

A tale of two fishing boat graveyards

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Summary

Two survey and research projects by SCAPE, NAS, the North of Scotland Archaeological Society, Findhorn Heritage and volunteers at Loch Fleet, East Sutherland and Findhorn Bay, Moray, have documented two early-20th century boat graveyards.

These encompass the remains of the local herring fleets, comprised of the mighty Zulu herring drifters, once ubiquitous, but now very rare in the archaeological record. Survey and research have shown how these sites tell the story of the decline of the local fisheries, illustrate the development of the national industry and give insight into the responses of these fishing communities in this changing world.

Key words

Fishing, boat graveyard, herring, Scotland, intertidal, Zulu

Introduction

Almost nothing tangible survives of the thousands of wooden sailing drifters engaged in Scotland's herring fisheries from the mid-19th to early 20th centuries. This paper tells the story of the documentation and investigation of rare assemblages of such vessels in two boat graveyards in northeast Scotland.

The first of these is found on the shore of Loch Fleet near Skelbo in East Sutherland. It was identified during a coastal survey by members of the North of Scotland Archaeology Society (NoSAS). The site comprises a group of at least 17 vessels lying across an area of 200m x 80m of a sandy sheltered embayment on the south side of Loch Fleet, centred on NH 79760 94968 (Figure 1). The vessels are partially buried in sand and beach sediment and are visible as wooden elements including keels and collapsed fragments of hull structures as well as occasional upstanding timbers, including the remains of frames, stem posts and stern posts. Exposed timbers are largely obscured by seaweed growth. Some retain metal fastenings, and a single capstan lies adjacent to one of the boats. Small localised ballast mounds are spread around the vessels.

Prior to this survey the only record of the site was a single entry in the Highland Historic Environment Record. This referred to an apocryphal story of the fishing boats which belonged to the nearby village of Embo, in a newspaper article from 1995 written by local historian Richard Easson,

which reported that *“after the war (1914-1918, I presume)...the boats constituting the fleet were taken round to Loch Fleet and burned.”*

The second site is found in the inner reaches of Findhorn Bay on the Moray coast. As a result of his involvement in the work at Loch Fleet, Findhorn resident and archaeologist Michael Sharpe recognised remains on the foreshore of Findhorn Bay as another example of a fishing boat graveyard. This site comprises a group of at least 30 vessels lying across an area of 600m x 50m in a sheltered sand and shingle embayment on the west bank of the River Findhorn, around 1km north of Binsness centred on NJ 03310 63710 (Figure 1). The vessels are partially buried in sand and beach sediment. Fourteen boats are recognisable as such with fragments of wooden hulls. Boilers lie in close proximity to eight of the remains. A further 16 vessels are indicated on the shore only by large ballast mounds which may obscure further remains.

Little information was recorded about the site in the Moray HER or Canmore (Scotland’s National Monuments Record) other than one wreck noted from aerial photos and records of losses for 27 craft on Findhorn Bar through the 19th and 20th centuries. Local sources related that the vessels were abandoned on the shore at the outbreak of the First World War.

Between February 2014 and July 2015, 31 volunteers from NoSAS and Findhorn, supported by SCAPE and the Nautical Archaeology Society, carried out a detailed archaeological survey of the boat graveyards and subsequently undertook historical and local research with the aim of piecing together the story of when and why these vessels came to be abandoned.

The projects created detailed records of the fragile physical remains of the vessels, while a review of the existing knowledge about such sites emphasises the rarity of these assemblages. A survey of the national historical context reveals the changes the fishery was undergoing during the period when the boat graveyards were forming and the wider technological and socio-economic developments which underpinned and drove these changes. An examination of the local backgrounds and the state of the herring fisheries in the two districts sheds light upon the specific conditions in which these fishing fleets were operating. Information held within the local communities in the form of oral histories and historical photographs was complemented by interrogation of the data held in the archives. These records of the size and composition of the local fleets, the numbers of workers employed and productivity in each of the two districts represented by these sites demonstrates how they fit into the wider history of Scotland’s herring fishing industry, and how they illustrate the impacts of the broad historical trends upon local communities, illuminating the different responses of these communities to these pressures.

[Wider historic background and context](#)

Archaeological remains of wooden sailing drifters, once ubiquitous around the coasts of Scotland, are rare, and recorded and researched examples even rarer. Yet the Scottish herring fishery is well-documented, with a number of useful primary sources. The data held within the Annual Reports of the Fishery Board for Scotland, and the Register of Sea Fishing Boats in Scotland is invaluable for research in this area, with a number of potential further avenues for research as highlighted by Tanner (1993), while the Mariners Almanac contains a wealth of further details about vessels. Reflecting its importance to Scotland’s economy, a number of reviews of the fishing industry dating

to the late 19th to early 20th century provide an insight into contemporary perceptions and preoccupations (summarised in Reid, 1995) including concerns over the sustainability of the industry (T. H. Huxley, cited in Cushing, 1988: 117; Wood, 1911). The emphasis of past research has often been on the economic history of the herring fishery (Gray, 1978; Coull, 1986; Reid, 1995) with a recent study of the export market to the continent (Sutherland, 2015). Social history has also been the subject of research. The collection of oral evidence (Dorian, 1985; Butcher, 1979, 1987; Thompson, Wailey & Lummis, 1983) providing insight into the local organisation of the industry, the relationship between the fishery and the community and a range of working practices. The Scottish Fisheries Museum in Anstruther curates a nationally important collection of tangible and intangible fishing heritage, including one of the few surviving examples of a 1st class Zulu herring drifter, the *Research* and a sailing Fifie, the *Reaper* (Scottish Fisheries Museum Trust, 2016). Examination of the physical aspects of the herring fishing industry has focused primarily on the remains of the harbours (Anson, 1939) and on the records of boat builders (March, 1952; Wilson, 1968; Smylie, 1999; Tanner, 2010), but there has been little archaeological work on the surviving remains of the vessels themselves.

The current state of the research into boat graveyard assemblages

The remains of vessels, both individual boats and assemblages which form boat graveyards, have the potential to add significantly to our knowledge, as highlighted by Richards (2011), but are underrepresented in historic environment records and archaeological research. This is possibly related to their location in the intertidal zone where they fall between the traditional disciplinary boundaries of terrestrial and underwater archaeology. The nature of the remains and their vulnerability to natural processes of decay and erosion also bring management and logistical challenges. Recent work in Scotland has created accessible inventories of maritime assets (Project Adair, RCAHMS and Historic Scotland, 2012) and has worked with local communities to record intertidal and submerged shipwrecks on Scotland's Atlantic coast (Project SAMPHIRE, McCarthy et al., 2015). Much of this work has focused on detailed study of specific vessels or sites (e.g. Christie et al., 2014; Martin, 1998, 2017; Wood, 1997a), however, some projects have emphasised the importance of assemblages of intertidal vessels for the wider understanding of maritime history (Milne et al., 1998; Parker, 1998; Barnett, 2007; HWTMA, 2008; Beattie-Edwards and Satchell, 2011) and surveys of boat graveyards in Scotland at Kincardine (Wood, 1997b) and the recently-scheduled example at Newshot Island (Graham et al., 2018) have placed the remains within their historic and landscape context. An audit and resource assessment of the intertidal hulks in England (Davies, 2011; Pett, 2013) led to several recommendations for further work, condition monitoring and volunteer involvement, but Scotland's intertidal maritime archaeological resource remains largely unquantified.

Basic records of fishing boat assemblages, or of individual vessels, exist in the regional and national databases, and there are likely to be further unrecorded examples around the Scottish coast. Only one other group of fishing vessels, at Aberlady Bay (HER MEL7835-43, 2241; Canmore 102102, 268126-34, 322283) has been extensively studied, and is protected as a Scheduled Ancient Monument (SM10471). These hulks, similar to the remains at both Loch Fleet and Findhorn Bay, are thought to be the remains of Cockenzie's herring fleet which used the shore to lay up during the off-season in the 1920s (Connect Archaeology, 2004). There has also been a recent discovery of the

submerged remains of a single historic fishing vessel in Scapa Flow (Sula Diving, 2018) identified as the remains of the *Edindoune*, a 1903 Buckie-built Zulu which was fitted with an engine in 1919.

The Scottish herring fishery

Through the 17th and 18th centuries, British ambition to rival the historic Dutch domination of the herring industry off the Scottish coast led to the introduction of Government bounties on fishing boats and on barrels of cured herring with an eye on the development of international export markets. Although the system of bounties ended in the 1820s, the inspection of barrels and the use of the crown brand was maintained for guaranteeing quality. As a result, the herring fishery became increasingly organised, developing into a major national industry in Scotland, explored in depth by Gray (1978) and summarised by Coull (1986).

Initially it was run along fairly simple lines, the crew owned shares in the boat and provided gear, while the organisation was led by curers, who retained boats on the engagement system, offering a fixed price per cran landed (Coull, 1986). From the late 18th century, the cured herring was exported to Ireland but also sent to the West Indies to feed slaves on plantations. Although this declined through the 19th century, with the abolition of slavery followed by the collapse of the Irish market in the 1840s, the development of the trade to the Continent came to dominate the market from 1850, particularly countries around the Baltic, feeding the working classes of growing industrial cities (Gray, 1978; <http://scottishherringhistory.uk/>).

While the general trend was of growing catches and a booming industry, impediments to its development included a lack of suitable harbours on the east coast which constrained the size of boats. The vicissitudes of the herring migration also led to unstable periods. A glut on the market in 1884 provoked a slump from which the industry took a decade to recover, and led to significant reorganisation, with a move from the engagement system to sale of the catch by auction. Later, a run of poor years in 1899-1902 has been described as 'literally ruinous for many' (Coull, 1986: 10).

Finally, the cataclysmic change wrought by the Great War on society also had major ramifications for the fishing industry, both for the fleet and the workforce, as summarised by Robinson (2019). Furthermore, amongst the longer term impacts on the trade, from which the fishery never fully recovered was the loss to of its traditional export markets on the continent, exacerbated by the 1917 Bolshevik revolution which reduced the market opportunities post-war (<http://scottishherringhistory.uk/>).

Regional development of the herring fishery

Moray

Fishing was a traditional livelihood for the villages of the Moray Firth coast, focused mostly on salmon fishing on the rivers which flow from the highlands, and on white fish; principally haddock and cod; but also encompassing halibut, whiting, turbot, ling, skate etc.; caught using lines. The Old Statistical Accounts (Sinclair, 1793) emphasise the importance of fishing to the local economy for many of the parishes along this coast, with salmon a major export to London, France and Spain, and white fish supplying both local markets, and other areas around Scotland. As the herring fishery developed, the Banffshire coast was one of the most active through the 18th century. This grew into

the main economic focus for many communities, offering lucrative, though less stable, returns than the white fishing, and this area became one of the main home bases for the herring fleet (Coull, 1986: 7). By 1845, the New Statistical Account for the parish of Kinloss (Gordon, 1845, vol.13) again emphasised the importance of fishing, when the herring fishery was described as second only to the traditional pursuit of salmon in the river Findhorn.

Building on this long tradition of fishing here as well as Aberdeenshire and Fife, the herring fishery expanded along the east coast of Scotland, where it was incorporated into the already well-established industry in the existing fishing communities, alongside the development of new centres along the Caithness coast. The Moray coast maintained a prominent role, with the crews' experience, knowledge, willingness to follow the shoals and embrace new developments widely acknowledged (Coull, 1986; l'Anson, 2008: 9).

Sutherland

By contrast, fishing was historically of lesser economic significance across East Sutherland. The development of the herring fisheries here was closely tied to the Highland clearances of the early 19th century. Prior to this, the economy was predominantly agricultural. Although Golspie in particular was seasonally active in white fishing and netting for trout, flounders and salmon, fishing was otherwise mostly a small-scale and dispersed activity. A key policy of the 19th century Sutherland Estate clearances was the resettlement of tenants from inland agricultural townships to specially-constructed coastal settlements, including those of Helmsdale, Port Gower and Brora on the east coast, with incentives to turn to fishing.

The village of Embo however, lay outside of the Sutherland estate through this period, belonging to the Gordons of Embo, a cadet family of the Earls of Sutherland. During the 1770s the estate passed to a cousin, Dr John Gordon, a Jamaican plantation owner who never came back to Sutherland. When he died in 1776 his son Robert Home Gordon inherited the estate and title and he lived at Embo House which he rebuilt. In his will dated 17th Aug 1812 Sir Robert Gordon left the estate firstly to his wife Susan, then to his cousin Sir Orford Gordon. The estate is described as two davochs of land (approximately 830 acres) which included Embo House and 'Fisheries, boats, fishings and fishtowns'. Sir Orford Gordon mortgaged the estate in 1855 to Davidsons, Barkly and Co, London, who held land on the Black Isle as well as plantations in Jamaica. His heir, Sir William Home Gordon, sold his estate for £12,000 to His Grace the Duke of Sutherland on 25th October 1858 (National Library of Scotland, Sutherland Collection 313/185 Embo). The document of the sale is in the Sutherland Papers in NLS although some histories of the Gordon family say the sale happened in 1835 (Bulloch, 1907).

Having been outside of the Sutherland Estate until this time, local tradition strongly states that Embo is not a 'Clearance' village (Anne Coombs, pers. comm.). Sir Robert Gordon built the fishertown of Embo which has the character of a 'Planned' village of the kind that was being developed all along the Moray Firth during the late 18th and early 19th century. These villages were frequently built by estate owners to encourage their tenants and others to take advantage of the growing market for the abundant fish stocks available off the East coast of Scotland. In line with other 'Planned' villages of the time, the estate owner owned the boats and the tenants of the village rented them from him. The herring market was especially important. It is tempting to speculate that one of the encouragements for Sir Robert Gordon to establish a fishertown at Embo was the fact that he had

plantations in Jamaica and a ready market for surplus and sub-standard herring to feed slaves who were not liberated in the British Caribbean until 1834. Although herring was a focus of the village, Embo boats would have also fished for white fish which their wives would sell locally. Despite the impetus from the landowner to develop Embo as a fishing village, the pier was not constructed until 1895/6, and according to local sources was difficult and vulnerable to damage in specific storm conditions; until local demand eventually led to refurbishment in 1934.

Development of herring boats

By the 1860s, fishing for herring had become an all year-round occupation for most of the Scottish fleet. From January to March winter herring was fished from the Forth, and off Wick and Stornoway. From May to September fleets sailed around Scotland to the Western Isles and west coast before returning to the east coast over the course of the season, with activity peaking in August. Scottish fleets often also sailed south for the autumn fishing around Yarmouth. Slightly later, the development of the Shetland herring fishery in the 1870s and 80s offered another area of exploitation of the summer herring (Anson, 1939: 18; Gray, 1978: 83-88).

These long seasons at sea required new styles of boats, and larger wooden sailing drifters were developed specifically for herring fishing. Built for speed and manoeuvrability, they were capable of venturing further from the shore to the fishing grounds. The development of the Scottish fleet has been well-examined (March, 1952; Smylie, 1999; Tanner 2010). By the latter part of the 19th century, east coast herring fleets were predominantly comprised of Zulus (Figure 2). These specialised sailing drifters were developed in Lossiemouth in 1879, following Moray's long tradition of shipbuilding. The innovative, hybrid design incorporated elements of the two main types of vessel previously in use on the east coast; the straight, vertical stem of the widespread Fifie and the raked stern of the predominantly Moray-based Scaffie (March, 1952: 234-5). Faster than its rivals and able to deliver its catch more quickly, the Zulu quickly came to dominate the east-coast herring fishery through the last two decades of the 19th century (March, 1952: 253).

Steam capstans were introduced to sailing drifters from c.1884, employed to assist in handling the sails and nets (Anson, 1939; March, 1952). The additional power they provided allowed the size of fishing boats to increase further.

However, it was the introduction of steam power in the early 20th century which has been described as the 'final and most decisive episode in the development of the fleet' (Coull, 1986: 10-11), although the adoption of steam was slower in the herring fleet than in white fish trawling. Moray yards moved wholesale to the production of steam drifters from around 1902, representing a step change for the herring fishery. The new steam drifters were larger and significantly more expensive than the sailing drifters, able to operate in all weathers and with far greater capacity both for catching and storing fish. By the outbreak of the First World War they were responsible for most of the catch, while many of the remaining sailing vessels were motorised during the war.

The pace of development in fishing boat design and the rapidity of the wholesale replacement of sail with steam in part reflects a pattern of generational improvements in the herring fleet. The working life of a wooden boat would have typically been around 20 years, after which it became uneconomical to repair and maintain, fuelling constant demand and opportunities for advances.

Moreover, the raked stern and narrow beam of the Zulu shape was said to be unsuitable for conversion to steam, rendering these sailing drifters obsolete in the face of this technology.

The projects

Aims

The aims of the projects were to create a comprehensive record of the visible elements of the vessels before they deteriorate further, which can be used as a basis for future condition monitoring; to research the history of the vessels; provide an opportunity for learning and involvement for the local community and volunteers; share the results with the regional HERs and Canmore; and tell the story of the Loch Fleet and Findhorn Bay boat graveyards.

Fieldwork

Methodology

The projects were designed as non-intrusive surveys. Seaweed was cleared from the remains, but no excavation was undertaken as beach sediment which had built up in and around the boats was judged to be protecting the wooden structures. As a result, the site record is of only the visible remains of the vessels. In most cases, more elements survive beneath the sediment. Drone aerial photography of both sites was carried out by Edward Martin. This was used to produce aerial photogrammetric models using PhotoScan software, from which geo-rectified, accurate, highly detailed orthophotos were created (Figures 3 and 4, also available online at <http://www.gigapan.com/gigapans/159738> and <http://www.gigapan.com/gigapans/179909>).

Permanent ground control stations related to the national grid using identifiable points on current OS mapping were established and a site survey undertaken with a Leica TC407. Survey markers applied to each identifiable wreck enabled hand-drawn detailed plans to be tied into the national grid. Accessible features were recorded as polygons or polylines. At Findhorn Bay, 16 large ballast mounds, 5 smaller stone mounds, a pier and a line of wooden posts were recorded to this level and photographed, and written records were made for a further three vessels. The 11 best preserved accessible boats were selected for further survey of which five were chosen for detailed recording. At Loch Fleet, every vessel was recorded in detail (Figure 5).

Detailed recording comprised completion of a pro-forma wreck form adapted from the NAS hulk recording form, photography and drawing at a scale of 1:20, using a baseline and offsets, with planning frames for details. Upstanding elements were drawn as elevations. At Findhorn Bay volunteers returned to record three further vessels on an offshore sandbar only fully visible at spring tides and accessible by boat. Due to time constraints, only written and photographic records could be made of these remains. Volunteers worked with the SCAPE and NAS teams in carrying out the fieldwork. After completion of the fieldwork, the records, drawings and photos for each vessel were checked and the drawings digitised by volunteers using the free illustration package Inkscape, following training delivered during the fieldwork weekend.

Wood identification was undertaken by Michael Sharpe. Some timbers were identified by eye on site. Nine samples from Loch Fleet and 34 from Findhorn Bay were recovered for microscopic identification (Tables 1 and 2).

Research by project participants and information from local residents resulted in the identification of several historic photographs of both sites. A series of images in the care of the University of St Andrews Special Collections showing Loch Fleet and taken in the 1930s, were brought to SCAPE's attention by a member of the Embo community. These show several vessels with identifiable registration marks on the shore at Loch Fleet. Photographs of Findhorn Bay, taken in the early 20th century were tracked down by Tim Negus from Findhorn Village Heritage.

Archival research was undertaken by members of NoSAS, Findhorn Village Heritage and SCAPE into the history of the local fishing fleets.

The Annual Reports of the Fishery Board for Scotland contain detailed records of the herring fishery, dividing the coast into administrative Fisheries Districts. From 1882 the figures for each district were sub-divided into individual villages, termed 'Creeks' in the reports.

Initial information suggested that the Loch Fleet remains were associated with Embo, so research encompassed both the fleet belonging to that Creek and the District of Helmsdale within which Embo lay. However, the historic photographs of Findhorn Bay show only a few legible registration marks, all prefixed with the letters BF (Banff), indicating that the vessels belonged to Banff and Buckie Districts, rather than to Findhorn District, which used INS numbers (denoting Inverness). However, there was no way of telling which Creeks they were associated with. The Reports were therefore examined for all the Districts along the Moray coast (Banff, Buckie and Findhorn), but were not interrogated at Creek level in this area.

The Annual Reports contain a wealth of information covering every aspect of the herring fisheries and including data on the size and number of boats in each District. From 1874 boats were divided into three size classes; 1st class boats with keels of 30ft and over, 2nd class boats with keels of 18-30ft and 3rd class boats with keels of under 18ft. It was predominantly the 1st class sailing drifters which formed the herring fleet, deploying nets, while the smaller 2nd and 3rd class vessels generally fished with lines for white fish. As vessels increased in size, from 1894, the 1st class size was subdivided into two categories; vessels with keels of 30-45ft and those of 45ft and over.

The relevant copies of the Mariner's Almanac held in the Scottish Fisheries Museum were consulted, and the Registers of Fishing Boats held at Caithness Archive Centre, Wick were examined. David Sutherland generously shared the results of his extensive research into the Scottish herring trade. Anne Coombs of NoSAS interviewed Embo residents who had a connection with the village's fishing heritage.

Results

Loch Fleet

The vessels

The wooden fishing boat graveyard at Loch Fleet comprises 17 individual vessels (Figure 6). Six can be identified as Zulus with a degree of confidence. A further nine can only be described as wooden sailing boats as too few diagnostic features were identified to further indicate their type. All details noted are consistent with Zulus and no evidence was seen on site that would suggest any of the vessels are anything else, while historical context and group association strengthen the hypothesis that most or all of the vessels in this boat graveyard are Zulus.

A discrete spread of detached elements probably represents at least one further wooden fishing boat of which too little survives to be positively identified, but includes a broken rudder and possible fragment of stern post. Ten are 1st class vessels, based on the length of the keel or the distance between visible stem and stern elements. Two appear to be the remains of smaller boats. None have any evidence of conversion to steam power. Three of the best examples (A, I and M) are illustrated.

Vessel A (Figure 7) is a 1st Class Zulu, with 12m beech keel. Surviving areas of planking (larch) and a notched floor timber indicate that this was clinker-built. The keelson and port garboard strake are in situ, the base of the upright oak stem post and stem deadwood survive, as does 0.7m of the oak stern post, showing an oblique angle. These diagnostic angles of the stem and stern demonstrate that this vessel had the distinctive straight stem and raking stern of the Zulu. Four detached futtocks and one floor timber (all oak) lie adjacent. Pitch caulking survives on the planking, gaps in the pitch show frame spacing of 0.4-0.45m centre to centre. All fastenings are iron. A large timber with iron fittings next to the stern may be the rudder. A possible iron chimney stay was noted.

Vessel B is a clinker-built wooden fishing boat. The few visible elements comprise stern post, six first futtocks (one identified as beech) and small piece of planking. The base of the raked oak stern post survives to a length of 1.8m standing 0.7m above the level of the beach. All fastenings are iron.

Vessel C is a 1st Class Zulu, lying on its starboard side. The original length of keel and keelson survive partly buried. The lower part of stem post and stem deadwood survive; although now detached from the keel, their angles illustrate that it originally stood upright. The lower part of the stern post survives in situ, with an iron gudgeon, its steep angle substantiates the identification of the vessel as a Zulu. Twelve in situ first futtocks on the starboard side are spaced 0.5m centre to centre. Three floor timbers and one cut timber knee are detached but adjacent. One small fragment of planking including the garboard strake is visible on the starboard side. More probably survives buried beneath the sediment. All fastenings are iron, pitch noted on the hull.

The group of remains D appears to be two vessels lying parallel c.3m apart, both on their starboard sides. The eastern keel (larch) survives to 7m, with a scarph joint halfway along its exposed length. Ten first futtocks survive in situ on the starboard side. Little planking is visible, but the lands on the frames demonstrate clinker construction. Square-section Fe bolts attached the frames to the planking. The base of the stern post is visible with one gudgeon and a possible pintle attached. Fragments of the garboard strakes survive on either side of the keel. The western keel is 9m, probably representing the remains of a 1st class vessel. Six first futtocks lie in situ on the starboard side. Several unidentified timbers and one floor timber lie scattered. All fastenings iron, pitch noted.

Vessel E is a 1st class Zulu. The larch keel/keelson is c.11m long. The stem post with rams horns is detached. Three oak first futtocks on the starboard side (0.4m centre to centre), and two possible floor timbers adjacent to the keel. A c.2.5m-long timber with Fe sheeting may be the detached stern post. The lines of the stem and stern suggest this can also be identified as a Zulu. Several other unidentified timbers lie around keel. All fastenings iron, pitch noted.

Vessel F is a wooden fishing boat. The keel and keelson lie just beneath the level of the foreshore mud, but are visible as outlines, with Fe fittings standing proud. The length of the keel is uncertain. 17 futtocks lie on the port side, spaced 0.47m centre to centre, cuts ends possibly indicate timber salvage. Their lower ends may continue buried, the upper ends may have been cut. One roughly triangular piece, possibly a floor timber, has two Fe fastenings. A detached timber with curved end may be the remains of the stern post.

The remains G constitute loose wooden elements, spread over an area 13m by 9m, possibly from more than one vessel, and with no obvious form. Many timbers remain unidentified, apart from a

piece of rudder c.1.2m in length, with attached iron pintle, which appears sawn at one end, possibly indicating salvage. A timber c.2.6 long may be the remains of a stern post.

Vessel H is a small wooden fishing boat. The keel/keelson is overlain by 5 frames and floor timbers (oak) formed of a single piece of wood, spaced 0.45m centre to centre. A small patch of planking indicates that this was clinker-built. All fastenings are iron, pitch noted.

Vessel I (Figure 8) is a 1st class Zulu visible as a line of 19 apparently in-situ floor timbers/frames on the port side (oak, 0.45m centre to centre), a stern post (oak) with three gudgeons, standing to 0.8m, at a steep raking angle and the base of the vertical stem post, indicating that this is the remains of a Zulu. The detached stem post lies adjacent with one ram's horn visible. All fastenings are iron. The starboard garboard strake is visible, the keel, keelson, further frames and planking are likely to survive buried in the beach sediment.

Vessel J is a wooden fishing boat. A keel/keelson with attached iron bolts and nine floor timbers (spaced 0.5m centre to centre) are visible. The adjacent capstan was made by R Tindall & Sons, ironmongers based in Fraserburgh. No evidence of the boiler was found; presumably it was salvaged or moved by the sea after abandonment.

Vessel K is a small wooden fishing boat. The remains cover an area 3.8m by 3.4m, comprising a keel/keelson with 8 frames on one side, 7 on the other, spaced 0.45m centre to centre.

Vessel L is a 1st class wooden fishing boat. Remains spread over 13.5m by 8.5m constitute six oak frames, spaced 0.45m centre to centre. Stern post (oak) at raked angle with attached gudgeon stands to 1.2m. Short length of iron pipe midship may be an exhaust or part of a bilge pump. Two unidentified timbers are buried on the foreshore adjacent to the vessel, one 2m long, rounded at one end and flat-topped, roughly squared at the other, with a patch of pitch. The second is c.1m by 0.4m, flat-topped, with a rounded underside, with two square indentations on the flat face, with pitch - possibly a setting for machinery/equipment. All fastenings iron.

Vessel M (Figure 9) is a 1st class fishing boat. The keel/keelson is intermittently visible, with eight collapsed oak frames on the starboard side, lands indicate that it was clinker-built. A cast iron block lies along the line of the keel adjacent to the stern post. A possible rudder fragment lies next to the stern. Patches of pitch visible on timbers. Oak mast step (1.4m by 0.5m) lies adjacent and with iron staining on the upper face, all fastenings iron.

Vessel N is a 1st class Zulu, timbers scattered over an area 14.2m by 6m. The beech keel/keelson survives for its original length of 13.2m. The base of the raked stern post is attached, the collapsed stem post is 3.5m long, associated with the stem deadwood, the angle of which indicates a vertical stem, bearing out the identification of this as a Zulu. One starboard frame lies collapsed in situ, other possible frame timbers detached in the immediate vicinity. Seven oak floor timbers with limber holes and one possible knee lie scattered on both sides of the keel. Lands indicate vessel was clinker built. Scattered fragments of planking observed. All fastenings iron, pitch noted.

Vessel O is a 1st class clinker built fishing boat. Remains scattered over an area of 11.4m by 4.5m but original length not seen; keelson intermittently visible. Ten in situ frames spaced 0.5m centre to centre, 1 detached frame. Four in-situ oak floor timbers. Larch planking visible c.2.5m to starboard

side of keelson. All fastenings iron, ironwood pulley block recovered. Further elements are likely to survive buried in the beach sediment.

Vessel P is a wooden fishing boat, little visible other than garboard strakes on port and starboard sides which lie 0.35m apart. Keel and keelson presumably buried. Possible base of stern post survives. Three detached floor timbers lie around the stern.

Vessel Q is a 1st class fishing boat, with a stem partially collapsed but originally vertical and a raked stern in situ, confirming this is a Zulu. Twenty-two in situ floor timbers spaced 0.5m centre to centre (oak where examined) possibly all floor timbers present. Port and starboard garboard strakes in situ; keel and keelson presumably buried. Pitched larch clinker planking with attached futtock. Further remains probably buried, all fastenings iron.

A note on the timber

Edgar March's authoritative book on Sailing Drifters (1952) describes in detail the construction of a Zulu and the wood selected for each element. Wood identification undertaken by Michael Sharpe (Table 1) generally corroborates March's information which records that beech was used for the keel. Boats **A** and **N** both have beech keels, however **D** and **E** have keels of larch. March states that stem and stern posts and frames were oak, though in some vessels larch was used for frames. The stern and frames of vessels **A**, **L** and **Q**; the stern posts of **B** and **M**, and the frames of boat **E** conform with this. One vessel (**B**) had a midship frame which was identified as beech. Planking from **A**, **O** and **Q** corroborates March's information that larch was used.

Historical photos

During the drop-in event run at the same time as the fieldwork, members of the local community brought in photos dating to 1932 showing both the north and south shores of Loch Fleet.

Figure 10 shows two abandoned 1st class boats; and three smaller boats which still appear workable; of which two are identifiable; WK 58, which retains a mast and rigging, and WK 482.

The Mariner's Almanac records the names and registrations of boats belonging to each port, though small vessels are not included before 1932. This confirmed that the vessels in these photos belong to Embo, corroborating the information that the south shore of Loch Fleet was used by the village's fleet, and also allows us to name the vessels in these photos. WK 58 is the Breadwinner, first registered in Embo in 1932 and owned by John Ross; WK 482 is the Georgina Isabella, first registered in Embo in 1932 and owned by David Fraser. The Registers held at the Caithness Archives state that she was broken up in 1941.

These vessels were in use at the time the photograph was taken, and are all of 2nd or 3rd class size, i.e. line fishing boats. The larger 1st class vessels do not appear to be in seaworthy condition and have apparently been abandoned, but Loch Fleet continued in use as a haven for the smaller boats, alongside the redundant hulks of the bigger vessels. The registration mark of the larger boat on the right is not wholly legible, but that on the left may be WK 28, the *Spartan*, a 1st class sailing lugger with a 42 ft keel, built in 1886 and owned by Hugh Ross of Embo. Unfortunately, the Register doesn't record an end date for the vessel's registration; but it is likely to be one of the vessels recorded in this survey.

Archival research

Data from the Fishery Board reports was extracted to build a picture of the industry in the period leading up to the First World War. Figure 11 shows that in the later 19th century Embo's fleet was mostly comprised of 1st class boats, with keels between 30 and 45ft in length. Of the eight villages which comprised the district of Helmsdale, Embo had the largest number of 1st class vessels.

Embo's 1st class herring fleet peaked at the end of the 19th century, with 30 boats between 1894 and 1898. From 1905 there was a steady decline, the number of 1st class boats dropping to single figures by 1909. By the outbreak of the First World War in 1914, Embo had only six 1st class fishing boats. This echoes the broader trend seen across the district from the turn of the century onwards; the overall number of boats declined, with the 1st class herring vessels dropping more sharply. From this time, the 2nd and 3rd class vessels engaged in the white fishing for local markets played a more important role in the District's fishing industry.

Figure 12 presents data on the number of workers employed in the herring fishery (fishermen, curers, coopers, gutters and labourers) in Helmsdale District and Embo during the week of greatest activity. The data shows a steep decline, dropping from nearly 900 in 1882 to figures in the teens by the end of the first decade of the 20th century. This collapse of a major industry must have caused local economic stress. Over the same time period, however, the numbers of resident fishermen at village and District level were more or less maintained and in Embo remained between 120 and 130 up to 1914. These fishermen were engaged in local white fishing, with a few hiring their labour out to non-local herring boats.

Figure 13 uses research by David Sutherland on productivity in the Scottish Herring Fishery generously made available on his project website (<http://scottishherringhistory.uk/>). This shows that over the same period, the production and export of herring from Helmsdale fell steeply from 1898 in contrast to the national trend of growth for the same period.

The Registries of Sea Fishing Boats often, but not consistently, record the dates and circumstances of the end of each vessel's registration. Where the dates are recorded, Embo's 1st class vessels often fell out of use in the first decade of the 20th century, ceasing use for fishing, declared unseaworthy or broken up prior to the start of the First World War. Some were sold, with sales mostly post-war. Conversely, the end dates for the use of the 2nd and 3rd class boats are generally later, in the 1920s, 1930s or up to the 1940s, reflecting the continuation of the line fishing much later than the demise of the herring fishery.

Taken together, the data contained in the Fishery Board Reports and the Sea Fishing Registers show that Embo's herring fleet was in steep decline through the first decade of the 20th century, and by the outbreak of the First World War the number of 1st class sailing drifters had dwindled to almost nothing.

Oral history

Oral history research was carried out by Nancy Dorian in the 1970s amongst Golspie residents who remembered the local fishing industry in the early 20th century. This confirms that by the beginning of the century, the East Sutherland fishing industry had already begun a steep decline, and that

increasing numbers were finding employment in other occupations. Finding a 'shore job' was perceived as desirable and a measure of success (Dorian, 1985: 8, 31).

The sheltered bay of Loch Fleet was highlighted not only as a safe place to moor over a spell of bad weather, but also as the winter haven where boats were hauled up outside of the fishing season(s) by both the Golspie fleet, which used the north shore and the Embo boats on the south. The use of such safe havens was common practice, necessitated by the dearth of locally available suitable harbour facilities and to avoid paying harbour fees. Given that the pier at Embo was not constructed until 1895, it is likely that there was a long tradition of using the loch shores prior to this, while the problematic conditions at the harbour until the pier's refurbishment in 1934 ensured the continued use of the bay long after it was built. The recollections of the Golspie community also reported that after the introduction of steam powered fishing boats, sailing drifters were rapidly rendered obsolete, and the redundant vessels were sometimes abandoned on the shores of their winter haul out at Loch Fleet (Dorian, 1985: 57).

The Loch Fleet boat graveyard

Documentary and oral history research confirms the archaeological evidence that the Loch Fleet boat graveyard predominantly consists of Embo's herring fleet of 1st class Zulu sailing drifters, which was in decline through the first decade of the 20th century, as new more efficient boats concentrated the catch in fewer, larger vessels. Embo's fleet was rapidly rendered obsolete by technological developments as the introduction of larger boats and steam power squeezed out the smaller older boats. Given that most wooden boats have a working lifespan of approximately 20 years, the majority of the Zulus may have been reaching the end of their economically viable working lives at this time, while the sharply raked shape of their stern rendered conversion to steam power difficult.

Neither Embo, nor the other small fishing villages in the Helmsdale district adopted in any significant numbers the new bigger boats which superseded the Zulu sailing drifters and which were both too expensive for local crews and too large to be accommodated in any of the local village harbours.

The shores of Loch Fleet were long established in use as a winter haven for boats outside of the herring season and it seems likely that the obsolete vessels were simply abandoned there as they ceased to be useful. It is possible that useful elements of the vessels may have been salvaged, although the most commonly recovered elements from abandoned boats are often the rudders and rigging (Richards, 2011: 160) which in this case, as the specific components which were now redundant, were not of any value. However, large timbers of the hulls and superstructures may have been of use as structural elements or simply as firewood.

Loch Fleet was not deliberately selected as a discard site, but the 1930s photographs which show smaller active boats alongside unseaworthy vessels give some insight into its development. The boat graveyard appears to have formed over a number of decades, with the white fishing boats continuing to use the shore of Loch Fleet next to the Zulu hulks. Some of the smaller boats recorded by this project (vessels H & K) may be the remains of the line fishing boats which were active into the 1940s and beyond.

There is no evidence to substantiate the local story of the movement en masse of vessels into Loch Fleet and deliberate burning of the fleet following the First World War. By 1914, the bulk of Embo's herring fleet had already largely ceased to operate. No evidence of burning was found on any of the vessels, though the presence of waterproofing pitch may have been mistaken for charring in the past, possibly accounting for the story. It has been highlighted (Richards, 2011: 160) that fire is sometimes used in salvage activity to facilitate the recovery of fittings. Although unlikely in the case of these fishing boats, this association, combined with the possibility that boats were broken up for firewood may have given rise to the local folklore story of deliberate beaching and burning.

Findhorn Bay

The vessels

The remains in the boat graveyard in Findhorn Bay (Figure 14) comprise 14 individual vessels; 12 of which can be identified with a degree of confidence as Zulus. Two can only be described as wooden fishing boats, as too few diagnostic features were identified on site to clearly indicate the type; though it is considered likely that these are also Zulus, based on their historical context and group association. A further 16 ballast mounds probably indicate the location of further vessels which either are buried or decayed. Several of the ballast mounds are a distinctive butterfly shape, formed when the wooden hull fell apart causing the ballast to settle either side of the keel. Five further small stone mounds are not thought to indicate the locations of vessels. Two individual timbers and a detached boiler are probably associated with the adjacent hulks. All vessels complete enough to give an indication of their original size are 1st class, and the majority of those fall into the 45ft-plus sub-category, with surviving visible keels of 14m (46 ft) and over. Many of the ballast mounds are of similar size to those associated with these remains, suggesting that they also may be from 1st class vessels. None have any evidence of conversion to steam propulsion. The small boilers associated with some of the wrecks powered steam capstans, although only one capstan was recorded. Ten of the most intact are described in detail, three of the best examples (BB, BBB and JJJ) are illustrated.

Vessel BB (Figure 15) is 1st Class carvel-built vessel. The port side of the hull lies flat on the foreshore beneath ballast, and is presumed to survive buried; while more of the upstanding starboard side hull has been lost. The remains cover an area of 19.6m by 3.8m, and the stern post stands to 1.2m, its steep angle identifying this as a Zulu. There is no evidence of the stem post, but the keel (17.7m) and keelson appear to survive to their full length. The forward part of the boat is less well-preserved, with just the keel (larch) and keelson surviving for c.8m. The aft section is better-preserved, with 18 frames (three identified as oak, three tentatively identified as larch) surviving to the first futtock on the port side, and one on the starboard side, with spacing of 0.43m centre to centre. There are 19 floor timbers, of which four are detached from the main body of the wreck. An area of carvel planking survives on the port side at the stern, beneath the ballast and the frames. The garboard strake on the starboard side survives for 7m. No obvious knees were noted, though a curved iron strap may be a metal knee. The stern deadwood is in-situ, partially buried by the ballast. The lower part of the stern post (oak), with gudgeons attached, survives to a height of over 1m, at a steeply-raked angle with a surviving length of 2.4m. The rudder, with two pintles, has fallen from the stern post and lies adjacent. The main mast step and mizzen mast step lie detached nearby. All fastenings recorded were iron, and pitch was noted on the hull.

Vessel BBB (Figure 16) is a 1st class sailing drifter, carvel-built, lying on its port side, little survives of the starboard side. The keel (beech, 17m) and keelson appear to survive to their full length, the lower part of the stem and the stem deadwood survive. Fifteen frames survive to the first futtock (oak) on the port side, with a large area of planking (larch) beneath them. The stern post (oak) survives to 6.37m, it and the rudder are detached, and submerged at normal low tide, its original rake corroborating the vessel as a Zulu. Two possible floor timbers (oak) and a part of the mast step survive. A boiler lies next to the bow. All fastenings recorded were iron, and surviving evidence of pitch/tar was noted on the hull.

Vessel CC appears to be a 1st Class Zulu. Little survives other than the keel (15.6m, beech) and keelson, and part of both garboard strakes. More may survive under the spread of ballast. The very base of the stern post survives with the raking angle of a Zulu stern, with one gudgeon attached, with a pintle and attached fragment of rudder.

GGG is a cluster of loose timbers which is thought to represent two vessels, one 1st Class Zulu, with a keel (larch) at least 16.6m. The stern end of the keel is intact with a Zulu's distinctive raking angle. A detached stern post (oak), 3.3m long with 3 gudgeons and very damaged boiler are probably associated. A second detached stern post, 3.48m long with 2 gudgeons and stern deadwood (1.82m long) appear to belong to a different vessel, likely also a Zulu based on similarities between this stern post and other examples on site. One possible futtock and loose strakes may be from either vessel. All fastenings noted are iron, and there are traces of pitch.

Vessel JJ is a 1st Class carvel-built Zulu fishing boat. More intact than most of the others due to its location, inaccessible except by boat, it retains the distinctive shape of the Zulu's hull. Most of the hull may be buried in the sediment, the visible upper part appears to survive almost to the gunwales, as part of the top rail is in situ. Its surviving dimensions are 18.7m by 5.8m. The stern post, frame 1 and starboard top rail have been identified as oak, frames 2 and 3 and crossbeam near bow identified as larch, all fastenings noted were iron, frame spacing 0.33m centre to centre. The steam boiler and associated firebox lie inside the hull close to their original position.

Vessel JJJ (Figure 17) is a 1st Class, clinker-built Zulu. The elements are quite scattered and buried but a keel of approximately 16.3m can be extrapolated from visible elements. The upstanding remains of the stem and stern posts (oak) indicate the straight upright stem and steeply angled stern of a Zulu, and the ends of 11 starboard frames (three identified as oak) protrude from the sand towards the stern. At the forward end are five bow frames (three identified as oak), one rebated bow frame. A long curved notched timber may be part of a gunwhale. All fastenings noted were iron. The mizzen mast step (oak) and boiler sit in almost their original positions. The detached timber III probably represents the top rail. A fragment of overlapping planking (larch) and several frames with lands show the boat was clinker built, an anomaly for a boat this size. This is the only intact boat without ballast, probably due to its large size and clinker construction. It was common practice to remove ballast from clinker hulls when vessels were hauled out, as the planking lacks sufficient strength to hold together under its weight when out of the water.

Vessel KK is a 1st Class carvel-built Zulu. More intact than most of the others due to its location, inaccessible except by boat. Most of the hull is probably buried in the sediment, the visible upper part is the diagnostically Zulu shape with a vertical stem and raked stern, and appears to survive almost to the gunwales, as part of the top rail survives. Surviving length of 20.8m by 4.8m, with a visible height of 1.2m. 46 frames are visible, spacing 0.37m (centre to centre) four identified as oak, four as larch.

Vessel PP is a 1st Class carvel-built Zulu. Beech keel 17.6m long, intact at both stem and stern, keelson and garboard strakes on both port and starboard sides; and a large, butterfly-shaped ballast mound. Part of the detached stern post (oak, 2.4m surviving length) with 2 gudgeons lies adjacent, along with the stern deadwood (oak), indicating the raking angle of a Zulu's stern. Boiler OO nearby is probably associated. All fastenings seen were iron, and waterproofing pitch was noted.

Vessel QQQ is a carvel-built 1st Class Zulu fishing boat, More intact than most of the others due to its location, inaccessible except by boat. Most of the hull probably survives buried in the sediment and underwater, obscuring much of the constructional detail. However, a stem post with attached rams horns is visible above the water level at low tide, standing vertically and supporting its identification as another Zulu. A boiler and capstan lie on the sediment which fills the hull.

Vessel SS is a carvel-built 1st class wooden sailing drifter. Much of the keel is obscured by ballast and the stern end of the hull and boiler are underwater at low tide. However, visible elements, including a straight stem post with rams horns (RR) which lies detached but is probably associated with this boat, and the submerged stern end which appears to have been steeply raked, though was not closely inspected, suggest that this can also be tentatively identified as a Zulu. Lies on its starboard side, eight first futtocks (three identified as larch) on the starboard side with patches of carvel planking underneath, largely under ballast. Two detached futtocks probably belong to this vessel. At least two first futtocks on the port side are underwater. Eight in situ floor timbers visible at low tide, more probably underwater. Further elements are likely to survive underwater and beneath ballast. As with several other less-well-preserved and less-visible vessels in this boat graveyard, this is thought to be a Zulu.

Although positive identification of type has not been possible for every vessel at Findhorn Bay boat graveyard, all construction details noted on surviving exposed hull elements are consistent with Zulus and no evidence has been seen that would suggest any other type of vessel. Moreover, the historical context of the Moray fisheries and association with other vessels on this site substantiates the assumption that most or all of the remains at Findhorn Bay are Zulus.

A note on the timber

As at Loch Fleet, wood identification (Table 4) of selected elements of the best preserved vessels generally corroborates the information in March (1952). Beech keels were identified in **BBB**, **CC**, **PP**, **UU**, **WW**; however boat **BB** had a keel of larch, and the long timber at GGG which may be a keel, was also identified as larch. All stem and stern posts examined were oak.

Historical photos

This photograph (Figure 18) dating to the late 19th/early 20th century held by Findhorn Heritage, shows a fleet of 1st class Zulu herring drifters hauled up on the shore at Binsness, opposite the village of Findhorn. The natural harbour of Findhorn Bay was described in the New Statistical Account (1845, vol.13: 211) as 'among the safest on the coast', despite the difficult approach caused by Findhorn bar, with a water depth of 13 to 17 feet at stream tides 'greater than that of any other harbour on the coast from Aberdeen to Inverness'. The bay was used as a safe haven in winter and at times of stormy weather by the fishing fleets from villages along the coast which lacked adequate harbour facilities for the large 1st class sailing drifters. A report in the Forres Gazette on 18th Feb 1914 recorded high tides accompanied by a strong westerly gale, causing damage to vessels in harbour, and stated that 'the herring boats were driven from their winter shelter on the Binsness shore and cast adrift'.

Where legible, all the registration marks in the photo are Banff numbers (BF), suggesting that the vessels which used this shore belonged not to the Findhorn district (which were registered in

Inverness (INS)), but to the adjacent fishery districts of Banff and Buckie, which comprised the ports of Crovie, Gardenstown, Macduff, Whitehills, Portsoy, Sandend, Cullen, Portknockie, Findochty, Portessie, Buckie, Buckpool and Portgordon. The only fully legible registration is BF 1039, identified by Tim Negus as the *Maggie Smith* of Portessie, built in 1883.

A collection of photographs belonging to a local family believed to date to August 1913 show several Zulus hauled up at Binsness (Figure 19). By contrast to the earlier image, these vessels are not ranked in a straight line, but form haphazard groups, and although they retain their masts, there are signs of disrepair.

Other photographs in this collection (Figure 20) show a family group playing on the beach, and confirm a summer date (i.e. in the middle of the herring season) demonstrating that these vessels did not join the herring fleet that year.

Archival research

Since it is thought that these boats belonged to several of the villages along the Moray coast, research undertaken for this project has focused on District level, for Banff, Buckie and Findhorn.

The number of 1st class vessels in all districts declined slightly from 1882 onwards, with fairly minor variation until the collapse in the number of registered vessels with the start of the war (Figure 21). However, examination of the two sub-categories of 1st class vessels shows that the overall numbers were maintained by growth in the larger 45ft-plus category. The numbers of smaller vessels of 30-45ft declined from 1894 (coinciding with the introduction of the larger sub-division) and was a very insignificant element of the fishing fleet prior to 1914. At village level, the records for Findhorn creek demonstrate that with only one 1st class boat recorded from 1891 onwards, the fishermen of the village were not engaged in the herring fishery, confirming that the vessels in the historic photographs did not belong to the village opposite.

Examination of local boat builders' records demonstrates a shift from sail to steam at the same time as the composition of the fleets changed from smaller to larger vessels. From 1904, the output of MacIntosh's yard at Buckie changes from Zulus to steam drifters (Crawford et al., 2010: 204-5) with an associated glut of sailing drifters over the following few years attested by boats offered for sale in local newspapers. In April 1909, the Banff Advertiser advertised 12 Zulus for sale, one of which was still being offered eight months later; and in December of the same year a 1st class Zulu was up for auction with a £15 reserve.¹

The Fishery Board Reports also record the numbers of resident fishermen (Figure 22) and show that although the fleet was changing, the overall numbers of resident fishermen in the Districts were maintained up to the outbreak of war in 1914. Analysis of the employment figures for the week of greatest activity in each District, however, shows a decline in the industry in Moray in the early years of the 20th century. Fluctuations reflect the natural variability of the herring, but our three districts show broadly similar trends in the period of interest, peaking in the final years of the 19th century

¹ Thanks are due to Tim Negus for researching and passing on this information.

before declining through the 1900s, though with signs of a brief resurgence in the years immediately prior to the First World War.

In summary, these statistics illustrate a more complex state of the Moray coast herring fishery than the steady overall numbers of boats and fishermen might suggest. This is supported by the falling numbers of barrels produced by each District from the turn of the century. The Moray coast fisheries were suffering a drop in production and activity, though there are hints of a recovery immediately prior to the start of the war. This was in contrast with the national picture of growth and increasing productivity of Scotland's herring fishery during the same period (Figure 23).

The Findhorn Bay boat graveyard

The survey work confirmed that the Findhorn Bay boat graveyard consists of the 1st class Zulus which formed the herring fleets of the south Moray coast. Following a boom in the late 19th century, the region's fishery declined over subsequent years. Although it remained important up to the outbreak of the First World War, the composition of the herring fleet changed, and the size of the vessels increased, which also highlighted the shortcomings of many of the smaller harbours in the districts of Findhorn, Banff and Buckie (Anson, 1939). The number of 1st class vessels was maintained by an increasing number of larger boats, while smaller 30-45ft vessels dwindled to nothing, possibly following a pattern of natural attrition and replacement as older vessels came to the end of their working lives.

However, where enough is visible of these remains to allow original size and keel length to be estimated, this assemblage appears to comprise mostly of larger 1st class vessels of 45ft or over. At least six have keels of c.56ft; given that a 1902 Hopeman-built Zulu the *Laverock* was described by March (1952: 278) as one of the largest ever built, with a 59ft keel, it is tempting to speculate that these examples in the Findhorn Bay boat graveyard may have been built around this time, when sailing drifters were increasing in size, but shortly before they were superseded by steam. It seems likely that these were amongst the largest, and therefore probably the latest of the Zulus constructed. If so, they were probably still relatively new vessels with many working years ahead of them at the point when they were outcompeted by new, faster steam drifters.

One example is of further interest. Vessel JJJ is an anomaly. At 53.5 feet, it is of a size that suggests it was a later build; however paradoxically it is of clinker construction, generally thought of as being replaced by carvel-built hulls through the 1870s and 1880s as size increased. The development of Zulus has been summarised by March (1952: 253) "Up to about 1885 the hulls were clinker-built with a keel length of about 40ft; when carvel construction was introduced length increased to 43ft". Boat JJJ should be too large and too late in date to be clinker-built. Either the vessel dates to the transition between clinker and carvel construction techniques represents one of the last clinker Zulus to have been built or is possibly one of the earliest Zulus of this size.

Against the backdrop of increasing vessel size, changing fleet composition, obsolescence of old technology and dwindling demand for the redundant older models, it seems that the boat graveyard at Findhorn Bay started to develop as sailing drifters were left at their regular winter safe haven. Like Loch Fleet, this location was not deliberately selected as a discard site. Although the First World War clearly made a dramatic impact on the herring fishery, there appears to have been no single factor in the site's formation. Suggestions that the dumping of the boats was due to the outbreak of the war

are an oversimplification of a more complex situation. The vessels which were discarded in 1914 would have joined those already abandoned here, while post-war the loss of the main markets fundamentally changed the fishery, rendering a return to the abandoned sailing drifters unviable.

Discussion

Both Loch Fleet and Findhorn Bay were used by the local herring fleets as safe havens during bad weather and as winter shelters. As the vessels fell out of use, their abandonment where they were laid up was a gradual process rather than a single deliberate event and may have been unconscious, with an intention to return to the fishing once market conditions improved.

These boat graveyards are a result of many complex factors which contributed to their formation. They illustrate the pressures that developing maritime technology brought to bear on traditional methods and models of fishing, the changing socio-economics of the industry and the responses of the fishing communities.

The communities which are illustrated by the boat graveyards at Loch Fleet and Findhorn Bay responded differently to these pressures. Examination of the physical remains and the stories behind them offers some insight into the decisions those communities made in the face of major change. In Embo, echoing the wider Helmsdale District, the herring fishery dwindled to almost nothing through the first decade of the 20th century. There was no widespread adoption of bigger boats which couldn't be accommodated at the local harbours or steam power, for which the Zulus which comprised the bulk of the existing fleet were unsuitable for conversion. Here, the herring fishery had essentially finished by the outbreak of the First World War as communities turned from herring to white fish or moved to different occupations. It was the obsolescence of the old sailing fleet in the face of steam drifters that led to the piecemeal abandonment of the Zulus on the shore of Loch Fleet, followed by the line fishing boats when they reached the end of their working lives. The remains on the shores of Loch Fleet are of the smaller, earlier, clinker-built vessels which were not updated and upgraded by the fishermen when they came to the end of their working lives. By contrast, although in decline in terms of activity and output, the Moray coast fishery held its own longer than the Helmsdale district (Figure 24). The composition of the herring fleet here changed through the same period. Larger boats came to dominate the 1st class vessel category as the fishermen embraced the new vessels, due partly to the local availability of superior harbours at Banff and Buckie. The remains on the shore at Findhorn Bay are of the larger, carvel-built, sailing drifters, which formed part of the newer generation of Zulus which Moray fishermen invested in as part of the cycle of replacement of older vessels. These communities adapted to the changing industry, possibly because of the area's longer tradition of fishing, and the experience, skills and confidence of the crews whose longstanding willingness to innovate is highlighted by several authors (Gray, 1978; Coull, 1986).

Nevertheless, a significant factor in the abandonment of these vessels appears to have been their obsolescence in the face of steam power. The introduction of steam initially to power capstans which aided the handling of nets and gear permitted the construction of larger sailing drifters. However, steam propulsion introduced from around 1900 was a turning point for the herring fishery with much wider ramifications. In the late 1890s and over the first decade of the 20th century, a tipping point was reached in the profitability of the national fishery, as the size of the catches and

the prices they achieved allowed those who could afford it to make the investment in the steam drifters, which cost at least three times as much as a sailing boat and came with heavier operating costs (Gray, 1978: 151). As summarised by David Sutherland's analysis of the contribution of different vessel types to the catch, very rapidly over the decade prior to the First World War, the contribution of sail power was overwhelmed by steam. By 1914, steam vessels were responsible for more than 60% of the total catch, with motorised fishing boats also contributing (<http://www.scottishherringhistory.uk/statistics/Extracts.html#Figure12>, 23/05/2017).

None of the vessels on either site shows evidence of conversion to steam power. The specialised sailing drifters, especially Zulus which formed the bulk of the fleet, with their raked stern and narrow beam were difficult to convert. They were rapidly rendered obsolete, unable to economically compete with the new, faster, larger steam drifters, and technologically redundant with no market for resale. This may have exacerbated the natural fluctuations inherent in fishing and eroded the communities' resilience to these variations. Increasingly outcompeted by new technology, they may have been unable to recover from the 'ruinous' run of bad years in 1899-1902.

Concurrently, the market was also changing. With a move from the curer-run engagement system, which had been in operation prior to 1884, to the auction system, purchase power became concentrated in the larger ports, and prices there rose. Exacerbating this, in many areas, especially Sutherland and stretches of the Moray coast, the local harbour facilities were inadequate for the new vessels. Not only did steam drifters need deeper harbours, they also required access to coal, and other facilities. All of these factors led to rapid centralisation of the fishery in fewer, larger centres. Although on a national scale, the herring fishery was booming, this was set against the decline of many of the small traditional fishing communities such as those represented by these boat graveyards.

Conclusion

Loch Fleet and Findhorn boat graveyards are of significance both for the intrinsic value of the vessels and as assemblages which provide an insight into how the history of a national industry played out in a local context.

The vessels themselves are some of the few physical survivors of the once-ubiquitous wooden sailing drifters that formed the Scottish herring fleet. Although this was a fleet of thousands, dominated by Zulus by the late 19th century, only four survivals are included on the UK Register of National Historic Ships (<https://www.nationalhistoricships.org.uk>). Deteriorated intertidal hulks, whether individual vessels or groups, are almost equally rare in the archaeological record, and although more are likely to exist unrecorded, this rarity further enhances their significance. The remains at these sites are thus a tiny surviving sample, representative not only of the herring fleet which was of major economic importance for the Scottish fishing industry, but also of the age of sail and its role in the herring fishery. The evolving technology is illustrated first by Zulus such as these, representing the apogee of sail powered fishing boats, and later superseded themselves by more powerful steam drifters. Each in turn facilitated ever-larger catches.

Yet this was at best a mixed blessing for the fishery. Contemporary complacency about the abundance of fish stocks was fed by booming production. However, this was a reflection of the

widespread uptake of more efficient vessels, which masked underlying issues of overfishing and dwindling herring stocks. The development of fishing technology which started with the introduction of steam power during the period illustrated by these sites was a process which rendered the herring fishery inherently unsustainable.

These sites therefore demonstrate a watershed in the development of the Scottish herring fishery, fishing fleets and maritime technology, when sail was rendered redundant by the introduction of larger, faster steam- and later motor-powered ships. Representing a period which has been described by Coull (1986: 17) as running parallel to the first phase of the Industrial Revolution, they are a microcosm of technological development, economic and societal change, reflecting wider trends of the early 20th century.

The inherent importance of these remnants of the Scottish herring fleet is reinforced by their setting in the local coastal landscape. Unlike many boat graveyards, their locations have not been specifically selected for discard, the vessels have been abandoned at their usual winter safe havens. The locations demonstrate the importance of sheltered winter havens to the fishing communities along this otherwise exposed coastline, giving some insight into their working practices and traditional informal uses of such places. It wasn't only the sailing drifters themselves which were rendered obsolete by the introduction of steam power, but also such sheltered havens which had historically been used for beaching but couldn't accommodate the larger steam boats which required bigger, more sophisticated harbour facilities.

The remains also illustrate the social history of the local fishing communities, their development and how they interacted with their landscape. The gradual and unpremeditated abandonment of the sailing drifters on these foreshores reflects the communities' responses to the obsolescence of their livelihood in the face of technological innovation and the challenges of the changing socio-economic backdrop of the early 20th century.

Although the history of the Scottish herring fishery has generally been extensively studied and is well-understood, boat graveyards offer an opportunity to investigate the physical remains. The value of an archaeological approach to our understanding of traditional boatbuilding techniques is demonstrated by details revealed on some vessels which contradict the prevailing beliefs about herring drifters. Differences between the theory and practice of the construction of vernacular craft can only be observed through detailed survey, as demonstrated by the nuances of different woods selected for various elements of the vessels on both sites, and by the presence at Findhorn Bay of an anomalously large 1st Class, clinker built fishing boat, too large to be of this construction type according to the conventional wisdom.

The study of Loch Fleet and Findhorn boat graveyards has highlighted the differences in how major trends of change manifest at national and local scales, and the degree to which the national picture masks the stories of small coastal communities. Furthermore, study of sites on two different stretches of the coast has allowed comparison between the impacts on and responses of two fishing communities with different traditions and so offers a more nuanced and complex picture of regional and local variation.

These sites are examples of the importance of boat graveyards as archaeological resources for the study of Scottish fishing history and the social history of local coastal communities. They also form an important part of the regional coastal landscape. Study of these remains can supplement and enhance the information about historic vessels contained in documentary sources and historical records. However, they are a rare and fragile resource. The intertidal zone is a challenging environment for the preservation of wooden remains which are also inherently vulnerable to the natural processes of decay. Neither have intertidal remains yet been targeted for systematic survey at a national level; they are often under-recorded and more work is needed to identify and investigate them. Both Loch Fleet and Findhorn Bay, although nominally recorded in regional or national datasets, were only highlighted as significant and worthy of further study by members of the local community through the opportunity presented by the SCAPE Trust's Scotland's Coastal Heritage at Risk Project. Thus, community recording prompted detailed survey and research, also carried out in partnership with local volunteers. This engagement not only demonstrates the degree of public interest in these sites and the potential of community projects to generate new knowledge of national significance, but also highlights the opportunities that integrating public involvement can offer for wider appreciation of this important heritage.

Acknowledgements

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Captions

Figures

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13. *Figure 13: Data from the Annual Reports of the Fishery Board showing the number of barrels produced by Helmsdale District (top) (data only recorded to 1906) compared with the national output. Data from <http://www.scottishherringhistory.uk/statistics/AnnualExport.html>, 14/12/2018*
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2. *Table 2: Loch Fleet wood species identification, Michael Sharpe.*
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Tables

Table 1

Vessel ID	SCHARP ID	NGR	Construction	Vessel type	Estimated keel length (ft)
A	12758	NH 79668 94897	Clinker	1 st class Zulu	40 ft
B	12586	NH 79709 94991	Clinker	Wooden fishing boat	Est. 33 ft
C	12587	NH 79751 94944	Unknown	1 st class Zulu	Est. 46 ft
D	12588	NH 79764 94950	Clinker	2 wooden fishing boats (1 st class)	Est. 31 ft, Min. 28 ft
E	12589	NH 79760 94968	Clinker	1 st class Zulu	36 ft
F	12593	NH 79771 95001	Clinker	Wooden fishing boat	Est. 29 ft
G	13605	NH 79778 94965	Unknown	Spread remains of wooden boat	Unknown
H	12590	NH 79790 94959	Clinker	Wooden fishing boat (2 nd /3 rd class)	Est. 20 ft
I	12591	NH 79788 94972	Unknown	1 st class Zulu	48 ft
J	12592	NH 79787 94986	Unknown	Wooden fishing boat	Est. 30 ft
K	12594	NH 79782 94999	Unknown	Wooden fishing boat (2 nd /3 rd class)	Est. 16 ft
L	13606	NH 79804 94995	Unknown	1 st class wooden fishing boat	Est. 36 ft
M	12595	NH 79804 94984	Clinker	1 st class wooden fishing boat	Est. 38 ft

N	12596	NH 79809 94977	Clinker	1 st class Zulu	43 ft
O	12597	NH 79819 94973	Clinker	1 st class wooden fishing boat	Est. 33 ft
P	12598	NH 79833 94985	Unknown	Wooden fishing boat	Unknown
Q	12599	NH 79843 94992	Clinker	1 st class Zulu	33 ft

Table 1: Loch Fleet vessel catalogue.

Table 2

Vessel ID	BOAT COMPONENT	SAMPLE NUMBER	MICROSCOPIC WOOD IDENTIFICATION	ON-SITE WOOD IDENTIFICATION
A	Stern post	001	Oak (<i>Quercus</i> sp.)	N/A
A	Keel?	002	Beech (<i>Fagus sylvatica</i>)	N/A
A	Plank, starboard	003	Larch (<i>Larix decidua</i>)	N/A
A	Two frames	-		Oak
A	Floor timber	-		Oak
B	Frame, midships	004	Beech (<i>Fagus sylvatica</i>)	N/A
B	Stern post	-		Oak
L	Stern post	-		Oak
L	Two frames?	-		Oak
M	Stern post	-		Oak
M	Mast step	-		Oak
N	Keel	005	Beech (<i>Fagus sylvatica</i>)	N/A
Q	Planking	006	Larch (<i>Larix decidua</i>)	N/A
Q	Stern post	-		Oak
Q	Three floor timbers	-		Oak
O	Planking	007	Larch (<i>Larix decidua</i>)	N/A
E	Keel	008	Larch (<i>Larix decidua</i>)	N/A

Vessel ID	BOAT COMPONENT	SAMPLE NUMBER	MICROSCOPIC WOOD IDENTIFICATION	ON-SITE WOOD IDENTIFICATION
E	All visible frames	-		Oak
D	Keel	009	Larch (<i>Larix decidua</i>)	N/A

Table 2: Wood species identification, Michael Sharpe.

Table 3

Vessel ID	SCHARP ID	NGR	Construction	Vessel type	Estimated keel length (ft)
AA	13574	NJ 03411 63880	Unknown	Wooden fishing boat	Est. 43ft
AAA	13575	NJ 03285 63560	N/A	Unknown - ballast mound, further remains buried	Unknown
BB	13576	NJ 03418 63861	Carvel	1 st class Zulu. See detailed catalogue	58ft
BBB	13577	NJ 03300 63551	Carvel	1 st class Zulu. See detailed catalogue	56ft
CC	13578	NJ 03390 63870	Unknown	1 st class Zulu. See detailed catalogue	51ft
CCC	13579	NJ 03293 63541	N/A	Ballast mound only, more possibly buried	Unknown
DDD	13580	NJ 03298 63527	N/A	Ballast mound only, more possibly buried	Unknown
FF	13581	NJ 03370 63851	N/A	ballast mound only, more possibly buried	Unknown
FFF	N/A	NJ 03294 63487	N/A	N/A - ballast only, possibly from construction of pier	N/A
GG	13582	NJ 03367 63820	N/A	Ballast mound only	Unknown
GGG	13583	NJ 03273 63442	Unknown	1 st class Zulu. See detailed catalogue	Est. 54.5ft
HH	13584	NJ 03346 63798	N/A	Ballast mound only	Unknown
II	13585	NJ 03335 63788	N/A	Ballast mound only	Unknown

Vessel ID	SCHARP ID	NGR	Construction	Vessel type	Estimated keel length (ft)
III	13586	NJ 03247 63339	N/A	Single timber, curved, 12.4m, oak, attached metal deadeyes, detached top rail associated with JJJ.	N/A
JJ	13587	NJ 03252 63721	Carvel	1 st class Zulu. See detailed catalogue	Est.c.56ft?
JJJ	13588	NJ 03225 63316	Clinker	1 st class Zulu. See detailed catalogue	53.5ft
KK	13589	NJ 03277 63715	Carvel	1 st class Zulu. See detailed catalogue	Est.c.56ft?
LL	13590	NJ 03312 63762	N/A	ballast mound only, more possibly buried	Unknown
MM	13591	NJ 03311 63752	N/A	ballast mound only, more possibly buried	Unknown
MMM	N/A	NJ 03250 63432	N/A	Small ballast mound, probably not a vessel	N/A
NN	13592	NJ 03304 63745	N/A	ballast mound only, more possibly buried	Unknown
NNN	N/A	NJ 03243 63426	N/A	Small ballast mound, probably not a vessel	N/A
OO	13593	NJ 03303 63730	N/A	N/A - boiler only, probably from vessel PP	N/A
OOO	N/A	NJ 03232 63356	N/A	Small ballast mound, probably not a vessel	N/A
PP	13594	NJ 03299 63717	Carvel	1 st class Zulu. See detailed catalogue	58ft
PPP	N/A	NJ 03224 63347	N/A	Small ballast mound, probably not a vessel	N/A
QQ	13595	NJ 03313 63719	N/A	ballast mound only, more possibly buried	Unknown

Vessel ID	SCHARP ID	NGR	Construction	Vessel type	Estimated keel length (ft)
QQQ	13607	NJ 03363 63744	Carvel	1 st class Zulu. See detailed catalogue	Est.c.56ft?
RR	13596	NJ 03283 63697	N/A	Single timber: stem post with rams horns, associated with SS	N/A
SS	13597	NJ 03296 63690	Carvel	1 st class Zulu. See detailed catalogue	46ft
TT	13598	NJ 03287 63685	N/A	Butterfly shaped ballast mound, probably remains of vessel	Unknown
UU	13599	NJ 03290 63654	Unknown	Wooden fishing boat under ballast mound, more remains buried	31ft
VV	13600	NJ 03277 63646	N/A	Ballast mound only	Unknown
WW	13601	NJ 03284 63624	Unknown	1st class Zulu, keel/keelson and butterfly-shaped ballast mound	47ft
XX	13602	NJ 03286 63608	N/A	Butterfly shaped ballast mound, probably remains of vessel	Unknown
YY	13603	NJ 03280 63587	N/A	ballast mound only, more possibly buried	Unknown
ZZ	13604	NJ 03288 63575	N/A	Butterfly shaped ballast mound, one detached timber, probably remains of vessel	Unknown

Table 3: Findhorn Bay vessel catalogue

Table 4

WRECK	BOAT COMPONENT	ON-SITE IDENTIFICATION	MICROSCOPIC IDENTIFICATION
BB	Stern post	Oak	Oak (<i>Quercus</i> sp.)
BB	Lower futtocks x3	Oak	Oak (<i>Quercus</i> sp.)
BB	Lower futtocks x3	Not oak	-
BB	Keel	Not oak	Larch (<i>Larix decidua</i>)
BBB	Floor timber x2	Oak	Oak (<i>Quercus</i> sp.)
BBB	Stern post with gudgeons	Oak	Oak (<i>Quercus</i> sp.)
BBB	Foot of stern post	Oak	Oak (<i>Quercus</i> sp.)
BBB	Keel	Beech	Beech (<i>Fagus sylvatica</i>)
BBB	Frames x6	Oak	Oak (<i>Quercus</i> sp.)
BBB	Planking (towards stern)		Larch (<i>Larix decidua</i>)
CC	Keel	Beech	Beech (<i>Fagus sylvatica</i>)
GGG	Stern post	Oak	Oak (<i>Quercus</i> sp.)
GGG	Keel		Larch (<i>Larix decidua</i>)
III (part of JJJ)	Top rail	Oak	Oak (<i>Quercus</i> sp.)
JJJ	Stern post	Oak	Oak (<i>Quercus</i> sp.)
JJJ	3x bow frames	Oak	Oak (<i>Quercus</i> sp.)
JJJ	Stern post	Oak	Oak (<i>Quercus</i> sp.)
JJJ	3x stern frames	Oak	Oak (<i>Quercus</i> sp.)
JJJ	Mizzen mast step	Oak	Oak (<i>Quercus</i> sp.)
JJJ	Port side planking	Softwood	Larch (<i>Larix decidua</i>)

WRECK	BOAT COMPONENT	ON-SITE IDENTIFICATION	MICROSCOPIC IDENTIFICATION
JJ	Stern post	Oak	Oak (<i>Quercus</i> sp.)
JJ	Frame 1	Oak	Oak (<i>Quercus</i> sp.)
JJ	Frame 2	-	Larch (<i>Larix decidua</i>)
JJ	Frame 3	Softwood	Larch (<i>Larix decidua</i>)
JJ	Starboard top rail	Oak	Oak (<i>Quercus</i> sp.)
JJ	Beam towards bow	Softwood	Larch (<i>Larix decidua</i>)
KK	Frame x4	Oak	Oak (<i>Quercus</i> sp.)
KK	Frame x4	Softwood	Larch (<i>Larix decidua</i>)
PP	Keel	Beech	Beech (<i>Fagus sylvatica</i>)
PP	Stern post	Oak	Oak (<i>Quercus</i> sp.)
PP	Stern deadwood	Oak	Oak (<i>Quercus</i> sp.)
SS	Frames x3	Not oak	Larch (<i>Larix decidua</i>)
SS	Keel	Not oak	?
UU	Keel	Beech	Beech (<i>Fagus sylvatica</i>)
WW	Keel	Beech	Beech (<i>Fagus sylvatica</i>)

Table 4: Wood species identification, Michael Sharpe.

Graphs

Graph 1, figure 11

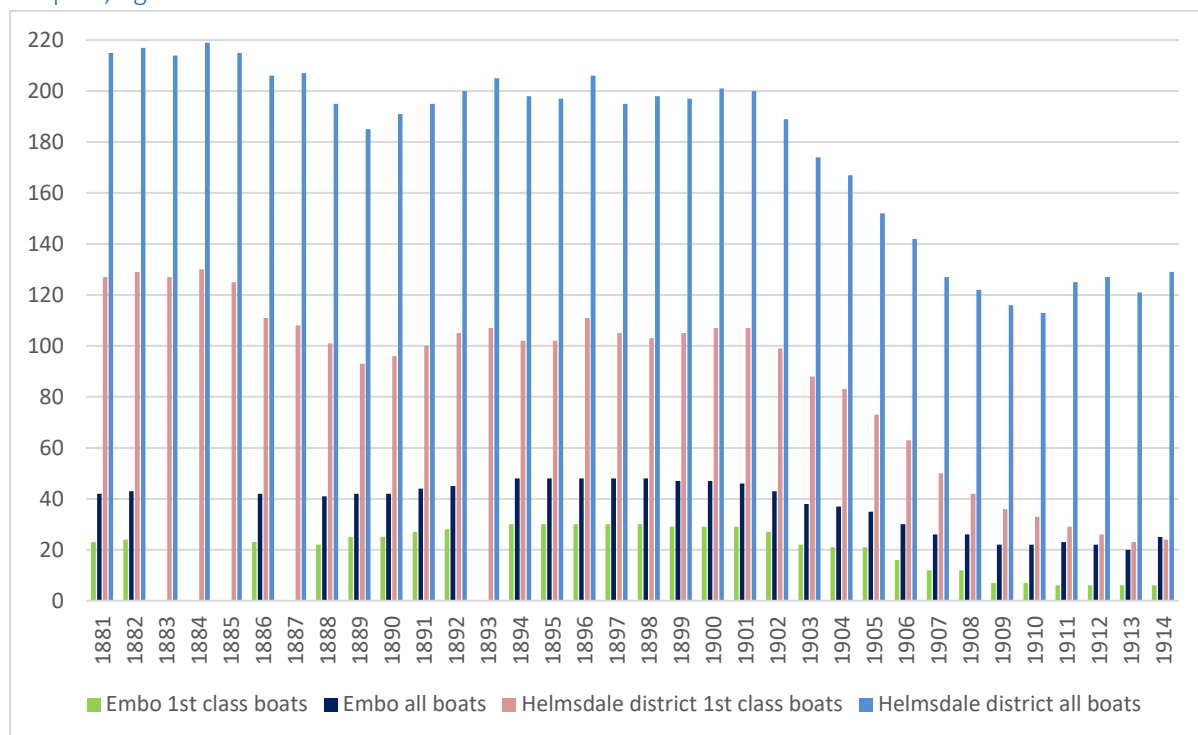


Figure 11: Data from the Annual Reports of the Fishery Board showing the total number of boats and the number of 1st class boats for the Helmsdale District and for Embo. The gaps reflect volumes missing from the collection of the Scottish Fisheries Museum.

Graph 2, figure 12



Figure 12: Numbers of resident fishermen in the District of Helmsdale and in Embo, compared with the figures of those employed in herring during the District's week of peak activity.

Graph 3, figure 13

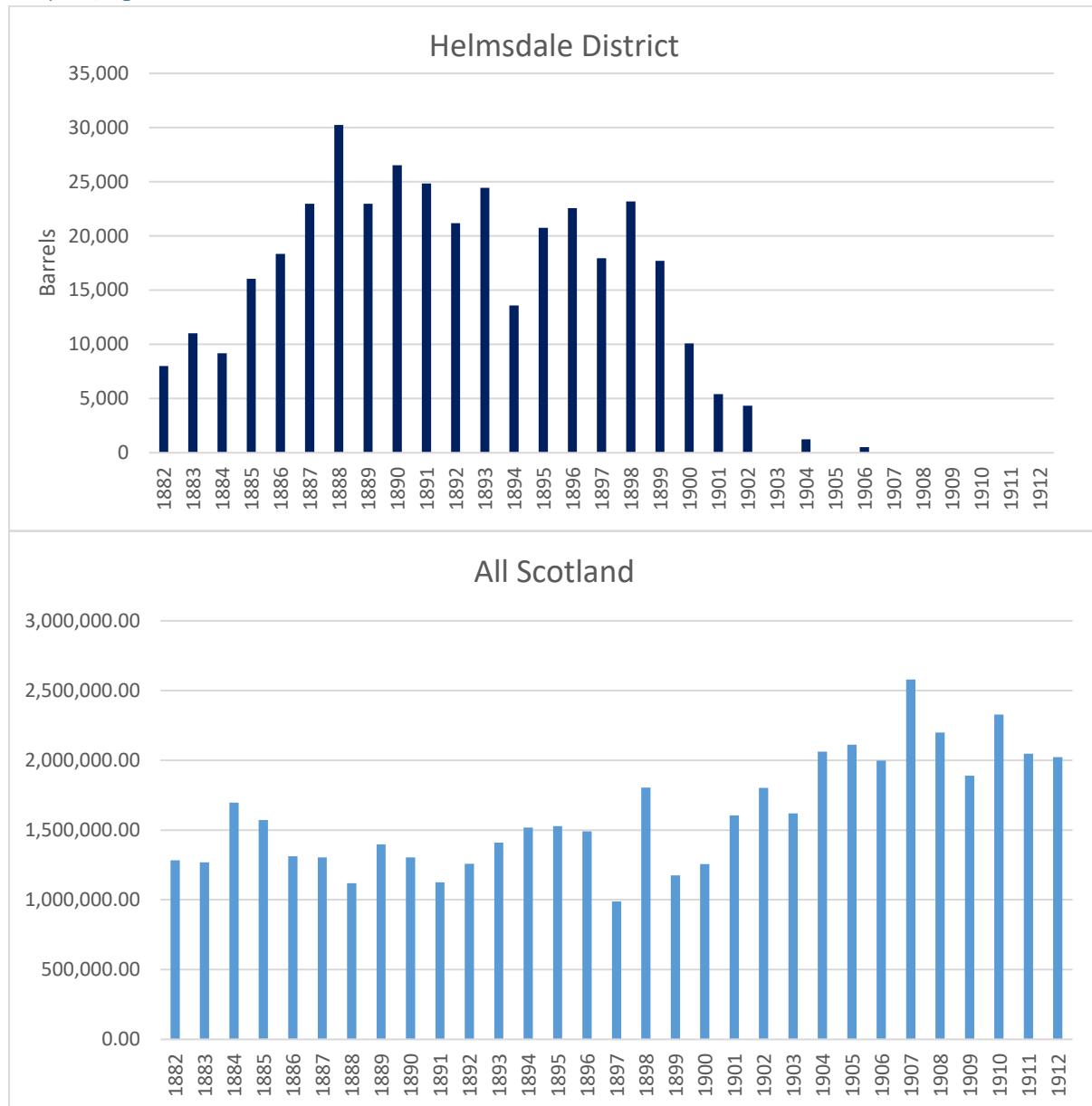


Figure 13: Data from the Annual Reports of the Fishery Board showing the number of barrels produced by Helmsdale District (top) (data only recorded to 1906) compared with the national output. Data from <http://www.scottishherringhistory.uk/statistics/AnnualExport.html>, 14/12/2018

Graph 4, figure 21

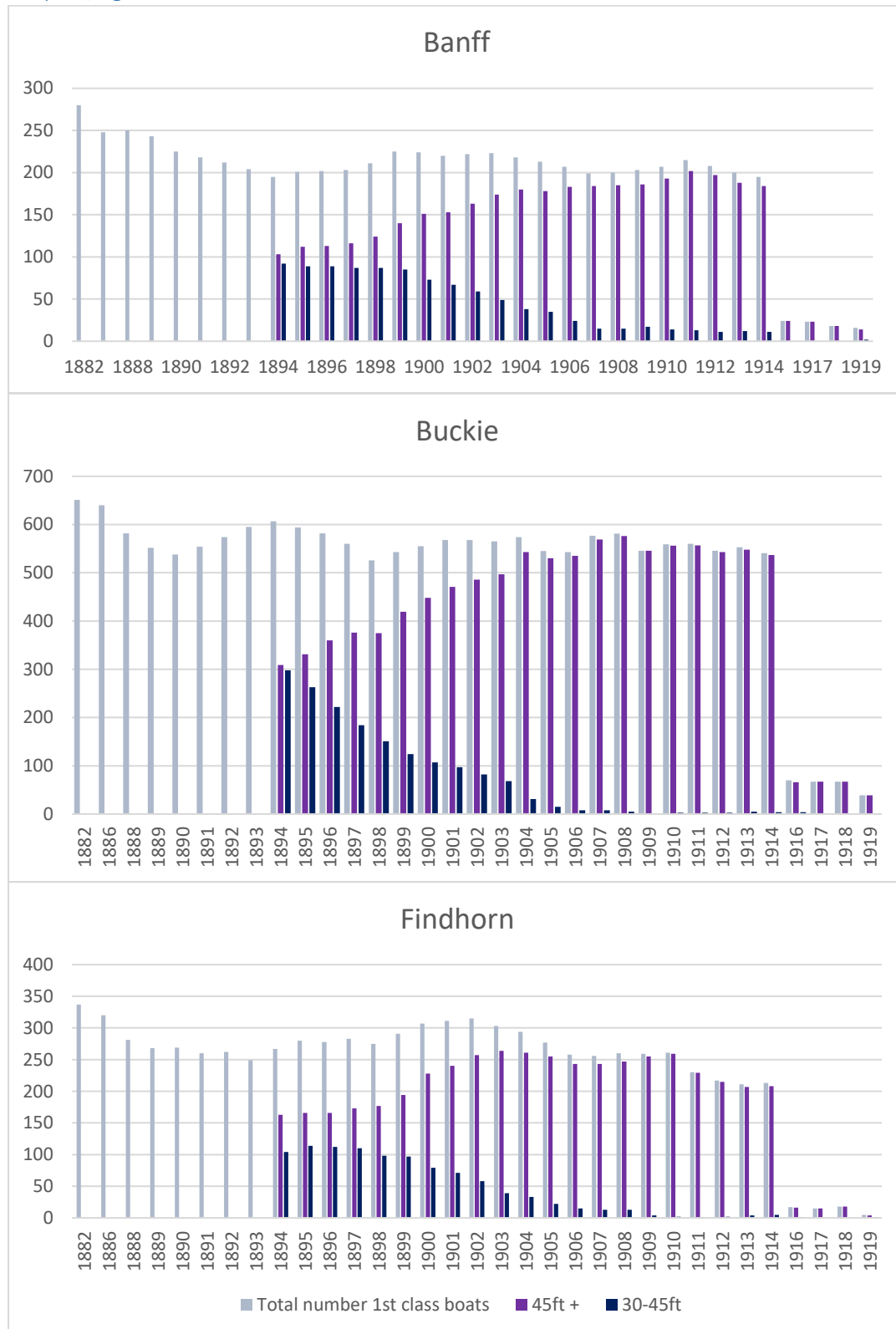


Figure 21: Data from the Annual Reports of the Fishery Board showing the total number of 1st class boats and the two sub-categories for Banff (top) Buckie (middle) and Findhorn (bottom) Districts.

Graph 5, figure 22

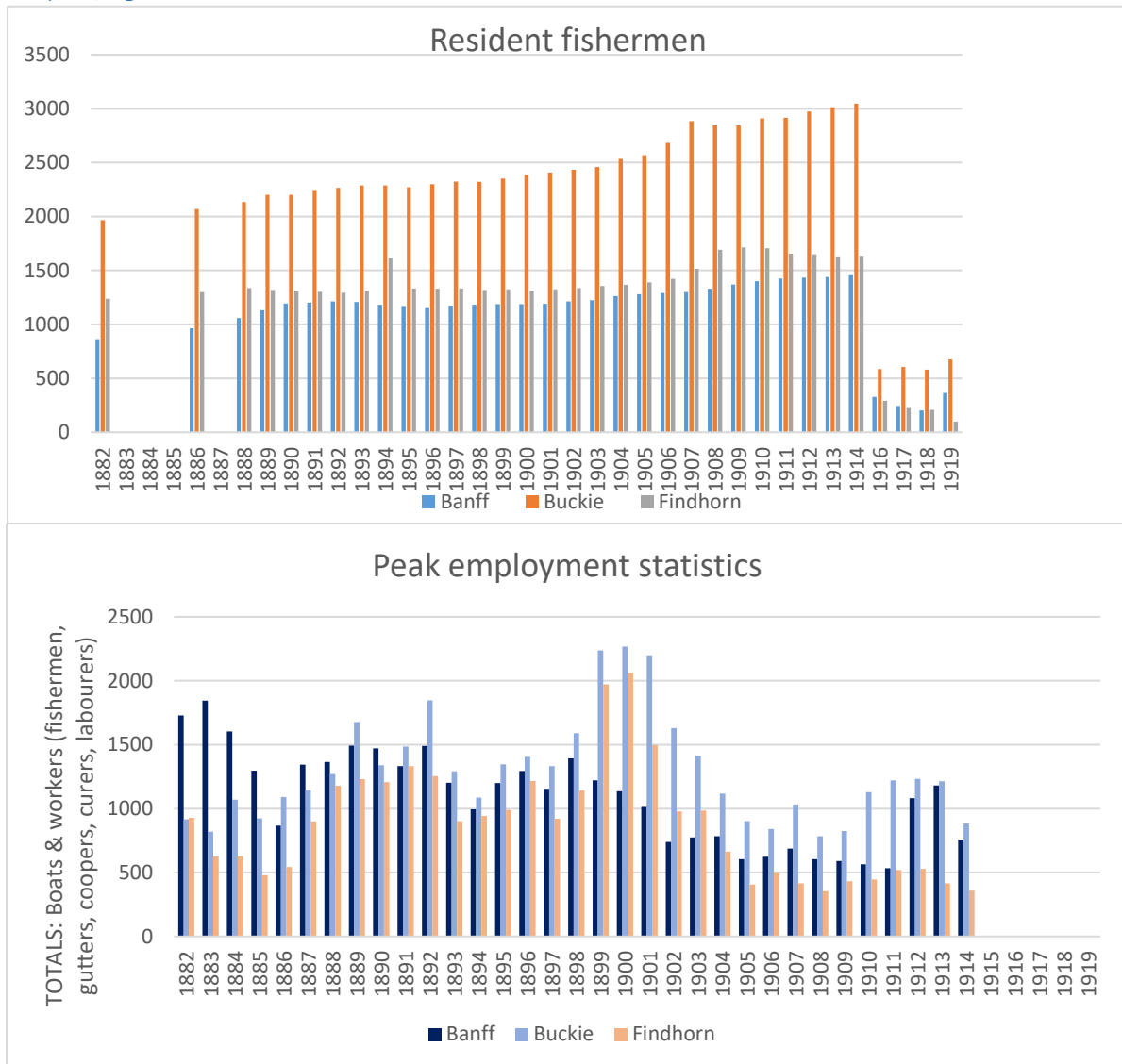


Figure 22. Numbers of resident fishermen in the three Districts, compared with the overall employment figures for each District's week of peak activity (<http://www.scottishherringhistory.uk/statistics/Employment.html>, 23/05/2017).

Graph 6, figure 23

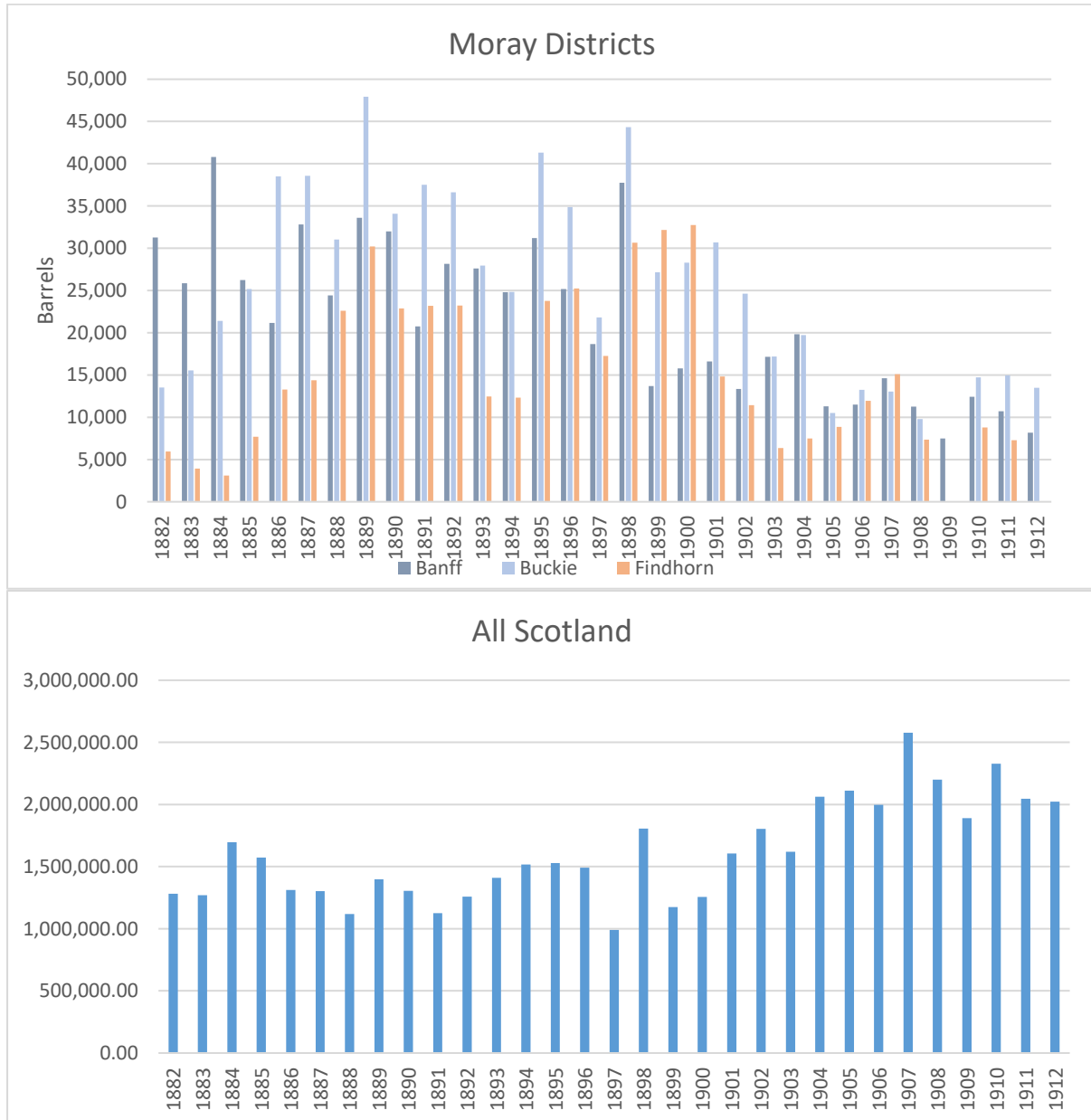


Figure 23: Data from the Annual Reports of the Fishery Board showing the number of barrels produced by Banff, Buckie and Findhorn Districts compared with the national output. Data from <http://www.scottishherringhistory.uk/statistics/AnnualExport.html>, 23/05/2017

Graph 7, figure 24

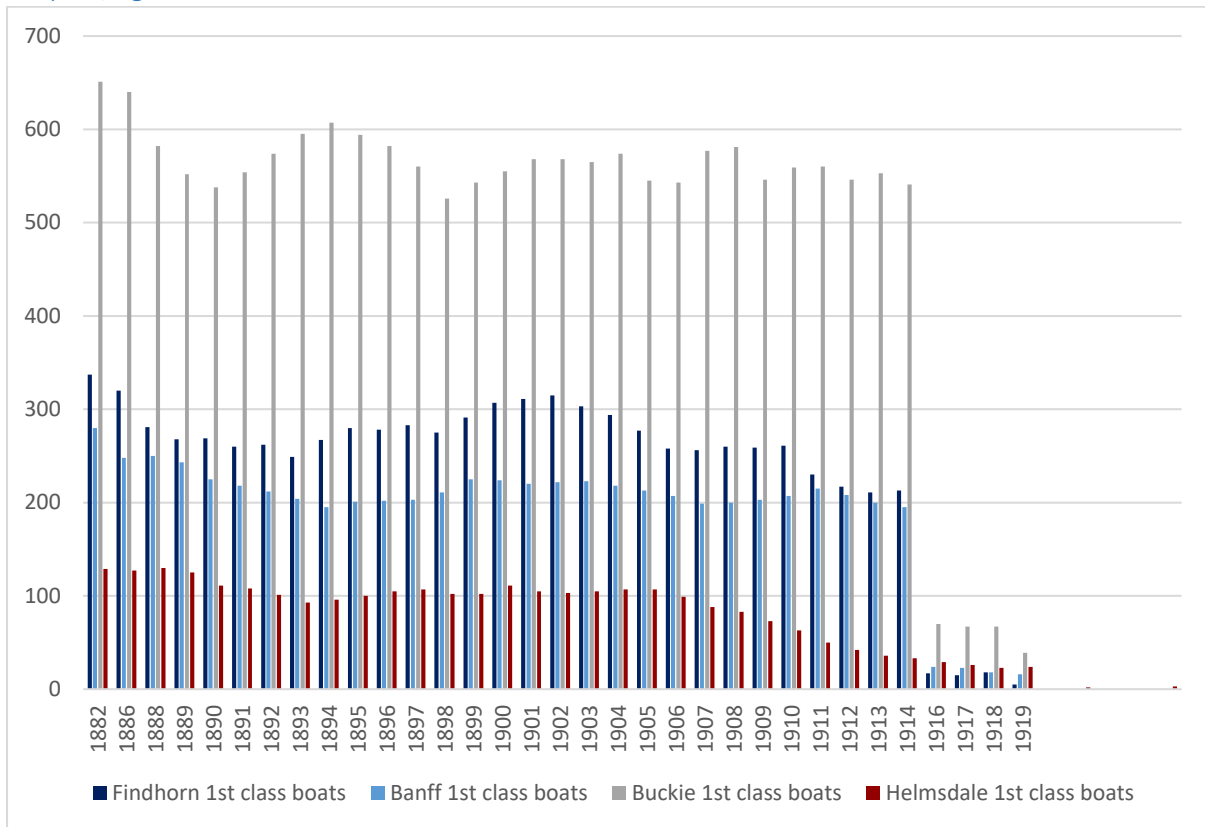


Figure 24. 1st class boats in all Districts, showing the steady numbers of vessels in Moray Districts up to 1914, compared to the decline of the Helmsdale fleet.