonar		1					

Route by Loss Period, West Scotland.

APPENDIX V
ROUTE TYPES

Region	Destination Class	Loss Period						
		Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
East Scotland	Scotland	1	4	2	4	10	2	
	UK		7	7	5	7		
	International, Scotland		5	3	5	4		
	International, UK		2	3		14		
	International			2				
North Scotland,	Scotland	1	1	2	1	3		1
	UK		1	1		3		
	International, Scotland		1	3	1	3	2	
	International, UK		2	6		4		
	International	8		9	4	3	1	
South West Scotland	Scotland		12		1	2		
	UK		13	4	4	3	1	
	International, Scotland		10			3	1	
	International, UK				1	1		
	International							
West of Scotland	Scotland	1	11	4	2	1	6	
	UK		4		5	3	1	
	International, Scotland		3	3	1	3		
	International, UK		4	8		14	2	
	International	1	3					

Route types by Loss Period

APPENDIX VI
PORT OF REGISTRATION

Registration Place	Loss Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Aberdeen		3	5	1	3		
Arbroath		1					
Avoch				1			
Banff		1					
Barrow-in-Furness					1		
Belfast					1		
Bergen			1		1		
Buckie		1					
Christiansun					1		
Cockenzie						1	
Copenhagen		1	1	1	1		
Dundee				1	1	1	
Fleetwood					2		
Fraserburgh				2			
Glasgow		3	4	1	2		
Grangemouth		1					
Granton					1		
Grimsby			6		1		
Harwich					2		
Helsinfors					1		
Hull		1		1			
Jersey					1		
King's Lynn				1			
Kleipata				1			
Leith		1			1		
Liverpool				1			
London		1	6		6		
Methil					1		
Middlesbrough		1					
Milford					1		
Monkwearmouth		1					
Montreal					1		
Montrose				1			
Nantes			1				
Newcastle-Upon-Tyne			1	1	3		
Newport			1				
North Shields		1			1		
Peterhead				1		1	
Porsgrunn		1					
Portgordon				1			
Rotterdam						1	
Sandefjord			1				
Sejro					1		
St Ives					1		
Stockholm					2		
Sunderland				1			
Tonsberg					1		
Whitby							1

Registration Place by Loss Period, East Scotland.

Registration Place	Loss Period						
	Pre-1850	1850-	1914-	1919-	1939-	Postwar	Unknown
Aberdeen		2	2	2	2		
Amsterdam	3						
Belfast					2		
Bergen			3		1		
Bideford					1		
Caen							1
Cardiff			1				
Christiania		1	1				
Copenhagen			1	1			
Dublin					1		
Dundee		1	1				
Fort William					1		
Gestermunde		1					
Glasgow		1	1		4		
Gothenburg	2		1	3			
Grangemouth					1		
Grimsby			1			1	
Hamburg		1			1		
Hartlepool			1				
Haugesand			2				
Helsinfors			1				
Helsingborg			1				
Hull		1	4	1		1	
Irvine					1		
Kirkwall			1				
Kragero			1				
Larvik			1				
Leith					2		
Lerwick				1			
Lillesand			1				
Liverpool		1	2				
London		1	6	1	4		1
Middlesbrough			2				
Newcastle NSW			1				
Newcastle-Upon-Tyne			1		1		
Piraeus						1	
Rouen			1		1		
South Shields			2		1		
Southampton			2				
Stockholm	1				2	1	
Stockton-on-Tees					1		
Tonsberg					2		
Trondheim					1		
Troon						1	
West Hartlepool			1				

Registration Place by Loss Period, North Scotland.

Registration Place	Loss Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Aberdeen					1		
Antwerp					1		
Ardrossan	2						1
Belfast		1	1	2			
Breskens						1	
Campbeltown		1				1	
Dublin			1				
Dumfries		1					
Dundee		1					
Findochty				1			
Fleetwood		3		1			
Fraserburgh				1			1
Gestermunde		1					
Glasgow	1	21	3	4	2		
Granton		1			3		
Greenock		2					
Grimsby					1		
Hull			2				
Liverpool			1	1	2		
London		1	2		1	1	
Lossiemouth				1			
Lowestoft			1				
Mallaig						1	
Maryport		1					
Methil					1		
Middlesbrough		1	2				
Milford					2		
Monkwearmouth		1					
Montreal					1		
Montrose				1			
Nantes			1				
Newcastle NSW			1				
Newcastle-Upon-Tyne		3	3	2	7		
Newhaven				1			
Newport			1				
Newry					1		
North Shields		1			1		
Oslo				1	1		
Peel				1			
Peterhead		1	1	1		1	
Piraeus						2	
Porsgrunn		1					
Port Glasgow					1		
Portaferry				1			
Portgordon				1			
Reykjavik							1
Riga				1			
Rotterdam					1		
Rouen			1		1		
Sandefjord			1				
Scarborough			1				
Sejro					5		
South Shields			2		1		
Southampton		1	2				
St Combs				1			
St Ives			1		1		
St Johns		1			1		
Stavanger			1				

Stockholm	1				2	1	
Stockton-on-Tees					1		
Stornoway		1		1		1	2
Sunderland			2	1			
Tonsberg		1	1		3		
Trondheim					1		
Troon						1	
Washington			1				
West Hartlepool			1				
Whitby		1					1
Whitehaven			1				
Wigtown		1					
Workington		1					

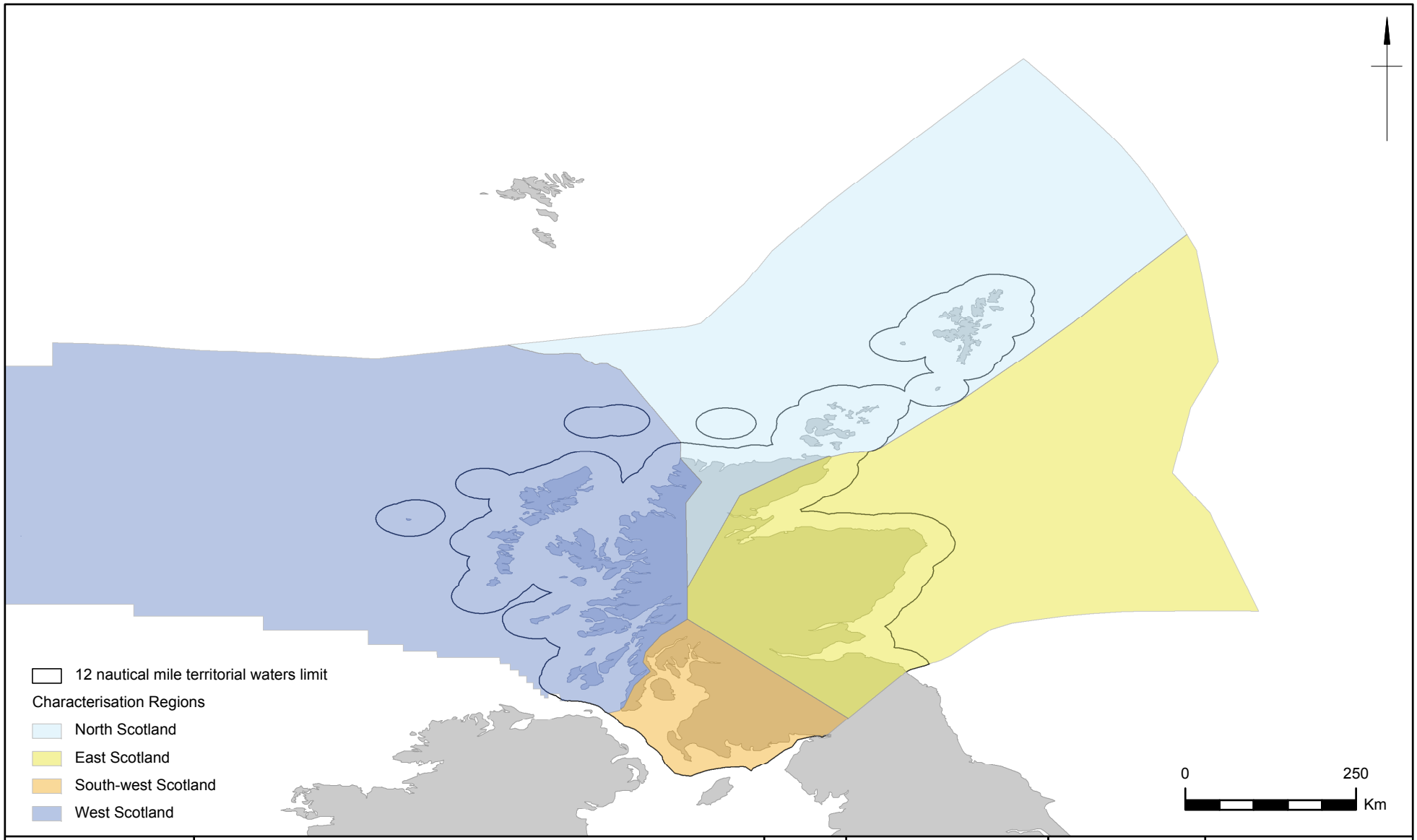
Registration Place by Loss Period, Southwest Scotland.

Registration Place	Loss Period						
	Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
Amsterdam					1		
Antwerp					1		
Ardrossan				1	1		
Barrow-In-Furness		1					
Belfast		1	1	1			
Bergen					1		
Bristol						1	
Caernarvon		1					
Cardiff			1				
Christiania		1					
Copenhagen		2	1				
Drammen			1				
Drogheda		1					
Fleetwood		1		2		2	
Glasgow		9	2	3	2	2	
Gothenburg				1		1	
Granton					2		
Greenock	1	2				1	
Grimsby			1				
Hamilton				1			
Helsinfor					1		
Hull					1	1	
Inverness					1		
Liepaja					1		
Liverpool		2	3		4		
London		1	2		5	1	
Lowestoft					1		
Maryport		1					
Milford					1		
Newcastle-Upon-Tyne		1	1		3		
Oslo				1	1		
Peterhead		1	1				
Riga				1			
Rotterdam					1		
St Combs				1			
St Ives			1				
St Johns		1			1		
Stavanger		1			1		
Stornoway		1		1		1	2
Sunderland			1				
Troon						1	

Registration Place by Loss Period, West Scotland

APPENDIX VII
LOSS CAUSES

Region	Loss Cause	Loss Period						
		Pre-1850	1850-1913	1914-1918	1919-1938	1939-1945	Postwar	Unknown
East Scotland	Abandoned	1			1			2
	Collision		5	2	2	7		
	Foundered		2	3	9	2	3	
	Fire/Explosion			1	1	2		
	Stranded	1	13	3	8	3	2	2
	Scuttled						2	
	Bombed					20		1
	Captured and Scuttled			4				
	Mined			16		11	1	1
	Rammed			1				
	Shelled			1				
	Target practice							1
	Torpedoed			5	1	11		2
North Scotland	Abandoned							1
	Collision			7	1	2		
	Foundered					2		
	Fire/Explosion			1		2		
	Stranded	10	8	8	11	7	5	1
	Scuttled			19	13	17		1
	Bombed					7		1
	Captured and Scuttled			3				
	Depth Charged			1		1		
	Mined			11				1
	Rammed			1				
	Shelled			3				
	Target practice							
	Torpedoed			8		7		1
South West Scotland	Abandoned							24
	Collision		17	1	2	7	1	1
	Foundered		5		2	1	3	
	Fire/Explosion				2	2		
	Stranded		21	1	10	5	4	
	Scuttled					1	1	1
	Bombed							
	Captured and Scuttled			1				
	Depth Charged			1		1		
	Mined						1	
	Rammed							
	Target practice							
	Torpedoed			11		1		1
West of Scotland, Territorial	Abandoned							
	Collision			2	1	2	1	1
	Foundered					1	2	
	Fire/Explosion			1	1	2		
	Stranded	4	27	6	11	20	12	1
	Scuttled		1			2		1
	Bombed					2		
	Captured and Scuttled			1				
	Depth Charged					4		
	Mined			3		3		
	Rammed							
	Shelled			2		2		
	Torpedoed			9		4		1



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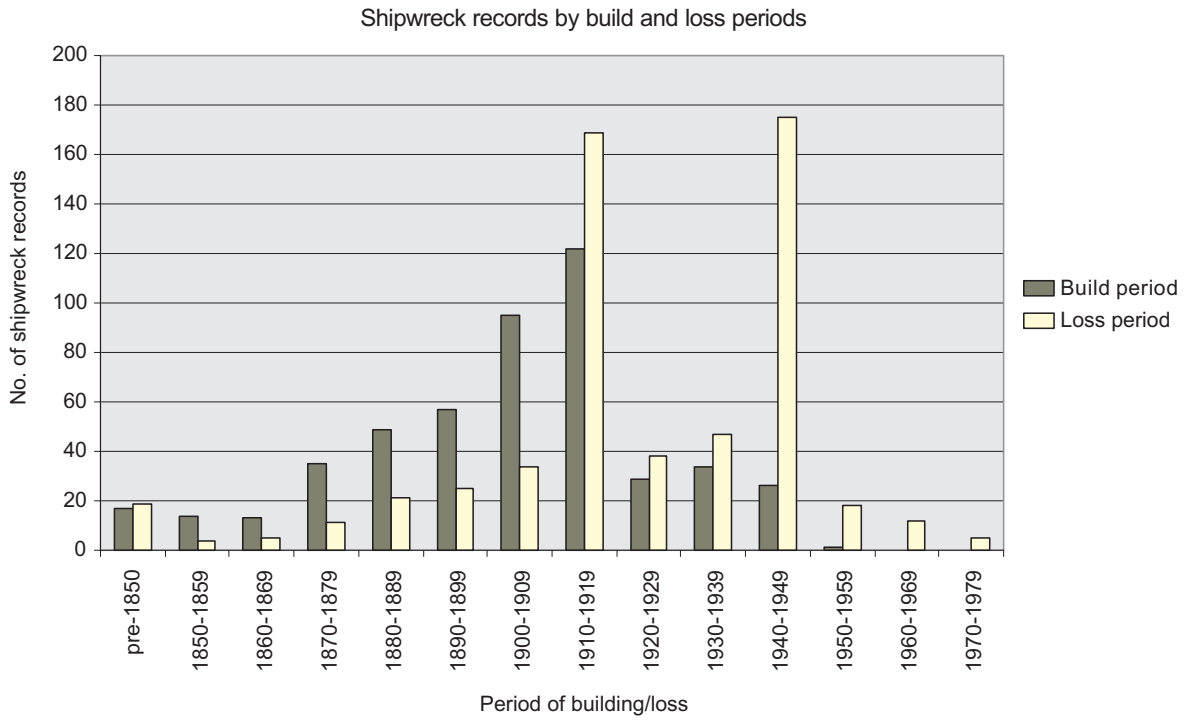
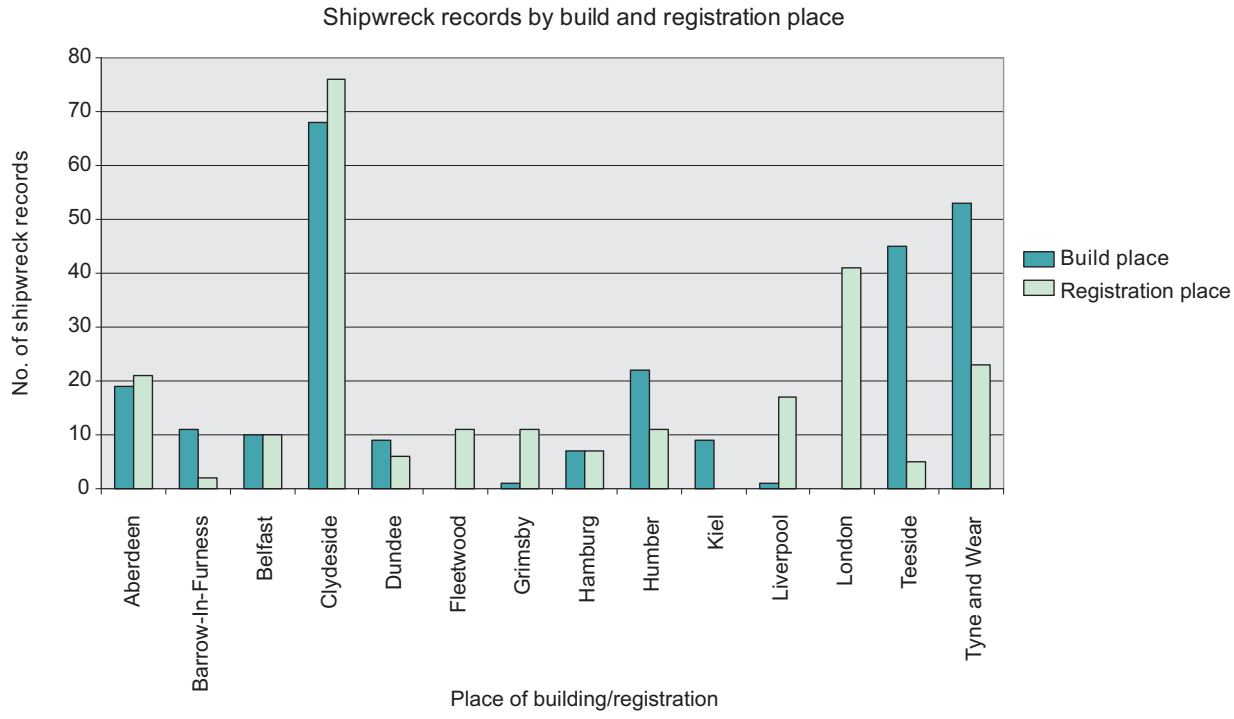
Regions used for characterisation of Scotland's Marine Archaeological Assets

Figure 1





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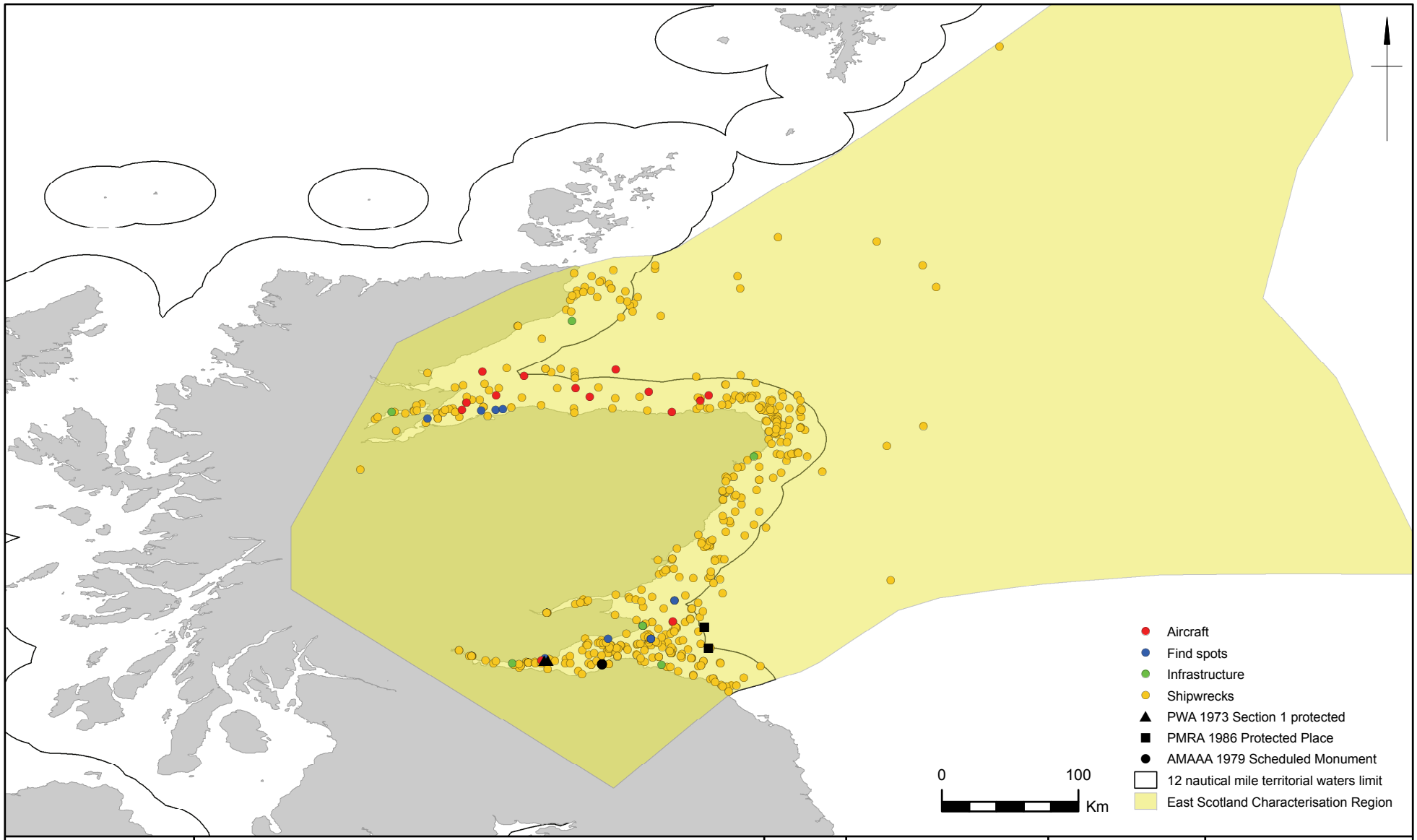
Shipwreck records by build and loss periods, and by build and registration place

Figure 2



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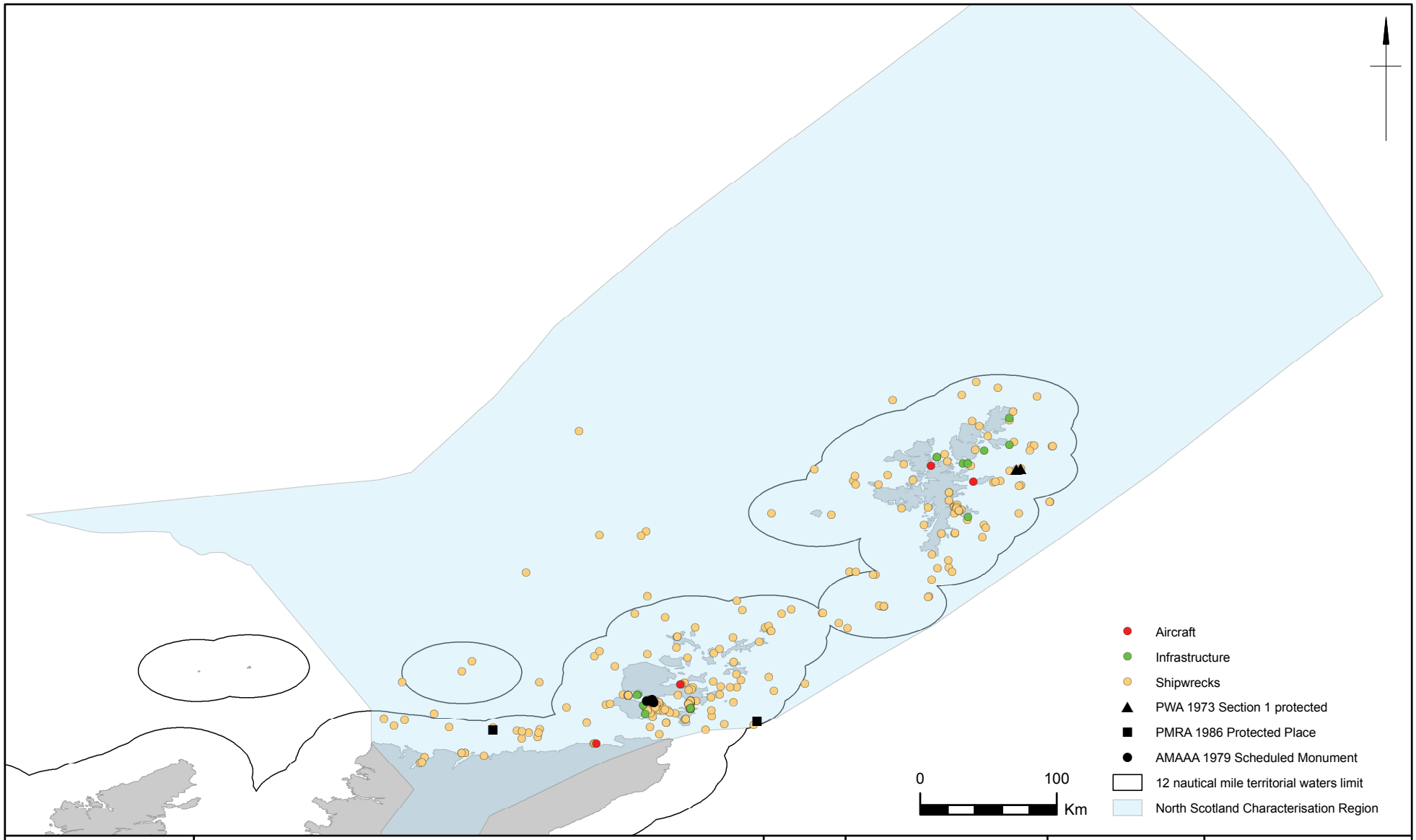
Marine Archaeological Assets in the East Scotland Region

Figure 3



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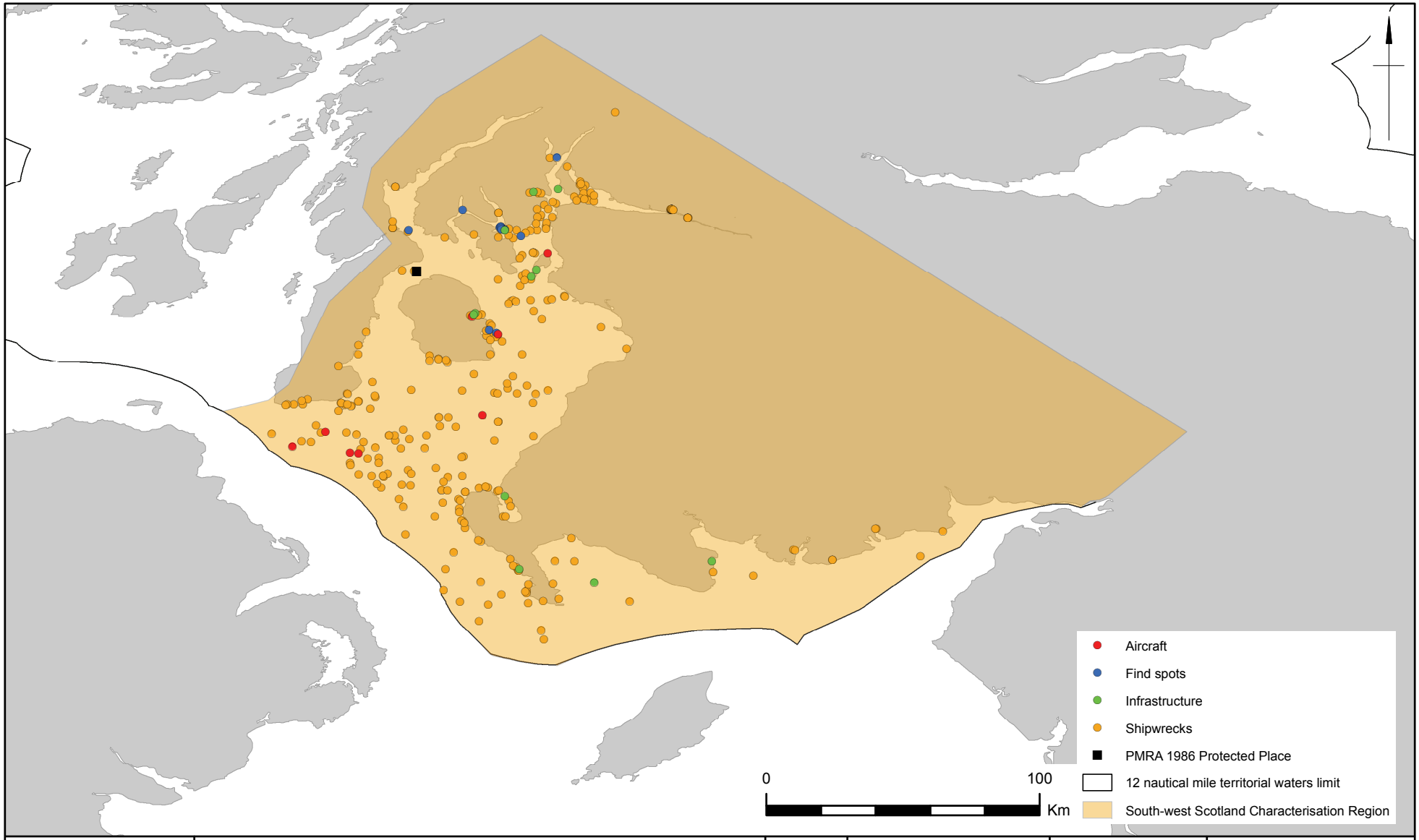
Marine Archaeological Assets in the North Scotland Region

Figure 4



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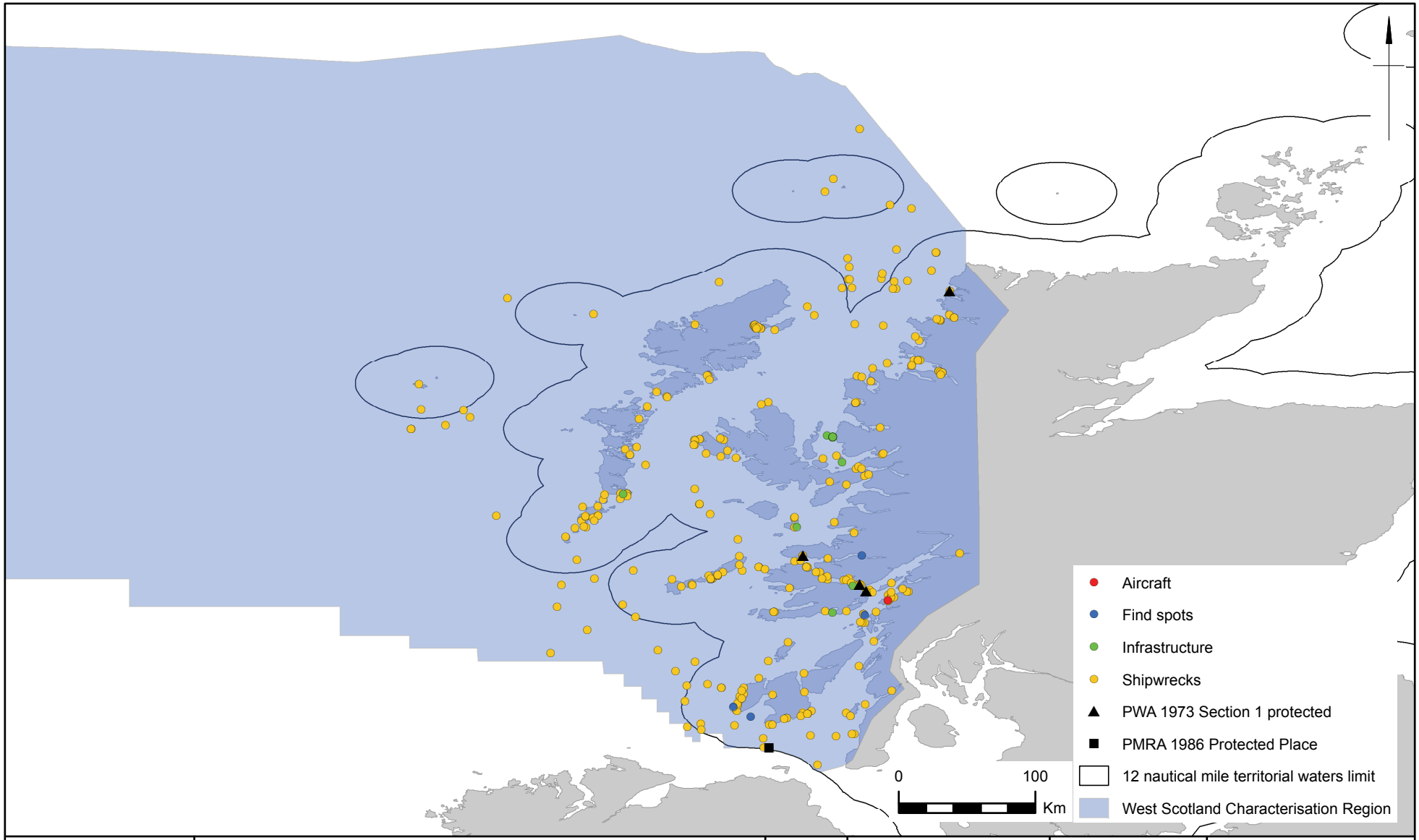
Marine Archaeological Assets in the South-west Scotland Region

Figure 5



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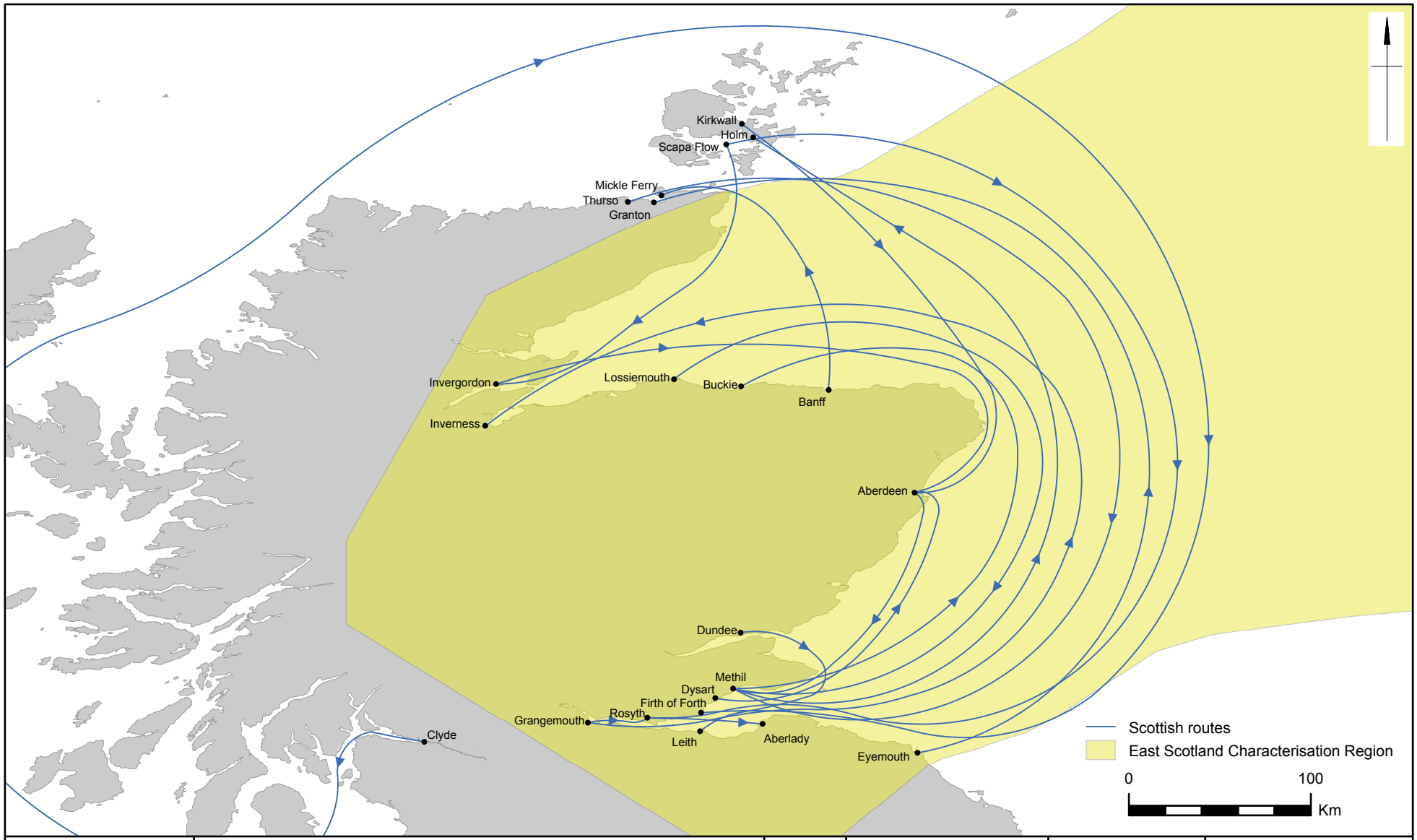
Marine Archaeological Assets in the West Scotland Region

Figure 6



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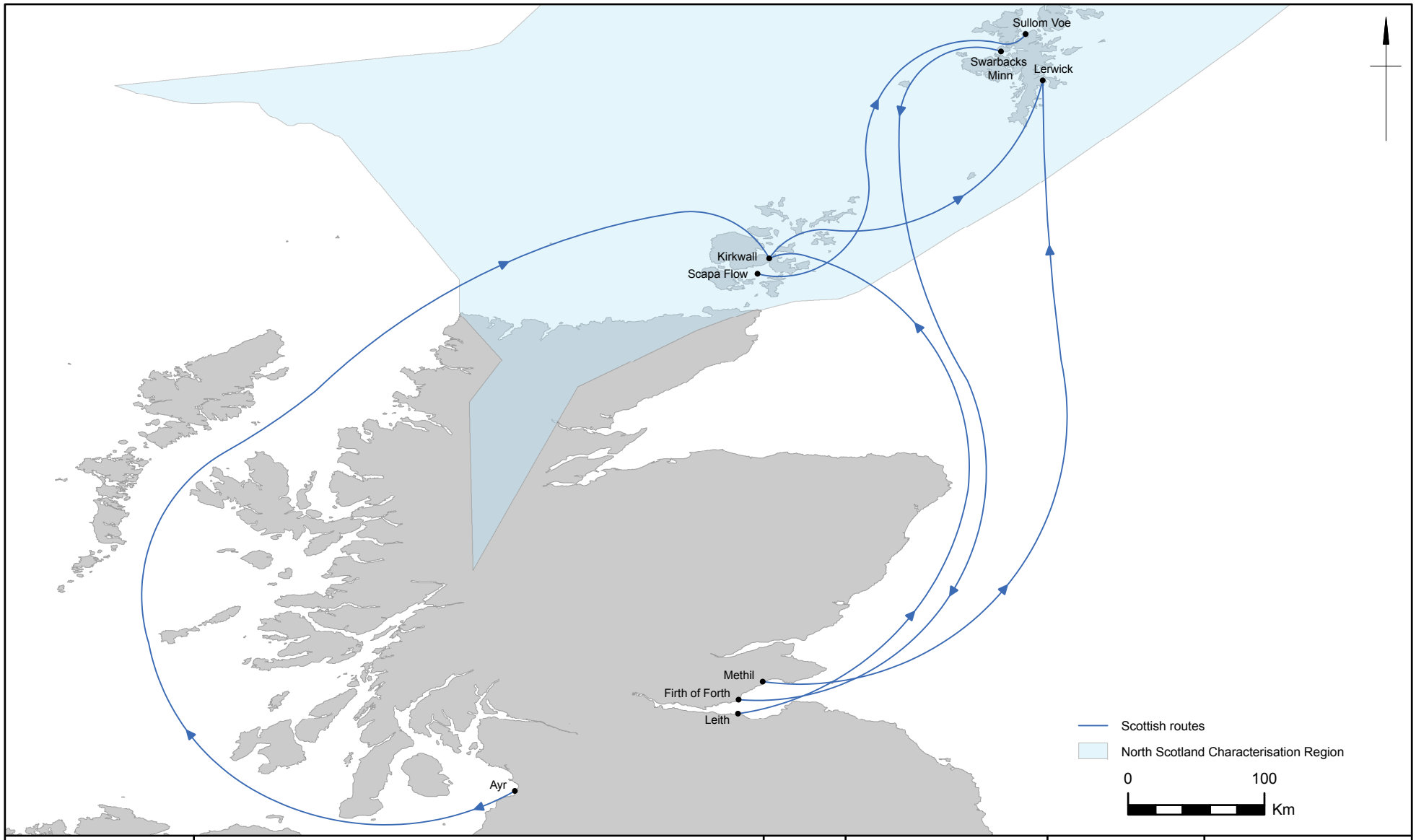
Ports of departure/destination in the East Scotland Region

Figure 7



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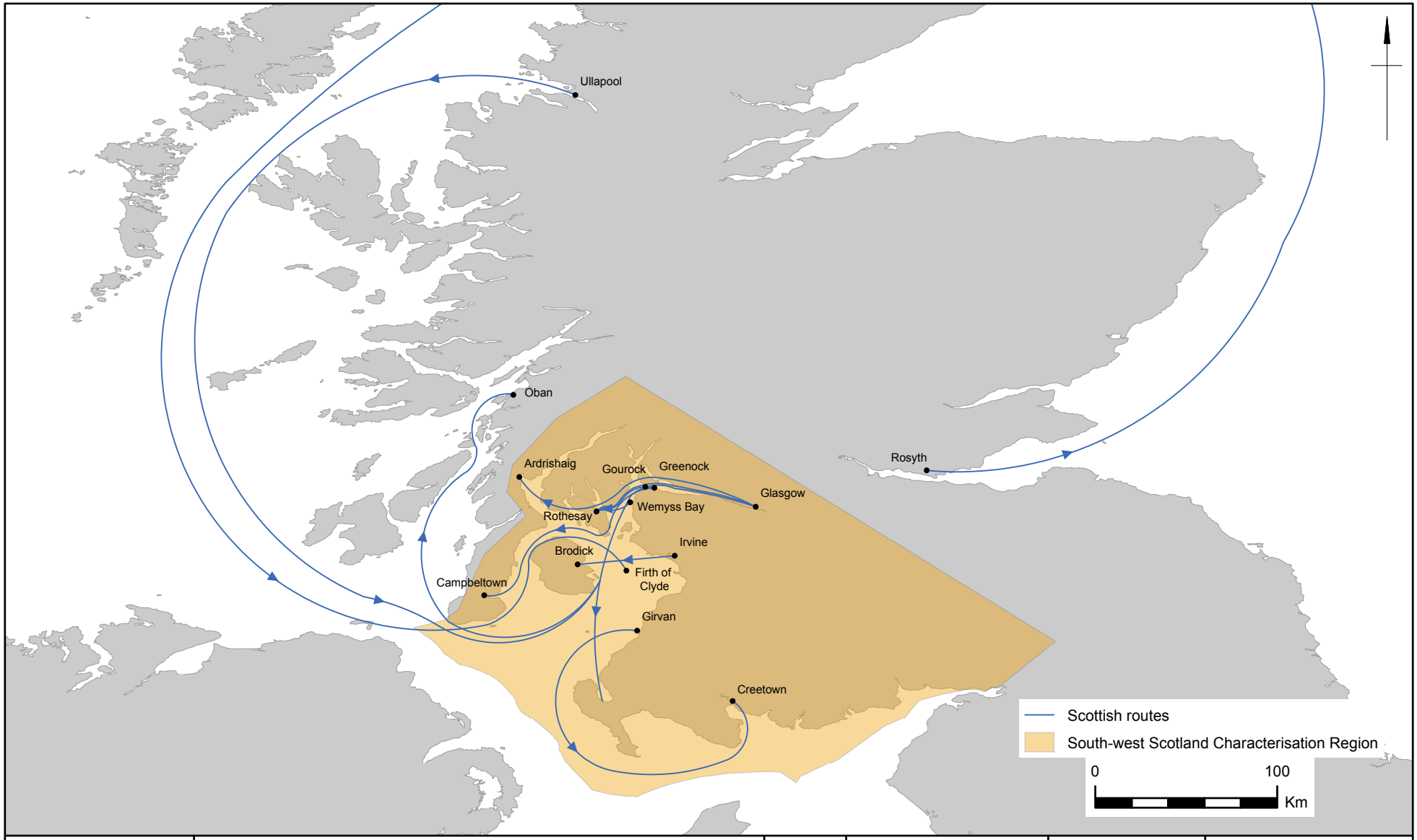
Ports of departure/destination in the North Scotland Region

Figure 8



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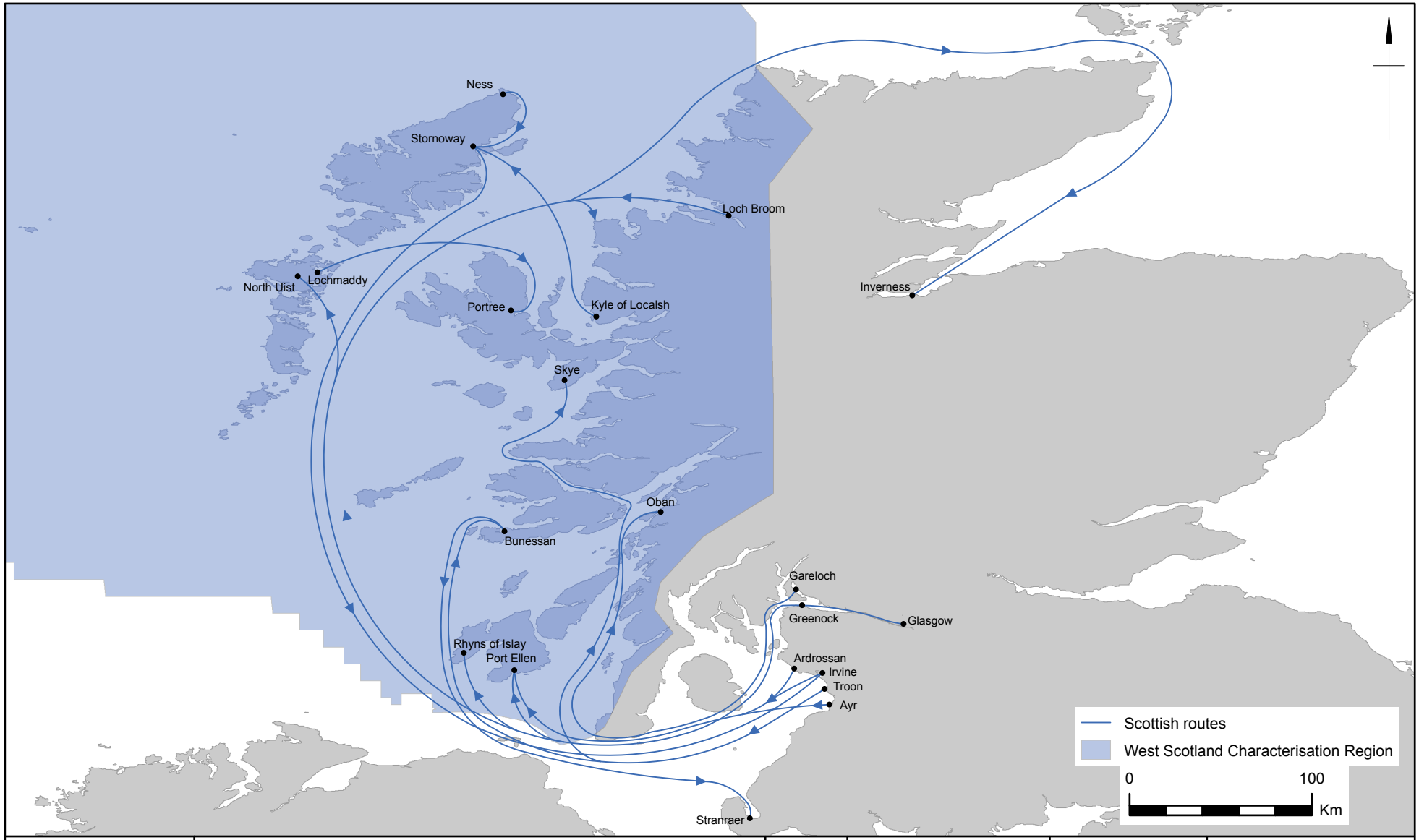
Marine Archaeological Assets in the South-west Scotland Region

Figure 9



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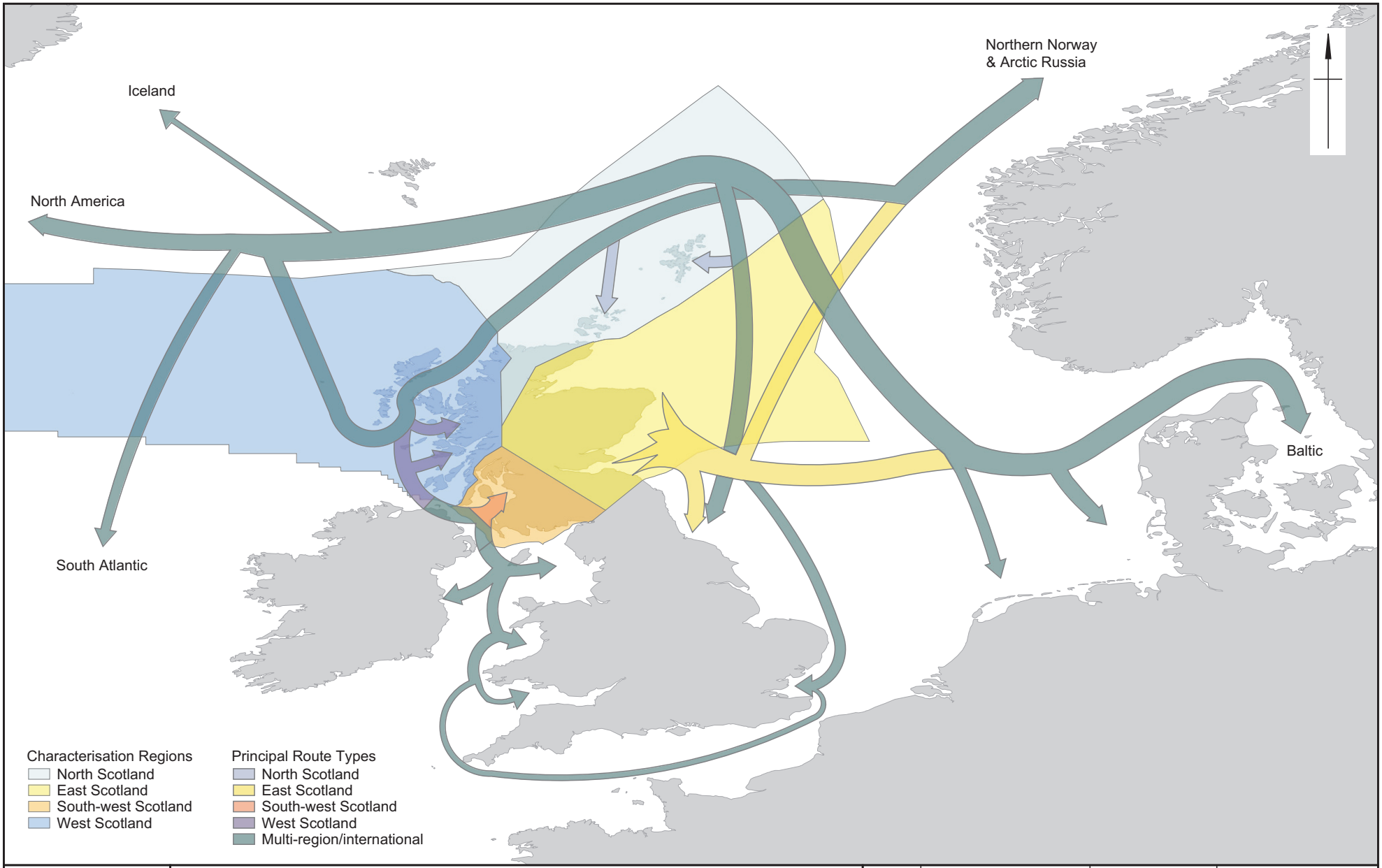
Ports of departure/destination in the West Scotland Region

Figure 10



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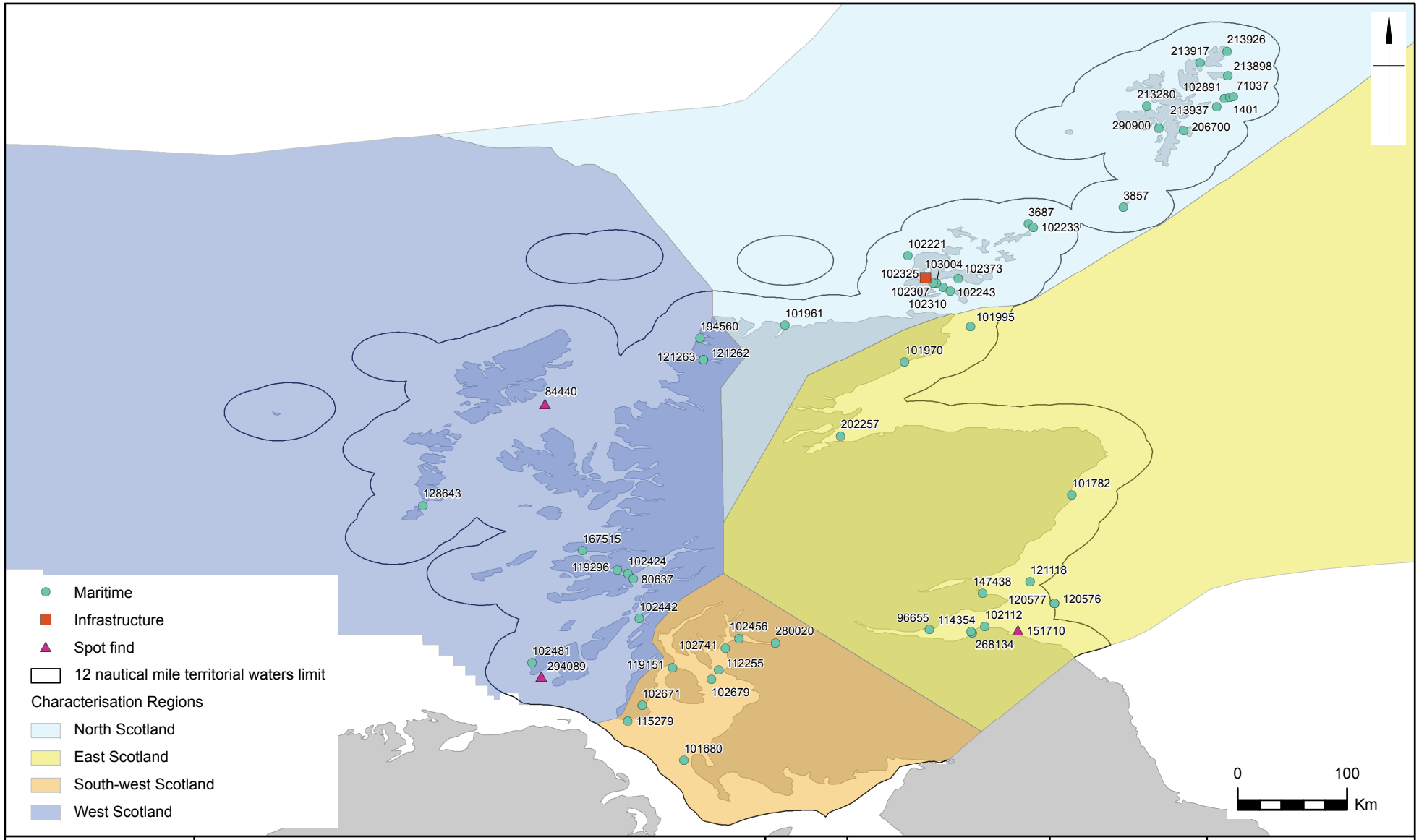
Main Routes to UK and International Destinations

Figure 11



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Map of archaeological assets named in the report text

Figure 12

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